French public defence expenditure and procurement policy

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Résumé : France was submitted to a US embargo on strategic technologies and products, so had to create them alone. This capacity in turn gave France a strong position on export market, which constituted a necessary complement to a policy of national independence, after the withdrawal from the integrated NATO command and the search for self-sufficiency. Military budgets maintain a relatively high level of defence expenses after the USSR crisis. Form the French arms industry, arms exports become a more and more necessity in order to obtain some scales economies. Dual technologies and spinoff of military R&D was encouraged, such as the possibility of international cooperation on programmes, the development of offsets and the rule of "juste retour".

Soumise à un embargo américain sur les technologies et produits stratégiques, la France a dû les créer seule. Cette capacité confère à la France une position forte à l'exportation, qui constitue un complément nécessaire à une politique d'indépendance nationale, après le retrait du commandement intégré de l'OTAN et la recherche de l'autosuffisance. Les budgets militaires maintiennent un niveau de dépenses de défense relativement élevé après la crise de l'URSS. Pour l'industrie française de l'armement, l'exportation d'armes devient de plus en plus une nécessité afin de réaliser des économies d'échelle. Les technologies duales et les retombées de la R&D militaire sont encouragées, comme la possibilité de coopération internationale sur les programmes, le développement des compensations et la règle du "juste retour".

Military expenditure, military procurement policy, arms industry, industrial military cooperation, France

Dépenses militaires, Politiques d'achats militaire, industrie d'armement, coopérations industrielles militaires. France

France is a medium-sized country with 56 million inhabitants. In addition to its European mainland, France still holds a number of overseas territories (mainly islands), which although not densely populated are of great importance both in military strategy (and space strategy as far as Guyana is concerned) and in the event of future exploitation of underwater resources.

This has always given the French armed forces two different missions:
- in Europe within the Atlantic Alliance (although outside the integrated NATO military command),
- and overseas.

The mission overseas was the most important one during the years 1945 to 1963, when the French armed forces had to fight in Indochina and then in Algeria; but decreased strongly after the end of that war. In 1963, the French Army alone had a force of 665,000 men; in 1988 (i.e. before the drastic political changes in Eastern Europe), this had already been reduced to 297,000 men, of which 48,000 in the rapid deployment force FAR, specialized in overseas missions. Without prejudice of what might happen in the years to come, the most important role of the French armed forces overseas now rests with the Navy.

The mission in Europe was predominant during the last three decades, but it now follows the general rule for all NATO members, i.e. a general reduction of importance following the decline of the Warsaw Pact. The CFE agreement has no strong incidence on the level of the French military equipment, but it contributes to a general evolution which leads to a further decrease in the number of Army personnel and the relative importance of the defence budget. In 1991, this budget, formerly the major budget, will only be second to that of education.

Now, above all these fluctuations, a general policy of national independence remains. The present situation of the French defence industry results from this policy being followed for some thirty years as the result of two important decisions confirmed or taken by General de Gaulle :
- the build up of a fully independent nuclear force (1959) which now accounts for approximately 25% of the defence budget,
- and the withdrawal from the integrated NATO military command, while remaining a member of the Alliance (1966).

In defence industry terms, withdrawal from the integrated NATO command did not imply a search for self-sufficiency. On the contrary, it gave rise to a systematic policy of cooperation with the FRG and the UK, as opposed to purchases of US equipment. But the buildup of nuclear force had an opposite effect, because the capabilities and facilities created to that end did give France a certain capacity for autarky, even on conventional weapons.

This was all the more so because of the fact that when this decision was taken, France was submitted to a US embargo on strategic technologies and products, so had to create them alone. This capacity, in turn gave France a strong position on the export market, which constituted a necessary complement to a policy of national independence (in order to reduce the cost of national equipment for the French armed forces), and where France occupies third position after the US and the USSR.

This political background results in a strong government implication in the defence industry, especially by means of the DGA (Délégation Générale pour l'Armement), a government agency initially formed within the Ministry of Defence in order to coordinate the buildup of the strategic force, and which now acts as the general coordinator of the whole national defence industry and as the upholder of the arms exports regulations.

The export market is now shrinking, and the national defence budget is also expected to do so. Conversely, European cooperation is becoming more structured. France was a pioneer of European cooperation in the 1960s and 1970s, but essentially in bilateral cooperations. France entered with more reluctance into the field of multilateral cooperations, but this trend is now over.

The interlinkage of all these factors make it difficult, sometimes, to analyse French public policies concerning military procurement and arms sales, and even industrial policies, since these are very dependent on the former. The following report attempts to sort out all these problems and to present a general overview of dual-use industries in France.

.1 Public defence expenditure

1.1 Defence budgets up to 1990

The French military budget is divided into 2 main categories, commonly used by experts :
- current expenditure ("titre III")
- equipment ("titre V"),

Pensions are not included in this budget (they are paid by another ministry).

Voting in this budget results from two different approaches :
- the appropriations and authorizations are voted for annually,
- but, as far as equipment is concerned, this vote should in principle be consistent with the contents of a "programme law", voted every 4 or 5 years in order to ensure a certain continuity of the industrial effort and investment forecasts.

The principle of such multi-annual programmes is not specifically French : in the USA, for instance, a 5-year sliding plan is presented annually by the DOD and discussed by the Congress. But this discussion does not end up as law, and in practice, this "sliding" plan can slide considerably. French programmes do slide, too - most often towards reductions - but being part of a law confers them a better stability and allows them to play their role in medium term industrial forecasts, except in periods of major geostrategic changes, which happen to be the case in 1990.

