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The development of the French defence industry in the 20th century

Abstract (not more than 200 words)

The French defence industry is the world's third largest national defence industry. It has an interesting history and reflects the development of the French military posture. This report presents an overview of the development of the French defence industry, an overview that starts in the 14th century but has its focus on the 20th century. The overview ends at the beginning of the 21st century.

The development of the French defence industry shows an interplay between technology; the demands of war; the interests, powers and limitations of the state; and the power struggles between different actors within the French "military-industrialised complex". The French state has shown (and still shows) considerable interest in the defence industry. It has not hesitated to use its powers or to intervene in the industry by means of nationalisations, industrial mobilisations and state-orchestrated consolidations.

Keywords

France, defence industry, military-industrialised complex, MIC, development, history, 20th century

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Rapportens titel (i översättning)

Den franska försvarsindustrins utveckling under det tjugonde århundradet

Sammanfattning (högst 200 ord)

Den franska försvarsindustrin utgör världens tredje största nationella försvarsindustri. Den har en intressant historia och återspeglar utvecklingen av den franska militära hållningen. Denna rapport presenterar en överblick över utvecklingen av den franska försvarsindustrin, en överblick som börjar på 1300-talet men har sitt fokus på 1900-talet. Överblicken avslutas i början av 2000-talet.

Utvecklingen av den franska försvarsindustrin visar på ett växelspel mellan teknologi; krigets krav; intressen, makt och begränsningar hos staten; samt maktkampen mellan olika aktörer inom det franska "försvarsindustriella komplexet". Den franska staten har visat (och visar alltjämt) betydande intresse för försvarsindustrin. Staten har inte tvekat att använda sina maktmedel eller att ingripa genom medel som nationaliseringar, industriella mobiliseringar och statligt orkestrerade konsolideringar.

Nyckelord

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Detta är en kortare, översatt version av den franske nationella försvarsmaterieldirektören (NAD: National Armaments Director), Laurent Giovachinis bok *L'armement français au XX^e siècle* (Les Cahiers de l'armement, Ellipses, Paris, 2000). Boken är utgiven med benäget tillstånd av Ellipses och M. Giovachini.

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Preface

The FOI Defence Industry Programme, FIND, has since 1990 studied defence industry transformation processes and corporate strategies in Western Europe and the US for the Swedish Ministry of Defence.

The French defence industry is the world's third largest national defence industry. It has an interesting history and reflects the development of the French military posture. The general knowledge in the non-French defence community has however been perceived by this author to be rather low or superficial. Therefore, a shorter and translated version of Laurent Giovachini's book *L'armement français au XX^{e} siècle* (Les Cahiers de l'armement, Ellipses, Paris, 2000) was seen as suitable.

This report has been made in parallel with a more analytical and in-depth report titled *To be or not to be – The integration and the non-integration of the French defence industry* (Lundmark, FOI, 2004). That report focuses on the more recent development of the French defence industry (1995-2004).

The FIND Programme and the author are greatly indebted to M. Laurent Giovachini and to the publisher Ellipses for approving of this report.

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1. Introduction

This report presents an overview of the development of the French defence industry, an overview that starts in the 14th century but has its focus on the 20th century. The overview ends at the beginning of the 21st century.

The development of the French defence industry shows an interplay between technology; the demands of war; the interests, powers and limitations of the state; and the power struggles between different actors within the French "military-industrialised complex". The French state has shown (and still shows) considerable interest in the defence industry. It has not hesitated to use its powers or to intervene in the industry by means of nationalisations, industrial mobilisations and state-orchestrated consolidations.

The report is primarily a translated, short version of a French book – *L'armement français au XXe siècle* – by a high-ranking DGA official, Laurent Giovachini. If not otherwise noted, the facts and the description emanate from his book. His book had been highly recommended by several French specialists on the defence industry. The descriptions, statements and evaluations made in his book are restated, and have not been tested or validated. The headings in this report also mirror the headings in Giovachini's book.

This translated summary was made in relation to a study regarding the French defence industry, conducted in France in 2003.[1] Giovachini has had a political position as advisor to Prime Minister Lionel Jospin. Giovachini's concluding discussion in his book concerning the development of the defence industry reflects the challenges in 2000, and that part is not included in this report.

The publishing of this report is made with the kind permission of Laurent Giovachini and the publisher of his book.

1.1. Purpose and disposition

The purpose of this report is to present a description of the development of the French defence industry, and what has shaped its development. No comparable overview has been found in English, so therefore this translated synthesis of Giovachini's book is believed to be interesting for a wider, non-French audience.

The delimitations and disposition of this report follow Giovachini's.

This report is a translated, short version of Giovachini's book. A smaller number of reflections by the author of this report are present in the report. There are also a limited number of references to other sources.

[1] Lundmark, (2004).

2. History of the French defence industry

2.1. Development before WWI

Arsenals and entrepreneurs

France has, as all great European powers, a long history of wars and the French state has a long history of organising and influencing the domestic defence industry. The production of powder was set under state regulations in 1336 and saltpetre was disallowed for export in 1540. In the 18th century, monopoly for the production of explosives and powder was given to the *Régie royale des poudres*, transformed into the *Agence des poudres et salpêtres*. This state monopoly was withheld until 1970, when it was transformed into a commercial company, the still existing *Societé nationale des poudres et explosifs* (SNPE).

During the 16th to 18th centuries a system of state arsenals combined with private *armureries artisanals* (weapon arsenals) was established. The private entrepreneurs produced hand-held weapons, cannons and swords under state supervision. In return they got the benefit of the government guaranteeing that it would not buy from others and that others were not allowed to produce it. In 1533, the first French arsenal for cannons was created in Paris. Other foundries for cannons were created in the 17th century, but France was not self-sufficient in cannons until early 19th century.

