FINANCIAL PROFILE OF THE U.S. AEROSPACE INDUSTRY 1960-1973

RESEARCH REPORT

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WORKING DRAFT

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FINANCIAL PROFILE
OF THE
U.S. AEROSPACE INDUSTRY
1960-1973

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AEROSPACE RESEARCH CENTER

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FOREWORD

There has been over the past several years a constant erosion of the aerospace industry's capital base. This trend could lead to unacceptable results for both the industry and the nation.

As part of a continuing series of economic analyses, the Aerospace Research Center (ARC) of AIA has examined in depth the aforementioned trend for the purpose of determining the strengths of the aerospace industry that have allowed the industry to survive in spite of lower demand and noncompetitive rates of return. The study also seeks to determine what must be done to increase the viability of these strengths in an effort to ensure the orderly growth of the industry in the years ahead.

The ability to attract capital depends on the prospects for an adequate rate of return on capital. In turn, these prospects depend on the projected level of stability of future demand for the industry's products. Of equal importance is investor confidence in aerospace management. It is not sufficient that technical and demand conditions be favorable for the future. The investing public must be convinced that these conditions are favorable. Otherwise, outside capital will be difficult to raise and the trend will continue.

Recommendations for combating the current trend are made in the study. These recommendations reflect the results of a survey of AIA member companies, findings of other financial and profit studies by Logistics Management Institute (LMI), the U.S. General Accounting Office (GAO) and others. Data inputs were principally those of AIA, the Federal Trade Commission (FTC), Bureau of the Census, and the Bureau of Labor Statistics (BLS).

Prior to the scheduled publication date of the study, the Financial Accounting Standards Board (FASB) announced a decision that could alter the data base employed in the analysis. The FASB ruled that all research and development costs not directly reimbursable by others should be charged to expense when incurred. The ruling was made retroactive. This might require that part of the analysis be reevaluated and certain conclusions be reconsidered. Accordingly, formal publication of the study will be delayed until companies affected by the recent ruling can submit revised data.

In the meantime, this working draft is being distributed to AIA member companies to assist them in both short-term and long-term financial planning efforts. During the interim, the ARC would welcome any comments concerning either the data, the analysis or the conclusions and recommendations.

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EXECUTIVE SUMMARY

It has been said that the aerospace industry* is lean but strong. And while such a statement might well conjure up visions of a lithe and powerful athlete, it more properly describes the financial posture of a major U.S. industry—an industry that since the early 1960's has undergone an extensive and radical transformation in product orientation emerging as a broadly based, diversified product business. It is also an industry that has sustained itself almost in spite of severe and strenuous financial problems which to this day continue to exist as an omnipresent reminder that U.S. aerospace firms are engaged in a high risk venture.

Paradoxically, the industry's high risk in both the government and commercial markets has never been adequately compensated. This simple economic fact of life does not augur well; it makes the potential investor wary. It diminishes the amount of capital that otherwise could be available for reinvestment if average profit levels were increased. And it makes the cost of outside capital nearly prohibitive. As such any financial profile of the aerospace industry will of necessity include data that underscores both the seriousness of the financial difficulties facing the industry and the need to implement policies to overcome these problems in the future. The alternative is to take the sinew out of "lean but strong."

Even though the U.S. aerospace industry has experienced growth in sales over the past 14 years, its overall financial performance relative to many other industries strongly suggests that there is need for a change. Its rate of return on total capital invested has been consistently below that of all manufacturing over this period. In view of the greater than average degree of risk in the industry, the profit margins need to be higher than the average for other industries in order to attract equity capital without a dangerous erosion of present stockholders' equity. As a consequence, most new capital has been raised from bond offerings and bank loans resulting in an undesirably large increase in the debt/equity ratio which increases the difficulty and cost of raising additional capital even in "normal" economic times.

The capital intensity of the industry has increased gradually over the past 14 years and the ratio of total assets to sales now exceeds that for all manufacturing. The industry continues to have a considerably higher current capital to sales ratio—but a lower fixed capital to sales ratio—than the average for all manufacturing industries.

Investors' risk in the industry, as measured by the number of changes in direction in the rate of return movement over time, is considerably higher than for most other high-technology manufacturing industries. This high risk has presumably been the cause of generally lower price/earnings ratios and higher costs of equity capital in comparison with other industries. Similarly, the cost of debt capital has also been considerably higher for the aerospace industry over the past 14 years. Total capital costs plus depreciation, as a percentage of sales, have increased substantially over the years and now exceed the percentage for all manufacturing.

The aerospace industry generated almost $17 billion in capital between 1960 and 1973. About two-thirds of this total came from internal sources (retained profits and depreciation); approximately two-thirds of the remainder was raised by expanding debt and one-third by increases in equity capital. Over half of the total capital raised was spent on new plant and equipment and most of the balance was applied to working capital. Progress payments from the U.S. government increased to over $5 billion in the late sixties but have receded to a point closer to their 1960 level.

Aerospace industry output is rising after the sharp decline which began in 1968; profits are following the same upward trend. The industry has reached a time when it may look forward to a period of orderly growth, a time in which to strengthen itself for undertaking future generations of aerospace products. This interim will be valuable for improving overall financial performance and regaining aerospace investors' confidence which eroded during the past decade.

Despite advances in output, profits, and capital intensity, the overall financial performance of the industry coupled with the current economic climate restrict substantial amounts of new capital being raised. Fortunately, any external capital requirements in the immediate future appear minimal if profit rates can be maintained at recent levels. Major new programs will require external capital in sizeable amounts and consistent improvement in the rate of return over several years will be needed to regain investor confidence sufficient to meet these program needs as they arise.

Replacement and expansion of obsolete fixed facilities will place heavy demands on capital. It is estimated that approximately $11 billion will be needed for this purpose over the next ten years—$3 billion for expansion and $8 billion for replacement of fixed plant and equipment. The major expansion element is equipment which is projected to represent more than two-thirds of the book value of plant and equipment by 1983. Due to excess capacity in the industry, investment in plant and equipment should remain relatively stable over the next few years; but it will rise sharply in later years after this capacity is absorbed through diversification, internal growth, obsolescence or other means.

Other new capital needs should be relatively small. Some increase in working capital will be needed—perhaps a little over $1 billion. This requirement would be higher if government progress payments are reduced; however, such payments are now at about a ten-year low and no further reductions are expected.

*Those companies whose principal business in research, development and/or production of aircraft, missiles, spacecraft and their subsystems and component parts, such as engines and avionics.

Nearly all of these capital needs can be met from after-tax profits and depreciation after allowing for dividends averaging 40 percent of profits, assuming that the after-tax profit on sales averages around 3 percent and the sales projections are valid. After-tax profits have averaged about 2.5 percent of sales over the past decade; providing that this average rate is maintained over the next decade, external capital needs would amount to about $1 billion. If a 4 percent profit after tax could be achieved, a surplus of capital funds would be generated sufficient to retire about 30 percent of the present long-term debt.

The large financial commitments required to introduce future generations of commercial aircraft pose a complex dilemma for the future of the industry. Recent experience in the introduction of wide-bodied jets is an illustration of the necessity for enormous cash outlays by individual companies before they begin to recoup the investment. The size of these outlays will undoubtedly increase in future programs.

This study concludes with three recommendations for change in policy and strategy on the part of the aerospace industry and government.

☐ *Capacity Utilization* More effective utilization of the industry's existing capacity can be partially accomplished through further diversification and mergers. In addition, the traditionally defense and space-oriented aerospace industry is in a strong position to pursue national interest programs having a high-technology content such as energy, transportation, and a wide range of other domestic needs.

However, some changes need to be implemented before the industry can effectively pursue a large-scale diversification program through mergers or acquisitions; therefore,

It is recommended that the U.S. government in acknowledging the high-technology capabilities of the U.S. aerospace industry, take note of the financial condition of the industry relative to other industries and through official sanction, encourage, promote and approve any future aerospace industry mergers, acquisitions, joint ventures and other efforts for consolidation of industrial resources. This implies among other things re-examination of antitrust policies, corporate tax structures, and joint ventures and trade policies with foreign countries.

☐ *Research and Development* If R&D efforts are allowed to decrease, the future of the aerospace industry could be placed in jeopardy. The product development cycle of the industry is long in comparison with that of other durable goods manufactures and puts the aerospace industry into a high risk equity capital market. The high risk nature of equity capital in the industry combined with the future instability of the equities market makes the industry's ability to attract capital difficult to forecast. This being the case, the appeal of equity capital in the aerospace industry is not sufficient to attract short-term or even medium-term holders and can only attract the very long-term holders of securities.**

A decrease in R&D expenditures or a deferral of these expenditures into future periods may in the long-run reduce the industry to a position of economic instability or, at worst, a lack of future viability to exist in a worldwide competitive market; therefore,

It is recommended that the U.S. government recognize the right of private contractors to exercise management discretion on the content and amount of independent research and development (IR&D), and thus encourage industry to increase IR&D rather than decrease it, so as to maintain the U.S. position of technological leadership in the world. A common policy and practice of independence and allowability of IR&D which recognizes such expenditures as essential costs of business should be adopted by all government agencies.

☐ *Profits* Reasonable profit rates are important to the future viability of any profit-oriented business. It is most important that efforts be continued to improve profit rates on government contracts by more realistic contract terms, cost allowances—especially interest costs which are even more critical to profit levels in this current period of unprecedented high rates—and costing methods which are responsive to the inflationary cost pressures upon the industry and which allow appropriate compensation for capacity in plant and equipment (which could serve the country well in an emergency). Responding to this objective, however, actually means addressing the countless policies, procedures, orders, directives, reporting requirements, and other regulations, governing the procurement process throughout the U.S. government; therefore,

It is recommended that government policies, principles, regulations and practices be revised and conscientiously enforced in order to accommodate a basic national industry resource by, allowing profit rates commensurate with financial risk and which are adequate to attract sufficient capital necessary to assure an economically sound industry capable of meeting the nation's domestic, defense, and space needs of the future.

Concentration on short-term actions aimed at improving the financial health of the industry should not detract from attention to the solution of longer-term financial problems of securing adequate financing and arranging appropriate risk-sharing for the industry. However, the short-term actions are a necessary first step.

**While this statement was written during a period of uncertainties surrounding the entire economy in late 1974 it is nevertheless correct that the aerospace industry's equity capital problems have been and probably will continue to be more acute even after the economic upturn than many other U.S. industries.

1 INTRODUCTION

The aerospace industry during the decade 1958 to 1969 realized an increase in sales of over 80 percent, only to lose about one-third of that gain during the next three years. Employment followed a similar trend during the period, rising from about 1,000,000 employees to 1,500,000 and then falling to a low of 922,000 in 1972. Today, aerospace is a $27 billion per year industry, employing over 960,000 people, supplying aerospace products and services not only to domestic markets, but also exporting nearly $7 billion worldwide.

Understandably, these dramatic changes and fluctuations in business activity over such a short period necessitated changes in product and market orientation and in turn created complexities in production and management generally not known before in the aerospace industry. The transformation of the industry from a military product orientation to that of a broadly based, diversified product business, appears to have gained momentum during those "lean years" when the industry was reassessing its future.

The changes of this recent past have created financial strains on the industry; in general its financial performance does not compare favorably with other major U.S. industries. In looking toward the future, there is justification for examining the financial viability of the industry and cause for concern over the potential implications of possible remedial measures for the long-term outlook of the industry.

The ability of the industry to attract capital depends on the prospects for an adequate rate of return on equity capital. These prospects in turn depend on the projected level and stability of future demand for aerospace products and investor confidence in management. It is not sufficient that technical and demand conditions be favorable for the future; the investor must be convinced that these conditions are favorable. Otherwise, capital can only be raised by serious dilution of present stock participation, eroding investor confidence and making it even more difficult to secure further capital.

An industry cannot survive a combination of circumstances in which the future demand for its products is unknown and its rate of return is forced to remain at a low level. Elements of uncertainty in future demand must be balanced by higher rates of return in order to attract needed capital. Risk must be compensated. The aerospace industry currently has limited markets for its products, largely the U.S. government, foreign governments, commercial airlines, and general aviation. Future potential markets exist, however, in many other areas such as commercial space ventures and ground transportation systems. All of these markets are volatile and future markets, subject to considerable uncertainty. In this situation there are several alternative remedies:

- ☐ Sharing risk with the customer
- ☐ Higher rates of return
- ☐ Further diversification of the industry into other more stable market areas
- ☐ An acceptable form of government involvement
- ☐ Some combination of the above

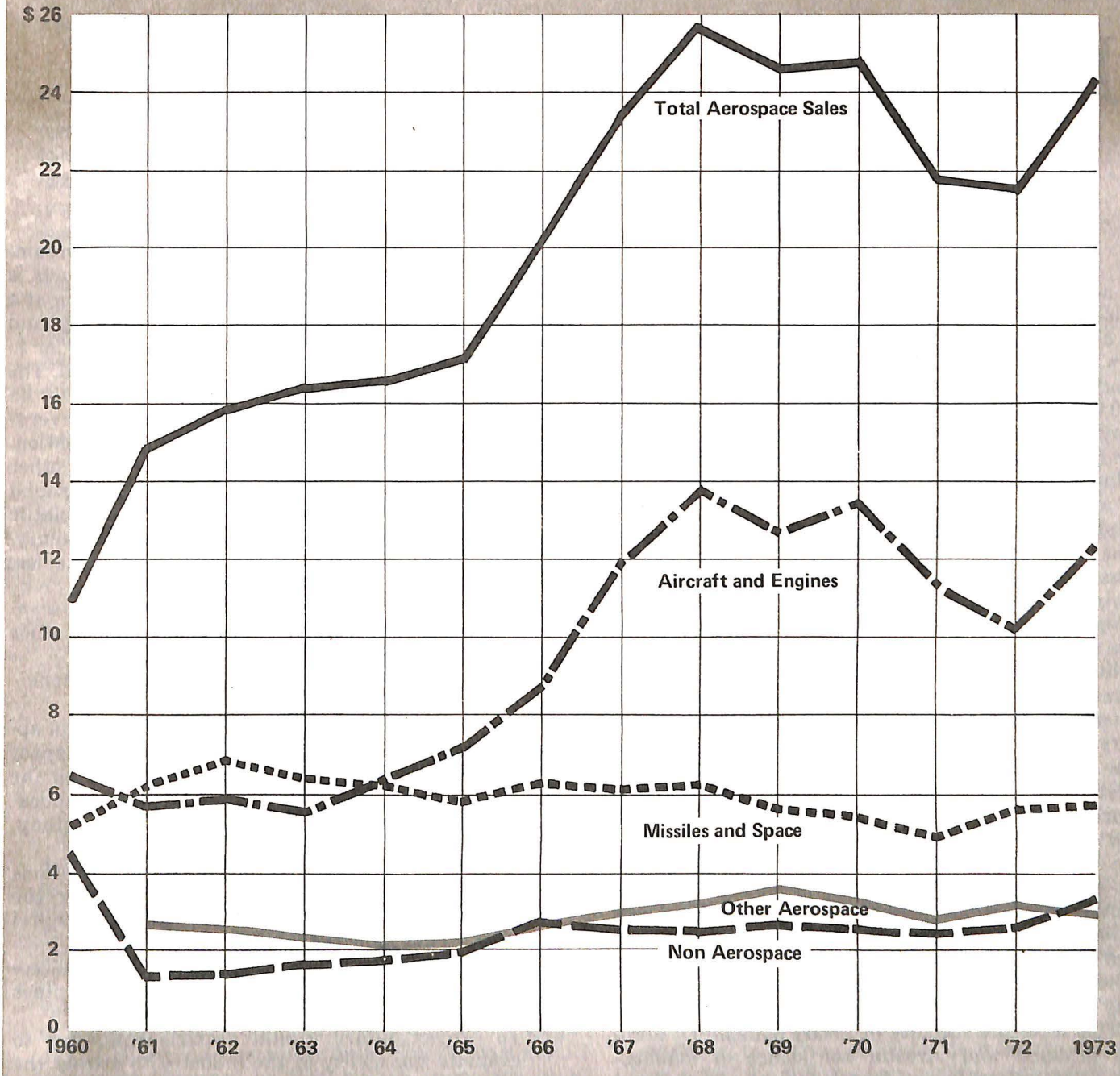
In view of the concerns discussed above and the apparent erosion of the capital base of the aerospace industry, it is important to identify the reasons for the loss of investor confidence and to analyze the implications of this for the future. The objectives of this study, therefore, are:

- ☐ To analyze past and current financial conditions in the aerospace industry and to identify the factors which have caused an erosion in the capital base of the industry.
- ☐ To compare—where possible and relevant—aerospace financial performance with that of other industries.
- ☐ To project future capital requirements, and to evaluate the ability of the industry to attract the needed capital.
- ☐ To evaluate feasible alternative remedial policies to improve the financial viability of the industry.

The objective of this study is to highlight relevant facts and provide insights for formulating policy actions to rectify a trend which holds potentially serious consequences for both the industry and the public sector.

Figure 1

AEROSPACE INDUSTRY SALES BY PRODUCT GROUP
1960-1973
(Millions of Dollars)



Source: Bureau of the Census, *Current Industrial Reports*, Series MQ-37D.

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FINANCIAL PROFILE
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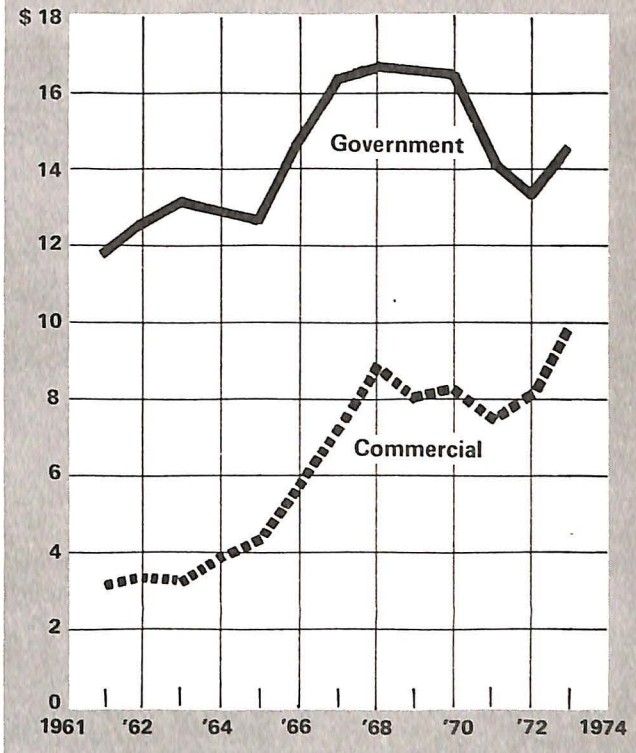
Figure 2

AEROSPACE INDUSTRY SALES
U.S. Government and Commercial
1961-1973
(Billions of Dollars)



Source: Bureau of the Census, *Current Industrial Reports*, Series MQ-37D.

The main purpose of this chapter is to present data on financial performance of the aerospace industry and to examine the adequacy of profit opportunities in relation to risks assumed by the industry. First, a general description of the industry's past behavior is presented, using such basic indicators as sales, growth and profit levels. Important financial variables are also introduced in the first section, and will be referred to later in the discussion of elements of risk.

The second section of this chapter examines alternative measures of return on sales, equity and total capital; discusses their merits; and compares all three aerospace returns against other industrial sectors. In analyzing the competitive position of the aerospace industry versus other manufacturing sectors, *relative* returns among different industries are used as measures rather than absolute levels of sales, profits, or even absolute growth rates. The comparison of rates of return among industries becomes an important criterion for evaluating the aerospace industry's relative health in the capital market.

The third section of Chapter 2 analyzes the difficult-to-measure element of risk, and its effect upon market rates of return.[1] Various indicators, or "proxies" of risk, are shown to fall more heavily on aerospace than on comparable industrial sectors.

The last section of this chapter discusses the implications of aerospace returns and related risks. It concludes that the aerospace industry compares unfavorably with many other industries which enjoy relatively higher profits and fewer risks.

[1] AIA, *Aerospace Profits vs. Risks*, June 1971.

Table 1

AEROSPACE INDUSTRY SALES PRODUCT AND CUSTOMER

(Millions of Dollars)

Year	TOTAL AEROSPACE			Aircraft and Engines			Missiles and Space Including Propulsion Units		
	Total	Other Customers	U.S. Government	Total	Other Customers	U.S. Government	Total	Other Customers	U.S. Government
1960	$ 10,997	$ N.A.	$ N.A.	$ 6,429	$ 2,183	$ 4,246	$ N.A.	$ N.A.	$ N.A.
1961	14,948	3,182	11,766	5,855	1,888	3,967	5,187	N.A.	N.A.
1962	15,972	3,420	12,552	5,900	1,772	4,128	6,078	N.A.	N.A.
1963	16,407	3,204	13,203	5,617	1,459	4,158	6,904	544	6,360
1964	16,686	3,871	12,815	6,431	1,863	4,568	6,381	623	5,758
1965	17,016	4,481	12,535	7,057	2,532	4,525	5,819	493	5,326
1966	20,227	5,697	14,530	8,725	3,267	5,458	6,241	605	5,636
1967	23,444	7,110	16,334	11,894	4,753	7,141	6,054	525	5,529
1968	25,592	8,957	16,635	13,850	6,439	7,411	6,076	497	5,579
1969	24,648	8,088	16,560	12,764	5,603	7,161	5,660	433	5,227
1970	24,752	8,345	16,407	13,466	5,880	7,586	5,422	390	5,032
1971	21,679	7,565	14,114	11,392	5,079	6,313	4,971	451	4,520
1972	21,499	8,007	13,492	10,153	5,199	4,954	5,598	673	4,925
1973	24,277	9,745	14,532	12,322	6,679	5,643	5,649	715	4,934

Source: Department of Commerce, Bureau of the Census, *Current Industrial Reports,* Series MQ-37D.