Over the past few years, the defence budget was the most important (15.5% of the overall national budget in 1989, slightly more than the education budget). It kept increasing annually at a higher rate than inflation, according to the prescriptions of the Atlantic Alliance (see table 1.1), although its share of the GNP tended to decrease continuously (from 4.08% in 1982 to 3.55% in 1990).

In terms of end users, the 1990 budget (27,463 Million ECU) was distributed as follows:
- Army : 26.1%
- Navy : 19.8%
- Air Force : 20.9%
- Gendarmerie : 9.0%
- "Common section" (i.e.strategic nuclear forces and space systems) : 24.2%

Within that increasing overall budget, an increasing share had been attributed to equipment (see table 1.2). This had been very high in the 1960s (reaching approximately 60% of the budget during the buildup of the nuclear force), then it had decreased down to 46.9% in 1984, then increased again, especially within the framework of the 1986-1991 programme : from 47.8% in 1986 to 53.7% in 1989. The 1990-1993 programme law had stabilized this ratio (53.9% in 1990).

Country: France DEFENCE BUDGETS					
Million Ecu	1988	1989	1990	1991	1992
Total Defence Expenditure	24,769	25,952	27,463	28,033	28,460
% of GNP	3.67%	3.61%	3.55%	3.37%	3.36%
% Change	+1.4%	+4.8%	+5.8%	+2.7%	+1.5%

TABLE 1.1

Sources:

-1988, 1989, 1990: budgets as voted
-1991: budget, as presented to Parliament
-1992: estimates, from the parliamentary report by A. Richard

Breakdown of the French defence budget

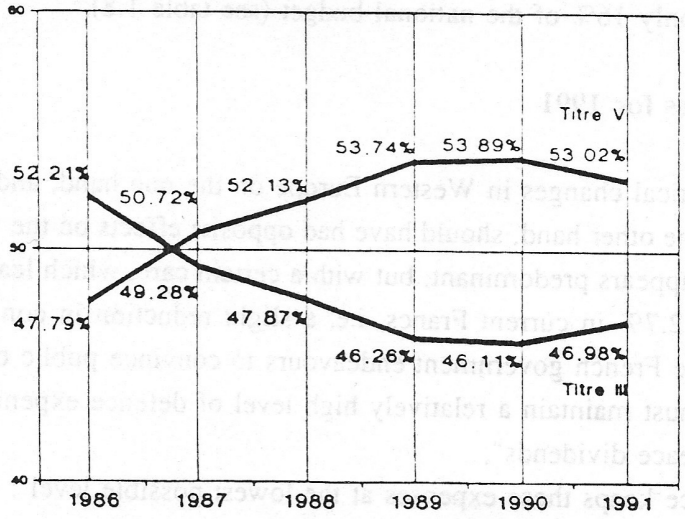

Table 1.2

"titre III" = current expenditure
"titre V" = equipment

Source :

Ministry of Defence

This increase (both absolute and in percentage) of the equipment budget accounted for the development of a number of new programmes for all three military services and for the strategic and space systems (see tables 1.3 through 1.6) in two consecutive programme laws, with emphasis on the Army which used to be less "technical" than the other two services. In compensation, the Army was the main loser in the reduction of the current expenditure budget, even before the revisions linked with the evolution of the Warsaw Pact : the so-called "plan Armée 2000", established in early 1989, implied a 6000- to 7000-man reduction of its personnel, together with a concentration in three army corps instead of four. The share of R&D in the defence budget has increased much more rapidly in the last 10 years than "titre V" as a whole : it was nearly doubled between 1981 and 1990. The precise figures are difficult to define, due to the existence of three different headings (overlapping) in the budget :

- "studies, research and prototypes" (19.3% of the overall budget in 1990);
- "research, development and tests" (16.5%)
- "research, development and tests" in "titre V" alone, i.e. exclusive of expenses of military personnel (16.2%).

The first of these three ratios does not allow many comparisons, and will not be used hereafter. The second one seems most adequate for international comparisons, and will be generally used in the present report. The third one shows that R&D accounts for 30% of the equipment budget. Another interesting ratio is that of military-funded R&D to the total public R&D : this amounted to 38.2% in 1990. This emphasizes the importance of military R&D in the national effort, since the Ministry of Defence alone funds 38.2% of the public expenses with only 16% of the national budget (see table 1.8).

1.2 Changes for 1991

The recent political changes in Western Europe on the one hand, and the outbreak of the Gulf crisis on the other hand, should have had opposite effects on the 1991 budget. In fact, the first effect appears predominant, but with a certain care, which leads to a stagnation of the budget : + 2.7% in current Francs, i.e. a slight reduction in constant currency. As a general rule, the French government endeavours to convince public opinion :

- that France must maintain a relatively high level of defence expenses, despite all dreams of "peace dividends",
- but that France keeps these expenses at the lowest possible level : in 1991, the defence budget should represent 15.3% of the overall national budget (instead of 15.5% in 1990), and become lower than the education budget, which constitutes a psychological reference.