In the naval sector, the first arsenal was created in Rouen in 1294. In the 17th and 18th centuries, further arsenals were created or declared in Brest, Rochefort, Toulon and Lorient. In the 19th century a further arsenal was created in Cherbourg, and Napoleon created arsenals in occupied territory in Venice, Anvers, Genua and La Spezia. This was paralleled by the creation of several foundries for naval cannons.

Engineers

L'Academie des Sciences was founded in 1666, and played an important role for the development of the defence industry. Louis XV later created the first engineering schools, primarily created for the needs of the military. *L'École de l'Artillerie* was created in 1720 and *École de la Génie militaire* (Engineering troops) in 1749. In 1760, *École Militaire* was created in Paris, along with ten *écoles royales militaires* in the provinces. The naval forces got their engineering schools in 1747 and 1765.

L'École Polytechnique was created in 1794, a school that since has been the almost single place of recruitment for defence-oriented engineers. Napoleon I changed its status into a military school.

Contraction, expansion and restructuring

After the Napoleonic wars, the defence industry had a period of contraction and consolidation as the defence budgets decreased. After 1840, a period of increased defence spending started. The humiliating defeat against Germany in 1870[2] was followed by a period of reorganising of the artillery and more efforts towards artillery materiel. The navy had its first armoured vessel in 1859 and the first French submarine, *le Gymnote* was built in 1886. Torpedoes and mines were first constructed in the 1870s.

[2] When France attacked Prussia, it was severely outgunned by the German artillery and lost Alsace and parts of Lorraine.

British and US industrial transformations of the production processes, as well as technological breakthroughs, inspired reforms of the French defence industry in the late 19th century, thereby making mass production possible. This restructuring was also followed by a process of relocating the means of production. The factories and foundries had previously been located near the North and East borders, i.e. close to the countries they usually fought. Factories were in this process moved to locations more centrally located in France. Factories in Klingenthal, Maubeuge, Charleville, Mutzig, Strasbourg, Douai and Toulouse were closed, and factories were created in Puteaux 1860, Tarbes 1872, Vernon and Bourges in 1877. From 1820 to 1870, the number of foundries was reduced from 3 to 1, factories from 14 to 3 and the construction facilities from 12 to 6.

The naval arsenals became increasingly specialised during the 19th century, the large ones were situated in Brest and Lorient, three smaller ones in Cherbourg, Rochefort and Toulon. These arsenals were brought under centralised planning into the *Section technique des constructions navales* in 1895, and the *Directions de constructions navales* in 1900. In order to decrease the variety among naval vessels, series of boats were started to be built, made from plans approved of by a technical commission. Reforms of industrialisation (as for the army materiel) were however not implemented.

Alongside these processes of specialisation and restructuring, a new corps of engineers was created, the *corps special des ingénieurs des poudres et salpêtres*, and its members were exclusively recruited from *l'École polytechnique*. This corps of engineers was at first civil, but was militarised in 1914. The corps of naval artillery engineers was created in 1909.

Industries producing materiel for military use (not weapons) also became more specialised and a smaller number, e.g. Schneider and Wendel were influential. These were regrouped by the *Comité des Forges* and the connections and ways of interacting with the state were organised by the state.

A new law in 1885, *loi Farcy*, liberalised the production and the commerce of arms. The law wanted to inspire the private entrepreneurs to find customers abroad and to ascertain a more prosperous French defence industry. The primary initiative became to sell cannons. Certain targeted countries were chosen that wished for modern artillery, but lacked the industrial means, e.g. Russia, China, Japan, Spain, Balkan countries and South America. The customers were however financially weak and unstable, and the competition from other foreign companies, primarily Krupps and Vickers, made the outcome of the export plans less prosperous than expected.

Around 1850, the first international trade shows were organised. At world fairs, armaments were strongly represented. Efforts were made in Europe to try to unify the nomenclatures and standardise measuring methods. Progress was however slow, but civil industrial harmonisation successively had spill over effects to military industry.

The birth of the aeronautical industry

At the turn of the century, the aeronautical industry began to grow. The military use was at first simply as reconnaissance, a way of observing from a higher altitude, but equipped with no weaponry. The French aeronautical industry was created by private entrepreneurs. By 1914, the French aeronautical industry had reached a level of specialisation and serial production resembling that of the automobile industry. The military had for a long time used balloons for reconnaissance, and in 1877 a military establishment was created in Chalais-Meudon for military aerostations. In 1909, the army ordered its first aircraft - 5 for the engineering corps and 7 for the artillery. *L'École supérieure d'aéronautique et de construction mécanique* was created the same year. In 1912 the *Centre d'aviation marine* was

created in Fréjus. The artillery and engineering corps had their process of aeronautic innovation, and the navy had another, the processes were quite separate. The aeronautical sector was however seen as inferior to the established military sectors, they were seen as simply providing supplementary sources of information.

By the start of WWI, the private industry was in general furnishing less specialised materiel to the military than the arsenals; they were also attempting to export whereas the arsenals strictly produced for the French military. The influential corps of military engineers was a distinctive trait of the French system of armaments production, where the recruitment still was from one school only, *l'École polytechnique*. This thereby made possible a strong unification and control of the armaments production. The powder production and the naval production was brought under central command. Other types of armaments production and engineering specialties were more fragmented into several types of engineering specialities and the corresponding industry was private.

