Government Transparency Institute

*Eva Renon*[1]

# Does the Defence Industry Capture the State in France?

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[1] External contributor at IHS Markit, ongoing Ph.D. in Political Science at the Institute of the Americas, University College of London

# Executive Summary

State capture is the disproportionate and unregulated influence of interest groups or companies, where they manage to bend state laws, policies and regulations by paying illicit contributions to political parties and for election campaigns, buy parliamentary votes, presidential decrees or court decisions, as well as through illegitimate lobbying and revolving door appointments. State capture can also arise from the more subtle close alignment of interests between specific business and political elites through family ties, friendship and the intertwined ownership of economic assets. The main risk of state capture is that decisions no longer take into consideration the public interest but instead favour a specific group. Laws, policies and regulations are designed to benefit a specific interest group, to the detriment of smaller firms and society in general. In the case of the defence industry, companies have an incentive to either bribe or establish networks of friends within government in order to ensure that the state awards their companies with large public contracts. This would come at the detriment of competitors, which could be producing better and cheaper equipment, and at the detriment of the state itself, which would not be paying a fair price. Given that most defence contracts in France follow a procedure of negotiation without competition, instead of a standard competitive procedure, we wonder whether defence industries are capturing the state in France and, if so, to what extent, how, and what can be done to reduce corruption risks?

We have found that, in the case of France, such a domestic state capture is unlikely, due to the great number of actors involved such decision, the strength of the legal framework (DGA 2014) and to the strength of oversight institutions: the parliament, the senate, the Cour des Comptes, and the BEDC which is the financial audit department within DGA – the institution in charge of defence purchases. This is confirmed by the fact that France has managed to obtain low purchase prices from industrials, in exchange for the state active support to exportations.

Yet, areas of improvement remain to reduce the risk for state capture in the future. The French defence industry is likely to see its world market share shrink due to the competition of China in South East Asian markets, and European partners' opposition to sales to Golf Monarchies engaged in unjustifiable and bloody wars, committing war crimes and crimes against humanity. The consequence of a smaller world market share could be a temptation to rely on the domestic market and public budget, hence increasing the temptation for state capture. We make two suggestions to reduce the risk of state capture and prevent this temptation to turn into real corruption:

1. **The purchase of military equipment and its maintenance service (MCO) should be negotiated jointly so that the cost of MCO is included in the initial quotes.**
2. **DGA should levy a tax on industrials hardwired to fund the armament studies at Polytechnique school.**

First, the main area for improvement is the equipment maintenance, said "MCO". MCO refers to maintenance, repair, overhaul and control of military equipment. The maintenance operations are carried out internally: in the forces and in the technical services of the armies (fleet workshops, aeronautical workshops, land industrial maintenance service) and / or externally with the industrials. MCO represents between 35% and 50% of the overall cost of an equipment on average (Bockel and Prunaud 2017) and, in 2018, cost a total of €8.785 billion. In comparison, that same year, the budget allocated to buying new equipment was of €10.888 billion.[2] These purchases of MCO have the common feature of being concentrated on a small number of manufacturers. For example, according to the Cour des Comptes (2013), in 2011, out of the 33 new contracts awarded in aeronautics, 23, accounting for 85% of the total value of purchases, were awarded to 16 industrials as sole suppliers, without competitive bidding. Half of the credits of MCO of land equipment were allocated to 4 manufacturers, and three-quarters MCO naval contracts went to a single company. These markets have the characteristic of being frequently negotiated without competition and for long periods, which leads to a "lock in" situation in which changing supplier is cumbersome if at all possible. Introducing more competition makes little sense given that most companies are in oligopoly or monopoly situation. This creates a temptation to state capture. This temptation comes from industrials' eroded profit margins on equipment sales, due to effective pressure of the state during the negotiations. These industrials may be tempted to catch up on these profit margins by winning MCO contracts for the equipment sold and negotiating very long contracts in order to overcharge the state over several years. An industrial could offer cheap material in appearance, win the state contract, then proceed to win the associated MCO in order to charge an excessive price spread over several years. This leads to our first recommendation: **the purchase of equipment and its MCO should be negotiated jointly so that the cost of MCO is included in the initial quotes.**

The second area for improvement is the number and diversity of armament engineers. Armament engineers are necessary to industrials, to build equipment, and to the state, to translate army's needs into an industrial design and assess industrials' work. This naturally creates a revolving door. The term "revolving door" refers to the movement of individuals between positions of public office and jobs in the same sector in the private, in either direction. If not properly regulated, it can be open to abuse. The main concern regarding the revolving door is how it compromises the integrity and impartiality of public office. Movement between the sectors is not something to be discouraged; rather it should be controlled both to manage immediate job transitions and to ensure that biases in public decision-making do not arise (Ninua 2010). The use of insider information, including personal and professional contacts, obtained in one's prior employment in the government may be exploited to create an unfair advantage for the industry or company when it comes to policy negotiations, public contracting and other interactions with public sector entities (Ninua 2010).

[2] See Table 1. Subdivision of the Defence budget in France (2019, Ministry of Finances Classification).

In the case of the defence sector, armament engineers need to gain experience both in the private and the public sector. In France, armament engineers are trained in a state school, Polytechnique, in which the “armament studies” are funded by DGA (the state) entirely. This limits the number of engineers that can be trained each year. Engineers are in scarcity and those starting a career in DGA have significantly lower wages than those going into private sector. This raises two issues. The first is that public funds subside the training of the engineers who are creating the added value hence the profit, of private sector companies. Second, the industry can make offers to DGA engineers to join them, for better wages. Salaries are inflated to persuade the civil servant engineers to quit and bring their knowledge and contacts to the industry. If there were more engineers trained, industries could recruit them straight out from school in greater numbers. Their salaries would be deflated. In addition, if DGA could use the budget it is now spending on Polytechnique into a wage hike which would narrow the gap between the private-public sector salaries, hence decrease the revolving door temptation. This leads to our second suggestion: **DGA should levy a tax on industrials hardwired to fund the armament studies at Polytechnique school.**

We contend that our first proposal would save DGA significant amount of money and benefit the army. We claim that our second proposal would enhance DGA’s capacity to retain in-house industrial capabilities embodied in engineers by narrowing the pay gap between public and private sector’s engineers. This would decrease the revolving door’s temptation and scale. In addition, it would increase engineers’ numbers hence improve industry’s competitivity on the world’s scene.

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# 1. Introduction

In 1975, the US Senate discovered that Lockheed Aircraft Corporation had sold fighter jets F-104 Starfighter to West Germany after having bribed German politicians. In 1976, the press reveals Lockheed Aircraft Corporation's involvement in a $12.6 million payoff to Yoshio Kodama, war criminal, yakuza member and close friend of the Japanese Prime Minister, via a leading trading firm and a mysterious Hong Kong advertising company, to win defence public procurement contracts in Japan. Thanks to this, Lockheed sold 200 fighter jets to the Japanese Air Force, and eliminated its competitor on this market, the US firm Grumman (Halloran 1976, Laïdi 2019). In the UK in 2003, the Serious Fraud Office investigates whether BAE Systems bribed Saudi officials to be awarded the then largest defence procurement contract signed by Britain for £40 billions, the Al-Yamamah (Leigh and Evans 2007). In 1989, for diplomatic reasons, French President Mitterrand blocked state-owned company Thomson's sale of six frigates to Taiwan. In reaction, Thomson has promised 60 million francs to the mistress of the French foreign affairs ministry, Roland Dumas, if she managed to convince her lover to support the frigate sales. The strategy proves effective as, in 1991, the president and his minister of foreign affairs gave their support to the deal. Thomson sold the six frigates for 14.7 billion francs, 3.6 billion more than the initial deal. This extra money was used to pay off Taiwanese military officials and to give kickbacks to French politicians (France Inter 2017).

In reaction to the Lockheed scandal, the US Congress passed the Foreign Corrupt Practices Act (FCPA) in 1977, criminalising the payment of bribes to foreign officials to assist in obtaining or retaining business (Laïdi 2019, U.S. Securities and Exchange Commission n.d.). The FCPA is by nature extra-territorial and allows the US Department of Justice to prosecute any company anywhere as long as this company has the faintest tie to the US which includes making transactions in dollars or sending emails that transit through a server placed in the US (Laïdi 2019). In 1997, the OECD adopts a similar legislation, the "Convention on Combating Bribery of Foreign Public Officials in International Business Transactions" (Laïdi 2019, OECD 2011). But, if bribing officials to obtain a defence procurement contract has become riskier than in the 1980s and 1990s, companies can still legally yet unlawfully obtain these markets while not being the best nor cheaper contender, thanks to their personal ties to public officials. This is what this report aims to investigate.

## 1.1 Why Be Suspicious of Low Level of Competition in Defence Procurement?

In 2009, the EU issued a directive introducing competition within Europe in some segments of the defence markets but explicitly protecting the EU defence industry against the non-EU firms (European Parliament 2009). Yet, the analysis of our collected quantitative data[3] indicates that some countries seem to consistently favour their national industry to the detriment of European partners, such as France and the UK. Other countries, such as Belgium, Denmark, Sweden and Poland seem to favour US companies over EU ones, also breaching the EU regulation (Cabirol, F-35 en Belgique : cinq "petits" mensonges entre "amis" 2018, Cabirol, Armement : la Pologne prête à acheter à nouveau aux Etats-Unis 2018). This has led us to wonder whether permeable tight elites would capture the state to their own profit, negotiating contracts “among friends” without opening national markets to a credible EU competition. If so, this would impair the European defence capabilities and would result in abusively high prices weighting on national budgets. To evaluate and investigate the extent of this phenomenon, Government Transparency Institute has launched a series of projects on public procurement in defence in Europe. The present report is part of this larger project and focuses on the case of France. Our research question is: **are defence industries capturing the state in France and, if so, to what extent and how?**

Most defence contracts in France are not following a standard competitive procedure yet France has managed to obtain low purchase prices from industrials since the 1960s. It has managed to do so by compensating industrials by promoting their exportations and encouraging dual activities (both military and civilian). In addition, capturing the state would be a hard and risky task because of the strong legal framework (DGA 2014), the fact that all state budgets are transparent, published and overseen by parliament and then by senate. The allocation of the budget to industrials is, in fact, decided by multiple actors among which are the three armies, the president, DGA, the industrials, parliament, and the senate. The Cour des Comptes reviews parts of the budget that it judges unsatisfactory while DGA’s audit department, the “Bureau d’enquête des coûts” (BEDC) reviews armament contracts individually. This allows France to successfully negotiate contracts without competition at reasonable prices and without state capture. In other countries in which oversight mechanisms are weaker and the budget less transparent, such negotiated procedures could pose a risk of state capture.

Yet, we have noticed that industrials do not include the MCO costs in their quotes in answer to public calls, which leaves room for deferred overbilling spread over several years. While the state reviews extensively the purchase price, it seems to have a harder time controlling for MCO costs. Both our quantitative and qualitative data confirm the intuition that MCO presents a risk of state capture. The Minister of Armed Forces has already announced a reform of MCO for aeronautics in December 2017

[3] Data available here https://tenders.exposed and upon request.

