REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* A UNIFORM PROFIT POLICY FOR GOVERNMENT ACQUISITION		5. TYPE OF REPORT & PERIOD COVERED Final
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Robert K. Wood Myron G. Myers M. Brian McDonald		8. CONTRACT OR GRANT NUMBER(s) MDA903-77-C-0370
9. PERFORMING ORGANIZATION NAME AND ADDRESS Logistics Management Institute 4701 Sangamore Road Washington, D. C. 20016		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Task Order 77-15 Subtask 4
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Federal Procurement Policy Office of Management and Budget Washington, D. C. 20503		12. REPORT DATE December 1978
		13. NUMBER OF PAGES 176
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

"A" Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

profit policy	contract policy
acquisition policy	financial analysis
procurement policy	

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report presents a policy to enable the government to determine equitable profit objectives for use in contract negotiations. The need for such a policy was recognized in 1972 by the Commission on Government Procurement. It was noted then that current profit policies were non-uniform from agency to agency. Further, current policies are thought to discourage cost savings and there is no criterion by which to judge the adequacy of profits.

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20. ABSTRACT (Cont'd)

    Two principles are embodied in the uniform profit policy: (1) the
policy should support the primary government acquisition goal of least
overall cost to the government; and (2) the target profit rates should
be derived from commercial rates and incorporate recent experience. The
policy has two formulas: for contracts in the service sector of the
economy, a profit formula based upon cost is applied; for contracts in
the manufacturing and construction sectors, a profit formula based upon
both cost and capital is used.

    The authors acknowledge that the recommended profit policy will not
by itself ensure that contractors configure themselves most efficiently
for government work. Many other government policies have influence.
They believe that it will, however, increase recognition and reward for
the functions of profit and alleviate impediments to savings and cost
saving investment.

A UNIFORM PROFIT POLICY

FOR GOVERNMENT ACQUISITION

by

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December 1978

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ABSTRACT

The Logistics Management Institute (LMI) undertook a study for the Office of Federal Procurement Policy to develop a uniform government-wide profit policy for determining equitable profit objectives to be used in contract negotiation. Negotiated procurement accounted for approximately $55 billion of the $75 billion in total procurement of goods and services by all Federal agencies in 1977.

The need for a study of this nature was recognized in 1972 by the Commission on Government Procurement. It was noted then that contractors doing similar work for different agencies operated under different profit policies and even different profit rate limitations. In addition, it became clear that the basis on which the negotiated level of profit typically was calculated, estimated contract costs, could motivate contractor behavior that was inimical to the government's best interest. Finally, there appeared to be no rationale, other than past government practice, to judge the equity of profit levels.

Profit is intended to compensate a contractor for

- the use of capital resources;

- the assumption of risk; and

- the entrepreneurial function of organizing and managing resources.

The uniform profit policy recommended by LMI has two formulas: for contracts in the service sector of the economy, a profit formula based upon cost is applied; for contracts in the manufacturing and construction sectors, a profit formula based upon both cost and capital (referred to as a hybrid) is applied.

The following principles are embodied in the recommended policy:

- the profit policy should support the primary government acquisition goal of least overall cost to the government;

-- for service contracts the government does not materially benefit from increased use of facilities capital (plant and equipment); consequently a formula in which profit is calculated as a percentage of the estimated cost of performance is recommended;

-- for manufacturing and construction contracts on which the increased use of facilities capital and the increased utilization of existing facilities can lower total acquisition costs to the government, a profit formula based upon estimated capital employed and estimated cost is recommended;

- the target profit rates should be derived from commercial rates and updated annually to incorporate recent commercial experience.

The cost based profit formula for service contracts reflects a commercial equivalent rate of earnings before interest and taxes of 7.2 percent return on cost. Adjustments are made for both the cost recoupment risk associated with different types of contracts and the entrepreneurial skill required for complex tasks. Including adjustments the target rate of return on costs varies from 5.7 percent to 9.7 percent.

The hybrid profit formula for manufacturing and construction contracts reflects a commercial equivalent rate of earnings before interest and taxes of 16.6% return on capital. Including the same adjustments as above, the target rate of return on captial varies from 14.1 percent to 20.7 percent or, expressed as a return on cost, from 8.5 percent to 12.5 percent for the firm with average characteristics.

The recommended profit policy will not by itself ensure that contractors configure themselves most efficiently for government work. There are many other influencing factors such as the government's policy toward taxes, depreciation, the expensing of or government purchase of partially used contractor facilities and equipment, and contract termination protection. A

profit policy can, however, recognize and reward all of the functions of profit listed above while not discouraging cost savings and cost saving investments.

ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

PURPOSE OF STUDY

The Federal Government annually buys large volumes of goods and services from the private sector. In 1977, approximately $55 billion out of $75 billion of its purchases were negotiated; that is, price was determined bilaterally between the government and the contractor. For the remaining purchases, amounting to $20 billion, the price was determined by the forces of competition in the marketplace, which in classical economic theory covers the costs of production plus a competitive level of "profit". Profit is required to compensate the contractor for use of capital resources, risk bearing and for the entrepreneurial function of organizing and managing resources.

Negotiated contracts require an explicit agreement between the contracting parties as to cost of performance and the amount of profit that the contractor will recoup as the total price paid by the government. This report recommends a profit policy with formulas to permit the determination of the government's profit position going into negotiations.

The need for a study on this subject was recognized in 1972 by the Commission on Government Procurement. It noted that contractors doing similar work for different agencies operated under different profit policies and even different profit rate limits. In addition, it was clear that the basis on which the negotiated level of profit typically was calculated, estimated contract costs, could motivate contractor behavior that was inimical to the government's best interest. Finally, there appeared to be no rationale, other

than past government practice, on which to judge the equity of profit levels. This report parallels these perceived deficiencies in its approach by considering:

- the efficacy of a uniform, but not necessarily single, profit policy for use by all government agencies;

- the basis on which the calculation of profit should be made in various procurement situations (referred to as profit policy structure); and

- the level of profit that the contractor should have an opportunity to earn in government work (the profit rate).

It suggests methods for applying the recommended uniform profit policy, including an illustrative set of regulations at the end of this Summary.

Government Acquisition Goals

The recommended profit policy is premised on furthering the government's acquisition goals when purchasing goods and services from the private sector. The spectrum of possible goals ranges from encouraging maximum employment to encouraging maintenance of a high level of industrial capacity for defense mobilization. We believe that these limiting goals are not effectively addressed by profit policy but are more appropriately pursued by varying the volume of government purchases and explicitly maintaining excess capacity, respectively. We have selected instead, as the principal goal, the acquisition of required goods and services that meet quality, performance and delivery requirements at least total cost to the government.

Scope of Study

We sought to develop a profit policy which motivates contractor behavior over time toward the goal of least total cost to the government. The policy is designed to offer the contractor the opportunity to earn profits comparable to levels achieved in commercial work of simlar capital requirements, risk and complexity. The study was unconstrained in terms of previous

policy and practice, present level of profits on government contracts and immediate budgetary impact.

At the same time we recognize that aspects of acquisition policy, other than profit policy, may substantially affect profit ultimately earned. The study does not explicitly address but is sensitive to the following areas which, although related to ultimate profit earned, are not considered to be part of profit policy:

- selection of contractor

- selection of contract type

- selection and application of contractual incentives relating to performance, delivery, life cycle cost, etc.

- inducements for investment including depreciation, tax policy and termination and buy back protection

- cost estimation and negotiation

- contract finance policy

- contract administration

- acquisition, retention and use of government property.

FINDINGS

Profit Structures

It has long been practice in government contracting to base profit primarily on estimated cost of contract performance. Once the contracting parties agree upon the level of costs to be paid for a task, profit is negotiated as a percentage of these costs. The percentage itself sometimes is related to the types of cost incurred, is judgmental, or relates to past experience of the agency in similar undertakings.

A cost-based profit structure discourages the use of facilities capital (plant and equipment) when its use can lower overall acquisition costs to the government. Use of facilities capital in place of more costly labor intensive methods reduces costs and thus profits and is therefore discouraged.

A cost-based profit policy discourages the participation of capital intensive firms in government work since negotiated profit as a given percentage of estimated costs of performance implies a lower level of profitability for more capital intensive methods of production. As a corollary, a cost-based policy implies a diverse profit outcome when applied to contractors with varying capital intensities.

The virtues of the cost-based structure, however, are its ease of application, its ability to cope with inflation since profits are related to cost, and its tendency to encourage high levels of volume within contractor facilities.

To correct the deficiencies inherent in profit structures which rely on estimated costs as the basis for profit formulation, a number of alternatives were considered. One alternative is to base profit on the level of capital employed, where capital refers to both fixed facilities and operating capital. This structure has the advantage of not discouraging investment, since profit levels increase with greater use of capital; but it does not necessarily encourage the contractor to undertake productive investments unless the contractor shares in the cost savings from the investment. Furthermore, capital intensive contractors are not discouraged from participating in government work.

There are drawbacks to this structure, however. The contractor may not be encouraged to increase the volume of business conducted at its facility so fixed costs may not be spread over higher volumes. If the rate of profit earned on either facilities or operating capital is too high, the contractor may be motivated to employ excessive amounts of capital. Finally,

the structure requires the measurement and allocation of facilities and operating capital to individual contracts and is consequently more difficult to apply than cost-based structures.

These findings lead us to recommend two profit structures. For situations where the use of facilities capital is of minor influence on the ultimate total cost of performance, a cost-base structure is recommended. In such situations, the penalty in terms of motivational attributes of a cost-based structure is small, and administrative ease and convenience outweigh any possible gain from using a more complex structure. Service contracts, e.g., R&D studies, architectural-engineering and other professional services satisfy the condition that use of facilities capital has little beneficial value to the government.

For other sectors (broadly defined as manufacturing and construction), a structure based on both capital employed and cost of performance is recommended. This combination or hybrid approach captures the best aspects of each structure and, at the same time, overcomes the deficiencies inherent when each is applied separately. The capital component is heavily weighted in the profit formula to encourage the use of facilities capital which reduces overall costs to the government. Operating capital is also recognized but at a sufficiently low profit rate so as to preclude the contractor from increasing profit by arbitrarily increasing the amount of operating capital employed. Finally, a portion of profit is based on estimated cost of performance to encourage high utilization of plant and equipment.

To both the cost-based structure for services and the hybrid structure for manufacturing and construction, two adjustments are included to reflect both the cost risk associated with different contract types and the entrepreneurial skill required on complex tasks. These adjustments are made

after applying the profit formula and are expressed as percentages of the estimated cost of performance. Finally, a procedure to encourage cost saving investment through the sharing of resulting cost savings is included.

Profit Rates

Overall target rates are required for the cost-based profit formula and for the hybrid profit formula as are risk and complexity adjustment rates. The principle followed in setting a profit objective for Federal negotiated procurements is to provide the contractor with the opportunity to earn a commercial equivalent rate of return for work of similar capital requirements, risk and complexity. Commercial equivalent rates are used for the following reasons: first, they reflect the marketplace rewards and investor requirements for all the functions of profit; secondly, firms cannot be expected to participate in government procurement unless commercially comparable profit opportunities are offered; third, firms doing government work must compete for capital in the same marketplace as others, and in order to compete effectively for capital, they must have the opportunity to earn competitive rates of return; fourth, to the extent that market profit rates reflect current and anticipated inflation, the use of commercial equivalent rates will help keep government contractors at a parity with firms in the economy at large; and lastly, any other basis for establishing profit rates for negotiated procurements is arbitrary and without a logical basis.

The cost-based structure uses return on cost found in service industries while the hybrid structure targets profits to return on capital for the manufacturing and construction sectors. Since the hybrid structure is to be applied to manufacturing and construction, profitability results were analyzed, primarily with Federal Trade Commission (FTC) historic data. Those data showed greater inter-industry variability for profit relative to costs or

sales than for profit on capital provided or assets employed. In addition, motivational considerations and results from independently conducted industrial surveys support our belief that target profitability should relate profit to capital invested.[1,2] Additional statistical analysis suggested that the profit formula should (1) be based on long term average profitability, (2) use economy-wide rather than industry profitability data and (3) pay higher profit when more facilities relative to operating capital is employed. The long term profit rate that is targeted for the manufacturing and construction sectors is earnings before interest and taxes of 16.6 percent on total capital provided.

The target rate of return for the service sectors was developed from a review of service sector profits from Internal Revenue Service and Robert Morris Associates data. Our analysis revealed no significant differences in profitability among service industries on a return on either cost or investment basis. Consequently, the long term profit rate that is targeted for service industries is earnings before interest and taxes of 7.2 percent on costs.

RECOMMENDED PROFIT FORMULAS

The recommended profit formula for the service sector has a single major element--return on costs--and two adjustments--an adjustment for the risk of recouping costs associated with different types of contracts and an adjustment

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[1] I. S. Reece, and W. R. Cool, "Special Report, Measuring Investment Center Performance," Harvard Business Review, May-June 1978, pp. 28-176.

[2] L. J. Gitman, and J. R. Forrester, Jr., "A Survey of Capital Budgeting Techniques Used by Major U.S. Firms," Financial Management, 6, Fall 1977, pp. 67-71.

for task complexity. Where no commercial equivalent rate exists, such as for GOCO activities, the recommended rate is 3 percent before adjustments. Table 1 summarizes the cost-based profit formula.

TABLE 1.   COST-BASED PROFIT FORMULA

ELEMENT	RATE
Return on Costs for	
Use of Capital Resources Risk Bearing Entrepreneurial Function	7.2% on Cost
Adjustment for Cost Recoupment Risk	+1.5% on Cost if Firm-Fixed-Price + .5% on Cost if Fixed-Price Incentive - .5% on Cost if Cost-Plus-Incentive Fee -1.5% on Cost if Cost-Plus-Fixed Fee
Adjustment for Task Complexity	0 to 1% on Cost

For manufacturing and construction, a profit formula based upon cost and capital is recommended. This hybrid formula calculates profit on facilities capital employed, operating capital employed and cost of performance. It is designed to achieve a commercial equivalent target return on total capital of 16.6 percent. The profit rates on facilities and operating capital have been selected so as to yield a minimum return on operating capital (to discourage its use) and so that an average of 70 percent of the overall target return is derived from capital employed. The profit rate on cost accounts for the remaining overall target rate. As in the cost-based formulas, adjustments for cost risk and task complexity are employed as deviations from the overall target rate.

The hybrid profit formula is derived from characteristics of firms covered by FTC data and thus reflects both commercial and government markets. To base the formula exclusively on the current financial characteristics of government contractors would ignore commercial experience in which profits are

competitively determined and would merely perpetuate the current configuration of government contractors whether beneficial to the government or not. Table 2 summarizes the hybrid profit formula.

TABLE 2. HYBRID PROFIT FORMULA

ELEMENT	RATE
Return on Operating Capital	7.5% on Operating Capital
Return on Facilities Capital	14.0% on Facilities Capital
Return on Costs	3.0% on Costs
Adjustment for Costs Recoupment Risk	+ 1.5% on Cost if Firm-Fixed-Price + .5% on Cost if Fixed-Price-Incentive - .5% on Cost if Cost-Plus-Incentive Fee - 1.5% on Cost if Cost-Plus-Fixed Fee
Adjustment for Task Complexity	0 to 1% on Cost

Application of the hybrid formula to a firm with characteristics similar to the average of all manufacturing industries would yield 16.6% return on capital before adjustments.

Table 3 summarizes the recommended profit policy.

The ranges of target rates reflect the application of the formula profit rates to an average firm. Individual firms with characteristics different from the averages used in developing the formula will have different results. Firms with more facilities capital than average will get correspondingly higher returns from the facilities capital component of the profit formula. This is desirable not only to encourage the increased use of facilities capital but also to reflect the higher returns earned by firms with more facilities capital.

A point worth emphasizing is that the hybrid profit policy could be applied to the service industries with their own target rates and lead to the same cost and profit results as the cost based policy. The added administrative complexity of the hybrid policy generally would not be justified by

TABLE 3. PROFIT POLICY SUMMARY

Profit Element / Activity	GOCO Contract	Service Contract	Construction Contract	Manufacturing Contract
Return on Operating Capital			7.5%	
Return on Facilities Capital			14.0%	
Return on Cost	3%	7.2%	3.0%	
Adjustment for Contract Type Risk	±1.5 on Cost			
Adjustment for Task Complexity	0 to 1% on Cost			
As % on Cost	1.5-5.5%	5.7-9.7%	5.0- 9.0%	8.5-12.5%
As % on Capital	N/A	N/A	14.1-25.3%	14.1-20.7%

the potential benefits to the government. Service firms, however, should have the option of having the hybrid policy applied to their contracts. Those service industries with significant facilities capital may opt for the hybrid profit formula over the cost based formula so that their facilities capital is recognized and rewarded. The reverse is not true: construction and manufacturing industries generally should not be exempted from application of the hybrid policy.

APPLICATION OF RECOMMENDED POLICY

A basic tenet of the proposed policy is that contractors should be offered an opportunity to earn profits at rates comparable to what is earned elsewhere in the economy. Consequently, a central requirement for operation of the policy is review and update of the profit formula to ensure that results are as intended and that targets conform to opportunities generally

available in the economy. Such review should be performed on a continuing basis by OFPP. Other guidelines for implementation call for applying the policy on a contract-by-contract basis, applying the policy to contracts above a threshold value, and measuring and allocating capital to contracts.

Measuring and allocating capital to contracts is novel and is the most complex administrative procedure required to apply the policy. As shown in the accompanying illustrative regulations facilities capital is measured and allocated to a contract using the procedure, with simplification, of Cost Accounting Standard 414. For operating capital, we recommend a procedure for immediate implementation which is based on three easily identified characteristics of a contract--the type of contract, the length of contract and whether or not progress payments are made. Using that procedure, contractor-provided operating capital on a contract is expressed as a percentage of total contract costs. Refinements to this procedure are discussed.

A procedure for applying sharing of cost savings to cost reimbursement type contracts also is described in the illustrative regulations.

CONCLUSION

The recommended profit policy will not, by itself, ensure that contractors in manufacturing and construction industries increase their use of facilities capital on government contracts to the most efficient level, nor will it ensure, by itself, that contractors increase their capital investments, let alone those that result in cost savings. That is asking too much from a profit policy alone. Many other factors such as the government's policy toward taxes, depreciation, expensing of or government purchase of partially used contractor plant and equipment, government market stability, and contract termination protection, influence efficient configuration. We can ask, however, that the profit policy recognize and reward all of the functions of

profit, and we can ask that a profit policy no longer be a disincentive to cost savings and to cost saving investment.

For the cost-based profit formula, the commercial equivalent return on costs captures all of the purposes of profit and there is an adjustment for contract type risk and one for complexity and sharing of cost savings where appropriate to reward management performance that leads to cost savings.

For the hybrid profit formula, the commercial equivalent return on capital captures all of the purposes of profit with explicit recognition of operating and facilities capital and the same adjustments and sharing as in the cost-based formula.

The recommended profit policy encourages innovation to the extent that they encourage cost savings, particularly cost saving investment, by offering the opportunity to earn commercial equivalent profit rates, by explicitly recognizing and rewarding facilities capital, by including the sharing of cost savings on cost type contracts where appropriate and importantly, by encouraging the participation of efficient capital intensive firms. It recognizes and rewards the functions of profit and provides increased incentive to innovation, cost savings and cost saving investment--actions which should benefit the government over the long run.

ILLUSTRATIVE ACQUISITION REGULATIONS ON PROFIT POLICY

Profit
1. Policy
(a) Purpose of Profit Policy. It is the policy of the Federal Government (1) to utilize profit to support the primary acquisition goal of acquiring goods and services at least total cost to the Government; (2) to utilize profit to reward the use of capital resources (both operating and facilities capital), the taking of risk and the entrepreneurial function of organizing and managing resources; (3) to offer contractors the opportunity to earn profits that are comparable to those earned in the private sector for work of equivalent captial requirements, risk and complexity. The profit policy is applied to establish the Government's negotiating position on the basis of estimated cost of performance and capital employed on a contract by contract basis.

(b) Threshold. The profit policy is applied to those contracts for which cost analysis is performed.

For those contracts where cost analysis is not performed and where adequate competition exists, fixed price type contracts will be awarded to the responsible offerer with the lowest price.

(c) Application to Subcontracts. The prime contractor may use the profit policy in negotiations with subcontractors giving regard to capital provided, risk assumed (including that associated with different types of contracts) and task complexity.

(d) Use of Alternative Profit Bases. For service contracts profit is determined as a percentage of estimated cost of performance. Services include, for example, architectural-engineering services, research and development studies, management studies and data processing services. For service contracts the Government usually does not materially benefit from increased use of facilities capital (plant and equipment); consequently profit calculated as a percentage of total estimated contract cost is satisfactory.

For production and construction contracts, profit is determined as a percentage of estimated cost of performance plus a percentage of capital employed on the contract. For production and construction contracts, the increased use of facilities capital can lower total acquisition costs to the Government; consequently profit is based upon estimated contract cost and capital employed.

2. Profit Based on Cost
A profit rate of 7.2% is applied to the estimated cost of contract performance, adjustments for the risk of recouping costs associated with different types of contracts (see 4(a)) and for task complexity (see 4(b)) are then applied. The profit rate will be revised annually to reflect recent commercial experience.

3. <u>Profit Based on Cost and Capital</u>

The basic formula for profit based on cost and capital is:

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7.5% x estimated contract operating capital

+14.0% x estimated contract facilities capital

+ 3.0% x estimated total contract costs
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The formula profit rates will be revised annually to reflect recent financial experience. Adjustments for the risk of recouping costs associated with different types of contracts (see 4(a)) and for task complexity (see 4(b)) are then applied.

A method to approximate the profit for contractor provided <u>operating</u> capital is the following:

If the contract is a cost reimbursement type, no operating capital is recognized.

If the contract is a fixed price type with progress payments, operating capital can be recognized and rewarded by giving the contractor 0.3% on the cost of the contract for a year long contract. The profit rate would vary directly with the length of contract, i.e.

$$.3\% \times \frac{\text{length of contract in months}}{12 \text{ months}}$$

If there are no progress payments, contractor provided operating capital can be recognized and rewarded by giving the contractor 1.7% on costs for a year long contract. The profit rate varies directly with the length of contract.

The steps for allocating <u>facilities</u> capital to a contract are shown below:

(i)   identify facilities capital by overhead pool as shown in columns (2), (3) and (4) of Table 1.

(ii) identify the annual allocation base for each overhead pool, e.g. 2,000,000 direct manufacturing labor hours. The annual allocation base is shown in column (5) of Table 1.

(iii) divide the overhead pool facilities capital by the annual allocation base to yield facilities capital per unit of allocation base shown in column (6) of Table 1.

(iv) identify each overhead pool allocation base for a contract, e.g. 500,000 direct manufacturing labor hours. The contract allocation base is shown in column (7) of Table 1.

(v)   multiply the facilities capital per unit allocation base by the allocation base for a contract to yield facilities

capital allocated to a contract for each overhead pool. Sum
over all overhead pools. These results are shown in column
(8) of Table 1.

The resultant figure for facilities capital allocated to a contract is
multiplied by the 14% profit rate on facilities capital to yield the return on
facilities capital.

A profit rate of 3% is applied to the estimated cost of contract per-
formance.

The three elements of the profit formula are summed to provide the pre-
negotiation profit objective (before adjustments).

4. Adjustments
(a) Contract Cost Risk. This factor reflects the policy of the Federal
Government that contractors bear an equitable share of contract cost risk and
to compensate them for the assumption of that risk. A contractor's risk
associated with costs to perform under a Government contract usually is mini-
mal under costs reimbursement type contracts. However, as procurements pro-
gress from Basic Research through Follow-on Production and Supply contracts,
the use of increased contractor risk assumption type contracts is appropriate
for increasing the contractor's responsibility for performance. The generally
accepted progression of the procurement spectrum ranging from Basic Research
through Supply procurements and from cost to firm fixed price contracts, is
shown below:

Type of Effort	Type of Contract
(1) Basic Research	Cost, CPFF
(2) Applied Research	Cost, CPFF
(3) Exploratory Development	Cost, CPFF
(4) Advanced Development	CPFF, CPAF
(5) Engineering Development	CPFF, CPAF, CPIF
(6) Operational System Development	CPIF, CPAF, FPI
(7) First Production	FPI
(8) Follow-on Production	FPI, FFP
(9) Supply	FFP

Since the commercial equivalent rates used to establish the target
profit rates come from an environment akin to a mix of fixed price and cost
reimbursable work, the adjustment for contract type risk is implemented in the
following manner:

Type of Contract	Percentage on Cost
Cost, CPFF	-1.5% on cost
CPAF, CPIF	- .5% on cost
FPI	+ .5% on cost
FFP	+1.5% on cost

(b) Task Complexity. The contractor's task can be difficult or easy,
regardless of the type of contract. An adjustment of 0 to 1% on cost rewards

TABLE 1. CONTRACT FACILITIES CAPITAL

Column (1) Overhead Pools	(2) Accumulation & Direct Distrib'n of Net Book Value	(3) Allocation of Undistributed	(4) Total Net Book Value (2) + (3)	(5) Allocation Base for Period	(6) Facilities Capital per Unit Allocation Base (4) ÷ (5)	(7) Allocation Base for Contract	(8) Facilities Capital (6) x(7)
Engineering							
Manufacturing							
Computer							
G&A							
TOTAL							

XXI.

the additional entrepreneurial skills required to organize and manage re-
sources resources for tasks of increasing complexity. Complexity should be
considered relative to the industry's average commercial work.

5. Sharing of Cost Savings on Cost Reimbursement Contracts

When a contractor receives some or all of the cost savings resulting
from cost reductions through sharing clauses or a fixed-price contract, the
contractor is motivated toward cost savings and cost saving investments. The
procedure below is followed in applying the concept of sharing of cost savings
to cost reimbursement type contracts. If, after contract formation, the
contractor proposes a process change or an investment that would result in
cost savings, the Government can accept the proposal particularly in cases
where costs are reasonably well known. If the cost saving results from an
investment, that investment is included in the facilities capital allocated to
the contract and earns profit at the 14 percent rate. If the cost savings
results from a process change, the cost of making the process change is
recovered as an allowable cost. In addition the contractor and the Government
negotiate the sharing of cost savings such that the Government's total con-
tract cost, including profit and cost savings shared by the contractor, is
less than the original contract cost.

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I. INTRODUCTION

Profit policy refers to that set of guidelines used by the government to negotiate how much it is willing to pay for goods and services in excess of the cost of performance. An explicit government profit policy is required only for those procurements of goods and services known as negotiated procurements, where the commercial marketplace is not used to determine a fair price. Negotiated procurements are made when unique and difficult government specifications, sole suppliers and/or other conditions preclude formally advertised procurements. For formally advertised procurements, the supplier's revenues are established by the market, and neither the government nor the supplier needs to articulate a policy governing the outcome of the transaction. In negotiated procurements, however, the government and the supplier enter into a bilateral agreement as to the price (cost plus profit) for the goods and services acquired, according to a distinct set of policies.

The fundamental proposition of this study is that what the government uses as the basis of its profit policy and the level of profits it permits greatly affect the price it ultimately pays.

PURPOSE OF STUDY

Profit on negotiated contracts used to be based on a uniform percentage of the contract's total estimated cost. In 1964, the Department of Defense (DoD), followed by some other agencies, adopted weighted guidelines, whereby profit was determined from a range of different profit rates on various cost elements, such as engineering labor, materials, and subcontracts. Explicit recognition of, and reward for, the use of facilities capital (plant and equipment) on a contract was introduced into the profit consideration in 1976

through the innovative work of the Cost Accounting Standards Board and the DoD. The result, which applies only to contracts with certain agencies, was the recognition, through the profit policy, of part of the cost of facilities capital (regardless of the source of financing) as an allowable cost, and the provision of an additional award for the use of such capital.