2.2. WWI and the birth of the French military-industrialised complex

During WWI, the French state gradually engaged in, and organised, the armaments production, driven by the military needs. It had important qualitative traits regarding technological breakthroughs, and also quantitatively regarding the industry. The French and the German militaries during the war alternatively invented and caused the other to invent a countermeasure or a superior alternative. In 1916, Schneider in Creusot made the first French battle tanks. France ordered its first battle-tanks in 1917, two series of 400 from Schneider, seven months after the first British tanks entered the war. The heavy Schneider tanks were complemented by lighter vehicles from Renault, Berliet, SOMUA (owned by Schneider) and Delauney-Belleville. Machine-guns and cannons for vehicles were made by Peugeot, Renault and Panhard.

Military aviation grew rapidly. In the beginning of the war, army aviation consisted of airplanes from Farman and Caudron for observation and reconnaissance, Voisin for bombardment and Morane for fighters. During the war, the types of airplanes multiplied (e.g. Nieuport, Spad, Bréguet, Salmson, Letord and Caproni). Airplanes gradually achieved a more and more offensive role during the war, especially when the machine-guns could get fired through the propellers and with the invention of bombs for airplanes. At the end of WWI, France had 12 000 military airplanes.

Naval aviation grew later and more slowly than Army aviation. It consisted mainly of seaplanes, produced by e.g. Nieuport, Franco-British Aviation, Tellier, Donnet-Denhaut and Lévy-Besson. There were a few hundred aircraft in 1916, and 13 000 in November 1918. The seaplanes were mainly used for anti-submarine warfare.

Overall and in all domains, the war was a major accelerator for the evolution of armaments technology. France's entire scientific and innovation resources were activated in this process.

Industrial mobilisation

The qualitative leaps in armaments production was also paired with an unprecedented industrial mobilisation. An industrial policy was shaped for the military needs. A Ministry for armaments was created, in order to centralise the state interests in one ministry. The naval needs arrived through the ministry of the Marine, however, and the aviation through the War ministry. During the war, the state came to the conclusion that it had to organise the industry and the incentive structure for mass production of armaments. The importance of logistics and industry in order to win a war was understood, and became more planned, organised and scientific than ever.

The war with Germany in the East had deprived France of territory that was an important provider of agricultural products, coal and steel. Therefore, new industrial capacities had to be constructed further to the West, thereby further concentrating the army armaments industry in central France. Aerospace and auto industries – which were new industries – primarily started in the Paris area.

At the end of the war, ten new state production units had been created, 15 500 private companies and the armaments sector employed 1 700 000 people. France had had a rapid expansion during the war and exported heavily to its allies at the end of the war. The private sector made up one fourth of the armaments production at the beginning of the war, and three fourths at the end.

The main industrial groups were: Schneider in artillery; Brandt made machine-guns; Peugeot, Renault, Citroën and Hotchkiss made trucks and armoured vehicles. In aviation, the state had come to choose certain suppliers, especially Bréguet and Hispano-Suiza. These companies had enormous orders and applied industrial processes like taylorism to organise the production.

The state organised, supervised and maintained the defence-industrial production. It established production programmes, made financial solutions for the entrepreneurs and helped with recruitment of personnel. The corps of engineers gradually gained influence at the expense of the military bureaucracies, which was also in the interest of the state. The rapid growth of the French armaments production created a multitude of committees, supervisors and new organisations. The aviation production was organised in 1918, where the roles of making the specifications were held apart from the construction afterwards.

The private industry created cartels or larger groups were established. The state held a firm grip over the overall system, but denied strong socialist proposals for nationalisation of the industry. The state could not replace private initiative, the industry was seen as the motor of the economy. The state had to plan initial initiatives, without taking the role of the companies. The production resources had to be oriented and co-ordinated. The policy behind this politics of armaments was primarily shaped by the first Minister of armaments, Albert Thomas, in 1915-1917. The most important traits of this policy were the active role of the state, without replacing private companies; incentive structures through contracts with private entrepreneurs and the planning and organising on a national scale of armaments production.

The industrial capacity was dimensioned for a nation at war, and therefore this structure deteriorated when the war ended. The state role in this military-industrialised complex (MIC)[3] left important footprints in the defence industry structure and for the future role of the state.

2.3. Between WWI and WWII

After WWI, UK and the US to a large extent dismantled their armies, whereas France had an army of 600 000 men with 12 000 artillery pieces, 2 600 battle tanks and 2 500 airplanes. It was at this time, according to Giovachini, the strongest armed forces in the world. In ten years time, this was gradually decreased. A large portion of the defence budgets went to the building of the Maginot line. In the 30s, due to Germany's general militarization and specific militarization of Rheinland, as well as the Spanish Civil war, a rearmament and rebuilding of the defence industry began.

From 1919 to 1930, the defence materiel produced in France was to a large part of models used during WWI. A process of building prototypes was used (mostly tanks and airplanes), but they never came to serial production. The armed forces also were reluctant to change their

[3] Borrowing the U.S. expression.

doctrine and strategies in order to take advantage of the possibilities that came with new innovation. In the early 30s, there was higher demand for more modern equipment, but the Maginot line (finished in 1935) used up a large portion of the resources; only 10 percent were used to buy armaments. The private industrialists had to a large part lost interest in the armaments market. The naval industry had a better period. From 1920-36 the turnover of naval armaments rose 42 %, compared to 31 % for army and 27 % for aviation.

