FOI
SWEDISH DEFENCE
RESEARCH AGENCY

FOI-R--0813--SE
April 2003
ISSN 1650-1942
Scientific Report

Defence Technology as Security Policy

Defence R&T as a Security Policy Tool in Europe, France, and the United Kingdom

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ISSN 1650-1942
Vetenskaplig rapport

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Utgivare	Rapportnummer, ISRN	Klassificering
Totalförsvarets Forskningsinstitut - FOI Försvarsanalys 172 90 Stockholm	FOI-R--0813--SE	Vetenskaplig rapport
	Forskningsområde 1. Försvars- och säkerhetspolitik	
	Månad, år April 2003	**Projektnummer** A1109
	Verksamhetsgren 1. Forskning för regeringens behov	
	Delområde 11 Forskning för regeringens behov	

Författare/redaktör	Projektledare
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	Godkänd av Bo Ljung
	Uppdragsgivare/kundbeteckning Försvarsdepartementet
	Tekniskt och/eller vetenskapligt ansvarig

Rapportens titel

Försvarsteknologi som säkerhetspolitik: Militär FoT som säkerhetspolitiskt medel i Europa, Frankrike och Storbritannien

Sammanfattning (högst 200 ord)

Högteknologi och forskning om detta inom försvarssektorn – försvars-FoT – är en ofta avgörande faktor för staters säkerhetspolitik och för utgången av internationella händelseförlopp. Syftet med denna rapport är att från både teknikpolitiska och säkerhetspolitiska utgångspunkter studera några av de mest avancerade systemen för försvars-FoT, nämligen de franska och de brittiska nationella systemen samt några olika multilaterala FoT-projekt.

Slutsatser dras inom fyra huvudsakliga analysområden. Det första diskuterar frågan om interdependens eller egenintressen dominerar uppbyggnaden av länders och multilaterala organs försvars-FoT. Resultaten indikerar, att även om interdependensretorik är frekvent är egenintressen i hög grad styrande. Det andra området gäller vilken sorts aktörer – pluralistiska eller statscentriska – som styr planläggningen av satsningarna inom försvars-FoT. Multilateralt dominerar statsmakterna, medan det på nationell nivå – framför allt i Storbritannien – finns nyare aktörer, t ex QinetiQ, ett nyligen privatiserat försvarsforskningsföretag.

Det tredje området rör gemensamma värderingar resp. materiell makt som förklaringsfaktorer för försvars-FoT. Rapporten drar slutsatsen att även om värderingar är underlättande snarare än nödvändiga faktorer är inte maktfrågor i sig själva tillräckliga för att förklara uppkomsten av internationellt samarbete. Det sista området rör dikotomin globalisering-geopolitik. Flera europeiska multilaterala utvecklingar inom försvars-FoT kan ses som geopolitiskt motiverade balanseringsförsök gentemot USA, vilket också understryks av fransk nationell retorik. Den brittiska linjen är mer splittrad, men torde på sikt fortsatt ha en atlantisk inriktning. Detta förstärks i viss mån av globaliseringsprocessen, till vilken det brittiska systemet är väl anpassat.

Nyckelord

Försvarsteknologi, säkerhetspolitik, EU, Frankrike, Storbritannien

Övriga bibliografiska uppgifter	Språk Engelska
ISSN 1650-1942	**Antal sidor:** 135 s.
Distribution enligt missiv	**Pris: Enligt prislista**

Issuing organization	Report number, ISRN	Report type
FOI – Swedish Defence Research Agency Defence Analysis SE-172 90 Stockholm	FOI-R--0813--SE	Scientific report
	Programme Areas 1. Defence and Security Policy	
	Month year April 2003	**Project no.** A1109
	General Research Areas 1. Policy Support to the Government	
	Subcategories 11 Policy Support to the Government	

Author/s (editor/s)	Project manager
Jenny Clevström and Mike Winnerstig	Mike Winnerstig
	Approved by Bo Ljung
	Sponsoring agency
	Scientifically and technically responsible

Report title (In translation)

Defence Technology as Security Policy: Defence R&T as a Security Policy Tool in Europe, France, and the United Kingdom

Abstract (not more than 200 words)

Defence R&T is often a decisive factor in the formation of state security policy as well as for certain international-political outcomes. The aim of this report is to study some of the most advanced defence R&T systems, i.e. the French and British national systems as well as a number of multilateral projects, from both a technology policy and a security policy perspective.

Conclusions are drawn from four main areas of analysis. The first area considers whether interdependence or more egotist national interests dominate the buildup of national and multilateral defence R&T. The results indicate that, despite the fact that interdependence rhetoric is common, national interests clearly dominate the field. The other area concerns what kind of actors – pluralist or state-centric – govern the planning of defence R&T. Here, at the multilateral level, state actors are clearly dominant, whereas at the national level some newer, more pluralist actors have emerged. An example of the latter is QinetiQ, a recently privatized British defence research company.

The third area concerns common values vs. material power as explanations for the development of defence R&T. The report concludes that common values seem to function as facilitating rather than necessary conditions. The issue of material power, in turn, are necessary but not sufficient conditions for the development of international collaboration on defence R&T. The last area considers globalization vs. geopolitics. Several European multilateral defence R&T projects can be regarded as geopolitical balancing moves against the USA. French rhetoric underlines this, whereas the British position, albeit somewhat split, will retain an Atlanticist orientation. The latter is reinforced by the process of globalization, a development to which the British defence R&T system is well suited.

Keywords

Defence Technology, Security Policy, EU, France, United Kingdom

Further bibliographic information	Language Swedish
ISSN 1650-1942	**Pages** 135 p.
	Price acc. to pricelist

Acronyms

AGARD	Advisory Group for Aerospace Research and Development
AVT	Applied Vehicle Technology
C3I,	Command, Communications, Control and Intelligence
CDE	Concept Development and Experimentation
CFSP	Common European Security Policy
CMS	Complex Managed Services
CNAD	Conference of National Armaments Directors
COST	European Co-operation in the field of Scientific and Technical Research
CRP	Corporate Research Programme
DARPA	Defense Advanced Research Projects Agency
DAS	Délégation aux Affaires Stratégiques
DERA	Defence Evaluation and Research Agency
DG	Director General
DGA	Délégation General pour l'Armement
DRA	Defence Research Agency
DRG	Defence Research Group
Dstl	Defence Science and Technology Laboratories
DTC	Defence Technology Centers
DTI	Department of Trade and Industry
DTSI	Defence Trade Security Initiative
EC	European Communities
EDC	European Defence Community
EEC	European Economic Community
ERRF	European Rapid Reaction Force
ESDI	European Security and Defence Identity
ESDP	European Security and Defence Policy
ESPRIT	European Strategic Programme for Research and Development in Information Technology
EU	European Union
EUCLID	European Co-Operation for the Long-term in Defence
EURATOM	European Atomic Energy Community
FA	Framework Agreement
GPS	Global Positioning System
HFM	Human Factors and Medicine
IEPG	Independent European Programme Group
IRC	International Research Collaboration
IST	Information Systems Technology
JCB	Joint Capabilities Board
LoI	Letter of Intent
MFA	Ministry of Foreign Affairs

MoD	Ministry of Defence
MoU	Memorandum of Understanding
NATO	North Atlantic Treaty Organisation
NC3A	NATO Command, Control and Communications Agency
OCCAR	Organisation conjoint de coopération en matière d'armement
PPP	Public Private Partnership
PRS	Public Related Service
R&D	Research and Development
R&T	Research and Technology
RACE	R&D in Advanced Communications Technologies in Europe
RBB	Research Building Block
RMA	Revolution in Military Affairs
RTA	Research and Technology Agency
RTB	Research and Technology Board
RTO	Research and Technology Organisation
S&T	Science and Technology
SAS	Studies, Analysis and Simulation
SCI	Systems Concepts and Integration
SDI	Strategic Defense Initiative
SEAD	Suppression of Enemy Air Defences
SET	Sensors and Electronics Technology
SIGINT	Signals Intelligence
TTCP	Technical Tripartite Co-operation Programme
UAV	Unmanned Aerial Vehicle
WEAG	Western European Armaments Group

Executive Summary

High, or cutting-edge, technology has often been a decisive factor in the context of security policy as well as in war. How the central actors in world affairs choose to cooperate and decide on issues of strategic – i.e., defence-related – research and technology (R&T), and the way in which countries allocate their resources to various technology areas, have implications for their security policy making and their relations with other international actors. The aim of this report is to study – from both a technological and a security policy perspective – some of the world's most advanced technological R&T systems, with a special emphasis on two state actors, France and the United Kingdom, and on two multilateral forums for the development of strategic technology, the European Union (EU) and the North Atlantic Treaty Organisation (NATO).

The report is structured in empirical descriptions of the defence R&T systems of France and the UK and a section on multilateral forums, as well as in four sets of research questions related to the R&T systems and their implications for security policy.

The first set of research questions concerns the driving forces of European defence R&T cooperation, that is, whether they reflect a new kind of international relationship, based on interdependence, or whether the actors pursue mainly self-serving policies. At the multilateral, European rhetorical level, there is an obvious bias in favour of the concept of interdependence. However, issues of national rivalry and the predominance of national interests seem to have been the major defining features of European defence R&T. Recent arrangements, such as the Framework Agreement Concerning Measures to Facilitate the Restructuring and Operation of the European Defence Industry (between France, Germany, Italy, Spain, Sweden and the UK), might constitute the first diversions from this pattern, but this is far from certain. In the case of France, the policy could be seen as using interdependence and European integration as tools for protecting its own state interests. In the case of the UK, interdependence rhetoric is also used instrumentally, while at the same time the overriding goal is to optimize the British national armed forces.

The second major set of research questions relates to the type of actors – pluralistic or state-centric – involved in defence R&T. At the multilateral level, the empirical investigation shows that the power of governments in the defence R&T field still is very strong, which also – paradoxically – leads to highly suboptimal results in terms of R&T collaboration. In the French case, the power of the state is still dominant in almost all areas of defence R&T. The financial hardships currently experienced by several state-owned companies might be an agent of change in this regard. The UK, on the other hand, emphasizes competition, which means that different actors are invited to take part in the R&T process. This is evidenced by the privatization of two-thirds of the former Defence and Research Establishment and the less than sentimental view of the domestic defence industry's R&T efforts. If the vision of future, less

regulated and more competitive defence R&T realized, the British system stands to benefit from its current structure.

The third set of questions relates to the dichotomy of common values vs. material and military power; in other words, do common Western, liberal values promote cooperation in defence R&T, or is R&T determined by traditional concerns of military power? At the multilateral level, we note, for example, that the total R&T-related work of the multilateral Western European Armaments Group (WEAG) in 2001 constituted only 2% of the European countries' combined R&T expenditure. However, many cooperative efforts are currently under way in Europe – the Framework Agreement, the Europa Memorandum of Understanding (MoU), and the Galileo programme, to mention just a few – which indicates a willingness among the European countries to increase their technological cooperation. While common values and identities alone cannot explain cooperation, or the lack thereof, neither can national striving for power.

In the French case, issues of values and identities can be said to contribute to the historically complicated French–US relationship. A certain European identity is put forward rhetorically, but defence R&T is considered to be basically a national priority. Only when French national resources do not suffice does policy seem to promote common European resources.

By contrast, the United Kingdom has a long tradition of close research cooperation with the United States. In material terms, this form of cooperation is still the most central to the British defence R&T system. This US–British cooperation has a clear background in common values and a common culture, but British firms seem to be experiencing increasing difficulties in their collaboration with US firms. The process of European integration might also direct the traditionally Atlanticist British policies in a 'Europeanist' direction. However, so far the Atlanticist tendency in British defence R&T seems to be very strong. Recent developments, such as the sale of QinetiQ – formerly the greater part of the national defence research agency, DERA - to a private US company, illustrate this phenomenon.

The last set of research questions concerns the dichotomy of globalization vs. geopolitics. Does the process of globalization play a central role in the development and financing of today's European defence R&T efforts, thus promoting international cooperation, or do traditional geopolitical considerations dominate the pattern of cooperation?

The ongoing process within the EU related to the European Security and Defence Policy (ESDP) can be seen as geopolitically motivated balancing efforts directed against the domination of the USA in the security and defence field. This is obvious in the space field, where there have been many advances in recent years. However, an increased integration of NATO and the EU/ESDP could also provide the impetus for common R&T investments. If, on the other hand, the roles of NATO and the ESDP diverge fundamentally, for reasons of geopolitical balancing, then the R&T investments are likely to be made by the USA and Europe, respectively.

In the French case, the rhetoric promotes a stronger European cooperative stance. In practical terms, European defence expenditure and R&T efforts are declining. The demands of globalization have obviously pressed French decision makers to relinquish some of the salient features of the nationalist, traditional Gaullist policies. Some British representatives exhibit an ambivalent attitude towards cooperation with the USA and the EU. In the UK, globalization is officially appreciated and regarded as a positive development. This also squares with US policies – albeit not with some aspects of its defence industrial policies, including technology transfer – and can be said to coincide with traditional Anglo-Saxon geopolitical considerations.

The primary foundation for states' defence R&T activity thus still seems to be national. However, both the British and French governments keep returning to the concepts of interdependence and integration as self-evident and unavoidable future components of their national efforts. In both countries, however, there seems to be a high degree of uncertainty as to where these new developments will lead. International cooperation consumes time and money that must be reallocated from national efforts, which in turn highlights the dilemma of reducing the latter before there is reliable international collaboration.

1. About the Report

1.1 Introduction

High technology, or cutting-edge technology, has often been a decisive factor in security policy contexts as well as in war. How the central actors in world affairs choose to decide and cooperate on issues of strategic – i.e. militarily relevant – technology, especially in terms of defence-related research and technology (R&T) – is therefore a central factor in the development of international relations. Historical examples abound. From Albert Einstein's letter to President Franklin D. Roosevelt on the military potential of the atomic bomb to President Ronald Reagan's Strategic Defense Initiative and today's US National Missile Defense project, cutting-edge technology has played a major role in international–political outcomes. How countries allocate their resources to various technology areas has implications for their security policy making and their relations with international actors. It is therefore relevant to study these issues from both a technology and a security policy perspective.

Aim of the Report

The objective of this report is to examine some of the most advanced technological R&T systems in the world with a special emphasis on two state actors, France and the United Kingdom, and on two multilateral forums for the development of strategic technology, the European Union (EU) and the North Atlantic Treaty Organisation (NATO).[1]

Moreover, the report takes both a technological and a security policy perspective, where the latter functions as an analytical toolbox for the examination of the political problems and benefits that might arise from technological cooperation – or the lack thereof. The final aim of the report is to constitute a basis for further research in this area, and its theoretical framework is developed with this objective in mind.

The potential gains and problems in this area can easily be identified. On the positive side, fruitful cooperation in strategic R&T among the West European states, and at the multilateral levels of NATO and the EU, could lead to benefits for all concerned parties. This is also interesting if the trend continues towards more integrated multilateral forms of EU foreign policy, such as the European Security and Defence Policy (ESDP): the European national R&T funds could then be spent on organized cooperative ventures, leading to greater efficiency and added value. Cooperation could help to ameliorate the perennial problem of the 'transatlantic gap' in strategic R&T, which can be illustrated *inter alia* by the fact that the EU member states spend only some

[1] The R&T system of the United States has been addressed in a recent FOI report; see Clevström & Lindvall 2001. NATO is, of course, a transatlantic organization rather than a purely European one, but the parts of the NATO framework with which we deal wth in this report are situated in Europe.

30–40% of the level of the US defence R&T budget, despite the fact that the size of the EU economy is similar to that of the USA and its population is much larger.

On the other hand, precisely these issues – EU countries' strengthened integration in the fields of strategic and security policy and the move towards independent policies and venues of cooperation that would exclude the transatlantic NATO structures – could damage relations with the United States, the major NATO state, and with other NATO allies that prefer to deal with defence and security issues in NATO rather than the EU. However, the United States has often argued that the EU countries should do more and spend more on defence in general, including defence R&T. On the basis of this perspective, one would expect the USA to support such European efforts.

The consequences of technological choices for security policy form a classical dilemma of international politics: on the one hand, the EU countries might increase their independent policy-making capability substantially and benefit from more efficient spending on R&T. On the other hand, complicated relations with the United States – owing to an increasingly independent, rather than interdependent, EU stance towards the USA – might create a new set of problems, some of which might be more difficult to resolve than those stemming from the EU countries' current interdependent or dependent relationship with the other side of the Atlantic.

Furthermore, national EU policies, which lead some member states to develop bilateral R&T relationships with the USA and others to develop a unified EU approach – with or without an ambition to politically lead the EU – could cause substantial problems and affect transatlantic relationships. The substantial turbulence in world affairs related to the US-led war against Saddam Hussein's regime in Iraq will probably also affect the general transatlantic relationships, but, at the time of writing, it is still too early to predict how they will be affected.

1.2 Outline of the Report

Chapter 2 presents the theoretical framework of the study and its implications for the empirical research. Chapter 3 outlines the general aspects of European strategic and defence-related R&T in order to frame the studies of two national systems, the French and the British.

Chapters 4 and 5, respectively, start with a brief historical outline of French and British foreign, security and defence policy, followed by an in-depth analysis of the defence R&T systems of the two countries.

Chapter 6 presents the conclusions of the report, using the theoretical framework developed in chapter 2 as an instrument of analysis.

The report is part of a recently developed, long-term field of research within FOI. As such, it constitutes a basis for other studies within this field. Forthcoming studies in

this area, to be initiated during 2003, will among other things consider the US defence R&T system, the issue of the transatlantic technology gap, and the importance of this gap for US–European security relations.

2. Security Policy and Technology Policy – A Framework for Analysis

2.1 Introduction

Apart from the more descriptive goals of this report – which relate to the actual R&T systems for and resources allocated to defence R&T work in France, the UK and two multilateral forums – the analytical focal point is the issue of cooperation. This concerns the defence R&T issue itself, but also relates to the general relationships – especially in terms of security policy – between states, transnational and domestic non-state actors such as the defence industry, and multilateral organizations dealing with defence R&T issues.

In the process of identifying the patterns and conditions for defence R&T cooperation, we also examine the linkage between the general strategic postures of the actors and their defence R&T efforts. We start by providing a brief analysis of the traditional policy stances and international–political experiences of the actors.

Cooperation is itself a contested concept, and the reasons why states and other actors collaborate, on the one hand, and the constraints and hindrances of cooperation, on the other, continue to form a substantial part of the scientific debate on international relations. The major problem areas that are related to the issue of cooperation in the international setting and from a security policy perspective are examined below.

2.2 Cooperation and Competing Paradigms

Interdependence or balance of power?

The foremost, but also the most abstract, condition for the debate on international cooperation, generally speaking, is the question whether the world – that is, international relations in general – has undergone fundamental changes in recent decades. Many argue that the political situation today has to a substantial degree enhanced the possibilities for international cooperation.[2] In this world view, the present international system is one based on *complex interdependence*.[3] This idea entails three interconnected features. First, multiple channels – interstate, transgovernmental, and transnational – connect modern societies, which do not rely exclusively on traditional, strictly governmental relations. Second, there is no clear or consistent hierarchy, even in interstate relationships; military security does not always dominate the latter. Third, military force is not used within interdependent regions.[4]

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[2] Zacher & Matthew 1995:109.

[3] Keohane & Nye 1989:3, passim.

[4] Keohane & Nye 1989:3, 24f.

Interdependence thus implies that what the government of a state does always affects other states, and vice versa. Unilateral action therefore becomes a problem if it has a negative effect on other actors in the system.[5] Thus, the interconnections of states and their actions determine the preferences of states: interdependence imposes binding constraints on state behaviour.[6] Furthermore, military issues – such as military threats, armaments, and balances of power – do not alone determine the international relationships of interdependent states. Such issues, which dominated international relations before the current age of interdependence, often led to a lack of cooperation and outright conflict, although today this occurs much less frequently, at least within the interdependent system. Interdependence itself does not necessarily promote peace and friendship but militarily interdependent states, regardless of whether they perceive themselves as 'enemies' or 'friends', are more likely than independent states[7] to maintain peaceful relations with each other.

On the other side of the debate, some analysts still see international relations as essentially a version of the 'state of nature', where the law of the jungle rules: every state must pursue its own interests, since no other state will.[8] The international system is still basically a world of many sovereign states – each following its own ambitions and desires without any overarching, well-functioning system of enforceable law – in which conflicts that may lead to war are bound to occur.[9] This view of international politics leads to a grim picture of world affairs. Regardless of how 'similar' states are in terms of ideology, identity and other related factors, they will always have conflicts of interests.[10]Thus, what we should expect even among and between Western, liberal, democratic and even allied states is that they pursue highly self-serving policies, display 'realpolitik' behaviour, engage others in balance-of-power games, and so on.[11]

With these two different views of international politics in mind, our first research question regarding defence R&T should therefore be the following:

- Does the level of cooperation in the defence R&T setting reflect a new kind of international relations, related to the concept of interdependence, or do the actors involved pursue mainly self-serving policies with their own state as the primary beneficiary?

Pluralistic Actors or Unitary States?

The view of the state as a conglomerate of domestic, societal actors, rather than as dominated by egotistical nation-states, is in line with the idea of the world as an in-

5 Adler, Crawford & Donnelly 1991:38.

6 Moravcsik 1997:520.

7 Doyle 1996.

8 Waltz 1959:165-171.

9 Ibid.:159.

10 Ibid.:182.

11 Waltz 1979:66.

terdependent system. In the first place, this view indicates that the interests or preferences of the state are, to a high degree, determined by domestic factors. Second, since the formation of a state's foreign policy is highly dependent on the interests of the state, foreign policy making also becomes highly dependent on the same, intra-state factors.[12]

Thus, non-governmental actors, such as interest groups, industry, transnational companies and public opinion, determine government policy.[13] Furthermore, a government agency may, rather than acting in the interest of a unified state, 'pursue its own interest under the guise of the national interest; and recurrent interactions can change official perceptions of their interests.'[14] That is, the workings of the government's apparatus can themselves change policy without any interference from, for example, external, international actors.[15] It also means that there is a direct causal link between societal–political domestic change and state behaviour in world politics: a new government, based in a new domestic political setting, can change foreign policy very considerably – not least in an important field such as strategic R&T.[16]

By contrast, the traditional view is that the state, as a unitary, self-serving entity, remains the main actor in the international system. This is not to say that nation-states are the eternal actor in the arena of world politics – only that they currently are the most important ones. They can also change: the transformation of modern states into larger and presumably more capable entities is entirely possible, albeit somewhat rare.[17] In line with this thinking is the idea that the new international balance of power – with the USA as the sole current superpower and with China as one of the rising powers – will force European states to develop the European Union into a larger entity: a federation of states which in the long run will become a new, enormous state in its own right and thus a major world actor.

This is related to another important traditional assumption about state action: in a self-help system such as the international one, those who do not 'mind their own business' in the constant international competition will suffer, regardless of their own rationality and intentions.[18] The expectation that can be extrapolated from this is that a successful state will trigger other states to become more similar to it.

Thus, the second major set of research questions can be formulated in the following way:

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12 Zacher & Matthew 1995:118.

13 Cf. also Zacher & Matthew 1995:119.

14 Keohane & Nye 1989:34f.

15 Milner 1997:261.

16 Cf. Moravcsik 1997:535.

17 Morgenthau 1948/1962:10.

18 Waltz 1979:118.

- Does the overall development of defence R&T efforts in France and the UK, and at the multilateral level, reflect a struggle among pluralistic actors, many of which are non-governmental? Do policies change after the intervention of non-governmental actors, such as industrial groupings? Or are the power and influence of the nation-states and their governmental actors still the most important factors?

Immaterial Factors or Material Power as Determining Issues?

Among analysts of international relations who embrace the domestic-sources view of foreign and security policy, there is no real consensus on which domestic factors affect, or determine, state interests. However, many hold the view that immaterial, rather than material, factors are among the most important in this regard.[19] Thus, ideas – in the form of values, norms and knowledge – are crucial parts of the construction and workings of international relations, since they affect the identities and actions of the states inhabiting them.[20]

For the purposes of this report, what is central in this view is that the concept of immaterial factors makes it possible to distinguish liberal from non-liberal states: the former are expected to behave very differently towards each other than towards non-liberal states.[21] Since the objects of this study belong to the category of liberal, Western, democratic states, they should exhibit a pattern of cooperation that is very different from what would be expected of non-liberal states. According to this reasoning, multilateral defence R&T cooperation among democratic states should not be hampered by, for example, defence-related security concerns.

The other view reflects the age-old idea of the importance of power – especially military power – in international relations. If military armaments are the principal means by which a nation maintains or re-establishes its power,[22] the immaterial factors of international life – such as common liberal identities – should be of minor interest, since the states of the international system would focus on the balance of power and act if it is threatened, that is, if any one state becomes too powerful.[23] This report deals with an important element of military power – defence R&T. This area should be affected by the same problems as regards cooperation.According to balance-of-power theorists, they have haunted the international system for ages: for reasons of lack of trust, nations do not want others to share their own defence R&T secrets or inventions. Furthermore, most research efforts should take place within a national rather than a multilateral setting.

Hence, the third set of research questions can be formulated in the following way:

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[19] More materialistic forms of liberalism indicate instead that the domestic pressure groups' narrow self-interests are more important than ideational factors. Cf. e.g. Milner 1997.

[20] Risse-Kappen 1995a:25f and Wendt 1987, 1992, 1994, 1999.

[21] Doyle 1997:19, 211.

[22] Morgenthau 1948/1962:180.

[23] Ibid.:23.

- Do the states analysed seem to cooperate on defence R&T because of their common liberal, Western democratic values and identities? Or does cooperation seem to be severely hampered by traditional concerns, based on the primacy of military power and the lack of willingness among states to share what they perceive as cutting-edge R&T knowledge or inventions?

Globalization or Geopolitics as Central Conditions?

After the end of the cold war, the importance of economic factors seemed to many analysts to supersede traditional concerns of security. Articles on the importance of 'geo-economics' rather than the traditional concept of 'geopolitics' began to appear in scholarly journals and politicians tended to focus on economics rather than on defence.[24] In addition, the concept of globalization, one closely related to international economic factors, was attracting increasingly more attention.

Generally speaking, the notion of globalization includes a number of conditions that determine the governance of modern economic relations and affairs. The major conditions can be identified as follows. First, the economic power of the markets – after the deregulation of world finance during the 1980s, which allowed for an unprecedented international freedom of capital movement – today vastly surpasses the economic power of a single state or even groups of states. This means that the traditional ability of a state to intervene in different markets and to govern the behaviour of non-state economic actors has diminished tremendously.

Second, another effect of the enhanced independence of market actors – such as large multinational companies – is that they are becoming increasingly more independent of national affiliation. In other words, although a company must have its headquarters somewhere in the world, the location is determined not by any nationalistic sentiments but by the economic conditions prevailing in a particular country, that is, the same considerations as are taken into account when decisions are made about production. It goes without saying that this development, if it is as salient as the proponents of globalization suggest, will have profound implications for the ability of states to govern the defence industry, not least its R&T parts.

Finally, the process of globalization is also related to the fact that national economies can only with difficulty resist international influences. Given the interdependence of national economies in a globalized world, it becomes very difficult for a single country to carry out radically different economic policies in relation to other countries. Thus, the defence industry and industry- or state-sponsored defence R&T ventures would to an increasing degree be internationalized, in terms of multilateral, cooperative joint ventures.