(Parly 2017), for land material in July 2018 (Parly 2018), of MCO for naval material in March 2019 (Parly 2019). Yet, we argue that as long as MCO prices will not be included in the initial contract price, industrials will still be able to take advantage from a lock-in situation to catch up on their profit margins by overbilling the state.

# 2. Research design and methods

Recent research using large scale administrative data has developed a method to estimate the degree of state capture in public procurement in general, and in defence in particular (Czibik, Fazekas and Wachs 2019, Fazekas and Tóth 2016, Fazekas, Tóth and King 2013). Their method consists of identifying densely connected clusters of high-corruption-risk organisations. They have attributed a corruption risk score to thousands of public contracts and have analysed whether specific companies or specific state departments would consistently exhibit a high corruption risk score. This score is based on the aggregation of a wide range of "red flags" identified by previous scholarship and their own field work in EU countries. Their measurement approach is based on the fact that for institutionalized "grand corruption" to work, procurement contracts have to be awarded recurrently to companies belonging to the network of tight elites. In order to award these contracts to other members of the network, elites need to circumvent legally prescribed rules of fair competition. Hence, strong indicators of the existence of a corrupt network include: leaving too little time for bidders to submit their bids, single bid received and recurrent contract award to the same company, if recurrently used by one or a group of actors. In their approach, unfair restriction of competition in public procurement is used as a proxy indicator of corruption (Fazekas and Tóth 2016). This composite indicator is a fair estimation of institutionalised favouritism that is consistent over time and across countries and aims at being validated using company profitability and political connections data (Czibik, Fazekas and Wachs 2019).

Institutionalised corruption's primary aim is the extraction of corruption rents. In public procurement those can be earned if and only if the winning contractor is a pre-selected company which earns extra profit due to higher than market price for a given delivered quantity and/or quality (Fazekas, Tóth and King 2013). The French defence market is worth particular attention because France is a world class player. France spends 2.25% of its GDP on military expenditure (World Bank 2017) which represents USD$56.3 billion, making it the largest spender in the E.U., followed by the U.K. with USD$48.4 billion (SIPRI 2017).

The NGO Government Transparency Institute has commissioned this report to analyse around 3,750 military-related contracts issued in France (Wachs 2019, [6]) in order to determine the degree state capture in the domain of defence procurement. The first goal is to help identifying effective policies that could reduce state capture risks. This is a significant contribution because providing large amounts of external funding such as the European Defence Fund, and the European defence industrial development programme (EDIDP), in a poor governance context would be likely to further increase rents extracted by captor groups (Fazekas, et al. 2013) and compromise the construction of a solid, efficient,

resilient and reliable European Defence. Our second goal is to provide to the wider English-speaking public with an overview of defence procurement in France. Publications exist but mostly – if not exclusively – in French and are referred to in this report to the best of the author's knowledge.

This research uses mixed research methods to conduct its analysis. The quantitative analysis of publicly available defence contracts to which colleagues (Czibik, Fazekas and Wachs 2019) have attributed a corruption risk score has allowed to identify potentially corrupted networks of actors. To quantify these risks at the contract level, colleagues have adapted the corruption risk indicator (CRI) from their earlier work (Fazekas and Tóth 2016) and applied it to the available TED data. They have calculated the CRI as a composite index of the following red flags:

1. Single bidding
2. Not open procedure type
3. Length of advertisement period
4. Subjective evaluation criteria
5. Call for tender publication
6. Length of decision period

In this context, institutionalised "grand corruption" or legal corruption refer to the allocation and performance of public procurement contracts by bending prior explicit rules and principles of good public procurement in order to benefit a closed network while denying access to all others. Competition has to be eliminated or tilted in order to award the contract to the pre-selected company. Bypassing competition can be done in three primary forms, each corresponding to a phase of the public procurement process:

7. Limiting the set of bidders: submission phase;
8. Unfairly assessing bidders: assessment phase; and
9. Ex-post modifying conditions of performance: delivery phase.

This provided me with an insight to guide the qualitative part of the study. I conducted ten semi-structured interviews with key defence actors, in March and April 2019 in Paris and Toulon. The next section lays out the industrial architecture of the defence sector in France, explaining actors and their relations, and lays down the budget functioning, which are essential notions supporting our final policy recommendations.

# 3. The industrial architecture

The industrial architecture is the system of division of labour between firms and institutions and the mechanisms of allocation of resources and of coordination between actors (Jacobides, Knudsen and Augier 2006). In defence, the industrial architecture is composed of the state, which is the developer of

the project, of a large firm called the lead systems integrator (Lazaric, Mérindol and Rochhia 2009) which is in charge of choosing subcontractors and of integrating the different components into a well-functioning and coherent system.

The public sector is organised as follows. The state is the unique buyer in France. It buys all production and delivers it to the army or allows for exports, via the committee CIEEMG (Commission interministérielle d'étude des exportations de matériels de guerre) (Ministère de la Défense 2016). The National Assembly (lower house of parliament) and the Senate (upper house) review, amend and vote the defence budget. They also have and oversight role, alongside the DGA's BEDC (Bureau d'enquête des coûts), the military Direction of Financial Affairs (DAF, direction des affaires financières) and the Cour des Comptes (institution in charge of auditing public finances). BEDC investigates costs a *priori*, bills and hours billed. It makes a cost investigation analysing all aspects of the industrials' answer to public offers and provide with their opinion on whether and how to negotiate adjustments. While the Cour des Comptes can only review the allocation and execution of the budget, both legislative chambers have the ability to ask specific questions about contracts and projects, providing with significant checks and balances.

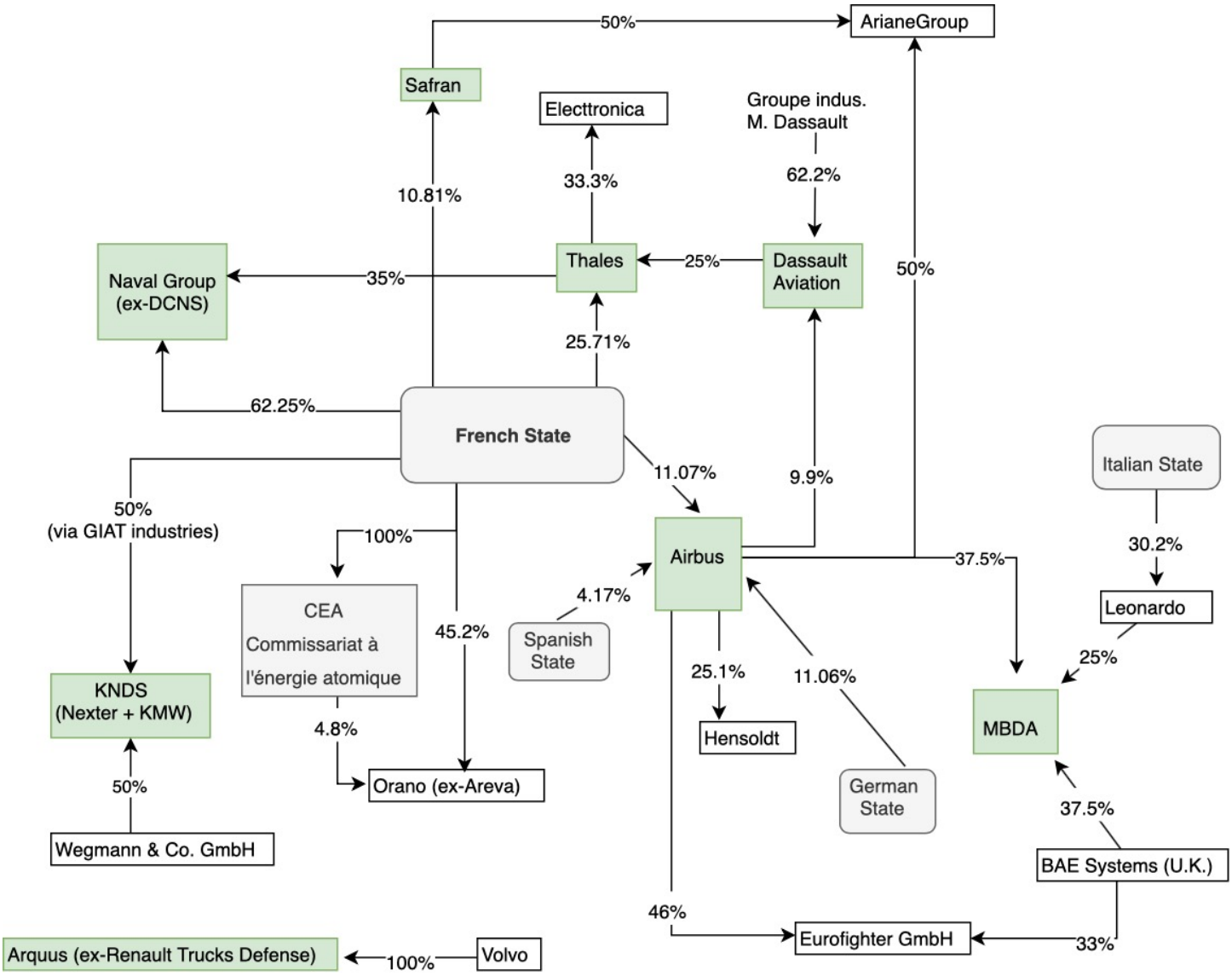
## 3.1 The Industry: Defence Technological and Industrial Base (DTIB)

Since the movement of market consolidation in the US in the 1990s and in Europe in the 2000s, the market has been dominated by the largest firms (SGA 2019). In the 1960s and 1970s, economic growth and significant budgets allocated to arms production have strengthened large firms in aeronautic, space, nuclear and telecommunication and led to the emergence of national champions which share the bulk of military public orders while also developing civil activities (Serfati 2014). Mitterrand government passed the law of nationalisation in 1982 which provided the state with either majoritarian or total control of all firms involved in defence. It also supported a wave of mergers and acquisitions that has consolidated the market in order to avoid competition between French companies (Serfati 2014). But, the next government, led by Chirac, passed a privatisation law in 1986. The following governments pursued this wave of privatisation of defence companies in 1993, 1998, 1999, 2004 and 2013 (Serfati 2014). In the 1990s, French governments pushed for the emergence of large European defence companies that could compete with the U.S. firms. Very large firms with a European capital were established: EADS which became Airbus, and MBDA, established in 2001. In 2015, the publicly owned French firm NEXTER DEFENSE SYSTEMS merged with the German KMW to form KNDS. French state's participations in defence firms is depicted in more details in Figure 1.

In addition to this historical trend, the growing complexity of weapons has also given a more important role to larger firms and inserted them at the top of the hierarchy of production. Growing complexity led to the development of weapon systems. Systems are electronic devices and / or software involved in launching tactical military weapons from a land vehicle, ship or aircraft military and involving

identification, location, target designation, launch figure calculation, firing, guidance. This technology requires a hierarchical industrial organisation in which large firms are “lead systems integrator”. They plan the overall system in accordance with the requirements of the buyer, DGA. In France, this division of labour gradually took shape in the 1960s with the design of the Mirage IV and the emergence of the status of system integrator for the firm responsible for the program (Versailles 2005). While the lead system integrator produces some elements of the system, it does not have the capacity to build an entire weapon system alone from scratch (save DASSAULT, in the case of the Rafale). Hence, the lead system integrator’s role is to select subcontractors which often are SME and mid-size firms specialised in one specific component or service.