Federal agencies have been free to develop and apply their own profit policies, within statutory limits, including the setting of administrative limits on profit rates paid for different types of negotiated procurements. Consequently, not only do the agencies have different policies, but they also apply different profit rate limits to similar procurements. For example, to quote from the Negotiations and Subcontracting Final Report of Study Group #8 of the Commission on Government Procurement:

> The Study Group found a wide variation in profit/fee determination policy between all government agencies and between policy and practice within agencies. In addition, within some agencies, there is a significant difference between statutory maximum fee levels and "administrative" levels set by those agencies. For example, the NASA Procurement Regulation requires the extra effort of written findings by the Director of Procurement for fees in excess of 10% for research and development and 7% for other types of work, regardless of the statutory limits of 15% and 10%, respectively. In addition, the AEC uses a sliding scale, which generally is well below statutory limits. DHEW's National Institutes of Health likewise apply administrative limits on research contracts of 7% for industrial firms and 8% for not for profit institutions. Also, at least one NASA center applies an administrative limit of 7% for research and development, irrespective of the complexity of the procurement.[1]

The Commission recommended the establishment of an Office of Federal Procurement Policy (created in 1974), which was to take the lead in an interagency effort to

> Develop uniform government-wide guidelines for determining equitable profit objectives in negotiated contracts, ... The guidelines should

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[1] Negotiations and Subcontracting, Final Report, Study Group #8, Commission on Government Procurement, Washington, D. C., February 1972, p. 255.

emphasize consideration of the total amount of capital required, risk assumed, complexity of work and management performance.[2]

The Logistics Management Institute (LMI) was given the assignment of developing a uniform profit policy. The study was unconstrained both in terms of previous policy and practice throughout the Federal Government and in terms of budgetary impact of the recommended policy. Furthermore, the reference to a "uniform" profit policy was not construed to imply a single policy for all acquisition situations. Similar acquisition situations, however, should be covered by the same profit policy, regardless of agency.

This study does not address the following areas which, although related to profit policy, are not considered part of it:

- Selection of contractor.

- Selection of contract type.

- Selection and application of contractual incentives relating to performance, delivery, life cycle cost, etc.

- Inducements for investment including depreciation, tax policy, and termination and buy back protection.

- Cost estimation and negotiation.

- Contract finance policy.

- Contract administration.

- Acquisition, retention, and use of government property.

Each of the above areas may affect either the articulation or implementation of profit policy. Thus, while profit policy addresses only a small part of the procurement process, it must be sensitive to the other parts of that process.

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[2]Report of the Commission on Government Procurement, Volume 1, Washington, D. C., December 1972, p. 77.

LEVEL OF FEDERAL ACQUISITION

Procurements by all Federal agencies approximated $75 billion in fiscal 1977, as displayed in Table I-1. This amount represents only the value of goods and services purchased directly by and for the Federal Government under contracts and purchase orders and excludes funds allocated through grants or other assistance programs. The Department of Defense (DoD) and the six civilian agencies indicated in the table account for almost 90 percent of total Federal procurement expenditures.

Negotiated procurements generally account for about 75 percent of Federal procurement expenditures each year. Table I-1 also displays the comparative values of formally advertised and negotiated procurements for fiscal 1977.

Negotiated procurements can be further broken out. The first step is to isolate those categories legally defined as negotiated procurements that are not truly negotiated. For example, all procurements made under "small business" and "labor surplus" set-aside programs are included in the negotiated totals. These procurements are generally formally advertised procurements, with competitive bidders restricted to a certain class of businesses to satisfy Federal socioeconomic objectives. The value of negotiated procurements going to educational and nonprofit institutions should also be eliminated.

The next step is to break true negotiated procurements down into categories of goods and services: R&D, hard goods, architect/engineering (A&E) services, other services, construction, government-owned contractor-operated (GOCO) facility operations and other. The results of these two steps are shown in Table I-2. In some cases, the data shown have been estimated rather than derived by summing actual contract totals by category.

TABLE I-1. ANALYSIS OF NEGOTIATED COMPONENT
(MILLIONS OF DOLLARS - FY 77 DATA)

AGENCY	TOTAL NEGOTIATED $	% FED.	SM. BUS. & LAB.SUR. SET-ASIDE	EDUCAT. & NON-PROFIT	"OTHER" NEGOTIATED TOTAL "OTHER"	R&D	HARD GOODS	SERVICES	A&E	CONST.	GOCO	OTHER
DOD	45,843	72	2,309	959	42,575	7,162	21,514	6,445	223	862	1,197	5,172
ERDA(D)	6,672	11	119	1,368	5,185	814	(B)	584	138	191	3,458(A)	(B)
NASA(D)	3,054	5	71	443	2,540	1,604	270	440	12	12	202(A)	(B)
GSA	773	1	338	-0-	435	(E)	(E)	(E)	3	15	(E)	(E)
HEW	1,300	2	43	761	496	(F)	(F)	(F)	(F)	(F)	(F)	(F)
DOT(D)	618	1	13	56	549	124	74	183	65	90	-0-	13
VA	764	1	251	38	475	2(c)	453(c)	3(c)	14(c)	3(c)	0(c)	–
SUBTOTAL	59,024	93	3,144	3,625	52,255							
OTHER CIVILIAN	4,640	7	149	639	3,852							
TOTAL	63,664	100	3,293	4,264	56,107							

NOTES: a) EXCLUDES UNIVERSITY OPERATION OF GOCO's: $289M FOR NASA(JPL/CALTECH), $1,161M FOR ERDA (UNIV. CALIF., PRINCETON, ETC.)

b) CANNOT DETERMINE FROM EXISTING DATA BASE

c) VALUES EXTRAPOLATED FROM REVIEW OF PRICING RECORDS

d) PRIMARILY FROM AGENCY'S OWN CONTRACT INFORMATION SYSTEM AND NOT FORM 37

e) DATA NOT AVAILABLE IN SINGLE DATA BASE

f) SPECIAL RUN ON DATA BASE STILL PENDING

TABLE I-2. OVERVIEW OF FEDERAL ACQUISITION

AGENCY (A)	MILLIONS OF DOLLARS				
	TOTAL	% TOTAL FED.	FORMAL ADVERTISED	FSS/GSA/& OTHER GOV'T.	NEGOTIATED
DOD	51,875	68	4,852	1,180	45,843
ERDA (B)	7,037	9	111	254	6,672
NASA (B)	3,221	4	93	74	3,054
GSA	1,991	3	708	510	773
HEW	1,537	2	51	186	1,300
DOT (B)	915	1	285	12	618
VA	1,401	2	378	259	764
SUBTOTAL	67,977	89	6,478	2,475	59,024
OTHER CIVILIAN AGENCIES	8,191	11	2,309	1,242	4,640
TOTAL	76,168	100	8,787	3,717	63,664

NOTES: (A) CIVILIAN AGENCY VALUES NOT IDENTICAL TO FORM 37 VALUES

(B) PRIMARILY FROM AGENCY'S OWN CONTRACT INFORMATION SYSTEM AND THEREFORE DOES NOT RECONCILE TO FORM 37 VALUES

FUNCTIONS OF PROFIT ON GOVERNMENT CONTRACTS

Profit paid on Federal negotiated contracts can be considered as fulfilling one or more of three functions:

1. To provide a return on capital employed on a contract

2. To compensate for the risks that all contract costs (both operating and capital) may not be recovered

3. To compensate for the entrepreneurial function of organizing and managing resources.

Return on Capital Employed

One function of profit is to provide a return on capital employed on a contract. Unless the level of return paid is comparable to what can be earned elsewhere in situations of similar risk and complexity, it can be expected that capital will not be forthcoming on government work. Profit paid to compensate for use of capital can be viewed as a "cost" which must be met to ensure the availability of capital. Capital employed can be considered as debt plus equity (source of capital) or equivalently as assets (use of capital). For purposes of policy implementation assets are preferred to debt and equity capital as a measure of capital employed on a contract, since assets are easier to measure and allocate to a contract.

A profit policy that recognizes return on capital employed as a function of profit will tend to encourage capital investment. On those current government contracts where profits are based solely on cost, capital investment tends to be discouraged, since capital investment which lowers cost would result in lower profit.

Progress payments by the government affect the amount of operating capital provided by the contractor. When profit is paid on capital employed, including operating capital employed, the contractor is reimbursed to the extent that he has operating capital outstanding. Progress payment policy

per se is not addressed in this study. However, a given progress payment policy affects the level of operating capital used and thus profits.

Risks That Costs Not Fully Recovered

Another function of profit is to compensate for the risks that the contractor may not fully recover all costs incurred. The most obvious risk is that caused by the type of contract, cost-reimbursable or fixed-price. On cost-reimbursable contracts, the risk is minimal; on fixed-price contracts, it is greater, depending on the extent to which contingencies have been included in the estimated cost of performance. This risk can be compensated for in profit. The premium for this risk can be expressed as a percentage return on costs, or as a factor or percentage by which to increase return on capital for different contract types. Since the risk is that costs may not be fully recovered, the most straightforward way to compensate for it would be as a percentage return on cost.

There is also a risk that a contractor will not recover the cost of long lived assets. The contractor needs sufficient long-term work to cover depreciation and provide profit opportunities to cover the going return on capital. Even multi-year contracts are funded annually so that the contractor faces the risks of completion, curtailment or termination of a contract before returns on his contract-related capital investments have been fully recovered. Such risks are better addressed through government purchase of partially used contractor facilities and equipment, and depreciation and contract termination policies than through a profit policy. Depreciation and termination policies can be tailored to allow rapid recovery of the investment in certain cost-saving equipment. For example, during World War II, Certificates of Necessity were issued that allowed defense contractors to depreciate certain assets over shorter than normal periods. Furthermore, at present, certain

specialized equipment unique to a contract can be deducted in full as a cost. A profit policy would address this risk in an inequitable and needlessly expensive manner by providing above-average returns on capital for all contracts.

Entrepreneurial Function

A final function of profit is to provide compensation for the entrepreneurial function of organizing and managing resources--both cost and capital. In the absence of any capital employed on a contract or any risk of not recovering contracts costs, such as in contracts to operate a government-owned, contractor operator (GOCO) facility, this entrepreneurial function still must be rewarded to gain the participation of profit making organizations.

Nonallowable Costs

Nonallowable costs are those which are not beneficial to the government. They should not be recovered through profit. That is, profit rates should not be adjusted to include coverage for nonallowables. It is illogical to declare certain types of expenses nonallowable costs and then compensate for them in profit. For example, entertainment expenses on government contracts are nonallowable costs, since they are neither necessary nor beneficial and consequently should not be recovered through an allowance in profit. If expenses are necessary and beneficial, such as advertising expenses related to recruiting for a government contract, they are or should be treated as allowable costs.

Interest expense is the exception. Interest is a beneficial expense for the debt financing of capital employed on a contract. It has been treated as a nonallowable cost in the past however. We believe it should continue to be treated as a nonallowable cost and recovered through a profit policy. We

support this practice because to do otherwise would have the government inappropriately expressing a preference for debt financing over equity financing, instead of allowing the contractor to make that decision on the basis of least cost.

ORGANIZATION OF STUDY AND REPORT

Initial analyses were carried out to define government acquisition goals (Chapter II, "Government Acquisition Goals"), the objectives of the profit-making firm (Appendix A), the role of profit in the market economy (Appendix B), the function of profit on government contracts (Chapter I preceding section) and to examine the experience of existing profit policies in foreign governments and in large purchasers in the private sector (Appendix C). These analyses were necessary to understand the problems of developing a uniform profit policy and to aid in identifying useful criteria and alternative profit structures or bases for evaluation (Chapter II).

Once a preferred structure was identified, profitability measures were defined, and target rates were established for all elements of the preferred policy (Chapter III). The structural elements and target rates were combined in the design of the preferred profit policy in Chapter IV. Questions related to the implementation and administration of the preferred profit policy, such as procedures to measure and allocate capital to a contract, are covered in Chapter V.

Other technical appendices develop guidance on the level of sharing that is required to motivate cost-saving investment (Appendix D) and describe the model and results used to identify the amount of operating capital employed on a contract (Appendix E).

II. <u>PROFIT POLICY STRUCTURES</u>

This chapter describes the analysis of alternative profit structures on the basis of which preferred structures were selected for various acquisition situations. Profit "structure" refers to input categories, such as cost or capital, on which profit is calculated for the purpose of determining the government's negotiating objective. The analysis treats the impact of profit structures--considered in the absence of other influences such as competition--on government acquisition goals. Our fundamental proposition is that profits of equivalent dollar value, but based on different structures, will motivate contractors very differently, and that these differences will affect the government's total payment for the goods and services procured over the long run.

The following sections explain government acquisition goals and their relation to profit policy; basic categories of profit-bearing input; the range of alternative profit structures and the selection of candidates for further analysis; criteria for evaluating the preferred alternatives; and the analysis itself. The final section is a summary of the advantages and disadvantages of each of the preferred alternatives.

GOVERNMENT ACQUISITION GOALS

Any profit policy will at best only assist in, or be conducive to, the attainment of specific government acquisition goals. It may at first appear that the Federal Government has an infinite number of potential goals for its purchases of goods and services from the private sector, closer examination reveals, that the range is reasonably finite and can be bounded at two extremes.

At one extreme is the goal of maximum employment for a given level of government purchases of goods and services. One way of furthering this goal would be to calculate profit solely as a percent of direct labor costs. A low level of facilities investment and concomitant high level of employment would contribute to this goal, but with the penalty of higher than necessary total cost to the government.

At the other extreme is the goal of maintaining, through government purchases, more capacity than is required to produce what the government needs at the least total cost (a mobilization reserve). This goal could be promoted by calculating profit solely as a percent of depreciation charges, for example.

Between these two extremes is the goal of acquiring goods and services at the least total cost to the government. Such a goal would dictate production with the least-total-cost mix of facilities, labor and purchased material inputs.

We have assumed that the primary objective of Federal acquisition is to obtain the goods and services required by the government at the least total cost to the taxpayer. The other two goals are not properly related profit policy. Full employment could be pursued through fiscal policy, including the sheer volume of government purchases per se. (Acquisition policy could direct government purchases towards labor markets where unemployment is highest, but again the pursuit of socioeconomic objectives raises the possibility of contracting with a more expensive and less efficient producer). A mobilization reserve could be achieved by consciously building and maintaining in a ready state facilities that are themselves configured most productively.

Thus, if the government's overall acquisition goal is to obtain the goods and services it requires at the least total cost, the profit policy

selected ought to make the maximum possible contribution to the attainment of that goal and encourage contractor responses that promote it over the long run. The primary purpose of this study is to design a profit policy that fosters production at the least total cost to the government, while allowing contractors equitable profit opportunities. Contractors should not have to use a less than efficient mix of facilities and allowable costs on government work in order to earn a competitive profit.

ALTERNATIVE PROFIT STRUCTURES

The major criterion for evaluating alternative profit structures is how well they motivate contractors to achieve lowest total long-run cost acquisition for the government. These motivational attributes are affected not only by the structure itself but also by the ways inputs are defined and the amounts of them associated with government work are measured or recognized. In the following subsections we present the basic categories of input and the range of alternative profit structures that can be generated from them. From these we then select candidates for further analysis.

Basic Categories of Input

Costs. Fundamental to any consideration of profit policy structures is the distinction between inputs recognized and reimbursed as allowable costs and those principally of a capital nature which are compensated in part through profit.

Traditional or generally accepted accounting principles treat expenses and deductions necessary for the conduct of business as costs. Implicit payment for the services of capital provided by the firm is not generally treated as an expense but as a distribution of earnings (dividends and retained earnings). The exceptions are interest on debt and depreciation, which are treated as expenses.

Economic theory defines a cost as a payment required to attract and retain the services of any productive input. Consequently, at least some, if not all, of traditional accounting profit would be viewed as a "cost" under this definition, since it is necessary to attract and retain investment capital. Failure to obtain a return on investment capital committed to government work at least equal to that available for commercial work of comparable risk and complexity would lead to the withdrawal of invested capital. Thus, a portion of profit is intended to cover the implicit or opportunity cost of capital and can be viewed as a necessary payment for the use of a productive resource.

Within the context of government acquisition, costs are defined as what may more properly be termed operating cost.[1] The government usually recognizes, and hence allows the contractor to recoup costs for, only those inputs that benefit itself. Such items as advertising, entertainment, and similar types of cost, which are recognized by accepted accounting principles, traditional economic theory, and the Internal Revenue Code, are therefore not allowable costs, because they do not benefit the government directly.

Other costs, such as interest and depreciation, do benefit the government. Interest payments are not recognized as an allowable cost. Depreciation, however, is allowed as a reimbursable cost, as a necessary

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[1]Practices as to the allowability of various types of costs differ among the agencies, especially with respect to independent research and development, depreciation, proposal preparation costs and patents. As a general proposition agencies treat as allowable costs those that are necessary for the conduct of business. Since it is sometimes a matter of administrative judgment as to whether a cost is necessary (i.e. beneficial), nonuniform treatment across procuring agencies exists. OFPP is currently conducting a study to obtain a uniform Federal Acquisition Regulation which is anticipated to set uniforms cost principles for the various government agencies.

payment for the implicit consumption of depreciable capital during the performance of the contract.

Given these disparities, some working definitions of cost and certain cost areas are necessary to clarify the alternative profit structures that follow. In this analysis, costs are considered to be ordinary costs, necessary to the conduct of the business, and of a reasonable amount.

For maximum comparability of government contracts both over time and among competing contractors, straight line depreciation is preferred. It prevents burdening contracts performed early in the life of an asset with a disproportionate share of depreciation charges as compared to contracts performed at later stages of an asset's useful life. Maximum comparability, however, would not be compromised if contractors were to use the Asset Depreciation Range (ADR) depreciation period allowed under IRS regulations. Firms that are willing to accept the competitive disadvantage of higher depreciation charges earlier in the life of an asset should be free to use accelerated depreciation.

Interest, although a valid cost of doing business, is not considered within this definition of cost. To recognize interest as a cost would, in effect, have the government stating a preference for specific forms of capital financing. This is an area where the contractor ought to make his own decisions influenced by established and reasonably competitive capital markets.

Capital. The second broad input category is contractor-provided capital. Profit (or fee) traditionally includes a substantial but not exclusive element paid to compensate the contractor for providing the capital employed on government work. Capital is divided into two components: facilities capital, which represents the tangible assets used to conduct government

work; and operating capital, which represents the amount of financing provided by the contractor for cash outlays that have not been reimbursed.

Note that some facilities capital employed on government work may be provided under leased arrangements. In those cases where the government recognizes rental payments under lease agreements as an allowable cost, such facilities would not be included in contractor-provided capital. When the constructive cost of their ownership has been allowed in lieu of rental costs, leased facilities are included in contractor-provided facilities capital.

We follow the Cost Accounting Standard (CAS) 414 and Defense Procurement Circular (DPC) 76-3 definitions of facilities capital employed and include land, buildings, machinery, equipment, vehicles, tools, patterns and dies, furniture and fixtures used in the regular business activities of a profit center. In addition, an allocable share of general-purpose assets owned by the corporation outside the profit center is included. Facilities capital is evaluated at net book value. Specifically excluded are intangible assets, such as, patents, copyrights, franchises, goodwill, and trademarks, regardless of whether or not they are subject to amortization. If idle or excess facilities capital has been disallowed in forward pricing rates, the value of these facilities is not included in the facilities capital base. Leaseholder improvements and regularly used computer system software, not intended for sale, capitalized on the contractor's books, and subject to depreciation, are generally included in facilities capital.

Operating capital employed relates to the financing of net current assets required for the conduct of government contracts. Such assets would consist of associated inventories and receivables, less payables, progress payments and accruals. Thus, at any point during contract performance, the contractor has operating capital outstanding to the extent that supplies, raw

materials, and work in process have not been financed by the government as progress payments and advances, by trade suppliers as accounts payable, or by employees, government, and others as accruals. Note that _other_ current assets appearing on the balance sheet (primarily cash) and deferrals for expenses unrelated to government work are excluded, because they are not part of the operating capital required to perform government work.

It is relevant to point out that a balance sheet measure of operating capital is not truly indicative of the value provided by the contractor on a particular contract. A balance sheet reflects the status of a firm at a moment in time; working capital, for purposes of measurement as a profit-bearing resource, should reflect the average value over an entire contract's duration. A contractor could have a large amount of operating capital employed over a contract's life but show little on a balance sheet if it coincided with the start or completion of a contract. Second, a balance sheet does not reflect a particular contract, or even government work in the case of a profit center performing both commercial and government work.

These considerations imply that a precise tracking of cash inflows and outflows, along with specification of payment and receipts leads and lags, is required to measure operating capital employed on a particular contract or on government work in a profit center. (See Chapter V for recommended methods.)

Generic Profit Policy Structures

In the preceding subsection resources (inputs) used to conduct government work were divided into operating resources (costs) and contractor

capital reimbursed through profit. Profit policy structures are delineated in the same way. Thus, profit can be calculated as:

- a percentage of allowable costs including depreciation and lease payments (cost-based)

- a percentage of capital inputs (operating plus facilities capital at net book value) (capital-based)

- percentages of both costs and capital in various combinations (hybrid).

Each of these generic structures represents a collection of individual structures, which parallel the various definitions of the profit base and have different motivational attributes. In the following subsections we describe these individual structures and select three (one from each generic category) for further analysis.

Cost-Based Structures

Raw Total Costs. This approach bases profit on the total estimated amount of costs incurred by a contractor, with no distinctions as to the types of costs represented. This policy was used in DoD, prior to the institution of weighted guidelines, and it is still used in many Federal agencies. It has the advantage of being extremely easy to administer.

Weighted Total Cost. Another approach to a cost-based policy is to calculate different profit rates for various categories of the costs incurred, either to reflect the inherent complexity of a job or to reward highly valued resources. This is the basic idea behind the weighted guidelines.

The weighted total cost approach requires subjective decisions by an administrator or policy-maker concerning the relative worth of various types of resource inputs, in effect a substitution of his judgment for that of the market. Differential profit rates may also be taken as a proxy for job complexity. The weighted guidelines give a heavier weighting to engineering labor costs than to manufacturing labor costs, on the assumption that a job

having a greater engineering labor content is more complex. While this may be true in any given case, it is not necessarily a foolproof way to measure a complexity; it merely gives a mathematical basis to a necessarily judgmental process. Since this type of a profit structure tends to reward certain types of contractor activity, one of the traditional arguments against the weighted total cost approach is that it will encourage the contractor to use resources in those categories carrying the higher profit rates.[2]

Value-Added Cost. Using value-added cost as a basis for profit calculation is in effect merely one specific type of weighted total cost structure. That is, costs of supplies, materials, and subcontracting bear no profit, while costs incurred by the contractor from within his own resources are given positive profit rates, depending upon the nature of the costs. Thus, this structure tends to encourage a contractor to perform as much of the total effort in-house as is possible, irrespective of its comparative efficiency in doing so.

Of these three alternatives, we have selected the raw total cost structure as the preferred cost-based profit structure, one where all allowable costs bear a uniform profit rate.

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[2] It has been argued that weighted guidelines were essentially an attempt to provide or to consider return on assets under the structure of a weighted total cost profit policy. To the extent that this purpose was in fact behind the development of the weighted guidelines, it can be said with reasonable certainty that the practical effect of weighted guidelines is not particularly different from a raw total costs structure. Contractors still view the profit policy as based on cost; and, since the profit rates given to various input categories take no consideration of the quantum of costs, and reward various levels of cost within categories with the same rate of profit, there is no incentive for the contractor to control cost. So, although some consideration may have been given in the development of the initial weighted guidelines profit ranges, the practical effect has been at best to reward return on assets to all contractors based on a presumed or assumed or normal but not real capital turnover ratio. A strong incentive is thus present to manage turnover by reducing the level of capital on government work thereby increasing the rate of return on remaining contractor invested capital.

There is no reason to use nonuniform profit rates for costs incurred directly by the firm (direct labor and certain overhead costs exclusive of subcontracts and materials). Giving different profit rates to different categories of cost is an unreliable means of assessing task complexity, capital employed, or the amount of management skill required for performance. Direct adjustment of profit for task complexity, by allowing a higher rate for work of more than average complexity, is preferable.

For costs representing pass-throughs of materials, supplies, leases or subcontracts, it is sometimes the practice (e.g. weighted guidelines) to award a substantially lower profit. The argument is that contracts with higher subcontracted components represent less prime contractor contribution towards those activities for which profit is paid--capital input, management performance and risk-bearing. We feel that this argument has several drawbacks.

Firstly, it is clearly more economic if certain inputs are purchased rather than made by the prime contractor. The profit policy should neither encourage nor discourage make-or-buy decisions, which would not be the case if a higher or lower profit rate were awarded on the basis of where the work was performed.

Secondly, the cost base on which profits are computed must be comparable to commercial experience, if the government is to offer commercial-equivalent profit rates to contractors (see Chapter III). For commercial work, market forces can be expected to lead firms to the most efficient mix of in-house and purchased inputs. The profit rates observed in commercial markets when expressed relative to costs, include all costs, irrespective of where the work is performed.

Finally, when a prime contractor in effect acts as a broker or assembler by subcontracting an unreasonably large percentage of the work, we would expect that cost analysis (not profit policy) would lead the government to reject his proposal as unresponsive and uneconomic. This is not to say that a high subcontracted component is prima facie evidence of unreasonable cost. In fact, a prime contractor may deserve high profits for effective management if he successfully subcontracts a large percentage of work to a number of specialized and efficient firms who would not otherwise have combined on a contract effort. Whether or not the mix of prime and subcontracted work is most beneficial to the government is the concern of cost analysis, not profit policy. At best, profit policy should not bias the make-or-buy decision in one direction or the other.

Capital-Based Structures

In the case of capital-based profit structures, the method used to determine or recognize the amount of facilities capital employed on government work has a substantial bearing on contractor motivation. In this context, the amount of capital employed is that amount recognized for the totality of government work performed in a profit center. Methods of measuring and allocating total capital employed to a specific government contract are discussed in Chapter V. Three capital-based profit structures are described below; for all of them it is assumed that both government and commercial work in a profit center use the same relative amounts of capital in their production processes.

Historic (Lagged) Turnover. This method takes the ratio of some measure of activity, such as costs incurred or direct labor costs to capital employed, from the preceding accounting period and attributes or recognizes

the amount of facilities capital employed based on this historic ratio (turn-over rate). Thus, if the previous period's cost-to-capital-turnover rate was 3:1, each $3 of costs incurred in the current period produces $1 of recognized and profit-bearing capital.

The apparent deficiency of this approach is also its virtue. The previous period's turnover rate reflects the then-prevailing level of capital utilization; the rate varying directly with utilization. The historic rate may be only at, say, 50 percent utilization. If the contractor maintains his historic business base in the next period, all his capital will be recognized and bear profit. If the contractor increases his business base in the next period, the government will recognize more capital than is actually possessed (neglecting depreciation or net new investment). Thus, use of the historic turnover rate offers a strong incentive for increased participation in government work in the near term. Once full utilization is reached, the contractor earns a return on the actual capital available and employed, provided business stabilizes at the full capacity level. Of course, to the extent the government disallows the inclusion of excess facilities in the capital base, the problem of full recognition of underutilized facilities capital disappears.

