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PYRAMIDING OF PROFITS AND COSTS IN THE MISSILE PROCUREMENT PROGRAM

HEARINGS

BEFORE THE

PERMANENT SUBCOMMITTEE ON INVESTIGATIONS

OF THE

COMMITTEE ON GOVERNMENT OPERATIONS UNITED STATES SENATE

EIGHTY-SEVENTH CONGRESS

SECOND SESSION

PURSUANT TO SENATE RESOLUTION 250, 87TH CONGRESS

PART 4

(BOMARC Program)

MAY 22, 23, 24, AND 25, 1962

Printed for the use of the Committee on Government Operations

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PYRAMIDING OF PROFITS AND COSTS IN THE MISSILE PROCUREMENT PROGRAM

(Bomarc Program)

THURSDAY, MAY 22, 1962

U.S. SENATE,
PERMANENT SUBCOMMITTEE ON INVESTIGATIONS,
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D.C.

The subcommittee met at 10:15 a.m., in room 3302, New Senate Office Building, pursuant to Senate Resolution 250, agreed to February 7, 1962, Senator John L. McClellan (chairman of the subcommittee) presiding.

Present: Senator John L. McClellan, Democrat, Arkansas; Senator Henry M. Jackson, Democrat, Washington; Senator Edmund S. Muskie, Democrat, Maine.

Also present: Jerome S. Adlerman, general counsel; Paul J. Tierney, assistant counsel; Thomas Nunnally, investigator; Ruth Y. Watt, chief clerk.

(Members present at the time of convening: Senators McClellan and Muskie.)

The CHAIRMAN. The committee will come to order. We are resuming some hearings this morning in connection with missile site construction.

I will make this brief statement.

In continuation of our hearings on the procurement practices of the military, the subcommittee today will study the procurement of the Bomarc missile by the Air Force from the Boeing Co. In addition to witnesses from the Air Force and the Boeing Co., it is expected that we will have testimony from representatives of certain major subcontractors on the Bomarc, namely Aerojet General Corp., ITT-Federal Laboratories, Inc., Lear, Inc., Thiokol Chemical Corp., and Westinghouse Electric Corp.

It is not the purpose of the subcommittee through this series of hearings to detract from what is indeed a major accomplishment of the Boeing Co. and its subcontractors in designing and developing this missile and its components which now play an integral part of this Nation's Air Defense System under SAGE.

However, this subcommittee, under its responsibilities does propose to determine whether or not the method used in the procurement of a modern weapon system such as the Bomarc has, by its very nature, generated unnecessary or excessive profits. During this phase of the hearing the subcommittee will also study incentive contracts. In essence, the incentive-type contract is one through which the Government attempts to stimulate the contractor to increase his efficiency and

reduce the cost of performance by providing for a bonus or incentive fee in the event costs are in fact reduced.

We will look into three contracts of this type negotiated between the Air Force and the Boeing Co. for the production of the Bomarc missiles, which have produced substantial incentive or bonus fees for the Boeing Co. The subcommittee will seek to determine in connection with these specific contracts, whether cost underruns were in fact due to the efficiency of the prime contractor rather than an unrealistic initial estimate of costs attributable to the absence of good cost data at the time the contracts were negotiated.

I think in one or two instances the facts may reveal that it would have been better, more economical, from the standpoint of the Government, to have simply given a cost-plus-fixed-fee contract to begin with. While an incentive-fee contract is an attractive window dressing, in a way, I am not sure whether always in the practical administration of them they prove to be more economical than some other methods of procurement.

Anyway, it is not to criticize, but simply at this stage of it to propose to make a study and try to discharge our responsibilities to determine with respect to economy and efficiency in these programs.

Very well. Senator Muskie, have you any statement?

Senator MUSKIE. No statement, Mr. Chairman.

The CHAIRMAN. Call the first witness, Counsel.

Mr. ADLERMAN. Col. John Coulter.

The CHAIRMAN. Colonel, you do solemnly swear the evidence you shall give before this Senate subcommittee shall be the truth, the whole truth, and nothing but the truth, so help you God?

Colonel COULTER. I do.

The CHAIRMAN. Colonel, will you state your name, your service, and your present responsibilities and duties in connection with your military service?

TESTIMONY OF COL. JOHN M. COULTER

Colonel COULTER. Mr. Chairman, I am Col. John M. Coulter. My service has been since April of 1941, with a 5-year break in service after the war, during which I went back to South Carolina and engaged in the construction business.

My immediate association with the Bomarc program dates from September 1958. During the interval, the 3-year interval, from September of 1958 until August of 1961, I was the Bomarc program director. Since that time, I have moved up one notch on the organizational chart and now look at Bomarc among several other defensive weapons systems. Bomarc is, however, still in my direct area of responsibility.

The CHAIRMAN. I am having difficulty hearing. Can you get the microphone up closer?

Colonel COULTER. Yes, sir; and I can talk louder.

With respect to the specific area of responsibility, you may recall that the division of responsibilities between the older AMC and the ARDC generated the formulation of a joint program office, wherein the procurement and production function was handled by the AMC personnel, and the development and engineering function was managed by the ARDC people.

In that context, and that situation existed until May of last year, I was the ARDC program director. This means that my deepest familiarity with the Bomarc program has been in the technical and engineering area as differentiated from the procurement-production area.

