

CPEE CONTRACTS AND VARIANTS--II  
26 February 1946

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CAPTAIN WORTHINGTON:

Gentlemen, Captain Andrews has returned to speak to us again. We will give no further introduction to him for this lecture.

CAPTAIN ANDREWS:

Gentlemen, it is a privilege for me to appear again. I have been asked to talk to you about two types of navy contracts, or contracts in general. If I use the term "Navy," it is because I have been thinking in terms of the Navy for four years.

The two types of contract are the estimated cost-plus-a-fixed-fee contract with the incentive feature to reduce the cost, and the other type of contract is the fixed-price incentive type contract in which there is an incentive to reduce the cost. I am going to use the blackboard to illustrate some of the deals under these contract types. I will pick out some specific deals which we have done at the Navy, in the Bureau of Aeronautics and the Bureau of Ships. I believe it will be better if I just talk in round numbers, but as we deal with these specific contracts we get into fractions of dollars and fractions of thousands of dollars.

First, I want to talk about the estimated cost-plus-a-fixed-fee contract with the incentive and the apparently painful process that we went through in working out a satisfactory incentive in that contract.

I want to say that the worst type of contract--thank God we did not use it in this war--is the cost-plus-a-percentage of cost contract. That is now specifically forbidden by statute--very wisely.

I want to show you a cost-plus-a-percentage of cost contract briefly to differentiate it from the other two types that I shall discuss. Some of you know it. Maybe all of you know it. But let us assume we have a contract to build an LST for a million dollars, on a cost-plus-a-percentage of cost deal.

The cost is a million dollars so the contractor gets ten percent or 100 thousand dollars. Now, let us say the contractor runs his cost up to a million; five hundred dollars. We would then pay him, under the ten percent clause, 150 thousand dollars. So the higher the cost, the more money he makes.

There is very little incentive on that kind of deal for low-cost production. That is what we did not use in this war. I want you to keep that in mind and I will show you the improvements that we made.

Briefly, this is the history of the estimated cost-plus-a-fixed-fee contract, the first type I shall discuss. That contract, or the method of arriving at the price, is done by negotiation. You sit across the table from the manufacturer, and he gives you estimates based upon available information. The negotiator for the Navy uses whatever information he may have—the costs of other builders, labor, material, engineering, and research costs, and other information supplied by technical men in the service. After negotiation you finally agree on that estimated cost.

Let us assume again that we have arrived at an estimated cost of a million dollars. The maximum fee that was allowable by law was seven percent. Let us assume, for example, we are allowing the maximum fee, a seven percent fee, or \$70,000 and that is all the contractor can make in that no matter what his costs are. If his actual costs are two million dollars he still gets \$70,000.

That is the good feature of an estimated cost-plus-a-fixed-fee deal. There is no incentive to raise costs to increase the profit. Regardless of how high the costs go, the profit still remains \$70,000 as in the above example.

Now I will show you the bad feature of the straight estimated cost-plus-a-fixed-fee contract. Suppose the contractor does the job exceedingly well, and we missed the estimate and the contractor missed the estimate and he still did a good job. The estimated cost is one million dollars and the actual cost \$500,000. Thus, he actually did the job for \$500,000 but he still gets \$70,000. Without any incentive he gets the same for a million dollar cost as for a two million dollar cost or for a \$500,000 cost.

He has made 3.5 percent if the actual cost was two million dollars and 14 percent if the cost was \$500,000, but in both cases the profit was 7 percent of the original estimated cost. On his over-all business he has made a greater percentage here (indicating), but the dollar amount remains the same (indicating).

We went through a long process of trying to reward a manufacturer for a good job well done; to give him something more for building a ship for \$500,000 instead of running up cost to one million dollars or more.

Our first attempt was a very feeble one. For example, we started out with a million dollars—again the estimated cost. We said, "We will give you a five percent fee. That is, \$50,000. We will give you another one percent, \$10,000, if you do the job ahead of schedule." That was in the early days when the greatest emphasis was for speed and production. "We will give you another one percent fee, equal to another \$10,000, if you get below the million dollar cost."

We ran into several difficulties with this kind of incentive. It was sort of a "Would have" proposition. The contractors frequently claimed "I would have had the stuff delivered before this if that had not happened," or "My costs would have been below a million dollars if something else had not happened."