Main Air Force programmes (before the 1991 budget)

PROGRAMME	1990-93 FUNDING (MECU)	IN SERVICE	PRIME CONTRACTOR
RAFALE (fighter aircraft)	2 635	1996	Dassalt Aviation
MIRAGE 2000 N (nuclear bomber version of the Mirage 2000)	4 216	1992	Dassalt Aviation
MICA (air-to-air missile	228	1996	MATRA

TABLE 1.5
Source: 1990-1993 programme law

Main strategic and space programmes (before the 1991 budget)

PROGRAMME	1990-93 FUNDING (MECU)	IN SERVICE	PRIME CONTRACTOR
M4 (submarine-launched ballistic missile)	1 268	1985	Aérospatiale
ASMP (medium-range air-to-ground tactical missile)	86*	1986	Aérospatiale
HADES (ground-to-ground tactical nuclear missile)	641*	1992	Aérospatiale
S4 (ground-to-ground strategic nuclear missile)	712*	2000	Aérospatiale
HELIOS (optical surveillance satellite)	570	1993	MATRA
SYRACUSE II (communications satellite)	926	1991	ALCATEL
* excluding nuclear warheads			

Table 1.6
Source: 1990-1993 programmes law

Main Army programmes (before the 1991 budget)

PROGRAMME	1990-93 FUNDING (MECU)	IN SERVICE	PRIME CONTRACTOR
TIGRE (support helicopter)	442	1997	Eurocopter*
ORCHIDEE (airborne surveillance radar)	156	1996	Aérospatiale
VBL (light armoured vehicle)	185	1990	Panhard
LECLERC (main battle tank)	855	1991	CIAT
MLRS (artillery rocket launcher)	584	1990	EPG*
* international consortium			

Table 1.3
Source: 1990-1993 programme law

Main Navy programmes (before the 1991 budget)

PROGRAMME	1990-93 FUNDING (MECU)	IN SERVICE	PRIME CONTRACTOR
SNLE-NG (new generation strategic nuclear submarine)	3 732	1994	DCN
SNA (nuclear-powered attack submarines)	455	1992	DCN
PAN (nuclear-powered aircraft carrier)	883	1998	DCN
Light Frigates	498	1994	DCN
ATLANTIQUE 2 (patrol aircraft)	1 239	1989	SEBCAT*
MURENE (torpedo)	242	1994	DCN
* international consortium			

Table 1.4
Source: 1990-1993 programme law

Country: France BREAKDOWN OF TOTAL DEFENCE EXPENDITURE				
Million ECU	1988	1989	1990	1991
Personnel	8,223	8,434	8,925	9,466
Maintenance	6,390	6,696	7,031	+1.6%
Procurement	6,514	6,929	7,058	
R&D	3,641	3,893	4,449	
R&D as % of total defence expenditure	14.7%	15.0%	16.2%	15.2%

TABLE 1.7

Sources:

-for 1988, 1989 and 1990: overall figures as for table 1.1, and breakdowns made by the French Ministry of Defence

-for 1991: parliamentary reports by A. Richard and J.G. Branger

Warning:

The figures for R&D in row 4 of table 2 must be handled with care, because they are exclusive of expenses of military personnel (since these are already taken into account in row 1). The overall military R&D expenses are given in row 3 of table 1.4, as compared to the corresponding civil expenses. The same remark applies to maintenance, whose total share of the defence budget was 28.9% in 1990, instead of 25.6% in table 1.3. Hence the evaluation of the value fir 1991 only as a percentage.

Country: France PUBLIC R&D SPENDING				
Million ECU	1988	1989	1990	1991
Total	12,159	11,966	11,843	
Civilian	8,037	7,693	7,492	
Military	4,122	4,273	4,531	4,373
% of total	33.9%	35.7%	38.2%	

TABLE 1.8

Sources:

- Civil R&D: French Ministry of Research and Technology

- Military R&D: French Ministry of Defence (for 1988, 1989 and 1990) and estimates from the parliamentary report by J.G. Branger for 1991.

At the same time, the total strength of the armed forces will decrease by 10,000 men in 1991. In the longer term, these 10,000 men represent only the beginning of a more drastic reduction corresponding to a withdrawal from Germany : 35,000 men (essentially in the Army) between 1991 and 1995, together with a reduction of the draft duration from 12 months now to 10 months in 1992, to be compensated by a higher number of professionals.

This evolution towards more professionals implies better conditions of life for military personnel. Hence another characteristic of the 1991 defence budget : the end of the continuous decrease of the share of current expenditure, which led to a deterioration of these conditions of life. So the "titre III" should come back to 47.4% of the budget (approximately its share in 1988 : see table 1.2), i.e. an increase of 4.64% in 1991 (in current Francs).

As a consequence, the "titre V" decreases to 52.6% in a non-increasing overall budget, while the 1990-1993 programme law was based on a fixed share of the equipment budget within an increasing overall budget. This led to a significant reduction of the objectives for 1991 : approximately 1000 Million ECU, i.e. an average 6.3% reduction, distributed as follows :

- Army : 10.8%
- Nuclear forces : 7.5%
- Air Force : 5.2%
- Gendarmerie : 2.3%
- Navy : 1.7%

As far as the Army and the Air Force are concerned, these reductions might be considered as consequences of the CFE treaty. In fact, the cuts anticipated for budgetary reasons seem to exceed these consequences, which are very limited for France. Indeed, the equipments to be destroyed (or only disarmed in the case of helicopters, if dual) are:

- 52 battletanks
- 305 armoured vehicles
- 38 artillery guns
- 87 helicopters

1.3 Consequences of budget cuts

Only the mid-course updating of the 1990-1993 programme law, to be voted for in late 1991, can officially alter the predictions of the initial law, but the 1991 budget and the ongoing discussions already give some indications as to the reductions or cuts anticipated. These indications are given below, case by case.

a) Army equipment (total cuts = 400 Million ECU - 10.8%)

As far as new developments are concerned, the decisions anticipated are :
- the total cancellation of the programme Orchidée ;
- a reduction of the number of Leclerc battletanks : 800 instead of the 1,400 forecast initially;
- a reduction of the number of MLRS systems : 2 regiments (i.e 48 launchers) instead of 3 (i.e. 72 launchers);

In addition, several orders for equipments already in production will be cancelled, in particular 68 artillery guns (155 mm), all 12.7 mm munitions and 34 000 FAMAS automatic rifles for the Gendarmerie.

