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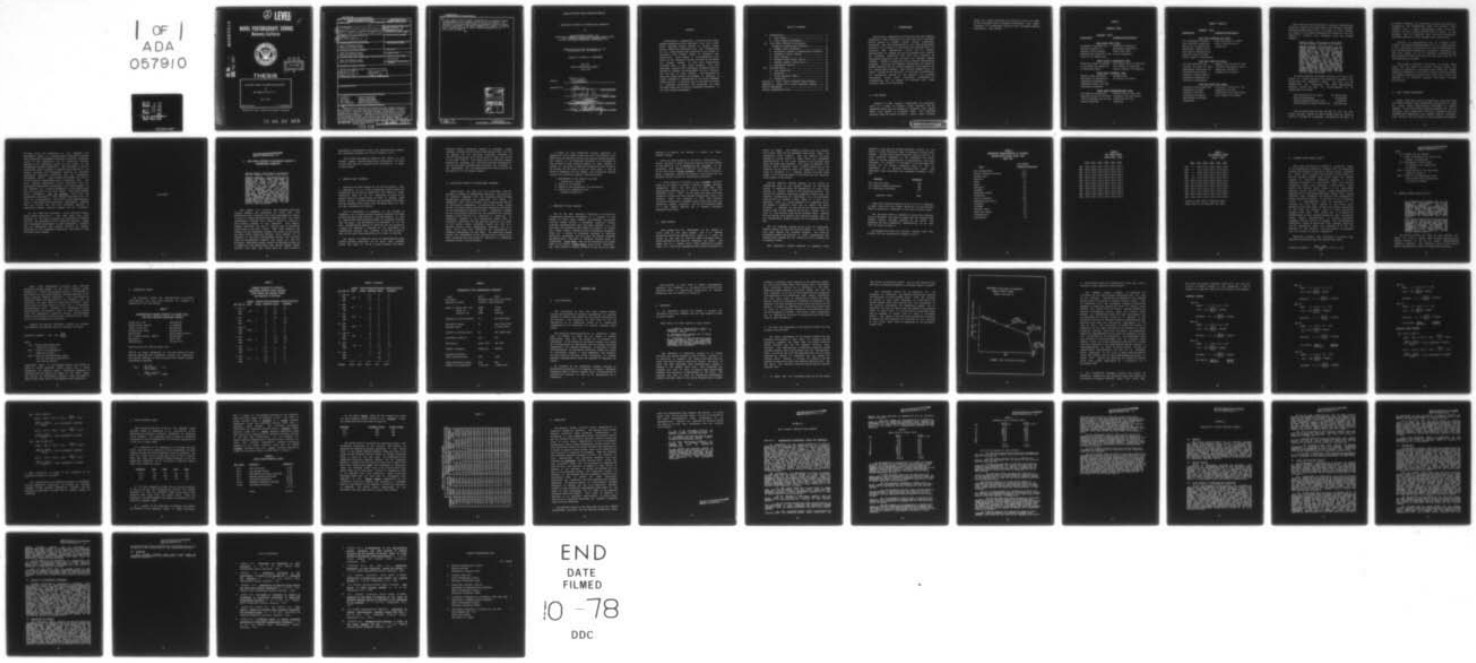

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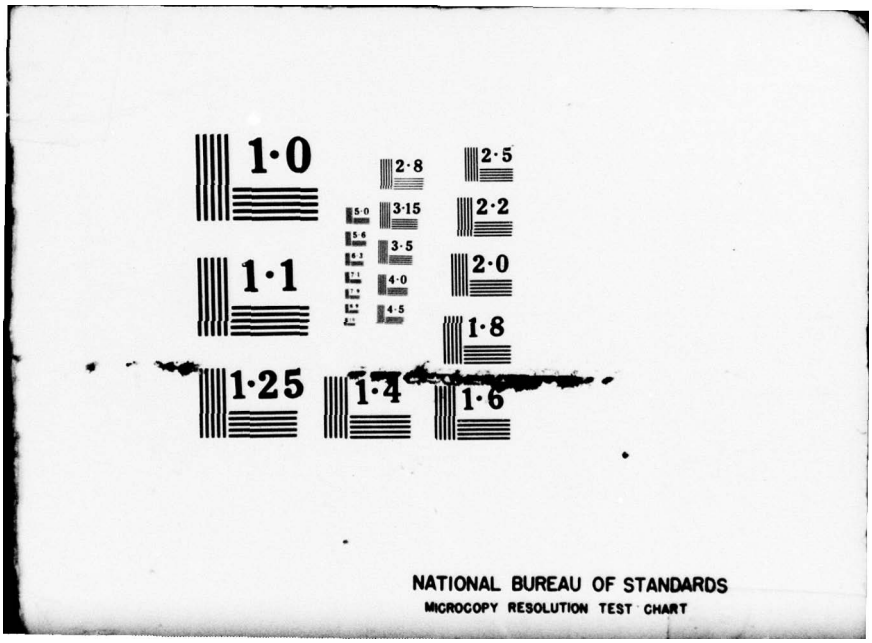
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NAVAL POSTGRADUATE SCHOOL
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THESIS

ESCALATION CLAUSES IN SHIPBUILDING CONTRACTS

by

John Demetrius Vellis, II

June 1978

Thesis Advisor: J. D. Buttinger

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Historically, shipbuilding contractors have been damaged financially while executing long term fixed price contracts during periods of rapidly rising prices. Escalation provisions have been incorporated in U.S. Navy shipbuilding contracts in an attempt to neutralize this adverse effect of inflation upon contractors. This thesis is an examination of the nature of two escalation clauses utilized by the Naval Sea Systems Command in long term shipbuilding contracts using a case study approach. The case over

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discusses general price increases, characteristics of escalation clauses, the measurement of price changes, and the use of price indices. The importance of selecting proper indices is stressed by focusing on actual escalation experienced in the DD-963 SPRUANCE Class contract. A teaching note is provided which may be used in classroom discussion or for out-of-class assignment.

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ESCALATION CLAUSES IN SHIPBUILDING CONTRACTS

by

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

Historically, shipbuilding contractors have been damaged financially while executing long term fixed price contracts during periods of rapidly rising prices. Escalation provisions have been incorporated in U.S. Navy shipbuilding contracts in an attempt to neutralize this adverse effect of inflation upon contractors. This thesis is an examination of the nature of two escalation clauses utilized by the Naval Sea Systems Command in long term shipbuilding contracts using a case study approach. The case discusses general price increases, characteristics of escalation clauses, the measurement of price changes, and the use of price indices. The importance of selecting proper indices is stressed by focusing on actual escalation experienced in the DD-963 SPRUANCE Class contract. A teaching note is provided to assist in classroom discussion, and questions are also provided which may be used in classroom discussion or for out-of-class assignment.

TABLE OF CONTENTS

I. INTRODUCTION

Historically, shipbuilding contractors have been damaged financially while executing long term fixed price contracts during periods of rapidly rising prices. Escalation provisions have been incorporated in U.S. Navy shipbuilding contracts in an attempt to neutralize this adverse effect of inflation upon contractors. Within the U.S. Defense Establishment, no command has been as concerned with solving the problems associated with long term contracts in inflationary periods as has the Naval Sea Systems Command (NAVSEA). NAVSEA is responsible for the Navy's shipbuilding programs. Contracts are prepared, negotiated, and signed by NAVSEA personnel and the various companies that comprise the U.S. Shipbuilding Industry. Each contract differs from all others because of its duration, its articles of production, the contractual parties to the contract, the economic environment within which contractual performance is accomplished, and the degree of certainty with which contract costs can be estimated.

A. COST GROWTH

Because of these inherent differences in contracts, there is a range of contract types available for use depending mostly upon the degree of certainty that actual costs will equate to estimated costs. The different contract types are shown in Table 1. While these contract

types can fairly distribute the amount of risk to be taken by the Government and a Government contractor, they cannot eliminate an increasingly difficult area of weapons systems acquisition: cost growth.

TABLE 1

CONTRACT TYPES

CONTRACT TYPE DESCRIPTION	ADVANTAGE/DISADVANTAGE
FIRM FIXED PRICE (FFP)	
Government contracts for a specific quantity at a specific price--usually awarding the contract on the basis of the lowest bid.	Simplifies budgeting. Encourages competition. Total risk borne by the contractor.
FIXED PRICE W/ ESCALATION (FPE)	
Additional money is awarded on the basis of changes in a prescribed index.	Govt shares risk of inflation. Poor choice of index may distort effects of inflation.
FIXED PRICE INCENTIVE (FPI)	
Several types available. Contractor is awarded for improving performance or decreasing costs from that originally estimated.	Spreads risk. No ceiling on profit.
FIXED PRICE REDETERMINATION (FPR)	
For quantity production. Realistic price can be negotiated initially but not for later production.	Reduces risk in long term contracts, but has little motivation for cost reduction.