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[24] Cf. e.g. Luttwak 1990:17-23.

However, the traditional views of the geopolitical conditions of international cooperation have not disappeared; on the contrary, they still have a large following. A geopolitical perspective yields a very different world view than that offered by the concept of globalization. The key idea of geopolitics – the merger of the geographical and the political – is that the geographical location of a nation determines its security policy and strategy.[25] The proponents of geopolitics have always put great analytical emphasis on the Eurasian/North American balance of power. Since Eurasia, together with Africa, is territorially roughly twice the size of North and South America combined, a 'land power' dominating the Eurasian landmass could have the capacity to overwhelm the insular 'sea powers' of the USA and the UK.[26] Regardless of the process of globalization, which seemingly transcends these geographical boundaries, the trajectories of international relations are, in this view, still governed by the same geographical–political factors that have influenced them for a very long time.

Thus, for many US geopoliticians, the USA should actively promote a balance of power, and a political division, between the most powerful states of Eurasia, in particular Russia, Germany, China and Japan.[27] Consequently, a united Europe should be considered as a strategic threat to the United States, because a future federal, or otherwise unified, Europe would clearly have the capacity to drastically diminish the United States' influence in Europe.[28] These analysts also tend to point to the problems that could arise if Europe should stop regarding the USA as a 'European power'. A united Western Europe without close links to the USA would spell disaster not only for the USA but also for Western Europe, since Russia or an Asian power – e.g. China – could then dominate Eurasia.[29]

By contrast, in a Eurocentric but still geopolitical balance-of-power view, the European states could be expected to unite in order to balance the sole superpower – the USA. The overwhelming power of the USA in world affairs, owing to its military supremacy, should thus be a sufficient cause for European states – regardless of their ideological and value-oriented affinity with the USA – to balance it by military and other means. In this view, the EU could become a major vehicle for balance of power-related action by European states against the USA.

On the other hand, if the EU member states do not want to give up their sovereignty and develop the EU into, for example, a federal state, the consequence could be that some European states might be more willing to bandwagon with the USA than to try to balance it. In the traditional view, the European states have to choose between balancing against or bandwagoning with the USA. The role of the UK is of special

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[25] The term geopolitics, or *Geopolitik*, was coined by the Swedish political scientist Rudolf Kjellén (see e.g. Kjellén 1916). Cf. also Spykman 1942:41.

[26] Mackinder 1919/1996:46.

[27] Spykman 1942:179-187.

[28] See e.g. Waltz 1979:202, Sloan 1988, Huntington 1991:8, 12f, Gray 1996:68, Kissinger 1994:813 and Brzezinski 1997:30f.

[29] Brzezinski 1997:35.

interest here: traditionally an Atlanticist state with close links to the USA, it has the potential to fundamentally change the policy of the EU if it should take a more Eurocentric stance.

Related to the topic of this report, the last set of security policy-oriented research questions should therefore be the following:

- Does the process of globalization play a central role in the development and financing of today's defence R&T, and does it promote international cooperation within that field, including transatlantic cooperation in for example the NATO framework? Or do traditional geopolitical considerations dominate the pattern of cooperation? If so, do the trends indicate that the European states are increasingly trying to balance the USA by cooperating in European, rather than transatlantic, defence R&T research efforts, or are some or several of them bandwagoning with the USA in order to gain individual benefits from bilateral cooperative ventures?

2.3 Summary of the Security Policy-Related Research Questions

From the above outline, we can summarize the analytical framework. In the table below, the subjects of study of this report are related to the security policy-oriented research questions of this theoretical framework. In addition to France and the UK, two multilateral forums – the EU and NATO – are considered.

Security Policy Research Questions

Issue	**Actor**			
	France	**UK**	**EU**	**NATO**
Cooperation based on interdependence or self-serving policies?				
Pluralistic actors or governmental Power?				
Cooperation enhanced by common values and identities, or hampered by concerns based on primacy of military power?				
Globalization or geopolitics as central conditions for cooperation?				

With these questions in focus, the report can analyse the questions of defence R&T from a security policy view, which may also suggest how the future of defence R&T cooperation within the field of transatlantic and European security might develop.

2.4 Methodology

The following sections analyse the European, French and British defence R&T systems from these theoretical perspectives. It goes without saying that some of the concepts used in the theoretical framework are difficult to operationalize. The concept of a self-serving 'national interest', for example, is one of the highly contested concepts of political science. Regardless of the content of policies, politicians tend to frame their actions in terms of the 'national interest', which for the purposes of this study may lead to empirical problems. If, for example, a government argues that 'pooling' sovereignty and relinquishing national control of defence R&T to a supranational or multilateral body is in the 'national interest' of that country, is this a self-serving policy or one that is influenced by the process of interdependence? This may be hard to discern, but given the extensive empirical material we have collected, as well as the interviews we held with contemporary actors, the problems of interpretating a certain policy should not be overstated.

The empirical investigation is based primarily on official documents, relevant academic and policy-oriented literature, as well as a number of interviews with decision makers in ministries of defence and foreign affairs and R&T institutions, as well as with researchers and analysts in independent think-tanks.

We also limited the empirical investigation to military-related technological issues. In today's world, much civilian technology, developed by civilian industry, is used in military applications. However, it would lead too far to take all these aspects of civilian industry into account. Thus, we confined the study to directly military-related technologies and research systems.

A simplified form of qualitative analysis is used in which the empirical data are presented in a manner relevant to the analytical framework. From the results of the empirical investigation, conclusions are then drawn with the help of the analytical framework presented above. Finally, the report suggests some implications for future research within the field.

3. Multilateral Technology Cooperation in Europe – Some Examples

This chapter identifies some of the problems, possibilities and development trends that can be found today at the level of the European technological resource base. We concentrate primarily on the technology level of defence-related research and technology.[30] General aspects of ongoing trends and attitudes among the European countries towards cooperation in strategic technologies can usefully be illustrated by other technological perspectives than R&T. We therefore also present examples of trends in European integration and cooperation in the strategically important area of space technology.

Rather than aiming at an all-inclusive survey of the existing forums and programmes for strategic technology cooperation in Europe at the R&T level, this chapter demonstrates trends in and general views on the kinds of defence R&T cooperation – national as well as multilateral – that the European countries seem to be willing to promote in the future.[31] Examples are taken from both civilian and military programmes and from organizations such as the European Union (EU), the Western European Armaments Group (WEAG), and the NATO Research and Technology Organisation (RTO). However, it is not our intention to present organizational outlines of these organizations. The work within WEAG, for example, is discussed from the perspective of one of its cooperation forms, EUCLID, not from an organizational schematic perspective. However, a short organizational description is given for the NATO RTO.

Finally, conclusions are drawn about the advantages and disadvantages stemming both from cooperation on the development of strategic technologies and from continued strategic work at the national level.

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[30] Both the terms R&T and R&D will be used in the following. The two expressions are not equivalent, although they are interchangeable to a great extent. R&D is an older term than R&T, and although more and more references today are made to "R&T" (in order to be able to distinguish development costs from research costs in earlier stages of the process), the term "R&D" is still commonly used to denominate the whole phenomenon of research, technology and development.

[31] Several programs that could be of interest to a study of this kind have out of time reasons been omitted. One program not mentioned here but of interest in the context is the EU civilian Framework Program. Other programs here omitted are the Garteur and Erea programs on the aerospace side. Purely Nordic cooperation programs are omitted as well.

3.1 Problems in the Present European Defence R&T Situation

It could be argued that there are several structural problems in the European defence R&T sector. European R&T efforts are fragmented and, although the funding is impressive, it is spread between national governments, institutions, defence bodies, and industry. There are also problems in creating synergy effects from existing R&T efforts: 80% of public sector civilian and defence research efforts in Europe are organized on the national level, which often implies duplication of efforts.[32] Disparate national regulatory and administrative systems also hamper the transnational transfer of knowledge between European countries.[33]

This fragmentation of R&T efforts in Europe can be partly explained by the historical legacy of national rivalry. The European dimension of defence industry and defence R&D has always been closely linked to the specific character of European defence policies. A senior European Union official recently described the situation in the following way:[34]

> Defence has remained outside the mainstream of the European integration process, after the unsuccessful attempt to build a European Defence Community. [1951-1954] The strategic context of the Cold War and the need of the American nuclear umbrella for the defence of Europe have led the Europeans to trust their security to NATO. Issues of arms procurement and the industrial aspects have followed the same path. (…). Armaments industry and defence R&D have remained essentially the province of national prerogatives. Strategic considerations and economic interests have combined in a mutually reinforcing process that perpetuated fragmentation and dispersion of efforts, weakening the competitiveness of the European armaments industry and tipping the transatlantic balance heavily in favour of the United States.[35]

Although armaments cooperation has been a core objective of the collective military effort in Europe since the founding of the Western European Union in 1948, European nations have had severe difficulties in promoting such collaboration owing to their eagerness to retain maximal influence over their defence industrial bases and to receive maximal returns from them.[36]

Today, however, Europe has set ambitious targets in terms of military capabilities and equipment in the context of the European Security and Defence Policy (ESDP). Although the ESDP process is still in its infancy, some analysts argue that the long-term achievement of these objectives requires cooperative European R&D in the defence sector in order to strengthen the industrial and technological defence base.[37]

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[32] Otte 2002:1.

[33] Escritt 2002:3.

[34] Otte 2002:1.

[35] Ibid.

[36] Cobble 2000:8

[37] Escritt 2002:2.

According to the same reasoning, there is a lack of defence R&D funding at the European level.[38]

Today, the USA spends nearly twice as much on defence as all the European countries combined. US defence spending, which is growing, amounts to around 3.2% of gross domestic product, compared to 2.2% for the European allies as a whole. The gap is even wider for defence R&D: here, the USA spends more than four times as much as all the European countries combined. The fragmentation of European resources adds further competition problems for Europe vis-à-vis the USA.[39]

The question whether there is a technological gap between Europe and the USA – and if so how this gap could be bridged – is not new and continues to be highly relevant. The US attitude towards a technologically advanced Europe is often ambiguous: on the one hand, competition from Europe can be perceived as a threat; on the other hand, the USA has no interest in the development of a technologically weak Europe since this could also imply that Europe would be weak in other areas, such as security, the economy and social stability. [40]

Some analysts argue that primarily structural phenomena within the technological scientific field hamper European countries in their competition with the USA.[41] According to this argument, the dividing line between Europe and the USA is not on the level of technology and research competence. Rather, the decisive difference consists in the United States' ability to concentrate its strength, primarily through DARPA (Defense Advanced Research Projects Agency), which aims mainly at financing revolutionary technological research at both the basic research level and the system concept level. Europe has no equivalent to DARPA and its resources are used more inefficiently – research efforts are often duplicated.

Researchers at the Norwegian Defence Research Establishment (FFI) have illustrated the United States' ability to concentrate efforts within defence-oriented science and technology research in the following picture:

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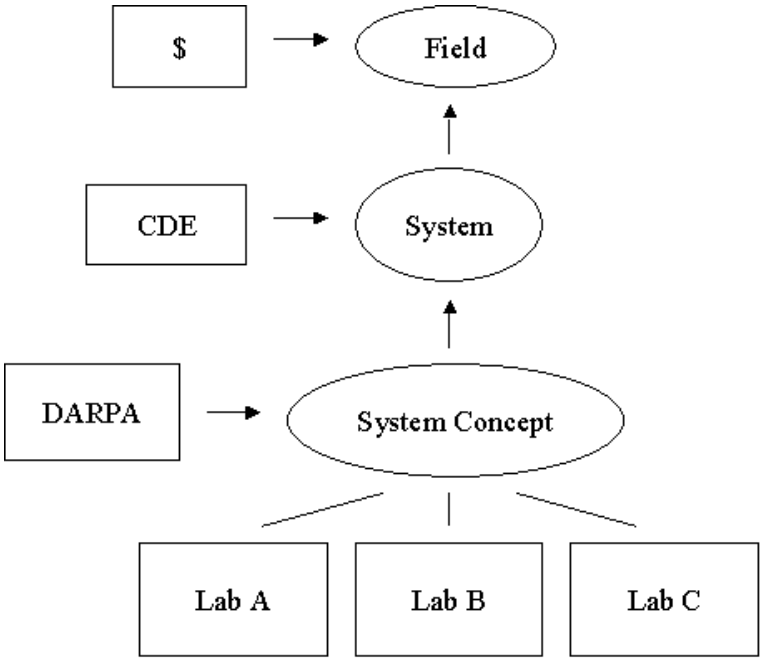
38 Otte 2002:1.

39 Enders 2002:1.

40 For an early, more thorough discussion on the technological gap see Pierre [ed.] 1987.

41 Interview, Ragnvald Solstrand, (FFI/FFISYS), Kjeller, Norway, October, 2001.

41 This was a frequent theme in the contributions to the NATO/SACLANT Symposium "Building a Vision: NATO's Future Transformation, September 5-7, 2001, Oslo.



Some of the specific US advantages can be seen to the left of the diagram. Even if US laboratories are qualitatively no more distinguished than their European equivalents, DARPA is able to step in and contribute extra financing at the systemconcept level, which has no counterpart on the European level. At the system level, the USA has an advanced organization for concept development and experimentation (CDE), which also lacks a counterpart in the European structure.

Levels of spending on military R&D among the European countries are also very uneven. The UK, France and Germany are far ahead of the other European states in terms of the size of their defence R&D budgets.[42] The UK spent $4.0 billion on military R&D in 2001 and is the lead country: France spent $3.1 billion, and Germany ranks third, with expenditure of $1.3 billion. The USA, in comparison, spent $39.3 billion on military R&D in 2001.[43]

The events of 11 September 2001 have also boosted US military programmes, further accentuating the technology gap. The 2002 defence bill allocated nearly $61 billion to procurement and $50 billion to R&D, including nearly $8 billion for missile defence. Major programmes, such as missile defence and the Joint Strike Fighter (JSF), will also have a big impact on US military R&D.[44]

A common view in Europe is that the lack of a European strategic R&D vision, in the sense of evolving ideas and longer projections, further aggravates inferior levels of European defence expenditure vis-à-vis that of the USA. Some kind of long-term vision/planning would be necessary to close this military technology gap. However, according to some analysts, European defence is not at present understood at such a

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42 Bühler 2002:1.

43 Military Balance 2001-2002:35.

44 Enders 2002:1, 3.

conceptual level. Rather, it is being negotiated among the European nations as a matter of cataloguing military units and making up for shortfalls in current inventories. The focus is still on narrow, current interests.[45]

These factors have severe implications for the future of European defence. As long as the political level remains submerged in immediate problems, the future development of capabilities will be inhibited. Delegating much of future European R&D development to industry without adequate funding from governments, analysts argue, is not an adequate solution and will probably make industry look elsewhere for profit.[46]

3.2 Impediments to Cooperation

Despite the historical lack of efficient European military technological collaboration, it is not true that the European states cannot or do not collaborate to produce technologies with military value. Nevertheless, historically they have preferred the indirect, ad hoc creation of bi- and multilateral groupings to solve problems of common interest rather than coordination in a dedicated defence forum.[47]

Four features of traditional European armaments cooperation can be identified. Since the 1960s, these features have had a big impact on the system and together they make armaments cooperation in Europe a sensitive issue. First, arms procurement in Europe has been highly de-marketized. Arms have been imported only under extreme economic or political constraints. This policy has not reflected any cost or competence criteria, but rather a political desire to channel technology work to national defence industries. Only smaller allies with restricted defence industries have relied on the import of defence technologies.[48]

Second, the practice of *juste retour* (fair return) has been the basis for co-development projects. States have demanded an exact work share, equal in value to their contribution to a given project's development cost.[49] This considerably restricts the possibilities for cooperation.

Third, European armaments collaboration has deliberately not been institutionalized but has been carried out on an ad hoc basis. The power has been within the nation-states, and dedicated procurement-harmonizing groups such as the NATO CNAD (Conference of National Armaments Directors) have had little influence until guidelines were established at the state level.[50]

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45 Executive Summary 2002:1-2.

46 Ibid.

47 Cobble 2000:3, 8.

48 Ibid.:8-9.

49 Ibid.:9.

50 Ibid.:9.

As a final feature, multilateralism in Europe has never been a pervasive tendency. Most European procurement collaboration has been limited to groups of two or three countries. Cooperation in defence-related research has also followed this pattern, with over 70% of the collaborative ventures occurring bilaterally between France, Germany and the UK.[51]

Traditional European armaments collaboration has thus assumed an *à la cart*e character. States have created strategic alliances and then dissolved them when the desired projects were obtained. Such limited partnerships have guaranteed that administrative costs are kept at a minimum, but also that they have not resulted in a learning experience in multilateral cooperation for European decision makers and firms. Cooperation has also suffered from difficulties in coordinating the agendas, needs and timetables of each of the cooperating partners.[52]

3.3 Science and Technology Policy in Europe – A Historical Review

Active participation in R&D processes has not always been an obvious task for states. In the mid-1960s the European states began to promote R&D and play an active role in technology policy formulation through government interventions in industrial R&D. Science policy became increasingly linked to economic objectives. Industrial departments and related governmental institutions were established in many European countries.[53]

The policy of the 1970s in Europe was one of 'national champions'. This was particularly the case in France, where companies were merged in order for them to remain competitive on the global high-technology market. Government R&D procurement favoured almost exclusively national industry.[54]

The 1970s was also the decade in which the European Community began to take the initial steps towards a technological–industrial R&D policy. The Council created an intergovernmental pre-competition R&D cooperation programme with possibilities for *à la carte* participation. The national-champion strategy was also expressed at the European level by the unsuccessful attempt to create a European response to IBM – Unidata.[55]

The 1980s saw in particular large national programmes, above all in information technology. Extensive programmes were introduced in Japan, the USA and several European countries. The emphasis was on coordination of national resources. The national programmes constituted important elements of the economic security pol-

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51 Ibid.:8-9.

52 Cobble 2000: 9, Marescaux 2000:9.

53 Sandholtz 1992:62.

54 Mörth 1996:87-88, Sandholtz 1992:94, 280.

55 Mörth 1996:87-88, 113, Sandholtz 1992:94, 280.

icy followed in the early 1980s. Technological–industrial questions became a high-priority item on the political agenda.[56]

The R&D policy of the 1980s was also characterized by enhanced European cooperation. Ambitious state interventionism diminished somewhat when the European countries faced the escalating costs of challenging Japan and the USA. [57]

3.3.1 The Beginning of Technological Cooperation within the European Union

Technological collaboration, in some form, has always been on the European Community's agenda. Plans for a 'European Technological Community' were included in the programme developed by Jean Monnet for a United States of Europe in the early 1950s. In 1957 many European leaders believed that EURATOM, which sought to pool R&D efforts in nuclear energy, was more likely to succeed than the European Economic Community (EEC) itself.[58] It was only under the pressure of competition from the USA and Japan that European governments agreed to shift significant resources from purely national support for R&D to European collaborative programmes.

Three major West European collaborative R&D programmes were initiated between 1982 and 1985: ESPRIT, RACE and EUREKA. The European Community sponsored the first two, while EUREKA was established and managed outside the EC structures.[59] EUREKA became the most successful technology programme of its kind in Western Europe and, although it was formally a cooperation programme formed and managed outside EU structures, it became an important component of the European integration process.[60]

In the late 1970s serious concerns for the health of Europe's information and telecommunications industries were expressed by the Commission of the European Communities. Europe's continued economic growth was seen to be dependent on strength in information technology, an area where Europe was lagging behind both its US and its Japanese competitors. The perceived crisis led European elites to question their unilateral, national strategies for promoting telecommunications industries.[61]

The European Commission and industry announced ESPRIT in 1982.[62] Its purpose was to promote regional collaboration in information technology at the pre-

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56 Mörth 1996:88. Sandholtz 1992:62.

57 Mörth 1996:89, Arnold and Guy 1986:146.

58 Peterson 1991:269.

59 Sandholtz 1992:3.

60 Mörth 1996:7-8.

61 Sandholtz 1992:4, 143.

62 Cf. Arnold and Guy 1986:103-104.

competition level.[63] The same Commission task force that promoted ESPRIT also created RACE, a collaboration programme in advanced communications technologies.[64]

3.4 EUREKA – A Successful Technology Programme

Initiated by French President Mitterrand in 1985, EUREKA was a response to the US Strategic Defense Initiative (SDI). SDI touched a sensitive nerve in Europe – the technological gap – and highlighted European dependence on US technology. Regardless of the prospects for the success of SDI as a weapon system, for the Europeans it quickly became apparent that the SDI programme would fund vast amounts of research in technologies with important commercial applications.[65] For some European states –in particular France – SDI was seen as an attempt by the United States to promote its interests in both security policy and industrial policy.[66]

SDI included an invitation to the US allies and others, including Sweden, to participate in research on SDI-related technologies. The UK and Germany signed government-to-government agreements with the USA, but they were largely symbolic because countries that had not entered such agreements could also be contracted within the SDI programme. France decisively rejected participation in the programme, and President Mitterrand put forward a proposal for a programme which came to be known as EUREKA.[67]

Even though SDI seemed to trigger the EUREKA programme, the success of the Commission's ESPRIT and RACE telematics programmes also played a role in convincing the European governments that European collaboration was a winning concept in technology strategy.[68]

The April 1985 French proposal contained no details as to the structure or content of the programme. Nonetheless, EUREKA was approved in general outline by 17 European states in July 1985. This rapid process shows the need felt among European states for such a programme.[69] EUREKA can be seen as an expression of an increasing Euro-nationalism, where France wished to follow a Gaullistic line and become the leading nation in Europe.[70]

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63 Sandholtz 1992:143, 208.

64 Cf. also ibid.:5.

65 Sandholtz 1992:259.

66 Ibid.:258-259, 267.

67 Ibid.262-264.

68 Ibid.:257-258.

69 Ibid.:6.

70 Mörth 1996:118.

It was initially unclear whether the French were proposing a military or a civilian R&D programme.[71] The areas suggested for cooperation were similar to those covered by SDI, and France was motivated by both military and industrial concerns. It can be argued that EUREKA illustrates the difficulty of untangling military and economic interests in advanced technologies. The same leading technological sectors may be crucial for both economic growth and the development of modern weapon systems.[72]

The French position, that SDI would strategically destabilize international relations, can be seen in the light of the challenge that an eventual efficient missile shield would pose to French reliance on an independent nuclear deterrent; the foundation of French security policy thus risked being undermined.[73] Given these French military concerns, it was not surprising that the initial EUREKA proposal was vague in terms of its orientation.[74]

EUREKA's linkage to SDI was short-lived, however. As early as July 1985, the European Conference of Ministers decided that EUREKA should include only civilian technology.[75] France realized that a military programme would hardly have been acceptable to its European partners and changed its view on the status of EUREKA. Both Germany and the UK were already engaged in directly competing SDI programmes.[76] The decision to make EUREKA a civil programme did not mean that the military aspect was resolved. The dual-use nature of applications makes it hard to draw a line between civil and military technologies.[77]

EUREKA was intended to be an alternative to the hierarchic and bureaucratic cooperation within the European Union.[78] Support from industry was regarded as criti-

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71 Peterson 1991:278.

72 Sandholtz 1992:265.

73 Ibid.:269. A comparison can be made with the present National Missile Defence (NMD) debate where some analysts argue that an American missile shield might be "strategically destabilizing" since it, if working, "pushes" countries to develop more nuclear weapons since a limited amount of nuclear weapons would become useless. The term "strategically destabilizing" is also used in the present debate referring to the possibility that a missile shield could give the US a reason to isolate itself.

74 Sandholtz 1992:270.

75 Mörth 1996:118-119.

76 Sandholtz 1992:270-271. It is possible, however, that France might have entered the path of civilian R&D cooperation with the hopes that the technologies could find military application in a later stage. A comparison can be made with the Galileo programme, the European equivalent to the American GPS-system, which the EU has decided to implement. Galileo is currently presented as a purely civilian project, that should take no notice of military requirements. However, it is not unlikely that the Galileo system can be used for future military applications. The decision to implement the Galileo programme is largely made on political and strategic grounds. Some European countries - primarily France – vividly argue that it is necessary for Europe to have an independent navigation and positioning system to avoid European dependency on the U.S. Se 3.8 below for more on this.

77 Mörth 1996:118-119.

78 Ibid.:118.

cal. A loose, decentralized, industry-led structure thus became a matter of necessity.[79] The purpose was also to bring EUREKA closer to the market than the existing Commission programmes.[80] The Hannover Declaration, which defined EUREKA's principles, stressed that commercial interests should prevail over political imperatives whenever possible.[81]

One element of EUREKA's success is related to the relative lack of political attempts to regulate business. Industrial firms are responsible for proposing EUREKA projects[82] and have the right to invite or reject candidate partners. Questions of intellectual property and technology transfer remain under the purview of industry, and states do not require '*juste retour*', which means that national industrial representation is not decided at the political level.[83] The role of national governments is essentially confined to decisions on the public funding of individual projects.[84]

EUREKA's success, it is argued, lies not in its technological portfolio but in how it promotes cooperative development. EUREKA allows governments to pursue domestic industrial policies and support their domestic industry at the same time as transnational relationships in advanced technology research are encouraged. Firms, on the other hand, enjoy state subsidies for collaborative projects that otherwise might not have been started.[85] The success of EUREKA also lies in the fact that it enables states to pursue their national self-interests while at the same time promoting European integration.[86]

3.6 EUCLID – Illustrating the Limits of Defence R&D Cooperation

By the end of the 1980s, EUREKA had become a success and the troubled European defence industry saw it as a model to emulate. In 1989 France initiated the EUCLID (European Cooperative Long-term Initiative in Defense) programme among the European NATO countries, that is, the members of the IEPG (Independent European Programme Group).[87]

EUCLID was an attempt to institutionalize and multilateralize cooperation in defence R&D in order to increase Europe's development capacity in critical technology areas. The IEPG national armaments directors hoped that armaments cooperation in the

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79 Peterson 1991:279.

80 Sandholtz 1992:258.

81 Eureka 1985, Cobble 2000:6.

82 Peterson 1991:279.

83 Cobble 2000:6-7.

84 Peterson 1991:279.

85 Cobble 2000:6-7, Mörth 1996:201.

86 Cobble 2000:7.

87 Mörth 1996:119.

early stages of development would create cross-border linkages between arms producers, restrain national fragmentation of R&D, and minimize defence R&D duplication.[88]

In a comparison between EUREKA and EUCLID, it can be argued that EUCLID's lack of success is related to its symbolic military character. 'The differences between EUCLID and ongoing efforts to institutionalize and Europeanize technology innovation in the civilian field were more visible than real.'[89] The programmes had considerable similarities: they were intergovernmental in nature, they stressed the pursuit of national interest and they focused on enabling technologies.[90] However, while EUREKA has been a success, EUCLID is considered as another failed effort to create a single European defence market. To many analysts, this is due to the fact that any smooth functioning of fixed transnational military R&D regimes will be hampered by the strong links between the state and the provision of defence.[91]

EUCLID can be seen as an example of a European habit of prioritizing symbolism over substantive action in matters of collaborative defence. To most analysts, EUCLID was the least successful of the attempts to create the foundation for a regional technology base in Western Europe during the 1980s, despite the fact that many EUCLID technologies were similar to those conducted in the major civilian-oriented programmes. The symbolic character of defence technology made the states act in a self-protecting way.[92]

One of EUCLID's major problems has been its relationship with industry. Although it was supposed to consider techno-industrial competencies, in reality it has not. Industry may propose projects, but control resides with the state actors. The principle of '*juste retour*' rules, and the state pledging the largest amount of financial support is entitled to perform programme management and select industrial consortia to conduct the research. This has led to a selection of firms according to nationality; even so-called developing countries with a defence industry, and a lack of basic technological capacities in certain fields, can join as equal partners by making financial contributions. This structure has done little to promote research efficiency.[93]

The issue of intellectual property rights is even more critical from the perspective of the defence industry. The MoU which constituted the foundation of EUCLID gave participant states full access to R&T performed by industry. Governments were also free to use this information – for production or transfer to manufacturers outside the innovation process. Naturally, industry rejected this arrangement and the final MoU was revised to give manufacturers shared control over their own inventions.[94]

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88 Cobble 2000:2-3, 8, 10.

