San Fernando Valley State College

A Study of Changed Conditions Affecting Prime Contractors in the Aerospace Industry for the Period 1945 to 1965 To Obtain an Objective Foundation for Developing Improved Marketing Programs

A Thesis Submitted in Partial Satisfaction of the Requirements for the Degree of Master of Science in Business Administration

by

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January, 1968
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January, 1968
PREFACE

No other industry of comparable size and scope has experienced such substantial change in such a relatively short time span as has the aerospace industry in the United States. Because of this unique history, firms in the industry have become aware of the need for vigorous application of the marketing concept and a wholesale overhaul of outdated marketing programs.

In essence, the problem consists of significant and rapid change within an industry and the resultant reaction of the corporations involved. The intent of the study is to analyze the history to determine trends and ramifications that may prove helpful in strengthening current marketing programs and developing effective future plans.
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ABSTRACT

CHANGES IN AEROSPACE INDUSTRY
AND MARKETING PROGRAMS

by

Adrian Richard Apple

Master of Science in Business Administration

January, 1968

Since the late 1930's and the weapons buildup for World War II, a number of large corporations have become the mainstay of the defense industry. Many of these giant firms have become prime contractors to the U. S. Government through their capabilities in the design and manufacture of all types of aircraft, missiles, spacecraft, and related support equipment. The history contains significant changes in conditions over the past twenty years. A basic contention of the study is that no other domestic industry of comparable size and scope has experienced such substantial change in such a relatively short time span. Because of this unique history, contractors in the aerospace industry have become aware of the need for vigorous application of the marketing concept and a wholesale overhaul of outdated marketing programs.

In essence, the problem consists of significant and rapid change within an industry and the resultant reaction of the corporations involved. The intent of the study is to analyze the history to determine ramifications that may prove helpful in strengthening current marketing programs and developing effective
future plans.

It should be recognized that a study of this nature deals with marketing practices and techniques -- a very proprietary subject to individual firms. Because of this, the literature is noticeably lacking on details of particularized marketing programs. Additionally, aerospace firms are politely but firmly unwilling to disclose their marketing ideas. Nonetheless, sufficient information is available to apply basic marketing principles to aerospace practices. To properly make this application, however, it is essential that the student have a firsthand observation of or a direct source to the actual activities of defense industry marketing. Without this, a study of this nature would be too academic. It is respectfully submitted that this study successfully overcomes this problem and provides a realistic treatment of the subject.
CHAPTER I

INTRODUCTION

Purpose of the Study

The defense and space exploration industry represents a substantial portion of the United States' gross national product (averaged at approximately eleven percent for 1952 through 1960).\(^1\) According to Pentagon estimates, the free world will spend about three hundred (300) billion dollars for new weapons between 1965 and 1975. Of this amount the United States will spend about two hundred (200) billion dollars and the other western nations one hundred (100) billion dollars.\(^2\) Additionally, some 1,783,000 people are employed by companies directly involved in providing goods and services to the U. S. aerospace industry. In spite of this impressive role in the economy, published studies and articles concerning aerospace industry marketing problems and trends seem relatively sparse compared with the magnitude of the market. This study is an attempt to describe the evolution that has transpired in the aerospace industry and provide an appreciation for the complexities involved in marketing aerospace products.

\(^1\)M. J. Peck and F. M. Scherer, The Weapons Acquisition Process - An Economic Analysis (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1962), p. 100.

\(^2\)Washington Post, August 29, 1965, Financial Section, p. 1
Statement of the Problem

Since the late 1930's and the weapons buildup for World War II, there evolved a considerable number of large corporations that became the mainstay of the aerospace industry. Many of these corporations became leading prime contractors to the U. S. Government through their capabilities in the design and manufacture of all types of military aircraft and related equipment. Some of these same firms have designed and manufactured virtually all of the passenger transports operated by the commercial airlines of the free world. In essence, the skies and the realm of flight belonged to a relatively few aircraft manufacturers.

The past twenty years have brought many significant changes to the internal and external environment of aircraft producers. The sale of commercial transports has proved costly for some producers and even unprofitable for others. There has been a vacillating preference by influential government officials between the manned military aircraft and the unmanned missile as the primary weapon system for the United States. Space exploration has received an increasing government outlay for rockets, satellites and related equipment. The result has been the evolution of the aerospace industry and its absorption of the airframe industry.

No other domestic industry of comparable size and scope has experienced such substantial change in a comparable short time span. Because of this unique history, corporations in the airframe and aerospace industries have become aware of the need for vigorous application of the marketing concept and a wholesale overhaul of
outdated marketing programs. The problem, then, consists of significant and rapid change within an industry's environment and the resultant reaction of the corporations involved.

Hypothesis

The history of the airframe industry in the United States reflects significant and radical change in the business conditions confronting firms in that industry. The nature and magnitude of these changes are such that a review and careful analysis of this history is worthwhile in an attempt to determine the effect on marketing programs of these corporations. A case study of the Lockheed-California Company, a division of the Lockheed Aircraft Corporation, depicts the reaction of one firm to the changed environment.

Significance Of Defense Industry

Percentage Of Gross National Product

Figure 1 depicts the relationship of federal government expenditures to gross national product (GNP). Since World War II, the percentage has ranged from 12.7 to 28.6 of GNP with an average of 15.9 percent of GNP since 1955.¹ The major portion of all government expenditures since the tremendous buildup for the second World War has been devoted to items and services needed for defense of the nation and friendly countries. Figure 2 shows expenditures

Fig. 1.--Gross National Product And Government Expenditures

Source: Statistical Abstract of the United States and Arthur D. Little, Inc.

1Ibid., p. 9.
Fig. 2.--Expenditures For National Defense

Source: Statistical Abstract of the United States

Ibid., p. 10
for national defense in terms of dollar outlay and as a percent of defense expenditures in relation to all federal government expenditures.

Expenditures

Although not projected on the chart, congressional appropriations for military functions and military assistance totalled 63.3 billion dollars in Fiscal Year 1966, and the request for Fiscal Year 1967 budget coverage is almost sixty billion dollars.¹ The Fiscal Year 1967 defense budget is premised upon no material change in the level of activity in the current Vietnam war. Judged by any standards, these are large amounts of money and represent a significant portion of the gross national product.

Employment

In addition to the sizable dollar outlay devoted to national security, the defense industry employs between 1.7 and 1.8 million Americans.² This is nearly two per cent of the total work force. Although the numbers employed vary drastically among the individual corporations (depending on the volume of contracts received and current backlog), the total industry figures are not as elastic as one might think. The reason for this lies in the high degree of mobility of the labor force that typically changes employment between corporations within the industry.

Subcontracts

Although the data is obscure and not completely reliable, it can be reasonably calculated that the major prime defense contractors traditionally pay out about fifty percent of their government receipts to other United States' businesses.\(^1\) This "flow down" of defense spending to different firms contributes materially to the backbone of the private sector of the economy.

Technical Progress

Another contribution to the economy stemming from accomplishments of the defense industry centers in the area of innovations and technical progress. The government takes extensive measures to make new ideas and inventions available for the benefit of the general public. It cannot be denied, however, that the defense contractors diligently attempt to protect their proprietary items for the sake of competitive advantage. In spite of this, advanced technology breeds further progress that ultimately does much to improve the public's standard of living.

Additional points could be described to support the position that the United States' defense industry does play a significant role in the economy. The above facts, however, regarding dollar volume, employment requirements, and technical progress provides adequate indication that the defense industry is sufficiently influential to be deserving of a study such as this.

\(^1\)Peck and Scherer, *op. cit.*, p. 150.
Common Misconceptions

Degree Of Competition

Many people have the opinion that little or no competition exists in Department of Defense (DOD) military procurements. This, of course, is a relative matter that should be brought into a proper framework. DOD purchasing must admit to a lesser degree of competition when compared with the furniture, home appliance or automobile industries. It boasts, however, of severe competitive forces when compared to the utilities, raw materials or farming industries. It is recognized that the above statements deserve extensive elaboration and could form the basis for lengthy debate, but that is not the intent. The purpose is to recognize that each industry has unique features--some with competitive forces in one area and others with competitive pressures elsewhere.

Tables 1 and 2 summarize the findings of an extensive analysis concerning the degree of competition in the aerospace industry.\(^1\) Table 1 shows that the number of programs awarded on a competitive basis increased from twenty to fifty percent over three decades. Worthy of note is the complete lack of competitive procurements of missile systems during the 1945–1949 period. This is logical when one considers that this was the beginning of earnest efforts to develop capability in a totally new field. Because of the postwar boom in all categories of consumer goods, most manufacturers were not eager to devote their equipment and creative talent on less profitable government business, especially in an unknown area somewhat far afield from

\(^1\)Ibid., pp. 324-424.
TABLE 1

COMPETITIVE VS. NONCOMPETITIVE BY CATEGORY BY TIME PERIOD

<table>
<thead>
<tr>
<th>Period</th>
<th>AIRCRAFT</th>
<th>MISSILES</th>
<th>TOTAL</th>
<th>TOTAL %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Competitive</td>
<td>Non Competitive</td>
<td>Competitive</td>
<td>Non Competitive</td>
</tr>
<tr>
<td>1920 - '39</td>
<td>1</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1940 - '44</td>
<td>6</td>
<td>14</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1945 - '49</td>
<td>8</td>
<td>10</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>1950 - '54</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>1955 - '59</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

TABLE 2

NEW VS. EVOLUTIONARY PROGRAMS AND COMPETITIVE VS. NONCOMPETITIVE

99 Programs Analyzed

39 Evolutionary Programs

60 New Programs

5 Competitive

34 Noncompetitive

31 Competitive

29 Noncompetitive

1Tbid., Appendix 12 A, pp. 645 - 667

2Tbid.
their familiar product lines. Hence, it was more a matter of the government convincing competent firms to undertake the projects rather than a case of many bidders vying for contract award. A seeming paradox is revealed in Table 2 which shows that new programs were awarded on a competitive basis to a greater degree than programs that evolved as derivatives of previously produced systems. This is to be expected because of the built in "know-how" capability of the manufacturer that has development and production experience. Unless there are other compelling reasons to the contrary, it is usually to the government's best interest to place follow-on business with the contractor that has the benefit of experience, tooling and an established production capability.

Procurement of major weapon systems in the 1960's has been conspicuous by the high degree of competition preceding contract award. The TFX jet fighter was awarded in 1962 to the General Dynamics/Grumman team over Boeing, Lockheed and others after a bitter competition that resulted in a much publicized controversy over the selection. The Manned Orbiting Laboratory (MOL) program was won by Douglas Aircraft to the disappointment of Lockheed, Boeing, Martin, North American Aviation, and General Dynamics. In 1964, the Counterinsurgency airplane (COIN) award went to North American Aviation in spite of the vigorous efforts of General Dynamics, Lockheed, and Douglas. The Lunar Exploratory Module (LEM) program was won by Grumman Aircraft in competition with Lockheed, Boeing, and Douglas. In 1965, Lockheed successfully competed against Douglas and Boeing for the C-5A Air Force cargo/transport. The Advanced Aerial Fire Support System (AAFSS) was hotly contested in 1964 - 1965 with Lockheed eventually winning
out over Boeing, Vertol, Sikorsky, Bell Helicopter, Hiller, and Piasackey. The competition for the Supersonic Transport (SST) program began in 1964 and North American Aviation was eliminated in the early rounds. Boeing and Lockheed continued the combat for a prototype program for over eighteen months until Boeing was declared the winner on December 31, 1966. Examples could go on extensively to verify the point that government prime contracts are not unilaterally doled out to defense industry contractors on a "whose-turn-is-it?" basis. The element of competition prevails thereby making a dynamic marketing endeavor a necessity for successful defense industry firms.

Degree Of Risk

There are people who believe that contractors assume little or no risk when contracting for United States government defense and/or space exploration procurements. This is an understandable notion if one were naive enough to think that conditions of twenty years ago still exist. In past years, most defense spending was awarded under a cost reimbursable type contract. This meant that the contractor was paid for all of his incurred cost along with at least some element of profit. No one could rightfully deny that the degree of financial risk was nominal under such conditions. Since 1960, however, there have been vigorous attempts by the government to award fewer defense contracts on a cost reimbursable basis.

Another facet of risk not usually considered is one related to the "state-of-the-art". This term is generally interpreted to mean the degree of technical knowledge currently known and convertible to practical application. Firms in nondefense business traditionally
produce a commodity, test it, sample consumer reaction and ultimately make it available in quantity to the general public. The significant risk lies with favorable public acceptance and the inevitable countermeasures of the competition. If it cannot be produced profitably and made to work effectively, it is never marketed. Defense industry contractors have some exposure to similar risk but are also concerned with the additional risk associated with the above described "state-of-the-art". Since almost all aerospace procurements are won on the basis of technical competence and the ability of the product to accomplish the performance requirements of the governmental procuring agency, defense contractors often contractually commit themselves to accomplish things beyond the "state-of-the-art" (i.e., never before accomplished) in order to win the competition. As a result, many firms have spent many dollars attempting to achieve things they were committed to accomplish before they ever knew precisely how it could be done or even whether it were possible.

A number of contracting techniques have been devised to recognize the degree of risk undertaken by aerospace defense contractors. Whenever one speaks of business risk, it must be in the context of potential profitability. Under the fading cost reimbursement type contract, aerospace firms historically managed to earn a mere two to five percent net profit. The government recognized the long range possibility that such low profits might drive the experienced and competent defense contractors into more profitable commercial ventures. The result has been a growing emphasis on incentive contracting and use of a pricing formula called "weighted guidelines" for profit determination. Without indulging in a lengthy discourse on defense
contracting and pricing techniques, suffice it to say that these and similar innovations have been developed to give due consideration to the degree of risk assumed by defense contractors and to offer a greater incentive to extend the state-of-the-art by applying their considerable creative and productive talents.

It has not been the intent of this section to assert that defense contractors operate in an environment of greater risk than nondefense firms. The objective has merely been to make the point that competitors for defense dollars do cope with the risk element even though the degree and types of risk exposure by the two industrial segments are not always comparable.
Definition Of Terms

Airframe industry: the business activities of those corporations engaged in the design and manufacture of manned aircraft and related equipment for use as commercial transports and military weapons.

Aerospace industry: the business activities of those firms engaged in the design and manufacture of airframes, missiles, space vehicles, rockets, satellites, and related equipment.

Defense industry: the business activities between the United States Government and its prime contractors. For the sake of expediency in terminology, this term includes United States Government procurements for space exploration and supersonic transport development even though such activities are not precisely defense oriented.

Marketing programs: the planning, organizing, staffing, directing and controlling of activities necessary to pursue and win new business by contracting to fulfill customer requirements.
Method, Scope, And Organization Of The Study

The basic approach to this study is a presentation of inductive reasoning to analyze cause and effect relationships together with resulting implications and predictions. Empirical data from authoritative secondary sources is used to substantiate certain historical events and the existence of described conditions.

The following summation describes the scope and organization of the study beyond this introductory chapter:

Chapter II. HISTORICAL HIGHLIGHTS OF THE UNITED STATES AEROSPACE INDUSTRY, 1945 TO 1965

An historical review is presented to set the background and describe events that bring about significant change to the aerospace industry. This chapter deals with the industry in general without particular regard to happenings within an individual corporation.

Chapter III. SUMMATION AND ANALYSIS OF THE CHANGES IN THE AEROSPACE INDUSTRY

An attempt is made to identify the major changes by certain categories and explain the results of the changed conditions.

Chapter IV. MARKETING ACTIVITIES OF AEROSPACE COMPANIES IN THE DEFENSE INDUSTRY

This chapter deals with a description and discussion of typical marketing activities of prime defense contractors.

Chapter V. MARKETING PROGRAM OF A LEADING DEFENSE CONTRACTOR

An investigation and description of the
Lockheed-California Company's marketing program is presented to show the reaction to the changed conditions.

Chapter VI. TRENDS AND PREDICTIONS CONCERNING MARKETING ACTIVITIES OF DEFENSE INDUSTRY CONTRACTORS

In conclusion, some predictions are offered as to probable trends and expected future changes to the marketing activities of defense industry contractors.
CHAPTER II

HISTORICAL HIGHLIGHTS OF THE UNITED STATES' AEROSPACE INDUSTRY 1945-1965

Brief Review Through World War II

Major Airframe Manufacturers

The July 1965 Fortune Magazine presents an annual directory of the five hundred largest industrial corporations in the United States. Of these, there are fifteen airframe manufacturers, and of this number, eleven are considered "major" producers in today's framework. Ranked by 1964 sales, these are:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>North American Aviation</td>
</tr>
<tr>
<td>* 22</td>
<td>Boeing Aircraft Company</td>
</tr>
<tr>
<td>* 29</td>
<td>Lockheed Aircraft Corporation</td>
</tr>
<tr>
<td>* 30</td>
<td>General Dynamics</td>
</tr>
<tr>
<td>* 42</td>
<td>United Aircraft</td>
</tr>
<tr>
<td>65</td>
<td>McDonnell Aircraft Corporation</td>
</tr>
<tr>
<td>76</td>
<td>Martin Marietta</td>
</tr>
<tr>
<td>* 95</td>
<td>Douglas Aircraft Corporation</td>
</tr>
<tr>
<td>106</td>
<td>Grumman Aircraft Engineering</td>
</tr>
<tr>
<td>198</td>
<td>Northrup</td>
</tr>
<tr>
<td>206</td>
<td>Republic Aviation</td>
</tr>
</tbody>
</table>

...
These corporations marked with an asterisk have a recent history of manufacturing both military and commercial aircraft. If the history is traced back far enough, it will be found that almost every one of the above companies had been a commercial producer but has since quit building airliners. During the pre-World War II era, each of the above listed corporations was principally engaged in the manufacture of airplanes. There was little or no attempt at diversification beyond a variety of airframe configurations.

Relationship And Comparison Of Products

A goodly number of the formative airframe manufacturers originally organized to compete for orders from the government and commercial airline operators. Of those currently considered major airframe producers, only five have been recently active in the commercial airline market: Boeing, Douglas, General Dynamics, Lockheed and United Aircraft (Fairchild). The balance are concerned with military aircraft and, to a much lesser extent, aircraft for private operators such as charter services and private corporations.

It would be most interesting to conduct an analysis to determine how many military aircraft evolved from airplanes originally created for commercial use and vice versa. An off-hand recollection clearly indicates that military fighter and interceptor type aircraft originated exclusively as weapon systems with no prior or subsequent commercial versions. The reasons are obvious. This situation, however, is not so definite in the case of bomber/transport type aircraft. To cite a few examples throughout the total history: Douglas DC 3 and DC 4 commercial series were readily modified and
used as military cargo and troop carriers; Lockheed's commercial Lodestar became the famous Hudson bomber of World War II, their commercial Constellation transport was converted to military use and back again to airline use, and the commercially developed Electra was adapted for anti-submarine warfare; Boeing's military C-47 transport became their commercial stratocruiser and the military KC-135 tanker/transport evolved into the leading jet transport of today--the 707 series flown by virtually every commercial airline. To be sure, these are merely a few samples but they illustrate the fact that cross fertilization of military and commercial aircraft does prevail.

General Conditions of the Market

The beginning years of the airframe producers were rugged and precarious. The aviation industry was, indeed, still in its infancy, and pioneers were men of great vision with a dedication to the advancement of flight. It cannot be assumed that any given corporation started out with the objective of concentrating exclusively on the commercial airline market or the military aircraft market. Building and selling airplanes was the primary goal--any kind of aircraft that satisfied any particular requirement. Every member of management was a salesman, and company presidents were ready and willing to pursue sales to any likely customer. The potential of the airplane was so enormous and the state-of-the-art so limited that rapid and tremendous growth was inevitable.

It is interesting to note that many of the major airframe corporations were originated in the late 1920's and early 1930's. The launching of a business venture in an infant industry during this
era of financial uncertainty required vision and fortitude. The military airplane had been used with modest success in World War I and was considered overly expensive for the advantage gained. A relatively small cadre of military leaders, however, had the dedication and determination necessary to press forward with gradual aircraft improvements for expanded military applications. There also existed a few entrepreneurs that envisioned a prosperous future in the commercial airline market. The airplane, however, was still considered revolutionary and the public had not yet accepted it as a safe, practical, and economic mode of transportation.

A few pioneers and flying enthusiasts persisted in the struggle to advance aviation and survive in their business ventures. Additionally, the great depression of the thirties did little or nothing to help the cause. The archives of almost every early aircraft producer contain stories and accounts of payrolls that could not be met on time, of key executives and stockholders mortgaging homes and scraping funds to stave off bankruptcy. Aircraft sales were won by company presidents, treasurers and other top company officials through discussions with military leaders and commercial airline operators which lead to a determination of some rather vague and general customer requirements for new aircraft. With shoe string and oftentimes borrowed funds, the aircraft manufacturer would design and build an airplane that would hopefully meet the customers needs and result in firm orders. The gamble was great and the environment hostile, but the industry survived and aviation progressed.

The big impetus to aviation's meteoric rise unmistakably rests with the weapons build up for World War II. The industry literally
grew up over night. The scratch and scramble for firm orders to keep meager production lines operating gave way to an abundance of contracts for large quantities of airplanes. This is certainly over simplified and understated because a great deal of frantic development and testing was involved on every new military aircraft. The impact, however, was profound. Essentially, the airframe industry was suddenly converted from a buyer's market to a seller's market. The problem was no longer one of vigorous competition and dynamic selling but rather one of production. Brick and mortar, with manufacturing equipment and manpower, were the crucial problems. Building, testing and flying airplanes "over-the-fence" at tremendously high delivery rates presented management with more challenges and problems than they care to remember. There was, however, little or no concern with the marketing function -- nor was their any real need for same.
Post World War II--1945 to 1950

Effect of Redirected and Reduced Defense Expenditures

Whereas World War I introduced the airplane as a potentially worthwhile weapon system, World War II proved it to be the most formidable and effective offensive weapon of the time. This emphasis on airpower during the second world war enabled tremendous advance in the state-of-the-art. In a very compressed time span, air speeds more than doubled, efficiency and maintainability improved, and technology leapt forward. But the war was over and the military urgency for aircraft fell off sharply. The veterans of the industry remember well how many people predicted the virtual collapse of aircraft companies after World War II. A multitude of the defense workers returned to their farms and nondefense occupations. Yet, the industry built more than 1000 military airplanes in 1946 and sales were five times greater in 1947 than in prewar 1939.\(^1\)

This seeming paradox is easily explained when one remembers that prior to World War II, the airframe industry was an infant that sprouted to a giant during the war years of tremendous defense expenditure. Even the severe cut back in defense spending of 1945 through 1950 (see Figure 2) left the airframe manufacturers with substantially greater sales than during the prewar years. This

\(^1\)C. S. Gross, Chairman of the Board, Lockheed Aircraft Corporation, from statements in a speech presented to the New York Society of Security Analysts, October 24, 1963.
bears out the contention that the airframe industry came of age during the era of World War II.

But it was in this same time span that a totally new and influential element entered the picture—rocket power. The highly advanced and proven potency of the German V-2 missile was one of the closing milestones of the war. It stimulated increased effort by the United States toward more rapid development of comparable or improved variations of this potentially awesome weapon. German scientist Werner Von Braun and many of his colleagues were wooed to the United States and subsequently became leaders in this relatively new realm of missile development.

So, this was basically the situation in this particular period: (1) aircraft production was up from prewar years but down severely from the active war period; (2) the birth of rocket power opened up a whole new vista of powered flight; and, (3) the aircraft industry had grown to monumental size with plants and equipment to keep busy and a serious lack of adequate orders for production aircraft.

Industry's Counteraction To The Environment

To make up for the reduced production of military aircraft and to fill the increasing demand for commercial air transportation, the major producers launched vigorous campaigns to develop and market transport aircraft. Boeing's Stratocruiser, Douglas' DC-6 and DC-7 series and Lockheed's Constellation were in competition for the very ripe demand of the airlines. Things, however, were not quite like the very early prewar years. Although public acceptance of air
travel had increased, causing the airlines to require more pieces of equipment, the competition had also increased. The market was broader but tougher competitively. Top executives of the aircraft producers were still very active and influential in the sale of airplanes but they needed much more assistance in the selling effort. There were more customers to cover, more military agencies interested in aircraft development, more territory to travel and much more technology to discuss and explain.

The whole new domain of military required preparation for participating in development, test, and production of a new breed of aerial vehicle which was a logical product line that mushroomed from conventional manned aircraft. Although missiles and aircraft shared many similarities (i.e. aerodynamics, structural construction, sophisticated electronics, and a need for minute all around precision), there were even more dissimilarities. One thing was certain: the technology had become significantly more complex with many new ideas needing development and testing.

Many, but not all, of the airframe producers considered the new missile field as a natural field of expansion and/or diversification. The transport business, however, was going well with several new military jet aircraft in the experimental stage. All this creative activity made the diversification task difficult because of the need for additional--yet scarce--scientists and engineering manpower to tackle rocket and missile development. The total dollars available for aircraft and missile products was far less than during the booming war years but the variety of products in demand was much increased. This required innovative marketing efforts and fairly
accurate forecasting of future requirements. The aircraft manufacturers had to determine where their particular company could best apply its talent and energy in these shallower but broader horizons. This period subjected the major producers to a process of testing, feeling, and weighing conditions in an attempt to determine the course best suited for their corporation.

**Emphasis On Technological Advance**

It is common practice for a firm to rely on profitable production articles to earn a reasonable profit with which to finance research and development of new items. The airframe companies had a golden opportunity to develop new and exotic products; yet they lacked the volume production of "bread and butter" contracts from which to gain the wherewithal.

Through limited company funded research, many worthwhile projects, weapons, and technological advancements were conceived and presented to the federal government as inducement to explore the subject further. In this manner, airframe corporations were able to obtain much of the necessary financing to develop, finalize and implement many of their most promising projects. This should not be construed that private firms were the sole source for conceiving new areas of research. On the contrary, the government had expanded its technical capability and many leading scientists and engineers directed and actually conducted much research within government agencies. The net result was a widespread emphasis on technological advance. The need for new and revolutionary jet aircraft along with the potential and importance of rocket power provided the impetus for
an all out campaign toward advancing the state-of-the-art in the aerospace industry.

General Conditions Of The Market

This period of the late 1940's presented opportunity in many unknown fields of endeavor. The old guard airframe producers made a valiant attempt to answer the call and meet the challenges. They did an admirable job under constraints of thinly spread technical manpower and small profit margins, but the opportunities were too attractive to be challenged only by the airframe companies. The war years had swept many consumer and industrial goods producers into the ranks of prime suppliers to the government. The missile age brought heavy concentration on electronic controls and automated guidance systems; consequently, nonairframe giants entered the competition for government business.

This postwar transition to a peacetime environment presented other difficult problems for the airframe producers. The booming wartime rate of production had resulted in substantial capital expenditures for increased facilities and production equipment. Without the huge military production orders, management had to find a reasonable balance between cutbacks and diversification to retain an appropriate return on investment. Aircraft production fell to about one half of one percent of the wartime peak. Some companies turned to manufacturing washing machines, automobile body parts and even metal coffins. Inasmuch as wartime production prevented manufacture of commercial transports, this market was ripe for sales, but the competition was keen amongst American, British and Canadian commercial
transport manufacturers. Those that elected to stay in the airframe business undertook vigorous sales and advertising campaigns to promote public preference for their particular airliner. This was something completely new to the airframe industry which had always aimed marketing efforts directly and exclusively at the commercial airline and military aircraft buyers rather than the flying customers.