The French aerospace industry collapsed after WWI, going from a workforce of 200 000 to 5 000 in 1919. A disparate and inefficient production of prototypes was their primary output (332 models from 1920 to 1930). In 1930 the workforce had risen to 15 000. Military aviation was still not seen as of equal importance as the army and the navy, and had a weaker position in the military headquarters. There was distinctive separation between the three services.[4]

The military strategy was fundamentally defensive, manifested by the Maginot line. Aviation was still given a information-providing role, and the navy only had lighter vessels for protecting commercial ships.

Nationalisation

As tensions in Europe grew, the government came to realise that France needed massive modernisation and military rebuilding. In 1936, the government of the *Front populaire* nationalised thirty-nine armaments factories, made possible by a law passed on August 11 1936. It also had an ideological character; that the ”merchants of cannons”[5] not should be able to get excessively wealthy. The industrial capacity was also seen as highly insufficient for France’s needs. Twenty-eight aerospace firms were nationalised (e.g. Bréguet, Dewoitine, Potez, Bloch, Farmant and Amiot-Caudron), nine army factories (among those parts of Brandt, Renault, Hotchkiss, Manurhin and Schneider). The naval industry was very small, and the clearly military parts were already in arsenals. The army factories and the torpedo factories became attached to the ministries of War and Marine. The land armaments concentration remained in this form until 1989, when GIAT became GIAT Industries. The aerospace industry was divided into six regional groups, classified as *societés nationales*, with their capital partly held by the private sector. The aerospace factories were also dispersed, their concentration to the Paris area made them vulnerable to German bombardment. The old owners of the companies remained in the management of the companies, e.g. the manager of the southeast company, Marcel Bloch, who named himself Marcel Dassault after WWII. The study bureaus remained largely private, one of them owned by Marcel Bloch. The airframe factories were nationalised to 80 % and the motors to 10 % into SNCM (later SNECMA).

France sent military aid to the Spanish government (that opposed Franco’s fascists), but the military aid proved itself insuperior to the Italian and German defence materiel, and also to Soviet materiel passed on to the government.

The private companies were closely controlled and scrutinised. The law passed in 1939 for the ”armaments regime”[6] is still in practice. By nationalising and concentrating the defence industry, the state was now able to create larger armaments programmes. In 1936, the general head quarters asked for funds of 9 billion francs, but were granted 14 billion, so the government was very serious about the armament. In 1939, it had risen to 21 billion. The

[4] More correctly two services and an auxiliary function, since an autonomous Air Force was not created until 1934.
[5] My translation: *marchands de canon*.
[6] *Régime des matériels de guerre, armes et munitions.*

rearmament focused on modernisation of the army (mainly tanks, anti-tank weapons and artillery) and of industrial mobilisation.

The program countered, however, problems in forms of institutional resistance from the services and the generals' headquarters. According to Giovachini, they had an excessive focus on perfectionism and failed to use the funds given to them. At the same time engineers produced numerous prototypes and models. Each branch of the army (cavalry, infantry, artillery etc.) had its own procurement process. The cavalry dealt with private enterprises and the artillery only purchased from the arsenals. The newly created *Direction des fabrications d'armement* did not exercise its given authority. The nation was also troubled with social unrest. Therefore, the defence industry and its production was fragmented and inefficient, it was not until 1938 that the nationalisations produced higher productivity than before the nationalisations. The naval industry did not start its buildup until 1937, but its productivity was severely held back by the inadequate industrial structure.

In 1938, a supplementary armaments program was launched of 12 billion francs, partly geared towards artillery and anti-aircraft defence. The main portion – nine billion – was for producing 4 700 aircrafts: 2 100 fighters, 1 500 bombers and 1 100 for reconnaissance. the aerospace workforce rose from 40 000 in 1937 to 82 000 in 1939. A ministry of Air was created in 1928, and an independent Air Force in 1934.

France had created a considerable build-up of its defence industry from 1936 to 1939, but the German industry was in all aspects qualitatively superior.

The build-up of the defence industry, the organisation of the procurement, the research, the innovation and the control – the expansion of such activities was almost entirely made by armament engineers.

The *Directions des fabrications d'armement* had been created In 1933. From that point, a separation was held between studies, industrial mobilisation and of the production. Previously, it was all managed by one group of military officers. In 1935 the state-owned industries were regrouped within the *directions des fabrications d'armement*, and in 1936 a fourth function was created in order to manage the nationalisation and regrouping of the industry. In 1939, a decree stated that the armaments engineers should be recruited directly from *l'École polytechnique*. During WWII, the armaments engineers were given military status.

The period between the wars was characterised by a period of decline and fragmentation, a period of gradual industrial build up, a period initiated by a harsh nationalisation and a following industrial build-up. The French defence industry to a large part remain fragmented and not subject to a national strategy. The nationalisation made programs possible that lasted for several years. Grave inefficiencies were apparent due to different perspectives and priorities between the military and the government, as well as of the output of prototypes rather than operational, modern materiel.

2.4. WWII

After the war had started, France worked fiercely to build up its military and defence industrial capacity. An armaments ministry was created in 1939 that was in charge of all service's armaments. It controlled more than forty arsenals and factories and also supervised the activities in 12 000 private defence companies. Reserve officers from the private industry came in charge of the conversion of private industries into defence production. The generals' headquarters however had its own perspective, according to Giovachini. The armaments ministry received demands for munitions and materiel that were impossible to deliver. The French defence research was almost non-existent, and a lot was produced under foreign

patent. The armaments industry had to deal with standardisation of materiel, rationalisation of methods and personnel recruitment. The industrial productivity was still vastly insufficient, and in late 1939 some of the factories were given back to its owners before the nationalisation in 1936, under the condition that they solely directed their efforts towards armaments. Renault and Berliet refused, and Berliet was immediately renationalised and Louis Renault was replaced by his nephew François Lehideux.