There was a lot of discussion about this "would have" business. We abandoned the five percent to reduce the cost after we used it on a few contracts. We went to another type of deal, and let us use the same estimated cost of a million dollars--the same kind of deal. This (indicating) was the first one. This (indicating) was the second one and this is the third one. We will still use the estimated cost of a million dollars for this example. We were getting further on in the war, production was building up and we were able to reduce the basic fixed fee. "We will give you a three percent fee, equal to \$30,000 on a one million dollar estimated cost. That is your fee regardless of actual cost. We are going to give you a four percent bonus. We are going to work out this bonus in this way: On the first \$20,000 by which actual costs are reduced below the original estimate, the builder gets one-fourth and the Navy gets three-fourths of the saving." The contractor gets \$5,000 and the Navy \$15,000. That was on the basis that the first reduction would be the easiest reduction.

On the next \$40,000 saving below the estimated cost we split it fifty-fifty. The contractor gets half of the saving and the Navy gets half the saving. So the contractor would get \$20,000 and \$20,000 would be retained by the Navy. On the next \$20,000 in saving below the original estimated cost we said, "that is the toughest one to make. That is where the going really gets tough. We will give the builder three-fourths of the saving and the Navy will take one-fourth." The builder gets \$15,000 and the Navy gets \$5,000. Thus \$30,000 is the contractors fee; \$50,000 is his incentive for the first \$20,000 reduction in cost; \$20,000 for the next \$40,000 reduction and \$15,000 for the next \$20,000 reduction, making a total fee and bonus of \$70,000 which is seven percent of the original estimated cost of one million dollars. If the builder got the cost of the ship down to \$920,000, he made his full seven percent.

I am going to go over that again. We start off with an estimated cost of a million dollars. The builder is given a three percent fee on a million dollars, which is \$30,000. Then if he gets his cost down to \$980,000, which is a saving of \$20,000, he gets \$5,000 and the Navy gets \$15,000. If he gets his cost down to \$940,000, which is this \$20,000 plus this \$40,000, he gets \$20,000 and the Navy gets \$20,000. That is the second saving. If he still reduces his costs down to \$920,000, which is eight percent difference between the million dollars and the \$920,000, or \$80,000 here, eight percent of a million; if he gets his cost down eight percent below the estimated cost, he makes his full bonus of \$40,000, making his total fee and bonus \$70,000.

Now, we thought, we had the answer. We said, "Here it is. On the easiest part we get three-fourths and he gets only one-fourth of the saving. On the next we split fifty-fifty. When the going really gets tough, if he still makes a saving, he gets three-fourths and we get only one-fourth. There is the incentive."

That type of incentive basis for the cost-plus-a-fixed-fee contract worked very well until manufacturers began to really wise up to it. This is what they began to do: They began to try to earn the bonus across the table in the negotiation rather than out in the shipyard or in the aircraft factory or ordnance plant. They knew that all they had to do was to stand firm here (indicating) and have eight percent more in their estimated cost than they actually thought they would require; and if they had that eight percent in there; they automatically got their four percent bonus, because they got half of that saving.

So we decided "This deal had developed into a deal where the incentive was much too quick." We pointed out to the contractors; "You make too much bonus, which is your four percent, and you make it too quickly, by reducing the estimated cost only eight percent." So we came around to the final type of incentive arrangement in the estimated cost-plus-a-fixed-fee deal. I will illustrate that type.

Bear in mind now that a four percent and a three percent deal sometimes resulted in too much bonus too easily earned, and the manufacturer was trying to earn his bonus right in the Bureau of Ships or the Bureau of Aeronautics in the negotiation instead of on the production line.

In this example we start out again with a million dollars as the estimated cost. This is the fourth type of incentive deal. We offered the contractor a three percent fee and a two percent bonus. You see, the bonus has gone down from four percent to two percent. That was the result of the tremendous volume of aircraft, ships and other military items that manufacturers were producing. We kept the three percent fee, but spread the bonus over a wider area. We required the contractor to reduce his costs about 20 percent (instead of 8 percent) before he could earn the full 2 percent bonus.

In order to furnish an incentive to try to earn the bonus and still permit a "close" estimated cost, we allowed the contractor to start earning his bonus at a figure that was higher than the estimated cost. This we called the "straddle" and it worked like this: We would negotiate a "close" or "tight" cost of say one million dollars on which the contractor would get a fee of three percent. We would then put the upper limit of the incentive straddle at 1.2 million dollars (when he began to earn his bonus) and the lower limit of the straddle at \$800,000 when he would earn the full two percent bonus.