Generally speaking, the country was experiencing a major post-war boom. Automobiles, television sets, houses, appliances and other consumer products in short supply during the war were selling at a rapid pace. Everything boomed except aircraft production. Business, generally, was making money but the aircraft industry sank rapidly into the red. Airplane production dropped from 36,700 units in 1946 to 17,700 units in 1947.¹ Much of this was caused by reduced military aircraft expenditure which dropped from about 1.8 billion dollars in 1946 to 593 million dollars in 1947.² This deemphasized program for military air strength was the serious concern of many industrial and national leaders. It was evident that America was following the same course it took after World War I by allowing its air power to decline to the danger point.

President Truman listened to the warnings of business executives, military leaders and politicians and created a five man Air Policy Commission to inquire into aviation's problems and defense policies. Headed by Thomas K. Finletter, the committee launched into

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²Ibid.
an extensive study that resulted in a report entitled "Survival in the Air Age" published in late 1947. Essentially, this investigation revealed that the aircraft industry was lurching along in low gear compared with its potential, that qualified people were deserting the industry because of its instability (among other things) and that the air force was "inadequate" for peace and "hopelessly deficient" in event of war. The committee's report recommended: (1) that air power form the core of a new concept for national defense; (2) a much stronger air force; and, (3) a long range buying program be invoked to stabilize the industry, cut costs, and enable its flexibility to expand fast to meet a crisis. These recommendations were supported and supplemented by similar ones from a joint congressional committee and the Air Coordinating Committee. At long last it appeared as though some sense of order and planning would come to the previously chaotic and spasmodic buying of military aircraft.
The post World War II era saw much experimentation and development of military air weapons but a serious neglect of maintaining a sizeable fighting air force. The Korean conflict, however, got off to a good early start for the United Nations' (UN) forces because in less than two months of strategic aerial bombings, practically all the enemy's major industrial targets had been "neutralized". General MacArthur launched a daring amphibious invasion at Inchon, recaptured Seoul and drove the Reds across the Yalu River on the Chinese border. With the political inability to bomb the Chinese bases, the UN victory march reached a standstill. The Communist Chinese surged back across the Yalu River and drove the UN forces back to South Korea.¹ This made it clearly evident that the Korean conflict would not be ended in a quick or decisive victory. The UN airpower was limited to use of World War II vintage F-51 Mustangs, F-80 Shooting Stars and F-84 Thunderjets to combat the modern Russian built, swept-wing Migs. Only by sending America's latest post World War II F-86 Sabrejet into action did the UN equalize the air dominance of the communists. The communists had not slacked up on their technological advancement in the art of war and America needed to do a lot of catching up if it was to lead the free world's combat capabilities. The findings of the 1947 Finletter Committee were a resounding echo postscripted by the small notation--"are we too late with too little?"

Boom of Research and Development Program

The situation described above brought a vastly enlarged program for military research and development progress. Air Force and Navy expenditures for research averaged 164 million dollars annually during World War II. Such funds zoomed to 662 million dollars in 1951 and to almost one billion in 1952.¹

But airplanes and missiles can't be bought "off-the-shelf" like a can of sardines. The planes needed in 1951 and 1952 should have been ordered in 1947. To fill the gap, B-29's and other wartime aircraft were pulled out of mothballs to be pressed into Korean service. Concurrently, new bomber and fighter programs that had been lolling along at a leisurely pace were spurred into high gear in an attempt to match the communist threat. Technological breakthroughs occurred in propulsion, fire-power, guidance and nuclear science. In a few short years, military aircraft speed range increased from 450 miles per hour to 1400 miles per hour. Similar advances in armament and electronics provided a more effective use of this tremendous speed.

Commercial Transport Progress

As previously mentioned, the commercial transport market was healthy and concurrently progressing with the expanding military aircraft activity. Many of the technological advances discovered in transport development were adapted to military aircraft and vice versa. New turbo compound engines developed under Navy funding were quickly accepted for use on commercial transports. Fuselages were stretched

¹Ibid., p. 3.
for greater passenger carrying capability. Cabin interiors became more comfortable and luxurious to better accommodate the growing demand of the flying public. Range, speeds and payloads were increased to make transports more attractive to the airlines of the world.

General Conditions Of The Market

Just five years after the devastating cut-back in aircraft production that immediately followed World War II, the aircraft industry was again riding high. Almost every major producer had significant production orders for advanced fighter interceptors. Military bomber/transport/cargo airplanes were in production, and two of the commercial transport manufacturers were building and selling airliners once again. The market was active and sales were up from the postwar years. Research programs related to all areas of airborne vehicles renewed the serious drain on technical manpower, and the United States became confronted with the now common dilemma known as "the engineering manpower shortage".

The environment was somewhat analogous to the booming wartime years; however, there was a very significant difference. The production capacity of the airframe industry was far from being fully utilized and much of the defense expenditure was spent on development of new and exotic aerial vehicles, most of which would never reach the production stage. The United States Air Force and Navy, previously the exclusive buyers of major aircraft systems, were now joined by the Army and the National Aeronautics and Space Administration (NASA) in developing airborne missiles and rockets. Additionally, many of
these high dollar prime contracts were being won by such interlopers as Westinghouse Electric, General Electric, Ford, Textron, Hercules Powder, Emerson Electric, and Thiokol Chemical.

These conditions brought about one of the most important internal changes in the aircraft industry--the need for a dynamic and effective system for marketing the engineering and production capabilities of the aircraft companies. No longer was there a waiting buyer to sign up with the company that offered the best design and price for the customer stipulated requirements. No longer did the government restrict their request for proposals to a few select airframe producers. No longer was it feasible for the prime aircraft manufacturers to limit their sights on the Air Force and Navy expenditures. The opportunities had broadened and so had the competitive base.
Cold War - 1953 To 1965

The Korean War ended in July 1953--just three years after the outbreak of hostilities. The airframe industry was again faced with deemphasized defense expenditures. The curtailment and contract terminations were not as severe as experienced at the end of World War II, but nonetheless, the brakes were applied and the industry had to reorientate again. The Korean buildup, stacked on top of the active commercial transport market, had been the stimulant for certain companies to pass previous peaks in production, hiring, plant improvement and facility expansion. The reality of reduced production orders and an added emphasis on technological advance placed aircraft industry firms in a similar position to that of the late 1940's.

The Korean conflict, however, had taught the United States an important lesson--it just is not practical or advisable to allow unfriendly nations to obtain a technological superiority. Because of this, the United States government adopted a high and increasing level of defense expenditures regardless of international combat urgency and the era was dubbed the "Cold War". Actual fighting was minimized to brief local skirmishes but the armament buildup continued at a lively pace.

Defensive And Offensive Strategy And Resultant Product Development

World conditions and advanced technology made it clearly evident that the United States must develop a completely new arsenal of offensive weapons and a drastically more effective system of national
defense. The awesome destructive capability of nuclear power coupled with the long range delivery ability of the ballistic missile resulted in extensive programs to build such an offensive force. The fact that communist Russia and communist China had developed a recognized destructive threat using this combination also made it imperative for the United States to find an effective defense against such weapons.

These conditions caused an all-out campaign to build an offensive and defensive system centered around the unmanned missile. Notwithstanding the fact that many military strategists clung to their belief that manned bombers and fighters were still a vital necessity of any offensive/defensive complex, aircraft programs were severely overshadowed by missile and anti-missile missile programs. Certain aircraft programs were kept active mostly because there was not a practical missile replacement. Such programs included highly sophisticated flying electronic stations that patrolled the Distant Early Warning (DEW) lines far afield from United States’ boundaries, and the super sensitive anti-submarine warfare patrol craft. Other programs that managed survival were those required for massive airlift operations of men and/or supplies such as those that made “Operation Vittles” and the Berlin Airlift so successful in outmaneuvering Russia in her attempt to isolate Berlin. The bomber and fighter aircraft, however, were conspicuously deemphasized. In addition to programs for patrolling the skies and oceans in precaution against attack, the anti-missile missile programs were given priority. The objective was to design and build a missile that could be quickly launched to seek, locate and destroy an enemy missile headed for any
point in the United States defense system. Such a program presented a fantastic challenge in the area of guidance and detection. Additionally, such a destructive weapon, once armed and launched, was destined to raise havoc somewhere because it could not be redirected to a quiet and unnoticed landing as could be done with a manned bomber.

The basic offensive strategy was redirected toward reliance on unmanned missiles capable of delivering tremendous destructive power to pinpoint locations many thousands of miles away. Again, this approach greatly curtailed the enthusiasm and military support for manned bombers and fighters.

It is clearly evident that the defense strategists were concentrating on the expectation that future wars would be fought on a "push-button" basis. Although this was not the unanimous opinion throughout the military, it was certainly a very real likelihood that could not be ignored. The criticism, however, was aimed at the degree of concentration on a push-button war at the expense of neglecting defense and offense capability using conventional weapons.

Defense Industry Level Of Activity

An historical trend line depicted in Figure 3 graphically shows what confronted the aerospace industry during the 1953 - 1965 period. Although the total defense expenditure persistently increased since 1956, the mix between Research, Development, Test and Evaluation (RDT and E) and production changed considerably. The relatively stable expenditure for military production programs is sharply contrasted by the steadily rising outlay for research and development. This provides evidence that the Finletter Committee recommendations of
Fig. 3.—Expenditures for production and research, development, test and evaluation (RDT and E) programs

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1947 are being followed. A greater degree of stability now exists in the purchase of military production hardware and the United States is seriously attempting to regain world leadership in defense technology.

This trend has a marked impact on the prime contractors of the defense industry. It provides some solidity for their long range planning and offers greater challenge and opportunity in their creative endeavors.

Results Of The Commercial Transport Ventures

Following World War II, the commercial transport producers found themselves in a hotly contested race to provide the world's airlines with much needed new equipment that had been unavailable because of military wartime needs. Lockheed's commercial Constellation had gone to war as the C-69 transport. Commercial plans for this airplane were renewed and it was readily remodeled into the Model 049 transport. Shortly after the surrender of Japan, Lockheed announced receipt of aviation history's largest block of commercial orders for one company--103 Constellations valued at 75.5 million dollars from eight major airlines.¹ Douglas Aircraft, however, was not to be outdone. Their DC-4 prewar commercial airliner had been converted to the military transport/cargo C-5¹ and was the forerunner of postwar DC-6 commercial transports. The Boeing Aircraft Company adapted their military C-97 cargo/transport into the commercial Model 377 Stratocruiser and vied for airline sales. They made limited sales of their Stratocruiser but never really penetrated the volume sales

dominated by Lockheed and Douglas. Republic Aviation attempted to enter the race with a warmed over version of a military reconnaissance plane known as the Rainbow. Republic was so far behind the competition, however, that they faded from the picture after building only one prototype.

The commercial transport world market, then, essentially contained most of the characteristics of an oligopoly with Lockheed and Douglas leading the group. By constant refinement, stretchout, and improvement, these two manufacturers successfully kept the Constellation and DC-6/DC-7 series as the world's leading commercial airliners until the mid 1950's. About this time, the British made a formidable bid for the commercial market with the revolutionary pure jet deHavilland Comet and the Vickers prop-jet Viscount. The previous ten years of military development had conclusively proven the performance ability of the jet engine, but American firms lagged in their adaptation of such propulsion to commercial use.

The British advancements caused American producers and airlines to take notice of these interloper transports that were challenging United States dominance of the free world's commercial air travel. Previously started programs gained impetus. Boeing lead the race for an American made pure jet transport by adapting its military KC-135 cargo/transport into the now famous 707 airliner. The Douglas DC-8 and the General Dynamics/Convair 880 were completely new pure jets that entered the competition as was the Caravelle made by Concorde of France. Lockheed's prop-jet Electra won the American Airlines competition for a new transport specially designed for short and medium range flights. As a result of this achievement, Lockheed decided to
abandon seven years of study and several millions of dollars spent on pure jet transports to concentrate on their Electra sales.

Once in gear, the United States manufactured airliners easily and overcame the British contenders. The deHavilland Comet suffered a series of disasters that indicated structural weakness and the Vickers Viscount, although being a good airplane, just was not big enough or fast enough to beat out Lockheed's prop-jet Electra. But the mighty United States' aircraft builders took a severe drubbing on the profit and loss statement in their commercial jet ventures. Although the figures are widely varied, reports show that Lockheed lost between 125 million dollars and 185 million dollars on the Electra and Jetstar transports\(^1\), General Dynamics lost approximately 400 million dollars on their 880 and 990 jet transports\(^2\), and the Douglas transports are thus far in the red to a sizeable degree.

The Lockheed Electra, after a shaky start, proved itself as a safe and economical work horse for the commercial airlines. Production, however, was terminated after the company had sold approximately 150 of these prop-jet transports. Undoubtedly, one factor that contributed to this unseemly low sales volume was the fact that the flying public overwhelmingly showed preference for the pure jet transports. Although the Electra prop-jet was a vast improvement over the old piston engine airliners, it lacked the speed, smoothness and quietness of the pure jets.

The Boeing Company has been the one shining light in the

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commercial transport business. Although Douglas stays in the competition with its DC-8 and shorter range DC-9, Boeing has steadily widened its commercial model product line and managed to do so on a profitable basis. That is pretty much the picture of the commercial transport manufacturing business as it existed in 1965. After all the race and hustle to sell airliners following World War II, Boeing remains the one producer in the free world that is dominating the market and Douglas is the only meager competitor.

But that is not the end of the commercial transport story. In the highly dynamic aircraft industry there is always another chapter, another horizon and another challenge. Early in the 1960's the British, in consort with the French, announced plans to build a supersonic transport (SST) called the Concorde. This plane would cruise at twice the speed of the existing subsonic 707's and DC-8's and carry between 120 and 140 passengers. American producers had been privately studying supersonic transport configurations and related technical problems for many years, but their analyses and planning clearly revealed that the task required financial investment too large for any one company to undertake. But now, with the British/French team challenging American dominance in commercial transports and the potential increased drain on the then suffering United States balance of payments, the federal government became interested in the possibility of a United States' Supersonic Transport. This interest became more intense with subsequent confirmation that the Soviet Union was engaged in developing a supersonic transport.

Secretary of Defense Robert McNamara adamantly claimed the Defense Department had no interest and little need for a supersonic
American Aviation as the participants for the airframe design. Pratt-Whitney, General Electric, and Curtis-Wright lined up as the potential engine suppliers. Surprisingly, North American Aviation was eliminated in the initial design study competition even though they were the only company with known actual experience in manufacture of supersonic aircraft through their Air Force contract for building two RB-70 experimental planes. The competition continued between Boeing and Lockheed for the airframe and Pratt-Whitney and General Electric for the power plants with a decision scheduled for late 1966. Many questions remained unanswered, and probably the biggest of all was how the financing would be arranged and how the federal government would recoup all or part of its investment.

One must surely ask if there is a genuine need for a supersonic transport. The simplicity of this question belies the many factors that affect the answer. Some of these have been mentioned above but the fundamental issue centers around the volume of air freight and passenger travel that must be considered in justifying such a vast program. Empirical data shows that the year-to-year rise in United States' passenger business has been twenty-five percent in recent years and this is up from a yearly rise of ten percent in the early 1960's. In addition to increasing the airlines' need for new planes, this surge in traffic has put the carriers in a better position to finance aircraft purchases. Industry analysts also reveal the revenue passenger miles (one passenger carried one mile) throughout the free-world rose sixty-six percent from 1960 to 1965. They further predict that the total will almost double between 1965 and 1970. Airline cargo currently brings in only about ten percent of the
United States carriers' revenue, but the forecasters predict that the freight business will grow at even a faster rate than passenger travel.¹

Although it is not the purpose of this paper to attempt a justification for a supersonic transport program, the above discussion is deemed pertinent inasmuch as it provides some insight into the matters that must be evaluated before the basic decision can be made as to whether or not an advanced airplane is marketable. Admittedly, the issues surrounding the supersonic transport decision are infinitely more complex and extensive than ever before confronted by the aerospace industry. This, however, is the sign of the times as airplanes and weapon systems become more sophisticated and more costly.

Free World Versus Communist World Competition

The year of 1957 has one real significance—that was the year of the Sputnik. The United States government had long been engaged in research and development effort toward advancements in the fields of rocket propulsion, missiles, and satellites. Much of the effort had been done by government research groups but, since the early 1950's, more and more of such research and development had been contracted to private industry. The American space efforts, however, received a tremendous boost shortly after Russia made public the successful Sputnik flight.

One can well remember the harangue, sharp criticism and ultimate controversy over the United States' space program and its accomplishments. How is it that the Russians beat the United States in space? Why had we so many embarrassing setbacks and publicized failures? And so it went—great discussion via all the news media, in Congress, and by the public throughout the country. The common concern was the "missile gap", and the "space gap", and the loss of America's prestige and technological world leadership.

The upshot was an increased expenditure and greater schedule priority for United States space programs. The foremost requirement was adequate thrust power to boost a sizable capsule into orbit. The rocket and missilery technology that preceded the stepped-up space program was invaluable in accomplishing long sought space objectives. American drive, determination, and added funds gradually began to pay off as the Mercury and Gemini astronaut programs achieved success.
after success. The data gathering programs of Echo, Agena, Ranger, and lunar probes were also tremendously important in the nation's effort to reduce the "space gap" between the United States and the Soviet Union.

Results Of The Competition

Effect on technological advancement

It has long been an economic axiom that competition breeds some form of progress. This is not restricted to competition between business firms, but is equally applicable to competition between nations. In the case of the race to space, the competition between the United States and Russia has, thus far, resulted most significantly in technological progress. Some would argue that the engineering and scientific accomplishments have been of questionable value and have not necessarily resulted in real "progress" because of the limited and specialized application. This, however, seems to be a negative attitude and a less opinionated outlook would recognize that progress, at least in the pure sense of the word, has in fact occurred.

The aircraft industry has been acclaimed as having made the most profound advancement of any field in the short half century since the first flight of the Wright brothers in 1903. When one considers the fantastic accomplishments associated with space exploration in the even briefer time span since the early 1950's, there can be little doubt that this era will go down in history as one of miraculous achievement.

Although admittedly biased and not completely representative, the results of a comprehensive study reveal that military development
programs place greater importance on state-of-the-art advance (index of seventy-seven) than on time schedules (index of seventy-one) and program costs (index of twenty-eight). Conversely, commercial development programs emphasize development costs (index of sixty-one), time (index of fifty-nine) and state-of-the-art advance (index of thirty-eight) in that order of importance. In addition, military programs had a "relative technical difficulty" index of seventy-one compared to twelve for the commercial programs. Although the make-up and explanation of the study is somewhat complex, it seems to bear out the contention that military programs contribute more to technological advance than commercial programs.  

The reasons for the above comparisons appear quite logical. Two powerful and resourceful rival nations compete for military and space dominance because such dominance provides greater payoffs in terms of security and ability to enforce its will throughout the world. A nation obtains the dominant role through faster and greater technological advancement. The rate of advance is a direct function of the amount of resources expended, but the payoffs of security and enforcement ability clearly dwarf the development costs. If the ultimate payoff is put in terms of life or death, the expenditure of men's time, money, and machines is a meager price to pay. This is the fundamental reason why military and space programs place the high index of seventy-seven on state-of-the-art advance and the relatively low index of twenty-eight on program costs. The international pressures on security and enforcement ability described above explain the reason

1Peck and Scherer, op. cit., pp. 288-298
for the relatively high index of seventy-one placed on time schedules of military programs. Competing nations dare not slip behind each other for fear of inadequate retaliatory ability and because a small gap can quickly widen if increased pressures are not applied to hasten accomplishment.

The Peck and Scherer study also revealed that at least some of the emphasis on rapid technological advance is internally generated. That is, engineers and scientists have an inherent characteristic to seek technical perfection. When a scientist sees something that is technically possible, he goes ahead and does it and argues about what to do about it only after he has achieved technical success. Furthermore, military personnel make weapons choices in an environment of competition and, thus, obtain as much performance and state-of-the-art advance as the designer/manufacturer will promise. As indicated earlier, this has oftentimes created many problems for the contractor that contractually commits to technological accomplishment, in a state of enthusiasm and competition, that he later finds is beyond his ability to achieve.

Additionally, technological progress is greatly motivated by interservice and intraservice rivalry. Interservice rivalry exists when one of the military branches pushes and drives for rapid state-of-the-art advance in order to preempt a particular mission with the weapon. As an example, the mission of the Army's long-range artillery, the Air Force's strategic manned bombers, and the Navy's big guns and attack aircraft could all be accomplished by the new concept

of a ballistic missile. The result has been a frantic race to develop essentially similar weapons (ballistic missiles of many different configurations) to do the basic offensive mission previously done by artillery, bombers, and fighters. Intrasevice rivalry exists when different factions within that service compete to accomplish a mission requirement. For instance, the late 1950's saw the missile-launching submarine challenge the dominance of the aircraft carrier for the lion's share of the Navy budgets. The rivalry resulted in a very rapid development of nuclear powered submarines and the Polaris missile system for submarine launch. The United States space effort has involved a running competition between the Airforce and the National Aeronautics and Space Administration for satellite programs. Although the data and innovations are freely exchanged between military services and other governmental agencies, the basic ingredient of rivalry and competition has helped propel technological advancement to a fantastic pace.

Effect on defense industry contractors

Technological progress is either the result of specialization or the cause of it. Ours is not to determine which is the chicken or the egg, but it has become clearly evident that technological achievement and greater specialization do go hand in hand. The first logical impact on the old guard aircraft prime contractors was evidenced by a trend toward diversification. This was done to greater and lesser degrees as missile divisions, electronic divisions, propulsion divisions, space system divisions, etc. were spun off as autonomous entities of parent corporations. As discussed previously, such action was
not limited to airframe producers. Leaders of other industries followed the same pattern as they were attracted by the growing diversity of governmental procurement.

This diversification required decentralization, which was predominantly product line oriented and resulted in a greater competitive base. The establishment of specialized products by aircraft producers and the influx of nonairframe manufacturers did much to broaden and stiffen competition for the defense dollar. Transplanted executives of aircraft firms found themselves in a different environment when they transferred to corporate divisions and attempted to gain a share of the more specialized product market they had entered. They were competing with smaller businesses that proved vigorous, flexible, capable, and usually enjoyed much lower overhead rates.

Along with the increased competition came greater emphasis on the marketing function. There were more product configurations to sell and many more potential government procurement agencies to cover for new requirements. Price and schedule commitments became more important considerations as there were many technically competent bidders. Again, all this must be viewed as being a matter of relative degree, and one should not be deluded into a comparison of this competitive vigor with that of the automobile or appliance industries. Nonetheless, there did exist a marked degree of difference from the somewhat oligopolistic situation of the outdated aircraft industry, and this difference had a profound impact on the organization, plans, and programs of aerospace contractors.

General Conditions Of The Market
(Cold War And Race To Space)
As shown in Figure 2 of Chapter I, United States defense spending from 1957 to 1965 was inclining steadily. Although the level of expenditure was only slightly more than half of that being spent at the close of World War II, the general health of the aerospace industry was believed to be well on the road to recovery. This era, however, was not without its ups and downs that had been so typical of the defense business. The mid 1950's showed great promise for postwar record sales volume and stability. Employment was again on the increase. Backlogs neared an all time high, including 2.5 billion dollars in commercial orders—biggest in history.

By the end of 1957, defense contractors again experienced military cutbacks, production stretch out programs and contract terminations. Healthy backlogs dwindled and the government went into a severe austerity program. The Russian Sputnik successes, however, motivated the United States government to greater outlays as the race to space received earnest emphasis which helped counteract reduced defense spending.

With increased federal expenditures on programs for social welfare and space exploration, the military departments were diligently attempting to obtain more defense value for their money. Cost reimbursable contracts gave way to fixed price type contracts with greater incentives to encourage contractors to deliver the promised performance without staggering cost overruns. The broadened competitive base gave government negotiators a golden lever to extract more and more from the bidding contractors and thereby help extend the purchasing power of the available defense budget.

The upshot of the overall environment was: (1) an increased
degree of competition both in numbers of competent bidders and potential military and space systems procured; (2) a general tightening down by the government on contractor cost and technical performance; (3) a more extensive involvement by the government in the management disciplines used by the contractors; (4) a decided deemphasis of military aircraft in favor of missile, rocketry and space systems; and (5) a profound proportionate increase in expenditure for Research, Development, Test, and Evaluation effort.
Conclusion

The preceding discussion is recognized as a brief review of historical highlights of the aerospace industry in the United States. Its purpose is to establish a reference upon which to base pertinent points throughout the balance of this study. Integral to this history are significant changed conditions that lead to resultant reactions by both the government as customer and defense contractors as producers. The impact of these changes is analyzed in the following chapter and the reaction to the changed conditions is described in Chapter IV.
CHAPTER III
SUMMATION AND ANALYSIS OF THE CHANGES
IN THE AEROSPACE INDUSTRY

Changes In The Customer

Department Of Defense

The Army, Navy, and Air Force have continuously been the principal procuring agencies that spend the United States' defense dollars. Historically, each of these services has operated autonomously in their procurement activities and, in certain respects, compete for the acquisition of weapon systems. The Army has traditionally purchased "off-the-shelf" aircraft, which are sometimes modified for their particular needs. In some instances, aircraft especially designed for military application are procured by the Army via Military Interdepartmental Purchase Requests (MIPR's) to the Air Force, who accomplish the actual contracting with the manufacturer. As recently as 1962, the Army was permitted to contract directly with airframe contractors for aircraft specially conceived for Army missions. Evidence of this is the Light Observation Helicopter (LOH) program awarded to Hughes Aircraft Company. The Army, however, has not fared too well with this program and is currently under severe Congressional criticism for mismanagement. Another case is the Advanced Aerial Fire Support System (AAFSS) which is the first instance wherein the Army has had full responsibility for procurement of the design, development,
test, evaluation and production of a totally new aircraft weapons system.\(^1\) The Army is hopeful that this Advanced Aerial Fire Support System program will overcome the stigma of the Light Observation Helicopter and independence from the Air Force in future procurement of aircraft systems.

The Navy and the Air Force have traditionally developed military aircraft and weapon systems created for their peculiar needs. The basis for this separate responsibility is primarily that each service has extensive need for aircraft and airborne weaponry. Furthermore, each of these services has been able to justify the need for unique weapon systems because of the peculiarities and differences of their assigned mission responsibilities. Briefly and very simply stated, the Navy requires ship based airborne weapon systems and Air Force missions employ land based systems. This has a significant bearing on the design, operating, and maintenance features of the weapon system best suited for each of these military branches. Hence, it has long been the policy to allow these services to contract individually for the development of new systems tailored to their specific needs.