The CHAIRMAN. Very well, Mr. Counsel, you may proceed.

Mr. ADLERMAN. Colonel Coulter, you have been working with the Bomarc program for quite some time now?

Colonel COULTER. Yes, sir.

Mr. ADLERMAN. And you are fully familiar with the operation and the scope of the program?

Colonel COULTER. Yes, sir.

Mr. ADLERMAN. Will you tell us something about what it is supposed to perform, what its makeup is, who makes it, the components, and so forth? Will you describe its functions?

Colonel COULTER. Yes, sir.

The CHAIRMAN. What is the function of it? What is it designed to do?

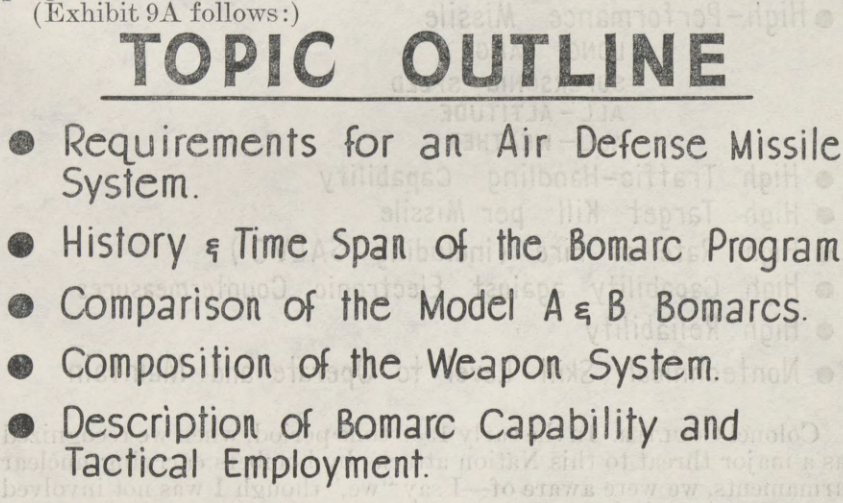
Colonel COULTER. Mr. Chairman, it is an air defensive weapon.

May I say at this point that I have several charts and a program review, a weapon system review, prepared in anticipation of this question.

The CHAIRMAN. Very well, if you want to go to your charts, go ahead.

Colonel COULTER. Mr. Chairman, I have about 30 minutes on the Bomarc weapon system prepared. This briefing is in response to conversations that I have had, that we have had, at Wright Field with the committee staff members, in which it was considered appropriate to establish a general background of knowledge about the weapon system, what it comprises, and what its capabilities are, to enhance your understanding of the more detailed matters which you will take up in subsequent hearings with Air Force people. This briefing has that purpose.

(Exhibit 9A follows:)



The CHAIRMAN. Very well.

Colonel COULTER. I will discuss in general terms the requirements for an air defensive missile system, both in terms of the missile systems environment and the missile itself. I will touch briefly on the timespan and give you a feel for the scale in time of the principal events in the development and operational employment of the system.

You are aware that the Bomarc missile comes in two models, and I will describe the essential differences between the A missile and the B missile in terms of hardware and performance.

The words "weapon system" is a large term in our operations nowadays, having as its genesis, I believe, the recognition that during World War II, and in the 1940's, the vehicle itself was the principal element of a fighting machine. The system, if we take an airplane as an example, comprised a few pieces of ground-support equipment. For instance, the B–36 or the B–29 or the B–17, those vehicles were the major elements of that piece of armament.

By contrast, missiles and their extremely varied and often complex support equipment and environment require the understanding and the integration and overall employment of a system of hardware wherein the missile itself, the vehicle, may comprise the 20-percent, not the 80-percent, element.

I will discuss the major elements of the Bomarc weapon system.

I will talk about the capability of the system and say something about tactical employment.

I will review its geographical coverage.

(Next visual aid (exhibit 9B) is referred to.)

DEFENSE-SYSTEM REQUIREMENTS

- Accurate and timely Target Information
- High Rate of Response (constant alert)
- High-Performance Missile
  - LONG RANGE
  - SUPERSONIC SPEED
  - ALL-ALTITUDE
  - ALL-WEATHER
- High Traffic-Handling Capability
- High Target Kill per Missile
- High Rate of Fire (including SALVO)
- High Capability against Electronic Countermeasures
- High Reliability
- Nontechnical Skill Level to Operate and Maintain

Colonel COULTER. In the early 1950 time period, when we recognized as a major threat to this Nation attacks by bombers carrying nuclear armaments, we were aware of—I say "we," though I was not involved directly at the time—we recognized the requirement for a system which had these characteristics: a system that provided accurate and

timely target information. Here I am talking about radar surveillance, continuous, automatic, on a 24-hour basis, and looking with radar eyes for hundreds of miles.

Certainly a system needs a high rate of response, in the circumstance of quick alerts, in the event it is over water or from the Canadian area, attacks occurring from the unpopulated areas to the north of our country. To do this, you need long-range, supersonic, all-altitude, and an all-weather system. All altitude, in this discussion, meaning from the ground to sensible heights that bombers can achieve, the 80,000-foot range being a maximum in this conversation.

The CHAIRMAN. That is a bomber missile. We are not talking about an antimissile missile yet?