89 Ibid.:3.

90 Ibid.:2.

91 Ibid.:2-3.

92 Ibid.:3, 13-14.

93 Ibid.:9, 11.

94 Ibid.:12.

Not only has industry been reluctant to participate in EUCLID, but this reluctance has been matched and strengthened by the member states themselves. Governments remained uncomfortable with the cooperation forum they had created for themselves. Compared to the support for national research programmes, the resources committed to EUCLID have been meagre. In 1994 EUCLID projects received only 1% of French and British spending on defence research. EUCLID's founding states 'continued to privilege the national production of defense technology to such an extent (…) that they effectively stifled the framework.'[95]

In 1994, the EUCLID governments declared that the institution would be revitalized. EUCLID was appended to the secretariat of the IEPG, renamed the Western European Armaments Group (WEAG). A major goal of the reorganization was to overcome industry's reluctance to participate, but it does not seem to have helped. State contributions to EUCLID projects continued to stagnate at a level below 3% of the annual defence research expenditure of all IEPG countries. The ambition was to create a forum that would consume 30% of total IEPG R&D spending each year.[96] In 2001 WEAG stood for about 3% of Europe's R&T efforts.[97]

EUCLID multilateralized European defence R&D collaboration to a then unmatched extent, but its success remained limited. Not only did it alienate those who were to develop the technology, but the EUCLID states did not move to correct its insufficiencies. The same states that enjoyed EUREKA's achievements were both unwilling and unable to transfer this success to the defence domain because of the symbolic character of defence technology, which states coveted above all other types of technology. This can be seen as a result of the fact that military technology not only provides means for national self-defence, but also is a component of state identity, national grandeur and autonomy.[98]

3.7 The Framework Agreement and the Europa MoU

Despite Europe's long history of institutional impediments to effective military collaborative R&T, the European nations have shown more willingness to collaborate in recent years. In July 2000 six European countries signed the Framework Agreement (FA), which codifies the ambitions of a 1998 Letter of Intent aiming at simplifying the conditions for defence industry. The six FA nations (France, Germany, Italy, Spain, Sweden and the United Kingdom) stand for about 85% of the defence R&T funded in Europe and for a high proportion of Europe's defence industries.[99]

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95 Ibid.:11-12.

96 Ibid.:11-13.

97 Interview, Ola Listh, FOI, July 2002.

98 Cobble 2000:11, 13-14.

99 Jordan 2002:2, Törnqvist 2002:2.

One of the six pillars of the FA concerns R&T cooperation, for which a number of principles have been established to guide it. They concern *inter alia* the following areas: information exchange on current and planned R&T projects; closed projects; a code of conduct for transnational defence companies; competition in R&T acquisition; no *juste retour* on the project/programme basis; and agreed policies and procedures towards third parties. A Group of Research Directors representing the countries is tasked with finding common projects and programmes. Transnational defence companies will in most instances carry out the projects, sometimes in collaboration with government laboratories or research organizations.[100]

The intention of the FA countries is to utilize existing structures and instruments for collaboration to the greatest extent possible. Following this ambition, the WEAG Defence Ministers signed the 'Europa MoU' in May 2001. The MoU and the associated European Research Grouping (ERG) implementation document permit the FA nations to cooperate with the other WEAG nations while still satisfying the terms of the FA.[101]

The Europa MoU and the ERG have been described by some analysts as the most flexible arrangement for defence R&T cooperation that Europe has ever had, with few restrictions on what can be implemented under it.[102] The Europa MoU includes, for example, conditions for both closed projects and the abolition of *juste retour*, and for contracting to be undertaken in competition.[103] It might be possible in the future to include all the existing WEAG cooperation programmes in the Europa programme since the latter offers a wide form of cooperation.[104]

3.8 A European Space Policy?

The area of space technology – satellites for surveillance, reconnaissance, telecommunications, positioning and navigation – is of special strategic importance in world politics today. From a technology policy perspective, it is a field that covers several strategically interesting technologies. Although this section does not illuminate the R&T aspects of the area, it is a field worth mentioning in this context since the EU countries are showing an increasing will to cooperate within space politics and since this could in the long term have spillover effects in other areas. The Galileo programme, the European equivalent of the US GPS system, is the most obvious example: it may become important for both the transatlantic and civilian/military relationship.

The end of the cold war shifted operations for Europe's armed forces from defence of national territory to deployed operations. Information and long-distance commu-

100 Törnqvist 2002:2-3.

101 Jordan 2002:2. Törnqvist 2002:3.

102 Jordan 2002:3.

103 Törnqvist 2002:3.

104 Listh:2002.

nication through space systems have become vital components of today's military capabilities.[105]

Several leading European defence analysts point to the importance of outer space from the perspective of European integration.[106] According to a senior EU official, space technology is crucial for Europe – for economic development, crisis prevention and management; defence of the population, and technological development. It also plays an important role in the critical capabilities of the European Security and Defence Policy (ESDP)– intelligence; interoperability, command and control; force projection; rapid reaction; and reconnaissance and surveillance.[107]

Space technology is interesting from a national/multinational perspective as well as for European integration. It requires a structured research policy, coordinated between politicians, industry, researchers and users. The technological character of space systems – system complexity, the long time span between concept and realization, and the need for system interoperability – highlights the fact that the lack of European cooperation is costly for individual countries. Resources dispersed over various national satellite systems without synergy effects do not result in optimal efficiency. If coordinated, 'the more the better' applies to satellite systems.

At the same time, an integrated European satellite activity is an example of an area in which the concept of interdependence – mutual dependencies – is carried to extremes. With common satellite systems, the European countries make a longer political and technological commitment. The wide range of potential satellite applications also makes it possible for both applications and duties to change during the course of cooperation. This in turn makes it very difficult to predetermine the end point of the whole enterprise.

The field of space technology is also interesting from a civilian/military perspective since the borderline between civilian and military technology is blurred. All space technology is dual-use. The systems themselves are not civilian or military, but it is the information gained from them that can be used in a civilian or military application. From an economic perspective it is also difficult to motivate separate civilian and military space industries – there is only one space industry.

Another interesting duality of space technology is the state/private aspect. Satellite construction has the character of infrastructure building and is therefore a political concern. The character of the space industry (the long time aspect) also makes it dependent on state resources. The relationship between the state and industry in the Galileo programme is interesting. The decision to implement the Galileo programme seems above all to be a political decision based on a desire to create a European independence from the USA. An interesting question is whether this will also be com-

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105 Laurent and Blom 2001:116.

106 This was stated in several contributions to the Conference on European Satellites for Security, Brussels, June 18th-19th 2002. For a report of the conference content see Ekblad 2002.

107 Otte 2002.

mercially feasible. It may be difficult to make a non-existing system competitive with the existing GPS system.

A further aspect that makes space technology interesting is its impact on the transatlantic relationship. The Galileo project might indicate an increasing will among the EU countries to adopt a balancing rather than a bandwagoning policy towards the USA. This will of course have an impact on other aspects of the transatlantic relationship, as illustrated by the fact that the USA has expressed a sceptical attitude towards the Galileo concept. [108]

The European Union has taken several steps in recent years to increase space activities within the Union. In November 2000 the EU Commission and the European Space Agency (ESA) presented a 'Joint European Space Strategy', underlining the importance of space technology for European construction and the need for European independence in certain strategic space fields.[109] On the same theme, the European Commissioner for Research has announced a common Task Force between the Union and the ESA in preparation for the possible integration of the ESA into the Union. The transfer in January 2002 to the EU of the WEU's Torrejon centre, now called the European Union Satellite Centre, was a further move to increase space activities. The satellite centre will support the ESDP and CFSP (Common Foreign and Security Policy) processes.[110]

The biggest effort hitherto in the integration of European space efforts is the Galileo programme. After years of political decisions to build and operate a European satellite navigation and positioning system, in April 2002 the Barcelona European Council agreed to fund the Galileo programme. The European Union transport ministers, who had already authorized €100 million for the Galileo system, decided to contribute another €450 million for development of the programme over the four-year period 2002–2005. ESA will contribute the same amount, or €550 million.[111] For the 2006–2008 construction phase, the EU will pay one-third (€700 million) of the costs and private industry will pay two-thirds (€1400 million).[112] However, severe problems have surrounded the funding of Galileo. The major EU governments – those of France, the UK, Germany and Italy – have differed on how to spend the allocated money. Delays are thus expected in the implementation of the various Galileo programmes.[113]

When it is in place, Galileo will allow users to accurately determine their positions on the surface of the earth or in space, and it will be equivalent to and compatible with the US GPS system. According to EU sources, there are several ideas behind

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108 Bell 2002.

109 Chamussy 2001:54.

110 Jouaillec 2001:68, Davara 2002.

111 *New Europe* 2002:1, 7.

112 Berner 2002.

113 *Defense News*, Sept. 16-22, 2002:38.

Europe's decision to develop a system of its own. Primarily, the European countries want to avoid a situation of being cut off from the use of GPS if the USA for some reason and at a given time chooses to forbid foreign use of its GPS system. Second, the EU wants to demonstrate its technological capability to build such a cutting-edge technology system and not miss the R&D steps that this will imply. Third, the creation and operation of the Galileo system can create many qualified jobs - more than 100 000 jobs, according to the firms involved.[114]

The Galileo programme is expected to generate 30 satellites that will be operational by 2008. Airbus, Thales and Eutelsat are among the firms backing Galileo in the aeronautics and electronics sector. A project headquarters has been set up in Brussels and in 2006 an operating company from the private sector will take over the project.[115]

The Galileo programme is essentially presented as a civilian project, although military use is not out of the question, according to EU officials. It is argued that the EU should be a sovereign institution in such a strategic domain as satellite navigation systems. Without them, the EU countries risk remaining 'subordinated' to the USA.[116]

As noted above, Galileo will be compatible with the GPS system. A background document from the European Commission states that the coordinated use of both GPS and Galileo will offer great advantages in terms of precision and security. If one of the systems goes down, the other system can offer a back-up.[117]

According to NATO officials, NATO has not taken a position for or against Galileo. NATO respects the EU's choice, although it does not want the eventual use of Galileo to interfere with NATO resources.[118]

One of the complications in the discussion between the USA and the EU concerning Galileo is the question of frequencies. Several solutions are being discussed. The solution which has met the strongest opposition in Washington is one in which Galileo's PRS (Public Regulated Service) frequencies totally overlap with the GPS military code (M-code), because jamming one of the systems causes jamming of the other. A second solution is a partial overlap of the EU's and the USA's frequencies. However, since the M-code frequencies are the most efficient, this is not as attractive for the EU as the first solution. A third solution is a flexible overlap, which entails an overlap of the PRS-code with the M-code in non-crisis situations and a switch of the PRS-code to non-overlapping frequencies in a crisis situation, but in this solution, in time of crisis, NATO would have to ask the EU to move its frequencies. Because not all EU member states are NATO members, this could be problematic. NATO officials indicate

114 *New Europe* 2002:1, 7.

115 Ibid.

116 Ibid.

117 Ibid..

118 Bell 2002.

that it would not be credible from the EU's side to ask why NATO did not have confidence in the EU's moving the frequencies, because if confidence 'had characterized the relation the EU would not have needed the Galileo programme in the first place'. A last solution is not to have any overlap of the frequencies.[119]

Despite the US concerns, it could be argued that Galileo may be desirable even from a US point of view – not from the perspective of achieving European independence but for achieving European sufficiency. The strategic role of accurate means of navigation and positioning can be expected to increase in the years ahead. From the perspective of network-centric warfare, an increased number of satellites and supplementing technologies would be desirable.[120]

However, in early 2003, the differences among EU states over the system for financing the project made its fate uncertain. German and Italian demands for increased shares of the project stalled the final negotiations on the start of the project.[121] At the time of writing, a political solution to this problem seems to have been reached. The Galileo project has, though, been delayed by at least two years: it will not become operational until 2010.[122]

3.9 NATO Research and Technology Organisation (RTO)

Within NATO, a transatlantic rather than European body, the Research and Technology Organisation (RTO), is responsible for directing and coordinating NATO defence R&T. It conducts and promotes cooperative research and technical information exchange among national defence research activities.[123]

RTO builds on previous cooperation in defence research and technology under the former Advisory Group for Aerospace Research and Development (AGARD) and the Defence Research Group (DRG).[124] The two bodies were merged into the RTO in order to gain better control and a better overview of activities.[125] RTO is supported by an extensive network of national experts, and it coordinates its activities with other NATO bodies involved in R&T. It reports both to the Military Committee and to the Conference of National Armaments Directors (CNAD).[126]

RTO is composed of a Research and Technology Board (RTB) and a Research and Technology Agency (RTA). Two or three persons from each country sit on the

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119 Bell 2002.

120 Interview, Paris, June 2001.

121 See Lake 2003:11.

122 Simonian 2003.

123 NATO Handbook 2001:327.

124 NATO Handbook 2001:327.

125 Interview, Nils Holme (FFI), Kjeller, October 2001.

126 NATO Handbook 2001:327.

Board, and about 50 employees work for the Agency.[127] Six panels cover the RTO's full range of R&T activities:[128]

- Applied Vehicle Technology (AVT)
- Human Factors and Medicine (HFM)
- Information Systems Technology (IST)
- Studies, Analysis and Simulation (SAS)
- Systems Concepts and Integration (SCI)
- Sensors and Electronics Technology (SET).

The panels are permanent and are intended to cover the central themes in military technology. Each panel has national representatives, including highly positioned scientific experts from defence industry and research organizations, so-called members at large. Under each panel, 10–20 groups (technical teams, task force groups and study groups) are created for specific activities and typically for a duration of two years. It is within these groups that the actual scientific and technological work is carried out:[129] they organize workshops, symposia, field trials, lecture series and training courses, and formulate long-term plans.[130]

The panels decide which studies and evaluations they will work on and the member countries announce their interest in participating. Participating members sometimes work together but otherwise conduct their part of the collaboration on their own. The entering parties cover all expenditures for their activities. It could be argued that this working method is more suitable for simpler studies that can be divided into smaller entities, and less well suited for more complicated studies where there is a need for synchronization. An example of a typical study that can be performed within a technical team is the elucidation of how much signal processing a specific system can handle.[131]

A complicating factor in the RTO's work is the fact that the NATO members have different national economy regulations which they must follow. Certain heads of research are prevented from deciding on place the projects they would like to participate in and must consult their sponsors before taking decisions. This is for example the case for the UK, while the Norwegian delegates can decide on place. These kinds of bureaucratic difference between national systems create problems with efficiency. Another efficiency problem is that work within the RTO is only one of several collaborative efforts that the countries are committed to. This means that work within the RTO has to suit the rest of the national agendas for cooperation programmes. Because agendas and timetables cannot always be coordinated, the NATO RTO has been spitefully described as a 'come together' club for discussions.[132]

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127 Interview, Nils Holme (FFI), Kjeller, September 2001.

128 NATO Handbook 2001:327-328.

129 Interview, Nils Holme (FFI), Kjeller, September 2001.

130 NATO Handbook 2001:328.

131 Interview, Nils Holme (FFI), Kjeller, September 2001.

132 Interview, Björn Backström (FOI), September 2001

WEAG is a forum that could be regarded as a competitor to RTO in the sense that it can divert time and money from NATO member states into other cooperation programmes than those of the RTO. On the other hand, WEAG is a competitor to RTO only to a minor extent since RTO's work concerns implications of technology in a system context, not in system development. NATO's advantage vis-à-vis other cooperation forums in Europe is that it is the only important multilateral security forum in Europe in which the USA participates. The role of the United States in RTO is central, as reflected in the number of technical teams of the various NATO countries: participation by the USA is the highest, followed by the UK and France.[133]

The European countries behave more courteously to RTB officials in NATO than in WEAG, although the dominant countries are the same in both organizations. According to the same reasoning, NATO has developed an open and positive organization culture, which is central to the character of the work. The fact that the European WEAG states lack a 'big brother' member such the USA is not the only possible explanation for this. The difference in organization culture in the two bodies is just as reasonable an explanation. It could be argued that the principle of consensus that reigns within NATO creates an atmosphere in which the partners strive to reach unity.[134]

One of the assignments of the RTB is to focus on potential implications of the results presented by the panels and to take a position on whether the results involve primarily a threat to or a possibility for NATO countries. Such evaluations are by their nature complicated, and the board has little time to concentrate on this kind of analysis in its current work.[135]

The board presents its evaluations and advice to the Military Committee and CNAD. The work within RTO is highly dependent on national assets. NATO has its own analysis capacity in only a few areas (e.g. logistics, air defence, and strategic communication), at the NATO Command, Control and Communications Agency (NC3A) in The Hague.[136]

3.10 Tentative Conclusions

After this overview of the recent history of European cooperation on defence R&T and its impediments, we now turn to analyse the conclusions with the help of the theoretical framework developed in chapter 2. The goal is to discern the major factors behind the development of European R&T efforts and how they are used in the security policy relationships between the states involved.

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133 Interview, Nils Holme (FFI), Kjeller, September 2001.

134 Interview, Nils Holme (FFI), Kjeller, September 2001.

135 Interview, Nils Holme (FFI), Kjeller, September 2001.

136 Interview, Nils Holme (FFI), Kjeller, September 2001.

Cooperation Based on Interdependence or Self-Serving Policies?

Regardless of the level or degree of international interdependence between the European countries, issues of national rivalry and the predominance of national interests seem to have been the major defining features of European defence R&T. This also seems to be a major explanation for why cooperation on defence R&T has been so limited. When issues of military power, military secrets and military projects are involved, governments obviously tend to act with extreme caution towards other states and keep their defence efforts to themselves.

This empirical fact does not, however, square well with today's rhetorical trends, where interdependence is a very popular concept. It should be noted again that, for an egotistic actor, there are advantages in both the self-serving and the cooperative approaches to conducting policy within the R&T area.

The first approach offers a number of traditional advantages. National military secrets can be kept confidential. No advantages are offered to competitors. National independence can be safeguarded and countries avoid becoming vulnerable, in terms of being forced to rely on the benevolence of their partners. Furthermore, from a technological–industrial perspective, national control of R&T means that the state 'knows what it gets'. Traditional communication channels in the defence contracting system can be used, and unnecessary bureaucratic procedures can be avoided.

The second approach also offers advantages, even from an egotistical perspective. The pooling of resources and knowledge can lead to competitive advantages internationally. Cooperation can allow a division of work, enabling the participants to concentrate on a certain niche, and new markets can be opened up. 'Interdependence' itself can also imply security guarantees because the cooperating countries have 'stronger incentives' to maintain friendly relations.

Declining European defence budgets and an accelerated process of European integration suggest that all the European countries would gain from embarking on the collaborative path. This is also a politically correct position – 'interdependence' in defence issues is a political concept with positive overtones. This is true not least for Sweden, even though it currently rejects the ultimate form of interdependence, that is, joining a military alliance with formal mutual security guarantees and a common defence.

The real-world facts, however, show that nationally governed defence R&T is still the most common solution for European countries. It remains to be seen whether newer arrangements, such as the Framework Agreement, will constitute the first moves away from this pattern.

Pluralistic Actors or Governmental Power?

As is partly obvious from the discussion above, the position of governments in the defence R&T field appears to be very strong. Although industry has had a certain impact on developments, much of the history seems to be characterized primarily by government initiatives.

European defence R&T collaborative efforts have generally been hampered by factors essentially relating to the position of strong states acting in their own interest, rather than a supranational entity. The defence procurement field has been heavily de-marketized, with obvious implications for R&T. The principle of *juste retour* has dominated many collaborative efforts. These efforts have also been characterized by intergovernmentalism, ad hoc agreements and a general dominance of states that have promoted bi- rather than multilateralism.

This is not to say that actors other than governments have nothing to say in the R&T field. In other, interrelated areas, industry did change because of external pressures, but the changes occurred without much governmental direction, as in the case of the consolidation of the European defence industry during the 1990s. This occurred for reasons of survival, in order to meet the consolidation taking place in the USA – which in turn was clearly encouraged, although not governed, by the US government. One could argue that the fact that the same changes were not implemented in the area of defence R&T in Europe might be explained by inertia. Long-term R&T efforts are less exposed to competition than short-term defence industry production. It is therefore understandable that it will take longer for a structural change to be perceived as necessary in the former area.

Common Values or Material Power Determining the Scope of Cooperation?

One of the conclusions that can be drawn from the comparison between cooperation within EUREKA and EUCLID is that nations attach a high symbolic value to matters of national defence R&T. In Europe this feature has been so strong that it could be said that, so far, the European nations have generally been prepared to sacrifice any benefits that could arise from cooperation in favour of preserving national defence R&T assets. Giving up national research has a high symbolic value since one of the main reasons for a country to conduct research is for purposes of national independence. This could indicate a strong tendency to let nationally controlled, material – perhaps even military – power, rather than a common European identity based on shared values, define the conditions for defence R&T.

Thus, the preference to think in terms of national interests rather than European capacity has been common among the European countries. There is nothing spectacular about this, since the national identities of the European countries have prevailed over a European identity. This phenomenon is clearly demonstrated by the principle of *juste retour*, which has enabled governments to embark on cooperation with the

guarantee that jobs will be steered to their national defence industry instead of letting competition criteria define the procurement process.

However, the Framework Agreement might be the beginning of a new era in European defence R&T because of its explicit abolishment of the principle of *juste retour*. This means that, for the first time, European countries are willing to let the market prevail over political incentives in some defence matters.

Globalization or Geopolitics as Central Conditions for Cooperation?

One could argue that, given the accelerated process of globalization and ensuing high level of competition, a collaborative approach would be the most attractive one for European countries. With fewer and fewer industries based in one single national home, and with the countries themselves drawn into each other's affairs through the linkages created by globalization, it would seem to be obvious that cooperation is a rational venture.

In general terms, for countries that are sceptical of or reluctant to engage in international cooperation, the fewer constraints imposed by a cooperation regime, the more business can be run as usual and the better the conditions for successful cooperation. The same reasoning applies to industry, which will not function well in a cooperation regime where working conditions differ greatly from its normal procedures.[137]

Complicated and unattractive cooperation conditions, on the other hand, tend to make participants reluctant to cooperate within the forum and therefore lead to a dead end. This was the case of the EUCLID programme, where the cooperation conditions alienated not only industry but also the states that had initiated it. EUCLID also shows that technology cooperation which is led by politicians rather than industry has little chance to succeed. Although governments can determine the general setting, industry must agree on the conditions for cooperation in order to make it successful. This is clearly due to the trends of globalization.

A conclusion that can be drawn from the EUREKA programme and the cooperation programmes initiated by the EC during the 1980s is that external pressure, such as the competition from Japan and the USA in the information technology industry during the late 1970s, seems to be a good incentive for the European countries to undertake cooperation.

The European cooperation programmes of the 1980s also show that positive experience of cooperation is important for generating will among participant countries to go on to further cooperative efforts. Learning curves – in terms of the need for states to experience that cooperation can be beneficial to them – should therefore not be underestimated in cooperation projects.

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[137] Cobble 2000:7.

This could indicate that geopolitical factors may coincide with the process of globalization, that is, that external pressure from geopolitically salient actors leads to a higher degree of collaboration in European defence R&T.

A further conclusion that can be drawn from the technology cooperation programmes undertaken in Europe is that symbolism matters in politics. In some ways, many of these programmes can be seen as attempts, albeit not always successful ones, to balance the USA. EUREKA was initiated as a response to the US SDI programme and, although the defence aspect of EUREKA was quickly abandoned, the technology dealt with in the programme was of strategic relevance. However, it was much easier for the European countries to cooperate in the field of strategic technology when the framework was civilian – as in the EUREKA programme – than when it was military-related, as in the EUCLID programme. On the other hand, it could be argued that the borderline between civilian and defence technology is even more blurred today than when EUREKA was initiated. This makes the debate over civilian versus defence technology programmes even more meaningless. Because strategically relevant technology can have both civilian and defence applications, it is very difficult to distinguish between them.

As regards a recent high-technology programme in Europe, the Galileo satellite programme, it seems to be easy to identify geopolitical balancing behaviour against the USA as one of its main driving forces. Although this project does not have an explicit military dimension at the moment, if and when it is completed its military potential will be easy to realize. This might in its turn complicate transatlantic relations, given the fact that the USA – at least in accordance with geopolitical theory – will want to maintain its influence in Europe and not become marginalized in the field of European security, including defence R&T. What the European countries make out of Galileo will thus also define part of their relationship with the USA.

After this brief survey of European multilateral efforts in the defence R&T field, the next two chapters turn to the individual efforts, organizations and policies of two major European countries: France and the United Kingdom.

4. France

4.1 French Security and Defence Policy

4.1.1 French Security Policy and the Gaullist legacy

General Charles de Gaulle, French head of government in 1944–46 and president in 1959–69, has had an enormous impact on the French political system. Whether they were essentially Gaullist or not, upon coming to power most French leaders after de Gaulle have maintained a more or less Gaullist foreign policy, the key elements of which are the following:

- the ideal of French autonomy in decision making
- the formal independence of the French nuclear weapons capability
- the refusal to participate in NATO's integrated military command structure
- France's exceptional status and special role in the world
- the denial of automatic rights of foreign access to French territory
- the procurement of French-produced rather than foreign armaments

One reason for the long influence of Gaullist ideas is that a doctrine that is so flattering to national sentiments is hard to relinquish once it has been initiated. Another decisive factor is that de Gaulle's set of policies is so closely identified with his powerful figure that it would have been regarded as hubristic for any French leader to proclaim that he understood French military and security policy needs better than the general himself.[138]

The paradigm of de Gaulle and his political priorities implied a specific set of rules for national policy. His policy included a special world status for France, including the resistance of superpower hegemony, a conception of French independence and French international interests, and an ambition to share the leadership of the Atlantic Alliance. This special status for France was not an innovation of de Gaulle. Ever since the French revolution, France had wanted to play the role of the *nation phare*, clearly evidenced in the the colonial period and its *mission civilisatrice*. In the post-war years, a powerful France was seen – by French politicians – as essential for a West European counterbalance in a global system characterized by two superpowers.[139]

It is often said that de Gaulle was able to pursue his policy of independence only because he knew that France was safe under the protection and security guarantees of the United States. He claimed that his policy was necessary since those very guarantees had expired. Throughout the 1950s the USA had the capacity to launch a nuclear attack on the Soviet Union without risking retaliation. However, from 1957, when the the Soviet Union launched the Sputnik, it was no longer certain that the USA would start a nuclear war with the USSR in a conventional conflict in Europe. For de

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138 Gordon 1993:159-164.