The history from World War II saw many variations in the authority of several agencies having the responsibility for coordinating military weapon system procurements. The prewar Army and Navy Munitions Board was preempted by the War Production Board until after World War II at which time the coordinating responsibility reverted to the Munitions Board. In 1941, the National Defense Research

\(^1\)Ronald E. Boehme, Unit Chief, Rotary Wing Procurement Section, US Army Aviation Material Command, Interview, St. Louis; August 1966.
Committee expanded into the Office of Scientific Research and Development (OSRD) with authority to decide research and development projects deserving sponsorship. After the war, coordination of research and development reverted to the military services with the disbandment of the Office of Scientific Research and Development. The National Security Act of 1947 created the Air Force as a third independent military service and established the National Defense Establishment with responsibility to coordinate military procurements. The National Defense Establishment evolved into the Department of Defense (DOD) and Congress has gradually bestowed increased power and authority in the Secretary of Defense. Evidence of this growing Department of Defense power exists in the appointment of a Director of Guided Missiles in 1950, and the abolishment of both the Munitions Board and Research and Development Board in 1953. The functions of these abandoned agencies were transferred to new Department of Defense assistant secretaries. Additionally, a Department of Defense Director of Defense Research and Engineering was authorized in 1958 along with the Advanced Research Projects Agency (ARPA). For the first time, the office of the Secretary of Defense was directly involved in the actual implementation of prospective weapons programs. The upshot of all these organizational gyrations has been a continual evolution of change in government policy, personnel, and practices related to procurement of defense weapons. The major impact on defense contractors is discussed in a following section, but one obvious effect is the simple problem of keeping up with organization titles, functions, and personnel. It is not uncommon to hear of marketeers hired expressly and exclusively by aerospace contractors to keep current with such.
changes and report on this volatile situation.

One favorable outgrowth of the organizational changes described above lies in the competency of the technical and procurement personnel. The knowledge, experience, and capability of government employees and military staff responsible for evaluation and contracting of weapon systems has improved considerably over the past two decades. A further result centers on the increased reliance on the Project Manager (also known as the System Program Officer) concept. As weapon systems become more complex and costly, the Department of Defense encourages responsibility to be placed on one centralized organization that has overall authority and responsibility for the progress of the project. This has had an impact on the prime contractors inasmuch as some requests for proposal encourage, if not insist, that the contractor establish an organization structure comparable to that of the military Project Manager's or System Program Officer's.

Other changes having a significant impact on the marketing activities of defense industry prime contractors deal mostly with the directing and control functions practiced by procuring services. This introduces a broad and comprehensive subject that is very basic to the Department of Defense procurement policy. The details of this policy are far beyond the scope of this study but the core essentials are mandatory to obtain an appreciation for the impact on aerospace contractors. At the risk of being overly brief, it is hoped that the ensuing cursory treatment adequately describes the meaningful aspects of the latest Department of Defense procurement policy. It should be recognized that literally volumes of printed matter have been published on this broad subject and the policy is persistently refined
and improved. The following statements attempt to present an overview of prevailing government procurement environment:

1. Major defense development programs were typically contracted on a cost reimbursable basis and the government experienced many horrendous overruns that resulted in expenditures much greater than the original estimates.

2. International tensions and the urgency of time required expedited development of systems that had not been carefully planned and were, in many cases, far beyond the realm of practical accomplishment.

3. As government projects become more complex and more costly, measures were needed to either: (a) exert better control over the contractor's activities; or (b) inject greater incentives to motivate the contractor toward better performance and/or lower costs.

4. The government undertook to implement both better control devices and more meaningful incentives. On the one hand, elaborate system management requirements have evolved to provide the government greater visibility and control of the contractor's activities. On the other hand, "cost plus" type contracts gave way to "fixed price" type contracts thereby virtually eliminating the exposure to an indeterminable government dollar outlay.

5. Along with these tactics, the government developed a policy of "phased" procurement. Essentially, this involves a
prescribed step by step process to move from an unknown and vaguely described project to full production of a precisely defined system. The "Conceptual" phase determines the nature of a required system and establishes that it is reasonably within the state-of-the-art. The "Contract Definition" phase obligates competing contractors to conceive initial designs and carefully present exhaustive plans for successful accomplishment of the proposed program. The "Acquisition" phase permits development, test, and evaluation of system hardware. Finally, the "Operational" phase provides for production of the fully developed system and the related logistic and support items necessary to employ it to the full use intended. Each phase requires rigorous justification and layers of approval to precede the go ahead of the next phase. Essentially, this approach forces detailed short and long range planning by both the government and the contractor, establishes check points to prevent overindulgence in a program that is not tracking to the desired progress, and disciplines the contractor to exert diligent effort to meet objectives or face serious consequences of program termination or equitable contractual adjustment.

This approach has essentially made the contractor's "management" a saleable commodity. It has emphasized the need for superior management techniques and talent to meet the challenge of developing and producing today's intricate weapon systems.
Other Government Agencies

Other government agencies that have a customer impact on defense contractors are primarily the National Aeronautics and Space Administration (NASA), the Atomic Energy Commission (AEC), the Federal Aviation Authority (FAA), and the National Science Foundation (NSF). Of these, the National Aeronautics and Space Administration is by far the most significant because of their space programs and associated large dollar outlay. Since the late 1950's, the National Aeronautics and Space Administration's expenditures for research and development have risen from less than one fourth of a billion dollars to four and one-half billion dollars in 1965. Additionally, many new National Aeronautics and Space Administration procurement agencies have been organized throughout the country with ever expanding areas of exploration and development. These centers are somewhat autonomous in their procurement practices and techniques employed by the Department of Defense agencies. This presents complexities and greater challenge to defense contractors because these differences between National Aeronautics and Space Administration and Department of Defense must be reckoned with in the marketing and contracting activities.

The Atomic Energy Commission, the Federal Aviation Authority, and the National Science Foundation are cited here only for completeness as they have, until recently, played a minor role in the expenditure of government funds for hardware produced by industry. With the tremendous increase in procurement of research and development effort, along with the Supersonic Transport program, these agencies, however,
have become the target of defense contractors' marketing activities to a much greater degree.

Commercial Airlines

The management techniques of commercial airlines have not undergone drastic change since 1945. This does not imply that improvements and progress have been lacking, but rather, that revolutionary methods in planning, organizing, staffing, direction, and control as they effect the procurement activity have had little impact on the aerospace producers.

The meaningful changes effecting marketing activities have resulted from advanced technology and number of transports purchased by commercial airlines. Economic factors and consumer demand are the fundamental considerations that control the purchase of aircraft by commercial operators. The forces of these two criteria guide the marketing activities of aircraft producers and the acquisition decisions of transport buyers. The flying public demands speed, service, and safety from the airlines. These demands are perpetuated by the airlines and made paramount in the selection of airplanes offered by the various producers. Inasmuch as commercial operators are profit oriented (even though some survive only because of government subsidy), the procurement of new aircraft models is somewhat infrequent and accomplished only after extensive evaluation of available bids. Financing arrangements, available funds, impact on stockholders, economic considerations and the service offered by competing airlines make the procurement decision even more difficult. Nonetheless, the commercial airlines are highly astute in their analysis and planning of future
equipment requirements. This long range planning and forecasting are
of key interest to the airframe producers, hence there is continual
marketing attention devoted to these activities.

As an interesting sidelight, some gross generalizations can be
made regarding associations between airplane manufacturers and commer-
cial airlines during the late 1940's and early 1950's. The fleets of
American Airlines and United Airlines were dominated by Douglas air-
planes; the Boeing Stratocruiser and Lockheed Constellation made up
the bulk of Pan American's equipment; and Eastern Airlines and Trans
World Airlines flew mostly Lockheed and Douglas transports. Since the
advent of pure jet and prop jet airliners in the late 1950's, the
pattern of these associations has tended to disappear and a greater
mix of transports now exists in the equipment used by commercial oper-
ators.

Other Private Purchasers

In addition to the military services, other government agencies,
and commercial airlines, the aerospace aircraft producers direct mar-
keting activities to individuals and private corporations. This seg-
ment has been an insignificant portion of the total market for the
major airframe producers. Business firms, rather than the private
citizens, have been the more likely customer, and their purchase of
small transports has shown a steady but modest increase. Serious con-
sideration has, however, been given to mass production of a family
type airplane but many factors have made such a marketing campaign
impractical. It would be naive to believe that airplane manufacturers
have completely discarded this possibility, nonetheless, it appears
to be a passive objective and only in the longest range plans. Again, this category of customers is recognized here for the sake of completeness. As air transportation accumulates statistical proof of safety, economy, comfort, convenience and saving of time, the number of potential customers, both individuals and corporations, will undoubtedly increase.
Changes In The Product

Military Weaponry

Previous discussion recognized the tremendous technological improvement in military weapon systems. With such technically complicated and specialized products, it is difficult to clearly identify product categories except in the broadest sense of aircraft, missiles, and space vehicles. The overall changes are much as one might expect from the historical sketch presented in Chapter II: missile procurement has increased a marked degree from an infinitesimal .037 percent of major military procurement during the World War II era to a thumping 20 percent in the late 1950's; and purchase of military aircraft remained relatively constant at around a 30 to 40 percent level of major militaryprocurements.1 The significant decline in weapons spending, both in absolute and relative terms, has occurred in ordnance and shipbuilding with an offset being in the electronic character of modern weapons. Defense spending for electronic and communication products has risen from 4.9 percent in World War II to 13.5 percent in 1958 - 1960.2 This increase, however, does not include expenditures for similar equipment integral to an aircraft or a missile system. As an example, a World War II airplane contained electronics equipment that amounted to only about 16 percent of the total cost, whereas by 1955 it was almost 50 percent.3

2Ibid.
The rise of missiles and electronics, the decline of ordnance, ships and, to a limited extent, aircraft, represent dramatic changes in the aerospace industry. These changes have had quite an impact on many activities of the competing corporations as shall be discussed later.

Space Vehicles

The technology boom gave birth to a whole new family of products conveniently grouped here into the general category of space vehicles. Revolutionary propulsion systems and sophisticated electronics made possible adventure into the far regions of man's realm of flight. The computer, precise guidance system, extended communication capabilities, and other exotic electronic achievements gave pioneers the confidence and ability to blast beyond earth's gravity and penetrate outer space.

It is not pertinent to attempt a detailed description of improvements made to space vehicles over the past twenty years. To be sure, improvements have been steady and space vehicle performance has been amazing. The pertinent point, however, is to recognize the very fact that space vehicles are now reality and constitute an important product line in the aerospace industry. We have progressed from fairly simple and unreliable satellites to intricate man carrying capsules that have orbited the earth for many days, docked with other satellites, and unfailingly returned their passengers safely to earth. Progress continues--painstakingly, meticulously, and expensively.

Commercial Transports

Changes in the commercial transport product line have been
noteworthy. Prop jet and pure jet power more than doubled the speed of passenger airliners, reduced vibration, and lowered cabin noise level. Electronic and navigation aids improved flight safety and contributed to airlines meeting scheduled arrival and departure times. All these things helped gain enthusiastic public acceptance and reliance on air travel. This, in turn, had the net effect of placing more airliners into operation servicing an increased number of communities. As described in Chapter II, this growth was not a continuous rising trend, but it is a part of the twenty-year history that is fraught with peaks and valleys of activity. The American flying public demands speed, safety, comfort, and convenience. With these as the prime requirements, the transport producers continue to change and improve their products to better satisfy these demands. Prime examples are the latest commercial airline programs to develop the supersonic transport capable of flying nearly 2000 miles per hour and the jumbo transport designed to carry three times as many passengers as present day airliners at about a thirty percent reduction in airline fares.

Research And Development

One cannot truly speak of change in this pseudo product line of the aerospace industry because the very nature of the subject creates change, improvement, and innovation. Considering research and development as a product line of sorts, the kind of change experienced by aerospace companies relates to the breadth of subject matter studied and the amount of sales dollars earned for the effort. In the very early years, airframe producers struggled with improvements in propulsion, aerodynamic design, and functional mechanism. Today, the
area of technology covers these same things but is expanded to an indefinable number of subjects. Consider for example the problems of eating and drinking in a weightless environment, elimination of human waste on prolonged space flights, developing functional systems that operate in temperatures of minus 250 degrees Fahrenheit and plus 1700 degrees Fahrenheit, etcetera. The obvious impact of this expanded base for research and development effort has caused aerospace prime contractors to become competent and expert in many more technical areas. This, in turn, has influenced the planning, staffing, and organization of marketing programs as will be discussed more fully in Chapter V.

Another type of change in research and development concerns the volume of the available market for this effort. As described in Chapter II, the emphasis on research and development, with its related increased dollar outlay by the United States government, provides a very substantial source of revenue for aerospace firms. With an increase from less than 200 million dollars annually in the World War II era to almost twelve billion dollars annually in 1965, it is little wonder that aerospace firms exert intense effort to earn this business.

A more obscure change underlies the importance of the research and development boom. This relates to the manner in which major weapon systems and space programs are now procured as described in the opening section of this chapter. The conceptual phase of the total procurement cycle involves basic applied and practical research effort to a much greater depth than employed in the 1940's and 1950's. These "good old days" saw major programs launched with little more
than some vague design objectives, a willing contractor that dis-
played some degree of evidence that he could reasonably come close
to satisfying the objectives, and a fund of money to finance the
effort. Inasmuch as the conceptual and subsequent procurement phases
depend almost entirely on research results, potential contractors
are obligated to conduct vigorous efforts to establish their compe-
tency and properly prepare themselves for the bigger prize of a profi-
table production program.
Changes In Defense Contractors

Planning And Product Mix

The conditions and integral changes of the industry described in Chapter II caused the management of aerospace firms to concentrate on improvement of their planning effectiveness. The rapid evolution of more advanced and complex products created a need for diligent short range planning and greater emphasis on long range planning. Product obsolescence and a volatile international situation were influential toward creating improved techniques in planning for longer spans. Long range planning is, of course, a relative thing depending on the company, but the term typically covers five years in the aerospace industry.

The importance of research and development efforts kept the management spotlight on the planning and decision making processes. With the success of aerospace firms so highly dependent on technological advance, plans and decisions are highly dynamic and directly dependent upon accomplishments of the research effort. To better appreciate the significance of this situation, it is worth noting some fundamentals associated with planning research and development approaches in the aerospace industry. There are two basic extremes to the spectrum of alternatives which are the basis for the planning policy of a firm that relies primarily on research and development to establish the product line:

**Alternate A.** - Recognize all possible known solutions that could logically and reasonably be expected to satisfy the requirements. Select the most promising candidate solution.
Write up the specifications for the selected approach and undertake the effort to develop the product as necessary to meet the requirements of the specifications.

Disadvantages: (1) accomplishment is limited to a few possible solutions; (2) new ideas or innovations are shut out due to the initial commitment which was based only on information known at the outset; (3) the ultimate solution developed could be inferior; (4) expensive to change course of action if conditions and knowledge change.

Advantages: (1) the solution is less costly if the original course of action provides an acceptable product that meets requirements; (2) contributes toward a minimum time span to develop a satisfactory product inasmuch as side tracked effort and delayed decisions are less likely.

Alternate B. - Establish broad objectives of the desired product and avoid constraints that would prevent flexibility and creativity. Proceed with development along many paths that show promise of achieving the established objectives. Avoid getting prematurely locked on to any one solution. Delay definitization of specifications as long as possible. Eliminate possible solutions when they compare unfavorably to the more promising solutions.

Disadvantages: (1) provides a built-in tendency to delay selection of a final solution; (2) very costly to conduct parallel development programs; (3) extends
time span to develop a satisfactory product; (4) extremely costly.

Advantages: (1) allows alternate solutions to evolve as progress permits; (2) leads to a better and more advanced final product; (3) enables possibility of developing by-products not imagined at the outset.

The planning policy used by an aerospace firm has a significant impact on that firm's degree of success. Somewhere between the extremes of the two alternatives outlined above lies a practical approach to planning for future products and a mix of products. The company's basic capabilities, areas of competency, amount of resources committed, and the degree of knowledge or insight into customer requirements are crucial elements in determining the most practicable planning policy for a given firm. A crucial key to success lies in the ability of an aerospace firm to find the right point on the planning spectrum that best fits their particular circumstances.

With the vigorous growth in advanced technology and a demanding, knowledgeable, and discriminating customer, the aerospace companies find it evermore necessary to concentrate on the planning function for survival. To await the customer's declaration of requirements is tantamount to failure in winning contracts for new products. Most of the basic research and much of the development must be accomplished before entering the competition. Preparedness is the byword.

The twenty years since World War II has seen a greater degree of specialization in weapon systems. In the mid 1940's, there were essentially four basic military aircraft categories--fighters, bombers
reconnaissance, and cargo/transport. Today there are many refinements of these basic categories plus additional groupings of anti-submarine warfare patrol planes, fighter/bombers, helicopters, close ground support aircraft, interceptors, etcetera. Furthermore, the current military airborne arsenal contains variations of rockets, missiles, space vehicles and intercontinental ballistic missiles along with the NASA's many rocket launchers and nonmilitary space vehicles. No one firm can successfully survive in all of these aerospace product lines, hence the planning function determines which areas the firm is best suited to compete and succeed. Planning decisions are less difficult when they involve a choice of entering a competition for a product that is clearly an extension or advancement to a firm's established capability such as an advanced fighter for McDonnell or a larger and faster helicopter for Sikorsky. More difficult planning decisions stem from the need to enter product areas that are related but dissimilar or totally foreign to the experience and history of the firm contemplating a change in course.

Because of the volatile nature of the aerospace industry, virtually all the prime defense contractors have had to face these crucial planning decisions that determine future product lines and product mix. The outcome of these planning decisions for certain corporations is discussed in the following section and illustrated in Table 3.

Organizational Structure

As described previously, changes in the aerospace defense industry caused a marked increase in the depth and extent of the plan-
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<th>Electronics</th>
<th>Ships</th>
<th>Ground Support</th>
<th>Comm'l Transports</th>
<th>Comm'l Cargo</th>
<th>Other</th>
<th>Corporate Sales</th>
<th>Oceanography</th>
</tr>
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<tbody>
<tr>
<td>Lockheed Aircraft Corp.</td>
<td></td>
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<tr>
<td>California Co.</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>Georgia Co.</td>
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<tr>
<td>Missiles &amp; Space Co.</td>
<td></td>
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<td>x</td>
<td>x</td>
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<tr>
<td>Propulsion Co.</td>
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<tr>
<td>Electronics Co.</td>
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<tr>
<td>Aircraft Service</td>
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<td></td>
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<tr>
<td>Air Terminal, Inc.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Aircraft Intern'l. Inc.</td>
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<tr>
<td>Shipbuilding &amp; Const. Co.</td>
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<tr>
<td>North American Aviation, Inc.</td>
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<tr>
<td>Atomics Intern'l. Div.</td>
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<tr>
<td>Autonetics Div.</td>
<td></td>
<td>x</td>
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<tr>
<td>Columbus, Ohio Div.</td>
<td></td>
<td>x</td>
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<tr>
<td>Los Angeles Div.</td>
<td></td>
<td>x</td>
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<tr>
<td>Rocketdyne Div.</td>
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<tr>
<td>Space &amp; Info. Systems Div.</td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>Navan Products, Inc.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Science Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

ning function. Some of the more major planning decisions involved changes in product line and the resultant organizational structure best suited to accommodate the product line mix. Table 3 illustrates the results of such planning, organization, and product line decisions of five aerospace corporations.

Although Table 3 covers only a few defense prime contractors, it illustrates the point that these corporations diversified product lines and organizational structure to a large degree over the past two decades. The original organizations of these five corporations were founded between 1925 and 1934 and were initially engaged in the manufacture and sale of various types of aircraft. Most of this diversification took place in the 1950's in an attempt to survive the unstable environment of the industry and take advantage of the promising future of missiles, rockets and electronics. The product categories in the table are broadly defined and a more precise breakdown would reveal a vast variety of products within each category and especially in that entitled "other".

It is beyond the scope of this study to compare the degree of diversification of the aerospace industry with other domestic industries. Nonetheless, it is a key contention that the unique and dynamic conditions in the history of the industry contributed to this profound and vigorous diversification. Also worthy of note is the influence of the Office of Defense Mobilization following World War II toward decentralizing defense industry to avoid over concentration in a few geographical areas. Such pressure was exerted to minimize the possibility of having defense output severely crippled by a successful enemy attack on any one concentrated area. A further factor is the
federal government's overt encouragement to locate defense plants in depressed labor areas. Thus, such external forces contributed to the internal environment that favored decentralization and product line expansion of firms in the industry.

The upshot of this discussion is to recognize this important change in the nature and makeup of many leading defense contractors. Although Table 3 is considered merely representative, the details are illustrative of the general reaction of virtually all the large defense contractors. As will be discussed later, this change had a significant effect on the marketing activities of aerospace companies.

Types And Numbers Of Employees

The historical highlights of Chapter II allude to several basic changes in conditions that impact on the types and numbers of employees in aerospace firms. The most influential of these changes are: the trend from a production oriented industry to a marketing oriented industry; the technological boom; the degree of fluctuating defense expenditures; the change in management techniques and disciplines; and, the overall growth of the industry. For purposes of this discussion, a reasonable categorization of defense contractor employees breaks down as follows:

1. Production skills
2. Engineers, scientists and technicians
3. Administrative staff and management
4. Marketeers

To describe the impact of the changes on these broad categories of employees, it is appropriate to briefly discuss each group
separately.

**Production skills**

The complexity and quantity of aerospace products has had a direct impact on number and types of direct production labor. Without a great deal of statistical justification, it can be reasonably deduced that production labor has become more specialized in higher skill levels covering a wider variety of labor classifications. Concurrent with this general trend has been a decrease in the percentage of production workers compared with overall employment. Traditionally, fabrication and assembly workers have dominated the aerospace production work force. In recent years this type of labor represents only half of the production workers with the balance devoted to installation or testing of electronic equipment or other highly skilled effort. Additionally, an Air Force survey revealed that only 35 percent of the labor force of 30 major aerospace companies involved direct production labor. Between 1954 and 1959 the quantity of production employees decreased from 541,400 to 451,100—a 17 percent decrease. This trend is even more meaningful in view of the overall increase in defense expenditures from about 12 billion dollars to 15 billion dollars in this time frame (see Figure 3 in Chapter II).

**Engineers, scientists and technicians**

This category of aerospace employees has had an inverse history to that of the production employee group. As products become more complicated and intricate, the need for engineers and technicians increases. The tremendous boom in research, development and testing

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1 Peck and Scherer, *op. cit.*, p. 162.
activities described in Chapter II is the most significant change that causes the dramatic increase in this category of employees. The number of engineers and scientists in aerospace increased from 48,500 in 1954 to 94,900 in 1959—an impressive growth of 96 percent.\(^1\)

Table 4 shows one basic reason for the previously mentioned "engineering shortage" which plagued aerospace companies during the 1950's.

**TABLE 4**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>US</th>
<th>RUSSIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945</td>
<td>4,000</td>
<td>9,200</td>
</tr>
<tr>
<td>1946</td>
<td>7,000</td>
<td>11,000</td>
</tr>
<tr>
<td>1947</td>
<td>19,000</td>
<td>15,000</td>
</tr>
<tr>
<td>1948</td>
<td>31,000</td>
<td>29,000</td>
</tr>
<tr>
<td>1949</td>
<td>47,000</td>
<td>25,000</td>
</tr>
<tr>
<td>1950</td>
<td>52,000</td>
<td>28,000</td>
</tr>
<tr>
<td>1951</td>
<td>42,000</td>
<td>29,000</td>
</tr>
<tr>
<td>1952</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>1953</td>
<td>24,000</td>
<td>40,000</td>
</tr>
<tr>
<td>1954</td>
<td>22,000</td>
<td>53,000</td>
</tr>
</tbody>
</table>

The figures of Table 4 clearly show that the United States was graduating fewer engineers each year between 1950 and 1954—a decrease of over fifty percent. Some of this can be attributed to the general decline of enrollment by veterans, but the proportion of students majoring in engineering and science dropped from about twenty percent.

\(^1\)Ibid.

in 1950 to about fifteen percent in 1954.\textsuperscript{1} Although more recent years have shown a marked increase in engineering graduates, the employment requirements of aerospace continue to be very high in relation to the available new crop of engineers. Because of this high demand by aerospace companies for a limited supply of available engineers, there has been rigorous competition to hire competent talent in this category. Extensive recruitment programs resulted as the destiny of a company relying heavily on research and development depended on the quantity and caliber of the creative talent it could employ.

The emphasis on advanced technology over the past two decades caused this vigorous pursuit of engineering employees. As described in Chapter II, the up and down nature of defense expenditures required contractors to hire and layoff engineers in a highly vacillating manner. The incongruity of these conditions caused many problems to both the aerospace companies and the engineers employed therein. Needless to say, such circumstances required great flexibility in the planning activities of both the aerospace firms and affected engineers. It is this very situation that creates one of managements' primary problems—how to maintain adequate, high level talent with continuity.

\textbf{Administrative staff and management}

Although truly two separate categories of aerospace employees, these types are discussed together primarily because changes in the industry have impacted quite similarly on these employee categories. To describe or even list the many levels or kinds of management and administrative jobs typical to an aerospace company would add needless

\footnote{Peck and Scherer, \textit{op. cit.}, p. 170.}
pages to this particular discussion. Furthermore, it is doubtful that comprehensive statistics are available to delineate the trend in quantity and types of managerial or administrative aerospace jobs. Nonetheless, such empirical information is considered unnecessary to support the observed and logical consequences of how the described changes have impacted on these categories. Grossly summarized, it can be deduced that:

1. the quantity of managers and administrators have increased due to diversification and decentralization;

2. the layers of management and variety of administrative jobs has increased due to greater specialization in work assignments and product complexity;

3. the demand for managers of high ability is emphasized because of the trend toward integrating many intricate technical ingredients into a total sophisticated system;

4. the knowledgeableness of managers and administrators has become more important due to the increased technical character of activities that permeate all decisions;

5. the flexibility required of managers is emphasized due to the volatile nature of the defense industry and the ever changing management disciplines and techniques advocated or imposed by the government.

Marketeers

The changes in the industry brought a new breed of aerospace employees to accomplish the marketing activities. Although the marketing function had always been performed, it had been done primarily by presidents and top level executives. Many of today's aerospace
should follow the abolition or relaxation of such controls.

"A general impression was evident that many persons with governmental responsibilities favor taut controls and close supervision because they do not believe sufficient motivation or incentives exist within the normal business operations of the defense industries to bring about efficient and economical results. Also they distrust the business manager's aggressive drive for increased profits. There was unanimous agreement among the task committees that such beliefs are erroneous or uninformed, and tend to negate the basic concepts of our free enterprise system. Profit is not a word of shame, but the key to the economic health of the nation and of its economic system. Defense industries can be operated more economically if mutual confidence between government and industry is improved to the point where controls are used on a management by exception basis. A greater trust should be extended wholeheartedly and without apologies to other agencies of the government, or to the public. Failures to do so are daily causing needless and wasteful expenditures and higher than necessary costs in military procurement.

"There was general recognition that in return for opportunities to earn greater rewards for superior performance through incentive contractual arrangements, the defense industry must be willing to accept penalties for inferior performance. The determinations, however, of whether performance has been superior or inferior should, wherever possible, be predicated upon findings of facts rather than upon subjective and unilateral judgements, and should recognize when interferences or delays, or the incurring of costs, have been caused by factors outside of the contractor's control.

"There was considerable sentiment evident that, in some areas, further centralization into the Office of the Secretary of Defense of policy determinations, supervision, or controls, are desirable if cost reductions are to be effected. Conceivably these ideas, if adopted, might lead closer to a centralized management of procurement and related matters, but so drastic a step as a single agency for procurement is not a recommendation of this program.