Colonel COULTER. Yes, sir; and I should make that clear. This is an air defense system, and it will attack air-breathing targets. These are airplanes. It has no capability against ballistic missiles.

The CHAIRMAN. "It has no capability," what you are talking about now?

Colonel COULTER. The Bomarc system has no capability against ballistic missiles. That is right. It is designed against the bomber attack, the bomber threat.

The system needs to have high traffic-handling capability because Bomarc will be employed with other interceptors. Here I talk about the manned interceptors, the airplanes that the air defense fleet has. The system needs to employ these selectively but in an integrated fashion also.

Obviously, we want a high-skill probability. We need a high rate of fire, in event you can visualize mass attack where dozens or hundreds of bombers could attack at the same time, a capability against countermeasures.

This whole discussion is an electronic discussion. This is a high requirement. Obviously, we need reliability and the susceptibility to maintenance by semiskilled technicians in the military forces. Those are requirements.

The CHAIRMAN. What is the last nontechnical skill to operate?

Colonel COULTER. We talk here, sir, about the airmen who make up the backbone of the maintenance capability in the military structure. These people are not technical in the sense that they are college graduates. These people are normally, or often, high school people who have had specialized maintenance and operations courses, but below the college level. That is what I mean by nontechnical.

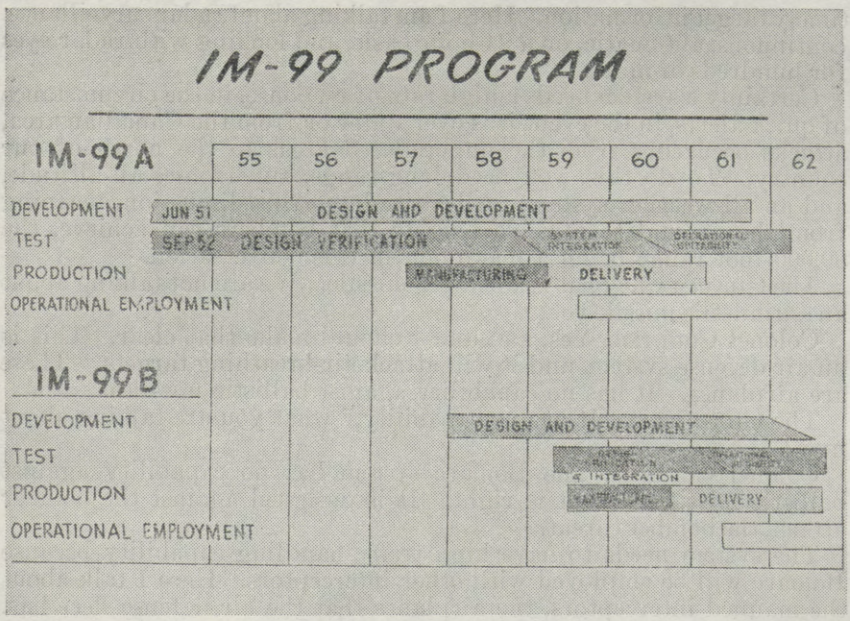
Senator MUSKIE. Colonel, what kinds of electronic countermeasures are anticipated? Or is that classified?

Colonel COULTER. What I can say about it, sir, is probably not classified. We are talking about a variety of jamming, jamming which can jam the ground installations or the missile itself; and immunity from this jamming is the requirement.

Senator MUSKIE. Countermeasures, in other words, that interfere with the guidance system?

Colonel COULTER. Yes, sir; with the guidance system of the missile or the airplane and with the ground surveillance radar system. I will show you how it works.

(Next visual aid (exhibit 9C) is referred to.)



Colonel COULTER. This chart lays out the broad time scale in which the Bomarc program has been prosecuted. In the late 1940's, and in 1950, there was a joint study between the Boeing Co. and the University of Michigan's Aeronautical Research Center. Out of that joint study came the concept of a fully automatic, continually alert missile air defense system.

Based on that joint study, the Air Force went into contract with Boeing for development of the Bomarc A system. The initial years were in the component design and development business. I mean by component, the ramjet engines, the booster rocket—and I will show you specifically what the hardware is on a subsequent chart—the flight control system and the airframe itself.

You see, we were building a supersonic missile that flew by itself, that took off, leveled off, and went to a target. This had not been done before. The early years, therefore, are associated with component and subsystem development and demonstration.

We went into a manufacturing posture, the initial manufacturing contract, with a May 1957 date on it for the A system. Our first operational capability at McGuire Air Force Base in New Jersey was achieved on September 1. There are five A bases, and I will show you the disposition of the A bases and their coverage in a subsequent chart. These bases are now operational.

The B system is a major technical step forward as contrasted to the A system.

I should comment here that low-altitude attack is a difficult thing to do technically. It is a fact of radar performance that radars—including target-seeking radar—and I will show you precisely how this works on a subsequent chart—when it looks at a target with the ground as its background, has difficulty discriminating between the target and the so-called clutter which the ground return provides.