TABLE 1 (Cont'd)

CONTRACT TYPE DESCRIPTION	ADVANTAGE/DISADVANTAGE
COST PLUS INCENTIVE FEE (CPIF)	
For development contracts when realistic incentives can be set to improve mgt efficiency. Rewards given when initial estimates are bettered. Keys on Target Costs, skeds, or performance.	Some incentives to reduce costs. Limited risk to contractor.
COST PLUS AWARD FEE (CPAF)	
For more definite type contract than CPIF but where performance objectives are determined and success probable. Awards based on subjective evaluation of ccntractor performance.	Spreads cost and profit risk. Incentive measurement may be inaccurate because of subjectivity involved.
COST PLUS FIXED FEE (CPFF)	
Contractor given fixed fee regardless of costs incurred. Used when performance uncertain and accurate estimates impossible.	Low risk to contractor. Low motivation for cost efficiency. High uncertainty with respect to funding.

Cost growth has been discussed in numerous congressional committee sessions in recent years. The following testimony occurred between Senator Milton R. Young, R - North Dakota, as a member of the Senate Appropriations Committee, and Vice Admiral R.C. Gooding, USN, Commander Naval Sea Systems Command.

> Senator Young: What kind of contractual and environmental problems do you have?
>
> Admiral Gooding: The contracts we are having trouble with today were signed in general in 1970, 1971, and 1972. In those years, we had a certain type of escalation clause and its principal feature was that we paid escalation according to the Bureau of Labor Statistics for steel ships. We stopped paying escalation at the time of contract delivery. Now, in late 1973 when the oil embargo hit, the delivery time for materials stretched out an inordinate amount, and the shipbuilders were unable to complete the ships on time. Therefore, they completed them, or are completing them, in a period when escalation is not recoverable. They are paying more for their labor than the clause allows us to repay them. So they are in a loss situation.

The above question and answer occurred on 31 March 1976 during U.S. Senate Appropriations Committee hearings on the Fiscal Year 1977 President's budget. The Navy, in its Shipbuilding and Conversion Navy (SCN) appropriation request, listed the need for $6,289,500,000 to be apportioned as follows:

New Construction (16 ships)	$4,104,500,000
Advance Procurement	477,300,000
Outfitting/Post-Delivery Work	84,500,000
Escalation/Cost Growth (Pre-FY 76)	1,623,200,000

Both the Escalation portion ($1.0895 B) and the Cost Growth portion ($.5337 B) would provide funds for ships in the FY 70 through FY 75 programs. According to the Navy in

its Senate testimony, the escalation shortfall was caused by increases in the shipbuilding labor and material rates resulting from a strong inflationary trend in the U.S. economy. The cost growth resulted from the effect of the increased rate of inflation upon the cost of government furnished material on ships already under construction.

Congress, in appropriating the FY 76 budget a year earlier, had deferred appropriating $1 B of a requested $2.4 B for cost growth and escalation in the SCN appropriation. Navy officials were subjected to extensive questioning in this area during the FY 77 hearings, considering that Escalation/Cost Growth accounted for over 25% of the FY 77 SCN appropriation request.

Cost growth is defined as the amount of actual money spent over and above the initial contract price. The problem of containing or controlling cost growth has become especially difficult in the last 20 years as DOD has shifted its weapons acquisition policy from a Cost Plus Fixed Fee approach to an Incentive approach (Cost-based or Fixed Price-based).

B. TOTAL PACKAGE PROCUREMENT

During World War II and the Korean War, Cost Plus Fixed Fee (CPFF) contracts were extensively utilized due to a need for large scale technolcgical development in weapons systems. In the early 1960s, Congress demanded the use of contracts that placed more risk on the contractor and that provided more competition for weapons systems contracts. What evolved was the concept of Total Package Procurement.

Although there was competition in the Research and Development phase of a weapons system acquisition program (the engineering development contract), there was generally little if any competition for the production contract because of the advantages gained by the winner of the development contract competition. DOD developed the idea of concurrency which attempted to preserve the benefits of the initial Research and Development contract by combining substantial production quantities with the engineering development effort. Total Package Procurement was seen to be the method of implementing this concurrency idea. The Total Package Procurement concept envisioned that all anticipated development, production, and as much support as was feasible for a system throughout its anticipated life was to be procured as one total package. This total package would incorporate into one contract firm price and performance commitments. Total Package Procurement did not live up to expectations. The controls were understandably rigid. Overly ambitious performance requirements combined with low initial cost and risk estimates resulted in engineering changes, schedule slippage, and cost increases.

It was these cost increases -- "cost overruns" through Total Package Procurement -- that came under such close scrutiny by the press, Congress, and Department of Defense critics. The implication of the resulting criticism ranged from management inefficiency to basic dishonesty. Although DOD has implemented many changes allowing for greater flexibility in the acquisition machinery, cost growth in DOD contracts still remains.

CASE STUDY

II. CASE STUDY: EFFECTS OF ESCALATION CLAUSES ON SHIPBUILDING CONTRACTS

> Senator Young: What kind of contractual and environmental problems do you have?
>
> Admiral Gooding: The contracts we are having trouble with today were signed in general in 1970, 1971, and 1972. In those years, we had a certain type of escalation clause and its principal feature was that we paid escalation according to the Bureau of Labor Statistics for steel ships. We stopped paying escalation at the time of contract delivery. Now, in late 1973 when the oil embargo hit, the delivery time for materials stretched out an inordinate amount, and the shipbuilders were unable to complete the ships on time. Therefore, they completed them, or are completing them, in a period when escalation is not recoverable. They are paying more for their labor than the clause allows us to repay them. So they are in a loss situation.

Vice Admiral R.C. Gooding, USN, Commander Naval Sea Systems Command, was presenting the Fiscal Year 1977 Shipbuilding and Conversion Navy (SCN) appropriation request to the U.S. Senate Appropriations Committee when the above conversation occurred with Senator Milton R. Young, R - North Dakota, a member of that committee. Vice Admiral Gooding mentioned the use of a certain type of escalation clause used in the early 1970s. This case examines the elements of two escalation clauses: the clause in use during the early 1970s, called the Contract Curve Method, as it appeared in the AOR-7 (USS ROANOKE) contract with National Steel and Shipbuilding Company, San Diego, CA, and its successor escalation clause, called the Marshall Method, as it appeared in the Option FFG-7 (USS OLIVER HAZARD PERRY) contract with Bath Iron Works, Bath, ME. Each clause is

reproduced in Appendices A and B, and representative numbers for comparison purposes are found in Tables 5 and 6.

While there are several causes of cost growth in the current weapons systems acquisition environment, the focus of this case will be on general price increases as a cause of cost growth.

A. GENERAL PRICE INCREASES

Inflation has been defined by the noted economist, Paul A. Samuelson, as "...a time of generally rising prices for commodities and factors of production." The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor is the primary source of indices which are used to measure these rising prices. The BLS publishes the Wholesale Price Index and the Consumer Price Index, both discussed below, as well as other statistics and reports.

The U.S. Department of Commerce, in the process of compiling the national income accounts, computes the Gross National Product (GNP) Deflator. The GNP Deflator is used to express the Gross National Product in "constant" dollars over the years. The GNP Deflator is considered to be the most representative measure of inflation for the economy as a whole, and includes a measure of the government and construction sectors (not included in the WPI or CPI) as well as the other items measured by the other two indices.

The impact of inflation cannot be underestimated under current economic conditions. As of April 1978, consumer prices had risen to 191.5% of their average 1967 level.

Although yearly percentage changes in consumer prices averaged between 3% and 6% from 1968 through 1972, the 1973 oil embargo and the resulting world-wide recession of 1974-75 forced prices up at yearly rates of 12%, 11%, and 9% in the years 1973-75. Such rapid rates of inflation created significant problems for long-term business arrangements, such as multi-year shipbuilding contracts, and resulted in the requirement for the Escalation/Cost Growth portion of the Navy's FY 77 SCN budget request.

B. ESCALATION CLAUSES IN SHIPBUILDING CONTRACTS

Historically, the Navy has had a particular need for escalation clauses in shipbuilding contracts. The high rate of inflation combined with the extensive length of Navy shipbuilding contracts had stimulated the desire to adequately deal with the effect that rising prices had had on contractual arrangements. In dealing with these rising prices, the Navy started incorporating escalation provisions in its shipbuilding contracts in 1962. Escalation clauses are the contractual provision for the occurance of a general change in price levels, i.e., inflation or deflation. An escalation payment is the contractual amount paid to reimburse a contractor for any measured change in the price of his inputs (labor, material) during the life of a specific contract. Most shipbuilding contracts are of a fixed price type with incentives for improvements in schedule, performance, or cost (FPI). The escalation clause allows for adjustments in the contract price, either up or down, depending upon the amount of inflation or deflation measured during a certain period.