Actual (Ex-post) Turnover. At the end of an accounting period, the government totals the actual amount of business accomplished by the profit center, including commercial work. The total capital base recognized and assigned to government work is the proportionate share of costs (or other measure of activity, such as direct labor costs) used on government work. To the extent that idle or underutilized facilities are included in the capital base, they would be recognized and bear profit. Assuming that totally idle facilities are eliminated from the capital base, the government would guarantee a return on the remaining invested capital employed in proportion to

the amount of direct labor or other costs incurred on government work, irrespective of the utilization of those assets. The contractor's profit is thus determined at the end of each accounting period, irrespective of the amount of work undertaken. Profit is paid in proportion to the amount of government activity on all capital available except that deemed idle or surplus.

Projected Capital Turnover. A third alternative is a projected turnover rate based on the government's estimate of the level of business activity likely to be undertaken in the next accounting period and the contractor's investment base. This method falls between historic and actual turnover, depending on the accuracy of the projection. A completely accurate projection resembles the actual turnover method, while a projection coinciding with the previous period's resembles the historic method.

The projected turnover method is analogous to an overhead projection, whereby an overhead rate is determined for forward pricing and bidding. However, the projected turnover rate, instead of being recomputed to conform to the level actually incurred, would be fixed at the projected level. If the contractor's actual business increased beyond this level without a concomitant increase in investment, more capital would be recognized than was actually employed. The contractor thus has an incentive to increase his business above the projected level.

We have chosen to eliminate the actual turnover method of recognizing capital employed from further consideration for a number of reasons. In the first place, this method recognizes whatever capital is actually available in a profit center in proportion to the amount of government activity conducted there, regardless of the level of utilization. Further, the actual capital turnover method must be applied following the end of an accounting period (i.e. ex-post), which presents several problems. First, the contractor

is encouraged to assign equipment that would otherwise be idle to the government profit center (to the extent that the government does not exclude such facilities as excess to its needs). Second, as long as the facilities are not ruled excess to the activities performed, the contractor is not motivated to increase the amount of government business undertaken by the profit center. Increased activity will not increase the level of recognized capital, and hence profit, once capital is fully recognized. Third, ex-post profit could be construed as cost-plus-a-percentage-of-cost contracting.

Therefore, we recommend a capital-based structure that uses both the historic and projected turnover methods. The historic method applies when business and investment levels are not expected to change materially; the projected method applies when material changes are expected. This dual method is in use today for determining the amount of facilities capital employed on government work.

Hybrid Structures

With hybrid structures, profit is calculated on the basis of both estimated cost of performance and recognized capital employed. Consequently, any of the various cost- and capital-based structures described above can be combined into a hybrid structure.

Hybrid structures can be further distinguished according to the weighting given to the capital and cost components. A hybrid is more like a cost-based structure when most of weight, measured in terms of profit dollars, is determined from the cost component, and more like a capital-based structure when most of the weight is placed on the capital component. Thus, the analysis of hybrid structures parallels that for the constituent cost and capital components, once the weighting of each component has been specified.

Summary

We have selected for further analysis the following individual

profit structures from each generic structure:

- Cost-based, with total (unweighted) cost as the base to which
  a uniform rate is applied

- Capital-based policy, using the <u>historic turnover method</u> when
  activity and facilities investment are not expected to change
  materially, and the <u>projected turnover method</u> when material
  changes in the level of government activity or facilities
  investment are expected

- Hybrid, with total unweighted costs as the cost base, and
  either historic or projected turnover methods for the capital
  component as described for the capital-based structure above.
  The weights to be given the cost and capital components are as
  yet unspecified.

EVALUATION CRITERIA

The major objective of this analysis is to gauge the effectiveness of

alternative profit structures in meeting the government goal of least total

cost acquisitions. Two complementary categories of criteria are applicable:

economic and administrative. Economic criteria are addressed on a theoretical

level and refer to how well the various structures motivate contractors to

support government acquisition at the least total cost. Administrative

criteria refer to practical aspects of implementing the profit structures

within the acquisition environment.

Economic Criteria

1. <u>Encourages Use of Facilities Capital to Reduce Total Cost of
   Performance</u>. Figure II-1 illustrates why this behavioral
   response is considered. To produce a volume of output A, the
   government prefers a contractor to use a scale of plant SP-2 as
   compared to a plant with lower facilities capital SP-1. The
   plant SP-2 produces volume A at lower total cost. A profit
   structure which encourages investment that reduces overall
   costs, as represented by SP-2, is thus preferred. Note that
   the emphasis on greater use of facilities capital follows from
   the belief that current profit policies have encouraged
   labor-intensive methods of production.

FIGURE II-1

ACQUISITION GOALS AND CONTRACTOR'S MOTIVATION
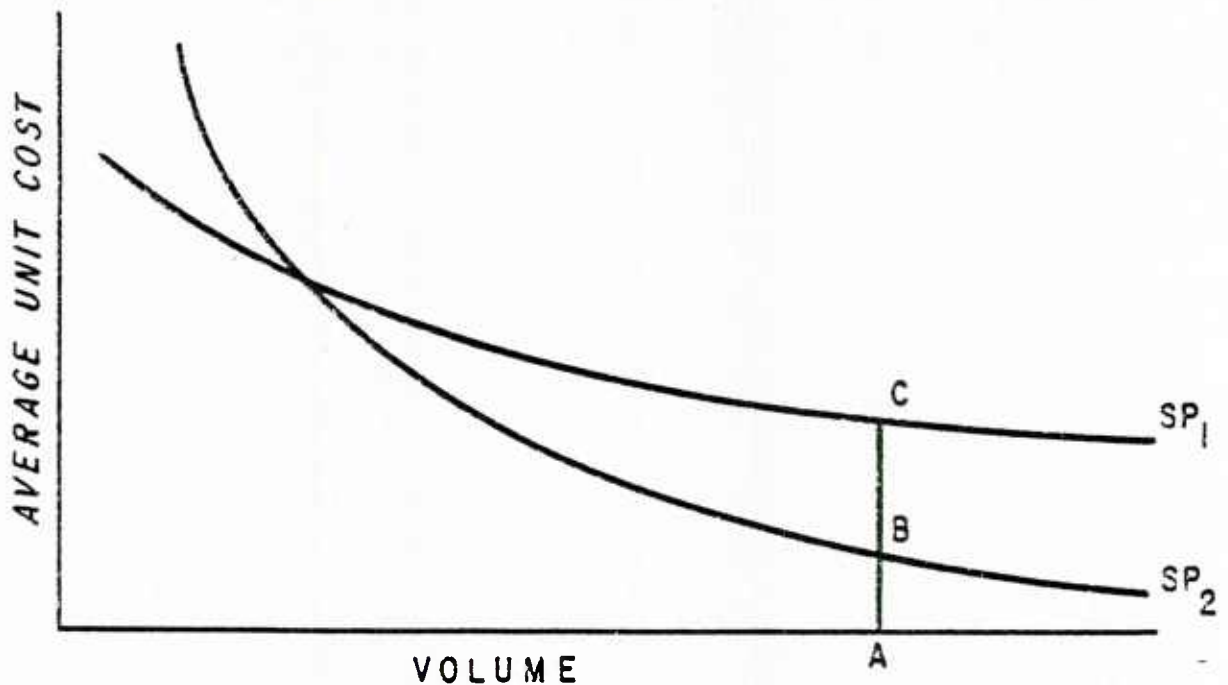
2. Encourages Increased use of Existing Facilities.   Decreasing
    unit cost in relation to increasing volume is also portrayed in
    Figure II-1.   This situation occurs as the fixed costs of
    performance are spread over increasing volume. We prefer a
    structure that encourages a contractor to seek more volume,
    regardless of the scale of plant currently in place.

3. Encourages Participation of Efficient Firms in Government Work.
    A preferred profit structure encourages firms that are config-
    ured to produce efficiently, perhaps with high levels of capi-
    tal,   to   seek   government   work.   Competitive   forces   in
    commercial markets generally lead to cost-efficient management
    decisions--location, investments, make-or-buy, process config-
    urations, number of shifts etc.   A preferred profit structure
    should not prevent a contractor from undertaking government
    work in a manner consistent with his commercial operations on
    account of below normal profit outcomes. An efficient con-
    tractor should be able to earn reasonable profits and should
    not have to use a less efficient mix of facilities and al-
    lowable costs in order to earn a competitive profit.

4. Is Neutral with Respect to Contractor Financing Decisions.   A
    contractor facing reasonably competitive capital markets,
    selects between debt and equity financing so as to achieve his
    capital financing at lowest cost. A preferred profit structure
    should not of itself encourage one form of financing over
    another but should leave the decision to the contractor as
    influenced by the market.   Otherwise, higher than necessary

costs of capital will be incurred. All profit structures are neutral toward the contractor's financing decision as long as interest remains a nonallowable cost.

5. <u>Is Neutral with Respect to Contractor Make-or-Buy Decisions</u>. Prime contractors' make-or-buy decisions should be based on whether the prime or a subcontractor can best accomplish a given task at lowest cost, given schedule and quality requirements. A preferred profit structure would not influence these decisions on grounds other than least cost and thus, absent other influences besides profit policy, would lead to economic decisions. As will be seen, no profit policy unambiguously meets this criterion.

6. <u>Copes with Inflation</u>. In the presence of inflation (or deflation) in the economy at large, a preferred profit structure should maintain the value of profit earned in real (constant dollar) terms. Ideally a contractor should neither benefit nor be penalized as the general level of prices changes.

Administrative Criteria

1. <u>Ease of Application</u>. The preferred profit structure should be simple to administer, with measurement and procedural features as simple as possible.

2. <u>Allows a Predictable and Meaningful Profit Measure</u>. The profit structure should be designed so that the intended outcome is predictable to both the contractor and the Government. The profit measure or base should be meaningful when comparing profitability across industries or sectors of the economy.

3. <u>Allows for Evaluation and Fine-Tuning</u>. It should be possible to evaluate the profit structure so that deviations from intended results can be understood and corrected.

ANALYSIS OF PREFERRED STRUCTURES

Methodology

Each preferred profit structure was evaluated in terms of the criteria presented in the preceding section.

A given profit structure was judged to be supportive of least long run total cost to the government when: (1) the contractor profited by using additional facilities capital that lowered total overall costs; (2) the contractor profited by increasing the volume of business undertaken at a facility of given size; and (3) profit fell when a contract was accomplished by a

contractor with less facilities capital and higher total costs, as compared to one with more facilities capital and lower total costs.

The emphasis is on facilities capital employed, since it is through the appropriate use of facilities capital that least-total-cost acquisition can be accomplished. However, when other attributes of profit policies, like the impact of inflation, are addressed, operating capital is considered. (Operating capital is generally employed in government work and should bear profit to the extent it is required (see Chapters III and IV).

The results of the evaluation are discussed in the following subsection. We emphasize that we are evaluating the motivational implications of the various profit structures per se; other influences and conditions may either reinforce or counter the motivational aspects.

Cost-Based Structures

Use of Facilities Capital. Cost-based structures positively discourage the increased use of facilities capital that reduces total acquisition costs to the government, under most circumstances. The use of additional facilities capital reduces both the total cost of performance and profits. Profits are lower because they are awarded on the basis of estimated cost of performance. Lower profits relative to higher levels of facilities capital employed translates into lower profitability--profit relative to capital invested. If a contractor has to choose between two facilities investments of equivalent cost, he will prefer the one that produces the smaller cost reduction, because lower costs mean lower profits.

A possible exception to this behavior may occur when the contractor benefits directly from a reduction in costs below the level estimated at contract formation. This may happen when a fixed-price contract is negotiated, or when incentive contracts call for a sharing of the savings if costs are kept below the estimated level.

When such cost reductions occur, either because of management efficiencies such as process changes or because of facilities investment, they are translated into additional profit--totally for a fixed-price contract or proportionately with an incentive contract. But these profits are likely to be negotiated away in subsequent government work, as the government is likely to have access to cost data indicating that lower levels of resources are required to accomplish the work. The contractor must therefore receive sufficient additional profits through the sharing of cost savings in the initial period of contract performance to justify a cost-saving investment. The more productive a cost-saving investment and the greater the contractor's share of the resultant savings the more incentive there is for such investment.[3]

Increased Utilization of Existing Facilities. Cost-based structures support increased utilization, since higher volumes lead to higher profit--both in absolute terms and relative to the level of capital investment. Certain administrative practices in government contracting further encourage this behavior. In particular, overhead projections to establish forward pricing rates are based on average accounting concepts. If average costs fall as volume increases, then the incremental cost of additional volume is below the levels embodied in average accounting concepts like projected overhead rates. Consequently, obtaining more volume by undertaking additional government business can be quite profitable since, absent renegotiation, the price paid per unit of output does not necessarily fall as actual unit costs fall.

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[3]Discounted cash flow analysis conducted by LMI revealed that, under a cost-based profit formula, for a $1 investment that annually saves an equivalent amount of costs, the contractor had to receive nearly all of savings in the year of the investment for it to be justified.

Participation of Efficient Firms. A cost-based profit structure discourages the participation of efficient firms if their efficiency is based on their use of facilities capital. A pure cost based structure is insensitive to differences among contractors' use of facilities capital--a given level of profit paid as a percentage of cost implies a higher level of profit on capital employed (profitability) the smaller the amount of capital relative to costs, and conversely. This means that an efficient firm (one producing at the lowest total cost to the government) would receive lower profit dollars and a lower return on investment than a less efficient firm. Hence, a highly facilitized contractor would be discouraged from participating in government work as compared to his less capital-intensive and presumably less efficient competitors.

Neutrality Toward Financing Decisions. Neutrality depends on whether or not interest expenses are treated as an allowable cost. Any profit structure that excludes interest as an allowable cost is neutral with respect to contractor's financing decisions. We support the exclusion of interest as an allowable cost, because to do otherwise would effectively favor debt over equity financing of capital.

Neutrality Toward Make-or-Buy Decisions. With cost-based profits, this decision tends to be made on a basis other than where the work can be performed at the lowest cost. When profit is negotiated at a uniform rate on all costs including subcontracts, the contractor increases his return on investment by subcontracting the most capital-intensive tasks. In this way, total profits are maintained, while capital investment is kept to a minimum and return on investment is improved. Although this behavior is not necessarily disadvantageous to the government, there is a strong incentive to base subcontracting decisions on something other than least total cost to the government.

Impact of Inflation. When profit is negotiated as a percentage of estimated costs, the impact of inflation tends to be neutralized, because profit dollars maintain their (real) value in constant dollars. The estimated cost of performance reflects inflated input prices; consequently, profit as a percentage of cost increases in proportion to the increase in input prices.

In practice, anticipated inflation is often "forward-priced" into the estimated cost of performance, by means of economic price adjustments (escalation) clauses. When such clauses are used, negotiated profit reflects the anticipated level of inflation over the period of contract performance. When inflation exceeds anticipated levels, or when contracts have escalation provisions at actual inflation rates and costs and profits are negotiated on a current dollar basis, the contractor's real profit is not protected from inflation. However, in subsequent contracts, profits will reflect the higher general price level and will tend to be protected from inflation in the longer run.

Ease of Application. The cost-based structure is extremely simple to apply. Profit follows directly as a percentage of the estimated cost of performance (itself a negotiated amount). This factor alone is a strong argument for using a cost-based structure when more complex methods are not expected to benefit the government materially.

On the other hand, profit negotiated as a given percentage of costs does not reflect the amount of capital employed relative to costs or sales (capital turnover). Because capital turnover can vary materially among different contracts and contractors, profit measured relative to invested capital can be highly variable even though equivalent profit rates of return on cost have been negotiated. Consequently, cost-based structures, which do not distinguish capital turnover differences, give highly unpredictable results and are therefore difficult to evaluate, target, and fine-tune.

Capital-Based Structure

Use of Facilities Capital. The use of facilities capital to reduce total cost to the government can be encouraged by basing profit on capital employed provided that: (1) the profit rate on facilities capital employed equals or exceeds the contractor's cost of capital; and (2) the contractor receives sufficient benefits from the resulting cost savings, as with incentive clauses or fixed-price contracts. Otherwise, the historic, and to a lesser extent the projected, methods of recognizing facilities capital employed tend to temporarily depress the rate of return on capital employed and total profit dollars.

The historic turnover method attributes dollars of capital to dollars of activity in relation to what occured in the previous accounting period. Suppose a reduction in actual production costs occurs through an increase in the amount of facilities capital used. The historic method attributes to the lower level of costs fewer dollars of capital than are actually employed; consequently, the return on actual capital employed falls. Total profit dollars earned also fall, since lower costs produce less profit-bearing capital recognized compared to the level employed prior to the investment.

In subsequent accounting periods, the actual (lower) turnover rate reflects the post-investment situation, and the rate of return stabilizes at the targeted level as business (costs) stabilizes. Thus, a one-time depressant to profits occurs when the historic turnover rate, used to determine the level of capital employed, fails to reflect the higher actual level of capital concomitant with each dollar of costs incurred.

A second instance of this phenomenon is when the contractor is faced with two equal-dollar investment opportunities. The more productive

investment leads to lower profitability and lower profit dollars than the less productive investment. This is a direct consequence of the historic turnover method attributing less capital employed to each dollar of costs than is actually the case.

The projected method of recognizing facilities capital employed compensates for these deficiencies to the extent that the actual higher level of facilities capital employed and the resultant cost reductions are fully anticipated. For example, if the projected facilities capital turnover rate is the actual rate experienced, all of the capital employed will be recognized, and the realized rate of return will be at the targeted level. Since actual capital employed has increased and the targeted rate of return has been earned, total profit dollars will increase. When projections deviate from actual experience, the contractor earns a higher or lower return on capital depending on whether the projection over- or under-estimates the actual turnover rate. Again, once the level of business activity and facilities capital employed stabilizes, the targeted return is realized in subsequent periods.

When the contractor receives some or all of the cost savings resulting from increased use of facilities capital through sharing clauses or a fixed-priced contract, the contractor is motivated toward the more productive investment opportunity. This occurs because some or all of the unanticipated cost savings are realized by the contractor as additional "profit." Since the most productive investment from among the alternatives available produces the most additional profit, the contractor is motivated to incorporate the best investment first.

Discounted cash flow investment analysis (described in Appendix D), was conducted assuming that: (1) cost savings were shared between the contractor and the government in the year the investment was undertaken; (2) a

projected turnover method was used to recognize facilities capital employed; and (3) business was maintained at a constant level over the life of the capital investment. This analysis showed that a hypothetical investment that reduced annual costs by 50 percent of the initial investment value required the contractor to share in 62 percent of the first year's cost savings for the investment to be justified from a business viewpoint. However, if the investment produced annual cost savings equal to 100 percent of the investment value, the required sharing (first year only) of cost savings was reduced to 35 percent.

Specific sharing-of-cost-savings rates are very sensitive to such parameters as the rate of return on investment required by a contractor, and the annual cost reduction as a percentage of investment value. Two conclusions may be drawn from this analysis, however: (1) the contractor sharing rate should be greater for contracts under a cost-based profit structure than under a capital-based or hybrid structure (where investment is explicitly recognized and rewarded); and (2) the contractor sharing rate should be greater than it typically is today. A recommendation for applying the concept of sharing of cost savings is included in Chapter V "Recognition of Cost Savings".

Increased Utilization of Existing Facilities. A capital-based profit structure using the historic method of recognizing facilities capital employed encourages increased utilization of facilities. The projected method also encourages increased utilization, to the extent that increases in business above forecasted (anticipated) levels occur.

Increases in the volume of business above the previous period's level lead to increases in the realized rate of return on facilities capital employed and in the absolute level of negotiated profit dollars. This happens

because when business volume increases above the previous period's level, the incremental business leads to recognition of profit-bearing facilities capital at the same ratio as given by the turnover rate. Since the previous period's level of business led to a recognition of all available facilities capital employed, the additional capital recognized on account of the incremental business leads to added profit. Higher profit with the same level of actual facilities capital available implies a higher rate of return on invested capital.

The encouragement of added business volume for a fixed level of facilities capital only occurs with year-to-year increases in business volume. Once business stabilizes, total profit dollars and the rate of return earned on facilities capital stabilize at the levels achieved before the increase occurred. Thus, a contractor doing $100 of business with a fixed level of facilities capital eventually achieves the same profits once business stabilizes at, say, $120. Profits increase only during the transitional period when business grew from $100 to $120.

Participation of Efficient Firms. A capital-based profit structure encourages the participation of efficient contractors to the extent that the profit rate on facilities capital employed exceeds the contractor's cost of capital. By contrast, a cost-based structure discourages the more capital-intensive contractor from undertaking government business. With a capital-based structure, only a sufficent rate of profit is required to attract capital-intensive contractors.

Neutrality Toward Make-or-Buy Decisions. A capital-based structure motivates a contractor to subcontract tasks requiring the heaviest application of facilities capital, despite the profit's being based on capital employed. This behavior follows from the method used to recognize facilities

capital employed. With an historic turnover rate, the contractor achieves higher profits when actual costs relative to available capital increase over historic levels. This can be accomplished by reducing facilities capital and/or adding to the business base. With a projected turnover rate, the same motivation prevails, but the contractor now seeks to add business and/or reduce capital relative to the projected levels. This aim can be accomplished by: (1) subcontracting the most capital-intensive tasks; and (2) subcontracting with high-cost producers, since subcontracting costs incurred form part of the business base.

Impact of Inflation. A capital-based profit structure has mixed impacts with respect to maintaining real profit levels. Operating capital employed tends to expand in proportion to increases in general prices, because it reflects the dollar value of costs embodied in inventories, work in process, and accounts receivable.

Facilities capital employed reflects historic price levels at the time equipment and other facilities were purchased. Consequently, there is a lag between the occurance of inflation and its impact on the value of facilities capital recognized, which lasts until facilities are replaced at (higher) current, rather than historic, costs. Working against this phenomenon is the operation of inflation on the turnover rate used to recognize capital employed. As the dollar value of the costs of doing business increase (even with physical volume constant), the historic or projected methods of recognizing capital will yield higher amounts of profit-bearing capital than actually exist (see the discussion under Utilization of Existing Facilities). Thus, the historic and, to some extent the projected, methods tend to increase profit dollars as a continuous rate of inflation increases costs. However, once inflation stops, or the rate of inflation declines, profit dollars return to pre-inflation levels.

Ease of Application. This is a major concern with capital-based structures. In addition to negotiating estimated cost of performance, a separate calculation of facilities and operating capital employed by the contractor must be determined to calculate profit. Such calculations are now performed for Federal procurements falling under CAS-414 jurisdiction and as part of the DoD's new profit policy (DPC 76-3 and 76-12). Chapter V presents a full discussion and delineation of methods to measure facilities and operating capital employed for both a contractor's total government work and on a contract-by-contract basis.

Hybrid Profit Structures

Hybrid profit structures borrow from both the cost-and capital-based policies in combinations reflecting the relative importance placed on each component. Consequently, hybrid structures have the same range of motivational attributes as cost and capital-based structures--when the cost component is heavily weighted, the hybrid resembles a cost-based structure in terms of motivation; when the capital component is heavily weighted, the hybrid resembles a capital-based structure. Note that by "weighted", we mean the relative profit dollars the hybrid structure nominally achieves on a going-in basis from costs and capital.

SUMMARY

This section summarizes the pros and cons of each profit structure and draws conclusions as to which acquisitions are best conducted with each. Some issues concerning the design of a profit policy are also mentioned.

Cost-Based Structure

The primary virtues of a cost-based profit structure are its ease of application, its encouragement of increased utilization of existing facilities, and its property of keeping real profit dollars in line with inflation.

The strongest argument in its favor is its ease of application and consequent low administrative costs.

The disadvantages of the cost-based structure--especially with respect to the use of facilities capital and the implications of applying it at a uniform rate irrespective of capital intensity--are severe. A cost-based structure discourages the use of facilities capital, which can lower overall costs to the government. It also discourages the participation of capital-intensive firms in government work, because a negotiated profit as a given percentage of estimated costs of performance implies a lower level of profitability (ROI) for more capital-intensive methods of production. Thus, a cost-based structure is likely to give different results when applied to contractors with varying capital intensities. Finally, this structure encourages the subcontracting of capital-intensive tasks to the least efficient subcontractor, even when the prime contractor conceivably could have accomplished the work at a lower total cost (perhaps with additional facilities investment).

Therefore, profit calculated as a percentage of estimated costs does not lead to a meaningful or predictable outcome, since the level of capital employed is not considered. The motivational implications suggest that the cost-based structure is suitable when the use of facilities capital is unimportant to the ultimate overall cost of performance. Even in these situations, it must be applied cautiously, because small variations in capital intensity can cause variations in contract profitability--care must be exercised to differentiate profit rates on costs when differences in capital intensity among industries exist.

The data analysis of Chapter III indicates that the cost-based structure is suitable for the service sector such as A&E, R&D studies and for

other professional services, which use relatively little facilities capital and where a uniform profit rate on costs gives similar profit outcomes.

Capital-Based Structure

The strengths of capital-based structures tend to be in those areas where cost-based structures are deficient. Complications arise, however, because capital employed must be measured with proxies when both government and commercial work is done within a profit center or when contract-specific capital employed is desired. An additional complication occurs when differential profit rates are desired for operating and facilities capital employed.

The major positive attributes of a capital-based profit structure are: the recognition of facilities capital, the fact that profit outcomes relate to profitability on investment and thus do not per se discourage capital-intensive contractors from participation in government work; and the fact that increased utilization of existing facilities need not be discouraged. As we have seen, when the impact of the investment in additional facilities on costs is not anticipated, it can lead to temporarily reduced profits and profitability. However, to the extent that such benefits are anticipated and shared between the contractor and the government, the capital-based structure does not discourage, and can encourage, cost-saving investments. The capital-based structure encourages full utilization of existing facilities insofar as increases in the business base are not fully anticipated in the turnover rate used to recognize facilities capital. This motivation exists only to the extent that unanticipated year-to-year increases in business are possible within the capacity constraints of the facility. Finally, the capital-based structure encourages capital-intensive (and presumably more efficient) contractors to participate in government work, since negotiated profits increase as more facilities capital is used.

On the negative side, capital-based structures are more complex to administer than cost-based structures. Use of the most efficient cost-saving capital is temporarily discouraged if its impact is not fully anticipated and its benefits are not shared. Fuller utilization of existing facilities is discouraged, though, the more accurate the projected level of capital. In sum, however, we prefer the more accurate projected method of recognizing facilities capital to encourage cost-saving investment, but the other element of profit, recognition of cost, is still needed to motivate fuller utilization of existing facilities.

A capital-based structure may not fully reflect current inflation, because facilities capital is accumulated over time and is based on the original price of an asset. Use of historic or projected turnover rates can avoid this problem, to the extent that inflation continually causes costs to increase.

Other drawbacks of the capital-based structure relate to separate treatment of operating and facilities capital and the resultant design of a capital-based policy. Since operating capital is a resource the costs of which are to be covered by profit and should be recognized but not encouraged, a minimum profit rate (less than the cost of capital) should be paid for it. Otherwise, contractors could add to total profits by adding operating capital. However, the profit rate on facilities capital, which is to be encouraged and is the result of constraining the profit rate on operating capital, may encourage the use of facilities capital beyond economic levels. Basing profit exclusively on capital employed can overcompensate for facilities capital and result in higher total costs--possibly even higher than with a cost-based structure.