**FIGURE 1. FRENCH STATE'S CAPITALISTIC LINKS WITH THE DEFENCE INDUSTRY (AS OF NOV-18)**




Sources: DGA 2018, Serfati 2014. In green: French lead system integrators

In 2014, the 7 largest firms and lead system integrators (in green in Figure 2) captured 84.6% of French equipment contracts (excluding ARQUUS) (Serfati 2014, 45-46). The projects most able to capture DGA

funding are large highly technological programmes.[4] These programmes are routinely expanding over two to six decades: from conception to maintenance and until replacement. For this reason, DGA needs to make sure that the firm in charge of the development would not no go bankrupt in the next decades and imposes a criterion of minimum size and turnover to firms that can pretend answer to its public calls.[5] These large firms, along with their main subcontractors, are affiliated to one or several business associations.

### 3.1.1. Business Associations

The French Defence Industries Council (Conseil des Industries de Défense Françaises: CIDEF) is the defence sector business association that gathers the three sectorial business associations: Grouping of French aeronautical and space industries (Groupement des industries françaises aéronautiques et spatiales: GIFAS), Grouping of land and air-land defence and security industries (Groupement des industries de défense et de sécurité terrestres et aéroterrestres: GICAT), and Grouping of Construction Industries and Naval Activities (Groupement des Industries de Construction et Activités Navales: GICAN). Smaller and more specialised business associations exist such as the Arbalest Circle (Cercle de l'Arbalète) which focuses on special forces, and the Defence committee of the Richelieu Group (Commission Défense du Comité Richelieu) which focuses on SME. The latter is regularly auditioned by parliament to provide with its opinions on important legislation such as the 5-year military budget plan (Loi de Programmmation militaire: LPM) (Comité Richelieu 2018).

These business associations gather firms of all sizes but given that the lead systems integrators have a direct access to government, the associations are most useful to SME and mid-size firms.[6] This allows firms to collectively buy consulting reports and market studies that would be unaffordable otherwise and to collectively fund and organise trips to potential buyer countries, such as GICAT did to Nigeria in 2019 for example.[7] The associations also organise important fairs such as the PARIS AIR SHOW in le Bourget organised by GIFAS, SOFINS and SOFLAB fairs (innovations directed at the special forces) organised by the Arbalest Circle, EUROSATORY (E.U.), EXPODEFENSA (Latin America) and SHIELAFRICA (Africa), organised by GICAT, EURONAVAL and EUROMARITIME organised by GICAN. In addition, the associations organise French firms' trips to defence fairs abroad. The fairs contribute to lead system integrators' choice of subcontractors and to SME fostering innovation by sponsoring some firms, providing firms with awards and facilitating their contact with the armed forces. These business associations are largely protectionist.[8] They facilitate contacts, organisation and articulation of interests

[4] Interview with the collaborator of a MP member of the armament commission, 11th April 2019
[5] Interview with a member of the Ecole de guerre économique and French army reserve soldier, 29th March 2019
[6] Interview with the CEO of a large consulting firm and academic, 29th March 2019
[7] Ibid
[8] Anonymous source

to their members, but tend to be reluctant to admit new members[9] and fairs participants rarely vary. They erect further barriers to entry to the sector.[10]

The business associations remain a place where all the actors, public and private, can meet. For example, at the 40 years anniversary of GICAT on the 12th of June 2019, over 500 people attended the event, hosted by the Parisian Chamber of commerce and industry. Attendees included the army chief of staff, the presidents of the committees of armament and defence from senate and the national assembly, the director of the new agency for innovation in defence and the director of DGA (M 2019).

## 3.2 The State: General Directorate for Armament (DGA)

The General Directorate for Armament (Direction Générale de l'Armement: DGA) is the state institution translating army's needs into an industrial project and selecting firms that are best fit to conduct the industrial project. The director of the DGA reports directly to the Defence Minister and is ranked above any military officer (Kapstein 2009). The DGA must have sufficient knowledge to identify and understand firms' various skills, to negotiate with them and to understand the variety of possible financial and organisational impacts associated with technological choices (Lazaric, Mérindol and Rochhia 2009). Knowing how to identify the knowledge and skills within each profession is essential to define the list of subsystems used in the composition of the complex products and systems.[11]

[9] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019, and Anonymous source

[10] Anonymous source

[11] "A weapons system is a device or coordinated set of devices or objects that consists of one or more weapons and a means of delivery as well as integral equipment and materiel. A weapons system is distinguished from a weapon in that while it incorporates one or more weapons in many instances it can also be used for other purposes than killing, injuring, disorienting, or threatening a person or inflicting damage on a physical object. For instance, an aircraft can conduct surveillance and a ship can transport personnel and materiel." (Weapons Law Encyclopedia n.d.)

**BOX 1 – DGA'S STAFF: ARMAMENT ENGINEERS**

The military corps of Armament Engineers (*Corps des Ingénieurs de l'Armement*), established in 1967, follows the army hierarchy of officers, from lieutenant to 5 stars general. There are three traditional routes to join this corps: to graduate from École Polytechnique, the prestigious state school for engineers; by passing an exam open to graduates from the top engineering schools; for civil servants serving in another administration, by passing an internal exam. At least 67% of the Armament Engineers are required by law to have graduated from Polytechnique. In 2018, there were 889 Armament Engineers, of which 54% were employed by DGA.

Before the 1997 reform, trained members of the military corps of Armament Engineers were in key positions in defence programs at CEA, CNES, ONERA, DGA and the main industrial companies involved in the design of armaments. The influence of armament engineers extended even into the definition of strategic concepts in the military and foreign policy fields. If the influence of Armament Engineers has weakened since, they retain most of positions within DGA.

In 2019, for the first time, DGA made some positions available to non-engineer graduates from the National School of Administration (École Nationale d'Administration: ENA), the higher education institution training civil servants.

Sources: Lazaric, Mérindol, & Rochhia 2009, Légifrance 2008, Art. 11, Fintz (ICA) 2018, Picture from "Le Magazine des ingénieurs de l'armement" No 114 2018.

DGA went through two major reforms, in 1997 and in 2003, that have deeply changed its role within the defence industrial architecture by creating new responsibilities for the state while transferring other responsibilities to the industry. From DGA's creation in 1961 until 1997, DGA was at the heart of the design of the weapons programs. DGA made the link between armies' operation needs and defence firms. To fulfil its role of contracting authority, it was actively involved in the design of the weapons programs. In the 1970s, the DGA was able to carry out exploratory development of new weapons. It would pass the phases of the development of solutions and of their commercialization on to defence firms (Mérindol 2005). In this model, DGA's technical and scientific roles were indisputable as long as it included the sub-department called Directorate of Research and Technical Studies (Direction des Recherches Études et Techniques: DRET).

Because of the growing complexity of weapons systems' technology, DGA externalised its technical expertise and focused on its role of unique centralised buyer. The 1997 reform suppressed the DRET, transferring part of the technical responsibility and of design to defence firms (Lazaric, Mérindol and Rochhia 2009). The Armament Systems Directorate (Direction des Systemes d'Armes: DSA) was created, effectively splitting DGA in two: DSA concentrating the technical abilities and DGA focusing on its role as a buyer (Fréville 2005). In addition, the naval industry, which used to be entirely part of the state and attached to DGA, continued its transformation into an independent firm from 1993 until 2000 giving birth to the company NAVAL GROUP. From 1997, DGA has granted more autonomy to firms and partly transferred to them new technological and organisational skills (Guillou, et al. 2009). Despite the priorities given to the technical expertise, DGA has gradually lost its architectonic capacity for "systems' systems" (Mérindol 2005). DGA has focused on its purchasing role, putting firms in competition on a systematic basis and using contracts with fixed-price, thereby transferring development risks entirely to the industry. In addition, DGA has developed its ties to dual research centres developing technologies that can have both civilian and military applications, such as the National Centre for Space Studies (CNES), the National Office for Space Studies and Research (ONERA), and the Office of the Atomic Energy and Alternative Energies (CEA).

The 2003 reform made DGA focus more on interface management rather than on the co-design of the technological architecture of the programs. DGA still retains its role in translating armies' operational needs into technical specifications. This role is sophisticated because of army's increasing variety of missions and the significant impacts that choices over priority and technical formulation have on the performance of weapon systems and on program costs. In this new position of "interface developer", DGA must have the knowledge to identify and understand firms' various skills, to negotiate and to understand financial and economic impacts of organisational possibilities associated with technological choices (Lazaric, Mérindol and Rochhia 2009). The DGA moves away from its position of tough on prices buyer towards a more collaborative approach in which risks are shared with firms and contracts are distributed between competitive public calls and more collaborative projects (Lazaric, Mérindol and Rochhia 2009). Knowing how to identify the knowledge and skills within each business is essential to define the list of subsystems used in the composition of complex product systems. This, despite the fact the ability to create a program architecture has been transferred to the lead systems integrators such as Thales, Naval, Nexter, Airbus, or MBDA, for example.

After 2003, government has made changes to DGA's organisation to improve its efficiency, reduce costs and adapt to new challenges. Most notably, DGA and DSA, which had been separated by the 1997 reform, were reunified in 2007 (DGA 2018). Adaptation to new challenges include the creation of the position of a Cyber defence advisor to the DGA's director and the institution "Defence Innovation Agency". This agency will federate all the actors of the defence innovation, pilot of the policy of research, technology and innovation of the Ministry of the Armed Forces and all the devices of innovation. It is attached to the research and innovation budget of the Ministry, which will rise from €730 million (2019) to one billion euros by 2022 (Parly 2018). In 2019, the Ministry of Armed Forces inaugurated the Council of Industrial Policy in Defence (Comité de Politique Industrielle de Défense), that depends from DGA,

and which will gather the Minister, DGA's head, the main industrials and SME at least twice a year to discuss about the industrial policy and public investment in defence (Parly 2019).

Throughout all these reforms, DGA has managed to pressure industrials to obtain cheap purchase prices while preserving the industrial capabilities of the country.

### 3.2.1 The Balance Between Low Price and Preserving Capabilities

The choice of which defence procurement procedure to use depends on four objectives: influence the purchase price, promote a higher quality of production, minimise transaction costs while contributing to the country's strategic autonomy (Bellais, Foucault and Oudot 2014, 40). The WTO gives states the right to exclude sensitive markets such as defence from foreign competition. Governments can invoke national security to protect their national armament industries which are tied to vital interests of the state. This provision is intentionally vague so to let states give it an extended meaning (Serfati 2014). The dependence of the state on industrials is further deepened by states' will to secure a national source of supply of armament, for political and strategic motives but also to preserve the country's technical capabilities. The state protection is also justified by the fact that defence industry requires specific assets (test bench, assembly line…), which could hardly be used to other ends hence reinforce industrials' dependence to state purchases. the state takes this strategic criterion into account when it buys from a monopoly which survival depends on public purchases. The choice of the procurement procedure reflects this situation. Three procurement procedures exist in France: open or restricted competition; negotiation; a mixed-procedure combining negotiation and competition, called "competitive dialogue" (Bellais, Foucault and Oudot 2014, 40).