A review of both escalation clauses appearing in Appendices A and B would reveal that both the Contract Curve Method and the Marshall Method have similar characteristics. The essence of an escalation provision is an agreement by both parties to wait a certain length of time, measure a change in the price of specified commodities and services, and finally for one party to pay the other party a sum of money to compensate for the change. Both escalation clauses contain the following essential Characteristics:

1. Measurement of the change in prices covered by a contract,
2. Prices to be covered,
3. Timing of the measurement for escalation,
4. Formula for compensation for measured escalation.

C. MEASURES OF PRICE CHANGES

One of the most important decisions to be made when establishing escalation procedures in a contract is the method by which price changes are measured. The method utilized should reflect a reasonable trade-off between accuracy, administrative cost, and "moral hazard", i.e., the risk that the contractor will reduce his efforts to obtain the lowest prices because he has an escalation provision. There are a series of decisions required in defining escalation procedures that will meet the desired trade-off mentioned above. The first is deciding between using an established <u>price index</u> such as the Wholesale Price Index (WPI) or to use the <u>actual prices</u> paid by the contractor. The usual method in current practice is the use of an index

because it is simpler and because it avoids the "moral hazard" problem.

Since the index approach is utilized in shipbuilding, a second decision is made concerning whether the index change is multiplied by: (1) an estimate of the progress of the contractor each quarter as written in the contract, or (2) by the contractor's actual progress. This choice reflects a major difference between the Contract Curve Method and the Marshall Method utilized in shipbuilding contracts.

A third decision is whether to use a standard material index for all ships or whether to develop a unique material composition index for each ship or ship type. Navy shipbuilding contracts use a standard material index as described below. Since not all ships are alike and since shipbuilding materials have changed substantially since the material index was composed in 1952, this practice introduces inaccuracy of possible major proportions into the escalation payment procedure. The use of a standard index is a much simpler approach and it probably minimizes administrative costs.

D. PRICE INDICES

Both clauses allow for measurement of the change in price level by the index method. The U. S. General Accounting Office has defined price index as a ratio of prices at one time or place to those at another time or place selected as the frame of reference (or base). The index may be a simple price index (related to a single item), or it may be an aggregative price index (related to a

group of items). Two indexes in common use, the Consumer Price Index (CPI) and the Wholesale Price Index (WPI), are aggregative price indexes. They are based on the price changes of a large group of items which are considered representative of the price changes in the universe from which the items were selected. The items are combined with weights which represent their relative importance in the universe (If the value of labor, for example, is twice the value of material in a weapons system, the labor index weight in the combined index is two-thirds and the material index weight is one-third).

The WPI measures average changes in the prices of commodities sold in the primary markets of the United States. It measures prices for commodities as they enter markets at various levels in the production process. The overall WPI comprises individual commodity indices that are combined successively into subindices, i.e., the individual item is part of a product class, which is a part of a subgroup, which is a major component of a commodity group. For example, a commodity group may be metals and metal products; a subgroup of this may be non-ferrous metals; a product class of this subgroup may be mill shapes; and an item of this product class may be aluminum sheet. Because of such detail, more specific and relevent indices, such as the shipbuilding Material Index, can be developed from the WPI.

The CPI measures changes in the price of a particular "market basket" of goods and services bought at retail by city wage earners and clerical workers. The index is published monthly and contains an index representing the average price changes for U.S. cities as well as indices for 23 separate areas.

Both escalation clauses depicted in Appendix A and

Appendix B rely upon two indices published monthly by the Bureau of Labor Statistics (BLS) as measures of price level changes. The BLS Steel Vessel Material Index is made up of three commodity subgroups of the Wholesale Price Index chosen to be most representative of shipbuilding. The three subgroups are weighted on the basis of the breakdown that existed for the typical commercial ship in 1952 as determined by a Maritime Administration study. The subgroups, their weightings, and subsequent composite index are:

SUBGROUP	WEIGHTING
10-1 Iron and Steel	45%
11-4 General Purpose Machinery	40%
11-7 Electrical Machinery	15%
Composite Index	100%

Steel Mill Products comprise 72.4% of the 10-1 subgroup, or about 33% of the total Index. Therefore, the BLS Material Index is sensitive to movement in the price of steel plate.

The BLS Labor Index is composed of inputs from eighteen private shipyards. The index is based upon the straight-time average hourly earnings reported by the yards. The shipyards and their respective representation as of June 1975 are shown in Table 2.

The monthly BLS Labor and Material Indices from 1970 through 1975 are shown below in Tables 3 and 4.

TABLE 2

PERCENTAGE REPRESENTATION BY SHIPYARD

(SHIPBUILDING LABOR INDEX, BLS)

JUNE 1975

Yard	% of Total Reported Employees
Bath Shipbuilding	4.4
General Dynamics (Groton)	19.6
Newport News	28.2
American	1.1
Defoe	0.2
Dravo	1.4
Marinette	0.5
Avondale	8.3
Bethlehem (Texas)	2.7
Levingston	2.3
Litton (Ingalls)	15.4
Bethlehem (San Fran.)	0.8
Gunderson	1.6
Lockheed	2.2
National Steel	5.4
Todd (San Pedro)	3.7
Todd(Seattle)	1.9
Williamette	0.3

TABLE 3
BLS LABOR INDEX
(June 1962 = 100)

	1970	1971	1972	1973	1974	1975
JAN	130.3	136.8	141.9	152.5	165.0	180.4
FEB	130.9	138.0	142.9	152.8	165.7	183.9
MAR	131.2	137.7	142.5	152.5	166.0	187.1
APR	131.4	137.9	142.8	152.9	166.6	188.7
MAY	132.0	137.8	143.3	154.0	167.4	190.4
JUN	132.1	137.1	144.2	153.9	167.4	192.0
JUL	133.4	139.0	147.6	156.5	172.4	194.1
AUG	134.6	138.5	148.8	157.1	174.6	196.1
SEP	135.2	138.7	149.6	162.1	175.2	198.2
OCT	135.4	138.5	150.2	162.6	176.3	200.3
NOV	135.8	140.6	150.9	163.5	177.9	202.3
DEC	135.9	142.2	152.2	164.1	180.2	204.4

TABLE 4
BLS MATERIAL INDEX
(1967 = 100)

	1970	1971	1972	1973	1974	1975
JAN	0	116.0	121.8	125.6	135.4	179.5
FEB	0	116.4	122.7	126.2	137.8	180.6
MAR	0	116.8	122.9	126.6	142.9	183.1
APR	0	117.0	123.0	127.3	147.7	185.6
MAY	0*	117.9	123.2	128.3	152.0	188.1
JUN	113.3	118.3	123.3	128.9	158.6	190.7
JUL	114.1	119.2	123.5	129.0	166.0	193.1
AUG	114.2	121.0	123.7	129.1	170.5	195.6
SEP	114.7	121.1	123.8	129.4	173.4	198.1
OCT	115.4	121.0	123.9	130.7	175.9	200.6
NOV	115.2	120.9	124.0	132.8	177.7	203.1
DEC	115.6	121.0	124.2	133.5	177.4	205.7

*Prior to June 1970, a Material Index using 1957 as the base year was used.

E. CONTRACT CURVE METHOD (AOR-7)

Since 1962, the Navy has included an escalation clause in its shipbuilding contracts. Through 1974, all escalation clauses were similar to the AOR-7 contract clause (Appendix A). Known as the Contract Curve Method or 1962 Method, it was the standard method used within Naval Sea Systems Command to determine escalation payments in a ship acquisition contract. In this method, Labor and Material escalation curves were specified in the contract. These curves were usually quite similar to the anticipated progress curves for the contract. Unless adjustments were required due to Government-responsible delays, these curves remained fixed throughout the contract life, regardless of actual contractor progress. In addition to the escalation curves, a Labor/Material split was specified in the contract, and this split, applied to the Target Cost, determined the fixed amount of base year dollars apportioned by the Labor and Material curves on which escalation payments were made. This method had no provision for reimbursement of price changes associated with engineering change orders, modifications, or schedule completion slippage. Once the contract was signed, the pre-determined expenditure values of Target Cost (TC), material /labor mix (C) and expenditure rates (Ei) remained fixed for the duration of the contract, and were subject to adjustment only in the event of partial termination.