Hybrid Profit Structures

Since hybrid structures borrow from both capital- and cost-based structures, we can take advantage of the best motivational attributes of each and overcome their inherent problems when applied separately. For this reason, the hybrid structure is recommended when facilities capital is an important influence on overall acquisition costs. This situation occurs in the manufacturing and construction sectors (see Chapter III).

The hybrid structure should give ample weight to facilities capital employed to encourage its use. The historic turnover method should be used when the level of business and investment is not expected to change from the previous accounting period; otherwise, the projected method should be used. The benefit of projecting capital turnover as closely as possible to actual experience is that it discourages the use of the most productive additional capital the least. The greater the weight given to capital in the hybrid structure, the more participation of capital-intensive contractors is encouraged, and the more predictable is the profit outcome in terms of return on investment.

The disadvantage of projecting capital turnover as closely as possible to actual experience is that increased utilization of existing facilities, and the concomitant reduction in unit costs with volume increases, are discouraged. The more accurate the projection of business base and investment (i.e., turnover), the more cost-saving investment is encouraged, but at the expense of increased facilities utilization. To correct this defect, the cost-based component of the hybrid structure policy is introduced. The cost component has several added benefits: it tends to maintain profit dollars in real terms when inflation is present, and it more readily allows adjustments for contract risk--primarily the risk of not fully recouping the incurred cost of performance, which is present in certain contract forms.

We have failed to specify a number of features of the hybrid structure in this chapter, in particular, the weighting of the capital and cost components, the differential profit rates for operating and facilities capital, and whether the formula should be specified for a firm, industry, or economy-wide. Chapter III discusses rate-setting, and Chapter IV integrates the results of this structural analysis chapter with Chapter III into recommended profit policy design.

III. <u>RATE SETTING</u>

<u>INTRODUCTION</u>

Profit compensates for: (1) the use of invested capital, (2) the risk that all the costs (operating and capital) of performance may not be recouped, and (3) the organization and management of the resources necessary to make an enterprise viable. Profit also acts as a resource allocation signal, attracting additional resources to economic activities where profits are high and discouraging them where profits are low.

The purpose of setting a profit objective for Federal negotiated procurements is to provide the contractor with the opportunity to earn a commercial-equivalent rate of return for government work of similar risk and complexity. Commercial-equivalent rates are used for several reasons. First, they reflect the marketplace rewards and investor requirements for all the different functions of profit mentioned above. Second, firms cannot be expected to participate in the government market unless commercially comparable profit opportunities are offered. Third, firms doing government work must compete for capital in the same marketplace as others, and to do so effectively, they must have the opportunity to earn competitive rates of return. Fourth, to the extent that market profit rates reflect current and anticipated inflation, the use of commercial-equivalent rates will keep government profit policy at parity with the inflation coverage afforded firms in the economy at large. Lastly, any other basis for establishing profit rates for negotiated procurements is arbitrary.

It might be argued that setting target rates higher than commercial-equivalent rates would increase the number of firms seeking government work,

thereby stimulating competition and innovation. One argument against this is that most government contractors would receive windfall profits. More importantly, such an approach tends to detract from the purposes of paying profit--to reward use of capital, and assumption of risk and entrepreneurial performance--by using profit policy to correct acquisition problems not necessarily related to the level of profit. To the extent that firms choose not to participate in government work because of forfeiture of patent rights, payment delays, and complicated bidding requirements, raising profit rates to higher than commercial-equivalent levels to encourage increased participation merely attempts to compensate for these problems rather than to solve them directly.

For regulated industries (e.g., utilities), profit rates are traditionally set to reflect a firm's specific cost of capital, especially with respect to the return given on equity. This is a logical approach, because the regulated firm serves a specific geographic area, and there is no possibility that a more efficient outside supplier with a lower required return on capital could serve that area's needs.

In government contracting, we seek to measure and negotiate profit rates that reflect industry, sector, or economy-wide norms. Efficient firms with lower than average capital costs will have an opportunity to earn above-average returns, while firms with high capital costs will earn below-average returns. We feel this is desirable. Setting profits to reflect firm-specific required rates of return would reward less efficient contractors and penalize the more efficient ones.

To use commercial-equivalent rates, we must first examine several empirical issues, such as what measures of profitability are appropriate, what

are the corresponding profit rates for various industries both contemporaneously and historically, and what accounts for differences in profitability among industries. We then provide our rationale for those rates in the profit policy that cannot be derived from commercial experience. The results of this chapter along with those from Chapter II are used in the next chapter in designing both the cost-based and hybrid profit formulas.

PROFITABILITY MEASUREMENT

The profitability of an enterprise is generally expressed as the ratio of the level of profit (however calculated) to some base. This ratio permits standardized comparisons of profit over time and among enterprises of different sizes. The base chosen for calculating the ratio generally must bear some significant relationship to the measured level of profit, which appears as the numerator of the ratio. For example, if the level of profit were "earnings before tax", then the appropriate base would be stockholders' equity, since earnings before tax represent the return to the owners of the enterprise. However, if the level of profit were "earnings before interest and tax", then the appropriate base would be all debt plus stockholders' equity, since earnings before interest and tax represent the pretax return on all sources of a firm's invested capital: equity and debt.

There can be as many profitability measures as there are definitions of the level of profit and/or bases. The appropriateness of any one measure depends upon the user's perspective. An investor is most concerned with return on stockholders' equity--earnings before tax relative to stockholders' equity. The investor seeks to maximize his return by investing in those companies perceived to yield the highest return on equity consistent with the level of risk he is willing to bear. Top management of a corporation is most interested in the return on funds that must be paid for, i.e. debt and equity.

The corporation must be able to earn a return on these invested funds equal to the current cost of capital, or else suffer in the future from an inability to attract additional capital. In this case, return on total capital provided--earnings before interest and tax relative to all debt plus stock-holders' equity--is appropriate. Within the same corporation, however, top management may evaluate profit/investment center managers using a return on total assets measure--operating income (before interest, taxes, and other corporate allocations) relative to total assets. Here, top management is interested in the most efficient use of a profit center's assets, irrespective of the source of asset financing.

Return on sales (or cost)--the ratio of earnings to sales (or cost)--is another widely used measure of profitability. However, return on cost must be used cautiously in profit comparability analysis. Return on cost is not a true profitability measure relatable to the use of invested capital. The base, cost, does not bear the same relationship to invested capital for all industries or for all firms within an industry. To translate return on cost into a true profitability measure, one needs to know the turnover rate of cost to invested capital. Return on cost times this turnover rate yields return on invested capital:

$$\frac{\text{Earnings}}{\text{Cost}} \times \frac{\text{Cost}}{\text{Invested Capital}} = \frac{\text{Earnings}}{\text{Invested Capital}}$$

If the turnover rate does not vary among firms in an industry, then return on cost is an adequate profitability standard for that industry: firms with high profit margins on cost have high rates of return on invested capital, and conversely. However, turnover will vary because of a firm's capitalization, because of product characteristics such as length of the

manufacturing process and competitive market pressures, and because of the degree of vertical integration of firms.

Table III-1 proves that turnover rates do vary widely from industry to industry. Return on cost is a decidedly inappropriate means of comparing profitability across industries. Consider for example what the same 10 percent return on cost translates into as a return on total capital provided for primary metal industries and aircraft:

	Return on Cost	Turnover Rate	Return on Total Capital Provided
Primary Metals	10%	1.17	11.7%
Aircraft	10%	2.53	25.3%

The same return on cost represents a substantially different (by a factor of two) return on total capital provided for these two industries on the basis of actual data for these industries from Table III-1.

Chapter II analyzed various profit policy structures and identified two as applicable to government negotiated procurements--a cost-based and a hybrid structure. The cost-based profit structure establishes the profit objective as a percent of the total estimated cost of the contract. Thus, we need a commercial-equivalent rate of return on cost. The hybrid structure establishes the profit objective as a function of two inputs: the amount of contractor-provided capital (operating and facilities) and the total estimated cost of the contract. However, the overall target rate of the hybrid structure is a return on total contractor-provided capital, so a commercially-equivalent rate of return on total capital provided is also needed.

For both measures--return on cost and return on total capital provided--the numerator of the ratio is earnings before interest and taxes. In

TABLE III-1. TURNOVER RATES (COST EXCLUSIVE OF INTEREST/TOTAL CAPITAL PROVIDED) BY MANUFACTURING INDUSTRY
(1962-1976 Averages)

	Turnover Rate
Food and Kindred Products	2.73
Tobacco Manufacturers	1.37
Textile Mill Products	1.89
Paper and Allied Products	1.26
Printing and Publishing	1.99
Chemicals and Allied Products	1.27
Drugs	1.24
Rubber and Misc. Plastics	1.70
Stone, Clay and Glass	1.31
Primary Metal Industries	1.17
Iron and Steel	1.24
Nonferrous Metals	1.06
Fabricated Metal Products	2.01
Machinery, Except Electrical	1.51
Electrical and Electronic Equipment	1.84
Transportation Equipment	2.15
Motor Vehicles and Equipment	2.08
Aircraft, Guided Missiles and Parts	2.53
Instruments and Related	1.37
All Manufacturing	1.65

Source: Federal Trade Commission, Quarterly Financial Report

Chapter II, we endorsed the existing policy of disallowing interest costs in order to maintain neutrality toward the firm's capital financing decision. Thus, any going-in profit rate must set a profit opportunity that allows a firm to cover the interest expense on its debt and provides a return to the owners' equity, the risk assumed, and the entrepreneurial expertise.

The denominator of the return on cost ratio is costs exclusive of interest paid; the denominator of the return on total capital provided ratio is all debt (long- and short-term) plus stockholders' equity. Thus,

$$\text{Return on Cost} = \frac{\text{Earnings Before Interest and Taxes}}{\text{Costs (Exclusive of Interest)}}, \text{ and}$$

$$\text{Return on Total Capital Provided} = \frac{\text{Earnings Before Interest and Taxes}}{\text{All Debt + Stockholders' Equity}}$$

The interpretation of return on cost is straightforward. Profit is calculated as a percentage of the estimated total cost of the contract. This profit then represents the return for all the functions of profit. Return on total capital provided represents what a firm earns on all of its invested capital, whether raised through debt or equity.

SOURCES OF PROFIT RATE DATA

Three sources of published information are available, which provide data enabling one to calculate profit rates economy-wide and by various industrial classifications: the Federal Trade Commission (FTC), the Internal Revenue Service (IRS), and Robert Morris Associates (RMA). All three provide accounting data on the book value of assets, liabilities, sales, and income. Return on total capital provided and return on cost measures were calculated with the data from each source. Other measures were calculated in some cases for analytical and illustrative purposes. Each data source is discussed separately below and the profitability data displayed.

Accounting data have certain limitations when used for profitability measurement purposes. They reflect only the monetary assets of a firm, which presumably enable it to earn a profit. However, some firms and industries possess significant nonmonetary assets (e.g. patents, licenses, locational advantages, excellent management) which contribute significantly to the firm's or industry's profitability. Further, leased capital assets do not appear on a balance sheet, yet they can affect profitability. Finally, the accounting treatment of certain costs (e.g. R&D, advertising, training) may affect the measurement of profitability. Expensing, rather than capitalizing, these costs will result in different reported profits and profitability.[1] Nevertheless, these three sources represent the best available data on profitability in the economy.

Federal Trade Commission

The FTC has long published the Quarterly Financial Report (QFR) for manufacturing, trade, and mining corporations.[2] It contains aggregate statistics on the financial results and position of U.S. corporations in 14 two-digit Standard Industrial Classifications (SIC) and 5 three-digit SIC classifications. Based upon an extensive sample survey, the QFR displays statements of income and retained earnings, balance sheets, and related financial and operating ratios.

The sample is stratified by company size. All domestic companies with total assets greater than $10 million are included; those with total assets less than $10 million are included on a sample basis. Altogether, the

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[1] See, for example, the discussion in Kenneth W. Clarkson, Intangible Capital and Rates of Return, American Enterprise Institute for Public Policy Research, Washington D.C., 1977.

[2] Quarterly Financial Report, Federal Trade Commission, Washington, D.C., various years.

results presented represent approximately 91 percent of all assets of U.S. manufacturing corporations. The FTC has analyzed the precision of the sample estimates and has concluded that they are highly reliable. A particular company is considered to be a manufacturer if 50 percent or more of its gross receipts come from manufacturing operations. A company is placed within a particular SIC classification based upon those products accounting for the largest portion of its manufacturing business.

Table III-2 below displays profitability data for all of the manufacturing sample for 1962 through 1976. Two profitability measures are shown--return on total capital provided and return on cost.[3]

Profitability measures were also calculated for each SIC industry classification using the FTC data. Averages for the 1962 through 1976 time period are presented in Table III-3 below.

Beginning in the fourth quarter of 1973, a change in accounting classification was made which tends to lessen the comparability of elements of the FTC data before and after the 1974 reports. Before the change, foreign operations were often reported in consolidated income and balance sheet data with domestic operations even though the FTC's intent was to eliminate reporting on foreign operations. After the change, income and asset data for

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[3]Interest as a separate cost element was not available in the FTC series prior to 1973. For the years 1962 through 1972, an estimate of interest paid was made equal to a 10-year moving average of long-term interest rates times long-term debt plus the short-term interest rate times short-term debt. The accuracy of this procedure was tested for the years 1973-1976, where actual interest expense was available. The procedure underestimated interest by 30 percent for those years. Thus, we went back and adjusted the interest estimates for 1962 through 1972 by this 30 percent factor. The numerator of the profit ratio in each case is income before income taxes and extraordinary items plus interest. Return on cost was calculated by transforming the return on sales measure by the following procedure: let r equal the return on sales; then return on cost = $\frac{r}{1-r}$.

TABLE III-2. FTC PROFITABILITY DATA FOR AVERAGE OF ALL MANUFACTURING INDUSTRIES

	Return on Total Capital Provided	Return on Cost
1962	15.27	9.68
1963	15.95	10.03
1964	17.10	10.61
1965	18.63	11.28
1966	18.97	11.28
1967	16.86	9.92
1968	17.89	10.64
1969	16.77	10.63
1970	13.52	9.04
1971	13.92	9.34
1972	15.41	9.73
1973	18.21	10.80
1974	17.64	10.31
1975	14.89	9.21
1976	17.41	10.27
Average (1962-1976)	16.6	10.0
Standard Deviation	0.017	0.0068

TABLE III-3. FTC PROFITABILITY DATA BY INDUSTRY
(Average, 1962-1976)

	Return on Total Capital Provided	Return on Cost
Food and Kindred Products	16.8	6.0
Tobacco Manufacturers	20.8	15.5
Textile Mill Products	12.9	6.7
Paper and Allied Products	14.8	12.5
Printing and Publishing	20.5	9.9
Chemicals and Allied Products	20.5	15.6
Drugs	29.9	22.9
Rubber and Misc. Plastics	15.4	8.9
Stone, Clay and Glass	14.6	10.9
Primary Metal Industries	12.4	10.2
Iron and Steel	12.9	9.8
Nonferrous Metals	12.8	11.7
Fabricated Metal Products	18.0	8.8
Machinery, Except Electrical	19.6	12.5
Electrical and Electronic Equipment	17.6	9.3
Transportation Equipment	21.9	9.4
Motor Vehicles and Equipment	24.9	10.9
Aircraft, Guided Missiles and Parts	16.1	6.3
Instruments and Related	25.5	17.5
All Manufacturing	16.6	10.0

foreign operations are reported as separate line items along with those of other non-consolidated entitilies. A comparison of the overlap period for the fourth quarter of 1973 reveals that the accounting change affected reported elements of the data but had little effect on the rate of profit since changes in total earnings and debt plus equity tended to be offsetting.

The analysis and profit results derived in this report from FTC data use income before taxes and extraordinary items plus an estimate of interest before 1974 and operating and non-operating income before taxes plus actual interest for 1974 and thereafter. Earnings defined in this way are compared to the total of all debt plus equity. For future rate setting when data from before 1974 can be dropped without a substantial loss of historic perspective, income from non-consolidated sources should be included as well. Had income from non-consolidated entities for the period 1974 to 1976 been included, the average profit rate for the average of all manufacturing industries over the 15 year period, 1962 to 1976, would have been three-tenths of a percentage point higher than the recommended profit rate of 16.6 percent.

Applying Rate of Return on Capital. An important issue is the recognition of the capital provided by the contractor in terms of a profit center and, ultimately, of a contract. The hybrid profit formula targets a rate equal to the commercial-equivalent return on debt and equity. However, it is difficult, if not impossible, to allocate a corporation's debt and equity to a particular contract.

We have therefore used the following procedure to approximate the amount of contractor-provided capital in a profit center or on a contract. Corporate assets (i.e. the uses of capital finance such as net plant and equipment, land, receivables, and inventories) can be much more easily identified with a profit center or a particular contract than debt liabilities and

equity. Allocating these assets to a profit center and then to a contract, after subtracting payables, advances, progress payments, and accruals (asset financing provided by sources other than the contractor), yields an approximation of contractor-provided capital for that contract. The measurement and allocation of capital to a contract are discussed in more detail in Chapter V.

Two questions arise. The first question is that, if the target rate is _applied_ to contract assets, why was it not _derived_ on the same basis. It is certainly a more direct approach to derive the overall target rate for the hybrid profit formula directly from the same asset categories (facilities capital and operating capital) to which the target rate applies. Return on total capital provided would be

> Operating earnings before interest and taxes
> Net plant and equipment plus land plus receivables plus
> inventories minus payables minus advances and progress
> payments and minus accruals.

This approach could not be used to determine the target rate for this study. There are two problems with this direct approach. The major problem is that debt and, in turn, interest expense as reported in FTC data cannot be identified within particular types of assets: operating assets, non-operating assets or other assets. Interest expense appears as a single entry. If all interest expense were included in operating income before interest and taxes, the return on total capital provided would be overstated. As an approximation, interest expense could be allocated to operating assets in the same proportion as operating assets are to total assets or debt plus equity.

The second problem is that, as discissed above, prior to 1973 some reporting companies included earnings from foreign and non-consolidated operations in operating income while others did not. Earnings from non-consolidated operations cannot be identified with operating assets in the form of net

plant and equipment, etc., so a target rate derived in this manner would be overstated prior to 1973. The problem does not affect derivation of the target rate used in this study based on earnings before interest and taxes to total debt and equity since reported earnings were consistently related to a company's debt and equity position.

In the fourth quarter of 1973, the rules for reporting this and other types of earnings were clarified so that operating income reported by the FTC after 1973 excludes earning from non-consolidated operations. As sufficient additional years of data become available so that only data after 1973 are necessary, this more direct approach to deriving the overall target rate (using prorated interest expense) should be considered.

The second question is how good is the approximation involved in going from a profit base of debt and equity on which a target rate is derived to a profit base of contract assets on which the target profit rate is applied. The target return on total capital provided is derived from data that include non-operating income from such assets as cash, cash equivalents and other current and non-current assets. Non-operating income was included since it was not possible to separate out the source of such income from the total of debt and equity. The target return on total capital provided is applied howevever to contract assets that exclude cash, cash equivalents and other current and non-current assets.

The implicit assumption in applying the target rate to contract assets is that the non-operating assets earn profit at a rate comparable to that on operating assets. One extreme--no earnings from cash, cash equivalents and other current and non-current assets--would imply too low a target rate. The other extreme--earnings from cash, cash equivalents and other

current and non-current assets at a rate in excess of that from operating assets--would imply too high a target rate. Analysis of Federal Trade Commission data for 1974 through 1976 indicated that the ratio of total earnings before interest and taxes to total debt plus equity was nearly identical (both averaged about 18.4 percent) to the ratio of operating earnings before (prorated) interest and taxes to net total assets as recognized on government work. This suggests that the rate of return on assets used to generate operating earnings is comparable to the total return on debt and equity. Consequently we feel justified in applying the derived target rate to contract assets.

Robert Morris Associates

RMA is the national association of bank loan and credit officers. Each year it publishes the Annual Statement Studies which contain financial data from over 50,000 financial statements for 306 lines of business engaged in manufacturing, wholesaling, retailing, services, and contract construction.[4] Limited balance sheet and income statement data are presented for the total sample and for four asset sizes. Only firms with total assets under $50 million are included, except in contract construction which has no upper limit.

It should be noted that the RMA data are not based upon a scientific sample. They are provided to RMA by its members and thus represent only firms that have obtained credit from a bank in that year. However, RMA does exercise some degree of control over the representativeness of the numbers. For example, there must be at least 10 companies reported for any data to be presented. Medians rather than averages are displayed so that the influence

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[4]Annual Statement Studies, published by Robert Morris Associates, Philadelphia, Pennsylvania.

of any one large firm at the extreme ranges of the sample does not distort the data profile.

The limited data presented include financial and operating ratios of interest to bank credit officers. To obtain suitable profitability measures requires some arithmetic manipulation. The earnings before interest and taxes (EBIT) measure became available in the RMA data in 1976, and they are the most recent available as of the preparation of this report. Thus, the existing RMA data are of limited use for establishing profit rates here, since a time series of EBIT profitability measures is really required to account for business cycle influences. Nevertheless, as more years of EBIT become available, the RMA data will be more useful, primarily because they represent the best detailed source of profit information for business sectors not covered by the FTC, such as architectural-engineering (A-E), commercial R&D labs, management consulting firms and contract construction.

Table III-4 below displays the median firm return on cost for four different service industries for 1976. The number of firms in the sample as well as the 25 to 75 percent quartile range are also shown.

TABLE III-4.   RMA DATA, 1976

Service	Median Return On Cost	25%-75% Range	No. of Firms
A&E	5.9	3.8-14.0	346
Commercial R&D Labs	8.8	4.7-13.8	87
Management Consulting/PR	8.9	3.2-16.7	165
Data Processing	10.7	6.0-19.5	100

Internal Revenue Service

As required by Section 6108 of the Internal Revenue Code, the IRS prepares the annual Statistics of Income, based upon a sample of unaudited

corporate income tax returns.[5] The data presented include sales, deductions
or costs, net income, assets, and liabilities. Information is classified by
industry and size groupings based on total assets and business receipts or
sales.

Income reported for tax purposes varies significantly from the
book income reported in the corporate financial statements that is the basis
of the FTC and RMA data. This variation is caused by different bases or
accounting values assigned to property, which affects the size of
depreciation; accounting differences in the timing of receipt of income and
the expensing of deductions; and the recognition of certain income and de-
ductions for tax purposes only. We have compared the all-manufacturing FTC
profitability measures based on book income to the IRS profitability measures
for manufacturing in order to evaluate the magnitude of this variation.

While the IRS data are available for all manufacturing industries,
industries within manufacturing, and wholesale and retail industries, we were
primarily interested in the data for all services and construction. A time
series on profitability for these two industry groups was not available in the
other sources. Since a cost-based profit structure is applied to service
industries, a target rate based upon return on cost for all services is
desired; since a hybrid profit structure is applied to the construction in-
dustry, a target rate based upon return on capital for construction is
desired. Table III-5 below displays the 1966 through 1973 return on cost for
all services and the return on total capital provided for construction.

In order to put the IRS data in Table III-5 on a comparable
basis with the book data of the FTC, the FTC all-manufacturing return on cost

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[5]Statistics of Income, Corporation Income Tax Returns, Internal Revenue
Service, Washington, D.C., various years.

TABLE III-5. IRS DATA, 1966-1973

	Return on Cost	Return on Total Capital Provided
	All Services	Construction
1966	6.59	14.64
1967	6.58	11.06
1968	6.52	11.00
1969	5.44	10.74
1970	4.54	9.80
1971	4.72	10.36
1972	5.38	9.12
1973	5.37	9.24
Average	5.64	10.75

(presented in Table III-1) was compared to the IRS all-manufacturing return on cost over the 1966 through 1973 period. Dividing the FTC return by the IRS return yields a factor for each year, which was then applied to the data in Table III-5. Tables III-6 and III-7 below summarize this procedure.

TABLE III-6. FTC VS. IRS RETURN ON COST
(All Manufacturing, 1966-1973)

Year	FTC	IRS	Factor (FTC ÷ IRS)
1966	11.28	9.39	1.20
1967	9.92	8.43	1.18
1968	10.64	8.60	1.24
1969	10.63	7.75	1.37
1970	9.04	6.55	1.38
1971	9.34	7.05	1.32
1972	9.73	7.56	1.28
1973	10.80	8.37	1.29

TABLE III-7. **IRS DATA ADJUSTED TO BOOK VALUE BASIS**

	Return on Cost	Return on Total Capital Provided
	All Services	Construction
1966	7.91	17.57
1967	7.76	13.05
1968	8.08	13.64
1969	7.45	14.71
1970	6.27	13.52
1971	6.23	13.68
1972	6.89	11.67
1973	6.93	11.92
Average	7.2	13.72

ANALYSIS OF PROFIT RATE DATA

Federal Trade Commission

Extensive analysis was performed on the FTC data. We were interested in testing the following hypotheses:

1. Is there a trend in profitability over time? If so, then it will be necessary to use contemporaneous rather than historical profit rate data or to weigh recent years more heavily than earlier years.

2. To what extent are the profitability measures sensitive to the business cycle? If profit rates are sensitive to the business cycle, then any proposed target rate in a profit policy should be an average over several years. Such an average will reflect normal profits with the effects of the business cycle neutralized.

3. How variable are profit rates among industries? If profit rates vary significantly among different industries within the economy, then the profit policy might want to consider those differences. An industry earning a higher return than another may require a higher target rate.

4. Is facilities capital more risky than operating capital? If so, then an industry with relatively more facilities capital deserves a higher target return. Also, any evidence on this question would support the idea of treating facilities capital and operating capital differently in the design of the profit policy.

Trend and Business Cycle Analysis. The all manufacturing time series data in Table III-2 were analyzed for evidence of a time trend and sensitivity to the business cycle. Multiple regression techniques were used to identify the relationship between each profitability measure and a simple time trend as well as the Wharton Capacity Utilization Index (CAPUTIL) for manufacturing. The following results were obtained:

$$\text{Return on Cost} = .022 - 0.005 \text{ (TREND)} + 0.009 \text{ (CAPUTIL)}$$
$$(0.95) \quad (-1.68) \qquad\qquad (3.67)$$

$$\bar{R}^2 = .49 \qquad\qquad \text{S.E.} = 0.005$$

(t-statistics in parentheses)

$$\text{Return on Total Capital Provided} = -0.025 - 0.006 \text{ (TREND)}$$
$$(-0.43) \quad (-0.79)$$
$$+ 0.02 \text{ (CAPUTIL)}$$
$$(3.29)$$

$$\bar{R}^2 = .39 \qquad\qquad \text{S.E.} = 0.013$$

(t-statistics in parentheses)

The trend in both profitability measures, while negative, is of a very small magnitude and neither is significant at the 90 percent level of statistical confidence. Both return on cost and return on total capital provided show a positive, statistically significant relationship with the business cycle, rising during an expansive period and falling during a recession.

Conclusion. The sensitivity of profitability measures to the business cycle argues for the use of an average of yearly profit rates in setting a target rate for a profit policy. This procedure will neutralize the effects of economic expansion and contraction. The absence of any significant trend in the FTC data indicates that it is not necessary to give more weight in this average to the more recent years.

Industry Profit Differences. To address the issue of the variability of profit rates among industries, two types of analysis were performed. First, the data displayed in Table III-3 (average profitability across industries) were used to calculate the coefficients of variation for both return on cost and return on total capital provided. The coefficient of variation (v) is the ratio of the standard derivation to the average and can be interpreted as follows: for a normal distribution, approximately 68 percent of the sample will lie within v percent of the average. The lower the value of v, the less variation about the average, and conversely.

