Chapter 4

FINANCING

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High risks have affected the mix of capital sources and the amount and cost of capital raised by the aerospace industry. This section examines the experience of aerospace firms in raising capital.

OVERVIEW

Firms finance new projects from internally and externally generated funds. Internally generated funds come primarily from operations and include such quantities as net income and depreciation, retained earning, and deferred taxes. * Externally generated funds come from borrowing (debt), sale of stock (equity), and advance or progress payments from customers. In borrowing, a firm essentially buys capital, while in issuing stock, a firm essentially sells portions of itself. The cash provided by advance and progress payments is not treated for acccounting purposes as capital, although it is invested by manufacturers.

Raising capital has costs. The cost of internally generated funds for- a particular project is the foregone profit expected from alternative projects. This (opportunity cost is not paid out in real resources, however. The cost of borrowed funds is the interest charged. Because firms must pay interest according to a fixed schedule, debt imparts financial risk, which is an implicit cost to the firm. Final l}, the cost of equity is a share of company profits, paid through dividends. Real resource (and implicit) costs usually make external capital more expensive than internal capital.

Aerospave firms generally have more difficulty raising funds externally than firms s in other industties because investment in them is relatively r i sky. Al t hough, as measured by such ratios as return on equity or return on total capital invested,** aerospace firms have been relatatively profitable, subtantial uncertainty about their financial performance in the future makes them seem risky to investors. Lenders and investors as a class are risk-averse—they discriminate against investments with relatively large probabilities of relatively large losses, and they require the promse of high returns (e. g., high interest rates) in exchange for exposing their funds to high risks. The problematic standing of aerospace firms in capital markets is illustrated by such commonly used indices as bond ratings and "beta" statistics.

Bond (and other credit) ratings reflect the perceived ability of firms to generate funds internally and thereby repay lenders. The typically mediocre bond ratings for aerospace firms displayed in table 4 suggest that lenders are skeptical about the financial prospects of aerospace firms. To compensate for the higher risks in lend-

Table 4.—Aerospace Firm Bond Ratings, 1981
(Moody's)

Company	Rating
Boeing	A
McDonnell Douglas	Ba
Lockheed	B
Fairchild Industries	Ba
General Dynamics	Aaa (Gov't guaranteed)
Grumman	B
General Electric	Aaa
United Technologies (Pratt & Whitney)	Aa & A (subordinated)

Key to Moody's ratings

Aaa	Best quality
Aa	High quality
A	Higher medium grade
Baa	Lower medium grade
Ba	Possess speculative elements
B	Generally lack characteristics of a desirable investment
Caa	Poor; may be in default
Ca	Speculative to a high degree; often in default
C	Lowest grade

SOURCE: *Moody's Industrial Manual*, 1981, Lawrence D. Schall & Charles W. Haley, *Introduction to Financial Management*, 1977

ing to them, aerospace firms must pay higher interest rates on debt than better rated firms; debt is essentially less available to them than to other, better rated firms. Note that an aerospace unit of a diversified corporation may have easier (if indirect) access to external capital if the corporation as a whole has a good credit rating. For example, General Electric, which has a large jet engine manufacturing unit, has a top, Aaa bond rating from Moody 's.

The beta statistic provides an indication of the riskiness of a particular investment relative to the investment market overall, based on historical data for financial performance. * The investment market as a whole has a beta of one. A stock beta greater than one signifies that return on investment for the stock will both rise and fall faster than for the market; a beta less than one signifies slower response of a stock's returns to changes in market value. As a cross-industry study shows, and table 5 displays, industries differ in average riskiness as measured by betas. Among industries, aerospace is relatively risky, though significantly less risky than its chief commercial customers,

*Other measures are necessary to evaluate risk not associated with market behavior. The beta statistic is calculated by dividing the variance of the excess return on the market portfolio into the covariance between the excess return on the security being studied and the excess return on the market portfolio, It measures the sensitivity of the excess return of the security to the excess return on the market portfolio, where the "excess return" is the difference between the period rate of return for the security or the market portfolio and the period rate of return on riskless assets. See, for example, William F. Sharpe, Chapter Six of Investments (Prentice-Hall, Inc., 1978) for a more detailed explanation.

