The Falcon and the Mirage: Managing for Combat Effectiveness

By B. A. "Tony" Kausal

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TABLE OF CONTENTS

ACKNOWLEDGMENTS

This project had its genesis in the summer of 1998 when I met Ingénieur en Chef de l'Armement (ICA) Patrick Defour while attending the National and International Security Management course at Harvard's Kennedy School of Government. The next spring Patrick was kind enough to brief me on the management approach of his program — the Mirage 2000. Having "grown up" within the U.S. acquisition system and our management practices, I found his perspectives intriguing. I remember, in particular, his preference for matrix support. It was unheard of that a Program Manager in the United States would want matrix support! In my ideal world, I would have been the Program Manager with control over all my resources. There were several other examples.

In April 2000, I proposed to Major General Claude Bolton, then Program Executive Officer for Fighters and Bombers, that I produce a study of French management practices. And what better to compare than the management of one of his programs — the F-16 — with the Mirage 2000. Both aircraft are of the same vintage and were now settling down to mid-life "crises" with the need to address wear and tear issues and to incorporate new equipment to respond to new military threats. With assistance and funding from Mr. Blaise Durante, Associate Deputy Assistant Secretary for Acquisition and Management, and Mrs. Darleen Druyun, Principal Assistant Secretary of the Air Force (Acquisition and Management), this effort was borne. This study was conducted under the auspices of a professional exchange between two schools — the Defense Acquisition University (DAU) and the Centre des Hautes Etudes de l'Armement (CHEAr). This first exchange of acquisition professionals is part of DAU's efforts to share ideas and foster an environment of cooperation.

I owe a debt of gratitude to DAU President Frank Anderson; Ingéniur Général de l'Armement (IGA) L. Alain Roche, Director of Human Resources (Direction des ressources humaines (DRH)); and IGA Claude Liévens, Commandant of CHEAr for sponsoring the exchange between our two nations and two schools. And a special thanks goes to my sponsor and caretaker, Dr. Gertrud Humily, Executive Director International Education, for helping with my move, setting me up in an office, and helping me make contacts. I also owe a special thanks to two new friends and colleagues — Mr. Gilles Le Brishoual, Project Manager, and Madame Francoise Novi, Public Relations — for helping with so many other things, such as finding an apartment, and getting ID cards. There are many others who helped me at CHEAr for my lectures and my office space and I want to thank them — Arlette Lion, Lise Guénot, Stefanie Palmer, and my friends at the Cercles du Management who made my daily office life so easy — Elisabeth Cadiou, Christine Gamez, and Thibauld Castillon du Perron.

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Finally, a special thanks goes to my wife, Mellie, who during the hot and humid month of August provided the initial reading of my first drafts of each chapter and provided constructive criticism.

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B. A. "Tony" Kausal, IV
October 2001

INTRODUCTION

"If a sufficient number of management layers are superimposed on top of each other, it can be assured that disaster is not left to chance."

— Augustine's Law Number XVI

Over the last several decades a significant body of writings has appeared on "management." Whether it is "*Searching for Excellence*," "*Swimming with Sharks*," or the latest tome from Peter Drucker, the reading public has shown a thirst for new management concepts, ideas, or trends that will make them better managers. Occasionally, a government organization makes the list as a well run or "excellent" organization. The Tactical Air Command's innovative use of quality principles under General Wilbur L. Creech was one such organization. Within the Department of Defense (DoD) and the three military departments — the Army, Navy and Air Force — billions of dollars are spent to develop, produce, field, and operate military weapon systems. The hub of that activity, at least in the Air Force, is the System Program Office (SPO). Little has been written on the management activities of a program office.

Management guru Peter Drucker said, "Size determines complexity." If he was correct, one of the most difficult management tasks may be the management of an acquisition program.[1] For an acquisition system is large, with many players, and many agendas. To start with an American historical perspective, the framers of the Constitution created a balance of power between the executive and legislative branches of government, both of which have a say in what DoD buys and the way it buys. Within DoD competing interests exist between the Services, and internally the Air Force struggles with competing interests. Laws, rules, and regulations govern the process, but technical difficulties arise in any program regardless of its lifespan. Problems occur whether developing new systems or just keeping old systems up-to-date. And finally finding one's way through the maze of laws, organizations, and politics of the Pentagon and its acquisition system is a real challenge. This provides, as we tell our new program managers, "an opportunity to excel."

Purpose

This case study looks at the "hub" of activity in the acquisition business — the System Program Office or SPO. This will be a transnational comparison. The approach is to examine, compare, and contrast the management methods, processes, and procedures of the French Délégation Générale pour l'Armement's (DGA) Mirage Aircraft Program and the United States Air Force's F-16 Fighter Aircraft Program for insight into more efficient management practices. These are not idle questions reserved for academia, but rather real issues to be faced by acquisition public decision makers. What is the most effective and cost efficient structure for managing a program office? What tasks and responsibilities does a program office perform? Can, and should, some of these be accomplished by industry? The bottom line question is how to deliver a complex weapon system such as the Mirage or F-16 at a cost the government and the public can afford and that is militarily effective.

The Value of a Comparison

MIT professor, Richard Samuels, in his book "Strong Nation, Strong Army" examined the Japanese defense industry and its role in the country's economy. His opening chapter describes Japanese government practices in directing and pressuring its defense industry to produce for the Japanese Self Defense Forces. While the book was written about Japan, his comparisons with DoD's practices provide thoughtful insight into the U.S. system. Often these comparisons afford a reader an "eye opener." Too often an employee is introduced to his new organization where the "right way" to do things is explained and demonstrated. Over time the organization's culture and norms provide the extent of their Weltanschauung. A comparison draws many questions. Why do we do that? Why do we do it that way? How can they do it? Your own system now has a different light shinning on it. One can draw one's own conclusions as to the relative merits and weaknesses of different forms of political, military, and bureaucratic organizations. But at least the world is now seen in a newer and hopefully larger light.

The System Program Office

The System Program Office (SPO), as we know it now, is an outgrowth of the race between the United Sates and the old Soviet Union. First, "the increasingly complex and multifaceted nature of developing aircraft and missiles engendered the concept of a "weapons system" encompassing a vehicle with its related airborne and ground equipment, services, facilities, and trained personnel required for it to operate as an instrument of combat."[2] Then, with the introduction of the "weapon system" concept came the "weapon system project office (WSPO)." "After the Soviet test of a hydrogen bomb in 1953, ballistic missile development began to become a national priority on the scale of the Manhattan Project of World War II."[3] Brigadier General Bernard A. Schriever, the Atlas Missile Program Manager at the Western Development Division (now the Space and Missile Systems Center near Los Angeles, California), pioneered the WSPO concept. Later, in recognition of the importance of other systems such as Command, Control, and Communication (3C) and surveillance the term "weapon was dropped and it became the System Program Office (SPO)."[4]

Since the concept of a "weapon system" required all the elements necessary to go to combat, the SPO (that managed a weapon system) also needed to have all the elements — personnel — necessary to deliver a new weapon system. Thus the SPO was designed to focus on a specific project. Whatever weapon system it was — a B-52, an Atlas missile, or an F-16 — the program office would have all the personnel necessary to manage a program, from development to production.

The Task

Whether it is an aircraft, naval vessel, or a main battle tank, the management task required to deliver "effective firepower" to the warfighter is noteworthy. Program Mangers must deal with real issues and problems. A recent study[5] by the Defense Systems Management College indicated the difficulty of managing a defense program when it evaluated over 30 Major Defense Acquisition Programs. Most of these programs encountered schedule slips and cost growth. The average schedule slip was 45 percent, while the average cost growth was 65 percent. Figure I-1 from their study indicates schedule and cost overruns during Engineering and Management Development (EMD). French programs — the Leclerc tank, the Tiger attack helicopter, the Rafale multi-role aircraft, and the nuclear-powered carrier De Gaulle — have also experienced cost and schedule overruns.[6] While no similar data exists for the production phase of U.S. systems, cost overruns are not unknown during the

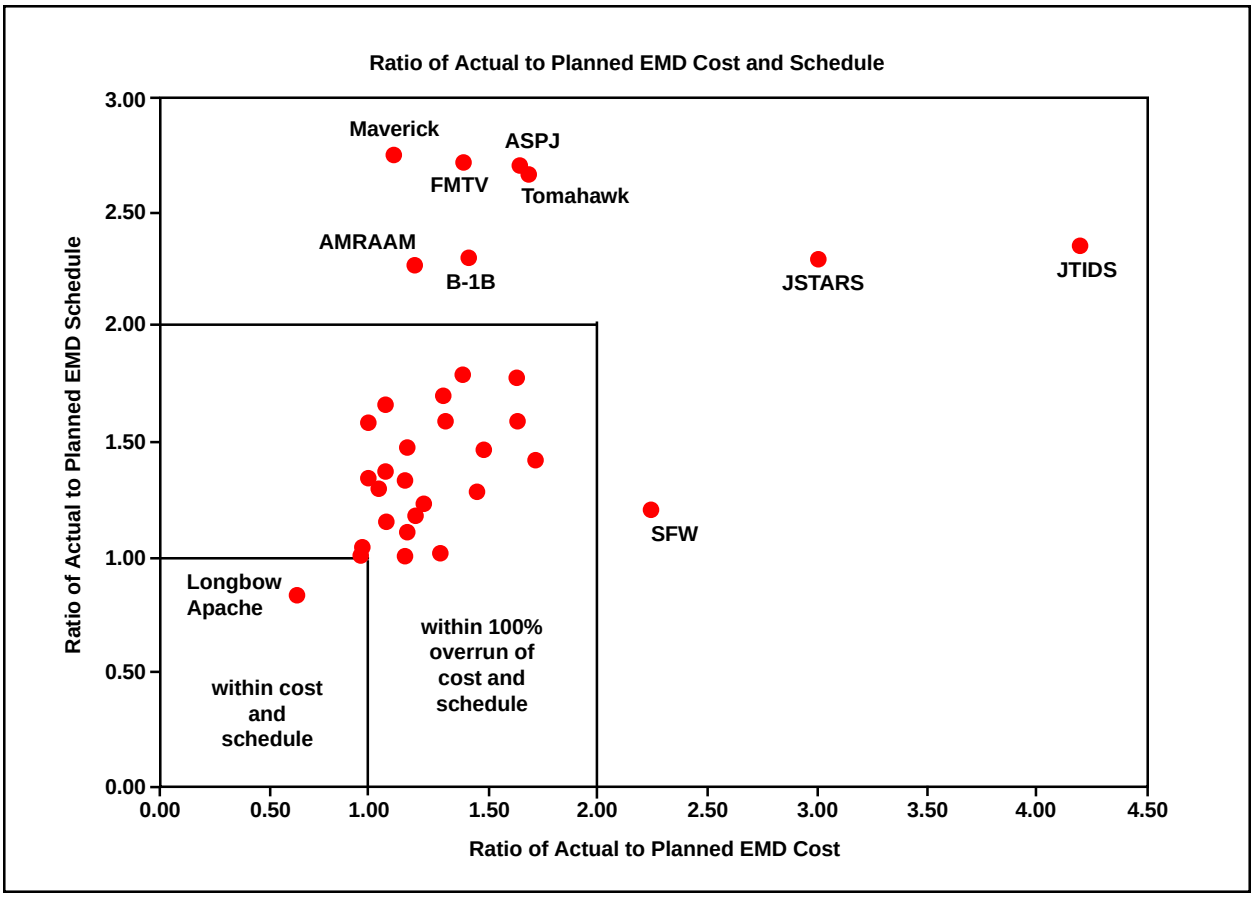

Figure I-1. Cost and Schedule Overruns during Engineering and Management Development (EMD) of 30 Major Defense Acquisition Programs

initial production phases of most systems. The F-16 and Mirage 2000 are now in their mid-life and past the large overruns that grab the attention of legislative bodies and the press. They are no longer in the acquisition development spotlight, which now shines so glaringly on their replacements — the F-22 and the Joint Strike Fighter for the U.S. and the Rafale fighter for France. Yet, the task is perhaps as challenging for several reasons. There is the need to modernize these front line fighters with the integration of new systems; yet as an "old aircraft," the challenge of maintaining them in "fighting condition" continues, even with diminishing sources of supply for parts and fatiguing metal.

This study provides a framework for analyzing the management practices of two acquisition programs from two countries. It describes and compares the managerial approach of two organizations — the F-16 System Program Office and the Mirage 2000 Program Office. Many U.S. studies over the years have looked at the processes, organizations, policies, and practices of managing acquisition programs. Informal studies within the military department have looked at the structures and tasks of program management with inconclusive results. Most of these studies, never published, were designed to evaluate the most effective method to organize a program office. What are the types of people? What is the proper size? What tasks are more efficiently performed in industry and others? From a historically perspective, the United States has always had larger program offices than other countries. Figure I-2, from a 1972 Rand study,

	Berrier (Kestrel)	Jaguar B.A.C.)	Viggen	Lightning (P-1B)	Mirage IIIA	Mirage IV	F-111A
Performance (Mach)	.9 (VTO)	1.6	1.8	2.2	2.2	2.2	2.3
Manning:							
Engineering Staff	106-330	320	650	400	50	70	4000 to 6000
Experimental Shop	350+	300	350	300	300	400	
Program Office (Government)	24	35	20	20	10	12	220
Months from Design Start to:							
First Flight	22	54	43	34	16	17	25
First Production Item Delivered	48	64	96*	45	38	54	58
Number of Test Vehicles	13	6	6	5	3	4	23
Development Cost Factor	1.0	1.1	1.3	1.4	1.0	1.1	1.8

* Includes 24-month schedule stretchout to reconcile a changed threat estimate with altered barrier constraints

Figure I-2. Aircraft Development Experience (West European and United States)

indicates the difference in approach staffing a program office between U.S. and European defense organizations. Probably this is the bottom line — "Is bigger better?"

Thoughts on Management

Management is rewarding when success is achieved, but there are also frustrations, complications, contradictions, and politics. For a Program Manager pressures come from many sources. Legislative leaders want to know why this or that was done, operational commanders want to know when it will arrive, or when it arrives why it does not work like promised. The press is looking for a good story and reports of program failures make "good press." Success rarely makes news!

What do I mean by management approach — the who, how, and why — or said differently, the organization's structure, functions, processes, and procedures. What types of risk takers are they? What are the tasks, responsibilities, practices each country uses to develop field and update major weapon systems? What types of personnel work in a program office? The traditional approach to defining management tasks is to divide them into four categories — Planning, Organizing, Controlling, and Activating. While this study looks at all of these activities to provide an adequate comparison, the primary focus will be on the organizing and planning functions.

In the United States, the SPO organization has the cost, schedule, and performance responsibility

for the development, production, and maintenance of weapon systems. The resources a program office uses are time, people, space, money, and materials. The actual work of research, development, production, and maintenance are performed both in-house by government laboratories and depots, and by companies that specialize in developing and building defense equipment.

Audience

This study was written for several audiences. The primary audience is the leadership of the acquisition community in both the U.S. Air Force and the French Délégation Générale pour l'Armement's (DGA) and their two schools, the Defense Acquisition University and the Centre pour Haute Etudes de l'Armements. This study will provide defense acquisition students in France and the United States and in other countries with a comparative approach to meeting the complex tasks of developing, manufacturing, and supporting first-line weapon systems. Finally, for students of comparative politics, governments, and public administration, this report provides a structured approach to understanding defense armament organizations and their operations.

Book Structure

This report looks at the major political and military acquisition characteristics of the two countries, and provides an overview of their organizations and processes. A useful starting point for understanding an organization is to look at its organizational structure. An organizational structure indicates where activities take place, how the management system operates, and indicates where authority and responsibility rest. The managerial system, which includes formalized policies and procedures, guides the activities of the acquisition organizations. It also provides an understanding of how the system operates.

The book is structured into six chapters. As "no man is an island," so no program office operates in a vacuum. The national and international political environment, history, cultures, bureaucratic traditions, and military needs all play a role the operation and management of a weapon system program office. Chapters One and Two provide a brief introduction of the political and bureaucratic systems in which the program office operates. They look at the political milieu, the culture (national and bureaucratic), education, the bureaucratic system, and the business environment. Chapter Three provides a look at the differences between the two countries, specifically the ways in which the legal and political systems relate to the relationship between the government and industry. In the case of France the close relationship between the state and defense industry, "has played a crucial and all pervasive role…in determining the major directions in which business activities have moved."[7]

Chapters Four and Five provide an analytic and descriptive look at the structural, managerial and personnel approaches of each program office. They try to answer the following questions. What are the military and civilian roles? What type of education and training do they provide their acquisition personnel? How does each country manage a major program? What are the influences of higher headquarter organizations on the program office? What role does the budgeting and planning systems play in day-to-day operations? How does the contracting process impact operations? What is the role of competition? How do they approach source selection? What types of contracts do they use? What type of oversight do they perform on their contractors? A specific area of interest will be the tasks performed by program office personnel. Examples include configuration management, contracting, test and evaluation, acquisition logistics, foreign sales, and the repair and maintenance of aircraft. Finally, Chapter Six provides

a comparative look at the acquisition systems, program offices and the management methods employed in overseeing a major defense system.

Culture

Our culture is us! "From the day we are born (using a computer as an example), we have "mental programs" that affect the way we think, the way we do things."[8] This also affects the way we work, how we respond to our bosses, how we expect decisions to be made, and the types of organizations in which we feel most comfortable — put more simply — what we see as right or wrong. What does this mean to the study? As an author I approach this study with my own set of "culturally bound" values. And as a reader your "culturally bound" values will affect the interpretations you make of each country's approach to acquisition management. "This does not mean that countries cannot learn from each other. On the contrary, looking across the border is one of the most effective ways of getting new ideas in the area of management, organization, or politics. However, applying these in one's own setting calls for prudence and judgment."[9] For the purposes of this study I have elected to use Geert Hofstede's[10] work on culture to help provide a perspective for viewing the French and U.S. approaches to management of an acquisition program.

He identifies four key cultural dimensions that categorize our cultural relationships. They are Power Distance, Uncertainty Avoidance, Individualism, and Masculinity. **Power Distance** refers to the "degree of inequality" between a "boss" and his "employee." Looking at the extremes you would expect a very hierarchical organization with the boss making all the decisions in a "large power distance" country. In a "small power distance country" participative management would be the order of the day, with employees consulted and group decisions made. As seen in Figure I-3 France has a much greater "power distance" number than the United States. This means France would be expected to have a greater degree of hierarchy and hierarchical style of management where "bosses" make the decision. In the United States, you would expect to find more consultative style of management. The next category, **Uncertainty Avoidance**, can be translated into the question, "How much risk does one want in one's life?" As shown in Figure I-3 an individual from the United States is willing to tolerate more risk in his or her work than someone from a French organization. By creating rules and providing stability in the job, we can control risk. What is also interesting is that, while there is a desire for the creation of rules, the implementation of the rule may be less strict in a high-uncertainty avoidance country, as in France. At the extreme, employees want decisions to be made by the "boss" rather than by taking a "risk" and making the decisions themselves. In a lower uncertainty-avoidance country, such as the United States, you would find employees more willing to live with an

	Power Distance	Uncertainty Avoidance	Individualism	Masculinity
US	40*	4	91	62
FR	68	86	71	43
* scale is 1 -100				

Figure I-3. Culture Comparisons

organizational structure in which subordinates have two direct bosses (in a "high uncertainty-avoidance" country this is to be avoided).

Individualism refers to the way a person is allowed to deviate from the norm. Is the work effort of Francoise perceived as creativity or as destructive to the activities of the organization? Both the United States and France score relatively "above average" on the scale, with the United States having a higher degree of individualism (near the top). France is a contradiction in this sense since in a large power distance county one typically would not expect to find significant individualism. The 'yin or yang" or "**Masculinity**" or "femininity" of society refers to the "the predominant socialization pattern for men to be more assertive and for women to be more nurturing."[11] What does this mean to the organization? A survey used by Hofstede shows "near consistency on men's scoring advancement and earnings as more important, women interpersonal aspects, rendering service and the physical environment as more important."[12] Countries have "masculinity" characteristics. Both France and the United States are in the middle of the scale, although the United States has a greater degree of masculinity in its culture. This mean that United States would favor more "bottom line" thinking than a French organization.

"There is a well-known joke in Britain that everything is permitted except that which is forbidden; in Germany everything is forbidden except that which is permitted; and in France everything is permitted, even that which is forbidden."[13] Culture colors our thoughts and actions. These few paragraphs have attempted to provide a setting for viewing the following chapters and remind the readers of both the author's and the reader's cultural outlooks.

Summary

In France and the United States, defense is big business and each country continues to allocate significant amounts of their national resources for the security of the nation. With competing demands for newer and better weapon systems versus domestic needs, acquisition organizations from both countries will keep the spotlight on cutting the costs of new and existing weapons.

Montesquieu said "that at the birth of political societies, it is the leaders of the republic who shape the institutions but that afterward it is the institutions, which shape the leaders of the republic."[14] Organizations mold behavior, but the organizations were created for a variety of reasons to include ideology, cultural constraints, and history. What is the effect of political and bureaucratic institutions on the acquisition system? What special problems arise from public accountability and political control? Within this environment, the business of meeting the future armament needs of the military continues. How do they do it?

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3. Benson, pg. 26.

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7. Gordon, 1996:1 in Barsoux, Jean-Louis and Peter Lawrence, *French Management: Elitism in Action*, Cassell Publishing, Wellington House, 125 Strand, London, 1997, pg. 9.

8. Hofsteder, Geert, *Cultures and Organizations, Software of the Mind: Intercultural Cooperation and its Importance for Survival*, McGraw-Hill Book Company, London, 1991, pg. 370.

9. Hofsteder, pg. 374.

10. Hofsteder, pg. ?.

11. Hofsteder, pg. 261.

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14. Jean-Jacques Rousseau, *The Social Contract*, translated by Maurice Cranston (Harmondsworth: Penguin Books, 1968), pg. 87.

Chapter 1

THE FRENCH NATIONAL MILIEU

The Political-Military Environment

The French Revolution sowed the seeds for the style of French governments that sprouted in the 19th and early part of the 20th Century. The belief in a Republican form of government provided the philosophical tenet for a strong legislature with a weak executive. Many, and in particular General Charles De Gaulle, felt that it also resulted in a more chaotic government and finally, to France's defeat in World War II. After the War, this instability continued during the 13 years of the Fourth Republic, from 1945 until 1958, with France having 26 different governments during that time. Then, threats of insurrection, and even a threat of a coup d'etat with French Algerian troops landing in Paris, contributed to the fall of the Fourth Republic in 1958. General De Gaulle was called out of retirement to take the reins of government. Under his direction a new constitution was drafted and submitted to a popular referendum. On 28 September 1958, the French people accepted the Constitution of the Fifth Republic. In line with De Gaulle's character and beliefs, this new constitution gave the foremost role to the President of the Republic, a role in which he was invested by the college of deputies, senators, locally elected officials and later by the French public.

"Old France, weighed down by history, bruised by wars and revolutions, going back and forth without respite from greatness to decline, but recovering, from century to century, through the genius of renewal." This proclamation by De Gaulle captures his vision of France. It was time for renewal and for France to again be a world player. This vision also provided the pattern of

French politics and foreign policy for the last half of the century. France was to reassert her role on the world stage. In support of this policy, the country needed the ability to act on its own and that meant strengthening the military (including a nuclear capability).[1] It also meant developing a defense industry and marking its independence from the NATO integrated military command structure, although it still remained a member of Atlantic Alliance.

Under the Balladur government much of the framework structured by De Gaulle for national autonomy was "swept away in the space of a few pages"[2] by the 1994 Defense White Paper. Now, coalition warfare and the ability to "*command* in situations — where "political, military and regional dimensions mingle"[3] — was part of the military and national doctrine. The French government's military perspective now must be seen in light of its political commitment to the European Union. It helped create the European single market and has supported the European

Union's (EU) fiscal policies including creation of the new currency — the Euro. It has been a supporter of the EU's political and diplomatic cooperation efforts. It has been a major driver for a European common defense policy and a European army.

This chapter provides the governmental framework and the political and bureaucratic environment that influences the decisions made in managing a major defense program, the Mirage 2000. The parliament, the executive branch, the Ministry of Defense, the military services, the national aspirations, the culture, as well as the idiosyncrasies of the personnel involved — all play a role in decision making. With this conceptual backdrop, and after a look at French industry in Chapter Two, Chapter Four will provide a detailed look at the management practices of the Mirage 2000 program office.

Executive Branch

The Fifth Republic has provided for institutional stability unequalled in the two preceding centuries. The philosophy emphasized by De Gaulle, Gaullism, underscored the need for a strong leader, who was to be the President.[4] The President, currently Jacques Chirac, is commander-in-chief of the armed forces and presides over the Higher National Defense councils and other committees (Council of Ministers, Council of Defense, Restricted Defense Committee).[5] The President has traditionally played a (or *the*) key role in Defense and Foreign policy, although he shares this latter responsibility with the Prime Minister.

The "Government" consists of the Prime Minister (PM) and the ministers of the departments. It determines and directs the nation's policies and oversees the civil service and armed forces. The government answers to Parliament. The Prime Minister is appointed by the President and is the "Head of the Government" and *administers* the government including national defense. Within the limits[6] imposed by the Constitution, the Prime Minister has regulatory powers that allow him much more leeway than the United States Constitution would allow the U.S. President. This is a fundamental point. While Parliament passes laws, which are general in nature, the executive branch issues regulations (decrees and ministerial orders) that have the effect of law.

Apart from its regulatory power the government also shares the power with Parliament to introduce legislation. Even here it enjoys an unquestionable advantage over the legislature, because it can set the National Assembly's agenda. Another constitutional provision again provides the executive with the ability to pledge the government's responsibility before the assembly — either on its program or on a statement of general policy. The bill is then considered adopted unless there is a motion of censure, filed in the National Assembly, and it wins a majority of the deputies' votes. If this happens, the Prime Minister must tender the resignation of the government to the President. This procedure, unique in Western Europe, reflects the determination of the framers of the 1958 Constitution to give the government stability and enable it to govern without "obstruction" from Parliament.

In the Defense domain, the PM administers national defense through the Secretariat General for National Defense (SGDN), currently Mr Jean Claude Mallet, and the Minister of Defense, currently Mr. Alain Richard. The SGDN provides, at the cabinet level, strategic planning or coordination with other ministries. The Defense Minister is responsible for the preparation and execution of the defense portfolio. He is assisted by senior defense civil servants, referred to as the "cabinet ministériel," chosen by the minister usually from the ranks of senior civil servants.

The Legislative Branch

The French Parliament consists of two houses — an upper, the Senate (321 members who serve 9 years) and a lower, the more powerful National Assembly (577 Deputies who serve 5 years). As noted earlier, the traditional French parliamentary powers were severely curtail by the 1958 Constitution. However, it still performs as a legislative body and has the responsibility for passing laws to include the finance laws (budgets[7]) and for setting the state goal for economic and social actions. The government, which is the majority party or coalition within the National Assembly, has the right to introduce bills (called project de loi); as indicated earlier it can set the agenda, which means its bills take priority in the Assembly. The Parliament does play a role as a check on government. The National Assembly has the power to force the government to resign; it may do so by passing a motion of censure.

Parliament's specific role in defense is to pass laws that define the defense organization, its annual defense budget, and military programming laws. It periodically makes statements about France's military policy (equipment for the armed forces), but it cannot initiate legislation in the area of national defense. And since the parliamentary committees have small staffs; they do not conduct the types of hearings typical of the U.S. Congress. Thus for parliament the defense issues are generally top-level, broad-based and they never get into the detail so typical of the United States.

THE MINISTRY OF DEFENSE

The Ministry of National Defense is organized as shown in Figure 1-1 into three distinct elements. The military element is composed of the Armée de la Terre (Army), the Armée de l'Air (Air Force), the Marine Nationale (Navy) and the Chef d'état-major des Armée (Joint Armed Forces Staff). The administrative side includes the Secrétariat Général pour l'Administration and the acquisition organization, the Délégation Général pour l'Armement (DGA). The current "Délégate Général" is Yves Gleizes, a Polytechnician and an ingénieur général de l'armement.

France has the fourth largest defense budget in the world.[8] The defense budget in FY 2000[9] was set at French Francs (FF) 188 billion francs (28.66 billion Euro[10]) (excluding pensions), 2.5 percent of the Gross Domestic Product (GDP) and 11.29 percent of the national budget.[11] In 2001 the budget increased to FF188.9 billion (excluding pensions) and represents 11.6 percent of the State's budget and approximately 2.9 percent of the Gross Domestic Product. The apparent amount of investment in modernization is high — 45 percent — when one looks at the investment part of the budget (Title V). The investment portion — research, development, production and infrastructure — is planned at a steady FF86 billion (in constant FY 1995 francs) through 2002. However, a true comparison probably puts it closer to FF65 billion and slightly higher than most other countries at around 30-35 percent of the defense budget.[12]

France operates on a five-year defense program,[13] called the "Loi de programmation," which sets the amount needed to meet the needs of the armed forces. Then a yearly budget is submitted by the government and approved by the parliament; but often it does not meet the needs of the five-year program.[14] The programming law also had an impact on the size of the military. It required a reduction of personnel from 548,280 civilians and military in 1998 to 440,000 in 2002.[15] The 2002 budget request, unveiled in July, shows a continued upward trend with an increase of 1.6 percent from 2001 for

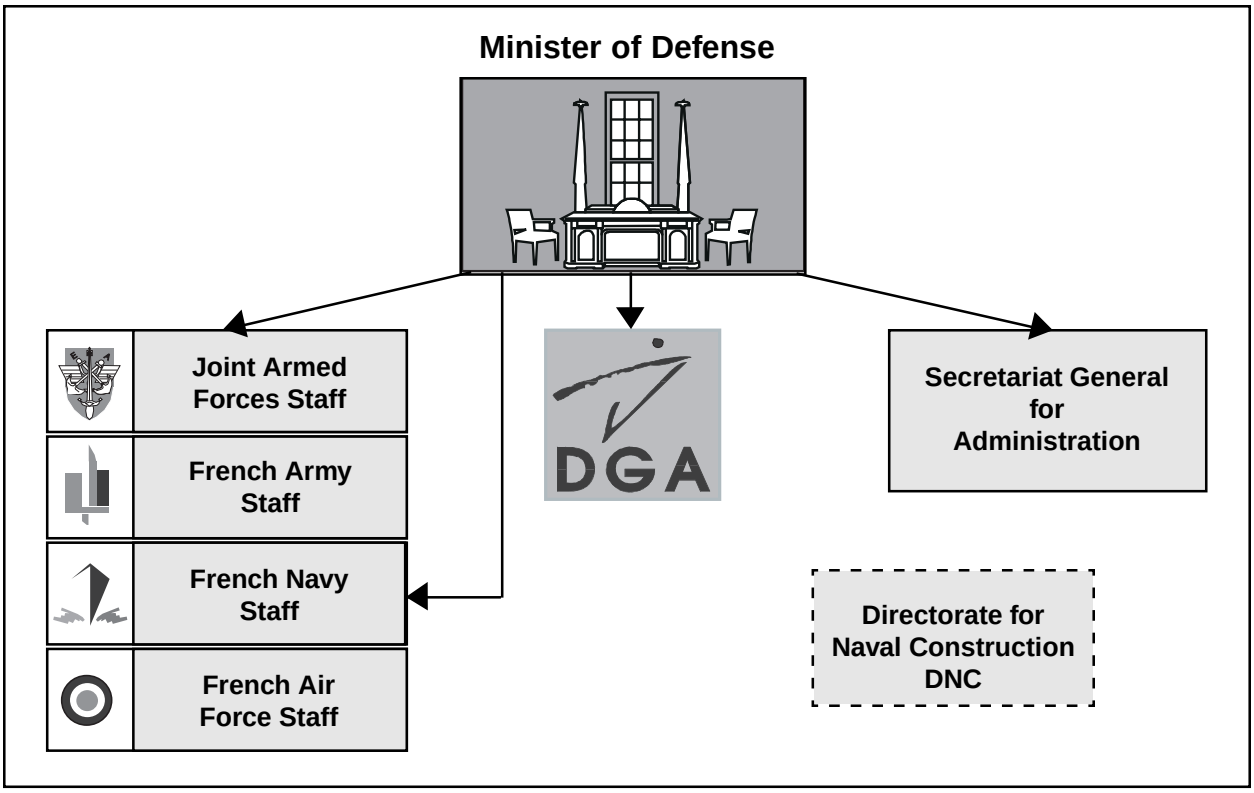


Figure 1-1. Ministry of Defense

defense (to FF191.3 billion), although the modernization account FF83.5[16] still falls well below the programming law's objectives of FF86.

DGA: ROLE AND ORGANIZATION

President Charles De Gaulle created the French Acquisition organization in 1961. He had several objectives: make France less dependent on other countries for military equipment and create a French nuclear force (la Force de Frappe). To create the technical capability necessary to bear on this task, the Ministry needed to create a "center of excellence." It took the existing armament engineers from the military services and created a separate branch of the military — an armament agency — now called the Délégation Général pour l'Armement (DGA). The concept was to create a Corps of dedicated and technically competent individuals who, working closely with the military services, would provide the modern equipment needed by the warfighting branches of military. The original mission of this organization was to define requirements, evaluate needed research and development, manage the R&D facilities and government production plants, and buy or develop the weapon systems for mission needs.

Historically, the DGA has performed two functions — a "state function" and an "industrial function." The state function manages research, development, production, and testing of weapon systems along with oversight of the defense industry. The industrial function includes managing entities such as shipyards and repair depots, which are government industries. Of the three services, the Air Force has historically relied upon a civilian defense industry (companies such as Dassault) to meet its needs, while the Army and Navy have relied more upon a combination of both government and civilian industry. The new programming law, discussed later,

and government policy have changed this traditional role. The relationship between government and defense industry is changing, and government industries are now becoming "profit" making industries.

Currently there are over 19,000 (see Figure 1-6) personnel employed at DGA organizations throughout France. This includes personnel at the headquarters (6,639) and test centers (9,600) performing state functions and those performing industrial functions at aircraft maintenance centers (3,394). DGA is specifically responsible for managing armaments programs, buying equipment, providing the technical and scientific expertise necessary to outfit the forces, performing trials and evaluations, and providing initial logistics support for military equipment. In practice DGA manages about 80 percent of defense equipment budgets with the balance being bought by the military services.

There are three directorates in charge of the programs (see Figure 1-3 for organizational chart):

The **Force Systems and Prospective Directorate (DSP)** monitors research activities, conducts common technology development, and

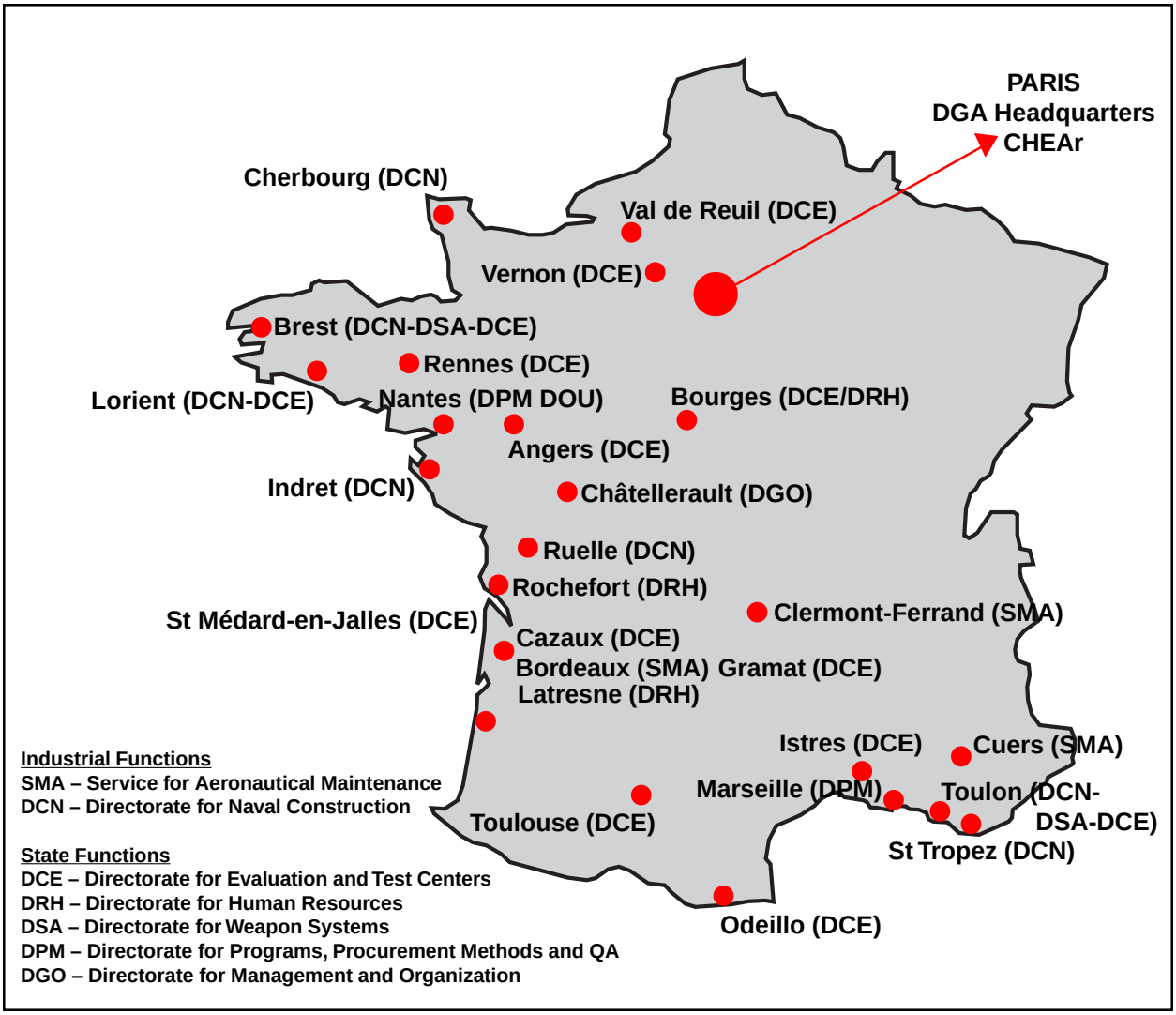


Figure 1-2. Locations of DGA and DCN Units

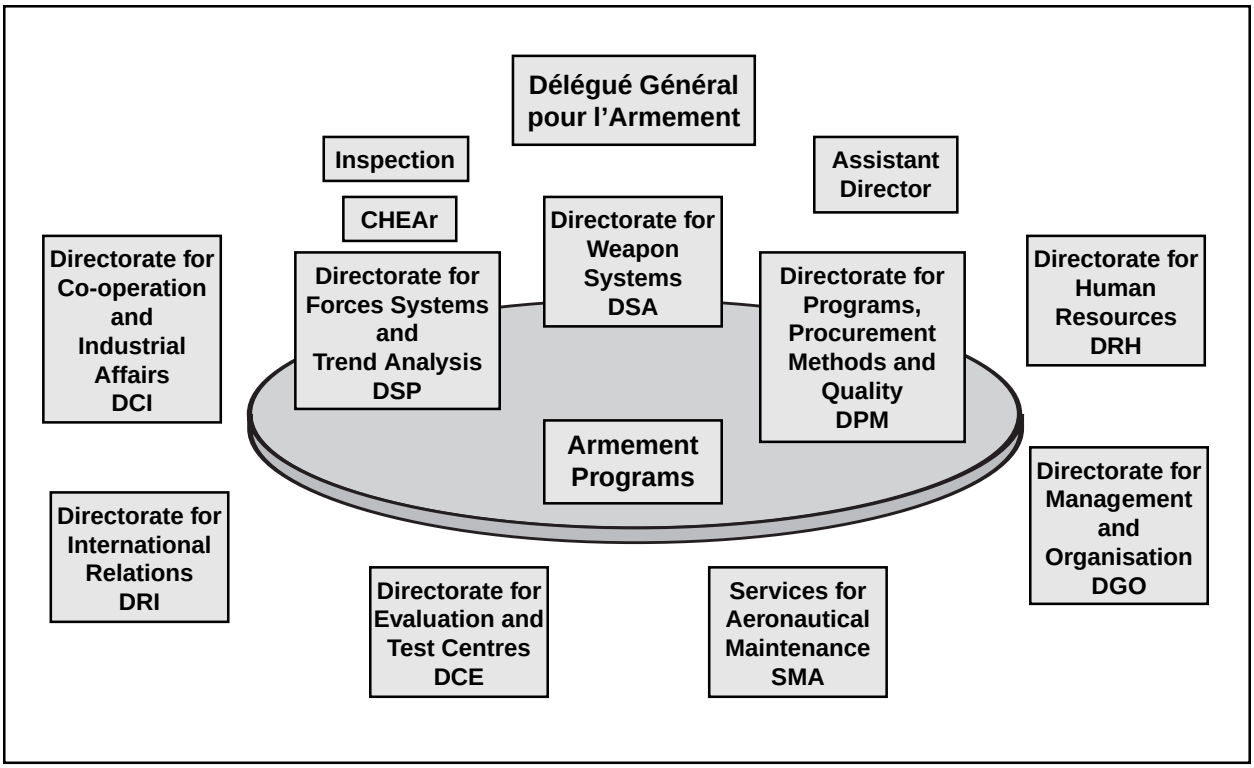


Figure 1-3. DGA Organization

prepares programs for development. It ensures technical consistency within the forces systems. It is responsible for strategic missile programs as well as those dealing with observation, information and telecommunications. It also provides the technical support to program offices located in DSA on an "as needed" basis.

The **Weapons Systems Directorate (DSA)** is in charge of the design and development of land, naval, aeronautical and tactical missiles programs. The Program Managers belong to this Directorate; they are fully responsible for all aspects of a program and receive support from a "program integrated team" which includes specialists, such as procurement and quality control.

The **Programs Management, Acquisition Methods and Quality Control Directorate (DPM)** has responsibility for funds management, to include budget preparation. It is also responsible for procurement, quality and logistics support. It also provides specialists, on an "as needed" basis, to support program managers.