The following results were obtained:

	Return on Cost	Return on Total Capital Provided
Coefficient of Variation	.37	.27

Based on these 15-year industry averages, return on cost is 37 percent (i.e. .37/.27) more variable among industries than return on total capital provided.

Conclusion. A cost-based profit structure would require greater differentiation of rates (and less uniformity) between industries to provide commercial-equivalent profits. This finding supports our use of a target rate for manufacturing industries based upon return on total capital provided, since a uniform target rate on capital provided is more representative of industry profitability than a uniform rate on cost.

The second type of analysis was directed at an examination of the variability of return on total capital employed across industries. The average return does vary among the industries as indicated in Table III-3. The issues here are the identification of factors explaining these differences and a test of the statistical significance of these differences.

Using data from a pooled cross-section sample of the 19 industries listed in Table III-3 for the years 1973 through 1976, multiple regression was

used to examine the relationship between return on total capital provided and the following dependent variables:

- Wharton Capacity Utilization Index for Manufacturing (CAPUTIL). This variable will capture the macro business cycle effects on profitability.

- Industry Turnover Rate (Cost-to-Total Capital Provided Ratio). This variable acts as a proxy for capacity utilization within a particular industry.

- Industry Asset Composition (Ratio of Net Plant and Equipment to Total Capital Provided). This variable measures the capital intensity of an industry and accounts for differences in profitability among industries because of the nature (mix) of their capital.

- Dummy variables, D_i where i = 1, 2, ... 18. D_i = 1 where the sample observation pertains to the ith industry; D_i = 0, otherwise. These dummy variables capture the unique industry differences in profitability after controlling for the influences of the three variables above. A statistically significant dummy variable for an industry indcates that industry's profitability differs from the average.

The following results were obtained:

Return on Total = -7.79 + 1.31 (CAPUTIL) + 0.41 (TURNOVER) +
Capital   (-4.1)   (3.14)   (2.59)
Provided

                  +0.13 (ASSET COMP.) + 0.38 (Tobacco Mfg.)
                  (1.0)   (1.9)

                  +0.32 (Drugs) + 0.36 (Instruments) - 0.41 (Textiles)
                  (2.0)   (2.8)   (-3.5)

                  -0.34 (Primary Metals, Iron & Steel, Nonferrous Metal)
                  (-2.7)

$\bar{R}^2$ = .48   S.E. = 0.23

(t-statistics in parentheses; variables, except dummies, are in logarithms).

Return on total capital provided is sensitive to the macro business cycle and industry turnover which reflects capacity utilization (an industry-specific business cycle measure). Industries where fixed assets

represent a greater proportion of total capital earn a higher return. The statistical significance of this variable (ASSET COMP) is less than the usual 95 percent. However, the sign of the coefficient fits our hypothesis that fixed assets are more risky, and therefore industries with relatively more fixed assets are accorded a higher return as a reward for this higher risk. This greater risk associated with fixed assets is especially true on government procurements, because operating capital (receivables, inventories, work in process) is in a sense guaranteed by the government except in rare cases of termination for default. Table III-8 below displays the average industry asset composition for the 1973 through 1976 period.

Only five industries had a statistically significant difference in return on total capital employed after controlling for the other variables. There are logical explanations for some of these differences: textiles and the primary metal industries are declining industries at present and are earning lower profits; both the instruments and drug industries have unique accounting conventions that understate assets (intangible assets such as patents) and are growth industries with above-average profits.

Conclusions. A hybrid profit structure that relates profit to capital provided should differentiate between facilities capital and operating capital provided by the contractor. Facilities capital is more risky and earns a higher return than operating capital. A uniform hybrid profit structure, with a target rate based on the all-manufacturing FTC return on total capital provided, is equitable, because there are few significant interindustry differences in profitability after accounting for asset composition, capital turnover and business cycles. The factors found to account for differences in industry profitability are elements of the profit formula derived in Chapter IV. The major influences on profit have been incorporated in our formula so

that, for example, contractors with relatively large amounts of facilities capital will tend to receive higher than average profits through the workings of the formula. Thus, the profit formula moves profits in the same direction as the marketplace.

TABLE III-8. INDUSTRY ASSET COMPOSITION

	Asset Composition
Food and Kindred Products	.57
Tobacco Manufacturers	.40
Textile Mill Products	.48
Paper and Allied Products	.75
Printing and Publishing	.62
Chemicals and Allied Products	.645
Drugs	.545
Rubber and Misc. Plastics	.55
Stone, Clay and Glass	.70
Primary Metal Industries	.725
Iron and Steel	.74
Nonferrous Metals	.705
Fabricated Metal Products	.50
Machinery, Except Electrical	.50
Electrical and Electronic Equipment	.49
Transportation Equipment	.60
Motor Vehicles and Equipment	.67
Aircraft, Guided Missiles and Parts	.435
Instruments	.54
All Manufacturing	.625

Robert Morris Associates Data

In Chapter II, we identified a cost-based profit structure as applicable to service industries, where the use of facilities capital does not significantly reduce costs. But should all service industries be treated alike, i.e. have the same target return on cost?

Limited data are available to answer this question. The FTC has no profit data for the service industry, and the IRS does not provide an appropriate breakdown of profit by different service industries. RMA does provide profit data on several classes of services, e.g., architectural-engineering, management consulting, data processing, and commercial R&D labs. However, the preferred profit measure, earnings before interest and taxes, is available only for the single year, beginning in 1976. No conclusions can be based on a comparison of a single year across services.

Earnings before taxes but after interest are available from RMA for the 1970 through 1976 period for these service industry groups. Limited analysis was performed on a return on sales profitability measure where the numerator of the profit ratio was earnings before taxes. The validity of the results, however, depend upon the uniformity of the capital structure (debt and equity) of the service groups. For 1976, all debt as a percent of total liabilities plus net worth for the four service industries were relatively uniform as shown below:

Architectural-Engineering	.196
Commercial R&D Labs	.209
Management Consulting	.271
Data Processing	.280

For the years 1970 through 1976, the average return on sales for the service industry groups were:

	Return on Sales
Architectural-Engineering	5.5
Commercial R&D Labs	5.8
Management Consulting	6.7
Data Processing	9.0

A statistical test of these profit rate differences was made and indicated that there was no significant difference in return on sales among these service industries, with the exception of data processing.

Conclusion. Based on this limited analysis, we propose to treat all the service industries uniformly. That is, the same target rate will be used in a cost-based profit structure. Should a particular service industry (e.g. data processing) feel that they are being inequitably treated under this uniform cost-based structure, because of substantial capital investments, they can opt for the hybrid profit structure, which provides for a target return on total capital provided. This point is discussed more thoroughly in the next chapter.

ADJUSTMENTS FOR CONTRACT TYPE AND COMPLEXITY

A contractor is exposed to different degrees of cost risk on different types of contract. On a fixed-price contract, any costs above the negotiated estimated amount are absorbed by the contractor out of profit; on a cost-reimbursement contract, this risk is assumed by the government. Incentive contracts fall between these extremes, with the degree of cost risk dependent upon the size of the cost-sharing ratio. Both the cost-based and the hybrid profit structures should recognize this additional risk element and reward contractors for assuming it.

Contracts also vary in terms of the technical complexity of the task undertaken. An A-E contract to design a state-of-the-art facility should bear more profit than one to design a standard building. The scope of the entrepreneurial function is different, and this difference should be recognized in the profit policy.

From the profit point of view, both contract type risk and complexity are proportional to the estimated size or cost of the contract. Adjustments will be made to the basic target rate to account for these two factors. For the cost-based structure, the adjustment will alter the target return on cost; for the hybrid structure, the adjustment will be applied to the cost rather than the capital component.

The question remains as to the size and direction of these adjustments. We found some evidence on the differential profit allowed on cost-type versus fixed-price incentive contracts within DoD.[6] The data were from 834 DoD contracts awarded in fiscal years 1963-1968. This study presented evidence of the differential in going-in profit rates as well as in the profit rates actually achieved after contract performance. The results are shown below:

Contract Type	Initial Negotiated Profit Rate (% Cost)		Final Achieved Profit Rate (% Cost)	
	Mean	Std. Dev.	Mean	Std. Dev.
FPI	9.69%	1.39	9.10%	6.57
CPIF	6.94%	1.23	7.28%	2.67
CPFF	7.17%	1.09	7.03%	1.35

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[6]David L. Belden, Defense Procurement Outcomes in the Incentive Contract Environment, Ph.D. Dissertation, Stanford University, May 1969. This was the only study found which presented evidence of finally achieved profit rates on government contracts.

Fixed-price-incentive (FPI) contracts received on the average an additional 2.52 percent going-in profit as a percent of cost compared to cost-plus-fixed-fee (CPFF) contracts. After contract performance, these same FPI contracts earned an additional 2.07 percent. Notice, however, the much greater variability (standard deviation) for FPI contracts in the final achieved profit rate (6.57 vs. 1.35). FPI contract profit outcomes were almost four times as variable as CPFF profit outcomes. Presumably, the extra 2.07 percent return on cost achieved on FPI contracts represents the required or negotiated premium for assuming the extra risk (profit variability) of an FPI contract.

Conclusion. The evidence above included only CPFF, cost-plus-incentive-fee (CPIF) and FPI contracts. It did not include firm fixed price (FFP) contracts which presumably are even more risky than FPI contracts. Taking this evidence into account and allowing for the omission of FFP contracts, we recommend a 3 percent differential for contract type risk in both the cost-based and hybrid profit structures.

While the total differential of 3 percent on cost may appear to be relatively narrow, it converts into what appears to be a wider differential when expressed in terms of percent on capital using a turnover rate. For the average of all manufacturing industries with a turnover rate of 1.65, the differential of 3 percent on costs converts to a differential of 5 percent on capital; for an average firm in the aircraft industry with a turnover rate of 2.56 it converts to a differential of 7.5 percent on capital. Nevertheless, the size of the adjustment remains primarily a judgmental decision.

We also make the assumption that the commercial equivalent rates used to establish our target profit rates come from an environment that is akin to a mix of both fixed-price and cost-reimbursement work. In the

commercial environment, a contractor usually does not produce under a performance contract; instead a market price is set, and orders are filled from inventory. Production is a continuous process at levels designed to balance inventory requirements and the level of current orders. In this environment, to the extent that a producer's costs increase due to his own inefficiency, he faces a fixed-price situation, unable to raise prices to recover these higher costs because of competition from his more efficient competitors. To the extent that costs for all producers in an industry increase, a producer faces a cost-reimbursement situation, since these cost increases are most likely to be recovered by higher industry prices. Based on the above argument, we implement the 3 percent adjustment for contract type risk in the following manner: 1.5 percent subtracted from the commercial-equivalent return on cost (and the cost component in the hybrid) for CPFF contracts; .5 percent subtracted similarly for CPIF contracts; .5 percent added similarly for FPI contracts; and 1.5 percent added for FFP contracts. The procedure assumes that the commercial-equivalent rate reflects an average of all contract types.

The second adjustment for the complexity of the work varies between 0 and 1 percent. If the work is equivalent to the industry's commercial work in terms of complexity, there is no adjustment; if it is more complex, then an adjustment of up to 1 percent of costs is added to profit. We believe that this judgment of relative complexity should be made by the government's technical representative and included as part of the request for proposal (RFP).

SETTING FUTURE TARGET RATES

As annual updates of industry profitability data become available, the target rates used in the cost-based and hybrid profit structures must be examined and updated to reflect current conditions in the marketplace. In

Chapter V, OFPP's role in carrying out these and other activities relating to profit policy and operating questions is discussed.

The most recent year's FTC data on all manufacturing industries should be incorporated into the most recent 15-year average data. If a trend in return on capital appears with the most recent 15-year data, then greater weight should be attached to the most recent years. The more direct approach to calculating a target rate by using the ratio of operating earnings before (prorated) interest and taxes to operating assets should be applied and its results considered. If FTC line of business data become available over a sufficiently long period of time, industry-specific refinements to the profit policy should be considered.

The RMA data should receive greater consideration in setting target rates for the service industries as additional years of data reflecting--earnings before interest and taxes become available. RMA began publishing such data in 1976.

Special sorts or breakouts of currently available data may be requested by OFPP from the FTC, IRS and from Renegotiation Board data. For example, if the FTC can drop conglomerates from specific industry data, it may increase the precision of such data. If the IRS can provide a more meaningful categorization of service industries, the data may support different target rates for different service industries. If Renegotiation Board data can be analyzed, it may provide a better indication of the profit differential between CPFF and FFP contracts, both going into negotiations and at the completion of contracts.

SUMMARY OF RATE-SETTING RESULTS

The results of this chapter are used in Chapter IV in designing both the cost-based and hybrid profit structures:

- Use of commercial-equivalent rates for target rates

- Analyses justifying a uniform target rate for all service industries

- A commercial-equivalent return on cost for service industries

- Analyses justifying a uniform target rate for manufacturing industries

- A commercial-equivalent return on capital for manufacturing industries

- Analyses supporting the differentiation of operating and facilities capital, with a higher profit rate on facilities capital

- Rates for adjusting for risk due to contract type

- Rates for adjusting for task complexity.

GLOSSARY OF TERMS

ACCOUNTING

Asset Composition	- Ratio of net plant and equipment plus land to total capital provided (government work).
Capital Turnover	- Ratio of costs exclusive of interest to total capital provided (government work).
Costs	- Cost exclusive of interest.
Facilities Capital	- Net plant and equipment plus land.
Operating Capital (Government Work)	- Receivables plus inventories minus payables minus advances and progress payments minus accruals.
Profit	- Earnings before interest and taxes (EBIT).
Return on Total Capital Provided	- Ratio of earnings before interest and taxes to total capital provided (balance sheet).
Total Assets (Balance Sheet)	- Net plant and equipment plus land plus receivables plus inventories plus cash plus cash equivalents plus other current assets.
Total Capital Provided (Balance Sheet)	- Debt and equity.
	- Net plant and equipment plus land plus receivables plus inventories minus payables minus advances and progress payments minus accruals plus cash plus cash equivalents plus other current assets.
Total Capital Provided (Government Work)	- Net plant and equipment plus land plus receivables plus inventories minus payables minus advances and progress payments minus accruals.

STATISTICS

Multiple Regression
- The determination of a functional relationship between a dependent variable and several explanatory variables based on the relationship most likely to generate the sample values observed in the past.

t - Statistic
- A statistic that indicates whether an explanatory variable used in a regression has a significant influence on the dependent variable. To be significant, the variable must pass the test with only a small chance (5-10 percent) of incorrectly concluding significance when none is present.

Coefficient of Determination (R^2)
- The percentage of the variability of the dependent variable that is explained or accounted for by the explanatory variables in a regression. It measures how much better a regression relationship is as an explainer of the dependent variable compared to the average of the dependent variable. When $R^2 = 0$, the regression is no better than the simple average; when $R^2 = 1$ the regression explains the dependent variable perfectly.

IV. DESIGN OF RECOMMENDED PROFIT POLICY

By combining the structures recommended in Chapter II with overall target rates and individual rates for each element of each structure, we can design a recommended profit policy.

COST-BASED PROFIT FORMULA

The cost-based structure for the service sector has one major element--return on costs--and two adjustments--one for the risk of not recouping costs associated with different types of contracts, and one for task complexity. Return on costs satisfies all the functions of profit: reward for the use of capital resources, reward for risk bearing, and reward for the entrepreneurial function of organizing and managing resources. The basic target rate for return on costs is 7.2 percent, based upon the commercial-equivalent rate for all service industries in Chapter III. Where no commercial-equivalent rate exists, such as for government-owned, contractor-operated (GOCO) activities, the recommended basic rate is 3 percent.

The adjustment for cost recoupment risk is -1.5 percent on the total estimated costs of the contract for CPFF contracts; -.5 percent for CPIF contracts, +.5 percent for FPI contracts, and +1.5 percent for FFP contracts. The adjustment for task complexity is 0 to 1 percent on the total estimated costs of the contract, depending upon how much more complex than the industry average the contract work is.

The design of the cost-based profit formula is summarized in Table IV-1.

TABLE IV-1. DESIGN OF COST-BASED PROFIT FORMULA

ELEMENT	RATE
Return on Costs for	
Use of Capital Resources ⎤ Risk Bearing ⎬ Entrepreneurial Function ⎦	7.2% Return on Costs
Adjustment For Cost Recoupment Risk	+1.5% on Cost if Firm-Fixed-Price + .5% on Cost if Fixed-Price-Incentive - .5% on Cost if Cost-Plus-Incentive Fee -1.5% on Cost if Cost-Plus-Fixed Fee
Adjustment for Complexity	0 to 1% on Costs

Applying the cost-based profit formula to service industries and GOCO activities yields the range of profits shown in Table IV-2. The profit rate for service industries is 7.2 percent on costs before adjustments. A CPFF contract of average complexity would yield 5.7 percent on costs, while a FFP contract of above-average complexity would yield 9.7 percent. For GOCO activities, a CPFF contract of average complexity would yield 1.5 percent on costs, while a FFP contract of above-average complexity would yield 5.5 percent.

TABLE IV-2. RANGE OF PROFITS WITH COST-BASED FORMULA

	Service Industry	GOCO Activity
Profit Before Adjustments	7.2% on Costs	3% on Costs
Profit After Adjustments	5.7 - 9.7% on Costs	1.5 - 5.5% on Costs

HYBRID PROFIT FORMULA

Variables

Five variables are used in the design of the hybrid profit formula. The variables are shown in Table IV-3, along with the recommended value for each and a source where possible.

The basic components of the hybrid structure are estimated capital provided by a contractor in the course of a contract, and his estimated cost to perform the contract. The first question is what the relative weights of the capital and cost components should be in determining profit. We recommend that return on capital be weighed more heavily, because the hybrid policy is to be applied to manufacturing and construction industries, where the use of facilities capital can reduce the overall cost of goods acquired by the government. The 70 percent weight indicates that our preference for the characteristics of the capital component is roughly twice as great as for the cost component.

TABLE IV-3. DESIGN OF HYBRID PROFIT FORMULA

Variable	Recommended Value and Source
1. Weight on Capital Provided vs. Weight on Cost of Performance	1. Greater Weight on Capital (70%)
2. Target Rate of Return on Total Capital Provided	2. Single Rate for All Mfg. Industries (16.6%, Federal Trade Commission)
3. Minimum Borrowing Rate	3. Lowest Treasury Interest Rate (e.g., 7.5%)
4. Ratio of Facilities Capital to Total Capital Provided (Asset Composition)	4. Single Rate for All Mfg. Industries (0.625, Federal Trade Commission)
5. Ratio of Cost of Performance to Total Capital Provided (Turnover Rate)	5. Single Rate for All Mfg. Industries (1.65, Federal Trade Commission)

For manufacturing firms with very high turnover rates, such as some large government contractors, even a 30 percent weight on the cost component can yield very high returns on capital. A contractor who avoids the use of his own facilities capital by subcontracting the most capital-intensive tasks, using leased or government-furnished facilities and equipment, or using

older, essentially fully depreciated facilities and equipment may have a turnover rate of 10. At such a turnover rate, a 3 percent return on costs on the hybrid formula's cost component alone yields a 30 percent return on capital.

Conversely, increasing the weight on the capital component introduces the risk of excessive use of operating and/or facilities capital. To the extent that the profit rates on operating or facilities capital are greater than a contractor's cost of operating or facilities capital, he is encouraged to use them to excess. Considering the profit rates on operating and facilities capital that result from the 70/30 percent weighting (shown later in this chapter), we believe that we have struck a reasonable balance between the two extremes.

The 70 percent weight on capital is before adjustments. After adjustments for contract-type risk and complexity are applied, the range in weight on capital can vary between about 56 and 83 percent, using the turnover rate for the average of all manufacturing industries.

A second question in designing a hybrid formula is whether the overall target rate should be expressed in terms of return on capital or return on costs. Return on capital is recommended, since it is a more meaningful measure of profitability for the manufacturing and construction industries than return on costs. Analysis of FTC data on manufacturing industries shows that return on capital varies much less across industries than return on cost. Although return on capital does vary across industries to some extent, for many industries, it does not vary in any statistically significant way from the average for all manufacturing industries after turnover rates and asset composition are considered. The hybrid profit

formula tends to reward a contractor in a manner consistent with our statistical analysis of interindustry profitability. Contractors with a higher mix of fixed to total assets and higher capital turnover will receive higher than the overall target rate, and conversely. A single target rate is recommended: 16.6 percent return on capital--the 15-year average for all manufacturing industries based upon FTC data.

Both operating and facilities capital are recognized in the hybrid formula: both have a cost; both vary considerably across contracts; and both deserve to be recognized and rewarded, although at different rates. The return on operating capital is established at a minimum borrowing rate equivalent to the lowest Treasury rate of interest (e.g., 7.5 percent) to partially reward operating capital, but not to encourage excessive use of it.

A higher profit rate on facilities capital is therefore necessary--to yield the target rate of return on total capital--and desirable--to encourage the use of facilities capital, which leads to lower overall acquisition costs to the government. To find this rate, it is necessary to know the mix of operating and facilities capital--the fourth variable in Table IV-3, asset composition, defined as the ratio of facilities capital to total capital provided. The asset composition for durable goods industries varies between 0.435 and 0.725 (for the aircraft and primary metals industries respectively), while the average asset composition for all manufacturing industries is .625. For the average firm, facilities capital represents 5/8 of total capital, and operating capital represents 3/8. We prefer the single value once again; its advantage is that it leads to a single profit rate on facilities capital for all contractors.

Finally, to get the profit rate for the cost component of the hybrid structure, we use the last variable shown in Table IV-3: the turnover

rate, defined as the ratio of the cost of performing a contract to the total capital provided on a contract. Knowing the weight of the cost component and the overall target rate of return on capital, we can find the profit rate on the cost component. That figure can be converted from a return on capital basis to a return on cost basis with the turnover rate. The industry-specific turnover rates for durable goods industries vary between 1.17 and 2.53 (for the primary metals and aircraft industries respectively). The average for all manufacturing industries is 1.65, and that is our preferred value for the turnover rate in the hybrid formula.

In our design of a hybrid profit formula, we have consistently favored simplicity over precision by choosing uniform, as opposed to industry-specific, values for the variables. Furthermore, once the adjustments for contract type risk and complexity are made the result is a range of target rates anyway, not a precise value. FTC data on specific industries are inherently imprecise, because of imprecise classification of firms into industry categories. When diversified firms like GE, ITT, LTV, Litton, Tenneco and United Technologies are identified with a single industry, the precision of the industry-specific data is diluted. If the FTC were to collect data on a line of business basis, industry-specific data might be precise enough to use in developing industry-specific profit formulas in the future. The effect of using industry-specific target rates, asset composition and turnover rates in the design of profit formulas is, however, examined at the end of this section (under Industry-Specific Profit Formulas).

Rates

Table IV-4 summarizes the design of the hybrid profit formula. The elements of the formula are shown in the first column, the variables upon

TABLE IV-4. SUMMARY OF HYBRID PROFIT FORMULA DESIGN

Element	Variables	Rate
Return on Operating Capital	Minimum Treasury Borrowing Rate	7.5% on Operating Capital
Return on Facilities Capital	Weight on Capital, Target Rate, and Asset Composition	14.0% on Facilities Capital
Return on Costs	Weight on Cost, Target Rate, and Turnover Rate	3.0% on Costs
Adjustment for Cost Recoupment Risk		+1.5% on Cost if Firm-Fixed-Price + .5% on Cost if Fixed-Price-Incentive - .5% on Cost if Cost-Plus-Incentive Fee -1.5% on Cost if Cost-Plus-Fixed-Fee
Adjustment for Complexity		0 to 1% on Cost

Hybrid Profit Formula:

    7.5% Return on Operating Capital + 14.0% Return on Facilities Capital
+3.0% Return on Estimated Contract Cost ±1.5% on Cost for Contract-
      Type Risk
+0% to 1% on Cost for Complexity

which the profit rates are based are shown in the second column, and the rate for each element is shown in the third column.

The rate of return on operating capital is taken as 7.5 percent, based upon the minimum borrowing rate of the U.S. Treasury. Such a rate varies with market conditions but would be set at least once a year, as described in Chapters III and V.

The profit rate on facilities capital is found in the following manner, using the weight on the capital component of 70 percent, the overall target rate of return on capital of 16.6 percent, the asset composition of .625, and the minimum borrowing rate of 7.5 percent on operating capital. The capital component accounts for 70 percent of the overall target rate of 16.6 percent or 11.6 percent return on capital. If operating capital, which is 3/8 of total capital, bears a profit rate of 7.5 percent, what profit rate must facilities capital, which is 5/8 of total capital, bear to yield 11.6 percent return on capital?

$$3/8 \times TCP \times 7.5\% + 5/8 \times TCP \times Y\% = 11.6\% \times TCP$$

where TCP = Total Capital Provided
      Y = Derived Profit Rate on Facilities Capital

Solving for Y,

$$Y = 14.0\%$$

Since the profit rate on facilities capital is derived from the profit rate on operating capital, as well as from the overall target rate, the weight given the total capital component, and the asset composition, incorporating large changes in the Treasury borrowing rate into the formula would necessitate resetting the profit rate on facilities capital.

The profit rate on the cost component is found by means of the weight on the cost component of 30 percent, the overall target rate of return on capital of 16.6 percent, and the turnover rate for the average of all manufacturing industries of 1.65. The cost component accounts for 30 percent of the overall target rate of 16.6 percent or 5.0 percent return on capital. The 5.0 percent rate of return on capital is converted to 3.0 percent rate of return on cost by dividing by the turnover rate.

The adjustments are the same as those with the cost-based profit formula: an adjustment for the cost recoupment risk associated with different types of contracts and an adjustment for the additional entrepreneurial skills required for complex tasks.

The hybrid profit formula can be summarized as follows:

7.5% Return on Operating Capital + 14.0% return on Facilities Capital

+3.0% Return on Estimated Contract Cost ±1.5% on Cost for Contract-
  Type Risk

+0% to 1% on Cost for Complexity

Applying the hybrid formula to the average of all manufacturing industries, with its parameters of asset composition of .625 and turnover rate of 1.65, yields a target rate before adjustments of 16.6 percent return on capital and 10 percent return on cost (in fact, the profit rates on elements of the policy are based upon the 16.6 percent overall target rate). After adjustments, the range expressed as a return on capital could vary between 14.1 and 20.7 percent and, expressed as a return on cost, could vary between 8.5 and 12.5 percent. That is, for a cost-plus-fixed fee contract with no adjustment for complexity, the return would be 14.1 percent on capital or 8.5 percent on costs; for a firm-fixed-price contract with a +1 percent adjustment for above-average complexity, the return would be 20.7 percent on capital or 12.5 percent on costs.

The hybrid formula is also recommended for negotiated construction contracts because increased use of capital on construction contracts can result in lower overall costs to the government. Although specific construction industry data are available from the IRS and RMA, as discussed in Chapter III, we have chosen to include the construction industry under the

hybrid formula developed from FTC data on the average of all manufacturing firms. This choice stems from our greater confidence in the FTC data, the necessity of adjusting IRS construction industry data to reflect generally accepted accounting principles, and the absence of RMA data on income before interest and taxes for the construction industry. The application of the hybrid formula based upon FTC data is more favorable to the construction industry than would be the case had the available industry data been used. The overall target rate with FTC data is 16.6 percent return on capital, while the adjusted IRS data give 13.7 percent return on capital for the construction industry.

Beginning in 1973, IRS construction industry data were subdivided into three categories: general building contractors, heavy construction contractors and special trade contractors. The asset composition of .35 (ratio of facilities capital to total capital) and the turnover rate of 2.82 (ratio of costs of performance to capital employed) for the whole industry are based upon the average of the two most relevant categories--general building contractors and heavy construction contractors.