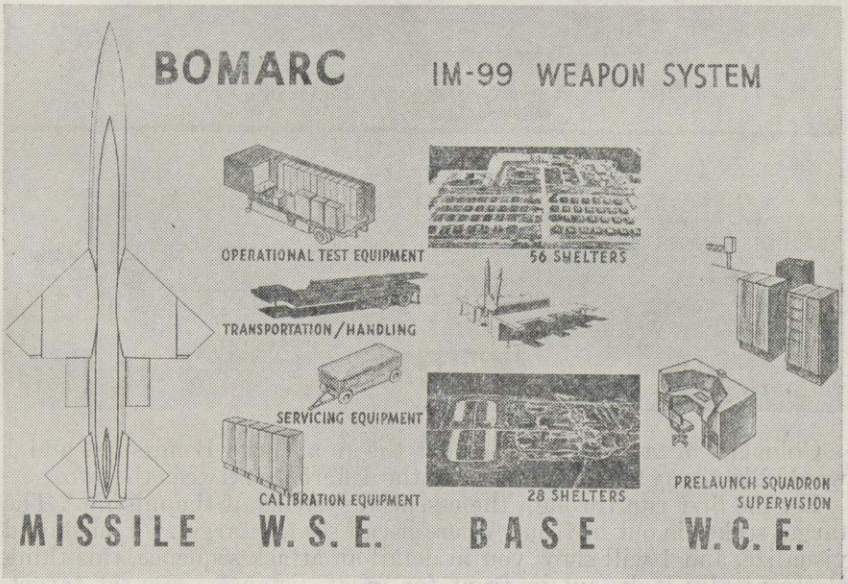
The B system achieved a major technical breakthrough, and the target seeker is a sizable improvement. We also doubled the range of the A system in the B system. As a matter of fact, in the late part of 1957, the Boeing Co. was studying two successive models, the Bomarc B and the Bomarc C.

We crowded the Boeing Co. into including in the B missile all of the features contemplated for both the B and C models, and—and I say this advisedly—got them to agree that the sum of these features could be incorporated in the B missile and that we could do it on the same time scale.

You see on this chart an example of the extreme overlapping of the development, the test, the manufacturing and delivery functions. This is called a maximum risk program, where, from the initial contract authority for design and development, you go to an operational capability in just over 3½ years.

I should say that this date, originally March 1, 1961, was established here in January of 1958, and was maintained with the exception of 90 days. We missed the initial operational capability date by 90 days. I believe, however, that it is significant that we achieved this complete weapon system design, development, test, manufacturing and operational employment in just over 3½ years.

(Next visual aid (exhibit 9D) is referred to.)



Colonel COULTER. The next chart gives a look at the weapon system business that I have been talking about. Here is the plan view of the Bomarc missile, 45 feet long, weighing about 16,000 pounds, and having a cruise speed velocity of in the order of 1,500 miles an hour, in excess of mach 2.

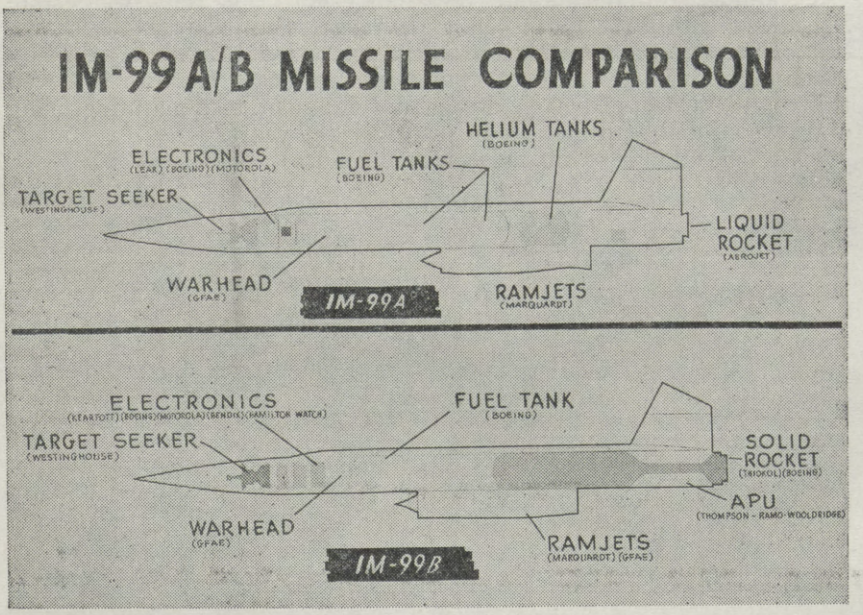
This missile is based—here is a typical base, a photograph of the McGuire Base, an A base, 56 shelters. Next is a picture of the base at Otis, a 28-shelter base.

(At this point Senator Jackson entered the hearing room.)

Colonel COULTER. I should say that we discuss these bases in terms of squadrons. A 28-shelter squadron—this is a unit. The 56 is a double squadron base, 56 shelters.

Also are shown samples of weapon system equipment, test equipment, transportation handling equipment, servicing equipment, hydraulic, power, these sorts of things, and electronic calibration equipment to keep the calibration standards in order. And then the weapon control equipment. Each base, and I have a blowup on a subsequent chart, has a squadron operations center, in which Air Force people run the base. They electronically monitor the status of each one of the 28 or 56 missiles on that base, and are able to determine instantaneously the readiness status of the missiles. This is done automatically and continuously.

(Next visual aid (exhibit 9E) is referred to.)



Colonel COULTER. I talked about the A and the B missiles, and I would like to say a little more about the difference between the two.