Escalation payments were determined as follows, with separate calculations made for material and labor:

$$\text{Escalation Payment} = \left(\frac{BLSi - BLSo}{BLSo} \right) \times Ei \times C \times TC$$

where

TC = target cost of contract

C = labor or material % of target cost subject to escalation

Ei = percentage of total labor or material cost apportioned to period i

BLSi = average value of the appropriate index for period i

BLSo = value of the appropriate index for the base month specified at the time of pricing

F. MARSHALL METHOD (OPTION FFG-7)

> It is apparent from recent bids on our ships that the inflation and general economic uncertainty in the investment-intensive shipbuilding industry are causing shipbuilders to be wary of fixed price long term contracts unless they receive reasonable protection against the financial risks involved in projects which take so long to complete and are so impacted by costs over which the shipbuilder has little control.
>
> There are actions which can be taken and are being taken to lessen these problems. We are negotiating with the contractors to provide more realistic contract provisions particularly in escalation clauses to reduce his economic risk. This will also help the government avoid future claims and should help to achieve better shipbuilder performance.

The quotation above was made by Vice Admiral J.H. Doyle, Jr., U.S.N., Deputy Chief of Naval Operations for Surface Warfare, at the FY 75 Senate Appropriations Committee hearings. The inflation rates of the 1973-75 period necessitated a review of escalation provisions.

Since 1975, shipbuilding contracts have contained escalation clauses similar to the DDG-7 contract clause (Appendix B). Called the Marshall Method or 1975 Method, it was derived by LCDR Clyde Marshall, formally assigned to the Naval Material Command (MAT-0233). With this method, no escalation curves are specified in the contract, and the escalation is paid based on actual costs incurred. Since actual costs are used, there is no need for a contractual Labor/Material split. Payments are determined by first "de-escalating" all incurred costs to base month values using the appropriate escalation indices. The difference between actual costs incurred and the calculated base month cost is then reimbursed as escalation.

Payments are usually determined monthly as follows, with separate calculations made for material and labor:

$$\text{Escalation Payment} = ACi - ACo \left(\frac{BLSo}{BLSi}\right)$$

where

ACi = actual escalatable cost incurred in period i

BLSi = value of the appropriate index for period i

BLSo = value of the appropriate index for the base month specified at the time of pricing

Escalatable costs, in the Marshall Method, are defined in terms of direct material, direct labor, and a fixed percentage of indirect costs. Escalation payments on indirect costs are made on the basis of the Labor Index. The portion of escalatable indirect costs are added to direct labor costs prior to determining labor escalation.

G. COMPARATIVE TABLES

The following tables are representative of the AOR-7 class contract but have been adjusted for purposes of comparison of the two clauses.

TABLE 5

REPRESENTATIVE NUMBERS UTILIZED TO COMPARE AOR-7 AND FFG-7 CONTRACT ESCALATION CLAUSES

Target Cost (TC)	$40,000,000
Target Profit (TProf)	$ 3,800,000
Target Price (TP)	$43,800,000
Ceiling Price (CP)*	$50,000,000
Share Ratio	80/20 (Govt./Contr.)
Pt. of Total Assump. (PTA)**	$47,750,000
Base Month	April 1972
Delivery Date	30 June 1975

*Ceiling Price is 125% of Target Cost.

**Point of Total Assumption is the point where all cost sharing ceases and the contractor absorbs all additional cost growth. Peculiar to FPIF contracts with ceiling prices. Determined as follows:

$$PTA = \frac{CP - TP}{\text{Gov't Share}} + TC$$

$$= \frac{\$50M - \$43.8M}{.8} + \$40M$$

TABLE 5

NUMBERS UTILIZED TO SIMULATE ESCALATION PAYMENTS UNDER CONTRACT CURVE METHOD AND MARSHAL METHOD (IN MILLIONS CF DOLLARS)

			TARGET	ACTUAL COSTS			
QTR	MON	YR	COST	TOTAL	MATERIAL	LABOR	INDIRECT
1	JUL	72			.2	.05	.05
	AUG		.68	1	.2	.05	.1
	SEP				.2	.05	.1
2	OCT				.3	.05	.15
	NOV		2.28	2	.4	.1	.25
	DEC				.4	.1	.25
3	JAN	73			.6	.1	.3
	FEB		4.88	3	.6	.1	.3
	MAR				.6	.1	.3
4	APR				.7	.15	.35
	MAY		5.64	4	.9	.15	.35
	JUN				.9	.15	.35
5	JUL				1.3	.1	.5
	AUG		5.12	6	1 4	.1	.5
	SEP				1.5	.1	.5
6	OCT				1.5	.1	.4
	NOV		4.2	6	1.5	.1	.4
	DEC				1.5	.1	.4

TABLE 6 (Cont'd)

QTR	MON	YR	TARGET COST	ACTUAL COSTS TOTAL	MATERIAL	LABOR	INDIRECT
7	JAN	74			1.3	.1	.3
	FEB		3.92	5	1.3	.1	.3
	MAR				1.0	.3	.3
8	APR				.7	.4	.3
	MAY		4.0	4	.6	.5	.3
	JUN				.5	.4	.3
9	JUL				.4	.4	.2
	AUG		3.76	4	.4	.4	.2
	SEP				.8	.8	.4
10	OCT				.5	.3	.3
	NOV		2.92	3	.4	.3	.3
	DEC				.4	.2	.3
11	JAN	75			.6	.2	.3
	FEB		1.96	3	.6	.2	.2
	MAR				.5	.2	.2
12	APR				.4	.2	.2
	MAY		.64	2	.3	.2	.15
	JUN				.3	.15	.1
13	JUL				.3	.15	.1
	AUG			1	.1	.1	.1
	SEP					.05	.1
TOTALS			$40.0	$44	$26.0	$7.4	$10.6

TABLE 7

COMPARISON OF TWO SHIPBUILDING CONTRACTS

Ship	AOR-7	FFG-7
Contractor	National Steel	Bath Iron Works
Escalation Method	Contract Curve	Marshall
Based on Target Cost (TC)	94%TC	Actual
Labor (L)	33%L	Costs
Material (M)	61%M	Incurred
Expenditure Curve Adjusted	No	Not Applicable
Escalation Beyond Delivery Date?	No	Yes, Index Ceil is Del'y Date
Limited by Ceiling Price	No	Yes (Base Cost)
Adjustment Based on:	BLS	BLS
Base Month:	April 1972	May 1974
Payment Frequency	Quarterly	Monthly
Payments Limited by Total Incurred Costs	95%	100%
Index Publication Delay-Payments by Projection:	Yes 4 Qtr Avg	Yes 3 Month Avg

III. TEACHING NOTE

A. CASE OBJECTIVES

The intracacies of long term major weapons systems acquisition necessitates detailed examination of specific clauses to measure their effect on the overall completion of the contract. The objective of this case is for the machination of an escalation clause to be studied and comprehended in an environment of rapidly changing price levels.

The essential characteristics of an escalation clause must be present in order for the clause to operate effectively. They are: the prices to be covered, the measurement of the change in the prices covered, the timing of the measurement for escalation, and the formula detailing compensation for incurred escalation. In addition to these characteristics, the escalation provisions should not create an environment wherein a less aggresive cost reduction attitude exists on the part of the contractor, or wherein excessive administrative costs are required to implement the clause.

By focusing on two escalation clauses utilized in shipbuilding contracts, it is possible to measure different techniques used to create a similar goal: the elimination of inflation as a portion of risk to be encountered by a contractor.

The inclusion in this case of recent congressional testimony has attempted to illustrate the visibility and importance given to contracting difficulties in dealing adequately with the effects of inflation

B. QUESTIONS

1. If escalation clauses are needed to protect the contractor from price changes, what are some possible causes of price change?

There tend to be three causes of price change:

1. A general change in price levels -- inflation or deflation, i.e., an "economic" change,

2. Relative price changes due to supply and/or demand changes,

3. Increases in the contractor's input prices (prices of labor or contracted items from suppliers and subcontractors) resulting from relaxed bargaining with suppliers by the contractor because of the escalation provision.

The objective of escalation clauses is to adjust contracts for general changes in price levels. However, it is difficult to separate the second item above from the first item when writing an escalation clause. The price of labor may have increased when Anheuser-Busch opened a brewery in the Newport News area. This situation may increase the cost of labor at Newport News Shipbuilding Company, thus serving as a disadvantage to the Navy. The existing low cost of labor in Pascagoula, Mississippi, however, attracts labor to the Litton Shipyard upon a slight

increase in shipyard wages relative to the existing economy, yet labor costs remain lower than similar costs nationwide. This situation serves as an advantage to the Navy. Escalation might respond to any price change and must be used carefully so as not to dis-incentivize the Contractor from adjusting to new technology, local supply conditions, etc. The third cause of escalation is called the "moral hazard" because the Contractor's reliance on escalation may preclude him from diligently holding down the prices of his inputs. If prices are measured on a broad scale rather than on those of a particular contractor, this potential cause can be minimized or avoided. This broad scale measurement can be effected by utilizing a recognized price index upon which to base escalation.