Table 5.–Average Stock Beta Values by Industry, 1966-74

Industry	Beta value	Industry	Beta value
Air transport	***1.80***	Energy, raw materials	1.22
Real property	1.70	Tires, rubber goods	1.21
Travel, outdoor recreation	1.66	Railroads, shipping	1.19
Electronics	1.60	Forest products, paper	1.16
Miscellaneous finance	1.60	Miscellaneous, conglomerate	1.14
Nondurable, entertainment	1,47	Drugs, medicine	1.14
Consumer durables	1,44	Domestic oil	1,12
Business machines	1,43	Soaps, cosmetics	1.09
Retail, general	1.43	Steel	1,02
Media	1.39	Containers	1,01
Insurance	1.34	Nonferrous metals	0,99
Trucking, freight	1.31	Agriculture, food	0,99
Producer goods	1.30	Liquor	0,89
Aerospace	1.30	International oil	0.85
Business services	1.28	Banks	0.81
Apparel	1.27	Tobacco	0.80
Construction	1,27	Telephone	0.75
Motor vehicles	1.27	Energy, utilitles	0.60
Photographic, optical	1.24	Gold	0.36
Chemicals	1.22		

SOURCE Barr Rosenberg and James Guy, "Prediction of Beta From Investment Fundamentals *Financial Analysts Journal* **32,** No4, July/August 1976, pp 6270

the airlines. Aerospace stock betas published in the Value Line Investment Survey are generally greater than one, indicating that most aerospace firm stocks are perceived to be relatively risky investments (see table **6).**

Table 6.–Aerospace Stock Beta Values by Company, 1981

Company	Beta value
Boeing	1.25
McDonnell Douglas	1.2
Lockheed	1.75
Fairchild Industries	1.3
General Dynamics	1.3
Grumman	1.3
Martin Marietta	1.1
Rockwell International	0.95

SOURCE *Value Line Investment Survey*

SOURCES OF FUNDS

Aerospace firms rely on different sources of funds to different extents. The exact contribution of internal sources of funds, in particular, is not always apparent from published financial statements because aerospace firms use somewhat anomalous accounting procedures which affect the recognition of revenues and expenses, the treatment of startup expenses, and the construction of balance sheets.[1] Nevertheless, it is possible to make some observations as to the relative importance of different sources of funds to aerospace firms.

Net Income

Net income is the amount of money available from operations after deducting costs of production, administrative costs, interest, depreciation, and taxes. In current dollars, net income for the seven major aerospace firms identified earlier first exceeded $1 billion in 1979; it fell to about $718 million in **1981.** Net income for Boeing, McDonnell Douglas, and Lockheed together was about **$361** million in **1981** (see table 7).

Net income trends across the industry have been erratic. Because of the cyclical nature of aerospace business, sales and/or net income often decline. Several firms have experienced losses (negative net income) during the postwar period and the group of seven major firms experienced aggregate losses in both 1960 and 1970.[2] Losses on commercial operations alone have been common, although they have often been offset by profits from Government and nonaerospace operations. Boeing, McDonnell Douglas, and Lockheed together lost about **$6** billion (current dollars) on civil aircraft programs over the last two decades. * Particular company losses can be attributed to technological problems (primarily during the **1950's),** sales problems (including contract cancellations), and/or operating inefficiencies. Fluctuating net income levels and occasional losses inhibit accumulation of cash for future operations and raise the cost of external funds because they make a company seem risky.

Note that expenses for R&D, whether charged to a specific project or to overhead, are generally expensed (written off as incurred). Since R&D is a major expense item for aerospace firms, this practice significantly lowers both net income and taxes. Indeed, substantial R&D expenses may more than offset positive earnings, creating an accounting loss,

[1] Hartman L Butler Jr., et al., "The Aerospace Industry Re-Revisited," in *Financial Analysts Journal* July -August 1 977.

[2] Ibid.

*Personal communication with Wolfgang Demisch, aerospace industry analyst with Morgan Stanley & Co., Inc.