"There was general accord that no changes are necessary in existing basic procurement legislation. P. L. 413, 80th Congress, has proven to be a flexible, adequate and excellent basic statute. Basic objections continue to exist, however, toward any forms of legislation requiring ex post facto profit recapture, such as the Renegotiation Act or the Vinson-Trammel Act or others. As long as any of these do survive, they tend to negate the ability to retain hard earned incentive rewards. If incentive contracting is to be meaningful, and more widely used, then the Defense Department should insist that the rewards for performance not be recaptured.
Changes In Contracting Techniques

The key to the effectiveness of the relationship between government and contractors centers on the contract which is the single, binding document that legally controls the two parties. Because of this, there have been significant changes in contracting techniques to accommodate the changed conditions confronting the aerospace industry.

There are fundamentally two types of contracts used most frequently by the government in procuring goods and services. The first is the cost reimbursement type contract which assures the contractor recovery of all his incurred cost in addition to some degree of profit. Cost Plus Fixed Fee (CPFF) Contracts were prevalent for most major weapon systems developed through World War II. The Cost Plus Fixed Fee Contract gave way in popularity to the Cost Plus Incentive Fee (CPIF) type contract inasmuch as the Cost Plus Incentive Fee Contract was considered mutually more beneficial to both the government and the contractor. This is essentially true inasmuch as the Cost Plus Incentive Fee Contract provides greater incentive to the contractor by offering the possibility of larger profits through lower costs, higher performance accomplishment, and/or early delivery.

The fixed price contract is the second basic contract type most used by the government. Like the cost reimbursement type contract, fixed price contracting permits several variations including firm fixed price (FFP), fixed price incentive with firm targets (FPIF), and fixed price incentive with successive target (FPIS). Within the categories of cost reimbursement and fixed price contracts, the ranking of contractor risk exposure are typically scaled downward from CPFF to
CPIF to FPIS to FPIF to FFP. Stated another way, the CPFF contract exposes the contractor to less financial risk, provides smaller profits and does little to motivate the contractor toward outstanding performance. On the other end of the spectrum, the FFP contract involves the greatest degree of financial risk, provides the best possibility for high profits (or losses) and does much to stimulate the contractor's incentive to perform well.

During the thirteen year period, 1949 to 1961, the use of various contract types for aerospace procurement have changed considerably. Table 5 shows the experience of seventeen aerospace companies as to the types of contracts received as a percentage of total United States sales. Two basic deductions can be made: (1) the use of contract types varies significantly over time; and (2) the use of incentive type contracts (CPIF and FPI) gained considerably in popularity during the 1950's. Worthy of note is the marked increase in CPFF contracts between 1957 and 1961 which can logically be attributed to the United States' entry into the then unknown areas of missile and space age development programs.

**TABLE 5**

**CONTRACT TYPES AS A PERCENTAGE OF GOVERNMENT SALES**

(SEVENTEEN AEROSPACE COMPANIES)\(^1\)

<table>
<thead>
<tr>
<th>Type</th>
<th>1949</th>
<th>1951</th>
<th>1953</th>
<th>1955</th>
<th>1957</th>
<th>1959</th>
<th>1961</th>
<th>13 Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPFF</td>
<td>26%</td>
<td>3%</td>
<td>22%</td>
<td>20%</td>
<td>26%</td>
<td>40%</td>
<td>40%</td>
<td>31.7%</td>
</tr>
<tr>
<td>CPIF</td>
<td>0</td>
<td>1%</td>
<td>4%</td>
<td>9%</td>
<td>8%</td>
<td>14%</td>
<td>12%</td>
<td>8.7%</td>
</tr>
<tr>
<td>FPI</td>
<td>21%</td>
<td>40%</td>
<td>57%</td>
<td>55%</td>
<td>48%</td>
<td>31%</td>
<td>29%</td>
<td>42.0%</td>
</tr>
<tr>
<td>FFP</td>
<td>26%</td>
<td>16%</td>
<td>9%</td>
<td>12%</td>
<td>14%</td>
<td>12%</td>
<td>11%</td>
<td>12.4%</td>
</tr>
<tr>
<td>other</td>
<td>27%</td>
<td>8%</td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>5.2%</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

\(^1\)Ibid., II, p. 162.
Since the early 1960's, there have been vigorous pressures by the Department of Defense to employ fixed price type contracts to the maximum degree. The Armed Forces Procurement Regulations (ASPR) contain guidelines which describe cost reimbursable type contracts as most appropriate for programs that contain vague requirements or require accomplishment beyond the existing state-of-the-art. Conversely, fixed price type contracts are described as proper for programs that involve clearly definable requirements that are within the state-of-the-art. It is recognized that these are gross generalizations, but they are sufficiently accurate to serve as a basis for stating that, in many instances, these fundamental ground rules are pushed aside in order to do that which is in favor with the Department of Defense. The result is that many contracts of a research and development nature are offered by the government under a fixed price contract whereas the nature of the work more properly calls for use of a cost reimbursable contract. The impact of this practice on the contractors has been profound and has strained the already tense government-industry relationship. A further result bears on marketing decisions based on willingness to pursue a program if the contract arrangements are not fair and equitable.

The contract is the vehicle for imposing the many requirements that provide the government visibility, involvement and control over the contractor's activities. In recent years, contract provisions have evolved that impose extensive requirements to deliver a vast variety and quantity of reports and data that reveal meticulous detail of the contractor's technical, cost, and delivery progress. The extent of these administrative requirements is so great that specialized
nongovernment organizations have been created to assist government agencies in planning, directing and controlling contractors' activities through the myriad of paperwork that flows because of these contract requirements. The Aerospace Corporation, the MITRE Corporation, the Applied Physics Laboratory, TRW, and BELCOM are examples of organizations that are retained to advise and assist government agencies on program management.

Another recent change in contracting techniques involves Total Package Procurement (TPP) which basically means that development, test, production and life cycle support of the weapon system is purchased in one contract that stretches over many years through options to perpetuate the program each fiscal year. A variation of this concept is the Multi-Year Buy contract that purchases a quantity of goods and services adequate to satisfy military requirements for up to a five year span. Both of these contract techniques involve complicated provisions to enable fiscal year funding within the constraints of congressional defense appropriations.

The upshot of these changes in contracting techniques impacts most significantly on the quantity and capability of the personnel involved. The added administrative and program control requirements create a need for new specialists to perform the functions. Additionally, the expansiveness and complexity of contract requirements makes it essential that program managers and contract administrators are experienced and highly competent. Of equal importance is the impact on marketing personnel. Inasmuch as contract provisions and techniques are the ultimate manifestation of the customer's requirements, it is essential that sales representatives and all members of
the marketing team be astute in this subject.
Changes In The Competition

Throughout the discussion of the industry's history and the summation of changes, comments have been made regarding competitive conditions of defense industry market. This section summarizes the results of the changes as they affect competition.

Nonairframe Companies

Advanced technology, mission specialization of weapon systems, and international pressures have been the primary factors leading to the influx of nonairframe companies into the defense aerospace industry. Table 6 shows that, of the ninety nine cases studied, all bomber and fighter programs were conducted by principal contractors made up of airframe companies. Missile programs, however, are dominated by nonairframe companies such as Western Electric, General Electric, Raytheon, Bendix, R.C.A., Philco, Firestone and Chrysler as principal contractors.

Nonairframe companies have penetrated the aerospace industry in yet another way. As weapon systems become more complicated through advanced technology, the airframe manufacturers tend to rely on subcontractors to design and produce major subsystems that require specialized capability. This is especially true in the field of electronics and primarily applies to navigation and guidance systems. Also included are booster control, landing gear, armament, fire control and propulsion subsystems. The total impact of this penetration is significant when one remembers that approximately fifty percent of the total dollar receipts for weapon systems are spent by prime contractors with subcontractors.
### Table 6

**Nonairframe Companies as Principal Contractors**

<table>
<thead>
<tr>
<th>Period</th>
<th>Bombers</th>
<th></th>
<th></th>
<th>Missiles</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aircraft</td>
<td>Nonaircraft</td>
<td>Aircraft</td>
<td>Nonaircraft</td>
<td>Aircraft</td>
</tr>
<tr>
<td>1920-1939</td>
<td>5</td>
<td></td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>1940-1944</td>
<td>16</td>
<td>4</td>
<td>13</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>1945-1949</td>
<td>4</td>
<td>13</td>
<td>6</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>1950-1954</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>1955-1959</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>23</td>
<td>23.2%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One Buyer Market

Much has already been said about the growing centralization of power in the Office of the Secretary of Defense and the resultant standardization of procurement practices throughout government agencies that procure aerospace products. In one respect, this tendency toward monopsonistic competition benefits defense contractors inasmuch as the marketeers have a better understanding of procurement practices and constraints universally facing all government agencies. Difficulties arise, however, in that standardization is far from complete and contractor marketing personnel are obligated to be well informed on the sometimes subtle differences between practices of government procurement agencies. Charged with the primary responsibility of being totally knowledgeable on customer requirements, marketeers are thus required to do extensive investigation to be aware of the common and peculiar requirements of the customer.

As seen from the history set forth in Chapter II, the dominance of defense weapon system procurements over commercial transports has caused many aerospace companies to concentrate almost exclusively on defense business to the detriment of retaining commercial business. In doing this, prime contractors have a natural tendency to gear operations toward government business and thereby diminish their ability to successfully compete for commercial transport business. A vivid example is the very recent experience of Lockheed in the commercially oriented SST program. Lockheed quit manufacturing Electra transports in the early 1960's and has not sold a passenger transport to a major airline since. Unofficial and little publicized reports indicate that much of the credit for Boeing's success in winning the
SST award is attributable to the fact that Lockheed had been out of touch with the commercial airlines for such a long time that they were not atuned to the needs and desires of the commercial airline operators. It was not a case of not trying, but rather a matter of Lockheed just not being completely up to date on the latest preferences and operating procedures of the jet age airlines. Assuming a degree of truth in these reports, it is clearly evident that the "one buyer market" element can be highly detrimental to marketing activities of an aerospace contractor.

**Environment Of The Aerospace Market**

Integral to this overall discussion on changes in competitive forces in the aerospace market is the related subject of the uniqueness of this market. The uncertainties connected with acquisition of weapon systems preclude the existence of a market system in anything approaching the usual meaning of that term. Without indulging in a lengthy dissertation of fundamental economic principles related to basic practices of American business, it is possible to highlight some of the peculiar conditions of the aerospace market to support the proposition that it is indeed unique.

Key essentials of the American market system include reliance on the decisions of many buyers and sellers to determine what is produced and the selling price at which it is offered. The "one buyer/few producers" situation of the defense industry places the government in control of deciding what new or different weapons (products) will be developed and produced. Essentially, the buyer takes the initiative to establish the need for a product. Additionally, the
government, as buyer, finances the development of selected products and thereby relieves the seller of the usual entrepreneurial risk of privately funding a new product (weapon). The pricing of products in the defense market is not necessarily accomplished through competitive forces as is the case in the "normal" market system. Due primarily to the uniqueness of the products and the limited number of bidders, prices of major weapon systems are arrived at through negotiation and are based upon estimated or empirical costs appropriately adjusted to accommodate a reasonable overhead rate and profit. These statements concerning product selection and pricing are presented as fundamental conditions existing in the defense market system to confirm the premise that basic economic principles are distorted in the defense industry. The fact that they exist does not conflict with, alter, or negate the points made in Chapter I which describe the existence of a specialized type of competition in the aerospace industry.

The very early history of the airframe industry that preceded the discussion of Chapter II found conditions more similar to those usually associated with the American market system. Prior to World War I, and occasionally since that time, private entrepreneurs conceived, built and tested aircraft which were subsequently presented to the government for acceptance in the hopes of recovering their private investment through orders for production quantities. With the complete reversal of this practice, conditions in the current weapons acquisition process prevent "normal" operation of the American market system. There are basically four fundamental reasons for this environment:
1. The magnitude and complexity of the task associated with developing and producing a modern major weapon system are simply too large to be totally financed by private capital from a single firm or small group of firms. Hence, the need for government funding to reduce the financial risk.

2. The nature of the uncertainties connected with development of a new and advanced major weapon is such that a competent company would be reluctant to independently assume the associated risks inasmuch as resources could be devoted to less risky ventures. The buyer's preferences are not subject to realistic forecasting because there are so many agencies, personalities and constraints built into the government decision making process. Additionally, government policy is highly volatile and a popular weapon program of today may become obsolete or fall out of favor within a short time span due to international pressures or changes in the administration. Finally, the uncertainties of advanced technology make weapons development a highly risky business.

3. As previously mentioned, the unusual defense industry procedure of establishing prices does not place much reliance on the forces of supply and demand. In reality, once a contractor has been selected, it is a monopolistic/monopsonistic like situation in the process of negotiating prices acceptable to both parties.

4. The defense "market system" is more accurately a "contracting system". It is a situation wherein the buyer and
seller agree on the sale long before the product is produced or even designed. The activities and relationship between the parties are meticulously set forth in contract requirements. There is little possibility of emotion, misjudgement or ignorance having a significant impact on the rights or responsibilities of either side. In other words, the "human element" of the normal market system is virtually eliminated by extensive contract provisions.

A final word on the uniqueness of the defense market system relates to the social, political and economic forces that affect events in the defense industry. The primary objective of the defense effort is to obtain a proper balance of offensive and defensive power to adequately protect the United States and her allies. The magnitude of this task and the billions of dollars required to accomplish it bears out the obvious fact that the economic health of the defense industry has an impact on the stability of the economy of which it is such a substantial part. Following this one step further, the economic health of individual firms, or groups of firms, in any given section of the country has a direct bearing on the economy of the surrounding community. At this point, it is clearly evident that selection of defense contractors and geographic distribution of defense dollars become subject to political pressures by elected representatives of the locations involved.

With the growing emphasis on welfare programs, the federal government is financially committed to billions of dollars devoted to the war on poverty, medi-care, the Peace Corps, slum clearance, higher education, occupational training, etcetera. These social improvement
programs have an important impact on the defense industry because they too compete for allocation of available federal funds. The net result is a complex and interwined maze of influences and pressures derived from these social, political, and economic forces that are prevalent at the national level of the democratic system.

The extent to which these pressures influence the award of defense contracts is a moot and controversial subject. Virtually every major contract for a new weapon and space system is surrounded by rumors and allegations that it was politically influenced. The defense industry communications grapevine consistently carry reports and evidence that one particular contractor has a political advantage for one reason or another. There are some knowledgeable people in the industry who are convinced that winning a major contract is somewhat a matter of waiting one's turn. Such an attitude, however, is intolerable to the successful defense industry marketing team inasmuch as every program for which they enter the competition must be adamantly considered a potential victory. It takes this kind of conviction and dedication to carry through the many obstacles, delays, and setbacks experienced in the marketing effort for every major weapon system program.
CHAPTER IV

MARKETING ACTIVITIES OF AEROSPACE COMPANIES

IN THE DEFENSE INDUSTRY

Marketing Intelligence

As in all procurement activities, the starting point is the definition of that which is to be purchased. The more complex the product, the more difficult the task of clearly stating the requirements of the buyer. This problem is common to both commercial airlines and military procuring agencies. Great care and diligence are devoted to this task of product definition. Commercial airlines apply their vast experience of passenger preference, maintenance simplicity, safety features and economic elements to define a transport that will meet their stringent requirements aimed at obtaining safe and comfortable equipment that can be operated profitably. The military services have different criteria for determining their requirements and greater resources from which to draw in defining the desired product. As described in previous discussion, the extensive research and development funded by the DOD is carefully planned and channeled toward assurance that a weapon system or space system is practical and possible. Not only do aerospace companies participate toward this end through research and development contracts, but also government in-house laboratories and research groups provide basic information essential to the establishment of requirements.

Once it is determined that a product is feasible and definable,
the requirements are set forth in a Request for Proposal (RFP), Invitation for Bid (IFB) or other appropriate document that is sent to potential bidders to obtain their response and indication of interest to compete.

As mentioned earlier, the principal spenders of US defense dollars are the Army, Air Force and Navy. The Army buys its aircraft from facilities located in St. Louis, Missouri; the Air Force from Dayton, Ohio; and the Navy from Washington, D. C. This appears to be a simple and straightforward arrangement but it is only the beginning of a labyrinthian organization for military aerospace procurement. Other buying agencies for research programs, space vehicles, parts, maintenance, overhaul, technical services, publications, training, ground support equipment and the myriad of related goods and services are numerous and spread over virtually all sections of the country. The NASA and Atomic Energy Commission follow a similar decentralization, but to a lesser degree. As products become more specialized and complicated, this tendency of growth and geographical spread increase.

Marketing intelligence deals with the sizable task of obtaining reliable and accurate information from this multitude of government procuring and planning agencies. Marketing staff experts diligently analyze state of the union messages, defense posture reports, periodicals, government statements and a myriad of other sources to detect trends, emphasis, and changes in defense planning. Most of this information provides a foundation and reference point for the formulation of broad company policies regarding basic marketing plans.

To augment the staff analysts' findings, marketing representatives comb the country to glean firsthand and inside information from
their many acquaintances throughout the vast complex of military procuring agencies. These activities are similar to those of David Riesman's "inside dopester" wherein the individual obtains information made available through his privy or company associations and exploits this situation to his personal and company benefit. These are the eyes and ears of the marketing intelligence activity. Information is gathered, screened, evaluated, interpreted, and forwarded through channels to those in the marketing planning activity.

As a casual observation, reference to a firm's representatives as "salesmen" is giving way to the preferred terminology based on the "marketing" concept which is considered vastly more encompassing than the more limited "selling" role. Typical titles include Marketing Vice President, Marketing Branch Manager, Marketing Representative, etcetera. Irrespective of the designation, marketeers actively, directly, and vigorously attempt to discover procurement plans of the customer. Seldom are there surprise discoveries of immediate government requirements because most aerospace procurements undergo an extensive process of approvals, funding requests, and similar activities that provide much visibility of upcoming procurements. It is not uncommon to track the evolution of a system procurement for several years before it becomes reality.

The above description is recognized as a cursory treatment of the intelligence gathering activity of modern day defense industry marketing. It is discussed here to make the point that the breadth and depth of this activity is extensive when compared with the

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relatively modest degree of similar effort exerted prior to about 1950. With the large increase in the number of government procurement agencies, variations of aerospace products purchased, and geographical dispersion of buying agencies, marketing intelligence has become a major activity and produces worthwhile results. Although the nature of the activity has not changed extensively, the methods used and the amount of effort expended are much different than previously.
Market Planning

Aerospace contractors are intimately involved in the activity of defining customer requirements. As alluded previously, much of this contractor involvement is the result of study programs that precede the final determination of ultimate system requirements. Many study contracts investigating a myriad of subjects provide findings that help establish the feasibility of a large scale program. These results are compiled, analyzed, and evaluated in a building block fashion to provide the supporting facts justifying the practicability of further expenditure and development. Through its research contracts, aerospace contractors are helping shape potential military requirements and are, therefore, quite familiar with the aims and trends of future customer requirements.

Government research activities are augmented by independent research and development programs partially financed from earnings of individual contractors. Such independent effort is carefully planned to parallel contractor capability and anticipated customer requirements. Although this activity is significant in determining customer requirements, it is somewhat less direct than the intelligence gathering activities of marketing personnel. These research efforts, along with the intelligence provided by the marketing contact men, help shape the sales forecast and long range plans of the aerospace contractors.

The information obtained by market representatives often results in submittal of unsolicited proposals. If the customer shows an active interest in a particular area, but has not finalized requirements or necessary arrangements to proceed with the formal procurement
procedures, it is sometimes advantageous for the contractor to take the initiative. This is accomplished by submitting a proposal aimed at obtaining a contract award without the usual competitive bidding process. In this regard, the marketeer's knowledge of customer requirements, rapport, and sensitivity to customer attitudes are key elements in determining the timeliness of submitting unsolicited proposals. Such proposals, along with solicited proposals and the aforementioned marketing intelligence information, are key elements in developing effective marketing plans.

The considerations and ingredients of defense industry market planning are described in much greater detail in the following chapters. That discussion illustrates the intricacy of manipulating many variables in weaving together strategy plans, company funded research efforts, customer mission requirements, conceptual studies, and other elements to arrive at an effective marketing plan. Prior to World War II, the marketing plan pretty much limited itself to short range measures to sell a limited variety of aircraft or keep the long production line operating. During World War II, the marketing plan gave way to the production plan as management concerned itself mostly with large scale production while keeping a less than frantic effort devoted to new product development. Although the requirement for this activity has always existed in some form and to some degree, the modern day approach is more sophisticated and critical.
The Bid And Proposal Activity

Most defense contractors have found a coordinating group to accomplish the bid and proposal activity a necessity. The makeup and organizational placement of such a group varies widely from company to company, but the essential activities must be performed. Basically, the bid and proposal functions include: (1) obtain management decision to bid on specific business opportunities; (2) coordinate activities of the proposal team to create a proposal that meets the customer's requirements; (3) obtain necessary management approval of the proposal content including the offering price; (4) arrange for printing and transmittal of the final proposal; and (5) followup to determine the outcome of the proposal including which company wins the competition and why. Although these are the major activities involved in processing a request for proposal, there are several basic considerations that deserve specific comment.

Gathering And Disseminating Bid Information

Aerospace contractors have generally decentralized their organizations through diversification and geographic separation. This, coupled with the wide dispersion of government procurement agencies, creates a rather significant communication problem. Large corporations typically maintain field offices near those government agencies that buy the particular products of the corporation's subsidiaries or divisions. These corporate representatives supplement the activities of the marketeers from individual corporate entities. Through mailing lists or personalized pick-up by market representatives, requests for proposals are sent to appropriate divisions of the corporation.
The communication problem exists in the effort to disseminate these bid opportunities to the corporation division best suited to fulfill the requirements of the solicited goods or services. Through extensive telephonic and telegraphic exchange of information, the request for proposal is expeditiously dispatched to the division that plans to compete for the contract. It is important that this exchange of information be thorough and accurate to ensure that business opportunities are not missed because of insufficient time or lack of information necessary to prepare the proposal. Although this sounds like a rather perfunctory activity, it actually involves aggressive and dynamic administration to enable coordinated decisions concerning the important subject of new business opportunities—an issue most vital to any aerospace corporation.

Selective Responses A Necessity

It is important for the contractor to be selective in deciding which bid opportunities deserve their reply. The quality of a proposal has an immediate and long range significance. An inferior proposal will needlessly waste company funds and manpower because such proposals seldom receive a contract award. Further, they do little to help the company's reputation and could even cause that company to be considered incompetent for future bid opportunities. Because of this, it is most important to concentrate on those requests for proposal that are germane to established or future products and areas of capabilities and those which contain a reasonable chance of contract award.

On the other hand, the bid and proposal activity is the start-
ing point in obtaining government contracts. For this reason, many proposals are submitted in an attempt to become recognized as a competent contractor in product areas that are in the company's long range plans to penetrate. Additionally, proposals are sometimes submitted because they provide an opportunity to gainfully occupy engineering personnel during occasional short span slack periods. Inasmuch as bid and proposal expenses are recoverable through overhead rates, such effort is never totally lost.

Proposal Ingredients

An "Invitation For Bid" (IFB) or "Request For Quotation" (RFQ) are usually used by the military to order spare parts, standard inventory items or other commodities readily identifiable and available from the industry or contractor's manufacturing line. The essential elements are price and delivery commitments for a known product and acceptance of the terms and conditions of purchase. On procurements of major weapon systems or research and development studies, government agencies use a "Request For Proposal" (RFP). The RFP is explicit in stating requirements that must be met by the contractor in order to be responsive and eligible for consideration of a contract award. The normal pattern is to require the response be submitted in separate sections covering the technical, management and price elements. There is very little standardization in government RFP requirements, especially in procurement of research studies and major systems. Some degree of generalization is possible, however, in describing the basic content of the various proposal sections.
Technical

This section describes what is offered for sale by the contractor. In many cases, it is a restatement of the customer's requirements, but amplified to convince the source selection evaluators of the bidder's competency. This is done by identifying key problem areas and emphasizing likely solutions to these problem areas. In the case of hardware, many details of construction are included along with statements of performance capabilities. For research and development proposals, the technical section describes what is to be studied and usually discusses the technique to be employed and the depth of research to be accomplished.

Management

This deals with a wide variety of subjects including the management techniques and tools to be used in conducting the program, facilities required, contractual terms and conditions, the organizational structure of the program, etcetera.

Cost

This section includes necessary pricing details and premises to provide evaluators an adequate basis for determining the reasonableness of the costs to the government.

It should be clearly understood that the details, organization and method of presentation included in these proposal segments vary widely between programs and bidding contractors. Although the government attempts to provide explicit proposal instructions to obtain uniformity in responses, it is virtually impossible to regiment bidders' proposals. After all, this is the one tangible selling media that enables competitors to distinguish themselves; therefore, ingenuity
and creativity is the bidder's objective.

Bid And Proposal Pitfalls

Inherent in any selling effort is the desire to win the competition. The nature of the competitive environment, however, makes it inevitable that any one competitor will not win all the contracts for which he competes. Hence, the outgrowth is a tendency to overcommit one's capability in anticipation that only a portion of potential business will be won. A recent trend in research and development procurement is to require the bidder to list his key personnel and state a percentage of time they will be working on the proposal program. Inasmuch as recognized experts employed by defense contractors are an important criteria in judging a bidder's competency, it is common practice to include these renowned individuals in every proposal related to their specialty area. If that company is unusually successful in winning several contracts requiring concurrent performance, the affected experts could be unrealistically committed to spend more than one hundred percent of their available time on the programs won.

Another bid and proposal pitfall also relates to exuberant salesmanship. As in any selling endeavor, defense contractors are attempting to persuade the buyer that theirs' is the best offer. Consequently, many proposals contain overzealous promises intended as evidence of confidence and capability. Many bidders have become chagrined when such commitments become contractual obligations that require absolute compliance or exposure to default of the contract. Astute contract negotiators can prevent such happenings if the circumstances are known in time, but this involves a rather unpleasant
experience wherein the contractor must retreat from his flamboyant proposal promises to a position that he can tolerate contractually. In the days of cost reimbursement type contracts, this risk was minimized because the contractor was not obligated to incur costs greater than the amount stated in the contract. In the more recent era emphasizing fixed price contracts, the risk is great inasmuch as the commitments must be fulfilled regardless of the cost to the seller.

This leads to another major pitfall of the proposal activity known as the "buying-in" policy. This is a case where the bidder arbitrarily prices his effort lower than the contemplated price of the competitors or at a level commensurate with anticipated available funds of the government procuring agency. The Armed Services Procurement Regulations (ASPR) strongly discourages this policy but it is a difficult practice to prevent. The consequences to the underbidding contractor can vary. He may benefit if the loss leader contract provides a springboard to profitable following business that offsets his initial losses. Conversely, he may suffer unrecoverable losses if the original contract causes him greater losses than contemplated or no profitable contracts are forthcoming.

Another danger of the proposal activity involves the issue of "nonresponsiveness". This is a case where the bidder submits a proposal that fails to meet all criteria of the customer. Submittal after deadline, incomplete or inadequate content, and restrictive qualifications are but a few of the reasons for which proposals can be disqualified. Suffice it to say that proposals answering government requests must be meticulously prepared to ensure acceptability. In those instances where absolute compliance to all terms of the
request for proposal is not possible, the bidder must assess the risk of being declared nonresponsive and determine if he still wishes to compete. There is some solace, however, in the fact that proposals from competent contractors for research effort or major systems are seldom declared nonresponsive unless they flagrantly violate the proposal requirements or completely miss the desired objective of the customer.