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What it amounted to was that if the contractor reached the million dollar estimated cost, he had earned one-half of the bonus, or one percent; and he made \$40,000. If his costs were 1.2 million dollars or more he got only his fee of \$30,000 (three percent of one million dollars). If the contractor got his costs down to \$800,000, he earned the fee of \$30,000 and the full two percent bonus of \$20,000, making the fee and bonus \$50,000.

By using that "straddle" we accomplished several purposes. First of all, we made the spread wide enough so it was hopeless for a manufacturer a producer or a supplier to win his bonus sitting across the table from us. Second, by putting the possibility of earning the bonus above the estimated cost, we made it possible to get a more realistic estimated cost. Manufacturers would come to us and say, "My estimated cost for this job is 1.5 million dollars." Our idea of the cost was around a million or 1.25 million dollars. We would have to battle between the contractor's estimate and our estimate.

With a straddle like that we could say, "All right. We will give you 1.2 million dollars as the upper limit of the straddle. That means if you are right in your estimated cost, you are going to make three percent on a million dollars." But bear in mind it was three percent on a million dollars instead of three percent on 1.2 million dollars, because the percentage, of course, is always based upon the estimated cost.

In that way we were able to reduce the estimated cost from 1.2 million dollars to a million dollars and still give the manufacturer or the producer a chance to earn a bonus if his figures were correct and the 1.2 million dollars was the correct estimated cost.

This type of deal produced very surprising and very favorable results in multiple ship contracts, aircraft contracts, in ordnance contracts, and so forth. It gave the contractor a real incentive, but he could not earn his bonus unless he really did a job. Actually he had to reduce his cost 20 percent below the estimate before he got the full bonus.

That is briefly the story of the cost-plus-a-fixed-fee deals. First of all we had just a straight seven percent. In that seven percent there was incentive to reduce costs. No matter how high the cost, he still got seven percent on the original contract. No matter how low the cost, he still got seven percent on the original contract.

The second development was the first bonus incentive of one percent for early delivery and one percent for reduction in cost. It shows how naive we were to get into that kind of thing, because the inevitable result followed. The manufacturers said, "I would have delivered on time if such and such had not happened. I would have gotten my costs down if you had supplied me with materials that we were supposed to have." So we did not continue it.

Then we went to the third type of deal, which was the estimated cost with a three percent fee and a four percent bonus. That resulted, as I have said, in too much bonus too easily earned. The manufacturers tried to earn their bonus right across the table rather than out in the plant.

So we changed our position again and went to this three percent fee and two percent bonus, which is the straddle I think, until somebody devises a better system it was the best type of incentive system that we worked out for cost-plus-a-fixed-fee contracts.

In specific cases we used this type of bonus on ships we also had fixed price deals; this estimated cost-plus-a-fixed-fee with this bonus resulted in final cost that were as low or lower than fixed price deals. So there really was an incentive for the manufacturer to reduce his costs.

Now, we have spent about half our time, and I will take up the fixed-price incentive deal unless you want to ask some questions now.

A STUDENT:

There is one point that I do not understand. If the field contract officer--I mean the officer established in the plant reviewing the contractor's costs--thinks that any of the costs incurred were prior to the contract, could he throw them out of the fee?

CAPTAIN ANDREWS:

That is right. We followed the cost-plus-a-fixed-fee accounting procedure that is set out in TD5000, and the "green book." I think the over-all experience of the Navy was that something like one-half of one percent of costs were disallowed costs. Of course, that was higher in the beginning, until contractors became accustomed to cost-plus-a-fixed-fee accounting. But as they got in the groove and ironed out their accounting differences, the disallowed costs became less. But you are correct; the disallowed costs came out of the contractor's fee or bonus.

A STUDENT:

Did you use escalator clauses?

CAPTAIN ANDREWS:

Yes. For the calculation of the bonus only. In cost-plus-a-fixed-fee contracts escalation is taken care of by the fact that the service pays the allowable costs incurred, but a rise in costs without escalation would deprive the contractor of the chance to earn his bonus.

We only used escalator clauses in computation of bonuses. That is a very intricate thing. I do not have time to go into it in detail. But we were using escalator clauses for labor and materials in cost-plus-a-fixed-fee contracts.

A STUDENT:

When did you start using that last form?