Table 7.— Net Income of Major Aerospace Companies (in millions)

	Boeing	McDonnell Douglas	Lockheed	General Dynamics	Grumman	Northrop	Fairchild Industries	Total
1966 ..., ...	$ 76.1	$(21.3)	*$ 58.9*	*57.8*	$26.1	$11.4	*$ 4.8*	$ 213.8
1967	83.9	7.5	*54.4*	*55.3*	21.5	13.7	*5.3*	241.6
1968	83.0	98.5	*44.5*	*38*	19.0	17.1	*3.2*	303.3
1969 ..., ...	10.2	79.7	*(32.6)*		22.1	19.7	*6.6*	108.7
1970	22.1	5.5	*(187.8)*	*(6.9)*	20.3	17.8	*6.4*	(127.6)
1971	22.4	20.4	(40)	*21.6*	(18.0)	11.0	*6.6*	24
1972	30.4	97,6	(7.2)	*24.6*	(70)	11.1		92.7
1973 ..., ...	51.2	133,3	(18)	*39.3*	28.2	11.6	*(2.3)*	279.3
1974	72.4	106,7	23.2	*52.2*	32.9	18.1	*6.0*	311.5
1975.	76.3	85.6	45.3	*84.5*	23.5	24.7	*3.2*	343.1
1976.	102.9	108.9	38.7	*99.6*	23.6	35.9	*4.9*	414.5
1977. ..,.....	180.3	123,0	55	*103.4*	32.4	66.2	*9.6*	569.9
1978.	322.9	161.1	64.9	*(48.1)*	20	88.4	*24.5*	633.7
1979, ...	505.4	199.1	56.5	*185.2*	19.6	90.3	*42.5*	1098.6
1980.	600.5	144.6	27.6	*195.0*	30.7	86.1	*54.5*	1139.0
1981 ..., ...	473.0	176.6	(288,8)	*124.1*	20.5	47.9	*64.4*	617.7

SOURCES Hartman L Butler, Jr, et al., "The Aerospace Industry Re-vesited:' Financial Analysts Journal July-August 1977, corporate annual reports

Finally, note that the ratio of net income to sales, a measure of profitability, is low for aerospace firms relative to other industries overall and to all manufacturing corporations combined (see table 8). This means that aerospace firms derive less cash from current operations to apply to new projects than other firms. Increases in net-income-to-sales for commerical air transport manufacturers after 1976 imply that the cash contribution of current operations increased; by the same measure, the cash contribution of current operations decreased between 1979 and 1981.

Depreciation

Depreciation charges for plant and equipment are a source of internal funds to a company otherwise making a profit because they lower tax payments. The size of depreciation charges depends on the amount and timing of investments in depreciable facilities. * During 1981, facilities depreciation charges for Boeing, McDonnell Douglas, and Lockheed totaled about $490 million.

Depreciation is typically a much more limited source of funds for aerospace firms than net income or other sources. This is largely so because those firms invest relatively little in depreciable facilities (about **$988** million for Boeing, McDonnell Douglas, and Lockheed in 1981, for example) compared with other major manufacturing firms. Instead, they invest relatively large sums in R&D. Boeing, McDonnell Douglas, and Lockheed together spent more on R&D than on new facilities in 1981, for example. By contrast, depreciation is much more important for financing airlines, which make relatively large investments in equipment (primarily aircraft and parts). A study of airline financing patterns found that depreciation typically contributed **30** to 40 percent of major U.S. airline funds between 1951 and 1974.[3]

Deferred Taxes

Since the mid-1970's an important source of aerospace funds has been tax deferrals associated with the use of the completed contract method of cost accounting for tax purposes. The Internal Revenue Service developed the completed contract regulations (see the Code of Federal Regulations, vol. **26,** sec. 1.451-3) for commercial construction, shipbuilding, aerospace, and certain other manufacturing industries between 1971 and 1976.

The regulations were developed to remedy tax accounting problems arising from the substantial uncertainty in costs, prices, and income for work

*Aerospace firms cannot depreciate for tax purposes facilities purchased or provided by the Government.

[3]Nawal K. Taneja, *The Commercial Airline Industry,* 1976.

