APPENDIX H: SCAN CASE

GOVERNMENT HANDOUT

SCAN ELECTRONICS COMPANY

Information Available to Both Government And Contractor Sides

During the year 199X, Mr. Arthur Fields, contracting officer for the Air Systems Command, received a purchase request for the buy of "Inflight Performance Indicators" (Model 202-4) which are manufactured by the Scan Electronics Company, Automatic Control Division, Cleveland, Ohio.

These inflight indicators were developed by the Automatic Control Division as Built-In Test Equipment (BITE) to serve as a replacement for a piece of rather complicated Aerospace Ground Equipment (AGE) which is presently required for "go/no-go" type of electrical circuit check.

Scan's initial contract with the Government called for the development of the Aerospace Ground Equipment presently being used. It was while working on this contract that one of Scan's design engineers, Ted Lyle, developed the concept and proposed that it be passed to the Air Systems Command for possible further development. Ted was sure that his end product would be light weight, compact and reliable. The Built-In Test Equipment would give the pilot the added advantage of inflight checks just prior to landing as opposed to the present preflight with the existing AGE. After further in-house study, Ted Lyle won his case primarily on the basis of the commercial market.

After a feasibility study the Air Systems Command signed a contract with Scan Electronics Company which called for the development and test of prototype units plus the manufacture of ten (10) additional units for further test after inspection, test, evaluation and acceptance of the first unit. The Scan Electronics Company agreed on a 50/50 cost sharing arrangement for the development effort on the basis that the end item could and would be sold in the commercial market. The contract provided that under the terms of the sharing arrangement, the contractor would have the exclusive right to the inventions, patents and technical information resulting from the research.

The Scan Electronics Company was motivated to apply their best effort and assume considerable risk on the premise it would mean considerable follow-on commercial and Government business if the item proved successful.

Under their development contract, test of the prototype and subsequent field tests of the additional 10 units exceeded the Government and contractor's best expectations.

The Government is interested in purchasing 500 of these units spread over 12 months during the first year of production. Scan has submitted the proposal which appears on the accompanying pages for $1,242,885. The proposal assumes the application of learning curve theory.

The following information was submitted by the contractor as supporting data to the SF 1411 for 500 Inflight Performance Indicators:

Cost Elements		Total Cost	Unit Cost	Reference
a. Purchased Parts				
b. Subcontracted Items				
1.	1) Raw Materials	$150,000.00	$300.00	
	2) Standard Commercial Items			
	3) Interdivisional Transfers (at other than cost)			
2. Material Overhead 8%		12,000.00	24.00	
3. Interdivisional Transfers at Cost				
4. Direct Engineering Labor		3,600.00	7.20	
5. Engineering Overhead 200%		7,200.00	14.40	
6. Direct Manufacturing Labor		225,000.00	450.00	
7. Manufacturing Overhead (183% of Direct Labor)		412,500.00	825.00	
8. Other Costs		137,745.00	275.49	
9. SUBTOTALS		$948,045.00	$1,896.09	
10. General and Administrative Expenses 14%		132,725.00	265.45	
11. Royalties				
12. Federal Excise Tax				
13. SUBTOTALS		$1,080,770.00	$2,161.54	
14. Profit or Fee 15%		162,115.00	324.23	
15. TOTAL PRICE (Amount)		$1,242,835.00	$2,485.77	

Discussion On The Use Of Learning Curves

The unit price is largely affected by the rate of learning which is shown by the learning curve slopes for direct material and direct manufacturing labor. The faster SCAN "learns" how to produce the item, the lower the costs and percentage of the slope of the learning curve. Consequently, the Government prefers to assume learning curves with lower slopes. For example, the Government would prefer a slope of 74 percent versus a slope of 78 percent.

In contrast to the Government's position, contractors prefer higher slopes because that indicates a slower rate of learning and corresponding higher direct material and labor costs. Thus, if the actual rate of learning (or slope of the learning curve) is lower than what is negotiated the contractor earns more profit. Conversely, contractor profits are reduced if the actual learning curve slope is higher than what was negotiated.

The direct material and manufacturing labor costs are also affected by the units of production. The per unit costs are higher if the contractor produces only 500 than if the contractor produces more than 500 even when the slope is the same. Since all learning "curves" slope downward, costs to produce additional units get lower and lower. Consequently, the costs for the first 500 units are greater than the cost for acquiring 500 units spread out over a longer production run.

Direct Material Unit Cost*

	Units of Production					
Slope	500	1000	1500	2000	2500	3000
93%	$204	190	182	176	172	169
94%	220	207	200	195	192	188
95%	238	227	220	215	212	209
96%	257	248	242	238	235	232
97%	278	270	265	262	260	257
98%	300**	295	291	289	287	285

*Assuming a first unit cost of $350.
**Direct material unit cost used in SCAN proposal.