In France, the common procedure is the negotiation, after having advertised and put contenders in competition, except in some cases allowing the absence of advertising and competition (Bellais, Foucault and Oudot 2014, 41) in accordance with the European Directive of 2009, integrated into French law by the decree 2011-1104 (Légifrance, Décret n° 2011-1104 du 14 septembre 2011 relatif à la passation et à l'exécution des marchés publics de défense ou de sécurité 2011). DGA's policy is to use competition as much as possible, provided that "the state needs to prepare for the long term and not to ignore the risks of industry's dependence that may influence its ability to provide with strategic equipment nationally, to export, and even to lead the innovative programmes of the future" (Bellais, Foucault and Oudot 2014, 41). As a consequence, in the 2010s, DGA would use a procurement procedure of negotiation in 50% of the cases and for a total of 90% of all its budget (Bellais, Foucault and Oudot 2014, 41).

In this situation, the four objectives of procurement may be conflicting. The objective of contributing to the country's strategic autonomy while minimising transaction costs by negotiating with known partners could come at the cost of a higher purchase price or at the cost of lower quality of production. Conversely, a more competitive setting might come with higher transaction costs, run the risk of weakening the strategic autonomy, but allow to obtain cheaper prices for a given quality. Finally, buying

equipment on the shelf (to buy an equipment already produced and stocked by another country, also said "sur catalogue") might allow for cheaper prices, a known and reliable quality, for very low transaction costs but at the risk of weakening the country's strategic autonomy.

The price of military equipment is a trade-off between preserving technical abilities, embodied in engineers, and the price of equipment. In all contracts, whether between public and private or between two private actors, the buyer always attributes a weight to the technical aspects and to the commercial aspects in the criteria of attribution, though this is rarely explicitly mentioned in the contracts.[12] For example, adequacy of technical aspects would weight 60% while commercial aspects (unitary price + transaction costs) would weight 40% in the final decision.[13] Armament engineers, whether within DGA or within industries, are usually pushing to lower transaction costs (working with the same known industrials and the same technology that they know well) and the highest possible quality.[14] In public procurement, once the minimum standard of technical qualification is reached, the cheaper quote wins the bid. This means that price is given an important enough weight in the decision so that a slightly more performant, but more expensive proposal would lose against one that matches exactly the minimum technical requirements for a cheaper price.[15]

Industrials know that unitary price is only one of the several criteria that DGA uses to pick the winner of a call for tenders but also in negotiations without competition. DGA knows that industrials are aware of this. DGA's strategy to push the purchase price down has varied, starting with "cost plus" contracting, to fixed cost contracts, to encouraging dual activities and supporting exports.

#### *3.2.1.1. "Cost Plus"*

In the late 1980s and throughout the 1990s, DGA focused on its role as unique buyer, enshrined in law by the 1997 reform, giving a heavy weight to the purchase price in its decision. It has created incentives for industrials to perform best at the cheapest price, with "cost plus" contracts. In those contracts, the temporary unitary price of equipment was calculated from the anticipated costs, calculated by DGA. The profit margin of the industry would be inversely proportional to the costs meaning that if the industrial managed to produce at lower costs, it would pocket the difference and have a greater profit margin. If the industrial was producing at greater costs than expected, the difference was taken out from the profit margin until the firm was forced to produce at loss in the event of significant cost overrun.[16] While

[12] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[13] Ibid
[14] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019
[15] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[16] Ibid

Kapstein (2009) argues that this form of contracting led to significant cost overrun that weighted on the state, a former DGA negotiator that I interviewed argued differently. DGA managed to get rather cheap prices and shrink industrials' profit margin thanks to cost plus contracting. So much that such a contract pushed RENAULT TRUCK DEFENCE (now ARQUUS) to produce at loss. The firm subsequently entered into financial difficulties that ultimately led it to be bought out by VOLVO.[17]

What became very costly for DGA were transaction costs. Cost plus contracting involves long formulas and complex estimations that have mobilised numerous staffs and involved lengthy procedures when it came to ex-post auditing. In addition, it pushed manufacturers to make compromises on quality in order to lower their costs and benefit from a greater profit margin.[18] For these reasons, DGA abandoned cost plus contracting to adopt fixed-price contracts. DGA changed its approach to value less the purchase price weight in its decision, in order to value more the technical capabilities preservation – by not making industrials bankrupt hence vulnerable to foreign acquisition –, value more quality, and value more transaction costs on which easy savings could be made by abandoning the complex cost plus contracting.

#### *3.2.1.2.Fixed Costs Contracts and Audit Capacity*

Now, nearly all French weapon procurement contracts are fixed-price based and cost overruns still occur but at a relatively modest scale (Kapstein 2009). French cost overrun is normally within the 5-10 percent range as opposed to an average 26 percent overrun in the US (Kapstein and Oudot 2009). In addition, DGA has developed the "responsibility principle" as a major element of the fixed-price contracting: those who are responsible for cost overruns (government or the contractor) must bear the extra cost in the case of a cost overrun and renegotiation (Euske and Wang 2012). If there is a technical change, a calendar change or a revision of the price, the DGA Armament Engineers would follow and control. If an unpredictable problem arises in the development phase, such as finding out that the technology is not yet mature, the development would be terminated. This case is very rare. If there is a change of technical characteristics halfway through the development, the responsibility principle is applied. But in fact, this seldom happens because both industry and the state know that such a change would cost a fortune.

Costs have been better kept in check because fixed price contracting reduces the need for auditing and since DGA keeps improving its audit capacity. In 2011, DGA had 30 employees in its audit department (Bellais, Foucault and Oudot 2014), while in April 2019 they were 43 in the cost investigation department (Bureau d'enquête des coûts: BEDC). DGA aims at bringing the team to 50 members in the next few

[17] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[18] Ibid

years.[19] BEDC investigates costs a priori, bills and hours billed. It makes a cost investigation analysing all aspects of the industrials' answer to public offers and provide with their opinion on whether and how to negotiate adjustments. If the industrial announces that it might deliver the production late, it is common for the cost investigator to threaten to not pay anything that will arrive after the due date – even if, in practice, it would be hardly feasible.[20]

If its audit capacity comes in support of strict and efficient contracting policy, the main reasons why DGA manages to obtain low purchase price is that it pressures the industrials by using competition as a threat when negotiating and by helping the industry to catch up on low profit margins by promoting its exportations.[21] Yet, DGA still excludes MCO price from the initial quote which allows industrials to catch up on low sales prices by overcharging maintenance.[22]

### 3.2.2 Exports and Dual Activity

DGA's International Development Division (DI) coordinates state support for armament exports and plays a central role in export controls. In 2011, DGA renewed its desire to simplify exportation procedure (DGA 2011). Under Hollande's presidency, armament exports increased fourfold (Béraud-Sudreau 2017). By supporting exports, DGA gains an edge in negotiating with industrials and can obtain cheaper prices itself, squeezing the profit margin on the national market by helping to catch up on foreign markets.[23] This leverage is especially relevant for firms that are exclusively military.

In the case of dual companies operating in both the military and civil markets, the dependence on state contracts is weaker if not absent altogether and R&D costs are partially absorbed by the civil activity. In 2014, France's seven largest industrials[24], the lead systems integrators, threatened that a decrease in defence budget would

> *"accelerate their conversion towards more civilian activities. They would then be subject to the only global competitive constraints (parity euros / dollar, labour cost, taxation ...) that will put the national interest in the background. […] Medium size enterprises and SME would not survive. Companies focused on defence markets alone would be victims of anaemia, which will quickly leave them no alternative but to pass under the control of foreign companies or disappear." (Cabirol 2014)*

[19] Ibid
[20] Ibid
[21] Ibid
[22] Interview with an Ecole de guerre économique's student and Army Reserve Soldier, 20th March 2019
[23] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[24] Airbus Group, Safran, Thales, Dassault Aviation, Naval, Nexter and MBDA.

Industrials' civil activities is the main source of profits and growth, accounting for 83% of sales in 2013 in aeronautic, whereas the defence activities suffer from lower profit margins and varying yearly state budgets. This, nonetheless, allows DGA to argue and pressure for lower purchase prices: the industrial's survival is not at stake. In addition, dual firms make economies of scale on their R&D spending. A significant part of the new technologies that are developed for civil activities (such as commercial aviation for example) are also useful to military purpose. This means that development costs for a new military equipment are usually lower because part of the technology has already been developed in the civil branch of the company and can be easily reused. The equipment is not developed entirely from scratch but is uses civil products as a base.[25] For example, Airbus MRTT (Multi Role Tanker Transport) military plane has been largely derived from the civil Airbus A300.[26] In order to benefit from these aspects of dual activities, DGA has been supporting NAVAL, an exclusively military shipyard, in developing civil activities, especially in the area of marine energies.[27]

### 3.2.3 Competition as a Threat

Finally, DGA uses competition as threat to pressure industrials and obtain lower prices, by negotiating directly with the few actors on the market. A good example is the case of replacement of the Milan missile (anti-tank missile). Javelin was produced in the 1960s by Euromissile which later became MBDA. This, in addition to MBDA being the only competent European producer of MMP missiles (Medium Range), let MBDA think that it would obtain DGA's contract for renewing the Milan missile, following a non-competitive negotiated procedure.[28]

But, DGA announced that it had decided to buy the US "FGM-148 Javelin" missile on the shelf instead and without having opened a competitive bid. In reaction, MBDA funded the development of a fifth generation MMP at 75% with its own funds (Cabirol, Le nouveau missile MMP de MBDA explose les performances 2018). MBDA's missile's technical abilities are notably superior to the Javelin's (Cabirol, Le nouveau missile MMP de MBDA explose les performances 2018). DGA cancelled its Javelin purchase and bought the MBDA MMP following a negotiated non-competitive procedure, due to the confidential and sensitive character of this new equipment.[29]

Another example in which DGA used competition strategically to obtain lower prices when the outcome of negotiation with industrials was not satisfactory is the case of FOMEDEC contract, won by a British company and a Swiss company in 2017. FOMEDEC is a 11-year contract for modernized training and

[25] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[26] Ibid
[27] Ibid
[28] Ibid
[29] Ibid

differentiated training of fighter aircraft crews (*Formation modernisée et entraînement différencié des équipages d'avions de chasse: FOMEDEC*). THALES and AIRBUS thought confidently that they would get this contract,[30] but DGA attributed it to the British company BABCOCK, responsible for 70% of all UK Ministry of Defence flying training hours, and to the Swiss company PILATUS, that produces training airplanes. The General Lanata, French Chief of Staff of the Air Force, explained the choice of BABCOCK and PILATUS over THALES and AIRBUS by declaring that "it was the only choice that could allow to satisfy the double objective of a high-quality operational preparation of future fighter jets pilots, and guaranteeing to remain within the financial limits imposed by the five-year military budget, the LPM" (Air&Cosmos 2016, Air&Cosmos 2017).