Two Directorates in Charge of International Activities

The **Cooperation and Industrial Affairs Directorate (DCI)** has responsibility for working European issues, such as cooperation within the EU and OCCAR. It provides armament attaches to Germany, United Kingdom, Spain, Italy, Greece, Turkey, the United States, NATO and the Western European Union (WEU). It has responsibility for industry — to include setting industrial policy and support and development of small and medium-sized companies. It also has responsibility for the revamping of industry in the new global environment.

The **International Relations Directorate (DRI)** has responsibility for countries mostly outside of Europe. Its primary responsibility is for the promotion and control of French armament equipment exports to foreign markets. It coordinates the development and implementation of export strategy. It provides armament attaches to Saudi Arabia, United Arab Emirates, South Korea, South East Asia, Japan, and Russia.

Two Directorates in Charge of the Management and Human Resources

The **Management and Organization Directorate (DGO)** has responsibility for management reporting, management of the information systems, internal quality control, general planning and budgeting, and administration.

The **Human Resources Directorate (DRH)** manages the career and the training policy for DGA.

One Directorate in Charge of Survey and Trials

The **Directorate for Evaluation and Test Centers (DCE)** has responsibility for providing the technical expertise and skills needed by program managers and other DGA departments for testing equipment and systems. It will also provide support for external customers (industry, foreign governments and companies). DCE manages all of DGA's Technical and Test Centers.

One Directorate in Charge of Industrial Activities

The **Service for Aeronautical Maintenance (SMA)** is responsible for aircraft maintenance on aircraft, engines, aeronautical equipment and maintenance of industrial facilities. Aircraft are repaired in Clermont-Ferrand, engines in Bordeaux and naval aircraft in Cuers-Pierrefeu. The SMA also offers services to foreign clients in partnership with French companies.

One of the organizational changes due to restructuring DGA was the recent semi-privatization of the **Direction de Constructions Navales (DCN)**, which now reports directly to the Minister of Defense. DCN is responsible for foreign exporting of ships, and manages shipyards located at Brest, Cherbourg, Lorient and Toulon.

New Armament Policy

As the Cold War vanished the "main threat to the French nation…disappeared, probably for a long time."[17] However, French policy makers recognize that the proliferation of weapons of mass destruction and crises, such as Kosovo, create an uncertain world and risk for the nation. In this uncertain world, the object is still to deter an aggressor from attacking vital national interests. This new armament policy still includes retaining nuclear capabilities, although nuclear testing has ceased. Of particular importance is the increased commitment by France, and other European nations, to a common defense policy and the European Union Rapid Reaction Force. France has several underpinnings to its relationships that influence its defense armament policy and action. They include the North Atlantic Alliance, the UN (United Nations), the Organization for Security and Cooperation in Europe (OSCE), the European Union, and the Western European Union (WEU). In the armament arena two groups that play an important role are the Western European Armaments Group (WEAG) and more importantly a multi-nation armament organization known by its French name — "Organisme conjoint de coopération en matiere d'armement" (OCCAR) — to be discussed later. There is also the recognition in the new armament policy that it is necessary to restructure the defense industry in Europe and particularly in France to make it competitive with the American Defense

Industry. The relatively newly-formed European Aeronautic Defence and Space Company (EADS) is but one example of the changes in Europe. And the final policy initiative is to harmonize the French export policy with the new EU policies for exports, currently under development, while at the same time improving the competitiveness of their exports.

Acquisition Planning

Thirty years out seems a long time, but as the United States has found, the life of a weapon system can easily extend for thirty years. In 1997 as part of the overall restructuring of the Ministry, the military services and the DGA began a "long term" look at the armament planning process. Michel Bouvet, then the agency assistant director for trend analysis, described a "30 year prospective plan, updated yearly, which "forces us to imagine new things. It's a plan which will never be finished."[18] This thirty-year forecasting plan looks beyond normal programming and planning documents to raise questions, make recommendations and to provide a framework for evolving military capabilities. This "prospective approach" provides the DGA and the services with a look at the future battlefield environment and the status of technology, and helps provide a focus for research and development (R&D) efforts. Tied closely with the "long-term look" is the development of a new construct called the ***"System of Forces."*** The "System of Forces" approach looks at a mission area, across the services, and assesses the military capacity being brought to solve the problem. They have selected eight areas: (1) deterrence; (2) command, control communications and intelligence; (3) strategic and tactical mobility; (4) in-depth strike; (5) controlling the air/ground environment; (6) control of the air/sea environment; (7) control of the aerospace environment; and (8) readiness. To provide an organizational structure for this approach they have created a senior level position called the System of Forces Architect (ASF), with the responsibility to look across each capability area to fulfill those needs. The ASF performs a role similar to the Program Manager within the force systems, or mission area, prior to turning over the system (see Figure 1-4) to the program manager.

ACQUISITION PROGRAM MANAGEMENT

Two key individuals manage acquisition programs. The System of Forces Architect (ASF)[19] and the Program Manager (PM). As seen in Figure 1-4 the ASF has the primary responsibility at the inception of a program. As one Architect said, "he has the freedom to think of the future." He takes a long-term, broad look — a "systems of systems" approach — to find the most effective means — from both a cost and a military basis. The ASF helps draft prospective plans, makes recommendations for research and development, propose timetables and funding for programs, and has initial responsibility for the system through the preparation stages and feasibility phase.

The military services also play a role in the management of programs. They define the military need. During the initial phases of a program, the counterpart to the ASF on the general staffs (referred to as the Operational Concept Officer (OCO)) and the General Staff Correspondent Officers (OCEM[20]) help define and monitor the systems of forces.

Once a program reaches the Definition Phase the key role in the conduct of an armament program reverts to two individuals, the *Program Director* from the DGA and *Program Officer* from the individual military general staffs. In the case of the Mirage 2000, it is the Air Force General Staff (Etat major de l'armée de l'air (EMAA). The Program Manager has the responsibility for the cost schedule and technical

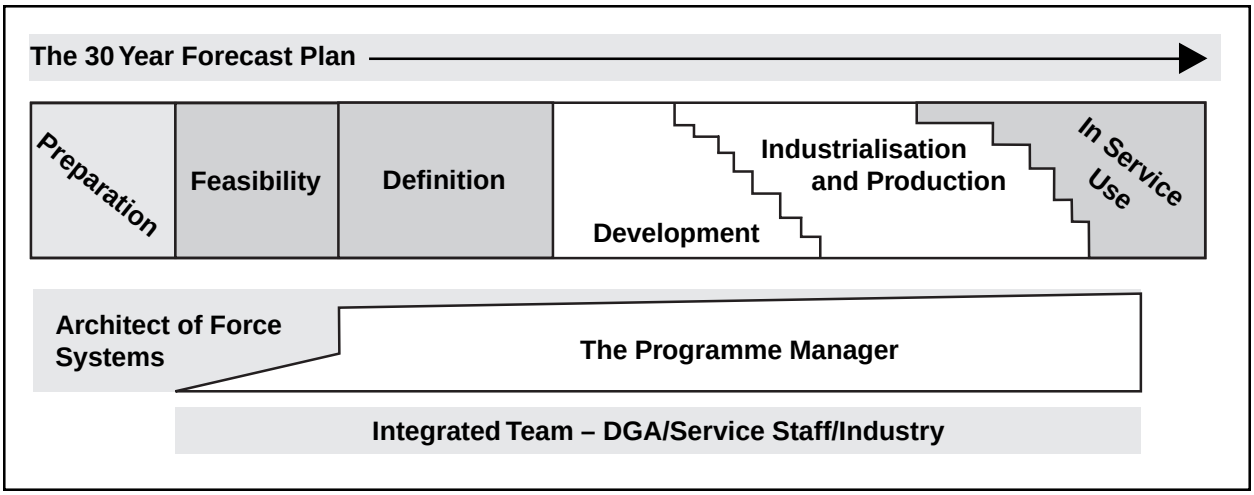


Figure 1-4. System of Forces Architect Role

performance of the system. The Program Officer has similar responsibility within the Services, which he performs by monitoring the system and participating with the PM as part of the Integration Program Team.

Major Programs

During all or a part of their implementation some programs are classified "major" in view of their importance, whether from a cost viewpoint or other national considerations. They undergo special decision procedures and their classification is mentioned in the list of armaments programs.[21] Normally, for national programs, program documentation requires approval at each phase of the process by the Permanent Executive Commission. For international cooperation programs, a separate procedure will be used.

For some armament programs (whose complexity and importance are justified), steering committees can be formed. Their establishment, chairmanship, composition, role and attributions are contained in specific instructions signed by the minister, or jointly by the Délégate Général for armaments and the service chief of staff.

Permanent Executive Committee

The **Permanent Executive Committee** prepares and publishes the list of armaments programs. They also provide recommendations on the feasibility, orientation and launching files and final documents of programs. Its members include: a representative of the armaments delegate general, who chairs the committee; a representative of the secretary general for administration, vice-chairman; representatives from the Joint Staff and the Services.

THE ACQUISITION SYSTEM[22]

The acquisition system[23] is divided into stages and phases characterized by the types of work involved (see Figure 1-5). It begins with the Preparation Stage where operational requirements are outlined, with possible solutions evaluated with a look at their risk, cost effectiveness and life cycle cost implications. The *program officially starts* during the Design Stage with its two phases — Feasibility and Definition. To move into the feasibility phase the ASF with the appropriate service representative prepares a Feasibility file, approved by the Minister of Defense after it has gone through the Permanent Executive

Committee. It searches for possible answers and their assessment, in terms of the degree of satisfaction they can bring to the military requirements — still expressed in general terms. In the definition phase the responsibility passes to the Program Manager. This phase is entered when one or more approaches appear to meet the military need and can be selected for a more thorough examination. During this phase the military requirements (including the need for support, environment and training, technical specifications, schedules, costs and industrial conditions) are refined. Once the system has been sufficiently identified, it enters the next Stage Realization and the Development Phase begins. At this point the DGA may also commit to production or partial production. The Realization Stage terminates with delivery of the complete product, along with the necessary training and support system. In principle this date marks the end of the program, although some of the DGA's activities continue long afterwards.

Each Phase has the requirement for a chain of documents — Feasibility, Orientation, Realization Launching and Production Launching documents — which must be approved prior to beginning the phase. These documents include the projected cost, schedule and technical performance along with the associated risks in the program. In addition to these specific approvals, the DGA (with the Services and the Secretary General for Administration) examines annually the programs at the Design Stage.

In general the definition, development, production and utilization phases are reached by decision of the DGA. However, the Minster of Defense makes the decision when a major program is concerned, when the permanent executive committee is unable to make a recommendation, or the military services have reservations.

Integrated Program Teams

One recent reform effort in the Ministry has been the use of Integrated Program Teams. The basic goal is similar to what other organizations are doing — to reduce costs and timescales, increase customer and user satisfaction. The operating principle for the teams is to make all participants work at the same time and assemble all the experts needed to provide optimum program

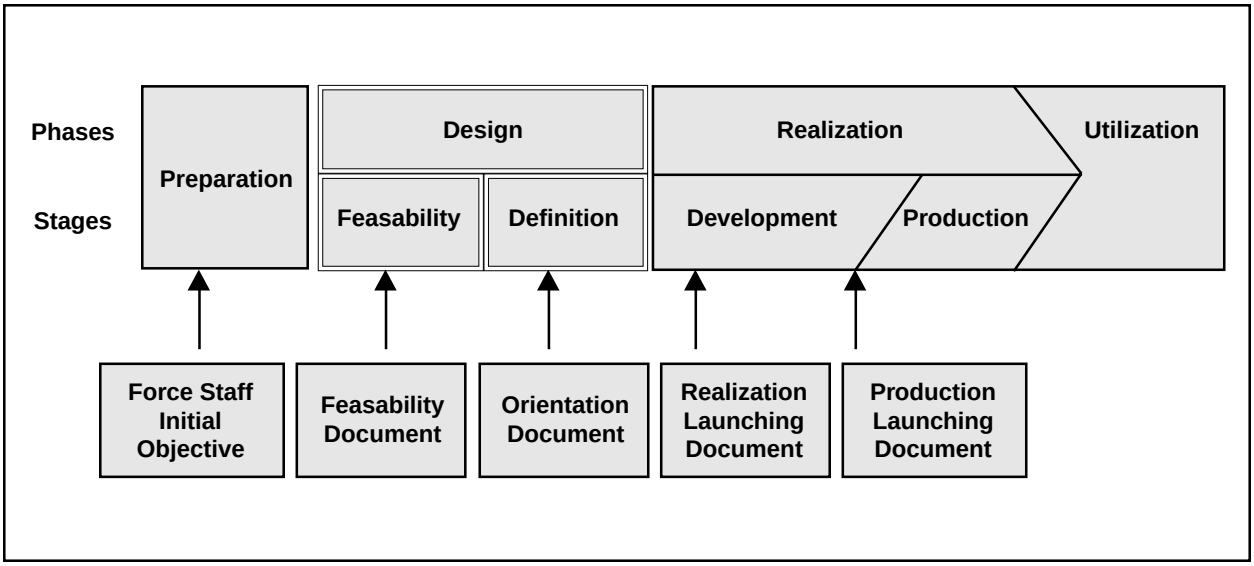


Figure 1-5. The Acquisition Process

support under the authority of the Program Manager. Expertise will be provided on an "as needed" basis by the support offices, typically within DSA — although other organizations also provide support. Typical of the types of capability provided to program teams include:

Functional

- methods, planning, costs
- standardization
- purchasing
- integrated logistics support
- product quality

Technical Fields[24]

- communications
- electromagnetic detection
- structural materials
- guidance – navigation
- aircraft architecture

Figure 1-6 depicts the IPT relationships.

PLANNING, PROGRAMMING AND BUDGETING

The 1994 defense "White Paper" provides the overarching security precepts for defense planning, programming and budgeting. Its three main tenets are to: (1) Defend the interests of France (well-being of the nation), (2) Construct Europe and contribute to international stability (play a leading role in the integration of Europe and contribute to the prevention of war outside of Europe), and (3) Implement a global conception of defense (civil, economic, social, cultural and military). From this derives four tasks for the Ministry of Defense. They are:

(1) Deterrence – sea- and air-launched nuclear weapons;

(2) Prevention – high-performance surveillance technology and the stationing of troops (such as the Foreign Legion) overseas;

(3) Power projection – involves land, air, and maritime forces in close cooperation; and finally

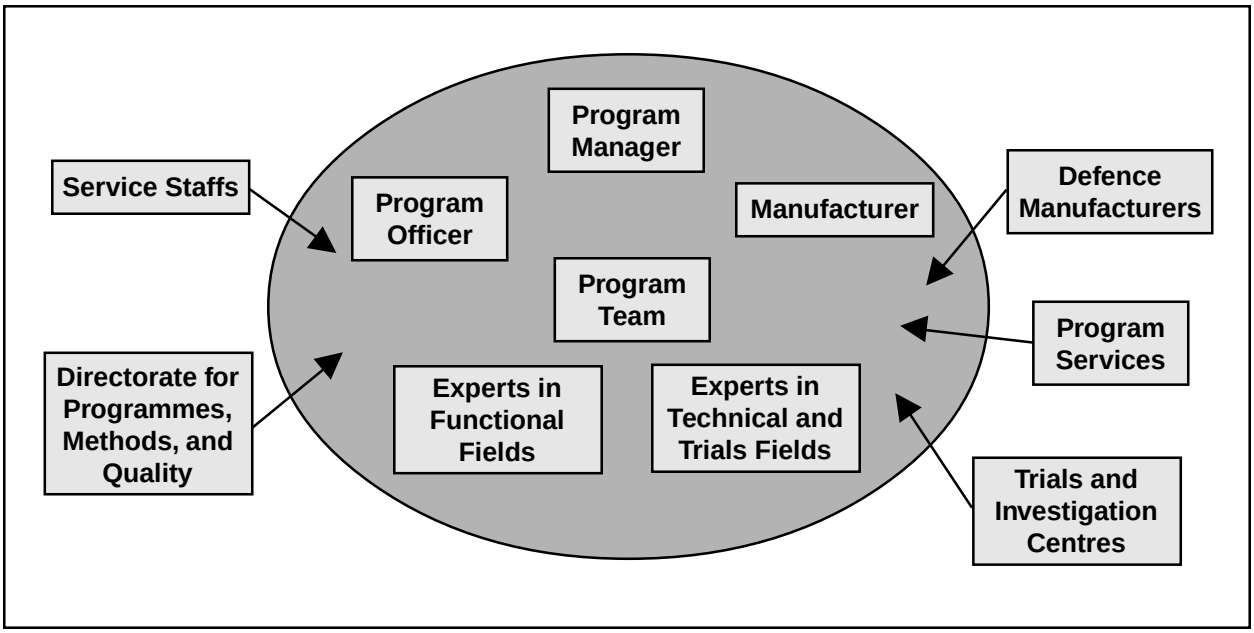


Figure 1-6. Integrated Program Teams

(4) The Protection of France's domestic territories – now left to the Gendarmerie with the absence of a military threat.

As a result of the changes recommended in 1995, the Parliament set out the main decisions with the 1996 Program Law. This contained the defense posture through 2015 (a twenty-year planning cycle), with more details including specific spending levels for modernization through 2002.[25]

In the medium term (6 years) targets were set for equipment and manpower. The armed services prepared a forecast on a year-by-year schedule of the needed resources. The ministry is required to report to the Parliament on its progress implementing the law. The annual budget specifies the yearly program amounts to be allocated to implement the program.

Internally within the department the Chief of the Defense Staff is responsible for overall coordination among the services and the DGA, the General Secretary for Administration and others and for preparing major decisions for the Minister. Of specific concern for acquisition is the Title V or capital investment portion of the budget. It should be noted that the budget amount for programs is contained within the budgets of the various services.

The actual budget process begins in January with a Ministry review of the yearly plan and the amount of money needed to implement the plan. Following the review (January-April) they revise and prepare the final budget submittals. The Government, in particular the Minister of Economy and Finance and the cabinet, gets involved in discussions in the April time frame. In June the final "real" discussions take place and an agreed-to budget is sent at the end of June or early July to the Parliament. Parliament reviews the budget in the July to August time frame and the DGA responds to questions posed by Parliament. In September the Chief of Staff of the Air Force (and other services for their programs) testifies before a Parliament committee to answer questions generally along these lines: Is this enough money to do what the long-term plans require? Then Parliament votes in October to have the money in place for the start of the Fiscal Year – 1 January.

THE PROCUREMENT/ CONTRACTING SYSTEM[26]

The DGA spent approximately FF90 billion (13.7 billion euros) in over 50,000 contract actions in fiscal year 2000 for a wide range of products and services to include R&D, basic and detailed design, modeling, testing, production equipment, supplies and support. The regulation that governs the procurement or contracting business is the "Code de Marché Publique," or Public Contracting Code. It is rather modest in size compared to U.S. regulations. It is also relatively general and easy to understand, although it is complicated somewhat by legal opinions written by government lawyers on the meaning of portions of it.

The general government policy is that competition is the rule. However, in defense the number of suppliers is low, particularly at the Prime Contractor level. Thus the philosophy in Defense is to move the competition to the next level — the subcontract level. In cases where competition is possible (prime and sub) DGA's commitment is for fair competition rules, transparency and the opportunity for the settlement of disputes.

An acquisition plan is required for each important program and updated every 18 months. There is also a Contractual Approach Document (CAD) required for each contract, which provides the proposed contract particulars, such as type of contract and duration. If the duration of

the contract is less than three years, then the prices shall be firm. For contracts of a longer duration firm prices will be used, but with a price escalation formula based on standard escalation rates used for engineering and manufacturing activities. In the past, the general strategy was to select a primary contractor. Using aircraft as an example, Dassault was selected as the primary contractor responsible for developing and building the airframe and then to integrate components into the overall system. The DGA would contract with other suppliers for avionics and engines, and provide these as government furnished equipment (sometimes referred to as component breakout). This saved contractor overhead but contributed to problems of late government-furnished equipment and coordination of the integration activities. A more important reason for the use of this approach was the concern that a contractor could use the leverage of its sole source position to vertically integrate into its company divisions that manufactured individual components. The current strategy approach makes the Prime Contractor fully responsible for overall system characteristics (technical, price, support in service), i.e., "global system performances." This includes a contractual commitment by the Prime for design, industrialization, initial production, and initial logistic support. It also includes the concept of co-contracting in which several major contractors all sign one contract, such as an airframe, engine, and avionics manufacturer.

If a company is unhappy with an acquisition then they can protest to DSA, DGA, sometimes to Minister directly or to Parliament. This can lead DGA to reconsider the case: this rarely happens. To reduce such cases, DGA develops for each program a buying strategy that is approved at DGA level. This strategy is detailed and indicates the main competitions that will take place during the program duration, and when competition is impossible, the legal arguments to justify that approach.

In the last several years the role of procurement as major contributor to the DGA mission has been recognized. As a result they have created a procurement directorate to manage and provide a home base for developing procurement managers. The selection of buyers and negotiators favors those primarily with technical backgrounds although every year personnel are hired from industry because of their business backgrounds. The general philosophy is that while the buyer may not have technical responsibility "you cannot separate the cost away from the technical and it is very helpful to have buyers that understand that."[27] Their training primarily is aimed at providing the buyers with an understanding of the rules and regulations, negotiation strategies, estimating and other tools to help them in their jobs.

THE DGA WORKFORCE

The DGA, headquartered in Paris, employs over 19,000 personnel (see Figure 1-7).[28] While it employs 15,718 personnel in "state functions" the actual number of personnel engaging in acquisition (as defined within the United States) includes about 6,043 personnel working directly for the DGA performing "state functions." The balance, 9,079 personnel, are employed at DCE's trials and investigation centers located throughout France. Until recently they have managed two industrial centers — the Aeronautical Maintenance Workshop (SMA) and Direction de Constructions Navales **(**DCN). SMA employees 3,394 personnel, while DCN (no longer a part of DGA) employees approximately 16,400 personnel at various places in the country (although most are employed at the shipyards in Brest, Cherbourg, Lorient and Toulon).[29] Current figures represent a decline of 21 percent in personnel since 1996 as part of the streamlining of the DGA with an attempt to cut overhead costs.

There are two primary categories of personnel that work at the DGA and in the program offices — Military and Civilian (see Figure 1-7). The Military includes armament engineers (*Ingénieurs d'Armement* (IA)), armament design and technique engineers (the "*Ingénieurs des Etudes et Techniques d'Armement* (IETA)) and officers of the armament technical and administrative corps (*Officier du Corps Technique Administratif de l'Armement* (OCTAA)). The IAs generally hold the majority of senior positions within DGA. The other two military categories provide personnel with a technical administrative background to support the DGA mission. Promotions for the other two categories are generally limited to Colonel.

The Civil Service or Fonctionaires

Traditionally the government plays a considerable role in the affairs of the country. With the responsibility to carry out the goals of the government the French civil servants enjoy a very important social position within the country. Starting ones career as a civil servant also opens, particularly for the higher civil service, opportunities both in senior levels of industry and within the top echelons of government. Many of France's political leaders have had civil service careers, such as Presidents Jacques Chirac and Giscard d'Estang, and Alain Richard, France's current Defense Minister.

Two categories of civilians work in the DGA — "fonctionnaires," and contract employees. The "fonctionnaires" are the civil servants who perform mostly two types of jobs — administrative and technological. They have three levels of civilians.

Niveau 1 Senior level up to General Office

Niveau 2 Mostly mid level management in law and analysis

Niveau 3 Secretaries and workers

The contract employees fall into two categories — the ICT (Ingénieur Commercial Technology) and ISC (Ingénieur Service Conceptual), who are hired on contract for three to four years. This allows the DGA to bring in personnel with special capabilities, such as lawyers and economists, at higher salaries than can be offered to civil servants. Their number is increasing slightly every year and it is not unusual for these personnel to remain many years at the DGA.

State Functions

DGA	6,639
DCE	9,079
	15,718

Industrial Functions

SMA	3,394
	19,112
DCN	16,418
	35,527

Figure 1-7. Number of Personnel at DGA

Military Rank	Ingenieurs de l'armement		Ingenieurs des Etudes et Techniques d'armement		Officiers de corps technique et administratif de l'armement	
Lt. Gen.	IG1A	Ingenieur general de 1 ere classe de l'armement	IG1ETA	Ingenieur general de 1 ere classe des Etudes et Techniques d'armament	OG1CTAA	Officer General de lere class du corps technique et adminstratif de l'armement
Major Gen.	IG2A	Ingenieur general de 2 eme class de l'armement	IG2ETA	Ingenieur general de 2 eme classe des Etudes Techniques d'armement	OG2CTAA	Officier general de 2 eme classe du corps technique et administratif de l'armement
Colonel	ICA	Ingenieur en chef de l'armement	IC1ETA	Ingenieur en chef de 1 ere` 2 eme classe des Etudes et Techniques d'armement	OC1CTAA	Officier en chef de 1 ere classe du corp technique et administratif de l'armement
Lt. Colonel	ICA	Ingenieur en chef de l'armement (en desous du 4eme echelong)	IC2ETA	Ingenieur en chef de 2 eme classe des Etudes et Technique d'armement	OC2CTAA	Officier en chef de 2 eme classe du corp technique et administratif de l'armement
Major	IPA	Ingenieur principal de l'armement	IPETA	Ingenieur principal des Etudes et Techniques d'armement	OPCTAA	Officier principal de corps classe du copr technique et administratif de l'armement
Captain	IA	Ingenieur de l'armement	I1ETA	Ingenieur de 1 ere classe des Etudes et Techniques l'armement	O1CTAA	Officier de 1 ere classe du classe du corp technique et administratif de l'armement

Figure 1-8. Military Officers in the DGA

Typical Career Path

Program Managers come from the IA Corps. In France the decision to become a Program Manager actually occurs quite early in one's life — at sixteen years of age. While a sixteen-year old may not know that he wants to become a Program Manager, the decision to attend one of the exclusive "Grand Ecoles" is made at that age. To understand the selection of individuals for top management positions both in the DGA (and in French organizations in general), it is necessary to start with the France's academic system.

Education in France

After completing five years of primary school and the first portion of secondary school, an individual is ready at the age of 15 or 16 for the Lycée, which is three years long and provides the "baccalaureat," roughly equivalent to a high school degree. In the Lycée the course to take to move in the direction of program management is the Bacalureate "S," the most prestigious of the degrees that is focused heavily on mathematics and sciences. "Mathematics is the central feature of French selection methods in education."[30] To gain "le bac" a very competitive exam is taken. At one time only 30 percent of the students passed the exam, although in recent years those passing have increased to as high as 75 percent. The "bac" is the key to higher education. It gives automatic entry into the university.

The top schools in France — the "Grand Ecoles" — have no equivalent in any other Western country. Yet they are the key to future success. For those wishing to attend, they must, after their graduation from the Lycée and their passing of the bac, spend the next two to three years attending a special post-bacccalaureat class. A competitive exam then determines which school they attend. The most prestigious are probably the Ecole Nationale d'Administration (ENA) for public administration and the Ecole Polytechnique for future armament engineers. An unusual feature of the Ecole Polytechnique is that it was founded by Napoleon to train engineers for the armed forces. It is run by the Ministry of Defense and led by a three-star general.

The number of students at the Ecole Polytechnique is kept very low with only a total enrollment of 1000 and a graduation class of 250 per year. These students are the future leaders of the ministry of defense, industry and other government organizations. Future armaments engineers will spend three years — two years in class and one year of military training. They will receive a master's in science degree.

Graduates from one of the Grand Ecoles have a choice of selecting one of the "elite Grand Corps," such as the Corps des Mines, the Corps des Ponts et Chaussees or the Armament Corps. The top graduates get first choice of their preferred Corps. The schools are free, but there is an obligatory three years of state service.

Each year 30 to 40 graduates are admitted to the armament engineers Corps and the DGA. From the Ecole Polytechnique they will continue their education with two additional years. It is typical that they will attend either ENSTA (Ecole Nationale Supérieure des Techniques Avancées) in Paris or at Sup'Aero (Ecole Nationale Supérieure de l'Aéronautique et de l'Espace) in Toulouse. They will receive specialized training in engineering fields such as aeronautics, mechanics or advanced techniques. Some may take additional training in foreign laboratories or prepare a doctoral thesis. This provides six to seven years of advanced training and prepares the personnel for the highest levels of technological, scientific and management positions in the DGA.

After school the IA will continue his training on-the-job (OJT). The typical path for an IA engineer would start out with a position in a laboratory or test center. They will remain in this position typically for a period of two to four years. Again, the primary focus of their OJT training is to gain technical knowledge. They rotate in several different types of jobs to ensure they have both broad based technical knowledge of armaments development — although lately there is an increased emphasis on developing business management skills. This allows them to operate effectively in the complex arena of acquisition. They also specialize in fields such as naval, armor, or aeronautics ("air").

Other Educational Opportunities

The DGA has several other schools — the ENSIETA (Ecole Nationale Supérieure des Ingénieurs des Etudes et Techniques d'Armement), the ENSICA (Ecole Nationale Supérieure d'Ingénieurs de Constructions Aéronautiques) and CHEAr (Centre des Hautes Etudes de l'Armement. The first two schools provide higher training for IETA and civil servants specializing in technical areas. CHEAr, on the other hand, provides training for executives, managers and program teams. Of special interest is the Advanced Program Management Course (44 days) which trains armament engineers to become future program managers. This course is designed to provide "know how" on managing integrated program teams and an understanding of tools available and the issues facing both the Ministry of Defense and DGA. CHEAr offers other short courses — working in an integrated management team; purchasing and cost analysis; negotiating with industry; human management; functional and value analysis; international negotiation; and others.

An interesting cultural perspective on training can be found in the literature on French management practices. The French perceive training in two ways. If selected and considered prestigious it is worthwhile doing. But to actually go out and select various types of training on one's own initiative would not be considered appropriate. "French managers are conscious that the real training does not happen inside the classroom. Formal training is largely irrelevant, reserved primarily for the lower echelons. The high flyers know that their development will be

organized by rotating them through various activities and will be guided by a mentor who will help them make contacts and oversee their leap from specialist to general management."[31]

COLLABORATION AND ARMAMENT SALES

Two key elements of the French defense policy are (1) the need for arms cooperation, particularly within a European cooperative framework, and (2) the need for armament sales to maintain the viability of their defense industry and to maintain lower prices for their own equipment. According to the May 2001 issue of *Janes* Magazine,[32] France is now the second ranked exporter of military equipment with the United States being first. From 1991 to 199 they exported FF 334 billion ($46.3B), while the United States sold $83 billion and Russia sold about $35 billion. They primarily export to three Persian Gulf nations — United Arab Emirates (UAE), Saudi Arabia, and Pakistan.

The primary focus of French acquisition policy makers currently is on arms cooperation within the European framework. This involves bilateral agreements, although the real effort has been in the multilateral area. This includes NATO, the Western European Armaments Group (WEAG); and of particular importance is the increased commitment by France, and other European nations, to the Organisme conjoint de coopération en matiere d'armement) (OCCAR). OCCAR was created in 1996 by four nations — France, Germany, the United Kingdom, and Italy. It is designed to be free of the normal strictures of each country, and to manage collaborative programs between member nations.

During its first five years, several program were moved into OCCAR, including the Roland Missile and the Tigre Helicopter Program. But since it did not have legal status it could not issue contracts. Its real birth took place this year when it became a legal entity and was given responsibility for a major new development program — the A400M military transport aircraft. As a legal entity, it now has the power to directly contract with industry. The A400M, a $20 billion program, offers the opportunity to OCCAR to show its abilities to handle the complexity of a large program in an international environment. Both France and Germany have indicated their desire to move many of their collaborative programs into OCCAR.

In the area of armament sales, as previously indicated, France is one of the major world players. In the DGA two organizations — Directorate for International Relations (DRI) and the Directorate of Cooperation and Industrial Affairs (DCI) — have primary responsibility for cooperation and for facilitating and promoting armament sales.

DRI has responsibility for countries outside of Europe. Its primary responsibility is to promote and control French armament equipment exports to foreign markets. It coordinates the development and implementation of export strategy. It assigns defense attaches overseas to promote military and armament relations with other countries. They also subsidize missions for small business to participate in events such as trade shows. They also have responsibility for export control activities and oversight of cooperation activities with allied nations.

DCI works European issues, such as cooperation within the EU and OCCAR. It also provides armament attaches to European countries and the United States to promote armament cooperation and sales. "While it is currently focusing on cooperation opportunities with its European Union (EU) neighbors, it has made a significant effort to build upon a solid bilateral relationship with the United States through multiple means, including more than 100 Data

Exchange Agreements (DEAs) — more than with any other European nation, and through multiple international cooperation agreements, including cooperative R&D."[33] Finally, an important point to remember on armament sales is that while both DRI and DCI promote and assist sales, sales are managed by the defense industry.

SUMMARY

This chapter highlighted several features of the French acquisition system. The first key feature is the political roles of the executive and legislative branches, which are characterized by a strong executive role in the management of defense programs. They have a centralized acquisition agency, the DGA, which develops and buys new weapon systems for the military services with a central corps of armament engineers providing the leadership for the organization. The selective nature of the national educational system is a central tenet for selecting future acquisition leaders.

There are several key positions — representing the DGA and the military services — involved in managing programs. They are the Architect of Systems Forces and the Program Manager (from the DGA) and the Operational Concept Officer (OCO), the General Staff Correspondent Officer (OCEM) and the Program Officer (from the Services). To assist the senior acquisition leaders, in this case Armament Engineers, an array of military and civilian personnel provide the necessary technical and operational expertise.

The long-range planning and programming process provides a framework for the five-year parliamentary passed programming laws, which among other things, provides a catalogue, schedule and target expenditure for the modernization of French armed forces. And then, the budgeting process tries to fund, albeit unsuccessfully, the modernization needs. The DGA operates in a typical hierarchical structure, although adopting modern management techniques, such as IPTs and matrixing, with a goal to improve responsiveness to its customers. And finally, the procurement approach is characterized primarily by sole source contracts, although to counter the increased cost subcontracting competition and component breakout are two techniques that have been used. The next chapter will provide a look at the U.S. environment for acquisition.

ENDNOTES

1. The Force de Frappe.

2. Bloch, George A., "French Military Reform: Lessons for America's Army?" in *Parameters, U.S. Army War College Quarterly*, Vol. XXX, No. 2, Summer 2000, US Army War College, Carlisle, PA, pg. 36.

3. Bloch, pg. 36.

4. Currently serves a term of five years, although originally it was seven. This was changed by a referendum in 2000.

5. Fifth Republic Constitution, Article 15.

6. Occasionally, these are in dispute.

7. A distinction between the two houses is that finance bills must be submitted to the National Assembly first (article 39).

8. The U. S. has the largest followed by Japan, Russia, France and then Britain. Some would argue that the Peoples Republic of China has a larger budget, but the official budget is only $17 billion for 2001.

9. Fiscal year is from January 1 to December 31.

10. In most cases I have used French Francs versus dollars because of the continually changing exchange rates. Generally you can use a 7 francs / 1 dollar exchange rate for an approximation in U. S. dollars. The Euro is included because shortly after this book is issued the French franc will have been replaced by the Euro.

11. Source is the French Embassy, Profile of France.

12. Title V includes items for the Gendarmerie and other activities not considered in modernization accounts.

13. The military programming law was enacted on July 2, 1996. It constitutes the first legislative expression of the objectives set for the armed forces by the President. For the 1997-2002 period it provides the means for planning efforts to be made for modernizing France's defense resources.

14. "Loi de programmation" of 1996 set the resources for modernization to be a steady FF86 billion through 2002. They missed the targets in 97, 98, 00 but did meet it in 1999.

15. This includes the gendarmarie, which is a part of the defense ministry.

16. From Le Figaro (online) 17 Juillet 2001 a 17h10.

17. From Defense White Paper ("Ministère de la Defense, Livre Blanc Sur la Défense," 1994).

18. Christina Mackenzie in *Defense New*s, November 2000, pg. 12.

19. There are 8 ASFs. Their areas of responsibility are: Deterrence (Dissuasion), C3I, Mobility (strategic and tactical), Deep Strike (Penetration), Readiness (Préparation et maintien de la capacité opérationnelle), Land, Air and Sea.

20. OCO in French is Officier de concept operationnel, while OCEM is Officier correspondant de l'Etat major.

21. The list of programs is contained in Instruction Ministerial # 7576.

22. Kausal, Tony, Gertrud Humily, Trevor Taylor, Peter Roller, *A Comparison of the Defense Acquisition Systems of France, Germany, United Kingdom and the United States*, DSMC Press, 1999.

23. The Instruction Ministerial # 1514 provides the official guidance for the Ministry.

24. Some examples from the 39 fields.

25. The overall defense budget was set at 185 billion francs, at constant 1995 levels. Total financial resources are divided between operating costs (99 billion francs) and capital investment (86 billion).

26. The terms procurement, contracting and occasionally acquisition can often be used somewhat confusingly even for acquisition professionals. In the sense used for this section procurement or contracting refers to the awarding and management of contracts.

27. ICA Jean Pierre Devaux, Budget Finances du Service Des Programmes Aeronautiques, (SPae/GP), various dates.

28. As of December 2000. Source is the Ministere De La Défense Rapport d'activité 2000 for the Délégation Général pour l'Armament. DCN stands for the Directorate for Naval Construction while SMA stands for Service de la maintenance industrielle aéronautique.

29. As of 1/1/2000,Directorate for Naval Construction reports directly to MOD.

30. Barsoux, Jean-Louis and Peter Lawrence, *French Management: Elitism in Action*, Cassell Publishing, Wellington House, 125 Strand, London, 1997, pg. 40.

31. Barsoux, pg. 78.

32. May 16 2001.

33. Boulesteix, Cara, "The Defense Industry in France," an U.S. and Foreign Commercial Service and U.S. Department of State document, 4/7/2001, pg. 3.

Chapter 2

THE UNITED STATES NATIONAL MILIEU

The Political-Military Environment

Former Senator Sam Nunn from Georgia was once asked "How is it that every year C-130 Hercules cargo planes appears in the annual defense budget?" Senator Nunn's response indicated that he was not sure, but perhaps his friends must put them in. "…Over the last two decades members of the Congress have ordered the purchase of two hundred fifty-one C-130s, the Air Force requested only five."[1] It must be puzzling to someone not familiar with the U.S. political system that something like this can happen. Yet it was borne as part of the original design process of the "founding fathers." To understand the military acquisition system one must start with the American political system.

The nation's founders struggled in 1789 with the creation of a system of government that was effective but did not centralize power with any one person or group. To ensure this did not happen they devised a scheme that provided for a "separation of powers" between the executive, legislative, and judicial branches of government. This "balance of power" gives each branch of the government specific authority and checks upon that authority from the other branches. "The American political system has a number of unusual institutional features that maximizes the probability that any given proposal for a change in policy will be rejected or deferred. These include: the distribution of power among the executive, legislative, and judicial branches of government, the electoral system and staggered terms of office, the decline of disciplined political parties and the growth of congressional committees and special interest groups."[2] As this relates to the military, the President (chief executive) is Commander-in-Chief of the Armed Forces. Although the constitution delegates the power of Commander-in-Chief to the President, the power to declare war rests solely with the Congress. Further, even though the president is in "charge" of the military, the power to determine the size of the armed forces, the rules that govern the military, and the funding for the military forces and their equipment are vested only in the Congress.

The purpose of this chapter is to provide a quick look at the general structure of the U.S. government, and how the Department of Defense, the Air Force and their armament programs fit into this framework. This will provide a conceptual backdrop for understanding the environment within which the F-16 program office must operate. With this as a setting, Chapter Five will look at how a program is managed.

Congressional Involvement in Acquisition

The Unites States has a bicameral legislature, or two-house system: the Senate with two representatives from each state (100 members) and six-year terms; and the House of Representatives with proportional representation (435 members) and two-year terms. Congress alone has the authority *to declare war…to raise and support armies…and maintain a navy…and to*

make rules for the government and regulation of the land and naval forces.[3] The work of Congress is accomplished in Committees. The Senate Armed Services Committee (SASC) and the Senate Appropriations Committee (SAC) authorize defense efforts and appropriate money. The House has parallel committees — the House Armed Services Committee (HASC) and the House Appropriations Committee (HAC) that, like the SAC, provides new spending authority for defense programs.

In most other countries the Government's budget is discussed and debated but rarely changed. In the U.S. system it is always changed. As an example, in the Fiscal Year 1998 budget, the Office of Management and Budget (OMB) identified a list of 254 programs or projects not requested by the executive branch that were added to the defense budget. The opposite is just as normal, where programs are zeroed out of the budget. This balance-of-power mechanism is a key differentiator of the American political model.[4]

Historically, Congress has always enjoyed a significant voice in acquisition. At the beginning of the 19th century when the nation was still young, Congress issued the first government-wide procurement statute mandating executive-legislative appointment of what we today call "contracting officers." Congress continued to play a significant role in acquisition throughout the last century, including the methods of procurement — formal advertising, creating advisory boards, and dictating the size and speed of ships. Throughout World War I and II Congress passed legislation to prevent unscrupulous contractors from overcharging the government.

The modern era of congressional involvement in acquisition began with the Armed Services Procurement Act of 1947. This law standardized contracting methods used by all of the services. As a result, the first joint DoD regulation was created — the Armed Services Procurement Regulation (ASPR).[5] In the last twenty years the amount of legislation involving the defense business has increased. During the Reagan administration, along with the significant increases in the defense budget came more Congressional oversight. Almost every two years, major legislation was passed to change some aspect of the acquisition system — organizational structure, policies, ethics requirements, and the education and training of the acquisition workforce. For the F-16 program over the last several years, congressional involvement has included increased purchases for new aircraft, with the latest buy four aircraft in the FY 2000 budget.