2. Are there any advantages of the Marshall Method over the Contract Curve Method?

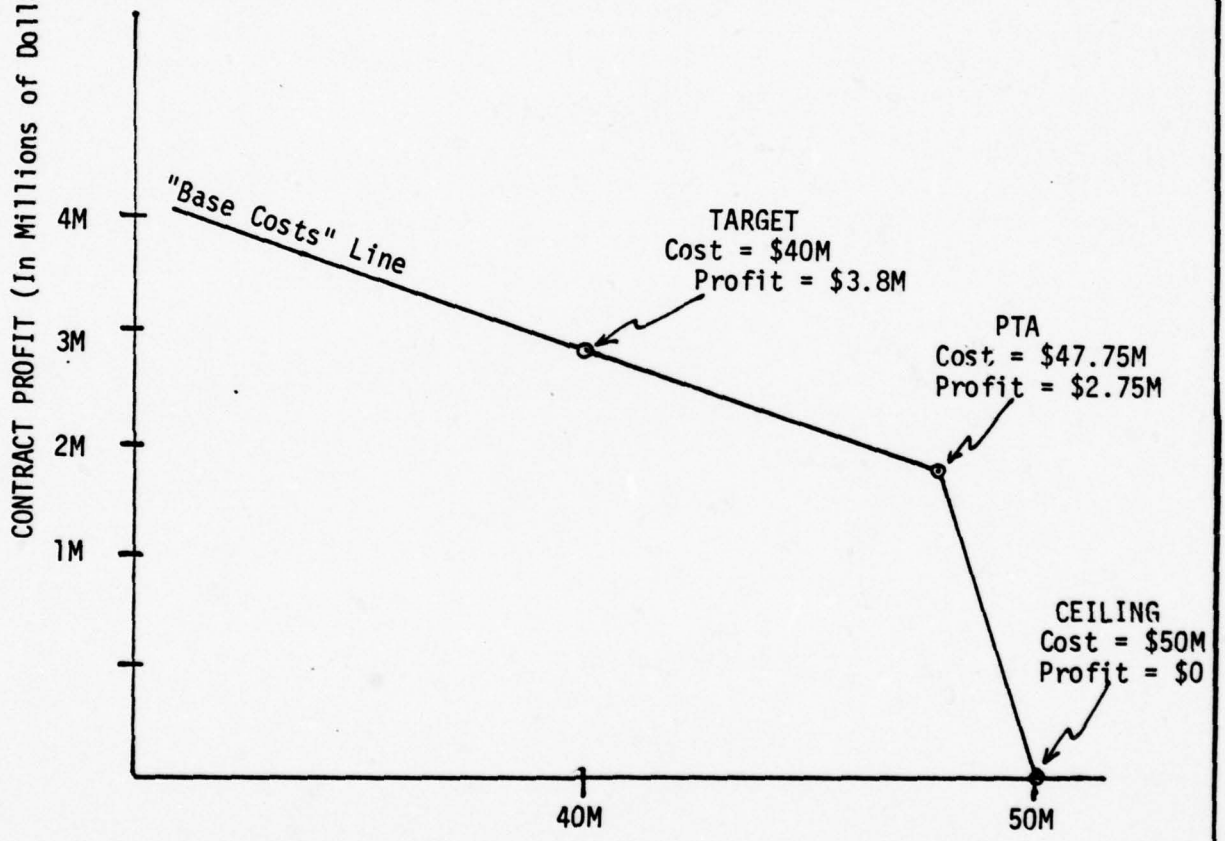
The major improvement of the Marshall Method over the Contract Curve Method is that under the Marshall Method escalation payments are based upon the actual timing of actual incurred cost and the payments continue until delivery. The continuation of escalation payments beyond contract delivery date is contingent upon two stipulations. First, the sum of the total de-escalated costs and all costs incurred not subject to escalation may not exceed the ceiling price. Second, a ceiling is placed on the BLS indices at some point after the contract delivery date. For the FFG-7, the ceiling on the BLS indices <u>is</u> the contract delivery date.

3. It seems that the contractor gets all of his actual

costs under the Marshall Method. What is the restraint upon him from irrationally spending an abnormal amount of money?

The Contractor should not be penalized for the occurance of inflation. The Marshall Method thus relieves the Contractor of this economic worry. Since the contract is priced in Base Costs according to a Base Month, the excess monthly costs over the Base Cost (as determined by the indices) constitute the escalation payment due to inflation, and only the Base Costs are added to the previous total of Base Costs. It is the total of these Base Costs that is compared to Target Cost in order to determine Profit. The graph on the next page illustrates the amount of profit due the Contractor as a function of the accuracy of his actual Base Costs in comparison to the contract's Target Cost.

MEASUREMENT OF BASE COSTS IN DETERMINING
AMOUNT OF PROFIT EARNED
(Numbers from Table 5)



4. Which method would you recommend for future use? How is contractor risk affected by each clause?.

The Marshall Method attempts to reimburse the Contractor for all price changes experienced over the life of the contract. Calculation of payments is not affected should either cost growth or schedule overrun occur. This is consistent with the conceptual purpose of escalation payments to reduce the Contractor's risk in bearing price changes over which he has no control, thereby reducing his need for contingency pricing. Under the Contract Curve Method, the expenditure curves for labor and material (Ei) are determined by the Navy based on an analysis of the historical data of the contract bidders, labor/material mix, material lead times, and fabrication requirements of the type of ship. The percentage of Target Cost subject to escalation (C) for labor and material is exclusive of those projected overhead costs which are fixed. The expenditure curves and labor/material mix are only an estimation of what will be achieved by the shipbuilder. The shipbuilder faces four elements of risk associated with the Contract Curve Method. First, the actual expenditures may occur at a later time than reflected in the predetermined curves, leading to undercompensation in terms of rising prices. Second, the predetermined labor/material mix may not be achieved. Third, escalation is not paid on costs incurred between target and ceiling, only on the predetermined percentage of Target Cost. Fourth, the index may not reflect the actual price level change experienced by a Contractor for a particular ship.

5. For illustration purposes, compute the amount of escalation payment due the contractor under each method for the months of January, February, March 1973; April, May,

June 1974; and January, February, March 1975. You will need to refer to Tables 3 through 6, and Appendices A and B (Figure on a quarterly basis for the Contract Curve Method).

Marshall Method:

JAN 73:

Labor: $.1 + (.75 \times .3) = .325$

$.325 - .325 \left(\frac{142.8}{152.5}\right) = \$20672$

Material: $.6 - .6 \left(\frac{123.0}{125.6}\right) = \$12420$

FEB 73:

Labor: $.1 + (.75 \times .3) = .325$

$.325 - .325 \left(\frac{142.8}{152.8}\right) = \$21250$

Material: $.6 - .6 \left(\frac{123.0}{126.2}\right) = \$15214$

MAR 73:

Labor: $.1 + (.75 \times .3) = .325$

$.325 - .325 \left(\frac{142.8}{152.5}\right) = \$20672$

Material: $.6 - .6 \left(\frac{123.0}{126.6}\right) = \$17062$

Qtr Totals: Labor: \$62614
Material: \$44696

APR 74:

Labor: $.4 + (.75 \times .3) = .625$

$$.625 - .625 \left(\frac{142.8}{166.6}\right) = \$89286$$

Material: $$.7 - .7 \left(\frac{123.0}{147.7}\right) = \$117062$$

MAY 74:

Labor: $.5 + (.75 \times .3) = .725$

$$.725 - .725 \left(\frac{142.8}{167.4}\right) = \$106541$$

Material: $$.6 - .6 \left(\frac{123.0}{152.0}\right) = \$114474$$

JUN 74:

Labor: $.4 + (.75 \times .3) = .625$

$$.625 - .625 \left(\frac{142.8}{167.4}\right) = \$91846$$

Material: $$.5 - .5 \left(\frac{123.0}{158.6}\right) = \$112232$$

Qtr Totals: Labor: \$287673
Material: \$343768

JAN 75:

Labor: $.2 + (.75 \times .3) = .425$

$$.425 - .425 \left(\frac{142.8}{180.4}\right) = \$88570$$

Material: $$.6 - .6 \left(\frac{123.0}{179.5}\right) = \$188858$$

FEB 75:

Labor: $.2 + (.75 \times .2) = .350$

$$.350 - .350 \left(\frac{142.8}{183.9}\right) = \$78222$$

Material: $.6 - .6 \left(\frac{123.0}{180.6}\right) = \$191362$

MAR 75:

Labor: $.2 + (.75 \times .2) = .350$

$$.350 - .350 \left(\frac{142.8}{187.1}\right) = \$82870$$

Material: $.6 - .6 \left(\frac{123.0}{183.1}\right) = \$196942$

Qtr Totals: Labor: \$249662
Material: \$577162

Contract Curve Method:

JAN - MAR 73 (QTR 3):