The basic differences between bid and proposal activities past and present center around greater formality, increased depth and detail required, more uniformity in format and proposal ingredients, and a much greater volume of RFP's to consider. As time has passed, these characteristics have grown more pronounced with the net result being a much larger amount of time, talent and money being devoted to the bid and proposal activity. Hence, the importance and criticality of this marketing activity is far greater now than in times past.
A more specialized type of customer relations centers around the advertising and promotion departments. Defense contractors expend large amounts of money to advertise their company and its capabilities. Much of this is done by institutional advertising through trade journals and business publications aimed at building the company image. To a lesser degree, advertising of company products and areas of activity is also conducted. The benefit of this product line advertising is questionable inasmuch as defense systems and products are purchased through rigorous government procurement procedures by very knowledgeable buyers who base their selection on many objective criteria. Additionally, such buyers are immune to product differentiation, which is the objective of product line advertising. One indirect by-product of such advertising is its possible influence in motivating qualified engineers to seek employment with a company that has programs which parallel his career interests.¹

Here again, this marketing activity is fundamentally not much different than in the past except with respect to the volume and breadth of coverage along with the current vogue of advertising technique and style.

¹Remarks by George Robinson, Director of Advance Systems Sales, Lockheed-California Company, presented at a Marketing Seminar; Burbank, California; February 25, 1967.
tion of the company. The age old objective of developing good customer relations is still considered paramount as a contributing element in the source selection process. Competency is established and confidence is earned for the company through the personalities and abilities of its marketing team representatives. These impressions have a lasting and meaningful impact on source selection evaluators.

In spite of the above, the source selection process attempts to obtain an objective determination of a winner. Great care and complicated weighting criteria are typically constructed to obtain an unbiased appraisal of the bidders' proposals. The methodology employed can vary between procuring agencies and programs being evaluated, but the goal remains one of arriving at a justifiable selection based on objective analysis.

Although the selection process is not performed by the company, it is mentioned here to recognize the marketing activities directly related to this very crucial customer activity. The historical trend has seen individual major weapon system programs become larger and more complex and/or competition has become broader and keener. Because of this, government source selection boards are more sensitive and meticulous in proper conduct during the evaluation process. This, in turn, has caused marketers to be more astute and prudent than ever before/in waiting out this critical period.
Contracting

One of the most determinative marketing activities is identified here as "contracting". This term is used to cover all the activities related to the establishment of a legally binding agreement between the government and the contractor, administration of all the contractual requirements and provisions, processing and implementing changes to the contract and settlement of all matters necessary to finally close out the completed contract. Some leading defense contractors place the contracting function in organizations other than marketing or set it out as a separate functional group reporting to the president or vice president. If, however, one accepts the philosophy that the marketing function embraces all activities directly related to customer satisfaction, contracting is unquestionably a marketing activity regardless of where it is formally placed in the organizational structure.

Significance And Role Of Contracting

As stated above, the contracting function is one of the most decisive and significant of all marketing activities. It is considered second only to the selling activity in rank of importance.\(^1\) Without the sales effort, the company would not likely progress to the point in the competition that involves the contracting activity. Once there, however, the company must take full advantage of that opportunity to negotiate an equitable contract--one that is accomp-

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lishable at a profit while, and at the same time, satisfies the cus-
tomer's needs.

The significance of the contract is sometimes not fully appre-
ciated. It is clearly evident that this document is the single tan-
gible and meaningful thing that makes a profit possible or causes the
company to suffer a loss on any particular program. The contract is
the basis for a firm's productive activities and is the instrument for
obtaining revenue. If the contract is inaccurate, vague or open-ended,
the company can suffer inestimable losses. Hence, the contracting
function becomes one of great significance in the overall business
activities of a corporation.

The role of the contracts department is difficult to describe
in detail as the activities are many and varied. The primary role of
the contracts group is that of coordinator aimed at obtaining a con-
solidated company position on all contractual matters. Secondarily,
the contracts group serves as watchdog: for the customer--to ensure
that all contractual requirements are satisfied; and, for the com-
pany--to ensure that noncontractual demands are not imposed by the
customer without equitable adjustment in contract price and other pro-
visions. To be sure, these primary and secondary roles are overly
simplified here and, furthermore, it should not be misconstrued that
the decision making power rests with the contracts department. The
essential point is that the contracts group is the focal point respon-
sible for obtaining resolution and contractual coverage for all issues
that develop between the company and the government.
Contract Negotiation

The negotiation activity is a critical, important, and delicate aspect of the contracting function. It is at this point that "good deals" are made or lost by the contracting parties. The setting is an interesting one in a monopsonistic versus an oligopolistic environment with the advantage ultimately on the side of the government as buyer. The negotiation of a prime contract with a military procuring agency is a complicated and tedious task. Without exaggeration, every word and phrase can have a meaningful and costly impact on either of the contracting parties. The objective is to clearly and accurately express the true intent of both sides (which is easier said than accomplished). The content, breadth, and depth of a military prime contract is such that no one person can be adequately expert in all the many details that are woven into the final document. For this reason, the principal negotiator must be supported by a variety of specialists who can counsel on particular areas of involvement that become part of the contract. Nonetheless, the principal negotiator must have the ability to comprehend the issues and determine the impact of any one point on the overall contract.

A further aspect of the negotiation activity involves the use of a significant amount of psychology. A successful negotiator is perceptive to the government negotiator's personality, weaknesses, strong points, and the limits of his authority. He must know when to aggressively pursue an issue and when to tread softly. He must be able to earn the respect and confidence of his government counterpart in order to build a rapport that will make the difficult negotiation process more tolerable. Without this rapport and a large degree of
mutual respect, the creation and negotiation of an intricate contractual instrument would consume an intolerable amount of time.

The subject of negotiating a military prime contract cannot be totally covered in a paper of this nature. There are many "do's and don't's" in the fine art of negotiation including the use of strategy, when to be silent, timing, diversion techniques, etcetera. The single most important essential, however, is preparedness. The negotiator must be thoroughly prepared in the technical requirements, delivery schedule, pricing, special provisions, and general provisions of the contract if he is to adequately represent his party (contractor or government) and obtain a satisfactory contract.

Contract Administration

Negotiating a fair and equitable contract is only the first step in the contracting function. Of equal importance is the contract administration activity. The advantages of the most favorable possible contract can be lost if the administration of the contract is not meticulous and diligent. Some basic responsibilities of the contract administration group include:

1. preparation of the work authorizing document that clearly describes all contract requirements and permits organizations to incur costs to accomplish these requirements;
2. interpret contract requirements to resolve internal company controversies or misunderstanding;
3. perform the "clearinghouse" function for all company/customer correspondence to ensure company replies and commitments are contractually appropriate and customer's requests and instructions receive proper action;
4. ensure that appropriate company organizations maintain complete and accurate records of all contractual paperwork for audit and verification purposes;

5. coordinate, negotiate, and document all changes to the initial prime contract; and

6. coordinate and ensure accomplishment of activities required to officially close out all contract requirements.

To be sure, the above listing cites only the main areas of responsibility and each could be amplified into a multitude of subheadings and affiliated activities. The intent is not to be complete in this description, but rather to indicate the breadth and importance of the issues involved in contract administration. As to the differences in contract administration activities past and present, that subject would be far too extensive and detailed to be treated fully here. The discussion in the section entitled "Centralization Of Power In The Department Of Defense" of Chapter III and its subsections entitled "Government Regulation And Interference" and "Changes In Contracting Techniques" provide some insight as to the basic contracting issues that are evolving through time. The gross impact of the history on the marketeers' contracting function requires a greater effort to keep pace with more frequent and extensive revision to all the government procurement regulations, an ever more demanding need for precise and complete attention to all contractual details, and a patient, tolerant, and understanding disposition toward customer personnel and their demands.
Logistics

Aerospace logistics includes the movement, storage, distribution and supply of all the necessary goods and services needed to maintain and support the weapon system, spacecraft, or missile during its life in operation. From the prime contractor's point of view, this involves such things as manuals covering operating and service instructions, ground support equipment, field service representatives, and spare parts. It is recognized that some students of defense industry marketing would isolate logistics as a separate marketing activity because it is the ongoing effort required to round out total customer satisfaction which extends until the initial basic product is phased out of service. There is no argument that the entire logistic activity must be considered when dealing with the marketing concept that includes the handling of all customer requirements from the birth to the death of the product. It is the contention of this analysis, however, that the logistics activities of defense prime contractors is a functional matter properly included as particularized contract requirements. There may be some peculiar marketing problems and different techniques associated with logistics, but essentially it is a matter of degree and emphasis rather than a unique and separate marketing activity. This subject is included here only for the sake of completeness and to recognize the very important logistics activity essential to the marketing concept of a defense product.
Conclusion

In the overall analysis of these aerospace marketing activities, it is readily apparent that they are not necessarily unique to defense industry marketing. Indeed, most of these same basic marketing efforts exist in virtually all industries to some degree or another. It is certainly beyond the scope of this study to analyze the reasons or techniques of application associated with these differences between industries. Worthy of note, however, are two influential conditions that cause peculiar treatment of these marketing activities when applied in the defense industry:

1. Use of the contracting system to consummate sales involves precise and extensive requirements that extend over many months, if not years, of buyer/seller relationships. The seller cannot operate on the basis of a sale, delivery of goods or services, and exposure to a few months' warranty. He must anticipate prolonged and close involvement with the customer through the life of the contract, hence his conduct and performance is a continuing thing and not limited to brief customer exposure typical of consumer sales and many industrial sales.

2. The nature of the product sold and the rigorous selection and procurement procedures practiced by the government invoke a unique set of criteria that determine the winning contractor. The defense contractor cannot rely on high pressure selling techniques, emotion motivated selection, a salesman's personality or instantaneous buying impulses. On the contrary--logic, analysis, and many layers of appro-
val are involved before the government is prepared to contract for a weapon system or a research program.

The existence of these two fundamental and important elements are significant in influencing the nature and emphasis of defense industry marketing activities. Although the discussion in this Chapter does not particularly highlight the impact of these two conditions, it should be realized that the activities described are conducted under the purview of these circumstances.
CHAPTER V

MARKETING PROGRAM OF A LEADING DEFENSE CONTRACTOR

The Lockheed Aircraft Corporation

The very early history of the Lockheed organization dates back to 1911 when the aviation industry was first making its mark on the American scene.¹ Starting with the part-time and sporadic efforts of the Loughead (pronounced Lockheed) brothers, the company went through many organizational and corporate gyrations until 1932 when it wound up on the auction block in bankruptcy proceedings. The Gross brothers (Robert and Courtlandt) and a small number of supporters purchased all assets of the company for forty thousand dollars which was a considerable amount of money in view of the bleak business environment of that time. This was the beginning of today's Lockheed Aircraft Corporation (LAC) and, until very recently, it was continually and actively managed by the Gross brothers (Robert died in 1961 and Courtlandt retired in 1967). After modest progress and growth in the mid and late 1930's Lockheed grew rapidly during the World War II arms build-up. Since that time, it has suffered the cancellations, stretch-outs, speed-ups and near wins typical of the industry as described in Chapter II. On

¹For an interesting and informative history of Lockheed, see the forty article series by Denham Scott, Assistant to the President of The Garrett Corporation, entitled "The Lockheed Story" in the Southern California Industrial News beginning with Vol. XIX, No. 39, May 8, 1967.
the other hand, IAC has enjoyed many successes over the twenty year history with a resultant healthy growth.

In planning this study, it was first considered reasonable and practical to analyze several aerospace corporations to determine how they reacted to the changed conditions of the industry insofar as marketing activities were concerned. Further analysis produced the conclusion that a description of a conglomerate reaction to the changed conditions would be somewhat extraneous, inasmuch as modern aerospace corporations are highly individualistic in their organizational and functional make-up. Therefore, the Lockheed Aircraft Corporation is selected for the investigation of this chapter for the following reasons:

1. Its total history spans the period from nearly the beginning of US aviation to the present, hence the organization and its management are sensitive and attuned to the many changes described in previous chapters because they have grown up in that environment.

2. It has been prominent in military and commercial aircraft development yet has diversified into other product lines in consonance with the transition of the aircraft industry into the aerospace industry. In this respect it can be considered a representative firm in the industry even though the manner in which the corporation has adapted to the changes may be atypical.

3. The personal experience of the writer as an employee in the marketing function of IAC enables insight and observation of this corporation which would be otherwise difficult if
not impossible to obtain through primary or secondary data sources.

A comparison of Lockheed with other aerospace firms is practical only in the broadest of terms. Table 7 presents some basic information to enable a general impression of how Lockheed compares with other leading aerospace corporations.

The details of Table 7 and similar backup statistics permit several basic observations:

1. Of the ten aerospace corporations listed, Lockheed is usually within the top three or four in rank by total sales (commercial and government); i.e., in 1963 it was first with an overall rank of twenty and in 1966 it was second with an overall rank of twenty-nine.

2. Of the ten aerospace corporations listed, Lockheed is third by a wide margin in earnings per share growth rate from 1956 to 1966.

3. Lockheed's profit as a percent of sales is almost the worst in the listing whereas their profit as a percent of invested capital compares favorably with the best in the listing.

4. There is a fairly close grouping of the first five corporations listed in Table 7 so far as sales ranking is concerned. The spread jumps significantly, however, for the last five listed.
### COMPARISON OF TEN TOP AEROSPACE PRIME CONTRACTORS

<table>
<thead>
<tr>
<th>Corporation</th>
<th>SALES ($000,000)</th>
<th>Rank '66</th>
<th>Rank '63</th>
<th>ASSETS ($000,000)</th>
<th>Rank '66</th>
<th>Rank '63</th>
<th>PROFITS AS PER CENT OF:</th>
<th>Employees</th>
<th>Rank</th>
<th>1956-1966</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing</td>
<td>2,357</td>
<td>23</td>
<td>25</td>
<td>1,445</td>
<td>38</td>
<td>65</td>
<td>401 460 13.5 216 313</td>
<td>128,500</td>
<td>12</td>
<td>5.99</td>
</tr>
<tr>
<td>Lockheed</td>
<td>2,085</td>
<td>29</td>
<td>20</td>
<td>727</td>
<td>84</td>
<td>86</td>
<td>425 398 18.5 68 16</td>
<td>90,335</td>
<td>23</td>
<td>11.80</td>
</tr>
<tr>
<td>North American Aviation</td>
<td>2,024</td>
<td>30</td>
<td>21</td>
<td>573</td>
<td>104</td>
<td>68</td>
<td>447 401 14.2 188 66</td>
<td>92,150</td>
<td>21</td>
<td>4.82</td>
</tr>
<tr>
<td>General Dynamics</td>
<td>1,797</td>
<td>32</td>
<td>30</td>
<td>734</td>
<td>83</td>
<td>76</td>
<td>400 171 20.4 48 3</td>
<td>93,196</td>
<td>20</td>
<td>3.05</td>
</tr>
<tr>
<td>United Aircraft</td>
<td>1,663</td>
<td>36</td>
<td>33</td>
<td>1,046</td>
<td>56</td>
<td>80</td>
<td>426 442 11.2 321 345</td>
<td>81,556</td>
<td>24</td>
<td>(1.0)</td>
</tr>
<tr>
<td>McDonnell</td>
<td>1,060</td>
<td>66</td>
<td>101</td>
<td>386</td>
<td>155</td>
<td>213</td>
<td>352 351 22.8 26 42</td>
<td>44,285</td>
<td>58</td>
<td>19.71</td>
</tr>
<tr>
<td>Grumman</td>
<td>1,059</td>
<td>67</td>
<td>123</td>
<td>286</td>
<td>210</td>
<td>226</td>
<td>435 444 24.3 16 143</td>
<td>34,500</td>
<td>88</td>
<td>13.12</td>
</tr>
<tr>
<td>Douglas</td>
<td>1,048</td>
<td>73</td>
<td>75</td>
<td>850</td>
<td>78</td>
<td>124</td>
<td>440 401 20.4 48 3</td>
<td>80,200</td>
<td>26</td>
<td>13.12</td>
</tr>
<tr>
<td>($27.5 million loss - 1966)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martin Marietta</td>
<td>670</td>
<td>120</td>
<td>53</td>
<td>487</td>
<td>126</td>
<td>88</td>
<td>255 299 12.4 270 204</td>
<td>32,000</td>
<td>92</td>
<td>3.43</td>
</tr>
<tr>
<td>Northrop</td>
<td>357</td>
<td>223</td>
<td>162</td>
<td>200</td>
<td>289</td>
<td>249</td>
<td>419 305 12.1 285 421</td>
<td>19,000</td>
<td>165</td>
<td>4.26</td>
</tr>
</tbody>
</table>

Note: Rank numbers are the rank order of sequence from the largest to the smallest and relate to the total of the 500 largest U.S. corporations listed in Fortune Magazine for the respective years indicated.

Source: Directory of the 500 Largest U.S. Industrial Corporations

Elements of Lockheed Aircraft Corporation's Marketing Program

One of the most profound changes of the aerospace history has been described as the technological boom and the increased complexity of aerospace products. Lockheed has reacted to this change through diversification and decentralization. As mentioned earlier, the current Lockheed Aircraft Corporation had a modest beginning on a small plot of land in Burbank, California building the original wooden Electra—and fortunate to have even that work in progress. Today, the Lockheed Aircraft Corporation is made up of a corporate organization, six operating divisions, three domestic subsidiaries, six foreign subsidiaries, and twenty-two outside offices scattered throughout the world.¹ Figure 4 provides a simple organization chart of the main groupings and their products.

Corporate growth and diversification paralleled the technological pattern of the industry: Lockheed Missiles and Space Company organized in 1954; Lockheed Electronics Company organized in 1959 and expanded by acquisition that same year; Lockheed Propulsion Company acquired in 1961; and, Lockheed Shipbuilding and Construction Company acquired in 1959. Although these Lockheed organizations are predominately active in the product area suggested by the name, it should be realized that many variations and lesser byproducts are under research within the various companies. Figure 4 partially illustrates the degree to which Lockheed is diversifying beyond its primary lines of aircraft, mis-

¹A complete listing of Lockheed Aircraft Corporation organizations and offices is not pertinent to the discussion but may be of interest (see infra, Appendix A).
Fig. 4.—Lockheed Aircraft Corporation and Principal Products
siles, space vehicles, electronics, and shipbuilding. All of this grew from the single product Electra transport of 1932.

To speak of Lockheed's "Corporate Marketing Program" may be misleading inasmuch as the small corporate body does not sell any goods or services. In the context intended here, it may be more accurate to think of the corporate marketing program as the "organizational foundation", the "corporate overview", or even the "grass roots philosophy of objectives". Whatever the terminology, the Lockheed Aircraft Corporation's marketing plan encompasses the broad spectrum of dovetailing the goods and services of all operating divisions and subsidiaries. To make an overly simplified illustration, consider the following: (1) manufacture and sell aircraft, ground support equipment, and spare parts to a customer (Lockheed California Company and Lockheed Georgia Company); (2) operate and manage airports used by the customer (Lockheed Air Terminal); and (3) overhaul, repair, and modify the customer's aircraft (Lockheed Aircraft Service Company).

With this corporate wide capability to provide virtually all the major needs of the customer that owns and operates the aircraft, it is possible to offer a "package deal" to the aircraft user. In the case of domestic commercial airlines and military agencies, there is little likelihood of such an all encompassing "package deal" contract because of the abundance of competition and resources in each of these areas.

On the other hand, Lockheed management has long believed in the social and business merits of developing underdeveloped countries. Through Lockheed Aircraft International, Incorporated, licensing programs can be arranged to implement this "package deal" concept wherein Lockheed's experience and know-how are transplanted into the under-
developed country. Lockheed benefits directly from its licensing pro-
gram and indirectly by nurturing potential customers for Lockheed
goods and services. This concept may sound somewhat altruistic and it
admittedly has never been totally and successfully accomplished.
Nonetheless, this philosophy of a gross corporate marketing program
does offer large challenges and potential benefit.

In actual practice, portions and certain combinations of the
corporate marketing program have been highly successful. The oper­
ating divisions persist with greater and lesser degrees of success--
each with their own product line and respective customers. The
foreign sales program made it possible for Japan, Italy, Germany,
Canada and other countries to manufacture, maintain and operate the
Lockheed F-104 Starfighter. A company in Japan is building a Lockheed
designed monorail. A utility type airplane effort spurted and flopped
in Mexico. Negotiations in South America, India and other areas are
persistently underway to find reasonable opportunities to further imple­
ment the corporate marketing plan.

Yet another side of the corporate marketing plan affects the
missiles and space activities. Here again, there is a meaningful
dovetailing of product lines. Lockheed Propulsion Company is gaining
stature in the rocket motor business and has the capability to design
and produce the large and powerful propulsion systems required to hurl
missiles thousands of miles or propel space vehicles into orbit.
Lockheed Missiles and Space Company designs and builds the Polaris and
Poseidon submarine launched missiles and the Agena spacecraft—all of
which need high propulsion to make their mission successful. Vital to
aircraft, missiles, and space vehicles are avionics equipment similar
to those of the Lockheed Electronics Company.

The preceding discussion carries a strong implication that the Lockheed corporate marketing program and organizational structure is laterally integrated so that the products of one division are used by another division—something akin to the practice of the automobile industry. The inference was intentional to point up the potential of the corporate overview. In actual practice, however, there is only a modest degree of interdivisional activity when compared with overall sales volume. As the more recently founded divisions become mature and established in their product lines, it may well be that the interdivisional purchase and sale of Lockheed products among Lockheed organization will increase considerably.

One might properly ask about the role of the marketeer in the corporate function. These "home based" marketeers are primarily staff oriented inasmuch as the corporation itself does not actively produce a product or customer service. The corporate marketeers, however, are vitally concerned and active in the interest of all the Lockheed operating divisions. Research and analysis of government spending habits and long range plans are constantly evaluated to keep corporate top management and marketing people in the affected operating division properly advised of events and trends. Additionally, the corporation maintains offices and representatives in key locations throughout the United States and the free world. These corporate representatives are the eyes and ears that live and operate as close as possible to the decision making center of the customer. They are available to further the interest of any of the Lockheed products or services and work in close harmony with the marketeers of the producing divisions.
The corporation maintains a policy of near autonomy for the divisions and subsidiaries which also applies to the marketing function. For this reason there is little control or direction from the corporate marketeers downward to the division marketeer. Although there is much interaction between operating division marketeers and corporate field representatives, the latter are acting as agents of the former and do not have an official voice in the decision making role.

The preceding discussion is not intended as a detailed description of all functions and responsibilities of Lockheed marketeers at the corporate level. On the contrary, it is merely to highlight their primary purposes of: (1) guiding the corporate-wide product line; (2) assisting the operating divisions in seeking and winning new business; and, (3) providing timely and credible marketing analyses and intelligence to appropriate strategy and decision makers.
Elements Of Lockheed-California

Company's Marketing Program

Whereas the previous section discussed marketing policy and practice on the corporate level, this section attempts to focus on the marketing program of the Lockheed-California Company (L-CC)—one of the three largest operating divisions of the corporation. By way of general orientation, L-CC can be described as the "old timer" of the corporation inasmuch as it occupies the same site of the original Lockheed Aircraft Corporation of 1932, its main products are still primarily airframes of flying machines, and many of the other Lockheed divisions were started as "spin-offs" of L-CC.

Corporate Coordination

As mentioned in the discussion regarding the corporate marketing program, the coordination between L-CC and corporate marketeers is greatest at the field representative level. Through a nationwide leased telephone and telegraph network, Lockheed marketeers are readily and frequently receiving and passing vital information regarding customer reactions, plans, and decisions. The pace of this communication loop makes "backyard gossip" tame by comparison.

Another more formal coordination activity between corporate and division marketeers is the "bid-pipe" activity. This is a vast communication procedure aimed at making certain all new business opportunities are channeled to the Lockheed organization best equipped to pursue the upcoming program. Through many outside offices and the many marketeers visiting government agencies, opportunities for new business are made known to the Lockheed representatives—some through
diligent sleuthing and others quite by accident. A conscientious markeeter never lets a reasonable chance slip by so he puts his information into the "bid-pipe" which is quickly telegraphed to all possibly interested Lockheed organizations. That group with the interest and ability responds in the affirmative that the bid opportunity will be pursued. In the event of unresolved dispute as to which of several interested Lockheed organizations is best capable, corporate marketing personnel coordinate the corporate decision as to which organization will make the proposal. These situations are infrequent but when they do occur, the decision is usually based on whose product line is most closely related to the new program in question.

Planning

Market planning is the most important management function in the marketing activity of the Lockheed-California Company. Years ago, market planning was much simpler than in today's environment because there were fewer variables. The product line was limited to one or two types of airplanes, the application of these products and potential customers were limited, and resources—especially money and engineering talent—made many alternate plans for broader or diversified product lines impractical. The past two decades have changed all that by introducing many variables that make market planning infinitely more complex and critical.

The market plan at L-CC starts with recognition of established lines of business and objectives to obtain additional business. At the time of this writing, the six established business lines are: (1) anti-submarine warfare (ASW) aircraft; (2) fighter/bomber aircraft;
(3) military rotary wing aircraft; (4) hypersonic vehicles and spacecraft; (5) subcontracting manufacturing capability; and (6) special products. The objective of obtaining additional business is dominated by plans to reestablish L-CC in the commercial aircraft line of business. Significant time, talent, and money was spent toward that end in the recent supersonic transport competition that Lockheed lost to the Boeing Company. Nonetheless, the company persists toward that commercial goal and is now working on a jumbo subsonic jet along with a rotary wing airbus for shorthaul passenger service.

The long range planning technique in L-CC's marketing program recognizes and accommodates company business objectives, customer needs, management desires, skills and facilities, profits, product areas, and research and development programs. Each of these factors are considered and reconciled in planning the company's long range course of marketing activity. The basic ingredients of the company's long range plan are used in making this analysis and reconciliation. These ingredients are briefly described below:

**Technical strategy plan**

Assessment of company's strengths and weaknesses in technology. Areas of technology needing improvement. Areas of technology that provide a competitive advantage. Specific roadmap of research and development leading toward a major hardware program.

**Marketing strategy plan**

Identifies the most likely potential customers for various products. Plan for appropriate and adequate customer coverage by marketing representatives to determine needs and preferences. Makeup of marketing team. Time table of key events upon which to schedule
activities.

**Manufacturing strategy plan**

Assessment of company's strengths and weaknesses in manufacturing. Program of facility expansion and improvement. Program to obtain manufacturing capability vital to future program but nonexistent as yet.

**Quality and reliability strategy plan**

Program to improve product quality and reliability through design to the maximum extent within the economics of time and money. Program to improve product quality through workmanship and processing techniques.

**Market assessment**

Objective analysis and evaluation of the market potential for the company's lines of established and desired business. Prediction of life spans for existing products and time frames for future products.

**Overall business plan**

Desired proportionate split of sales dollars by products. Plan to capture a realistic portion of the total market for each active product. Program to keep compatible with efforts of other corporate divisions and subsidiaries.

**Technology tree**

The Lockheed-California Company has devised a significant tool which is integral to the long range planning ingredients described above. This associated planning discipline is labeled the "technology tree", a sample of which is shown in Figure 5. A technology tree is created for those select upcoming programs earmarked for maximum
proposal effort. Most major programs are identified and known about sufficiently in advance to make a technology tree worthwhile. As the makeup and use of the technology tree is explained, it will be obvious that this tool is only practical on large scale programs that are several years in the conceptual process.