Direct Manufacturing Labor Unit Cost*

	Units of Production					
Slope	500	1000	1500	2000	2500	3000
86%	$235	203	186	175	166	160
87%	256	223	206	194	186	179
88%	278	245	227	216	207	200
89%	302	269	251	239	230	224
90%	327	295	277	265	257	250
91%	355	323	306	294	285	278
92%	384	354	337	326	317	310
93%	416	387	371	360	352	345
94%	450**	424	409	398	390	384

* Assuming first unit cost is $715.
**Unit cost used in SCAN proposal.

SCAN ELECTRONICS COMPANY

Government Confidential

Accounting and Learning Curve Data

During the Defense Contract Audit Agency visit, the Auditor was able to trace Scan's costs. As a result, the proposed overhead rates for material overhead, engineering overhead, manufacturing overhead and G&A are acceptable. The other costs of $137,745 were analyzed and found to be acceptable for this initial acquisition. Also, the engineering labor hours and engineering labor rates were found to be very realistic and therefore the Auditor recommended that the proposed engineering cost be accepted.

In discussing the application of the learning curve on this proposal, the company indicated that since they applied learning curves to direct material costs and direct manufacturing labor costs on the original AGE contract, they also applied learning curves to these cost elements in the current proposal. They said they used a projected first unit cost of $350 per unit for direct material and applied a 98% learning curve slope which they projected over the 500 units with a resulting average rounded cost of $300 per unit. For direct manufacturing labor they used a projected first unit cost of $715 per unit and applied a 94% learning curve slope which they projected over the 500 units with a resulting average rounded cost of $450 per unit.

However, the Auditor indicated that the learning curve range for the electronics industry has been running anywhere from 87% to 94% for direct manufacturing labor costs and from 95% to 98% for direct material costs. The Auditor has determined that the projected first unit costs for direct material and direct manufacturing labor are reasonable and acceptable.

Marketing and Production Data

There appears to be considerable commercial aviation interest with respect to the Inflight Performance Indicators. The contract administrator on the AGE equipment said that Scan has placed ads in several technical publications and that marketing representatives have personally called on several large prospective buyers. **From what the Government could gather, it appears that the Production Department is planning on producing approximately 2,000 units the first year (500 for this Government contract and 1,500 for commercial buyers)**. However, the proposal is priced with the **assumption that SCAN will not have any commercial business and will only produce the 500 units the government is ordering. The Government would like to price the contract for 500 units over a anticipated production run of at least 2000 units because the unit cost will be considerably lower. Moreover, your boss, the Director of Contracts, has insisted that the order be priced to include commercial production in order to take advantage of the anticipated economies scale.**

Requirements

Identify issues and develop minimum, objective and maximum negotiation price positions and be prepared to negotiate these positions. In developing your price positions consideration should be given to the fact that the delivery schedule for the 500 units is for 41 or 42 units per month over a one year period. The type of contract needed is a firm-fixed price contract.

The Government wants these initial 500 units and would also like to negotiate a firm-fixed price contract. The Government is also interested in obtaining a fair and reasonable price for the 500 units.

When negotiating contract price, do not "bottom line" price without justifying each cost element. In this regard, you will have to negotiate learning curve percentages for both direct material costs and direct manufacturing labor costs. Moreover, since the costs attributable to the learning curve percentages also depend on the number of production units, **you will also have to get agreement on the anticipated number of units to be produced.** (Remember: The Director of Contracts has directed that the order be priced with commercial business to take advantage of anticipated economies of scale. The Director has even made an analogy that new Fords would be priced over $1 million each if the company priced their cars at the start of the model year based on the actual number of orders received instead of anticipated sales.

CONTRACTOR HANDOUT

SCAN ELECTRONICS COMPANY

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The Scan Electronics Company was motivated to apply their best effort and assume considerable risk on the premise it would mean considerable follow-on commercial and Government business if the item proved successful.

Under their development contract, test of the prototype and subsequent field tests of the additional 10 units exceeded the Government and contractor's best expectations.

The Government is interested in purchasing 500 of these units spread over 12 months during the first year of production. Scan has submitted the proposal which appears on the accompanying pages for $1,242,885. The proposal assumes the application of learning curve theory.