N.A.: Not available.

Note: Aerospace Industry Sales is based on Census sample from approximately 55 companies; "Sales" represents net sales on a company basis for those companies whose principal business is in aerospace. For those companies where aerospace is not the principal business, sales are reported on an establishment basis, where the principal business of an establishment can be identified as aerospace.

BASIC INDUSTRY DATA

During the past decade, total aerospace sales as defined by the Bureau of the Census, MQ-37D, climbed to over $25 billion through 1968, but registered absolute declines in three of the following four years (Table 1). In 1973 sales were reported at $24.3 billion, $1.3 billion less than in 1968. This drop represents a decline of 5 percent from 1968 levels with the major dollar value absorbed in aircraft sales of $1.5 billion, measured on a product basis, and in sales to the U.S. government of $2.1 billion, on a customer basis. Sales to commercial customers increased by $800 million from 1968 levels (Figures 1 and 2).

Of the decline in sales to the U.S. government (Figure 3), sales to the Department of Defense (DOD) represent the largest cutback in total dollar value ($3.7 billion) through 1973, or 22 percent off 1968 sales. Even sharper percentage declines (39 percent) were experienced from 1968 through 1973 in National Aeronautics and Space Administration (NASA) and Atomic Energy Commission (AEC) contracts, although this amounted to a much smaller portion of total dollar value loss since 1968. Slight increases in "non-aerospace" sales to the U.S. government by aerospace firms accounted for the only offset to both of these declines, increasing by about 30 percent over the same period.

Sales for 1973 increased 13 percent over 1972, measured in current dollars. Commercial sales for 1973 accounted for the greatest portion of this increase and rose by $1.7 billion, or 22 percent, over their 1972 levels.[2] U.S. government sales for the same period

[2]Bureau of the Census, *Current Industrial Reports*, Series MQ-37D.

Table 1
(continued)

Other Aerospace			Non-Aerospace
Total	Other Customers	U.S. Government	
$ N.A.	$ N.A.	$ N.A.	$ 4,568
2,676	852	1,824	1,230
2,553	762	1,791	1,441
2,293	682	1,611	1,593
2,153	735	1,418	1,721
2,172	759	1,413	1,968
2,624	869	1,755	2,637
2,916	1,002	1,914	2,580
3,117	1,040	2,077	2,549
3,525	986	2,539	2,699
3,220	896	2,324	2,644
2,793	884	1,909	2,523
3,102	1,035	2,067	2,646
2,995	948	2,047	3,311

were also up over their comparable 1972 levels, although this represented a smaller increase (7.7 percent), amounting to nearly $1 billion.

Measured in constant (i.e. deflated 1958) dollars,[3] the recent sales performance in aerospace is less optimistic (Figure 4 and Table A-1). "Real" product sales reported in constant 1958 dollars declined steadily from 1968 through 1972, from $22.3 billion to $15.9 billion. Deflated 1973 sales of $17.3 billion exceeded 1972 sales but still compared unfavorably with constant dollar sales for the peak years of the late sixties.

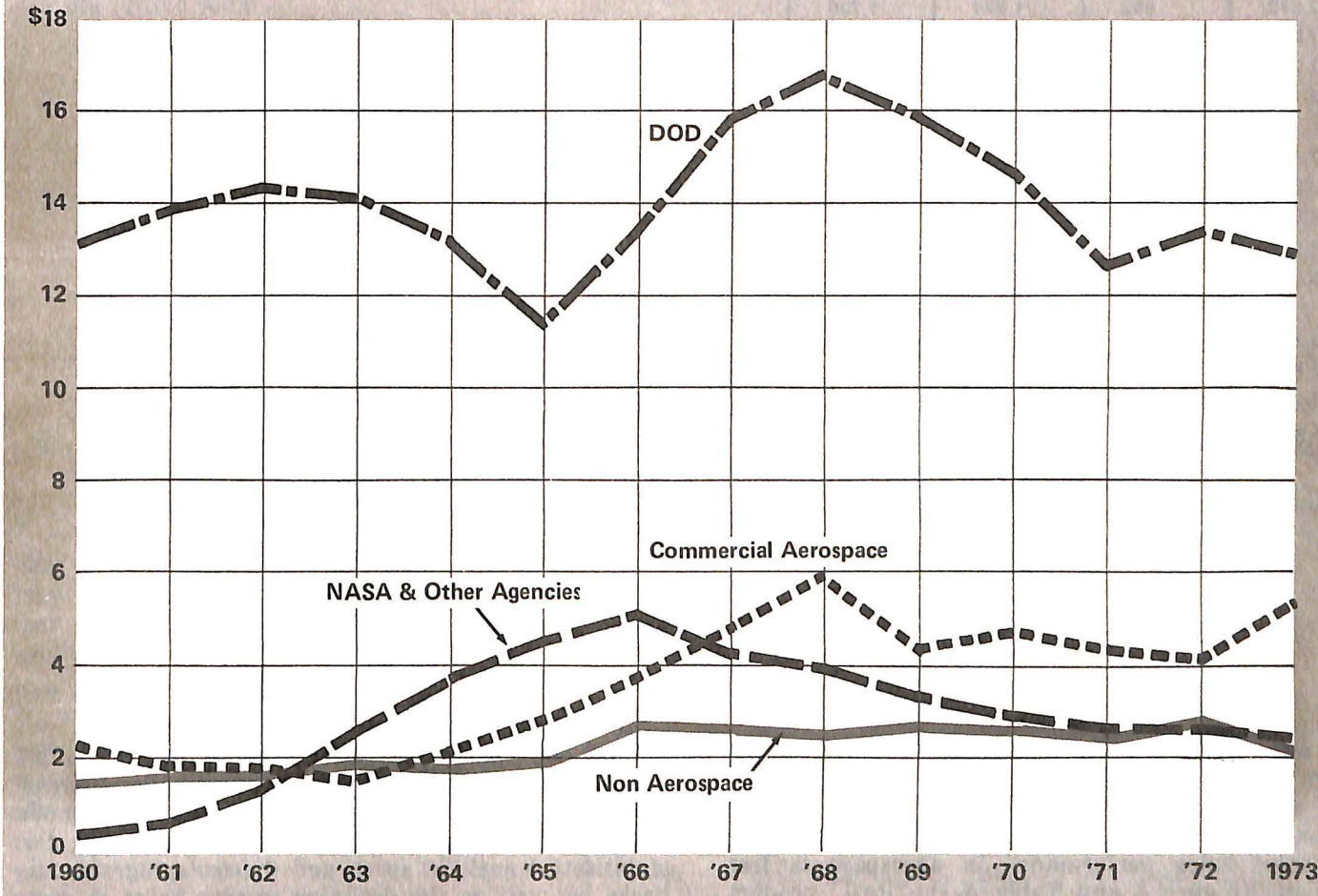
Total aerospace sales have stabilized (in constant prices) since 1971, and now represent a smaller share of total gross national product (GNP) and durable goods than was the case in 1968. Several causes for the stabilization include space and defense program cutbacks, as well as the declining growth rates in commercial air travel. A more permanent factor may also be the high unit value associated with this high-technology industry, and the unstable demand conditions implied in a monopsonist, or single-buyer, market for U.S. government sales.[4]

[3] *Ibid.* (Current dollar sales were converted to 1958 dollars by using unpublished shipment deflators for "Aircraft and Parts" developed by the Department of Commerce, Bureau of Economic Analysis, in connection with Gross Product Originating Accounts.)

[4] AIA, *Monopsony: A Fundamental Problem in Government Procurement*, May 1973.

Figure 3

AEROSPACE INDUSTRY SALES BY CUSTOMER
1960-1973
(Billions of Dollars)

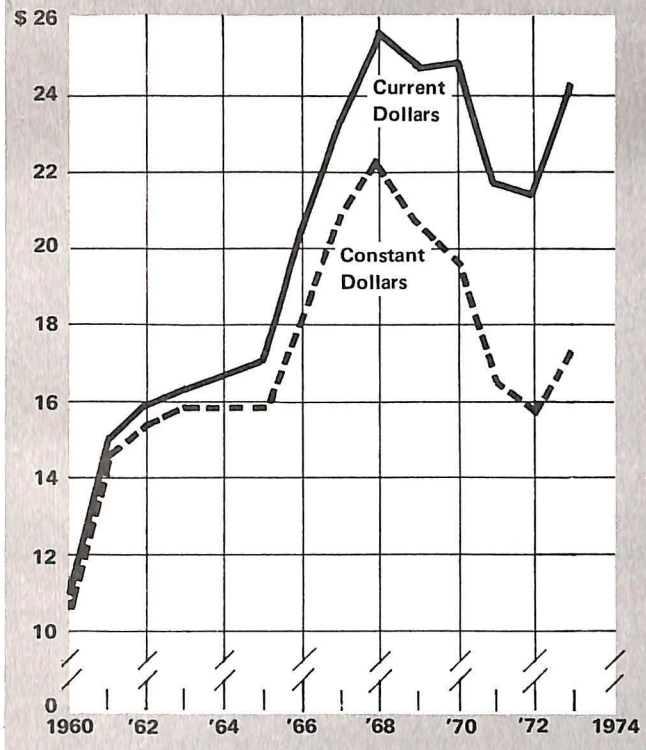


Source: AIA, *Aerospace Facts and Figures 1974/75*, p. 13, and Figures 1, 2 and 4.

Note: Sales data reflect AIA estimates of U.S. government sales and do not correspond exactly with industry sales reported in Table 1.

Figure 4

AEROSPACE INDUSTRY SALES
(Current and Constant 1958 Dollars)
1960-1973
(Billions of Dollars)



Source: Bureau of the Census, *Current Industrial Reports*, Series MQ-37D.

The sales decline experienced since 1968 is also reflected in swings in the backlog/sales ratios (Table A-2). Business cycles affect this ratio due to the different degree of growth felt in backlogs, which are more keyed to anticipated demands in the near future versus sales. Entering a period of upswing in the business cycle, growth in backlogs (unfilled orders) should be expected to outrun the growth in sales which are more geared to the demand conditions of the preceding period. Conversely, backlogs would tend to increase at a slower pace relative to sales or actually decrease at a faster rate at the beginning of a cyclical downtrend.

During the defense build-up associated with the mid-sixties, backlog/sales ratios increased from 0.9 to 1.4, from 1964 through 1966 (Figure 5). Thereafter, ratios declined from 1.3 in 1967 to 1.0 in 1970 for all aerospace products. The ratio for sales to the U.S. government fell from 1.0 to 0.8 for this same period, while that for commercial sales fell from 1.8 to 1.4.

Since 1963 commercial backlogs have averaged larger ratios to sales than is the case for U.S. government contracts. With few exceptions, this has held true for the entire decade, including the period 1964 through 1967. Backlog/sales in commercial sales ranged from 0.9 to 2.1 over this period, as opposed to lower government backlog/sales ratios of 0.9 to 1.1.

Profit levels also tended to follow the declines in aerospace output from 1968 through 1971, falling over one-half, or by over $430 million after taxes (Tables A-3 and A-4). Prior to 1968, profits had risen almost continuously, from $184 million in 1960 to $610 million in 1967. Since 1971 profits resumed this upward trend, but in 1973 still remained below 1968 levels.

A more accurate measure of industry performance relates profits earned to some activity base (such as sales, equity, or total capital invested[5]) for some given time span. As more fully discussed later, the three methods for measuring profits vary in their relative usefulness as measures of industry profit performance. At this point, however, several similarities may be noted with regard to these three measures of industry returns.

First, all aerospace rates of return grew steadily over time prior to 1969, and then fell each of the next three years (Table A-3). Rate of return on sales after taxes rose by 129 percent from 1960 to 1968, but then fell over 40 percent through 1971. Profits on equity capital grew by over 90 percent through 1968, declining 60 percent over the next three years. Finally, profits as a percent of total capital invested rose approximately 85 percent from 1960 to 1968, and dropped over 40 percent through 1971.

Second, all returns indicate similar trends over time, whether measured before or after taxes. The relative tax effect among the three different rates of return does not appear to have changed over time. For instance, both before and after-tax rates of return on sales remained low relative to return on total capital invested throughout the decade; and both measures of return were lower than returns on equity, whether or not taxes were deducted from profits.

Finally, all three measures of return indicate that 1973 rates still fall below those reached in 1968. These rates compare unfavorably with the performance of manufacturing returns as a whole in 1973, which have already exceeded their 1968 rates of return on equity (Table 2). As seen in the following section, aerospace profit performance—whether related to sales, equity, or total capital invested—has been below that of its counterparts in the rest of the industrial sector.

[5] National Bureau of Economic Research, *Capital and Rates of Return in Manufacturing Industries*, pp. 120 and 124.

RATES OF RETURN: AEROSPACE AND ALL MANUFACTURING

In comparing profit performance among industries (Tables 2 and A-4 and Figures 6, 7 and 8), three measures are generally accepted: profits as a percent of sales, profits as a percent of equity capital, and profits plus interest (or return to lender capital) as a percent of total capital invested. For purposes of comparability, all returns are based upon data taken from a single source,[6] the sample base of which has remained relatively uniform over time. All profit performance data represent a company-level reporting system, rather than the establishment-level system used in other sources (Table A-1).

Return on Sales

The rate of return on sales is probably the best known measure of profit and is perhaps useful for that reason alone. "Returns," or profits, are measured prior to dividend distributions and are defined as gross receipts less all costs. Before-tax profits are defined as gross profits before adjustments for federal income taxes.

Aerospace returns on sales have remained below the composite rate for all manufacturing since World War II. Profit rates have averaged approximately 60 percent of the returns for manufacturing as a whole on a before-tax basis, and 50 percent on an after-tax basis for the decade since 1963. This gap widened appreciably

Table 2

ALTERNATIVE RATES OF RETURN BEFORE AND AFTER TAXES

Aerospace and All Manufacturing

YEAR	ON SALES				ON EQUITY CAPITAL			
	Before Taxes		After Taxes		Before Taxes		After Taxes	
	Aerospace	Manufacturing	Aerospace	Manufacturing	Aerospace	Manufacturing	Aerospace	Manufacturing
1960	2.6%	8.0%	1.4%	4.4%	13.3%	16.6%	7.3%	9.2%
1961	3.7	7.7	1.8	4.3	19.8	15.9	9.8	8.9
1962	4.5	8.2	2.4	4.5	24.0	17.6	12.7	9.8
1963	4.3	8.5	2.3	4.7	21.5	18.4	11.3	10.3
1964	4.9	8.9	2.6	5.2	23.1	19.8	12.2	11.6
1965	6.1	9.5	3.2	5.6	28.4	21.9	15.1	13.0
1966	5.4	9.3	3.0	5.6	26.4	22.5	14.4	13.5
1967	4.8	8.3	2.7	5.0	23.1	19.3	12.8	11.7
1968	6.0	8.8	3.2	5.1	26.6	20.8	14.2	12.1
1969	5.4	8.4	3.0	4.8	18.9	20.1	10.6	11.5
1970	3.5	6.8	2.0	4.0	12.0	15.7	6.8	9.3
1971	3.2	7.1	1.8	4.1	10.4	16.5	5.8	9.7
1972	4.4	7.5	2.4	4.4	14.3	18.4	7.9	10.6
1973	4.9	8.0	2.9	4.7	17.5	21.8	10.3	12.8

Sources: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*
IRS, *Corporate Source Book of Income, 1960-1970.* Moody's Investors' Service, *Moody's Industrial Manual.*

[6] FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

during 1968 through 1971, a period of declining profits as well as output. During this time after-tax profits in aerospace fell from 3.2 percent to 1.8 percent of sales volume, while higher-level manufacturing returns fell less sharply from 5.1 percent to 4.1 percent. As a result, 1971 returns on sales for aerospace, at their lowest absolute level in over ten years, were also at their worst relative position compared with other industries.

Since 1971 profit returns on sales have improved gradually as aerospace returns began to recover in 1972. However, the comparative gap remains *vis-a-vis* other industrial rates of return with aerospace returns for 1973 at 2.9 percent as opposed to all manufacturing returns of 4.7 percent.

Table 2
(continued)

ON TOTAL CAPITAL INVESTED			
Before Taxes		After Taxes	
Aerospace	Manufacturing	Aerospace	Manufacturing
7.4%	11.8%	4.7%	6.9%
9.8	11.3	5.5	6.7
11.8	12.3	6.8	7.2
11.3	12.8	6.5	7.5
12.7	13.5	7.3	8.4
15.6	14.7	8.7	9.0
13.4	14.4	7.9	9.1
11.5	12.7	7.1	8.3
14.0	13.4	8.7	9.6
10.2	13.0	6.6	8.1
7.3	10.5	5.3	7.0
6.9	10.6	5.1	6.9
7.4	11.3	5.0	7.3
8.9	13.3	6.0	8.5

Return on Equity

Rate of return on equity capital is commonly used by investors in evaluating the future probabilities of profits and growth. It becomes a more useful measure of return than sales where there are different capital requirements among industries being compared. (This does not eliminate all capital structure variance, as will be discussed in the treatment of total capital invested.)

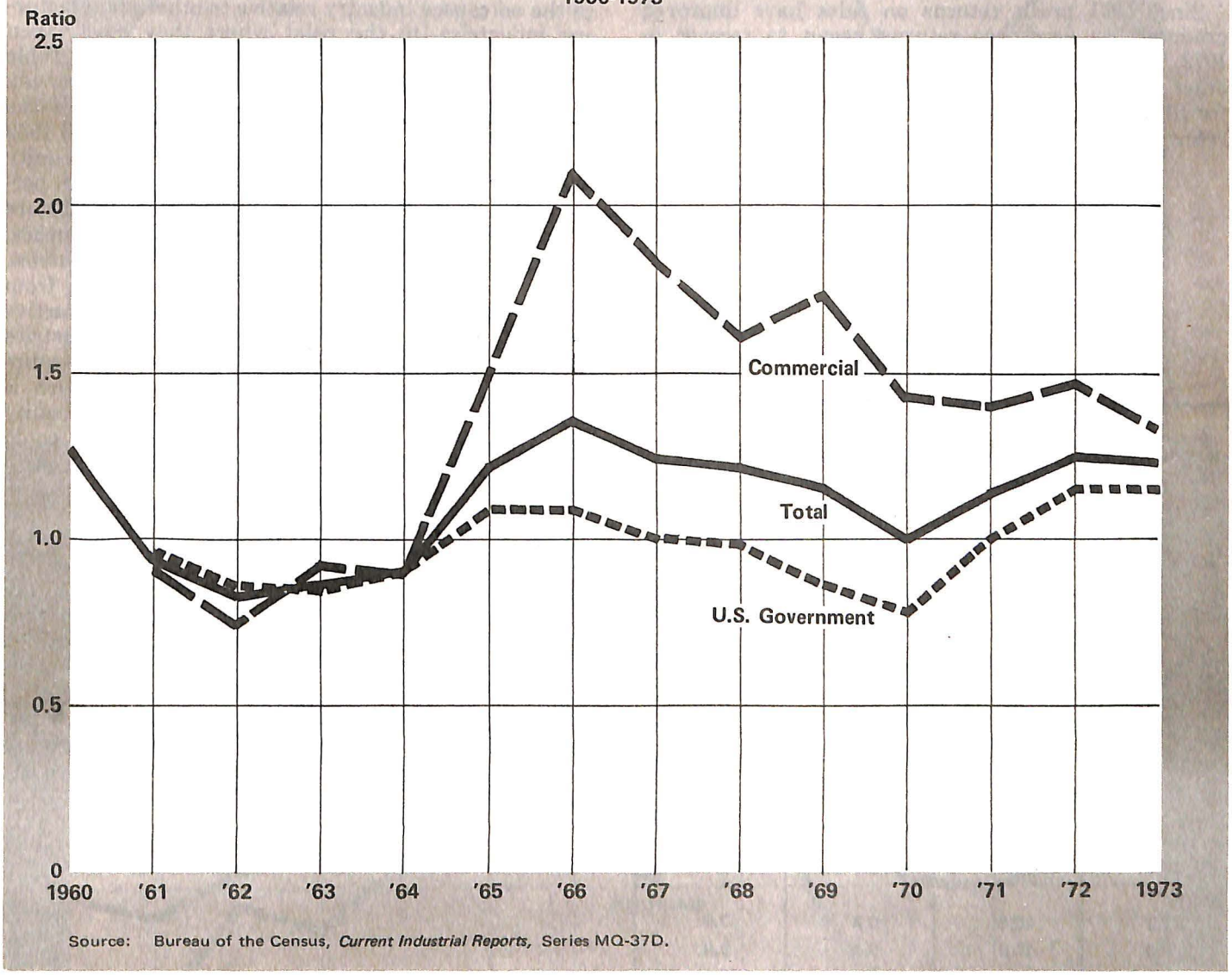
Over time, market returns on equity have declined in the aerospace industry relative to other manufacturing industries, to the point where they have fallen below composite industrial returns since 1969 (Table A-5). This has been true on both a before and after-tax basis, which have averaged about 75 percent of the composite industrial rate of return for the period 1969 to the present. After-tax returns to aerospace equity averaged 10.3 percent in 1973, as opposed to 12.8 percent for all manufacturing industries. Profits before taxes totaled 17.5 percent of equity for aerospace, versus 21.8 percent for all manufacturing industries.

This gap appears to be a significant change from earlier years when returns on equity were attractive relative to two out of four comparable industries (electrical machinery and general industrial equipment). This differential on equity rates of return is especially serious; if the market rate of return on equity fails to offer the investor a return which he could potentially earn elsewhere (from an investment with similar risks), the industry can expect difficulty in attracting or retaining capital.