The French collaborated with the British regarding armaments in 1939-1940, perhaps the first real European armaments collaboration.

The defence industry workforce was in the summer of 1939 1 300 000, but decreased to 650 000 after mobilisation. In May 1940, it was up to 1 700 000, mostly due to recruited women.

The French defence materiel proved to be vastly inferior to the German armaments when the Germans invaded in May 1940. The artillery still used the WWI *canon de 75*, designed in 1897, the French number of cannons being 4 000 to Germany´s 11 000 and the cannons' caliber did not allow the grenades to penetrate German tanks sufficiently. The ground-to-air cannons were mainly converted 75s. The French tanks were however of equal or better standard compared to the Germans. The air force had 1 500 airplanes against the Luftwaffe's clearly superior 3500. The German armed forces also proved to have superior military tactics and strategy. The French armed forces were defeated in one month and a half.

The humiliating defeat in 1940 was, according to Giovachini, an event that along with the defeat in Dien Bien Phu in 1954 and the Suez Crise in 1956 stood behind de Gaulle´s later defence policy following from 1958, which to a large extent has been withheld by the following presidents. The present-day relation between the ministries and industry has to a large extent been withheld from 1939 until today.

2.5. Post WWII

The French state wished after the war to restore the French armed forces to a largely autonomous, modern and reactive military. The help from allies, the UK and primarily the US, was instrumental in the French build-up. After 1950, the US aid was substantial in all areas. The US weaponry introduced new technologies to the French military. The French forces also became a part of the Atlantic forces. The first French steps towards a nuclear capacity were taken in October 1945. De Gaulle wanted a strong and responsive army, whereas the socialists wanted to decrease its size, and make it primarily defensive. The defence budgets decreased rapidly, De Gaulle left office, and but came back in 1958 as president. The downsized defence ambitions of France caused the Americans to suspend the armaments deliveries in mid 1945.

The existing French defence industry in 1945 was very limited, and its technology content was largely outdated. In 1944-46, the production was inefficient and often abandoned. The naval arsenals were used in order to rebuild the commercial fleet. The aerospace industry was in better shape, partly because the Germans safeguarded it in an accord with the Vichy government, and it employed 37 000 persons at the end of the war. SNECMA was created in 1945. Like before WWII, an active policy of building prototypes was started (around 40 each year between 1945-1950). Little military use came out of it, and primarily British planes were bought. Marcel Dassault started to produce military airplanes such as MD 315 Flamant and MD 450 Ouragan.

As international tension grew at the end of the 1940s, France committed itself more strongly to the Atlantic community, but was hampered in reaching its NATO ambitions due to its engagements in Indochina. France was given defence material from the US under the "Mutual Security Act". The Air Force came to use American airplanes such as F 47 Thunderbolt,

Skyraider, T6, Sabre and Super Sabre. The allied aid was very important for the build-up of the naval aviation. Tanks and artillery was produced under license. The naval capacity was gradually built up, and in 1950, the French Navy had all-French vessels. The US military aid helped to build up a technology know-how and a defence capacity that a few years later came to compete with the US companies. The US Air Force also was present at fourteen air bases and the US Navy was present at four locations. The US military aid was as high as 50 % of the French military budget. The French defence budget rose from 18 % of GNP to 30 %. The engagement in Indochina however demanded large portions of those funds.

From November 1945 to January 1947, the armaments policy was centralised under one ministry of armament, but then converted back into three separate ministries for *Air, Marine* and *Guerre.* A centralised organisation was not created again until 1961. The French Defence minister had in 1947 only supervision over powder production and film entertainment for the troops, the rest was under three other ministries. The research under each ministry was conducted separately and isolated from the other ministries, sometimes producing dissimilar solutions for similar problems and demands. The army built up a light air force, and the Navy had an air force and an infantry. In 1948 a single Supreme Commander was created, and the three Services had to present its armaments plans for that body. The industry was however not at all in synchronisation with the services. The land-oriented arsenals still made munitions for Navy cannons no longer in use and the Air force made air lifters for tanks no longer in use. In 1955 a structure similar to the one de Gaulle created in 1945 was created, but with little influence. Especially the Navy and the Air force were vividly against a common armaments agency, as they feared that they would lose influence and that their specific needs would lose to Army needs. In 1956 the division into three parts was fully put back in place, but a *Comité des programmes* was created in order to make longer programs possible. In 1958, de Gaulle replaced the Service Commanders with government officials, thereby being able to more coherently modernise the forces.

After the war, the government concentrated on the build-up of society, rather than defence. The Cold War however increased the focus on defence. After 1948, the French armed forces were less influential in Atlantic Security, despite the large US military aid. It did however modernise the armed forces and introduced new technologies. The French military build-up was steered by rearmament within the Atlantic community, but also by the goal to have a technological and industrial capacity in France. The French state made the strongest commitment to a build-up in missiles and aeronautics. Discretely, a nuclear capacity was also being created.

The French aerospace industry was in 1950 still not internationally competitive. France and the UK had discussed collaboration, but the UK decided to concentrate on bombers and France on fighters, partly since SNECMA could not produce large enough motors for bombers. The defence budget rose greatly from 1950 to 1952 and several French aerospace programs were launched (e.g. the helicopter Alouette, the airplanes Mystère IV, Mystère B2, Mirage III, Mirage IV and Jaguar.) From 1950 to 1960 the workforce rose to 90 000. In 1962 the aerospace export consisted of 40 % of all export, compared to 10 % in 1955. The civil aerospace sector was also developed (e.g. Caravelle). The Air force wanted NATO interoperability, but the armaments engineers resisted since they feared that the French industry would disappear in an open competition within the Western community.