Labor: $152.5 + 152.8 + 152.5 \quad \frac{457.8}{3} = 152.6$

$$\left(\frac{152.6 - 142.8}{142.8}\right) \times .005 \times \$40000000 = \$13720$$

Mat'l: $125.6 + 126.2 + 126.6 \quad \frac{378.4}{3} = 126.1$

$$\left(\frac{126.1 - 123.0}{123.0}\right) \times .110 \times \$40000000 = \$110880$$

APR - JUN 74 (QTR 8):

$$\text{Labor: } 166.6 + 167.4 + 167.4 \quad \frac{501.4}{3} = 167.1$$

$$\left(\frac{167.1 - 142.8}{142.8}\right) \times .051 \times \$40000000 = \$347208$$

$$\text{Mat'l: } 147.7 + 152.0 + 158.6 \quad \frac{458.3}{3} = 152.8$$

$$\left(\frac{152.8 - 123.0}{123.0}\right) \times .043 \times \$40000000 = \$416756$$

JAN - MAR 75 (QTR 11):

$$\text{Labor: } 180.4 + 183.9 + 187.1 \quad \frac{551.4}{3} = 183.8$$

$$\left(\frac{183.8 - 142.8}{142.8}\right) \times .040 \times \$40000000 = \$459360$$

$$\text{Mat'l: } 179.5 + 180.6 + 183.1 \quad \frac{543.2}{3} = 181.1$$

$$\left(\frac{181.1 - 123.0}{123.0}\right) \times .006 \times \$40000000 = \$113376$$

6. What alternative is there to the inclusion of an escalation clause in a contract?

The alternative to an escalation clause is contingency pricing whereby the contractor, in pricing his contract proposal during contract formulation, "builds" into his estimates a provision to account for an assumed amount of inflation.

C. DD-963 MATERIAL INDEX

(The following material on the DD - 963 SPRUANCE Class Material Index is presented as an illustration of the importance of selecting relevent parameters in measuring price changes. The material can be utilized in classroom discussion or can be assigned for out-of-class assignment as a part of the basic case).

If a comparison of the components of the NAVSEA Material Index were made over a period of time, differences in price changes between the three components would be revealed. For Iron and Steel (10-1), prices had risen in 1975 to 203% of their 1960 level, while General Purpose Machinery (11-4) and Electrical Machinery (11-7) had risen to 183% and 134% of their 1960 respective levels.

Subgroups	1960	1966	1973	1975
10-1	100	101	146	203
11-4	100	100	146	183
11-7	100	94	114	134

If 11-7 had a weighting of 45% vice its actual weighting of 15%, and if 10-1 had a weighting of 15% vice its actual weighting of 45%, the Material Index at the end of 1975 would be much lower than its actual level. Thus the weightings of index elements can affect the behavior of the resulting composite index.

If a change in the weightings of elements will affect the behavior of the composite index, it seems reascnable

that a change in the elements selected for the composite index will also affect the composite index. The need to choose between using a standard or a unique material composition index was mentioned earlier under Part C, Measuring Price Changes. The following discussion illustrates the difference between using a standard NAVSEA Material Index and a unique material composition index that reflects the composition of materials actually utilized in the ship type construction. LT. D.D. Geismar, in a thesis entitled "Composition of Material Price Indices for Naval Ship Contract Escalation", compared escalation payments on the DD-963 contract using both the NAVSEA standard Material Index and a unique material composition index for the DD-963 class as shown below in Table 8:

TABLE 8

DD-963 CLASS MATERIAL INDEX

WPI Codes	Commodity	Weighting
10-1	Iron and Steel	4.1%
10-2	Non Ferrous Metals	3.7%
10-7	Fabricated Structural Products	4.7%
11-4	General Purpose Machinery	15.6%
11-7	Electrical Machinery	58.2%
11-94	Internal Combustion Engines	11.6%
13-92	Insulation Materials	2.1%
	Total	100.0%

If the above unique index had been grouped only along the three elements used by NAVSEA in its standard index, the weightings would have been as follows:

Subgroup	Standard Weight	DD-963 Weight
10-1	45%	24%
11-4	40%	46%
11-7	15%	30%

The DD-963 contract contained an escalation clause that determined escalation by the Contract Curve Method. By applying the escalation payment procedures in that clause first to the NAVSEA standard Material Index and then to the unique DD-963 Computed Material Index, LT. Geismar developed Table 9 shown on the next page. The difference in the cumulative escalation payments between the two composite material indices over the period of July 1970 to April 1975 shows that substantially more was classified as escalation using the standard index than if the unique DD-963 Class Index (Table 8) had been used. It must be remembered that it is possible that this escalation, based on the BLS published index, may not have been an overpayment when compared to the actual prices experienced by the contractor, since the indices are basically a benchmark based on the average of the industry to which the contractor is compared. The actual prices experienced by the contractor may have been above or below this average.

TABLE OF COMPARATIVE ESCALATION FIGURES

	WEIGHTED INDICES		PERIODIC ESCALATION PAYMENTS *(MILLION $)		CUMULATIVE ESCALATION PAYMENTS* (MILLION $	
PAYMENT DATE	NAVSEA INDEX	COMPUTED INDEX	NAVSEA INDEX	COMPUTED INDEX	NAVSEA INDEX	COMPUTED INDEX
10/70	114.1	110.5	1.209276	.859705	1.209276	.859705
1/71	115.2	111.6	1.339351	.989779	2.548627	1.849483
4/71	116.4	112.6	1.973459	1.477553	4.522086	3.327037
7/71	117.7	113.3	5.170424	3.772134	9.692511	7.099171
10/71	120.4	114.1	6.824798	4.497700	16.517303	11.596870
1/72	120.9	114.2	8.034076	5.190748	24.551376	16.787613
4/72	122.4	114.9	10.926181	6.902030	35.477554	23.689636
7/72	123.2	115.7	13.673985	8.845003	49.151535	32.534637
10/72	123.6	115.9	16.673798	10.731071	65.825333	43.265701
1/73	124.0	116.0	17.401382	11.070481	83.226715	54.336182
4/73	126.1	116.9	21.391006	13.194340	104.617722	67.530518
7/73	128.2	118.7	22.236176	17.376999	131.853897	84.907516
10/73	129.2	119.4	31.331467	20.076019	163.185364	104.983536
1/74	132.3	121.2	36.276291	23.012863	199.461655	127.996399
4/74	138.7	125.2	36.898193	23.366486	236.359848	151.362885
7/74	152.7	133.0	47.873154	29.317352	284.232910	180.680237
10/74	170.0	143.1	59.628571	36.123871	343.861328	216.804108
1/75	177.0	149.9	61.630478	39.520004	405.491699	256.323975
4/75	180.4	154.1	44.997314	30.053085	450.489014	286.376953

D. CONCLUSION

The Marshall Method utilizes actual expenditures in computing escalation payments. The Contract Curve Method computes escalation using scheduled expenditures. In attempting to draw comparisons between the Marshall Method and the Contract Curve Method, one must initially assess the value of using actual expenditures in lieu of scheduled expenditures. While actual expenditures (actual prices) will more effectively reduce the risks involved when operating in a period of rapidly rising prices, there is no incentive for the contractor to maintain his schedule. Under the Contract Curve Method, escalation payments follow the schedule of cost expenditures, and escalation payments stop upon reaching the scheduled contract delivery date. Should not this incentive remain for the contractor to complete his work on time? The incentive to complete on time should be present in the contract, of course, but perhaps not as a part of the escalation clause. The escalation clause, as provided in the Marshall Method, eliminates inflation as a contractual risk. It leaves for other contractual provisions the incentives for cost reduction and schedule adherence. One possible method of incentivizing schedule adherence is through the use of an Award Fee. Periodic reviews of the contractor's performance would result in the award of some percentage (up to 100%) of the period's available award fee dollars. This could be effected in addition to an incentive type contract. In other words, costs would be incentive fee-based, and schedule adherence would be award fee-based.

The Marshall Method is now being used on all new NAVSEA shipbuilding contracts. The BLS Material Composition Index,

using the established three elements and weights, is still being used as the material index. Its use is justified by the lower administrative costs encountered in its implementation. Reasons for adopting the Marshall Method are based on its four main advantages over the Contract Curve Method:

1. It is an equitable sharing of contract risk, consistent with the sharing inherent in an FPI contract.

2. It reduces contingency pricing which is consistent with the central purpose of basic DOD escalation policy.

3. It more accurately reflects cost growth due to economic factors as opposed to lack of production efficiencies.

4. It limits the maximum amount of escalation to that based on costs not to exceed ceiling price. Payments do not stop at scheduled delivery date, however a ceiling is placed on the index at some point on or after scheduled delivery date (Depending on the particular contract).