b) Navy equipment (total cuts = 60 Million ECU - 1.7%)

Due to the role of the Navy in the first Gulf crisis (during the Iran/Iraq war), to the present evolution of the threat and to the fact that naval forces are excluded from the CFE treaty, this is the only budget where no major programme cut is forecast.

c) Air force equipment (total cuts = 200 Million ECU 5.2%)

The decisions anticipated are :
- no cancellation of any of the new developments, but the production rate of the Rafale programme might be reduced (24 aircraft per year instead of 28);
- a cancellation of orders for 4 Mirage 2000 fighters, and for the retrofit of Mirage F1CR observation aircraft.

d) Nuclear and space systems (total cuts = 325 Million ECU - 7.5%)

The satellite systems Syracuse and Helios remain stable in the 1991 budget which provides for a 2.4% increase of space programmes. On the contrary, a cut is anticipated for the first time in the French nuclear arsenal : this will likely be the cancellation of the S 4 programme, and it might even result in the total renouncement of the ground-based

strategic missiles of the "Plateau d'Albion" within ten years, which would mean a historical event in recent French military policy.

The final decision depends to some extent on the British answer to the French proposal of developing jointly a long-range version (ASLP) of the ASMP, medium range air-to-ground missile, in service with the French Air Force. This long range missile, if developed, would result in the replacement of the ground-based component of the strategic forces by an airborne component (which would also replace the Mirage IV bombers).

e) R&D (decrease = 6%)

The share of R&D in the 1991 budget follows the same trend as "titre V" : it decreases slightly from 16.6% of the overall budget in 1990 to 15.6% in 1991 (i.e. a 6% decrease). But this averaged value covers very diversified situations :
- a 22% decrease for the Army, part of it due to the termination of the development of the Leclerc battletank, now entering the production phase;
- a 23.55% increase for the Air Force, corresponding to the development of the Rafale fighter (also to equip the Navy);
- relative stability for the Navy and for strategic forces.

.2 Procurement policy

.2.1 General situation

The French defence industry does not depend exclusively on national orders, since France is an arms exporter. But even exported goods had often been initially developed under national contracts, so the government's procurement policy affects nearly the entire defence industry's activities.

French public opinion is not antimilitarist, but is traditionally suspicious as regards military expenses. Even within the armed forces - as opposed to the procurement agency - there is a permanent suspicion that industry might make undue profits with the defence equipment budget, or use it for other purposes than the real operational needs.
Thus, when a public report announced in 1988 that the objective cost of the Leclerc main battletank had increased by 27% with respect to the initial forecast, a press campaign was launched, politicians declared themselves indignant, and the Prime Minister decided to

place the procurement agency DGA under stronger surveillance by means of an external auditing.

At the same time, the cost of some major civil engineering projects increased by a factor 2 or even 3 without raising any indignation or even interest in public opinion. This shows that the problem of market control is especially touchy in the particular case of defence equipment, which results in an obligation to follow very strict rules.

Some experts object that the strictness of financial procedures is not a purpose as such, and that it may sometimes be in contradiction to the real purpose of arms procurement, i.e. satisfying military needs. Indeed, its first implication is to freeze the characteristics of an armament, at the very beginning of a development which may last ten years or more, while the operational scenarios may - and do - change considerably in the meantime. But this point of view has not been accepted so far as a publishable argument.

2.2 General process

The French procurement policy is a complex system with four major elements :

1) The political authorities who have to define the threats.

2) The Staffs who elaborate the military scenarios (requirements and characteristics of each armament, forces structures, operational doctrine...) to respond to the threats.

3) The General Delegation for Armament (Délégation Générale pour l'Armement - DGA) which is the architect of defence programmes with two complementary functions: a state and a industrial function.

As a state agency, the DGA collaborates closely with the Staffs, heeds to their needs, defines their requirements and conceives the technical solution. It then prepares the equipment study, research and manufacture programmes, submits them for the Minister's agreement and carries them out.
With its operational Directorates and establishments (DCN - Direction des Constructions Navales for instance ; see company profile) the DGA is also able to fulfil an industrial function (study, development, manufacture and/or repair) for some major programmes.

4) The manufacturers (private or public) who realize the programme under the DGA's supervision.

2.3 Control of markets

This general strictness in cost prediction and control results in strict rules for each individual market.

Defence contracts can be passed after a competitive bidding. Most often, competition is limited to those companies which are considered most valuable, but this short list is compulsorily established after a public call for candidates.

Even with the short-list system, competitive developments can only be afforded for components or minor subsystems. For major subsystems and whole systems (or for the French share of systems developed in international cooperation) competition can only take place on paper projects. This is one more reason for applying strict rules after the choice is made, i.e. in the development and production phases, and whenever possible avoiding blank cheques such as the cost-plus procedure.

In fact, the cost-plus procedure cannot always be avoided. It is commonly used in research contracts (as will be seen later), and was used for the development of strategic nuclear systems, because the technical risk seemed too high to allow for other procedures. It is also applied to flight tests for aircraft, which are mostly carried out on military test ranges, i.e. with a total control of the expenses.

But the most common procedure for production and even for developments is the firm fixed price ("firm" meaning that the only revision admitted is the price escalation due to the shift of the economic conditions). As opposed to strategic missiles, all tactical missiles are developed within this procedure, because it is estimated that the companies concerned have acquired sufficient background and experience in former programmes, to enable them to take that risk.