## 3.3 Check and Balances

### 3.3.1 National Assembly and Senate

MPs from the National Assembly can choose to take part in the Assembly's Permanent Committee of National Defence and Armed Forces. Like all other permanent committees, its role is to prepare the legislative debate in public session and to inform the Assembly and control the Government (Assemblée Nationale 2017). It is composed of 60 members, 4 secretaries, 4 vice presidents and 1 president (Assemblée Nationale 2019). These MPs are usually from the regions in which the defence industry provides with the most jobs.[31] The committee can easily audition whoever they wish, including top generals and admirals, and ministers, in order to complete an expertise study, or check on the government action or prepare the Assembly's debate on a specific topic.[32] The Senate has a similar role with 49 members in its committee of foreign affairs, defence and armed forces, and works hand in hand with the lower house.

These auditions, all published on both houses' websites, are a great source of information regarding the practices of the defence industry and the possible concerns about the costs of contracts. For example, the Minister of the Armed Forces has launched a 18-month study on the future French aircraft carrier including questions about the desired combat capabilities, the propulsion mode (conventional or nuclear), the adoption of electromagnetic catapults in place of the current steam catapults, or the integration of future combat drones that will complete the piloted on-board hunting. The resulting choices will make it possible to define the size of the future aircraft carrier, which will probably be larger than the current Charles de Gaulle. This study will also be an opportunity to define the needs for the navy to return to a fleet with two aircraft carriers instead of one, which would allow to recover a permanent operational availability of the carrier. In this context, Admiral Jean-Philippe Rolland, commander of the

[30] Ibid
[31] Interview with the CEO of a large consulting firm and academic, 29th March 2019
[32] Interview with the President of the armament commission, 8th April 2019

Naval Action Force (Alfan) and former Commander of Charles de Gaulle, was heard on 12th March 2019 by the Defence Committee and Armed Forces of the National Assembly. During this hearing, he was questioned about the future aircraft carrier project(s) by MP Thomas Gassilloud, who asked him to confirm that the cost of the successor of Charles de Gaulle would be "on the order of five to six billion euros". The admiral recalled "that [they] have only available a very wide range of evaluation". But, he added, "today, the order of magnitude amounts to several billion euros, at least five billion probably - and even more if the nuclear propulsion is retained. But, of course, if we buy more than one, you spread the development costs over all the units bought, which makes each unit cheaper" (Groizeleau 2019).

The Committee and its MPs also lead the reviewing and amendments of the military budget, which involves deeply critical conversations about a wide range of topics, including the most sensitive such as armament exports to Saudi Arabia. For example, the committee analysed an amendment to the 2019 army budget, proposed by MP Bastien Lachaud. MP Jean-Charles Larsonneur, argues against it:

> *"On your amendment itself, I see a fundamental problem: it deals with the fiscal impact of a moratorium on arms sales on Saudi Arabia and the United Arab Emirates on public finances. However, there is no direct budgetary impact of these sales contracts on public finances: it is the manufacturers who sell, and not the State. I do not think it's a good idea to suggest that the state itself would derive some direct benefit from arms sales, regardless of the client. As such, I give an unfavourable opinion."* (Gassilloud 2019, 98)

The president of the commission subsequently rejected the amendment of the budget.

#### *3.3.1.1. National Defence Budget*

The military budget follows a 5-year plan, based on France's strategic priorities, called the Military Programming Law (Loi de Programmation Militaire: LPM). It is not law-bidding in itself but provides guidance for the redaction of the yearly budget of the Ministry of Armed Forces,[33] which subdivision is illustrated below in Table 1. Table 1 follows the budget classification of the Ministry of Budget. The Ministry of Armed Forces has a different budget classification for its internal management purpose. The overlaps between both classifications are presented in Table 2.

The White Paper (*Livre Blanc*) lays down the French strategy for defence and national security and specifies in particular its articulation with the common security and defence policy of the European Union and with NATO, and the capacities required to implement it in the next fifteen to twenty years (République française 2013). The 2008 White Paper was updated in 2013 because the security and defence challenges of France have shifted dramatically. Between 2015 and 2017, multiple terrorist

[33] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

attacks have left 239 dead in France (LCI 2017), which sparked the need for a new strategic roadmap. The 2017 Strategic Review (*Revue Stratégique*) answers to this need. It draws lessons from the evolution, since the White Paper of 2013, of an unstable and unpredictable strategic context, marked by a durably elevated terrorist threat, the simultaneity of the crises, the military affirmation of established or emerging powers, the weakening of multilateral frameworks and the acceleration of technological upheavals (République française 2017).

The LPM (military 5-year budget) lays down the road map for the yearly "Defence Mission" which is one of the four parts of the Ministry of Armed Forces' budget. The Defence mission is itself divided into four thematic yearly budgets, the P144, P146, P178 and P212, themselves divided into "actions" themselves divided into sub categories to which a certain amount of money is allocated. The DGA's specialised "management units" (*Unités de Management*) are in charge of executing the budgets of the P146 "Armed Forces Equipment", the Future Plans ("Études Amont") segment of the P144, and projects of P178, P152 and P212. The units also participate in exports support for the benefit of the International Development Directorate (ID); and contributes to the good execution of contracts of export operations (DGA 2016).

**TABLE 1. SUBDIVISION OF THE DEFENCE BUDGET IN FRANCE (2019, MINISTRY OF FINANCES CLASSIFICATION)**

**Livre Blanc de La Défense et Sécurité Nationale (2013)**
and its update, the
**Revue Stratégique de Défense et de Sécurité Nationale (2017)**

Identify the main security threats and set the strategic objectives of the country

↓

**Loi de Programmation Militaire (LPM)**

Translates the Livre Blanc and Revue Strategique's strategic objectives into a 5-year budget plan

↓

| Ministry of Armed Forces yearly Budget, divided into four "missions" → | **Defence Mission** Translates the LPM into a yearly budget allocated into four categories of spending, called "Programmes" | | | | **Security Mission** | **Interministerial Mission "Veterans, memory and links with the Nation"** | | **Interministerial mission "Research and Higher Education"** |
|---|---|---|---|---|---|---|---|---|
| Operational Budget Programmes (BOP) → | **"Programme 144" (P144)** Environment and prospective of defence policy €1.476 bn | **P146 (Equipment purchase)** Armed forces equipment €10.888 bn | **P178 (MCO)** Preparation and use of forces €8.785bn | **P212** Support to Defence Policy €23.195bn | P152 Gendarmerie | P167 Links between the Nation and its army | P169 Recognition and compensation for veterans | P191 Dual research (civilian and military) |
| "Actions" → | 1. Strategic analysis<br>2. Prospective force systems<br>3. Search and exploitation of intelligence<br>4. The security of France<br>5. Maintaining industrial technological capabilities<br>6. Export support<br>7. Defense Diplomacy | 1. Deterrence<br>2. Command and control of information<br>3. Projection - mobility - support<br>4. Commitment and fight<br>5. Protection and backup<br>6. Preparation and conduct of arming operations<br>7. Foreign shares and civilian programs | 1. Means planning and operations management<br>2. Preparation of land forces<br>3. Preparation of naval forces<br>4. Air Force Preparation<br>5. Logistics and Joint Support<br>6. Additional costs related to external operations<br>7. Incremental costs related to domestic operations | 1. Direction and management<br>2. Control function<br>3. Central management and external bodies<br>4. Real estate policy<br>5. Information, Administration and Management Systems<br>6. Accompanying the human resources policy<br>7. Promotion and enhancement of cultural heritage<br>8. Communication<br>9. Restructuring | | | | |

Sources: Légifrance 2018, Art. 3, Perrin and Conway-Mouret 2018, Direction du budget 2018, and Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

The Ministry of Armed Forces uses a different budget classification. The reason is that it is resisting the reforms of classification, imposed by the Ministry of Finances.[34] Hence, instead of speaking of the Defence Mission's P144, P146, P178 an P212 budgets, the Ministry of Armed Forces evokes the "Equipment Aggregate" (*agrégat équipement*) which is divided up into ten categories, called the "Strategic Operations" (Opérations Stratégiques: OS) which partly overlap with the Defence Mission's programmes but most notably excludes the military deployments abroad (Opérations extérieures: OPEX). The overlaps are detailed in Table 2.

**TABLE 2. OVERLAPS BETWEEN DIFFERENT BUDGET CLASSIFICATIONS**

| **Ministry of Armed Forces budget classification** | | **Ministry of Finances budget classification** | | | | |
|---|---|---|---|---|---|---|
| | **Strategic Operations (OS)** | **P144** | **P146** | **P178** | **P212** | |
| Equipment Aggregate | Foresight and preparation for the future (PPA) | X | | | | "Defence Mission" |
| | Intelligence (RENS) | X | | X | | |
| | Major effect program (PEM) | | X | | | |
| | Other arming operations (AOA) | | X | | | |
| | Nuclear Deterrence (DIS) | X | X | X | X | |
| | Environment of arms expenditure (EPA) | | X | | | |
| | Scheduled maintenance of equipment (EPM) | | | X | | |
| | Scheduled maintenance of staff (EPP) | | | X | | |
| | Accompanying and coherence equipment (EAC) | | | X | X | |
| | Defence infrastructures (INFRA) | | | | X | |

[34] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

### *3.3.1.2. The Political Economy of the Budget*

The LPM determines how much the state is willing to buy from industrials over the next 5 years and provides with a good insight of the expected repartition of this budget. For example, the table below is a projection of which material will need replacement and when. Industrials can base their production plans on this table because it is a fair indication of how much, when and what the state will buy. For example, Table 3 below shows selected rows from the parliamentary review of the LPM in which the expected purchases of the government are clearly outlined per category of material. This layout of the budget is a rather accurate representation of the state future contracts in defence procurement. While the selected lines for the army and the air force show that the precise type of material has already been selected, the navy line shows a project that has not been developed yet. Industrial use these plans to make their own profit projections and investment decisions which is why, they "threatened" the government to focus on their civil activity if the LPM was not respected, as it used to be the case in the 2000s (Serfati 2014). Yet, industrials do not have enough independence from the state orders to carry out these threats.[35]

To draft the LPM, the Ministry of Armed Forces launches a consultation for which the main stakeholders meet regularly until they reach a consensus.[36] The LPM is the result of a consensus at the level of the executive power between the President, the DGA (for technical expertise), the Chief of Staff of the Armed Forces, indicating operational needs,[37] and industrials, estimating the budget and technical feasibility within 5-10 years, called the operational technical study (Études Techniques Operationally: ETO)[38]. Because missiles, electronic systems, ships and fighter aircrafts are imbedded in one another, industrials and DGA need to estimate whether each element can be developed and delivered within the same timeframe.