In comparing returns among alternative investment opportunities, an investor evaluates the element of risk, assigning to any relatively "risky" investment an additional premium equal to the cost of added risk. Thus, total investment return would have to be high enough to cover alternative investment returns plus the added cost of risk involved. Since aerospace rates of return have compared unfavorably with other industries for several years, market rates of return are discouraging existing and potential lenders of equity capital.

Figure 5

AEROSPACE BACKLOG/SALES RATIOS 1960-1973



Source: Bureau of the Census, *Current Industrial Reports,* Series MQ-37D.

Return on Total Capital Invested

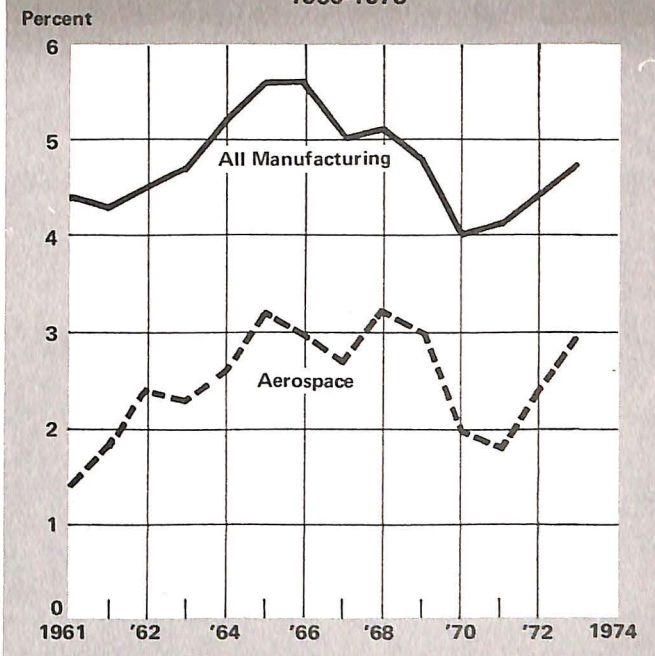
A third measure used for comparing relative profit performance among industries and firms is the rate of return on total capital invested.[7] It is superior to the return on equity capital, where there are differences among industries (or firms) in the composition of total capital or assets. Since debt/equity ratios vary considerably between aerospace and other industries (Table A-10), the ratio affects relative leverage, or the risk of equity financing. Theoretically, all other factors held equal, the higher the debt/equity ratio, the higher the risk involved. Returns on equity tend to reflect different levels of risk due to this factor and hence would not be comparable measures of return.

This difference in equity risks can be partially eliminated by basing the rate of return on "total capital invested." Total capital is defined here as the sum total of all assets less government progress payments. As pointed out by the Government Accounting Office (GAO),[8] this measure of capital lends itself well to comparisons of profits on negotiated government contracts under which interest paid is not an allowable expense (i.e., is treated as an addition to profits). In keeping with GAO practice, profits are defined to include interest paid (or return to lender capital) in addition to the return on equity capital in the form of corporate profits.

Throughout the last decade, rates of return on total capital invested for aerospace have averaged 85 percent of the rate earned by all manufacturing industries combined. Rates of return for aerospace fell appreciably from 1968 to 1971, and continued to decline through 1972, as opposed to returns on total manufacturing sales and equity which recovered that year. In 1973, aerospace returns to total capital did rise to 6.0 percent but still compared unfavorably with all manufacturing returns of 8.5 percent.

Figure 6

AFTER-TAX RATES OF RETURN AS A PERCENT OF SALES
Aerospace and All Manufacturing 1960-1973



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*
IRS, *Corporate Source Book of Income, 1960-1970.*
Moody's Investors' Service, *Moody's Industrial Manual.*

Total capital invested as a measure of the capital base helps to compensate for part of the differential due to debt/equity mix, and hence is considered by economists to be an especially meaningful measure of relative profit performance among industries. For this reason the trend over time in relative rates of return on total capital invested between aerospace and all manufacturing appears especially significant.

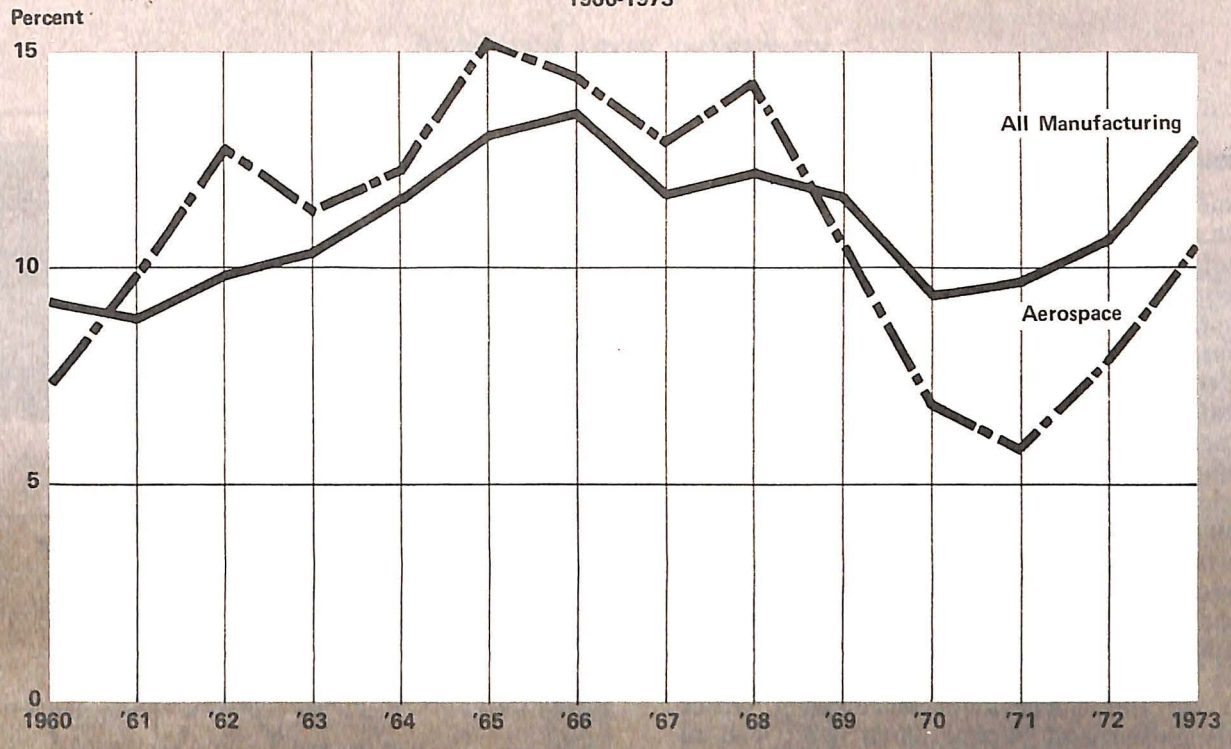
[7] AIA, *Aerospace Profits vs. Risks,* June 1971.

[8] GAO, *Defense Industry Profit Study,* Report to Congress, March 1971, pp. 13-14. This report points out that several factors influence the difference between defense contractors ECI's and TCI's and those of other industries. Substantial amounts of capital provided by the government in the form of progress payments, cost reimbursements, equipment and facilities reduce capital investment requirements from the contractors for defense work. Additional analysis is required to fully document the true value of the impact caused by these factors.

Figure 7

AFTER-TAX RATES OF RETURN AS A PERCENT OF EQUITY CAPITAL

Aerospace and All Manufacturing
1960-1973

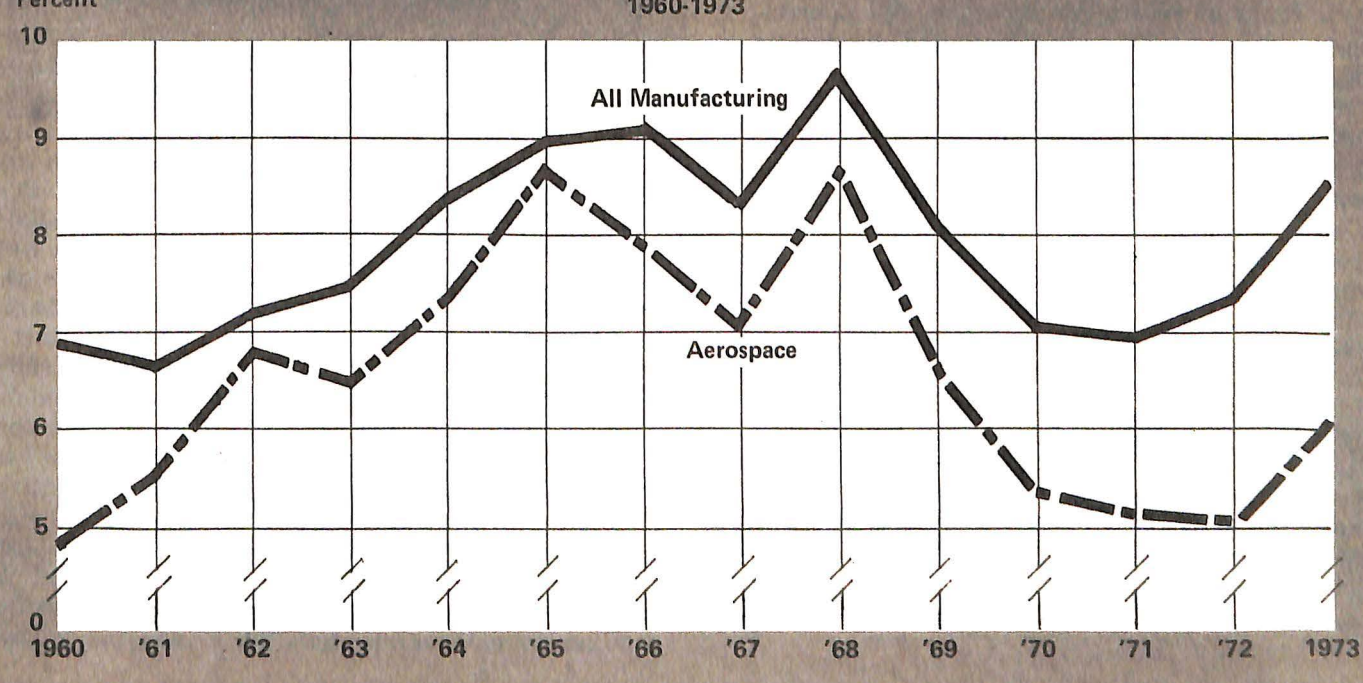


Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations*
IRS, *Corporate Source Book of Income, 1960-1970.* Moody's Investors' Service, *Moody's Industrial Manual.*

Figure 8

AFTER-TAX RATES OF RETURN AS A PERCENT OF TOTAL CAPITAL INVESTED

Aerospace and All Manufacturing
1960-1973



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations*
IRS, *Corporate Source Book of Income, 1960-1970.* Moody's Investors' Service, *Moody's Industrial Manual.*

FACTORS AFFECTING RETURN

Unmeasured Capital

Any rate of return based on total capital still has some limitations if used directly as a measure of relative profit performance among industries. First, it may fail to include the non-capitalized investments in specialized personal skills often referred to as "human capital." Second, some R&D expenditures also represent intangible assets (such as patents, licenses, and documentation of R&D findings) which could be capitalized but often are not. Third, it also excludes from the definition of "capital" those fixed assets which are leased rather than owned. There are no easy solutions to measuring these types of capital, but it should be noted that they do represent elements of capital risk which must be reflected in the rates of return needed to attract capital investment.

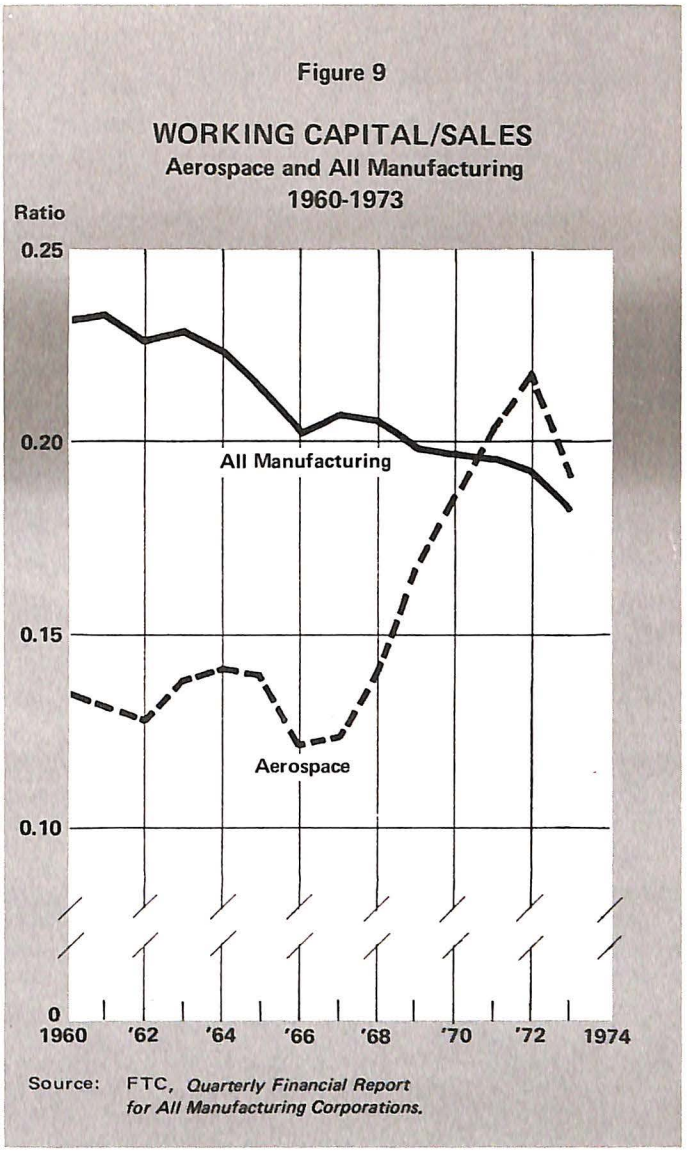
Capital Turnover Rates

Another qualification should be added when using the rate of return on total capital invested as a measure of profit performance among different industries. Varying levels of risk may be associated with this measure of return due to different capital turnover rates. The capital turnover rate, or the ratio of capital to sales volume, shows the level of capital which is needed to produce a dollar of sales over a unit of time. If different risks are associated with the degree of capital which is "tied" to output, this would not be reflected in a rate of return on capital alone. It ignores the functional relationship of capital to sales which is especially important for current assets and working capital.

The ratio of total assets/sales (Table A-6) has increased dramatically for the aerospace industry since 1969, and as a result has exceeded the ratio for all manufacturing since then. Increases in ratios of current assets/sales explain most of this, as cash and inventories have grown more rapidly relative to smaller increases in sales since 1969. For instance, current assets jumped by $2.9 billion, a rise of 22 percent, from 1968 to 1973 (Table A-7). The ratio of current assets/sales for 1973 was 0.54 for aerospace versus 0.36 for manufacturing; throughout the last decade aerospace has averaged ratios about 25 percent higher than all manufacturing.

This differential also outweighs the effect of the rates of fixed assets to sales, which are low relative to other manufacturing ratios, but which account for less than 15 percent of total aerospace assets. In 1973 total capital turnover rates were nearly 0.8 for aerospace versus about 0.7 for all manufacturing.

Figure 9



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Working capital, or the residual of current assets less current liabilities, has also increased since 1970 to the point where working capital/sales ratios exceed comparable ratios in other manufacturing (Figures 9 and 10). Of all three types of assets, working capital tends to be most closely tied to particular sales, and hence is most risky in the sense of potential loss or discard in the event of an uncompleted sale. In 1973 working capital/sales was 0.19 for aerospace versus 0.18 for all manufacturing (Table A-6).

Table 3

CAPITAL/LABOR INTENSITY

Aircraft and All Manufacturing

YEAR	FIXED CAPITAL (Millions of 1958 Dollars)		PRODUCTION WORKERS (Thousands)		TOTAL EMPLOYEES (Thousands)	
	SIC 372	Manufacturing	SIC 372	Manufacturing	SIC 372	Manufacturing
1960	$ 3,695	$ 176,780	409.2	12,209.5	678.7	16,149.9
1961	3,983	180,358	399.3	11,778.5	692.6	16,729.6
1962	4,065	184,263	401.6	12,126.5	715.2	16,154.7
1963	4,137	188,427	390.3	12,232.0	679.4	16,231.9
1964	4,165	193,858	359.9	12,403.0	640.8	16,485.7
1965	4,224	201,794	376.7	13,076.0	643.3	17,250.5
1966	4,610	212,370	452.5	13,826.5	745.1	18,200.3
1967	5,070	223,034	489.3	13,955.3	802.0	18,492.0
1968	5,360	232,280	487.3	14,042.5	809.6	19,527.6
1969	5,633	242,085	445.7	14,359.6	773.1	20,037.4
1970	5,677	250,308	361.0	13,528.0	648.2	19,217.2
1971	5,573	256,658	284.6	12,874.9	515.5	18,363.1
1972	N.A.	263,743	280[p]	13,200[p]	488[p]	18,648[p]

Source: BLS, *Study on Fixed Capital for the Non-Residential Business Sector, 1890-1973;* (deflated gross book values).
Bureau of the Census, *Annual Survey of Manufacturers;* (employee counts).

Note: Employment data is not in agreement with data cited in other AIA reports and publications, the source of which is the U.S. Department of Labor.
SIC 372: Aircraft and Parts.
p Preliminary.

Capital/Labor Intensity

As discussed above, total capital turnover rates in aerospace have exceeded comparable ratios for all manufacturing since 1969. Most of this has been due to high ratios of current assets relative to sales, rather than in fixed capital (i.e., plant and equipment). As in Table A-6, fixed capital/output ratios for aerospace have averaged about half those for all manufacturing, when "fixed capital" is measured in net book values and "sales" is reported in historical dollars.

In the case of capital/labor ratios, it is customary to define capital in "real," or constant-dollar base values, and to relate this measure to labor inputs, or numbers of employees. "Capital" is defined here as a fixed input and includes only depreciable assets which are tangible, i.e., plant and equipment.

Although estimates of deflated capital stocks can be made for the whole aerospace industry, deflated capital stock series for all three-digit SIC industry codes have also been compiled by Jack Faucett Associates for the Bureau of Labor Statistics (BLS). This latter series was used for purposes of deriving capital/labor ratios, on a comparable (establishment) basis of reporting, rather than combining company-level measures of fixed assets (Table A-6) with establishment-level labor inputs.

Throughout the last decade, capital/labor ratios for aircraft and parts (SIC 372) have reflected relatively low capital/labor intensities compared with all manufacturing (Table 3). While capital per aerospace employee ranged from $5,444 to $10,811 from 1960 to 1971, comparable figures were much higher for manufacturing and grew from $10,946 in 1960 to $13,977 in 1971. For the same period, capital per production worker rose from $9,029 to $19,582 in aerospace, while growing from $14,479 to $19,935 in all manufacturing.

Recently, capital/labor intensity has increased in aerospace at a faster rate than the composite of all manufacturing. From 1969 to 1971 capital per production worker for the aerospace industry grew from 66 percent to 98 percent of all manufacturing ratios, while capital per each employee rose from 55 to 77 percent, respectively.

Table 3
(continued)

CAPITAL/LABOR INTENSITY			
Per Production Worker		Per Each Employee	
SIC 372	Manufacturing	SIC 372	Manufacturing
$ 9,029	$ 14,479	$ 5,444	$ 10,946
9,975	15,313	5,751	10,781
10,122	15,195	5,684	11,406
10,600	15,404	6,089	11,608
11,572	15,630	6,500	11,759
11,213	15,432	6,566	11,698
10,188	16,557	6,188	11,669
10,362	15,982	6,322	12,061
10,979	16,541	6,608	11,895
12,639	16,859	7,286	12,082
15,726	18,503	8,759	13,025
19,582	19,935	10,811	13,977
N.A.	19,980	N.A.	14,143

Capital expenditures (Table 4) may partly explain the increase in capital/labor intensity since 1969, although constant-dollar capital investments may have declined somewhat. More significantly, however, labor cut-backs have noticeably altered the realtive "mix" of capital versus labor between 1969 and 1971. While layoffs in the aircraft industry have amounted to 63 percent from 1969 through 1972, all manufacturing fell less than 10 percent for that same period, whether measured by production workers or total employees.

Thus, aircraft experienced a decline in labor relative to capital at least through 1971. Although there may be success in eliminating excess capital capacity in the next few years, capital intensity continued to increase relative to labor between 1969 and 1971. Some of this trend may have represented shifts toward more capital-intensive production technology during a period of rising labor costs. However, it appears more likely that declining sales were responsible and that aircraft producers were unable to disinvest in fixed capital capacity as easily as they could reduce labor inputs.