The same rationale was applied to the M 88 engine of the Rafale fighter, but the argument of technical risk was retained for the airframe and the electronic equipment. Even so, the cost-plus procedure was rejected, and the market was passed with a provisional price, with three precautions :

- this provisional price was agreed upon before the contract was signed ;
- a maximum value was fixed for the future fixed price ;
- as an incentive to reduce this future fixed price, the contract provided for a sharing of the economy (with respect to the maximum price) between the company and the state.

2.4 Case of research - R&D policy

All this applies to production and development contracts. Obviously, the same mechanisms cannot be applied to research contracts, because it seems difficult to order technological breakthroughs at a fixed price. Hence the obligation to resort to the cost-plus system.

But even so, research contracts are under control, because the French DGA (Délégation Générale pour l'Armement) is not only a procurement agency but also employs a number of experts in all military and dual technologies (all of which are independent of industry) who compensate for the "blank-cheque" aspect of the cost-plus system by an accurate selection and control of the laboratories under contract.

Now, the same expert can be very strict on the use made of the defence budget, and care about efficient spinoffs : generating spinoff is an openly declared policy, and an efficient one, considering the level of defence research in France. As pointed out previously, the French Ministry of Defence alone finances 38.2% of the total public-funded R&D, as compared to its 16% share of the national budget.

Another approach to the same figure is the ratio of R&D to the total defence equipment budget : this amounts to 30%. In other terms, R&D (including the corresponding military personnel) accounts for 30% of the cost of armaments. Part of this funding is devoted to so-called "upstream studies", i.e. research and exploratory developments ahead of real developments : these must be granted a minimum 6.5% of the equipment budget.

These expenses are shared as follows between the different industrial sectors or end-products (in % of the defence R&D budget) :

- electronics : 25%
- land- and sea-vehicles + ammunition : 22%
- nuclear : 20%
- aircraft : 18%
- missiles : 15%

The 22% share for vehicles and ammunition may seem very high as compared to electronics. But it must be taken into account that there is strong additional civil (public and private) funding for electronics, which is not the case for purely military end-products.

Even so, the public funding of electronics is relatively low in France : in professional electronics, it amounts to 40% of the turnover, to be compared with 49% in the UK, 67% in the FRG and 90% in the USA.

As far as aircraft and missiles are concerned, their total share adds up to 33% of the total R&D budget. Another interesting ratio is that of the public funding of the whole aerospace industry (civil and military) to its total turnover : it amounts to 31%, to be compared with 37% in Europe as a whole, and to 70% in the USA.

The R&D programme is very carefully planned, even upstream of the developments, i.e. before any end-product is defined. This is done on the basis of proposals which are issued from everywhere (government agencies and industry), then cross-examined versus long-term military needs, and which end up in an annual selection.

This careful planning is characteristic of the French approach, with a "General Delegation for Armament" organized not by end-users (Army, Navy, Air-Force), but by types of products or technologies, in order to avoid duplications. For instance, the missiles for all three end-users are dealt with by the same directorate, which receives a funding independent of these end-users for studies of common interest.

In addition, the Ministry of Defence is the "tutor" of the whole aerospace industry. This does not mean that it decides what developments should be made for civil uses, but that it holds all the technological assets, especially the research centre ONERA (whose German equivalent DFVLR depends upon the Ministry of Research and Technology).

France always considered that research should be a candidate for international cooperation, just as the development and production of armaments. This aspect of the problem will be examined within the general policy of international cooperation.

2.5 - Technological spinoff and other aids

It can be questioned whether spinoff is a subsidy. It is clearly not for 100% military companies such as DCN and GIAT (which represent jointly 21% of the total defence turnover), but it certainly is a subsidy to dual-use companies, commonly and openly granted throughout the world (unless these subsidies are directly paid to civil industries, like in the US aerospace sector, where public funding for research and technology is equally shared between military and civil end uses). French regulations follow the common rule, as they do not provide for the payment of royalties in the case of civil applications of defence research, whereas they do provide for such royalties in the case of exports of military equipment.

This may seem inconsistent, since it is public money in both cases. Now, the present trend is to renounce all of these royalties, whether officially due or not, in exchange of a substantial percentage of self-financing in defence R&D (in addition to the defence budget) by the firms concerned. This mechanism restores the consistency of the whole system, since it leads to re-investment into national defence developments cash-flows generated by civil or export sales which might have benefited by national defence orders.

There should be no confusion between the freedom, for a company, of re-using a military-funded defence background for civil purposes, and the right of carrying out "free" studies, as granted in most defence markets by means of an allocation (with an upper limit of 3.5% of the market price for aircraft and missiles, and 5 to 8% for electronic equipment and systems). Indeed, the expression "free studies" means that the companies concerned have a certain initiative in the choice of those studies they feel necessary for the achievement of the contract, but these must remain within the topic of this contract, and companies must report back on the use made of this allocation.

2.5 International cooperation on programmes

In addition to its policy of national procurement, France had an early policy of international cooperation. During a decade - 1959 to 1968 - France played a pioneering role in European cooperation, as opposed to purchases of US equipment or even co-production of US-developed systems :

- in 1959, France took the lead of the NATO maritime patrol aircraft Atlantic, the other participants being the FRG, the Netherlands and Italy ;

- from 1959 to 1964, France cooperated with the FRG on 5 programmes : the airlift Transall, the artillery radar RATAC, the antitank missiles Milan and HOT, and the ground-to-air missile Roland ;

- from 1964 to 1967, France cooperated with the UK on various aeronautical programmes : the air-to-ground missile Martel, the fighter Jaguar, the helicopters Gazelle and Lynx, together with a British participation in the Puma and Exocet programmes.