APPENDIX A

AOR-7 CLAUSE (CONTRACT CURVE METHOD)

ARTICLE 8. COMPENSATION ADJUSTMENTS (LABOR AND MATERIAL)

(a) Regardless of the actual changes in the cost of labor or materials during the performance of this contract, adjustments in compensation shall be made as provided in paragraphs (b) and (c) of this Article. Said adjustments are based solely on the changes in the Labor Index identified in paragraph (b) of this Article and the Material Index identified in paragraph (c) of this Article. Each Supplemental Agreement entered into pursuant to this Article shall set forth the calculations upon which the adjustments in compensation are made. For the purposes of this Article, 33% of the Target Cost shall be deemed to constitute the labor cost subject to adjustment and shall be apportioned as shown in the second column of Table 1 of paragraph (b) hereof. Similarly, 61% of the Target Cost shall be deemed to constitute the material cost subject to adjustment and shall be apportioned as shown in the second column of Table 2 of paragraph (c) hereof. No part of said Tables 1 and 2 shall be revised, unless this contract is partially terminated and then only as provided in subparagraph (f) (2) of this Article.

(b) Adjustments in compensation on account of changes in labor cost shall be made as follows for each quarterly period shown in the first column of Table 1 for this paragraph based on the changes in the Nationwide "Index of Changes in Straight Time Average Hourly Earning for Selected Shipyards" (June 1962 = 100) for steel ship construction herein sometimes called the "Labor Index", furnished to the Naval ShipSystems Command (Ed. note: Now called Naval Sea Systems Command) by the Bureau of Labor Statistics of the United States Department of Labor:

(1) The Labor Index for the base month of April 1972 shall be subtracted from the Labor Index for the quarterly period involved, determined in accordance with paragraph (d) below, and the difference computed as a plus or minus figure as the case may be.

(2) The aforesaid difference, whether plus or minus, shall be divided by the Labor Index for the base month and the resulting quotient carried to four decimal places.

(3) The aforesaid quotient shall be multiplied by the percentage of the Target Cost set forth in the third column of Table 2 below, opposite the quarterly period involved, and the resulting product carried to six decimal places.

(4) The aforesaid product shall be multiplied by $(Target Cost). The resulting amount shall constitute the

amount of the adjustment in compensation for the quarterly period involved.

(5) The amount of the adjustment in compensation shall be upwards or downwards depending upon whether the difference in the labor indices calculated in subparagraph (1) above is a plus or minus figure, as the case may be, and shall be set forth in a Supplemental Agreement to this contract.

TABLE 1

LABOR (33% of Target Cost)

Qtr	% of Labor	% of Target Cost
1	0.4	0.1
2	0.8	0.3
3	1.2	0.5
4	3.0	1.0
5	6.8	2.2
6	9.5	3.2
7	13.1	4.3
8	15.5	5.1
9	17.3	5.7
10	15.6	5.1
11	12.2	4.0
12	4.6	1.5
	100.0%	33.0%

(c) Adjustments in compensation on account of changes in material costs shall be made for each quarterly period shown in the first column of Table 2 below, based on the changes in the "Material Index for Naval Ship Systems Command Steel Vessels Contract", herein sometimes called the "Material Index", furnished to the Naval Ship Systems Command by the Bureau of Labor Statistics of the United States Department of Labor:

(1) The Material Index for the base month of April 1972 shall be subtracted from the Material Index for the quarterly period involved, determined in accordance with paragraph (d) below, and the difference computed as a plus or minus figure as the case may be.

(2) The aforesaid difference, whether plus or minus, shall be divided by the Material Index for the base month and the resulting quotient carried to four decimal places.

(3) The aforesaid quotient shall be multiplied by the percentage of the Target Cost set forth in the third column of Table 1 below, opposite the quarterly period involved, and the resulting product carried to six decimal places.

(4) The aforesaid product shall be multiplied by $(Target Cost). The resulting amount shall constitute the amount of the adjustment in compensation for the quarterly period involved.

(5) The amount of the adjustment in compensation shall be upwards or downwards depending upon whether the difference in the labor indices calculated in subparagraph (1) above is a plus or minus figure, as the case may be, and shall be set forth in a Supplemental Agreement to this contract.

TABLE 2

MATERIAL (61% of Target Cost)

Qtr	% of Material	% of Target Cost
1	2.5	1.5
2	8.5	5.1
3	18.0	11.0
4	20.0	12.2
5	16.0	9.8
6	11.0	6.7
7	8.0	4.9
8	7.0	4.3
9	5.0	3.1
10	3.0	1.8
11	1.0	0.6
12	-	-
	100.0%	61.0%

(d) For the purpose of this Article:

(1) The first quarterly period shall commence on the first day of the calendar month following the effective date of the contract.

(2) The term, "Target Cost", as referred to herein, shall be the target cost in effect at the effective date of this contract.

(3) For the purposes of computing the amount of adjustment in compensation, the amount of Target Cost set forth in subparagraphs (b) (4), and (c) (4) shall not be revised unless this contract is partially terminated and then only to the extent provided in paragraph (f) (2) of this Article.

(4) The Labor Index and Material Index for a quarterly period shall be the arithmetical average carried to one decimal point of the Labor Index or Material Index, as the case may be, for each of the three months comprising such quarterly period.

(e) Nothing contained in this Article shall be construed as prohibiting the inclusion of changes in the cost of labor or material in any adjustment in the target cost, target profit, target price, ceiling price, or total final price provided for under any other provision of this contract.

(f) (1) If this contract is terminated in whole, for any reason, no compensation shall be made under this Article for any quarterly period subsequent to the quarterly period during which the contract is terminated.

(2) In the event that this contract is terminated in part, and such partial termination terminates the completion of one or more vessels, then, notwithstanding any other provision of this Article, the target cost set forth in paragraphs (b) and (c), the percentages of target cost set forth in paragraph (a), and each column of Table 1 of paragraph (b) and table 2 of paragraph (c) shall be adjusted for the reduction in the number of vessels to be completed under this contract.

(g) Deferred payments for escalation shall be paid promptly, upon submission of invoices, whenever such payment, when added to the total of all payments previously

made under the contract, would not exceed ninety-five percent (95%) of the costs certified by the Contractor on such invoice to have been incurred by it in the perfcrmance of the contract. Upon delivery of the last vessel under this contract, any remaining deferred payments for escalation shall, upon submission of invoices, be promptly paid. In the event that the amount shown in any Supplemental Agreement pursuant to paragraphs (b) and (c) above is a minus figure, such amount shall be deducted from the next invoice(s) presented for payment under this contract until such amcunt has been offset or recouped in full.

(h) No adjustment shall be made in the target cost, target price, or ceiling price on account of upwards or downwards adjustment in compensation made in accordance with this Article and hence said adjustments are outside the incentive price revision formula provided for in Article 8, "INCENTIVE PRICE REVISION (FIRM TARGET)". Acordingly, even if the ceiling price is exceeded, amounts otherwise payable to the Contractor in accordance with this Article shall continue to be paid.

(i) Any dispute arising under this Article shall be determined in accordance with prcvisions of the "DISPUTES" clause of the contract.

(j) In the event that the labor or material indices for the quarterly period involved have not been furnished tc the NAVSEA by the Bureau of Labor Statistics by the end of the ensuing quarter, compensation adjustments for the quarterly pericd involved shall be made based on upon the average of the cha nges in the indices for the preceding four quarters for which indices have been computed and furnished by the BLS. The average of changes so calculated shall be added to the applicable index for the immediately preceding quarterly period and the sum shall constitute the labor or material index for the quarterly period involved. When an index for the quarterly period involved is computed and furnished by BLS, the Contractor shall reflect any required corrections for the quarterly period involved in the submittal for adjustment for the following quarter.

APPENDIX B

OPTION FFG-7 CLAUSE (MARSHALL METHOD)

(a) General

The contract price agreed to by the parties reflects the labor and material price levels of the base month identified in paragraph (d) below. It is anticipated that the Contractor's actual costs for labor and material may change from the labor and material costs projected on the basis of such price levels and the parties desire to provide for adjustment to the compensation to reflect such changes. However, regardless of the actual changes in the costs of labor and material experienced during the period of performance, compensation adjustments shall be computed and effected solely on the basis of monthly changes in the Labor and Material Indices identified below, in accordance with the procedures specified herein.

(b) Monthly Period

Except as hereinafter provided in paragraph (e), adjustments in compensation shall be made for each monthly period following the effective date of this contract until delivery of the last vessel to be delivered under the contract. For the purpose of this Article, a "monthly period" or "monthly period involved" shall begin on the first day of a calendar month and shall end at the end of the last day of that calendar month; except that "monthly period" shall include the calendar months of the effective date of this contract and the delivery date of the last vessel to be delivered under the contract, respectively.