Let me first run through the essential systems of the missile. The target seeker is out in front, where it can see the target. You should visualize, and I will show you in detail an attack sequence, this thing electronically looks out in front for great distances, sees the target, and then takes over control of the missile and directs controls, or steers the missile in to intercept. Electronics, several packages.

Back here is the liquid booster. Remember, I said that the missile has a boost phase and a cruise phase. The booster is that engine which gets the missile off the ground and up to an appropriate velocity, at which time it goes out and the ramjet engines are ignited in flight and then the ramjet engines furnish the cruise propulsion which takes the missile on its way.

One of the principal reasons for going to the B system is that we got rid of the liquid rockets. Liquid rockets require handling of acids, of dangerous fuels. These two tanks have to be kept separate. These are the liquid tanks. The are mixed under pressure in the booster chamber and burned violently. They are hyperbolic, a word meaning when you mix them, they are instantaneously flammable, without any ignition, and so on.

We required also a high-pressure gas tank to force the fuel out of these two tanks at a very rapid rate and into the booster.

The warhead is common between the A and B systems, a nuclear warhead. The target seeker system, and I have touched on this before, represents a major advance in electronic techniques. It gives the system the capability to do the low-altitude attack. The low altitude, the ability of an enemy to come under radar coverage, involves a discussion of line of sight, and the rest. That is a difficult air defense job. This target seeker is the best in the inventory—I think that is a fair statement—in this low-altitude attack regime.

The CHAIRMAN. Is that much improved over the A missile?

Colonel COULTER. Yes, sir. I can't give you numbers, Mr. Chairman, but the improvement is dramatic between the low-altitude capability of the A missile and the B missile.

The CHAIRMAN. What is dramatic?

Colonel COULTER. The improvement is dramatic. "Significant" is probably a better word.

The CHAIRMAN. All right.

Colonel COULTER. Now, as I said, we went from a liquid rocket to a solid rocket. Solid rocket requires no storage of acid fuels. It has a shelf life of many years. It requires no attention. It is a great improvement from handling and missile system simplicity points of view.

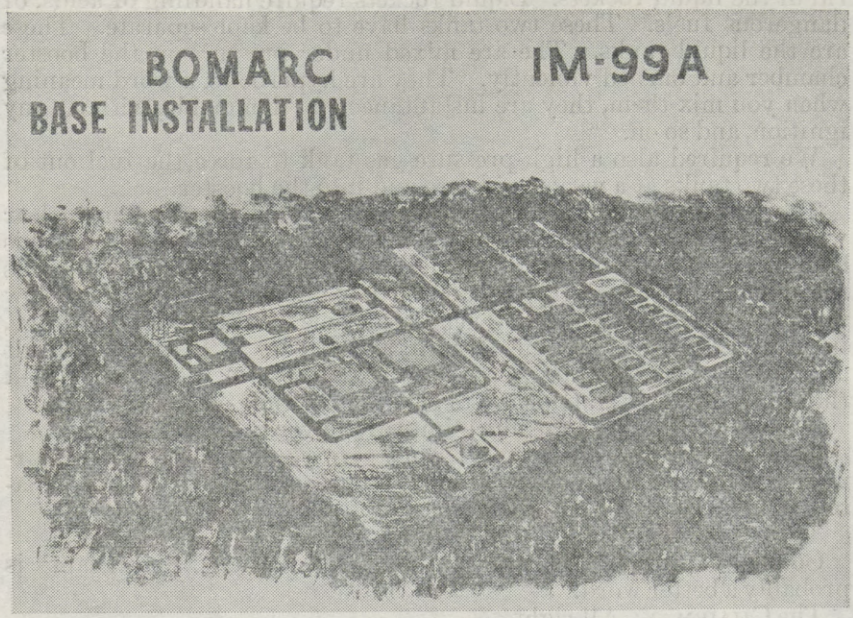
The CHAIRMAN. It does not deteriorate?

Colonel COULTER. That is correct. The ramjet engines represent another major improvement in the design of the two systems. A fuel economy construction is involved here in terms of missile range. This missile, A, flies or has a range in excess of 200 miles. The B missile has a range in excess of 400 miles. The reason for this more than double range performance is the ramjet engine design. This is a major set forward in the design of this type of engine.

One other small point is that the A missile had batteries for power for use in the electronics and target seeker and other electrical system requirements. The batteries have to be replaced. They have a shelf life of 90 days. When you look at a fleet, when you go through the economics of new batteries every 90 days times the number of missiles, economics is involved.

We developed an auxiliary power unit which was a troublesome piece of equipment in the test program. The APU is a gas-driven turbine generator which provides both electrical and hydraulic power for use in the system. The APU does not deteriorate with time as do batteries. It has performed most satisfactorily in recent tests. We had some trouble in the early development phase.

(Next visual aid is referred to.)