139 Ibid.:4-5, 14, 16.

Gaulle, the decline of US hegemony, as manifested in Vietnam and by the US budget deficits of the 1960s, implied that there was a need for a European deterrent. No country under the threat of thermonuclear annihilation could be expected to engage in nuclear war on behalf of another country.[140]

The political situation in France has changed somewhat. Analysts have argued that France followed a much more adaptive and integrating policy during the 1990s. It has opened up its economy to international competition and influence and has gradually adapted to a liberal, global economy. The state has reduced its role in the economic sphere, and market-oriented policies have gained a foothold in French society. French leaders have also become increasingly convinced that their best chance of maintaining control is through the European Union. France is therefore the European nation that has most actively sought to develop the EU as both a political and a military power.[141]

However, these shifts do not necessarily amount to a total departure from Gaullist tradition. Arguably, France cannot alone rival the sole superpower, the USA, in any significant political or economic area – but the EU might be able do so. If France wants to challenge US unilateralism, it will have to do so via the EU.

The 1991 Rome NATO Summit recognized the possibility for an exclusively European force that could operate abroad. France had been the greatest supporter within the EU for such a 'European security identity' as an alternative to a US-dominated NATO. At Maastricht, the summit leaders agreed that the Community's common foreign and security policy would include the eventual framing of a common defence policy, which in time might lead to a common defence. It was said that the WEU should be an integral part of the development of the European Union and that the WEU, if the EU so wished, should elaborate and implement the decisions and actions of the Union with implications for defence. Important differences divided the European countries on the subject of the WEU. The UK, the Netherlands and Portugal were less enthusiastic about the EU playing a defence role. They wanted European efforts to remain under the NATO umbrella. This debate between an 'Atlantic Europe' and a 'European Europe' goes back to the early 1960s. The French–German proposal to expand the Franco-German joint brigade into a European corps in which all the WEU member states could participate was part of the effort to build a European defence.[142]

A Europe with security and defence responsibilities is an old French idea. It was a part of the launching of the EC and a goal of de Gaulle's in the 1960s. Today it takes the form of the European Union's Common Foreign and Security Policy (CFSP), launched at Maastricht in 1991 and advanced in Amsterdam in 1997 and in Saint Malo in 1998, when the British, to the explicit delight of the French, agreed that the EU should develop a capacity for the autonomous use of military forces. This was codi-

140 Ibid.:46-50.

141 Gordon and Meunier 2001:13-14, 101, 113-114.

142 Gordon 1993:171-175.

fied at Cologne, Helsinki, Feira and Nice, from June 1999 to December 2000, in the European Security and Defence Policy (ESDP).[143]

How can the strong French interest in the development of a European security identity be explained? A geopolitical explanation lies in the unification of Germany, which transformed the Federal Republic into a state with more than 80 million inhabitants. France concluded that Germany would no longer accept, for example, constraints on European integration in the economic sphere if France was not willing to do the same in the military field. Another, related French view is that a Europe without a defence capacity could never become a sovereign political union. This is the Gaullist argument transposed from the state to the European level. Another motivation is the long-term insurance that a European defence could offer against a US disengagement from Europe.[144]

Thus, from the perspective of the Gaullist legacy in French security and defence policy, one would expect geopolitical factors and reasons of self-interest to dominate French policy on strategic defence R&T. However, other aspects of French policy making are also at work.

4.1.2 France and the Challenge of Globalization

Traditionally, the French state has enjoyed substantial control over all sectors of society. The French system has put a high value on national independence and freedom from foreign influence. France has also been late among the European countries to privatize its nationalized industry and open its market to foreign ownership.

It would be reasonable to assume that a system which put such a high value on the specific characteristics of its own national system would find it difficult to cope with a modern economic system in which state intervention cannot match market forces, companies are becoming increasingly independent of national affiliation, and national economies find it difficult to resist international influences. These factors can be referred to as the conditions of globalization.

The French relationship to an increasingly globalized world is complicated. State intervention to protect employment and a generous social welfare system are still highly appreciated by the French public, and this has made globalization a taboo topic in France. French leaders, obliged to maintain the notion that the French state is still in control in the major societal areas, are also taking a special stance towards the process of globalization. Prime Minister Lionel Jospin referred to the need for regulations in the globalized world ('*mondialisation maitrisée*'), for example within the WTO, which puts human welfare at the heart of processes. Europe is in the same way seen as the instrument to harness the forces of globalization.[145]

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143 Gordon and Meunier 2001:113-114.

144 Gordon 1993:175-178.

145 Gordon and Meunier 2001:9, 14 , 98, 102, 113.

According to some analysts, French policy contains an apparent paradox in this regard. On the one hand, France resists globalization, sometimes vociferously, but on the other hand it adapts to globalization, to a greater extent than French people realize. The explanation for this is that French leaders, who believe that it is necessary for France to adapt, still cannot publicly admit that they are doing exactly this. Thus, what emerges is a policy that could be called 'globalization by stealth', illustrated by the fact that in 2001 the socialist government of Lionel Jospin privatized more state-owned assets than the six previous governments combined, which Jospin euphemistically preferred to call 'private sector participation'.[146]

Globalization challenges some of the most fundamental principles and values on which the French republic is built: for example, decisions reached through rational processes and the view of an enlightened state working for the enhancement of the collective destiny of the French people. By contrast, globalization is commonly described as a disorderly process that interferes with the state's ability to play such a role. The USA, for example, a country with a tradition of individualism and a scepticism of state intervention, seems much more suited to adapt to such a chaotic world.[147]

To many Frenchmen, globalization is equated with 'Americanization' and is seen as a direct challenge to the French *dirigiste* tradition in politics and economics. Given the traditional Gaullist animosity towards US power, to the extent that globalization means ceding world leadership to the USA in both the political and the economic field, this process is particularly difficult for France to accept.[148]

French leaders have become increasingly convinced that the European Union is the instrument to harness the forces of globalization and to challenge US world power and unilateralism. European integration seems to have been easier for France to accept than globalization. This is somewhat ironic, since the increasing process of Europeanization in the early 1990s, reinforced by the Maastricht Treaty in 1991, challenged France in much the same way as globalization does today. The same questions – foreign influence, lack of control over the domestic economy, the rule of market forces, and the declining power of the state – were at stake then, as in they are in the anti-globalization debate today. Ratification of the Maastricht Treaty was approved in a French referendum with a majority of only 51% but the debate faded significantly thereafter and globalization gradually replaced Europe as the cause of France's troubles.[149]

In the traditional French *dirigiste* policy, the state exercises tight control over industry in general, and over the defence industry in particular. However, the relationship between industry and the state has changed greatly in France over the past decade,

146 Gordon and Meunier 2001:4, 9, 11, 21.

147 Ibid.:9.

148 Ibid.:7-8.

149 Ibid.:71-74, 98, 101-102, 113.

and it is still in a transitional phase. Within the French defence industry, it is often said that its views on political matters differ substantially from the views of the state. Today, several of France's largest defence firms are multinational companies, with multinational influences and market-driven policies. Thales, for example, has 40 subsidiaries around the world.[150] A common view on the part of industry is therefore that French *dirigiste* policy will have to come to an end, that nationalization and 'golden shares' will have to disappear and that the market must be allowed to rule.[151]

Industry representatives also point out that the state is behaving paradoxically towards French industry and appears to be tired of its management role. At the same time, it wants to maintain control over issues of national interest, such as mergers and acquisitions. In the case of the completely state-owned defence company GIAT, for example, it could be argued that there are good reasons for the state to want to be relieved of its management role: GIAT is losing money, and the state has to rescue it on a regular basis.[152]

Thus, the French state's role vis-à-vis industry seems to be undergoing change and the state is relinquishing its grip on the defence industry. In the specific case of GIAT, today the state sometimes recapitalizes it and sometimes not, in contrast to the years when it stepped in every time the company was in trouble.[153]

The French arms export industry is another area that appears to be in a transitional phase. Arms exports have long constituted both a strategic effort for France and a lever for French foreign and employment policy.[154] However, some analysts argue that France must change its liberal arms export policy. By selling arms to Asia, for example, France is contributing to the development of the Asian countries' strategic capacity, which in the end can cost France more than it gains. European cooperation could help, or force, France to change its arms export policy.[155]

Furthermore, French arms exports are in a transitional phase. French companies are developing increasingly less military technology and increasingly more civilian technology. This is true even for a company such as Dassault, which formerly produced only military equipment. French arms-export industry is more than ever confronted with world competition, the major challenge coming from the USA but also from newer suppliers such as Israel and South Africa.[156]

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150 Interviews, Paris, March 2002.

151 Interviews, Paris, March 2002. The French state has e.g. a "golden" share in Thales, implying that the government's share hold special voting privileges that gives it the right to veto board decisions that it disagrees with.

152 Interviews, Paris, March 2002.

153 Interviews, Paris, March 2002.

154 Texier 2000:17, and interviews, Paris, March 2002.

155 Interview, Paris, March 2002

156 Texier 2000:17, and interviews Paris, March 2002.

It can be argued, however, that Europe will have little influence on French export regulations. Under the Framework Agreement (FA), for example, two types of export questions will be dealt with: intra-LoI exports, and exports to third countries. Many French observers believe that it is highly unlikely that the idea of a common 'blacklist' prohibiting exports to third countries will ever be realized by the FA signatory states.[157]

4.1.3 French Defence R&T Policy: Empirical Expectations

Given this brief outline of the traditional French view of security and defence policy, one would expect French policy in the defence R&T field to be defined by a number of salient characteristics.

On the one hand, if the importance of the Gaullist policies is as strong as post-war French history suggests, the policies should be influenced by the following factors. National, self-serving policies should be more dominant than interdependence-based policies of cooperation. The power of the government should prevail over the power of other actors. Although very likely promoting common European values and identities, French policies should ultimately be based on considerations of national military power and geopolitics. Finally, all this should direct French defence policies in general, including defence R&T, towards a balancing position vis-à-vis the USA, primarily through the EU frameworks – and under French leadership. Thus, international cooperation should be encouraged by the state, but for reasons of pure self-interest.

On the other hand, if the forces of globalization and the increasing pluralism of important actors in the defence field dominate the way in which French policy makers organize defence R&T issues, other issues would dominate the latter. Given the increasing power of globalized markets and the difficulties governments meet in controlling defence-relevant technological issues, international cooperation based on policies of interdependence should be easy to identify. The demands of the globalization process would then have pressed French decision makers to abandon some of the salient features of Gaullist policies.

The following empirical investigation explores what seem to be the dominant trends in French R&T policy in these regards.

4.2 The French Defence R&T System

4.2.1 Introduction

This section examines the structure of the French R&T system. It presents a short description of the MoD's DAS (Délégation aux Affaires Stratégiques) organization

[157] Interviews, Paris, March 2002.

and an in-depth description of the DGA (Délégation General pour l'Armement) – the state's main organization for advanced research and military technology. The focus is on strategic visionary plans, prioritized R&T areas, the relationship with the rest of the scientific community, firms involved in defence contracting, and R&D spending.

Military R&D and defence-related innovation networks have been highly significant in France ever since the late 1950s and General de Gaulle's coming to to power. A major objective of the Gaullist policy was domestic development of weapon systems in order for France to achieve independence. State support of the arms industry has thereafter been at the top of the industrial policy agenda.[158] Thus, the general changes in this regard during the subsequent decades in France can be illustrated by the development of state–industry relations.

The 1960s and the 1970s were two decades of steady growth in the French arms industry, and further stimulus was provided by President François Mitterrand's left-wing government after the elections of 1981. Mitterrand's government nationalized the major private-owned defence firms, including Alcatel, Dassault, Matra-Lagardère and Thomson-CSF, after which a new round of consolidation of 'national champions' took place. The 1980s were marked by strong consensus between the right- and left-wing parties on the defence and security agendas. The consensus was based on the utilization of the defence technological programme as an engine for industrial development.[159]

In 1986–1988 the centre–right government of Prime Minister Jacques Chirac initiated a privatization programme. The sell-offs included for example the defence manufacturer Matra. Paradoxically, this development was reinforced by the Socialist–Communist–Green coalition under Prime Minister Jospin (1997), which privatized companies that had previously been out of the question, including such giant enterprises as Thomson CSF and Aérospatiale.[160]

The traditional view of the French defence system sees companies, technical agencies and the DGA – the procurement agency – as closely tied to each other.[161]

In the 1980s, French economists developed the concepts of '*filières*' and '*méso-système*' for their analysis of the French economic system. '*Filières*' are production chains that cut across traditional boundaries in industrial activities. The notion of 'méso-système' emphasizes technological linkages, in both directions, between companies throughout the production process.[162] It also implies a high level of system cohesion.

The French model of capitalism is also known to include other unique features, such as:

158 Serfati 2000:1, Serfati 2001:223.

159 Serfati 2001:223.

160 Gordon and Meunier 2001:4, 21.

161 Serfati 2000:1, 8.

162 Serfati 2001:225-226.

- a closed system of recruitment of governmental and business elites
- an education system that perpetuates a tight circle of powerful elites permeating industry and government and upholding the central role of the state[163]
- a strong ownership autonomy vis-à-vis financial markets
- an innovation funding mechanism based on a credit financial system 'influenced' by governments

It is also typical of the French defence system that a handful of major defence contractors belong to the nexus of the R&D funding networks.[164]

The big challenge for the French arms industry during the 1990s thus seemed to be to reconcile the features of the old system with the new conditions of increased European cooperation and international integration.

4.2.2 The MoD Délégation aux Affaires Stratégiques (DAS)

The Délégation aux Affaires Stratégiques (DAS), within the MoD, deals with issues concerning the Joint Staff and Procurement and is the central body for defence R&T within the French MoD. DAS has 150 employees, of whom half are military and half civilian.[165]

DAS consists of five departments dealing with the following issues:

- NATO, EU, ESDP; bilateral relations; contacts between the military services and other actors involved in foreign affairs
- All other geographical areas and crisis management
- Technology and proliferation
- Export control; dual-use control
- Coordination of MoD policy work: security policy documents, such as Defence White Papers.

Thus, the DAS serves as a strategic office within the MoD and drafts the guidelines for both technology policy and security policy in the defence field. DAS, through the MoD, is the main actor in the formulation of the PP-30, the Thirty-Year Forecasting Plan. The PP-30 is by most accounts the most important document for French defence R&T. Previously, DAS controlled everything in the field of R&T, but when the PP-30 was initiated in 1997 a more collegiate way of drafting the central guidelines of

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163 Most of the elite administrators receive their education at the École Polytechnique or the École Nationale d'Aministration.

164 Gordon and Meunier 2001:13, Serfati 2000:1, 10.

165 As a comparison, the French MoD has in total around 430 000 employees among which 137 000 work in the army, 100 000 in the navy and air force, 100 000 in the gendarmerie, and 90 000 are civilians.

French R&T was introduced.[166] Furthermore, all Ministry of Defence R&T funding is left to the DGA in order to achieve coherency between efforts.

4.2.3 French National Strategic Defence R&T Concepts

The Thirty-Year Forecasting Plan (PP-30)

The first PP-30, *Plan Prospective de 30 ans*, or Thirty-Year Forecasting Plan, was presented in late 1997. It was designed to to meet President Chirac's demand for more transparency and the involvement of more actors in the R&T process, aiming at obtaining added value from investments in defence R&T. One of the advantages of the PP-30 process was supposed to be the combination of MoD, general staff and acquisition personnel. The PP-30 defines equipment requirements and technologies that are seen as necessary for future development of selected 'force systems'. It is a study conducted jointly by the DAS, the 'force system architects' within the DGA, and operational officers in the military services and joint staffs.[167]

The PP-30 is developed from forecasts identifying 'possible future scenarios' for the conditions under which the armed forces may have to operate over the next 30 years. It explores the equipment needs of all the service branches for the next 30 years.[168]

Analysts argue that it is important to further develop the relationship between the armed forces, the DGA and industry. The bonds between the army and the DGA have been strengthened through, among other things, an officers' exchange programme between the two institutions. The PP-30 is thus part of a general effort to bring industry into a closer relationship with the DGA.[169]

Some industry representatives argue that industry's influence on the development of the PP-30 is minor and, perhaps not surprisingly, that industry does not consider it to be an important document.[170] Others argue that, although individual firms have an input in the process of developing the PP-30, they have no power to influence decisions on the final draft.[171]

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166 Interviews, Paris, March 2002.

167 Gleizes 2001:6-7.

168 The present force systems are: Deterrence; Command, Control, Communications and Intelligence (C3I); Strategic and tactical mobility; In-depth strike; Control of the air-land environment; Control of the air-sea environment; Control of the aerospace environment; Preparing and maintaining operational capability. (DGA 2002:4).

169 Marescaux 2000:11.

170 Interview, Paris, March 2002.

171 Interviews, Paris, March 2002.

The Technological Model 2015

The Technological Model 2015 (Modèle technologique 2015) is, after the PP-30, the other decisive tool for French defence studies, especially in the R&T field. The model is developed by the MoD, the DGA and the armed forces to facilitate appropriate decisions on the procurement of weapon systems.[172]

The technologies discussed in the Technological Model 2015 are: digitalization of the battlefield, command and control systems, directed weapons, protection against attacks on computer systems, and integrated modular avionics or man–system interface. It also stresses the importance of demonstrators to obtain a better understanding of the possible applications for and the risks inherent in new technology.[173] The following demonstrators are currently being constructed: micro satellites; radars for the future combat aircraft and components for its engine; and a demonstrator for validation of vertical launch and firing of the future naval cruise missile from a submarine. Other demonstrators, such as tactical maritime UAV and micro-UAVs, are also planned.[174]

French analysts argue that the PP-30, as defence planning in general, suffers from a long time horizon. The Technological Model 2015 may in this respect be more realistic than the PP-30.[175]

4.2.4 Délégation General pour l'Armement (DGA)

The Délégation Generale pour l'Armement (DGA), created in 1961, was born out of General de Gaulle's desire to create an independent French nuclear deterrence capability. The DGA has been responsible for French cutting-edge weapon technology programmes ever since then.[176]

The official role of the DGA is to ensure the long-term effectiveness of equipment and the coherence of defence systems. Its activities should enable the French defence industry to develop advanced, competitive defence equipment for French requirements.[177]

The DGA has 19 000 employees, of whom 9500 work in test and evaluation centres, 1000 are political appointees and 7000 work in programme management. In 1997 the DGA underwent a major reform. One of the major changes was to group resources

172 DGA 2002:5.

173 Leloup 2001:31-32.

174 DGA 2002:5.

175 Interview, Paris, March 2002.

176 Gleizes 2001:4

177 DGA 2002:4.

into the 'force systems' required to generate a given operational effect, regardless of which branch of the armed services they belonged to.[178]

The 1997 redefinition of the DGA's mission also included a shift towards the abolishment of its shipyard production activities, which might have weakened its role in arms production. Nonetheless, the DGA's arms engineers, all of whom came from one of the grand corps of Polytechnique schools of engineering, possess unique expertise in defence technology. This expertise will continue to be critical in the future design of complex weapon systems. The 1997 reform has also increased the DGA's strategic influence because it got involved in the formulation of the long-term PP-30 strategy (see below).[179] It seems to be the case that the DGA has more important venues of cooperation with the military services than with industry. DGA–industry cooperation is also said to be conducted mainly in the pre-competition phase.[180]

As noted above, the MoD leaves all R&T funding to the DGA. Specifically, responsibility lies within the DGA's Direction des systèmes de forces et de la prospective (DSP). The DSP is responsible for supervising the '*études amont*' – the advanced defence R&T studies – to ensure that they comply with the overall guidance decided and presented by the MoD. The DSP is also responsible for the DGA's work with both the PP-30 and the Technological Model 2015.[181]

Études Amont" (Advanced Research)

"Études amont" are studies of all the DGA work on R&T that is entrusted to industry and research organizations. The aim is, through advanced defence research and technology studies, to facilitate choices of equipment and technologies in preparation for future defence systems.[182]

Études amont are essentially carried out by industry in association with academia, university laboratories, and small and middle-sized companies.[183] About 75% of the études amont are directed at the operational requirements that are identified in the PP-30, and 25% are devoted to innovative research to consolidate emergent technologies and enhance available technologies.[184]

It could be argued that there is a definitional problem inherent in the concept, since there is no shared view among the defence actors – the DGA, industry, the general

178 Interviews, Paris, March 2002.

179 Serfati 2000:11, and interview, Paris, March 2002.

180 Interviews, Paris, March 2002.

181 Leloup 2001:32.

182 Leloup 2001:31, Lignières-Cassou 2001:8, 9.

183 An industry view on "études amont" is that the French industry gets very little money from "études amont". However, it could be argued that the industry benefits indirectly from money from "études amont" since it is interested in the work done by e.g. CNES (Centre Nationale d'Etudes Spatiales), ESA (European Space Agency) and DGA. Interview, Paris, March 2002.

184 Leloup 2001:32, DGA 2002:6.

staff, and other civil financiers – on what the word 'amont' actually means in the context of defence research. Analysts claim that the different approaches of the actors hinder an evaluation of the level and evolution of the research efforts that take place under this concept. According to these analysts, the reform of the études amont introduced by the DGA in 1997 has not yet met expectations. Furthermore, the reform is not anchored in the defence industry. Analysts claim that the long-term vision has disappeared and that there is a lack of synergy between civilian and military research.[185]

Prioritized R&T fields within the DGA

The DGA prioritizes the following R&T fields for 2002–2004:[186]

- Control of information and intelligence: information and intelligence chain, zone management and digitalization of theatre, sensor and communications resources
- So-called complex systems
- Interoperability: simulation, standardization
- Security of forces: threat management, individual and collective protection
- Force support: integrated logistics, medical protection and support to the combatant
- Future air combat systems
- Coherence of close-quarter land combat systems.

The table below shows the shares of DGA funding of advanced research, by force system, in 2001:[187]

Control of the air–land environment	28%
Control of the aerospace environment	27%
C3I	24%
Control of the air–sea environment	22%
Deterrence	20%
In-depth strike	15%
Strategic and tactical mobility	8%
Preparing/maintaining operational capability	8%
Other	5%

185 Lignières-Cassou 2001:9, 10.

186 These R&T tasks shall lead to construction of technology demonstrators. (DGA 2002:5)

187 DGA 2002:10.

Thus, it can be clearly seen that the emphasis of DGA funding is on the C3I sector. More traditional concerns, such as deterrence and deep strike, receive comparatively less funding. In this regard, French defence R&T seems to be following the current trends in military research: that is, it focuses on the Revolution in Military Affairs (RMA), in which C3I technologies are most important.

The DGA's relations to the civilian scientific and technical research community

The MoD has identified specific areas – aeronautics and space, information and communication technologies, environmental questions, advanced materials, biotechnology and energy – where civilian/military research synergy would be particularly beneficial.[188] The MoD's dual-use activities are defined as primarily space dual-use studies within the Centre Nationale d'Études Spatiales (CNES), nuclear dual-use research within the Centre d'Energie Atomique (CEA) and aeronautics dual-use studies within ONERA.[189]

In line with this effort, the MoD has been trying to develop its relations with the French Ministry of Research (MoR). In January 2001, they signed a protocol on the improvement of research programme harmonization and the introduction of a long-term exchange structure. The MoD and the DGA also try to foster relations with the Ministry of Economy, Finance and Industry (DIGITIP), the Transport Ministry (DGAC) and the Health Ministry (INSERM).[190]

Following the MoD lead, DGA is trying to strengthen its links with the civilian scientific and technical research community, perhaps primarily because more defence technology is now dependent on civilian technology.[191]

According to the DGA's research policy, research that is directly funded by the DGA is conducted within the following institutions:[192]

- Commissariat à l'Energie Atomique (CEA) for basic research and new experimental procedures in the nuclear field
- Organizations under DGA's authority (Office National d'Études et de Recherches Aérospatiales (ONERA)[193], the Saint-Louis Franco-German

[188] Leloup 2001:33.

[189] Interviews, Paris, March 2002..

[190] Leloup 2001:33, DGA 2002:7.

[191] Leloup 2001:33,. DGA 2002:7.

[192] DGA 2002:7.

[193] ONERA has a mediator role between research and industry bringing knowledge to industry for usage. ONERA's objectives are to create conditions permitting the emergence of technological breakthroughs characterized by an important risk taking. 60% of ONERA's funding comes from contracts from national or European agencies and industry. The remaining 40% comes from the state and is included in the defence budget. ONERA's activity in 2001 consisted of 37% strictly civilian activities, 33% strictly military activities and 30% dual-use activities. ONERA cooperates with industrial groups like EADS, THALES, SNECMA and national agencies like CNES and DCE. In 1996 the international cooperation made up 10% of the total activity while the equivalent number in 2001 was 20%. See Jouaillec 2001:69-70.

Research Institute[194]) or where authority is shared with other ministries (Centre Nationale d'Études Spaciales (CNES) in the space field)

- University laboratories and engineering colleges under its aegis (École Polytechnique, École Nationale de la Statistique et de l'Administration Économique (ENSAE), École Nationale Supérieure de Techniques Avancées (ENSTA), École Nationale Supérieure d'Ingénieurs de Constructions (ENSICA), École Nationale Supérieure des Ingénieurs des Études et Techniques d'Armement (ENSIETA).
- Centre Nationale de la Recherche Scientifique (CNRS) laboratories.

The table below shows the share of DGA grants to research organizations in 2001.[195]

CEA	54%
CNES	28%
ONERA	15%
ISL	3%

Defence contracting, concentration on few firms

The French defence system exhibits a strong concentration of public funding on a few defence contractors. A handful of organizations wield the power and have the technical expertise to carry out the R&D programmes in the French armament system.[196]

A 1997 study found that French public funds to R&D went to 120 firms out of 3500 companies with R&D activities. All but a few of the 120 firms were owned by defence contractor groups. The study concluded that 10 groups were the nearly exclusive recipients (over 98%) of the military budget's R&D allocations. Only 1% of military R&D contracts went to independent firms.[197]

The study found that the firms benefiting from military R&D contracts also received the bulk of the R&D contracts allocated for major technological programmes by civilian ministries. The bulk (87%) of civilian public funds went to 180 defence contractor-owned firms. Among these, 120 firms also received military R&D contracts.[198]

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194 France and Germany run jointly an institute for fundamental research and scientific and technical studies in armaments at the St Louis Franco-German Research Institute. It is composed of around 420 people and is financed equally by the ministries of defence of the two countries with an average annual budget of about 270 million French francs. Its scientific and technical activities focus on the following topics: projectile acceleration; projectile guidance; perforation, protection, study of explosives; protection and environment of the combatant; and effects of laser beam on matter. See De Longueville 2000:134.