The French missile technology build-up was partly made possible thanks to German engineers that after WWII came to work for the French government, and they were also instrumental in creating competence for submarine detection. At the end of the 50s, the missile competence was divided by government decisions between three companies: air-air to Matra, air-ground to Nord Aviation and ground-air to Thomson.

The nuclear capacity was gradually built up during the 50s, aiming to build what de Gaulle named a *force de frappe*, a retaliation capability that would make no other country willing to attack France. The first nuclear bomb was detonated February 13, 1960 in Reggane, Algeria.

Overall, the 1950s was characterised by a multitude of projects and prototypes, and of inter-service rivalry as well as of intra-service isolation. New weapons (missiles, nuclear) were introduced and electronics became increasingly important. This created new administrative structures and new competencies. The engineers wanted French solutions and the officers wanted the best possible, thereby creating a dilemma of integration between French and non French industries and research communities. The importance of exportation also started to become apparent.

2.6. The golden age of the French military-industrial complex

From 1961 to 1980, a strong French defence identity was created, characterised by the influence of its armaments engineers which created a coherent administrative system. This system proved efficient during the Cold War, an era of high geostrategic stability, which favours a homogenic community. According to Giovachini, this development occurred under little public opposition, nor interest.

DMA/DGA

The *Delegation ministérielle pour l'armement* (DMA) was created in 1961, thereby unifying armaments under one body, incorporating – apart from the three services' armaments development – also a smaller number of defence-oriented government agencies. The concentration of an inter-service armaments administration revealed that the armaments engineers had different traditions and careers. Therefore, the services as well as the armaments engineers had to be harmonised and made to function together. According to Giovachini, the services did not appreciate DMA:s increasing power and their own decreasing influence, especially claiming that the performance of tanks, vessels and aeroplanes were decreased due to the creation of production centres and the build-up of research.

DMA was led by generals from 1961-1968, thereafter by non-military managers in the form of public servants (*fonctionnaires*), all of them *ingénieurs d'armement*. As in the case in many other countries, the managers had a background from different parts of the MIC, and after being heads of DMA/DGA not seldom became managers of private defence companies.

In the 70s, DMA gradually gained more influence, and as regards defence industry, a national defence industrial posture became clearer and clearer in order to create a national autonomous and versatile defence industry. DMA was transformed into DGA (*Délégation générale pour l'armement)* in 1977, where the symbolic change of the organisation was that the Supreme Commander was placed on equal rang as the public servant in charge.

In 1986, a modification of DGA was made. The DPAI (*Direction des programmes et des affaires industrielle)* was divided into two parts: DPA (*Delegué aux programmes d'armement*) and SCAI (*Service central des affaires industrielles*). DPA managed armaments programmes and SCAI the governance of the defence industry. Thereby, a clearer separation was made between the procurement and the production. According to Giovachini, DPA at first received more influence over SCAI, and therefore the Services grew stronger. In 1994 and 1996, further reforms were made within DGA, creating more inter-service structure and also less political influence of DGA.

De Gaulle's creation of DMA/DGA was according to Giovachini instrumental in creating France's *force de frappe* and also the size, breadth and export successes later seen by the French defence industry. Large armaments programmes were created and managed (esp. the tank AMX 30 in 1966; the missiles Exocet, Hot and Roland in the early 70s; nuclear attack submarines in 1983; the airplane Mirage 2000 in 1984 and in the space area the satellites Syracuse and Hélios)[7]. From 1960 onwards, programs and plans could be set in use for several consecutive years, thanks to the *loi de programmation militaires* (LPM, "law of creating military programs", a seven-year defence program planning process, still in use). Thanks to this law, a far-reaching industrial policy could also be put in use, accompanied by a matching and corresponding defence research policy. Nationally strong defence companies were created and supported, each becoming specialists in their area. This national monopolisation was possible thanks to article 223 of the Rome treaty, which restricts the signatories' control over the defence sector.

Industry

In 1970, Aérospatiale was created by grouping Nord and Sud Aviation together with Sereb (a government company created in the 60s for ballistic missiles), thereby creating a company covering tactical and ballistic missiles, civil aviation, helicopters, satellites and space launchers. Dassault Aviation was "awarded" Breguet in 1967. The other industrial poles created were Thomson-CSF (systems and electronic equipment), Matra (tactical missiles and satellites), SNECMA (airplane motors), SNPE (1971, powder and ammunition) as a *societé nationale*, GIAT (*Groupement industriel des armements terrestres,* 1971, armoured vehicles, artillery systems and munitions) and finally DCN (surface vessels, submarines and systems for naval combat). GIAT transformed into *GIAT industries* in 1989, in the form of a societé nationale.

At the end of the 80s, the residual national competition was reduced thanks to the co-ordinated specialisation of the national defence industrial poles. What was still seen as duplication according to Giovachini, was in tactical missiles and satellites (Aérospatiale and Matra), electronics (Thomson-CSF and Dassault) and in armoured vehicles (GIAT, Panhard and Renault). The third duplication was eliminated in a few years due the shrinking size of that sector, but the first two remained.

DCN and GIAT were public arsenals in the form of *établissement d'État*, but GIAT changed its legal form in 1990 into a form less state-run *(societé nationale*), but far from private. Aérospatiale was made a *entreprise publique*, with the capital entirely held by the state.