(c) Costs Subject to Compensation Adjustment

(1) For the purpose of this Article, the elements of cost which will comprise the monthly costs of the contract subject to adjustment are (i) direct material costs, (ii) direct labor costs, and (iii) 75% of indirect costs; the remaining 25% of indirect costs are not subject to adjustment. The costs subject to compensation adjustment under this Article include the costs of performance of change orders or other work for which the contract price is subject to adjustment pursuant to the "Changes" clause or pursuant to other provisions of the contract. Accordingly, all such contract price adjustments shall be priced on the basis of the labor and material price levels of the base month identified in paragraph (d) below. For the purpose of this contract, the terms "direct material costs", "direct labor costs", and "indirect costs" shall have the meanings and shall be allowable in accordance with Section XV of the Armed Forces Procurement Regulations in effect on the date of this contract.

Within 15 days following the end of each monthly period, the Contractor shall submit to the Government (i) a certified statement of the costs incurred by vessel, for each vessel under the contract during that monthly period ("monthly costs") and (ii) a certified statement of the total cumulative costs incurred for all vessels under the contract from the effective date of the contract to the end of that monthly period ("total costs"). The statement of monthly costs shall separately identify the direct material costs, the direct labor costs, and the indirect costs incurred during that monthly period for each vessel.

(3) For the purpose of this Article, monthly costs and total costs are costs which are "incurred costs" as that term is defined in paragraph (a) (iii) of Article 4, "Payments", except that:

(i) incurred costs for material shall also include the full amounts of all billings received from vendors during the monthly period involved, whether or not the Contractor has paid the full amount of such billings.

(ii) incurred costs shall exclude the amounts determined in accordance with the contract provisions identified in paragraph (a) (1) (ii) of Article 6, "INCENTIVE ncentive Price Revision" of this contract (Ed. note: any items fully forward priced and separately accounted for).

(4) The costs identified in the preceding subparagraphs shall be subject to Government verification upon submission by the Contractor of the certified statements of such costs.

(d) Labor and Material Indices

(1) Adjustments in compensation of account of changes in direct material costs shall be based on the changes in the "Index for Steel Vessel Contracts", (1967 = 100) (herein sometimes called the "Material Index") furnished to tee Naval Sea Systems Command by the Bureau of Labor Statistics of the Department of Labor (BLS). For the purpose of this contract, the base month for the Material Index shall be May 1974 (Ed. note: Student should utilize the base month given in Table 3).

(2) Adjustments in compensation of account of changes in direct labor costs and on ccount of 75% of indirect costs shall be based on the changes in the "Indexes of Change in Straight-Time Average Hourly Earnings for Selected Shipyards for Steel Vessel Construction and All Regions" (June 1962 = 100) (herein sometimes called the "Labor Index"), furnished to the Naval Sea Systems Command by the Bureau of Labor Statistics of the Department of Labor (BLS). For the purpose of this contract, the base month for the Labor Index shall be May 1974 (Ed. note: Student should utilize the base month given in Table 3).

(3) In the event that the Labor or Material Index, or both, for the monthly period involved is unavailable to the Contractor at the end of that monthly period, compensation adjustments pursuant to this Article shall be based upon the average of monthly changes in the applicable Index for the previous 3 months for which BLS indices are available. The average of changes so calculated shall be added to the applicable index for the immediately preceding monthly period and the sum shall constitute the Labor or Material Index for the monthly period involved. When the BLS Index for that monthly period has been made available, the compensation adjustment for that monthly period shall be recomputed on the basis of such BLS Index, and any additional payment to or repayment by the Contractor required by such recomputation for that monthly period shall

be reflected in any invoice(s) thereafter submitted for payment under any provision of this contract until such amount has been paid, offset or recouped in full.

(4) In the event that the Final Labor or Material Index, or both, for any monthly period differs from the Labor or Material Index previously made available by BLSfor that monthly period, the compensation adjustment for the monthly period shall be recomputed on the basis of such Final Index and any additional payment to or repayment by the Contractor required by such recomputation for that monthly period shall be reflected in any invoice(s) submitted theeafter for payment under any provision of this contract until such amount has been paid, offset or recouped in full.

(5) The Contractor shall be responsible for the calculations involving the Indices provided for in this paragraph and said calculations shall be subject to verification by the Government.

(e) Computation

(1) The direct material costs for each vessel certified on the statement of monthly costs shall be multiplied by the base month Material Index and the product thereof shall be divided by the Material Index for that monthly period, provided however, that in respect of any monthly period commencing after the delivery date then set forth in Section H for such vessel to be delivered under the contract, the above product shall be divided by the Material Index for the monthly pericd of the aforesaid contract delivery date or by the Material Index for that monthly period, whichever is the lesser; provided, further, that in the event thereafter such contract delivery date is extended for reasons of Government responsibility or excusable delay, the compensation adjustment for each month of such extention shall be recomputed on the basis of the Material Index for such month. The result of each computation for each vessel shall be expressed in dollars and cents.

(2) The direct labor costs plus 75% of the indirect costs certified on the statement of monthly costs for each vessel shall be multiplied by the base month Labor Index, and the product therof shall be divided by the Labor Index for that monthly period; provided however, that in respect of any monthly period commencing after the delivery date then set forth in Section H for such vessel to be delivered under the contract, the above product shall be divided by the Labor Index for the monthly period of the aforesaid contract delivery date or by the Labor Index for that monthly period, whichever is the lesser; provided, further, that in the event thereafter such contract delivery date is extended for reasons of Government responsibility or excusable delay, the compensation adjustment for each month of such extention shall be recomputed on the basis of the Labor Index for such month. The result of each computation for each vessel shall be expressed in dollars and cents.

(3) The amounts of the results of (1) and (2) above, for each vessel, and the amount of the 25% of indirect costs for each vessel certified on the monthly statement which are not subject to adjustment shall be added, and the sum shall constitute the "Base Cost" for such vessel for that monthly period.

(4) The Base Cost for each vessel for the monthly period involved shall be subtracted from the monthly costs of such vessel and the resulting difference (plus or minus) shall constitute the amount of the adjustment in compensation for the monthly period involved for each

vessel, provided, however, that no adjustment in compensation shall be made in the event that the cumulative sum of the Base Costs of all vessels for all preceding months exceeds the Ceiling Price then set forth in the contract; provided, further, that in the event the Ceiling Price thereafter is increased, adjustment in compensation shall be made for each month that the cumulative sum of the Base Costs of all months preceding such month does not exceed such increased Ceiling Price.

(5) The amount of the adjustment in compensation for each vessel determined as above, (plus or minus), shall be set forth in a Supplemental Agreement to this contract, which also shall set forth the computations upon which the adjustment in compensation is based.

(6) In the event that the amount shown in any Supplemental Agreement pursuant to subparagraph (e)(5) above is a minus figure, such amount shall be deducted from any invoice(s) presented for payment under any provision of this contract until such amount has been offset or recouped in full.

(f) Payment of Compensation Adjustment

Payments of amounts of compensation adjustment under this Article shall be made monthly, after submission and verification of the information and calculations required by paragraphs (c), (d), and (e) above, and after execution of the Supplemental Agreement pursuant to subparagraph (e)(5) above, and upon submission of proper invoices by the Contractor, subject to any adjustments pursuant to subparagraphs (d)(2), (d)(3) and (e)(6), as applicable; provided, that any such payment shall be deferred to the extent of the amount that such payment, when added to the total of all payments previously made under the contract (other than payments made pursuant to paragraphs (b) and (d) of Article 4, "Payments") would exceed the amount of the total costs. Payment of such deferred amount shall be made promptly, upon submission of proper invoices by the Contractor, whenever such amount, or portion of such amount, when added to the total of all payments made under the contract (other than payments made pursuant to paragraphs (b) and (d) of Article 4, "Payments") would not exceed the amount of total costs. Upon delivery of the last vessel under this contract, any remaining deferred payments for compensation adjustments shall, upon submission of proper invoices by the Contractor and verification thereof by the Contracting Officer, be promptly paid.

(g) Inspection of Records

The Contractor shall maintain and make available for inspection by the Contracting Officer or his duly authorized representatives, in addition to such books, records, and papers otherwise required under this contract to be maintained and made available to the Government for examination, such books, records, and papers as may be necessary (i) for the verification of the costs certified by the Contractor have been incurred, and (ii) for the evaluation and substantiation of any compensation adjustment requested under the provisions of this Article. Errors in the statements of costs incurred and/or in the computation of compensation adjustments shall be corrected promptly, and such correction shall be reflected in the next invoice submitted after such correction. (Failure of the Contractor to comply with any provision of this paragraph (g) shall constitute proper grounds for the withholding of any and all payments under any provision of the contract until such time

as the Contractor fully complies with all provisions of this paragraph to the satisfaction of the Contracting Officer.)

(h) Disputes

Any dispute arising under this clause shall be determined in accordance with provisions of the "Disputes" clause of Section L.

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