Congress and The Budget

"The power of the purse has always resided in Congress; it represents its ultimate weapon in dealing with the executive branch."[6] In February every year, the administration submits the President's budget to Congress. The budget goes to the House and Senate budget committees, which issue a Budget Resolution that provides the top line budget for DoD. "Every committee wants a hand in budget making. Hence, Congress has a two-step financial procedure: authorization and appropriations. Congress first passes authorization laws that establish federal agencies and programs and recommend funding them at certain levels. Then it enacts appropriations laws that allow agencies to spend money. An authorization then is like an "IOU" (I owe you) that needs to be validated by an appropriation."[7]

This process, from the President's budget submittal through approval by Congress and the final signature by the President takes approximately eight months. Debates, hearings, and the committee processes — aggravated by the controversial nature of the issues — often delay the passage of bills in Congress. To ensure the smooth operation of government under these conditions, Congress may pass interim legislation, referred

to as "continuing resolutions," that allows government agencies to continue all existing programs, at prior-year amounts. Such interim legislation does not usually allow for the initiation of any new programs. The implementation of an interim budget has become the standard method of operations since 1979.

Congressional Oversight

The SASC and HASC conduct their "oversight responsibilities...primarily within the context of the Committee's consideration of the annual defense authorization bill."[8] Every spring, key administration personnel (such as the Secretary of Defense and the Secretaries of the Army, Navy and Air Force) along with the senior military leaders are called to testify before the appropriate subcommittees on the President's budget. The subcommittees will also have hearings with other key defense acquisition personnel on the budget, acquisition policy and programs. When Congress has a specific interest or concern, investigative committees will be created. They will have hearings on specific problems or issues which arise, or when Congress is interested in a department's implementation of prior legislation. Again, government acquisition personnel, along with industry or industry-association representatives, may be called to testify.

The Cabinet

To provide advice to the President and to "run" the governmental agencies, the President appoints Cabinet members. They serve as the advisors to the President on policy matters. Members of the Cabinet, unlike those in other countries, are responsible to the President rather than the legislature. They serve at the pleasure of the President and can be removed from their jobs by the President for any reason. Traditionally, Cabinet members are from the same party as the President and share the same political beliefs. The Cabinet member responsible for defense is the Secretary of Defense.

To assist the politically appointed Secretary of Defense, the President also appoints hundreds of other "political appointees" to serve in key positions such as Secretary of the Air Force, and key acquisition positions such as the Under Secretary of Defense (Acquisition, Technology and Logistics) and Assistant Secretary of the Air Force (Acquisition). In the DoD there are approximately 240 political appointees, of which 48 require Senate confirmation.[9]

DEPARTMENT OF DEFENSE

The Department of Defense (DoD) is divided into two elements — the warfighting elements and the acquisition and logistics support elements. Figure 2-1 depicts an overall view of the department with the warfighting elements being the Unified Commanders for each theater. The three major organizations involved in acquisition within the DoD are the Army, Navy, and Air Force. Other defense agencies play a support role to acquisition, such as the Defense Contracting Management Agency (DCMA) that provides contract administration for the department, and the Defense Contract Audit Agency (DCAA) that provides audit support for the services and defense agencies.

The Office of the Secretary of Defense (OSD)[10] is the core staff that provides advice and support to the Secretary. OSD consists of approximately 2,000 personnel that, through the Secretary, sets "general policies and programs" and provides "general direction, authority, and control" of the military departments and defense agencies. The Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) is charged with responsibility for acquisition matters.

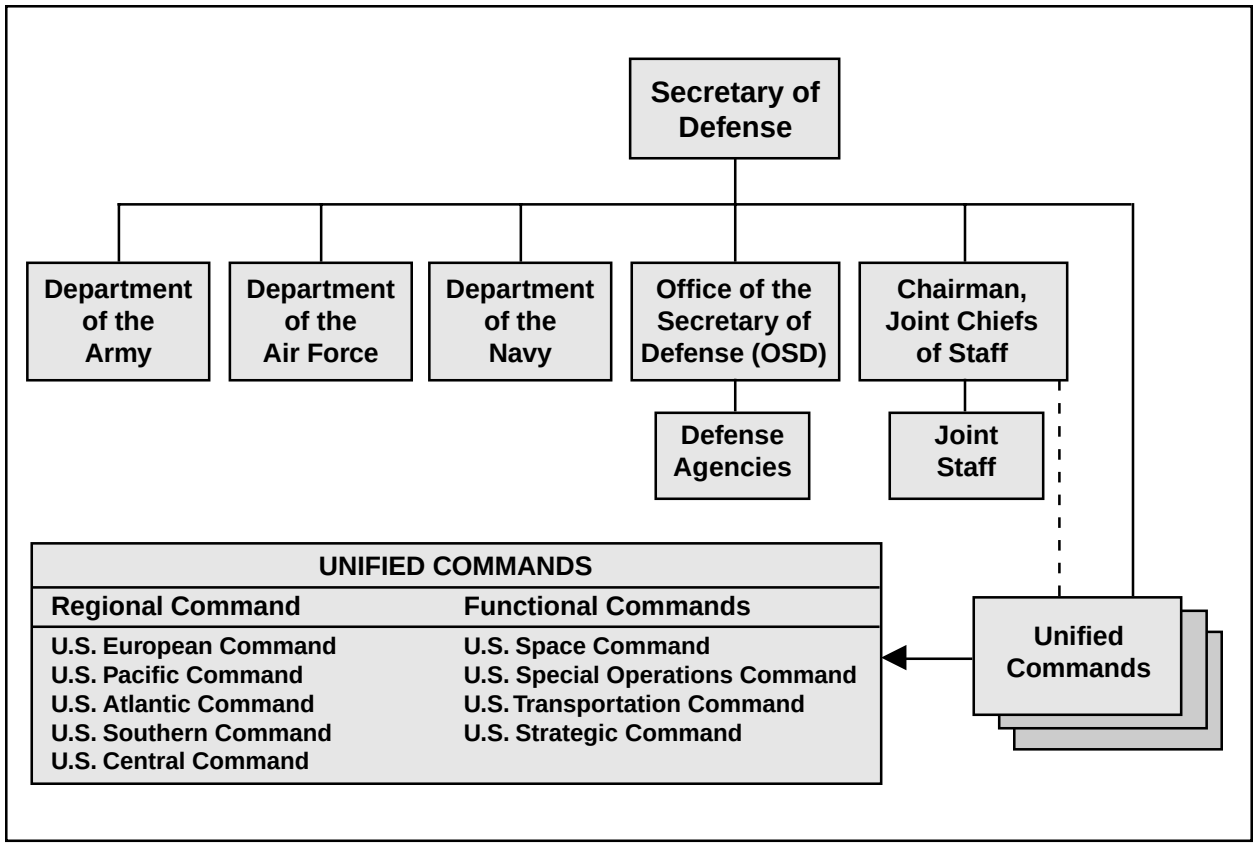


Figure 2-1. Department of Defense

The 2001 fiscal year budget for the Department of Defense (DoD) is over $293.2 billion, of which $98.2 billion is for the research, development and production of weapon systems. It is 3.0 of the Gross Domestic Product (GDP) and 16.2 percent of the overall government budget. The Air Force portion of the defense budget was $85.6 billion in FY 2001—an increase of $3.5 billion from the prior year. The modernization portion was $34.6—a rise of $1.4 from FY2000. In the last several years there has been political pressure to increase the defense budget to meet modernization and operating needs of the Services.

Defense Acquisition Structure

In 1986 a Presidential Blue Ribbon Commission on Defense recommended a change in the management of acquisition programs. They called for the Department to "establish unambiguous authority for overall acquisition policy, clear accountability for acquisition execution, and plain lines of command for those with program management responsibilities." Included in those plain lines of command were to be "short lines of command." Both Congress and the President accepted these recommendations and created the current structure. This was a major reporting change for the military services. In essence removing the responsibility for defense acquisition programs from the "military" side to the "civilian side" of the organization. These issues are still of concern and have been repeatedly raised over the last 10 years.

Out of the above efforts, the popularly coined "*acquisition czar*" position was created. Officially titled, the Under Secretary of Defense (Acquisition, Technology and Logistics),[11]

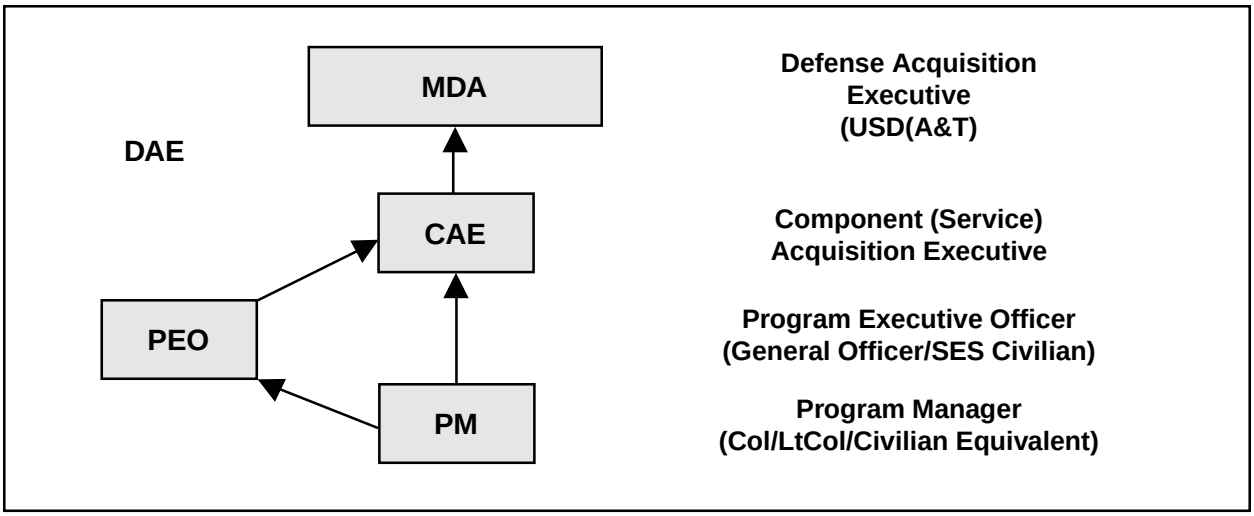


Figure 2-2. Acquisition Program Reporting

(USD/AT&L) or the Defense Acquisition Executive (DAE), the "acquisition czar" was given overall responsibility for the policy and management of the acquisition system. Similar positions were created within the Services. To create "short lines of command," the Program Executive Officer (PEO) structure was created with four levels of management. The lines of command between the Service Acquisition Executive (SAE) and the program manager are limited to two (see Figure 2-2).

The Air Force Acquisition Organization

The Air Force is a separate department within DoD with the requirement, by law, to train,

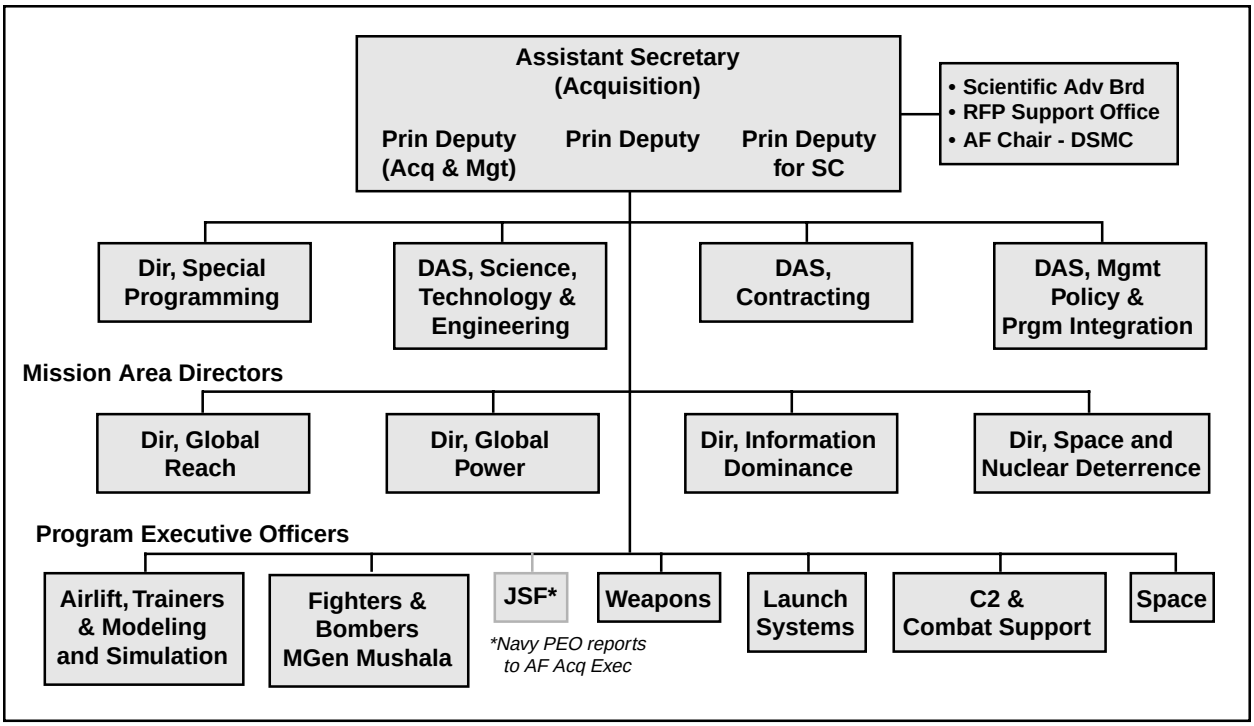


Figure 2-3. Office of the Assistant Secretary of the Air Force (Acquisition)

organize, and equip its members. The acquisition executive is the Assistant Secretary of the Air Force (Acquisition) — (ASAF (A)) (see Figure 2-3 for organization structure). He has three principal deputies. The Principal Deputy (Acquisition and Management) oversees the management of Air Force acquisition programs, acquisition reform, and acquisition training and education. This individual currently holds the position of chairman of the NATO Airborne Early Warning and Control Program Management Board of Directors. The Principal Deputy (Acquisition) provides management direction of programs and interface with the user[12] and the Hill. Recently a Principal Deputy for Business and Information Management was created to increase the management emphasis on software and computer problems.

To help in the management of programs the Air Force has seven Program Executive Officers (PEOs), responsible for a number of mission-related programs, which collectively comprise a PEO's portfolio. Six of the current seven PEOs have portfolios grouped into areas, such as fighters and bombers, weapons, airlift, trainers and modeling and simulation, space, launch systems, and command, control and combat systems. A seventh PEO (and Program Manager) manages the Joint Strike Fighter (JSF). The PEOs are a field unit, not part of the headquarters staff, and have small staffs, consisting of seven personnel for each office. A typical PEO will have oversight of five or six programs, each managed by a Program Manager, who is held responsible for ensuring that cost, schedule and performance aspects of acquisition programs are executed within an approved program baseline. The PEO for the F-16 is Major General Michael Mushala (Fighters and Bombers).

Air Force Materiel Command

The main field level organization involved in acquisition is the **Air Force Materiel Command (AFMC)**. Headquartered at Wright-Patterson AFB, Ohio, it employs approximately 100,000 personnel. Its mission is to manage the Air Force research, development, test, and acquisition efforts and to provide logistics support for Air Force weapons systems. Specifically, they perform scientific research and depot maintenance, provide technical support for existing weapon systems (such as the F-16); and certifies and manages system safety, integrity and suitability for combat use. It also provides the manpower and process support to the PEO structure.

The division of responsibility for acquisition program work rests with either a Product or Logistics Center. Weapon systems with significant development or production efforts remaining are usually managed by one of four Product Centers. These centers are primarily responsible for development, acquisition, testing, and fielding of new or modified weapon systems. The four centers are:

- Aeronautical Systems Center, Wright-Patterson AFB, Ohio
- Space and Missile Systems Center, Los Angeles Air Force Base, California
- Electronic Systems Center, Hanscom Air Force Base, Massachusetts
- Air Armament Center, Eglin Air Force Base, Florida

Existing weapon systems and military equipment are managed by one of three air logistics centers. These centers have responsibility for logistics support and maintenance of weapon systems and equipment. They are:

- Ogden Air Logistic Center, Utah
- Oklahoma City Air Logistics Center, Oklahoma

- Warner-Robbins Air Logistics Center, Georgia

In support of weapons development, AFMC has two test Centers — Arnold Engineering Development Center, Tennessee, and Air Force Flight Test Center at Edwards AFB, California. AFMC is also home of the Air Force Research Laboratory (AFRL). The AFRL, at Wright-Patterson AFB, is the science and technology organization for the Air Force. They perform internal research and leverage the capability of other national scientific organizations, industry, and academia. The Air Force Security Assistance Center (AFSAC), likewise at Wright-Patterson AFB, is also part of AFMC, and manages foreign military sales programs totaling in excess of $20 billion in support of more than 80 foreign countries.

THE ACQUISITION SYSTEM

To discuss the acquisition management system it is necessary to mention two other decision support systems used to manage the department. They are the Requirements Generation Process and the Planning, Programming, and Budgeting System (PPBS). All three systems are designed to assist senior decision-makers such as the Secretary of Defense, USD (AT&L), Secretary of the Air Force and other senior officials in making critical decisions. The output from these systems provides the money, authority, people and other resources necessary to execute programs and deliver a product to the warfighters. Figure 2-4 provides a conceptual look at the systems and the overlap between the systems. While these systems interact continuously, they also operate separately. Decisions and issues overlap from one system to the other; and each impacts on the ability of the acquisition system to deliver timely, cost-effective systems.

The Development of Military Requirements

The process to determine future military needs is referred to as the *Requirements Generation Process*. All acquisition programs must be based on identifiable, documented, and validated mission needs. The Joint Chiefs of Staff (JCS) is the organization responsible in DoD for setting requirements policy. For large dollar programs, referred to as Major Defense Acquisition Programs (MDAP), or Acquisition Category (ACAT) I programs, the JCS is the approval authority for the requirement. For smaller dollar programs,

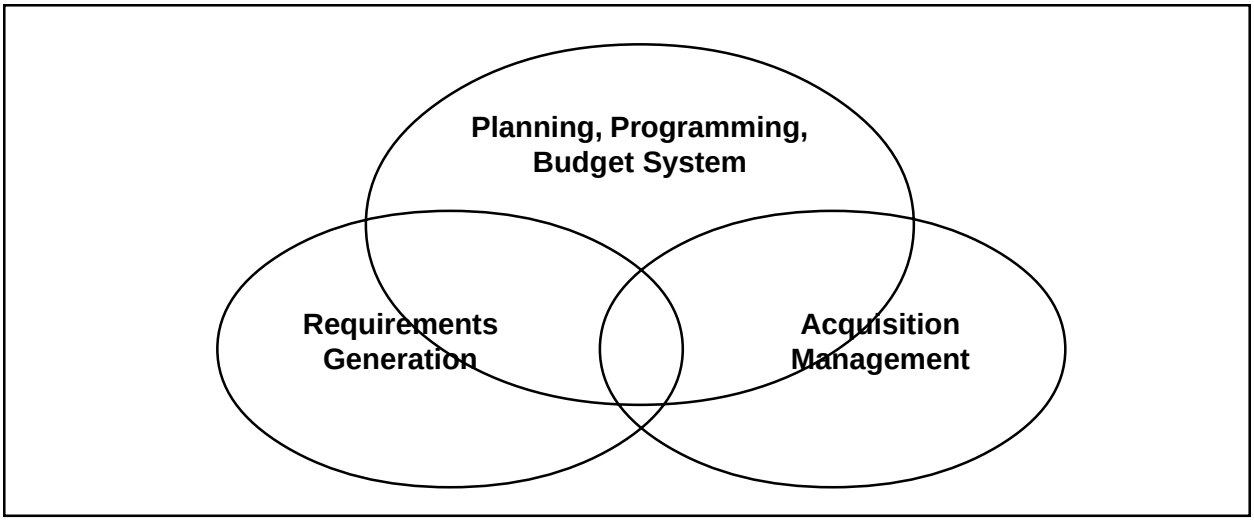


Figure 2-4. Three Decision Making Support Systems

referred to as ACAT II and III programs, the individual services develop and approve their own requirements in coordination with the other services and defense agencies.

The Air Force Requirements Processes

In the Air Force, the requirements process is decentralized with the major operational command for a program such as the F-16 being the Air Combat Command (ACC) located at Langley Air Force Base, Virginia. The ACC Director of Requirements (ACC/DR) as part of its modernization reviews, identifies deficiencies, evolving threats or technological opportunities, and then generates new military requirements. DR then writes the requirements documents called the Mission Needs Statement (MNS) and the Operation Requirements Document (ORD). They prioritize programs and then advocate within the Air Force budgeting process for money to fulfill their needs. In the Headquarters Air Force, the Deputy Chief of Staff for Air and Space Operations (AF/XO), and specifically the Directorate of Operational Requirements (AF/XOR), reviews and coordinates MNS and ORDS. They guide those programs requiring approval and validation through the JCS process. The Chief of Staff is the approval authority for all MNS and ORDs for ACAT II and III programs.

Planning, Programming, and Budgeting System

The Planning, Programming, and Budgeting System (PPBS), designed to link strategic planning activities to the budget, is unique to the DoD. The PPBS is a cyclic process, looking out five years, with annual reviews of the resources necessary for the department to operate. In each phase, OSD issues guidance; the Air Force and other organizations request resources; and the Defense Secretary issues a decision.

The planning portion of the PPBS begins about two years in advance of the fiscal year in which the budget will be requested. The Air Force, with OSD, conducts a six-month process beginning in the fall and ending in March. The overall framework for planning is provided by the President in his National Security Strategy and the National Military Strategy. This phase begins when the JCS issues the Joint Planning Document (JPD) that proposes long-term strategy and force levels necessary to achieve national military objectives. Based on the JPD, OSD issues the Defense Planning Guidance (DPG) document that provides the strategic mid-range-planning framework for developing the Air Force Program Objective Memorandum (POM).

The programming phase is next. The Air Force responds with their POM stating requirements for resources (such as personnel and supplies) and justifying acquisition programs. Then, an assessment of the capabilities and risks associated with the proposed forces and programs is made. A period of formal discussions (program review cycle) follows between the Air Force, OSD, and the JCS. Once an acceptable level of resources and programs is agreed to, the Secretary of Defense issues a Program Decision Memorandum (PDM).

The final phase is the budgeting phase. The PDM has set the resource and acquisition program levels. These are translated into the Air Force annual budget, which is in turn reviewed by OSD. Based upon OSD comments, the Air Force submits a Budget Estimate Submission (BES) in September. After resolution of issues caused by the BES submittal, OSD issues program budget decisions and the DoD budget is finalized. What survives is voluminously documented and submitted to OMB for inclusion in the President's Budget, which is submitted to Capitol Hill in February.

The Acquisition Management System

The Acquisition Management System consists of the policies and procedures governing the operations of the entire DoD acquisition system. There are three documents that guide the defense acquisition business. The first is DoD Directive 5000.1, The Defense Acquisition System, which identifies the key officials and panels for managing the system and provides broad policy and principles for all acquisition programs. DoD Instruction 5000.2, Operation of the Defense Acquisition System, provides detailed procedures to implement the broad policies of DODD 5000.1. And finally, the third document is DoD Regulation 5000.2-R, which provides guidance for the management and oversight and review of major defense acquisition programs, and major automated information systems

The acquisition system is designed around a series of life-cycle phases. It begins by conceptualizing a system and extends to actually developing and fielding a system, and eventually phasing it out of the inventory. More colorfully it is described as a "womb to tomb" system. The life cycle model shown in Figure 2-5 is divided into three main activities. They are: (1) the Pre-Systems Acquisition activity which includes the Concept Exploration and Component Advanced Development Phases, (2) Systems Acquisition, which includes the Systems Integration, System Demonstration, Low Rate Initial Production and Full Rate Production and Deployment phases, and (3) Sustainment which includes the Sustainment and Disposal phases. Figure 2-5 also depicts the milestone decision points, which a program must pass to continue to the next phase. A program can enter the process at any milestone — A, B, or C (or within phases).

The milestones are decision points. At each milestone, the decision maker, the Milestone Decision Authority (MDA) (see Figure 2-6), will make a determination whether or not the system is programmatically and technologically ready for the next phase. As an example, an Air Force Avionics system begins the System Integration work effort with two goals — demonstrating certain technology and developing a successful prototype. The MDA evaluates how successful the program performed its goals and what its projected cost, schedule and technical risks are for the next phase. If the goals have

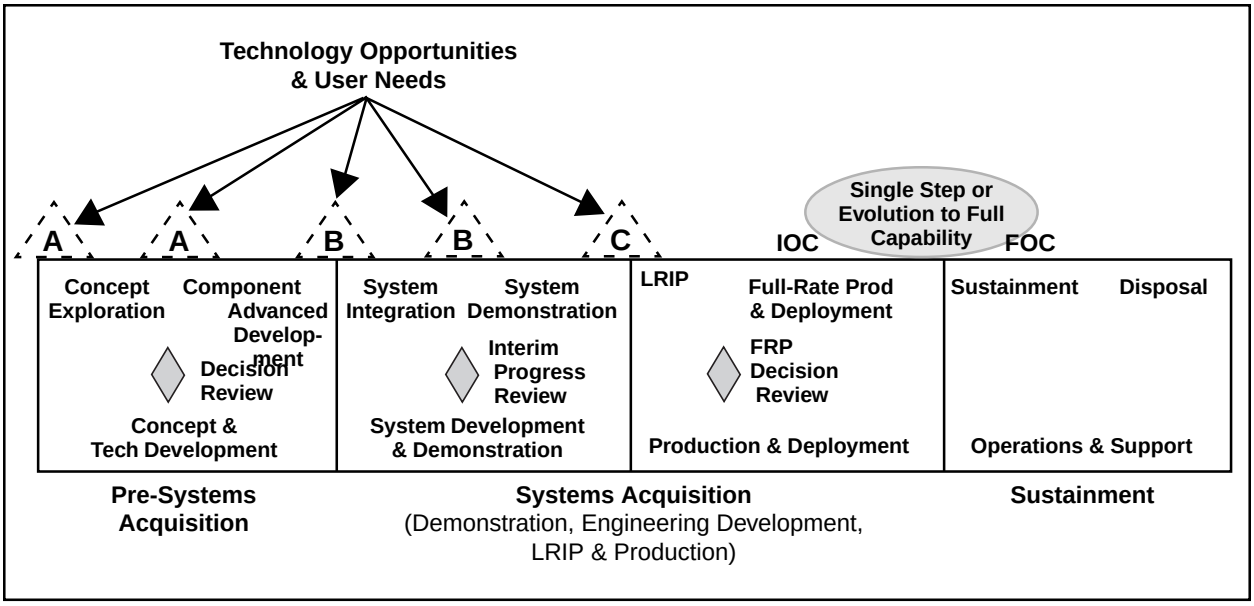


Figure 2-5. Defense Acquisition Management Framework

Category	Management Responsibility/MDA
ACAT ID*	USD (AT&L)
ACAT IC	Generally the Service Acquisition Executive
ACAT IAM	Assistant Secretary of Defense (C3I)
ACAT IAC	SAE
ACAT II	SAE
ACAT III	Delegated to PEO/PM/acquisition command

*Acquisition Category (ACAT)
D=Defense, C=Component (Service), M=Major Automated Information System

Figure 2-6.
Categories of Acquisition Programs and Milestone Decision Authorities (MDA)

been met and the performance parameters are acceptable, the MDA approves the program to begin the next phase — System Demonstration. Of course, if the program has not met its goals and the risks are perceived to be too great, the program could be cancelled or additional technical efforts may be undertaken. For Major Defense Acquisition Programs, the Defense Acquisition Board (DAB) (to be discussed later) is the MDA. This is an event-driven process and some programs will go through a phase in one or two years, whereas another may take four or five years.

Defense Acquisition Board (DAB)

This body has been called the "corporate-level vice-presidents of DoD weapons acquisition." As the senior review board, it is chaired by the USD (AT&L) for ACAT I programs. At each milestone, the DAB authorizes program initiation or continuation. Each DAB review assesses the program accomplishments during its current phase and determines whether or not it is ready for the next acquisition phase. When the DAB approves continuation, it provides exit criteria, which must be met to continue to the next phase.[13] In the case of the F-16, which is now an ACAT II program, the OSD has delegated all authority to the Air Force level.

Integrated Product Teams (IPT)

The IPT concept was introduced to Air Force program offices in the early 1990s. The acquisition community found the concept worked well and expanded it as part of the Department's Acquisition Reform efforts. With the change in administrations in 2001 and the corporate style approach to managing the DAB process the role of the IPTs will probably change over the next couple of months. For that reason only the Overarching IPT[14] will be discussed here. The Program Office IPT is discussed in Chapter 5. The Overarching IPT is the highest organizational level IPT and is used in managing ACAT level I programs. An OSD official assigns each program to an OIPT lead. There are four OIPTs, and the officials leading them (see Figure 2-7).

Typical OIPT membership is the Program Manger, PEO, Service Staff, Joint Staff, USD (AT&L) staff and other senior OSD staff members involved in oversight and review of a particular program. OIPTs meet as necessary over the life of a program. The goal is to resolve as

OIPT	OSD Official
Strategic& Tactical	Director of Strategic and Tactical Systems
Space	Assistant Deputy Under Secretary of Defense (Space and Acquisition Management)
C3I/AIS	Deputy Assistant Secretary of Defense (C3I)

Figure 2-7. OIPTs and OSD Officials

many issues and concerns at the lowest level possible, and to expeditiously escalate issues that need to be resolved at a higher level, bringing only the highest-level issues to the MDA for decision.

THE PROCUREMENT/ CONTRACTING SYSTEM[15]

The Department of Defense is the largest buyer in the world. It spent, on contract, approximately $109 billion in Fiscal Year 1998, $116 billion in FY 1999, and $122B billion in FY2000. The Air Force in the same time frame spent $35.3 billion, $36.5 billion and $38.9 billion**,** respectively. The items bought range from developing major weapon systems, such as the F-22, to buying repair services for copiers. It is a large, complex system with hundreds of buying offices located throughout the world. The basic policy of the U.S. Government is that products and services will be bought, if possible, competitively.

The regulation governing procurement for the DoD is Federal Acquisition Regulation (FAR). The Director, Defense Procurement, who is the USD (AT&L) staff, sets policy for procurement within the department. In turn, the Deputy Secretary for Contracting (SAF/AQC) is functionally responsible at the service headquarters level for Air Force contracting policy. The actual awarding of contracts in the Air Force is decentralized. The main contracting organizations within the Air Force are located with the Air Force Materiel Command. Weapon Systems Contracting is done at centralized agencies, such as the Air Force's Aeronautical Systems Center, at Wright Patterson Air Force Base.

There are two general types of contracts used in DoD contracting—Fixed Price and Cost Reimbursement. Fixed price type contracts, as the name implies, set the price to be paid to the contractor on the day the contract is awarded. This type of contract is used where the item is well defined, for example, a jeep or an existing missile. For newly developed equipment, where there are many technical and manufacturing risks, a cost-type contract is used to share the risk between the government and the contractor. In a cost-type contract, the government reimburses all allowable and reasonable costs, plus a small fee. For a more thorough discussion of contract types, see FAR, Part 16.

Contractors are competitively selected for a major acquisition contract through a highly structured process of "Source Selection." This is done to ensure fairness and transparency in the selection of a source. A typical source selection starts with the "Contracting Officer"[16] issuing a Commerce Business Daily (CBD) announcement for a pre-proposal conference.[17] All interested bidders are invited. Attendees will be briefed on the military requirement and an approximate schedule of events. The next event is issuance of a "draft" Request for Proposal (RFP) looking for industry comments for changes and problems. Finally, all interested contractors are provided an RFP. Interested contractors submit

a proposal. A source selection team evaluates proposals. Their assessment will be briefed to the Source Selection Authority (SSA), a senior government official, who will make the actual selection. For large dollar and highly controversial weapon system acquisitions, the Source Selection Authority could be the Secretary of the Air Force or the SAE. Most often it is a Program Executive Officer or another senior official. Once the contract is awarded the program office will assign contract administration activities, such as payment and quality assurance, to the Defense Contract Management Command, which has offices located in various regions throughout the United States. Management of the contract, as it relates to key program requirements, will be maintained in the program office. The Defense Contract Audit Agency (DCAA) plays a significant role in supporting program offices with contract audits and accounting and financial advice during the negotiation, administration, and settlement of contracts and subcontracts.

The U.S. defense acquisition system is highly regulated with laws and policies covering every area of procurement, such as the contractor's financial systems, records keeping, socio-economic requirements, subcontracting, and ethics. But, it is also a transparent system designed to ensure fair treatment of vendors with equitable opportunities to bid on new defense work.

DEFENSE ACQUISITION AND TECHNOLOGY WORKFORCE

About 149,000 personnel, military and civilian, work in the Defense Acquisition and Technology workforce.[18] In the Air Force currently 20,600 military and civilians position in the acquisition and technology workforce as shown in Figure 2-8,[19] a dropped 2900 from the previous year. There is a subgroup within the Acquisition and Technology Workforce referred to as the Acquisition Corps," i.e., those that fill a Critical Acquisition Position (CAP) (3,337 positions). A CAP, for GS-14 and Lieutenant Colonel positions, requires appointment by only those personnel who have met all the defense acquisition experience, training and education requirements.[20]

The Acquisition Corps is only about a decade old. In 1990 Congress passed the Defense Acquisition Workforce Improvement Act (DAWIA). DAWIA's purpose was to create a workforce fully proficient and knowledgeable in the business of acquisition. Education, training, and experience requirements were established for each acquisition position based on the level of complexity of duties required for that position.

The Defense Acquisition University (DAU) was established to provide for the formal education and training of the workforce. DAU as of

FY 2001		FY 2000		CAP Positions	
Civilian	13,280	Civilian	14,009	Military	1,237
Officer	5,885	Officer	7,872	Civilian	2,100
Enlisted	1,495	Enlisted	1,709		
TOTAL	20,660	TOTAL	23,590	TOTAL	3,337

Figure 2-8. Acquisition and Acquisition Corps Positions

September 2001 reorganized its campuses and regions. Five regional campuses now include:

- DAU Northeast Campus at Fort Belvoir, VA (also the DAU Headquarters location)
- DAU Midwest at Wright-Patterson AFB, OH
- DAU South at Huntsville, AL
- DAU Tidewater at Patuxent River, MD
- DAU West at San Diego, CA

Additional offices of instruction fall under these campuses at several previous DSMC locations. Essentially for FY 2001 and much of 2002, courses will continue at their usual previous locations as the University transitions to the new structure.[21] During the rest of the transition period (FY 2002 and 2003) course locations will probably change. DAU offers over 80 courses with 1200 offerings covering all acquisition career fields. In FY 2000, DAU graduated more than 40,000 students, with current projections showing this number increasing in the out years.

A Typical Career Path

Every acquisition career or functional field defines the education, experience and training requirements for its members. Examples of career fields are Financial Management, Logistics, Manufacturing, Quality Assurance, Contracting, Program Management, Engineering, and Test & Evaluation. When individuals are hired into the workforce, they enter at Level I, the first of three levels of progression. Generally, individuals possess an appropriate degree, and once hired, receive a combination of on-the-job and formal training.

For program management the formal training is ACQ[22] 101, the Fundamentals of Systems Acquisition (see Figure 9) for career training). After several years on the job, an individual will continue to receive on-the-job-training plus attend the ACQ 201, Intermediate Systems Acquisition Course and PMT[23] 250, Program Management Tools Course, to achieve their level II certification. With continued successful performance on the job, and by taking the PMT 352, the Program Management Course at the Defense Systems Management College (DSMC), an individual

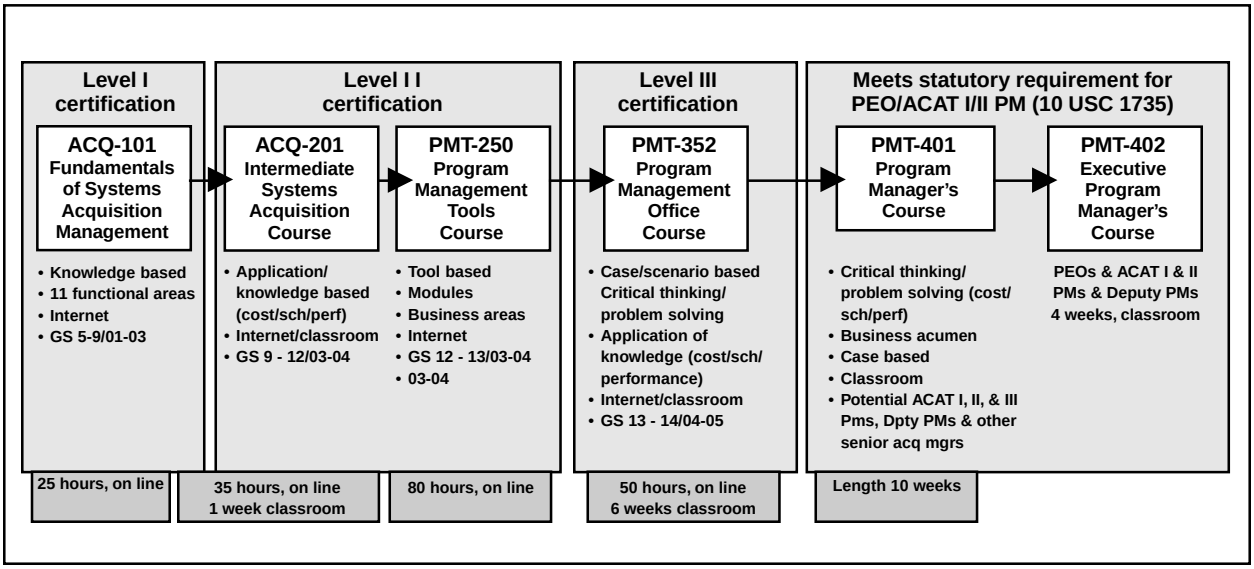


Figure 2-9. Program Management Career Track

can achieve Level III certification and be eligible for a critical acquisition job. A critical acquisition job is a senior position — GM/S-14[24] for civilians and lieutenant colonel and above for military. The final step in the program management career field would be competitive selection to attend the ACQ 401, the Program Managers' Course, and then selection to manage a major system program and attendance at the PMT 402, the Executive Program Managers' Course. These three levels meet the training and experience requirements to become a major systems program manager. Similar types of education and training requirements exist for all acquisition career fields.

Of the three military services, the Air Force has traditionally had the most military working in acquisition. One of the contributing factors for the difference is the Navy and Army's tradition of military personnel spending the first several tours in an operational environment. Later in their careers, Army and Navy personnel move from an operational job, such as an artillery officer or pilot, into the acquisition workforce. This approach is similar to the Air Force's tradition of moving its rated personnel, pilots and navigators, into the acquisition workforce, at about the 8-10 year point in their career. However, the Air Force also has a significant number of career acquisition military personnel who begin and finish their careers in acquisition. Military officers fill most program management positions, although one of the features of DAWIA was to increase the number of program management positions available for civilians.

To ensure personnel continue to maintain or grow their skills and knowledge, the Department has mandated 80 hours of professional continuing training every two years. This program is designed to keep the workforce current with acquisition reform changes as well as functional and technical advances, and generally to improve the business knowledge and leadership competencies of the workforce.

COOPERATION AND ARMAMENT SALES

International Armament Cooperation has been a key component of the Department of Defense's strategy for several decades. The F-16 multinational production program is a prime example of an aircraft developed and produced as part of a cooperative effort. It is also an example of a successful armament sales program, with fourteen additional nations currently flying the F-16s. Nowadays, the pressures of tight defense budgets and increasing operational activities with coalition forces make international armaments cooperation an even more attractive proposition. By sharing development and production costs, each national partner can buy more military power at less cost. Standardizing equipment, particularly with our NATO allies, can also lead to shared logistics lines, making the fighting forces more capable, again at less cost.

The DoD has two approaches to working with our friends and allies either as Cooperative Program for research, development and production or as part of a Foreign Military Sales (FMS) program. Under the general rubric of Security Assistance, the FMS program provides military and economic assistance to our allies. FMS includes the sales of military equipment, education and training of foreign military, and loans or grants for the purchase of U.S. equipment. Arms sales in the United States are conducted in two ways: government-to-government (referred to as FMS) or foreign government to a U.S. contractor (referred to a Direct Commercial Sale). Through FMS, allies and friendly nations spent an estimated *$18.6 billion dollars in Fiscal Year 2000.*[25]

Both the executive and legislative branches play significant roles in Cooperative Acquisition and Security Assistance. Congress provides the legal basis for executive branch actions in the Foreign Assistance Act, Foreign Military Sales Act, Arms Export Control Act, and Export Administration Act (which has expired and has not been renewed). Besides providing the legal basis for arms sales and transfers, Congress is involved in several other ways. As part of its routine procedures, the department is required to notify Congress whenever it sells significant military equipment with a value over $14 million to a foreign government, or when an international agreement for a cooperative acquisition project is signed, or in certain cases, proposed for signature. In some cases, Congress may pass specific legislation denying an arms sale. One of the most famous examples of this type of congressional involvement was the passing of the "Pressler Amendment"[26] which restricted the sale of F-16s to Pakistan. This, however, is extraordinarily unusual. Usually, the mere threat of legislative restriction will cause the executive department to restructure an arms sale, as was the case with the F-16 aircraft sale to Saudi Arabia.

In the executive branch, the three primary departments most heavily involved in security assistance and cooperative programs are the Departments of Defense, Commerce and State. The Department of State (DoS) has the overall responsibility for the continuous supervision and general direction of the security assistance program. The Secretary of State determines whether or not there will be a security assistance program sale to another country. The State Department makes its decisions based upon the foreign policy and national security implications of a transaction. They must answer specific questions. Does this transaction protect and promote U.S. interests throughout the world? What are the political, economic, human, environmental and security impacts of this transaction? They also maintain the International Traffic in Arms Regulations (ITARs), which provides the rules for the registration of, and import and export licensing of all direct commercial imports and exports of armament into and out of the United States.