195 DGA 2002:9.

196 Serfati 2000:5, 8.

197 Ibid.:3-5.

198 Ibid.:3, 5.

These figures illustrate the strong concentration of technical capabilities in a few industrial groups. This heavy concentration of public R&D funds in a handful of industrial groups has important implications for the shaping and dynamics of France's remaining technology policy, and it can be argued that the defence technological programmes and the public civilian programmes are shaping not only the government's R&D system but also the French system of innovation.[199]

The French system of innovation is strongly hierarchical and divided into compartmentalized sub-systems. Its core is mission-oriented and it is set in motion by the state. The impetus is provided by government agencies in charge of procuring the programmes and orienting the technological direction. The managers in each agency are mainly recruited from rival Polytechnique professional schools, and the element of compartmentalization can be seen as a sign of each government agency's eagerness not to lose its core competences to another agency.[200] It can also be due to the fact that the core of the innovation system is located in the aerospace, nuclear, and arms industries – industries that have a very short tradition of technological diffusion between sectors.[201]

Some of the most important organizations for governmental technology policy include the DGA, the state technical agencies – Commissariat à l'Energie Atomique (CEA), Centre National d'Etudes Spatiales (CNES), and Office National d'Etudes et de Recherches Aérospatiales (ONERA) – and major industrial groups such as Thales, Alcatel, Aerospatiale, Dassault, Snecma, and Matra.[202]

The diagram below shows the cross-participation in the so-called French meso-system of armaments.[203]

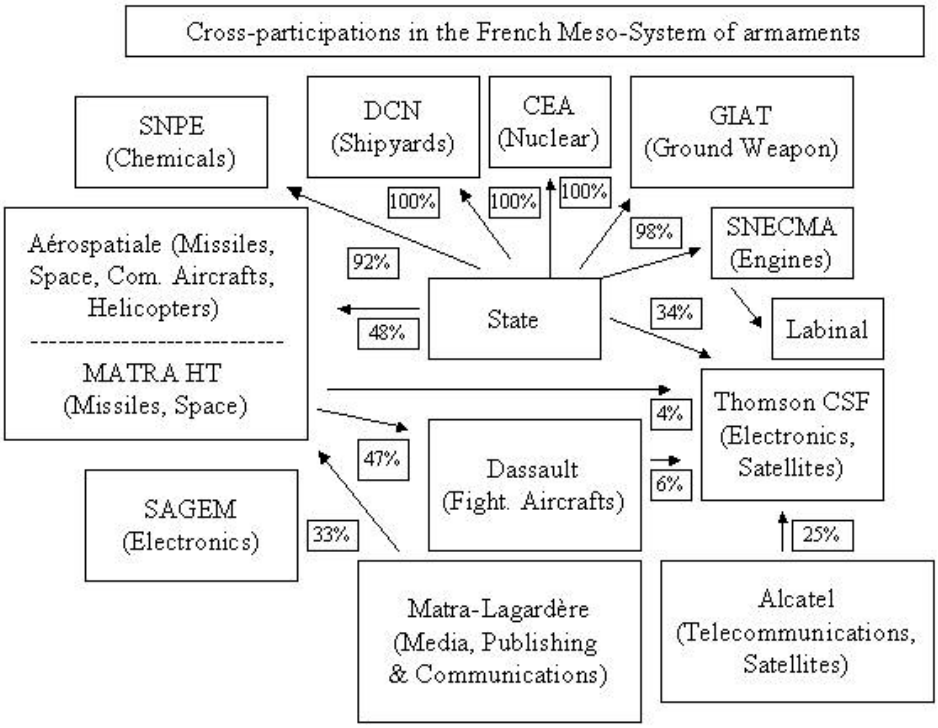
199 Ibid.:5-6.

200 In the case of CEA the main recruitment is done from "Ingénieurs des mines", in the case of CNET "Ingénieurs des télécommunications", in the case of DGA "Ingénieurs de l'armement" etc.

201 Serfati 2000:6.

202 Ibid.:8.

203 Serfati 2001:236.



The notion of a meso-system is defined as a cohesive system of 'forward and backward technological linkages between companies through their contribution to the final product'.[204] To French observers, there are disadvantages in this structure, with its heavy concentration of military R&D contracts in a few firms. Therefore, the DGA has ongoing programmes to involve more small and middle-sized firms in its contracting procedure. However, there are problems associated with small companies: they can easily disappear or be bought up, which has to be taken into account when their attractiveness as high-level innovators is regarded.[205]

The DGA presents the following breakdown of research contracts, by group, in 2001:[206]

[204] Serfati 2001:225f.

[205] Interviews, Paris, March 2002.

[206] DGA 2002:10.

Major defence companies, system prime contractors and defence equipment suppliers	69%
Other companies and laboratories	16%
Small/middle-sized enterprises (SME) (including subsidiaries of the major groups)	10%
ONERA (in the form of advanced research contracts)	5%

Despite the DGA's efforts to address the problems associated with strong concentration of defence contracts on a few firms, analysts argue that its policy to increase its links to small and middle-sized companies to a value of 10% of 'études amont' is far from being realized. Despite the positive efforts of the DGA, the sharing of state funding between the bigger groups and the SMEs still penalizes small companies.[207]

R&D spending

French funding for advanced research was reduced by 50% over 10 years.[208] Declining government expenditure on defence R&D has decreased the share of the Defence Budget's R&D Expenditure (DBRDE) allocated to industry in the total of Business Enterprise Research & Development (BERD) expenditure. From the early 1990s to 1996, the government share of BERD fell from 20% to 13%. However, DBRDE remained the major source of public funding for industry. Its share of total budget R&D expenditure allocated to business increased from 62% in 1983 to 69% in 1995, while the share of civilian budget R&D expenditure allocated to business decreased over this period. Budgetary constraints on public outlays have thus hit the civilian side harder than the military one.[209]

For 2001, the DGA allocated €1229 million to R&T, of which €513 million for research contracts and €716 million for research organizations[210]

[207] Lignières-Cassou 2001:8, 10.

[208] Lignières-Cassou 2001:8.

[209] Serfati 2000:2-3.

[210] DGA 2002:8.

4.3 France and International Cooperation

4.3.1 French Views on National Technologies Versus Shared Technologies

National independence and self-sufficiency in arms procurement have traditionally been important constituents of the national sovereignty concept for European countries in general and for France in particular. National independence has also been one of the main motivations for nations to perform research.

At a time when cooperation between the European countries is developing at both the industrial and the political level, it is tempting to ask: what place is there for national research? In the French case, several former national defence industries are today multinational companies. Presumably, this would have an impact on the French view regarding the linkage between high technology, independence and national sovereignty.

It is therefore of interest to study questions such as:

- What are the French strategic choices in terms of technology?
- Which technologies does the French state want to keep as French and which technologies is it willing to share?
- Are there certain technological areas where France sees European cooperation as a necessity in order to remain competitive on the world market?
- Are there certain technological areas where France particularly welcomes transatlantic cooperation?

The DGA technology and science policy regulates which technologies are to be kept under national control and which technologies can be shared. According to French government representatives, there are reasons for France not to be involved in cooperation as well as reasons why it should cooperate. There are two aspects of the question whether France should keep its technologies French. First, with nationally developed technologies, 'you know what you get'. Second, and regardless of the globalization of defence industry, France would want to keep truly secret information confidential. The reasons given for this are straightforward: no advantages would be given away to any opponent, national independence could be preserved, and the state would not put itself in a weak position where it would have to rely on others – that is, it *would avoid* interdependence rather than embrace it.[211]

A French view in line with this reasoning is that, in the field of defence technology, France should give first priority to a national choice, second priority to a European choice/cooperative venture, and third priority to a US solution/cooperative venture.[212]

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211 Interviews, Paris, March 2002.

212 Interviews, Paris, March 2002.

However, French representatives also point to a number of advantages inherent in international cooperation. The pooling of resources and knowledge can yield comparative advantages in relation to other international actors, and new markets can be opened.[213]

This slightly more 'politically correct' view is also present in the official policy of the DGA: it states that, apart from issues of national sovereignty primarily associated with deterrence, the DGA systematically seeks and prefers European cooperation. France currently allocates about 20% of its resources for advanced research to international cooperation – primarily with Germany and the UK. The DGA's stated objective is to increase this share.[214]

The table below shows the shares of cooperation with the DGA in advanced research in 2001:[215]

Germany	6%
UK	4%
UK/Germany	2%
USA	1%
Italy	1%
NATO	1%
Others	6%

It would thus be possible for France to cooperate in the future with other countries at the European level within a process similar to that of the PP-30. Such a process could start by identifying the European shortfalls, technological breakthroughs and needs.[216]

Regarding the weaknesses and strengths of French technology areas, industry representatives argue that France possesses cutting-edge technology in: optical remote sensing satellites; drones; precision-guided munitions; tactical missile defence; and air defence radars. France is trying to become stronger in signals intelligence (SIGINT) from space, and it would like to be stronger in unmanned combat aerial vehicles (UCAVs) and stealth technology, an area in which it has not made large investments.[217]

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213 Interviews, Paris, March 2002.

214 DGA 2002:8.

215 DGA 2002:9.

216 Interviews, Paris, March 2002.

217 Interview, Paris, March 2002.

Expenditure on international operations has taken resources from equipment in France as well as in other European countries, resulting in a lack of important military capabilities in France and the rest of Europe. A common French view is that there is no technology gap between Europe and the USA. Rather, it is said that there is a capability gap. However, some French analysts argue that this is not a valid claim. France has a weak SEAD (Suppression of Enemy Air Defences) capacity, and all the European countries lag behind the USA in stealth technology. France is also relatively weak in C4 (command, control, communications and computers).[218]

According to industry representatives, it is important for France to retain its national sovereignty and independence. Furthermore, Article 296 of the European Union Consolidated Treaties (1997) which excludes products of 'national security interests' from the European Common Market, has served this purpose well. According to this reasoning, Article 296 is therefore strongly defended in France - by both government and industry - although the European Commission is against it.[219]

4.3.2 French Views on Galileo, the ESDP and the Framework Agreement

France has for several years been trying to persuade the other European countries to acquire their own independent means of military space observation and telecommunications systems. France has seen itself as a natural leader in Europe for the development of such systems to 'meet the challenges raised by the United States in the field of information control'.[220]

Both the French defence industry and the French MoD welcome the Galileo programme, although the MoD states that it, at least not today, cannot see that it eventually will pay for the system. European independence in the space area, which the Galileo system could provide, is important for two reasons. First, if Europe wants its voice to be heard in discussions with the USA, it will have to have some technology to put on the table. Second, the GPS system raises security concerns for France: jamming is a real problem, and duplication may be a good security measure to resolve it.[221]

MoD representatives further argue that Galileo will be a case study in two senses. Transferring from a US GPS monopoly to a situation with European participation will put the transatlantic relationship to the test. The transfer from a civilian application, with fewer security precautions, to a defence application demanding higher security measures will also test civilian–military relations.[222]

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218 Interview, Paris, March 2002.

219 Interviews, Paris, March 2002.

220 Brachet 2001:20.

221 Interviews, Paris, March 2002.

222 Interviews, Paris, March 2002.

Regarding the ESDP, views in France differ considerably. Industry representatives view the eventual realization of the ESDP as dubious, whereas the government wants to portray it as a strong policy. However, most analysts consider the basic problem of the ESDP as being what is seen as the UK's ambiguous views on the future of Europe, that is, whether it supports developments in an Atlanticist or a Eurocentric direction.[223]

With regard to the Framework Agreement, French MoD representatives express concern that industry will move too fast and ignore security issues. The MoD also points out two particular aspects of the Framework Agreement - Operational Requirements and R&T - that may become difficult for the signatories to agree on. These two aspects can be developed along different tracks, which might cause compatibility problems. The issue of Operational Requirements might be treated within the EU, whereas R&T work can continue to be conducted within the countries where the money and the industry reside. The national governments are still what matters in the field of R&T, according to the MoD view.[224]

Representatives from industry also stress bilateral relations as much more important than multilateral institutional relations. European defence R&T institutions have hitherto played a marginal role, and cooperation between countries that have a good defence industry is still what matters in defence cooperation. Whether the Europa MoU will constitute a change in this pattern and play an important role in the years ahead is impossible to predict because it is still in its infancy. What is important, however, is that the signatories of the Framework Agreement do not start to compromise on the FA rules. Countries which do not accept the FA rules cannot be allowed to join the agreement if it is to remain a viable instrument.[225]

4.4 France and the Transatlantic Relationship

As noted above, an independent French stance towards the USA has since the time of de Gaulle been a central part of French foreign policy. However, many French representatives argue, on the one hand, that France has a good relationship with the USA, both bilaterally and multilaterally on armaments cooperation in general, including R&T information exchange. On the other hand, joint efforts with the USA are often described as much more difficult to achieve. The following factors are said to contribute to this difficulty:[226]

- France has nothing to put on the table that is of interest to the USA from a cooperation perspective.

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223 Interviews, Paris, March 2002.

224 Interviews, Paris, March 2002.

225 Interviews, Paris, March 2002.

226 Interviews, Paris, March 2002.

- Security is becoming an increasingly more important issue for the USA, which makes it more difficult for the Europeans to obtain permission to share US secrets.
- The fact that France always seeks a national solution first might contribute to the difficulties.

Industry representatives argue that there are problems with the transfer of technology from the USA to Europe. The United States does not allow Europe to share US technology, offering only 'black boxes'. European companies should therefore be aware that access to the US market does not mean access to US technologies. European states could complement a strong national industrial base with business in the USA in order to earn money, but they should not expect to receive technologies.[227]

Some French firms, such as Thales, are heavily involved in transatlantic cooperation. Thales was the first French company with joint ventures in the USA but it got access to US technologies only by teaming up with Raytheon.[228]

The personal views of some industry representatives indicate that the USA perceives the ESDP and the Framework Agreement as a threat, as illustrated by the US DTSI (Defense Trade Security Initiative) agreement with Sweden. DTSI bestows privileged status on various countries with regard to defence material imports from and exports to the USA. The DTSI accord with Sweden was agreed just after Sweden had ratified the Framework Agreement. This may indicate that a more integrated European defence policy makes the European countries more interesting to the USA, in the sense that it perceives its position as threatened.[229]

4.5 The French Defence R&T System: Conclusions

Several general conclusions about the characteristics of the French R&T system can be drawn from this review. First, it is obvious that the French R&T system is a very structured planning system. Those who are involved work in a tight network that is essentially controlled by the state. This has of course great advantages in terms of the ability to focus research and direct or allocate resources.

Another advantage is that the system is fairly coherent. The tight network makes it easy to concentrate strength and cooperate across different technology areas. Both decision makers and researchers have a good overview of the R&T system itself, which makes it possible for France to speak with one voice in Europe on behalf of French capabilities.

On the other hand, the disadvantage of this kind of system is that it can also be perceived as very rigid and inflexible. These characteristics can cause the system and the

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227 Interview, Paris, March 2002.

228 Interviews, Paris, March 2002.

229 Interviews, Paris, March 2002.

researchers involved in it not to observe or experience other forms of research being carried out outside the perimeter of the tight French national network.

Moreover, government protectionism can create actors that lack independence and integrity, which in itself can be detrimental for research efforts. Greater competition within the system could help to avoid this, but it does not seem likely to happen in the near future..

Section 4.1.3 presented a number of empirical expectations for French policy in the defence R&T field, regarding international cooperation, multilateralism and the relationship between R&T policy and security policy. The overarching conclusions that can be drawn from the subsequent empirical investigation are summarized in the following sections.

Cooperation Based on Interdependence or Self-Serving Policies?
Given the history of French security policy, we expected that its defence R&T policies would be more nationally oriented and self-serving than interdependence-based in terms of international cooperation.

To a considerable extent, this seems to be the case, but both in rhetoric and in practice, the virtues of international – i.e. European - cooperation are becoming increasingly important. This emphasis on cooperation is not necessarily related to a positive understanding of the concept of interdependence: on the contrary, interdependence is considered as a problem that needs to be rectified through cooperation. Furthermore, one of the major driving factors of cooperation seems to be a balance of power-oriented one: in the French view, the fact that the USA is so dominant necessitates a stronger European cooperative stance.

Pluralistic Actors or Governmental Power?
In the French case, the power of the state in defence R&T seems without exception to be the dominant one. Although there are, of course, a number of other actors, government agencies seem to dominate the direction of research, the allocation of resources and the general framework of government–industry relations. The fact that so many French defence industrial companies are or used to be state-owned also supports this hypothesis.

However, the state is obviously affected by international developments: privatizations and other new developments point to this fact. The state-owned companies that are in financial trouble – such as GIAT – will not necessarily be able to rely on government support in the future.

Common Values or Material Power Determining the Scope of Cooperation?
We expected that French policy in the defence R&T field would promote common European values and identities, and that policies would be based on considerations of national military power and geopolitical factors.

Both these expectations seem to be supported by fact. As noted above, something like a European identity is put forward rhetorically, but defence R&T is still considered to be a national priority – for traditional, material reasons. Rather than being an effect of the promotion of a European common identity in its own right, European solutions seem to be sought when French national resources do not suffice.

Globalization or Geopolitics as Central Conditions for Cooperation?
The last set of expectations presented above indicated, on the one hand, that traditional, Gaullist and geopolitical factors would guide French defence policies in general, including defence R&T, despite all the changes brought about by the processes of globalization. In practical terms, this would entail policies directed towards a balancing position vis-à-vis the USA, primarily through the EU frameworks – under French leadership. Thus, cooperation on defence R&T should be encouraged by the French state, but for clear reasons of self-interest.

On the other hand, an alternative expectation was that the forces of globalization would have a great impact on the French defence system. This would entail an increasing multiplicity of important actors in the defence field in terms of the way French policy makers organize defence R&T issues. If this development were detected empirically, the power of the globalized markets and the difficulties the French government might have encountered in controlling military technological issues would provide much of the explanation.

In this set of issues, the empirical investigation yielded mixed results. Obviously, balancing behaviour and rhetoric are explicit features of French policies towards the USA, both in defence in general and in the defence R&T field. However, defence and defence R&T resources have been severely declined in recent years, which of course makes balancing in real terms very problematic. Balancing from a position of weakness is not likely to result in a balancing policy in any case. French attempts to activate the EU to control this process – probably for reasons of national self-interest – might be a way to change the situation.

At the same time, it is clear that French policy is not immune to the processes and impacts of globalization. The demands of the process – in terms of increased competition, decreased political regulation of business life, etc. – have obviously pressed French decision makers to abandon some of the salient features of Gaullist policies. Here as well, ambiguity seems to be at work: Gaullism is not what it used to be, but it is still present, and it is profoundly unclear whether it will change fundamentally.

5. The United Kingdom

5.1. British Security and Defence Policy

5.1.1 British Security Policy and the Atlanticist legacy

After World War II, which left the UK in a profoundly different geopolitical and geostrategic situation compared to the pre-war period, British security and foreign policy rather quickly became closely linked to that of the United States. In his 1946 speech in Fulton, Missouri –best known for the coining of the 'Iron Curtain' concept – Winston Churchill first defined the 'special relationship' between the UK and the USA. Churchill, and most British politicians who have come after him, saw this relationship as both an Anglo-Saxon cultural community and a military and security policy community, in which the two insular sea powers came together in a geopolitical class of their own.[230]

However, at this time the idea of a transatlantic military alliance was not self-evident. In 1948, the USA preferred a situation where the UK would play a leading role in the European setting, with the USA providing support from outside – thus not taking part in any alliance with European countries. The UK, however, clearly preferred the idea of a USA that was engaged and militarily present in Europe.

The North Atlantic Treaty, signed in 1949, was preceded in 1948 by the creation of the Western European Union (WEU), a military alliance in its own right. The British leadership of the time seems to have regarded the WEU as merely a show of West European determination to cooperate in security and defence affairs, in order to attract US interest and get the USA to stay in Europe. After some debate, the United States accepted this position and NATO was formed.

The reason why NATO developed into a coherent political–military organization was not a US desire to forge military links with Europe per se, but the threat perceptions emanating from the Korean War in the early 1950s. Western leaders saw the Communist assault in Korea as a dress rehearsal for an eventual attack on Eastern Europe. What began as a loose political–military network grew over the years into the NATO integrated command structure. This command structure, and the NATO politico-military organization in general, were in all aspects essentially Anglo-Saxon, that is, dominated by the USA and the UK and serving to reinforce the 'special relationship' between these two countries.

The debate over the creation of a purely European defence organization continued in Europe even after the establishment of NATO. In the context of the European Defence Community (EDC) initiative, the USA supported the plans for a defence structure linked to the fledgling EC, whereas the UK vehemently opposed them. This debate dragged on, and then US Secretary of State John Foster Dulles even threatened the UK with a scenario in which the USA would switch to a policy of hemi-

[230] Unless otherwise stated, this subchapter is based on Baylis 1984.

spheric defence with a focus on the Far East, leaving Europe and the UK to their own devices.

The EDC initiative fell through, however, because the French National Assembly refused to accept it – primarily owing to French fears of German rearmament under the EDC concept. The British–US differences in this context were resolved by the initiatives of British Foreign Minister Anthony Eden and his success both in getting the UK to engage in European security – through a reinvigorated WEU – and in reintegrating Western Germany into the West (i.e. NATO). The latter was a US demand, and its realization in 1955 also contributed to maintaining the United States' engagement in NATO.

A year later, in 1956, the British–US special relationship was dealt a major blow by the Suez crisis. The USA refused to accept what in Washington was regarded as a 'neo-colonial' war against Egypt, waged by France and the UK. In the aftermath of the war, however, the UK drew the opposite conclusion to that of France about how to relate to the USA in the future. Whereas the Suez crisis was one of the major driving forces behind de Gaulle's independence-oriented policies, the UK seemed to have accepted that its position in the world had changed profoundly, forcing it to work even more closely with, not against, the USA.

Later events in the history of contemporary British security policy have, by and large, reaffirmed this position. At one particularly crucial moment, the so-called 'second cold war' of the early 1980s, Prime Minister Margaret Thatcher was regarded as the foremost European ally of the USA, in spite of the tremendous domestic opposition to this relationship as well as to most contemporary US security and defence policies. The new NATO deployment of US nuclear weapons in Europe, implemented in the autumn of 1983, was seen as a major test of the 'special relationship'. The UK passed the test, but not easily. The domestic British opposition to US-led NATO policies and the resulting animosity towards the USA among a vocal minority of British public opinion even led some commentators to express pessimistic outlooks, although most eventually concluded that 'it would be premature to write off the 'special relationship' especially in the defence field'.[231]

After the momentous changes of the early 1990s, the British–US special relationship seemed still to be strong. It had obvious benefits: first, for the UK, it forged strong links with the biggest, later the sole, military superpower. From a geopolitical, security policy perspective this was and remains an invaluable advantage. In addition, the UK and its defence industry and defence R&T community received highly preferential treatment by the USA in terms of military technology and technology transfer, especially in the nuclear field.

However, there has also always been a debate in the UK about the drawbacks of the special relationship. In recent years, the debate has centred primarily around issues of transatlantic relationships, although the initial identified drawback - the lack of

231 Baylis 1984:xxii.

strategic independence and the reliance of US defence manufacturers that the relationship entails for the UK – is still part of the equation. British commentators often cite the following as the new disadvantages. A close relationship with the USA obstructs British relations with the rest of Europe, which could result in a marginalization of the UK in the event of increasing European integration and unification. Furthermore, when US–European relations are bad, the UK suffers the most, since it gets trapped between the USA and its European/EU partners.

Since 2001, the interests of the USA and the EU have increasingly diverged, and it has been said that the transatlantic relationship is in a phase of rapid deterioration. The following quotation illustrates some of the more acute factors that have traditionally been part of the history of transatlantic relations:

> [The U.S. is focussing more on Asia and less on Europe, something that is] accompanied (…) by serious disputes between Europe and the United States (…) on a range of issues, including monetary policy [and] Middle East diplomacy (…). In these disagreements Britain has usually found herself on the side of the other European states, despite attempts by the [UK] government to preserve its close ties with the United States. The result of these transatlantic tensions has been a growing questioning about whether the United States and Europe continue to share the same interests and objectives. For some, these differences represent the 'first stage of a change that is historically inevitable – the disengagement of the United States from Europe and a major transformation in the structure of Western security'. [In any case,] there can be no doubt that [we recently] have witnessed a crisis in Atlantic relationships which has reflected fundamental changes taking place in the international system. (…) The tensions in European-American relations have clearly had their impact on Britain's relations with the United States. There can be no doubt that, for the United Kingdom, as a close ally of the United States in Europe, [this] has been a particularly difficult period. (…) The key questions for the future are how far [the] divergences of interest indicate a significant decline in the sense of 'community' between Britain and the United States and how far they suggest that the special relationship will increasingly be seen as a thing of the past.[232]

Several obvious transatlantic issues are at stake here: a shifting US geopolitical interest (from Europe to Asia); severe diplomatic differences, not least over the Middle East; a divergence in values, ideas, and interests between the USA and Europe and the generally predicted severance, with grave consequences for the UK and its 'special relationship'. However, the fact that this was written in 1984 should lead today's media observers to the conclusion that crisis rhetoric has always been an important part of NATO's internal discourse. Given the historical developments since 1984, it seems obvious that this rhetoric is not necessarily a good indicator of future reality: only a few years after 1984, the NATO alliance triumphed in the cold war, and the relationship between the USA and Europe was stronger than ever.

5.1.2 The UK and the Challenge of European Integration

Paradoxically, after the success of NATO had led to the political revolutions in Eastern Europe and the fall of the Berlin Wall in 1989, the alliance began to experience a

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[232] Baylis 1984:217.

number of problems related to two things: the question of the future role of the United States in Europe; and the process of European integration, especially in the field of security and defence policy.

The latter coincided with the reunification of Germany. For historical reasons, Prime Minister Thatcher was reluctant to embrace this idea, which weakened the British position in both Germany and the USA. Moreover, as an ardent Euro-sceptic, Thatcher argued intensively against any closer EC/EU cooperation in the defence and security field. This issue, however, had started to gain momentum in the late 1980s and early 1990s and contributed to the increasing dividing lines within the ruling British Conservative Party: some saw British sovereignty as threatened by EC/EU developments towards a closer political union, whereas others saw the conservative resistance to anything that hinting of greater European integration as a great threat to the British position and venues of influence in Europe.[233]

British European policies also started to complicate relations between the Conservative Thatcher government and the Republican administration of President George H. W. Bush, which was very active in the policy making leading to German unification A number of US administration officials seemed willing to replace the special US–British relationship with an equivalent relationship with Germany.[234] Thatcher was also doubtful about the United States' plans to transform NATO into a more political organization.[235] Thatcher lost the election in the autumn of 1990 owing to a combination of domestic problems and the perceived risk of international isolation, and John Major took over as the Conservative Party prime minister.[236]

In 1990–91, the turmoil generated by the Gulf War coincided with, or prompted, discussions on a more integrated European defence posture through the WEU. The UK took a clearly Atlanticist stance, but allowed the WEU to begin developments which would allow it to carry out certain tasks on behalf of the EC/EU.[237] At the conclusion of the EC/EU Maastricht Treaty in 1991, the UK also accepted both the idea of the transformation of the EC into a political union (the EU) and the language, albeit highly ambiguous, on future defence integration within the EU. However, the Major government was explicitly strongly opposed to any form of a common European defence.[238]

At the WEU Petersberg summit in 1992, the UK and the other EU member states endorsed the idea that the WEU should have operational capabilities, although mainly in the peacekeeping and humanitarian fields. The UK also insisted that the WEU should not move towards a common European defence.[239]

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233 See Bartlett 1992:166-175.