The technology tree is compiled by knowledgeable marketing and engineering management personnel to graphically depict all the technical fragments associated with a major system. The first determination is to make a breakdown of those basic systems that make up the total system. In the Figure 5 example, this first level of breakdown includes Advanced Reentry and Precision Recovery System, Hypersonic Vehicle Technology System, and Advanced Ballistic Reentry System shown at the far left of the technology tree.

The next order of business is to identify technological problem areas within each system that should be solved. Also worthy of inclusion are those technological capabilities essential to managing the overall program. Given this visibility, it is then possible to determine those areas in which the company has outstanding, mediocre or inadequate competency. Through careful planning and balancing, the company pursues research contracts to apply their established competency toward solving the customer's technical problems. On the other hand, company funded independent research and development programs are undertaken to improve technical or manufacturing competency in weak areas. In this fashion, customer funds are used to help solve customer problem areas and company funds are used to improve Lockheed's all-around capability to manage the total program.

Additional benefits can be obtained through proper use of the
technology tree. By objective and honest assessment, the company can determine their facilities and manpower deficiencies by careful analysis of the kinds of technology that will be significant in the upcoming program. Such information is essential in preparing and updating those plans described above as ingredients to long range planning.

A further significant use of the technology tree centers around the eternal problem of keeping track of the competition. By watching notices of contract awards and annotating the technology tree as to which companies are receiving contracts relating to the identified technological areas, the serious contenders for the program soon become apparent along with their strong technical competencies. This tracking process can reveal which companies are doing the most business with the customer in any particular area, and conversely, it can show which Department of Defense procurement agency is doing the most work in particular technical areas.

As can be determined from the preceding discussion of the "technology tree" approach to gaining new business, Lockheed-California Company marketing efforts are not exclusively hardware oriented. There is considerable preparatory effort required to adequately undertake a major proposal effort to compete for a large weapon or space system. For this reason, much of Lockheed's marketing effort is aimed at research or study programs that strengthen competence in one or more of the building blocks in the "technology tree".

Marketing assessment and strategy plan

Once a potential program or research effort survives the test of compatibility with the long range planning elements and is within the established or desired business lines, marketeers prepare a
marketing assessment and strategy plan (MASP). The MASP is customized toward winning that particular marketing target and is made up of three elements briefly described below:

**Mission requirements**

This analysis determines the purpose of the product and the requirements it must meet. This sounds like a rather perfunctory task, but to accomplish it in the breadth and detail necessary to ensure meaningful plans takes weeks and sometimes months of dedicated determined effort devoted to interviewing customer personnel to screen out consistent information and sift valid from invalid data.

**Program assessment**

This is an honest and candid appraisal of the program to assess its chances of survival and possibility of progressing to the point of making it worthwhile to pursue. Things to consider include:

1. Are the mission requirements realistic and vitally important?
2. Is there a committed and clearcut sponsor dedicated to the success of the program such as the Army, Navy or Air Force or is there conflict or indecision as to which service should take the development lead?
3. Is the program a replacement for an ongoing successful program or an inferior program?
4. Is the program a significant advance in the state-of-the-art thereby establishing a new capability?
5. Does the program have stretch and long life potential?
6. Does the program contribute to commercial or other military derivatives?
7. What existing or potential alternate programs compete with satisfying like or similar mission requirements of the program?

**Program strategy**

This is made up of three factors consisting of the customer's
strategy, estimated program data, and company strategy. Each of these are briefly described below:

1. Customer strategy considers the fact that the procuring agency has many problems to overcome in obtaining program approval. There is always an abundance of programs pursuing a limited amount of dollars, hence persistent competition among programs seeking go-ahead. The procuring agency (customer of the prime contractor) must strategize as to the most favorable time to process his request for approval to proceed to the next phase of the procurement process. It is essential that the prime contractor's marketing team be fully aware of the customer's strategy and timing so they can work together toward their mutual objective of moving the program forward.

2. Estimated program data is essential to program strategy. This is part of the intelligence gathering activity and it relates to determining the kind of data the customer will require through the process of getting the program launched. This program data includes: financial data to help plan total program costs and annual fiscal year funding requirements; technical data to show the reasonableness of accomplishing program objectives; and schedule data to show that accomplishment is possible in the desired time frame. Potential prime contractors are constantly pressured to provide such data and information to assist the customer in moving the program forward.
3. Company strategy relating to a particular program includes the following ingredients:

a. Company objectives are aimed at furtherance of products to be marketed via the instant MASP. In this regard, program plans must provide for compatibility with the ingredients of the company's long range plans previously described, i.e. profitability, skills and abilities, research and development programs, management desires, customer needs, etcetera.

b. There must be a determination of key factors influencing program success. Some of these factors have already been considered in analyzing mission requirements and program assessment. In developing company strategy, all these factors should be identified and listed for particular attention.

c. Of the key factors listed in b. above, certain ones are directly influenced by company action. Such factors would include technical design approach, pricing, schedule performance, program organization, availability of adequate facilities and manpower, etcetera. These factors of the internal environment must receive adequate management attention to structure them toward a winning proposal.

d. Another ingredient of the company strategy is to determine factors of the external environment that will affect the program outcome and identify those
that are subject to influence by company marketing efforts. Such factors would include requirements of the Request for Proposal, knowledgeableness and preference of key customer decision makers, and program timing.

e. Having identified the factors of the internal and external environment that are subject to influence, by the company, the next logical step is to develop a plan to apply the appropriate influence.

f. The final ingredient of the company strategy is to conduct a continuous review and updating of the detailed plans and overall strategy.

Organization

The Lockheed-California Company's Marketing organization is depicted in Figure 6. Rather than laboriously describe each segment, it is the intent of this discussion to make some basic observations regarding the overall marketing organization and identify elements of the organization which accomplish the marketing activities described in Chapter IV.

Basic Observations

1. The total marketing function is divided between two directors each reporting to the president. At this writing, the commercial air transports marketing organization is small inasmuch as the company is just beginning a rejuvenated effort to sell commercial transports after many years of being without a product. As mentioned earlier, there was
Fig. 6 -- Lockheed-California Company Marketing Organization
good reason to believe that Lockheed's loss of the supersonic transport competition was partly attributed to a lack of familiarity with the current operating practices of the commercial airlines. To preclude reoccurrence of that deficiency, the commercial air transport marketing organization was created and is further augmented by virtually the full time participation of the company's president in the role of marketeer. As a result, a totally new position of executive vice president has been established to act in behalf of the president on all military business of the company. This action is considered extreme in today's environment and it is reminiscent of the practice twenty years ago whereby presidents and other top level executives did practically all the selling.

2. The departments under the four directors of sales of government programs are the most flexible inasmuch as customer and/or product emphasis is highly dynamic. Evidence of this is the inconsistency between sales departments within each of the four basic product lines. As an example, rotary wing sales separate US Government sales from commercial and export sales. This is a rather simple and logical division of sales effort made possible because the company's penetration of rotary wing aircraft market is still very modest inasmuch as this product line is still in the process of development. Another example lies in the breakdown of the Patrol Aircraft sales organization. Patrol Aircraft for Anti-Submarine Warfare (ASW) is an old and
established product line for the Lockheed-California Company, hence the sales departments are more specialized than in the neophyte rotary wing effort. Whereas the rotary wing marketeers are attempting to establish customers, the patrol aircraft marketeers are trying to retain their customer through P-3 derivatives, special programs and VSX (a new ASW model still in the concept formulation stage). The point of emphasis here is that sales departments within each of the basic product lines do change with internal emphasis and the external environment. These groups originate, disband, expand or contract in accordance with the success or failure of the company's marketing plans.

3. In contrast to the sales departments, the groups under the Director of Marketing Administration are fairly stable in basic functional activities. The dynamic nature of these departments is from within and caused by the shifting emphasis on products and/or customers depending on the placement of the major sales efforts. An illustration is the Market Engineering and Research Department which has existed for many years, remains fairly stable in personnel, and continues to do pretty much the same basic type of work. The nature of the assignments, the techniques employed, and the projects receiving attention, however, are constantly changing depending on which customer or product is getting the marketing attention.
4. The product support portion of the marketing organization is concerned with the broad field of logistics which was briefly discussed at the end of Chapter IV. The assignment of the logistics activities as part of the marketing organization of the Lockheed-California Company may be considered somewhat unique in the aerospace industry. It is part of the marketing activity because it is a vital part of achieving total customer satisfaction. Not only is the product support organization responsible for the sales and administration of these goods and services but it is also responsible for the accomplishment of some of these requirements. For example, technical publications, field service representatives, and training are performed by personnel and departments within the marketing organization. The design and manufacture of ground support equipment, training aids, and spare parts are accomplished by the functional organizations of engineering and manufacturing.

The product support organization is structured primarily on a customer basis dividing its departments among Army, Navy and Air Force contracts. Historically, this practice has been synonymous with a product line segregation inasmuch as Lockheed-California Company's products have been specialized systems peculiar to the particular military service making the procurement. In a few infrequent past instances where more than one service buys a basic aircraft model, organization by customer has prevailed.
Marketing activities accomplished

Using the fundamental marketing activities described in Chapter IV, following is a brief assessment of the Lockheed-California Company marketing groups responsible for accomplishment of these activities:

1. Market intelligence is gathered and processed by all sales departments under the four directors of sales, the Bid and Proposal Coordination Department, and the corporate marketing organization.

2. Planning is done primarily by the two marketing directors, the four directors of sales, and the Director of Marketing Administration. Department managers of the sales groups, and the staff of the Market Engineering and Research Department and Sales Control Department do much of the detail work to provide basic information from which the plans are formulated.

3. Bid and proposal coordination is accomplished by the department of the same name for all new business. The respective contracts department performs this coordination for all business that is additive to existing contracts. The basic decisions and actual preparation of the proposal are accomplished through the combined efforts of virtually every functional group in the company, i.e. manufacturing, engineering, finance, quality assurance, marketing (all aspects), flying operations, legal, industrial relations, master scheduling, materiel, and program management (representing the affected vice president).
4. Customer relations are arranged and coordinated by the staff group assigned to the director of marketing. Actual briefing, hosting, and entertainment of customers, potential customers, and dignitaries is done by top management and sales personnel assisted by particular specialists of the marketing team. (The make up of the marketing team will be discussed in the next section of this chapter).

5. Advertising and promotion is accomplished by the Sales Promotion Department. They are assisted by nonmarketing groups such as Public Relations and the Motion Picture section of the Photographic Department. Outside consultation services and an independent advertising agency are used extensively.

6. Contracting is accomplished by the respective contracts department. The Government Contracts Department is organized on a product line basis with separate groups for rotary wing, patrol aircraft, fighters, advanced design (research and development) and industry sales. Because of peculiarities, the contracting function for intercompany business is within the purview of the Intercompany and Industry Sales Department.

7. All the activities related to logistics are within the responsibility of the Director of Product Support. To better appreciate the magnitude of coverage and emphasis given to this important aspect of the aerospace industry, Figure 7 is provided to show the departmental breakdown of the total product support activity.
Fig. 7.--Product Support Organization
Staffing

The ideal aerospace marketeer has been described as an individual that has: a broad technical background; engineering experience; project management experience; project followon marketing experience; and, experience in supervising new marketing projects. Because of the renewed emphasis on the marketing concept throughout the aerospace industry, such individuals are difficult to find and time consuming to develop. As a result, the Lockheed-California Company compensates for this lack of "ideal marketeers" by using the marketing team approach for precontract selling efforts. Very simply stated, this approach consolidates marketeers, engineers, and program managers into a close working team to perform the selling effort. Virtually all marketing representatives (salesmen) have a solid technical background either from formal education or practical experience. Many are ex-military pilots or engineers turned marketeers and a few have come up through the ranks of various functional organizations. The marketeer's primary role is to determine customer requirements, convey these requirements to other team members, and coordinate the activities of the marketing team.

In selling complex aerospace systems there is repeated need to make program planning and technical presentations to many layers of customer hierarchy. For such activities, the marketeer's effort is augmented by engineer and program manager personnel to provide a well rounded coverage that can properly convey company competency and

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professionally discuss customer questions and problems. As the marketing effort progresses from the initial selling job to the proposal stage, a bid and proposal coordinator joins the marketing team in preparation for submittal of the formal proposal. As the program advances to the source selection and contract negotiation stages, other specialists such as schedulers, price estimators and contract administrators participate as marketing team members. To avoid a false impression, it should be pointed out that members of the marketing team participate in preparation of necessary "homework" from the very beginning of the marketing effort and are called into action with the customer as progress demands. Additionally, marketing team representatives are heavily supported by appropriate in-plant specialists that never confront the customer.

Although this discussion is primarily devoted to staffing the marketing team, one final observation concerning the marketeer per se is worthy of note. The typical Lockheed-California Company marketeer is a serious minded, conscientious, and technically competent person. He projects personal integrity and seeks the confidence of the customer. The verbose, back slapping, joke telling, glad-hander type is seldom, if ever, employed as a marketing representative.

Implementation And Control

Responsibility for control of manpower budgets, expense accounts, travel budgets, entertainment allowances, advertising expenses, promotional material, etcetera is the responsibility of line
supervision in the Lockheed marketing organization. Performance is tracked and reported by the Sales Control Department and control is direct via supervision. Mention of these operating details is made here only in passing to the primary issue of implementing and controlling marketing programs.

Implementation of marketing programs is the responsibility of the sales directors. Assignment of a marketeer in charge of implementing any given marketing program depends on the magnitude of the effort, the number of marketing programs concurrently underway, and the stage of development of active programs. On a major program, the sales director will likely take the primary active role and participate full time toward achieving the marketing program. On secondary programs, the sales manager might well be assigned the lead marketing role and on smaller programs, the marketing representative could be delegated this responsibility. Regardless of who takes the lead or the size of the program, there is no magic about implementing the marketing effort. It takes sheer vigor and leadership to organize the marketing team and motivate them to accomplishment.

With a rather vast marketing organization and many programs in various stages of marketing emphasis, visibility of progress is vitally important so that appropriate control measures can be exercised as needed. This progress visibility is accomplished primarily through periodic reports and review meetings. Outlined below are some of the more formal tools used toward controlling the total marketing program:

**Marketing objectives**

Each of the year's marketing objectives is assigned to an appropriate sales director. A monthly report is required to indicate
the status of each objective and an evaluation of accomplishment to indicate if it is progressing as planned, not progressing, accomplished, or reasons why accomplishment not expected. A listing of the 1963 marketing objectives is shown in Figure 8.

Sales forecast

At the beginning and middle of each year, the sales directors supply their forecast of sales for the ensuing twelve months. These forecasts are structured in the format shown in Figure 9. For obvious reasons, the content shown is fictitious.

Monthly status

Each sales director submits a monthly status report of the marketing programs under his product line. This report identifies the project, presents a brief statement of its status, identifies the next key date for decision or action, lists the key marketing team members by name, and identifies the competition by company and product.

Sales sign-up, summary tracking report

This report is a summarization of all marketing sign-ups. It is issued each month to show actual sales to date compared with budget (quota) for the year to date and the budget for the total year. Figure 10 is a reasonable facsimile of this report but with fictitious contents. Accompanying this summary report is a series of breakdown sheets which show essentially the same information but expanded to itemize sales sign-up, actual and budgeted, by month for the entire calendar year.

Sales sign-up, monthly review

Each month, the Director of Marketing makes a presentation to
THE 1963 CALAC MARKETING OBJECTIVES

★ Attain Sign-ups of $444 million, including at least $11 million in Research Contracts and $32 million in Development, Test and Evaluation Contracts.

★ Obtain a new major Space Project.*

★ Obtain a new major Airplane Project.*

★ Sell a version of the F-104 for Air Force use.*

★ Sell a substantial Helicopter Experimental Development Contract to the U.S. Government.

★ Obtain a major Aerospace Subcontract.*

★ Extend the life of the F-104 and P-3A through Design Improvements, New Versions, New Missions, and New Customers.

★ Endeavor to sell to other customers a Contract Service for Customer Inventory Support Management similar to that sold for the P-3A.

★ Endeavor to sell Management and Technical Service Contracts for the F-104 Consortium which will help insure a successful overall program.

★ Make maximum use of Cost Effectiveness Evaluations in selling CALAC products.

★ Adopt a standard practice of developing Sales Strategy and Sales Plans for every project or program.

★ Achieve, for all CALAC functions and organizations, a maximum level of preparedness for Major Proposals to customers, including policy and system innovations where appropriate.

★ Complete the definition of specific plans for Market Engineering Department efforts for full Market Research Coverage in CALAC product areas and for full operation of a Marketing Branch Intelligence Center. Plans are to be in a form susceptible to feasibility evaluation and milestone tracking.

★ Establish and maintain close coordination between CALAC Organizations whose activities contribute directly to the Long Range Planning Function via Market Analyses, Sales Planning, Intelligence, Sign-up Forecasting and Competitor Analyses.

★ Complete the implementation of Electronic Data Processing for Customer Supply Order Control and Management Reporting on all major contracts.

★ Place added emphasis on the sale of Servicing Kits for Out-of-Production Models, and improve marketing competence in the sale of Ground Support Equipment.

★ Improve Marketing’s capability to recommend allocation of Independent Research and Development Funds on the basis of optimum return on investment.

★ Endeavor to improve performance in all matters affecting Customer Relations.

*Apply maximum effort within company charter and budget limitations without sacrificing the independent R&D activities necessary for subsequent competitions.
## SALES FORECAST THROUGH DECEMBER 1967

*(Fictitious Content)*

Sales Director:

Approved:

Date:

<table>
<thead>
<tr>
<th>No.</th>
<th>Customer</th>
<th>Program</th>
<th>Number Competing</th>
<th>No. of Winners</th>
<th>Number Competing</th>
<th>Go</th>
<th>Win</th>
<th>Amt. (000)</th>
<th>Mo.</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>1</td>
<td>USN</td>
<td>ABC</td>
<td>10</td>
<td>3</td>
<td>--</td>
<td>190</td>
<td>50</td>
<td>90,000</td>
<td>Nov.</td>
<td>RFP issued</td>
</tr>
<tr>
<td>2</td>
<td>USA</td>
<td>DEF</td>
<td>6-9</td>
<td>2</td>
<td>--</td>
<td>50</td>
<td>70</td>
<td>25,000</td>
<td>Nov.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>USA</td>
<td>GHI</td>
<td>--</td>
<td>--</td>
<td>5</td>
<td>100</td>
<td>60</td>
<td>8,000</td>
<td>Jul.</td>
<td>DOD approved, no Contract Definition required</td>
</tr>
<tr>
<td>4</td>
<td>USAF</td>
<td>XYZ</td>
<td>7-10</td>
<td>2-3</td>
<td>--</td>
<td>80</td>
<td>40</td>
<td>10,000</td>
<td>Oct.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>USN</td>
<td>RST (Prod.)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>100</td>
<td>100</td>
<td>99,000</td>
<td>Dec.</td>
<td>Option to buy prod. qty. expires in Dec.</td>
</tr>
<tr>
<td>6</td>
<td>USN</td>
<td>OPQ (Study)</td>
<td>--</td>
<td>--</td>
<td>8</td>
<td>40</td>
<td>80</td>
<td>100</td>
<td>Aug.</td>
<td></td>
</tr>
</tbody>
</table>

*Fig. 9.--Sample sales forecast report - monthly*
MARKETING SIGN-UP TRACKING SUMMARY
(Fictitious Content)

As of: (date)

Dollars in millions

<table>
<thead>
<tr>
<th>VP/Sales Dir.</th>
<th>Program</th>
<th>1967 Budget</th>
<th>Year to Date Budget</th>
<th>Actual</th>
</tr>
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<tr>
<td>White/Meyer</td>
<td>Fighter Model 123</td>
<td>4.7</td>
<td>4.7</td>
<td>2.5</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; &quot; &quot; Mods.</td>
<td>10.5</td>
<td>8.3</td>
<td>8.3</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; &quot; &quot; Tech. Assist</td>
<td>2.0</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; &quot; &quot; Misc.</td>
<td>-</td>
<td>-</td>
<td>.5</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; R and D new model</td>
<td>1.5</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>White/Robinson</td>
<td>Intercompany (Gelac)</td>
<td>25.0</td>
<td>20.0</td>
<td>22.0</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; (other)</td>
<td>10.0</td>
<td>8.0</td>
<td>7.0</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; Industry subcontracts</td>
<td>6.0</td>
<td>5.0</td>
<td>5.5</td>
</tr>
<tr>
<td>White/Wayman</td>
<td>Spares, kits, etc.</td>
<td>35.0</td>
<td>30.0</td>
<td>25.0</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; Field Service and Training</td>
<td>2.0</td>
<td>2.0</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>SUBTOTAL</td>
<td>96.7</td>
<td>81.0</td>
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<tr>
<td>Real/Hight</td>
<td>Model ABC - Development</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - Production</td>
<td>10.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - Changes</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - Spares and GSE</td>
<td>2.0</td>
<td>1.0</td>
<td>2.5</td>
</tr>
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<td>&quot; OPQ Study</td>
<td>3.0</td>
<td>3.0</td>
<td>-</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; Misc. R and D</td>
<td>5.0</td>
<td>3.0</td>
<td>2.0</td>
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<tr>
<td></td>
<td>SUBTOTAL</td>
<td>40.0</td>
<td>27.0</td>
<td>26.5</td>
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<tr>
<td>Wilder/Gannon</td>
<td>Model XYZ - FY 1967 Buy</td>
<td>80.0</td>
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<tr>
<td>&quot;</td>
<td>&quot; - FY 1968 Buy</td>
<td>60.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - Spares, kits, etc.</td>
<td>10.0</td>
<td>8.0</td>
<td>8.5</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; Misc. R and D (New Model TUV)</td>
<td>10.0</td>
<td>9.0</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>SUBTOTAL</td>
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<td>97.0</td>
<td>95.5</td>
</tr>
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<td>Wilder/Robinson</td>
<td>R and D - Physical Sciences</td>
<td>1.0</td>
<td>.8</td>
<td>.7</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - Hypersonics</td>
<td>2.0</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - Advanced Concepts</td>
<td>.3</td>
<td>.3</td>
<td>.5</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; - General Technology</td>
<td>3.0</td>
<td>1.8</td>
<td>3.2</td>
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<td></td>
<td>SUBTOTAL</td>
<td>6.3</td>
<td>4.4</td>
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</table>

TOTAL MARKETING SIGN-UP BUDGET 303.0 209.4 203.4

Fig.10.—Sample marketing sign-up report
the president and his staff to review the sales sign-up picture. Using the previously described sales sign-up tracking summary, accomplishments for last month and the year to date are presented as an indication of how sales are tracking to quota. The review then looks at the very near future and discusses sales targets for the current month, the next two months, and till the year end. Major programs are discussed to describe status, prospects, hazards, and strategies needed to win. Major variations from sign-up budgets must be identified and explained along with any expected deviations. Finally, the sign-up review describes the current marketing emphasis and discusses immediate prospects.

Semi-annual sales and sales expense forecasts

The midyear performance report reviews the past six months' actuals compared to budgets for sales sign-ups and selling expenses, and updates the forecast for the next six months. A similar recap is prepared for a year end performance report but treats the past twelve months and the forecast for the next twelve calendar months. The Year End Performance Report is accompanied by a supplement that forecasts sales and expenses for the subsequent ten year period and is detailed by major product categories.

Corporate review

The Corporate Marketing Vice President periodically issues a statement indicating major programs of the various divisions and subsidiaries to be reviewed by the Corporate President and his staff. These reviews are held as frequently as every other month and sometimes as infrequently as every six months. Although these corporate reviews cover all aspects of the total program--cost, technical performance,
and schedule status—they also require a thorough analysis and presentation of the marketing prospects for the short and long range picture.

The reports and reviews described above are helpful tools to obtain perspective and critique from knowledgeable management. It is quite common to generate discussion and evaluation that leads to revision of the existing marketing program for any particular program. On the other hand, the individual marketeer and marketing team members assigned to a given program are constantly making their independent assessment of the effectiveness and need for marketing program redirection. In this manner, first hand control is continually being applied on a day to day basis. Such control is essential to a successful marketing program in the highly dynamic aerospace industry.
This chapter has glanced at the marketing program of the Lockheed Corporation and discussed ingredients of Lockheed-California Company's marketing program. Having moved from the corporate marketing overview to marketing activities of a major operating division, it is now appropriate to describe activities associated with the marketing plan to pursue and win a particular competition. The program to be discussed is particularly interesting inasmuch as it involves a new product line sold to a new customer. The program is the Advanced Aerial Fire Support System (AAFSS) and the customer is the United States Army.

Background

The account begins with a technological breakthrough in the mid-1950's wherein Lockheed engineers reexamined a theory of vertical lift aerodynamics abandoned many years ago by an inventor named Juan de la Cierva. Through a company funded research program, the rigid rotor concept for a vertical take-off and landing aircraft was developed and proven practical. Experimentation confirmed original hopes that the rigid rotor concept offered many advantages over conventional helicopter rotor systems--primarily inherent stability in flight through gyroscopic action and lower operating costs due to fewer moving parts. Lockheed funded research continued while some twenty key patents were processed and reduced to practice. By this time the company had gained experience, confidence, and protection to actively market the rigid rotor concept.

After an initial contract to build and test two research rigid
rotor helicopters (co-sponsored by the Army and Navy), it was clearly evident that the Army was the most promising customer for the foreseeable future. Between 1959 and 1963, Lockheed worked closely with the Army's Fort Eustis research and test agency in Virginia. Many small contracts were conducted for additional studies or expanded test and modifications using the two research vehicles. These contracts served three purposes; (1) they helped Lockheed become better acquainted with the customer's technical preferences; (2) they helped earn Army confidence in the revolutionary rigid rotor concept; and (3) they contributed to the Army's concept formulation effort which was required prior to full scale development of a new weapon system. Through these Lockheed research programs, those of several other helicopter company's, and in-house government studies, the Army decided they were prepared to move forward with the Contract Definition Phase of the Advanced Aerial Fire Support System (AAFSS) development program. The then Secretary of the Army, Cyrus Vance, challenged Army Aviation in 1963 to lift their sights and launch a program to develop a totally new weapon system expressly tailored to the Army's needs. In June of 1964, Lockheed marketeers confirmed that DOD had approved release of a Request for Proposal (RFP) for a contract definition study which had been in process of preparation almost a year since Secretary Vance had issued his motivating challenge. Soon after this, a draft version of the AAFSS RFP was issued to industry for advance review and industry comment. On August 1, 1964, the official RFP was mailed to

1Remarks made by Finn Larsen, Ph.D., Deputy Director Defense Research and Engineering as Principal Speaker at first flight of AAFSS, Van Nuys, California, Dec. 12, 1967.
approximately 110 firms and the AAFSS competition was formally under-
way.

AAFSS Marketing Program

The Army had made a major decision to proceed with their AAFSS
program. Since the inception of the United States Air Force in 1947,
Army aviation had been limited to reconnaissance, rescue, and mobil-
ity of resources. None of their existing aircraft could be considered
advanced weapons containing avionics, fire control, and armament inte-
grated into one total weapon system. Because of its mission require-
ments, the AAFSS was defined as being a vertical take off and landing
(VTOL) type vehicle. Because of its advanced nature and the state of
international war pressures, the AAFSS program was touted as poten-
tially being one of the largest procurements of VTOL aircraft. Under
these circumstances, the leading manufacturers in the VTOL segment of
the aerospace industry were expectantly preparing for a maximum effort
to win this AAFSS competition—considered by industry as the rotary
wing plum of the decade.