The Department of Commerce has responsibility for setting policy and licensing for export of equipment that has primarily a commercial use but can have a military use, often referred to as dual use items. A multitude of other organizations is involved in Security Assistance — the National Security Council, Defense Threat Reduction Agency, Security Assistance Offices and Offices of Defense Cooperation in all major foreign capitals and other organizations.[27]

Within DoD, the Under Secretary of Defense for Policy (USD (P)) is the principal national security and security assistance adviser to the Secretary. Reporting to the USD (Policy) is the lead agency within DoD for security assistance — the Defense Security Cooperation Agency. Cooperative acquisition programs have a different reporting chain of command with responsibility resting with the Director, International Cooperation, within the office of the USD (AT&L). Within the Air Force, the lead office for policy and oversight of security assistance and cooperative acquisition programs is the Deputy Under Secretary of the Air Force for International Affairs (SAF/IA). Air Force Materiel Command, Director of International Affairs and its subordinate command, the Air Force Security Assistance Command (AFSAC), manages the security assistance program. Cooperative acquisition program management responsibility rests with the Assistant Secretary of the Air Force (Acquisition). Management of cooperative programs is part of the normal acquisition management system.

SUMMARY

This chapter has explored the political roles played by the executive and legislative branches and underscores the pervasive role that Congress plays in the management of defense programs. They establish in the law the DoD organizational structures, the policies and, of course, approve the programs and money. The system has several other significant features. The acquisition organization is large, authority and responsibility are distributed to many levels and it is geographically dispersed throughout the country. The key players and organizations involved in acquisition are many — OSD, SAEs, PEOs, PMs, SAF/AQ, AFMC, ACC and others. To guide this large organization and its needs, OSD has created several decision-making structures — Requirements, PPBS, and the Acquisition System — all designed to operate simultaneously, but separately, yet with the need to coordinate, to provide military equipment lacked by the warfighting forces. Within this large organization, management arrangements, such as the PEO structure and the use of IPTs, have attempted to provide expeditious, less burdensome decision-making methods. Finally, the defense business is a $100 billion a year business relying heavily on the competitive buys of equipment to ensure reasonable prices. Closely tied to DoD buys is the sale of armaments by U.S. defense businesses, which accounts for about half the world sales. The next chapter will look at the industrial relationships between government and industry.

ENDNOTES

1. Kwame Holman on the News hour with Jim Lehrer (transcript) September 29, 1998. MsNeil.

2. Perino, Jr., George H. (Tony), "Defense Procurement, American Style, The Cultural Ingredients of Weapon System Acquisition Policy," unpublished paper, 1992, pg. 9.

3. U.S. Constitution, Clauses 11, 12, and 13.

4. For a more in-depth look at the American System prior book entitled "A Comparison of the Defense Acquisition Systems of France, Germany, United Kingdom and the United States," or the website version at http://www.dsmc.dau..mil .

5. Now called the Federal Acquisition Regulation (FAR).

6. Trask, Roger R., and Alfred Goldberg, The Department of Defense 1947-1997, Organization and Leaders," Historical Office, Office of the Secretary of Defense, Washington, D.C. 1997, pg. 15.

7. Davidson, Roger H. and Oleszek, Walter J., "Congress and Its Members," Third Edition (Washington: CQ Press, 1990), pg. 327.

8. Oversight Plan for the 105th Congress, pg. 1.

9. Source is the OSD Legislative Affairs administration and personnel office.

10. For clarification purposes, generally, when "DoD" is used it means the entire department. OSD refers to the Secretary's office.

11. Originally the title was Under Secretary of Defense (Acquisition). I have used the current title to avoid confusion. By law these political appointees are required to bring a significant industrial background to qualify for the position.

12. The user is a term used to denote the warfighting or other organizations that "use" the equipment the acquisition organizations buy. In the case of the F-16 there are several organizations, but the primary one is the Air Combat Command located a Langley Air Force Base, Virginia.

13. Note that the DAB review only approves a program to proceed; it has no direct role in the resource allocation process.

14. The other two are the (1) the Working IPT and (2) the Integrating IPT. Both are designed at the staff levels of the headquarters to improve the decision making process.

15. The terms procurement, contracting and acquisition can often be used somewhat confusingly even for acquisition professionals. In the U.S., "acquisition" is meant to be the all-encompassing term, while procurement and contracting are meant to be a subset of acquisition dealing with the awarding and management of contracts. To make it even more confusing, Congress often passes legislation using all three terms interchangeably or often with specific meanings.

16. The only person authorized by law to award or modify contracts.

17. The CBD is scheduled to be replaced by "Fedbizops" on 1 January 2002. The website is www.fedbizops.gov.

18. In the Department of Defense when one talks about the acquisition workforce this has a specific legal meaning. There are various measures of the acquisition workforce: 1) DoD Instruction 5000.58, acquisition organizations, 355,299 people; 2) Pub.L. no. 101-50, Defense Acquisition Workforce Improvement Act, 105,544 people; and 3) Jefferson Solutions Report, revised Packard Commission, 177,613 people. Current number reflects March 1998 data.

19. Office of the Associate Defense Acquisition Career Manager, as of 15 Feb 01.

20. There are waiver procedures available.

21. To view the DAU course catalog, visit www.dau.mil.

22. ACQ is an acronym for "acquisition."

23. PMT indicates Program Management Training.

24. GM/S – General Manager or General Scale and refers to the Program Scale/Rank for Civil Servants.

25. According to a study "Conventional Arms Transfers to Developing Nations, 1993-2000," as quoted in the New York Times, August 20, 2001. In recent years the U.S. has had over 50 percent of the world's arms sales.

26. Named for Senator Larry Pressler, Republican South Dakota.

27. The Defense System Management College, Fort Belvoir, Virginia conducts training for management of Cooperative Acquisition programs.

Chapter 3

INDUSTRY-GOVERNMENT RELATIONSHIPS

Introduction

The defense industry theme of the last five years has been *globalization.* On both sides of the Atlantic and even in the Pacific, defense companies have moved to merge and form partnerships with foreign firms. In the United States, the British firm BAE is now the fourth largest defense company.[1] The year 1999 saw the creation of a transnational company — EADS. Three companies from France, Germany and Spain formed the European Aeronautic, Defense and Space (EADS) Company. In June of this year, Raytheon and Thales (formerly Thomson CSF) announced a cross-Atlantic joint venture. Whether it is across the Atlantic or across borders, industry and government relationships are changing. As companies have moved ahead to deal with changing international relationships, governments have struggled to adjust their policies and deal with the politics of this changing world.

The two countries in this study — France and the United States — have been on the forefront of these efforts. But they come from different perspectives. The first look at these two countries reveals a rather striking difference in the size of their defense industries. As shown in Figure 3-1, the United States has by far the

Rank	Company	Country	Revenue 1999 (Billion)
1	Lockheed Martin Corp.	US	$ 17.8
2	Boeing	US	16.3
3	BAE Systems	UK	15.2
4	Raytheon Corp.	US	14.5
5	General Dynamics	US	9.0
6	EADS	Netherlands	6.0
7	Northrop-Gruman	US	6.0
8	Thomson SCF (Thales)	France	3.6
19	DCN	France	1.6
33	Dassault Aviation	France	.9
37	Giat Industries	France	.8
42	SNECMA Group	France	.7
44	SAGEM S. A.	France	.7

Figure 3-1. Selected Top Defense Firms – 1999

biggest defense industry. This is to be expected considering the significant difference in the defense budgets of both countries. However, France has recently become the second largest seller of defense equipment, and thus both a major competitor and a major cooperative partner on many research and development efforts. A second striking difference between the two countries is the concept of the relationship between government and industry. In France, it has been the tradition for the State to play a significant role in the lives of its people. The American tradition has been exactly the opposite. This chapter will provide a look at defense industries and the relationship between the government and industry.

THE UNITED STATES DEFENSE INDUSTRIAL BASE[2]

To discuss the current U.S. defense industrial base, one needs to start with the "Last Supper" in 1993. Then Under Secretary of Defense and later Secretary of Defense William J. Perry invited the CEOs of the top U.S. defense firms to dinner. Asking each of them to look to their left or right, he prophesied that by the next time they had dinner 50 percent of them would be gone. The end of the Cold War now signaled the end of large defense modernization budgets. There was just not enough defense business to go around and over-capacity was now the problem. It is a fundamental American belief that this is the private sector's responsibility. It was thus up to industry to sort out the problem, hopefully in the most efficient way. Out of this famous "Last Supper" came a wave of mergers and acquisitions as many old-time defense firms were eliminated. Hughes Aircraft (producer of a line of missiles such as the Maverick) and Rockwell International (designer, developer and producer of the B-1) are now part of the history books. "Merger mania" result in forty some aerospace firms being consolidated into three global giants — Lockheed Martin, Boeing and Raytheon[3] (Northrop-Grumman not far behind).

Background

The original American concept of the proper role for government was to define that role narrowly. That state's role was to provide for a military, a postal service, roads, and other activities, but industry was part of the private sphere of society. Even the regulation of industry was an issue; the Supreme Court finally decided this when it stated that the national government did have the right to regulate the interstate transportation of goods through the commerce clause of the constitution. This practice in the United States has been to separate the two spheres — public and private — and in the defense arena, to rely upon private industry for its needs. Notwithstanding this separation — ownership of a defense industry or not—"all of them (governments) — as regulators, licensers, subsidizers, standard-setters, rate-setters, taxers, buyers and sellers — undoubtedly exert a great variety of powerful economic influences"[4] on industry.

Historically, the United States has maintained a small peacetime arsenal system, publicly owned, but relying on the public sector industries to fill much of their needs. During World War II, military demands quickly overcame this small capability. The United States commercial industry responded to the government's call producing the millions of pieces of military equipment needed to pursue the war. With the surrender of Japan signed aboard the USS *Missouri* in Tokyo Bay in 1945, the military demobilized and the industrial base — the "Arsenal of Democracy" — demilitarized and returned to the lucrative pre-war commercial market — producing cars and household appliances. But as Winston Churchill so adequately commented, an Iron Current had descended on Eastern Europe and the Soviet Republic and we "entered the era of the "Cold War." For the next fifty years, the West

and the Soviet Empire engaged in an arms race. The United States, its allies, and the Union of Soviet Socialist Republics (USSR) continued to produce large amounts of military weapons, each generation more capable than the preceding. To support this race, defense industry became "big business."

As defense industry grew, the Department of Defense developed its own set of specialized procurement rules and regulations, a system of technical specifications and standards, Cost Accounting Standards (CAS), ethics requirements, and oversight procedures. Congress, responding to cost overruns and to various special interest groups, passed legislation imposing many new requirements on the Department of Defense and its contractors, such as set-asides of work for small businesses and domestic producers. Rather than imperil their commercial divisions with increasing costs, industry spun-off separate defense divisions. Having a separate manufacturing and technology base increased the cost of buying military equipment. An early 1990s study indicated that the defense industry legitimately charged a 20–25 percent premium because of these arcane rules and regulations mandated by the government.[5]

Traditionally, the United States has relied on a privately-owned, profit-oriented industrial base to provide most of the goods and services used by the military departments. This defense manufacturing and technology base industry can be characterized as providing high performance, high quality military equipment at high cost but with a low volume of production. Defense is currently over a $100 billion a year business. This includes over $80 billion a year for research and development and procurement of systems and equipment. Four firms — Lockheed Martin, Boeing, Northrup-Grumman and Raytheon— are the dominant businesses in defense. Three of the four firms, with Boeing being the exception, rely on defense contracts for over 80 percent of their business revenue. Historically, over the last forty years most of the U.S. defense firms have very little non-defense business.

Over the last 50 years, the Department of Defense has "primed the pump" of R&D with its investment in many new technologies. The U.S. Government supported and directed programs that produced the basic technologies that spawned numerous military and commercial innovations. These innovations, both military and commercial applications, include mainframe computers, personal computers, stealth technology, avionics for commercial aircraft, and many other technologies. As an example, in the microelectronics industry, DoD was once the dominant buyer, with almost 70 percent of the microelectronics industry sales in 1965, and it contributed significantly to that industry's investment in R&D. Today, defense accounts for less than 1 percent of microelectronic sales. In general, the defense investment over the last twenty years in R&D has been overshadowed by private sector investment in R&D. In 1997, defense R&D spending provided 30 percent of the U.S. investment in R&D. This was down from the peak years of the defense buildup in the mid-1980s when it was 46 percent of the national investment.

While DoD policy has been to rely on private sector facilities for the fulfillment of government contracts, remnants of the government's earlier "arsenal system" still remain. These public facilities are used to manufacture and repair aircraft, ships, ground combat systems, and other military equipment. They generally fit into two categories. The first category is government arsenals and depots where government personnel perform all the work. Examples of these in the Air Force include depots such as Warner-Robbins Air Logistics Center, Warner-Robbins Air Force Base, Georgia and the Ogden Air Logistics Center, Ogden, Utah. The other category is referred to as Government-Owned-

Contractor-Operated (GOCO) facilities. While it has been a slow process, the military departments have attempted to divest itself of GOCO plants.

Recent Trends

In recent years, several trends have emerged as a result of declining defense budgets. Businesses have left the defense market, companies have merged, and the Department has recognized that its defense budget could not support its modernization program as well as a separate defense industrial base. While no hard data exists, significant numbers of companies at the 3rd or 4th tier vendor level have apparently left the defense business over the last decade. Large companies, such as Intel, Motorola and Hewlett-Packard have refused to do business with DoD unless it buys on commercial terms, without the imposition of expensive and burdensome federal laws and regulations. Many companies lost interest in the defense market, thus companies such as GE, Westinghouse, and IBM got out of the defense business, selling off their defense units. Defense industry went from five or six manufacturers for a military product to one or two. This was a simple matter of economics — smaller budgets, the concomitant drop in work orders, and the "stretching out" of programs made the defense business less attractive to commercial vendors.

But in the "unforeseen consequences" category, the merger mania of the 1990s left U.S. policy makers concerned with the number of companies remaining to provide a competitive base for buying its new equipment. "Merger mania" may be over for at least the major contractors. The first sign of the change in policy was the Justice Department (with OSD concurrence) blocking the Northrop Grumman and Lockheed merger in 1998, because it had the potential to create a monopoly. One of the foundations of U.S. government procurement is competition. As companies drop out of the defense business or merge, competition disappears and costs rise. This is particularly worrisome with the large system integration companies like Lockheed Martin and Boeing. As the defense business base continues to decline, smaller companies will probably continue to merge. At the large prime level, the market has probably seen the end of U.S. company mergers, although mergers or partnerships between international companies are still probable. Teaming arrangements, partnerships, joint ventures, and other similar ventures will probably continue, particularly in the international arena.

While DoD has attempted through its "acquisition reform" and "revolution in business affairs" initiatives to change the way DoD does business, it has not resulted in the "hoped for" merger of the defense and commercial industrial bases. Even with Congress passing several laws, at DoD's urging, to remove some of the barriers, the evolution to a merged defense industrial base has not happened. There are some exceptions, such as the Atlas II, which uses the same production line for both commercial and domestic launch vehicles. These laws made modest changes with major issues still left to be resolved, such as eliminating specialized accounting and auditing systems. But defense firms are still primarily defense firms. With the upturn in defense spending for modernization and most of the same rules and regulations still in place, they will most likely remain separate from the commercial industrial base.

THE FRENCH DEFENSE INDUSTRIAL BASE

France has the largest defense industry in Western Europe, employing more than 175,000[6] people, and represent 4.5 percent of the total French industrial employment. It generates roughly 15 billion euros in sales annually.[7] It

also occupies an important position in the French economy with more than 5,000 companies (including government owned facilities) involved in defense. Approximately 6 billion Euros goes into the export markets in 2000.[8] It offers its defense customers a wide range of products — ships, aircraft, and tanks are just some of the examples. In terms of skills, it has developed the expertise to design develop and produce its own systems. It provides nearly (90 percent) all its own defense equipment. And most of the large companies involved in defense have a significant commercial market presence to help offset periods of slow defense spending.

Background

The real force behind the creation of a robust defense industry for France was President Charles De Gaulle. For the most part, the United States provided defense equipment to France after the end of World War II and in the early years of the Cold War. With De Gaulle's return to power in 1958 and his decision to create a military force that was both independent and had nuclear capabilities (la Force de Frappe), it was also necessary for France to produce its own equipment. It was essential to develop and maintain a strong, self-reliant defense technology and manufacturing industry able to produce a full range of products.

Thus, in addition to the creation of the DGA in 1961 to manage defense programs, France promoted its "national champions" within the defense sector of the French economy. Its national champions included Dassault for fighter aircraft, Aerospatiale for helicopters and ballistic missiles, GIAT for tanks and artillery, Matra for air-to-air missiles, and SNECMA for engines.

This approach follows a long tradition and practice for the French government to be extensively involved in the economy and with business. Unlike the United States, there is no precise distinction between the public and private sectors in France. An Office of Technology Assessment report on the French defense industry written in the mid 1990s stated that, "Nearly four-fifths of the French defense industry is owned directly or indirectly by the state, either in the form of government-owned and -operated arsenals, nationalized companies (e.g., Aerospatiale, GIAT Industries, and SNEMA), or firms in which the government owns a large share of the stock (e.g., Dassault Aviation, Matra and Thomson Brandt Armaments)."[9]

Politics and political philosophy have played a role in the government's "see-saw" policy toward the defense industry during the last forty years. De Gaulle and his successor, George Pompidou, saw the need for a "guiding hand" — government pressure on industry to merge where appropriate, along with the creation of state ownership of various companies, such as Aerospatiale in 1970. The election of the socialist Mitterand in 1981 saw a wave of nationalization of industry — banks, steel and defense (such as the seizure of Matra). With the socialist losing the 1986 election, although retaining the Presidency, the conservative government of Prime Minister Jacques Chirac came to power. A period known in France of "cohabitation" came into being, with the President from one party, the Prime Minister from another. As politicians are wont to do, the socialist Mitterand, who had been responsible for the nationalization of industry, issued his famous "ni-ni" remarks — neither further nationalization nor privatization. In other words, maintain the status quo. Notwithstanding those remarks, the French governments began a period of the privatization of industry. Even the current socialist government of Prime Minister Jospin has continued, and in fact, put in force the privatization efforts initiated "by the right."

The French government has exercised its control through the bureaucracy and, in the case of

defense industry, the DGA's Cooperation and Industrial Affairs Directorate (DCI) has facilitated the development and nurturing of the defense industry. In practice how has the DGA approached its role in managing or guiding defense industry? First, it is a customer for defense equipment. Second, it has been responsible for looking ahead at the defense industrial needs and then to sustain, create, and nurture as appropriate. Third, it is an operator of industrial facilities such as SMA and formerly DCN. Next it has oversight of the State's majority shares in defense firms such as SNECMA (97 percent), GIAT (100 percent), and SNPE (100 percent). Fifth, with the European Union laws and regulations are binding on its members, and it has been the enforcer and monitor of compliance. It is also involved in reviewing investments, mergers, and exports of defense goods, although the primary responsibility for export control has moved from DGA to the central ministry. When potential cooperative projects between countries or between industries are involved, DCI is the point of contact with its new Director, Laurent Giovachini, serving as the National Armament Director (NAD).

Restructuring and the Europeanization/ Globalization of the French Industry

Thirty years ago, there were still many doubters on the ability of Europe to throw off centuries of divisiveness to create a European Union. While it has been a step-by-step process, it has moved forward and dealt with the tough issues. Institutions have been created — a parliament and operating agencies — borders have come down, and next January 2002, a common currency, the Euro, will be the script of France, Germany, and many other European nations. A common EU defense policy and force are not far behind. While this area has traditionally been sacrosanct from EU rules, changes have begun. The Helsinki agreement in 1999 and the decision to create a European rapid reaction force indicate the resolve of the various governments to move in the direction of a common European Union defense policy. The June 1999 EU summit in Cologne also recognized the key role played by industry and called for a restructuring of defense industry. A framework agreement was signed in July 2000 designed to aid European consolidation. It covered areas such as security of supply, exports, security of information, research and technology, and intellectual property rights.

As background, Europe entered the 1990s with several defense industries — primarily France, Britain, Germany, Sweden, Spain and Italy. The European defense industry was highly fragmented and had significant over-capacity even before the Cold War ended. A spur to the reorganization of Europe's defense industry was the creation of huge U.S. firms and fear of American dominance. The European nations, and in particular France, felt it necessary to have a European approach to counter the huge American industrial giants. Governments provided encouragement to their contractors to diversify, create strategic alliances, buy foreign firms, and evaluate cross-border mergers.

French defense companies, with government pressure, have made major efforts to adapt. Thomson CSF (now Thales) in 1998 and Aerospatiale in 1999 were restructured and transferred from the public to the private sector. Previously a majority shareholder of these companies, the French State concluded shareholder agreements with the private industrial groups Alcatel and Lagardere, which acquired significant interests in the new and enlarged Thomson CSF. Aerospatiale then merged with Matra and then further merged into EADS[10] (the French government owns 15 percent of EADS). Dassault Aviation, the producer of the Mirage 2000, was transferred from the government (at least the State's shares — 46 percent) to Aerospatiale Matra (now EADS). Most change

has occurred in the aerospace portion of defense industry with the land and naval industries not taking any action, although the government has continued its privatization efforts with its decision to transform DCN, a major builder of ships, into a state-owned company.[11]

As a side note, one of the concerns of the United States has been the perception of the creation of a "fortress Europe." While the answer to that question is still out with the jury, the recently announced formation of a transatlantic venture between Thales and Raytheon ground-based air operations command and control and battlefield systems may indicate that that concern may be misplaced.

The demand side of the equation is also being addressed. As was mentioned in Chapter One, the creation of the European procurement agency OCCAR paves the way for improved management of cooperative programs with the hope that this would lead to more cooperative programs. There have also been recent French government efforts to increase the role that small and medium enterprises (SME) play in the defense business. The DGA wants to develop a structure of dynamic, successful, and innovative SMEs that support and complement the major prime contractors and equipment manufacturers. The goal is lowering cost while creating SMEs that bring technological innovation yet competitively compete in the export market.

Consolidation and merger have not occurred without problems. Cultural differences create problems in management. And of course there are still the political issues. "Old habits die hard." An example last year was the "fighter bid in Greece…French government support for its national champion, Dassault Aviation, has caused friction with and within, the Franco-German-Spanish, European Aeronautic, Defense and Space (EADS) Co."[12] While it is still too early to see the final outlines of the future defense industry, the major thrusts seems to be a European focus, with a recognition that it cannot be only Europe, but that some form of transatlantic effort is necessary.

ENDNOTES

1. Worldwide it is number three.

2. The U.S. defense industrial base is somewhat difficult to define, since it relies upon private companies that continuously enter and leave the business.

3. Weidenbaum, page 15-40. Companies in whole or in part, were consolidated into three — Lockheed Martin, Boeing and Raytheon.

4. King, Anthony, "Ideas, Institutions and the Policies of Governments: A Comparative Analysis: Parts I and II," *The British Journal of Political Science*, Cambridge University Press, 1973, pg. 296.

5. Coopers and Lybrand /TASC Project Team Study of the Defense Industry from March to October, 1994, at the request of then-Deputy Secretary of Defense Dr. William J. Perry. The study was conducted under the auspices of the Office of the Under Secretary of Defense for Acquisition and Technology (OUSD(A&T)).

6. This figure includes personnel from the public sector — DCN, SMA and program office personnel.

7. Boulesteix, Cara, "The Defense Industry in France," an U.S. and Foreign Commercial Service and U.S. Department of State document, 4/7/2001, pg. 1. For comparison purpose, the Euro is trading in early September 2001 at roughly a 1 to 1 ration with the U.S. dollar.

8. *Aviation Week and Space Technology*, February 26, 2001.

9. From U.S. Congress, Office of Technology Assessment, *Lessons in Restructuring the Defense Industry: The French Experience — Background Paper, Report No.* OTA-BP-ISC-96, pg. 8.

10. EADS is a consolidation in 2000 of Daimler-Chrysler Aerospace AG, Munich, Aerospatiale Matra, Paris and Construcciones Aeronautics S. A., Madrid.

11. Remembering that there is no specific distinction between public and private in France, there are thus several levels of public/private ownership. Thus privatization in France refers, as an example, to a process of moving from an arsenal to a state-owned company (nearly 100 percent ownership by State) to an "enterprise publique" (>50 percent ownership), to transfer to private sector (<50 percent ownership of capital).

12. From *Defense News*, October 23, 2000, pg. 66.

Chapter 4

FRENCH MIRAGE 2000 PROGRAM

"Aircraft are like the soul,
they have wings and they defy death.
My aircraft will still be flying
when I am no longer here."

Marcel Dassault[1]

History

The fighter aircraft developer and manufacturer for the Armee de l'Air, the French Air Force (FAF), is the Dassault Aviation Corporation, founded by Marcel Dassault at the end of the Second World War. In the early 1970s Dassault Aircraft Company, along with a small team from the DGA and FAF, developed a "Super Mirage" to meet Air Force requirements for an "Avion de Combat Futur" (ACF).[2] The ACF was to be a twin-engine fighter similar to but larger than the U.S. Air Force F-15. The Armee de l'Air had two missions to perform — deep attack and interception — so it needed an aircraft that could reach speeds of mach 2.5 and with long range. While several swing-wing prototype aircraft (Mirage G and G8) had been successfully flown, it was finally decided that a fixed-wing aircraft was the best solution. Unfortunately, it cost more than twice the prior version of the Mirage, the F-1. The ACF was just too expensive for the Ministry's budget. In mid-1975 the Air Force and the DGA appealed to the Defense Council, chaired by the President.

At the same time, Dassault also had under development a less costly, lightweight fighter. According to Marcel Dassault, "Since there will be no funds left to develop a single-engine aircraft, we may lose our foreign clients who currently account for more than 1500 Mirages and who keep the whole French aeronautical industry going."[3] He decided to set in motion a project with the company's own capital — without government financial assistance. His goal was twofold: first, provide a backup should the ACF fail to secure the government's blessing; and second, maintain and increase "market share for single-engine aircraft."[4]

Finally in late 1975, then President Giscard d'Estaing authorized a new, single-engine fighter program to be ordered from Dassault. "It chose …an aircraft that could fulfill French military ambitions, and that also corresponded to budgetary provisions and was easier to export… since exports play a vital role in maintaining the capability of the French aeronautical industry."[5] This new delta-wing aircraft also needed a name. After several attempts, the Air Force settled on the designation "Mirage 2000" — the plane to take the French Air Force into the 21st Century.

With the government's go-ahead, a prototype of the Mirage was assembled in only 27 months. It began its first flight test in March 10, 1978. The small program office, about six or seven persons, was responsible for managing the Mirage contract, as well as several other contracts. The prevailing strategy during that period was to buy separately the major subsystems such as engines, an electro/optical system, and radars. These would be provided, as Government-Furnished Equipment (GFE), to the primary contractor — Dassault — to integrate into the basic aircraft. In 1979 the first production aircraft were authorized, although tight budgetary issues resulted in the requested 20 aircraft being cut to only four. Continual tight budgetary pressures and a change in government did nothing to improve the luck of the Air Force during the next three years. Defense budget woes continued and a much smaller number of aircraft was ordered in the 1980-82 time frame (22, 22, and 25 versus 23, 43 and 44) than originally requested and needed by the Air Force. The first production unit rolled off the line 20 November 1982. "On 2 July 1984 — exactly 50 years to the day that the French Air Force was officially established as an independent armed service — the initial Mirage 2000 squadron was formed."[6] All told, more than 300 have been ordered and delivered to the Air Force.

While originally designed for the French Air Force, DGA and Dassault have sold another 286 aircraft in various configurations to seven other countries[7] — Egypt, Greece, India, Peru, Qatar, the United Arab Emirates, and Taiwan.

Mirage — The Aircraft

The Mirage 2000 Program consists of four versions (see Figure 4-1) of its aircraft — Air Defense (single and two-seater), air-to-ground, penetration, and ground attack. Four versions of the Mirage include the M 2000 C, both a single- and two-seater, primarily for Air Defense, although it does have air-to-ground capability. In 1982 Dassault rolled off the assembly line the next Mirage version, the Mirage 2000N,

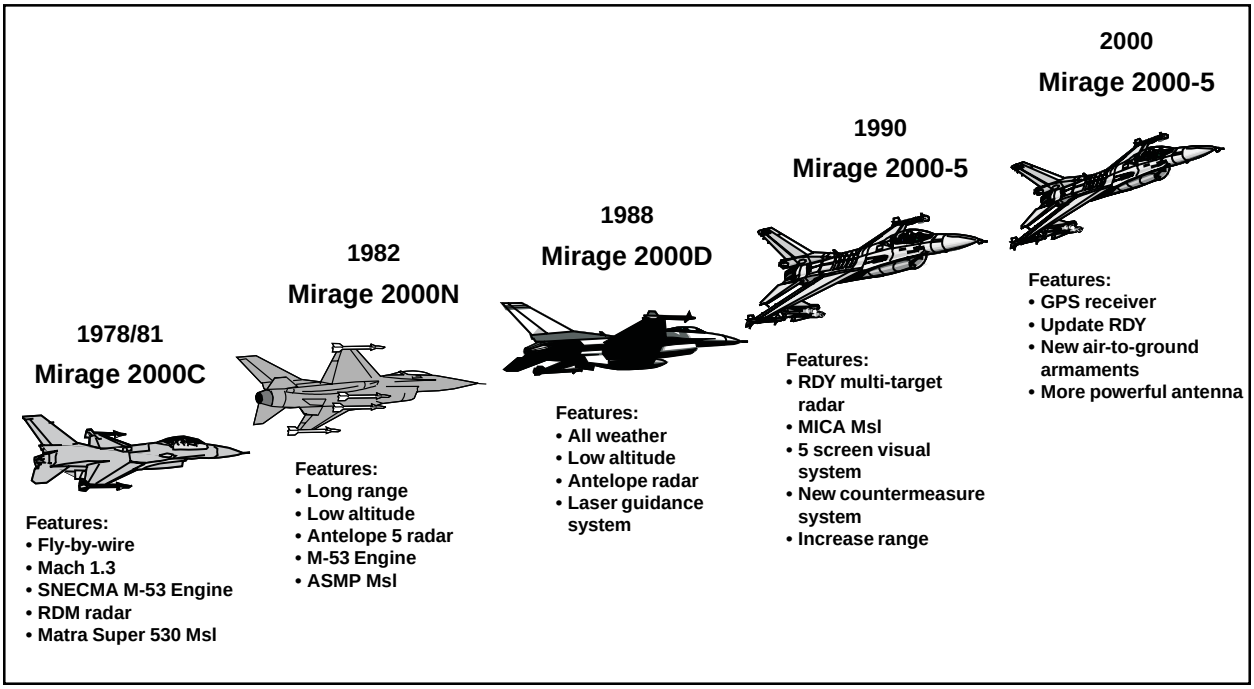


Figure 4-1. Aircraft Models

a two-seater. It is dedicated to launching the Air-Sol Moyenne Portée or ASMP (air-to-ground nuclear missile) with a high-speed low-altitude penetration using automatic terrain-following radar. It also has a conventional, secondary, air-to-ground mission — the same as 2000 D. The French Air Force's Mirage 2000 D, two-seater is designed for penetration and air-to-ground attack, and carries a variety of advanced conventional weapons such as Guided Bombs and stand-off weapons such as the Apache, SCALP, Air-to-Air and Surface Missile (AASM). The M2000D has an advanced navigation and attack system that allows it to fly under any weather conditions and at very low altitude. It is also "nuclear weapon" capable. The M2000-5 is multi-role aircraft single- and two-seater, and has more advanced avionics including the ability to select multiple targets both air-to-ground and air-to-air with an advanced visualization and control system. For Air Defense, it is capable of carrying the latest weapons and has several new systems for radar and the Missile d'Interception et de Combat Aerien (MICA).[8] It carries laser-guided missiles rockets and bombs. The primary contractor for all versions of the Mirage, including the Mirage 2000, and the latest generation of aircraft for the French Air Force, the Rafale, is Dassault Aviation. Assembly of aircraft takes place at the Mérignac Aircraft plant near Bordeaux. For the Mirage 2000 Thales[9] provides different types of radars (pulse doppler, radar doppler multi-mode (RDM), radar doppler impulse (RDI), Antilope, and terrain following radar) and other avionics. The single turbofan engine, M53-P2, is provided by SNECMA.[10] The aircraft has a range of 1151 miles and can attain speeds in excess of Mach 2.2 at high altitude.

MANAGEMENT STRUCTURE AND APPROACH

Headquarters DGA is located at the Cite de l'Air in the 15th Arrondisement of Paris. It is organized in a traditional hierarchical model and has three principal Directorates involved directly

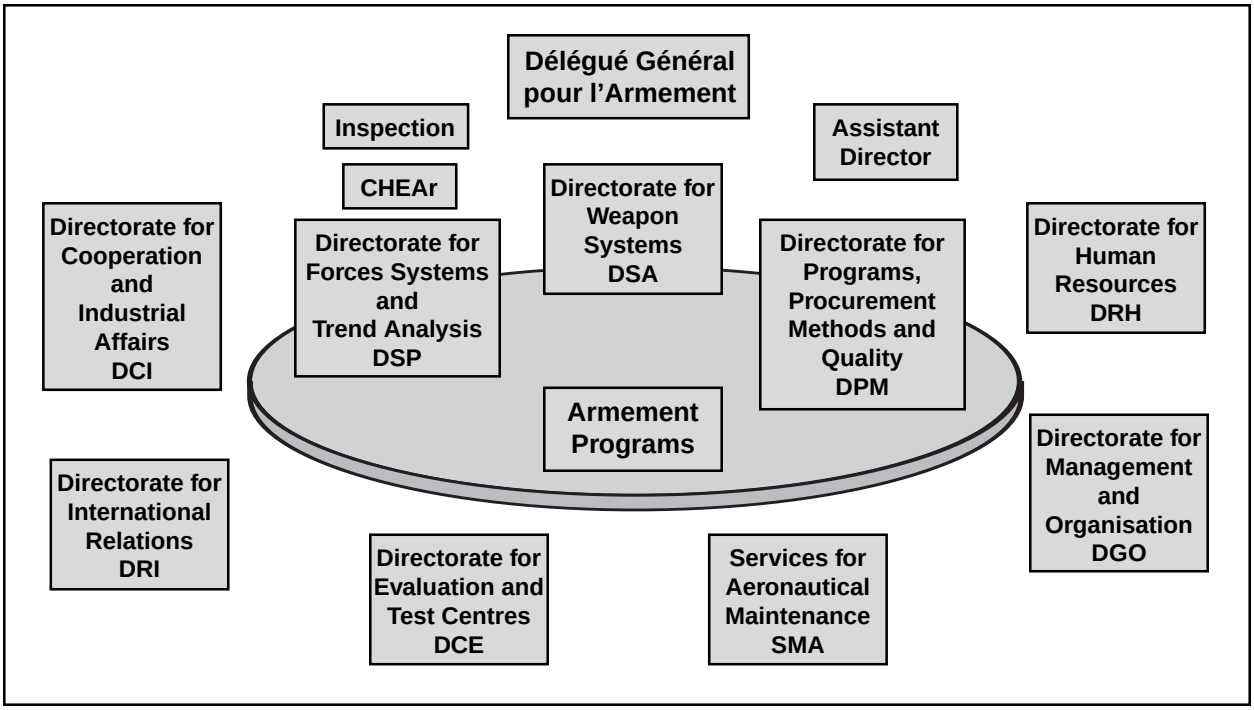


Figure 4-2. DGA Organization

with the management or support of armament programs (see Figure 4-2). They are the Directorate of Weapons Systems (DSA)[11] — the home office for all programs managed within DGA), the Directorate for Force Systems and Trend Analysis (support to the PM and the home of the ASFs) and the Directorate of Programs, Procurement Methods and Quality (support to the PM).

Within the DSA, as shown in Figure 4-3, are six main divisions. The six divisions cover the traditional military areas such a Land, Naval and Aeronautics, as well as tactical missiles, command, communication and information (C2I), and finally nuclear. The Aeronautical Programs Division (DSA/SPAe) is home to the Mirage-2000 program, as well as a variety of other aeronautical-related programs. A two-star armament engineer, IGA Patrick Bellouard, leads SPAe. Within the SPAe division (see Figure 4-4) there are two general categories of support branches — SPAe/GP and ST — and the Program Management branches. SPAe has assigned a total of 650 persons, with the program management division having about 37 personnel directly assigned.[12] They are about one third military (about 200 military) and two-thirds civilians.

Nine program management branches are responsible for aeronautical programs. An armament engineer, ICA Bruno Berthet, currently leads the program office with which we are most concerned — the Air Force Combat Aircraft (AFCA)[13] Division. Within that division is the Mirage 2000. Other program offices include programs teams for the newest French Dassault-built fighter Rafale, air mobility (such as the new A400M), the Tigre Helicopter, air and airport operations, combat avionics, and naval systems. Finally, they also have program management responsibility for civil aviation equipment, much like the Federal Aviation Authority in the United States.

The two support divisions — SPAe/GP and SPAe/ST — provide matrix manpower needed by the program management divisions. The ST[14]

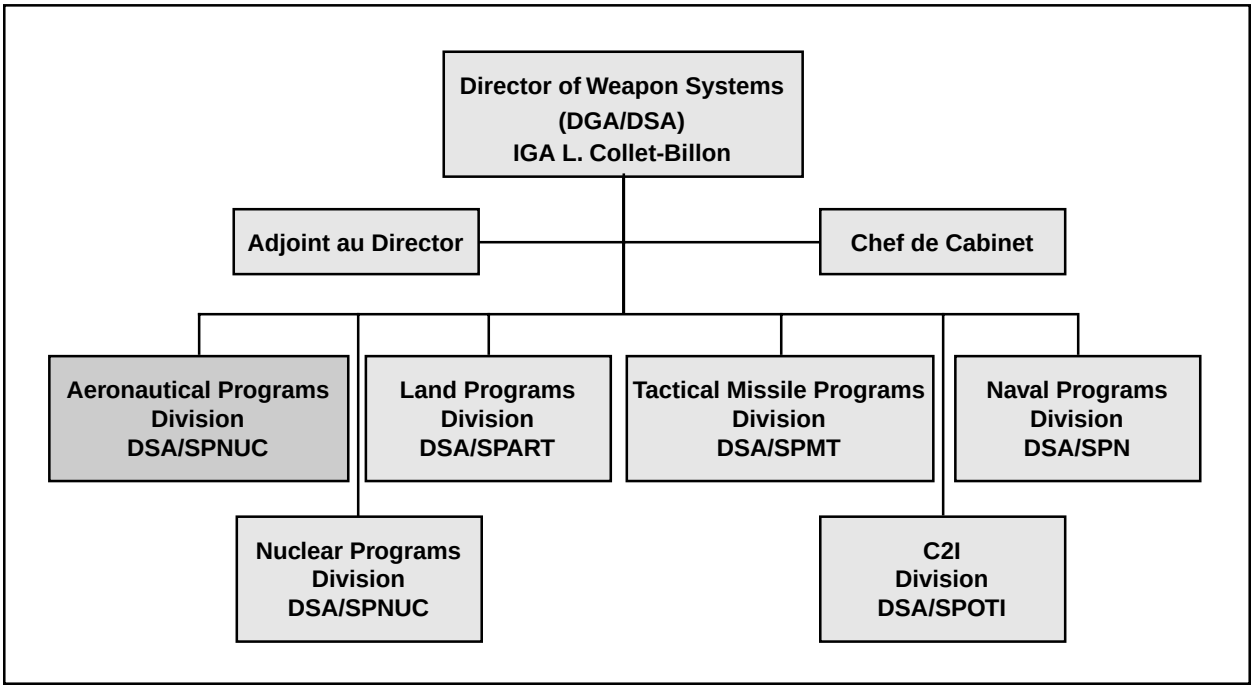


Figure 4-3. DSA Organization

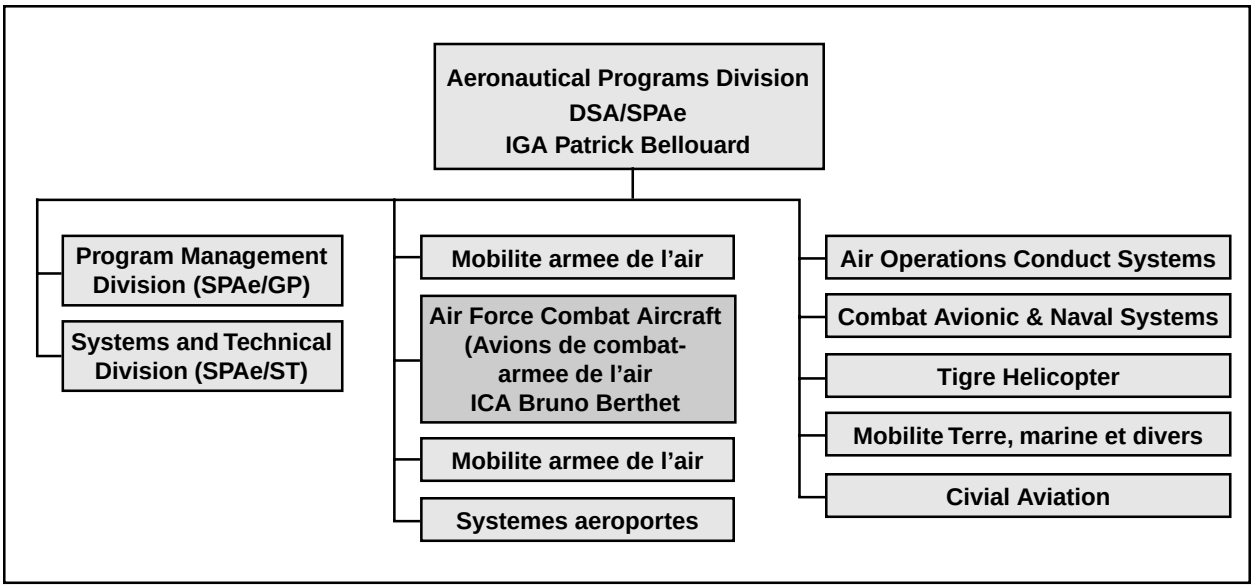


Figure 4-4. Aeronautical Programs Division (DSA/SPAe)

organization provides technical support to the program offices in three basic functions — *systems architects* for aircraft integration; *technical support personnel* for various major functions such as fire control systems, navigation, guidance, and electronic counter-measures; and *technical specialists* for items such as radar, engines, sensors, and logistics. They prepare technical specifications for contracts both for research and development (R&D) within SPAe and for the program offices. They participate in negotiations for the technical issues, much as the PM would participate for management issues, although the actual team leader of the negotiation is the buyer. The Science and Technology Department/Division (ST) is responsibility for R&D studies and contracting for the R&D. Additionally they have technical responsibility for the qualification and approval of the aircraft.[15] They have within the division to provide a user perspective about 10 to 20 military officers and enlisted in addition to the integrated work teams from the French Air Force staff. This division is also be a potential starting point for armament engineers to acquire, very early in their careers, the technical training necessary to prepare for more senior positions.