234 Bartlett 1992: 171-174. See also Sharp 1999.

235 Bartlett 1992: 171-174.

236 Bartlett 1992: 171-174.

237 Bartlett 1992:176-179.

238 Foster & Schmidt 1997:1f.

239 Ibid.:31f.

However, the idea of a common defence as the final goal of the CFSP – the EU Common Foreign and Security Policy – came up on numerous occasions in the mid-1990s, primarily as German and French interpretations of the Maastricht Treaty, which entered into force in 1993. The British position at the time was consistently that: a) there is already a common defence in Europe, i.e. NATO, and neither the UK nor the neutral EU members are going to allow the EU also to have one; and b) there is a clear difference between the CFSP and a common defence, and the latter does not necessarily follow from the former.[240]

Given the strong Atlanticist credentials of the Major government, the 1994 NATO Summit somewhat surprised the UK, since the USA, under President Bill Clinton, endorsed the idea of a European Security and Defence Identity (ESDI) performed by or under the auspices of, for example, the WEU. The US position was clear in one respect: any form of ESDI was acceptable only as long as it did not undermine NATO. The new US administration assumed that it would not undermine the alliance, whereas the UK feared that it would. The Euro-sceptic British Atlanticist view was in any case perceived by other European allies as less persuasive after this event.[241]

Furthermore, the Major government's relationship with the USA under Clinton was strained in other areas as well. The Bosnia policies of both sides made it problematic, as well as the occasional US desires to promote EU-oriented – but NATO-compatible – forms of European defence cooperation. London's relations with Paris improved, partly because of the bruising experiences of both countries in Bosnia, where their military forces suffered high casualties without the aid of US ground support, at least not until 1995.[242]

During the last years of the Major government, and especially after the victory of the Labour Party in the 1997 elections, the idea of the necessity of a leading British role in Europe, including European defence cooperation, coincided with the traditional emphasis on NATO and the transatlantic relationship as the cornerstone of European security. With Labour Prime Minister Tony Blair, it quickly became obvious that the UK was set for at least a partial transformation of its policies on European defence. Analysts have debated whether this was due to the problems the UK had experienced with the USA in Bosnia a few years earlier, or whether it was simply because of the UK's desire to become a major player in the development of the EU's CSFP – a role hitherto abdicated by the UK. The possibility that these two policies were contradictory was brushed aside by the Blair government: in its view, the CSFP was intergovernmental, complementing NATO, and not a part of any form of territorial defence.[243]

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240 Ibid.:18f.

241 Ibid.:21f.

242 Ibid.:46f.

243 Aggestam, Engelbrekt, Wagnsson, Winnerstig 2000: 55-72.

In late 1998, discussions of a European Rapid Reaction Force (ERRF) within the framework of a European Security and Defence Policy (ESDP) were initiated at the Anglo-French summit in Saint Malo. The decisions were codified at the EU summits in Helsinki, Cologne, Feira and Nice in 1999–2000. This development would have been impossible without the UK as one of the driving forces. However, in the British view, these initiatives had nothing to do with the undermining of NATO, nor were they the embryo of an EU common defence. The Blair government presented the decisions merely as a means for the EU to contribute to crisis management, including peacemaking operations, in a way that would strengthen and complement NATO. The official motivation, frequently reiterated by the Blair government, was to allow Europe to take on an increasing burden of responsibility, within the NATO framework and in a way that would release US resources that might be needed elsewhere.[244] This is obviously a very different interpretation of the entire ESDP process from that put forward by, for example, France. It is also echoed in current official British policy on the issue:

> The EU is not competing with NATO or duplicating its operational structures. To do so would not make sense. EU efforts will complement and strengthen NATO. [The] EU has been quite explicit that it will act only 'where the Alliance as a whole is not engaged'.[245]

The British position from 1998 to 2001 on the buildup of the ESDP has been likened to a dance simultaneously with the USA and the dominant European countries - above all France. Today, even many of the strongest conservative British critics of the Blair government seem to perceive it as being much more coherently Atlanticist:

> Europe's ambitions for an independent Rapid Reaction Force (or Euroarmy) bear no obvious relationship to reality. (…) Europe only needs to be a second-order player on the world stage to create a host of problems for [the U.S., which] can still reduce the harm that the development does to NATO (…). [To achieve this] America needs Britain. For his part, Blair will use every available device to avoid choosing between America and Europe. But if Washington presses its case, as a political realist he will buckle.[246]

Other British hard-line Euro-sceptics frame it differently and more dramatically, to the point of warning of a coming war between the USA and a united EU and including a role for the UK in the latter:

> [The] current debates about whether the UK should submerge itself in a European defence union or should be the strongest voice in Europe for a stronger NATO is crucial. Whilst no one is suggesting that the EU would have immediate hostile military intent against the U.S. (…) it would be a more uncomfortable feeling for the U.S. if the united European forces, including the UK, developed along the lines that some are suggesting.[247]

Thus, in recent years British policy seems to have changed from a clearly Atlanticist stance to a more pro-European one, and perhaps back again to a traditional Atlanti-

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244 See e.g. MoD 2001a.

245 Ibid.

246 Harris 2002:7

247 Redwood 2001:77.

cist posture. However, this may not by any means be the last shift in British foreign policy towards the EU and the USA.

5.1.3 The British R&T System: Empirical Expectations

A number of empirical expectations in terms of the characteristics of the British R&T system could be put forth from this outline of British foreign and defence policy. Although it is different from the explicit nationalist aspects of the Gaullist legacy in France, little in contemporary British policy seems to be based on ideas of interdependence. Self-serving policies, with a focus on the interests of the British state, should be central to the system. In terms of the actors, however, given the Thatcher legacy, the role of free competition even in defence R&T should be clear and strong. Thus, the government should not hesitate to use both industry and R&T institutions for its own benefit, rather than subsidizing these actors from tax revenue. One would also expect the British system to be different from the French system in terms of the latter's centralized, non-competitive focus.

On the one hand, from a geopolitical perspective, the overarching thrust would be the transatlantic aspects; that is, British R&T policy should be directed towards British–US relationships and cooperative ventures. The European factor and its impact should be much smaller. History, tradition and geography would all contribute to this.

On the other hand, the process of European integration might also push British policies in a different direction. If the European integration process is going well, and the British Atlanticist, rather than Europeanist, position is seen as a liability in this regard, British policy might be shifting since its influence in European affairs would demand a higher sensitivity to European solidarity and ideas, thus promoting a higher degree of cooperation with the EU countries than with the USA.

The following empirical investigation explores what seem to be the dominant trends in British R&T policy in these regards.

5.2 The British Defence R&T System

5.2.1 Introduction[248]

Given the fact that the UK spends more than any other EU nation on military equipment per serviceman and -woman, the technology and science behind the development of equipment have always been central aspects of British defence policy.[249] The defence science and technology programme as a whole is thus directed at three major areas: at allowing the British MoD to plan its equipment in terms of what technology allows; at informing the MoD in a way that makes it possible for the Department to be an 'intelligent', 'demanding' customer in the procurement of military equipment; and at enabling the British defence industry to bid to supply a 'substantial part' of British equipment requirements.[250]

Fundamental decisions on British defence R&T issues are essentially made by the Ministry of Defence. Hence, the structure of the defence research system within the MoD is central to British defence R&T. However, this structure is fairly complex, as described below.

The MoD has overall responsibility for all issues related to defence R&T questions and performs this task through what is called the Research Building Block (RBB). The RBB is composed of the Corporate Research Programme – covering more basic scientific and technological research with military potential – and the Applied Research Programme, covering capability-oriented, applied science and technology, aiming at eventually producing complete weapon systems.[251]

5.2.2 The British Defence R&T Budget

The British MoD currently invests around £458 million per year in its overall defence research programme (the RBB). This is significantly less than what was previously the case, and the downward trend is continuing.

A shift in the balance between civil and military government-funded research was signalled in 1987.[252] The government recognized the importance of an increasing share of *civil* research and development in public R&D and announced that it was taking appropriate action to restrict the real level of *defence* R&D.

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248 If not otherwise indicated, this subchapter is based on the MoD:s website (www.mod.uk) and presentations made by MoD officials at meetings with the authors of this report in June 2002.

249 See e.g. MoD 2001b:§1-3.

250 Ibid. §6.

251 Fundamental basic scientific research, however, which is driven by scientific curiosity rather than by military demands, is not included in the CRP. That kind of research is in the UK – as in most countries – normally made at civilian higher education institutions. See MoD 2001b:§28.

252 Data from HC 1999.

In fiscal year (FY) 1986/87, 45% of government-funded R&D was dedicated to defence. By FY 1995/96 it had reached a low of 37%, and in 1997/98 it was 39%. Between 1986/87 and 1998/99, defence R&D expenditure fell by 26% in real terms.

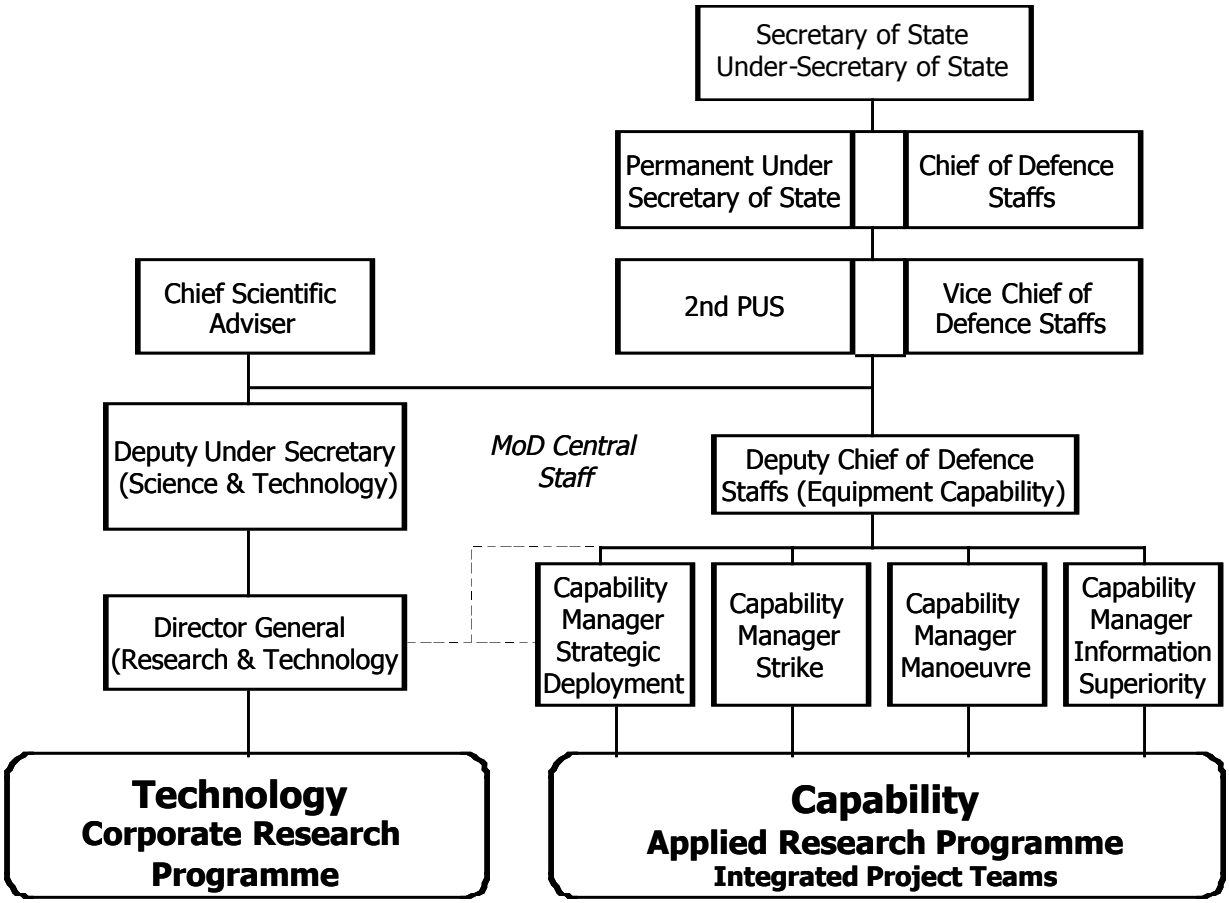
However, a divergence in the trends in the research and development components of MoD R&D expenditure can be identified. While MoD *development* expenditure is now set to rise in real terms, *research* expenditure is set to continue to decline. From a high point in FY 1993/94, MoD research expenditure was expected to decline by 31% in real terms by 2001/02.

A decline can also be seen in R&D expenditure funded by industry, particularly in the defence sector. In the eight years up to 1997, industry's *civil* R&D rose by 3% in real terms but its *defence* R&D fell by 42%.

In relation to the total RBB, the Applied Research Programme is by far the largest one, consuming some two-thirds - £336 million - of RBB funds. The Corporate Research Programme thus uses around a third of the RBB (£109 million).

5.2.3 MoD Defence R&T Structure

The MoD R&T organizational structure is presented in the following diagram:



In brief, defence R&T issues are handled in the following way. The Secretary of Defence (currently Geoffrey Hoon) and an Under-Secretary of State for Defence (currently Lewis Moonie) are the actors who are politically responsible for defence R&T issues. The Permanent Under-Secretary of State and the Chief of the Defence Staff are the two highest-ranking civil servants responsible for these issues within the MoD.

Within the Central Staff of the MoD, however, defence R&T issues are bifurcated in two areas, essentially following the division of the RBB, into the Corporate Research Programme (CRP) and the Applied Research Programme (ARP).

On the CRP side, the leading actor is the MoD's Chief Scientific Advisor (CSA), currently Sir Keith O'Nions. The CSA is in theory a part-time job – for example, Sir Keith is still an active professor of geology at Oxford University – but in practice it is a central, and thus time-consuming, position.

Under the CSA, the Science and Technology Director– together with the Deputy Chief of Defence Staff (Equipment Capability) – oversees general S&T issues within the MoD and exercises overall responsibility for the MoD's international research collaboration.[253] Under the S&T Director, the Director General (Research and Technology), or DG(R&T), is responsible for coherence of both the CRP and the ARP. In that capacity, he is also a member of both the Science and Technology Board and the Joint Capabilities Board (JCB) – the two boards within the MoD responsible for R&T and for the setting of requirements for British military equipment, respectively.[254]

The CSA and S&T directors are the leading figures on the MoD S&T Board. The board also includes the Directors General of the four MoD directorates involved in R&T issues: R&T, Strategic Technologies, Science and Technology Policy, and Scrutiny and Analysis. also In addition, its members include the Chief Executive of Dstl – the Defence Science and Technology Laboratories (see below for more on Dstl). Since the DG(R&T) is responsible for the coherence of both the CRP and the ARP, in practice the DG(R&T) performs much of the actual work of the S&T Board.[255]

Directly under the DG(R&T), the CRP – the basic science and technology side of British defence R&T – is organized in nine technology research domains, each headed by a technology research director. Of these, there are seven principal domains:

- materials
- energy, guidance & control
- communications and information processing

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253 The distinction between S&T and R&T is not always easy to make. However, according to UK MoD officials, "S&T" indicates a broader, general view on scientific and technological issues, whereas "R&T" indicates an ambition to focus on the generation of new knowledge in a specific field.

254 The JCB is chaired by the Deputy Chief of Defence Staff (Equipment Capability).

255 Interviews, London, July 2002.

- sensors and electronic warfare
- chemical and biological defence (CBD)
- human systems and synthetic environments (SE)
- simulation & support and operating environment

The last two domains – ballistic missile defence and nuclear systems – have been considerably scaled back.

The research teams under the technology research directors typically work both with basic research of their own and with collaborative projects with researchers in the ARP. On the CRP side, the vast majority of the researchers and their directors are civilian scientists.

In terms of the share of the overall CRP budget, the largest research areas – at least £10 million per area and year – are shown in the following table:[256]

Corporate Research Programmes	£ million
1. Radio Frequency Technology	17
2. Infra Red & Visible Technology	14
3. Energetic Materials & Terminal Effects Technology	13
4. Chemical & Biological Defence & Medical	13
5. Computing and Information Processing	11
6. Human Sciences and Synthetic Environments	10

Thus, it should be noted that, although traditional areas such as radio frequency and infra-red technology dominate the CRP priorities, at least in terms of budget, newer technological areas such as computing and human sciences are also important items.

The applied research part of the RBB, the Applied Research Programme, aims at the eventual production of weapon systems for the British armed forces. It is led by the Deputy Chief of Defence Staff (Equipment Capability), or DCDS(EC), who is normally a senior military officer. He leads the Equipment Capability Organisation, consisting of four main capability areas – Strategic Deployment, Strike, Manoeuvre and Information Superiority – each under a Capability Manager (CM). The first three areas were traditionally service-oriented - Strategic Deployment related to the Navy, Strike to the Air Force and Manoeuvre to the Army - but this is changing. For example, the Strategic Deployment area includes airlift issues – it is not confined to naval deployment issues.

A total of 11 Capability Research Directors report on their specialist technical areas to the Capability Managers.[257] This structure, based on the two pillars of basic S&T and

[256] See MoD 2001b:Annex A.

[257] These are the following ones. Strategic Deployment: Above Water Battlespace; Below Water Battlespace, Air Lift, Sustainability from the Sea. Strike: Deep Strike; Theater Airspace. Ma-

applied technology/capability issues, is fairly new: it was instigated in 2001 after the presentation of the findings of a major defence S&T review commissioned by the Chief Scientific Advisor. The point of the new system is that these two pillars – embodied essentially in the form of the technology research directors and the capability research directors, who comprise the central MoD Research Direction Community – should together develop and formulate the major MoD research programmes. In this way, it is argued, both technological/basic science-oriented and capability-oriented issues will be considered. Ideally, this should lead to greater efficiency– since there would be no duplication of work– and to better equipment - since basic technological issues and problems are already considered the equipment/capability requirements.

In budget terms, the largest ARP research areas – at least £10 million per area and year – are shown in the table below:

Applied Research Programmes	£ million
1. Theater Airspace	50
2. Deep Strike	47
3. C2 and Information Infrastructure	42
4. Under Water Battlespace	41
5. Above Water Battlespace	40
6. Direct Battlefield Engagement	30
7. Special Projects	19
8. NBC Protection	16
9. Tactical Mobility	11

This list might give the impression that air force- and navy-related research areas dominate the ARP agenda, with army-oriented areas far below in terms of funding. However, the third largest programme is command and control (C2)/information infrastructure, which might indicate a considerable interest in newer features of warfare.

5.2.4 British National Strategic Defence R&T Concepts

Introduction

In the field of domestic defence R&T, a number of strategic plans have been developed within the British defence R&T structure, such as the MoD Science and Innova-

noeuvre: Direct Battlefield Engagement, Indirect Battlefield Engagement, Tactical Mobility, Manoeuvre Support, Combat Services Support, Special Projects, NBC Defence. Information Superiority: Command, Control and Info Infrastructure, ISTAR.

tion Strategy.[258] Some of these plans – such as the *Defence Science and Innovation Strategy* – were formulated as a response to demands from other parts of the government and, although they are comprehensive, they have not attracted much attention among the rank and file of British defence scientists.[259] Other publications, such as the 'Science and Technology Review', which was a comprehensive study of the general structure of the British defence R&T system, more directly involved the laboratories and the scientists working there.[260] This, and the fact that the S&T Review also initiated a number of reorganizations of the MoD defence R&T structure, made the laboratories and their scientists pay attention to it in a much more concrete way. However, the government's willingness to involve laboratory personnel and scientists in the formulation of British technology strategy is a matter of contention among the scientists themselves: some perceive that there is an increased willingness on the part of the government, while others do not.[261]

While it is involved in the formulation of government strategy plans for defence R&T to some but not a great degree, the British defence industry does not seem to perceive these plans as very strong driving forces for the industry's own R&T. It did publish a strategy plan of its own – the National Defence Industry Technology Strategy – to meet the MoD's *Defence Science and Innovation Strategy*, but industry representatives see these strategies has having only a limited impact.[262]

The MoD has initiated two major strategic concepts for the organization and the enhancement of collaboration between British defence research institutions and other actors that might contribute substantially to British defence R&T. These are primarily the scientists employed by the MoD, the MoD-related laboratories and the British defence industry as well as academia – higher education institutions of different kinds. The concepts are called 'Towers of Excellence' and 'Defence Technology Centers', respectively.

Towers of Excellence

The 'towers of excellence' concept relates primarily to the interface of collaboration between the MoD and the defence industry – and to a lesser extent also the universities.[263] Given the limited resources available for British defence R&T, the idea behind the 'towers' is to build up a broad national 'knowledge foundation' across the whole spectrum of defence-related technologies. The purpose of this foundation is to make it possible for British decision makers to be 'intelligent', that is, to know where they can get impartial advice on technology and future weapon systems, and what 'world-class standard' means in different areas of defence-related technology. When

258 See MoD 2001b.

259 Interview, Farnborough, June 2002.

260 MoD 2001c.

261 Interviews, Farnborough, June 2002.

262 Interviews, London, June 2002.

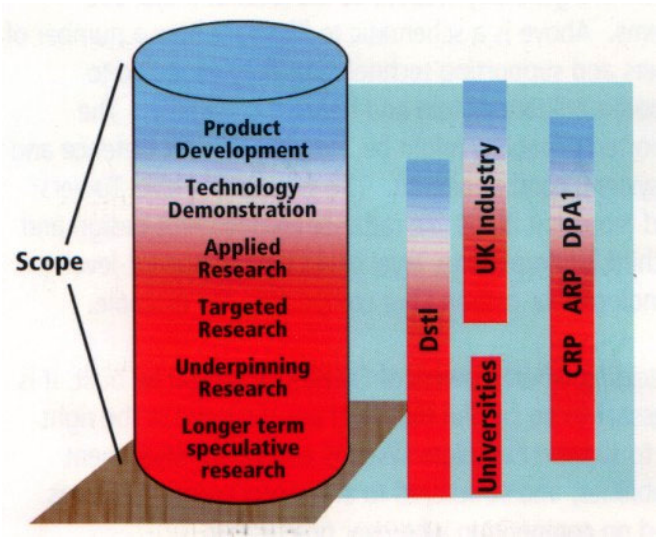
263 This subsection is based, if not otherwise stated, on MoD 2001d.

the knowledge foundation is in place, the government can decide the specific areas on which it can and needs to spend research money; because of the limited resources, it cannot spend a lot of money on all technological fields. These – presumably carefully selected – areas are then developed and built up as so-called 'towers of excellence'. The 'location' of these towers, that is, the specific fields of technology, should be selected in partnership with industry, since the long-term goal for each tower is to enable industry to produce world-class military equipment for the British armed forces.

In this way, the British MoD hopes to achieve cost-effectiveness in world-class research in the most important areas, without having to pay either for full-spectrum research or even for all of the costs of the towers, since industry is supposed to pay for at least a substantial part. The bulk of the money for the towers should, however, come from the applied research budget of the MoD.[264]

The scope of each tower thus ranges from long-term, speculative research carried out by MoD laboratories (primary Dstl, see below) or contracted British universities, to practical product development by British suppliers of defence equipment, as illustrated by the diagram below:

The Tower of Excellence



In more concrete terms, if it is decided to construct towers of excellence in order to support a certain capability, such as air defence, the towers would consist of, for example, sub-system technologies such as radar or aerodynamic design. Together with underpinning areas such as component-level technologies (carbon fibre composites, etc.) this would facilitate the production of world-class defence systems such as military combat aircraft.

Towers can also be constructed through international collaboration, although so far it seems to be primarily a national concept. The first 'pilot towers' that have been

264 Cook 2002:10.

identified relate to the radar, acoustic sensors, synthetic environment, thermal imaging, guided weapons and man-machine interface fields.[265]

The emerging problems in the towers concept, according to representatives of British industry, relate to the fact that, although the government will at most fund half of the projects of a certain tower, it will under the present conditions retain all the intellectual property rights that might come out of these projects. This continues to be a huge problem for the industry and for its willingness to participate in the towers of excellence framework.[266]

Another problem for the framework, according to industry representatives, is that the introduction of broad strategy plans of any kind within the overall British R&T community leads to tough bureaucratic turf wars among the institutions engaged in the field. This is another reason why implementation of the towers of excellence concept has been so slow.[267]

Defence Technology Centres

The second national strategic concept for defence R&T is called Defence Technology Centres (DTCs).[268]

Initiated by the MoD, these centres will consist of formal collaborative arrangements between industry and academic experts in a particular technology. They will be funded jointly by the participants and the MoD. As in the towers of excellence concept, participants in the DTCs will collaborate to generate and enhance the technology vital to the delivery of future British defence capabilities.

The DTC programme will be defined by the participants. Each DTC is expected to undertake a diverse range of innovative and inventive research in its specialist technology area. The MoD has set a number of requirements for the DTCs. They should and must: i) generate knowledge, via research, that is appropriate for future British defence needs; ii) enable the earliest possible exploitation of knowledge generated for the benefit of British defence; and iii) enable the knowledge that is generated to be used by the MoD for internal government purposes.

Furthermore, according to the MoD plans, each DTC should enable the knowledge generated within the civil sector to be used within the DTC and enable the knowledge generated by the DTC to be exploited for the benefit of the civil sector.

The DTCs will be chosen by the MoD to meet the following criteria. They must concern technology with the potential to provide a high return to British defence or with

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265 Ibid.

266 Interviews, London, June 2002.

267 Interviews, London, June 2002.

268 If not otherwise stated, this subsection builds on MoD 2002a.

a significant research base outside the MoD, or technology in which MoD investment can make a significant impact.

The likely suitable topics would include multifunctional and active materials and structures, electromagnetic remote sensing, data and information fusion, optical and electronic signal processing, propulsion and human factors integration. The consortium mandated to form a DTC will be selected by a competitive process. In this way, UK-based defence and civil industry, both major defence suppliers and small/medium enterprises (SMEs), will be able to take part alongside British universities and research institutes. As in the case of the towers of excellence concept, participation by offshore organizations is not ruled out - although the main emphasis is on British organizations and actors.

The MoD will provide each DTC with up to £5 million per annum for three to six years. The actual amount will depend on the topic, and the duration will be subject to negotiation. Each consortium is expected to provide a significant (up to 50%) contribution.

The DTC concept has in principle been well received by industry, but since it is still in an initial phase its eventual outcomes and benefits for industry are still unknown.[269]

5.2.5 The British Defence Laboratories

British Defence Research: A Background

For the UK, and for example the USA, the development of science and engineering during the last half of the 20th century was intimately connected with defence: more than half of government-funded R&T was funded from defence budgets. For both countries, this amounted to around 25% of the national totals.[270]

For the UK, in terms of policy, the investments in defence R&T paid off early. Thus, because of its nuclear research the UK could build up an 'independent' nuclear deterrent force, which enabled the country to retain its great-power status. Its world standing had otherwise had been severely diminished by, for example, the decolonization process and the failed Suez campaign of 1956 .[271]

During the cold war the UK invested a great deal money and other resources in defence R&T, making it a leading power, behind the USA and the USSR, the superpowers of the time. The structure of the research establishments, however, may seem – to an outsider – as a perpetual exercise in bureaucratic reorganization. During the post-war years, more than 30 establishments were engaged full-time in military R&T. In 1989, they were concentrated in seven main units, of which all but those

269 Interview, London, June 2002.

270 Bud & Gummett 1999:1.

271 Ibid.:8.

dealing with nuclear, biological and chemical issues were only two years later moved to a new agency, the Defence Research Agency (DRA). In 1995, DRA was transformed into the Defence Evaluation and Research Agency (DERA), and other agencies dealing with test and evaluation as well as with biological and chemical issues were incorporated. At this time, DERA, with an annual turnover of more than £1 billion and a staff of just under 12 000 people, was the largest science and technology organization in Europe. However, in 1971 the total staff of the British defence R&T establishments numbered about 34 000. In other words, the combined reorganizations had reduced staff by about two-thirds.[272] However, this has affected the administrative staff much more than the scientific personnel.