Debt/Equity Ratios

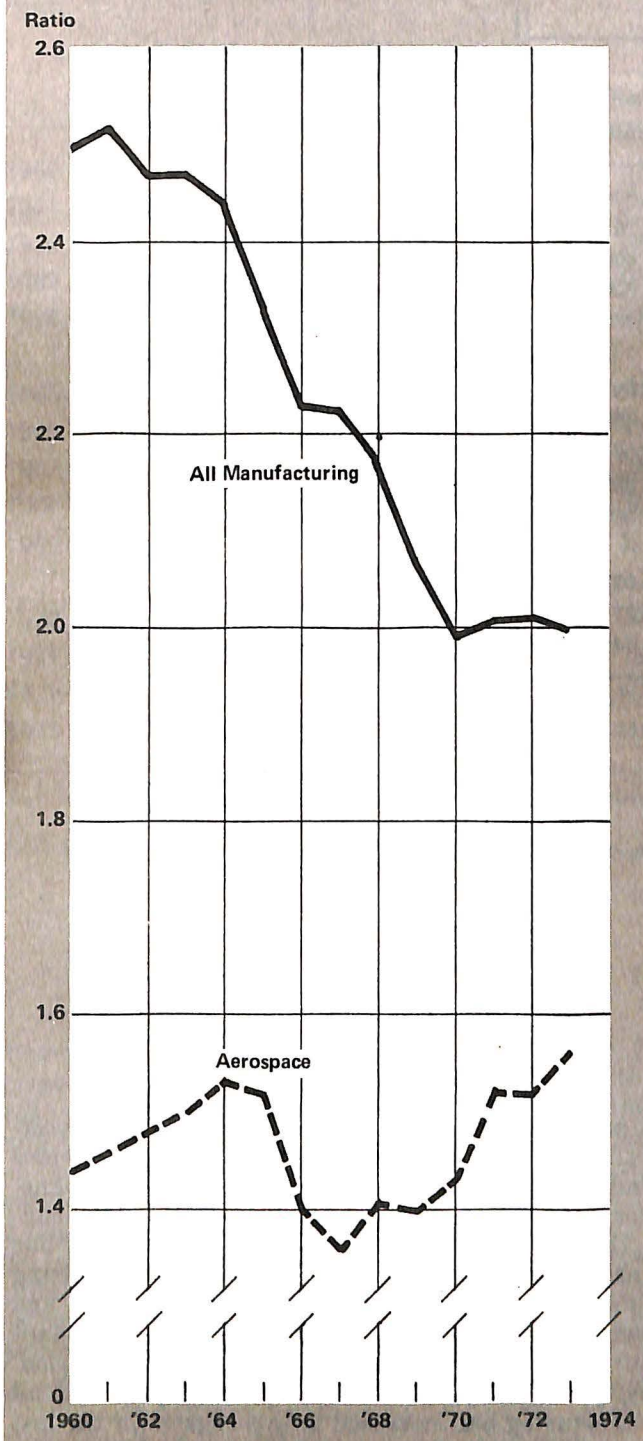
A partial measure of the inherent risk of an investment is the ratio of debt to equity capital; this provides an indication of the "mix" of equity versus debt financing or the relative "leverage" assumed by equity lenders. The ratio of aerospace long-term debt to equity has increased continuously, rising from 0.24 to 0.49 during the decade 1964 through 1973 (Figures 11 and 12 and Tables A-9 and A-10). Comparable ratios for manufacturing vary from 0.20 to 0.33 for the same period. Thus, the differential risk between aerospace and all manufacturing has increased in this regard for the last decade. Whereas aerospace long-term debt/equity ratios were 20 percent higher than manufacturing in 1964, this difference had grown to 50 percent by 1973.

Figure 10

CURRENT ASSETS/CURRENT LIABILITIES

Aerospace and All Manufacturing

1960-1973



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Compared with selected industries (Figure 12 and Table A-10), the difference in these ratios is even more noticeable. Since 1967 four comparable industries ranged from 0.10 (motor vehicles) to 0.37 (electrical equipment). Through 1970 rises in long-term debt relative to equity were due mostly to a growing volume of corporate bond issues and long-term bank loans. Since 1960 the total of long-term bonds and bank loans have doubled relative to equity financing, growing from 25 to 50 percent of total net worth. Other non-current liabilities have also grown dramatically relative to total capital, but still account for a small share of total long-term financing.

As aerospace firms have resorted more heavily to debt financing, it is interesting to note the trend in sources of debt (Table 5). Long-term bank loans (of over one year) have grown from 6 percent to over one-third of all debt financing since 1960. Other sources (private placements and public issues of bonds) accounted for two-thirds of long-term debt in 1973; in 1960 they provided almost all long-term debt financing for aerospace.

Research and Development as a Percent of Sales

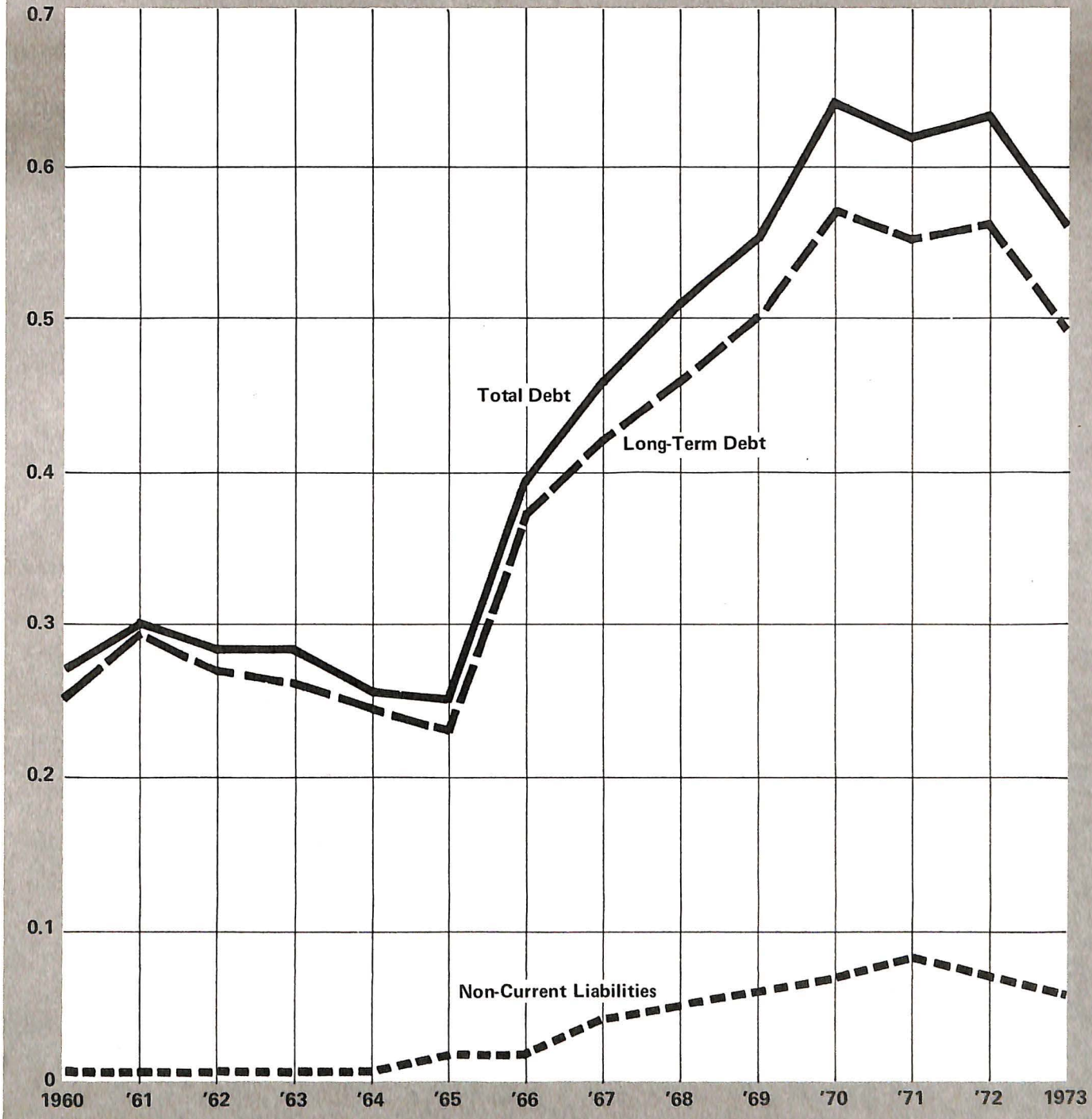
Aerospace products have always required substantial investments in R&D due to the high-technology component of much of its output. When measured as a percent of sales, 1972 R&D expenditures in aerospace were about 16.3 percent, as opposed to 3.4 percent in all manufacturing (Figure 13 and Table A-11). Aerospace R&D represents one-half of total federal expenditures in this field. Comparable industries fall quite short of aerospace, ranging from levels of 8 percent of total sales (electrical equipment) to 3.5 percent (motor vehicles).

Implicit in this relationship between R&D and total output is a high degree of risk due to the uncertainty of funding. From 1964 through 1972, federal funding for aerospace research fell from 26 to 13 percent of the total value of aerospace output, or by over $370 million. This drop in federal spending was countered by an increase of company-funded expenditures for R&D from $457 million in 1964 to $1.1 billion in 1967 (Table 6).

In addition to the obvious risk associated with continuing adequate funding, R&D expenditures also increase risk due to the longer time span involved, compared to normal production. The higher the percentage of total sales which is tied to successful completion of the research or prototype phase, the higher is the level of risk. In addition, inflationary conditions can exacerbate the inherent risk due to the possibility of cost overruns in prototype development.

Figure 11

AEROSPACE INDUSTRY DEBT/EQUITY RATIOS
1960-1973



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Table 4

AEROSPACE CAPITAL EXPENDITURES

Current and Constant 1958 Dollars
(Millions of Dollars)

YEAR	CAPITAL EXPENDITURES		PLANT AND EQUIPMENT AS A PERCENT OF TOTAL CAPITAL EXPENDITURES			
	Current Dollars	Constant Dollars	Current Dollars		Constant 1958 Dollars	
			Plant	Equipment	Plant	Equipment
1960	$ 340	$ 338	31 %	69 %	32 %	68 %
1961	300	297	34	66	34	66
1962	400	392	05	95	35	65
1963	450	438	05	95	34	66
1964	420	404	22	78	22	78
1965	460	435	34	66	33	67
1966	920	841	41	60	38	62
1967	930	826	32	68	36	64
1968	860	740	26	74	21	79
1969	830	684	28	72	26	74
1970	540	421	29	71	26	74
1971	380	289	16	84	14	86
1972	430	N.A.	N.A.	N.A.	N.A.	N.A.
1973	530	N.A.	N.A.	N.A.	N.A.	N.A.

Source: Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business,* January 1970, p. 29; December 1970, p. 15; December 1971, p. 18; January 1974, p. 11; (capital expenditures).
Bureau of Labor Statistics, Capital Stocks Study (unpublished), (investment deflators); SIC 372, Aircraft and Parts.

DOD Contract Returns Versus Risks

Government contracts since World War II tend to represent the largest single source of income for the aerospace industry, as seen in Figure 2. Given this condition, much interest has centered on empirical studies of rates of return on commercial versus government contract profits. Recently, studies conducted by the Logistics Management Institute[9] and by the GAO[10] have indicated that government contracts are less profitable than commercial contracts, when measured as a percent of sales, and in more recent years even as a percent of total capital invested.

This study's sample of 14 aerospace firms (Figures 14 and 15 and Table 7), representing approximately 80 percent of the total industry, supports this finding. During the period 1968 through 1972, firms which were more oriented to government contracts (i.e., reporting over 60 percent of total sales as government work) averaged net income equal to 1.7 percent to 2.1 percent of total sales. On the other hand, commercially-oriented and mixed-market firms (i.e., reporting over 60 percent of total sales to customers other than government) enjoyed rates of 2.1 to 3.0 percent. Rates of return on equity for commercial and mixed-market firms ranged from 8.6 percent to 14.9 percent, as compared to a range of 6.8 percent to 10.9 percent for government-oriented firms.

This suggests that the low returns which the aerospace industry has been suffering during the recent past may be in part due to a high level of government contract work. Immediate explanations of low profits

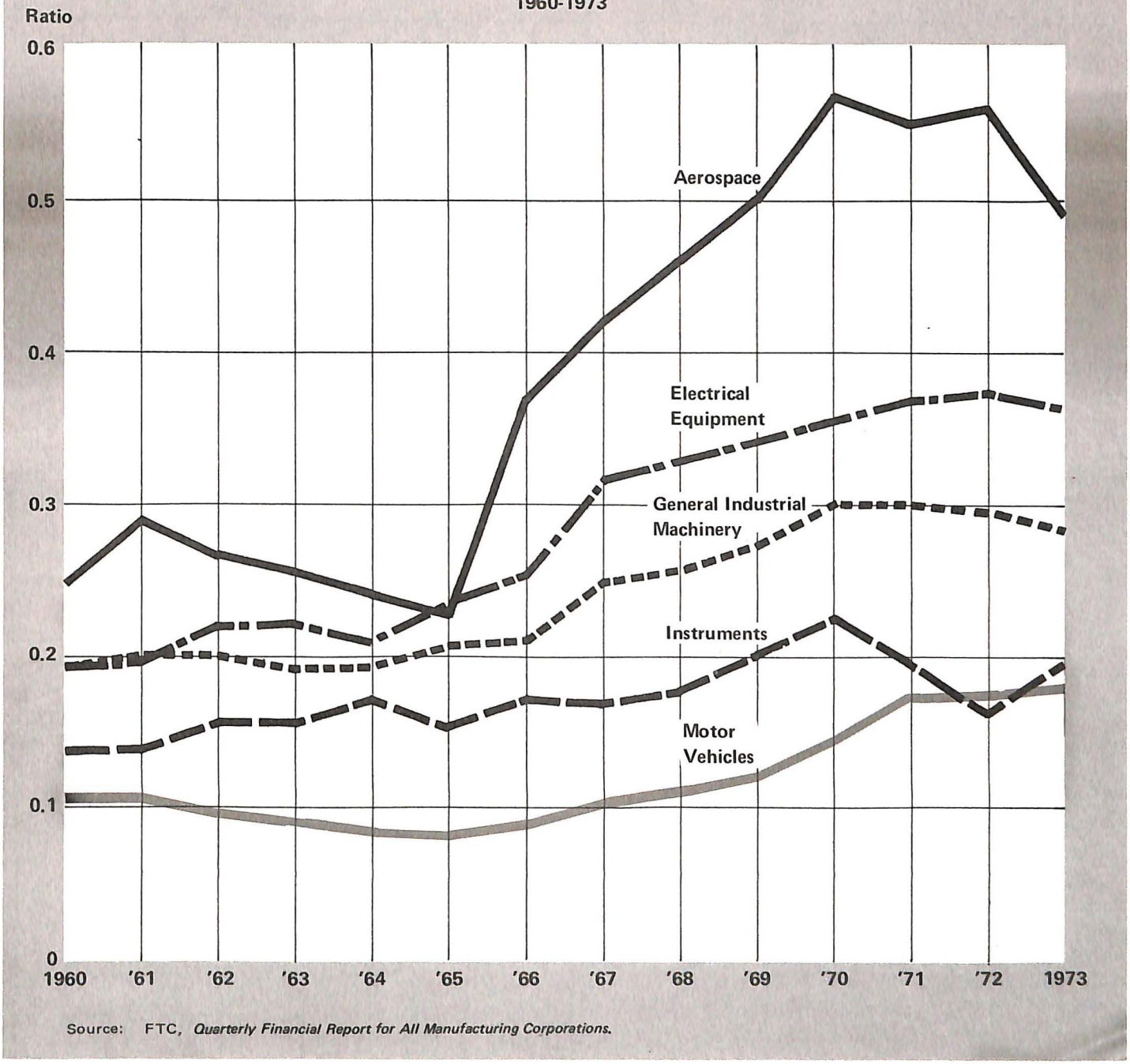
[9]LMI, "Defense Industry Profit Review," Task 69-27, March 1970.

[10]GAO, *op. cit.*

Figure 12

LONG-TERM DEBT/EQUITY RATIOS

Aerospace and Selected Manufacturing Industries
1960-1973



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

might include the disallowability of interest and certain research expenses as a reimbursable expense of government contract work. More underlying causes might be found in the high unit value and long lead-time requirements associated with aerospace output, which runs considerable risk of cost overruns during periods of inflation. This risk can be considerable for any single firm.

Table 5

AEROSPACE INDUSTRY SOURCES OF LONG-TERM DEBT
(Millions of Dollars)

YEAR	TOTAL		FROM BANKS			OTHER SOURCES		
	Current Dollars	Index 1960-100	Current Dollars	Index 1960-100	Percent of Total	Current Dollars	Index 1960-100	Percent of Total
1960	$ 645	100	$ 78	100	5.7 %	$ 567	100	94.3 %
1961	806	125	37	47	12.1	769	136	87.9
1962	783	121	30	38	4.6	753	133	95.4
1963	835	129	40	51	3.8	795	140	96.2
1964	803	124	60	77	7.5	743	131	92.5
1965	818	127	135	17	16.5	683	120	83.5
1966	1,511	234	433	56	28.7	1,078	190	71.3
1967	2,261	351	528	68	23.4	1,733	306	76.6
1968	2,930	454	1,013	130	34.6	1,917	338	65.4
1969	3,618	561	1,434	181	39.6	2,184	385	60.4
1970	4,113	638	1,788	229	43.5	2,325	410	56.5
1971	4,004	621	1,383	177	34.5	2,621	462	65.5
1972	4,229	656	1,598	204	37.8	2,631	464	62.2
1973	4,159	645	1,506	193	36.2	2,653	468	63.8

Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Table 6

AEROSPACE INDUSTRY
RESEARCH AND DEVELOPMENT EXPENDITURES
By Source of Funds
(Millions of Dollars)

YEAR	TOTAL			FEDERAL			COMPANY		
	Current Dollars	Index 1960=100	Percent of Net Sales	Current Dollars	Index 1960=100	Percent of Net Sales	Current Dollars	Index 1960=100	Percent of Net Sales
1960	$ 3,514	100	23.2 %	$ 3,150	100	20.8 %	$ 364	100	2.4 %
1961	3,829	109	23.5	3,438	109	21.1	392	108	2.4
1962	4,042	115	23.8	3,588	114	21.1	454	125	2.7
1963	4,712	134	26.7	4,261	135	24.1	452	122	2.6
1964	5,078	145	28.3	4,621	147	25.8	457	125	2.5
1965	5,148	146	27.0	4,499	143	23.6	649	178	3.4
1966	5,526	157	23.7	4,724	150	20.3	802	220	3.4
1967	5,669	161	19.7	4,531	144	15.7	1,138	313	4.0
1968	5,776	164	17.4	4,544	144	13.7	1,232	339	3.7
1969	5,909	168	18.3	4,554	145	14.1	1,355	372	4.2
1970	5,245	149	16.0	4,032	128	12.4	1,213	333	3.7
1971	4,940	141	15.9	3,928	125	12.6	1,012	278	3.3
1972	5,177	147	16.3[p]	4,250	135	13.2[p]	927	255	3.1[p]

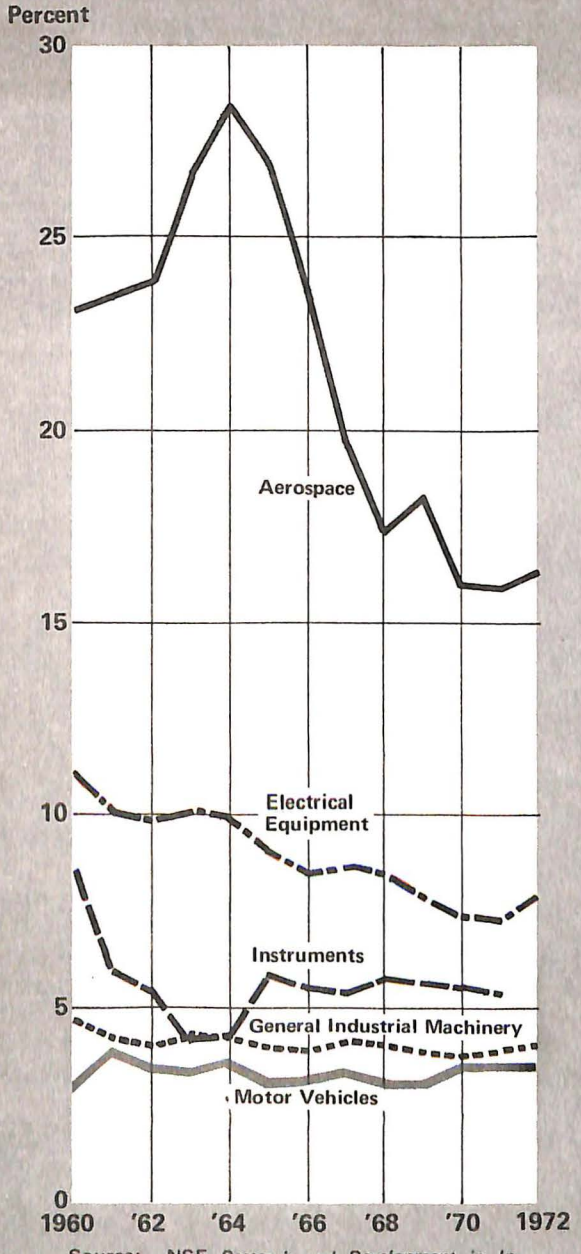
Source: National Science Foundation, *Research and Development in Industry: 1971,* NSF 73-305, Table B-3, B-7, B-11, B-39 and B-41 (1960-1971); NSF Science Resources Studies, *Highlights,* NSF 73-317, p. 3 (1972).

p Unofficial preliminary estimates.