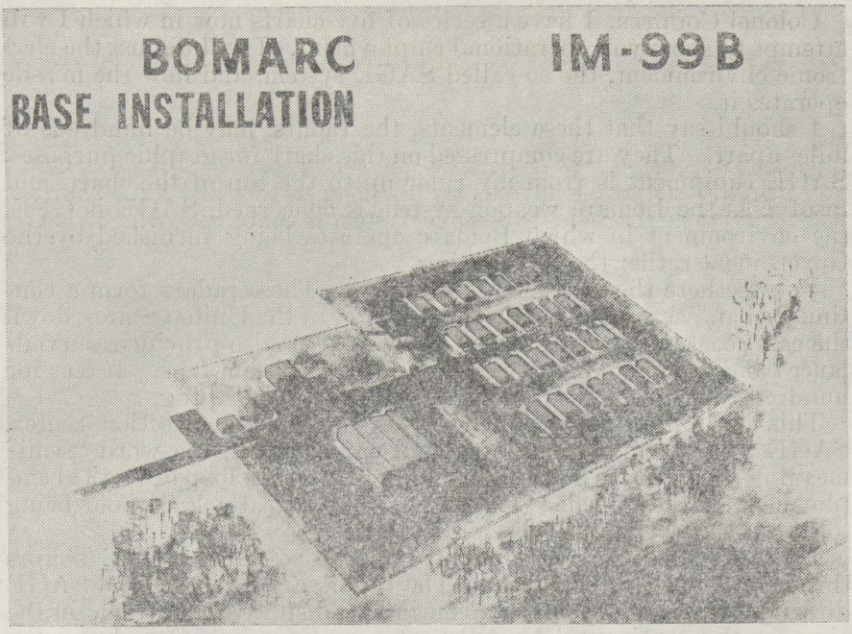


Here is a quick look at a typical Bomarc A base. This is a 56-shelter base, and we show assembly and maintenance buildings, the heat and power building. Here are shown the high pressure gas facilities. Remember I said that the A system required helium for pressure to exhaust the liquid fuel tanks. We have that gas piped all over the thing, and you have compressor buildings to maintain pressure and this sort of thing.

These buildings shown are for fuel storage. One is an acid building and the other is the standard JP–4 building.

I should say at this point, since it is a good place to look at it, that the Corps of Engineers did what we call the brick and mortar construction. The Corps of Engineers built the bases. All the shelters, shelter roofs—and I will show you an operating model of that in a moment—they built these buildings, installed the base utilities. Boeing's participation begins with the weapon system equipment, the installed equipment, but the corps built the bases for us.

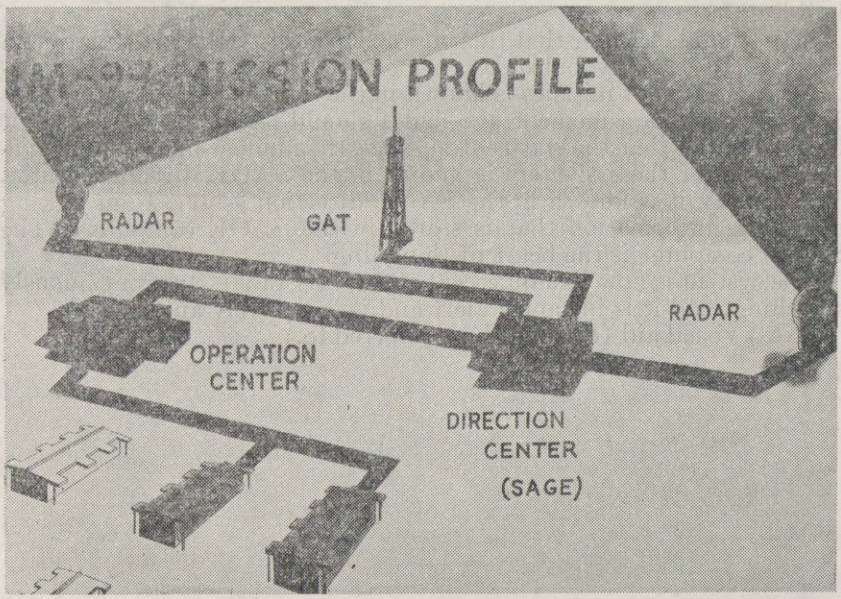
(Next visual aid (exhibit 9G) is referred to.)



A similar look at the B base shows the simplicity achieved in base design because of some of the simplicities of the B missile, itself. The air pressure systems are gone, the acid facilities are gone. We combined the assembly, maintenance, and heat and power functions into one building, and came up with a much cleaner base.

It was in anticipation of this simplicity and cleanliness of design that motivated us to go to the B system as rapidly as we could get an agreement on the specifications and a contract arrangement.

(Next visual aid (exhibit 9H) is referred to.)



Colonel COULTER. I have a series of five charts now in which I will attempt to show you operational employment. I will discuss the electronic environment, the so-called SAGE system, and how the missile operates it.

I should say that these elements, the radars, may be hundreds of miles apart. They are compressed on this chart for graphic purposes. SAGE equipment is from my ruler up to the top of the chart, and insofar as the Bomarc weapon system is concerned, SAGE is GFE, the environment in which Bomarc operates being furnished by the Government rather than by Boeing.

You see here the heavy SAGE radars. These radars form a continuous band across the northern perimeter of the United States, down the east coast and down the west coast. They also provide a surveillance band around our southern borders. The beam fans. It sees for hundreds of miles. It is a constant 24-hour-a-day thing.

This building I am pointing to is the SAGE direction center. SAGE means semiautomatic ground environment, the word "semi" meaning that there is a decisionmaking man in the loop of tactical employment of the system. The system does not attack without being told to. But everything else is automatic.