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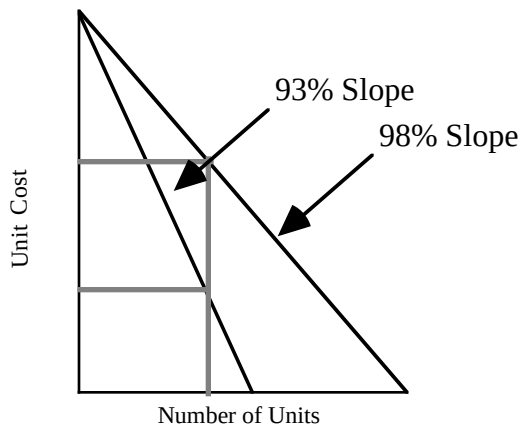
In contrast to the Government's position, contractors prefer higher slopes because that indicates a slower rate of learning and corresponding higher costs. Thus, if the actual slope of the learning curve is lower than what is negotiated the contractor earns more profit. Conversely, contractor profits are reduced when the actual learning curve slope is higher than what was negotiated.



The direct material and manufacturing labor costs are also affected by the units of production. The per unit costs are higher if the contractor produces only 500 than if the contractor produces more than 500 even when the slope is the same. Since all learning "curves" slope downward, costs to produce additional units get lower and lower. Consequently, the costs for the first 500 units are greater than the cost for acquiring 500 units spread out over a longer production run.

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92%	384	354	337	326	317	310
93%	416	387	371	360	352	345
94%	450**	424	409	398	390	384

* Assuming first unit cost is $715.
**Unit cost used in SCAN proposal.

SCAN ELECTRONICS COMPANY

Contractor Confidential

Accounting Department

Personnel of the Accounting Department reported that during the Defense Contract Audit Agency visit, the Auditor was pleased with respect to our traceability of costs, and agreed with the overhead and G&A rates used on our proposal. Also, the Auditor found the engineering labor hours and engineering labor rates to be realistic and apparently has recommended that the proposed engineering costs be accepted. Other costs of $137,745 were analyzed and found acceptable and were recommended for approval.

The Auditor, however, asked some very pointed questions with respect to a learning curve. Perhaps the negotiator should be prepared for this one since the learning curve was applied to direct manufacturing labor costs and direct material costs in the contract with the Air Systems Command on the original AGE contract.

The learning curve range for the electronics industry has been running anywhere from 87% to 94% for direct manufacturing labor costs and from 95% to 98% for direct material costs. The application of the learning curve was considered in the current proposal sent to the Air Systems Command. Using the projected first unit cost of $350 per unit for direct material, a 98% learning curve slope was projected over the 500 units with a resulting average rounded cost of $300 per unit. Using the projected first unit cost of $715 per unit for direct manufacturing labor, a 94% learning curve slope was projected over the 500 units with a resulting average rounded cost of $450 per unit. The Government Auditor also indicated that the projected first unit costs for direct material ($350) and direct manufacturing labor ($715) are reasonable and acceptable to the Government.

Since SCAN does not yet have any commercial orders to include in the production run, the proposal is priced using a learning curve costs covering just 500 units of production . The prospect that the Government will buy 500 units is the only potential order so far received by the company.

Marketing

Commercial aviation interest with respect to the Inflight Performance Indicators has exceeded even the most liberal estimates of the department. Marketing representatives have personally called on several large prospective buyers and ads have been placed in several technical publications. Even at this early date, orders for as many as 3,000 units annually over the next three years may appear to be realistic marketing estimates. However, the Vice President for Marketing suggests that the contract negotiator not be overly optimistic on sales since economic conditions can have an adverse impact on any sales forecast.

Production Department

The production plan for the Inflight Performance Indicators and associated spare parts calls for a separate production line at the Automatic Controls Division, located at Cleveland, Ohio. Existing space has been available for the production line and machinery is being moved into place. The production

schedule calls for 2,000 units plus associated spares during the first year including the proposed 500 units for the Air Systems Command. The delivery schedule for the 500 units is for 41 or 42 units per month. The second year delivery schedule is for 3,000 units and then levels off at 3,000 to 4,000 units during the third year.

Requirements

Identify issues and develop maximum, objective, and minimum negotiation price positions and be prepared to negotiate these positions. Consideration should be given to the fact that the delivery schedule for the 500 units is for 41 or 42 units per month and the type of contract anticipated is a firm-fixed price contract. The Government wants only 500 units. **At this time our company is very interested in obtaining this Government business as it could have a favorable impact on not only future Government business but also on our commercial customers. Because the company contributed 50 percent of the development costs, you are under enormous pressure to obtain this business. Failure to reach agreement with the government would jeopardize the plans for the expected follow-on commercial orders.**

When negotiating the contract price, do not bargain a "bottom line" price without justifying each cost element. In this regard, you will have to negotiate learning curve percentages for both direct material costs and direct manufacturing labor costs. Moreover, since the costs attributable to the learning curve percentages also depend on the number of production units, **you will also have to get agreement on the anticipated number of units to be produced.**