Figure 13

RESEARCH AND DEVELOPMENT AS A PERCENT OF SALES

Aerospace and Selected Industries
1960-1972

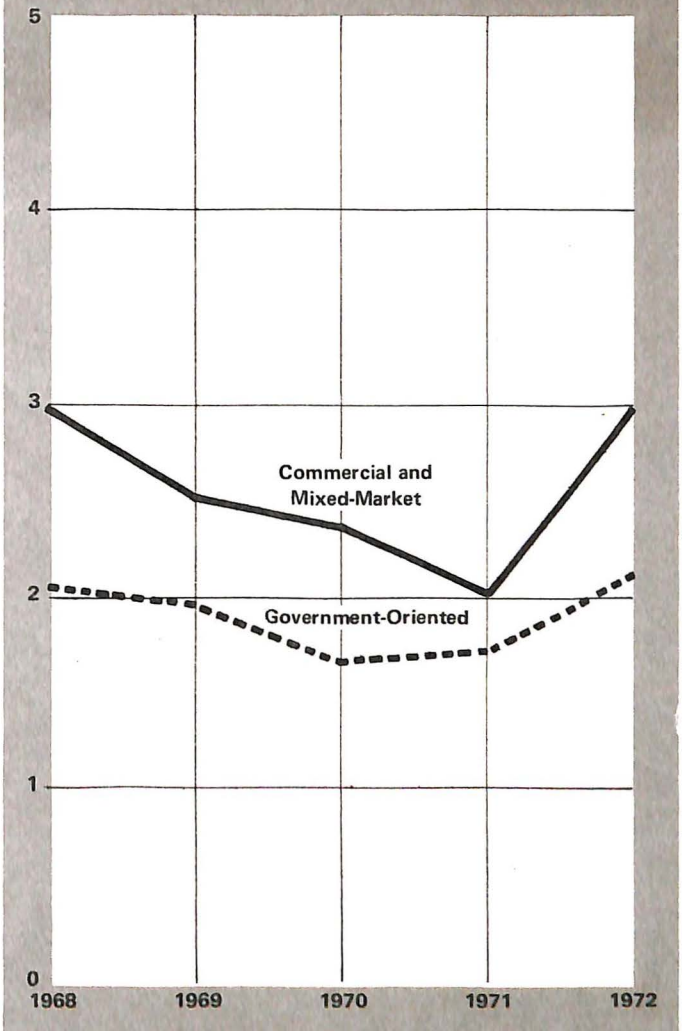


Source: NSF *Research and Development in Industry: 1971,* Table B-39, NSF 73-305 (1960-1971). NSF *Science Resources Studies Highlights,* NSF 73-317 (1972).

Figure 14

AEROSPACE NET PROFITS/SALES

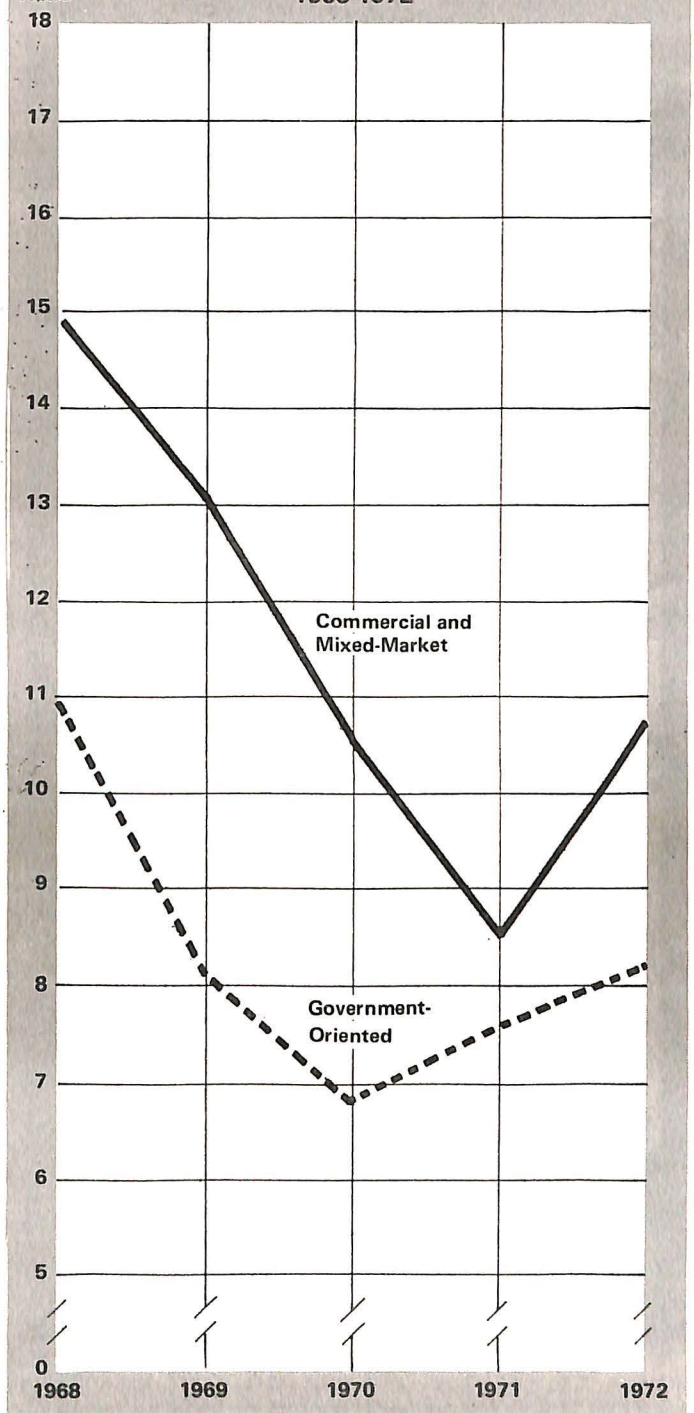
Commercial and Mixed-Market vs. Government-Oriented
1968-1972



Source: AIA sample of 14 aerospace contractors for which weighted average rates of return on net sales were computed.

Figure 15

AEROSPACE NET PROFITS/EQUITY
Commercial and Mixed-Market vs. Government-Oriented
1968-1972



Source: Selected sample of 14 aerospace contractors for which weighted average rates of return on net sales were computed.

Table 7
AEROSPACE RATES OF RETURN
Government Oriented vs. Commercial and Mixed Market Firms
1968-1972

YEAR	COMMERCIAL AND MIXED MARKET		GOVERNMENT ORIENTED	
	As a Percent of		As a Percent of	
	Sales	Equity	Sales	Equity
1968	2.89%	14.88%	2.03%	10.94%
1969	2.56	13.20	1.90	8.17
1970	2.41	10.64	1.67	6.84
1971	2.10	8.55	1.69	7.57
1972	3.04	10.78	2.07	8.16

Source: Rates of return on sales represent a weighted average of net income after taxes/sales, computed from a sample of fourteen aerospace firms whose combined sales accounted for approximately eighty percent of industry sales during the years 1968-1972. Return on equity was based on the same sample of firms, using company earnings and net worth, reported on a per share basis, in Standard and Poor's Industry Surveys, *Aerospace Basic Analysis,* October 1972.

CONCLUSION

The foregoing discussion of profits and risks by no means covers all considerations of interest to the investors in selecting among industries for investing. However, the risks outlined above do outweigh whatever comparative benefits may have been omitted from the analysis. It seems overwhelmingly obvious from the data available that aerospace profits suffer an unfavorable position *relative* to other industries. This has been especially true for the last five years, during which rates of return for aerospace fell below comparable rates, whether measured in terms of return on sales, equity, or total capital invested.

If it also holds true that investors discount rates of return for the element of risk, it appears that there has been considerable disincentive toward investing in aerospace stocks over the past five years. Overall, the future ability of the industry to retain or attract capital may be in doubt if past trends alone are considered in assessing the outlook.

3

ANALYSIS OF FINANCIAL PERFORMANCE

Relative to other industries the aerospace industry's past financial performance has not been satisfactory. Its rate of return on total capital invested has been persistently and substantially lower than the average for all manufacturing industries (Table 2). Its return on sales has generally been 50 percent less than that of the average for all manufacturing industries. In recent years its return on equity capital has declined substantially below that for other industries. In view of the substantially higher than average investment risks in the industry which normally demand higher than average rates of return, this performance cannot be viewed with satisfaction.

Risk is the element of uncertainty in the return on investment. A good measure of risk is the fluctuation or variability in the rate of return over time; the greater the variability, generally the greater the error in predictability. The volatility of aerospace rates of return is depicted in Figure 16 in which comparisons are made with other principal heavy machinery and high engineering manufacturing industries. The rate of return on aerospace equity investment has fluctuated more than any of the industry groups shown except motor vehicles, measured by the number of turning points in the direction of movement since 1960: six for aerospace, seven for motor vehicles, three for instruments, three for electrical machinery, and two for general industrial machinery. However, the level of the rate of return on aerospace equity investment has been only average or, in recent years, substantially lower than any of the other industry groups.

Table 8

PRICE/EARNINGS RATIOS

Aerospace and Selected Industry Groups

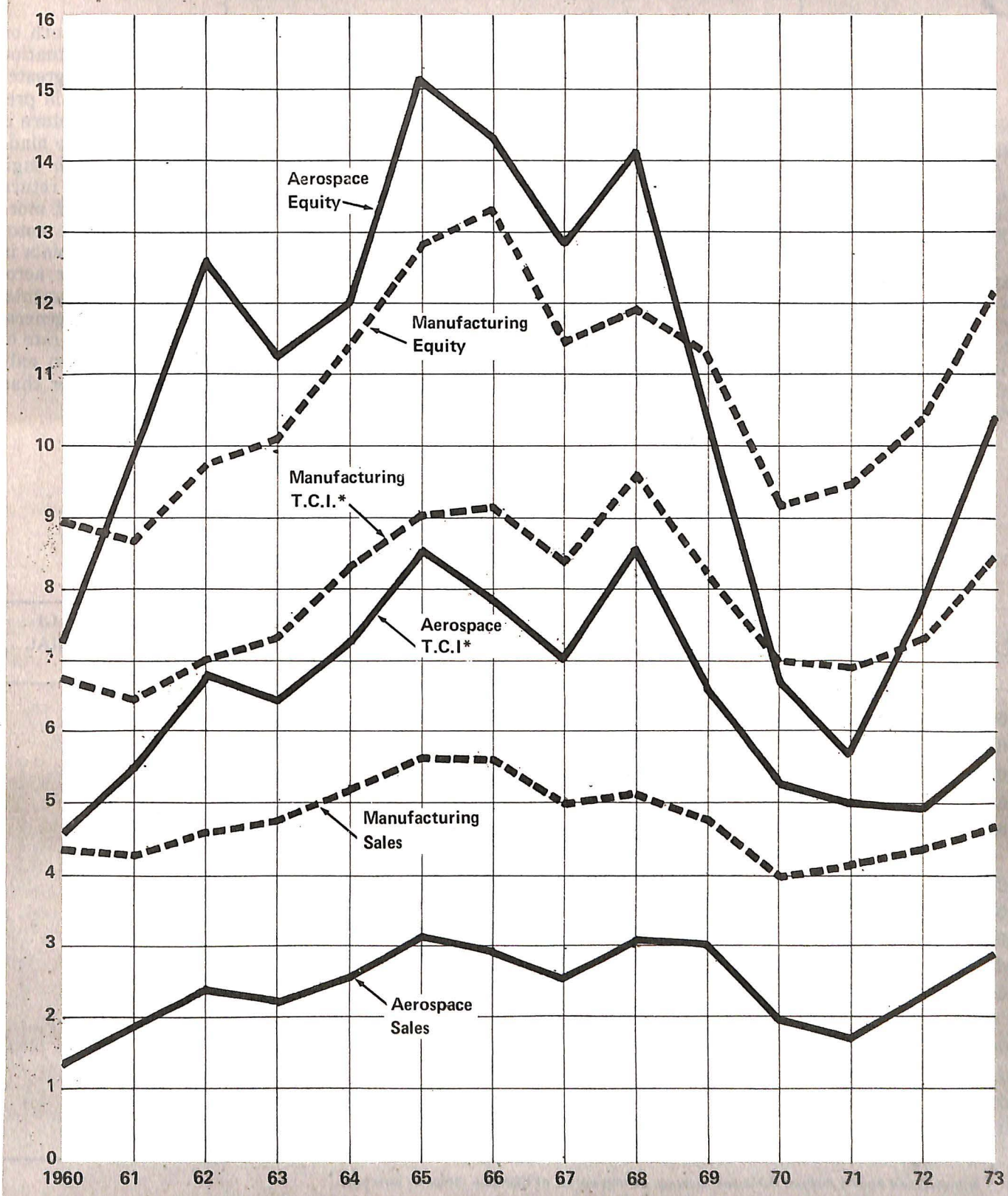
YEAR	AEROSPACE	MOTOR VEHICLES	ELECTRICAL EQUIPMENT	GENERAL INDUSTRIAL MACHINERY	COMPOSITE OF 425 INDUSTRIAL STOCKS
1960	deficit	13.8	16.5	15.7	17.7
1961	23.0	15.9	20.0	17.5	20.4
1962	11.1	10.2	14.6	15.0	17.0
1963	10.5	12.5	17.1	14.2	17.1
1964	10.2	14.0	15.3	13.5	17.6
1965	12.6	13.0	17.8	13.6	16.8
1966	15.2	12.9	16.6	11.7	15.2
1967	18.9	15.7	18.9	14.8	17.0
1968	14.6	12.5	21.0	16.0	17.3
1969	18.5	12.5	19.4	15.5	17.5
1970	15.8	28.9	18.7	13.4	16.5
1971	18.9	12.2	23.2	18.9	18.0
1972	14.4	9.8	23.7	19.0	18.0
1973	7.5	5.8	19.8	21.8	13.8

Source: Standard and Poor's *Analysts Handbook;* (average of mid-points of high-low range by quarters).

Figure 16

RATES OF RETURN AFTER TAX

Aerospace and All Manufacturing
1960-1973



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

*Total Capital Invested

The rate of return on total capital invested, a preferred measure as discussed previously, is still lower relative to other industries (Table 2).

The low price/earnings ratios of aerospace stocks is another indication of the risk of investments in the industry as viewed by investors. Comparisons are made with other heavy machinery and high-engineering manufacturing industries in Table 8. Aerospace ratios have been substantially lower than for the other industries except for motor vehicles which has been as low or lower in recent years. Returns in both aerospace and motor vehicles are quite volatile signifying greater uncertainty and risk for investors than for the other industries.

The result of poor performance of aerospace equities in terms of rates of return and price/earnings ratios has severely limited the equity market as a viable route for raising capital for the industry. Since 1960 most of the external capital has been raised by increasing long-term debt. The increase in the debt/equity ratio has increased the leverage of equity capital and the risk factor. As a consequence, equity investors in the future will require an even higher expected rate of return than previously. Since previous expected rates have not been met, it will be increasingly difficult to raise equity capital in the future if there is not a dramatic improvement in rates of return for the industry.

COST OF CAPITAL

Cost of capital includes the financial costs of equity and debt capital plus depreciation on depreciable assets. The cost of equity capital is the expected earnings per share divided by the per share price. Since there is no way of measuring expected earnings as viewed by the collective investors, the best measure which can be derived is the current earnings divided by the per share price, i.e., the earnings/price ratio. These ratios are shown for both aerospace and all manufacturing in Table 9, along with bond yields.

Bond rates as seen from the table have been significantly higher for aerospace throughout the period, the largest gap occurring in 1970. In the past three years the difference has narrowed somewhat. The equity rates have also been higher for aerospace in most years, especially before 1965, and in 1973 were about 85 percent higher than the rate for all industrials.

Total capital costs are derived and related to sales for aerospace companies and all manufacturing companies in Table 10. Interest costs are from Internal Revenue Service (IRS) data; the implicit cost of equity capital is estimated by applying the equity rate from Table 9 to equity capital as reported by the FTC; and depreciation is from the FTC reports. The ratio of total capital costs to sales is given in the last column under each section of the table.

Table 9

COSTS OF CAPITAL

Aerospace Industry and Industrials
Percent of Equity Capital Cost and Bond Yields

YEAR	COST OF EQUITY CAPITAL		BOND YIELDS	
	Aerospace	Industrials	Aerospace	Industrials
1962	9.0 %	5.9 %	5.0 %	4.5 %
1963	9.5	5.9	5.3	4.4
1964	9.8	5.7	5.4	4.5
1965	7.9	6.0	5.3	4.6
1966	6.6	6.6	5.6	5.3
1967	5.3	5.9	6.1	5.7
1968	6.9	5.8	6.7	6.4
1969	5.4	5.7	8.0	7.2
1970	6.3	6.1	9.6	8.3
1971	5.3	5.6	8.3	7.6
1972	6.9	5.6	7.8	7.4
1973	13.3	7.2	8.2	7.6

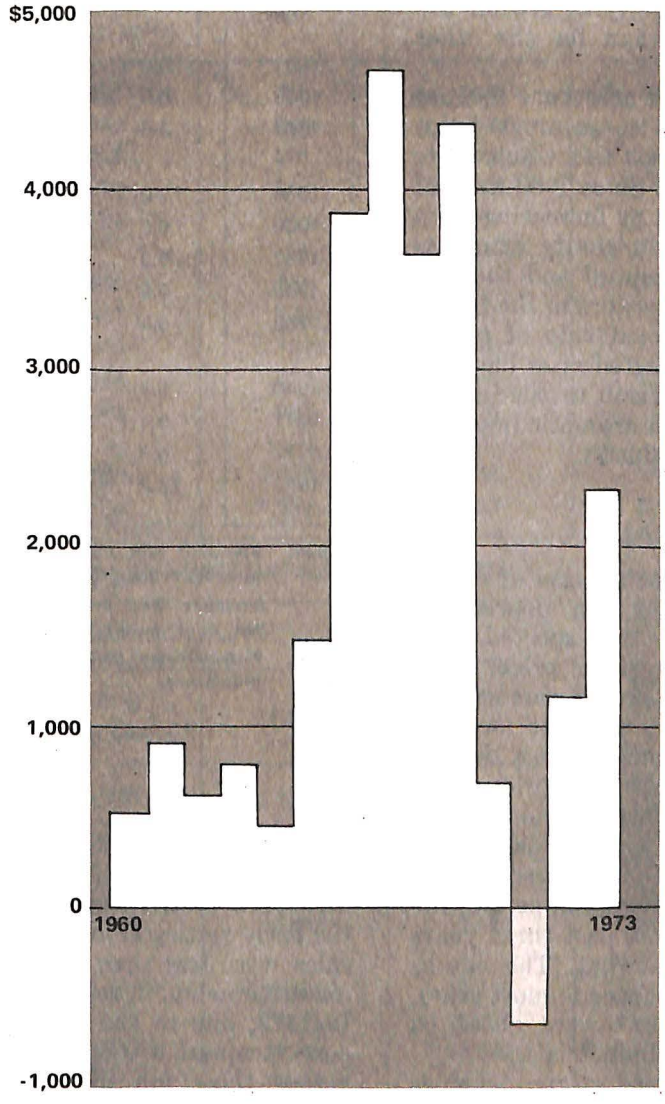
Source: Standard and Poor's *Analysts Handbook;* (inverse of price/earnings ratios).
Standard and Poor's *Year-End Bond Guide* (weighted average for bond issues for sample of large aerospace companies.
Federal Reserve Bulletin (bond yields for Moody's corporate industrials.

A comparison of the time trends in capital costs as a percent of sales shows a decidedly upward trend for aerospace relative to all manufacturing. Whereas in the early sixties aerospace capital costs as a percent of sales were less than two-thirds the percentage for all manufacturing, in recent years the gap has been closed. In 1973, due to the dramatic increase in the cost of equity capital to the aerospace industry, capital costs exceed those for all manufacturing as a percent of sales.

This reflects an increase in both the quantity and unit cost of capital per dollar of sales in the aerospace industry relative to the average for all manufacturing industries. This also indicates that the rate of return on sales for the aerospace industry needs to be as high as that for the average of manufacturing in order to attract necessary capital.

Figure 17

AEROSPACE INDUSTRY AVAILABLE FUNDS
1960-1973
(Millions of Dollars)



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations*

ANALYSIS OF SOURCES AND USES OF FUNDS, 1960-1973

The aerospace industry has raised large amounts of capital since 1960, largely from internal sources. Total internal funds generated from profits (after dividends), adjustments to surplus, and depreciation, amounted to $10.7 billion whereas funds raised from equity issues and other long-term liabilities amounted to $5.9 billion or approximately one-third of the total.

Increase in long-term debt amounted to $3.6 billion representing two-thirds of the external funds raised. Short-term bank loans also increased substantially during the period but have been reduced in the past few years with a net increase of only about $200 million since 1960.

Flow of funds data by source and use are presented for the industry in Table 11. The top part of the table shows consolidated industry balance sheet data for the years 1960 through 1973. Sources and applications of funds are shown in the lower part of the table.

Approximately $25 billion (including short-term liabilities) was generated by the industry or raised externally over this 14-year period with over two-thirds of it concentrated during the five years from 1965 through 1969. Approximately 30 percent of these funds were generated from profits and another 25 percent from depreciation charges. The remaining 45 percent was raised from external sources: equity financing, 7 percent; long-term debt, 15 percent; current liabilities, 21 percent; and short-term debt (including government advances) and other, 2 percent. The importance of each source from 1960 through 1973 is depicted in Figure 18.

Financing from government progress payments and advances on contracts apparently decreased during the period although the data are confused. In 1971 the FTC discovered that such payments had been overstated in previous data due to reporting practices of prime and subcontractors. Apparently the prime contractors were showing the full amount of such advances and reporting advances passed to the subcontractors in current assets (loans or accounts receivable) rather than as a debit against government advances. The subcontractors were reporting the payments received from the primes as government advances rather than as loans payable or accounts payable which would be symmetrical with the reporting by the primes. Hence, when the balance sheet data were consolidated for the industry, government advances are duplicated to a considerable extent with an offsetting understatement of current liabilities. The amount of the error corrected in 1971 was approximately $1.7 billion; since the amount of such duplication in past years is not known, it is not possible to calculate the exact change in government advances over the period. The best estimate is that, although they increased during the mid-sixties, advances have since been reduced to approximately the level of 1960.[11]

The allocation of funds to principal uses over the period 1960 to 1973 is highlighted in Figure 19.