In GP[16] (the other support organization), personnel provide assistance in functional areas such as finance, buying, management and quality assurance. As the contracting authority for SPAe, about 20 buyers assigned at various levels of effort support the AFCF program office. The Chief of GP has contracting authority up to FF60M to sign contracts. They also have on the staff about 20 specialists in law[17] who help ensure contracts written within their Division comply with the laws. Management specialists are available to help on organizational issues and in the preparation of documents, such as the launching files. And finally, they provide quality assurance, configuration management, industrial, budget, and financial specialists to support program needs.

Air Force Combat Aircraft (AFCA) Division

The program office is located at DGA headquarters but support personnel are located at test centers and contractor's plants throughout the country. In the last year they have restructured their program management framework to reflect a truly matrixed organization. Renamed the Air

Force Combat Aircraft Division (Avions de combat-armee de l 'air), it consists of the Program Manager plus three project managers and a manager responsible for handling export issues. The PM and the project managers are armament engineers, while the person responsible for exports is an Ingénieurs des Etudes et Techniques d'Armement (IETA). They have responsibility for all versions of the Mirage 2000, plus older versions of the Mirage F-1, Jaguar, Mirage-IV and the Alphajet trainer. Part of the rationale for the reorganization is the need to set up a "program-like" management structure for aging aircraft. Currently the total support by the matrixed organizations — SPae/GP and SPae/ST — ranges from 30 to 50 staff for Mirage 2000 support. In the past the program office consisted of the program manager with a core group of 10 personnel assigned to the program office, while another 20 personnel from various functional organizations provided technical support on an "as needed" basis.

The Mirage Program Manager has life-cycle responsibility for the aircraft including major upgrades and integration of new weapons as they enter the inventory. More specifically, he develops the acquisition strategy (shared with the buyer) and manages the program within the cost, schedule, and technical guidelines of the approved program. He is responsible for working obsolescence, a source of continual problems for older aircraft. When a modification or update is needed to the aircraft, he will work scheduling issues with the FAF, SMA, and contractors to incorporate the modifications into the aircraft. When the aircraft is delivered, the PM has the obligation to ensure that the support systems — support equipment initial spares, training and other initial items-are also delivered. While he is responsible for updates to the Mirage, he is no longer responsible for the operational and logistics support of the system. The Air Force plans, budgets, and orders operational repairs to the aircraft with SMA or the contractor, as appropriate.

The Program Office also operates as part of an Integrated Program Team (IPT) with the French Air Force (discussed later). The DGA, the AFCA and the Headquarters Staff of the Air Force are all located on the same base, which makes teaming and working together a simpler business. Another primary interface for the PM is the Architect of Systems Forces (ASF) from the Directorate for Force Systems and Trend Analysis (DSP), specifically, the ASFs for penetration, air superiority and nuclear deterrence on issues relating to Mirage.

Other organizations support the program office. They include personnel at the test center at Istres in the south of France near Marseilles and at the Dassault Aircraft plant[18] near Bordeaux (for acceptance of the aircraft).

A recent organizational change moved responsibility for logistics or sustainment to a new central defense department called Institute for Service for the Maintenance of Aeronautical Material or by the French acronym — SIMMAD (Structure integree du maintien en condition operationnelle des material aeronautiques).

Tactical Missiles Program Division (DSA/SPMT)

The SPAe is the largest of the six DSA divisions. A sister division, SPMT, providing tactical missiles to the military services, is an interesting contrast. A two-star armament engineer leads it. It employs about 150 persons to support the program offices. They have 50 personnel working directly in their program branches. Examples of the types of programs managed in SPMT include Unmanned Air Vehicles (UAVs) and air-to-air, surface-to-air and air-to-surface missiles for all three services. They have 650

active contracts and they perform about 450 contractual acts per year. Forty to fifty percent of their work is involved in cooperative programs with other nations.

Integrated Program Teams (IPT)

During the tenure of Yves Helmer (the former DGA), the concept of Integrated cross-disciplinary Program Teams (IPTs), became the core management approach for armament programs, although integrated teamwork was already a general practice on major aircraft programs. The IPTs for the Air Force Combat Aircraft Division (Avions de combat-armee de l 'air) and the individual programs, such as the Mirage 2000, each are responsible for achieving program goals. The teams are formed, depending upon the circumstances, with appropriate personnel. The IPT for some efforts, but particularly for the relationship between the Air Force Headquarters staff and the DGA, is critical to ensure all parties are aware of program progress and each organization's needs. This is a permanent IPT, headed by the PM with the Program Officer, which meets on a regular basis for programmatic issues. Often industry members may be a part of the program team. Another example of an IPT, created for a specific event, is the request for proposal. For a new buy, an IPT would develop a request for proposal. It is headed by a project manager and the responsible technical personnel — buyers, the Air Force Program Officer, cost analysts, and others as appropriate.

Typically a team is composed of 10 to15 core team members with the specialist included as necessary (see Figure 4-5.) DPM, DSP and the other directorates supplement the SPAe/GP and ST with technical or management specialists when needed. One of the basic principles of the IPT is to get away from the old sequential model of working an issue or problem — DGA reviews,

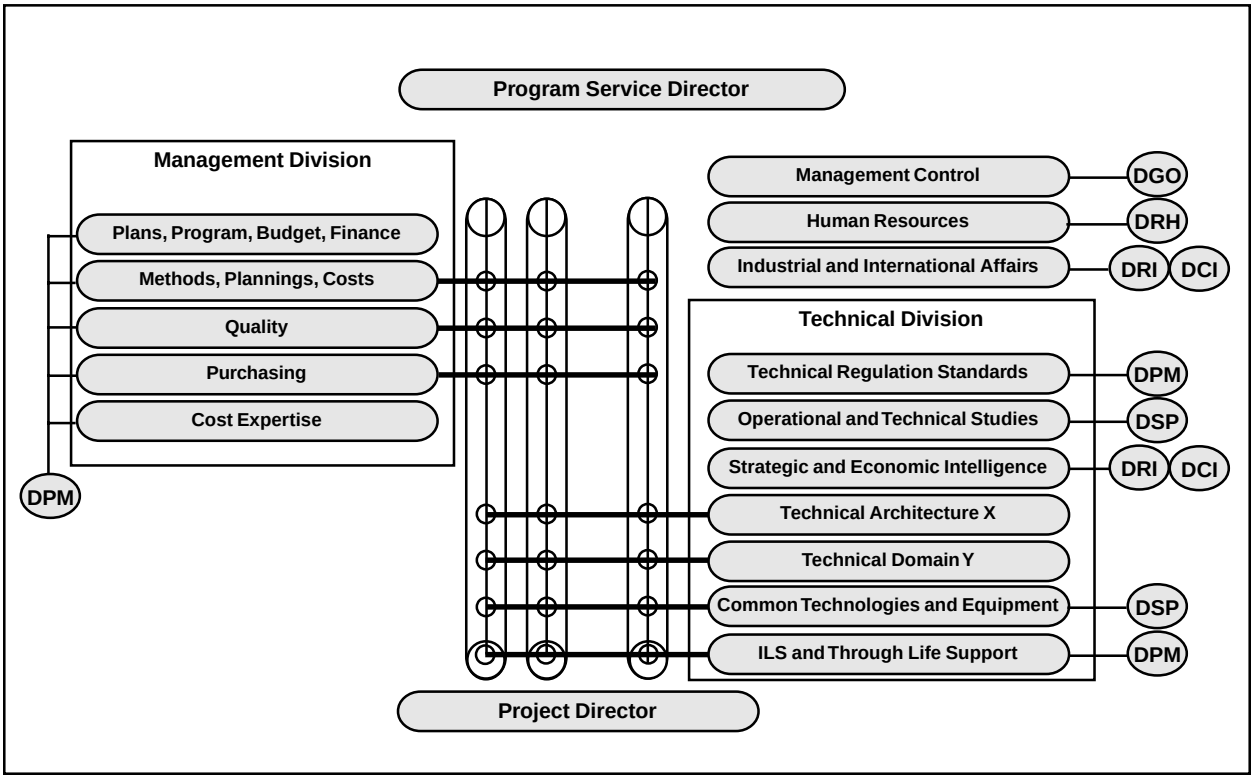


Figure 4-5. A Matrix-like Organization to Manage Programs

then the general staff reviews and so on. Rather, working as a team accelerates the process, contributes to better decision making, and creates a "team atmosphere" as common program objectives are identified.

THE PROGRAM MANAGERS

The selection, education, training, and career paths of military acquisition personnel (referred to as Armament Engineers in France) differ significantly when contrasted to the U.S. approach. The typical Armament Engineer, a member of a fourth branch of the military, receives his education with a heavy emphasis on mathematics and sciences, and graduates from one of the most distinguished schools in France, the Ecole Polytechnic. His selection is part of a national process to select the very best achievers for service to the country. From the beginning of his career, he is a full-time acquisition professional (although after graduation he will do a tour of duty for one year with one of the military services).

This section takes a look at the nine people who have managed the Mirage program over the last 28 years (see Figure 4-6). The first Program Manager was l'ingénieur en chef de l'armament (ICA) Pierre Tamagini. ICA Tamagini and a small office staff managed the Avion de Combat Futur (ACF), (as the plane was known then) through its development until it was determined in 1975 that the Ministry would develop and buy a less costly aircraft — the Mirage 2000. He then became program manager for the Mirage until 1980, when ICA Yves Michot replaced him. The program has always been managed by an ICA, in the upper half, with the equivalent rank of colonel.

Name	Time Period	Career
ICA PIerre Tamagnini	1873 to 1980	Programme manager for Avion de Combat Futur) finished Career IGA (***) as CEV Director
ICA Yves Michot	1980 to 1984	CEO forAerospatiale Aircraft Division before the merger with Matra
ICA Herve Groualle	1984 to 1987	Finished his career IGA (***) as CEV Director
ICA Jean-Luc Monlibert	1988 to 1990	Currently IGA (***) Director of DGA/DGO
ICA Francois Flori	1990 to 1991	Currently IGA (***) DGA/DPM/SQ
ICA Pierre Bascary	1991 to 1996	Currently IGA (***) Director of Ecole Nationale Superieure de l'Aeronautique et de l'Espace
ICA Bruno Delor	1996 to 1997	Currently IGA (***) Sous-directeur achats in DGA/DPM
ICA Patrick Dufour	1997 to 2000	Currently ICA in CHEM and IHEDN
ICA Bruno Berthet	2000 to Present	Current Programme Manager

Figure 4-6. Mirage 2000 Program Managers

What are some of the attributes of the job and the characteristics of the personnel that have managed the Mirage? First of all, it has been a good position for future promotion. Six of the first seven have gone onto the rank of Ingeniuer General de l'armament (IGA) with four rising to the rank of three-star general. ICA Yves Michot moved to industry becoming the CEO of Aerospatiale prior to the merger with Matra and has since retired. One of the requirements for selection as a Program Manager is a technical background in aeronautics. Thus all PMs have attended Ecole Nationale Supérieure de l'aéronatique et de l'espace (Sup'Aero) for their initial education in aeronautics. From there they were assigned to an aeronautics test center to increase their technical knowledge. The DGA approaches program management with the belief that a solid technical background is necessary to success in the PM job. All PMs were a part of the "air" branch of the armament engineer corps.

The current PM, Bruno Berthet, brings the usual technical credentials, but also brings a background as a fighter pilot in the French Air Force in Salon and Tours (as did three prior PMs). Patrick Dufour, his predecessor, while not a fighter pilot, did possess a general aviation license. Several others possessed pilot credentials. Typical was Pierre Tamagnini, the first PM, who according to a former colleague, "as a young officer he attended the fighter pilot course of the Air Force, then spent almost 15 years in the flight test center (CEV) in Istres where he attended EPNER (Ecole de Personnel Navigant d'Essais et de Réception) and graduated as a flight test engineer and was at one time chief of the aircraft department of the flight test center. As I recall, he flew almost every type of aircraft — short of prototypes — as a pilot, and on prototypes as a flight test engineer."[19]

From an educational perspective all Program Managers were graduates of the same two "Grand Ecoles," — the Ecole Polytechnique (Masters Degree) and Sup'Aero (aeronautics). The average amount of acquisition experience brought to the job by each person has been 16.8 years of acquisition experience in test centers and in program departments. What types of experience have these military personnel brought to the job? As indicated above, most bring a technical experience, having worked in DGA test centers. Of nine program managers, five had long experience in flight testing at the Centre d'essais des Vol (CEV) in Istre in the south of France near Marseilles, two in structural testing in Centre d'essais Aeronautiques de Toulouse (CEAT) and one in engine testing in Centre d'essais des Propulseurs (CEP). The length of time spent as the Mirage PM averaged 3.75 three years per person, with Tamagnini staying the longest at seven years and Bruno Delor the shortest at one and a half years. The general DGA policy for many years was to assign a PM to program for approximately five years. This changed under the administration of Jean-Yves Helmer when the goal was changed to three years.

PROGRAM PERSONNEL[20]

What types of people work in a DGA program office? I will examine a variety of variables in this section to provide insight into the characteristics of the personnel and certain aspects of acquisition personnel management in France. These variables include the number of personnel assigned, the types of personnel by function and whether they are military or civilians, their educational backgrounds, and their acquisition experience. The nucleus of the Aircraft Combat Program office is small with only five personnel assigned. Four personnel are armament engineers with the fifth an IETA. Approximately 30 to 50 matrixed personnel support them. The types of personnel assigned that provide matrix

Functions	Numbers
Achats (Purchasing)	9
Qualite	2
Plans, programs, budget, finance	3
Management de programme	3
Logistics	4
Engineering	18
Test and Evaluation	1
TOTAL	40

Figure 4-7. Program Office Personnel by Function

support to the program office on a regular basis (although not full time) are shown by functions in Figure 4-7.[21]

The distribution of military and civilians is shown in Figure 4-8. The program office has 14 military officers assigned to support the program. They consist of 9 armament engineers and 5 Ingénieurs des Etudes et Techniques d'Armement. The balance of the program office support consists of 26 "fonctionnaires" (civil servants), along with four ICTs (contract employees).

Note that armament sales do not play a significant role in the work of the program office, since France does not normally have government-to-government sales. Rather, industry is responsible for armament sales. Normally, the PM will be called to respond to questions regarding a sale and provide his advice.

Education and Experience

Data is gathered from respondents using the survey in Appendix D. The 40 responses received

Military		Civilian	
Rank		Rank	
Ingenieur de l'armement		Fonctionnaire	
IA	2	Niveau 1	5
IPA	3	Niveau 2	15
ICA	4	Niveau 3	2
		ICT	4
Ingenieurs de Etudes et Techniques d'armement			
I1ETA	2		
IPETA	3		
Subtotal	14	Subtotal	26
TOTAL 40			

Figure 4-8. Program Office Personnel Distribution

represent personnel who spend at least a portion of each day performing work for the program office. Of these 40 personnel, nine are graduates of the Ecole Polytechnique — all armament engineers who graduated from Sup'ero and are in the "air" arm of the Armament Engineer corps. One had overseas training with an MBA from Stanford University in California. Of the five IETAs, all had graduated from the Ecole Nationale Supérieure d'Ingéniuer de Constructions Aéronautiques (ENSICA) (a Grand Ecole). Sixteen had received technical degrees, including two of the buyers (ICTs) who attended advanced training at Ecole Nationale Supérieure d'Ingénieurs (ENSI). The average amount of acquisition experience is approximately 10.5 years, with 2 having less than two years, and with 45 percent having over 10 years of acquisition experience. Several respondents indicated they had received a variety of acquisition training to include the program management course at CHEAr, as well as other DGA internal training, procurement training, and fighter-pilot training.

Training and Turnover: One of the areas of emphasis within the DGA is training. Every one of the functional areas identified above has a senior manager responsible for ensuring each of his personnel receives training. It is done on an informal basis, mostly through short courses of one or two weeks. Current DGA planning includes having PMs stay three years on the job and then move on. This was signed into policy by the former DGA, Yves Helmer.

MANAGEMENT PRACTICES

This section looks at the way the AFCA manages its work. What are the types of work performed? How much management authority is delegated? What are the pressures from outside sources (customers and bosses)? And how is work controlled? The problems faced by the Mirage PM are typical of those found in many offices — getting things started, getting the right people, as well as making sure objectives are set and then met. Major day-to-day work issues include staffing, relationships with the contractor(s) and their customer (Headquarters Air Force), and the budgeting and financing necessary to manage the program. In a matrix-supported organization, a significant amount of program office time is spent ensuring availability of personnel to support work efforts. With the contractor, negotiating new contract work efforts and oversight (review of program status) of current contract requirements absorbs considerable program office resources. Currently the program office has two program reviews per year, mostly with Dassault since they now have system responsibility. In the past, when the program office used a different acquisition strategy and contracted with several contractors, program reviews were much more extensive. One of the important areas of coordination mentioned was to ensure they agree with their customer (the Air Force), and in particular the Program Officer, so they meet Air Force needs and address funding issues. And finally there is always the need to provide their input to the annual budget submissions. Other taskings important to the program office operations include preparation of an "acquisition plan," which includes program risks, key issues, major operations, and of course, monitoring the plan.

The work performed within the AFCA is first and foremost acquisition work. This means the development of systems or subsystems, integration into aircraft and production of new aircraft, plus the development of the initial support structure. The Mirage 2000 has reached the end of its production life with 12 Mirage 2000Ds delivered in 2000 and the final production aircraft delivered in the spring of this year. The remaining work for the program office will be primarily aircraft updates and modernizations with a current life expectancy through the year 2020. At present nothing indicates any future

production buys, internal to France, although the United Arab Emirates and Greece have indicated a desire to buy additional Mirage 2000s.

Eight general categories of work or functions are performed in ACF Program Office: Program Management; Achats (Purchasing); Qualite; Engineering; Plans, Programs, Budget, and Finance; Logistics; Test; and finally, Armament Sales Support. The preceding chart provides a breakout of some of the activities that take place within each function. Within each function are processes and procedures for managing work and for contributing to the acquisition of a product. These all come together through an IPT effort. This is where the members bring their functional expertise to make decisions for the program.

Decision Making

What types of decisions are made in a program office? Who makes them? What type of decisions does the PM delegate to his staff? What are the senior levels a Program Office must go to for approval? How often do they need to go to senior levels? These are some of the questions this section will answer.

Once a decision has been made to acquire a new weapon system,[23] administrative personnel and political appointees agree to meet certain cost, schedule, and technical goals. These become the mandatory requirements for the Program Manager. The PM during the acquisition cycle prepares a series of documents — Feasibility, Orientation, Realization Launching and Production

Program Management – Integration of program activities, Program Strategies, Program Reviews, Workforce and organization shaping, Contractor Oversight.

Achats (Purchasing) – Acquisition Strategy, Negotiation, Evaluation of Proposals, Contract Preparation, Award and Administration, Modificatin of Contracts.

Quality – Specification preparation, Oversight of contractor, contractor's procedures, Configuration Management, and review of contractor preparation for production, acceptance and qualification of aircraft.

Engineering – Specification preparation/approval, design reviews, contractor oversight.

Plans, Programs, Budget, and Finance – Preparation of the Program budgets, management of internal financial resources, schedules, financial forecasts, review of the Contractor program financial status.

Acquisition Logistics/Logistics Support – Supply support preparation, initial provisioning, development of test equipment, reliability/maintainability assessments, authorize technical orders.

Testing – Test and Evaluation Planning, preparation and review of test plan.

Armament Sales Support –

Figure 4-9. Program Office Tasks Performed

Launching — which capture cost, schedule and performance requirements and changes as a result of research or development efforts.

Management reviews and oversight are rather straightforward in the DGA. The PM has one major yearly review with the DGA and the Air Force staff where he lays out his plan to accomplish the cost, schedule, and performance mandates. Once approved, he manages the program within those guidelines until the following year — providing that he stays on the approved path. With the emphasis on reducing cost, all the DGA PMs are required to establish cost-cutting objectives and then report yearly success in meeting those objectives. Note that the PM has immediate and direct access to the Head of SPAé who in turn has immediate and direct access to all DGA directors and to the Delegate.

When new acquisition is planned, the PM will prepare with the buyer an Acquisition Strategy Document that provides a description of the system and the planned contracting approach, including the sources. The Director for Programs, Procurement, Methods, and Quality (DSA/DPM) will approve this or recommend higher-level approval, if appropriate.

Several events can trigger the necessity of the program office to go back to senior leadership for approval. Obviously, when the program cost, schedule, or technical performance requirements are not met, senior management must be briefed and new goals established. Approval of a contract action more than FF30 million (USD$2.1 million) requires review and approval from the Commission Spécialisée des Marchés, a part of the Ministry of Economics, Finance and Industry in Bercy. Nevertheless, French regulation states that Bercy can only check on the compliance of the contract with regulations, not on the relevance of the need.

Reform Initiatives

Over the last five to six years, the Ministry and the DGA have embarked upon major reforms. Sanctioned by the "Loi de programmation" mentioned earlier, they have started a process of moving to an all-volunteer military force and Europeanizing their focus. In the DGA they have shifted from a technical performance, i.e., achieving technical performance at the expense of cost and schedule, to acquiring a more businesslike viewpoint in managing a program. They have also begun the privatization of their industrial enterprises, changed the relationship to industry, and tried to find ways to reduce the cost of weapons. For program offices, the cost reduction initiative has had an immediate effect. They have to set goals and must report their success in meeting the goals. (A personal letter from the Delegate to the PM sets cost reduction objectives.) The second impact to a program office will change the business relationships internal to the DGA. All program offices in the future will have to fund and pay for services that had hitherto been free. As an example, the Istres test center, which used to provide services without a charge to the PM, now must provide a cost estimate for the work they perform. They will sign an agreement with the PM on the tasking and the cost. In the future it is planned that these efforts will require the PM to pay for their services.

Outside Influence

Located in Paris, the center of government in France, the Mirage program would be expected to have significant political involvement. In my interviews with the program managers and other program personnel, past and present, the general level of political involvement is low. With the aircraft in mid-life, it does not generate a lot of interest from either the press or the politicians. When the aircraft was first developed, it experienced significant involvement from all

levels within the executive branch of government. The ministry in particular was heavily involved of the program. After it started production, the government generally supported it; although when Francois Mitterend was elected President in 1982, it was a time of concern for the program. During this time with low interest in the program by the government, quantities did initially drop below plans, although they shortly returned to their programmed levels. In the last couple of years they have experienced a lot of cost reduction pressures from the ministry. Generally, in looking at the various organizations that could influence the program office — parliament, cabinet, Ministers office, DGA headquarters—most were rated as having very little, if any, impact on program office work by key personnel. The Headquarters for the French Air Force is rated medium because of the normal day-to-day workings with the Program Officer and other FAF units. Contractors additionally provide outside pressure with the desire to sell new equipment to the program office or simply to minimize their commitments in existing contracts.

Configuration Control

Configuration control responsibility for the Mirage rests with the contractor(s). Internally in the DGA the configuration control function is the responsibility of the Program Manager. He chairs the Configuration Control Commission and has membership from the technical functions (DPMSQ — Quality Division), and the users. DPMSQ performs the technical and administrative functions of evaluating the ECP, verifying its technical capability, and the administrative function of logging it into the system. And configuration control can be complicated with many different versions — one configuration for the French Air Force, another for export with perhaps three versions of the engines and five different versions of the radar. While the PM does not approve the configuration changes for export, he is often called upon to provide his opinion on the proposed change.

In discussing the configuration control process, two example were used — the Rafale and the Mirage. The Rafale is France's newest fighter, with the first production units delivered to the FAF in 1998. For a new aircraft like the *Rafale* fighter, more frequent configuration change meetings are necessary. Thus the Rafale program office conducts two yearly meetings of the Configuration Control Commission (CCC) to determine which change will be incorporated into the aircraft. The *Mirage* program office, on the other hand, holds one yearly meeting. On average it would be typical to approve about 100 changes a year, mostly very minor with a few significant changes.

One of the key questions facing the commission is: Is the change significant enough to require a new standard (this equates to a new block within the F-16)? An example of the need for a new standard would be a change to incorporate the air-to-air, MICA (missile d'interception et de combat aerien) missile. Configuration stability of the aircraft may be one of the hallmarks of their management approach. During the six-year contract for the Mirage 2000-5, they only had about five to six contract changes, and one of these was preplanned.

In planning the initial contract, they were up against a deadline, and the technical specification for a new electronics system could not be finalized. Thus they initially incorporated an old system into the contract to start the effort. But shortly thereafter, they were able to complete the new technical specification, negotiate a price, and add the new electronics system to the contract. Additional changes were required after the Air Force found problems testing the firing system and the radar. Maintenance problems also required additional changes to improve maintainability. The contractor had some development

problems that also required changes to the contract. The contract was awarded in 1993 and all the changes were incorporated prior to actual approval of the aircraft for production in 1995.

Budget and Budget Process

They have three budget preparation plans — one long-term for 2003-20015, one mid-term for 2003-2008, and the next year's budget. Since the Air Force actually owns the money the DGA budget personnel expend a significant amount of effort working with their Service counterparts. With efforts to reduce cost and differences in the planned (programming law) versus the actual budget, the DGA program offices perform a lot of "What If" exercises regarding changes to outyears. Parliament is not an issue on specific budgetary problems. Rather the Minister of Economy and Finance, in Bercy, performs the role of determining what the cuts to the budget will be, "often without apparent regard to programmatic issues."[24] Within the staff, the budget division (SPAe/GP/ GPPP[25]) supports the PM both in budget preparation and in tracking and accounting for program authorizations. It is interesting that money for production, R&D, and O&M can be rolled over and used in the next fiscal year, although they too track it separately.[26]

BUSINESS ARRANGEMENTS

Four major contractors are involved in the program. They include the primary contractor for new production aircraft Dassault Aviation Company, Thales for radars and for electronics items; Matra for missiles; and SNECMA for engines. There are 15 contracts directly supporting the Mirage 2000 and another 50 contracts supporting contract work for the Mirage 2000. As an example, an umbrella-type contract covers engines for the Mirage 2000, the Rafale and others with SNECMA. Of 50 contracts, 5 to 10 contractors provide software support and other technical assistance. The traditional acquisition strategy was discussed earlier; the program office contracts directly with subsystem contractors and provides items as Government-Furnished Equipment to the primary contractor for incorporation. Mirage 2000 contracting is done primarily sole source with fixed price contracts. Figure 4-10 shows the SPAe contract activity (new contracts and modifications to existing contracts), as well as the ACFA contract amounts spent over the last three years (SPAe in Euros and ACFA in U.S. dollars).[27]

SPAe has about 100 buyers assigned; of these, about 20 buyers support the Mirage 2000 program on an "as needed" basis. Typically they would manage their contracts by assigning one

	Fiscal Year		
	1998	1999	2000
New Contracts	468	417	321
Modifications	1843	1181	1585
Value (in Euro)	772m	335m	365m
ACFA Value (in FF)	2.4b	1.9b	1.4b
Value (in Dollars)	334m	264m	195m

Figure 4-10. SPAe Contracts Activity

buyer for a development contract, one for a production contract, and one for each of the major subsystems (such as a radar). Their requirements tend to be very stable, and they delay the changes until the appropriate time to incorporate them.

Who can sign a contract? The SPAe Director has unlimited authority to sign and has delegated authority for contracts under 60 million French francs (15 million for development/studies) to his deputies and deputy directors.[28]

A contract IPT has the responsibility to generate the contract. In the normal process, the buyer meets with the PM, his deputies, and also a specialist in law to review the contract for compliance with the rules and regulations. Once all are satisfied, and if the contract is over 30 million French Francs, then they go to the Commission Spécialisé de Marché in the Ministry of Economics, Finance and Industry for approval. A constant problem has been to comply with the competition requirements of the government. It is typically an item of concern on the part of the Commission.

Contract Administration is performed both in the program office and at the contractor's plant. As mentioned earlier, 23 people work at Dassault on final acceptance of the aircraft. Contractor payment is made up-front with an initial payment of 5 percent of the first year's payments. They make quarterly payments, tied in with a milestone accomplishment. Contractors are required to have an adequate accounting system to track cost. This is generally only a problem for some of the smaller contractors. Once the contractor submits an invoice to DGA, the ST technical person responsible for the aircraft reviews the invoice and signs off. (They do this for several reasons: (1) the technical person has the knowledge of the work being done, and (2) he has specific responsibility by law for the airworthiness of the aircraft (naval and terrain vehicles do not have the same restriction). Next it goes to the buyer who reviews it for compliance with the contract. Next it goes to the accounting specialist for review of the financial information. Finally it is sent to the Treasury Department, which makes the payments.

SUMMARY

Several points to note on the organizational structure include the decision making process, personnel selection, and the politics of defense acquisition in the DGA. With the completion of the last of the planned Mirage 2000 production buys for the FAF, the DGA restructured the Mirage 2000 Program into a new office — the ACFA, which now includes several older aircraft programs. Small, with only five full-time personnel assigned, it operates on a matrixed basis calling upon its parent organization, SPAe, for most of its support resources. The DGA and its major headquarters units are all located centrally in Paris; the Mirage 2000 Program Office (ACFA) is located within walking distance of its customer — the French Air Force. The decision-making process tends to be somewhat informal, although there are yearly briefings to senior military and political leaders. The PM is given significant leeway in managing his program as long as he stays within cost and schedule goals. Probably reflecting this informality, the regulatory procedures governing management of programs and contracting are more broad-based and less prescriptive. The selection of key individuals to become future DGA leaders reflects a national selection process with an intense concentration on mathematics and science. Future PMs continue this technical track with their advanced training and their initial job assignment. In several interviews, personnel often described the work atmosphere as a "family framework" — personnel come from the same schools, know each other, and the organization is small.

Finally, programmatic issues are generally not political within France. This is probably true for several reasons — the role of the cabinet within the government, the industrial champion notion, and the lack of legislative involvement in the details of programs. The PM is thus able concentrate more on business and technical problems and less on political issues. This is not to be confused with lack of oversight, since audit organizations, such as the Compte de Cour,[29] exist to perform audits of programs. The technical and managerial problems of the aircraft carrier, *Le Charles De Gaulle* made front-page news on Paris newspapers.

ENDNOTES

1. Quoted from Carlier (cover).

2. Future Combat Aircraft.

3. Carlier, Claude and Luc Berger, *Dassault: The Corporation, 1945 – 1955, 50 Years of Aeronuatical Adventure*, Vol. 2, Editions by Du Chene-Hachette Livre, 1996, pg. 274.

4. Carlier, pg. 274.

5. Carlier, pg. 276.

6. Mirage, pg. 105.

7. Dassault has produced 315 aircraft, plus seven prototypes of the French Air Force and has on order 286 aircraft, with 60 yet to be delivered, plus four prototypes for foreign customers.

8. Combat and Air Intercept missile.

9. The result of the merge of former Thomson-CSF, Dassault Electronics and UK Racal.

10. SNECMA government-owned company best known in the US for its (50/50) partnership between General Electric in CFM International, headquartered in Bordeaux, France.

11. Directeur des systèmes d'armes.

12. Only three of them are civilian.

13. In French Avions de Combat de l'Armees de l'Air.

14. Division des Systèmes et Techniques.

15. It only refers to the development approval. The Air Force does the final acceptance for operational use, with the help of the concerned DGA department, when technical help through contracts are needed.

16. Division Gestion des Programmes.

17. Although they are not lawyers.

18. About 21government, DGA personnel are located at the Dassault plant.

19. From IGA Bernard Besson, a friend and coworker with Mr. Tamagnini for almost 15 years.

20. While the subject of this project is the Mirage 2000, the program office has now incorporated several other aircraft. Thus the responses reflect total ACFA work, rather than just the Mirage 2000, although the Mirage still is the primary aircraft in the office.

21. Forty responses were received to the questions in Appendix D.

22. ENSICA is located in Toulouse France.

23. Their Ministerial Document # 7576 provides a list of programs that are considered to be a major program.

24. Uncited source within the government.

25. They have about 50-55 people in accounting, finance and plans, with about 20 personnel in payments and authorizations.

26. There are some one-year type funds that can only be used in the year authorized.

27. It is estimated that about 1/8th to 1/9th of new contracts and 1/10th of the modifications are dedicated to Mirage 2000 program.

28. He has three deputies. In the GP division they have 4 persons authorized to sign at the same franc level.

29. Similar to the U.S. Government Accounting Office (GAO).

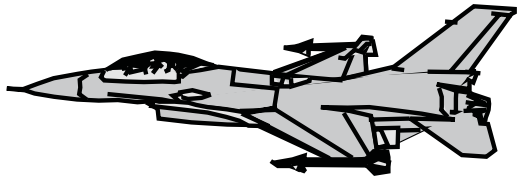
Chapter 5

UNITED STATES F-16 PROGRAM

History

It was not the war the planners in the Pentagon envisioned. F-86s had ruled the skies over Korea, shooting down ten enemy planes for every American plane lost.[1] Only a decade and a half later, on the good months in Vietnam, it was "one for one." Other months, they won! The United States needed a plane that could provide air superiority over Vietnam. And once Vietnam ended, air superiority was necessary to meet the tremendous tactical advantage the Russians enjoyed with their more numerical air forces. The United States possessed a clear advantage in air-to-air combat in Korea. Yet in Vietnam American pilots faired poorly in the early air-to-air combat exchanges with the MIGs flown by the Vietnamese. Complicating the war planner's job was the introduction of the Soviet Mach 3, high-altitude Foxbat, and the technical and cost difficulties with the F-111.

The United States needed a new air-superiority fighter. The solution was the F-15 Eagle. In 1972 the prototype F-15 fighter rolled out on the runway to take off on its initial flight test. Four years later the first production units were delivered to operational forces. But despite its operational abilities, the F-15 had one drawback — it cost about $11 million per copy. Also the Vietnam War had ended and the threat was now seen as the large number of aircraft fielded by the Warsaw Pact nations. With the high cost of the F-15, the Air Force could not field the quantities of aircraft necessary to meet the Soviet threat. In what is referred to as the "High-Low Mix,"



the Air Force looked to complement the F-15 with a lightweight, low cost, air-to-ground aircraft.

The F-16 was the answer. But the answer did not come easily. Once the Air Force had committed to the F-15, senior leaders within the Air Force were reluctant to sponsor any conflicting program that might imperil funding for the F-15. Operating in obscurity "from 1972 until early 1974, the prototype programs (under two colonels and with a small system program office at ASD, in Dayton, Ohio) were spared interference from the Air Force in Washington.[2]" Colonels Lyle Cameron and Bill Thurman were in charge of developing a prototype aircraft not only matching those needs, but also demonstrating new technology, such as fly-by-wire. In what one writer refers to as the Schlesinger Compromise,[3] named for former Secretary of Defense James Schlesinger, the Air Force agreed in 1974 that a less expensive alternate to the F-15 was needed. A competition was held, and based upon the flight tests of the General Dynamic's (GD) YF-16 versus the Northrop YF-17, the Commander of the Aeronautical Systems Division, Lieutenant General James T. Stewart selected the GD aircraft. It entered Full Scale Development[4] in January 1975 with GD receiving an initial order for 15 F-16s at a total price of $417.9

million. The plan was to acquire a total of 650 aircraft at an average cost of $4.6 million per plane.[5] In 1978 the first production F-16 Fighter rolled off the manufacturing line at the former General Dynamics, now Lockheed Martin Aeronautics Company (LM Aero)[6] plant, in Fort Worth, Texas.

The F-16 was also the first multinational production plane for the United States when the countries of Denmark, Norway, Belgium and The Netherlands selected it over competition from Northrop's Cobra and YF-17, Dassault's Mirage F and Saab's Viggen. These countries committed to buying 348 air combat fighters. Forming a multi-national program office in Dayton, the so-called European Participating Governments (EPG) along with the United States coordinated the development and production of the F-16. The work with the EPG allowed the United States to share the development and production cost of the aircraft. Assembly lines were opened in Belgium and The Netherlands where European components were attached to F-16s.

Subsequently other countries started expressing interest in the F-16 originally Canada, Iran, Israel, Pakistan, Australia, Korea, Greece, Egypt and Turkey. Currently the total number of F-16s delivered and on firm orders stands at 4,285.

The F-16 has been in continuous production around the world since 1978, including by SABCA in Belgium, Fokker in The Netherlands, KAI in South Korea, Turkish Aerospace Industries (TAI) in Turkey and by Mitsubishi Heavy Industries in Japan (a derivative of the F-16). Of the five multinational co-production assembly lines, only the LM Aero, Fort Worth, Texas line is still open. Korea recently completed it production run. More than 4000 have been manufactured over the last 24 years. The United States bought a total of 2240 F-16s, and as of March 2001 was still flying 125 of the A/B models and 1269 of the C/D versions. The United States Air Force (USAF) continues to buy F-16s for force sustainment. Congress is primarily responsible for continuing U.S. buys in the last several years. They have directed through Appropriations Acts, from FY96 through 99 and FY01, for the USAF to purchase additional Block 50 configuration aircraft. The FY00 procurement was introduced to Congress via the President's Budget. To comply with congressional direction, the F-16 System Program Office (SPO) awarded a contract in December 2000 to LM Aero-Ft. Worth. Thus Calendar Year 2000 was a good year for LM Aero with 234 F-16s bought for both foreign military sales (FMS) and the USAF. Current production is expected to continue through 2010.

The nineteen countries that currently fly the F-16 are:

- USAF – Air Combat Command (ACC), Pacific Air Forces (PACAF), United States Air Force Europe (USAFE), the Air National Guard (ANG), Air Force Reserve Command (AFRC) and the Air Education and Training Command (AETC), United States Navy (USN)

- European Participating Air Forces (EPAF) – Denmark, Belgium, Norway and The Netherlands, Portugal

- Foreign Military Sales (FMS) customers – Bahrain, Egypt, Greece, Israel, South Korea, Singapore, Taiwan, Turkey, Thailand, Venezuela, Jordan, Indonesia and Pakistan.

The United Arab Emirates (UAE) contracted with LM Aero to buy F-16s and will be country "number twenty." Italy signed a Letter of Offer and Acceptance (LOA) for refurbished aircraft and will be country "number twenty-one," while Chile will be number "twenty-two." Several other countries are interested in either buying or

leasing existing F-16s from USAF inventories, or buying new ones from LM Aero.

The F-16 is in its midlife. It has been one of the USAF's premier combat fighters. And it will continue to be so in the future. Major upgrades for all F-16 versions are being incorporated to keep the fleet modern and fully supportable over the aircraft's long service life. While its genesis began in the early 1970s, it will be around long enough for the grandchildren of the first pilots, and perhaps their great grandchildren, to fly it in the 2024 timeframe, its current scheduled date for removal from the inventory. With half of the USAF combat fighters being F-16s, it deserves its name — "The Fighter of Choice."

F-16 – The Aircraft

While the F-16 was initially to be an air-to-air day fighter, it was later converted to an all-weather night fighter. It was also designed with maintainability as a priority to make it simpler to maintain with easily removable access panels, locations of avionics boxes, and built-in-test (bit) systems, installed to pinpoint technical failures. Originally ordnance was limited to a gun and Sidewinder Air-to-Air Missiles. It has since added more fire capability with the inclusion of additional missiles, such as the Maverick and AMRAAM (Advanced Medium Range Air-to-Air Missiles) missiles. It is powered by either a single General Electric F110 engine or by a Pratt and Whitney F100 engine. With a range of 2,634 (nominal combat radius is 550 nautical miles), it can attain a speed of Mach 2.0 plus above 40,000 feet. Figure 5-1 shows the many variants of the F-16, upgraded in what is referred to as "blocks." The F-16A/B versions include Block 10/15, while the USAF F-16 C/D versions start with Block 25 and continue through Block 50. Block 60 is currently under development and supports the UAE. It was recognized at the outset that changes would be a part of the life of the aircraft. A formal change process was adopted and given a name in 1979 — the Multinational

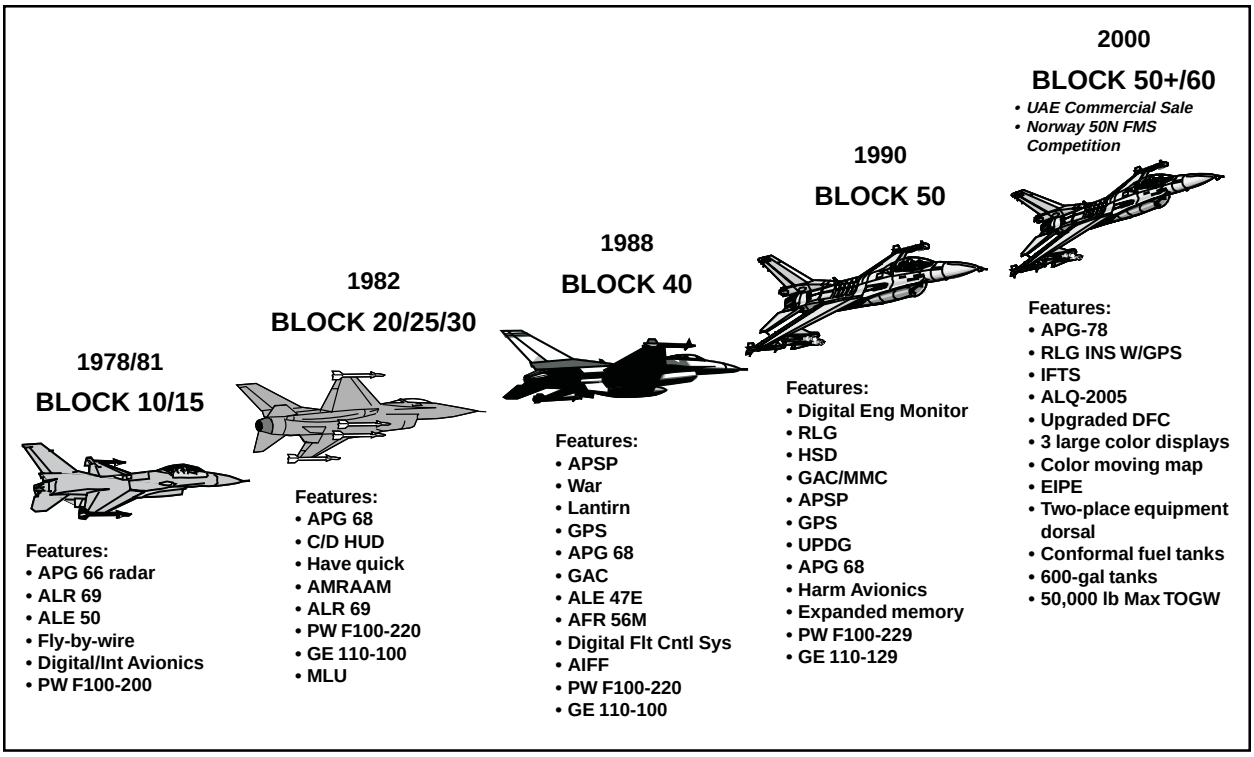


Figure 5-1. Aircraft Diversity

Staged Improvement Program (MSIP). MSIP was a logical systematic upgrade of weaponry, communications, navigation, and sensors. This approach fostered the development, integration and production of all the EPG members.[7] While the formal aspect of MSIP was discontinued in 1987, the general approach has continued, even today. The F-16 satisfies multiple requirements: Air-to-Surface (Interdiction and Suppression of Enemy Air Defenses), Air-to-Air, Air Defense Fighters, Close Air Support, and Reconnaissance.