CAPTAIN ANDREWS:

We started using the last form in early 1944. It was under consideration in the latter part of 1943. In January or February or March or thereabouts in 1944 we started using it.

A STUDENT:

How extensively did you use it?

CAPTAIN ANDREWS:

The Bureau of Ships--I am only referring now to one bureau in the Navy--spent about 25 million dollars a day on ships. That is about 10 percent of the total war expenditures. I would say that, a third or a fourth of these contracts were of this type.

A STUDENT:

Was that for building ships?

CAPTAIN ANDREWS:

Yes. That went on for about three years. In all of 1943, all of 1944, and 1945 we used cost-plus-a-fixed-fee contract with the incentive features.

I will go now to the fixed-price incentive. I must go over this pretty quickly in the time allowed. I hope I shall not go too fast for you all to follow me. I know if I were sitting out there, it would be very difficult for me to take in any of this unless I had worked with it for two or three years.

We come now to the fixed-price incentive contract. It, in my opinion, is the best method of contracting if the contract is for a production period. I do not care whether it is a long production period in millions of rounds of ordnance or whether it is a long production period on hur-

dreds of aircraft. The fixed-price incentive contract works best when there is a long production period. The simple reason is because it gives the contractor an opportunity to put into play the forces of efficiency that will result in low cost.

I now will give you a little history of the fixed-price incentive contract.

I am not the father of this contract. I guess I was one of the attending physicians when the baby was born. The mother of the contract is a musical instrument manufacturer, who makes harmonicas and things like that--guitars, mandolins, and so forth. The father of the contract is Mr. Charles S. Thomas, who was a civilian in the Navy, a special assistant to Mr. Forrestal, who was at that time in the Bureau of Aeronautics.

Way back in 1942 or 1943--I do not know exactly--Charley Thomas and I were working with this manufacturer of musical instruments, who was going to make a Chinese copy of the Sperry gyroscope. Sperry did all the engineering, development and so forth and the manufacturer was giving the contractor the drawings, the blueprints, and prices of the actual equipment. The harmonica manufacturer was going to build thousands of them. So we started out in a very feeble way to work out an incentive deal.

Briefly, the incentive deal is exactly the opposite of the cost-plus-a-percentage of cost deal, the first type of deal, that I said was the worst type of contract, where the higher the cost, the more the contractor makes. In the fixed-price incentive deal the lower the cost, the more the manufacturer makes. So it is a self-corrective deal. The better job he does, the more money he makes. The poorer job he does, the less money he makes. If he does too poor a job, he loses money out of his own pocket.

Here is the way the contract works: We will take the proposed cost of a ship in round numbers as a million dollars. I am using a ship example because we had these incentive contracts on ships, we also used them on aircraft and ordnance. In the negotiation the manufacturer says, "These LST's are going to cost me a million dollars each." However we have reason to believe in the Navy that from previous actual construction cost from other builders, and from estimated costs from other bidders and from cost estimates of the Navy, that is a high figure.

I might add right here that ship costs follow a curve something like that (indicating). Here is the first ship, here is the second, third, fourth, fifth, sixth, seventh, eighth, eleventh, and so on. They decline continuously as "know-how" and efficiency are increased, but level out at the end and then pick up a little bit for the cost of a ship or two.

So our manufacturer comes in with his first ship cost of a million dollars and says this is going to be the average cost of all fifty ships on the contract.

Judging from the information available to the Navy, we do not think curves indicating costs are going to level out at one million dollars, but we think the average cost for the fifty ships will be about \$700,000. So we start our incentive deal. We write in here (indicating) a million dollars nine hundred thousand, eight hundred thousand, seven hundred thousand, six hundred thousand dollars. We even go to five hundred thousand just to be safe, because, if we do not, sometimes the contractor may get down that low.

All right. This sum, a million dollars (indicating), is the ceiling. If those ships cost more than a million dollars apiece, the contractor loses every dollar of that excess. On the other hand, for every dollar that the contractor reduces his cost below a million dollars he gets twenty cents profit. So, if he builds the ships for \$999,999, he gets twenty cents profit and the Navy gets eighty cents back.

I am now going to build up an "incentive table" (indicating). The profit is zero dollars here (indicating one million dollars on the "incentive table"). The profit here would be \$20,000 (indicating \$900,000 on the table the profit here is \$40,000 (indicating \$800,000), the profit here is \$60,000 (indicating \$700,000), the profit here is \$80,000 (indicating \$600,000 on the (incentive table"), and the profit here would be \$100,000 (pointing to \$500,000 on the "incentive table").