But in 1968, when the Eurogroup was created, the particular position of France with respect to NATO meant exclusion from this group, which was to become the forum of European cooperation. In addition, a "golden age" for defence exports began in the 1970s, and French export policy was sometimes incompatible with some cooperations, as will be seen in the analysis of exports. So the French contribution to international cooperation became more sporadic : essentially the trainer/support aircraft Alphajet with the FRG, and the minehunter Eridan with Belgium and the Netherlands.

But France found itself gradually isolated. This is why it strongly supported the creation of the IEPG in 1976, and also took a more lenient attitude towards cooperation with the USA within the "2-way street" system. All this makes France a full partner, although not a systematic one, as shown by its attitude towards the European Fighter Aircraft programme (i.e. the national development of its competitor Rafale). But in spite of this exception, 50% of the turnover of the French aerospace industry results from cooperative programmes (mostly European) covering a wide range of products. And international cooperation also exists in most other dual sectors, with military or civil applications
No cooperation has taken place so far on nuclear vectors, but several official proposals were made to that end with the UK.

All cooperations in existence, involving French companies in joint productions, developments or studies, are listed in twelve tables as follows :

- 2.1 : land-based equipment
- 2.2 : ships
- 2.3 : fixed wing aircraft (military)
- 2.4 : fixed wing aircraft (civil)
- 2.5 : helicopters
- 2.6 : turbine engines
- 2.7 : missiles (land-based)
- 2.8 : missiles (naval)
- 2.9 : missiles (air to air and air to ground)
- 2.10 : drones
- 2.11 : space systems
- 2.12 : C3I systems

The square "joint venture", when filled, designates either a joint subsidiary, or an industrial consortium with capital sharing, or a "GIE" (Groupement d'intérêt économique), a typical French institution with no capital sharing between the companies involved, each one keeping its financial autonomy. This will be seen in more details within the company strategies, in particular for Aérospatiale.

COOPERATION ON LAND-BASED EQUIPMENT				
Name of Programme	Type of Programme	Joint Venture	Companies Concerned	Status
RATAC	artillery radar		LMT SEL	Production
MLRS	multiple launcher rocket system	EPG	LTV (licence) + Aérospatiale SNIA BPD RTG Hunting	Development
MLRS phase 3	terminal guided submunitions		Martin Marietta Thomson-CSF Thorn-EMI Diehl	study
COBRA	counter-battery radar	GE (US) + EURO-ART	GE (licence) + Thomson-CSF Thorn-EMI (40%) Siemens (20%)	development
MACPED	area-effect anti-tank mine		GIAT DNAG Honeywell Hunting	study
APGM	autonomous precision-guided munition	ASP	International consortium with Matra	study
ACED	"smart" anti-tank projectile		International consortium with Thomson-CSF	study

Table 2.1

COOPERATION ON SHIPS				
Name of programme	Type of Programme	Joint Venture	Companies Concerned	Status
ERIDAN	minehunter		DCN Beliard (B) Van de Griessen (NL)	production
BREDA	corvette		Alsthom At. Bremer Vulkan	development

TABLE 2.2

COOPERATION ON FIXED-WING AIRCRAFT (MILITARY)				
Name of Programme	Type of Programme	Joint Venture	Companies Concerned	Status
TRANSALL	airlift		Aérospatiale MBB	production
JAGUAR	air support	SEPECAT	(Bréguet) Dassault (50%) (BAC) BAE(50%)	production
ALPHAJET	trainer + air support		Dassault Av.(50%) Dornier (50%)	production
ATLANTIQUE 2	maritime patrol	SEBCAT	Dassault Av. Aérospatiale Aeritalia DASA	production
EUROFLAG	airlift		Aérospatiale MBB BAe CASA Aeritalia	study

TABLE 2.3

COOPERATION ON FIXED-WING AIRCRAFT (CIVIL)				
Name of Programme	Type of Programme	Joint Venture	Companies concerned	Status
CONCORDE	liner		Aérospatiale BAe	production
AIRBUS	liner	AIRBUS Industrie (GIE)	Aérospatiale MBB CASA Aeritalia	production
ATR	liner commuter	ATR (GIE)	Aérospatiale Aeritalia	production
FALCON 2000	executive aircraft		Dassault Av. Aeritalia	production

TABLE 2.4

COOPERATION ON HELICOPTERS				
Name of Programme	Type of Programme	Joint Venture	Companies concerned	Status
GAZELLE + LYNX	antitank, naval	HELI-EUROPE	Aérospatiale (50%) Westland (50%)	Production
PUMA	multipurpose	HELI-EUROPE	Aérospatiale (72.5%) Westland(27.5%)	Production
TIGRE	antitank and support	EUROCOPTER	Aérospatiale (60%) MBB (40%)	Development
NH 90	multipurpose (gun turret)		Aérospatiale MBB Fokker Agusta GIAT General El.	Study Study

Table 2.5

COOPERATION ON TURBINE ENGINES				
Name of Programme	Type of Programme	Joint Venture	Companies concerned	Status
OLYMPUS	(Concorde engine)		Rolls Royce SNECMA	production
TYNE	(Transall & Atlantic engine)		SNECMA Rolls Royce MTU FN Moteurs(B)	production
ADOUR	(Jaguar engine)		SNECMA Rolls Royce	production
LARZAC	(Alphajet engine)		SNECMA TURBOMECA MTU KHD	production
CFM 56	turbofan	CFM International	General Electric(50%) SNECMA (35%)	production
GE 36 (THR)	high speed rotor turboreactor		General Electric(50%) SNECMA (35%)	development
MTR 385/390	(Tigre engine)		TURBOMECA MTU Rolls Royce	development
GE 90	turbofan		General Electric(60%) SNECMA (25%) Fiat (10%) Ishikawajima(5%)	study
	2nd generation supersonic		SNECMA + SEP Rolls Royce	study