There are deep tensions between DGA, industrials and the Chief of Staff of the Armed Forces because this negotiation determines the allocation of resources in accordance with one or the other's preferences.[39] Armament engineers within DGA and within industries would push for allocating more budget to improve technical capabilities while the "commercial" departments within DGA, would rather attempt to translate armies needs into cheaper, more simple programmes.[40]

[35] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019
[36] Ibid
[37] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019
[38] Interview with the CEO of a large consulting firm and academic, 29th March 2019
[39] Interview with the President of the armament commission, 8th April 2019
[40] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019

The LPM is then sent to the National Assembly which reviews it and produces a report, in the name of the President of the Defence Committee (Bridey 2018), then to Senate. Parliament and Senate make non-substantial amendments that do not disturb the initial consensus found at the executive level[41] and rather focus on more local issues. For example, one point of legislative chambers' debate was whether former military personnel could run for mayor in their regiment's city and/or in their home town.[42]

[41] Interview with the President of the armament commission, 8th April 2019; and Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

[42] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

**TABLE 3. EXTRACT FROM THE TABLE "EVOLUTION OF THE MAIN PARKS OF CONVENTIONAL EQUIPMENT"**

| Programme | LPM (2014-2019) | | Stock in 2019 | LPM 2019-2025 Projects | | Stock by the end of 2025 | Comments |
|---|---|---|---|---|---|---|---|
| | Target | Deadline | | Target in 2030 | Deadline | | |
| Army | | | | | | | |
| Armoured reconnaissance and combat vehicle JAGUAR | 248 | 2033 | 0 | 300 | Tbc | 150 | - acceleration of the timetable: 150 deliveries in 2025 instead of 110<br>- increase of the target: + 52 |
| Navy | | | | | | | |
| PATMAR future (replacing the Atlantic 2, the Maritime Patrol Aircraft) | - | - | 0 | 12 (could change depending on the programme development) | 0 | 0 | - new programmes<br>- orders should be placed by 2025 |
| Air Force | | | | | | | |
| A400M Atlas | 50 | 2030 | 14 | Target of 53 transport planes (A400M + C130-J) | tbc | 25 | none |

Source: Bridey 2018

In general, the LPM allocates most budget to large and very technological programmes, which often means that budgets are allocated for 20% to nuclear deterrence, and that the rest is divided up between the Air Force programmes (Rafale) and the Navy's (Charles de Gaulle) whereas the Army (land) gets the smallest share of the pie.[43] The army got a larger share of the pie in 2014 with the launch of the SCORPION programme. This programme is a highly technological programme aimed at renewing and

[43] Interview with the collaborator of a MP member of the armament commission, 11th April 2019

modernising the army's material, but also at capturing a larger share of the budget.[44] The SCORPION programme focuses on connecting groups of vehicles that can have intelligent automatic reactions, to design a connected and intelligent outfit for soldiers and to collect and analyse information from drones and vehicles more efficiently (Lagneau 2018). The development of these technologies should bring THALES, NEXTER and SAFRAN together (Lagneau 2018).

### 3.3.2 Cour des Comptes

The other main oversight institution is the Cour des Comptes. Its main task is to ensure the proper use of public money and to inform citizens. It is an independent court standing half way between Parliament and Government, assisting both in accordance with Article 47-2 of the Constitution. The Court of Auditors bluntly critical reports on all aspects of public finances. For example, its mid-term evaluation of the 5-year military budget (LPM) 2014-2019, pointed the deficiencies of budget planning in a letter to Prime minister Philippe:

> *"The LPM 2014-2019 balance was based on the following assumptions: […]*
>
> - *Exceptional revenues from the sale of terrestrial frequencies and real estate rights, uncertain in their amount and timing […];*
> - *the volume of orders for Rafale aircraft by the armies implied the conclusion of export contracts as early as 2016, which at first sight seemed very uncertain."*
>
> *This lack of coherence between ambitions and means, already noted in previous LPM, led the Ministry of Armed Forces to renegotiate, in a costly manner, in 2014, a number of contracts for major weapons programs to reduce their costs targets or spread out deliveries and payments. The only staggered deliveries for the three programs of the European multi-mission frigates (FREMM), Barracuda submarines and A400M transport aircraft led to additional costs exceeding € 1 billion. These renegotiations, whose effects have accumulated with those already carried out in 2009, have resulted in a surge in unit costs of equipment. The unit cost of the French FREMM was thus increased by 67% compared to the initial estimates. Finally, the postponement of deliveries required the maintenance of aging equipment whose renewal horizon set by the previous 2008 white paper was, for some of them, already exceeded in 2014." (Migaud 2017)*

These criticisms have been widely taken into account into the new 5-year plan, 2019-2025, which based its financial balance on more realistic bases (République française 2018).

[44] Ibid

The Cour des Comptes also publishes one-offs reports on specific topics of interest. For example, in 2013, it published an analysis on the maintenance in operational condition (MCO) mentioning that out of the 33 new contracts awarded in aeronautics, 23, accounting for 85% of the total value of purchases, were awarded to 16 industrials as sole suppliers, without competitive bidding. Half of the credits of MCO of land equipment were allocated to 4 manufacturers, and three-quarters MCO naval contracts went to a single company (Cour des Comptes 2013). In 2014, it published an extensive review of the MCO cost and performances in terms of equipment availability (Cour des Comptes 2014). It mentions that, in 2012, MCO cost over 15% of the defence budget and that the state needs to control these costs more efficiently. It states that the strengthening of the BEDC (DGA's internal audit department) would help in this regard. In addition, it advises the state to revise its contracts and relations with industrials in order to pressure them more efficiently. Another report mentions that MCO contracts are still largely allocated to national suppliers (Cour des Comptes 2018, 55).

# 4. Findings on state capture

In the French domestic defence market, DGA has consistently managed to obtain rather cheap prices from industrials while preserving the country's technical capabilities and local jobs. It has used export promotion, pressures and competition threats to force industrials to lower their prices. This has allowed DGA to benefit from the best prices while preserving industrial capabilities. In this section we show how we came to the conclusion that (1) the purchase of military equipment and its maintenance service (MCO) should be negotiated jointly so that the cost of MCO is included in the initial quotes; and that (2) DGA should levy a tax on industrials hardwired to fund the armament studies at Polytechnique school. We contend that our first proposal would save DGA significant amount of money and benefit the army. We claim that our second proposal would enhance DGA's capacity to retain in-house industrial capabilities embodied in engineers by narrowing the pay gap between public and private sector's engineers. This would decrease the revolving door's temptation and scale. In addition, it would increase engineers' numbers hence improve industry's competitivity on the world's scene.

## 4.1 MCO

MCO is the one area in which DGA pays a rather high price. MCO includes all the operations of revision, repair, control to keep the materials in good operational state, that is to say able to fulfil missions in response to various politico-military solicitations (Droff 2017). The quality of MCO is usually measured by the availability rate of military equipment. For example, a good sign of degradation is that, since 2000, the availability of aircrafts has decreased overall by 10% while maintenance costs had soared by 40% over the same period (Lagneau, Pour la maintenance aéronautique, Mme Parly préfère «la rationalité Ford» à «l'imagination de Kafka» 2018). DGA has allocated MCO contracts to few industrials, recurrently and through contracts spanning over an excessive number of years (Cour des Comptes 2014).

Industrials could be taking advantage from this to bill higher prices in compensation of sales low profit margins.

In our dataset (Wachs 2019), we have collected all contracts from 2006 and 2016 Tender's Electronic Daily (TED), the EU's portal for public procurement, and identified a series of "red flags" that could indicate that contracts were potentially part of a corrupt network. Based on this, we gave each contract a CRI (corruption risk index) score and computed all contracts into a network analysis software that allowed us to visualise whether one institution or one company had a most of its contracts scoring higher than the average CRI score. In the case of France, we have found that SIAé and SIMMAD, the DGA technical department for aeronautical MCO (Serfati 2014, 30), awarded contracts that were recurrently marked with a higher than the dataset's average CRI score of 0.16 (see below, Figures 2 and 3). When we rise the CRI threshold to 0.5, a new potentially corrupt node appears, SIMMT, which is the state institution. In charge of the land army MCO (Figure 4).

As mentioned at the beginning of this report, CRI mainly measures the lack of competition which is a proxy, or clue, for potentially corrupted networks of actors, distributing non-efficient (in terms of price and quality) contracts among the members of the network. Interviews confirmed that MCO is a case of technological lock-in in which manufacturers have been catching up on their sales' low profit margins.[45] This is especially the case in aeronautic, as also shown in our network analysis, because of the sectors' security and specificity's characteristics.[46]

[45] Interview with a member of the Ecole de guerre économique and French army reserve soldier, 29th March 2019 and Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019