Perhaps a more useful way to view the sources and applications of funds is to consolidate the changes in current assets and current liabilities into a change in working capital and to treat profit as net of dividends. On this basis the sources and applications of funds for the 14-year period are shown in Table 12.

On this basis, $16.6 billion in new funds were generated over the period 1960 through 1973, 64 percent from internal sources and the remainder from external sources. Less than one-third of the capital from external sources was from equity issues with the remainder raised by bond issues and bank loans. Most of the equity capital was raised during the years 1966 to 1969 when the price/earnings ratios were favorable. In 1970 and 1971, equity issues were very small in spite of a favorable price/earnings ratio; little new capital was needed in these years due to the depressed conditions in the industry. A moderate amount of equity capital was raised in 1972 but almost none in 1973. Present price/earnings ratios would make it extremely costly to raise any capital through equity issues.

The largest use of these funds was for the financing of additional plant and equipment, largely the latter. A large amount of new tooling was necessary for the wide-bodied jets, substantial increases in military production, and the space program. Approximately 58 percent of the total new capital went for replacement and expansion of fixed plant and equipment and other real property.

Another 24 percent of the funds were used to increase working capital by approximately $4 billion. This increase in working capital was concurrent with little if any increase in government advances over the whole period although they did increase substantially during the mid-sixties only to decline to approximately the 1960 level in the past few years.

The remainder of the funds was used to finance increases in other assets, principally R&D costs associated with commercial product development still to be amortized.

[11] Additional firms were also brought into the FTC sample in 1971 which has increased the absolute level of government progress payments and advances but not necessarily the change over the period.

Table 10

CAPITAL COSTS RELATED TO SALES

Aerospace and All Manufacturing
(Millions of Dollars)

YEAR	AEROSPACE CAPITAL COSTS					AEROSPACE SALES	CAPITAL COSTS AS PERCENT OF SALES
	COST OF FINANCING ASSETS			DEPRECIATION	TOTAL		
	Interest Payments	Cost of Equity Capital	Total				
1962	$ 79	$ 256	$ 335	$ 266	$ 601	$ 15,206	3.95 %
1963	73	293	366	269	635	15,313	4.15
1964	74	317	391	292	683	15,403	4.25
1965	71	273	344	300	644	16,073	3.53
1966	111	262	373	349	722	19,224	3.59
1967	184	250	434	465	899	22,739	3.95
1968	356	417	773	587	1,360	26,852	5.06
1969	321	410	731	668	1,399	26,392	5.30
1970	459	464	923	688	1,611	25,505	6.32
1971	507	388	895	655	1,550	23,566	6.58
1972	438	565	1,003	677	1,680	24,838	6.76
1973	405	1,104	1,509	653	2,162	29,494	7.33

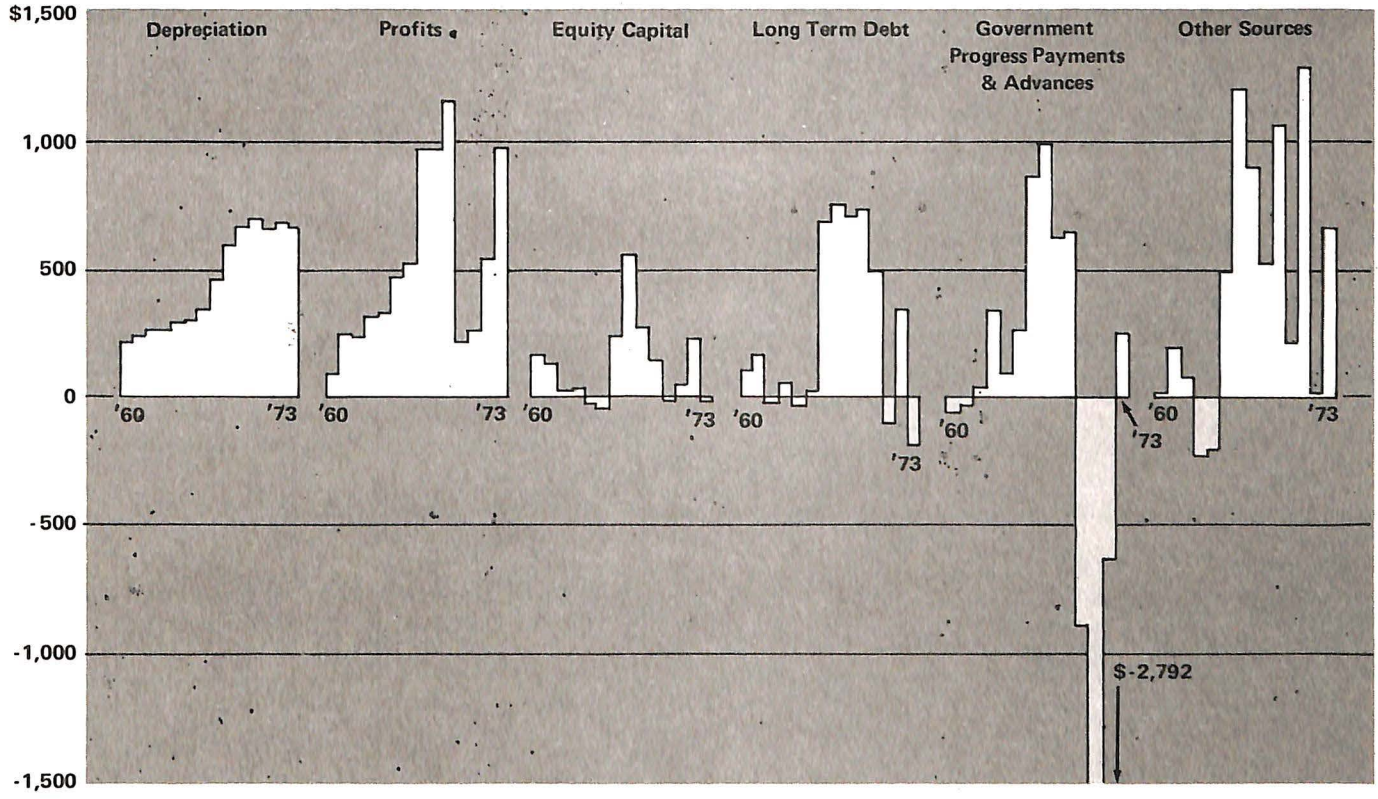
YEAR	ALL MANUFACTURING CAPITAL COSTS					MANUFACTURING SALES	CAPITAL COSTS AS PERCENT OF SALES
	COST OF FINANCING ASSETS			DEPRECIATION	TOTAL		
	Interest Payments	Cost of Equity Capital	Total				
1962	$ 2,410	$ 10,698	$ 13,108	$ 12,825	$ 25,933	$ 389,404	6.66 %
1963	2,620	11,191	13,811	13,545	27,356	412,678	6.63
1964	2,800	11,387	14,187	14,442	28,629	443,072	6.46
1965	3,178	12,703	15,881	15,722	31,603	492,201	6.42
1966	3,889	15,199	19,088	17,573	36,661	554,298	6.61
1967	5,066	14,607	19,673	19,529	39,202	575,427	6.81
1968	6,149	15,423	21,572	21,190	42,762	631,911	6.77
1969	8,427	16,524	24,951	22,842	47,793	694,584	6.88
1970	10,687	18,715	29,402	24,716	54,118	708,810	7.64
1971	11,190	17,961	29,151	26,491	55,642	750,832	7.41
1972	11,610	19,269	30,879	29,641	60,520	850,806	7.11
1973	8,640	26,938	35,578	32,894	68,472	1,017,163	6.73

Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Note: Interest payments are derived by imputing interest rates from IRS composite industry returns to debt reported in the FTC *Quarterly Financial Reports for All Manufacturing Corporations.* Interest rates are estimated for the last three years based on the lagged relationship of interest rates from the IRS data to bond yield data in previous years (IRS data not available subsequent to 1970).

Figure 18

AEROSPACE INDUSTRY
SOURCES OF FUNDS
1960-1973
(Millions of Dollars)



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations*

Table 11

AEROSPACE INDUSTRY BALANCE SHEET INCLUDING SOURCES AND USES OF FUNDS

(Millions of Dollars)

	1960	1961	1962	1963	1964	1965	1966	1967
TOTAL ASSETS	$7,113	$7,688	$7,901	$8,284	$8,297	$9,301	$12,638	$16,573
Current Assets	5,690	5,963	6,135	6,431	6,311	7,083	9,350	11,954
Other Assets (Non-Current)	1,424	1,725	1,765	1,853	1,985	2,220	3,287	4,618
Property, Plant & Equipment, Net	1,195	1,420	1,508	1,575	1,615	1,779	2,459	3,278
Gross Book Value	2,426	2,928	3,244	3,425	3,647	3,956	4,946	6,459
(Reserve for Depreciation & Depletion	(1,231)	(1,508)	(1,736)	(1,850)	(2,032)	(2,177)	(2,487)	(3,181)
Other Assets (Non-Current)	229	305	257	278	370	441	828	1,340
TOTAL LIABILITIES & NET WORTH	7,113	7,688	7,901	8,284	8,297	9,301	12,638	16,573
Current Liabilities	3,890	4,045	4,139	4,246	4,126	4,852	6,904	8,660
Government Advances	1,346	1,308	1,338	1,674	1,762	2,018	2,878	3,869
Short-Term Debt	770	724	730	489	404	402	957	1,031
Short-Term Bank Loans	745	700	698	461	364	355	885	946
Installments Due on One Year	25	24	32	28	40	47	72	85
Other Current Liabilities	1,774	2,013	2,071	2,083	1,960	2,432	3,069	3,760
Other Liabilities (Non-Current)	677	834	820	877	849	893	1,608	2,493
Long-Term Debt	645	806	783	835	803	818	1,511	2,261
Other Liabilities (Non-Current)	32	28	37	42	46	75	97	232
Net Worth	2,548	2,808	2,943	3,162	3,321	3,556	4,126	5,419
Equity Capital	1,154	1,291	1,318	1,354	1,336	1,289	1,533	2,084
Earned Surplus & Surplus Reserves	1,392	1,512	1,621	1,804	1,981	2,267	2,593	335
Reserves Not Reflected Elsewhere	2	5	4	4	4	—	—	—
SOURCES OF FUNDS	525	919	610	788	457	1,493	3,878	4,627
Profits & Adjustments to Earned Surplus	95	233	237	319	331	471	518	970
Equity Capital	177	137	27	36	-18	-47	244	551
Long-Term Debt	104	161	-23	52	-32	15	693	750
Government Progress Payments & Advances	-63	-38	30	336	88	256	860	991
Short-Term Debt	25	-46	6	-241	-85	-2	555	74
Other Current Liabilities	-39	239	58	12	-123	472	637	691
Depreciation	214	237	266	269	292	300	349	465
Other Long-Term Liabilities	12	-4	9	5	4	22	22	135
APPLICATIONS OF FUNDS	525	921	607	789	458	1,492	3,875	4,628
Current Assets	39	273	172	296	-120	772	2,267	2,604
Property, Plant & Equipment (Net of Depreciation)	317	462	354	336	332	464	1,029	1,284
Other Assets (Non-Current)	65	76	-48	21	92	71	387	512
Dividends	104	110	129	136	154	185	192	228
WORKING CAPITAL	1,800	1,918	1,996	2,185	2,185	2,231	2,446	3,294
Change in Working Capital (1959 Working Capital = 1,752)	48	118	78	189	-0-	46	215	848

Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Note: Represents data for companies classified in Aircraft and Parts until 1971; beginning in 1971, data for companies classified in Guided Missiles and Space Vehicles are included; data shown on both bases for 1971.

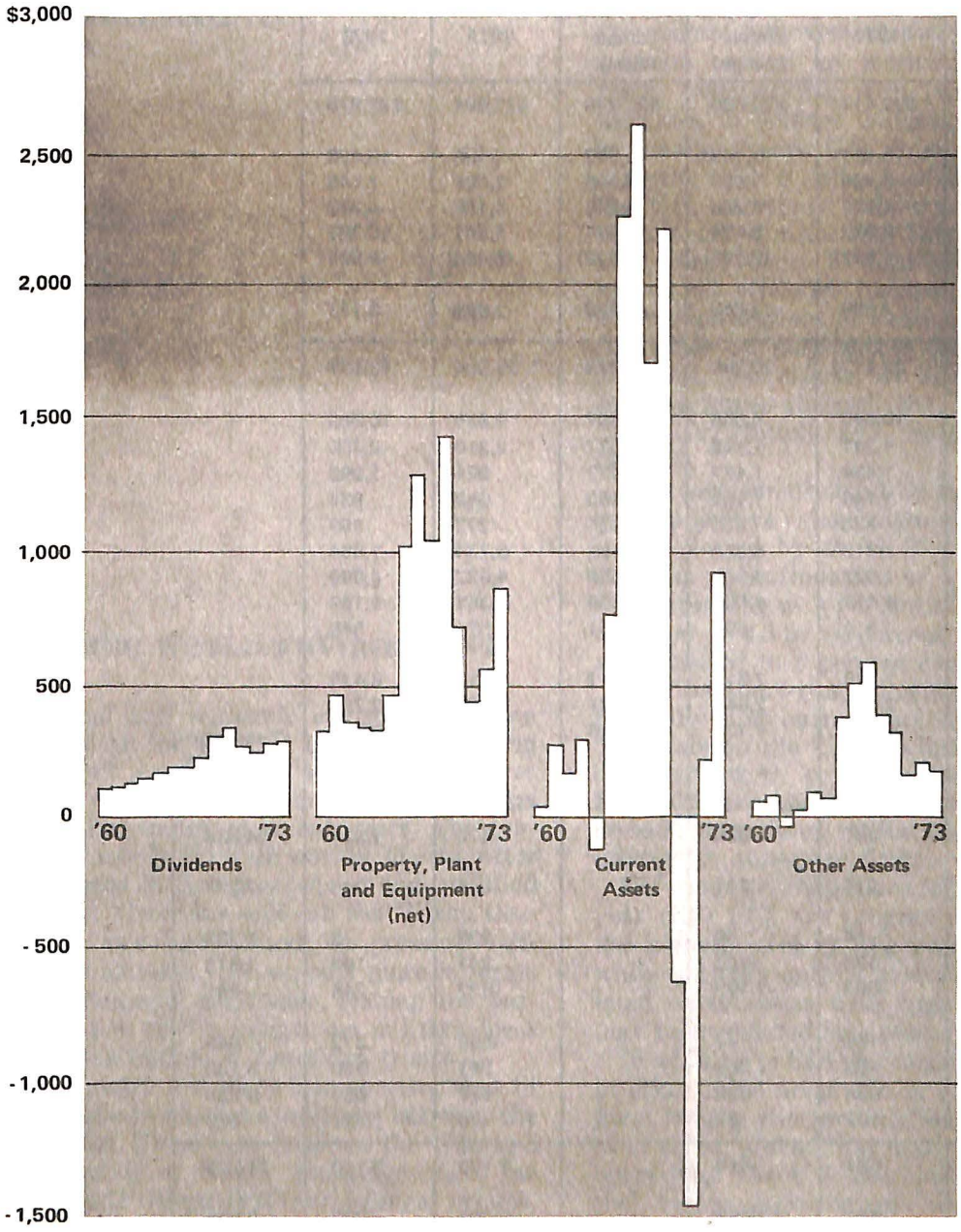
a Totals reflect year-by-year changes in comparable sample and differ from changes in composite balance sheet data because of sample change in 1971.

Table 11
(continued)

1968	1969	1970	1971 Before Sample Change	1971 After Sample Change	1972	1973	Totals for 1960-1973[a]
$19,317	$22,678	$22,417	$20,880	$22,379	$22,604	$23,976	
13,659	15,865	15,251	13,795	15,295	15,498	16,428	
5,658	6,813	7,166	7,085	7,085	7,096	7,548	
3,731	4,496	4,527	4,296	4,296	4,108	4,376	
7,431	8,815	9,350	9,474	9,474	9,591	10,357	
(3,700)	(4,319)	(4,823)	(5,178)	(5,178)	(5,483)	(5,891)	
1,927	2,317	2,639	2,789	2,789	2,998	3,173	
19,317	22,678	22,417	20,880	22,379	22,604	23,976	
9,745	11,334	10,540	9,008	10,507	9,865	10,803	
4,492	5,135	4,241	1,449	2,837	2,210	2,456	
762	1,318	1,484	1,477	1,477	921	1,293	
643	1,132	1,146	1,152	1,152	649	934	
119	186	338	325	325	272	359	
4,491	4,881	4,815	6,082	6,193	6,734	7,054	
3,221	4,030	4,627	4,555	4,555	4,922	4,699	
2,930	3,618	4,113	4,004	4,004	4,351	4,159	
291	412	514	551	551	571	540	
6,352	7,312	7,248	7,317	7,317	7,816	8,475	
2,359	2,505	2,491	2,541	2,541	2,763	2,758	
3,993	4,807	4,757	4,776	4,776	5,053	5,717	
—	—	—	—	—	—	—	
3,638	4,363	691	-638		1,170	2,311	24,834
963	1,151	214	261		546	948	7,257
275	146	-14	50		222	-5	1,783
669	688	495	-109		347	-192	3,618
623	643	-894	-2,792		-627	246	-341
-269	556	166	-7		-556	372	548
731	390	-66	1,267		541	320	5,130
587	668	688	655		677	653	6,320
59	121	102	37		20	-31	519
3,637	4,366	691	-640		1,170	2,310	24,829
1,705	2,206	-614	-1,456		203	930	9,277
1,040	1,433	719	424		489	921	9,604
587	390	322	150		209	175	3,009
305	337	264	242		269	284	2,939
3,914	4,531	4,711	4,787	4,788	5,633	5,625	47,256
620	617	180	76	1	845	-8	

Figure 19

AEROSPACE INDUSTRY APPLICATIONS OF FUNDS
1960-1973
(Millions of Dollars)



Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations*

Table 12

AEROSPACE INDUSTRY
SOURCES AND USES OF FUNDS RECAPITULATION
1960-1973
(Billions of Dollars)

	Dollar Value			Percent	
Sources					
Profits	$ 7.3				
Less Dividends	2.9				
Profits Retained		$ 4.4		26 %	
Depreciation		6.3		38	
Total Internal Sources			$ 10.7		64 %
Equity Capital		1.8		11	
Long-term Debt		3.6		22	
Other Long-term Liabilities		0.5		3	
Total External Sources			5.9		36
TOTAL			16.6		100
Applications					
Working Capital*			4.0		24
Property, Plant & Equipment			9.6		58
Other Assets (Non-Current)			3.0		18
			$ 16.6		100

*Note: The change in working capital is derived by netting the changes in the following components of current assets and current liabilities in the sources and applications of funds accounts in Table 3-4:

Current Assets		$ 9.3
Current Liabilities		
Government Progress Payments	$ -0.3	
Short-term Debt	0.5	
Other Current Liabilities	5.1	
TOTAL		5.3
Working Capital		$ 4.0

CONCLUSION

In spite of a generally poor financial performance over the past 14 years the aerospace industry has raised an impressive amount of capital and more than doubled its assets after allowance is made for the effects of inflation. Most of this capital has been generated internally in spite of the low return on total capital invested; dividends have been held to 40 percent of earnings on the average. Since most of the capital from external sources has been raised by issuing bonds, the debt/equity ratio has reached a level which portends high future rates for both new equity and debt capital. This problem of high capital costs can only be remedied by improving profit rates sufficiently to afford a better return on capital invested and more security for debt capital.

4 THE CHANGING ENVIRONMENT

THE CHANGING WORLD ENVIRONMENT

The world political and economic environment upon which assessment of the level of defense, space and commercial aircraft expenditures are predicted over the short run, as well as for the long-term future, has undergone dramatic change in recent years. The concept of America's role in the free world's liberty, after being severely tested in Southeast Asia, and modified somewhat by what historians will call the "Nixon Doctrine," recognizes our commitment to preserve self-determination but stresses U.S. support more in terms of materiel and financial assistance, leaving the burden of self-protection to the indigenous military force without direct intervention of American troops.

Simultaneously, with this more introspective view of America's role, detente has been initiated between the U.S. and the Soviet Union and between the U.S. and the People's Republic of China. Exchange visits between leaders, trade delegations and cultural groups, not to mention the tireless worldwide journeys of the U.S. Secretary of State, have all helped in establishing greater dialogue among the world's superpowers.

The U.S. aerospace industry particularly will benefit from these steps toward rapproachement. Aerospace is a high-technology intensive industry, and technology in many areas (political and scientific) is the basis for exchange programs and trading agreements. Without becoming involved in the delicate issue of technology transfer and its ramifications, exchange of information and know-how which the aerospace industry believes is a necessary adjunct of economic growth, also serves to bring the world and its various cultures and systems closer together.

In spite of the frailties inherent in a detente—as evidenced by the uncertainties in the Middle East War—they signal a movement away from a policy of *ad hoc* reaction toward an institutionalized strategic stalemate. Negotiations, with less dependence on annual increases in defense budgets, will play a greater role in shaping future U.S. defense policies.

Again, such a policy has important implications for the U.S. aerospace industry. For example, the Strategic Arms Limitations Talks (SALT) which seek to limit deployment of anti-ballistic missiles and ultimately all offensive nuclear weapons demand a constant reassessment of defense budgets. It is noted too that while the emphasis of the SALT talks is on strategic arms, new efforts are also afoot to reduce general purpose forces through the NATO and Warsaw Pact talks on Mutual and Balanced Force Reductions (MBFR).