Table 8.– Net Profit After Taxes as a Percentage of Sales

Year	All manufacturing corporations	Non-durable goods	Durable goods	Aerospace [a]
1960	4.4%	4.8%	4.0%	1.4%
1961	4.3	4.7	3.9	1.8
1962	4.5	4.7	4,4	2.4
1963	4.7	4.9	4.5	2.3
1964	5.2	5.4	5.1	2.6
1965	5.6	5.5	5.7	3.2
1966	5.6	5.5	5.6	3.0
1967	5.0	5.3	4.9	2,7
1968	5.1	5.3	4.9	3,2
1969	4.8	5.0	4.6	3.0
1970	4.0	4.5	3.6	2.0
1971	4,1	4.5	3.8	1.8
1972	4,4	4.6	4.3	2.4
1973	4,7	5.0	4,5	2.9
1974	5.5	6.4	4.7	2.9
1975	4.6	5.1	4.1	2.9
1976	5.4	5.5	5.2	3.4
1977	5,3	5.3	5.3	4.2
1978	5,4	5.4	5.5	4.4
1979	5,7	6.1	5,2	5.0
1980	4.8	5.6	4.0	4.3
1981	4.7	5.2	4.2	4,3

[a] Based on a sample of Standard Industrial Classification codes 372 and 376 corporations having as their principal activity the manufacture of aircraft guided missiles and parts

SOURCE Aerospace Industries Association, from Federal Trade Commission data

Net Income as a Percent of Sales for Major Manufacturers

Company	1975	1976	1977	1978	1979	1980	1981
Boeing	2.1	2.6	4.5	5.9	6.2	6.4	4.8
McDonnell Douglas	2.6	3.1	3,5	3.9	3.8	2.4	2,4
Lockheed	1.3	1.2	1.6	1.9	1.4	0.5	–5.6

SOURCES Standard &Poor Industry Survey Aerospace Basic Analysis (April 3,1980) corporate annual reports (1980 and 1981).

performed under long-term contracts. They allow aerospace (and other) firms to defer recognition of income, deduction of direct and certain indirect costs, and payment of taxes associated with long-term manufacturing contracts (Government or commercial) until the tax year in which the contract is completed. Other related cost items (primarily for overhead) are expensed during the years prior to contract completion.

Both the deferral of income recognition and the expensing of certain costs reduce taxable income and taxes payable in the years prior to contract completion. Moreover, the deferral of tax payments can raise the effective aftertax return on investment of manufacturers using completed contract cost accounting.[4]

Although the full impact of completed contract cost accounting is not obvious from published financial statements, which often reflect different accounting procedures than statements prepared for tax purposes, industry analysts estimate that the top dozen aerospace firms (in terms of sales) have gleaned about $5 billion in cash through tax deferrals primarily associated with Government contract work since the mid-1970's, and that loss

[4] U.S. [Department of the Treasury, "General and Technical Explanation of Tax Revisions and Improved Collection and Enforcement Proposal s," Feb. 26.1982

of tax deferrals could reduce industry cash by at least 25 percent. * This evaluation reinforces the notion that aerospace firms have difficulty raising cash through "normal" channels. The current Congress is contemplating modifying these regulations to increase tax revenues.

Retained Earnings

Retained earnings represent the accumulation of past earnings retained for investment in firm activities (rather than dispersed to shareholders). At the end of 1981, Boeing, McDonnell Douglas, and Lockheed together reported having about $2.5 billion in retained earnings, $349 million less than end-of-1980 levels. Aerospace firms reinvest less capital from retained earnings than do other manufacturing industries. For example, while retained earnings comprises about 37 percent of total assets for all manufacturing firms combined in the fourth quarter of 1981, they were about 23 percent of total assets for aerospace firms. * *

Debt

Borrowing is the major means of external aerospace financing. Because aerospace sales and profits are cyclical, borrowing can even out the flows of funds necessary to meet development and production spending schedules. The following passage from the 1980 Boeing annual report brings out the important role of debt:

> It was a year in which many of our airline customers were adversely affected by the combined impact of recessionary and inflationary trends . . . an extremely competitive market . . . record interest rates and escalating fuel prices. As a result, demand slackened for the 727 and 747 commercial jet transports . . . Such reductions come at a time when substantial inventory buildup to support the 757 and 767 programs is required, when expenditures for plant and equipment to support current commitments and future growth continue at a high level, when increased investment must be planned to support the high level of Government business being projected, and when increased customer financing must be provided for . . . the reduced delivery rates have changed projections as to the level and timing of external financing that may be required. As a consequence, the previously established bank revolving credit agreement was increased . . . the company sold . . . convertible subordinated debentures . . . The company is also considering requesting a further increase in its . . . bank revolving credit agreement and may engage in additional financing . . .