[46] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019

**FIGURE 2. FIRST POTENTIALLY CORRUPT SIAÉ NODE AT >0.16 CRI SCORE**

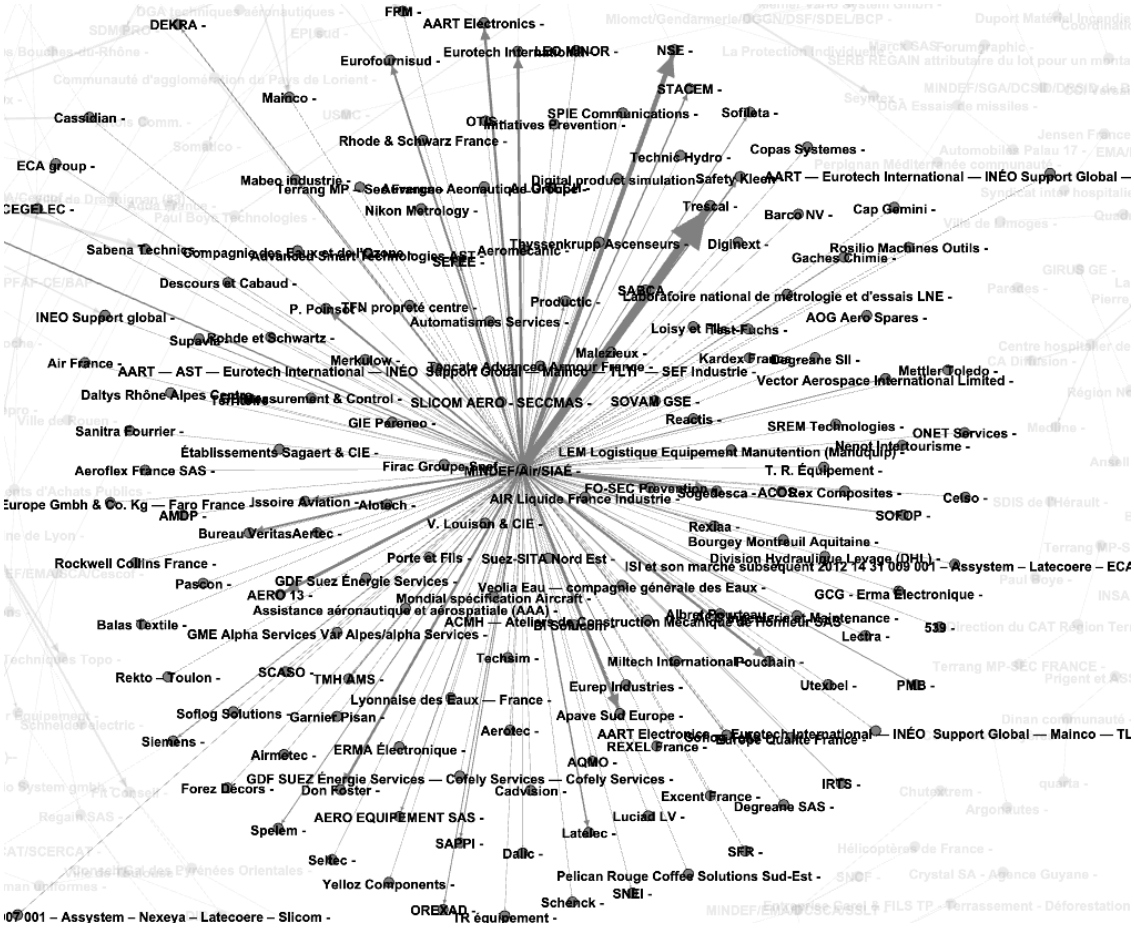
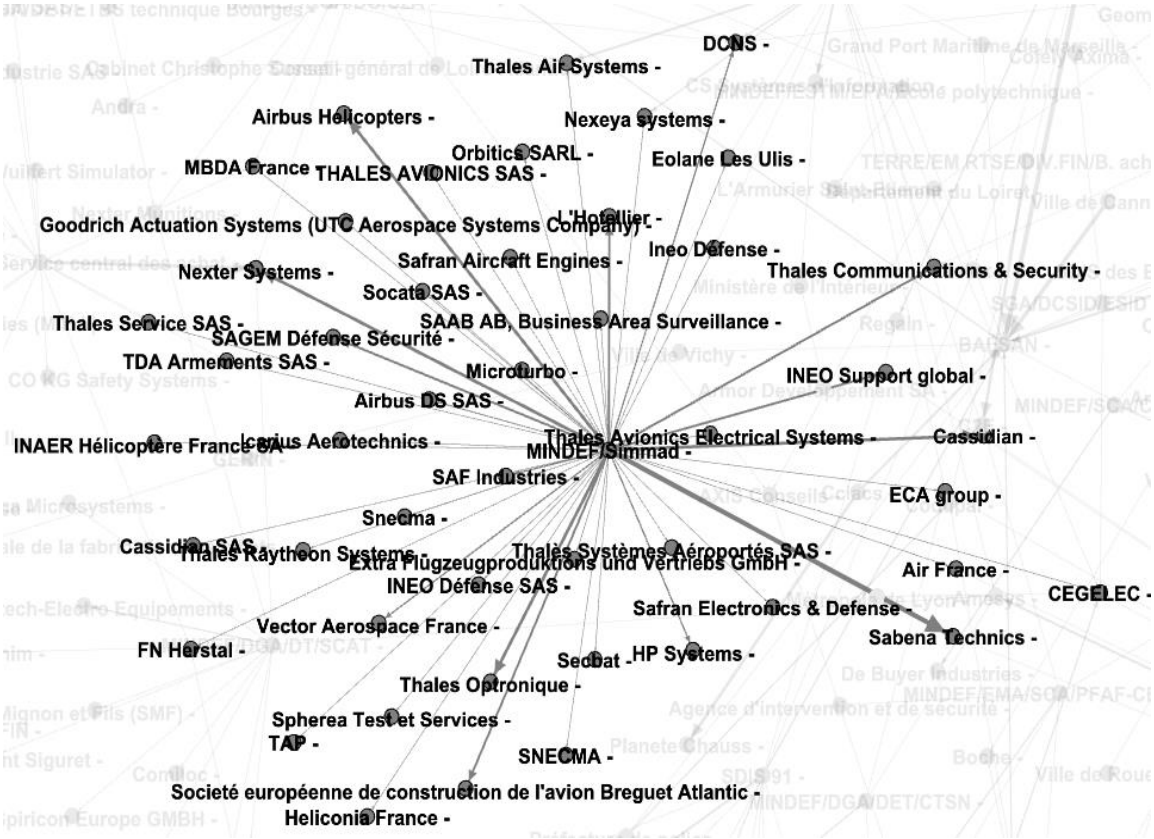


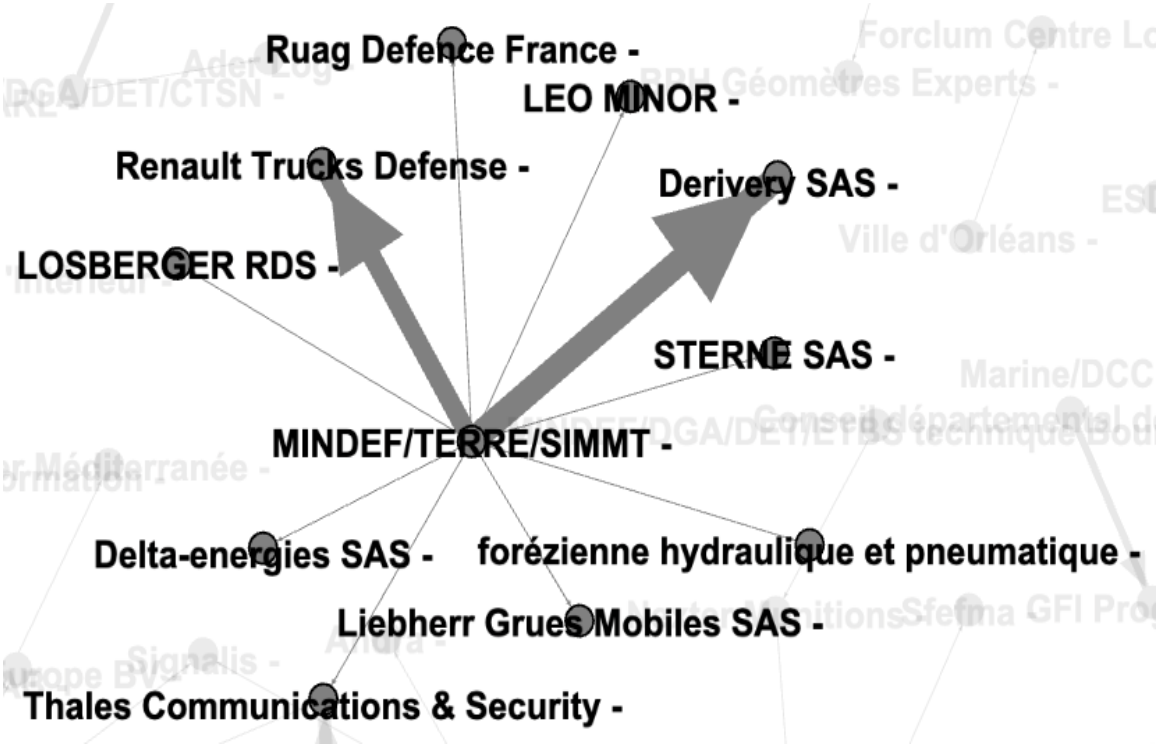
**FIGURE 3. SECOND POTENTIALLY CORRUPT SIMMAD NODE AT >0.16 CRI SCORE**




The decline of availability of aircrafts and rise of their maintenance costs, have stirred the reaction of the Minister of Armed Force who, in 2017, promised a reform of MCO (Lagneau, Pour la maintenance aéronautique, Mme Parly préfère «la rationalité Ford» à «l'imagination de Kafka» 2018). This MCO reform was announced in the LPM 2019-2025. The LPM indicates that SIAé should be reformed in order to "engage industrials more". This means that MCO has been led by multiple companies, as confirmed in Figure 2, which has prevented the state from pressuring on specific industrial for the poor overall performance. The Cour des Comptes also mentioned that 33 new contracts awarded in aeronautics, 23, accounting for 85% of the total value of purchases, were awarded to 16 industrials as sole suppliers, without competitive bidding (Cour des Comptes 2013). The state is now looking to centralise this MCO

in order to be able to find a responsible to pressure to obtain lower costs.[47] This industrial may be THALES. In 2017, the firm was awarded a contract of 10 years to deploy a logistics organisation including the supply, storage and routing of 200,000 item references in the 47 delivery points of SIMMAD and SIAé referenced in France. Thales will ensure optimized flow management by ensuring forecasting calculations, the supply of aeronautical spare parts such as tires, electronic components, cables, joints, etc., the setting up of an industrial stock, as well as treatment of obsolescence (Thalès Group 2017).

**FIGURE 4. POTENTIALLY CORRUPT SIMMAT NODE AT >0.5 CRI SCORE**




For SIMMAT, the story is not only one of technological lock-in but one of maintaining capabilities for exterior military deployment. Contracts are more concentrated than in aeronautics, and our findings in Figure 4 are consistent with the Cour des Compte report which states that half of the credits of MCO of land equipment were allocated to 4 manufacturers (Cour des Comptes 2013). The LPM mentions that

[47] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

land material MCO would be more efficient by calling more for private industrials' contribution. This points out to the fact that MCO is still performed – relatively inefficiently, according to the LPM and an interviewee – by military personnel themselves.[48] But, this is for a valid reason. Vehicles and all material used by the land army are heavily engaged in Sub Saharan Africa and the Middle East with the two operations BARKHANE (4,500 soldiers) and CHAMMAL (1,100 soldiers) (Ministère des Armées 2019). And, industrials cannot operate in these war zones to maintain and repair the material used on site which is why the land army itself needs to maintain the capacity to maintain its own equipment.[49] In order to maintain these capabilities, the public sector allocates part of all MCO contracts to the army itself.

## 4.2 Revolving Doors

Our second finding is that the presence of a revolving door between DGA and the lead systems integrators could pose a risk of state capture. Departure from the private sector to government service and vice versa begets the risk that individual interest or class interest would make a private use of public interests (Louçã and Ash 2018). To determine whether industries make a widespread use of public resources for satisfying private interests, this section focuses on the different revolving doors in the defence sector in France via the armament engineers, the retired higher rank officers and consultants.

### 4.2.1 Armament Engineers

DGA engineers are recruited from the military body of armament engineers (see Box 1, section 3), which organisation follows the military hierarchy (Légifrance 2008). By law, most of them are trained at École Polytechnique, but recruitment is possible from other high-level engineering schools, whether in France (ENSTA ParisTech, ISAE SUPAERO, TELECOM ParisTech, etc.) or abroad. Armament engineers generally start their careers at DGA in positions with high technical added value and, in the first part of their career, technical experience outside the DGA, in industry or other French or international organisations. This mobility across all actors of the defence industry is encouraged in order to broaden engineers' experience and skills. In some cases, their first position may be outside DGA (Polytechnique 2019). In the case of engineers, the revolving door is not a by-product of influence networks but a constitutive part of the profession. Armament engineering is a highly skilled niche profession which is half way through a military and a civil servant status. This explains that only some schools can provide with the appropriate training.

[48] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019
[49] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

The armament engineers esprit de corps is very pronounced (Kessler 2005). They carry a set of values based on their history, myths, a technical culture and a common language, as well as a representation of their role in the Defence Institution. Until the early 1990s, armament engineers were at the heart of innovation networks and weapon system design systems. Informal relations and the mobility of engineers between Defence Ministry and DGA and industry are dense and obey the tacit rules of the functioning of a military body. This wide-open revolving door was adapted to the then model of relations between Defence and industry during the Cold War. The acquisition of the scientific and technical expertise of the engineers of DGA was done through many round trips between public and private sectors (Lazaric, Mérindol and Rochhia 2009).