Applying the hybrid formula shown above to the construction industry with its industry-specific parameters of asset composition (0.35) and turnover (2.82) yields an overall profit rate before adjustments of 18.2 percent return on capital and 6.5 percent return on cost.

.65 TCP x 7.5% + .35 TCP x 14.0% + 3.0% x TCC = 18.2% return on capital

where TCP = Total Capital Provided
      TCC = Total Cost of Contract

$$\frac{18.2\% \text{ Return on Capital}}{\text{Turnover Rate of 2.82}} = 6.5 \text{ \% Return on Cost}$$

After adjustments, the range of returns on capital could vary between 14.1 and 25.3 percent, and the returns on cost could vary between 5.0 and 9.0 percent.

Applying the hybrid profit formula shown above to specific <u>firms</u> also leads to a range of target rates different from that for the average of all manufacturing industries. Individual firms with asset compositions and turnover rates different from the averages used in developing the formula will experience different results. Firms with more facilities capital than average (asset composition greater than .625) will get correspondingly higher returns from the facilities capital component of the profit formula. This is desirable, not only to encourage the increased use of facilities capital, but also to reflect higher returns to firms with more facilities capital, as demonstrated in the analysis of FTC data discussed in Chapter III. Firms with higher than average turnover rates (greater than 1.65) will also tend to get higher returns on capital, due to the effect of the turnover rate in converting the profit rate on the cost component of the formula (3 percent return on cost) to a return on capital basis. Firms with higher than average turnover rates may be either efficient producers or labor-intensive producers. Turnover rates of some government contractors of from 5 to 15 reflect their aversion to use of their own capital--through subcontracting of capital-intensive tasks, use of leased facilities and equipment, use of government-furnished facilities and equipment, and use of old, fully depreciated facilities and equipment.

The results of applying the recommended hybrid profit formula to a number of manufacturing industries with industry-specific parameters taken from FTC data are shown in the upper half of Table IV-5, along with historic results and results for the construction industry. The extremes in asset composition for durables are represented by the aircraft and primary metal industries (lowest and highest ratio of facilities capital to total capital

TABLE IV-5. APPLICATION OF RECOMMENDED UNIFORM HYBRID FORMULA AND
INDUSTRY-SPECIFIC HYBRID FORMULAS

	Aircraft	Primary Metals	Fabricated Metals	Electrical Equipment	Instruments	Average of All Mfg. Industries	Construction
15 Year FTC Industry Average Data							
As % Return on Cost	6.3%	10.2%	8.8%	9.3%	17.5%	10.0%	4.9%*
As % Return on Capital *Based on IRS Data	16.1%	12.4%	18.0%	17.6%	25.5%	16.6%	13.7%*
Application of Recommended Uniform Hybrid Formula							
As % Return on Cost	5.6- 9.6%	11.9-15.9%	6.8-10.8%	7.3-11.3%	9.5-13.5%	8.5-12.5%	5.0- 9.0%
As % Return on Capital	14.1-24.2%	14.0-18.6%	13.8-21.8%	13.4-20.8%	13.1-18.5%	14.1-20.7%	14.1-25.3%
Application of Hybrid with Industry-Specific Param.							
As % Return on Cost	4.8- 8.8%	9.1-13.1%	7.5-11.5%	8.1-12.1%	17.2-21.2%	8.5-12.5%	3.4- 7.4%
As % Return on Capital	12.3-22.4%	10.7-15.3%	15.0-23.1%	14.9-22.3%	23.5-28.9%	14.1-20.7%	9.6-20.9%

Industry Specific Hybrid Formula for

Aircraft Industry	7.5% x operating capital	+ 16.2% x facilities capital	+ 1.9% x costs	+ adjustments
Primary Metals Industry	7.5% x " "	+ 9.1% x " "	+ 3.2% x "	+ "
Fabricated Metals Industry	7.5% x " "	+ 17.7% x " "	+ 2.7% x "	+ "
Electrical Equipment Industry	7.5% x " "	+ 17.3% x " "	+ 2.9% x "	+ "
Instrument Industry	7.5% x " "	+ 26.7% x " "	+ 5.6% x "	+ "
Construction Industry	7.5% x " "	+ 13.5% x " "	+ 1.5% x "	+ "

respectively). The extremes in turnover rate are also represented by the aircraft and primary metal industries (highest and lowest industry turnover rates respectively). The fabricated metal, electrical equipment, and instrument industries are also shown. Applying the hybrid profit formula to the aircraft industry, with its asset composition of .435 and turnover rate of 2.53 yields a range of return on cost between 5.6 and 9.6 percent, and a range of return on capital between 14.1 and 24.2 percent. The comparable 15-year FTC averages for the aircraft industry are 6.3 percent return on cost and 16.1 percent return on capital.

Results of applying the hybrid formula to the primary metals industry are higher than those reflected in FTC data, because the hybrid formula intentionally overcompensates for facilities capital (of which the primary metals industry has the highest ratio to total capital) and because FTC rates for the industry reflect a currently declining industry. Conversely, results for the instruments industry are below those reflected in FTC data, which indicate a high-growth industry of above-average profitability (see Chapter III, "Analysis of Profit Rate Data").

Industry Specific Profit Formulas. While not recommended, using industry-specific variables in the design of a formula hybrid admittedly would be more precise. The extreme case would be represented by industry-specific overall target rates, asset compositions and turnover rates, but a uniform weight on the capital and cost components of 70 percent and 30 percent respectively and a uniform minimum borrowing rate of 7.5 percent as the profit rate applied to operating capital.

Consider the following example of an industry-specific hybrid profit formula for the aircraft industry. Its target rate is 16.1 percent return on capital; its asset composition is 0.435 (ratio of facilities capital

to total capital); and its turnover rate is 2.53 (ratio of costs of goods produced to total capital employed). The weight on the capital component is 70 percent; it is therefore responsible for 70 percent of the overall target rate of 16.1 percent return on capital, or 11.3 percent. If operating capital, which is .565 of total capital (from the asset composition), bears a profit rate of 7.5 percent, what profit rate has to be applied to facilities capital, which is .435 of total capital (the asset composition), to yield the 11.3 percent return on capital applicable to the capital component?

$$7.5\% \times \text{Operating Capital} + Y\% \times \text{Facilities Capital} = 11.3\%$$

$$7.5\% \times .565 \text{ Total Capital} + Y\% \times .435 \text{ Total Capital} = 11.3\%$$

$$Y = 16.2\%$$

The appropriate profit rate on facilities capital is 16.2 percent. The weight on the cost component is 30 percent; it therefore accounts for 30 percent of the overall target rate of 16.1 percent return on capital, or 4.8 percent return on capital, which when divided by the aircraft industry's turnover rate of 2.53 converts to 1.9 percent return on costs. The resulting industry-specific hybrid formula for the aircraft industry is then given by:

$$7.5\% \times \text{Operating Capital} + 16.2\% \times \text{Facilities Capital} + 1.9\% \times \text{Costs} + \text{Adjustments}$$

The adjustments are uniform for all policies. The range of target rates, after adjustments, for the aircraft-industry-specific hybrid formula is 12.3 to 22.4 percent return on capital and 4.8 to 8.8 percent return on cost.

The results of developing and applying industry-specific hybrid profit formulas to a number of manufacturing industries and the construction industry are shown in the lower half of Table IV-5. The results of applying the recommended uniform formula to the same industries are also shown. The aircraft, primary metals and construction industries face higher target rates with the recommended uniform hybrid formula than with the industry-specific

formulas. The fabricated metals and electrical equipment industries face about the same target rates with either formula. The instrument industry faces higher target rates with the industry-specific hybrid formula. It is unlikely, however, that work on government contracts in the past has yielded a return on cost of 17.5 percent as reflected in the 15-year FTC data for the instrument industry as a whole. For all other industries, the differences are not large (the ranges overlap with either formula).

SUMMARY

Table IV-6 summarizes the recommended profit policy: a cost-based formula for service industry and GOCO contracts--where the government is not

TABLE IV-6. PROFIT POLICY SUMMARY

Profit Element \ Activity	GOCO Contract	Service Contract	Construction Contract	Manufacturing Contract
Return on Operating Capital			7.5%	
Return on Facilities Capital			14.0%	
Return on Cost	3%	7.2%	3.0%	
Adjustment for Contract Type Risk	±1.5 on Cost			
Adjustment for Task Complexity	0 to 1% on Cost			
As % on Cost	1.5-5.5%	5.7-9.7%	5.0- 9.0%	8.5-12.5%
As % on Capital	N/A	N/A	14.1-25.3%	14.1-20.7%

interested in encouraging the increased use of facilities capital—and a hybrid formula based on both cost and capital for construction and manufacturing industry contracts—where the government does want to encourage the increased use of facilities capital to lower its overall acquisition costs.

The cost-based formula has one major element—return on cost, which captures all the purposes for which profit is paid—and two adjustments, one for contract-type risk and one for complexity. Its application leads to a range of target rates of from 1.5 to 5.5 percent return on cost for GOCO contracts and from 5.7 to 9.7 percent return on cost for service contracts.

The hybrid formula has three major elements—return on operating capital, return on facilities capital, and return on cost—and the same two adjustments as the cost-based formula. Its application leads to a range of target rates of from 8.5 to 12.5 percent return on cost and from 14.1 to 20.7 percent return on capital for the average of all manufacturing industries, and from 5.0 to 9.0 percent on cost and 14.1 to 25.3 percent return on capital for an average construction firm.

A final point worth reemphasizing is that the hybrid profit formula could be applied to the service industries with their own target rates and lead to the same cost and profit results as the cost-based structure. We believe that the added administrative complexity of the hybrid formula would not be justified by the potential benefits to the government. The hybrid is most beneficial when the additional use of substantial amounts of facilities capital can greatly reduce other costs, which is unlikely in most service industries. Service firms, however, should have the option of having the hybrid formula applied to their contracts (as discussed further in Chapter V). Those service industries with significant facilities capital, e.g., the data

processing service industry, may opt for the hybrid profit formula over the cost-based formula so that their facilities capital is explicitly recognized and rewarded. Of course, the reverse is not true: construction and manufacturing industries generally should not be exempted from application of the hybrid formula.

V. APPLICATION OF THE RECOMMENDED PROFIT POLICY

Once the structure and rates of a recommended profit policy have been determined, basic implementation and application guidelines must be set forth. Such guidelines are discussed in this chapter in the form of specific application issues: basing profit on estimated costs and capital, applying the policies on a contract-by-contract basis, applying the policies to contracts above a threshold value, applying the policies to subcontracts, measuring and allocating capital to a contract, applying the concept of sharing of cost savings, and OFPP's responsibilities for government-wide profit policy and operating questions.

ESTIMATED COSTS AND CAPITAL

When in the acquisition process should the profit determination be made? At present, profit may be calculated at several different times. Target profit is determined on the basis of estimated cost and capital (if applicable) at the time of contract formation. Incentive or award fees are awarded after contract completion, based upon an assessment of actual performance. At the conclusion of an accounting period (which also may coincide with contract completion), another profit-type determination is made either by the Renegotiation Board or by application of the Vincent-Trammell Act to certain procurements, which makes "excess" profits subject to recoupment by the government. Finally, there is an unusual profit-type adjustment, which may be made during the contract or when it is completed. This is a unilateral contract modification under Public Law 85-804, which empowers the government, under certain circumstances, to modify a contract without consideration. Current profit policies, however, are based mostly upon estimated costs and

capital at the time of contract formation, and after-the-fact profit calculation is less common.

Determining profit on estimated costs and capital before a contract is performed has the advantages of simplicity and familiarity, but changing circumstances during the contract that might affect the equity of its final outcome cannot be taken into account.

Alternatively, profit could be forecast at the time of contract formation, with the final determination being made from actual cost and capital either at the end of an accounting period or at the completion of the contract, or both. This would be similar to the present handling of overhead and G&A. One major disadvantage of determining profit at the completion of a contract is that once a contractor has taken on enough work to have his facilities capital fully recognized and rewarded, or nearly so (e.g., by using it only four hours a day or one shift a day), he has no incentive to increase his facilities utilization by taking on additional work, since he would receive no additional profit. Further, profit determined at the completion of a contract amounts to a guaranteed profit, as opposed to merely the opportunity to earn one. On balance then, we believe that basing profit on estimated costs and capital at the start of a contract is the preferable approach.

Some have argued that large defense contractors should receive exceptional treatment and be awarded profit after the contract is completed, on the basis of the actual costs and capital employed. Their rationale is that since large defense contractors possess specialized, in fact unique, capabilities, they should be treated as natural monopolies and regulated like utilities. Moreover, the government must guarantee the existence of these contractors anyway, because they are essential to the national defense, so guaranteed profits based on actual cost and capital employed are appropriate.

Others have claimed that guaranteed profits destroy the contractor's incentive for efficient production; once he has taken on enough work to have his facilities capital fully recognized and rewarded, he has no reason to increase his facilities utilization by taking on additional work, since he would receive no additional profit. Further, large defense contractors are not natural monopolies, as utilities are. A utility offers a uniform product (electricity, water or sewage treatment) to all customers; a large defense contractor offers different products to commercial and military customers. More importantly, a utility faces relatively constant demand for its product and has a monopoly in satisfying that demand; a large defense contractor's work ends when a contract is completed, and he generally has to compete against similar firms for contracts.

Unless and until the government is willing to restructure the defense industry to give it more of the characteristics of a utility--i.e., fewer firms, each with guaranteed amounts of work each year, special treatment of large defense contractors does not appear warranted. Such restructuring is unlikely, because the government would not want to give up the benefits of competition and because a surge capability for war mobilization is served by whatever overcapacity is built into today's defense industrial base.

CONTRACT-BY-CONTRACT

At present, all profit policies are applied on a contract-by-contract basis. There is some question whether this process should be continued or whether profit should be determined annually for a company or a profit center, particularly if its business is dominated by the Federal Government.

The annual profit determination could be based upon estimated costs and capital data, but it would be more logical to base it on actual costs and

capital at the completion of the contract because of the tremendous un-certainty associated with forecasting these amounts annually for an entire business unit. Contract-by-contract determination of profit is more consistent with the use of estimated costs and capital and hence is preferred.

THRESHOLDS

Both the cost-based and hybrid profit structures should be applied to contracts for which cost and pricing data are collected. The threshold levels for collecting cost and pricing data vary from agency to agency, from $10,000 to $100,000. For contracts below these thresholds, only the total price of a contract is negotiated.

SUBCONTRACTS

Prime and subcontractors are free to use the appropriate recommended profit formula in their negotiations but should not be required to do so. In those contracts where the Federal Government has the right to consent to the use of a particular subcontractor, it does consider the reasonableness of profit negotiated between prime and subcontractor. An obvious measure of reasonableness would be the result of applying the appropriate recommended profit formula.

MEASUREMENT AND ALLOCATION OF CAPITAL

The issue of measuring and allocating capital to a contract applies only to the hybrid formula. In its simplest terms, the problem is to find the amount of operating and facilities capital used on a contract, to which a rate of 7.5 or 14 percent can be applied.

Operating Capital

Operating capital is defined as government-contract-related inven-tories, plus receivables, less payables, progress payments, advances and accruals (see Chapter II for a more detailed description).

To identify the contractor-provided operating capital over the course of a government contract, it is necessary to follow the cash flow of contract-related receipts and disbursements over the period. The Air Force Contract Financing Model (FINMOD) was developed for this purpose over 10 years ago and has been applied to such problems as progress payment levels. FINMOD is a cash flow model that recognizes and accommodates such factors as the lags in receipts and disbursements of contract payables and receivables, the amount of accruals in vacation leave, the amount of bank float resulting from the lapse of time between writing checks to pay for accounts payable and recording the transactions in the contractor's bank account.

FINMOD was the basis of the Comptroller General's finding in a December 21, 1976 letter to Senator William Proxmire that progress payments on DoD contracts should not be increased. The model was also the basis for many of the progress payment recommendations in the report of the Industry Advisory Council Subcommittee to Consider Defense Industry Contract Financing, June 11, 1971.

LMI used FINMOD results (provided by the Office of the Assistant Secretary of the Air Force for Banking and Contract Financing) to develop simple approximations of the amount of contractor-provided operating capital on a government contract once three easily identified characteristics of the contract had been specified:

- the type of contract

- the length of contract

- whether or not progress payments were made.

Use of the model on a sample of 12 contracts with audited data inputs provided by contractors indicated that for cost-reimbursement-type contracts, on average, the contractor provided no operating capital. In fact, for some

contracts, operating capital provided by other sources such as the government, suppliers, employees (through accruals) and banks (through float) exceeded the contractor's average need for operating capital over the life of the contract.[1]

For the sample of 12 fixed-price contracts, the model showed that, with progress payments (typically 80 percent), the amount of contractor-provided operating capital was equal on average to 4.1 percent of the total contract cost. Applying the profit rate of 7.5 percent on operating capital to 4.1 percent of the total contract cost gives a required 0.3 percent return on cost for a year contract. Since the profit rate on operating capital is an annual rate, the 0.3 percent return on cost to reward operating capital is assumed to vary directly with the length of the contract. The corresponding return for a two-year contract would be 0.6 percent; the return for a six-month contract would be 0.15 percent.

If no progress payments are made, we can use FTC data for the average of all manufacturing industries to develop a return on cost that compensates for the use of operating capital. Based on the FTC data, a contractor has 3/8 of his assets or capital in operating capital. At an average turnover rate of 1.65 (ratio of cost to capital in a firm), a contractor's operating capital represents 22.7 percent of his costs (the corresponding figure from FINMOD is 19 percent). Applying the profit rate of 7.5 percent on operating capital to 22.7 percent of contract costs gives 1.7 percent return on cost for a year contract.

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[1]See Appendix E for a more complete discussion of FINMOD and the findings.

The results of these analyses of the model runs can be expressed in the following simple approximations of the return on operating capital for use in the hybrid profit formula:

If the contract is a cost-reimbursement type, no operating capital is recognized.

If the contract is a fixed-price type with progress payments, operating capital can be recognized and rewarded by giving the contractor 0.3 percent on the cost of the contract for a year contract. The profit rate would vary directly with the length of contract, i.e.

$$.3\% \times \frac{\text{length of contract in months}}{12 \text{ months}}$$

If there are no progress payments, contractor-provided operating capital can be recognized and rewarded by giving the contractor 1.7 percent on costs for a year contract. The profit rate varies directly with the length of contract.

While the above approximation is simple and easy to apply, a refinement could be made to increase the precision of measuring contractor-provided operating capital on a contract. FINMOD could be run for a much larger sample of contracts in an attempt to develop more precise measures--in effect to develop a simple table that would identify the dollars of contractor-provided operating capital per dollars of contract cost, based upon a few of the most significant characteristics of the contracts. From LMI's limited analysis, using the results of applying FINMOD to the 12-contract sample, the refinement looks promising.[2]

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[2]A proposal that was rejected was to have progress payments scheduled so that contractor-provided operating capital was reduced to zero, thereby eliminating the need to recognize operating capital in a profit policy. We believe, however, that it is advantageous for a contractor to have some of his own funds tied up in a contract, particularly if the operating capital is recognized and rewarded. The contractor is then motivated to manage contract funds more wisely, e.g., in trading off a volume discount for raw material against the greater immediate cash outlay required.

Facilities Capital

Facilities capital is defined as the net book value of fixed assets and land in profit center(s), plus the prorated share of the general-purpose assets of the corporation, less idle facilities. Discussion and more detailed definition of facilities capital may be found in Chapter II. That definition is the same as in both CAS 414 and DPC 76-3.

As importantly, the method of measuring and allocating facilities capital to a contract is a simplification of the procedure in CAS 414 and DPC 76-3. That is, facilities capital is measured using historical accounting data, or projected data, if substantial changes in facilities capital levels are expected over the coming year. Facilities capital is allocated to a contract by means of the same overhead allocation bases used by the contractor to allocate his depreciation charges to overhead. For example, facilities capital associated with a manufacturing overhead pool may be allocated to a contract based upon the proportion of direct manufacturing labor hours on the contract to the total direct manufacturing labor hours projected for the year. Facilities capital associated with a contractor's direct charge computer center may be allocated to a contract based upon the proportion of direct computer hours on the contract to the total number of computer hours projected for the year.

The simplifications are significant, however, since the hybrid profit formula treats the entire return on facilities capital as profit, in contrast to CAS 414 and DPC 76-3, which treat return on facilities capital as part cost (an imputed cost of facilities capital) and part profit. By treating the return on facilities capital solely as profit, the concept of imputed cost of facilities capital is avoided, and the allocation of facilities capital to a contract is simplified.

CAS-414 is an innovative breakthrough in government contracting practice, however, since it recognizes and partially rewords a contractor's facilities capital employed on government work. By recognizing and fully rewarding contract facilities capital, the profit policy recommended in this study is a logical extension to and relies heavily upon the concepts introduced by CAS 414.

The present practice for defense contractors could easily be incorporated into the hybrid profit formula by reducing the 14 percent return on facilities capital by the Treasury borrowing rate used to find the imputed cost of facilities capital under CAS 414. Assuming a Treasury borrowing rate of 8 percent under CAS 414, the hybrid profit formula would become

7.5% Return on Operating Capital + 6% Return on Facilities Capital + 3% Return on Costs + Adjustments

There are some advantages to treating the return on facilities capital partly as an allowable cost and partly as profit. First, it provides more immediate motivation for investment, because part of the contractor's investment will be recognized as a cost, even though it is made after a contract is signed. In contrast, if return on facilities capital is treated solely as profit, an investment made after a contract is signed is included in the profit determination only to the extent that it had been projected. Second, contractors prefer to have return on facilities capital treated as a cost, because a cost is more certain to be covered than is a profit. Third, when part of the return on capital is treated as a cost, profits will appear to be smaller than when return on capital is captured solely through profit.

On the other hand, return on capital is split into two arbitrary pieces: one piece is an imputed cost--not an accounting cost--and the rest is in profit. The imputed cost of facilities capital is found by applying a U.S. Treasury borrowing rate to all facilities capital whether raised through debt

or equity financing. This imputed cost is a proxy for interest expense, which the government treats as a nonallowable cost. Treating return on capital solely as profit is simpler and easier to implement and apply, since it avoids this complicated concept of an imputed cost of capital.

Table V-1 shows how facilities capital may be allocated to a contract with fewer steps and fewer arithmetic operations than the combined CAS 414 and DPC 76-3. The steps are outlined below:

a) Identify facilities capital by overhead pool as is done in CAS 414 and shown in column (2), (3) and (4) of Table V-1 and likewise shown in columns 2, 3 and 4 or current Form CASB-CMF, Facilities Capital Cost of Money Factors Calculation.

b) Identify the annual allocation base for each overhead pool, e.g., 2,000,000 direct manufacturing labor hours. The annual allocation base is shown in column (5) of Table V-1 and is likewise shown in column 6 of current Form CASB-CMF.

c) Divide the overhead pool facilities capital by the annual allocation base to yield facilities capital per unit of allocation base shown in column (6) of Table V-1 and not shown on any CAS 414 or DPC 76-3 forms.

d) Identify each overhead pool allocation base for a contract, e.g., 500,000 direct manufacturing labor hours. The contract allocation base is shown in column (7) of Table V-1 and likewise in column 3 of current DD Form 1861, Contract Facilities Capital and Cost of Money.

e) Multiply the facilities capital per unit of allocation base by the allocation base for a contract to yield facilities capital allocated to a contract for each overhead pool. Sum over all overhead pools. These results are shown in column (8) of Table V-1 and likewise in row 8 of current DD Form 1861.

The resultant figure for facilities capital allocated to a contract would then be multiplied by the 14 percent profit rate on facilities capital in the hybrid profit formula to give the return on facilities capital.

In the construction industry, hourly equipment rates such as those of the Associated General Contractors, are commonly used to estimate contract costs. The rates include operating and maintenance costs, and depreciation charges based upon an equipment utilization lifetime. Equipment used on-site

TABLE V-1.   CONTRACT FACILITIES CAPITAL

Column (1) Overhead Pools	(2) Accumulation & Direct Distrib'n of Net Book Value	(3) Allocation of Undistributed	(4) Total Net Book Value (2) + (3)	(5) Allocation Base for Period	(6) Facilities Capital per Unit Allocation Base (4) ÷ (5)	(7) Allocation Base for Contract	(8) Facilities Capital (6) x(7)
Engineering							
Manufacturing							
Computer							
G&A							
TOTAL							
Shown in Present Form*	Column 2 Form CASB-CMF	Column 3 Form CASB-CMF	Column 4 Form CASB-CMF	Column 6 Form CASB-CMF	Not Shown	Column 3 DD Form 1861	Row 8 DD Form 1861

*Form CASB-CMF   Facilities Capital Cost of Money Factors Computation
DD Form 1861   Contract Facilities Capital and Cost of Money

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is charged directly to the contract, using these rates. Thus, facilities capital equipment employed is uniquely identified to contracts by this practice.

Two equivalent methods of applying profit to the capital equipment employed are possible. A 14 percent profit on net book value could be built into the hourly equipment rate as a "capital recovery factor." The Corps of Engineers is developing equipment rates incorporating the return on capital concepts. A second and equivalent method would use the net book value of the equipment charged directly to a contract and apply a 14 percent profit rate on the equipment's proportionate share of annual use.

RECOGNITION OF COST SAVINGS

When a contractor receives some or all of the cost savings resulting from cost reductions through sharing clauses or a fixed- price contract, the contractor is motivated toward cost savings and cost saving investments.

The following procedure is recommended for recognizing and applying the concept of sharing of cost savings to cost reimbursement type contracts. If, after contract formation, the contractor proposes a process change or an investment that would result in cost savings, the government can accept the proposal, particularly in cases where costs are reasonably well known. If the cost saving results from an investment, that investment would be included in the facilities capital allocated to the contract and earn profit at the 14% rate. If the cost savings results from a process change, the cost of making the process change would be recovered as an allowable cost. In addition the contractor and the government would negotiate the sharing of cost savings such that the government's total contract cost, including profit and cost savings shared by the contractor, is less than the original contract cost.

For example if the original cost of contract performance is $100 and the original profit is $8, the total original cost to the government is $108. If the contractor proposes an investment that will cost $20 and result in a cost savings of $10, the government would pay profit on the additional facilities capital of $2.80 ($20 facilities capital x 14% rate) plus up to 72 percent of the $10 cost savings without paying more than the $108 original contract cost.

Two general conclusions can be supported by the analysis of sharing of cost savings: (1) the contractor sharing rate should be greater for contracts under a cost-based profit structure than under a hybrid structure (where investment is explicitly recognized and rewarded); (2) the contractor sharing rate should be greater than it typically is today.

OFPP RESPONSIBILITIES

OFPP is responsible for developing government-wide profit policy. It should also assume responsibility for profit policy and operating questions. OFPP should periodically evaluate the results of government profit policy and compare them to the intended results:

- to yield commerical-equivalent rates

- to encourage participation of efficient capital-intensive manu-facturing and construction firms

- to encourage the increased use of facilities capital.

The evaluations could be carried out through sampling, interviews, and analysis and could lead to such changes in profit policy as:

- more precise methods of measuring operating capital

- different weights on the capital and cost components of the hybrid

- different adjustment levels for complexity and contract-type risk.