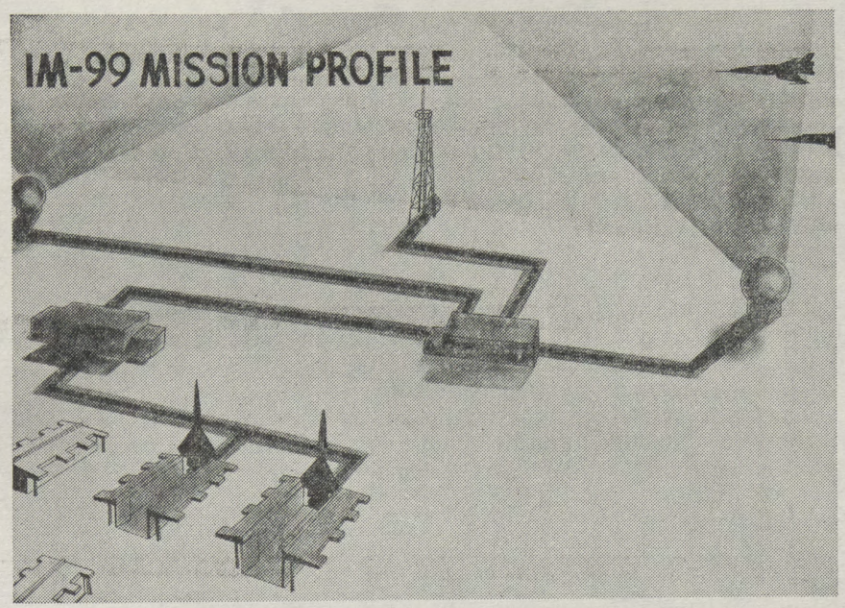
There are many of these located in the so-called SAGE sectors throughout the United States. The radars are netted to the SAGE direction center and provide a continuous display of all traffic in the air over the continental United States, and far into Canada all the time. The tracks are watched, are identified as friendly. The airlines file flight plans. It is a complicated control business.

From here down to the bottom of the chart you look at some of the Bomarc system equipment elements. The operation center, housing the buildings shown on the previous charts, provide the Air Force-operated squadron functions. Here we talk about the status of the missiles on the site being continually observed and displayed on the status equipment in the squadron operations center. The squadron operations, the maintenance cycles, the whole thing is run from this building.

You should consider that this chart depicts SAGE and Bomarc in a constant alert, ready, but quiescent posture. It is constantly alert because the status of missiles is known in the squadron operation center. I didn't say this a moment ago, but I should have: It is important to understand that the status of missiles, the number of available missiles in all of these shelters is known in the SAGE direction center. When I say it is known in the SAGE direction center, I am talking about the information that is stored in the SAGE computer. The SAGE computer is the heart of this thing.

The system is now in a quiescent state. Its radars are continuously searching, and it is instantly alert and is completely automatic.

(Next visual aid (exhibit 9I) is referred to.)



Colonel COULTER. We will trace this thing through an attack.

This chart shows the penetration, the detection by a heavy radar of unidentified targets. They appear on the scopes in the SAGE direction center, and if their track, altitude, and other related data cannot be correlated with any known "friendlies," then after surveillance they are classified as hostile.

At this point, SAGE, knowing it has distance, altitude, azimuth, heading, information in its computer on the target, it has established a track. It sees hostiles traveling at specific rates and in a specific geographical area— the accuracy here is quite precise——

The CHAIRMAN. How can you definitely establish them as enemy planes or missiles? I am sure you can. I am not questioning that. But it is a mystery to me how you can detect something a thousand miles off and say whether it is an enemy.

Colonel COULTER. I think, Mr. Chairman, the answer is that we have precise knowledge of all friendly traffic.

The CHAIRMAN. You have to have knowledge of all——

Colonel COULTER. Of all airline operations, all over-water operations. They are precisely controlled by the Federal——

The CHAIRMAN. Over what?

Colonel COULTER. And over the United States, too. There are some exceptions. The light-plane traffic, the cubs, the small planes, fly without flight plans, under so-called visual flight rules, in the sunshine. But traffic at altitude—well, where you see this thing, and its incoming direction, would be an indication. You know of all the traffic that should be in that area.

The CHAIRMAN. Is it possible to make a mistake and shoot down one of our own or a friendly plane?

Colonel COULTER. The answer is "No, sir." I can't be directly responsive because in the first place I don't know this subject well, and in the second place, I am sure it involves the Norad operational plans.

Senator JACKSON. In response to the chairman's question, wouldn't you say that it is possible to make a mistake? You could not want to be in the position in which it is not possible to make a mistake. That was the chairman's question.

The CHAIRMAN. Is there very much hazard, let's put it that way, very much likelihood?

Colonel COULTER. The possibility of making a mistake is extremely remote. The emphasis is on "extremely."

The CHAIRMAN. It is not impossible to make a mistake, but the likelihood that you will make a mistake in view of what you have developed up to now is very remote?

Colonel COULTER. Extremely remote.

The CHAIRMAN. Extremely remote.

Senator JACKSON. Wouldn't you explain further, Colonel, that it is a practice, when unidentified aircraft appear, that the first thing you do is, of course—and we are talking about various layers of defense—send up interceptors? You want to identify it. Then if it is not friendly, it is foe, and then you intercept and then you destroy. Isn't that the procedure?