That looks like an awfully big profit--20 percent profit if he gets down to \$500,000, but the ships have cost \$500,000 instead of one million dollars and although the shipbuilder has made \$100,000 the Navy has saved \$500,000 on each ship. In the back of our head when we are negotiating over in the Bureau of Ships and making up the "incentive table", we think there (indicating \$700,000) is about where that fellow ought to do that job. That is about eight percent (indicating to a profit of \$60,000 on a cost of \$700,000).

That, as you will notice, will tie in a little bit with the cost-plus-a-fixed-fee incentive deal. If the contractor does the job that we think he can do, he will get about eight percent profit instead of the maximum of seven percent under a cost-plus-a-fixed-fee incentive contract. So in the negotiation of the contract we say to the contractor, "All right, you say these ships are going to cost a million dollars. If they cost a million dollars, you do not make a dime.

If they cost more than a million dollars, you actually lose the excess \$100,000 per ship.

cost \$950,000 you make \$10,000, if they cost \$850,000 you make \$30,000. For every dollar you get below a million you make twenty cents down to \$500,000, but your maximum profit will not exceed \$100,000 per ship."

If he gets down to the \$600,000 figure, that means that the Navy has saved the difference between \$680,000 and a million dollars if his cost went up there (indicating one million dollars). In profit it is true he has made about 12.5 percent against a figure of what we thought would be a fair figure, of five percent (indicating \$800,000 cost and \$40,000 profit on table). But what has happened, the ship instead of costing the Navy \$840,000, which would be \$800,000 cost plus \$40,000 for profit actually he cost the Navy \$680,000 (\$600,000 cost and \$80,000 profit).

I have gone over that pretty quickly, but I want to make certain points clear.

First of all, in this deal (indicating) you are trading on the whole "incentive table." You are not making the entire deal on one specific figure like \$800,000 and saying in effect, "For every dollar you get below \$800,000 Mr. Contractor, you get one dollar. For every dollar you go above \$800,000 you lose one dollar. In this incentive deal the Navy and the contractor are sharing in the risk and they also share in the Profit." When we are talking about five hundred LST's, or let us say, one hundred LST's, and when we are talking about one million dollars apiece (we bought over a thousand LST's), of course, every bit there (indicating costs on the table) means a lot over here (indicating to profits on the incentive table). But if you sit down with a manufacturer and trade on one figure, it is win all or lose all over that figure. When you are talking about a hundred million dollar deal or a two hundred million dollar deal, the pressure is on; it is on the contractor and it is on you. It is awfully hard to arrive at a fair figure. The contractor wants plenty of protection. Naturally you want a price that is going to be a fair price to him and a fair price to the Government, and it is almost impossible to arrive at one figure that will produce that fair price.

But where you are trading on the whole table here from a million dollars down to five hundred thousand the contractor can be looking up and saying to himself, "Well, I am going to be protected if it costs a million dollars, and so I do not see how I can lose any money." The negotiator for the Navy may be looking down here (indicating a cost of \$600,000 on the "incentive table") and be thinking that if the contract gets down to \$600,000, he gets about 12.5 percent, but the negotiator is perfectly willing for him to make 12.5 percent if he does that good a job

So, instead of trading on that one point right here (indicating one million dollars and \$600,000 on the table), win all or lose all, you are trading on the broad table from a million dollars to five hundred thousand dollars. It makes your deals much easier to get across. The manufacturer has protection over his head within reasonable limits against loss. He knows, if he does a good job, he can make a real profit. While he may be talking about a million dollars, his thoughts are really somewhere between \$700,000 and \$800,000. Your thoughts there too.

I must caution you, however, that we must keep the profit figure and the dollar cost figure within reasonable limits, so that the contractor does not get 20 percent profit for a mediocre job. We have found through experience that a 20 percent "participation" was about as satisfactory as any that we worked out. It can be made 25 percent or even 33 and a third percent. By "participation" I mean what the contractor gets out of every dollar that he reduces his costs below the ceiling figure on the incentive table (indicating one million dollars), and the Navy gets the balance out of the dollar.

A STUDENT:

What if he goes up to 1.2 million dollars?

CAPTAIN ANDREWS:

If his costs go to that amount, he digs down in his own pocket to the tune of \$200,000.