Most observers conclude, however, that the British defence laboratories and the scientists employed by them do not have any substantial impact on the decision-making process of British defence R&T. The scientific community in the UK seems to regard the latter as a policy-driven, centrally decided process, often determined by budget constraints rather than scientific considerations.[273]

In 1998 the MoD published a Strategic Defence Review which recommended a Public Private Partnership (PPP) arrangement as the best means of maximizing the strategic value and operational cost-effectiveness of the UK's defence research capabilities. Accordingly, until July 2001, DERA was an agency of the Ministry of Defence, incorporating the bulk of the MoD's non-nuclear research, technology, and test and evaluation establishments. It then split into two organizations, Dstl and QinetiQ Group plc.[274] This was probably the first time a Western government decided to privatize the major part of its own defence R&T system.[275]

There has, however, been an intense debate in the UK over why this split occurred and whether it was beneficial for British defence R&T. Some argue that the official reason – the fact that the defence R&T budget was decreasing, which thus prompted more efficient use of it – was not the only one. Reducing the number of civil servants by 9000, by transferring them to a company directed to go to the private sector, was also a 'politically correct' thing to do. Furthermore, the whole concept of public–private partnerships was, and still is, politically trendy in the UK.[276] The reason why DERA was split, instead of being privatized as a whole, was that the US government refused to accept the idea of dealing with a private company when highly sensitive and state-controlled technological issues were concerned; thus, the sheer existence of Dstl should be seen as a concession to the US government.[277]

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272 Ibid.:14-18.

273 Interview, Farnborough, June 2002.

274 Defence Science and Innovation Strategy, http://www.mod.uk/issues/science_innovation/ index.htm·

275 Interview, Farnborough, June 2002.

276 Interviews, Farnborough, June 2002.

277 Interview, Farnborough, June 2002.

Some analysts argue that the split has not yet led to any clear benefits but rather created much ill feeling within the research community.[278] Others note, from a personal perspective, that the split was a huge mistake since DERA was functioning very well and there was no need at all to split it up.[279]

Some industry representatives also regard the split-up as basically negative. The fact that Dstl can now contract QinetiQ for work that formerly went to industry itself is regarded as a major drawback for industry, since QinetiQ's ties to the government are still regarded as very strong. The role of Dstl, however, is seen as more positive, since its position is close to DERA's former state-governed position and thus not a government-owned, competition-skewing part of the industry.[280] Others believe that the privatization of QinetiQ might lead to sharper competition in the long run, within five years or so, but also that many problems emanate from the fact that the split of DERA was not clean. The industry still needs to deal with both Dstl and QinetiQ in the same way as it used to deal with only the state-controlled organization DERA.[281]

MoD representatives argue, however, that after the privatization of QinetiQ there will be no practical difference between this company and others in the field, enabling the government to contract out even more research on a 'free market' of defence research. This should lead to both increased competition and added value for the MoD's R&T funds.[282]

Dstl (Defence Science and Technology Laboratory)

Historically, the formerly separate British defence research establishments, subsequently the Defence Evaluation and Research Agency (DERA), were the principal suppliers of research to the MoD, although about a quarter of the work was contracted out to industry and academia by the DERA under extramural contracts.[283] As mentioned above, in July 2001 DERA was split into two organizations, Dstl and QinetiQ plc. Dstl is an integral part of the Ministry of Defence, whereas QinetiQ is legally a private company, although it is still owned by the British state (see below).

About a quarter of the DERA staff (about 3000) were retained in the MoD to form Dstl, and the rest – around 9000 employees – were transferred to QinetiQ. Dstl houses the largest number of scientists and engineers in British public service, and comprises all the defence laboratories and capabilities retained within government

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278 Interview, London, June 2002.June 2002.

279 Interview, Farnborough, June 2002.

280 Interviews, London, June 2002.

281 Interview, London, June 2002.

282 Interview, London, June 2002..

283 When not otherwise stated, the source for this subchapter is the Defence Science and Innovation Strategy, at http://www.mod.uk/issues/science_innovation/index.htm.

from the DERA.[284] The largest sector within Dstl – in terms of employees – is 'Analysis & Systems', with some 1200 employees. The other two sectors – 'Science' and 'Technology' – each employ about 900. In terms of employees, the four largest departments (of a total of 15) are Land Systems, Air Systems, Electronics and Biomedical.[285] The general purpose of Dstl's work is to focus on those areas that are considered inappropriate for the private sector, that is, sensitive and secret defence-related research and development. Thus, Dstl inherited from DERA e.g. the sectors concerned with chemical and biological defence, and radiological protection. The other areas that are the exclusive domain of Dstl are counterterrorism (primarily related to sensors for detection of explosives), electronic warfare, and defence operation analysis. However, even in those areas, 10–20% of the work is in fact subcontracted to other actors, including foreign ones.[286]

Dstl currently has a total turnover of £275 million; 92% of its revenue comes from the MoD, of which more than half is for research conducted directly on behalf of the MoD. For the non-MoD work (8%), all commercial activities require an agreement with the MoD. Dstl is also, to a limited extent, able to conduct research on behalf of other government departments.[287]

However, Dstl tries not to carry out research in areas where the work can be readily accessed by external suppliers. The organization also tries to build partnerships with other research organizations.[288]

The rise of new threats – and possibilities – stemming from global information networks, nanotechnology, gene-sequencing and asymmetric warfare has changed the profile of Dstl. During the 1991 Gulf War, Dstl personnel provided information to protect allied troops from Iraqi biological weapons using the Dstl biological detection system (BDS). The staff also supported British forces through operational analysis in the Gulf and gave technical advice on command and communications, armour improvements, and surveillance and target acquisition projects, including new targeting equipment for laser-guided bombs.[289]

In Kosovo, Dstl personnel have been working on upgrading engine thrust for Harrier aircraft and improving radar performance on Tornado aircraft, as well as utilizing operational analysis to provide advice on the handling of refugees. In the field of counterterrorism, Dstl's specialized X-ray machines are deployed at airports to screen baggage for explosive devices and arms.

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284 http://www.dstl.gov.uk/

285 Earwicker 2002.

286 Interview, Farnborough, June 2002.

287 Earwicker 2002.

288 http://www.dstl.gov.uk

289 http://www.dstl.gov.uk

QinetiQ

As noted above, in 2001 approximately 75% of the former DERA staff were transferred to a company called QinetiQ Ltd, which is now wholly owned by the British government, but with the intention to complete the so-called Public-Private Partnership (PPP) during 2002. During the period July 2001–March 2002 QinetiQ Ltd had a total turnover of £653.3 million.[290] Initially, the government intends to retain a financial stake in the company in order to ensure that taxpayers can benefit further from any growth in value immediately following the PPP. However, the government's intention may ultimately be to sell its entire stake in QinetiQ. Given the turbulence on the stock markets, the decision to sell QinetiQ was postponed on 6 March 2002, despite the fact that the MoD had already received a £250 million advance from the Treasury on the expectation that the privatization of QinetiQ would yield a huge profit for the MoD.[291]

In September 2002, it was announced that the MoD had selected the Carlyle Group, a US private investor group, as the 'preferred bidder' to become the new 'strategic partner' of QinetiQ. Carlyle already owns several defence industrial companies, including a 49% share of United Defense Industries – a major supplier of such land forces equipment as tanks and self-propelled howitzers. United Defense, in its turn, currently owns for example the formerly Swedish company Bofors. The British MoD's plans for the QinetiQ–Carlyle partnership seem to be for a relatively short-term process, in which Carlyle oversees the implementation of QinetiQ's commercial business plan and then helps the company to realize its full value through a public offering on the London Stock Exchange. According to press reports, the still undisclosed price for the 50% of QinetiQ stock that, under the deal, could be bought by Carlyle would be around £250 million.[292] In December 2002, however, the MoD announced that the Carlyle Group would acquire a 33.8% share for an undisclosed sum, which analysts estimated at £140–150 million. The MoD also indicated that it would sell the rest of the shares in three to five years, including the offer of a 3.7% share to QinetiQ employees.[293]

The government will in any case appoint two non-executive directors to the company's board and keep a 'golden share' in QinetiQ, to safeguard the security interests inherent in the company's defence research.[294] This 'Special Share' will enable the government to outvote all other shareholders on certain types of company decision, above all on the protection of defence interests. However, some analysts doubt that the government will use its 'golden share' power: this has not been done in other companies with the same construction.[295]

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[290] If not otherwise stated, the source of this subchapter is the MoD 2002b and QinetiQ's website at http://www.qinetiq.com.

[291] Lake 2002a:24.

[292] Lake 2002b:4.

[293] Lake 2002c:22.

[294] Ibid.

[295] Interview, London, June 2002.

Furthermore, a compliance regime will be instituted for *inter alia* protection of sensitive research and military secrets. British defence interests are supposed to be protected by the compliance regime in both the short and long term. The MoD expects QinetiQ to remain a major supplier of research, but the government's position also explicitly states that the proportion of MoD research that is exposed to competition will be increased annually. The major official reason for this is the drive to obtain improvements in the value for money in defence research.

The government also expects that the PPP process will contribute to defence diversification, since it will be in the commercial interests of QinetiQ to exploit opportunities for 'spin-off' of defence technology to the civil sector. Thus, research for and in civilian sectors will be an increasing part of QinetiQ's activity.

However, analysts have forecasted that QinetiQ, as an increasingly commercial company, will be forced to leave the non-profitable research areas. Whether this will mean that it reduces its defence research and instead develops more profitable civilian research areas is still unclear, but it is a concern for the British defence establishment.[296]

In line with the privatization process, QinetiQ aims to increase its engagement in non-defence-related business areas. Its business structure covers three fields: *Solutions*, *Complex Managed Services* (CMS) and *Ventures*.[297]

Solutions is by far the largest sector, generating 76% of the company's total revenue in July 2001–March 2002. This part of QinetiQ is similar to a technical consultancy firm: it deals with technical solutions in a wide array of fields, such as defence, transport and communications, space, energy, health care and financial services. It accounts for 68% of QinetiQ's staff. The limitations – so far – of QinetiQ's outreach to the private sector are shown, for example, by the fact that 77% of the revenue of *Solutions* still comes from the MoD.

In the same period the *Complex Managed Services* area accounted for 17% of QinetiQ's revenue and 21% of its staff. The business areas related to the CMS are above all concerned with testing, evaluation and technology, especially testing and evaluation on behalf of the MoD, which accounts for 80% of CMS's revenue.[298]

The third business field is *Ventures*, which deals with licensing and joint-venture projects based on the inventions of QinetiQ scientists. This field currently accounts for only about 7% of QinetiQ's total revenue, but it is increasing in importance. [299]

One of QinetiQ's key roles is acting as an independent adviser and provider of test and evaluation services to the British MoD. This has, in turn, led to problems in rela-

296 Interview, London, June 2002..

297 QinetiQ 2002:5-6.

298 Ibid.:7.

299 Ibid.

tion to the private sector: QinetiQ has been accused, at least implicitly, of being able to use its position as an evaluator to compromise other companies' technologies when these companies bid for MoD contracts.[300] QinetiQ tries to counter such allegations through a rigorous process of compliance, which aims to ensure confidentiality for all parties and to enable QinetiQ to both advise the Ministry of Defence and support the defence industry, while maintaining its impartiality. In practical terms, in a situation where QinetiQ, on behalf of the MoD, engages in evaluations of other companies' products and simultaneously bids for an MoD contract in open competition with the same companies, 'Chinese walls' will be erected within the company to minimize the possibility of wrongful conduct. It goes without saying that this will be a difficult task. Furthermore, there is a widespread perception in the field that the British government still regards QinetiQ as a government agency, but attitude will probably change when the company is privatized.[301]

5.3 Research in the British Defence Industry

Generally speaking, most observers conclude that the input of British industry in the politically driven processes of British defence R&T is very weak. The directions and policy plans established by the MoD are seen as the results of centrally decided and policy-driven processes, in which industry takes very little part.[302] For example, industry is not involved in government work on the identification of crucial defence-related technologies.[303] Compared to industry, the military establishment has a much stronger role in terms of being able to affect defence R&T, and it has dominated the capability/equipment-oriented part of the R&T field.[304]

However, according to some industry representatives, the National Defence Industry Council and the Defence Manufacturers Association – essentially lobbying and trade bodies for the industry as a whole –sometimes play an important role in getting the MoD to spend its research funds on what industry considers to be the 'right' R&T issues. However, industry generally regards the state-governed research establishments as having much more influence on defence R&T policy issues than industry itself.[305]

According to the Department of Trade and Industry's (DTI) annual *UK R&D Scoreboard*, which assesses the British industry's investment in research and development in comparison with its competitors overseas, the R&T and R&D efforts of the defence companies are not extraordinary. The 1999 *Scoreboard* surveyed 561 British companies and the 300 top international R&D-investing companies. Across the 561 British companies, expenditure on R&D represented only 1.9% of sales, whereas the

300 Lake 2002d:32.

301 Interview, Farnborough, June 2002.

302 Interviews, London, June 2002.

303 Interviews, Farnborough, June 2002.

304 Interview, London, June 2002.

305 Interviews, London, June 2002.

300 international firms invested 4.9%. Across all the sectors of economic activity, only 16 of the world's 300 leading R&D-investing firms were British companies. Those top 16 British companies invested 2.9% of sales in R&D, compared with 3.1% for international firms in the same sectors of the economy. In the Defence and Aerospace sector, however, the position of the British industry was considered as being relatively good. The UK's 10 leading R&D-investing firms in this sector invested on average 5.0% of its revenue from sales sales on R&D, compared with 4.4% for the international top 10 defence firms. The UK's position could be considered as somewhat skewed given the large size of BAE Systems, whose total sales and R&D figures matched those of the other nine UK firms combined.

To stimulate research efforts within the industry, the British government announced the so-called Small Business Research Initiative, which is designed to increase the success of smaller firms in obtaining government contracts to conduct research. It aims to strengthen those existing small firms whose businesses are based on providing R&D – by increasing the size of the market – and to encourage other smaller businesses to increase their R&D capabilities and capacity - to exploit the new market opportunities.

According to industry representatives, however, there are many problems connected with the way in which the government chooses to relate R&T efforts to the industry. Above all, the highly market-oriented, and thus very competitive, approach is considered detrimental to industry. Primarily, from the industry's perspective, it is very risky to invest heavily in projects that in the end might be contracted to other, sometimes foreign, actors. This is also the case for the new concepts introduced by the government, such as the 'towers of excellence'.[306] Industry representatives also express their frustration with the limited extent to which industry is involved in the general policy-making process in the R&T field.[307] However, in a recent MoD policy paper on defence industry and procurement, *Defence Industrial Policy*, the government confirmed its strong support for the process of competition.[308] The British industry is thus likely to continue to work in a very competitive international environment. Another aspect is that the British industry to an increasing degree is foreign-owned: non-British investors own more than 50% of the shares of both BAE Systems and Rolls-Royce. This can be said to constitute another example of the ease with which the government has embraced the process of globalization.[309]

The issue of competition is also central in the British debate on defence R&T. Some observers argue that private contracting will increase substantially in the defence field, since the government's R&T budget is shrinking and some of the sectors that are important for RMA (Revolution in Military Affairs)-oriented issues, such as information technology and warfare, will be lucrative for private industry.[310] Private

306 Interviews, London, June 2002.

307 Inteview, London, June 2002.

308 See MoD 2002b.

309 See Mulholland & Lake 2002 and Chuter 2002.

310 Interview, London, June 2002.

defence firms as such are not contentious in the UK, however, since even British nuclear weapons were produced by a private company (one co-owned by the US giant Lockheed Martin).[311]

QinetiQ and Dstl actually already subcontract up to 20% of their own work to all kinds of private companies, although the biggest ones in this regard are also the biggest companies in the business, primarily BAE Systems and Thales.[312]

5.4. British Defence R&T and International Cooperation

5.4.1. The MoD Technology Strategy and International Collaboration

The British defence R&T system builds on both domestic and international efforts in the development of a defence-related technology base.[313] The MoD has placed each technology in one of three different categories (I–III). Category I is technologies of a defence-specific or otherwise sensitive (security) character, such as radar absorbing materials and infrared sensors. In this category, the MoD takes on most of the funding of related research.

Category II includes technology areas where it is preferable to engage in collaborative efforts with non-MoD actors, in the UK or abroad. These technologies consist of substantial non-defence-specific matters, such as metal matrix composite technology or operational analysis techniques. Here, international research collaboration funded by the MoD is a very important tool for the benefit of the defence R&T system.

Category III consists of technological areas where the main driving force is the civilian/commercial sector or in which much of the work is of minor importance to the MoD. These technologies include for example superconducting materials and human health physics. In these areas, the MoD will rely on other actors to fund and to provide the research necessary for the exploitation of defence-related applications.

The international research collaboration (IRC) efforts of the MoD are centralized in the IRC Team within the Directorate of Science and Technology Policy of the MoD. The head of the IRC Team reports directly to the Director of S&T Policy, but the S&T Director is the principal for IRC. The IRC Team consists of six subunits responsible for research collaboration with industry, European states and multilateral collaboration efforts, North America and Australasia, MoU negotiations, and so on. The MoD has cooperative links with more than 20 nations, including over 1000 activities covering many technology areas. Collaboration between other actors than the MoD – such as the defence research laboratories of Dstl and QinetiQ (see below) is also financed directly and entirely through the IRC Team of the MoD.[314]

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311 Interview, London, June 2002.

312 Interview, London, June 2002.

313 This subsection builds, if not otherwise stated, on MoD 2001b:§6-8.

314 MoD 2001e.

5.4.2 The UK and European Cooperation

Although one current thrust of defence research in the UK, as well as in other major European countries, is directed towards international collaboration, there is no doubt that the driving force for all the research is national. For example, according to Dstl's self-presentation, under the rubric 'For Queen and Country', the laboratory asserts that 'our purpose is of national significance – to provide the best impartial scientific and technological defence advice to the British government'.[315] However, international aspects are also increasingly relevant. Essentially, the major reason for this is not that international ventures are good in their own right, but the fact that the UK cannot do everything for its forces on its own – and the British armed forces are still the only big customer. International collaboration is therefore only a secondary feature for the UK.[316] Industry representatives also find export controls problematic – even more so in the USA than in Europe – and conclude that it is always best to control technology nationally.[317]

The traditional centrepiece of the British defence research establishments' international collaboration is its connection with the USA. However, given the changes in Europe, especially since the formation of the ESDP in the late 1990s, there is a certain movement within the British establishment for stronger European ties – following the Blair government's policy on closer cooperation within the EU.

Some observers argue that there are no real conflicts of interest between the traditional Atlanticist outlook of British defence R&T and a 'rapprochement' with the EU. In the process of globalization, it is not difficult for the UK to choose between the EU and the USA. In fact, despite all the talk of a rapprochement, it has had a very small impact on either acquisition or R&T policy in the UK.[318] Judging from a recent MoD policy paper on defence industrial issues, the UK still very clearly makes transatlantic relations its first priority:

> [There] are significant potential benefits to be gained from (…) better prioritisation of research and technology budgets in Europe, providing this can be implemented without damaging transatlantic co-operation.[319]

This could be interpreted as follows: European cooperation and integration are fine as long as they do not threaten relations with the USA. Others note that the UK's R&T relations with the USA are both problematic and excellent. The United States is seen as an actor that wants to retain its industrial dominance, whereas the European setting makes it possible for the UK to work among equals. This is in particular the case within the Letter of Intent/Framework Agreement (FA) group of countries. The cuts in European defence budgets, including R&T items, create great pressure

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315 Unless otherwise stated, this section is based on the Dstl website at http://www.dstl.gov.uk/

316 Interview, Farnborough, June 2002.

317 Interviews, London, June 2002.

318 Interview, London, June 2002.

319 MoD 2002b.

for international, primarily European, cooperation. The EU countries can also conduct cooperative ventures within a framework of mutual dependence (interdependence), which together with European integration is the UK's key to the future.[320]

Other British representatives argue that the same problems arising from the size and dominance of the USA that are forcing European countries to cooperate more with each other can also lead to precarious situations, such as future conflicts with the USA. However, the Framework Agreement might provide ways of getting things done without alienating the USA.[321] Industry representatives argue that the FA is a crucial step, with a great technical and political potential, but also note that the contracting harmonization rules, for example, are very difficult to agree on.[322]

A specific, and controversial, European technological project such as the Galileo satellite programme is viewed somewhat differently within the British establishment. Some industry representatives see the Galileo programme as having great potential, and as well as a project that the EU needs if it is ever to develop a credibly independent common foreign and security policy.[323] Others see it as a programme emerging more from national 'machismo' than from need-based analyses.[324] Analysts outside the government have even characterized it as an 'unnecessary redundancy' whose benefits do not equal the costs.[325]

5.4.3 The UK and Transatlantic Cooperation

The bond between British and US defence establishments dates back to World War II. The most well-known historical collaboration was in nuclear technology, but the British–US partnership has also been behind many other developments.[326]

Research agreements with the USA account for around half of Dstl's collaborative research and development work. Some of the bigger projects in this regard are those for to counter chemical and biological terrorism.[327] Technology specialists and Dstl analysts have supported the UK's Joint Combat Aircraft programme - working with their counterparts in the US Department of Defense on the Joint Strike Fighter (JSF).

British defence establishments, especially Dstl, are also major players in NATO-wide research collaboration and have pursued joint air training studies to examine how improvements can be made through training systems that connect British partners

320 Interview, London, June 2002.

321 Interview, London, June 2002.

322 Interviews, London, June 2002.

323 Interviews, London, June 2002.

324 Interview, London, June 2002.

325 Interview, London, June 2002.

326 When not otherwise stated, the source of this subsection is www.dstl.gov.uk.

327 Interview, Farnborough, June 2002.

in a computer-simulated environment. Dstl is also heavily involved in the NATO RTO system (for more on the RTO, see above**).**

While the technical links between the UK and the USA have been strong since World War II, the Tripartite Technical Co-operation Programme (TTCP), which also includes Australia, New Zealand and Canada, has helped sustain close partnerships between the five allies. Dstl is one of the major actors in this programme.

The TTCP, which is sometimes derogatorily called 'The Travelling Cocktail Party' is, much like the NATO RTO: a venue for the discussion and organization of joint ventures, sharing of data, and identification of fruitless channels of research that should be avoided.[328]

However, as mentioned above, because of its sheer size and dominance, cooperation with the USA is often considered difficult by British observers. First of all, since the USA has a very limited experience of true cooperation (US actors are more accustomed to leadership than to cooperation) cooperation becomes difficult when the USA is dealing with smaller allies, including even middle-sized allies as the UK. Furthermore, co-developed projects are becoming increasingly difficult to carry out because of the pressure from the US Congress to keep all important work within the USA (and thus within the Congress' constituencies).[329]

British industry representatives also note that the USA guards its technology secrets very closely. Even the BAE Systems corporate structure, BAE Systems North America, cannot provide BAE Systems UK with all the technology it uses in its own products, produced in the USA; 'black boxes' (i.e. the confidential parts of a weapon system to be exported) and export controls affect BAE Systems internally as well. There are times when the British MoD knows more about the technology involved in certain BAE Systems North America projects than the staff of BAE Systems UK does. Therefore, BAE Systems entered the US market more on commercial grounds than with any great hopes of benefiting from technology transfers.[330]

The British government obviously regards this as a problem. According to the MoD's Defence Industrial Policy Paper, there are 'still major obstacles to ensuring that technology created within the U.S. – even by the subsidiaries of UK companies – can be exploited in the UK'.[331] One attempt to solve this is the British–US *Declaration of Principles*, an agreement signed in early 2000 that commits both governments to improve US–British defence business, especially in terms of easing restrictions on arms and technology exports from the USA to the UK.[332]

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328 Robinson 1999:401.

329 Interview, London, June 2002.

330 Interviews, London, June 2002.

331 See http://www.mod.uk/issues/industrial_policy.htm, §36.

332 See http://www.mod.uk/issues/industrial_policy.htm, §35.

Nonetheless, a central observation of British representatives is that the British–US relationship will continue to be crucial. If something is to be done quickly and effectively, cooperating with the USA is the best route.[333] Industry representatives conclude that, at the R&T level, the British–US bond is as strong as ever, with both sides enjoying and benefiting from it. At the equipment level, however, cooperation is much more difficult.[334] A future structure for British defence R&T would therefore benefit, as some analysts argue, from a close working relationship with the USA while simultaneously promoting the harmonization process – including specialization – within Europe.[335]

5.5 The British Defence R&T System: Conclusions

A number of preliminary conclusions can be drawn from this overview of the British defence R&T system. First, the system itself exhibits several special characteristics. There have been no great, long-term plans for defence R&T. Rather, British policy seems to be one of 'muddling through', where ad hoc adjustments and inductive working methods are central. This being the case, it is possible to identify both disadvantages and advantages stemming from the system itself.

In terms of the disadvantages, the lack of long-term planning can be said to cause a certain lack of coherence within the system. This leads to a lack of proper oversight of the system, which could contribute to structural problems in the coordination of work on technologies extending over several system areas. The lack of focused planning might also make it difficult to speak with one voice in Europe about British capabilities. Finally, the lack of governmental instructions makes it difficult for the British industry to act on defence R&T issues with a long-term perspective.

There are also a number of obvious advantages inherent in the British system. It is a non-exclusive system that can easily grasp innovations outside its own network. Big structural changes, such as the split-up of DERA, have been carried out within the system, which implies that there are well-functioning, competitive conditions. As a whole, the British system is also very exposed to competition, even foreign competition, which makes its units highly market- and customer-oriented.

Section 5.1.3 above presents a number of empirical expectations with regard to British defence R&T policy, derived from the analytical framework of this study and the historical and general positions of the UK in security and defence policy. These expectations are evaluated below, in the light of the empirical investigation.

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333 Interview, London, June 2002.

334 Interview, London, June 2002.

335 Interview, London, June 2002.

Cooperation Based on Interdependence or Self-Serving Policies?
Historically, British foreign and defence policy has been based on traditional, self-serving policies. Recent developments indicate that contemporary policies do not seem to be based on policies of interdependence. Hence, self-serving policies, with the interests of the British state in focus, were expected be central to the organization and development of British defence R&T.

To a considerable degree, this was confirmed in the empirical investigation. Most R&T efforts are directed towards the national armed forces, and international cooperation is – albeit not uninteresting – not a big part of the total effort. Interdependence as such does not seem to be regarded as a concept leading to any major consequences for British defence R&T.

Pluralistic Actors or Governmental Power?
In terms of the actors involved in defence R&T, and given the Thatcher legacy, we expected the role of free competition even in this field to be strong. Thus, the principle of competition should result in a number of non-state actors playing a very considerable role in the business of defence R&T.

This expectation was met in the sense that there seems to be no sentimental views on state ownership of defence R&T institutions, primarily illustrated by the split-up of DERA and the subsequent sale of a part of QinetiQ to a private US company. Other features of the British system, such as the very hard-nosed, competition-based government views of the domestic defence industrial companies and their research efforts, underscore this impression.

However, other aspects – such as the centralization of the government defence R&T structure (with the exception of QinetiQ) in the MoD – seem to indicate that the rationale for the government's interest in the field is impossible to reduce entirely to market factors. The vision of the government's keeping its 'golden share' even in QinetiQ indicates that the defence R&T field is not reducible to any other form of business.

The strong emphasis on competition, however, makes the British system very different from the French system.

Common Values or Material Power Determining the Scope of Cooperation?
Another expectation concerned the process of European integration. If successful, it might also press the traditionally Atlanticist British policies in a Europeanist direction. A greater sensitivity to European solidarity and ideas, thus promoting a higher degree of cooperation with the EU countries rather than with the USA, would characterize British policies.