The evaluations could also identify problems beyond the scope of profit policy, such as:

- selection of contract type

- uniform progress payment schedules across government agencies or other contract financing questions

- appropriate levels of government-furnished equipment

- lack of investment caused more by uncertainty of recovering all returns on capital than by inadequate annual profits; e.g., if an investment's payback period were longer than the life of contracts in hand.

OFPP should also rule on:

- day-to-day operating questions for which policy regulations are ambiguous or nonexistent

- requests for exemptions from the cost-based policy by service firms with above-average amounts of facilities capital, who accept the additional complexity of using the hybrid profit formula because it explicitly recognizes and rewards facilities capital.

Furthermore, OFPP should collect and analyze industry profitability data from the Federal Trade Commission, Internal Revenue Service, Securities and Exchange Commission, Robert Morris Associates and other sources to facilitate the updating and resetting of target rates. Finally, OFPP should perform analyses that could lead to changes in the profit policy such as:

- more precise, yet simple methods of measuring contractor-provided operating capital on a contract

- consideration of industry-specific profit formulas if significant differences appear in commercial profitability measures from reliable data sources, and if industry-specific formulas appear feasible to implement.

APPENDIX A

BUSINESS OBJECTIVES AND STRATEGIES

WHY WE ARE CONCERNED WITH BUSINESS STRATEGY

Evaluation of potential profit policies for negotiated procurements requires an understanding of contractors' business objectives and the strategies used to achieve them. How business will react to alternative profit policies and whether such actions will be consistent with government objectives will depend on what contractors are trying to accomplish by doing business generally and by undertaking government work in particular. A contractor's decision to participate in government work and the way it conducts its government business will be contingent upon how government acquisition policies affect the achievement of its business objectives.

It is impossible to formulate a model of business objectives that captures all possible situations, factors, and motives confronting contractors. Further, only rational behavior can be modeled, and contractors may not always act rationally. This is especially true when decisions involve major corporate commitments, or when extreme business conditions threaten the very existence of the firm.

In this appendix we present some theoretical arguments in support of our basic contention that the most meaningful standard of profit, and hence the basis for business decisions affecting government acquisition, is earnings in relation to capital used. We also cite several recent surveys of large business firms, which provide empirical evidence that consideration of return

on capital relative to its cost has become the standard for investment decisions and evaluation of management performance.

GOALS OF THE FIRM

In general, it seems reasonable to assume that a corporation does business mainly to benefit its owners (stockholders). Stockholder well-being, or wealth, is represented by the value the market places on the business. Thus, corporate actions are presumed to be based on making the market price per share of the firm's common stock as large as possible over the long run.

The value the market places on a share of common stock at any one time reflects the value of current and future flow of pro rata income to stockholders, as perceived by the investor. The share's market value therefore embodies investors' preferences in terms of current versus future income, their expectations of prospective earnings and dividend policy, and their attitudes towards the riskiness of those prospects. The firm pursues its objective through a number of decisions: acceptance or rejection of new projects involving the commitment of resources; and the financing of new projects through flotation of new capital, issuance of additional debt or through retained earnings. Included in the scope of possible decisions is the retirement of outstanding equity and debt from current earnings.

Maximization of stockholders' wealth as represented by market price per share of the firm's stock is not identical to, but more inclusive than, several other well known objectives. In particular, maximization of market price per share does not necessarily correspond to: 1) maximization of the absolute level of profits, 2) maximization of per share earnings, and 3) maximization of the rate of return on investment. A firm can maximize the absolute level of profits by issuing additional stock and investing the proceeds in income-earning securities (e.g., Treasury bills). However, this

policy is not necessarily rational, nor will it necessarily increase stock-holders' wealth on a per-share basis. In fact, per-share profits are likely to fall. The policy is rational only when the rate of return on the invested proceeds exceeds the cost of equity capital paid to attract the investment funds.

Similarly, a policy of retaining all earnings and investing the retained proceeds in interest-earning securities will help maximize per-share earnings. But this will not necessarily maximize market price per share. Had the retained earnings been paid out as dividends, the stockholders would have received additional dividends, plus appreciation of equity stock price. The added returns from dividends and price appreciation will exceed the earnings from the investments of retained earnings if the implicit cost of equity capital exceeds the return earned on the retained earnings.

Finally, maximizing the rate of return on invested capital (ROI) may lead to decreases in income. A contractor whose current ROI is 20 percent can increase its overall ROI by eliminating investments with ROIs between say 15 and 20 percent. However, if the cost of investment funds (capital) is below 15 percent, overall profits will fall, since the eliminated investments earn more than the cost of capital.

The corporation maximizes the stockholders' wealth by adopting a dividend, investment, and finance policy that maximizes the present value (i.e., current stock price) of the ownership claims. The issue facing the corporation is then what discount rate is applicable for investment decisions (i.e., dividend payout versus reinvestment of earnings, issuance of additional stocks or debt issues, repurchase of equity on the open market) in order to achieve the maximum current value for the corporation. The discount rate used to evaluate the suitability of investment opportunities is called the cost of

capital. The cost-of-capital is the cutoff rate for allocation of capital to investment projects that will leave the market value of the firm unchanged on a per-share basis. It is the minimum required rate of return needed to justify the use of capital.

In the course of doing business, the firm has a number of alternatives relative to investments undertaken and methods of financing them. It can reallocate its existing investment among its various lines of business, while maintaining its overall level of capitalization; it can contract its overall investment base; or it can expand capacity into existing or new lines of business. Maintenance of the overall level of capitalization implies payment of dividends from earnings after meeting replacement needs.[1] Contraction of the investment base implies payment of dividends out of earnings without meeting replacement needs. Expansion of capacity through net positive investment implies additional financing beyond replacement needs from either retained earnings, additional borrowing, and/or floating of new common stock. For any of these alternatives, it is the perception of the anticipated return from an action weighed against its cost (implicit or explicit) that determines its suitability. Suitability refers to the beneficial impact of the action on the market price of the firm's stock.

In the ensuing discussion, we deal first with the firm having a static amount of capital to allocate to its various lines of business and discuss the rule for maximizing stockholder wealth under this circumstance. Next, we develop rules for the growing firm, which adds to its capacity by retaining earnings or floating additional stocks or bonds. Finally, we provide empirical evidence (from surveys) of the techniques in actual use by business.

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[1]An alternative is to repurchase existing stock on the open market. Such a policy is rational when the firm judges that the return to the firm from purchase of its own stock exceeds the return from additional investments the firm could undertake.

BUSINESS STRATEGY WITH FIXED CAPITALIZATION: ACHIEVING STATIC MAXIMIZATION

For any accounting period, the firm has a cash flow equal to net accounting income plus depreciation. The cash flow, provided it is positive, can be used to replace capital consumed in the course of production; for net investment, if in excess of replacement requirements; or for dividends. If all the cash flow is paid out as dividends, the firm is decapitalizing (disinvesting), since the capital consumed by production is not being replaced. Such a policy is rational in terms of maximizing the price of stock, if the current return on the existing or future investment is less than the cost-of-capital. It may, however, not be adopted in the short run if management is divorced from ownership and if management views its survival as of first priority.

Within individual product lines or divisions, these same decisions must be made. Instead of being corporate-wide, the perspective is growth and decline of activity and capacity for a product line. One would expect more adherence to maximizing principles since product line survival, not corporate survival is at stake.

When product lines or divisions earn different rates of return on invested capital (or allocated stockholders' equity), a reallocation of investment funds from low-return to high-return activities will increase the overall corporate rate of return, and hence earnings and dividends per share. This can be accomplished without new outside financing by allocating cash flow from each division from low- to high-profitability activities. Otherwise, each dollar of investment taken from a low-profit activity and allocated to an activity with highest returns per dollar of investment increases overall corporate profits. Corporate-wide profitability is highest, given the level of total capitalization, when this process continues until rates of return are

equalized. If the common rate of return is the same as the cost of capital, then a global maximum is achieved.

The implication for firms with government divisions is that unless the rate of return there is at least as high as is earned in the firm's other divisions, maintenance of the existing investment base in government work is unwise. Freeing capital resources from low-profit lines of work by real-locating cash flow without replacing consumed assets produces a net increase in earnings and hence in the market price of the stock.

THE GROWING FIRM

For a firm in a steady state, financed exclusively by equity, which pays all income out as dividends, the cost-of-capital is given by the market as the ratio of earnings (dividends) to the price of stock. Unless a new investment earns at least this rate, the market value of the corporation on a per-share basis will decline. As a corollary proposition, a new investment financed by a new issue of stock will increase the per-share value of stockholders' equity if it earns a return in excess of the current earnings price ratio. Similar logic can be used to show that the cost-of-capital for retained earnings is the earnings price ratio.

The effects of debt financing in the capital structure become more complicated because the characteristics of the earnings stream available to stockholders are changed. In particular, the use of debt increases the varia-bility of stockholders' earnings, and increases their "risk of ruin." The average cost of capital for a firm with debt in its capital structure is a weighted average cost of debt and equity financing, where the weights are the proportion of debt and equity in the capital structure and the costs are the interest rate (cost of the debt) and earnings price ratio (cost of equity).

As long as the relative importance of debt and equity (proportions) remains constant, the average and marginal cost of capital coincide, as long as scale changes do not affect the riskiness of the earnings stream. Again the investment decision rule to increase stockholders' wealth is to undertake new investments, provided they are expected to yield rates of return in excess of the average (equal marginal) cost of capital. When the proportions of debt to equity change, the cost of debt and equity capital change and, consequently, so does the overall average cost of capital. Again, new investment projects must yield a return in excess of the new cost of capital.

An additional complication occurs because of corporate tax treatment, whereby interest payments on account of debt in the capital structure are deductible from operating income before the calculation of income taxes. This tax treatment tends to reduce the after-tax cost of debt relative to equity financing, as long as operating income is large enough to cover interest payments on debt. The average before-tax cost of capital, assuming that the mix of debt to equity in the capital structure remains unchanged, becomes the weighted cost of capital, where the cost of equity capital is increased by a factor $1/1-t$ where t is the tax rate. Thus, the pretax cost of equity capital is higher with a corporate income tax because $1/1-t$ dollars must be earned to yield one dollar of earnings after tax.

To summarize these ideas, it follows from the assumed objective of maximizing the market value of the firm (stock price per share) that new investment must meet a threshold rate of return criterion. This is true regardless of the method of financing the new investment--retained earnings, new issues of equity, or stock, or some combination of the three. Thus, financing through retained earnings is not without implicit costs, because stockholders are deprived of current income in favor of higher future income.

As long as the future income is higher by at least the opportunity cost of capital (earnings price ratio), stockholders will be at least as well off because of the investment.

To be judged from the appropriate viewpoint, then, investment must be stated in terms of return on investment. The impact of how the investment is financed is on the threshold rate of return required to justify the investment. The more that debt is relied on, the greater the riskiness of the stockholders' earnings stream and the greater is the required (threshold) rate of return.

SURROGATE BEHAVIOR

It is sometimes observed that the professed behavior of corporate management is different from that outlined above. This may happen for several reasons. However, alternative behavior may be quite consistent with maximizing the market value of equity stock.

For example, maximization of sales may be a manifestation of several alternative situations. If the existing capital base is underutilized, then any additional sales that at least cover out-of-pocket (i.e., marginal short run or avoidable cost) will increase the rate of return on the existing investment base. Secondly, sales maximization that requires new investment may be consistent with meeting a threshold rate of return as long as corporate management is sure that additional sales are by definition "profitable." This may be especially relevant in the government environment where profits are largely based on costs.

For example, when a dollar of sales requires say 30¢ in additional investment and a profit of 10 percent is awarded per dollar of sales, then the rate of return on investment is 33 1/3 percent. Provided the threshold

required rate of return (i.e., the cost of capital) is less than 33 1/3 percent, additional government business is "profitable" and increases the market value of stockholder equity per share. Consequently, following the rule of maximization of sales under these circumstances is rational. Nevertheless, it is a proxy for, and manifestation of, a more fundamental criterion.

EMPIRICAL EVIDENCE

We have selected two recent surveys of U.S. business which verify the prevalent use of ROI as a measure of performance and key decision variable for investment analysis and corporate decisions. The first survey by Reece and Cool appeared in the Harvard Business Review and concerns measures of division level performance.[2] This survey questioned the Fortune 1000 industrial companies of which 620 (62 percent) responded.

The questionnaire first asked whether the company employed divisionalized structures, and if so whether profit centers or investment centers were used to gauge performance. A profit center is a unit for which a separate income statement measuring the excess of revenues over operating expenses is kept. An investment center is similar to a profit center, except that assets employed are measured and profitability is measured relative to the center's asset base. The 620 responses indicated that 74 percent of the firms employed investment centers for measuring performance, approximately 22 percent used profit centers, and only about 4 percent used neither control structure.

For those firms using the investment center concept, two alternative measures of performance are used. The first and most prevalent (65 percent of the firms using investment centers) is the standard ROI, where profit

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[2]I. S. Reece, and W. R. Cool, Special Report, Measuring Investment Center Performance, Harvard Business Review, May-June 1978, pp. 28-176.

(revenues less expenses) is expressed relative to the investment base. The second approach is called the residual income approach (RI), which measures performance as profit before interest minus an imputed charge on the investment center's asset base. The authors prefer the RI measure for the same reason we prefer the objective of maximizing wealth: (1) decisions that increase ROI may decrease economic wealth; and (2) a profitable investment opportunity whose ROI is above the cost of capital but below the investment center's current ROI may not be undertaken.

This survey also is revealing as to the accounting concepts used to measure profit and the investment base. Forty percent of the surveyed firms calculate profits of a profit or investment center in a manner consistent with the way net income is calculated for stockholder reports. For the remaining 60 percent of survey firms, many eliminate from expenses of a profit/investment center those that are of a corporate-wide nature, taxes, general and administrative costs, etc.

For companies using investment centers, the possible basic definitions of the investment base are total assets, invested capital (total asset less current liabilities equivalent to long-term liabilities plus equity), and owner's equity. The survey found that nearly all companies included in the investment base receivables, inventories, and fixed assets used solely by the investment center. This indicates that items included are those that can be managed by the centers, and consequently the ROI and RI measures are used primarily to evaluate managerial (not economic) performance.

The second survey by Gitman and Forrester concentrated on determining the capital budgeting techniques used by major firms.[3] A list of 268 companies

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[3]L. J. Gitman, and J. R. Forrester, Jr., "A Survey of Capital Budgeting Techniques Used by Major U.S. Firms," Financial Management, 6, (Fall 1977): 67-71.

was compiled, based on highest stock price growth and capital expenditures. Responses were received from 103 of the firms surveyed (38.4 percent response). With respect to projects undergoing formal analysis (generally above $100,000 in size but as low as $10,000 in size for 32 percent of the firms), 88.4 percent of the companies indicated that they used the relatively sophisticated techniques of net present value, benefit/cost ratios, or internal rate of return. These techniques require cash flow estimation of revenues and costs associated with a project as well as selection of a cutoff or required rate of return. Internal rate of return techniques were the predominant choice among the sophisticated methods used, with nearly 54 percent of the respondents indicating it as the primary method employed.

The values of the cutoff rate or cost of capital used for project evaluation were also reported. Sixty percent of the companies indicated a required rate of return or hurdle rate in the 10 to 15 percent range. An additional 23 percent had cutoff rates in the 15 to 20 percent range. Approximately 70 percent of the firms responding to the Gitman and Forrester survey required returns of at least 15 percent before considering a project.

APPENDIX B

ROLE OF PROFIT IN MARKET ECONOMIES

A market economy is one where prices are set based on the unfettered interaction of supply and demand. Prices so determined function as allocators of resources among competing uses. Thus, wages (the price of labor) rise in expanding industries to attract workers from other industries. Prices of popular products rise and attract resources to expand production of these products; the reverse is true for activities where demand is slack.

At any one time, there are myriad "prices" set by the marketplace. Every resource input to a productive activity and every output of productive activities have a price. One such "price" is for financial capital that eventually is embodied in plant, equipment, work in process, and inventories. On the demand side of the market, producers require financial capital to maintain or expand productive capacity, including inventories. On the source or supply side, investors choose to forego consumption of current income in order to save. Savings are, by definition, income that is not consumed.

The act of saving releases resources for investment. The level of savings affects future economic capacity and productivity. Note that although the acts of saving and investment have identical value in an aggregate accounting sense, they are usually performed by different agents within the economy.

The "price" that guides the actions of saving and investing is the rate of return earned (and paid) in the economy. In practice, there is virtually an infinite spectrum of returns, reflecting the various financial instruments and investments available and their respective maturities, inherent risk, and

other characteristics. Activities that earn exceptionally high returns because their product is in favor are able to attract capital; the reverse is true for activities with declining returns. When the general level of return in the economy is high, individuals are induced to forego current consumption to avail themselves of attractive returns.

Certain complications are inherent in these simple notions. For example, taxes of all sorts drive a wedge between returns paid and what is actually realized by the suppliers of financial resources. Government financial investments are an outlet for savings by individuals, but these savings do not necessarily produce a concomitant level of real social investment. Government borrowing often finances various forms of consumption such as social expenditures and maintenance of an armed force which do not necessarily increase future national income. Corporations raise investment capital through the retention of current earnings. This behavior is really an act of saving (corporate savings) undertaken by the corporation on behalf of its owners. However, this action skirts the market, since it does not necessarily follow that owners would have saved the earnings retained. Alternatively, had stockholders saved the retained earnings, they might have chosen to invest them elsewhere. Finally, there is not necessarily a clear distinction between acts of consumption and of savings. An automobile used for commuting may be more investment than consumption. Education, which increases lifetime earning potential, may be a mix of consumption and investment in human capital.

The preceding discussion indicates that the rate of return on investment in a market economy can be viewed on two levels - macro and micro. On the macro level, the national rate of return on private investment, which corresponds roughly to the economy-wide ratio of earnings before taxes and interest to debt plus equity, represents the "benefits" of additional investment in

terms of increased real national income in the future. The cost of achieving this benefit is the savings necessary to finance additional investment. The price or reward paid savers for their savings is represented by the cost of capital - the rate of interest paid on debt and the cost of equity capital. It is the property of a market that price changes so as to equate supply (savings) with demand (investment). In the capital market, for example, the cost of capital represented by interest rates and cost of equity capital should change until it is at a level that forces firms to tailor their aggregate investment demands to the available supply. Thus, the market solution implies that the cost of capital should correspond to the rate of return earned on investment.

At the micro level, profit serves to allocate available savings (supply) among competitive investment opportunities. The available savings are distributed in the following manner. Unless a particular investment earns a return as high as what can be earned elsewhere, the capital market will discontinue channeling resources to the activity. Thus, "profit" broadly defined as the total return on all capital, regardless of the source of financing (i.e., earnings before interest and taxes), serves as a signal to indicate where resources are most highly valued. A perfect market would channel resources to their best use, through the signal of profit. The benefit of the market functioning in this way is that capital resources flow to those activities where they are most highly valued. Consequently, the available supply of capital is channeled into its best use in the sense that national income is at its highest possible value consistent with income distribution and tastes.

APPENDIX C

RELATED POLICIES AND METHODS

LMI reviewed other situations where price is determined not by the unfettered market mechanism but by reference to estimated costs and profit. Principle examples are the bilateral relationships between large buyers and suppliers in the commercial sectors of the economy, foreign government procurement, and the regulated sectors of the economy such as utilities and transport. The purpose of this review was to gain an understanding of how profit is determined in other negotiated environments with the aim of determining the spectrum of profit bases and profit rate philosophies that are employed.

MAJOR COMMERCIAL BUYER

The company annually deals with thousands of suppliers to procure the goods that it requires. It deals with these suppliers in three types of transactions. The first type is called open market transactions whereby the company's buyers merely find sources of supply and negotiate the best price possible for the volume delivered. The second type of procurement arrangement is called known-cost relationships. In these types of transactions the company has a reasonably good idea of the cost and pricing in an industry or an industry segment and it negotiates price with a supplier without a long-term contractual commitment. The third type of transaction is called a basic buying agreement and is most analogous to government contracting. The company has these types of arrangement with about 1% of its suppliers. The basic buying agreements, however, cover a large portion of the high price items

which the company carries and accounts for a substantial percentage of its dollar volume.

An important characteristic of the basic buying arrangement is that the company has the right to audit the books of the supplier. The supplier and the company enter into a comparatively long-term commitment (normally 3 years) during which time the company agrees to provide a given percentage of its requirements to the supplier. On an annual, semi-annual or quarterly basis during the period of these 3-year agreements, the company and the supplier jointly determine and forecast volume requirements.

At the time of these volume requirement determinations, a cost to the company is also negotiated. This cost is made up of supplier costs which the company audits and determines to be reasonable, plus what is known as a formula profit. In the area of costs, the company takes the position that it will not recognize or pay as a cost those supplier costs associated with such things as advertising, interest on long-term debt, management bonuses, premium transportation charges for materials and supplies, return transportation charges on seconds, and most costs associated with the supplier's own marketing and distribution programs.

After subtracting these types of costs from the forecasted costs for the given level of volume then being negotiated, the company then negotiates and enters into the contract what is known as a formula profit. The formula profit is stated as a percentage on cost although the amount of profit considers assets employed. The rate of formula profit is, of course, a subject of negotiation between the company and its suppliers. The company's position going into negotiations concerning the level of formula profit is a function of advice given to the buyer by such staff as the factory comptroller, audit staff and the engineering staff. The factory comptroller and

audit staff tend to view formula profit as expressing, in terms of percentage on cost, an amount intended to provide a specified return on total assets to the supplier.

In determining what is a reasonable return on total assets for the supplier, the factory comptroller and audit staff use various documents which contain industry-type performance measures, such as the Robert Morris Associates periodic publications (data based upon financial statements collected by the national association of bank loan and credit officers), 10K filings to the Securities and Exchange Commission of major manufacturers engaged in similar activity, and industry analyses published by brokerage firms and industry trade associations. The company evaluates the performance of firms producing similar goods and determines what the range of return on assets is for these various firms or industry groups. They tend, for the most part, to rely heavily on the Robert Morris Associates data. In giving a recommendation to the buyer, the comptroller and audit staff tend to target their formula profit recommendation so as to provide a return on assets for that supplier that is above the mean or the median shown in the corresponding Robert Morris data for that industry grouping, but below the upper quartile. The governing philosophy is that the company feels that it is to their advantage to have their suppliers making at least a competitive profit so that they will be willing to undertake those investments that will be needed in order to make or keep them efficient.

The audit staff and comptroller look at the assets which the supplier will use in performing the work for the company and determine at a given level of production what percentage on cost will be required in order to provide a

return on assets for the supplier's activity which is slightly above the median of the Robert Morris figures.

The basic buying agreements have two other characteristics or provisions which relate to the profitability of the supplier. The first is a market clause, which in effect provides the company with the opportunity to insure that the supplier is remaining competitive in its price. This clause gives the company the unilateral right to terminate the contractual relationship if it has been able to find or has been offered a similar product of similar quality in similar quantities and at similar delivery rates at a lower price than is presently required in the contract between the company and the supplier. Effectively, the company gives the supplier an opportunity to meet what is known as a market price, which is essentially the best price available in the market from a reliable supplier; and, if the present supplier cannot meet it, the company has the unilateral right to withdraw from the contractual relationship.

The second unique provision in the basic buying agreement is what is in effect a built-in cost sharing arrangement which provides that if the supplier earns more at the end of a period then the formula profit level that was negotiated in the contract for that period, the supplier and the company share equally in the difference. Although this renegotiation-type clause is not limited to those occasions when a supplier may make more than the formula profit by reasons of his own actions in reducing costs or increasing efficiency, the company's acquisition personnel believe that the major reason for profit in excess of the formula profit tends to be greater volume during that period than the level upon which the formula profit was forecasted. They therefore feel that their own actions have just as much to do with the suppliers' profit outcome as do the actions of the suppliers, and, therefore,

feel that it is not unconscionable or unreasonable for the company to share in that excess profit. Cost sharing does not, however, apply in the opposite direction when the supplier's profits fall below the formula level.

The company's acquisition personnel emphasized that they do not consider entering into a basic buying arrangement with a supplier unless they feel it will be a long-term relationship, and also unless they feel that the company constitutes a significant portion of that supplier's business, for example, a minimum of 20% of a supplier's capability. On the other hand, they do not want to dominate the supplier by accounting for much in excess of 50% of a supplier's capability. They feel that as the company's domination of the supplier increases, the efficiency of the supplier tends to decrease because market imposed discipline can erode. They prefer to account for between 20% and 50% of a supplier's capability.

In summary then the company's relationships with suppliers with whom it has basic buying agreements tend to be similar in many ways to the dealings of the government with some of its major suppliers. The company maintains the right to audit a supplier's books. Certain costs are unallowable. The company and supplier do negotiate profit which, although expressed in terms of return on cost is based on return on assets. Profits are generally negotiated at rates above the industry median since the company wants to deal with the more efficient producers. The company retains the unilateral right to terminate the agreement if it finds another arrangement on better terms. It has other contractual clauses which provide, in effect, a self-administering renegotiation process.

Many of the suppliers which the company has under basic buying arrangements are also major competitors in the very markets for which they are supplying the company. Therefore, the inequality of bargaining power, which may

be present in a basic buying relationship, may tend to be diminished somewhat because of the size and market sophistication of the supplier with whom the company is dealing. This may be somewhat analogous to some of the government's procurement relationships with larger suppliers, especially in the defense and aerospace markets, where the government is a large buyer but the suppliers are few in number and tend, also, themselves to be large.

FOREIGN GOVERNMENTS

United Kingdom Profit Policy

Background. In February 1968, a new policy was instituted for pricing of "non-competitive" government contracts in the United Kingdom (U.K.). The policy applies to government contracts, mainly for defense purchases, where price is negotiated (regulated in their terms). The new policy took the form of an understanding between the government and the Confederation of British Industry (CBI) prescribing a new profit formula, formally recognizing the government's right to cost and pricing data prior to negotiations, and the establishment of an independent Review Board to periodically review the results of the profit formula and to conduct post-contract reviews of profit results (renegotiation).

Subsequent to the 1968 agreement, two interim and two General Reviews have been conducted. These reviews are well documented and provided valuable data as to the efficacy and results of the new policy. The policy reviews are especially valuable since the policy pioneers in the direct recognition of capital employed as an important element in the consideration of the government's profit position for negotiation. Modifications to the policy have been proposed by the Review Board to the government and the CBI so that we have the added benefit of hindsight to identify potential problems,

deficiencies, and proposed solutions. The ensuing discussion focuses primarily on the profit formula; its formulation and results after application.

Profit Formula. The profit formula is designed to provide a target rate of return on capital employed for government work (operating and facilities capital) compatible with the rate earned by British industry taken as a whole. Thus, the formula recognizes profitability on capital employed as the appropriate policy variable and attempts to establish a norm for profitability which is just enough to induce government contractors to remain as participants in the government market.

The target norm is based on the average historic return on capital employed by British industry over a number of years. This norm reflects variation in utilization and hence profitability due to the business cycle, and the effects of inflation on current profits. Keying profit on government work to this norm tacitly assumes that the average government and commercial work is of equivalent riskiness. The primary risk difference in this context is from differential degrees of instability of demand. No evidence, however, is presented on comparative variability of demand as between government and commercial markets.

Once the historic norm or target rate of return is determined (this is the subject of much discussion and debate between the parties), a distinction is drawn between risk and non-risk government contracts. The practice has been to define risk contracts as fixed-price types and non-risk contracts as those using cost-reimbursable contracting mechanisms. Some modification to this definition has been suggested to differentiate among cost-reimbursable contracts with ceiling prices, those with incentive fees and

contracts with escalation clauses insulating the contractor from inflation during contract performance.