Firms may borrow to satisfy overall capital needs or to fund particular projects. Boeing, for example, obtained a $2.25 billion standby line of credit in part to support its two new commercial air transport programs (the Boeing 757 and 767). An advanced air transport program would be so expensive that dedicated funding is likely to be necessary.

A review of financial statements shows that aerospace firms borrow in a variety of ways, including lines of bank credit, notes payable, convertible subordinated debentures (debt instruments that can be converted into stock), mortgages, and lease obligations. Convertible subordinated debentures (bonds that can be converted into common stock within a designated period of time) have helped aerospace firms (and airlines) get financing that might not have been available with straight debt (or equity) because the flexibility they afford the lender lessens the risk of lending to these firms.

The use of long-term debt has grown for both aerospace firms and airlines with the cost of new aircraft. Short-term debt holdings (for periods of up to 1 year) of aerospace firms have also increased periodically. Table 9 lists 1980 debt holdings of the seven major aerospace firms. Increasing use of debt implies an increasing burden of debt servicing costs. In 1981, for example, Boeing, McDonnell Douglas, and Lockheed paid $19.3 million, $69.8 million, and $186.2 million respectively in interest costs.

*Personal communication with Wolfgang Demisch, aerospace industry analyst, Morgan Stanley & Co., Inc.

* *In contrast, the ratio of retained earnings to total assets was about 36 percent for motor vehicle and equipment manufacturers and for manufacturers of other durable equipment during the fourth quarter of 1981, See the "Quarterly Financial Report for Manufacturing Corporations, " prepared by the Federal Trade Commission, for the first quarter of 1982 (published June 1982).

Table 9.—Aerospace Firm Long-Term Debt Holdings

Long-term debt outstanding	Amount	Interest rate
Boeing		
Convertible subordinated debentures	$250 roil.	8 7/8°/0
Notes payable	90.1 roil.	6 3/8°/0, 5°/0, other
Stand-by credit agreement	1.5 bil.	
McDonnell Douglas		
Convertible subordinated debentures	$ 47.2 roil.	4¾%
Notes and lease-purchase obligations	28.7 roil.	
Lockheed		
Convertible subordinated debentures	$101.1 roil.	4 1/4°/0
Notes payable and other	738.5 roil.	
Credit agreement	850 roil.	Over prime, London Interbank offered rates
General Dynamics		
Installment purchase notes	$ 14.2 mil.	9%
Other notes	18.9 mil.	
Credit agreements	170 roil.	
Subsidiary credit agreements	73 roil.	
Other subsidiary debt	301.1 roil.	
Grumman		
Convertible subordinated debentures	$ 18.4 roil.	4¼%
Convertible subordinated debentures	75 mil.	11%
Lease-secured installment notes	17.1 mil.	7-22 1/4%
Lease obligations	2.6 mil.	2-9 3/4°/0
Notes and mortgages	15.5 roil.	7/8 - 11 °/0
Revolving credit agreement	103. roil.	Over prime rate
Fairchild Industries		
Convertible subordinated debentures	$ 0.99 roil.	9 3/40/0
Convertible subordinated debentures	13.6 roil.	9 3/4°/0
Notes payable and other	97.7 roil.	
Credit agreements	140 roil.	Over prime, London Interbank offered rates
Northrop		
Promissory notes	$ 10.5 roil.	7 1/8°/0
Notes payable	2,5 roil.	61 /4°/0, 9 7/8°/0
Capital lease obligations	6.4 roil.	

SOURCE Moody's ***Industrial*** **Manual, 1981**

Equity

Aerospace firms have issued stock in the past, but they cannot easily raise additional capital through stock now for three reasons. First, aerospace stocks have had limited appeal to investors because of erratic performance and high risk. Aerospace stocks have historically sold at price-earnings (P-E) multiples well below average (although between late 1979 and early 1980 aerospace P-Es exceeded the industrial average). Low P-E multiples generally signify that investors deem the market values of aerospace firms to be low, because future earnings are anticipated to be low and financial risks are anticipated to be high. Second, unless aerospace firms can maintain substantial growth, the concern to avoid diluting stockholders' equity (resulting in lower earnings per share and making the stock less attractive) limits their ability to issue additional shares. Equity can be more expensive than debt because, with dilution, higher returns must be paid on equity to attract capital. Third, stock prices have been depressed for several years, limiting the amount of money that can be raised through stock.