MANAGEMENT STRUCTURE AND APPROACH

The hub of activity in keeping the F-16 current, making new buys, and ensuring its is ready when needed, is the F-16 System Program Office (SPO). The management environment the SPO operates in is complex. The traditional approach to organizing would be hierarchical — design an organization chart that shows the headquarters, major divisions, and then perhaps branches. This organization structure does exist in the Air Force, but over the last twenty years for a variety of management and political reasons, several other overlapping structures have been created. To appreciate the Air Force management structure and approach to managing programs, it is necessary to understand three organizational arrangements — the Program Executive Officer (PEO), Command, and Integrated Weapon System Management (IWSM).

It is also appropriate at this time to define two terms used to distinguish the division of responsibility and management — *acquisition* and *sustainment*. *Acquisition* refers to buying or developing new equipment and modifying and updating current equipment. It also important to note it refers to the line of authority for acquisition programs, since they fall within the PEO structure. *Sustainment* refers to maintaining and supplying support for existing systems. Sustainment efforts are the command responsibilities of the Air Force Materiel Command (AFMC). (See Appendix C for the AFMC organizational chart.)

As was indicated in Chapter Two, the PEO structure is used to manage programs. Figure 5-2

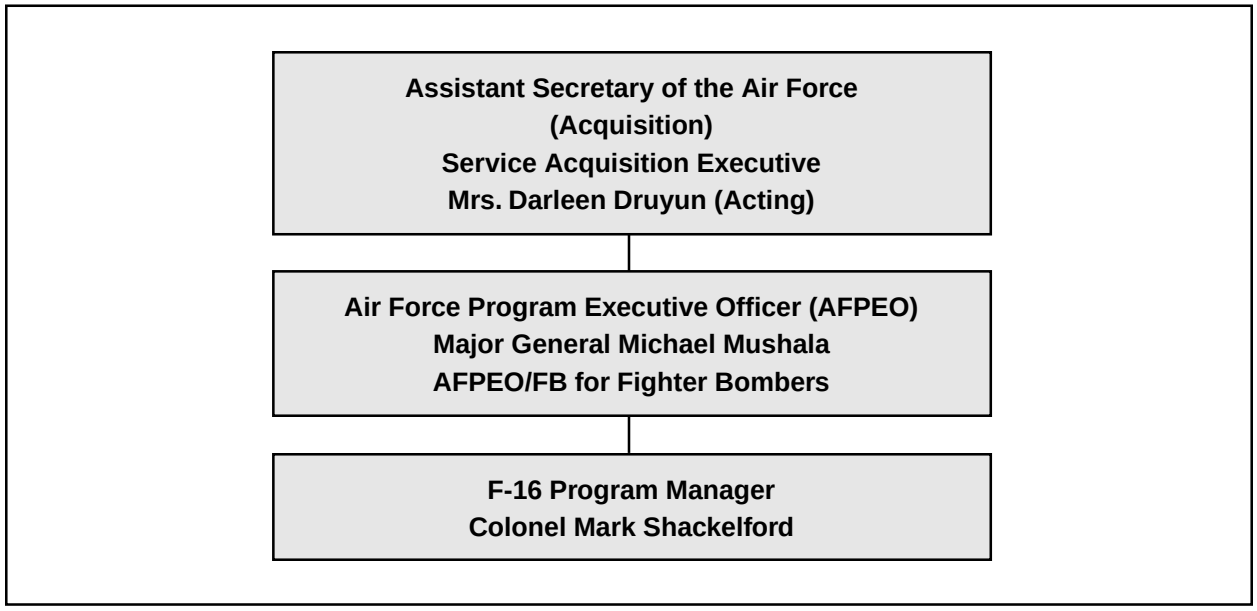


Figure 5-2. PEO Structure

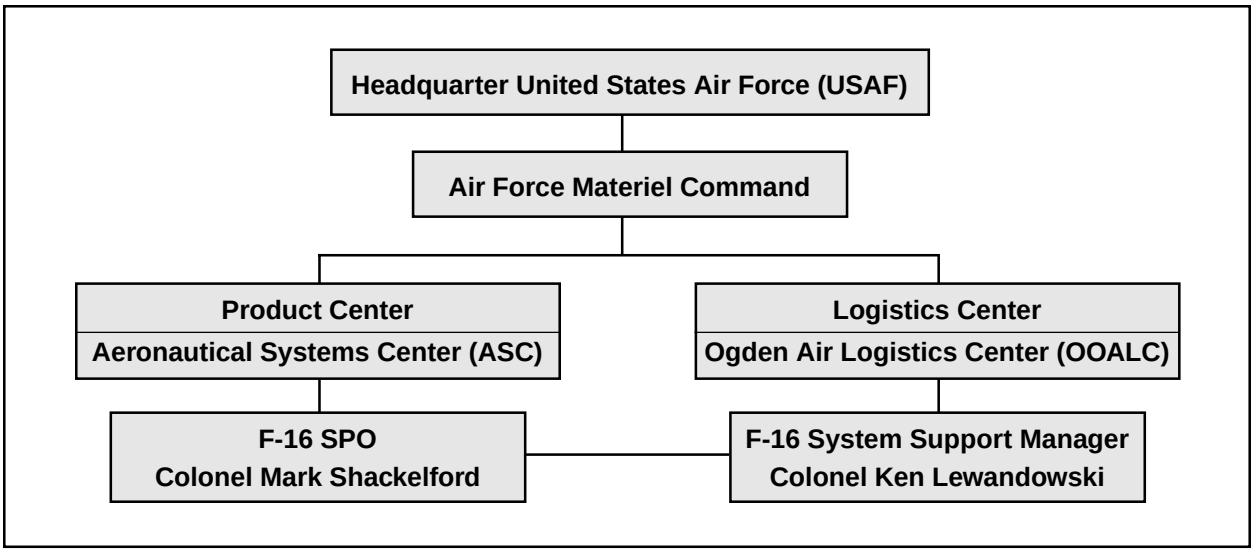


Figure 5-3. Command Structure

depicts the program management chain for the F-16 SPO. This approach provides the short "lines of authority" envisioned by the Packard Commission. The second organizational arrangement is the normal line, or command relationship, flowing from Headquarters Air Force down through AFMC to the Aeronautical Systems Center (ASC) and the Ogden Air Logistics Center (OO-ALC) (see Figure 5-3). In this management arrangement AFMC, and in particular, the ASC Commander and the OO-ALC Commander, have the responsibility to provide the manpower, facilities, processes and procedures within which the F-16 SPO can operate. However, they have no acquisition program authority nor responsibility for a program managed within the PEO structure. Finally, as part of its normal chain of command responsibilities, AFMC is tasked to logistically support, or sustain fielded systems, such as the F-16. To support its sustainment tasks, AFMC created in the early 1990s, a management construct, called

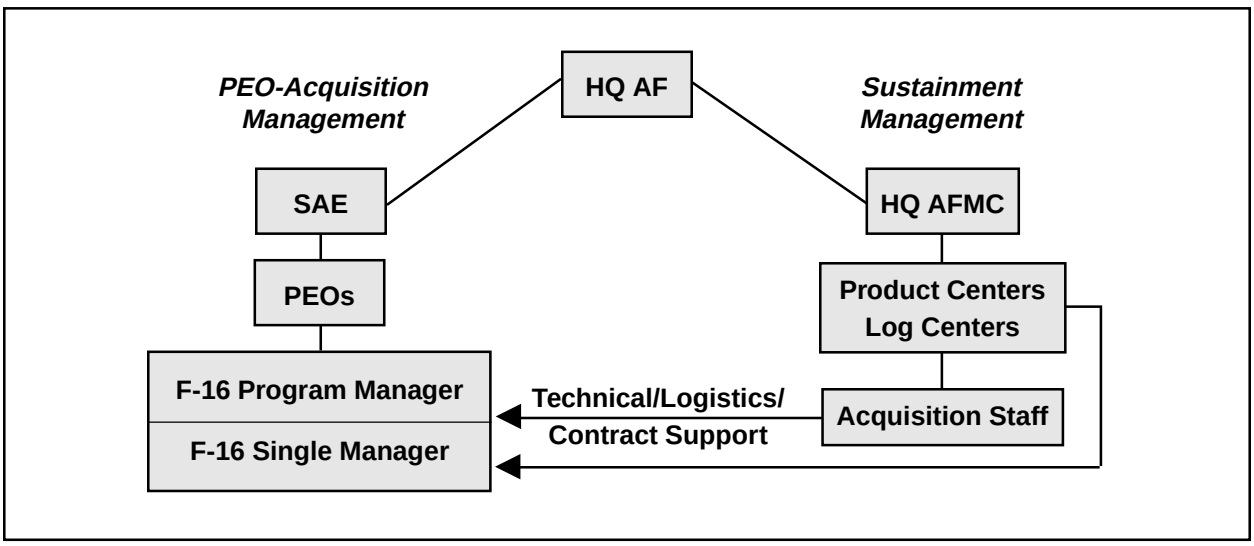


Figure 5-4. Acquisition and Sustainment Management Structure

IWSM. The basic purpose of IWSM was to have one person, "the Single Manager," with responsibility for a weapon system from "cradle-to-grave." To make this an effective approach it was necessary to establish relationships between the Single Manager and various organizations within the command. This link was vital since resources (manpower, facilities, equipment, etc.) are allocated through the AFMC chain of command. This relationship also provides users who fly F-16s with a "single belly button" to push when they have a problem. This "Single Manager" for the F-16, located at Wright-Patterson AFB, is also the same program manager (PM) who reports up the PEO chain of command (see Figure 5-4). Needless to say this command framework makes the life of a PM challenging as he tries to meet the demands of several bosses.

With this introduction as a framework, let's look more closely at the complexity of managing a large organization, such as the F-16, within these constructs. First of all, AFMC[8] employs more than 100,000 personnel geographically dispersed throughout the country (see Figure 5-5). They have two main types of organizations to manage acquisition and sustainment work — *Product Centers* and *Logistics Centers*, respectively. ASC, commanded by a Lieutenant General, is a *Product Center* and located at Wright-Patterson AFB. While OO-ALC at Hill AFB, is a *Logistics Center* and its commander is a Major General. The F-16 System Program Office is split between these two locations.[9]

Aeronautical Systems Center (ASC) and Ogden Air Logistics Center (OO-ALC)

ASC is the home of many aeronautical system development, production and modernization programs, such as the F-22 fighter aircraft, the C-17 cargo aircraft, as well as the F-16 Fighting

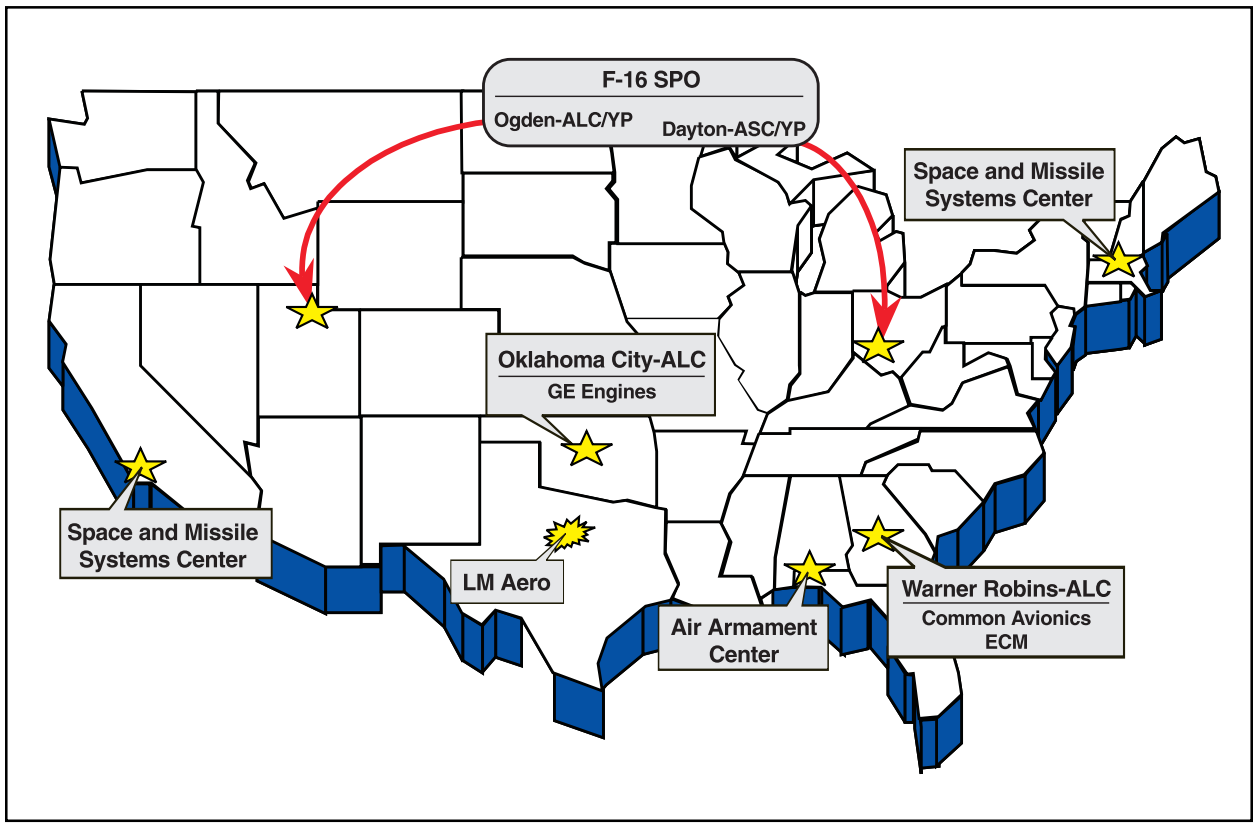


Figure 5-5. Air Force Materiel Command

Falcon. OO- ALC, as a logistics or sustainment center, provides engineering and logistics management for a variety of aircraft including the C-130 Hercules, the A-10 Warthog, F-117 Nighthawk, and the F-16 Fighting Falcon. Also located at Ogden, but not part of the F-16 SPO, are other organizations that support the F-16 aircraft for the overhaul and repair of landing gear, wheels and brakes, avionics, hydraulics, software, and other aerospace related items.

The F-16 System Program Office (SPO)

A brownstone, 1920s Art Deco building on Area B at Wright-Patterson Air Force Base houses the F-16 System Program Office (SPO). More than a generation of development, production, and sustainment of the Fighting Falcon has been managed. Currently Colonel Mark Shackelford,[10] is both the Program Manager and the Single Manager. As indicated, the SPO operates in two geographically separate regions of the country — "SPO East," for the acquisition[11] organization and "SPO West," for the sustainment[12] office. Colonel Ken Lewandowski, the System Support Manager (SSM),[13] has responsibility for the sustainment of the F-16 at "SPO West."

The SPO's mission is to develop new capability, acquire new aircraft, modify existing aircraft and logistically sustain the large operational F-16 fleet for both the United States and foreign customers. To do this they are organized into four main organizational groups (see Figure 5-6) with corresponding contingents at both Dayton and Ogden:

1. Programs Group

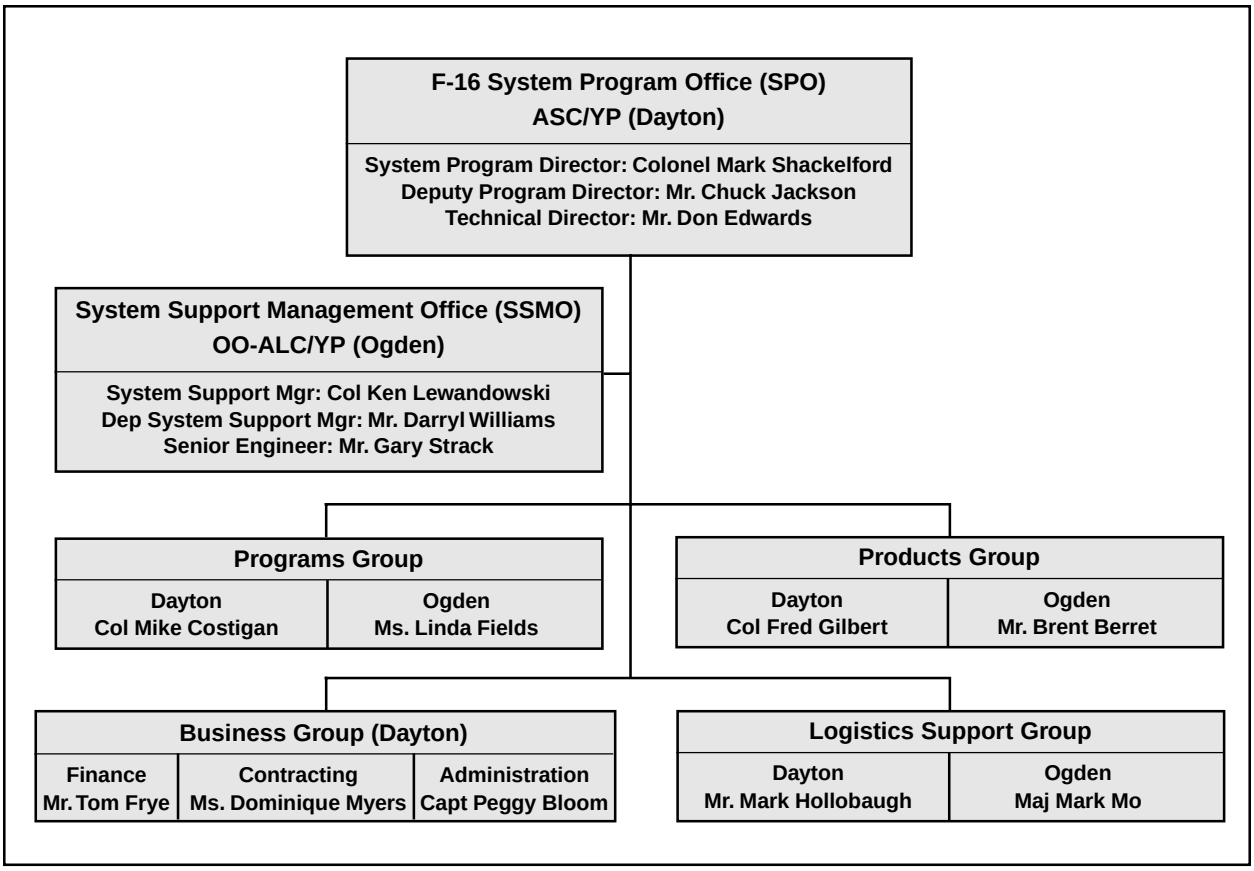


Figure 5-5. Air Force Materiel Command

2. Products Group

3. Business Group

4. Logistics Support Group

The division of work is "generally" distributed to "SPO East" for new development and production work, and to Ogden for supply support, maintenance, repair and transportation and minor modification work. The concept behind the structure was to create two major divisions that mirrored each other. Each center has a Programs Division (provides program management of various projects) and a Products Division (manages subsystems common to all versions of the aircraft and provides systems engineering support). There is also a Business Group, not duplicated at SPO West, and a Logistics Support Group.

To support the large FMS work and cooperative efforts with other countries, International Liaison Officers are assigned to Hill AFB and to "SPO East." There are representatives from Belgium, Denmark, The Netherlands, Norway, Greece, Korea, Israel, Egypt, Japan, Portugal, Singapore, Taiwan, Thailand, and Venezuela. The rest of the discussion in this part will center on the types of work performed by each Group.[14]

Programs Group
(ASC/YPX and OO-ALC/YPX[15])

The Programs Group manages a range of development, test, production, or modification programs for its three customer groups — the USAF, the European Participating Air Forces (EPAF), and Foreign Military Sales (FMS) customers. The breakout for work responsibilities between the two Program Groups is indicated in Figure 5-7. Normally, SPO East (five branches) takes the lead on all F-16 new FMS programs. In the Flight Test Branch, they manage all flight test processes and resources for USAF, EPAF, and FMS programs to verify the combat capability of the F-16 weapon system. They also have management responsibility to work with the Japanese on the development of the F-2, an F-16 derivative. The two "SPO East" International Branches manage by country teams (each with five to six personnel per team) as shown in Figure 5-7. At "SPO West" they have responsibility for the logistics planning and sustainment aspects of USAF and international programs, although the bulk of their work is in support of FMS customers. The Logistics Integration Branch regenerates F-16s from the "boneyard" at Davis-Monthan Air Force Base near Tucson, Arizona for refurbishment and sale to international customers. With international interest high

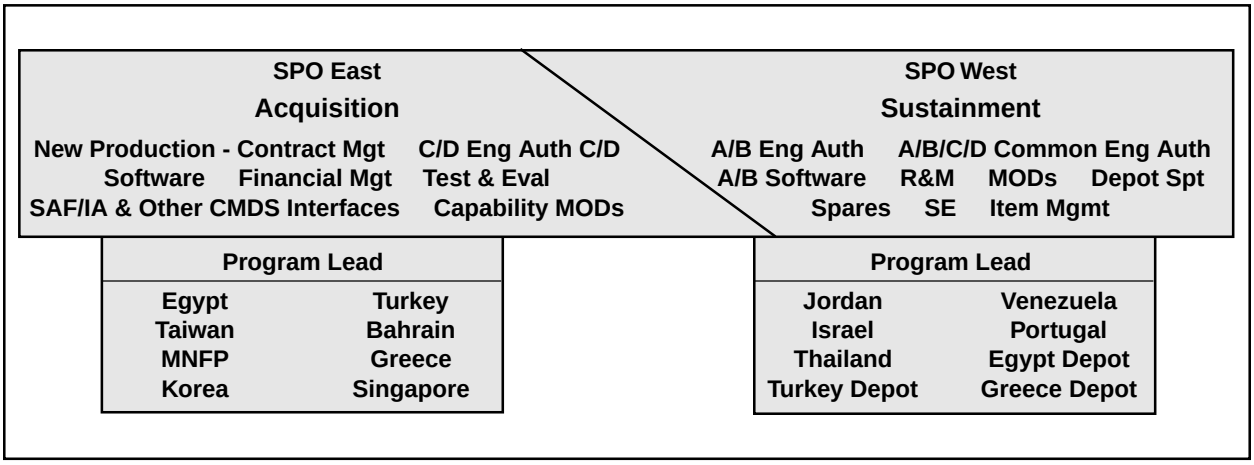


Figure 5-7. SPO East and SPO West Work Responsibilities

in obtaining F-16s, the USAF began in the 1994 timeframe to look at early version F-16 A/Bs for possible FMS sale. The cost of a regenerated aircraft is about two-thirds of a current production aircraft, and while not as capable as current designs, it can be refurbished, and it provides more capability than when originally built. Since this program started, they have regenerated 70 aircraft.

Product Group (ASC/YPV and OO-ALC/YPV)

The **Product Group (YPV)** is the process and common systems staff within the SPO. The staff provides technical definitions of new requirements, systems engineering, manufacturing, and safety for the aircraft and its subsystems. If an IPT or Country Team needs systems engineering expertise, then YPV's Flight Systems, Sensor and Systems Engineering branch will provide personnel to support the effort. They also have engineering responsibility for the common systems, e.g. engines, ejector seats, and electronic warfare (EW). This organization, as part of its technical responsibilities, has oversight of configuration and manufacturing management. It also manages, along with Ogden, the many minor modification programs, such as the Night Vision installation in the F-16s. At "SPO East" is an Acquisition Initiatives Branch that tracks implementation of acquisition initiatives such as Reduced Total Ownership Cost (RTOC), Single Process Initiatives (SPI), Activity Based Costing (ABC) and Product Support Business Area (PSBA). The F-16 has been selected as a "pilot program"[16] for several of these. "SPO West" provides field and depot engineering and technical support for aircraft structures including mechanical items, and manages embedded software and computers updates to the F-16 for USAF and FMS customer for all pre-block 40 aircraft. They also review, approve, and distribute Technical Orders.

Business Group (ASC/YPF, YPK, YPO)

The **Business Group** as is indicated in Figure 5-6 does not have a counterpart at SPO West, at least not as a separate function. The Business Group provides financial and contracting support to the SPO. The **Financial Management Division** is the "money manager" for the SPO. It prepares, with inputs from contractors; the cost estimates used for FMS sales. It allocates financial resources and maintains funds control for the SPO. Yearly it spends about $500 million on the USAF side, but it has overall responsibility for about $1.5 billion in total money managed. The FMS side receives and spends yearly about $500 million to $1 billion in new business. They also have the responsibility to monitor the contractor's program cost and schedule performance, including adherence to the Cost/Schedule Control System Criteria (C/SCSC). One routine financial activity that takes place during the budget preparation cycle is the "What if?" exercises. Typically a headquarters office will ask questions like, "If we reduce your program by $10 million, or if we reduce quantity by 10 percent, what impact does that have on your program?" The **Contracting Division** awards and administers F-16 contracts for both FMS and USAF. At "SPO West" contracting is organized differently. They provide matrixed support to the F-16 SPO, as well as to other organizations, such as the Mature and Aging Aircraft Directorate. While they do not work directly for the PM, they do provide about 11.5 man-years of effort to the SPO West.

Logistics Support Group (ASC/YPL and OO-ALC/YPL)

The **Logistics Support Group** is made up of two sister divisions — one responsible for Acquisition Logistics (SPO East) and the other for Systems Support activities (SPO West). The Acquisition Logistics Division is responsible for the management of all Integrated Logistics Support

acquisition functions, including development of all F-16 support equipment and technical orders. They are also responsible for warranty management and post-production support planning. The System Support Division provides daily liaison with the F-16's suppliers who collectively provide sustainment for the fleet. They also serve as the primary support interface between the HQs Air Force and other commands on issues impacting readiness of the weapon system. The **Customer Support Branch** provides a 24-hour a day "help desk" or Hotline for technical assistance.[17] Their Non-Commissioned Officers (NCOs) work customer issues and can form a Crisis Management Team (CMT) to quickly resolve a customer's critical technical issue and send the CMT to a customer's site.

Other Organizations within AFMC that Support the F-16

Keeping an aircraft flying and at its peak requires the work of many people and organizations. No program office contains all the expertise to keep an aircraft flying. The logistics and the repair support for the F-16, as for other aircraft, is a product of the effort of many different organizations. The F-16 is no different. If one thinks of one's car, many specialty companies have sprung up over the years to provide low cost, quality maintenance — Jiffy Lube for oil changes and Midas for muffler replacement are just two of the examples.

As an example, at Ogden the Logistics Management Directorate (OO-ALC/LG) provides supply management, through an individual called the "Supply Chain Manager (SCM)." A Division within LG has the SCM duties for the F-16 for buying and transporting spare parts for maintenance and repairs activities. When the aircraft is modified, they become a part of the modification effort to ensure that old parts are no longer bought and new parts are on the shelf ready when needed.

Another Ogden example is the Aircraft Directorate (OO-ALC/LA), which is the depot facility, or industrial facility, where aircraft are flown in from an operational base to be modified with the latest changes (such as Night Vision), or for structural enhancements, or for service life improvements. The examples just mentioned represent only two of several organizations at Ogden that support the F-16 for landing gear, wheels, brakes and tires, engine starter systems, gas turbine engines (GTE), auxiliary power units (APU), and secondary power units (SPU). Other air logistics centers (Oklahoma ALC and Warner Robbins ALC) provide support for items such as propulsion and automatic test equipment.

Integrated Product Team (IPT)

In the early 1990s a new management concept was inaugurated within DoD and Air Force acquisition — the Integrated Product Team. The IPT was an attempt to replace the traditional serial approach to staffing actions in order to decrease decision-making time and to make more informed decisions. "IPTs are cross-functional teams (e.g., program management, engineering, manufacturing, test, logistics, financial management, procurement, and contract administration, including customers and suppliers) that are formed for the specific purpose of delivering a product for an external or internal customer …and…making the right decision at the right time….IPT members should have complementary skills and be committed to a common purpose, performance objectives, and approach for which they hold themselves mutually accountable."[18]

IPTs play a key role in managing work effort within the SPO. The IPT is also indicative of the delegation of authority, a key tenet of the IPT philosophy, to personnel operating within the program office. While the composition of an IPT will vary, the typical FMS IPT (often referred to as Country Team) consists of membership

from the product center, logistics center, contractors, and the buying country. A Security Assistance Program Manager (SAPM) leads it, with a typical "core" membership that includes a systems engineer, logisticians, a financial manager, a contracting officer, and buyer. IPTs are the focal and often decision point for resolution of all F-16 issues and problems related to their specific projects. One final point on IPTs: often members are matrixed to an IPT, rather than a permanent part of an IPT team. A "matrixed" employee is one who joins the team, works with the team often, but not always to the extent of sitting in their office space.

There are a variety of other IPTs that mostly focus on functional or process topics. Some examples of these IPTs are:

- ***Environmental IPT –*** Provides environmental consulting expertise and support to ensure institutionalization of Pollution Prevention, and minimizes adverse environmental, safety, and health impact regarding cost, schedule, and performance.

- ***Safety IPT –*** Makes safety integral to all aspects of design and modification programs.

- ***Acquisition Initiatives IPT –*** Reviews impact and implements various initiatives such as RTOC, CASMIS[19], ABC , SPI, etc.

- ***Manufacturing IPT –*** Reduces program risks by balancing product design process with contractors manufacturing capabilities. Specific areas include Lean Manufacturing, Product Assurance, and transition to commercial practices.

- ***Sensors IPT –*** Evaluates impact of radar, electronic warfare, communication, navigation, identification issues and changes.

- ***Process IPTs –*** Integrates technical review of ECPs and modifications and develops system engineering and software acquisition process.

IPTs generally have a "core" group of personnel that form it. Using the Manufacturing IPT as an example, it has a core team of eight consisting of a team leader, several industrial engineers, a manufacturing engineer, a quality assurance, and industrial specialist. The team brings in other experts as necessary to reinforce the team. The team forms when a specific manufacturing issue arises, such as a Lean Aircraft Initiative. The initial effort may require the team to work the problem on a full-time basis. As the project is completed, the team dissolves, or in some cases it will continue to work residual issues on an ad hoc basis. The use of the formal title IPT is much more a part of the culture of the F-16 SPO East, than it is at the SPO West. SPO East uses many IPTs and country teams to manage projects within the SPO. Ogden tends to refer to their teams as country teams, funded by the FMS country rather than by an IPT.

THE PROGRAM MANAGERS[20]

This section takes a look at the twelve people who have managed the F-16 SPO over the last 29 years. The first Program Manager was Colonel Lyle W. Cameron, a former prisoner of war in Korea. He was the first of many who wore "wings" to become an F-16 Program Manager. Then, operating with a small program office at ASD, Colonel Cameron and his successor Colonel Bill Thurman managed the contractor development of a prototype technology demonstration aircraft and the initial Full Scale Engineering Development of the F-16. As the F-16 moved through its development and up the Air Force's priority list, the rank of the Program Manager also changed. The next Program Manager selected was at the general officer level —

Brigadier General, later Major General, James A. Abrahamson. As the aircraft entered "midlife" the general officer position returned to the Colonel level it was in the early 1990s.

What are some of the attributes of the job and the characteristics of the personnel that have managed the F-16? First of all, it has been a good position for future promotion. All but one Program Manager made general officer, several moved on to three stars, and one to four stars — General Ron Yates. The incumbent, Colonel Mark Shackelford, was recently selected for promotion to Brigadier General. One of the criteria or traits that seems to go into the selection process for an F-16 program manager is the need to have a user perspective — normally a former pilot. Over the last thirty years, of 12 program managers, ten have been pilots (nine fighter pilots and one a C-130 pilot). Only two have not been pilots — former Colonel, now Lieutenant General Leslie Kenne (maintenance officer) and Colonel Larry Cooper (navigator). From an educational perspective all the Program Managers have had at least a masters degree with the exception of one, Major General Bob Eaglet, who has a doctoral degree in Electrical Engineering. Six have been academy graduates, with two of the earlier PMs being Naval Academy (Bill Thurman), and West Point (George Monahan) graduates. Others have attended a variety of schools throughout the nation from large state schools (University of Nebraska and Auburn) to private schools such as the Massachusetts Institute of Technology (MIT), University of Southern California (USC) and St. Joseph's University. All but two have earned either an undergraduate degree or graduate degree in "hard science," such as engineering or physics. Acquisition experience brought to the F-16 job by each person has been an average of 10.3 years; Bob Eaglet had over twenty years and Bill Thurman had the least amount at 5 years.

What types of experience have these military personnel brought to the job? As indicated above

Program Managers	Years
Colonel Lyle W. Cameron	1871–1972
Colonel William E. Thurman	1972–1976
Major General James A. Abrahamson	1976–1980
Major General George L. Monahan, Jr.	1980–1983
Major General Ronald W. Yates	1983–1986
Major General Robert D. Eaglet	1986–1989
Brigadier General Ralph H. Graham	1989–1992
Brigadier General Ronald T. Kadish	1992–1993
Colonel Leslie F. Kenne	1993–1994
Colonel Larry H. Cooper	1994–1998
Colonel Jeffrey R. Riemer	1998–2000
Colonel Mark D. Shackelford	2000– Present

Figure 5-8. Program Managers

most have been pilots and bring the perspective of the operational user to the Program Office. The Air Force traditional goal to include the user perspective is well represented, and of course how could it be better represented than as the program manager. Acquisition experience included tours as headquarters staff officers, chiefs of integrated product teams, program directors of other programs, project managers at test and evaluation centers, and deputy program managers. The average rank to enter acquisition was as Major, with six entering acquisition as Lieutenant Colonels. In all cases, coming in at a more senior level, they moved into management level jobs. The length of time spent as the F-16 Program Manager has varied from only one year for Kenne to over four years for Abrahamson, with the average stay on the job about 2.5 years.

PERSONNEL[21]

This next section takes a statistical look at the workforce of the SPO. I have chosen a number of variables to examine in this section to provide insight into the characteristics of the personnel and certain aspects of acquisition personnel management. First, the number of personnel in the F-16 program office is 565 personnel — 474 government personnel, consisting of 80 military and 394 civilians. Also operating as part of the SPO workforce are 91 support contractors, often referred to as Advisory & Assistance Support (A&AS) contractors and 21 foreign national customer representatives. The largest component of the SPO is at "SPO East" with a total of 330 personnel — composed of 60 military, 197 civilians, and 73 A&AS contractors. "SPO West" has a total of 235 personnel, with 20 military, 197 civilians and 18 A&AS contractors. The average grade is GS-12/Captain.

There are a couple of characteristics worth noting between SPO East and West. The most obvious is the use of support contractors, only 7 percent, at SPO West, while in Dayton support contractors make up almost 22 percent of the workforce. Second, is the difference in a military presence with significantly more military personnel working on the acquisition side. Military personnel in Dayton make up 23 percent of the government acquisition workforce, while at Ogden they are only 9 percent. The ratio however is still 10 percent less than the military to civilian ratio for the Air Force acquisition and technology workforce.

Acquisition Positions

As mentioned in Chapter Two, the DoD created an Acquisition Workforce and Corps in the early 1990s. Certain government positions were identified either as Acquisition Workforce positions or as Critical Acquisition Positions (CAP). CAP positions at the Lieutenant Colonel or GS-14 level are filled with personnel from the acquisition workforce. In the case of the F-16, out of 474 government positions, 273 are acquisition workforce positions, 27 are CAP positions, and the balance are non-acquisition positions.

As indicated above most SPO East government positions are part of the acquisition workforce. While at SPO West many non-acquisition

	Total Positions	Acquisition Positions	CAPs
East	257	240	24
West	217	33	3
Total	474	273	27

Figure 5-9. Acquisition Positions

positions still perform acquisition functions. They are considered part of the sustainment workforce.

Functional Discipline

The personnel working in the program office represent a range of work disciplines or professions as shown below:

FMS Support

One of the major drivers of SPO activity is FMS support. Sixty percent of the SPO positions support the FMS Process. Foreign governments, through FMS accounts, fund these positions. That equates to approximately 339 of 565 personnel working on FMS slots. At SPO East that totals 179 positions, while at SPO West 160 positions are funded by FMS.

In FY 2000 the program office went through a major resizing of the SPO. They reduced the number of positions from 950 to 494. When looking at the workload the USAF support has declined from 470 to 227 personnel. The new FMS workload has increased the size of the workforce by an additional 71 positions, to bring the total workforce to 565 personnel.

Education and Experience

This data is gathered from the respondents to the survey shown in Appendix D. The total population for the survey was 413 personnel, 70 military, and 343 civilians (Received back 147 responses for a percentage return of 36 percent). It should be pointed out that all the military officers will have at least a bachelor's degree, with most having a master's degree.

SPO East

Of the 95 personnel (42 percent of the acquisition population — A&AS contractors not included) who responded to our survey at SPO East, 4 had high school as their highest degree, 34 had a Bachelors degree, while 55 had a Masters degree. The average amount of acquisition experience is approximately 15.5 years, with six having less than two years, and over 50 percent having over 10 years of acquisition experience.

Function	East	West	Total
Contracting	39	11.5	50.5
Financial Management	28	12	40
Program Management	47	3	50
Logistics	19	78	97
Science and Engineering	90	22	112
Test and Evaluation	3	0	3
Non-Acquisition Corporation			
Production/Modification Management		20	20
Equipment Management Specialist		31	31
Item Management Specialist		23	23

Figure 5-10. Functional Discipline

For acquisition training, 86 had received some acquisition training with 53 having achieved Level III. Acquisition level III training is required for critical acquisition positions (SPO East has 24 CAPs). Thirty-two of the respondents indicated they were multi-functional qualified with the achievement of at least Level II certifications (several had Level III) in other fields.

SPO West

Of the 52 personnel (28 percent of the acquisition population) who responded to our survey at SPO West, 15 had high school as their highest degree, one had an Associate's degree at a junior college, 22 had a Bachelor's degree, while 14 had Master's degrees. The average amount of acquisition experience is approximately 12.3 years, with five having less than two years, and slightly less than 50 percent having over 10 years of acquisition experience. Only 47 had received some acquisition training, and only 12 had achieved Level III certification. Eleven indicated they had more than one career field certification. SPO West has 3 critical acquisition positions.

Training

One of the areas of emphasis for DoD is career training for the acquisition workforce. Over $100 million is budgeted annually for their training by the Defense Acquisition University located at Ft. Belvoir, Virginia. Acquisition training refers to career training, distinct from level of education — such as Bachelor's or Master's degrees. As indicated in Chapter Two, the career training path envisions entry-level training (for which one receives a Level I certification), mid career training (Level II certification) and journeyman training (Level III certification). This researcher had two questions related strictly to acquisition training. How well trained is your workforce? And does it receive yearly adequate training?

SPO East

Responses from SPO East supervisors indicate they could get training for their workforce when they needed it and that the workforce was well trained. This is borne out by responses to the survey in which 53 personnel were identified as Level III certified, in at least one career field, 26 certified at Level II, and 7 certified at the entry Level I. Additionally, as indicated above, 32 had received certifications in more than one career field. Besides official career training, the SPO as part of an ASC effort embarked upon cross-training efforts, particularly between the financial management organization (FM) and the contracting organization (PK). This encouragement of cross-functional training was perceived to be beneficial for broadening personnel. Two areas of concern were identified: (1) a need for F-16 SPO specific job training and (2) additional training in several logistics areas — provisioning, support equipment and technical orders.

SPO West

At SPO West training needs were seen differently. Those in acquisition-coded positions felt they were well-trained and that training was available when needed. However, two problems were identified. For those not in an acquisition-coded position, but performing acquisition functions or wishing for career broadening training, training was hard to obtain. By DoD policy they receive a low priority for training at DAU courses. A second problem identified by several respondents related to the level of interest in training. "Adequacy of training is sufficient, but proficiency- or broadening-training was not of much interest to personnel." The problem was perceived to be one of an aging workforce with many personnel not far from retirement and generally not interested, particularly in any career-broadening training. As was indicated in the survey, 12 had received Level III certification,

23 had achieved Level II, and 12 had achieved Level I. Eleven had additional career field certifications.