Any assessment of future foreign relations is fraught with subjective value judgments; but an analysis of policies followed by the U.S. since the Korean conflict suggests a continuation of a policy for reducing defense spending as a percent of GNP—dropping perhaps to as low as 4.5 to 5.0 percent within the next five years as compared to 6 percent currently.

For the short-run, aerospace stands to benefit substantially from current increases in the defense budget. The drain on the U.S. stockpile of weapons due to our commitment to replenish inventories in the Middle East plus the obsolescence problem, all add up to increased pressure on military spending in those areas of interest to aerospace firms.

For example, obligations for military aircraft in fiscal year (FY) 1975 are programmed at nearly $7 billion, the highest level in five years. Missiles procurement while showing only a modest increase will be stimulated nevertheless with higher levels of R&D which may be translated into procurement in later years.

In addition to R&D for missiles, some major increases in other R&D areas are in order. Vietnam, being the great testing and proving laboratory that it eventually came to be, proved that many weapons systems needed upgrading. The U.S. left those combat zones realizing that major improvements were needed in propulsion systems, communications, avionics and in some aircraft. All of these program areas are demands on future DOD budgets.

The U.S. space effort at best will continue as a level situation for the foreseeable future. Space will undoubtedly hover around or slightly over the $3 billion level for the next few years. The space shuttle and the joint US/USSR rendezvous and docking missions will preoccupy space planners for the next few years, with no new major programs being initiated.

Aside from defense and space the industry is best known for its success in the air transport market. Indeed, three U.S. airframe manufacturers currently account for about 80 percent of all the jet transports flown by the free world's air carriers. While the manufacturers were initially unable to predict the likely impact of the fuel shortage on aircraft demand, the industry's current production rates, employment levels and new orders are not being as negatively influenced by the energy crisis or the economic downturn as first thought.

In 1973 the export of civil aerospace products contributed $3.8 billion to the U.S. trade balance. In fact, over the past six years, exports of civil aerospace products have consistently exceeded $2 billion. While foreign competition has not succeeded in materially affecting the market picture, several foreign governments have announced policies for changing this situation.

Nationalism, and more recently a trend toward international joint ventures or consortiums have had pronounced effects on U.S. aerospace industry policy matters in Europe. The U.S. industry cannot become complacent for there is no guarantee that tomorrow's orders will be placed with U.S. producers. As has been noted by many an international firm, orders are often dictated by national policy or national pride and prestige and are not necessarily the result of sound economic or business principles.

It is reasonable to conclude that the industrialized nations of the world will resort more and more to government support of their own aerospace and other high-technology industries. Moreover, the same nations will increase their efforts to obtain offset production. As a result U.S. companies could face an increasingly competitive world market environment if these policies continue.

FACTORS IMPACTING U.S. AEROSPACE PERFORMANCE

In addition to changes in U.S. foreign policy and competition from abroad, there are many other factors at play which will dramatically influence future sales levels and financial performances of the aerospace industry. Some of these are:

☐ Changes in recent years in government procurement policies and practices are encouraging to the future business viability of the industry. A retreat from the total package procurement concept toward a more realistic approach to procurement of complex weapons systems is definitely for the good of all contractors. This new approach promises firms the needed flexibility in procurement as the defense environment changes without placing so much of the risk and burden of such changes on the contractor. It should allow for reassessment of costs at reasonable intervals—a consideration of great importance in view of the increasing flexibility in defense posture with consequent changes in product mix and large fluctuations in the rates of inflation. In sum, it offers hope of a more reasonable approach to risk sharing which is far more equitable than recent past practices.

☐ In the commercial transport sector, there has been an historic evolution in capital requirements and lead-times required for the development and production of commercial aircraft, all of which necessitated changes in the financing of these programs. Over the past few years leasing firms have been established to facilitate the easing of the burden and banks have played an increasingly larger role in extending credit based on backlogs and delivery schedules. Such developments reflect a trend toward a more realistic sharing of risk with commercial customers, and are encouraging for the future as aircraft costs are certain to be pushed higher as size and speed increase with future generations of transports.

☐ Research and development in the aerospace industry has not kept pace with growth in the industry's output over the past decade. Major reductions in total R&D efforts occurred in spite of a more than doubling of company financed R&D activity (independent research and development, IR&D). Company financed R&D in turn reflects shifts in aerospace output toward a substantially larger share of commercial product output. As has been seen, however, aerospace continues to be one of the most R&D intensive of any major industry.

☐ Furthermore, material shortages and the energy problem in particular will continue for a long time. Simply put, the energy crisis is a classical illustration of the economics involved in a limited supply and an unharnessed demand situation. In this case, the ever-diminishing supply of fossil fuels and the ever-increasing demand for energy poses a threat to the nation's—and indeed the world's—orderly economic growth. The possible ramifications of this quandary could be serious for the entire industrial world.

Transportation systems, whose contribution to economic growth is so obvious, are almost totally dependent upon fossil fuels. In aviation, cutbacks in flight schedules resulting from reductions in fuel availability, while representing a reasonable day to day solution, do not strike at the heart of the problem and do not portray the gravity of the situation. For the aerospace industry, it seems to be a clear cut mandate for increases in R&D efforts directed toward improvements in fuel efficiency or even for new engines adapted to alternative energy sources. This is an opportunity born of the crisis.

Material shortages, however, may prove to be a real brake on the future growth potential of the industry. Persistent shortages in basic metals, electronic components and other areas are certain to continue. And, as long as supply is limited, inflation will be a factor continuingly plaguing not only the aerospace industry but also the entire world economic environment in which aerospace must operate.

□ Finally, one concern capsules all others under one heading: economic performance. There has not been a more confusing period in recent economic history. The U.S. as well as economies worldwide are currently witnessing runaway inflation while simultaneously trying desperately to arrest recessionary movements in all sectors of the economy. When seen against a backdrop of unprecedented increases in interest rates, ever-rising public and private debt, and continuous confusion in the international monetary system, there seems to be evidence of a prolonged period of economic adjustments.

Economic history teaches that the average American businessman does not know how to cope with dramatic ups and downs in the business cycle; too many unknown variables are at play in the economic model. Two things are generally certain: it is nearly impossible to protect profit margins at a time when costs are escalating faster than prices; and it is equally difficult to maintain productivity levels during a downturn. These uncontrollables could prove to be an effective damper on the short-term future of the aerospace industry, since the industry's present day performance is most often tied to long-term contractual obligations which do not adequately provide for price adjustments. Thus, the aerospace industry, a major consumer of many of the goods and services hit hardest by inflation, usually does not have the option to pass through many cost increases to its major customers.

It seems clear in today's economic climate that costs will be significantly higher at the end of a contract than at the beginning. Government has yet to find some vehicle for providing appropriate relief, such as a wider acceptance of price adjustment clauses in fixed-price and cost-type incentive contracts, and a reliance upon shorter term contracts during this period of economic uncertainty.

WHY DIVERSIFICATION?

Due in part to the risks associated with shifting market demands and unstable profits, many aerospace firms have considered the alternatives of diversification versus vertical or horizontal integration. Another consideration is the method in which expansion is accomplished: merger, acquisition or internal expansion. Examples are many—some successes and some failures —in aerospace as well as in other industries. Integration can be accomplished through acquisition, as in the case of an auto firm's purchase of a tractor or trailer plant, or by simply expanding its internal operations, as is the case when a firm forms an export financing and leasing subsidiary.

Still other firms represent both diversification and integrated lines of operation. For example, a high degree of vertical integration is achieved when an aerospace firm through internal expansion enters into electronics components production. On the other hand, the same firm may further diversify into building materials, metals, and/or chemical production, and even into real estate promotion. Finally, there are cases of conglomerate acquisitions of entire firms such as those that have been accomplished in aerospace and other major industries.

The question has often been raised whether diversification is a better route to improve financial performance than continued specialization in the aerospace field. It can be argued, for instance, that a more broadly-based product "mix" is less subject to the more violent swings in market demand which many aerospace firms have experienced since 1968. On the other hand, it can also be argued equally strongly that diversification itself can become a relatively risky proposition without adequate managerial expertise in new areas of operation. Furthermore, "specialization" is a broad term that can take the form of vertical or horizontal integration, as well as strict concentration in one product line. Many aerospace firms have successfully continued to specialize in aerospace by expanding into complementary lines of activity rather than by diversifying into non-aerospace operations.

Using a representative sample of aerospace firms,[12] it appears that diversified aerospace firms have recently experienced higher returns than have integrated firms (Table 13). Since 1968 returns on sales for diversified firms have averaged 3.2 percent while integrated firms averaged 1.7 percent. Comparable returns on equity for the same period were 10.4 percent and 9.5 percent, respectively. From 1968 to 1972, returns on sales ranged from 3.1 to 3.3 percent and always exceeded returns for integrated firms. Although returns on equity for diversified firms did not always exceed integrated returns, this was the case in the majority of observations.

[12] Fourteen large companies representing 80 percent of total industry sales from 1968 to 1972 (on a company basis), as reported by the FTC *Quarterly Financial Report*, are included in the sample. Firms were classified either as diversified or integrated based on their history of acquisitions, mergers and expansion into closely related aerospace activities or into other product lines.

Table 13

RATES OF RETURN

Diversified Versus Integrated Aerospace Firms
1968-1972

Year	After-tax Profits Taken as a Percent of							
	Sales				Equity			
	Total Aerospace	Integrated	Diversified	Sample Total	Total Aerospace	Integrated	Diversified	Sample Total
1968	14.2 %	13.7 %	12.6 %	13.1 %	3.2 %	2.2 %	3.2 %	2.6 %
1969	10.6	10.3	12.3	11.4	3.1	1.7	3.1	2.2
1970	6.8	8.0	9.4	8.7	2.0	1.4	3.1	2.0
1971	5.8	6.7	8.8	7.9	1.8	1.2	3.1	1.9
1972	7.9	9.0	9.0	9.0	2.4	2.2	3.3	2.6
Avg. 68-72	8.8	9.5	10.4	10.0	2.5	1.7	3.2	2.3

Source: Returns as a percent of sales and as a percent of net book value are weighted averages of company returns as reported in Standard and Poor's *Industry Surveys: Aerospace Basic Analysis,* October 1972. Returns for all aerospace firms are taken from FTC *Quarterly Financial Reports for All Manufacturing Corporations.* (See Table 2).

Note: Rates of return are based on company-level data, and hence do not distinguish between different product lines at the establishment level.

Combined rates for returns on sales for all firms in the sample averaged 2.3 percent, versus 2.5 percent for all aerospace firms over the five-year period examined, and annual observations showed similar results in three out of five years.[13] As a percentage of equity capital, returns for all firms in the sample averaged 10.0 percent, compared with 8.8 percent for aerospace as a whole. Annual returns for all firms in the sample exceeded total aerospace returns in four out of five years.

The survey permitted an analysis of specific examples of diversified operations and integrated operations into which aerospace firms have expanded. Firms represented indicate how the expansion took place: acquisition, merger or internal expansion. Overwhelmingly, diversification has been by acquisition whereas expansion into integrated operations has been accomplished to a much larger extent by internal expansion.

[13] Since the firms in the sample represent larger firms, the differences in rates of return between the sample and the average return for all aerospace firms reflect differences between large and small firms on the average, and perhaps reflect economies of scale and differences due to the degree of specialization.

CONCLUSION

A cursory review of the recent past is ample proof that the business community in general and the aerospace industry in particular is more than ever affected by the interdependence of the world's economies and political systems. Policy decisions on military postures obviously dictate levels of defense spending and in turn impact the aerospace industry. Likewise, assessment of national priorities dramatically influences the level of government support for programs that may or may not directly offer business opportunities for aerospace. The preceding discussion mentions some of these as offering areas for possible diversification.

An analysis of the industry's current external environment as well as its internal financial position suggests that the industry would be well advised to continue pursuing diversified opportunities outside the industry. Financial performances indicate that diversified firms have experienced higher profit margins than have non-diversified firms in recent years. The next chapter, after presenting a brief analysis of the future, develops specific recommendations for both the industry's and the government's consideration.

5 THE FUTURE

PERSPECTIVE

Sales of the U.S. aerospace industry bottomed out during 1971 but now seem to be on a definite upturn (in current prices). The near-term will most certainly be characterized as a period of adjustment and reassessment of business opportunities and risk in an ever-changing economic, social and political environment. The industry therefore can look forward to a more stabilized period of business activity, a time in which to strengthen itself for the development of a new generation of aerospace products, as well as a time for improving its financial performance and gaining the confidence of investors.

For the next few years there will be a limited market growth rate for traditional government products, which suggests that the successful company of the future will have executed well-laid plans for product and market diversification. There are emerging opportunities in the social, welfare, transport, energy and other high priority program areas of the federal, state and local governments which could offer the industry markets for diversification.

Diversification immediately raises the question: But how? There seems to be ample proof in the industry that many problems can be solved through mergers and acquisitions or through internal planning and investment in growth markets. Most financial analysts look for more such activity in the future as aerospace-oriented firms acquire non-aerospace companies and possibly more mergers between complementary businesses and financial interests. Likewise, aerospace firms will be allocating more of their scientific manpower and monetary resources toward R&D efforts in pursuit of new products and services, i.e., outside the traditional aerospace markets.

In the traditional air transport sector, a period of level order-taking activity seems to be in the offing, but after the short interval required for the airlines to reappraise the economic slowdown and fuel crisis there should be renewed and vigorous growth. As already announced by some airframe companies, the introduction of new generations of air transports will probably be delayed for the simple reason that years of "growth" remain to be built into the present day series of highly productive vehicles. This decision seems to be welcomed by aerospace investors everywhere for it forestalls the day when huge R&D and capital investments must be made in order to perpetuate a product line.

CAPITAL NEEDS

Recent financial performances of the industry have resulted in a situation in which it is difficult to raise substantial amounts of new capital. Current price/earnings ratios make the equity route prohibitively costly; and the amount of outstanding debt also makes further loans or bond issues difficult except in very selective cases. Fortunately for the industry, any external capital requirements in the near future appear minimal if profit rates can be maintained at modest levels. There will come a time, however, when major new programs will require external capital in sizeable amounts. Improvement in the rate of return on equity over a period of years will be needed to regain investor confidence sufficient to meet these needs when they arise.

Most projections of demand indicate a modest 2 percent annual average growth in sales over the next ten years (measured in constant dollars), approximately a 25 percent total increase in sales over the next ten years. Commercial business is expected to rise more steeply, with sales to the government remaining relatively stable. Exports are also forecast to rise, reflecting the projected growth in global air travel and foreign military procurement and the U.S. manufacturers' continued predominance in world markets for aerospace products. In short, it appears that a relatively stable but modest growth period lies ahead.

Over the next decade the largest capital outlays will be for replacing and expanding fixed facilities. It is projected that approximately $11 billion will be needed for this purpose. Of this total amount, approximately $3 billion is for expansion, and $8 billion for replacement of fixed plant and equipment. The major part of this expansion is for equipment which is projected to represent more than two-thirds of the book value of plant and equipment by 1983. Depreciation will increase slightly as a percent of book value due to the increase in the share of equipment.

Projections of investment and depreciation (Table 14) were made by extending the trend in capital/output ratios (separately for plant and equipment) and applying the ratios to projected sales to obtain estimates of investment for expansion purposes. Replacement investment is treated as equal to depreciation which is projected by applying estimated depreciation ratios to projected book values. Investment is projected to remain relatively stable over the next few years due to the existence of substantial excess capacity in the industry at the present time, rising sharply over the later years after this excess capacity is absorbed.

Other new capital needs should be relatively small. Some increase in working capital will be needed—perhaps a little over $1 billion. This would be higher if government progress payments and commercial advances are reduced; however, such payments are now at about a ten-year low and no further reductions are expected. New product development capitalization probably could be offset by amortization unless some new large programs not now foreseen are undertaken.[14]

Almost all of the projected capital needs (Table 15) can be met from after-tax profits and depreciation after allowing for dividends averaging 40 percent of profits, provided the after-tax profit rate on sales averages around 3 percent and, of course, if sales projections are valid. Profit rates have averaged about 2.5 percent on sales over the past decade. If this rate holds over the next decade, external capital needs would amount to about $1 billion. If a 4 percent rate could be achieved, a surplus of capital funds would be generated sufficient to retire about 30 percent of the present long-term debt.

RECOMMENDED POLICY AND STRATEGY CHANGES

From the analysis presented in this study a number of policy changes and industry actions are recommended:

☐ *More Effective Utilization of the Industry's Existing Capacity* Some further diversification will probably be necessary for more effective utilization of the industry's existing capacity. Imbalances in capacity among companies may best be accommodated through the merger route, i.e., mergers between companies with expanding backlogs and those with decreasing backlogs. This action would probably be preferable to any concerted policy on the part of the government to award contracts based partly on current backlog considerations, i.e., to favor those companies with low backlogs. On the other hand, it may be cost-effective for the government to adopt a concerted policy toward diversification. Such a policy would not necessarily entail giving preferential treatment to firms with current low backlogs but rather to firms with the largest competitive advantage for performing the work. This policy would in turn promote mergers that would absorb the low backlog firms into diversified work without encouraging inefficiency. From the standpoint of overall economic efficiency, it would tend to put idle capacity to work while at the same time improve the overall financial viability of the aerospace industry.

[14]This prediction could be significantly altered as a result of the recent Financial Accounting Standards Board (FASB) directive. See "Statement of Financial Accounting Standards No. 2—Accounting for Research and Development Costs," October 1974 which states that all research and development costs not directly reimbursable by others are charged to expense when incurred. FASB, High Ridge Park, Stamford, Conn. 06905.

Table 14

AEROSPACE INDUSTRY
PROJECTED INVESTMENT AND DEPRECIATION
(Billions of 1972 Dollars)

Year	Plant, Equipment & Land (Book Value)[a]	Investment	Depreciation[a]
1973	$ 4.4	$ .8	$ .7
1974	4.3	.6	.7
1975	4.2	.6	.7
1976	4.2	.7	.7
1977	4.3	.8	.7
1978	4.5	1.0	.8
1979	4.9	1.2	.8
1980	5.4	1.3	.8
1981	5.9	1.4	.9
1982	6.5	1.6	1.0
1983	7.2	1.8	1.1
Total 1974-1983		11.0	7.9

[a]Book value projected by adding projected investment in constant 1972 dollars to 1973 book value and subtracting projected depreciation.

Moreover, national leaders have recognized the important role that technology has played and will continue to play in the solution of most of the nation's priority programs; and no industry can contribute more to high-technology than aerospace. In addition to its traditional role in national security and space, the aerospace industry is in a potentially strong position to assist in finding solutions to other national interest programs such as in energy, transportation and a wide range of other domestic problems. A financially strong and well-diversified aerospace industry would be in still a better position to respond effectively to these challenges.

Table 15

PROJECTIONS OF CAPITAL NEEDS AND SOURCES
of the Aerospace Industry
(Billions of Dollars)

	1968	1969	1970	1971	1972	1973	1983	1974-1983
NEEDS								
Working Capital	$ 3.9	$ 4.5	$ 4.7	$ 4.8	$ 5.5	$ 5.6	$ 6.6	$ 1.1
Sales	26.9	26.4	25.5	23.6	24.2	29.5	26.5	
Working Capital/Sales	.15	.17	.18	.20	.23	.19	.25	
Plant, Equipment & Land (from Table 5-1)								$ 11.0
Other Non-Current Assets	$ 1.9	$ 2.3	$ 2.6	$ 2.8	$ 2.9	$ 3.2	$ 3.2	$ .3
Ratio to Sales	.07	.09	.10	.12	.12	.11	.12	
TOTAL Projected Investment Needs, 1974-1983								$ 12.4
SOURCES								
Profits (after-tax)	$ .96	$ 1.2	$ .21	$ .26	$ .51	$ .98		
Sales	$ 26.9	$ 26.4	$ 25.5	$ 23.6	$ 24.2	$ 29.5		$ 243.0
Profit/sales	.036	.045	.088	.011	.021	.033		
Profit Rate: 4 percent — less dividends of 40 percent of profits								$ 5.8
2 percent — less dividends of 40 percent of profits								2.9
Depreciation (from Table 5-1)								7.9
TOTAL Projected Internally Generated Funds, 1974-1983								
At 4 percent rate of profit on sales								13.7
At 2 percent rate of profit on sales								$ 10.8
Capital Required from External Sources								
Under 4 percent rate of profit on sales								$ -1.3
Under 2 percent rate of profit on sales								1.6

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations.*

Note: 1968-1973 expressed in current dollars; 1974-1983 expressed in constant 1972 dollars.

Unfortunately, however, some changes need to be implemented before the industry can pursue a large-scale diversification program through mergers or acquisitions; therefore,

It is recommended that the federal government in acknowledging the high-technology capabilities of the U.S. aerospace industry, take note of the financial health of the industry relative to other industries and, through official sanction, encourage, promote and approve any future aerospace industry mergers, acquisitions, joint ventures and other efforts for consolidation of industrial resources, which implies among other things, re-examination of antitrust policies, corporate tax structures, and joint ventures and trade policies with foreign countries.

□ *Research and Development Efforts* The future of the aerospace industry, like any high-technology industry, is dependent in large part on the current level of R&D effort. Because the industry's historical product development cycle for both government and commercial products is between five and 15 years, an expenditure in R&D to generate future products or services generally will not show concrete growth potential for a minimum of five years.

The aerospace product development cycle is long in comparison to that of other durable goods manufacturers and places the aerospace industry into a high risk equity capital market. The high risk nature of equity capital in the industry combined with the future instability of the equities market makes the ability to attract capital difficult to forecast.

Typical markets for capital formation have been split between income securities and growth securities. Investment criteria have generally been based on five-year forecasts for reasons of conservative portfolio analysis and ten-year forecasts only in the cases of highly stable utilities.