Thomson-CSF became a public company in 1981, but the state withheld 56 % of its capital. Dassault and Matra were also nationalised in 1981[8], all three nationalisations largely resembling the nationalisations made in 1936 before WWII. The leaders of Dassault Aviation and Matra were not changed, since they were seen as responsible and suitable by the state, i.e. Marcel Dassault and Jean-Luc Lagardère (head of Lagardère which owned Matra). Matra became entirely private in 1988.

In the *établissements d'État* especially, but also in the *entreprises publique* and the private companies, a large part of the top management were recruited from the corps of armaments engineers, thereby making the armament engineers present and dominating in the entire administration, Ministry of Industry, DGA, industry, research etc. Henri Martre became after

[7] All years indicate when they were put in operative use.
[8] More correctly, Dassault was able to make a deal with Président Mitterrand, where 46 % of the Dassault shares were given to the state, and in return Dassault stayed a private company. (According to interviews in Paris, 2003.)

heading DGA (1977-83) the manager of Aérospatiale. The French MIC was thus more and more cemented.

European cooperation and international trade

In the 1960s some important European cooperations occurred, e.g. in antitank and surface-to air missiles (the missiles Hot, Milan, Martel and Roland) and combat aircraft (Jaguar), transport aircraft (Transall, with Germany) and trainer jets (Alphajet). Other NATO countries relied more on intra-NATO programs, whereas France more relied on other constellations chosen among NATO countries in Europe. According to Giovachini, the French ways of organising programs became a role model for European cooperations. The military collaboration also inspired civil cooperation, especially in aviation and space, e.g. Franco-British Concorde, Airbus (at first French-German, later joined by UK and Spain) and Ariane in space.

At the end of the 70s, European cooperation entered limitations, according to Giovachini. Political will did not suffice in order to convince the supreme commanders, and from industrial leaders who feared for their identity disappearing into multinational consortias. Therefore, several failed projects occurred, e.g. the French-German tank program, solemnly announced by d'Estaing and Schmidt in 1980 and abandoned in 1982[9] and the abandoned European Fighter in 1985, and also the frigate NFR 90 and the rocket Europa.

The political wills and the national dynamic of defence funds proved to be different, an important factor for failure. Giovachini also stresses the inadequate rules of "juste retour" which deals with that each nation receives industrial production in exact equivalence to its investment, thereby not basing on competence at all.

The French defence materiel export went from 8 % of national industrial exportation in 1960 to 31 % in 1990. This was helped by the number of countries that wished not to be dependent on the US or the Soviet Union. The main buyers were Israel (until 1967), Iraq (until 1990) and Saudi Arabia. DGA played an important role in this development. Its DAI (*Direction des affaires internationales*) helped the companies in their choice of prospects and in the negotiation. Certain favourable mechanisms were introduced in order to reduce the financial risk undertaken by the companies. In the middle of the 70s, the French surpassed UK as arms exporter.

Overall from 1960 until around 1990, starting with de Gaulle as president, sectorial industrial logic and the specific demands of each service and their subservices were overruled in order to create national specialties, industrial concentration and clarity, technological capacity and long term research policy and programs. The specific efforts for reaching these goals were primarily public financing of research, *loi relative à la programmation militaires*[10], industrial regrouping and the export support as well as systematically favouring the chosen companies and perhaps most of all, the creation of DMA/DGA. The armaments engineers irrigated (and still irrigate) the entire structure, creating a firm MIC. The European integration increased, but was overall limited to programmes of secondary importance and were by definition riddled by economic and/or political difficulties. According to Giovachini, the power of DGA started to decrease by the end of the 1970s, mainly since it lacked responsive reflexes vis-à-vis larger political, economical and strategic changes. After the fall of the Berlin Wall, this openly

[9] Bée, presentation (2003).
[10] Loi relative à la programmation militaire (LPM) is a government document published every sixth year. It shapes in the medium term the detailed guidelines for the three services and the *gendarmerie.*

proved to be a severe handicap for the French defence-industrial community, and an adjustment of the overall policy should have come earlier.[11]

The defence industry of the 90s and onwards

Most national defence industrial capacities were slow in changing after the Cold War. The higher pace of industrial regrouping started in the US around 1994-1995, in the UK 1997-99, Sweden 1997-99, Germany 1999-2000 and France around 2000. France is different in Europe in that it has not allowed any substantial foreign acquisitions of French defence companies.

The European restructuring became a central reference for French makers of defence-industrial policy, at the same time as European collaboration had problems of intensifying and deepening, as well as transatlantic collaboration became increasingly important. Within industry, transnational companies started to emerge, thereby making national policies more blunt. National defence-industrial capacities were, and still are, characterised by inertia and national logic.

France distinguished itself in the beginning of the 90s by not lowering defence budgets at the same rate as UK and the US, since it did not outrule the re-emergence of some hostile reincarnation of the Soviet Union. François Mitterrand described it as ”not lowering the guard”. The maintaining of a high level of defence spending made it possible for the French companies to engage in numerous European alliances, thereby theoretically making it possible to maintain all the large armaments programmes started in the 80s (mainly the tank Leclerc, the fighter Rafale, next generation nuclear submarines, aircraft carrier Charles de Gaulle and the Tigre helicopter) and also to finance new priorities towards space and reconnaissance. This created after a few years, according to Giovachini, inflated figures and imbalance time wise between production and financing the production. Programs were delayed, interest rates increased and the numbers of produced items were clearly decreased. This made the French defence industry more fragile, now being present in all technological areas, but also weak in most of them. The workforces in research and production decreased. In 1995, France had more prime contractors (Aérospatiale, Dassault Aviation, Matra, Thomson-CSF, Dassault Electronique, Sagem, Snecma, GIAT industries and DCN)[12] than the US, after the US government-initiated consolidation from around fifteen to four prime contractors (Lockheed Martin, Boeing, Raytheon and Northrop Grumman).