Personnel Turnover

How often do personnel move, or said differently, what is the turnover rate of the Program Office? A typical complaint of managers and personnel relates to the movement of personnel since it often negatively affects the management of a program. Every time a new "boss" comes in with a new agenda, it is typical for change to occur in an organization — reorganizing, retraining, establishing new initiatives, and instituting new program direction. Also as personnel change, most often experience level decreases. In discussions with senior personnel from the SPO, turnover is no more different from what one would expect at any other program office. In the case of the military, it is typical to stay on the job approximately 2–3 years. In an early study by the IDA[23] of the F-16 and other programs significant upper-level management movement was found in the 1980s. More recently PMs have rotated more rapidly than in the past, with the last five program managers staying on the job slightly longer than 2 years. A review of other senior personnel in YP — directors, division and branch chiefs — indicates significant stability at SPO West, with most of the civilian senior leaders having worked in the SPO for five or more years. At SPO East, at the Group level, all senior managers have been in the program office less than three years. While at the branch level more stability is seen, with six of the managers having tenure over five years. Over 50 percent of the SPO managers came to their jobs since 1999.

SPO East

The SPO East turnover rate was from low to moderate with two exceptions. The main driver appeared to be career-broadening opportunities for personnel in contracting and financial management. While this in the long term will provide more capable personnel from a program perspective, it impacts F-16 knowledge and experience. Thus both FM and PK indicated significant change within the last five years (perhaps as high as 20 percent turnover yearly in the contracting division) that indicated only five of 35 professional contracting personnel remain.

SPO West

The SPO West turnover rate was identified as low. The main reason for turnover was identified as career management changes to provide personnel growth. Looking over a five-year period, the turnover rate is slightly higher — low to moderate, averaging about 10-15 percent. Data obtained on the length of time personnel have spent in the program office seem to bear out this finding with the exception of calendar year 2000 when 25 percent personnel turnover was witnessed. The only area mentioned as a problem was at another organization — the Technology and Industry Support Directorate, OO-ALC/TI organization—which had trouble retaining software writers. With many of our systems still using older languages — Jovial — it was difficult to attract and retain software writers to support SPO updates.

MANAGEMENT PRACTICES

This section attempts to look at the way the F-16 manages its work. What do I mean by management practices? Generally I mean the way we organize, process, delegate, lead, control, activate, and respond to outside sources (customers, bosses). We have already discussed the organizational structure, which gives us clues for other areas we want to consider. As indicated above, work performed in the SPO is of two general types — acquisition and sustainment. For the United States, the development and main

production runs of the F-16 all occurred in the 1970s and 80s. The production line has been kept open for new aircraft — primarily for FMS buys. However, the United States still buys small quantities of F-16s, usually by Congressional Direction. As an example, the Fiscal Year 2001 Defense Appropriations Acts required the Air Force to buy four additional F-16s. So while acquisition continues and new developed items are added to the F-16, much of the work falls under the sustainment umbrella.

Eight functions are represented by work performed in the F-16, plus FMS support. The categories are:[24] Financial Management, Logistics (Acquisition Logistics), Manufacturing, Quality Assurance, Contracting, Program Management, Engineering, and Test & Evaluation. These functions also relate to the way the acquisition workforce is organized, as shown in Chapter Two. Thus it makes sense to analyze the types of work performed by function, since people tend to see themselves as part of a functional group and their career-path training is aligned by functions. These activities take place regardless of whether the work is performed for the USAF or for an FMS customer. The following chart provides a general breakout of some of the activities that take place within each function (for a more detailed list see Appendix C).

Within each function are processes and procedures for managing work and for contributing to the acquisition or sustainment of a product. The way these all come together in the SPO, at least for a specific project, is through an IPT, or country team.

Program Management – Integration of Program Activities, Program Strategies, Program Reviews, Workforce and Organization Shaping, Contractor Oversight.

Contracting – Acquisition Strategy, Market Research, Negotiation, Evaluation of Proposals, Contract Preparation, Award and Administration, Modification of Contracts/Award Fee administration, yearly options.

Engineering/Quality/Manufacturing – Specification preparation/approval, design reviews, contractor oversight, Statement of Work reviews, configuration management, audits, Quality Oversight of contractor, contractor's procedures, review of contractor preparation for production.

Financial Management – Preparation of the program budgets, management of internal financial resources, schedules, financial forecasts, review of the Contractor program financial status.

Acquisition Logistics/Logistics Support – Supply support preparation, initial provisioning, development of test equipment, reliability/maintainability assessments, authorize technical orders, equipment management, item management.

Testing – Test and Evaluation Planning, preparation and review of test plan.

Foreign Military Sales Support –

Figure 5-11. SPO Tasks Performed

Decision Making

What types of decisions are made in a program office? Who makes them? What type of decisions does the PM delegate to his staff? What are the senior levels a Program Office must go to for approval? How often do they need to go to senior levels? These are some of the questions this section will attempt to answer. As a general management philosophy, as indicated in Chapter Two, DoD generally sees its higher headquarters offices as policy setters, with authority delegated to the lowest appropriate level to carry out the work. We indicated earlier that there are several chains of command — acquisition, sustainment (IWSM), and command. Program approvals for the F-16 run through the acquisition chain.

The Program Director receives his formal direction through a document prepared within the Air Force at the SAF/AQ level called a Program Management Directive (PMD). This document lays out the development, production, deployment schedule, systems support, and modification for the USAF work effort. The current PMD is 6075 (80)/0207133F and was issued in August 1997, but is updated as necessary. For Foreign Military Sales, direction comes from a document called a Letter of Offer and Acceptance (LOA), signed between the United States Government and a foreign nation.

Senior leaders conduct a variety of official reviews to check the status of projects within the SPO (see Figure 5-11). Since it is designated an ACAT II Major Program, the DoD Directive does not require any specific reporting activities. The Program Manager does generate a variety of reports, one of which — the Monthly Acquisition Report (MAR) — is sent to both SAF/AQ and PEO/FB. This is the most frequently generated report. A two-page status report, it highlights top-level issues on the program to the leadership. Annually, the PEO/FB Combined Portfolio Review (CPR) is held with SAF/AQ and AFMC/CC in which the F16 is one of several programs briefed. The Chief of Staff of the Air Force (CSAF) is briefed annually on the readiness status of the F-16.

Several business events can trigger the SPO to go to higher headquarters for approval prior to taking an action. Not withstanding the receipt of the PMD, prior approval is required for an acquisition strategy for a buy above $50 million. The approval level is either the PEO or the SAE (see Figure 5-12**).** Two other actions require approval outside of the program office — award of a sole source contract and approval of the

- **Annual**
  - **SAF/AQ & AFMC/CC Combined Portfolio Review (CPR)**
  - **CSAF Quarterly Acquisition Program Review**
- **Monthly**
  - **Monthly Acquisition Report to SAF/AQ and AFPEO/FB**
  - **Division Level Program Management Reviews with Contractors**
- **Bi-Weekly**
  - **SPO Telecon with Lockheed Martin Aero**

Figure 5-12. F-16 Reporting Requirements and Related Activities

Approval Authority	$ Threshold
PM (ASC/YP)	< $50M
AFPEO/FB	> $50M to < $50 M
PDASA (A&M)	> $500M

Figure 5-13. Program Approvals

Request for Proposal (RFP). See the contracting section for specific approval requirements.

Within the F-16 SPO

The current Program Manager generally has a "hands-off" approach to management. He will review key documents such as the Single Acquisition Management Plan (SAMP) and the Test and Evaluation Master Plan (TEMP) primarily for macro level, politically sensitive issues. This general approach flows throughout both SPOs — East and West. At the Division level, weekly and monthly reviews are conducted with program management personnel to ensure that schedules and obligation rates are being executed as planned. Customer satisfaction is used as a major guideline of how successful the organization is performing its mission. Note that the SPO is required to go to higher headquarters for approval. While this does not happen frequently, the issue of using expired funds requires approval of the Air Force Comptroller. One other politically sensitive area requiring higher-level approval is the selection of the Source of Repair Decision (SORAP) for a new inventory item. Because of Congressional requirements to maintain at least 50 percent of the repair work in-house at one of the Depots, the SORAP decision must go to Headquarters AFMC for approval.

The F-16 program management approach relies upon openness and shared communication and data as key tenets of management. The IPTs or Country teams have been delegated specific responsibility for a program, or project, and as long as they stay within cost, schedule, and performance guidelines, they have significant authority to perform their work. Each IPT tracks its contractor's progress.

Keeping on schedule and within cost goals and achieving the performance of new improvements is important. But the SPO also has the responsibility as the "single manager" for the health and well being of the F-16 fleet. What measurement criteria do they use to determine that? And more importantly, how well do they perform the job? This is a key question for any organization. The F-16 SPO and the Air Force uses a variety of measures to determine the well-being of their fleet of aircraft. The key aircraft measurements look at the ability of an aircraft to perform at least one of its missions (Mission Capable (MC). For the F-16 the operational air force wants to achieve a *minimum* fleet rate of 77.2 percent. Other measurements focus on the source of the problem — supply problems or awaiting maintenance action. One other key area to consider is the cannibalization rate (i.e., how many spare parts are "raided" from one aircraft to get another one airborne?). A high cannibalization rate often indicates supply problems, but also increases the cost of maintenance, for example, by having to remove an engine from one aircraft for use by another. In recent years the F-16 has had problems achieving its mission-capable rates often due to the lack of spare parts.

Mission Capability (MC)

Total Not Mission Capable for Supply Rate (TNMCS)

Total Not Mission Capable for Maintenance (TNMCM)

Cannibalization Rates (Cann Rates)

Figure 5-14. Aircraft Performance Measures

I have one final comment on the decision-making process within the program office. For development, integration and production projects that involve the European Participating Governments — Belgium, Denmark, The Netherlands, Norway and recently-included Portugal — they are treated as part of the program office and become a part of the decision-making process.

F-16 Reform Initiatives

Over the last decade, the United States was embarked upon a period of acquisition reform. Out of this effort emerged changes in laws, changes in policies and regulations, and a variety of initiatives aimed at improving the process and lowering the costs of buying and maintaining equipment. Of all these initiatives, several have had a distinct impact on the F-16. They are Reduced Total Ownership Cost (RTOC), Single Process Initiatives (SPI), Activity Based Costing (ABC), Product Support Business Area (PSBA), and the Air Force's Lightning Bolts. For these initiatives, specifically RTOC, SPI and ABC, the F-16 program office was selected to participate as a "Pilot Program" to test the effectiveness of implementing the initiative. Another series of initiatives the Air Force unleashed in 1995 were called "Lightning Bolts." Of the seven Lightning Bolt initiatives,[25] one focused on creating a new, leaner program office. This resulted in a significant restructuring of the Program office to comply with the requirement to significantly cut back the overhead of managing programs. They resized the SPO from 950 personnel to 494 personnel in 1999. When this is evaluated by the breakout of work between the USAF and FMS work, the following changes occurred — the USAF reduced from 470 to 227, while FMS was reduced from 480 to 316. The size of the SPO is now 565 personnel.[26] The basic thrust of all the changes was to become more "commercial like." Thus the department went from significant reliance on military specifications to use of commercial specifications. This included a Statement of Objectives — stating our needs, not detailed requirements, and asking industry for their best ideas. The SPO also recognized on its own the need to cut down the amount of time to get "on contract." An initiative called Span Time to Acquisition Reduction, or STAR, was implemented to speed up the process of awarding contracts. To track these initiatives the SPO created a separate division called YPVB with seven personnel.

Foreign Military Sales (FMS)

The F-16 is the Air Force's largest Foreign Military Sales procurement program with over 4000 aircraft produced through calendar year 2000. FMS is a part of the security assistance program of the United States in which foreign nations buy military equipment, supplies, training, and services from DoD. The F-16, which began as a multinational cooperative development and production program between the United States and the EPG, has evolved over time to be a major player in the FMS process with significant international interest in buying F-16s. Figure 5-13 shows the nations that fly the F-16. It is of

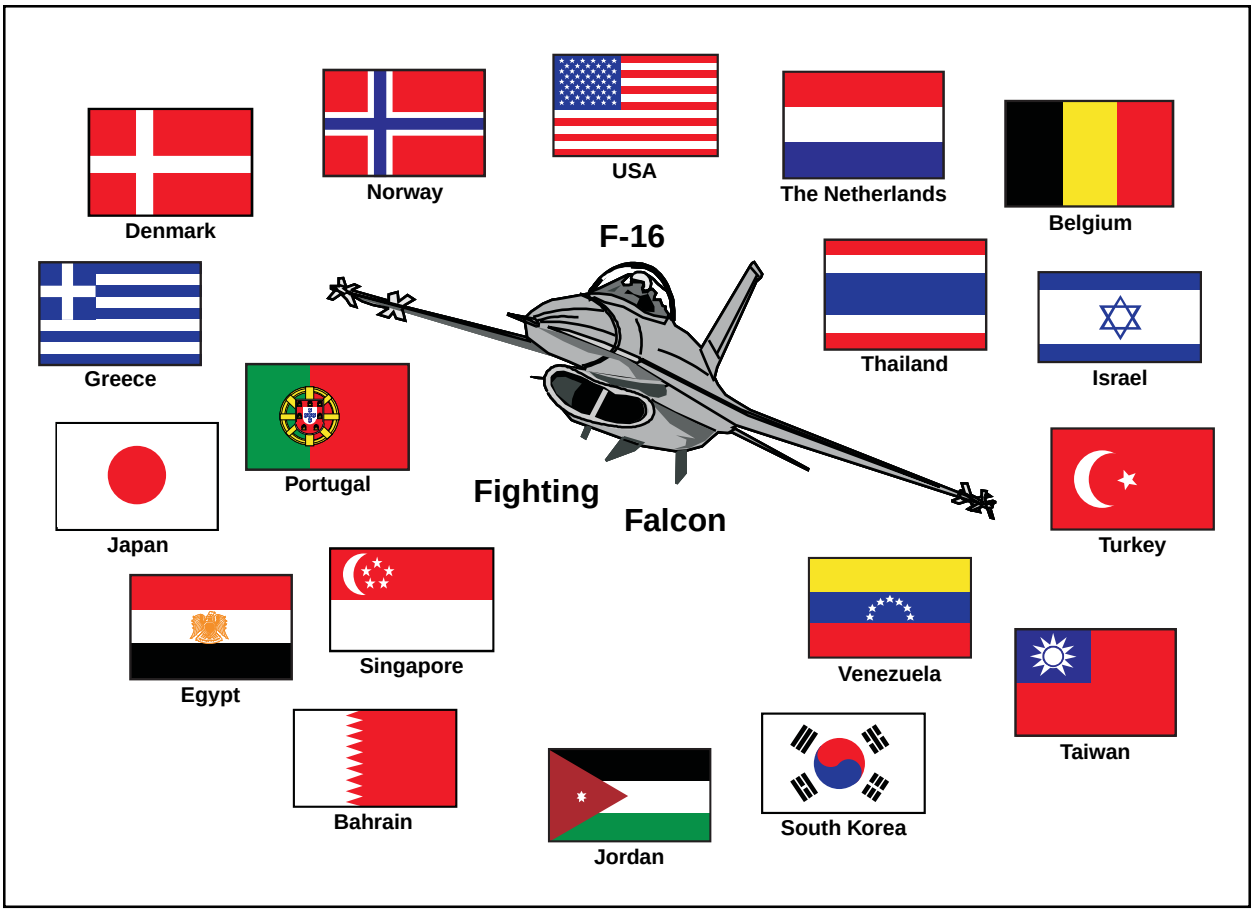


Figure 5-15. Countries Flying the F-16

interest to note that the newest buy of the most modern F-16 by the United Arab Emirates (UAE) is a Direct Commercial Sale, which means normally the SPO would not be involved in the management and contracting for the program. However, because of the technology involved in the Block 60 program, a Memorandum of Understanding was signed with the UAE for SPO involvement.

While FMS work is performed throughout the SPOs East and West, these Program Groups provide the program management for FMS. Other groups such as the Product and Business group provide support to the country teams on a matrixed basis, as needed. FMS is a non-appropriated funds program; personnel are paid out of a separate FMS account. Currently, that equates to 360 of 585 personnel.

Configuration Updates

In 1978, I bought a Ford Thunderbird, sleek, sort of sporty. It had the latest everything — four whitewall tires, 8-track stereo, analog clock, and lots of "get-up-and-go." After six years, it limped onto a car dealer lot, where using my best negotiation tactics, I convinced the dealer to sell me a new car and please take my old one in trade. The first F-16s were delivered in 1978 and while many of the early version A/B models are in mothballs at Davis Monthan, many are still flying. The C/D models will probably be around for another twenty years. Old airplanes, like old cars, suffer aging problems, but the difference is that Air Force maintains them. Also, as technology in cars has changed, so has the technology used in aircraft. New cars have more aerodynamic designs, new technology such as Global

Positioning Systems (GPS), and many digital devices — such as clocks that actually work.[27]

A military aircraft in this era of tight budgets is flown for many years beyond its normal life cycle. Besides normal maintenance, as the aircraft ages, structural problems caused by cracks in metal, rust, and other aging issues require additional corrective action. As technology and threats change, it is necessary to provide updates to aircraft to maintain or enhance their capability. This is an ever-changing environment. While the F-16 program office may develop the new capability they will be tasked with incorporating updates into the aircraft.

As we indicated earlier the F-16 uses a "block" process to identify and manage aircraft. Figure 5-16[28] indicates the capability currently being added to each block of aircraft. The SPO approaches the updates to the aircraft in a planned methodology. How does the process work? As an example a country, such as Singapore, will ask for a new capability. The SPO will ask the contractor for a Rough Order of Magnitude (ROM) estimate. Then the SPO task the contractor, LM Aero with an Advanced Change Study Notice (ACSN) that includes the Statement of Objectives and a requirements checklist. The SPO's country IPT, including the contractor and the Senior National Representative will have jointly prepared the ACSN. This is signed out by the Contracting Officer to LM Aero. In the next step, the contractor, jointly with the program office, prepares the technical portion of the Engineering Change Proposal (ECP).

The ECP is submitted to the SPO 72 days later and then is coordinated inside and outside of the SPO.[29] Fifteen days after receipt of the ECP, it is submitted to the Board, which usually approves it. After approval, again jointly, they prepare the cost proposal. Once submitted, it goes to the Contracting Division (YPK) for its business clearance requirements and then to negotiations to resolve the final price and incorporation on contract. Once that is done, the IPT monitors the contractor's efforts until the task is completed.

With all the configurations of the F-16 and the complexity of the aircraft itself, the SPO uses two boards to manage configuration changes to

Mission Description	FY00 Program Content
• **Block 10/15** **– 147 A/C** **– Air Defense Fighter**	**Service Life Extension Program (SLEP)**
• **Block 25/30/32** **– 619 A/C** **Close Air Support (CAS)/Interdiction**	**Add GPS, Night Vision, CMS, PATS, OFPs, Falcon Up/SLIP and other modifications**
• **Block 40/42** **– 415 A/C** **– Interdiction/CAS**	**CCIP (LINK 16, MMC, CCMFD, JHMCS), IDM, DTS, NVIS, Smart Weapons, Counter Measures, OFPs, CCIP (LINK 16, MMC, JHMCS, AAI), DTS, NVIS, Smart Weapons, Counter Measures, OFPs**
• **Block 50/52** **– 236 A/C** **– SEAD/Interdiction**	

Figure 5-16. F-16 Models and FY 2000 Upgrade Plans

the aircraft. They are the Joint Multi-national Configuration Control Team (JMCCT) for the majority of changes and the Joint Multi-National Configuration Control Board (JMCCB) for flight safety and for proposals that cannot be resolved by the JMCCT. The government and the contractor, LM Aero, jointly chair both boards. LM Aero performs the actual work of maintaining configuration control of the aircraft (drawings, specifications, etc.) and its subsystems. The main functions of this board are to evaluate recommended changes and ECPs, and then authorize the change.

The SPO makes several efforts — one of which is shown above as the Common Configuration Implementation Program (CCIP) — to group similar ECPs to take advantage of the opportunity to incorporate them at the same time for efficiency and cost savings. Below is a breakout of the number of ECPs and Contract Change proposals over a five-year period approved by the Board and incorporated on contract. They are ranked by their complexity with a low complexity rating, for a simple change such as a part number change, to high complexity for a totally new capability.[30]

Outside Influence

In interviews with program office personnel, one of the striking features was the "lack of high-level attention" and the impact on work activity in the SPO from senior levels of the government. Since the F-16 was operational and has been operational for 20 years, it does not generate the same level of interest from Congress, OSD, and the Service headquarters that a new developmental aircraft such as the F-22 receives.

The reason for this question is the common complaint of personnel in the acquisition community of the impact of extra work generated by headquarters and congressional tasking. In my

	1996	1997	1998	1999	2000
Engineering Change Proposals					
Completxity					
High	**9**	**6**	**5**	**3**	**7**
Slightly above	**11**	**9**	**5**	**18**	**3**
Average	**5**	**8**	**18**	**2**	**4**
Slightly below	**9**	**20**	**15**	**15**	**10**
Low	**58**	**41**	**44**	**8**	**3**
Total Approved	**92**	**84**	**87**	**46**	**27**
Contract Change Proposals					
Complexity					
High	**7**	**6**	**8**	**2**	**1**
Slightly above	**15**	**11**	**9**	**4**	**6**
Average	**10**	**13**	**7**	**5**	**3**
Slightly below	**14**	**12**	**6**	**1**	**2**
Low	**10**	**10**	**6**	**1**	**1**
Total Approved	**56**	**52**	**36**	**13**	**13**

Figure 5-17. ECPs and Contract Change Proposals (1996–2000)

interviews with senior managers at both SPO East and West, the workload impact from Congress, OSD, and AFMC was generally adjudged to be minimal. Headquarters Air Force, on three primary issues, was seen as contributing moderately to the workload of the SPO; the three areas were from SAF/IA, because of technology transfer issues, SAF/FM for "what if" exercises and budgetary issues, and SAF/AQ for acquisition initiatives. From the local Acquisition organization, ASC and OO-ALC, impact on their work was judged low to moderate. One of the interviewees perhaps captured the local impact issues when asked about the impact of the local headquarters responding, "very little (currently), but sometime that varies depending upon the personality of the individual holding these jobs. Some are micro-managers who get heavily involved into what goes on, while others are top managers who provide a lot of leeway."

Management responsibility is retained within the Air Force and within the PEO chain. Thus most of the high level impact is probably indirect through policy and regulatory changes. Individual organizations do drive some additional work for reviews of initiatives within AFMC for aging aircraft, common systems, and others such as Operational Safety, Suitability, and Effectiveness (OSS&E). Local organizations, such as ASC and OO-ALC, have a greater level of involvement since they actually provide people and processes and often "tap" them for reviews of local initiatives. Congressional notifications for contract awards and new F-16 buys were the primary political items identified as impacting the SPO. For example, in the FY01 appropriations act, Congress directed the Air Force to buy 4 new aircraft and to plan for modernization of Air National Guard (ANG[31]) units that have F-16A aircraft assigned. In some cases during the interviews, some organizations were identified as the "guilty parties" for new work, when in reality it was other organizations.

Business Arrangements

Two different contracting organizations support the program office. At SPO East they currently have about 40 active contracts, with 4 prime contractors. The four primes are LM Aero (aircraft), Northrup-Grumman (radar), Sargent Fletcher Company (auxiliary mission equipment), and Luminescent System Inc (Night Vision Goggles). Since 1975 the primary F-16 contracting work has been done "all sole source" to LM Aero, using both firm fixed-price and cost reimbursement contracts.[32] They have 14 warranted contracting officers who are authorized to award or modify contracts and direct the contractor.[33] Last year in FY 2000, they issued eight new contracts and processed 268 changes to existing contracts. The SPO's contract activity — new contracts, modifications to existing contracts, and the dollar value of all contract actions — over the last three years can be seen in Figure 5-16 for both FMS and USAF efforts. The large increase in money spent in FY 2000 reflects two major FMS buys of $1.3 billion each. The normal business strategy employed

	Fiscal Year		
	1998	1999	2000
New Contracts Actions	9	10	8
Modifications	441	343	262
Dollar Value	$ 629M	$ 852M	$ 3.3B

Figure 5-18. F-16 SPO East Contracts Activity

by the SPO is to issue a new contract for each new FMS buy. For a U.S. buy, the existing LM Aero contract is modified to incorporate the new acquisition. They also regularly make use of Government Furnished Equipment provided typically by a logistics center to help reduce the cost of the system.

At SPO West, contracting is provided as matrixed support not only for the F-16 SPO, but for other organizations that support the F-16 aircraft, such as the Logistics Management Directorate, which provide the spare parts for repair and modification of the F-16 aircraft. They have 51 separate contracts, for a total face value of slightly more than $1 billion, and spend approximately $275 million yearly. Fifteen of these contracts are with LM Aero, all sole source. The LM Aero share of yearly spending average about $96 million. Only five contracts are competitive and the largest one of those is for $5 million.[34] In FY 2000 they issued a total of 214 modifications, plus 504 delivery orders.[35]

One final area that needs to be mentioned is the role played by the Defense Contract Administration Agency. This organization, located at the contractor's plant in Fort Worth, Texas, has the responsibility for administering the contracts for the program office. Typical duties include reviewing contractor proposals, administrative systems, advising the program office on schedule and technical difficulties, and making payments.

SUMMARY

The locus of management activity for the acquisition (new buys and changes) and sustainment (logistics support) of the F-16 is the SPO. The program office exists in a very complex management environment. It is part of a very large organization, geographically dispersed, operating within a set of overlapping management structures (PEO, AFMC, IWSM, and IPT). Even internally it is large; and perhaps reflecting the competing interest of various players, it is geographically separate, reporting up several chains of commands. The Program Manager (and Single Manager) is also responsible for the readiness of the aircraft fleet for peacetime and combat. This adds a large group of customers with concerns about their ability to perform their missions, and it provides a management environment where it is necessary to respond to the conflicting demands of all parties. As part of a large, dispersed organization the senior levels of management (Congress, OSD, and Service Headquarters) provide a more formal set of rules and regulations to govern the activity of its personnel.

Decision making is relatively formalized, with several yearly briefings to high-level commanders, plus a variety of monthly meetings with senior-level managers and contractors, primarily LM Aero. For acquisition strategies and contracts for major efforts, the SPO is required to go to higher-level authorities for approval, mostly at the SAF/AQ level in Washington, D.C. The program office operates more informally with internal reviews at the division level, but expects project leaders to bring to senior managers significant problems or breaches of approved baselines. The IPT (including country teams) management technique plays a key role in the work structure within the SPO. It is used for product (F-16 C/Ds), or country purposes, but also provides the means to address technical and management issues. The IPT also provides the customer a focal point for issues and concerns.

The selection of the key individual to manage this effort reflects the Air Force desire for a PM with primarily an operational and management background, but inculcated with a certain measure of acquisition experience. In this case the F-16 PMs bring, on average, over a decade of

acquisition experience. An array of military, civilian, and support contractor (acquisition and non-acquisition) personnel provides the technical and business skills necessary to run the program office. Educating and training of government personnel is very structured and a training and experience career path is laid out in a series of DoD and Service regulations. And finally, as USAF work has diminished over the years, FMS has become the backbone of SPO work, with FMS making up almost 60 percent of the work performed by the program office.

ENDNOTES

1. In Korea, for a variety of reasons, the U.S. shot down ten of their aircraft for every one lost by the U.S. In Vietnam the early exchange rates was 1 for 1. The introduction of more F-4s later in the war helped improve the exchange rate.

2. Dorfer, Ingemar, *Arms Deal: The Selling of the F-16*, Praeger, New York, 1983, pg. 9.

3. Dorfer, pg. 14.

4. Over the years the term for the development phase has changed — Full Scale Engineering Development, Full Scale Development, Engineering and Manufacturing Development and its current term, the Systems Acquisition and Production and Deployment Phase, which includes the Systems Integration, System Demonstration, Low Rate Initial Production and Full Rate Production and Deployment work efforts.

5. Current price for an F-16C/D model is $20 million plus per aircraft.

6. At that time the company producing the F-16 was General Dynamics. The Fort Worth aircraft division was sold to Lockheed in the 1990s. This facility was then known as Lockheed-Martin Tactical Aircraft Systems, LMTAS. Following a recent Lockheed Martin reorganization, this facility is now part of the Lockheed Martin Aeronautics Company, specifically Lockheed Martin Aeronautics Company-Fort Worth (LM Aero-Ft. Worth).

7. For a detailed explanation of the MSIP effort see Frank Camm's study on risk management.

8. Air Force Materiel Command was formed in July 1992 with the merger of Air Force System Command (AFSC) and the Air Force Logistics Command (AFLC).

9. Recently the ASC Commander was titularly identified as responsible for sustainment of all aircraft, although since he does not actually control any of the resources for sustainment, it is uncertain as to how this policy will be implemented.

10. Recently nominated to Congress for the rank of Brigadier General.

11. Acquisition is a broadly-used term that refers in its narrowest sense to the research, development, and production of systems. In its broadest sense it also includes the testing, the modification, the logistics support, and disposal of weapons and other equipment. Many other countries use the term procurement, or armaments development in lieu of acquisition.

12. Sustainment refers to the classic logistics disciplines of Supply, Maintenance, and Transportation, more commonly termed logistics support to the systems — supplies, spare parts, and maintenance.

13. SSM is an IWSM term—The SSM is the lead individual at a Logistics Center who is delegated sustainment responsibility for a system or product. The SSM reports directly to the SM.

14. For a complete description of the work of each division, see Appendix C.

15. It is traditional in the U.S. military to refer to offices by their program office symbol, such as YP, YPX, etc.

16. An organization is often selected to test (or pilot) new policies or procedures prior to Air Force-wide implementation.

17. Note: The SPO focal point for customer support is at SPO west under YPL. The SPO East Customer Support Group functionally works for the SPO West focal points.

18. See Navy website http://www.acq-ref.navy.mil/ipt/html/map.htm on IPTs.

19. CASMIS is an ASC contracting system Contract Administration Support Management Information Systems.

20. In the Air Force Program Manager of major air force programs are referred to as Program Directors. For this publication the term PM will be used to avoid confusion.

21. All personnel numbers are as of 22 March 2001 and provided by ASC/YPO, Ms Lisa Shannon.

22. A non-acquisition position would include secretaries, administrative personnel, equipment specialist, inventory managers and others. In some cases they may actually perform acquisition work for a portion of their jobs, but not enough to justify being included in the Corps.

23. Camm, Frank, "The F-16 Multinational Staged Improvement Program: A Case Study of Risk Assessment and Risk Management," A Rand Study, 1993.

24. Auditing, Industrial/Property Management, Intelligence Support, Security.

25. The seven Lightning Bolts made the following changes: created a centralized Request For Proposal support team, created a standing Acquisition Strategy Panel, developed a new SPO Manpower Model, eliminated center level acquisition policies, reinvented the Air Force System Acquisition Review Council, enhanced the role of past performance in source selections, and replaced the many required plans and documents with the Single Acquisition Management Plan.

26. As of May 2001.

27. For those too young to remember, it was a popular complaint that the old analog clocks rarely worked much past the drive from the dealership to the home.

28. The acronyms are: CCIP (Common Configuration Implementation Program), CMS (Combat Management System), MMC (Modular Mission Computer), PATS (Precision Attack Targeting System), DTS (Digital Test Station), NVIS (Night Vision Imaging System) JHMCS (Joint Helmet - Mounted Cueing System), OFP (Operational Flight Program), GPS (Global Positioning System), AAI (Air-to-Air Interrogator) and SLIP (Service Life Improvement Program.

29. Same process for either USAF or FMS customers.

30. Data provided by Ms Teresa Watson, ASC/YPVE.

31. The motto of the National Guard is "Civilian in Peace, Soldier in War, I Am the Guard" captures the role of the Air National Guard. They work for the individual states during peacetime, and for the national government in war. They are citizen soldiers.

32. The last source selection was in 1997.

33. These individuals are selected because of technical competence. In the U.S. system, the contracting officer is the only person that can direct, through the contract, the activities of the contractor. Prior to awarding a contract, contracting officers are required to receive approval to begin negotiation and to award a contract.

34. They conduct on average about two source selections

Chapter 6

A CONTRAST OF PROGRAM MANAGEMENT

Two contrasting images emerge between France and the United States.

Size! The Grand Canyon in Arizona, the rolling plains across the heartland of America, and the Great Lakes on the northern border! Paris with its centuries-old buildings and grand boulevards! The Eiffel Tower! The Arc d'Triomphe!

Cultural differences! The wild, wild West, surfing in California, or singing "Jimmy Buffet songs" on a beach in the Keys! Small Parisian cafes, listening to the expressive voice of the "Parisian Sparrow Edith Piaf, long vacations, and wine and cheese!

In the early 1990s, the F-22 aircraft program office staff (under the leadership of then Colonel Jim Fain) adopted and became the disciples of a new concept borrowed from American industry — the Integrated Product Team. The implementation of this concept by DoD and the DGA captures the difference in management styles between the two organizations. The IPT philosophy was to have the right people with the right authority formed into a team to work an issue or manage a program. The result would be enhanced communication, reduced cost, improved customer satisfaction, and so on. From within the Air Force, this concept spread to other organizations. Embarked upon an effort of "Acquisition Reform," DoD adopted the IPT as a centerpiece of it efforts to reform the acquisition system. It was formalized into regulations, articles appeared in DoD publications, DoD websites (including the IPT College) were created — all dedicated to spreading the IPT concept. An organizational structure was created with a hierarchy of IPTs. The lowest level IPT was the program office IPT (where the original concept started). Then DoD created Integrating IPTs, Working IPTs, and Overarching IPTs, all to help the normal management structure manage. It was humorously observed around the Pentagon that the answer to ALL problems was an IPT. One individual remarked, as a source of pride, that he was a member of 54 separate IPTs. France in contrast, under the leaderships of DGA's Yves Helmer, also adopted the IPT technique on a much smaller scale. IPTs were created at the program office level to improve communication with its customers (the military services) and for program office activities, such as preparation of a Request for Proposal. Short-term training courses were initiated to help teams get started, and once started, to operate effectively. It served as a tool rather than as an end itself.

This chapter provides a comparison of the management environment and the business practices of the F-16 and the Mirage 2000 program offices. The prior chapters have provided a separate understanding of how each program office operates and the milieu within which they operate. This chapter also provides a comparison to foster mutual understanding of how each, in different ways, addresses its complex task. While there is a general standard used for program management in both countries — achievement of cost, schedule and technical goals — each country goes about it in different ways.

Politics and Armament Acquisition

"Were we directed from Washington when to sow and when to reap, we should soon want bread,"[1] said Thomas Jefferson as a warning about the centralization of government. His warning captures the American historical tradition — a tradition and a deep-seated value still held dearly by many Americans today. Congress's active participation in the acquisition process is part of the design of the creators of the constitution. They not only provide the money, as the French Parliament does, but they stipulate conditions conduct additional aircraft tests, or change equipment needs — adding or deleting aircraft. This contrasts sharply with the lack of parliamentary involvement in France. Under the 5th Republic's Constitution, Parliament is unable to even initiate legislation on defense matters. France also has a tradition of a strong central government. All schools, from elementary to university, are part of the national system of education in France. In contrast, in the United States, it is the right and a responsibility of local governments — State, County, and City — to determine what is taught and to fund the education of its students. While strong executive control on defense matters may reduce the turmoil between the legislative and executive branches in France, it does not mean that Defense gets what it wants. Competing interests within the Administration — social versus defense — under both conservative and socialist governments — have often left Defense short.

Besides the money spent on defense, Defense often creates advanced technology that translates into future jobs. In other words, it also satisfies an economic purpose. Both countries see the economic impact of defense. The U.S. Congress is famous for its support of programs with a view to what is manufactured within "my district." It customarily views the production of military equipment as something that should be produced on American soil. France considers its defense industry as an important component of its worldwide leadership and an important part of its technological and business interests. Thus issues of offsets on cooperative programs and future sales play a serious role in their decision processes.

The relationship between government and industry provides a striking difference between the two countries. This long-standing tradition, dating from the times of Louis IV and his Minister Colbert,[2] ensures the State is heavily involved in the affairs of its people. The precise distinction between public and private sectors in the United States does not exist in France.

Thus the French State has owned companies and identified "national champions" such as Dassault for Aircraft. Paraphrasing a famous quote on war, "Production is too serious a business to be left to industry,"[3] captures French thought on the government's relationship to industry. Despite the theoretical difference, no one would doubt that the U.S. Department of Defense plays a significant role in regulating defense industry, and mandating its accounting rules and regulations and manufacturing methods (although this is changing somewhat).

The French armaments approach can no longer be looked at as strictly internal to the country. The "Europeanization formula" now addresses the previously sacrosanct issue of defense and the defense industry. This has two effects on the French nation and its defense industry. Management of cooperative programs, and these will often be major programs, will take place in OCCAR (an EU entity). With the July 2000 signing of a framework agreement, nations have given a green light to European industrial consolidation across national lines. While still many issues remain to be worked, such as the French government's ownership and potential involvement in company actions, the political equation has changed.

Breadth of Defense Activities

A variety of factors need to be examined when comparing these two countries in the defense arena — the scale and breadth of defense activities, defense industry (breadth of product areas, size of programs), and armament sales.

The United States, in pure money and manpower terms, puts the most into defense. The United States still spends the largest amount for its military and has the second largest standing military force in the world at 1.4 million active duty military personnel. At $293.2 billion for fiscal year 2001, of which $98.2 billion is for the research, development and production of weapon systems, the U.S. budget is more than eight times larger than the French budget. However comparing the percentage of the nation's wealth — the Gross Domestic Product — the United States at 2.9 percent spends approximately the same percent as France. Yet France has the fourth largest defense budget in the world and spends on average slightly less than FF 86 billion on its modernization efforts.

The first look at these two countries reveals a rather striking difference in the size of their defense industries. The United States has by far the largest defense industry. Three of the top four defense firms in the world are in the United States (Lockheed Martin, Boeing and Raytheon) with the fourth being BAE a British firm. EADS with significant French involvement is 6th, while Thales is 8th. This should be expected considering the significant difference in the defense budgets of both countries. However, France has the largest defense industry in Western Europe employing more than 175,000 people, representing 4.5 percent of the total French industrial employment. It also occupies an important position in the French economy with more than 5,000 companies involved in defense.

As far as what the United States manufactures, it has the largest range of products in the world. France however produces 90 percent of its own equipment and does offer a wide range of products — ships, aircraft, and tanks. In terms of skills, it has developed the expertise to design, develop, and produce its own systems. A main difference is that the large American defense firms, Boeing excepted, are defense firms, while the large French companies have and need a significant commercial market presence to help offset periods of slow defense spending.

The United States was again the largest supplier of arms to the world in Fiscal Year 2000. This is a position it has held for almost a decade. Its sales in 2000 through its Foreign Military Sales program to allies and friendly nations were estimated at $18.6 billion dollars. France in the last decade actually surpassed Russia in the sale of military equipment. From 1991 to 1999 France exported FF 334 billion ($46.3 billion), while the United States sold $83 billion, and Russia sold about $35 billion. Approximately 6 billion Euro goes into the export markets in 2000.[4] There is a difference in the impact on France for armament sales. These sales are *critical* to its ability to keep a defense industry and its

U.S.	France
$ 293.2B Budget	$ 26.3B (188.9 FF) Budget
$ 98.2B Modernization	$ 11.6B (85.0 FF) Modernization
1.4M Active Duty Military Personnel	440,000 Military and Civilian Personnel

Figure 6-1. Comparison of FY 2001 Defense Activities

worldwide influence. While for the United States it is *important* to lower the cost of weapon systems yet protect the health of its defense industry. Both programs in this study are major contributors to the success of armament sales. The F-16 is the largest Foreign Military Sales procurement program of the USAF, with over 4000 aircraft produced. The Mirage 2000 with armament sales to seven countries of 286 aircraft has been a significant contributor to the health of the Dassault and the French defense industry.

The Way of Doing Business

A recent study of French management captures the French perspective.[5] "As French executives see it, management is a state of mind, not a set of techniques. For them, it is the ability to think logically and analyze systematically that sets them apart from the rest of the personnel. So to be named cadre is akin to passing an intelligence test — it is a hallmark of intellectual caliber. It follows that the title bestows social as well as professional consideration on its incumbent. A cadre "superieur" enjoys the same kind of social prestige as a lawyer, architect or doctor." This statement on the French management outlook in general also captures at least one aspect of the cultural differences in approaching organization, policies, procedures and selection of personnel to run the organization. Management in the United States tends to revolve around techniques rather than the state of mind of the manager.

While both countries have identifiable formalized structures for dealing with the development and production of weapon systems, the United States has a more formalized process with its series of regulations — the Federal Acquisition Regulation and the DoD 5000 series regulations. The system is also characterized as being much more legalistic with it protest procedures, Board of Federal Contract Appeals, and courts. In France, on the other hand, you find fewer regulations and they operate much more informally. Protest procedures are mostly unused. Even in the structure of its career development, the DoD has a created a formalized structuring for training, experience, and education of its workforce. Training is done in the DGA on a more informal basis (supervisor to employee).

Size does have an impact. Any organization operates within an environment. And this environment — the size of organization (number of people), geography, history, culture, political climate, bureaucracy, military-civilian relationships and strategic direction — all play a role in how it organizes and how it operates. The U.S. system is like any big business with divisions around the country and the world. This results in more hierarchy, certainly more rules and regulations. Unquestionably, any reader of Scott Adam's cartoon strip *Dilbert* would recognize ironic, yet similar management activities found in Dilbert's world. Comparing the organizational structure between the United States and French acquisition organizations, we also find striking difference. The United States is highly decentralized both organizationally and geographically. The military Services, operating under the general policy guidelines of the OSD, are responsible for buying military equipment. Geographically the military departments are decentralized, with buying offices located throughout the country. Even the F-16 SPO is split between two offices in separate parts of the country with its headquarters 450 miles away in Washington. This certainly contributes to creating a more complicated management structure to the F-16 PM to operate within. This when added to the bureaucratic interlocking organizational structure — PEO, SAEs, IWSMs and many more customers — gives it many bosses.