Now, there are many refinements of these fixed-price incentive deals. That is the basic incentive table (indicating to the "incentive table") the cheaper the man does the job, the more money he makes. He participates in the savings and the Navy, or the Army participates in the savings. If he goes above that figure (indicating one million dollars), then he loses one dollar on every dollar above it. If he goes below \$500,000, we make a floor (indicating) down here, and if he should go down to \$300,000, he still does not get but \$100,000 profit; the Navy gets the ship for \$400,000.

A STUDENT:

Why do you set a ceiling on his estimated cost?

CAPTAIN ANDREWS:

That ceiling fixes the maximum amount that the Navy will pay for the ship and makes the contract a fixed-price contract.

There are many "incentive tables" that can be worked up for any one incentive contract. My advice to anybody who goes into one of them is to be sure to make a series of tables in advance of the negotiation with the contractor, with 20 percent participation, 30 percent participation, and so forth, and with different ceilings and floors. If you start off with a million dollars and use a 20 percent "participation," or if you start with a million dollars and use a 25 percent "participation," you will be greatly surprised at how the figures will jump around. I always made at least five tables before going into a negotiation and only used the one I thought most appropriate during the negotiation. Never make up a table quickly in the negotiation. It is too dangerous to you and to the contractor.

We used to smoke companies out by giving them their choice of two, three or four incentive tables. We would make one table where the contractor made a good profit up here (indicating a high-cost figure on the table), but did not make much down here (indicating a low-cost figure on the table). We would make another where the contractor made a very nice profit in the middle range of the table, but did not make much up here or down here (indicating). And in another table we would put a bait down here (indicating a very low-cost figure), where he would really make a killing if he got down to that figure. Then we would say to the contractor, "All right, take your choice of the table you want."

A STUDENT:

How do you make sure that you are getting what you want at these low figures?

We have to rely upon our cost inspectors, figures from other builds on Navy cost data and estimates for the same or similar ships, etc. Bear in mind the manufacturer has to meet the Army or Navy or Marine Corps material inspection, and he can not get by with inferior quality products

A STUDENT:

That brings up a lot of argument, does it not?

CAPTAIN ANDREWS:

That is right. But men will argue for twenty or thirty million dollars, or twenty or thirty thousand and you can not blame them for that.

A STUDENT:

I will tell you the main thing about this incentive of 20 or 30 percent. While the price may be above board, the excess profits tax is going to take it away from him.

CAPTAIN ANDREWS:

No the excess profits tax only takes part of it away not all. Also renegotiation comes before taxes and in some instances, no in every case, we exempt a fixed-price incentive contract from renegotiation. However, we could not exempt it from taxes. But for every dollar the contractor gets before taxes he has at least ten cents left after taxes.

If an incentive contract was not specifically exempted from renegotiation we would go to the Price Adjustment Board and say, "Here is a man who has done a good job. He has met our deliveries. He has met the specifications. He has really done a fine job on reducing costs. Now, in your over-all renegotiation, if you do not set this aside specifically and exempt it, put it over here, for possible consideration."

A STUDENT:

But in a lot of cases redetermination will get him.

CAPTAIN ANDREWS:

Do you know what this fixed-price incentive contract really is? It is a straight fixed-price contract with a redetermination clause in it. But, instead of using the standard redetermination clause you add the "incentive table" as part of the redetermination clause. It is nothing in the world but a fixed-price contract with the redetermination clause set out in advance in the form of the "incentive table" and the table becomes a part of the contract. You know that if he gets his costs down to \$800,000, he gets this (indicating), and if he gets to \$700,000, he gets this (again indicating). So when the job is done the Navy and the contractor know exactly what the contractor's profit is. The fixed-price incentive has another great advantage over the straight fixed-price contract with the standard redetermination clause.

We got the Comptroller General to allow up to redetermine the price and to set the final price in that fixed-price incentive deal after the job was finished to avoid "a cost plus a percentage of cost system of contracting" that is prohibited by law.

A STUDENT:

Do you want to say a few words on what happens when one of those things is terminated?

CAPTAIN ANDREWS:

That is not too complicated. As a matter of fact, there is more cost information under this kind of deal than there is under almost any other kind of deal except the cost-plus-a-fixed-fee.

In determining the cost in the termination a new pattern is really set. In essence we would negotiate a new incentive pattern based upon the number of ships the contractor has actually built, taking into account their cost and the completion cost of the uncompleted ships.