Since the aerospace industry is based on product development periods of up to 15 years, the attractiveness of equity capital in the aerospace industry is not sufficient to attract short-term or medium-term holders and can only attract the very long-term holders of securities.

If R&D efforts are allowed to decrease, the future of the industry will be placed in jeopardy. A decrease in R&D expenditures or a delay of these expenditures into future periods, may in the long-run reduce the industry to a position of economic instability or, at worst, a lack of future viability to exist in a worldwide competitive market. Currently some government representatives are not willing to accept a reasonable share of a company's independent R&D (IR&D) expenditures in the contract price of a government contract. Should this view prevail, recognizing that in excess of 50 percent of the sales of the industry are to public sector users, there is little question that IR&D and hence the viability of the industry will be damaged substantially; therefore,

It is recommended that the federal government recognize the right of private contractors to exercise management discretion on the content and amount of IR&D, and thus encourage industry to increase IR&D rather than decrease it, so as to maintain U.S. leadership in the world's position for technological supremacy. A common policy and practice of independence and allowability of IR&D which recognizes such expenditures as essential costs of business should be adopted by all government agencies.

□ *Reasonable Profit Rates* It is important that efforts be continued to improve profit rates on government contracts by more realistic contract terms and costing methods which are responsive to inflationary cost pressures upon the industry and which allow appropriate compensation for capacity in plant and equipment which could serve the country well in an international emergency. This action should be carried out in a way so as not to reward inefficiency but simply to recognize the financial costs of capital facilities which are not currently fully productive due to irregular patterns in government procurement.

Responding to this objective, however, actually means addressing the countless policies, orders, procedures, directives, reporting requirements and other regulations governing the procurement process throughout the federal government. Contracting officers seek to negotiate prices, quantities, profit rates, schedules, and other contract terms which they believe to best protect the public interest, but which often are instrumental in exposing the free enterprise industry to unnecessary and intolerable risk, which in the final analysis is definitely not in the national interest.

It is recommended that government policies, principles, regulations and practices be revised and conscientiously enforced in order to accommodate a basic national industry resource by allowing profit rates commensurate with financial risk and which are adequate to attract sufficient capital necessary to assure an economically sound industry capable of meeting the nation's domestic, defense and space needs of the future.

APPENDIX

Table A-1

ALTERNATIVE MEASURES OF AEROSPACE SALES
(Millions of Dollars)

YEAR	INDUSTRY SALES (Current Industrial Reports, Census)		COMPANY SALES (FTC)	ESTABLISHMENT SHIPMENTS (Annual Survey of Manufacturers, Census)		
				Current Dollars		
	Current Dollars	1958 Dollars	Current Dollars	Total	SIC 372	SIC 1925
1960	$ 10,997	$ 10,699	$ 12,974	$ N.A.	$ 12,360	$ N.A.
1961	14,948	14,527	13,954	N.A.	13,374	N.A.
1962	15,972	15,462	15,206	N.A.	13,723	N.A.
1963	16,407	15,898	15,313	16,906	13,776	3,130
1964	16,686	15,816	15,403	16,955	13,771	3,184
1965	17,016	15,844	16,073	17,834	14,519	3,315
1966	20,227	18,305	19,224	21,578	17,564	4,014
1967	23,444	20,856	22,739	25,704	21,064	4,641
1968	25,592	22,312	26,852	27,579	22,721	4,858
1969	24,648	20,678	26,392	26,867	22,234	4,632
1970	24,752	19,691	25,505	20,566	20,527	3,970
1971	21,679	16,587	23,566	22,423	18,433	3,990
1972	21,499	15,902	24,838	21,402[p]	17,169[p]	4,233[p]
1973	24,277	17,340	29,494	N.A.	N.A.	N.A.

p Preliminary data from *1972 Census of Manufacturers,* advance report; 1973 data not yet available.

N.A. Not available.

Note: "Industry Sales" in current dollars include the total sales of companies whose primary business is in aerospace. For companies whose primary business is not in aerospace, sales are reported on an establishment basis. Annual industry sales were extracted from annual issues of *Current Industrial Reports,* Series MQ-37D. Current dollar industry sales were deflated to 1958 dollars by means of unpublished shipments deflators, developed by the Department of Commerce, BEA, in connection with its Gross Product Originating Accounts.

"Company Sales" reports all product sales, including non-aerospace, but only for firms classified as belonging to IRS industry code 3720, "Aircraft and Parts". Source of data was FTC *Quarterly Financial Reports for All Manufacturing Corporations.*

"Establishment Shipments" represent the sum of SIC codes 372 plus 1925 and are reported on an establishment basis in the *Annual Survey of Manufacturers.* Establishment level reporting includes only those plants whose principal activity is aerospace, whether or not they belong to companies so classified.

Table A-2

AEROSPACE INDUSTRY BACKLOG/NET SALES

Commercial versus U.S. Government
(Millions of Dollars)

YEAR	TOTAL AEROSPACE			U.S. GOVERNMENT			COMMERCIAL AND OTHER		
	Backlog	Net Sales	Backlog/ Sales	Backlog	Net Sales	Backlog/ Sales	Backlog	Net Sales	Backlog/ Sales
1960	$ 13,950	$ 10,997	1.27	$ N.A.	$ N.A.	N.A.	$ N.A.	$ N.A.	N.A.
1961	13,922	14,948	.93	11,018	11,766	.94	2,904	3,182	.91
1962	13,138	15,972	.82	10,572	12,552	.84	2,566	3,420	.75
1963	13,904	16,407	.85	10,950	13,202	.83	2,954	3,204	.92
1964	15,188	16,686	.91	11,651	12,815	.91	3,537	3,871	.91
1965	20,385	17,016	1.20	13,696	12,535	1.09	6,689	4,481	1.49
1966	27,547	20,227	1.36	15,711	14,530	1.08	11,836	5,697	2.08
1967	29,339	23,444	1.25	16,397	16,334	1.00	12,972	7,110	1.82
1968	30,749	25,592	1.20	16,343	16,635	.98	14,406	8,957	1.61
1969	28,297	24,648	1.15	14,298	16,560	.86	13,999	8,088	1.73
1970	24,705	24,752	1.00	12,882	16,407	.79	11,823	8,345	1.42
1971	24,579	21,679	1.13	13,997	14,114	.99	10,582	7,565	1.40
1972	26,922	21,499	1.25	15,322	13,492	1.14	11,600	8,007	1.45
1973	29,679	24,277	1.22	16,710	14,532	1.15	12,969	9,745	1.33

Source: Bureau of the Census, *Current Industrial Reports,* Series MQ-37D.

Table A-3

AEROSPACE INDUSTRY PROFITS BEFORE AND AFTER TAXES

YEAR	MILLIONS OF DOLLARS				BEFORE TAX PROFITS AS PERCENT OF			AFTER TAX PROFITS AS PERCENT OF		
	Before Tax Profits	After Tax Profits	Est'd. Interest Payments	Total Capital Invested	Sales	Equity	Total Capital Invested	Sales	Equity	Total Capital Invested
1960	$ 333	$ 184	$ 86	$ 5,697	2.6 %	13.3 %	7.4 %	1.4 %	7.3 %	4.7 %
1961	521	257	75	6,030	3.7	19.8	9.8	1.8	9.8	5.5
1962	682	360	79	6,441	4.5	24.0	11.8	2.4	12.7	6.8
1963	665	350	73	6,534	4.3	21.5	11.3	2.3	11.3	6.5
1964	748	395	74	6,460	4.9	23.1	12.7	2.6	12.2	7.3
1965	984	524	71	6,841	6.1	28.4	15.6	3.2	15.1	8.7
1966	1,046	572	111	8,640	5.4	26.4	13.4	3.0	14.4	7.9
1967	1,099	610	184	11,126	4.8	23.1	11.5	2.7	12.8	7.1
1968	1,606	857	356	14,015	6.0	26.6	14.0	3.2	14.2	8.7
1969	1,433	804	321	17,132	5.4	18.9	10.2	3.0	10.6	6.6
1970	881	501	459	18,300	3.5	12.0	7.3	2.0	6.8	5.3
1971	761	423	507	18,262	3.2	10.4	6.9	1.8	5.9	5.1
1972	1,103	609	438	20,752	4.4	14.3	7.4	2.4	7.9	5.0
1973	1,449	855	405	20,930	4.9	17.5	8.9	2.9	10.3	6.0

Source: FTC, *Quarterly Financial Reports for All Manufacturing Corporations* (1964-1973 rates of return on sales and equity, average of quarterly annualized rates); For 1960-1963, rates of return represent annual profits taken as a percent of (1) total sales for the year and (2) the four-quarter average of stockholders' equity; Return on total capital invested is derived from Table 2.

Note: Profits include interest paid in computation of return on total capital invested. See p. 28-29 for description of return on total capital.

Table A-4

PROFITS AFTER TAXES

Aerospace, All Manufacturing and Selected Manufacturing Industries

Year	MILLIONS OF DOLLARS					
	Aerospace	All Manufacturing	Motor Vehicles	Electrical Machinery	Instruments	General Industrial Machinery
1960	$ 185	$ 15,197	$ 1,676	$ 1,026	$ 313	$ 1,006
1961	257	15,311	1,488	1,024	308	1,061
1962	360	17,727	2,289	1,229	372	1,308
1963	350	19,483	2,562	1,299	390	1,432
1964	395	23,211	2,808	1,512	495	2,001
1965	524	27,521	3,496	1,926	777	2,499
1966	572	30,937	3,053	2,379	1,073	3,058
1967	610	29,008	2,356	2,297	1,064	2,893
1968	857	32,069	3,222	2,518	1,138	2,947
1969	804	33,248	2,845	2,594	1,280	3,138
1970	501	28,572	1,424	2,349	1,311	2,689
1971	423	31,038	3,097	2,563	1,347	2,489
1972	609	36,467	3,639	2,999	1,514	3,481
1973	855	48,058	4,083	3,968	1,817	4,957
Year	INDEX 1960=100					
	Aerospace	All Manufacturing	Motor Vehicles	Electrical Machinery	Instruments	General Industrial Machinery
1960	100	100	100	100	100	100
1961	139	101	89	99	98	105
1962	195	117	137	120	119	130
1963	189	128	153	127	125	142
1964	214	153	168	147	158	199
1965	283	181	209	188	248	248
1966	309	204	182	232	343	304
1967	330	191	141	224	340	288
1968	463	211	192	245	364	293
1969	435	219	170	253	409	312
1970	271	188	85	229	419	267
1971	229	204	185	250	430	247
1972	331	240	217	292	484	346
1973	462	316	244	387	581	493

Source: FTC, *Quarterly Financial Report for All Manufacturing Corporations.*

Note: General Industrial Machinery is listed as "Other Machinery" by FTC.

Table A-5

AFTER-TAX PROFITS AS A PERCENT OF EQUITY CAPITAL

Aerospace, All Manufacturing and Selected Manufacturing Industries

Year	Aerospace	All Manufacturing	Motor Vehicles	Electrical Machinery	Instruments	General Industrial Machinery
1960	7.3 %	9.2 %	13.5 %	9.5 %	11.5 %	7.7 %
1961	9.8	8.9	11.4	8.9	9.1	7.8
1962	12.7	9.8	16.3	10.1	12.0	9.1
1963	11.3	10.3	16.7	10.1	12.1	9.6
1964	12.2	11.6	16.8	11.2	14.3	12.4
1965	15.1	13.0	19.5	13.5	17.4	14.1
1966	14.4	13.5	15.9	14.8	20.8	15.1
1967	12.8	11.7	11.7	12.8	17.9	12.9
1968	14.2	12.1	14.3	12.2	16.5	12.3
1969	10.6	11.5	12.6	11.1	15.6	12.2
1970	6.8	9.3	13.4	9.1	14.2	9.9
1971	5.8	9.7	13.0	9.5	13.5	8.7
1972	7.9	10.6	14.0	10.8	14.8	10.6
1973	10.3	12.8	15.1	13.1	15.9	13.4

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations*. Quarterly profit rates are averaged, except for 1960-1963, where profits were computed as a percent of average equity for the year.

Table A-6

CAPITAL/SALES RATIOS
Aerospace and All Manufacturing

YEAR	CURRENT ASSETS/SALES		FIXED ASSETS/SALES		TOTAL ASSETS/SALES		WORKING CAPITAL/SALES	
	Aerospace	Manufacturing	Aerospace	Manufacturing	Aerospace	Manufacturing	Aerospace	Manufacturing
1960	.422	.387	.090	.283	.545	.730	.135	.232
1961	.416	.388	.091	.290	.526	.741	.132	.234
1962	.394	.381	.096	.280	.509	.722	.128	.226
1963	.413	.384	.101	.274	.532	.719	.138	.228
1964	.406	.379	.103	.272	.531	.709	.141	.224
1965	.413	.372	.104	.270	.542	.698	.140	.213
1966	.428	.368	.112	.272	.577	.697	.122	.202
1967	.472	.379	.125	.293	.647	.733	.124	.207
1968	.488	.380	.132	.295	.683	.740	.140	.205
1969	.581	.382	.161	.297	.845	.755	.166	.198
1970	.619	.395	.178	.318	.897	.800	.185	.196
1971	.594	.387	.186	.318	.895	.795	.203	.195
1972	.635	.376	.168	.295	.921	.756	.219	.192
1973	.542	.361	.144	.264	.792	.702	.194	.181

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations.* Assets reflect averages for the four quarters.

Note: "Net Sales" and assets are defined on a company basis for "Aircraft and Parts." FTC sales are compared with other measures of sales, on an establishment basis and on an industry basis, in Table A-1.

"Fixed Assets" are defined as net book value in historical dollars, including land.

Table A-7

COMPOSITION OF ASSETS IN THE AEROSPACE INDUSTRY
(Millions of Dollars)

YEAR	TOTAL	NET BOOK VALUE OF FIXED CAPITAL		CURRENT ASSETS		OTHER ASSETS (NON-CURRENT)	
		Amount	Percent of Total	Amount	Percent of Total	Amount	Percent of Total
1960	$ 7,071	$ 1,171	17 %	$ 5,703	81 %	$ 198	3 %
1961	7,345	1,276	17	5,802	79	268	4
1962	7,738	1,462	19	5,995	77	281	4
1963	8,153	1,549	19	6,320	78	285	3
1964	8,185	1,591	19	6,254	76	341	4
1965	8,709	1,670	19	6,637	76	403	5
1966	11,068	2,148	19	8,237	74	684	6
1967	14,704	2,849	19	10,727	73	1,128	8
1968	18,331	3,542	19	13,116	72	1,674	9
1969	22,297	4,248	19	15,333	69	2,716	12
1970	22,883	4,538	20	15,775	69	2,569	11
1971	21,089	4,373	21	13,988	66	2,728	13
1972	22,867	4,181	18	15,774	69	2,912	13
1973	23,361	4,248	18	15,985	68	3,128	13

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations,* average of quarterly data.

Note: Net book value of fixed capital includes land value.

Table A-8

WORKING CAPITAL RATIOS
Aerospace and All Manufacturing

YEAR	CURRENT ASSETS/ CURRENT LIABILITIES		WORKING CAPITAL/ TOTAL CAPITAL	
	Aerospace	Manufac-turing	Aerospace	Manufac-turing
1960	1.44	2.50	.566	.451
1961	1.46	2.52	.590	.494
1962	1.48	2.47	.570	.447
1963	1.50	2.47	.578	.454
1964	1.53	2.44	.577	.452
1965	1.52	2.33	.575	.440
1966	1.40	2.22	.521	.426
1967	1.36	2.21	.498	.414
1968	1.40	2.17	.516	.410
1969	1.40	2.07	.507	.400
1970	1.43	1.99	.509	.381
1971	1.52	2.02	.522	.381
1972	1.52	2.04	.562	.393
1973	1.56	2.00	.574	.407

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations.* Quarterly data were averaged for annual balance sheet entries.

Note: Total capital is defined as net book value of fixed assets plus total working capital; excludes government-owned assets.

Table A-9

AEROSPACE INDUSTRY CAPITAL AND DEBT/EQUITY RATIOS
(Millions of Dollars)

YEAR	STOCK-HOLDERS' EQUITY	LONG-TERM DEBT		OTHER NON-CURRENT LIABILITIES		TOTAL DEBT	
		Amount	Long-term Debt/Equity	Amount	Non-Current Liab./Equity	Amount	Total Debt/Equity
1960	$ 2,548	$ 645	.25	$ 32	.01	$ 677	.27
1961	2,808	806	.29	28	.01	834	.30
1962	2,943	783	.27	37	.01	820	.28
1963	3,162	835	.26	42	.01	877	.28
1964	3,321	803	.24	46	.01	849	.26
1965	3,556	818	.23	75	.02	893	.25
1966	4,126	1,511	.37	97	.02	1,608	.39
1967	5,419	2,261	.42	232	.04	2,493	.46
1968	6,352	2,930	.46	291	.05	3,221	.51
1969	7,312	3,618	.50	412	.06	4,030	.55
1970	7,248	4,113	.57	514	.07	4,627	.64
1971	7,317	4,004	.55	551	.08	4,555	.62
1972	7,816	4,351	.56	571	.07	4,922	.63
1973	8,475	4,159	.49	540	.06	4,699	.56

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations,* fourth quarter data.

Table A-10

LONG-TERM DEBT/EQUITY RATIOS

Aerospace, All Manufacturing and Selected Industries

YEAR	AEROSPACE	ALL MANUFACTURING	MOTOR VEHICLES	ELECTRICAL MACHINERY	INSTRUMENTS	GENERAL INDUSTRIAL MACHINERY
1960	.253	.187	.105	.190	.137	.190
1961	.287	.193	.105	.194	.138	.196
1962	.266	.196	.098	.218	.155	.197
1963	.264	.198	.089	.219	.155	.189
1964	.242	.200	.084	.209	.170	.191
1965	.230	.216	.081	.233	.153	.205
1966	.366	.238	.087	.252	.168	.208
1967	.417	.267	.101	.317	.164	.248
1968	.461	.290	.107	.326	.175	.256
1969	.495	.305	.115	.339	.200	.272
1970	.567	.330	.140	.355	.226	.299
1971	.547	.341	.172	.366	.198	.299
1972	.557	.337	.173	.374	.167	.294
1973	.491	.328	.176	.364	.194	.282

Source: FTC *Quarterly Financial Report for all Manufacturing Corporations,* fourth quarter data.

Table A-12

COMPOSITE INDUSTRY INCOME AND PROFIT STATEMENT

Aircraft and Parts
(Millions of Dollars)

	1960	1961	1962	1963	1964	1965	1966	1967
Sales	$ 12,974	$ 13,954	$ 15,206	$ 15,313	$ 15,403	$ 16,073	$ 19,224	$ 22,739
Costs and Expenses*	12,589	13,384	14,467	14,618	14,647	15,076	18,149	21,586
Operating Profits	385	570	739	695	756	997	1,075	1,152
Other Profits (Losses)	(52)	(50)	(58)	(30)	(10)	(13)	(30)	(55)
Total Profits	333	520	681	665	746	984	1,045	1,099
Federal Income Taxes	149	263	321	315	351	460	473	489
Total Net Profits	184	257	360	350	395	524	572	610
Cash Dividends	104	110	129	136	154	185	192	228
Net Profits Retained in Business	80	147	231	214	241	339	380	382
*Depreciation and depletion charges included above	214	237	266	269	292	300	349	465

Source: FTC *Quarterly Financial Report for All Manufacturing Corporations.*

Note: Aircraft and Parts represents data for companies classified in aircraft and parts until 1971. Beginning in 1971, data for companies classified in guided missiles and space vehicles are included.

Table A-11

RESEARCH AND DEVELOPMENT AS A PERCENT OF SALES

Aerospace, All Manufacturing and Selected Industries

YEAR	AEROSPACE	ALL MANUFACTURING	MOTOR VEHICLES	ELECTRICAL EQUIPMENT	INSTRUMENTS	GENERAL INDUSTRIAL MACHINERY
1960	23.2 %	4.2 %	3.0 %	11.2 %	8.6 %	4.7 %
1961	23.5	4.3	4.0	10.1	6.0	4.2
1962	23.8	4.3	3.5	9.9	5.4	4.0
1963	26.7	4.5	3.4	10.1	4.1	4.2
1964	28.3	4.6	3.6	9.9	4.3	4.2
1965	27.0	4.3	3.1	9.1	5.9	4.0
1966	23.7	4.2	3.2	8.5	5.5	3.9
1967	19.7	4.2	3.4	8.6	5.4	4.2
1968	17.4	4.0	3.1	8.5	5.8	4.1
1969	18.3	4.0	3.1	7.9	5.7	3.9
1970	16.0	3.7	3.5	7.4	5.5	3.8
1971	15.9[r]	3.5	3.5	7.3	5.3	3.9
1972	16.3[p]	3.4[p]	3.5[p]	7.9[p]	N.A.	4.0[p]

Source: NSF *Research and Development in Industry: 1971,* Table B-39, NSF 73-305 (1960-1971). NSF *Science Resources Studies Highlights,* NSF 73-317 (1972).

p Unofficial preliminary estimates.

r Revised estimates.

Table A-12
(continued)

1968	1969	1970	1971	1972	1973
$ 26,852	$ 26,392	$ 25,505	$ 23,566	$ 24,838	$ 29,494
25,191	24,899	24,526	22,674	23,585	27,873
1,661	1,493	980	893	1,254	1,619
(54)	(61)	(99)	(133)	(150)	(170)
1,606	1,433	881	761	1,103	1,449
749	629	380	338	494	593
857	804	501	423	609	855
305	337	264	242	269	284
552	467	237	181	340	571
587	668	690	666	677	653