This functioning has become impossible to preserve after DGA 1997 reform, which has transferred part of the technical responsibility and of design to defence firms and made DGA focus on its role of unique buyer. Privatisation and industrial reorganisation, as well as the focus of DGA on its purchasing function will have reduced the possibilities of building technical competence through round trips between industry and Defence. The 1997 reform was therefore perceived as calling into question the position of the armament engineers in the governance of the programs (Lazaric, Mérindol and Rochhia 2009).

The 2003 reform made DGA focus more on interface management rather than on the co-design of the technological architecture of the programs. The DGA has retained its role in translating armies' operational needs into technical specifications. Although it has rehabilitated the importance of the role of DGA as the contracting authority, the reform has marked another retreat of Armament Engineers. This role is sophisticated because of armies' increasing variety of missions and the significant impacts that choices over priority and technical formulation have on the performance of weapon systems and on program costs. But, putting DGA in this new position of "interface developer", has also reflected a growing and direct involvement of the Armed Forces in the management of programs. In this evolution, the Armament Engineers have gradually moved from a work centred on design, to a work centred on the programming of upstream studies. Going from doing to make industries do, led engineers to lose skills due to lack of practice. In addition, organisational skills are transferred to industrial groups, which means that they are weakened within DGA (Guillou, et al. 2009). The latter is forced to focus its technological capacity no longer on mastering in-depth knowledge necessary for production but on mastering their scope in order to know where localised knowledge available in firms and research institutes (Lazaric, Mérindol and Rochhia 2009).

The impact of the reform explains why before 1997, Armament Engineers were most needed in DGA and that now, the industry needs them most. In both cases, the revolving door seems unavoidable as it is a niche profession that is badly needed in both the public and private sector. The main point that can be argued is that, given that following the 1997 and 2003 reforms, industries have been needing Armament Engineers most, there is no reason why DGA should be the only funder of Polytechnique studies. Industries could contribute to training of this profession as well. Otherwise, the public sector is only subsidising an industry making private profits by training its best staff.

### 4.2.2 Retired Higher Rank Officers and Consultants

Before DGA 1997 reform, engineers would come and go between the industry and DGA. After the 2003 reform, DGA has been focusing on its role as the translators of armies' needs into technical specifications and as an "interface developer". This has opened another revolving door, between armies and DGA, but also between armies and Lead Systems Integrators. Hiring former military personnel is useful not so much for building an influence network but rather to gain in-depth knowledge of armies' specific needs.[50] A lead systems integrator that would not hire former military personnel would deprive itself of valuable advice about how to design equipment that answer as much as possible to operational needs specified in DGA's calls for tenders.[51] This is also why firms encourage their employees to enrol in the military reserve.[52] This is represented below in Table 5, by the row "technical level".

When DGA, armies and lead systems integrators have a conversation about technical specifications, each actor's interlocutor is of similar rank and qualification. In DGA we would find the "IPA" or "ICA", ranks from the Armament Engineers body that correspond respectively to "Commandant" or "capitaine de corvette" and to "lieutenant-colonel and colonel" or "capitaine de frégate and capitaine de vaisseau", in the army/air force and in the navy (Légifrance 2008, Art. 2). A corresponding position in the industry is indicated by "…" in the table, representing the revolving door through which former DGA or military personnel could join the private sector.

[50] Interview with the CEO of a large consulting firm and academic, 29th March 2019
[51] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019
[52] Interview with the CEO of a large consulting firm and academic, 29th March 2019

**TABLE 4. REVOLVING DOORS: A COMMUNICATION CHANNEL**[53]

| | **Buyer:**<br>**DGA** | **User:**<br>**Armies** | **Maker:**<br>**Lead Systems Integrators** |
|---|---|---|---|
| **Political level** | **IGA (+/- 2 years)** | **General (+/- 2 years)** | **…** |
| Technical level | IPA (Ingénieur principal) – ICA (Ingénieur en chef) | Capitaine de Corvette – Capitaine de frégate / vaisseau (navy) Commandant – Lieutenant-colonel / Colonel (army and air force) | … |

Another reason why industries might hire former military personnel is to facilitate commercial transactions and have a conversation over budgets allocations and the LPM with the executive power (see Table 4, political level). This conversation happens at the level of generals and a corresponding position within lead systems integrators has to be filled as well. At this level, personal relations matter most which is why it is important that the IGA (Ingénieur Général), the army general and the corresponding people within industries belong to the same cohort, plus or minus two years. These are cohorts from the military schools and from Polytechnique. In fact, most former or retired military personnel switching to the industry are allocated to the commercial department or the institutional relations department.[54] Finally, another function of retired or ex-military personnel is to establish a more fluid connection between the subcontractors and the lead systems integrators. SME gain a decisive

[53] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019
[54] Interview with a retired NAVAL engineer, armament attaché, DGA and Small specialised firm employee, 4th April 2019 and Interview with the CEO of a large consulting firm and academic, 29th March 2019 and Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019

edge by hiring a former military or engineer that could allow it to have a more regular conversation with the lead systems integrators.[55]

Because of this well-functioning practices, former military personnel rarely establish their own consultancy companies. They would rather be directly integrated into the institutional relations or commercial departments of companies.[56] The consulting that DGA may require often regards management for which it would ask for the services of KPMG or ACCENTURE.[57] There are cases in point in which a former engineer or military person would establish his or her own consulting firm. This happens only in niche subjects because it would be too expensive for DGA to have permanent employees specialised on this niche topic hence it is worth contracting these consultants punctually.[58] Other former military personnel set up their own private security companies, but these are cases in point as well. These companies operate mainly in Africa are assimilable to training and/or mercenary and/or analyst services and serve the UN and local governments.[59]

[55] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[56] Interview with a current collaborator of MP member of the armament commission and consultant in Public affairs, 12th April 2019
[57] Interview with a current senior MBDA employee (public contracts), former DGA employee, and former small specialised firm employee, 3rd April 2019
[58] Ibid
[59] Interview with a Former-Army sub officer, now operating in security companies and punctual UN consultant, 16th of April 2019.

# 5. Conclusion

We have wondered whether defence industries are capturing the state in France and, if so, to what extent, how, and what can be done to reduce corruption risks?

We have found that, in the case of France, such a domestic state capture is unlikely, due to the great number of actors involved such decision, the strength of the legal framework (DGA 2014) and to the strength of oversight institutions: the parliament, the senate, the Cour des Comptes, and the BEDC which is the financial audit department within DGA – the institution in charge of defence purchases. This is confirmed by the fact that France has managed to obtain low purchase prices from industrials, in exchange for the state active support to exportations.

Yet, areas of improvement remain to reduce the risk for state capture in the future. The French defence industry is likely to see its world market share shrink due to the competition of China in South East Asian markets, and European partners' opposition to sales to Golf Monarchies engaged in unjustifiable and bloody wars, committing war crimes and crimes against humanity. The consequence of a smaller world market share could be a temptation to rely on the domestic market and public budget, hence increasing the temptation for state capture. We make two suggestions to reduce the risk of state capture and prevent this temptation to turn into real corruption:

1. **The purchase of military equipment and its maintenance service (MCO) should be negotiated jointly so that the cost of MCO is included in the initial quotes.**
2. **DGA should levy a tax on industrials hardwired to fund the armament studies at Polytechnique school.**

First, the main area for improvement is the equipment maintenance, said "MCO". MCO refers to maintenance, repair, overhaul and control of military equipment. These markets have the characteristic of being frequently negotiated without competition and for long periods, which leads to a "lock in" situation in which changing supplier is cumbersome if at all possible. Introducing more competition makes little sense given that most companies are in oligopoly or monopoly situation. This creates a temptation to state capture. This temptation comes from industrials' eroded profit margins on equipment sales, due to effective pressure of the state during the negotiations. These industrials may be tempted to catch up on these profit margins by winning MCO contracts for the equipment sold and negotiating very long contracts in order to overcharge the state over several years. An industrial could offer cheap material in appearance, win the state contract, then proceed to win the associated MCO in order to charge an excessive price spread over several years. This leads to our first recommendation: **the purchase of equipment and its MCO should be negotiated jointly so that the cost of MCO is included in the initial quotes.**

The second area for improvement is the number and diversity of armament engineers. Armament engineers are necessary to industrials, to build equipment, and to the state, to translate army's needs into an industrial design and assess industrials' work. This naturally creates a revolving door. Movement

between the sectors is not something to be discouraged; rather it should be controlled both to manage immediate job transitions and to ensure that biases in public decision-making do not arise (Ninua 2010).

In the case of the defence sector, armament engineers need to gain experience both in the private and the public sector. In France, armament engineers are trained in a state school, Polytechnique, in which the "armament studies" are funded by DGA (the state) entirely. This limits the number of engineers that can be trained each year. Engineers are in scarcity and those starting a career in DGA have significantly lower wages than those going into private sector. This raises two issues. The first is that public funds subside the training of the engineers who are creating the added value hence the profit, of private sector companies. Second, the industry can make offers to DGA engineers to join them, for better wages. Salaries are inflated to persuade the civil servant engineers to quit and bring their knowledge and contacts to the industry. If there were more engineers trained, industries could recruit them straight out from school in greater numbers. Their salaries would be deflated. In addition, if DGA could use the budget it is now spending on Polytechnique into a wage hike which would narrow the gap between the private-public sector salaries, hence decrease the revolving door temptation. This leads to our second suggestion: **DGA should levy a tax on industrials hardwired to fund the armament studies at Polytechnique school.**

We contend that our first proposal would save DGA significant amount of money and benefit the army. We claim that our second proposal would enhance DGA's capacity to retain in-house industrial capabilities embodied in engineers by narrowing the pay gap between public and private sector's engineers. This would decrease the revolving door's temptation and scale. In addition, it would increase engineers' numbers hence improve industry's competitivity on the world's scene.

# 6. Interviewees list

| Date of interview | Interviewees' institutions and sectors |
|---|---|
| 28th March 2019 | Ecole de guerre économique |
| | Army Reserve Soldier |
| 29th March 2019 | Consulting (CEO, large firm) |
| | Academia |
| 3rd April 2019 | Airbus (finance) |
| | MBDA (public affairs) |
| 3rd April 2019 | MBDA (public contracts) |
| | DGA |
| | Small specialised firm |
| 4th April 2019 | NAVAL (engineer) |
| | Diplomat (armament attaché) |
| | DGA |
| | Small specialised firm |
| 8th April 2019 | Assemblée nationale (President of the armament commission) |
| 11th April 2019 | Assemblée nationale (collaborator of a MP member of the armament commission) |
| 12th April 2019 | Assemblée nationale (collaborator of MP member of the armament commission) |
| | Consultant in Public affairs |
| 16th April | Former-Army |
| | Security companies |
| | UN |
| | Anonymous |

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