The DGA is a centralized acquisition organization, separate from the military, with most of the key players located in Paris. It is certainly smaller than the comparable U.S. organization

(149,000 to 6,639 acquisition personnel). From the aircraft program perspective, it is also fortunate to be located on the same base as Headquarters, French Air Force. Organizationally it is much more streamlined than the U.S. equivalent. It has a single individual responsible for acquisition — the Delegate General for Armament — while DoD has not only a central figure at OSD but also three Service Acquisition Executives.

At the program office level, the obvious difference between the two program offices is the size of the organization, with the F-16 program office more than ten times (565 versus 50 personnel) larger than the Mirage. The yearly budgets for both countries have been roughly the same over the last five years, although the FMS portion of the F-16 has been particularly active with about $2.6 billion spent in Fiscal Year 2000. Size alone dictates different management styles. The U.S. PM focuses more on the management of a large organization and the relationships with his PEO, user, and outside organizations. The actual running of the SPO is left to the deputies and division chiefs. With the small staff, the French PM finds himself much more of a hands-on player. The mission is also slightly different, with the Mirage PM no longer having responsibility for the logistics support of the system, and of course, no responsibility for armament sales external to the country.

The difference in selection of the individual to lead these two program offices also reflects the difference in the importance given to technical versus managerial skills. Again the contrast is apparent. The United States selects military officers as managers with a background in operations and with managerial experience. Most have been pilots and all have spent time in operational commands, including combat time in Vietnam and Korea. The DGA grooms and selects armament engineers, who, while they are military, are in reality a fourth branch of the military and not combat personnel. The DGA emphasis is on a PM with a strong technical background at a test center and program office. France does recognize the need for operational flying experience and does offer its young armament engineers the opportunity to attend flight test school either as pilots or flight test engineers.

The selection process for PMs provides a relative similarity of paths for senior leadership — same schools, same training. This applies to industry and has worried at least some companies. “French Companies run a risk in focusing on too like-minded a population. Uniformity of perspective can facilitate coordination, but it can also result in impoverished information search and reality testing, incomplete attention to alternatives, failure to consider risks, and premature agreement — collectively know as “group think.”[6] The American pipeline, also reflects the American cultural differences; PMs have attended a wide variety of schools from large (University of Nebraska) to small (St. Joseph’s College); and while most have at least one degree in a technical field, one-third completed advanced study in management or business.

Looking at the difference in acquisition experience, the DGA PM brings, on average, about six more years of experience to the job (10.3 versus 16.8). And as for the types of acquisition experience, F-16 PMs have mostly held staff and management positions while Mirage PMs add technical focus in test centers and program departments. And finally, regarding tenure, Mirage PMs have stayed, on average, about 3.75 years on the job (a goal of 5 years), while F-16 PMs have averaged about 2.5 years.

Staffs that support the program office in the DGA contain a mixture of military (armament engineers (IA), study and techniques engineers (IETA), and civil servants. Again one sees the focus on the technical side of the business in the

DGA with even purchasing personnel having a technical background. The F-16 has a slightly more experienced workforce with a higher average acquisition experience level at 15.5 years (10.5 for the Mirage).

Both program offices perform essentially the same types of work. The general categories of work were identified in Chapters Four and Five. Several exceptions, most notably the Foreign Military Sales responsibility, make up 60 percent of the SPO work and the sustainment responsibility primarily performed at "SPO West." One other area worth mentioning is the absence of initiatives in the Mirage program office, while F-16 SPO plays a very active role as a Pilot Program for several key Air Force initiatives, such as RTOC (Reduced Total Ownership Costs).[7] Two other areas of interest are contracting and configuration control. Both program offices are in a sole source situation, and the dollar values spent on contracts yearly are roughly the same, with the exception of the FMS portion of the SPO's contracting work.[8] Both countries have to worry about changes to the aircraft. In each case it is a contractor responsibility, with the program offices reviewing and keeping track of the changes. The number of ECPs and other changes in the F-16 SPO has been slowly declining from 150 in 1996 to 40 last year. While I do not have the same level of detail on the Mirage, it continues to average about 100 changes per year, but mostly minor changes.

Decision Making

Decision making can be viewed from two levels — the political and the bureaucratic (executive and managerial). The political is generally at the highest level — Congress, Parliament, and political military and civilian leaders. This can affect even what is bought. While the military may define the need, the political and bureaucratic leaders make the final decision. Budgets, priorities, and what is referred to in the United States as "pork" often dictate what is to be bought. In France, Parliament may not make changes, but at the political level the "government" often decides what is to be purchased, as was the case for the Mirage 2000. At the bureaucratic level, decision making again differs in the two organizations. The F-16 PM has several chains of command. The PM reports up through the PEO chain for program management, the AFMC chain of command for sustainment issues. And of course he has a significant number of users to whom he must respond, including Air Combat Command and the theater Commanders located around the world. The Mirage in contrast has a much simpler chain of command within the DGA — SPAe, DSA and DGA. It has only one customer — the Headquarters French Air Force. Once a decision has been made to acquire a new capability, it must be approved within the DGA then by the Ministry. Once that happens, the PM has his cost, schedule, and technical goals and delegations of powers. He and his direct deputies make big decisions quickly with little need for a lengthy approval system and without have to justify themselves in lengthy written detail. Only for contracting actions does he require outside approval. In the United States, approval is also required for contracting actions as well as higher dollar value acquisition strategies. Finally the USAF is much more formal in its direction with the issuance of the PMD.

The U.S. Program Manager generates a variety of reports — the Monthly Acquisition Report (for acquisition issues), an annual Combined Portfolio Review (with the acquisition and military leaders), plus an annual briefing to the Chief of Staff on F-16 readiness issues. The Mirage PM briefs once a year to the DGA and the Air Force staff, where he lays out his plan to accomplish the cost, schedule, and performance mandates.

The next management level — the SPO management level — differs significantly. Since the Mirage PM manages primarily a matrixed organization, he has lesser personnel issues to deal with such as appraisals and the like. While he does spend a significant amount of time negotiating for personnel, he is a hands-on manager where his technical knowledge and skills allow him to be more deeply involved in issues.[9] In the case of the F-16, the PM is a manager of a large organization. The current PM generally adopts a "hands-off" approach to management. He reviews key documents primarily for macro-level, politically sensitive issues. This general approach flows throughout both SPO — East and West. At the Division level, weekly and monthly reviews are conducted with program management personnel to ensure schedules and obligation rates are executed as planned. Customer satisfaction is used as a major guideline to how successful the organization is performing its mission. The IPTs or Country teams have been delegated specific responsibility for a program or project. As long as they stay within their cost, schedule, and performance guidelines they have significant authority to perform their work. Each IPT tracks its contractor's progress. One final comment on the decision-making process within the SPO — for development, integration, and production projects with the European Participating Air Forces (Belgium, Denmark, The Netherlands, Norway and Portugal), they are treated as part of the program office and become a part of the decision-making process.

Why the Difference in Management Styles?

Certainly size and cultural differences (but also the differences in tasks required of each organization) play a role in how each program offices responds to meet its mission. Historically, the DGA has relied upon a small group of elite personnel with highly technical backgrounds. Companies such as Dassault and its founder Marcel Dassault, the "Godfather" of the French aerospace industry, have focused on technical excellence. They could do this, comfortable in the knowledge that they were the French "champion" for aircraft. They have been helped by the national political consensus on defense and the political structural stability created by the Constitution of the Fifth Republic. What politics has existed has mostly been represented at the Ministerial and Cabinet level and the "check and balances" have been internal to the administration and less sensitive to short-term policy implications.

Organizationally, they have a professional organization, and have adopted a "skunk works" type approach to management, similar to what the United States used in programs such as the F-117 and that Lockheed has used in its famous "skunk works." In comparison, the F-117 development and production was a team of 20-30 on the contractor side and about the same on the government side. According to a former Lockheed executive, "The skunk works approach also demands the use of a small number of high-quality individuals staffing each function. Individuals are given broad responsibility and have substantial workload. Our experience has shown that under these circumstances individual achievement is most often much higher than management's expectations."[10] This is exactly the approach used by the DGA. It is organized around a program manager who is given total control of all program aspects. Functional organizations support him. They keep the program offices small, they have fewer rules and regulations, and they operate more informally.

So what does this all mean? What are some of the lessons that can be taken from this study? Certainly cultural differences drive the way we do business — the difference in the grooming individuals for program management jobs is just one example. This is an important point for those individuals working with our allies.

Understanding the cultural background and differences of the people you work with needs to be a part of the training of those individuals working in armament sales and in cooperative programs. But, efficiencies can also be learned for managing in the acquisition environment. Several features of the French system are worth evaluating for application to the Air Force. The development of senior managers with a technical background destined for Program Management positions may provide the skills necessary to manage in a smaller office environment. This extends to the selection of purchasing personnel with a technical background.[11] Adopting a program management philosophy or "mind set" similar to the F-117 and the Lockheed "Skunk Works" may be the most important adjustment since it provides not only the opportunity for lower operating costs with fewer personnel, but probably more efficient management — "expect more of the people and they will not disappoint!" Fourthly, in addition to the current training

Category	France	United States
Political:		
Legislative	• Limited Legislation by Constitution and oversight	• Pervasive Congressional legislation
Executive	• Split – President and PM • PM largest party or coalitoin in Parliament	
Organization	• Small • Separate from Service • Single agency for all	• Strong service staffs • Service acquisition organization
Resources	• Limited • Program stability, but modernization underfunded	• Roughly 10 times the money and 20 times the personnel • Budget instability – changes yearly by Congress
Program Offices	• Small Program Office • PMs are Armement Engineers • Support team military/civilian	• Large Program Office • Military PMs • Support team military/civilian • Mandatory training, education, and experience for PMs
Industry		
Export Sales	• Small, diversified, strong government industry tie-in, including ownership • Critical exports to defense industry	• Large, diversified, separate from government • Exports are important to defense industry
Purchasing	• Competition but defense is sole source • Market champions • Fixed Price Contracts	• Competition but open market limited by U.S. industry lobby and industrial base concerns • Contract type selected based on situation and risk
Rules and Regulations	• Limited	• Pervasive at all levels

Figure 6-2. Differences Between France and the United States

which focuses on techniques, acquisition training efforts using cases studies designed to enhance "critical thinking," skillsis an important facet of improving management of programs.[12] Coupled with these efforts is the continual need to reduce the regulatory burden on the U.S. acquisition community, which was a goal of the acquisition reform efforts of the 1990s. And finally, the concept of the Architect of Systems Forces (ASF) has provided the DGA with a mechanism to effectively look across mission areas, target research and development efforts and to select the most optimum paths for new weapon system. While each country goes about its armament work differently, they both have developed effective acquisition systems that allows their professionals to deal with the politics, the bureaucracy, the complexities of a tough job and yet provide the weapons needed by the warfighter.

ENDNOTES

1. Thomas Jefferson, Autobiography, 1821 from http://etest.lib.virgninia.edu/Jefferson/quotations.

2. Jean Baptist Colbert, 1619-83, French Comptroller General of Finances under Louis IV.

3. Thanks to Jean Tisnes for rephrasing an old French proverb — "War is much too serious a matter to be entrusted to the military."

4. *Aviation Week and Space Technology,* February 26, 2001.

5. Barsoux, Jean-Louis and Peter Lawrence, *French Management: Elitism in Action*, Cassell Publishing, Wellington House, 125 Strand, London, 1997, pg. 32.

6. Janus, 1971, cited in Barsoux, Jean-Louis and Peter Lawrence, *French Management: Elitism in Action,* Cassell, Wellington House, 125 Strand, Longodn, 1997, pg. 31.

7. As the reader may remember from Chapter Five, they are the Pilot Program for a variety of initiative such as Reduced Total Ownership Cost (RTOC), Single Process Initiatives (SPI), Activity Based Costing (ABC), Product Support Business Area (PSBA).

8. Mirage – FY 98 $334, FY 99 $264, FY 00 $195; F-16 (USAF Work Only) – FY 98 $386, FY 99 $299, FY 00 $180.

9. An interesting perspective came from industry when they referred to the PM as the Chief Engineer.

10. Leland, Nicolai, "Skunk Works Lessons Learned," paper presented at the AGARD Flight Vehicle Integration Panel symposium on "Strategic Management of the Cost Problem of Future Weapon Systems," held in Drammen, Norway, 22-25 September, 1997, in Advisory Group for Aerospace Research and Development (AGARD) Conference Proceedings, published September 1998, pp. 1-5.

11. This is also true of U.S. commercial industry (hiring buyers with a technical background) as was indicated in several studies in the 1980s and 1990s on commercial practices.

12. This is currently an initiative of the Defense Acquisition University particularly for its more senior courses.

APPENDIX

Appendix A

F-16/MIRAGE INFORMATION

F-16 PROGRAM DIRECTORS/PROGRAM MANAGERS

Colonel Lyle W. Cameron	1971-1972
Colonel William E. Thurman	1972-1976
Major General James A. Abrahamson	1976-1980
Major General George L. Monahan, Jr.	1980-1983
Major General Ronald W. Yates	1983-1986
Major General Robert D. Eaglet	1986-1989
Brigadier General Ralph H. Graham	1989-1992
Brigadier General Ronald T. Kadish	1992-1993
Colonel Leslie F. Kenne	1993-1994
Colonel Larry H. Cooper	1994-1998
Colonel Jeffrey R. Reimer	1998-2000
Colonel Mark Shackelford	2000-Present

MIRAGE 2000 PROGRAM MANAGERS

ICA Pierre Tamagnini	1973-1980
ICA Yves Michot	1980-1984
ICA Herve Groualle	1984-1987
ICA Jean-Luc Monlibert	1988-1990
ICA Francois Flori	1990-1991
ICA Pierre Bascary	1990-1996
ICA Bruno Delors	1996-1997
ICA Patrick Dufour	1997-2000
ICA Bruno Berthet	2000-Present

MIRAGE 2000 (DASSAULT)[1]

2000B:	Two seat trainer version of the 2000C
2000C:	Standard interceptor with various sub variants (eg S3, S4)
2000RDM:	2000C and 2000B also referred to 2000DA
2000RDI:	2000C with upgraded radar and M53-P2 power plants
2000D(S):	Two seat conventional attack variant of 2000N (Export)
2000E(ED):	Multi-role fighter for export (Two-seat trainer)
2000N:	Low-altitude penetration, with nuclear weapon capability
2000R:	Single-seat day/night reconnaissance export of 2000E but fitted with normal radar nose.
2000-5:	Multi-role upgrade incorporating new avionics and weapon carrying enhancements.

F-16 FIGHTING FALCON (LOCKHEED MARTIN)

F-16A/B:	Initial production model and two-seat trainer.
Block 10/15:	APG 66 Radar, ALR 69 (radar warning receiver), ALE 40 (countermeasure dispenser system), Fly-By-Wire, Digital Avionics
F-16C/D:	Multinational Staged Improvement Program model.
Block 20/5/30:	APG 68 Radar, C/D Heads-up-Display (HUD), HAVE QUICK, AMRAAM (advanced medium range air-to-air missile), ALR 69, MLU, Pratt-Whitney and General Electric Engines
Block 40:	APSP (Advanced Programmable Signal Processor), WAR, LANTIRN (day/night stand off target identification system), Global Positioning System (GPS), APG 68 Radar, GAC (General Avionics (or Aircraft) Computer), ALE 47E, AFR-56M, Digital Flight Control System, AIFF (Advanced Identification Friend or Foe), PW and GE Engines.
Block 50:	Digital Engine Monitor, RLG (Ring Laser Gyro), HSD (High Speed Data Base/BUS), GAC/MMC (General Avionic Computer/Multi-mission Computer), APSP, GPS, UPDG (Upgraded Programmable Display Generator), APG 68 Radar, HARM (High-Speed Anti Radiation Missile) AVIONICS, EXPANDED MEMORY, PW and GE Engines
Block 50+/60:	UAE Commercial Sale (F-16U)/- NORWAY 50N FMS Competition—Advanced avionics for JDAM compatibility plus increased drop tank capability. APG-78 radar, RLG INS (inertial navigation system/inertial navigation system) W/GPS, IFTS (Internal FLIR (Forward-Looking Infrared) targeting System), ALQ-2005 (electronic countermeasures systems), Upgraded DFC (Digital fire control), 3 Large Color Displays, Color Moving Map, Two-Place Equipment Dorsal, Conformal Fuel Tanks, 600-Gallon Tanks, 50,000 lb Max TOGW (Take-Off Gross Weight).
F-2:	Japanese Self-Defense Forces—Mitsubishi aircraft evolved from F-16.

[1] Source: Jane's Pocket Guide, *ADVANCED TACTICAL FIGHTERS*; Harper Collins Publishers 1998 and the F-16 Program Office.

Appendix B

FRANCE AND UNITED STATES DEFENSE BUDGETS 1996 TO 2002

FRANCE[1]

	Years						
Category	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Budget FF[2]	189.6	190.9	184.7	190.0	188.0	188.9	191.3
Budget Euro[3]	28.9	29.1	28.2	29.0	28.7	29.8	29.2
Modernization			80.7	86.0	82.9	85.0	83.5
% of GDP	3.0	3.0	2.8	2.8	2.5	2.9	
Mirage Budget[4]bF	4.0	3.3	2.4	1.9	1.4	1.1	
	$ 556m	459m	334m	264m	195m	153m	

UNITED STATES[5]

	Years						
Category	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**[6]
Budget $	255.1	254.2	259.1	272.7	284.2	292.3	295.8
% of GDP	3.5	3.3	3.1	3.0	3.0	2.9	
AF Budget $	74.2	73.1	76.5	80.1	82.1	85.6	88.5
AF Modernization	29.1	28.5	29.6	31.9	33.2	34.6	36.9
F-16 Budget[7]	$ 511m	426m	386m	299m	180m		

[1] Various sources to include latest programming law proposals and budgetary announcements from the DGA and Ministry.

[2] Excludes pensions

[3] The current exchange rate with the FF is 6.56 and is roughly equivalent to the dollar.

[4] Sourcce DGA/DSA/SPAe/GP

[5] Source is the DOD Comptroller's March 2001 Report.

[6] Proposed President's Budget

[7] Source F-16 Program Office

Appendix C
F-16 ORGANIZATIONS

PROGRAMS GROUP (ASC/YPX AND OO-ALC/YPX)

The Program Group (YPX) manages a range of development, test, production or modification programs for its three customer groups — the USAF, the European Participating Air Forces (EPAF), and the Foreign Military Sales (FMS) customers. There are 103 personnel working in Dayton and 129 at SPO West for a total of 232[1] personnel. The breakout for work responsibilities between the two Groups is indicated in Figure 5-5. Normally, SPO East takes the lead on all F-16 new FMS programs, while SPO West has responsibility for the logistics planning and sustainment aspects of USAF and international programs, although the primary work of their support is FMS customers.

SPO East

The **Combat Capabilities Upgrade Branch (YPXA)** manages new development, integration, and major avionics modernization programs for the EPAF (Blocks 10/15) fleet and USAF (Blocks 40/42 and 50/52) fleet. Currently they are currently managing seven major upgrades to the F-16. The advantage of managing both the USAF and EPAF fleets in the same branch is to keep development costs at a minimum by using common hardware processors and configurations that allow the USAF and EPAF to share costs. (Functions[2]: Program Management, Engineering)

The **Production Branch (YPXB**) manages the FMS program for twelve countries. For each country they have created a "country teams" organized under the principles of an Integrated Product Team (IPT) led by a Security Assistance Program Manager (SAPM) with membership from the program office, contractor(s) and foreign representatives from the countries involved. Typically a team consists 4-5 core members with participation from others as required. The teams can vary from a small team of 1 or two personnel, to a large team, such as for Israel and Greece, which can be as large as 10-15. It is also characteristic of the prime contractor to mimic the team with roughly the same types of personnel. The F-16 SPO provides a management service to the FMS customer that includes all aspects of acquisition — development, production, test, deployment, site activation, facilities construction, training, training equipment, spares and logistics support of the aircraft and associated systems. This branch also has the responsibility for managing the acquisition of new USAF production aircraft when Congress authorizes new buys, as happened in the FY 2001 Appropriations Act. (Function: Program Management, Engineering)

[1] All personnel numbers are as of 22 March 2001 and provided by ASC/YPO Ms Lisa Shannon.

[2] Functions as used in this section refers to the career fields of personnel in the branches and also the functions performed in that branch. As an example the individual could be a Logistic Management Specialist by career field, but performing a program management job as a Security Assistance Program Manager.

The **Flight Test Branch (YPXT)** manages flight test processes and resources for USAF, EPAF, and FMS programs to verify the combat capability of the F-16 weapon system. They also have management responsibility to work with the Japanese on the development of the F-2, an F-16 derivative. (Function: Test & Evaluation)

SPO WEST (OO-ALC/YPX)

Two FMS International Branches

The two **International Branches (YPXV and YPXB)** manage FMS programs. Each Country Team has 5-6 people on it depending upon the needs of the program. The current country teams are: Portugal, Taiwan, Denmark/Norway, Korea, The Netherlands, Israel, Thailand, Singapore, Turkey, Greece, Egypt, Bahrain, Jordan, and Venezuela. They manage approximately 20 modifications per year for the FMS customers. (Function: Logistics, Program Management, Inventory Management, and Financial Management)

The **Sustainment Branch (YPXG)** operate a "help desk," for customers on a "pay as you go basis," by providing technical assistance in maintaining, modifying and operating the aircraft. This provides the user — foreign or domestic — with a single focal point for questions on the F-16 sustainment. This branch has its counterpart at SPO East — the Customer Support Branch in the Products Branch. (Function: Logistics)

The Logistics Integration Branch (YPXX) has two primary activities. They regenerate F-16s from the "boneyard" at Davis-Monthan Air Force Base near Tucson, Arizona for the refurbishment and sale to international customers. The USAF has about 350 early version F-16A/B aircraft currently in storage at the Aerospace Maintenance and Regeneration Center (AMARC)[3] . With international interest high in obtaining F-16s the USAF began in the 1994 timeframe to look at early version F-16 A/Bs for possible FMS sale. The cost of a regenerated aircraft is about two-thirds of a current production aircraft, and while not as capable as current designs, it can be refurbished and provide more capability than when they were originally built. They recently signed a contract with Italy for 36 regenerated aircraft. Since they started this program they have regenerated 70 aircraft. This branch also manages the development of new depot repair capability for interested FMS customers. They have three teams developing depot capability for high failure and expensive repair items for Turkey, Greece, and Egypt. (Function: Program Management, Logistics)

PRODUCT GROUP (ASC/YPV AND OO-ALC/YPV)

The Product Group (YPV) is the process and common systems staff within the SPO. They will provide technical definition of new requirements, systems engineering, manufacturing and safety for the aircraft and its subsystems. If an IPT or Country Team has need of systems engineering expertise YPV's Flight Systems, Sensor and Systems Engineering branch will provide the personnel

[3] The web site for AMARC is: http://www.dm.af.mil/amarc/default.htm.

to support the effort. They also have engineering responsibility for the common systems, e.g. engines, ejector seats, and EW. This organization as part of its technical responsibilities has oversight of configuration and manufacturing management. They also manage, along with Ogden, the many minor modification programs, such as the Night Vision installation in the F-16s. The other two branches are the Acquisition Initiatives Branch and the Requirement Program Development Branch. There are 80 personnel working in Dayton and 72 in Ogden for a total of 152.

SPO East

Two Common Systems Branches

The **Flight Systems Branch (YPVF)** has engineering responsibility for common products between all versions of the F-16, covering the cockpit, air vehicle, and external carriage, which includes items such as OBOGS, wheels and brakes, and hydraulic system. (*Function: Engineering (Specialty*)

The **Sensors Branch (YPVI)** has engineering responsibility for common products covering mission planning, sensors, avionics and electronic warfare, which includes items such as radios, radar, and counter measure systems. (Function: Engineering – Specialty)

The **Systems Engineering Branch (YPVE)** provides a range of engineering skills for integration management and technical direction for manufacturing, configuration, data, environmental, quality, safety, airworthiness, health and systems management. This branch administers the Configuration Control Boards — the Joint Multi-national Configuration Control Team (JMCCT) and the Joint Multi-National Configuration Control Board (JMCCB) — both discussed later. The appropriate contractor, usually Lockheed, does the actual configuration updates of drawing and specification, but the SPO is responsible for approving changes to the technical baseline, through Engineering Change Proposals (ECPs). (*Function: Engineering – Systems, Specialty, Data Management, Configuration, and Manufacturing*)

The **Acquisition Initiatives Branch (YPVB)** tracks the implementation of acquisition initiatives such as Reduced Total Ownership Cost (RTOC), Single Process Initiatives (SPI), Activity Based Costing (ABC) and Product Support Business Area (PSBA), several for which the F-16 has been selected as a pilot program. (*Function: Financial Management, Program Management*)

The **Requirements and Program Development Branch (YPVR)** is the outside interface branch. When a new FMS or USAF effort is planned they are the first stop. Their efforts will begin with working level discussions with staff officers in the Pentagon. They are the focal point for Congressional, OSD, or AF Headquarters questions. They also work closely with YPF on budgetary issues whether providing oversight, or analysis and alternatives on the USAF budget. They administer the Integrated Requirements Review Board and the Executive Review Board, which look at the validity of requirements and then the funding availability. (*Function: Engineering – Specialty*)

SPO West (YPV)

The **Structures Branch (YPVS)** provides field and depot engineering and technical support for the aircraft structures including mechanical items. This is accomplished through field dispositions, system technical orders, and time compliance technical orders (TCTO) management, depot line support and mishap investigation assistance. They also manage the Aircraft Structural Integrity Program (ASIP), Reliability Centered Maintenance (RCM), Analytical Condition Inspection (ACI), and Non-Destructive Inspection programs. Finally they plan, implement and manage major structural and mechanical upgrade programs, such as the Falcon UP, The Service Life Improvement Program (SLIP), the Service Life Extension Program (SLEP) and Falcon STAR. Additional subsystems they have responsibility for are the Landing/Gear/Anti-skid Brake System, Oxygen On-Board Generation System, Engines/Jet Fuels Starters/Auxiliary Drive systems, Hydraulic System, Pneumatic System, Flight control System, Egress System and Environment Health and Safety. (*Function: Engineering, Equipment Specialist and Logistics Management*)

The **Operational Flight Program Software Branch (YPVO)** primarily manages embedded software and computers updates to the F-16 for USAF and FMS customer for all pre-block 40 aircraft. They have three functional disciplines in the office — Program Managers, Engineers, and Logisticians — to oversee the software work of contractors. Much of their contracting efforts are with another Ogden ALC organization — the Technology and Industry Support Directorate (OO-ALC/TI). (*Function: Program Management, Engineering, and Logistics Management*)

The **Product Integration/New Business Branch (YPVT)** reviews and approves contractor prepared Technical Orders and then is responsible for their distribution (they manage 15,000 Time Compliance Technical Orders (TCTOs). They also provide organic support for the flight manual program, weight and balance, munitions loading and special inspection and maintenance requirements. They work closely with SPO East processing Engineering Change Proposals/Contract Change Proposals (ECPs/CCPs) and Advanced Change Study Notices (ACSNs). (*Function: Equipment Specialist, Logistics Management*)

The **Product Management Branch (YPVP)** is the single POC between the Depot and the F-16 SPO for modifications and repairs. They keep the “modification roadmaps” and coordinate project requirements to maximize the schedule and minimize the cost. They work with the depot facilities to gather cost and pricing data for cost estimates for customers. As the SPO liaison for sustainment they participate in aircraft damage repair assessments and evaluation of aircraft destined for AMARC. (*Function: Logistics Management*)

BUSINESS GROUP (ASC/YPF, YPK, YPO)

The **Business Group** as is indicated in Figure 5-4 does not have a counterpart at SPO West, at least as a separate function. The Business Group has three branches with the following functions:

The **Financial Management Division (YPF)** is the "money manager" for the SPO. They have three areas of responsibility — cost estimating, financial management and budgeting. They prepare, with inputs from contractors; the cost estimates used for FMS sales. They allocate financial resources and maintain funds control for the SPO. Yearly they spend about $500 M on the USAF side, but have overall responsibility for about 1.5 billion in total money managed. On the FMS side they receive and spend about $500 M to $1 billion in new work business yearly. They also have the responsibility to monitor the contractor's program cost and schedule performance, including adherence to the Cost/Schedule Control System Criteria (C/SCSC). One of the routine financial activities that takes place during the budget preparation cycle is the "What if?" exercises. Typically a headquarters office will ask questions like — What if we reduce your program by $10 million or if we reduce quantity by 10 percent, what impact does that have on your program. YPF has 49 personnel in its three branches, or teams — one for USAF Financial Management (YPFF) and two for International Financial Management (YPFA/B). (*Function: Financial Management*)

The **Contracting Division (YPK)** awards and administers the F-16 contracts. This includes, but is not limited to, Acquisition Planning, Contract File Preparation and Contract Award. Contracting encompasses preparation and approval of, Requests for Proposals (RFPs), source selections, fact-findings, negotiations, reviews, and awards of contractual actions. YPK has 42 personnel in its four branches. Three of these branches — Production (YPKA), Major Upgrades (YPKB), Product Support (YPKD) — manage contracts for FMS and USAF. The final branch — Contracts Systems Management Branch (YPKP) handles a variety of administrative activities from contract closeout to the Procurement Management Information System (MIS), to leases, small business and competition plans. (*Function: Contracting*)

SPO West Contracting

SPO West contracting is organized differently. They provide matrixed support to the F-16 SPO, as well as to other organizations, such as the Mature and Aging Aircraft Directorate and the supply chain management organizations. They do not work directly for the PM, but provide about 11.5 man-years of effort to the SPO West. No military in the organization and they are not members of any of the SPO IPTs. (*Function: Contracting*)

The **Management Operations Division (YPO)** provides support for personnel matters, training, information management, security, supplies, equipment, communication and facility management. (*Function: various — primarily personnel and administration*)

LOGISTICS SUPPORT GROUP (ASC/YPL AND OO-ALC/YPL)

The **Logistics Support Group** is made up of two sister divisions — one responsible for Acquisition Logistics (SPO East) and the other Systems Support activities (SPO West). The Acquisition Logistics Division is responsible for the management of all Integrated Logistics Support acquisition functions, including development of all F-16 support equipment and technical orders. They are also responsible

for warranty management, post-production support planning and they are the SPO focal point for technical customer support.[4] The System Support Division provides daily liaison with the F-16's suppliers who collectively provide sustainment for the fleet. They also serve as the primary support interface between the Air Force Headquarters and other commands on issues impacting the readiness of the weapon system and they are the SPO focal point for technical customer support. There are 41 personnel working in SPO East and 29 in SPO West for a total of 70 personnel.

SPO East

Customer Support (YPLD), with the **Sustainment Branch** at SPO West, provides the user a single focal point via the F-16 "Falcon Hotline" for all technical and logistics issues. If a problem is significant enough and requires on site assistance they will dispatch a Crisis Management Team to aid the user. To spot problems earlier they also track trend failures, incidents and corrective actions on flight critical and high visibility aircraft systems. (*Function: Logistics Management*)

Product and Product Support (YPLV) has the basic responsibility for support equipment recommendations, preparing Price and Availability (P&As) for FMS buys, managing the SPO technical library, and financial administration responsibility for SPO logistics funds. (*Function: Logistics Management*)

Program Support Branch (YPLX) is responsible for Integrated Logistics Support (ILS) management. They participate and support SPO IPTs to ensure maintenance and logistics issues are addressed. This includes development of all F-16 Organizational, Intermediate, and Depot level support equipment and Technical Orders. (*Function: Logistics Management*)

Combined LifeTime Support Branch (YPLC) has responsibility for a special initiative called Total System Performance Responsibility (TSPR) which places configuration control with the contractor. (*Function: Logistics Management*)

SPO West

The **Analysis and Requirements Branch (YPLA)** is responsible for support for three distinct functions — supply support, maintenance analysis and sustainment forums. Supply support functions is responsible for parts resolution, development of RSP requirements, and war planning. Analysis includes identification and analysis of critical maintenance indicators, reliability and maintainability analysis and aircraft inventory file maintenance. They also administer several forums for determining the quality of SPO support to the users and to identify and resolve customer issues. They are the System Supportability Review (SSR), Senior Executive Management Review (SMR) and any OO-ALC/CC Management Reviews. (*Function: Logistics Management*)

[4] Note: The SPO focal point for customer support is at SPO west under YPL. The SPO East Customer Support Group functionally works for the SPO West focal points.

The **Customer Support Branch (OO-ALC/YPLB)** provides a 24-hour a day "help desk" or Hotline for technical assistance. Their Non Commissioned Officers (NCOs) work customer issues and can form a Crisis Management Team (CMT) to quickly resolve a customer's critical technical issue and send the CMT to a customer's site. They also have the responsibility for issuing Time Compliance Technical Orders (TCTOs) for exigent changes to the aircraft. (*Function: Logistics Management*)

The **Management Operations Branch (OO-ALC/YPLO)** manages the manpower, personnel, financial and management operations for "SPO West." They have seven matrixed financial management personnel from the Logistics Center to support management of funds and for preparation for budgetary input to the Budgeting portion of the Planning, Programming and Budgeting System (PPBS). They also have an analysis branch, which tracks the health of the fleet through several data bases for mission capability trends. (*Function: Personnel, Financial Management, and Logistics*)

Others: ASC/YP (EN) Engineering. The senior collocate from engineering is assigned to the YP FOG as the Technical Director. The Programs and Product divisions are assigned a Chief Technical Integrator while the rest of the engineering workforce is assigned to various IPTs. The mission of engineering is to ensure that the F-16 PM is provided engineering visibility, technical alternatives, risk assessment, and technical recommendation in making required decision. Engineering also establishes weapon system performance, design, test and engineering support requirements. Technical Integration, manufacturing, environmental, system safety and configuration function specialties are accomplished by engineering. The Technical Director also leads the effort to provide technical oversight and develops and maintains processes for Operational Safety, Suitability and Effectiveness (OSS&E) certification.

F-16 SPO TASKS PERFORMED

Program Management
- Integration of Program Activities
- Approval of Program Plans
- Program Management Reviews (with Users, Headquarters, etc.)
- Program Status Reporting
- Program Direction
- Strategic Planning
- Workforce and Organization Shaping
- Contractor Oversight

Contracting
- Acquisition Strategy Development
- Market Research
- Negotiation
- Request For Proposal development
- Contract Preparation
- Contract Award
- Contract Administration
- Award Fee Administration
- Modification of Contracts
- Exercise of Yearly Options
- Contract Closeout

Systems Engineering
- Specification Preparation/Approval
- Conducting Preliminary and Final
- Design Reviews
- Review Contractor Engineering Status
- Statement of Work Review
- Contractor Oversight

Configuration Management
- Review of Engineering Change
- Proposals
- Configuration Audits

Manufacturing Management
- Review of Contractor Preparation for Production
- Contractor Oversight

Testing
- Test and Evaluation Planning
- Preparation and Review of Test and Evaluation Master Plans

Financial Management
- Preparation of the Program Budgets
- Program Objective Memorandum (POM)
- President's Budget (PB)
- Management of SPO Financial Resources
- Management of Schedules
- Financial Forecasts
- Review of the Contractor Program Financial Status

Acquisition Logistics/Logistics
- Support
- Supply Support Preparation
- Spares
- Provisioning
- Maintainability Assessments
- Authorize Technical Orders (TOs)

Production/Modification Management

Equipment Management

Item Management

Foreign Military Sales Support

AFCA (MIRAGE 2000) PROGRAM OFFICE TASKS PERFORMED

Program Management
- Integration of Program Activities
- Approval and Development of Program Strategies
- Program Management Reviews (yearly with Headquarters)
- Program Status Reporting
- Program Direction
- Strategic Planning
- Workforce and Organization Shaping
- Production/Modification Management
- Contractor Oversight

Achats (Purchasing)
- Acquisition Strategy Development (DPM Actual Approval)
- Market Research
- Negotiation (Evaluation of Proposals)
- Request For Proposal Development
- Contract Preparation
- Contract Award
- Contract Administration
- Modification of Contracts
- Exercise of Yearly Options
- Contract Closeouts

Quality
- Specification Preparation
- Oversight of Contractor
- Review of Contractor's Procedures
- Configuration Management
- Review of Engineering Change Proposals
- Configuration Audits
- Review of Contractor Preparation for Production
- Contractor Oversight
- Acceptance and Qualification of Aircraft
- Engineering Specification Preparation/ Approval
- Conducting Preliminary and Final Design Reviews
- Review of Contractor Engineering Status
- Statement of Work Review (occasionally used)
- Contractor Oversight

Plans, Programs, Budget, and Finance
- Preparation of the Program Budgets
- Management of Internal Financial Resources
- Management of Schedules
- Financial Forecasts
- Review of the Contractor Program Financial Status

Acquisition Logistics/Logistics
- Support
- Supply Support Preparation
- Initial Provisioning
- Development of Test Equipment
- Reliability/Maintainability Assessments
- Authorize Technical Orders (TOs) (shared with Air Force)

Testing
- Test and Evaluation Planning
- Preparation and Review of Test Plans

Armament Sales Support

Appendix D

QUESTIONNAIRES

QUESTIONNAIRE – UNITED STATES

Career Field:

- ☐ Contracting
- ☐ Financial Management
- ☐ Program Management
- ☐ Logistics
- ☐ Science and Engineering

  Speciality _____
- ☐ Testing & Evaluation
- ☐ Other _____

Military/Civilian Rank:

- ☐ Capt./GS-12
- ☐ Major/GS-13
- ☐ Lt. Col./GS-14
- ☐ Col./GS-15
- ☐ Gen./SES

Education:

- ☐ High School
- ☐ Bachelors
- ☐ Masters
- ☐ PhD

Name of Undergraduate School _____

Name of Graduate School _____

Training:

Certified Level: ☐ I ☐ II ☐ III

Additional Career Field Certification:

Years of Acquisition Experience:

- ☐ 0-2
- ☐ 3-5
- ☐ 5-10
- ☐ 10-20
- ☐ over 20

Current Title (e.g., Director, Analyst)**:** _____

- ☐ Government
- ☐ Contractor

QUESTIONNAIRE – FRANCE

Career Field:

- ☐ Achats (Purchasing)
- ☐ Qualite (Quality)
- ☐ Expertise de couts
- ☐ Plans, programmes, budget, finance
- ☐ Management de programme
- ☐ Logistique
- ☐ Engineering

  Speciality _____
- ☐ Testing & Evalution
- ☐ Autre _____

Military Rank:

1. Igenieur de l'armement

   ☐ IA ☐ IPA ☐ ICA

2. Ingenieurs des Etudes et Techniques d'arament

   ☐ I1ETA ☐ IPETA

   ☐ IC2ETA ☐ IC1ET

Civilian Rank:

1. Fonctionaire

   ☐ Niveau 1 ☐ Niveau 2 ☐ Niveau 3

2. ☐ ICT

Education (mark all that apply)**:**

- ☐ Baccalaureat
- ☐ Technicien
- ☐ Ecole d'ingenieur (preciser) _____
- ☐ ENA
- ☐ Autre (preciser) _____

Training:

Experience acquise dans le domaine des acquisition (en annees):

- ☐ 0-2
- ☐ 3-5
- ☐ 5-10
- ☐ 10-20
- ☐ over 20

Current Position (e.g., Director, Analyst)**:** _____

— SAMPLE QUESTIONNAIRE —

TYPE OF WORK/DELEGATION OF AUTHORITY/DECISION MAKING

What is your title and job?

Who is your immediate supervisor?

How is the (program) office organized?

- What type of decisions do you delegate?
- What senior levels do you need to go to for approval?
- How often do you hae to go to senior authority?
- What kind of decisions does the PM have to formally sign off?

What is your interaction with the contractor(s)?

- How often do you meet with them?

What types of work does your organization perform?

- What are workload drivers?
- How do you measure workload?
- How do you determine whether or not you are successful (what measures)?
- What role does FMS-type work play in your organization?
- How many dollars do you control or have responsibility for?

How much top-level involvement in your program (Congress, Headquarters, etc.)?

- How much do the following organizatins impact your work (H, M, L)?
  - Congress
  - OSD Headquarters
  - AF Headquarters
  - AFMC Headquarters
  - ASC Headquarters

How well-trained is your workforce? Do they receive yearly adequate training? How do career paths impact training?

How much does the contracting process impact your workload (H, M, L)?

- Market Evaluation
- RFP Preparation
- ASP
- Sources Selection
- Contract Administration (management of program)
- Protest Procedures
- Award Fees (how many)

APPENDIX E

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ICA Laurent Gloumeau, CEV/ISTREs (interview/briefings and visit to Istres), June 2001

ICA Jean Tisnes, Adjoint-tutelle et strategie, DCI/AE, various dates.

Frederic Petit, Sous-Direction des PME-PMI and de l'action regionale and Chef du Bureau Etudes Generales et Internationales, July2001.

IGA Jacques Pechamat, former Deputy Commandant CHEAr, now retired various dates in August 2001.

IGA Bernard Besson, Deputy Director, Force Systems Architecture, DSP/SASF, July 2001.

IGA Robert Finance (retired), Former Program Manager for the Mirage F-1 and the Rafaele, August 2001.

Patrick Hebrard, Director for Training and Research, Ecole Nationale Superieure d'Ingenieurs de Constructions Aeronautiques (ENSICA), August 2001.

ICA Olivier Prats, Deputy Director, Ecole Nationale Superieure de l'Aeronautique et de l'Espace, August 2001.

M. Michel Liebert, Directeur de Programme Avions Militaires, (Program Manager for Military Aircraft), Dassault Aviation Company, 5 September 2001.

M. Benoit Berger, Vice President, General Manager, Dassault Aviation, Merignac, August 2001.

M. Antoine Goncalves, Chef de Fabrication Military Aircaft Production Manager, Merignac, August 2001.

ICA Thierry Carlier, Chef Bureau de le Politique des Achats, August 2001.

IGA Patrick Auroy, Architect de Systems de Forces, (Maitrise du milieu aerospatial), DSP/SASF, September 2001.