A STUDENT:

The reason I asked that question is that if any contractor made better than seven percent, he automatically went through price adjustment. How did you avoid that under this kind of deal?

CAPTAIN ANDREWS:

First, I know of no such rule or regulation that a contractor must make more than seven percent before he is renegotiated. I think you are confused with the seven percent maximum profit allowed on cost-plus-a-fixed-fee contracts. Renegotiation is not avoided, except by specifically exempting the contractor. A lot of contractors made less than seven percent and still went before the Price Adjustment Board. On the estimated cost-plus-a-fixed-fee the maximum fee allowed by law was seven percent. The Price Adjustment Boards sometimes allowed up to 15 percent on these contracts, and in earning 15 percent the contractor probably saved the Navy up to 35 percent.

A STUDENT:

Do you want to say something in regard to the amount of cost inspection under that form of contract?

CAPTAIN ANDREWS:

It is axiomatic in the fixed-price incentive contract that the final costs must be accurate, but it is not necessary to have rigid cost inspection. It does not require the cost inspection and audit required under TD5000 also known as the "green book." This contract should be treated as though it was a fixed-price contract, because it is a fixed-price contract; but all costs submitted by the contractor are listed against the cost inspectors report on the contract and are based upon accepted sound accounting practice.

The contractor can use his own accounting methods and procedures provided he uses them consistently, and provided those methods and procedures are generally accepted by business. So we do get away from the "green book", TD5000, but there are cost inspections. The cost inspectors will inspect the books and records, but they do not have to check and approve each voucher or time slip as they do in audit of a cost-plus-a-fixed-fee contract as required by TD5000, the "green book."

What we had them do was to go out and really make three audits. One was a straight business audit. Two was based on what the allowable cost would be if they had followed the "green book" TD5000. The third was an analysis of the difference between one and two. We could then negotiate the deal somewhere in between them. We used TD5000, the "green book" as a basis in the negotiation, but we negotiated the final price on the basis of sound and accepted accounting practice. It was not just a cost inspection and audit. There was that difference which for the want of a better term we called negotiation. We also had the problem of reimbursement for changes. We also followed the rule that if there was an increase in the contractor's labor rate, he was to be protected by escalation; not for the number of hours he used, but for an increase in the labor rates. The same is true for material. The contractor was protected for increases in prices of materials after the date of the original negotiation and agreement on the incentive table. He was not protected if he used more material cost, the Navy would get the benefit of it, because escalation worked both ways.

If there were plus-cost changes in the ship or aircraft due to changes in design, we would reimburse the contractor for them outside of his incentive table. The same way if there were decreased costs, the Navy would be reimbursed for them by the contractor outside the "incentive table;" in other words by escalation or by renegotiation of the change or adjudication of the change we did not disturb this incentive pattern. We might pay him \$650,000 for the ship and then on the side we might pay him an additional \$20,000 for "extras" or design changes that he built into the ship. Or we might deduct \$20,000 for things that were left out of the ship. Or we might give him another \$5,000 for labor increases or take out \$5,000. But those things were done outside of the incentive pattern.

We did everything we could to fix that deal as of the date it was negotiated and the effective date of the contract, so that, no matter what happened to the material prices and labor rates or how many changes we made, in the ship the contractor and the Navy still had the same deal as that on the day of the contract.

A STUDENT:

I think if \$800,000 is arrived at as a good figure, it ought to be put that in as a good figure. The contractor makes a pretty liberal profit up there. If the estimates of other manufacturers are available, it should be known what a good figure is.

CAPTAIN ANDREWS:

We had in the Bureau of Ships and also in the other bureaus, but particularly in the Bureau of Ships, excellent cost data. We did not just guess blindly at those costs. Men like Captain Small and Captain Wynkoop, who are outstanding engineers and naval constructors as well as cost accountants and cost estimators, made cost estimates on the basis of actual returned costs on similar ships and on other cost data.

We had in the Navy a very, very well developed system of cost estimating. From vast experience they would estimate the cost of ships on a total manhour basis, on an amount of steel-tonnage basis. Then we would also break down the cost of the ship into hull cost, propulsion machinery cost, plans cost, and all the other work that goes into a ship, such as labor, material, overhead costs; etc. There are about sixty items that go into one of these complete breakdowns. Then those sixty items would be grouped into four or five big items.