Advance and Progress Payments

Advance and progress payments are an important source of funds, primarily for work done on Government projects. Progress payments on Government contracts have nominally covered 80 percent of most contract costs (coverage was raised to 90 percent in late 1981), although there is

evidence that actual cost coverage may be about 20 percent less (because of delays in recording of costs, billing, and payment).[5] Advance payments for commercial programs have typically amounted to about 35 percent prior to delivery, when the balance is due. *

However, because aircraft manufacturers compete with each other on the terms of customer financing, which are negotiated separately with each customer, advance payments are a somewhat unreliable source of funds that is usually under pressure to be reduced. Also, manufacturers may in some cases finance commercial aircraft purchases, thereby drawing out the period over which they will receive payment and increasing their needs for cash. At the end of 1981, Boeing, McDonnell Douglas, and Lockheed together reported having over $6 billion in advance and progress payments, an aggregate increase of about $165 million over end-of-1980 levels.

[5] "'Completed Contract Method of Tax Accounting in Aerospace Industry, " a memorandum prepared by John S. Nolan, attorney for the Aerospace Industries Association of America, Inc.

*Personal communication with Wolfgang Demisch, aerospace industry analyst, Morgan Stanley & Co., Inc.

FINANCIAL CAPACITY

The above discussion of sources of funds suggests that, excluding debt and deferred taxes (an uncertain source vulnerable to policy changes), the three firms which have been dominant in commercial air transport manufacture have been able to garner together up to about $2.5 billion in new funds in a year (about $1 billion from net income plus about $1 billion in net increases in advance and progress payments, plus under $0.5 billion in depreciation charges, based on 1980 figures). Adding in debt and other sources could at least double this aggregate figure. However, there are several reasons why a single commercial aircraft manufacturer would have difficulty affording the $6 billion to $11 billion or higher investment required over a period of several years for an advanced air transport program. These reasons are reviewed below.

First, the 1980 figures cited above reflect a relatively good year for commercial air transport manufacturers. Because finances in this industry are relatively volatile, neither total nor source-specific figures for 1980 or any other year can be viewed as reliable indicators of financial capacity in any future year or period. Indeed, 1981 figures for net income, net increases in advance and progress payments, and depreciation for the three companies total $1.02 billion, or less than half of the 1980 total.

Second, the funds amassed by aerospace firms support a variety of projects. Therefore, the total amount of funds generated by a given manufacturer overstates the amount available for a commercial air transport project. Moreover, funds from certain sources may be restricted in their application. For example, advance and progress payments for Government aerospace projects—the major component of advance and progress payment funds—should not be considered a source of funds available for commercial air transport development.

Third, the firms that are today involved in commercial air transport production differ substantially in financial strength and fund raising capacity. For example, during 1981 Boeing generated $825 million from net income, net increases in advance and progress payments, and depreciation charges, compared with $545 million generated by McDonnell Douglas and $355 million by Lockheed. Industry analysts generally accept that Boeing is financially the strongest of the three.

Finally, even the most financially sound of existing aerospace firms might well have difficulty raising enough debt to support an advanced air transport project for two reasons. First, applying substantial amounts of leverage to a single aerospace firm would entail very high and probably unacceptable financial risks for lenders. Second, a $6 billion to $11 billion or greater investment is so high relative to the net worth of any one aerospace firm (indicated by stockholders' equity), which ranged from over $0.1 billion for Lockheed to about $2.7 billion for Boeing in 1981, that it would appear to put the viability of a single

commercial aircraft manufacturer at a totally unacceptable risk. * That is, it appears to be beyond the capability of a single commercial aircraft manufacturer at this time to bear the risk of financial loss associated with an advanced air transport program requiring an investment of $6 billion to $11 billion or more.

* Stockholders equity equals the par value of common stock plus capital i n excess of par value plus retained and net earnings less dividends and treasury stock purchases