To achieve an overall targeted return on capital employed and to allow a differential return between risk and non-risk contracts, a return is calculated on each contract type based on the historic proportions of risk vs. non-risk contracts and an _arbitrary_ differential. Risk contracts were originally allowed to earn a 50% greater rate of return than non-risk. Thus, if the overall target is 16% and 2/3 of all contract dollars are let as risk type contracts, risk contracts should earn a return of 18% and non-risk 12%. Again, the differential is arbitrary and there is no assurance that the proportion of dollars let under each contract type remains constant.

The profit formula consists of two components--the more influential is a direct return on capital employed augmented by a smaller percentage of operating costs. The two components are designed to achieve the targeted rate of return on capital employed for each type of contract. Since one component of profit is based on cost, it is necessary to convert this factor into an implicit return on capital employed using a capital turnover ratio (cost of production to capital employed denoted as CP and CE, respectively). The CP/CE ratio used is based on government contractors as a whole. It is not clear whether the ratio is weighted or unweighted but it is historic and has increased over time through either contractor design or from the effects of inflation.

For _risk_ contracts the 1975 formula (second iteration) specified a direct profit component of 10.8% on capital employed and a 5.4% on cost of production for a total of return on capital employed of 19.8% (assuming a CP/CE of 1.67 to 1 so that 5.4% on CP yields 9% return on CE). Thus, slightly over one-half of the profit consideration is based directly on

capital employed. An individual contractor can achieve a higher than target rate of return when his CP/CE ratio is above the industry average. However, the built-in regulatory review cycles will eventually adjust the profit rate on costs to reflect changed conditions should all contractors increase their turnover ratios.

For _non-risk_ contracts, the 1975 formula has three components: a direct return on CE, a small fixed rate based on CP, and a larger variable rate on CP based on performance, similar to an award fee. The rates established in 1975 were 9.9% directly on CE, 0.7% fixed rate on CP, and an average 2% on CP as an award fee. The 2.7% on CP (0.7% fixed and 2% average award) gives a 4.5% on CE based on the industry average CP/CE ratio of 1.67 to 1 for an overall target rate of return of 14.4% on CE.

Application. To apply the profit formula to individual contracts, the U.K. procedure is to use the contractor's own CP/CE ratio from the last accounting period to measure the amount of capital employed on contracts. The other component, based on CP, is based on the entire government sector and is not adjusted to reflect the contractor's specific CP/CE ratio. Thus, if a contractor's historic CP/CE is, say 3 to 1 overall, he would receive the target 10.8% as direct return on CE for risk work by recouping 10.8/3 = 3.6¢ on each dollar of CP incurred on a particular contract.

Renegotiation. The original profit policy granted to the government the right to review actual profit outcomes on an individual contract basis. Pursuant to this, the government audits all large contracts plus smaller contracts on a selected basis. An _independent_ Review Board is charged with the responsibility of reviewing contracts with outcomes greatly at variance with the intended profit target and the determinaton of any adjustment that may be appropriate. Under existing guidelines, contracts may be

referred to the Board for review only when realized profit exceeds 33.75%, or a loss exceeds 4.5% of capital employed. The upper limit was determined by considering that a contractor benefiting from slightly more than a 7% cost-saving relative to the estimated contract cost would realize a return on CE of 33.7%. For contracts that are labor intensive (defined as those with a CP/CE ratio above 2.5 to 1) the reference points indicating contract review are expressed in terms of profit on costs and are defined as potentially excessive if over 13.5% on cost, and potentially deficient if a loss of 1.8% on costs was realized. Since initiation of the policy in 1968 through 1977, 5 cases have been submitted to the Board. Over the period 1971 to 1976, approximately 3,000 non-competitive risk type contracts were placed by the Ministry of Defense and hence subject to renegotiation.

Accounting Definitions. The usual practice is to compute capital employed for a contractor's business as a whole, or possibly for a section of a contractor's business dedicated to government work for which separate figures are available. CE is taken as average net assets as shown in the balance sheet at the opening and close of the accounting period adjusted in the following ways:

Exclude:

- goodwill, patents and trademarks
- investments in securities and shares
- surplus cash
- land and buildings not occupied, and plant and machinery not in use where held for speculative purposes or for long-term expansion not yet planned or where there has been unreasonable delay in disposal of surplus assets.

Assets are valued at historic costs less depreciation. Net stocks and work-in-progress less progress payments and advances are included in CE. In addition:

- all loans which are interest bearing are admissible as capital employed

- government-furnished assets are <u>included</u> at one-eighth of the current value

The government includes as allowable costs those specifically identifiable to government work and costs which apply to commercial and government work adjusted if necessary to correct any disproportionate incidence on such work. Costs which are generally excluded are:

- any expenditure of a capital nature

- costs of raising and servicing capital, including short-term financing (this is covered by profit),

- maintenance for idle fixed assets excluded from capital employed,

- bad debt, agent's commissions, loss of profit insurance, royalties and license fees,

Items partially excluded are:

- entertainment, advertising, R&D, marketing and selling expenses.

<u>Results</u>. Although all non-competitive contracts normally are to be priced in accordance with the profit formula, many non-competitive awards (about half) were not. For the most part those priced outside the formula were purchases of proprietary products or standard items where the government has reference to manufacturers' list price and perhaps negotiated a quantity discount.

A sample of reports from large contractors for the period 1972-1974 revealed a weighted average return on <u>capital</u> employed of 23.7% for risk work (target was 16.1%) and 11.3% for non-risk work (target was 10.7%). The board has reconciled the variance between actual and target returns as

largely accounted for by an increase in the CP/CE ratio from the level used to back into the profit-on-cost component of profit. Note that the CP/CE ratio for the three years was 2.16 to 1 compared to the assumed ratio of 1.36 to 1 at the start of the period. In turn, the increase in the actual CP/CE is attributable to inflation which immediately impacts on CP but affects the facilities component of CE less rapidly. The increase in the CP/CE ratio would also affect the profit based directly on return to CE since the contractor-specific "rates" that is used is from the previous accounting period. The government also contends that there has been some variance between estimated and actual costs in favor of contractors which leads to higher than target profits. Reasons advanced for this were: increased labor productivity, over generous provision for contingencies, and subcontracting of work originally intended to be done inhouse.

Recommendations of the Review Board. Pursuant to the general review conducted by the Review Board in 1977, the following general recommendations were developed:

1) Employ a projected CP/CE ratio to measure CE which is more relevant to the contract performance period in place of the historic rates used prior to the general review.

2) Since the government/contractor relationship is long term, the relevant norm for target return should be past performance by U.K. industry rather than contemporaneous profitability.

3) The new (beyond 1977) target rate of return should be fixed at a level which would give a rate of real net return on capital sufficient to enable industry to maintain (replace) its capital base.

4) The government should develop means to identify capital employed attributable to individual contracts more precisely than under current procedures where the CP/CE ratio is for the totality of a company's business.

5) With respect to contracts for professional services (A&E, other labor intensive work), it was argued that the profit formula gives unduly low profit on non-risk work. The Review Board felt that much of this work is professional

in nature and consequently questioned whether return on capital employed is appropriate.

Canadian Profit Policy

A single agency - the Supply and Services Ministry - is responsible for all procurement activity in the Canadian Government. At the present time, profit policy is based only on estimated contract costs. Profit guidelines limit fee to level of 7% on low risk contracts and 10% on high risk contracts.

The Ministry is in the process of developing a new profit policy based on estimated contract costs and capital employed on a contract. The motivation for a new policy is attributable to contractor calls for recognition of capital and the initiation of CAS 414 and DPC 76-3 in the U.S. Although many aspects of the policy have not yet been established, the elements of the policy that have been identified are:

- return on working capital

- return on facilities capital

- return for entrepreneurial skills based upon the mix of cost components on a contract

- return on costs based upon the type of contract

Issues of overall target rates, profit rates on individual elements and methods of measuring and allowing capital to contracts still have not been resolved. It appears, however, from discussions with cognizant officials that a profit rate on capital employed would be at the risk free level similar to the approach of CAS 414. The profit rate based on cost of performance will not be designed so as to relate to a target return on capital employed. Rather an arbitrary percentage on cost without reference to asset turnover but instead consistent with current practices is contemplated.

REGULATED SECTORS OF THE U.S. ECONOMY

Regulation of private utilities in the U.S. usually is applied on a firm specific basis by regulatory bodies constituted by the various states. Exceptions are for commerce that enters interstate markets where price (typically unit price) is based on industry characteristics and regulation is under federal level jurisdiction.

In most situations, the regulators determine total revenue requirements which correspond to costs and a "fair" return on investment. The product is typically homogeneous (kilowatt hours, airline passage over a specified distance, etc.) so that total revenue requirements can be translated into a "unit" price. Furthermore, industry capacity can also be measured so that revenue requirements can be determined at prescribed level of capacity utilization. For example, an electric utility can be regulated by determining the operating costs associated with a forecasted level of output, the capital charges for the investment base of the utility and then prorating these costs to each unit of forecasted output. This basic procedure is employed for utilities, airlines, and pipelines. Investment based rate of return regulation is not, however, used for setting rail or truck rates.

The annual capital charges associated with the investment base is found from consideration of the utilities' cost of capital and a projected level of output or capacity utilization. The rate of return implicit in the level of capital charges reflect firm specific embedded interest costs of debt, the current cost of new debt and the required return on equity capital as reflected in the marketplace. Since the determination of revenue requirements has implicit a level of capacity utilization and since the unit price so determined is fixed until the next regulatory review, the firm has the ability to earn a rate of return in practice that is higher than the targeted level.

This phenomenon is known as regulatory lag and worked historically to the benefit of the regulated industry as input prices were stable and demand growth increased capacity utilization above the level that was implicit in the regulated output price. In essence, the regulated firm was operating in the context of a fixed price contract in an environment where market demand produced scale economies leading to lower unit costs and hence higher profits. In recent times, inflation and slow growth in demand has caused the opposite phenomenon whereby regulatory lag has worked to the detriment of the industry. The consequence has been a change in regulatory practice where an important cost item, fuel, has become an immediate pass through cost to rates. Frequent fuel adjustments at prevailing costs have changed the form of the regulatory contract from one of firm fixed price to a cost reimbursement contract for the fuel portion of costs.

In summary, the standard regulatory method is return on investment where:

- capacity is measurable

- utilization is implicit in the determination of revenue requirements and ultimately unit price

- firm specific rate of return is allowed to reflect the fact that different firms have different costs of capital; consequently inefficient firms are protected and efficient firms penalized

- regulatory lag, which is in essence a fixed (unit) price contract until the next rate review, has to a large extent been replaced by cost reimbursement on account of rapid and frequent increases in fuel costs

- the market is characterized by predictable demand and homogeneous output, and

- the supplier is granted a monopoly owing to the advantages to the consumer of scale economies but it is usually required to provide service to all consumers in its service area.

APPENDIX D

DERIVATION OF SHARING RATES AFFECTING COST-SAVING INVESTMENTS

INTRODUCTION

In the competitive commercial marketplace, a contractor contemplating a cost-saving investment will realize some benefits from it. He will gain a competitive advantage in the short run, as his costs fall in relation to the market price of the product. If he does not attempt to increase market share by reducing price and if other producers do not make similar cost-saving investments, the contractor will be the sole recipient of the cost savings. In the long run, the benefits will be eroded as the product price falls because of competition from other producers making similar cost-saving investments. Competition will diminish the value of the cost-saving investment through product price reductions, until only a normal (competitive) return on the additional investment is earned. Since the investment is assumed to be "economic", total overall cost (including the capital costs of the new investment) and product price are reduced.

In the negotiated procurement environment, the benefits of cost-saving investments are likely to accrue largely to the government over time. Historic actual costs are used to appraise current contractor cost estimates so that any cost-saving from new investment is likely to be negotiated away in subsequent years. We have conducted an analysis of the required rate of sharing of cost savings as between the contractor making a cost-saving investment and the government. This analysis calculates the level of benefits from the cost-saving investment (the sharing rate) that must accrue to the contractor in order to motivate him to make such an investment.

The analysis is based on consideration of the level and timing of investment, the timing of subsequent cost reductions and financial characteristics of the firm. The discounted cash flow models that accommodate these considerations were constructed for cost- and capital-based profit structures. The assumptions and nature of the analysis is presented below. The analysis is necessarily hypothetical and is meant to illustrate the range of cost-sharing rates that may be required to motivate cost-saving investment. No specific recommendation on sharing rates is made, since the results are unique to the hypothetical values used in the analysis.

PURE COST-BASED PROFIT STRUCTURES

To derive the minimum sharing rate required to motivate beneficial contractor investment in facilities capital, consider the following model. Suppose that after contract formation, a contractor contemplates an investment requiring an outlay of ΔCE dollars and produces an annual reduction in other costs of performance of ΔCP dollars. The contractor will realize a benefit of $s(\Delta CP)$, where s is the contractor's sharing rate negotiated in the contract. The government will realize $(1-s)$ x 100 percent of the cost savings, where s can vary from zero, for a cost-reimbursement contract without sharing, to unity, for a firm-fixed-price contract. Assume further that in years subsequent to the investment, the government negotiates new target costs at a reduced level corresponding to the actual lower costs experienced by the contractor after the new investment. Thus, any benefits realized by the contractor occur through sharing of the cost savings, but only in the initial year of the investment.

The cash inflows and outflows realized by the contractor from the investment are as follows:

Period	1	2	3 ...
Cash Flow	$\Delta CE + s\Delta CP$	$(r\Delta CP + d\Delta CE)$	$(r\Delta CP + d\Delta CE)...$

In the initial period, the contractor incurs an investment outflow of ΔCE and realizes an inflow from cost-sharing of $s(\Delta CP)$. In subsequent periods, profit, which is based on cost of performance, is reduced by $r(\Delta CP)$, where r is the negotiated profit rate on costs. However, the contractor receives reimbursement for depreciation on the additional investment of $d(\Delta WCE)$ over the depreciable life (1/d) of the investment.

To determine the required sharing rate s, the cash flows must be discounted by the contractor's required ROI. That is, s must be sufficiently large so that the present value of all cash outflows (treated as negative quantitites) must equal or exceed the present value of all cash outflows (positive quanities) where the required ROI is the contractor's discount or cutoff rate for new investments.

$$(\Delta CE + s\Delta CP) = \frac{(r\Delta CP + d\Delta CE)}{(1 + ROI)} + \frac{(r\Delta CP + d\Delta CE)}{(1 + ROI)^2} + ...$$

A computer program was written to solve for the minimum sharing rate s, given hypothetical values of the parameters in the discounted cash flow formula. The least certain of these parameters is the productivity of the investment, which refers to the annual dollar savings in cost, ΔCP, which occurs for an investment of ΔCE dollars. This factor was treated through sensitivity analysis, where the annual cost savings was expressed as equal to the investment value, 50 percent of the investment value, 25 percent of the

investment value, etc. The basic result was that extremely large sharing rates (often in excess of 100 percent) are required, since the cost-based policy exacts extremely high penalties from the contractor. Profits are reduced in subsequent years because the base on which profit is calculated, cost of performance, is lowered. The results of the calculation for required sharing rates is shown in Table D-1 at the end of this appendix.

CAPITAL-BASED PROFIT STRUCTURE

Capital-based profit structures were examined in much the same manner, with discounted cash flow techniques. In this analysis we assumed that the historic asset turnover method of recognizing capital employed was used. The projected or actual asset turnover method, for recognizing capital employed would tend to produce somewhat lower required sharing rates since these methods recognize more capital employed and hence give more profit than the lagged asset turnover method.

For the capital-based profit structure with the historic asset turnover method the cash flow resulting from an investment of ΔCE, which produced cost savings of ΔCP would be:

Period	Cash Flow
1	$\Delta CE + s(\Delta CP) - r(\frac{CE_0}{CP_0})(\Delta CP)$
2	$r(\Delta CE - d\Delta CE) + d(\Delta CE)$
3 ...	$r(\Delta CE - 2d\Delta CE) + d(\Delta CE)$

In the initial period, the cost of the investment ΔCE would be incurred, while the contractor would receive a share s of the resultant savings in production cost ΔCP. The historic turnover method would fail to capture all the new investment in the capital base used to calculate profit. Since the

amount of capital attributed to each dollar of cost is taken from the experience of the previous accounting period, and since the cost of performance falls, less capital than available previous to the investment will be recognized. In subsequent periods, the new investment will be recognized and bear profit at the rate r, and depreciation will be paid on the prevailing net book value. The determination of a required sharing rate, s, becomes one of solving for the sharing required to equate present values of cash inflows and outflows at the contractor's cutoff rate ROI.

$$\Delta CE + s\Delta CP - r(\frac{CE_0}{CP_0}) \Delta CP =$$

$$\frac{r(\Delta CE - d\Delta CE) + d(\Delta CE)}{(1 + ROI)} + \frac{r(\Delta CE - 2d\Delta CE) + d(\Delta CE)}{(1 + ROI)^2} + \ldots + \frac{d(\Delta CE)}{(1 + ROI)^{1/d}}$$

Results of the calculation of sharing rates for both cost- and capital-based profit policies are shown in Table D-1.

An investment with a depreciable life of 12 years producing annual cost savings from 20 to 100 percent of the investment value was modeled. The firm was assumed to have an asset turnover of 2:1, so that a profit rate of 8 percent on cost corresponds to 16 percent on assets. The firm was assumed to have, first, a 16 percent cutoff rate for investments, and, second, a 32 percent cutoff rate.

Under the cost-based structure, sharing of in excess of 100 percent of the first year's cost savings was required for all but the most productive investment (the investment with a one-year payback period). Required sharing rates are insensitive to changes in the firm's cutoff rate, but sensitive to the productivity of the investment.

With the capital-based profit structure, sharing rates were less than half the level required for the cost-based profit structure and were below

100 percent once the investment had a payback period of less than four years, assuming a cutoff rate of 16 percent. In contrast to the cost-based structure, the sharing rate is very sensitive to the firm's required cutoff rate on investment.

TABLE D-1. REQUIRED SHARING RATES

Profit Structure	Investment Productivity*	Profit Rate	Depreciation Life	Required Sharing Rate	
		Profit as % of Cost		16% ROI	32% ROI
	20%	8% (16% ROI)	12 yrs.	3.23	3.99
COST-BASED	25%	8%	12 yrs.	2.66	2.11
	50%	8%	12 yrs.	1.53	1.73
	100%	8%	12 yrs.	0.96	0.98
		Profits as % of Investment			
	20%	16%	12 yrs.	1.42	3.03
CAPITAL-BASED (lagged turnover)	25%	16%	12 yrs.	1.12	2.44
	50%	16%	12 yrs.	0.68	1.26
	100%	16%	12 yrs.	0.35	0.67

*Annual cost saving as a percentage of initial investment.

APPENDIX E

AIR FORCE CONTRACT FINANCING MODEL

In an attempt to measure the amount of contractor-provided operating capital for a particular contract, LMI explored the potential use of the Air Force Contract Financing Model (FINMOD), which can provide a detailed cash flow analysis for an individual contract. Sources of financing on a contract include the contractor's own funds, government progress payments, supplier credits or payables, labor cost accruals, and bank float. For each source, FINMOD estimates the average amount of work-in-process financed over the life of the contract.

The algorithm of the FINMOD program can account for all the important parameters that will affect the amount of contract financing attributable to a particular source. These parameters include:

- Length of contractor accounting period
- Costs incurred for each accounting period
- Relative amount of material and subcontractor costs
- Material and subcontractor payment lag time
- Bank float lag time
- Government progress payment rate
- Government payment lag
- Final delivery date(s)
- Progress payment liquidation rate
- Subcontractor progress payments
- Subcontractor invoice payments

A detailed discussion of the effect of each parameter is contained in the working paper, "The Air Force Contract Financing Model: Modeling Concepts," available from the Office of the Assistant Secretary of the Air Force for Banking and Contract Financing.

ANALYSIS OF FINMOD DATA

The above-mentioned office supplied LMI with results from runs for each of 12 different contracts. In each case, the model had been run after contract completion, using audited contractor-provided values for the key parameters mentioned above. On prior occasions, the model had been run using hypothetical values to simulate contract cash flows and souces of funds. All the contracts (shown in Table E-1) were Air Force fixed-price types with 80 percent progress payment rates.

TABLE E-1. FINMOD CONTRACT CHARACTERISTICS
(Millions of Dollars)

Contract Number	Cost	Profit	Price	Length of Contract (In Days)	Days to First Delivery
0485	$ 48.8	$ 3.1	$ 51.9	820	260
0203	18.1	1.7	19.8	890	130
0250	146.6	15.3	161.9	1170	615
0630	123.6	13.6	137.2	1700	700
0095	32.2	2.0	34.2	1850	700
0202	6.4	0.3	6.7	670	490
0081	75.2	6.1	81.3	1155	500
0287	15.5	1.9	17.4	790	450
0006	188.5	38.9	227.4	855	500
0589	21.5	0.0	21.5	1770	850
0187	65.7	4.6	70.3	1480	210
0256	3.5	0.4	3.9	700	335

For each contract, the model was run twice--once for the actual 80 percent progress payment case and once assuming that each contract was a cost-reimbursement-type contract. This permitted analysis of the effect of contract type on the amount of contractor-provided financing, with the significant differences arising from the 100 percent cost reimbursement rate

E-2

and the timing of the payment of profit on cost-type contracts. Tables E-2 and E-3 below present these results, showing the dollar amount of contract financing by sources.

TABLE E-2. FIXED PRICE, 80% PROGRESS PAYMENT CASE
(In Millions)

Contract	Contractor Financing	Gov't Prog. Payments	Creditor/ Labor	Bank Float	Total Average Work-in-Process
0485	$ 1.2	$ 5.8	$ 1.2	$0.2	$ 8.4
0203	0.4	2.4	0.4	0.1	3.3
0250	8.0	34.5	1.7	0.5	44.7
0630	5.6	21.2	2.2	0.3	29.3
0095	2.3	4.5	0.3	0.1	7.2
0202	0.6	1.6	0.3	0.1	2.6
0081	2.5	8.4	1.6	0.0	12.5
0287	0.3	1.2	0.4	0.0	1.9
0006	6.1	18.1	4.2	0.0	28.4
0589	1.4	2.6	0.2	0.1	4.3
0187	1.9	8.4	0.7	0.3	11.3
0256	0.5	0.6	0.1	0.0	1.2
TOTAL	30.8	109.3	13.3	1.7	155.1
% of Total	20%	70%	9%	1%	100%

TABLE E-3. COST REIMBURSEMENT TYPE CONTRACT CASE
(In Millions)

Contract	Contractor Financing	Gov't Cost Reimbursement	Creditor/ Labor	Bank Float	Total Average Work-in-Process
0485	$ 0.5	$ 3.0	$ 1.2	$0.2	$ 4.9
0203	0.0	0.5	0.4	0.1	1.0
0250	0.0	12.4	1.7	0.5	14.6
0630	(1.2)	8.1	2.2	0.3	9.4
0095	(0.2)	1.2	0.3	0.1	1.4
0202	(0.1)	1.0	0.3	0.1	1.3
0081	(0.4)	1.6	1.6	0.0	2.8
0287	(0.2)	0.5	0.4	0.0	0.7
0006	(0.2)	4.5	4.2	0.0	8.5
0589	0.0	11.6	0.2	0.1	11.9
0187	(0.5)	2.8	0.7	0.3	3.3
0256	0.0	0.5	0.1	0.0	0.6
TOTAL	(2.3)	47.7	13.3	1.7	60.4
% of Total	3.8%	79%	22%	2.8%	100%

Conclusions

Two significant conclusions follow from Tables E-2 and E-3. First of all, there is <u>no</u> contractor-provided operating capital on cost reimbursement contracts. For only one contract was contractor financing a positive value in Table E-3; in seven cases contractor-provided financing was negative, indicating a positive cash flow to the contractor from the government as a result of the contract. Secondly, the amount of contractor-provided operating capital varies significantly by contract. Contractor financing differs not only between cost-reimbursement and fixed-price contracts but also among fixed-price contracts themselves. This latter point can be demonstrated by expressing contractor financing in Table E-2 relative to contract cost. For these fixed-price contracts, contractor financing as a percentage of contract cost varies from 1.9 to 14.3 percent with a weighted average over all contracts of 4.1 percent.

The cost of operating capital is a contractor cost that can only be recovered in the profit paid on the contract. Since these data indicate a wide variation in the amount of operating capital provided by the contractor on a contract, an equitable profit policy must somehow take into account these differences when profit on a contract is negotiated. A contractor with more operating capital employed on a particular contract deserves a higher profit.

FURTHER ANALYSIS OF OPERATING CAPITAL DIFFERENCES

The above analysis indicated differences in contractor-provided financing by contract. The differences among the fixed-price contracts can be explained by differences in specific contract parameters that affect contractor financing levels. By modeling the joint effects of these parameters on the level of contractor financing, it should be possible to specify (estimate) a level of

contractor financing on a specific contract, given the estimated values of these parameters.

With the limited sample (12 contracts) available for analysis, it was not possible to model the effect of all the parameters listed previously. Discussions with the Office of the Assistant Secretary of the Air Force for Banking and Contract Financing identified three parameters--contract cost, contract length, and time to first delivery--which appeared to be the most significant. Data for these parameters were obtained (see Table E-1), and multiple regression techniques were used to examine the statistical relationship between dollars of contractor financing and these parameters.

The following specification was used:

$$\log Y = \log A + a \log X_1 + b \log X_2 + c X_3$$

where Y = dollar amount of contractor financing

   X_1 = contract total cost

   X_2 = length of contract in days - the time from first incurrence of costs until final delivery

   X_3 = days to first delivery/length of contract - a measure of delivery frequency, interpreted as the percent of contract period that passes before first delivery.

Using the data from the twelve contracts, the following results were obtained:

$$\log Y = -8.59 + .70 \log X_1 + .82 \log X_2 + 1.84 X_3$$
$$ (-2.56)\ (5.11) (1.7) (1.96)$$

$$\bar{R}^2 = .793 \qquad S.E. = .50$$

t - statistics are in parentheses.

Conclusions

The coefficients of $\log X_1$ and $\log X_2$ can be interpreted as elasticities because of the logarithmic specification. These results indicate: (1) that for a 10 percent increase in contract cost (X_1), the dollar amount of

contractor financing increases by 7 percent. This implies that contractor financing is not linearly related to contract cost, i.e., a larger contract (by cost) requires less contractor financing as a percentage of the contract cost; and (2) that for a 10 percent increase in contract length (X_2), the dollar amount of contractor finance increases by 8.2 percent. Again, the length of the contract and contractor financing are not linearly related. A contract twice as long does not require twice as much contractor financing.

The coefficient of delivery frequency (X_3) is not an elasticity. However, the elasticity can be calculated at the mean value of X_3 and is equal to .31. Thus, for a 10 percent increase in the time to first delivery relative to contract length, the dollar amount of contractor financing increases by 3.1 percent.

Future Research

A limited sample of 12 contracts enabled us to obtain some meaningful results for the relationship between dollars of contractor financing and three contract parameters. With a larger sample of contracts, it would be possible to analyze the effect of the other significant contract parameters (e.g., payment lags, progress payment rate) on the amount of contractor financing. A larger sample would also increase the confidence one could place in the results.

Knowing the relationship between the amount of contractor financing and all the significant contract parameters, one could construct a table of contract parameter combinations. For a particular contract with specific parameters, the table would provide an estimate of the contractor financing required on the contract. This then could be used by government contract negotiators as the measure of operating capital for the hybrid profit formula.