TABLE 2.6

COOPERATION ON MISSILES (LAND-BASED)				
Name of Programme	Type of Programme	Joint venture	Companies concerned	Status
MILAN + HOT (1,2,3)	antitank	EUROMISSILE (GIE)	Aérospatiale MBB	production
MIRA	thermal imager for MILAN		TRT Marconi Siemens	production
ROLAND (1,2,3)	air defence	EUROMISSILE (GIE)	Aérospatiale MBB	production
HAWK HIP	air defence	EUROGRIP (GIE)	Raytheon (licence) + Thomson-CSF MBB Alenia	production
AC3G	antitank	EMDG (GIE)	Aérospatiale MBB BAe	development
SAMP-T	air defence	EUROSAM (GIE)	Aérospatiale Thomson-CSF Selenia	development
CROTALE NG	air defence		Thomson-CSF LTV Fokker	development
ROLAND Mach 5	air defence (hypersonic)		Aérospatiale Matra MBB	study
	future air defence systems	EURO-DYNAMICS	Thomson-CSF (50%) BAe (50%)	study

TABLE 2.7

COOPERATION ON MISSILES (NAVAL)				
Name of Programme	Type of Programme	Joint Venture	Companies concerned	Status
OTOMAT	antiship		Matra Otomelara	production
SAAM LAMS	anti-sea-skimmer	EUROSAM (GIE)	Aérospatiale Thomson-CSF Selenia	development
ANS	anti-ship		Aérospatiale MBB	study
MILAS	torpedo launcher		Matra Otomelara	study

TABLE 2.8

COOPERATION ON MISSILES (AIR)				
Name of Programme	Type of Programme	Joint venture	Companies concerned	Status
MARTEL (ARMAT)	air to ground (anti-radar)		Matra BAe	production
MICRASRAAM	air to air		Matra GEC Marconi	development

TABLE 2.9

COOPERATION ON MISSILES (NAVAL)				
Name of Programme	Type of Programme	Joint Venture	Companies concerned	Status
OTOMAT	antiship		Matra Otomelara	production
SAAM LAMS	anti-sea-skimmer	EUROSAM (GIE)	Aérospatiale Thomson-CSF Selenia	development
ANS	anti-ship		Aérospatiale MBB	study
MILAS	torpedo launcher		Matra Otomelara	study

TABLE 2.8

COOPERATION ON MISSILES (AIR)				
Name of Programme	Type of Programme	Joint venture	Companies concerned	Status
MARTEL (ARMAT)	air to ground (anti-radar)		Matra BAe	production
MICRASRAAM	air to air		Matra GEC Marconi	development

TABLE 2.9

COOPERATION ON DRONES				
Name of Programme	Type of Programme	Joint venture	Companies concerned	Status
CL 289	surveillance		Canadair Dornier SAT	development
BREVEL	surveillance	EURODRONE (GIE)	Matra Bremer Vulkan	development

TABLE 2.10

COOPERATION ON SPACE SYSTEMS				
Name of Programme	Type of Programme	Joint venture	Companies concerned	Status
ARIANE	space	ARIANESPACE	("Société Anonyme" with many European companies France=54.48%)	production
HISPASAT	satellite		Matra BAe	production
HELIOS	satellite		Matra + Alcatel Alenia CASA INISEL	development
HERMES	space	EURO-HERMESPACE	Hermespace France (Aérospatiale 51% Dassault Av 49%) DASA Alenia	study

TABLE 2.11

COOPERATION ON C3 I SYSTEMS				
Name of Programme	Type of Programme	Joint venture	Companies concerned	Status
NADGE	NATO air-defence ground environment		Hughes (US) Thomson-CSF GEC Marconi	production
RITA	communications system		Thomson-CSF MBLE	production
RITA/MSE	mobile subscriber equipment		Thomson-CSF MBLE GTE (US)	production
NIS	NATO identification system		(US-European consortium with Thomson-CSF)	production
MIDS	multifunctional information and distribution system	MIDSCO	(US-European consortium with Thomson-CSF)	development

TABLE 2.12

2.6 Sharing, "juste retour" and offsets

The main difficulty in cooperation is to define the sharing of the managing responsibilities and of the workload.

As far as qualitative worksharing is concerned, France never accepted to give up a whole industrial sector, so always endeavours to balance what it yields and keeps in each individual programme, in order to remain globally in a position of potential "technological autarky".

As far as quantitative worksharing is concerned, France follows the usual rule of "juste retour" in all those cooperations where the responsibilities are shared from the very beginning, i.e. including the investments and the risks of the development. But France objects to the systematic application of this rule, as requested by the IEPG, to joint productions of items where France alone has made the investments and taken the risks, except if a principle of reciprocity is established.

Such a reciprocity can only exist between nations having similar levels and capacities in the field of armaments. In practice, this led to a reciprocal-purchasing agreement between France and the UK, reinforced in 1987, but already in existence for a number of years.

Through this agreement three goals were sought :

- opening to offers from British and French weapon manufacturers of each national market for defence equipment,
- bilateral cooperation in the research field,
- periodical survey on cooperation perspectives for development and production of major weapon system.

In order to avoid timetable intervals on armament procurement, harmonization of operational specifications and "juste retour", each nation is committed to look for an off-the-shelf solution in the other nation before envisaging a particular development.

This agreement starts to have effects. The latest figures (1989) show volumes roughly balanced between each country with slightly less than 40 Million ECU in each way. Medium term forecasts are to reach 300 Million ECU per year. Due to non-reciprocity fear, habits weight (previous situation,...) and sometimes the persistency to prefer a specific equipment rather than an on-the-shelf one even if it is more expensive, the result is modest. But the process is on the way, partner's habits are changing thanks to the joint commission work, increasing amounts of information is going round through the French and British MOD Bulletin and conditions for an increasing competition are set down.