The international armaments market also became much more competitive as defence-industrial capacities in a number of countries were trying to safeguard their size and competence with the help of exports. National support also increased in the concerned countries. The armaments export thereby fell from around 30 billion francs to 20 billion in the mid 90s.

French attempts to gain foothold on the US (Thomson-CSF/LTV) and the UK market (Thomson-CSF/British Aerospace) failed. Some European joint ventures were what brought the French industry into a European structure: Matra Marconi Space in 1990 (French-British), Eurocopter 1992 (French-German), Thomson Marconi Sonar 1996 (French-British) and Matra BAe Dynamics 1996 (French-British). These industrially created joint ventures however boosted the integration which could not be pushed further by state intentions.

[11] Giovachini, p. 117-118.
[12] Giovachini here uses the expression ”*de premier rang*”, where the most common Anglo-Saxon expression is ”prime” or ”prime contractor”. Out of this standpoint, at least Dassault Electronique and Sagem cannot be said to be integrators on the same level as the US primes.

According to Giovachini, the election of Jacques Chirac as France's president in 1995 meant a turn in France's defence policy. The mandatory military service was abandoned and the armed forces were reduced significantly. Defence budgets decreased accordingly, going from a stable level of 100 billion francs to a new level of 85. The DGA ordered all programs to decrease its costs by 30 % in six years, which of course created compromises and lowered ambitions. Experimental, long-term programs were started in 1997, especially in missiles and torpedoes (Scalp, Mica, Vesta, Mu 90). Rafale was also chosen to be benefiting from positive priorities. In return for lowered costs for programs, the government offered longer planning horizons and guarantees to finish programmes in a more precise way than ordered by the *loi de programmation militaires*.

The French industry was also recommended to create an aeronautical and an electronics pole, thereby implicitly pooling Dassault Aviation with Aérospatiale and Dassault Electronique with Thomson-CSF. These processes were started in 1997 by the Prime minister Juppé, and implemented in 1997 by Prime minister Jospin with the defence and financial ministers. A electronics pole was created by pooling Dassault Electronique, Thomson-CSF and the military parts of Alcatel. The aeronautical pole was created by a fusion between Aérospatiale and Matra Hautes technologies and with the transfer of the shares (46 %) held by the state in Dassault Aviation to Aérospatiale. Thomson-CSF and Aérospatiale were private companies, but the state held close to half of the capital in each company, and remained its foremost shareholder. Thomson-CSF and Aérospatiale thereby comprised over 90 % of the French defence electronics as well as civil electronics industry, as well as over 90 % of civil as well as the military aviation industry. Of lesser amplitude were that Sagem first absorbed Sat and then acquired Sfim and Compagnie des Signaux and also that Turbomeca rejoined the Snecma group.

The development of the electronics and aviation sectors were strongly supported by the progress in the civil Airbus.[13] GIAT and DCN, however, had no civil corresponding sectors and defence spending on army and navy platforms had also decreased globally since the Cold War and they did neither have any other diversified civil activities. Thereby, their position was much more unfavourable than that of the electronics and aviation companies. GIAT was most clearly in financial problems, and DCN in management problems. DCN and GIAT thereby radically had to reduce its workforces. It was therefore very difficult for them to find collaborative partners in other countries. According to Giovachini, the transformation of DCN into "*service a competence nationale*" and a partnership with Thomson-CSF for naval vessels for exportation made the situation better for DCN.

An armaments Europe

The concession towards a common defence and defence policy within the EU, as well as the creation of a European rapid reaction force changed the institutional dynamics. In several dimensions the European military identity started to weave a network of connections, although progress is slow and uncertain. Several multilateral programs have also failed for France, e.g. telecommunication satellite Trimilsatcom with the UK, the frigate Horizon with the UK and Italy, the satellite system Helios with Germany and MRAV/VBTI/GTK[14] with UK and Germany.

OCCAR, LOI

[13] See also Schmitt (2001)

[14] An armoured vehicle, MultiRole Armoured Vehicle, Véhicule Blindé de Transport d'Infantérie and Gepanzerte TransportKraftfahrzeug.

Industrial restructuring – primarily centred on France, UK and Germany – has been difficult to implement due to different national traditions and different capitalistic structures. France had semi-private enterprises, and a variety of degrees of state control, UK had a dispersed private ownership and Germany had a very concentrated private ownership. Furthermore, Italy and Spain were in the midst of uncertain processes of privatisation. The French had in its structures a number of state-controlled blocks, which were seen as unwanted uncertainties by industrialists. The national defence-industrial logics also still remained strong in all nations; it was treated as nationally strategic.

The joint ventures constructed in the early 90s (Matra Marconi Space, Eurocopter, Thomson Marconi Sonar and Matra BAe Dynamics) had not resulted in the deeper industrial integration envisioned by governments, partly because the strategically important decisions were still an outcome of discussions between states.

In 2000, Aérospatiale-Matra, Dasa of Germany and Spanish Casa were grouped into EADS, thereby forming a large transnational defence company. Another important event was the Thomson-CSF acquisition of British Racal in 2000.

Giovachini could not see a reason for renationalising the French companies, this said in 2000.

The French defence companies had thus (in 2000) integrated into a joint venture structure and one transnational company and Thomson-CSF has a strong British presence. The electronics and aviation sectors have clearly benefited from Airbus. DGA has had little influence in the European restructuring, and has since 1995 mainly been working with a policy of reducing costs.

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