The Lockheed AAFSS marketing team was well aware of the compe-
titive environment in which they would be operating. They recognized
that they were entering the race with several important disadvantages:
(1) Lockheed had never manufactured a rotary wing aircraft on a pro-
duction scale; (2) the Lockheed rigid rotor concept had been success-
ful in research models but many government and industry experts were
not yet convinced of its technical capability; (3) Sikorsky, Bell,
Vertol, Kaman, and Hughes were established Army VTOL aircraft sup-
pliers and their reported position was an informal coalition to prevent
a newcomer--Lockheed--from joining their ranks. The Lockheed marketing team considered these to be major obstacles and adopted the philosophy that they must win the contract definition study contract at almost any cost. To fail at this first step would mean a loss of eight years of preparatory effort and elimination from the race for the development and production programs.

To make this a winning effort, the Lockheed Marketeers formalized the following AAFSS marketing program:

To bid or not to bid

The pros and cons of entering the AAFSS competition were identified and evaluated. An objective assessment of some typical basic considerations listed below resulted in a decision to proceed.

- A win brings penetration of the Army aviation market.
- A win develops a basic rotor system with many alternate applications (i.e. derivatives).
- A win establishes Lockheed in the rotorcraft community.
- A win establishes a long term production program.
- A win establishes the rigid rotor concept as acceptable in the helicopter industry.
- Profit potential versus profit hazard seems favorable.
- High bid cost justified by high award probability.
- Specialized technical capability is available.
- Manpower and dollar resources are available.
- Time is sufficient.
- Does not conflict with other programs.
- Contemplated design can meet all requirements.
- Are competitive with major competitors.
Identify periods of marketing effort

A simple table depicts the time frame and phases of the total marketing program:

<table>
<thead>
<tr>
<th>Competition For</th>
<th>Expected Time Frame</th>
<th>No. of Competitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Definition Phase (study)</td>
<td>Aug-Nov 1964</td>
<td>10-15</td>
</tr>
<tr>
<td>Engineering Development (hardware)</td>
<td>Jan-June 1965</td>
<td>2-3</td>
</tr>
<tr>
<td>Production (hardware)</td>
<td>Nov 1966-1972</td>
<td>unknown *</td>
</tr>
</tbody>
</table>

*DOD approval to enter and stay in production dependent on achievements of many competitors, alternate and improved weapon systems, international war pressures, etcetera.

Determine key requirements of the marketing plan

- Assist the Army in justifying the program by proving the AAFSS can accomplish the mission requirements at a reasonable cost and be operational in a reasonable time
- Convince the Army that Lockheed's vehicle is the AAFSS by proving that a rigid rotor is best, Lockheed's Management is best and Lockheed's experience is best
- Enhance Lockheed's position with the Army by meeting program schedules, produce an AAFSS that performs as promised, and support the military requirement for AAFSS
- Convince the US military that the AAFSS can be a multi-mission vehicle by emphasizing "commonality" and considering possible derivative requirements from the start of design

Determine criteria for selecting a winner

The marketing team identified the following criteria to receive the greatest emphasis in the proposal inasmuch as they are the most important in selecting a winner:
o Demonstrate understanding of requirements and ability to satisfy them
o Demonstrate ability to manage the program
o Demonstrate validity of technical approach
o Define interfaces and contractor responsibilities
o Identify high risk areas of program
o Offer realistic schedules for study and development programs
o Offer realistic and competitive cost estimates for study and development programs
o Offer reasonable cost and schedule estimates for the total program including production and maintenance
o Demonstrate continuity of technical and management personnel

Plan of attack
o Know Army AAFSS Management
o Know competition's weak and strong points
o Obtain continuity and control of Lockheed's team
o Promote customer visits to Lockheed
o Improve Lockheed's rotary wing posture

Participate in activities
o Identify when and where of key activities in each marketing phase
o Identify Lockheed participants for each event
o Track accomplishments
o Disseminate important findings

Maintain intelligence center
o Track who's where—brief before leaving and debrief after
return
  o Record where team members have visited to ensure full coverage
  o Develop dossiers on key Army personnel
  o Determine what competitors are doing and saying
  o Determine what customer is doing and saying
  o Keep abreast of Counter AAFSS activity by other military services
  o Record customer questions and obtain company answers/positions for prompt reply

Learning About The Customer

Although Lockheed had been working with the Army on various small scale programs, they were relatively unfamiliar with the Army's regulations and procurement practices on major programs. To make up this deficiency, a team of fifteen specialists pooled their experience in March and April of 1964 to review and digest Army regulations which would be imposed on the long awaited AAFSS competition. This group prepared a working manual that identified Lockheed organizations responsible for satisfying particular requirements and described the essentials of how these organizations meet these requirements. This pre RFP effort proved worthwhile inasmuch as it was homework vital to preparation of the upcoming AAFSS proposal and it was also a sound orientation to the requirements of a new customer. This early task force effort actually constituted the beginning of the Lockheed AAFSS marketing team. Although it provided a good understanding of the paperwork procedures associated with the RFP, team members were quite un-
familiar with Army technical requirements and operating procedures to be employed on the AAFSS. To bridge this gap, an additional "get acquainted with the customer" effort was programmed. It was identified in the marketing plan of attack as getting to know Army AAFSS management.

Marketeers quickly began identifying key Army personnel and organizations associated with the AAFSS procurement. Lockheed marketing team members were assigned responsibility to make personal visits with Army counterparts to better understand their requirements. Examples of this effort included: supervisors of engineering technical groups—avionics, armament, fire control, structure, etcetera traveled to Army commands to indulge in face to face discussions with Army specialists; contracts people visited Army procurement people; quality assurance people visited Army experts in quality control; logistics experts traveled around the country and Vietnam to see how the Army supports and services helicopters and train personnel. This amounted to a full scale campaign to build customer rapport by showing an active and intense interest in seeking ways to provide a product or service to better satisfy Army needs and avoid many traditional problems. This was not merely an overt display for the sake of customer relations. It was a genuine attempt to truly understand and appreciate the customer's requirement and preferences. To obtain full benefit of this "get acquainted" effort, the marketing intelligence center was established. This activity maintained daily account of the comings and goings of team members. Key customer contacts were monitored to ensure that adequate personal contact had been made and no customer group overlooked. Through daily morning meetings and distri-
bution of trip reports, all team members were apprised of major find-
ings. It should be pointed out that this was a planned, systematic, and monitored effort coordinated by the marketeers. It was considered essential inasmuch as the Army had not employed Lockheed as a major system prime contractor since World War II (P-38 Lightning Intercep-
tors). More important, however, was the fact that Lockheed knew lit-
tle of the Army's modern day system requirements and operating tech-
niques. There was much to learn to catch up with the competition which had been active Army contractors for the past decade or more.

In addition to keeping well informed on the customer, Lockheed team members took special measures to determine what competitors were doing. Included in this activity was an effort to maintain a current status on other weapon system programs receiving support from the Air Force, Navy or Marines. In marketing major defense programs such as the AAFSS, it is just as important to keep the customer's program alive as it is to be selected the winning competitor.

The Bid And Proposal Process

As mentioned previously, the AAFSS RFP was received by industry about August 1, 1964 and required proposal submittals on November 23, 1964. This allowed a little less than four months to conduct the Lockheed "get acquainted" effort, determine proposal content, create proposal text and illustrations, obtain management approval of prices and commitments, and get thirty copies of the entire package printed and delivered. There was absolutely no time for wasted motion and it was obvious that pre proposal preparatory effort had proved worthwhile.

Previous planning had determined team leaders responsible for
certain portions of the proposal. It was their assignment to organize, originate narrative and illustrative material, coordinate with other groups where there was interface in subject matter, and obtain approval of draft manuscripts. It was during this creative stage that team leaders put to use all that knowledge they had learned from listening to customer problems and needs. It was here also that innovative features were proposed in order to go that one extra step to be better than the competition.

The review and approval procedure was clearly established and coordinated by personnel of the bid and proposal department. Each volume of the proposal required approval by the top manager of the functional group responsible for preparation. (i.e. technical volumes required approval by the Engineering Branch Manager, the manufacturing plan required approval by the Operations Branch Manager, etcetera). Following this initial approval by the responsible functional manager, the various volumes were then exposed to the prescribed review and approval channel. Those volumes that contained the most critical commitments went as high up the management hierarchy as corporate officers for approval. The Program Manager, Bid and Proposal Manager and Sales Manager were required to approve all volumes to ensure a harmonious and well integrated total package.

Pricing the proposal was the next difficult task of the marketing team. Intelligence gathered by the marketing network established two million dollars as the amount available to conduct the contract definition study. It was also reliably reported that the Army planned to select three bidders to continue the competition into the study phase. Lockheed's marketing team made a basic assumption that the two
million dollars would be equally divided among the three contractors to be selected for the contract definition study. Based on this rationale, the study effort was policy priced at just under seven hundred thousand dollars even though price estimating procedures placed the value of the effort at a higher figure. The outcome of this decision will be discussed later in this section.

In summary, the entire bid and proposal effort was carefully structured and monitored to present a proposal that would satisfy the criteria determined to be essential for winning the competition (see the seven elements listed under the previous subsection entitled "Determine Criteria For Selecting a Winner"). This total effort resulted in some twenty-two volumes of printed material. All volumes were bound in eight and one-half by eleven inch books and one complete set measured approximately five lineal feet. When the Army received thirty copies of this Lockheed proposal plus similar shipments from the other eleven bidders, a special building was cleared to store and lock up the mass of paper.

A co-winner of round one

It was now the Army's turn to go to work evaluating the proposals. With a team of some 300 specialists, the mountains of material was carefully reviewed and analyzed. Questions and requests for clarifications were made by the Army and answered by the bidders. These exchanges were meticulously processed through the contracting officer and a veil of secrecy shrouded the evaluation team. At long last, in February 1965 Sikorsky and Lockheed were announced as the two winners selected to continue the competition in the contract definition phase.
The Army asked Lockheed to negotiate their contract first because they preceded Sikorsky alphabetically. These negotiations lasted several weeks wherein the Army imposed some added requirements that enabled Lockheed to revise their offered price to nine hundred thousand dollars—an increase of over two hundred thousand dollars. Sikorsky followed in negotiations and settled for about one and one half million dollars. After these facts became known, Lockheed marketers deduced that the Army strategy was to settle with Lockheed first at a low price of less than a million dollars. This accomplishment could be leverage on Sikorsky to reduce their price during subsequent negotiations from an estimated two million dollar original offer. It will be remembered that Lockheed anticipated three winners equally sharing two million dollars. Sikorsky apparently strategized that they would bid for the full two million dollars and reduce their effort should more than one winner be selected. As it turned out, the Sikorsky strategy paid off and they received a higher contract price than Lockheed.

The winner of round two

In the spring of 1965, Lockheed and Sikorsky were under Army contract to conduct the AAFSS contract definition study. This was essentially another round of proposal preparation to compete for the next contract which would build and test ten aerial vehicles and related ground support equipment. The contracts called for six months' of study to be followed by submittal of a firm offer to develop and test hardware. Along with the firm offer for the development contract, the companies were required to submit planning purpose proposals for production and logistical support of large quantities of AAFSS machines.
The Lockheed marketing team was naturally exuberant over winning the first phase of the competition. It was an important victory because it confirmed that the rigid rotor concept was acceptable for the AAFSS and it narrowed Lockheed's competition to only one of the old guard rotary wing manufacturers. The Lockheed team renewed activities with increased vigor and a dedication to win the next round of the drawn out AAFSS competition.

Lockheed's marketing program was thus far successful and tracking well. Refinements and reemphasis were required now that the competition was narrowed but the essentials were retained. Basically, this next phase of the marketing effort was to convince the Army that Lockheed's AAFSS could best solve the Army's problems and that Lockheed was capable of managing this intricate and large scale program.

A renewed customer contact campaign was launched. Salesmen, engineers, and program management personnel traveled the country and overseas explaining the new rigid rotor concept and extolling its virtues. The Army AAFSS management team were meticulously exposed to Lockheed's facilities, management, and past record of accomplishment. No stone was unturned and no key government decision maker was spared exposure to Lockheed's AAFSS capabilities. Advertising and promotion effort was increased to help publicize the Lockheed rigid rotor concept. Publications in trade magazines and technical journals carried articles on the Lockheed revolution in rotary wing technology. Appendix B was released in the middle of the Lockheed/Sikorsky competition and depicts the quality and depth of this sales campaign.

On August 11, 1965 the technical and management portions of the proposal were submitted to the Army followed by the cost proposal on
September 1, 1965. Again, the Army evaluation team meticulously re­viewed and rated the Lockheed and Sikorsky material. During this eval­uation period, there was a more extensive exchange of questions and answers between the government and bidders. This was the big decision. The single winner would carry on with hardware development and testing, and the Army had to be sure of its selection. On November 3, 1965, Lockheed received a notice of contract award along with an invitation to begin contract negotiations. This was the big news joyfully received after seven years of preparation and eighteen months of selling. Maybe now the marketers could take deferred vacations and get reacquainted with neglected families.

Still another round

Although the Lockheed AAFSS team succeeded in co-winning a study contract against eleven competitors and succeeded in winning the development contract in competition with Sikorsky, the fight was not yet over. While the study effort and paperwork preparation had been going on, two new competing forces gained momentum. The first of these is in the form of the "Huey-Cobra" (US Army model AH-1G) manufactured by the Bell Helicopter Company a division of Textron Corporation. With the Vietnam conflict raging and highlighting the need for armed helicopters, Bell marketers convinced the Army that they should authorize Bell to build an interim AAFSS. This interim AAFSS was a conversion of Bell's workhorse utility helicopter (Army model UH-1B, "Huey") into an armed weapon system to provide an improved helicopter for the pressing Vietnam needs. This same idea had previously been rejected by the Army in 1963 when the decision was made to proceed with the AAFSS. In spite of this, Bell is currently under contract for a large quantity
of Huey-Cobra AH-1G helicopters. For a company that was eliminated in the first phase of the AAFSS competition, Bell's success in selling an interim AAFSS should be considered one of the outstanding marketing ploys in the aerospace industry.

The presence of the Huey-Cobra has a disturbing impact on Lockheed's AAFSS program and represents a new and serious form of competition. Until Lockheed receives a contract that moves AAFSS from development into large scale production, there is the continuing possibility that the Army will decide to cancel the Lockheed program and settle for the smaller, cheaper, and less potent Huey-Cobra. Should this happen, Bell marketeers should receive an aerospace "oscar" for turning their loser into a winner and Lockheed's winner into a loser.

The second new competing force takes shape in the form of the United States Air Force. As the AAFSS development progresses and paperwork evolves into hardware, a greater degree of attention is directed to the program. The Air Force is reported to consider the AAFSS vehicle a potential infringement on their charter of controlling aerial weapon systems. At this writing, the AAFSS production contract is jeopardized by the possibility that the Air Force will resist allowing the Army to procure an aerial vehicle that has the capabilities of the AAFSS. This is a case in point of the previously described interservice mission rivalry.

The impact of these two elements--the Huey-Cobra and the Air Force--causes Lockheed marketeers to continue a vigorous campaign to keep the AAFSS program sold. In reality, this effort consumes a great deal of time on the part of Lockheed's AAFSS vice president and marketing staff. Numerous studies and presentations have been made to
justify the AAFSS and demonstrate its cost effectiveness value when compared to the Huey-Cobra and other aerial weapon systems. Additionally, Lockheed participates with the Army in satisfying DOD decision makers that the AAFSS is properly an Army weapon systems. In truth, the competition continues and the marketing effort remains at a lively pace. Even now, almost two and one half years after the initial RFP, there is serious concern over the future of the AAFSS production program.

Perpetuating The Product Line

Concurrent with the continued marketing efforts on the AAFSS program are equally active campaigns to expand Lockheed's rotary wing business. Under the management of the Rotary Wing Director of Sales are two sales managers and fourteen salesmen. These marketeers are supplemented by three additional men assigned to rotary wing programs in the Washington D. C. corporate office. Except for those assigned to the AAFSS program, these marketeers are working with the Army, Navy, Air Force, Marines, commercial airlines, and foreign countries in attempts to determine customer requirements that can be fulfilled by Lockheed's rigid rotor aircraft.

A basic ingredient of Lockheed's rotary wing objectives is to advance the state-of-the-art far beyond current helicopter type vehicles. This means that Lockheed's future vertical take off and landing (VTOL) vehicles will employ the principles of "compounding" (rotary wing plus a fixed wing with auxiliary forward thrusting engines) and "compounding" with a stopped, stowed, and folded rotor. With the increased acceptance of VTOL as a versatile aircraft, the marketing
potential for this product line family is extremely attractive to Lockheed. Many customer requirements are in various stages of fruition. Those closest at hand are programs for a utility tactical transport, a combat air rescue aircraft, a patrol and surveillance aircraft, an anti-submarine warfare aircraft, a light intertheater transport, and a composite research aircraft. Each of these potential programs is receiving active marketing effort including a marketing program established and underway. As evidenced by the AAFSS experience, these marketing programs may take several years of nurturing before any sales sign-ups are realized. Such is the way of life in marketing aerospace products.
world. Its very existence and progress depends upon continued improvement in this technology. Additionally, the international situation shows no sign of radical change in the foreseeable future. If the Vietnam action ends, it is unfortunately likely that another violent disruption would soon follow in the industry. In any event, analysis of DOD's "Military Posture Statement on the Fiscal Year 1968 - 1972 Defense Program" indicates an all out hydrogen war is considered as unlikely as total disarmament with genuine peaceful coexistence—at least in the next five years.\(^1\) The emphasis on different weapon systems or space exploration programs will continue to fluctuate in relation to the pressures of the international situation as the government attempts to find a balance between defense expenditures and social improvement programs. These factors alone ensure a continued dynamic defense market. Even though total expenditures for aerospace products decrease, level off, or increase, the dollar outlay will be considerable and adequate to attract competent and aggressive competitors—hence the marketeer's job will remain of vital importance.

**Status Quo Of Procurement Practices**

Existing defense procurement practices, as outlined in the first section of Chapter III, have evolved during the seven year regime of Secretary of Defense Robert S. McNamara. With his imminent reassignment to head the World Bank, there is some speculation as to the longevity of these policies. In spite of certain controversial

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elements, it is reasonable to assume that the basics of current defense procurement practices will be retained for some time to come. The reasons for this are threefold: (1) inasmuch as McNamara has held this position seven years—longer than any previous Secretary of Defense—any qualified replacement will likely have been groomed during the McNamara era;¹ (2) inasmuch as a replacement will be appointed by President Lyndon B. Johnson—who openly praises McNamara’s accomplishments—he will probably pick an advocate of McNamara’s policies; and, (3) it is widely acknowledged that current procurement policies have, in the overall analysis and taking many shortcomings into account, generally improved the management of public funds spent for the defense effort.

The status quo of procurement practices means continued low profits to defense contractors and continued government involvement in the management of defense programs. More directly pertinent to the marketing effort is the practice of phased procurement which involves a series of bidder competitions progressing through the concept formulation, contract definition, acquisition, and operational phases (see the first section of Chapter III). This requires marketing campaigns that span several years before a new product reaches the point where production quantities are under contract.

New Market Prospects

Aerospace defense contractors contemplating future marketing programs cannot ignore the impact and challenge associated with poten-

¹The announcement of his successor is imminent due to his resignation to become President of the World Bank.
tial new nondefense markets. The outstanding technical competency and
precision manufacturing ability of aerospace companies make them
natural candidates to capture business in these totally new markets.
Even a cursory review of the literature indicates exotic new goods and
services necessary to satisfy immediate and future requirements: (1)
oceanography offers potential commercial benefits by underwater min-
ing, offshore drilling, and undersea farming; (2) systems are needed
to economically purify salt water for useful purposes; (3) air pollu-
tion and control urgently need improvement inasmuch as serious detri-
mental effects are predicted for humans and plant life if trends con-
tinue unchanged; (4) urban ground transportation problems and traffic
control are old problems long overdue for solution; (5) prediction and
control of the weather shows promise of worthwhile benefits; (6) self
development programs for underdeveloped countries will improve chan-
ces for international peace and provide an economic boost to their
well being; and, (7) great benefits could accrue from improved data
storage and retrieval systems to efficiently make use of the growing
mass of available information. An active imagination could add other
difficult problems whose ultimate solution lies with improved techno-
logy. Many of these areas are social issues and may involve federal,
state or local government financing inasmuch as the cost of accomplish-
ment is high and consumption is by the population via government.
Nonetheless, aerospace companies do have the talent and type of
resources that could provide solutions to many of these nondefense
requirements. The corporate overview must take these challenges (and
in some cases, social obligations) into account when projecting their
product lines of the future. As an idea of the magnitude of this
market, Dr. Simon Ramo, Vice Chairman of the Board of TRW, Incorporated, predicts one trillion dollars will be spent in the United States during the next ten years for these kinds of nondefense activities.¹ A trillion dollars is a staggering figure and one that certainly must be attractive to companies competent to compete for its capture.

A Buyer's Market

A final observation regarding the future environment in which aerospace companies will be operating is that a buyer's market will prevail. The history of the defense industry since World War II clearly shows the evolution from a production oriented industry to a marketing oriented industry. Competition will remain keen and new companies will continue to enter the industry. Hence, abundant supply will chase limited demand—caused by restricted availability of defense funds—creating a consumption rather than a production problem. Even though this situation is clearly evident, it is worth highlighting here as a reminder to those corporate executives that become myopic in believing that creation of a better mousetrap will bring the world to their order desk. The life of an aerospace marketeer will just never be that comfortable because his products will become more difficult to sell rather than easier.

Planning

In the sense used here, planning refers to the company's long range marketing plans. The history has certainly made it evident that long range market planning cannot be neglected. Aerospace products are complicated and expensive; consequently, fruition is a lengthy process and marketing efforts for any one program span many years. Under these conditions, the concept of Critical Path Analysis (CPA) offers worthwhile possibilities for improving this long range market planning function.\(^1\) Although marketing planners typically account for timing and interdependency of events, some variation of a CPA technique could well improve this activity because it is a good disciplinarian for thoroughness and completeness. Reading the literature gives little evidence that this tool is being adapted to the marketing function in aerospace. The CPA method need not be highly elaborate and computerized to be effective and would probably be equally practical if accomplished manually—at least for the smaller scale or shorter span marketing programs. For this reason, aerospace marketeers should not readily discard this tool because of a lack of understanding or the fear of costly operation. Lockheed's use of the "technology tree" (described in Chapter V) is merely a beginning step in developing a market planning tool adaptable to the CPA concept. Much work needs to be done to refine and improve this approach and the benefits will be more thorough and realistic long range planning and greater visibility of competitive standing.

Aerospace long range planning must recognize the possibility

that markets can still be created. Through the past three decades, the military customer has almost completely conditioned aerospace contractors to the frame of mind that their marketing role is to create a product meeting the customers' specified needs. This is all well and good and the contractor should satisfy customer requirements fully and absolutely. The problem, however, is that this conditioning has caused aerospace contractors to seldom, if ever, take the initiative to create a market through introduction of a new product. Aerospace firms originate many ideas for DOD using government funds, but actual development of hardware using company funds is a rarity. There are several notable exceptions to this in recent years: (1) General Dynamics built and tested its "Charger" after losing out to North American Aviation in the 1964 "Coin" competition in hopes the company funded airplane would prove superior to the government sponsored version; and, (2) Lockheed built and tested its privately financed rigid rotor helicopter in anticipation of a potential market. There are undoubtedly other less publicized examples, but the point here is that such action is infrequent.

In spite of the large investment required, aerospace contractors should seriously consider creating new markets through introducing new products. If the cost is prohibitive on expensive sophisticated items like aircraft or special ground transportation vehicles, at least much could be done toward converting aerospace gadgetry to commercial or industrial application using company funds. The incentive of course is that successful commercial products are typically more profitable and provide a broader and better base on which to
build well rounded corporatewide operations. More corporate boldness in this area might pay off surprisingly well assuming the marketing job is properly done.

Another consideration for marketing long range planners must be the standing invitation from the United States Government to expand the markets of existing and future aerospace products. Henry J. Kuss, Deputy Assistant Secretary for International Logistic Affairs, forecasts a 1.5 billion dollar per year market between 1965 and 1975 through sales to foreign governments of aerospace products made in the United States.\(^1\) In 1966, the Defense Industrial Advisory Council predicted a potential of fifteen billion dollars in such sales by 1969.\(^2\) Whatever is a realistic forecast, this is a sizeable amount of potential revenue for aerospace producers and some are pursuing this business. Many qualified companies, however, are not rushing to accept Mr. Kuss' open invitation inasmuch as they believe private industry should be left free to acquire and consummate such business without dealing through the United States Government. Industry complaints include: (1) no guidance as to who to sell what weapons to; (2) government gives away patents and proprietary rights of participating firms; and, (3) government underprices total effort by ignoring selling, servicing, and realistic support costs of the producing company.\(^3\)

In spite of the difficulties, here is a large potential market that

\(^1\)C. William Borklund, "What Military Exports Can Mean," \textit{Armed Forces Management} (Vol. 11, No. 4, January 1965), P. 31.


needs critical scrutiny and attention of the market planners of defense contractors.

Organization

History makes it only too evident that aerospace products become infinitely more sophisticated with the passage of time. Such complexity encourages a product oriented organization and future marketing activities will undoubtedly follow this trend toward structuring the marketing organization on product lines. Basically, the reason seems to be that the marketeer can get to know the customer and his procedures easier than he can thoroughly understand the intricacy, history and advantages of the products.¹

Aerospace corporations that have mixed government and commercial business have yet to solve the problem of how they should most effectively organize divisions and subsidiaries to maximize returns and encourage the most productive "fall-out" of ideas, inventions and products. Commercial business is much different than government business in that military regulations and specifications do not apply. Additionally, commercial business carries no constraint on the manufacturer's accounting and paperwork procedures, and profit opportunities are more favorable and free from renegotiation at the end of the contract. For these reasons, there are some distinct advantages in separating commercial and government business. On the other hand, it seems totally impractical to have a separate division build and sell

a commercial product that is closely similar to a military counter-part built and sold elsewhere. The problem seems to center on compatible manufacturing techniques and equipment, dissimilar management and administrative techniques, and semiharmonious marketing techniques. In any event, extensive effort toward minimizing the adverse impact of these areas of incompatibility is in order for those aerospace firms that now have or expect to capture near equal portions of commercial and government business.

An outgrowth of the diversified aerospace corporation with multidivisions, numerous products, varied capability, and common government agencies for customers is that customer understanding of their marketing organization must be improved. Military procurement personnel repeatedly express confusion as to which division is represented by visiting salesmen, which products are made and sold by which division, etcetera. To improve this situation, aerospace corporations with widespread operations and varied capabilities should seriously consider ways to help their customers clearly understand their corporate structure and the separation of product lines between operating divisions. This is certainly the marketing organization's responsibility and those marketeers contacting the customer can do much toward this end. Nonetheless, it appears that this is the type of thing that could be readily accomplished through a simple brochure or an elaborate capabilities manual made available to all current and potential customers. Whatever the method, more must be done in this area.
The changes in the industry and the anticipated course of future practices indicate the likelihood of significant impact on staffing the marketing organization. As the emphasis on advanced technology continues to broaden product lines and production capability stays ahead of consumption, the need for competent marketeers is bound to increase or existing numbers must become much more effective. Salesmen and marketing staff personnel will become more specialized in fewer specific products and therefore less versatile than in the past. Additionally, it is evident that the ideal marketeer (as described in Chapter V) is not plentiful, and the approach of a marketing team of specialists has many practical limitations. These conditions, then, highlight an obvious need for vastly improved education and training of marketing personnel. Some company sponsored courses are being conducted to help marketing representatives do a better job of communicating. Oral presentations, negotiating techniques, government contract administration, and similar speciality subjects have recently gained some popularity in industry, university, and professional association sponsored courses. With such a large portion of the gross national product devoted to defense expenditures, it is surprising, however, that there is not a greater abundance of defense industry marketing courses available. Aerospace companies must soon awaken to this shortcoming and take the lead in sponsoring and improving training opportunities in the finer points of developing marketing programs, strategies, and implementation techniques. The common practice of pinning a marketeer's badge on a bright aggressive engineer, an ex-pilot, or a retired officer without proper indoctri-
nation into the real issues of defense marketing seems to be a disservice to the individual and the company. Although it is probably wishful thinking to expect large numbers of "ideal marketeers", much can be done to better equip the old hands and those on their way up.