Given the limited scope of this empirical investigation, it might be too early to tell where this development is leading. What was seen only a few years ago as the new Europeanist orientation of the Blair government has partly affected the British defence R&T system, but its main thrust seems definitively to be firmly Atlanticist. The sellout of more than a third of QinetiQ, by far the largest British defence R&T institution, to a private US company with very close relations with past and current US policy makers – rather than to a European consortium – may be another clear signal. However, given the secrecy surrounded the QinetiQ deal it is still impossible to tell whether the Carlyle bid won for economic or for political reasons.

Globalization or Geopolitics as Central Conditions for Cooperation?

Related to the dichotomy of values and power, the final expectation set out above was a geopolitical one: given British policy, the overarching thrust of British R&T policy would be its transatlantic aspects, that is, it should be directed towards British–US relationships and cooperative ventures.

This seems to be the case, although is difficult to distinguish the causes. The British–US attitude towards globalization is a common, positive one, and it is probably fair to say that both the UK and the USA have adapted their policies to the process of globalization. There are important exceptions, however, not least in the field of defence: the US policy towards technology transfers and arms exports is often governed by national–protectionist factors rather than by the principle of the free flow of goods and non-politicization of markets.

Globalization-oriented explanations do not exclude a geopolitical explanation in this case. The latter is, after all, the traditional one in British–US relations, reaffirmed by 'softer' explanations such as cultural and linguistic affinities. Both geopolitics and globalization could be said to coincide in bringing US and British policies closer to each other.

6. Conclusions

6.1 Introduction

This chapter summarizes the results of the empirical investigations and analyses them with the help of the research questions and the analytical framework developed in chapter 2. The ambition is to compare, analyse and evaluate the empirical findings in order to draw general conclusions and identify areas of further research.

6.2 Evaluation and Conclusions

Chapter 2 introduced four sets of research questions. This section provides answers obtained through the empirical investigations, presented thematically and comparatively.

6.2.1 General Conclusions Regarding France and the UK

As noted above, the French R&T planning system is highly structured and controlled by the state, bringing advantages of coherence, focused research and resource allocation, and 'customers' with a good overview of the system.

The disadvantages include a degree of rigidity and inflexibility and the risk that research performed outside the tight French national network will not be noticed. Related to this point is another potential disadvantage: government protectionism, which could create actors that lack independence and integrity.

The system in the UK, on the other hand, does not include extensive, long-term plans for defence R&T. Rather, ad hoc adjustments and inductive working methods are central. This type of system also has a number of advantages: it is non-exclusive and can easily find and use innovations stemming from research outside its own network. The considerable structural changes in the institutional framework of British defence R&T imply that there are well-functioning, competitive conditions at play within the system. The British system is also exposed to competition, which normally gives rise to productive research.

The disadvantages inherent in the British system seem to include a lack of coherence, an effect of the lack of long-term planning. This might contribute to structural problems in the coordination of work on technologies extending over several system areas. The lack of focused planning might also lead to difficulties in being able to speak about British capabilities with one voice in Europe. Finally, the lack of government instructions makes it difficult for British industry to act on defence R&T issues in a long-term perspective. The table below presents an overview of the features of the British and French national systems.

A Comparison of the British and French Defence R&T Planning Systems

Issue	Country	
	France	**United Kingdom**
Characteristics of the Defence R&T System	A structured planning system. The performers find themselves in a tight network controlled by the state.	No long-term plan. A policy of muddling through. Ad hoc-adjustments and inductive working methods.
Disadvantages	A rigid and inflexible system that can miss innovation existing outside of the tight network. Governmental protectionism can create actors that lack independence. The system is not as exposed to competition as the British system.	The system lacks coherence. Structural problems regarding coordination of work with technologies extending over several system areas. No good oversight of the system. Lack of government instructions makes it difficult for industry to act in a long-term perspective.
Advantages	A coherent system. The tight network makes it easy to muster up strength and cooperate over different system areas. Good over sight of the system. Can speak with one voice in Europe for French capabilities.	A non-exclusive system that easily can grasp innovation existing outside the network. Big structural changes have been realized within the system, which implies a well-functioning competitive system. More exposed to competition than the French system.

6.2.2 Cooperation Based on Interdependence or Self-Serving Policies?

The first set of research questions concerned the driving forces behind European defence R&T cooperation. We investigated whether the development and the level of cooperation in the defence R&T setting reflected a new type of international relationship, related to the concept of interdependence, or whether the actors involved mainly pursue self-serving policies with their own state as the primary beneficiary.

The Multilateral Level

At the European rhetorical level, there is an obvious bias in favour of the concept of interdependence: 'cooperation on defence R&T is necessary for a strong Europe' is often heard in the political debate. Much can also be said about the current degree of international interdependence between the European countries, both politically and economically.

However, issues of national rivalry and the predominance of national interests seem to have been the major defining features of European defence R&T. The field itself, involving such sensitive issues as military power, military secrets and military projects, tends to make governments extremely cautious in their interaction with other states. For the self-serving state, purely national defence R&T efforts have many advantages. Strategies of interdependence and collaboration also offer substantial advantages, even from an egotistical perspective: the intra-European pooling of resources could lead to a better collective standing in the world at large. This, in combination with declining European defence budgets, could lead to great benefits for

Europe as a whole, but today's European policies show few signs of such a redirection. Newer arrangements, such as the six-nation Framework Agreement, might constitute the first moves away from this pattern, but this is still an open question.

The French and British Policies

In this area, our expectation was that both the French and the British defence R&T policies would be more nationally oriented and self-serving than interdependence-based.

In the French case, the concepts of integration and sovereign state interests to some extent coincided during the 1990s. French policy could be seen as using interdependence and European integration as tools to pursue French state interests. Thus, the EU has become the instrument through which France could remain an important actor on the international arena. To an extent, the concept of interdependence is in France considered as a problem that needs to be solved through cooperation.

In the British case, interdependence rhetoric is also used in an instrumental way: international and industrial cooperation is encouraged and seen as a necessity. At the same time, the overriding goal of British defence technology cooperation is to lead to an optimization of the British national armed forces and their equipment.

The primary foundation for states' defence R&T work thus still seems to be national. However, in both the British and the French case, governments keep returning to the concepts of interdependence and integration as self-evident and unavoidable future components of their national efforts. However, in both countries there seems to be a high degree of uncertainty as to where these new developments will lead. International cooperation consumes time and money. This must, evidently, be reallocated from national efforts, which in turn highlights the dilemma of reducing the latter before there is a reliable successor in the form of international collaboration.

6.2.3 Pluralistic Actors or Governmental Power?

The second major set of research questions formulated in chapter 2 dealt with the actors involved in defence R&T. We investigated whether the defence R&T efforts reflected a system of pluralistic actors, where many non-state actors were highly influential, or whether the power and influence of nation-states and their governments still seem to the most important factors.

The Multilateral Level

Given the empirical results presented above, it seems reasonable to conclude that government power in the defence R&T field is still very strong. The main developments and initiatives presented and analysed above seem to be clearly related to the government agencies more than anything else.

Flowing from this, albeit rather paradoxically, is the fact that many of the problems and deficiencies inherent in multilateral, European collaborative defence R&T efforts appear precisely because of the strong influence of individual nation-states and their governmental interests. De-marketization, the principle of *juste retour* and the strong position of the principle of inter-governmentalism are all contributing factors. The result is that multilateral efforts are less than effective and that states tend to work nationally or bilaterally in the field of defence R&T.

This state of affairs will not necessarily last forever, however. External or internal pressures, such as international competition or integrationist political moves within the EU, might force national governments to rethink their current policies. On the other hand, since defence R&T is obviously closely related to the essence of state sovereignty, this might be a very long-term prospect.

French and British Policies

As noted above, states seem to be eager to maintain defence R&T as a domestic activity, at least in terms of planning and control. However, the British and French governments also perceive a need to include more actors in the implementation process of government R&T efforts, although implemention is still in its infancy in both countries. The British system exhibits the biggest efforts, in terms of strategies addressing the problem, to change this situation.

In the French case, state power still dominates in almost all parts of the defence R&T field. The fact that the actors which could play an important role, such as the defence industry, are or previously were state-owned contributes to the continuation of this state of affairs. Given the financial hardships currently experienced by several state-owned companies, econonomic factors might function as an agent of change in this regard.

In both the British and the French case, however, governments have expressed their views on the need to follow what happens in the civilian industry and in the private defence sector, in order to make better use of existing knowledge. This indicates a certain government consciousness of the importance of multiple actors in technological development. When it comes to developing strategies and plans for defence R&T, however, both France and the UK use these multiple actors only to a very limited extent. The British R&T plans are described as entirely policy-driven, and in France even the DGA acknowledges that French industry plays a minor role in the development of the main document for French defence R&T, the PP-30. In both cases, however, industry plays a role in the implementation phase.

One important difference between the UK and France is the former's strong emphasis on competition, arguably a legacy from the Thatcher government. The sale of QinetiQ and the less than sentimental view of the domestic defence industry's R&T efforts are all signs of this. If a future, less regulated and more competitive world of defence R&T were realized, the British system would stand to gain a lot because of its current structure.

6.2.4 Common Values or Material Power Determining the Scope of Cooperation?

The third set of questions presented in chapter 2 relates to the dichotomy of common values vs. material power. We investigated whether the actors we analysed seemed to cooperate on defence R&T because of their common liberal, Western democratic values and identities, or whether the primacy of military power and the subsequent lack of willingness among states to share knowledge would severely hamper cooperation in the defence R&T field.

The Multilateral Level

If one considers the total of WEAG's R&T-related work in 2001, constituting only 2% of the European countries' combined R&T expenditure,[336] it is tempting to draw the conclusion that European nations wish to keep their technologies national and that they are not interested in sharing high-technology research with each other. At the same time, however, France invested 20% of its R&T expenditure in 2001 in international collaboration projects. One can therefore assume that these states, in respect of WEAG, are negative towards this particular form of cooperation rather than sceptical of cooperation *per se*.[337]

Many cooperative initiatives are taking place in Europe - the Framework Agreement, the Europa MoU and the Galileo programme, to mention just a few - indicating a willingness among the European states to enhance their technological cooperation. Among these, the Framework Agreement is regarded as a very positive development, especially in the UK, whereas many French government and industry representatives are still hesitant.

As noted in chapter 3, a comparison between the EUREKA and EUCLID programmes indicates that European states still value the national aspects of defence R&T highly, to the point of accepting the sacrifice of benefits that may emerge from international cooperation. Thus, they seem to consider their own national material – possibly military – power in the first place and in the second place value a common European identity based on shared values.

Hence, it could be concluded that common values and identities among countries are important but not sufficient conditions for cooperation in the defence R&T field. This is illustrated by the fact that even the historically close British–US relationship has recently become complicated.

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336 Discussion with Ola Listh, responsible for questions concerning WEAG at the Swedish Defence Research Agency, July 2002.

337 At the same time, it should not be forgotten that the cooperation form within an intergovernmental organisation like WEAG is decided by no other than the countries themselves and therefore in some way reflects the wish of the countries.

While common values and identities alone cannot explain cooperation, or the lack thereof, nor can national strivings for power. The European countries cannot afford to pursue only balance-of-power policies towards each other. A kind of consensus seems to be emerging among the European countries, not on exactly how cooperation should be performed but on the fact that it is needed. Mutual technology dependency is an economic reality for the European countries, since none of them can afford to cover all technologies on its own. This implies that states have to 'trust' other countries and cooperate with them. This is of course much easier when the countries involved share common values and identities.[338]

French and British Policies

In the French case, values and identities can be said to contribute to the historically complicated French–US relationship. Although they are Western, liberal and democratic, France and the USA have in many respects very different cultures and values, which seem to complicate cooperation between them. The fact that, according to many observers, they share one specific value – the idea that their own culture is superior and should be generously extended to the rest of the world – does not make cooperation easier.

In terms of the European aspects of French policy, a certain European identity is put forward rhetorically, but defence R&T is basically considered a national priority. Only when French national resources are insufficient does French policy seem to promote European policies.

In contrast to the French experience, the UK has a long tradition of close research cooperation with the USA. In material terms, this form of cooperation is still the most central to the British defence R&T system. US–British cooperation has a clear background in common values/common culture, but it seems that British representatives are experiencing increasing difficulties in their cooperation with the USA. US technology transfer is becoming an increasing problem even for UK, which enjoys a special relationship with the USA.

The process of European integration might also direct the traditionally Atlanticist British policies in a Europeanist direction. This was a common expectation after the rise to power of Tony Blair and the 'New Labour' government in 1997. However, so far the Atlanticist tendency in British defence R&T seems to be very strong. A number of recent developments, such as the sale of QinetiQ to a private US company, underline this as well.

338 As an example, British defence industry representatives not seldom refer to Sweden as a country they find it very easy to cooperate with, due to the similarities in the Swedish and UK business cultures.

6.2.5 Globalization or Geopolitics as Central Conditions for Cooperation?

The last set of research questions concerns the dichotomy of globalization vs. geopolitics. These issues are related to the third set of questions, analysed above. We investigated whether the process of globalization plays a central role in the development and financing of today's European defence R&T efforts, thus promoting international cooperation within that field, or whether traditional geopolitical considerations dominate the pattern of cooperation. The alternatives we envisioned were the following. Either the European states would increasingly try to balance the USA by cooperating in European, rather than transatlantic, defence R&T research projects, or some of them would bandwagon with the USA in order to gain individual benefits.

Inherently, the EU is a forum with the potential to integrate increasingly more security and defence activities. A number of activities in the past five years or so, above all the ESDP process, seem to show movement in that direction. With the introduction of the ESDP, cooperation began to develop in other areas as well, such as defence matériel and space technology. This is an example of how the activities of international cooperation forums can involve a momentum *per se*: commitments in one area can give rise to commitments in other areas.

The ongoing process within the EU related to security and defence policy can be seen, and is certainly regarded as such by some, as geopolitically motivated balancing efforts directed against the domination of the USA in the security and defence field. This is particularly obvious in the space field, where a lot has taken place in recent years. The Framework Agreement, the Galileo programme and the ESDP can all be seen as examples of this, although the extent to which the ESDP will be a competitor or a complement to NATO is still an open question. The EU Commission and the ESA presented a 'Joint European Space Strategy' in November 2000; the European Commissioner for research has announced a common Task Force between the Union and ESA as a preparation for the possisble integration of ESA into the Union; and the Western European Union's so-called satellite centre in Torrejon, Spain, was transferred to the EU in January 2002 –and renamed the European Union Satellite Centre.

European defence R&T politics cannot be disengaged from developments within the EU nor from the remaining Euro-Atlantic security policy. Developments within the EU, the ESDP and NATO can be expected to have important implications for developments in the resource base. An increased integration of NATO and the EU/ESDP can also push common R&T investments. If, on the other hand, the roles of NATO and the ESDP diverge fundamentally, for reasons of geopolitical balancing, then the R&T investments are likely to become US and European, respectively.

Thus, geopolitics matters. At the industrial level, however, there is an increased willingness among European firms to bandwagon with the USA. The decline in European defence budgets in the 1990s has led to decreased markets for the defence

industry, which has further increased their efforts to reach the US market. The process of globalization – due to which fewer and fewer firms are 'national' in the traditional sense – also makes it much easier in principle for industry to engage in multilateral, non-geopolitical and non-national R&T ventures. This makes it in fact more difficult for the actors proposing a clearer EU balancing of the USA to use industry as a tool: given the decreasing European willingness to spend money on defence issues, industry – and its R&T efforts - is likely, because of the pressures of globalization, to try to form transatlantic partnerships.

French and British policies

In the French case, we expected either that cooperation on defence R&T would be encouraged by the French state, for clearly self-interested reasons – i.e. to make the EU act for the sake of France, primarily as a balancing counterweight to the USA – or that the forces of globalization would force the French R&T system to become a more multilateral and less national structure. In the British case, we expected that geopolitics would govern British defence R&T policy: the importance of the transatlantic link would be the most salient.

The empirical facts are mixed. Rhetorically, in the French view a stronger European cooperative stance is necessitated by the dominant position of the USA – clearly a geopolitical position. In practical terms, European defence expenditure and R&T efforts are declining.

Some British representatives exhibit a relatively divided attitude towards the importance of cooperation with the USA and the EU. On the one hand, fears are expressed about the future of the relationship with the USA if EU cooperation becomes too exclusive. On the other hand, cooperation seems a necessity for the EU. Others argue that it will not be necessary for the UK to choose between the USA and the EU - it will be able to cooperate with both actors.

At the same time, the demands of globalization have obviously pressed French decision makers to abandon some of the salient features of the nationalist, traditional Gaullist policies, although they are very reluctant to do this. In the UK, on the other hand, globalization is officially appreciated and regarded as a positive development. This squares as well with the policies of the USA – albeit not with some aspects of its defence industrial policies, including technology transfer – and can be said to coincide with traditional British–US geopolitical considerations.

6.2.6 Summarizing the Conclusions

The table below presents answers to the research questions posed in chapter 2, as identified in the empirical investigations of this study.

Table 1: Security Policy Research Questions

Issue	Actors			
	France	**UK**	**EU/NATO and related**	
Cooperation based on interdependence or self-serving policies?	• Self-serving policies		• Self-serving policies • Framework agreement a new and different trend?	
Pluralistic Actors or Governmental Power?	• Governmental power	• Governmental power • Encourgament of new actors and competition	• Governmental power • New actors gaining ground?	
Cooperation enhanced by common values and identities, or hampered by concerns based on primacy of military power?	• National military power the base of considerations • Values and identities promote European cooperation, hampers cooperation with the U.S.	• National military power the base of considerations • Values and identites promote cooperation with the U.S., hampers intra-European cooperation – so far	• Common values and identities important but not sufficient conditions for cooperation • Multilateral cooperation on defence R&T a small share of european total	
Globalisation or geopolitics as central conditions for cooperation?	• Geopolitical balancing obvious in rhetoric, less so in practice • Globalisation affecting but not determining policy	• Geopolitical bandwagoning with the U.S. • Globalisation regarded positively and partly determining policy	• Several developments seemingly balancing the U.S.; unclear end-goals	• NATO-EU relations still unclear: integration or competition?

With these results, it seems reasonable to claim that there is no clear-cut direction in European defence R&T efforts. These efforts are largely still national and guarded by the traditional state/government powers. There are, however, a number of more recent developments which in time might challenge this state of affairs. For now, however, it is an open question whether they will succeed or not.

6.3 Implications for Further Research and Suggestions for Future Policies

A common view among analysts in Europe is that there is a lack of a European R&D vision and that this constitutes a great impediment to European R&D development.[339] To a considerable extent, this situation contrasts starkly with the case of the USA, but why is this so?

A traditional explanation would be that, in the US case, the state and its industrial base are driven more easily by strategic interests, since there is only one government – albeit a huge one – and thus also only one 'vision'. The European countries, however, identify themselves as traditional nation-states in the first place and as parts of a common European entity in distant second place. That is, for structural reasons alone, a European common defence R&T vision might be very difficult to achieve: there is no common strategic vision in Europe and thus no common vision of issues of strategic importance, such as defence R&T.

Even at the national level, however, it is difficult to find a national vision, shared by decision makers and implementing actors, in the two most prominent European countries in the defence R&T field.

This is obvious in the British case, where industry argues that it receives no government guidance for where it would like to see industry's future R&T investments go. This seems also to be true for the French defence planning system, which is more structured than the British. French analysts argue that there is a definitional problem with the word '*amont'* in French defence research and that there is no shared view of what it means among the defence actors – the DGA, industry, the general staff, and other civilian financiers. The different approaches of the actors in this field prevent an analysis of the level and evolution of research efforts.[340]

This may be explained by the fact that it is not out of disinterest that states act this way but because of the difficulties involved in managing an ever more complex situation. Rapid technological developments - driven primarily by demand in the civilian market and increasingly globalized - are difficult for governments to follow. Rapid developments in technology also stand in stark contrast to defence planning, which is much slower. Thus, the impact of globalization might explain the lack of a common European vision.

It is tempting to ask why governments, even at the national level, find it so difficult to establish efficient, non-exclusive - in terms of participating actors – long-term technology visions. Cutting-edge technology is a decisive factor in security policy contexts as well as in war. It is also an important constituent of economic growth and

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339 This was an argument put forward by several contributors to the Conference on European Defence R&D, heldin Brussels in January 2002.

340 Lignières-Cassou 2001:9.

therefore a ground for social welfare systems. With this vital role for the state, why do governments not try to take advantage of all the technological knowledge available to them within the borders of their countries?

In order for governments to put forward technological strategy visions, they must have a good overview of the entire technological system - defence/civilian technology, public and privately performed research, national and multinational work – but this is becoming an increasingly difficult task. Coordinating international collaboration within various cooperative forums also constitutes an increasing part of the work of civil servants in the European ministries of defence, and it takes a lot of time away from national work.

However, it could be argued that the complexity of rapid technological development is not a reason for governments to give up their guiding and coordinating functions and responsibility. On the contrary, complexity entails an even greater need for coordination and division of labour. For governments to have an impact on strategic technology development - and not end up producing strategy plans of no real importance - they need to make use of a broad network of actors in the process. Preferably, such networks should be flexible and non-exclusive.

Another important issue concerns the question how, or whether, the strategic interests of states are transformed into defence R&T efforts. In our investigations, we were unable to identify in any detail how these processes work. What can be argued, however, is that the structural set-up of national defence R&T systems reflects a great deal of strategic orientation, and thus the strategic interests, of the states involved. We have focused on the issue of cooperation, and it seems to be the case that, for example, the traditional Atlanticist posture of the UK is significantly reflected in its policies on defence R&T, both in terms of establishments and in terms of practical cooperation. In the case of France, its Eurocentric rhetoric is not matched by higher allocations of resources to cooperative European defence R&T efforts.

There are several ways in which the European countries could improve national systems and their handling of strategic R&T. Better organization of national systems should not be seen as contrary to increased European integration – rather, this could facilitate European synchronization. The multiplicity of European instruments for technology cooperation within or outside the European Union can create the impression that multilateral structures take over from national politics when in reality research funding rests within each country.[341]

In the French case, analysts have proposed a stronger engagement of the French Parliament in order to improve the national R&T system. According to this proposal, the French Parliament should have a strategic vision for what should happen in the field in France and Europe, and should set up a clearer state policy with fixed objectives for public R&D funding. This would help France in its negotiations at the European level, it is argued. The national system could be further improved by an inter-

341 Ibid:10.

ministerial approach to R&T, as advocated by some analysts.[342] It is interesting to note that these suggestions advocate a policy that could be described as *dirigisme* and that industry would not necessarily object to such measures. On the contrary, industry generally asks for more governmental guidance for the direction of their future work – as noted above, this is also the case in the UK.

Regardless of which strategy the European countries choose for defence R&T – the development of a strategy is a good thing. Along the road to such a strategy, European states could benefit from considering the following questions:[343]

- To what extent do the European countries want technological interdependence, organized at the European level?
- What should be done at the national and European levels, respectively? Where and how does transatlantic cooperation fit in?
- What degree of independence or security of supply does Europe want vis-à-vis the outside world? Does it want to have a capability in every single area, or can it take advantage of expertise and technology outside Europe?
- What roles should governments and companies play, particularly in terms of funding?

The direction of European defence R&T efforts is likely to be directly dependent on which strategic course the European countries set. Here, it is important to note that European strategic independence, or defence R&T independence, is not necessarily the most obvious route to take - for a number of reasons. It would be very expensive, risk alienating allies – primarily the USA – and lead to tough choices for the EU member states in terms of which multilateral body of the EU system is going to decide about 'EU strategy'. Strategic and technological interdependence with the USA for example, is another, perfectly viable policy choice: it is restraining politically, but, with a certain willingness on the part of the USA to easy, for example, technology transfers, it would be a much more efficient way to use European taxpayers' R&T money. Furthermore, it would link the USA and the EU more closely politically and would not risk pitting the two against each other in opposing blocs, a constellation in which the EU would be the weaker part for the foreseeable future.

Furthermore, given the developments surrounding the US/British-led war on Iraq in 2003, it is reasonable to argue that the chances for a cohesive European foreign,

342 Ibid.:9, 11-12. Interesting to note for Swedish readers is that the same arguments can be found in the final report submitted by the governmental commission on Swedish defence R&D. The commission wishes to see a stronger role for the government and the parliament in making out strategies for R&D (SOU 2001:22. 2001:14). The principal "placers of orders (including the Swedish Government Offices) should, in a more clear-cut manner than to date state their demand for knowledge and expertise build-up in a long-term perspective, and in dialogue with the major R&D producers document this." (SOU 2001:5) The commission finds it crucial to deal with "the Government's control of the R&D activity as well as the distribution and earmarking of resources for it". It equally stresses the need to set up a "R&D strategy at governmental level". (Commission on Swedish Defence R&D. 2001:4)

343 Bühler 2002:3, 5.

security and defence policy have diminished substantially. Thus, although there are a number of very rational reasons why the EU member states would benefit from closer cooperation on defence R&T in a pan-European forum, a number of strategic obstacles are likely to stop them – at least in the short and medium term.

In addition to the current strategic problems, there are also a number of inherent European structural problems which have a restraining influence on the European defence and defence R&T market from a competition perspective. They can be summarized as follows:

- Market fragmentation and non-productive use of resources, including a multiplication of R&D initiatives. Total European investment in R&D is less impressive than the constituent parts.
- Great diversity in working methods and economy regulation systems among the various European pieces of the puzzle.
- National protectionism towards high-technology national champions in Europe, leading to a less competitive European industry. Protected companies experience less need to obtain increased competitiveness.
- A risk-avoiding business environment. In comparison with the US culture, the European business culture is said to judge failures more harshly. Europeans are also described as less willing to make investments in industry. By such behaviour Europe risks losing its young, well-educated, risk-inclined leaders to the US business culture, where the taking of risks is encouraged.
- A weak linkage between research carried out by state laboratories or universities and that conducted by industry.

The technological gap can thus be divided into two aspects. On the one hand, there is a gap between the levels of European and US defence spending, and this gap is widening. On the other hand, there is a structural aspect of the gap, where the European countries could use their collective resources more efficiently than they do today.

It could be argued that European countries, in the first stage, should concentrate their efforts on the latter aspect and on improving the situation. It is not likely that the European countries will be willing, in the near future, to bridge the first aspect of the gap. In the words of Robert Kagan:

> It was one thing for Europe in the 1990s to increase its collective expenditures on defense from $150 billion per year to $180 billion when United States was spending $280 billion per year. But now the United States is heading toward spending as much as $500 per year, and Europe has not the slightest intention of keeping up.[344]

It should be easier for the Europeans to make structural improvements . Analysts see a number of structural measures that could help European states to begin to narrow the gap, some of which are:

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344 Kagan 2002:13.

- Creation of a strong defence equipment procurement organization (which could possibly be derived from OCCAR).
- Establishment of a common programme strategy, deciding which programmes should be handled at the national, European or transatlantic level.
- Moves towards a 'European DARPA', with common, multi-year funding and strong political support (Enders 2002:4)

Given the difficulties inherent in the multilateral, European R&T efforts identified in this study, however, it is questionable whether Europe will decide to undertake these measures. The important, but difficult, issue for the future will be to strengthen European defence R&T efforts without causing a split between the USA and the EU.

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