The manufacturer would come down with his labor, material, overhead, administrative expense, and so forth. The Navy would have not only estimates of the labor, material, overhead, and so forth; but we would have actual experience of other shipbuilders or other plane manufacturers or ordnance manufacturers for the same thing. We knew how much this kind of ship should cost.

We knew how much these other similar ships had cost. We knew from experience that this shipbuilder's curve would check something like this (indicating). One builder's curve would be like this (indicating), another would be like this. We would plot all those cost curves in different colors to show the comparative costs. We found that those curves took a course or that these costs took a course something like that (indicating). One fellow might dip down.

We had all that information. So in the negotiation when we looked at this \$800,000 down here or this \$600,000 (indicating), we know, or we were pretty sure, that this (indicating) was what we thought he could do the job, for if he did a good job. It was not just guesswork.

We did have some deals where the type of ship has never been built before and yet the estimates were not purely guesswork. I recall one deal that we were buying six tugs for the Russians; the only thing we had to go on was the general hull lines. The contractor insisted on a price of one million dollars each; we gave him an incentive deal for a million dollars. We thought he could get costs down to about \$600,000; we set the incentive table so he would make about 10 percent at that figure. He built the tug at a cost of about \$625,000 each and made about \$60,000 on each instead of \$375,000 as he would have made on a straight fixed-price contract.

We found it was very easy to switch a manufacturer on a subsequent contract from a cost-plus-a-fixed-fee deal to a fixed-price incentive deal. Under the cost-plus-a-fixed-fee deal the most he could make was five, six or seven percent--the legal limit. So on his new contract he would jump from the cost-plus-a-fixed-fee deal, where he might make three or four percent, to one where he could make up to eight or ten or twelve percent.

He had not as much protection against loss, but he had enough protection over his head to protect him; he could look down at this bait, the larger profit, under the incentive deal (indicating).

So it was not hard to switch him from a cost-plus-a-fixed-fee deal to a fixed-price incentive deal, for the next contract. It was plenty hard to switch him from a fixed-price to a fixed-price incentive deal on a subsequent contract, that fixed price he got a dollar out of every dollar he reduced his cost. Under the incentive he only got twenty cents. So he said, "What is the use of my switching from the fixed-price deal to the incentive deal, where I will have to give up eighty cents out of every dollar?"

The way we engineered that switch was by giving him a three-way deal. That is what I want to bring out. We gave him the choice of three deals - one the fixed price deal, which was what he had had before two, a fixed-price incentive deal; and, three, an estimated cost plus a fixed-fee deal. What I am going to describe now is a delicate operation. Those three deals must be balanced. If they are not balanced, the contractor is not given three deals. You are giving him only one, because he would jump for the best one.

But, to balance them you should give him a fixed-price deal low enough that you are perfectly sure he will not make an excessive profit. If it is a good, tight deal so that he sees he has to jump on the price or he might actually lose money, it will make him begin to jump away from that tight fixed price; but if the deals are properly balanced, you should be willing that he take any one of the three.

You should give him a fixed-price incentive deal that gives a ceiling over his head with more protection than the tight fixed-price deal; but for that protection against loss, he should give up a little profit. We might give him a fixed-price deal for about \$750,000 or \$800,000. He knows he must really jump to do that. We would give him a fixed-price incentive deal at a million dollars; so he has a couple of hundred thousand dollars ceiling over his head. But in the fixed-price deal we would give him more money at \$750,000 than we would give him in the fixed-price incentive deal. He has a chance, if he wants to take a gamble on a tight fixed-price deal, to make more money but he also has a chance to lose money. Then the third choice would be the cost-plus-a-fixed-fee, where we would set the estimated cost at about \$900,000 and he could not make more than three or four on five percent no matter how good a job he did but he could not lose any money on the third deal.

With those three deals we found we could switch a contractor out of the fixed-price deal into the fixed-price incentive deal sometimes. We could not do it always, because if you made the switch price a little too stiff, he would stay on the fixed price. But we did work out a great many deals, that way and the contractor could have no complaint.

We had billions of dollars in these deals. I think the Navy probably had between six and ten billion dollars in fixed-price incentive deals, in Aeronautics, in Ordnance, and in Ships. Aeronautics and Ships used far more than Ordnance; Aeronautics used more than Ships of the fixed-price incentive, and Ordnance used the least.

CAPTAIN WORTHINGTON:

Thank you, Captain Andrews, very much.

(6 December 1946--200.)S