Engineers are a good source for developing marketeers because they understand the complexities of the products. There are problems, however, because most engineers are just not marketing oriented and many consider the marketing function beneath engineering in the job status hierarchy. To make matters worse, engineers generally make more money than marketeers so there's little incentive for them to change roles. There are two messages here: (1) marketing management might well evaluate the equitableness of their salary structure; and, (2) there might be deep seated reasons to rely more heavily on the engineering-marketing team approach already used by many aerospace firms.

Staffing the marketing team poses additional future problems for those defense firms that choose to pursue foreign and commercial sales. Marketing techniques and programs unique to these kinds of sales will require special attributes of assigned marketeers. For this reason, special consideration must be given to selection and training of personnel that will conduct foreign and commercial marketing activities. Just as the machinist uses the proper tool for a particular cut in making an item, so must the aerospace firm use the "right" salesman in accomplishing the total marketing job involving sophisticated products and very knowledgeable customers.

\textsuperscript{1}Ibid., p. 48.
It is difficult to assess the strengths and weaknesses of the control function because internal procedures and effectiveness thereof are not readily revealed by aerospace marketing organizations. Lacking any evidence to the contrary, it may be appropriate to assume that current control techniques are adequate and effective. On the other hand, things may be so out of control that companies dare not admit that marketing programs progress by happenstance rather than strong and positive control. Seriously though, the previously mentioned CPA concept or refinement thereof may well offer a valuable control tool for managing marketing programs. When one has the CPA roadmap clearly laid out with key milestones and dates identified, the job of tracking and controlling program accomplishment and identifying the need for revision just has to be much easier.
First hand observation and the literature are noticeably lacking any evidence of what aerospace firms are doing to gather intelligence on competitors. Silence on this subject is attributed to the extremely sensitive nature of this issue rather than on a lack of activity. Nonetheless, there is reason to believe that aerospace marketeers can do a far better job in this area than they have evidently been able to do in the past. This need not be an industrial espionage cloak and dagger campaign but rather a rigorous gathering, review, sifting, and analysis of overtly available information. Such information regarding competitors might well prove beneficial and well worth the effort. Use of Lockheed's "technology tree" approach is a beginning step in this direction and offers an insight into technical areas and design concepts being pursued by the competition. Additionally, not all but many of the reports prepared by aerospace firms under government contract are available to other firms interested enough to exert the administrative effort required to obtain them. Until this is earnestly pursued, who knows the potential benefit. Furthermore, can the marketing management of any given firm be confident that their competitor does not have a fat file bearing their company's code name and full of meaningful proprietary information?

An additional area needing improvement in the market intelligence activity relates to communication between government and industry for complex weapons or space system programs. There is a real

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1Wall Street Journal, November 18, 1964, p. 3.
need for the government to be completely candid, absolute and complete in making their requirements known to aerospace competitors. Anything less than this provokes continued pursuit by unqualified companies or pursuit of a solution by a qualified company but in a direction unacceptable to the government.

Marketing Program Planning

It will be remembered that, by definition, this is the effort that blends the management functions into a specific plan to market a particular product. This is probably the marketing activity most susceptible to future improvement. As mentioned earlier, adaptation of some form of Critical Path Analysis (CPA) methodology—either a sophisticated computerized program or a manually manipulated program—will help ensure detailed and thorough planning. Marketeers need such tools to put a vast amount of information and detail into proper perspective and manageable order.

It is a common tendency these days to anticipate remarkable accomplishments through use of electronic computer programs. Although such programs are not considered a panacea, more extensive application to marketing activities is inevitable. The planning of marketing programs can be improved by computerized programs to accomplish some of the following tasks: (1) Critical Path Analysis, or variation thereof, to identify and track key events; (2) analyze airline operator routes, fares, revenues, costs, passenger loadings, etcetera (Boeing, Douglas, and Lockheed have already launched on such computerized analysis of airline operations); (3) determine military mission effectiveness and force mix structures; and, (4) evaluate cost
effectiveness of contemplated weapon systems to determine if they offer an improved solution to existing or competitive systems. Creative marketeers will undoubtedly find additional areas for which computerized programs will make future marketing planning more proficient.

It is axiomatic that the sales forecast is the foundation on which most business activity is planned. This is equally true of aerospace defense contractors. There is, however, little in the literature that discusses sales forecasting techniques of defense contractors—probably because this is a highly individualized and proprietary activity. For those corporations that have had little success in accurately forecasting future sales, much promise lies in the use of mathematical models and quantitative analysis to more precisely predict sales sign-ups.

**Bid And Proposal**

In direct connection with quantitative analysis techniques for forecasting sales is the need for improved methods of selecting which new business opportunities should be pursued. Observations made in the course of this study indicate that win probability of any given proposal is typically determined by projections based on empirical records and/or subjective assessments by marketing management and key staff personnel. The prediction for bid and proposal activity indicates that this effort will become far more costly than in the past. This is true because the combined influence of more knowledgeable source selection evaluators, more sophisticated weapon and space systems, and greater competition will cause a continued increase in the quality and voluminousness of proposals submitted in response to
government bid opportunities. Government procurement agencies are reluctant to place a limit on permissible proposal material because they believe they need as much information as possible on which to evaluate the bidders. Defense contractors believe they cannot afford to leave any stone unturned for fear their competitors will outdo them in coverage and thoroughness. This tendency has become so pronounced in recent years that both government and industry recognize the need for corrective measures.\footnote{Remarks by Brigadier General Arthur E. Exon, Director of Defense Contract Administration Services Region--Los Angeles, as keynote speaker before a seminar and workshop of National Contract Management Association, Los Angeles, May 1966.}

For the aerospace firms, they can help themselves by devising more realistic techniques to determine their "win probability" for any given proposal. Statistical analysis coupled with genuine soul searching honesty as to the chances of winning a competition will assist aerospace firms in being realistically selective in pursuing bid opportunities. Government policies can also be improved in this regard. The existing government practice of allowing recovery of virtually all bid and proposal expenses through overhead rates can be modified to discourage defense contractors from bidding on programs for which they have little or no capability. Additionally, government procurement agencies can make a careful analysis of proposal requirements and specify precise information needed with explicit and realistic limitations as to allowable volume. It is believed that this can be done without curtailing information adequate for winner selection.
As mentioned in a preceding subsection entitled "Market Intelligence", free and easy access to all information pertinent to a potential government program was recommended. The intent is to help ensure that those firms contemplating participation in the anticipated competition could more realistically assess their chances for success. Unfortunately, there are indications that the military services are seriously considering a rigorous screening of potential bidders to select those few to be favored with a Request for Proposal (RFP). The obvious intent of such a practice is to save unqualified bidders the wasted expense of preparing a proposal predetermined to be a loser. The benefits include: (1) reduced costs to the government through curtailed bid and proposal expense as an element of overhead rates; and, (2) less waste of scarce engineering manpower that could be otherwise assigned to exert needed talent in more productive directions. In spite of these good things, one cannot help but appeal for total assessment of the long range ramifications of this policy. The obvious worry is that competition would be curtailed and the marketing function could degenerate to a practice of exerting political influence to ensure receipt of a RFP. Such conditions would ultimately impair customer satisfaction. This is a real concern in the defense industry marketplace. Through government-industry effort, a way must be found to reduce the cost of bidding on government programs without curtailing the freedom of competition.

One final word about ways to improve the firm's bid and proposal activity. There must be a renewed and strengthened dedication to win by all personnel! This may seem axiomatic, but unfortunately it is not. It especially applies to the old guard defense contractors
that are well established with long standing records of successful sales and products. The danger of complacency is ever present—particularly by those employees remote from the front line marketing activities. The solution of this problem rests squarely with marketing management who must spearhead the effort to motivate all employees in developing a spirit and attitude equivalent to that of the marketer. Engineering, manufacturing, quality assurance, finance, procurement, and staff personnel must recognize the vital need to learn the customer rules and adapt their thinking toward total fulfillment of customer requirements. Without this permeating dedication, the defense contractor has little chance of survival in the future environment of tough competition.

Source Selection

Although the source selection process is not a defense contractor's marketing activity, it is the crucial customer transaction that determines the winner and losers in the competition. For this reason, the source selection process is of vital interest to the marketing organization and they should give particular attention to the forces that will influence selection decisions. In this regard, there are at least three forces that must be recognized and accounted for in marketing activities. A very brief description follows.

Centralized procuring agency

The Armed Services Procurement Act of 1947 provided the cornerstone for a unified government procurement agency to buy the goods and services needed by all government agencies involved in the defense of the United States. As pointed out in previous discussion, the DOD
has gradually been moving in the direction of becoming that centralized power to accomplish, or at least control, all defense expenditures. Congressional legislation is repeatedly introduced toward that end and taxpayers have a growing interest in getting the military services operating together and in greater harmony.\footnote{James M. Hertzberg, \textit{op. cit.}, p. 53.}

Defense contractor marketeers must recognize this trend and appropriately prepare for its impact. The obvious results will be for aerospace firms to lean toward weapon system commonality in conceiving new approaches to satisfy customer requirements. Even though one military service comes out with explicit requirements to satisfy their mission requirements, aerospace firms will have to strive toward fulfillment of these particular needs and at the same time build in versatility for adoption to requirements of other services. It is interesting to contemplate the mixed customer loyalties that could arise from such a situation.

\textbf{Cost effectiveness}

Another DOD technique used in deciding the fate of competitors and future programs is the cost effectiveness of the proposed weapon system. For a program to be "cost effective", it must be determined as the most economical alternative system available to accomplish stated objectives when considering all pertinent tangible and intangible factors. Needless to say, making such an evaluation is a mathematician's dream come true. Every conceivable element must be identified, weighted, and used in the computation to determine which system will best accomplish the task at least overall cost. Development
of highly sophisticated and computerized math models to analyze a system's cost effectiveness earned Secretary McNamara and his colleagues the "whiz kids" nickname. The impact on defense industry contractors will be the need for marketeers to develop the capability to make similar cost effectiveness studies. With this ability, an aerospace firm can better determine if his candidate weapon system will measure up to the test of cost effectiveness. Additionally, the contractor's analysis can be used to support or refute the results of the DOD cost effectiveness studies.

Contractor Performance Evaluation

Contractor Performance Evaluation (CPE) is another recent tool being developed by DOD to help select winning competitors. CPE, as the name implies, is a program wherein defense contractors are objectively graded on actual accomplishments under government contracts. The government project manager and/or contracting officer establish technical, schedule, and cost criteria against which to measure a contractor's performance. Periodic reports are prepared and submitted to a computerized data bank for processing and retention. Over a period of time, the CPE data bank will have accumulated considerable detail on how well individual contractors have performed against requirements. During the source selection process, data print-outs will be readily available to the evaluators and this empirical record will be used in grading the competency of the competitors.

It is obvious that use of CPE results can help or hinder a firm's competitive position. There is little the marketeer can do to offset the historical account of his firm's poor past performance. "Brochuresmanship" and flamboyant promises cannot make up the differ-
ence. The only action available to the marketeer is the positive approach of ensuring good report cards. As mentioned under the subsection on Bid and Proposal, this ties in directly with the need for all members of the firm to adopt the marketing attitude by diligently pursuing total and outstanding fulfillment of customer requirements.

Contracting

One of the most changeable of the marketing activities is that of contracting. As discussed in Chapters III and IV, government requirements and relationships with contractors are meticulously spelled out in the contract. Consequently, contract provisions are continuously being added, deleted, and refined as experience reveals shortcomings. The contract spells out the detailed obligations of both parties and is the single most important document to the government and the contractor. For these reasons, it is absolutely predictable that government contracting will remain in a constant state of evolution. These circumstances impact on the marketing function through the criticality of the contract and the need for shrewd and meticulous contract negotiators and administrators.

The history of current literature reveal a number of significant consequences that have some basic impacts on defense contracting practices.

**Government procurement regulations**

The Armed Services Procurement Regulations (ASPR) contain the fundamental requirements for defense industry contracting. Each military service, however, maintains their own particularized regulations to amplify and embellish the ASPR. This condition requires
defense industry contracts personnel to be astute on the differences between these many regulatory manuals thereby causing extensive study and difficulty in understanding and myriad of requirements. A long standing concern over these conditions is now nearing positive action to improve the situation. Such relief may come through a commission on government procurement now being proposed to the United States legislature in House of Representatives Bill Number 157 and Senate Bill Number 1145. Under these bills, the proposed commission will make studies and recommendations to the Congress concerning the extent to which existing statutes, regulations, procedures, practices, and organization affect basic government procurement policies.\(^1\) Essentially, this is the first step in what could lead to a major overhaul and simplification of regulations to make government contracting more consistent, understandable, and administratively practical. Accomplishment will be a major boon to all personnel involved with defense industry contracting.

**Contract types**

As discussed in Chapter III, the use of cost reimbursement type contracts has pretty much given way to fixed price type contracts. The fixed price incentive contract is currently considered the most desirable because it eliminates outrageous overruns, provides greater incentives for outstanding contractor performance, and offers some degree of protection to the contractor and the government if the original estimate of program costs are significantly higher or lower than

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actuals. Operating under fixed price incentive contracts has revealed three primary conclusions: (1) certain research and development programs that advance the state-of-the-art should just not be attempted under fixed price type contracts if the risk of accomplishment is extraordinarily high; (2) the accuracy of pricing defense programs for fixed price type contracts needs considerable improvements; and, (3) the writing of requirements, terms, and conditions of fixed price type contracts must be improved to absolutely express the intent of the parties without vagueness, ambiguity, or open ends. Inasmuch as fixed price type contracts are expected to retain their popularity for a long time to come, contracting personnel must prepare themselves for these more difficult tasks.

**Total package procurement concept**

Total package procurement (TPP) is the latest DOD contracting innovation and shows signs of great future popularity for major weapon or space system programs. This concept makes use of life cycle costing and incorporates development, testing, production, and logistical support requirements all in one single contract. At the time of this writing, the first and most publicized TPP contract is between the Air Force and Lockheed's Georgia Company for the C-5A jumbo cargo/transport. The total magnitude of the entire program, assuming the government exercises all the option provisions, is approximately 1.4 billion dollars. Obviously, the complexity and precision of the contractual document for such a program is tremendous. Here again, marketers responsible for the contracting activity must be conditioned and well prepared to negotiate and administer contracts for future programs of this nature.
Contractual data requirements

Much has been done in recent years to better define the myriad of data and reports required under defense contracts. Under DOD directives, the military services have developed data lists describing the specific items of data they may procure to supplement defense hardware. The cost of this data can have a significant impact on the price of the total program and procuring agencies are directed to restrict data requirements to a minimum. Nonetheless, some rather startling figures have been compiled:1

1. Estimated hours expended annually to prepare data and reports, contractually as well as noncontractually required, have risen 400 to 450 percent since the Korean war (2,258,335 estimated hours annually in 1960);

2. The Government Reports Committee of Aerospace Industries Association concludes that fifty percent of the data requirements are questionable as to their usefulness;

3. Ten large aerospace companies have estimated they spend over one hundred million dollars annually on administrative type reports to the military services.

The obvious conclusion to be drawn from these conditions is that the government must receive less hardware for the sake of more paperwork—assuming a strict ceiling on total dollars available for any given program. Under current conditions, it is reasonable to assume that aerospace defense manufacturers will launch a mild revolt

regarding extensive data requirements that adversely affect their opportunity to produce a greater volume of manufactured goods. As stated, this will be a mild revolt inasmuch as the competitive environment gets keener and many firms are as willing to sell paperwork as they are hardware. This condition will get worse before it gets better and it is the uninformed and victimized taxpayer that gets hurt in the long run.

Other contractual ingredients

As the government continues to operate with strong purchasing power through a large defense budget and in a highly competitive marketplace, peculiarized contract provisions can be expected by aerospace defense contractors. Many of these provisions relate closely with the social welfare objectives of the federal government. Contract requirements are frequently incorporated into defense contracts obligating contractors to make use of: small business companies; firms in labor surplus areas; employment of minority groups; American made products; and, purchase of natural rubber, aluminum ingot, and jeweled bearings from government owned sources. As a result, it is common practice to include propaganda in proposal material describing how extensively a company cooperates in these requirements. Although this is not considered a major contracting issue, it does require marketeers to be knowledgeable of company accomplishments in these areas and offers the government an avenue to perpetuate social improvement programs.

General observation

Major programs for production of defense weapons and space systems have tended to become fewer in number and larger in magnitude.
This trend, coupled with the many contracting innovations introduced in recent years, places the contract document in the limelight of attention. In the old days, defense contracts were rather loose and vague inasmuch as program requirements were expressed in terms of "objectives" instead of "requirements". Under these conditions, the contract was considered little more than a necessary evil to make things legal and permit payment for accomplishment. As systems become more complex and requirements become more explicit, everyone from top management to line supervision becomes vitally concerned with all elements of the contract. The upshot is that the contracting activity of the marketing function has increased in significance and will require greater attention from marketing management.
Summary

It is recognized that this has been an extensive subject covering many aspects of defense industry marketing. Because of the breadth of the discussion, it is appropriate to provide a gross summation in an attempt to obtain a clearer overview of the material covered.

Chapter I describes the magnitude of the defense industry and sets forth the hypothesis of the study. This hypothesis contends that the history of the airframe industry in the United States reflects significant and radical change in the business conditions confronting firms in that industry. The nature and magnitude of these changes are such that a review and careful analysis of this history is worthwhile in an attempt to determine the effect on marketing programs of these corporations.

Chapter II presents some historical highlights of the industry between 1945 and 1965. This discussion describes events that brought about significant changes in the aerospace industry and serves as a reference for subsequent analysis relating to this history. Outlined below are the most significant changes identified with this twenty year span:

1. After a slow start, the airframe industry rapidly increased and has continually undergone cyclic ups and downs in level of activity;

2. The nature of the products has required tremendous emphasis on technology with the result that the industry has undergone extreme technological advance in a short time;
3. Reliance on commercial airplane products gave way to military products with commercial transports being relegated to secondary importance by most defense contractors;

4. Commercial transport ventures proved so unprofitable to most firms that only two continue producing virtually all those made in the United States;

5. A production oriented airframe industry evolved into a marketing oriented aerospace industry;

6. Defense expenditures for research and development effort have become higher than for production articles;

7. Advanced technology brought greater product complexity and specialization which provoked widespread diversification by aerospace corporations;

8. Greater product specialization has caused increased competition from nonairframe producers;

9. Increased government purchasing power and greater competition has enabled the government to shift more risk onto defense contractors; and

10. The complexity and magnitude of major defense programs has brought more involvement by government in the contractor's management domain.

Chapter III describes how these changes have impacted on various elements of the defense establishment. The analysis considers the results of the changes on the aerospace customers, products, defense contractors, government - contractor relationship, and the competition with an emphasis on the interactions with marketing activities.
Chapter IV describes the major marketing activities of aerospace firms. Although there is no specific comparison of the "was" and "is" conditions, the emphasis is on the involvement of these activities in the current environment. The discussion deals with the major areas of marketing intelligence, market planning, bid and proposal, customer relations, advertising and promotion, source selection, contracting, and logistics.

Chapter V describes the ingredients of the Lockheed Aircraft Corporation marketing program. The discussion considers the corporation's overall marketing program and that of the Lockheed-California Company as they relate to planning, organization, staffing, and control. Having looked at these overall functions of marketing management, the study then recounts the marketing activities of a particular case study which successfully won the competition for the Army's Advance Aerial Fire Support System program.

This final Chapter VI makes some basic predictions concerning the environment of the defense market in the next five years. Anticipating these conditions, a summation is presented to stimulate further study of those areas that could be improved to increase effectiveness of defense contractors' marketing activities.
Conclusion

No intelligent management can afford to ignore the future. Yet it is at best a difficult task to offer meaningful comments on future trends in the aerospace industry. . . . Truly the dynamics of our industry are such that predictions often become essentially outdated before publication.¹

The above quotation is particularly appropriate to this study as it substantiates one of the main contentions—aerospace marketeers must be flexible, vigorous, and creative to keep up with the environment. Although an attempt has been made to recognize and account for changed conditions that have occurred during the preparation of this paper, all significant recent events have not been covered. To attempt such a reconciliation now would be futile, but it is respectfully submitted that the material stands essentially complete and current as presented here.

Several constraints must be recognized when evaluating the merits and credibility of the findings presented herein. First, the resources used to accomplish the study were limited to those of one individual operating on his own private funds. The time available for work on this project was constrained by a full time job schedule and normal family responsibilities. Furthermore, there was no staff of researchers available to search the literature or compile original data. This is not offered as an excuse for the quality of the work, but rather to account for the preparation time and the likelihood that much pertinent information may have escaped consideration.

Secondly, it must be pointed out that the subject matter deals with highly sensitive information considered vital to the competitive

¹Beveridge, op. cit., p. 121.
position of aerospace firms. Extensive perusal of the literature revealed virtually nothing concerning the details of marketing strategies and programs for individual companies. Efforts to obtain first hand information from aerospace marketing organizations resulted in polite but firm refusals. It should be pointed out that information concerning the Lockheed Aircraft Corporation came primarily from personal observation and material not classified as private data. Such information presented herein is appropriately neutralized to protect any proprietary interests. The upshot of this second constraint is that this study must be considered a general treatment of the subject. The Lockheed case study is presented as illustrative of how a representative firm has adjusted marketing activities to accommodate the environment.

All in all, this study is a sincere attempt to give recognition and visibility to a rather remarkable happening in the field of marketing. It is hoped that those who read this work will gain a better insight and appreciation for the complexity and difficulty of marketing defense industry products. This is not to say that the defense industry has a corner on all the marketing problems, but rather to make the point that their problems and advantages are somewhat peculiar to that industry. For those readers that are only passively interested or unacquainted with defense industry marketing, this study will be hopefully an enlightenment to that which has transpired and will provide an appreciation for the activities involved in marketing defense products and systems. For those readers actively engaged in the industry, this material may be totally redundant or even contrary
to practices as they know them in their particular companies. In any event, and whatever the background of the reader, this study is presented with the aspiration that it will provide insight and perspective on current defense marketing programs to stimulate thinking on what lies ahead.
APPENDIX A

Lockheed Aircraft Corporation
Division, Subsidiaries, And Offices

Divisions

LOCKHEED AIRCRAFT SERVICE COMPANY, Ontario, California
Aircraft modification, maintenance, and support. Data recording and
Low cost housing construction systems. Aircraft training aids. Exhibits and displays.

LOCKHEED-CALIFORNIA COMPANY, Burbank, California
F-12, F-104, P-3, and SR-71 military aircraft. AH-56A military com-
ound helicopters and rotary wing aircraft. Commercial aircraft and
annned hypersonic vehicle research. Oceanography.

LOCKHEED ELECTRONICS COMPANY, Plainfield, New Jersey
MILITARY SYSTEMS, Plainfield and Metuchen, New Jersey. Tactical and
INDUSTRIAL TECHNOLOGY, Edison, New Jersey. Spacecraft and commercial
recorders. Fuel oil computer registers. AVIONICS AND INDUSTRIAL PRO-
DUCTS, Los Angeles. Computer memory systems and components. HOUSTON
AEROSPACE SYSTEMS, Webster, Texas. Space engineering support. Com-
puter services. ENGINEERING SERVICES, Metuchen, New Jersey. Engi-
neering support.

LOCKHEED-GEORGIA COMPANY, Marietta, Georgia
C-130, C-141, and C-5 military transports. Commercial cargo aircraft.
JetStar executive transports. Vertical takeoff research aircraft.
Aircraft and cargo ground equipment. Nuclear, industrial, and elec-
ronics products.

LOCKHEED MISSILES AND SPACE COMPANY (A group division), Sunny-
vale, California, Divisions:
MISSILE SYSTEMS. Poseidon and Polaris fleet ballistic missiles. Tacti-
cal missiles. SPACE SYSTEMS. Agena satellite-booster space vehi-
cles. Military and civilian space programs. Multipurpose launch
vehicles. RESEARCH AND DEVELOPMENT. Space and missile research.
Information systems.

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LOCKHEED PROPULSION COMPANY, Redlands, California
Short range attack missile (SRAM) propulsion motors. Post-boost propulsion systems. Large solid rocket motors. Thrust vector control systems. Solid and hybrid rocket motors. Sounding rockets. Apollo launch escape motors.

Domestic Subsidiaries

LOCKHEED AIR TERMINAL, INC., Burbank, California
Airport operation. Fuel handling and general aviation services.

LOCKHEED AIRCRAFT INTERNATIONAL, INC., Los Angeles, California
International joint ventures, licensing programs, and manufacturing facilities.

LOCKHEED SHIPBUILDING AND CONSTRUCTION COMPANY, Seattle, Washington
Shipbuilding and repair. Heavy construction. Colby cranes and materials handling equipment.

Foreign Subsidiaries

LOCKHEED AIRCRAFT (AUSTRALIA) PTY., LTD., Canberra, A.C.T.

LOCKHEED AIRCRAFT CORPORATION OF CANADA, LTD., Ottawa 4

LOCKHEED AIRCRAFT DEUTSCHLAND GmbH, Frankfurt am Main, Germany

LOCKHEED AIRCRAFT INTERNATIONAL A.G., 1200 Geneva, Switzerland

LOCHEDE AIRCRAFT INTERNATIONAL LIMITED, Hong Kong

LOCKHEED WESTERN EXPORT COMPANY, Nassau, The Bahamas, U.S.
Office; Marietta, Georgia

Outside Offices

Belleville, Illinois  Lancaster, California
Boston, Massachusetts  Los Angeles, California
Cleveland, Ohio  New York, New York
Colorado Springs, Colorado  Omaha, Nebraska
Dayton, Ohio  Paris VIII, France
Eglin-Rucker, Florida  Philadelphia, Pennsylvania
Fort Monmouth, New Jersey  Rome, New York
Hampton-Norfolk, Virginia  Sacramento, California
Honolulu, Hawaii  St. Louis, Missouri
Houston, Texas  Washington, D. C.
Hunterville, Alabama
APPENDIX B

Appendix B is presented as an example of company publications distributed to customers and potential customers. It will be noticed that the content is primarily informative in nature and discusses the company's product line capability. The particular publication presented here was issued in the summer of 1965 during the competition for the Advanced Aerial Fire Support System—hence the emphasis on rotary wing technology.
SELECTED BIBLIOGRAPHY

Articles And Periodicals


"Are We Too Rich Already?" Fortune, XXIV (March, 1959), p. 112.


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