With all other European countries, cooperation is systematically sought (the "contract bulletins" issued through the IEPG being only one of the possible methods). When this does not lead to joint developments, but to compensated sales, offsets are negotiated on a case-by-case basis.

They can also take the form of off-the-shelf purchases, e.g. that of Spanish airlift CASA 235 (which were in competition with a military version of the Franco-Italian ATR 72). But they more usually take the form of a licenced production of components for the whole system, as an alternative source or even in single source sharing (a typical example being the sharing of the Exocet production between France and the UK).

With non-Western European nations, single source sharing is considered too hazardous, so offsets take other forms, from off-the-shelf purchases (e.g. Brazilian liaison aircraft Xingu) to purchases of other than military products.

.2.7 International cooperation in defence research

In addition to the programme-oriented cooperations considered so far, the French Ministry of Defence signed a number of cooperation agreements on defence research over the years, most of them on a bilateral basis with other industrialized countries. One of the main research centres directly controlled by the DGA is shared 50/50 with the German Ministry of Defence : it is the Franco-German research Institute of Saint-Louis (ISL), which employs 700 scientists and engineers equally shared between the two nations.

The DGA also participates in multilateral defence research cooperations, in particular :
- two NATO groups : AC 243 or DRG (Defence Research Group), and AGARD (Advisory Group for Aerospace Research and Development, located in Greater Paris);
- the European GARTEur (Group for Aerospace Research and Technology in Europe) and its cryogenic wind-tunnel, with the UK, Germany and the Netherlands;
- and naturally, all dual aspects of EC research programmes (BRITE-EURAM, ESPRIT, etc).

Last but not least, since France had taken the initiative of the EUREKA programme in 1985 (partly as a response to the American SDI), it logically promoted its military counterpart EUCLID (European Cooperation for the Long-term in Defence). This was officially created in November 1990, with a budget of Million ECU 120 for 1991 to be shared equally between governments and industries. France is expected to participate 25% of the total, and take the lead for three projects : silicon-based micro-electronics, artificial intelligence and (together with Norway) teledetection in space.

Bibliographie

Albrecht, U. (1987), *Spin-off : a fundamental analysis*, Wiston House, Sussex, 21 September.

Assemblée Nationale (1988), *Défense, Espace et Forces Nucléaires,* Tome IV, 13 Octobre.

Assemblée Nationale, Sessions ordinaires 1980-1990.

Assemblée Nationale, Défense, *Recherche et industrie d'armement*, Première session ordinaire de 1990-1991, Tome X, 10 Octobre.

Bellany, I., Huxley, T. (1987), *New Conventional weapons and western defence,* Frank Cass ; London.

Brzoska, M. (1989), *The structure of arms production in Western Europe beyond 1992*. Meeting International Sudies Association, London.

Cars, H.C., Fontanel, J. (1987), Military expenditure comparisons, in *Peace, defence and economic analysis*, McMillan

Chesnais, F. (1990), *Compétitivité internationale et dépenses militaires*, Economica, Paris.

Colard, D., Fontanel, J., Guilhaudis, J-F. (1981), *Le désarmement pour le développement : dossier d'un pari difficile*, Fondation pour les Etudes de Défense Nationale, Paris.

Dussauge, P. (1985), *L'industrie d'armement en France*, Economica, Paris.

Dussauge, P. (1988), La baisse des exportations d'armement françaises et ses répercussions industrielles, *Défense Nationale*, Janvier.

Fontanel, J. (1982), *Military Expenditure and Economic Growth : France, Morocco*, report written for the United Nations 6.

Fontanel, J. (1984), *L'économie des armes*, La Découverte, Paris

Fontanel, J., Smith, R. (1985), L'effort économique de défense, *Arès, Défense et sécurité*.

Fontanel, J., Smith, R. (1986), Le coût des forces nucléaires, *Arès, Défense et Sécurité.*

Fontanel, J. (1989), Defence costs and budgeting in France, in Franco-British Defence cooperation. A new Entente Cordiale. The Royal Institute of International Affairs London, and l'Institut Français des Relations Internationales, Paris, Routledge, London,

Fontanel, J. (1990) *French arms industry*, CEDSI, Université Pierre Mendès France.

Fontanel, J., Smith, R. (1990), The impact of strategy and measurement on models of French military expenditure, *Defence and Peace Econo*mics 1(4).

Fontanel, J., Smith, R. (1991), *A European defence union* ? Economic Policy 6(13).

Martin, S., Smith, R., Fontanel, J., de Haan, H. (1987), Time-series estimates of the macroeconomic impact of defence spending in France and the UK. *Peace, defence and economic analysi*s.

Ministère de la Défense (1988, 1989, 1990), *La défense de la France.* Paris.

Percebois, J. (1985), Economie de l'effort d'armement, in *L'aventure de la bombe ; De Gaulle et la dissuasion nucléaire*, Plon, Paris.

Schmidt, C., Pilandon, L., Aben, J. (1989), *Defence spending in France ; the price of independance*, Mimeo, Paris.

Smith, R., Humm, A. Fontanel, J. (1985), The economics of exporting arm, *Journal of Peace Research* 22(3).

Smith, R., Humm, A. Fontanel, J. (1987), Capital labour substitution in defence provision, *Defence, Security and Development*, London.

Smith, R., Fontanel, J. (1987), Weapons Procurement : Domestic production versus imports, in *New Conventional weapons and western defence*, Frank Cass. London.