Colonel COULTER. Yes.

Senator JACKSON. We do this constantly, do we not? We are always sending up manned interceptors, out on the perimeter, to identify planes.

Colonel COULTER. To make positive identification, that is correct.

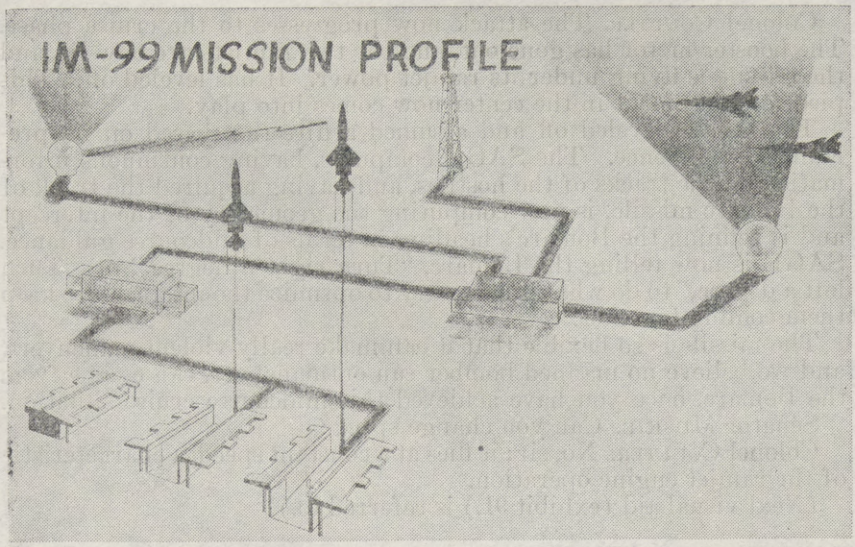
Now the SAGE computer, knowing its inventory of available weapons, and having precise geographical position data on the hostile, selects the right armament—and this might be an interceptor, it might be a Nike. For our example, we chose a Bomarc. It selects the right, the correct, armament to use in the attack, correct from a standpoint of interceptor geometry, based essentially on geography.

The CHAIRMAN. On these bases you have various kinds of missiles in the system, or do you have just a particular weapon on a base?

Colonel COULTER. The latter is a better example, Mr. Chairman. It is, however, a fact that in some case we have a mixture. At Maguire, for instance, in New Jersey, there is an air defense interceptor base, a manned operation, in addition to Bomarc missiles. But, generally speaking, the Bomarc missiles, because of their longer range, are located, for reasons of housekeeping and the ownership of real estate, generally contiguous to an existing military installation.

The Nike system, with its capability for point defense, is normally located in and around the heavier population centers.

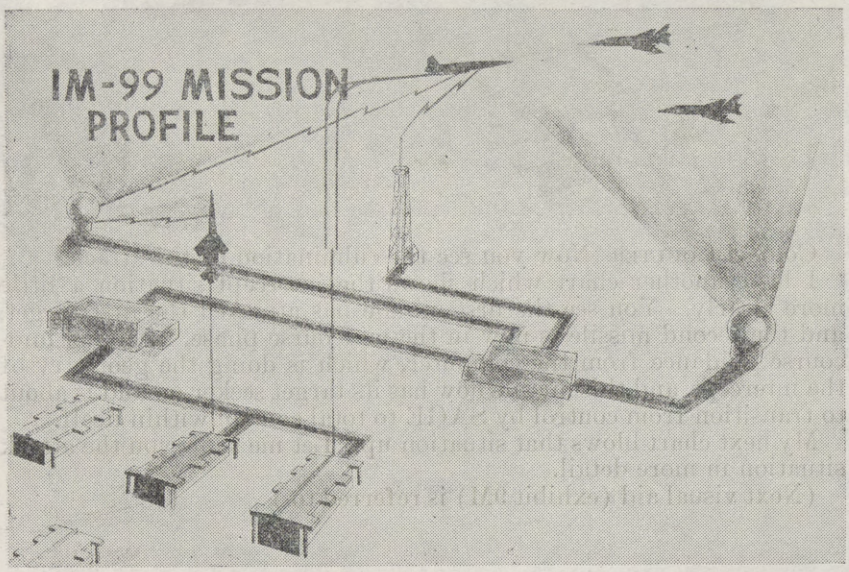
(Next visual aid (exhibit 9J) is referred to.)



Colonel COULTER. As this attack progresses, you see the computer has now launched these two Bomarc's in order to do an intercept on these two identified hostile targets. The computer provided the two missiles with prelaunch commands, electrically, through the squadron operations center into the missile shelters, so that the missiles at launching know, first, the altitude at which they are going to level off, and, second, they know the heading which they must assume, the direction which they must assume, to achieve intercept. That is provided in the missile in the form of prelaunch commands generated by the SAGE computer.

You see here that the second heavy radar has now acquired the first missile.

(Next visual aid (exhibit 9K) is referred to.)



Colonel COULTER. The attack now progresses to the cruise phase. The booster motor has gone out, and the two ramjets are now lit, and the missile is flying under its ramjet power. It has leveled off. This piece of equipment in the center now comes into play.

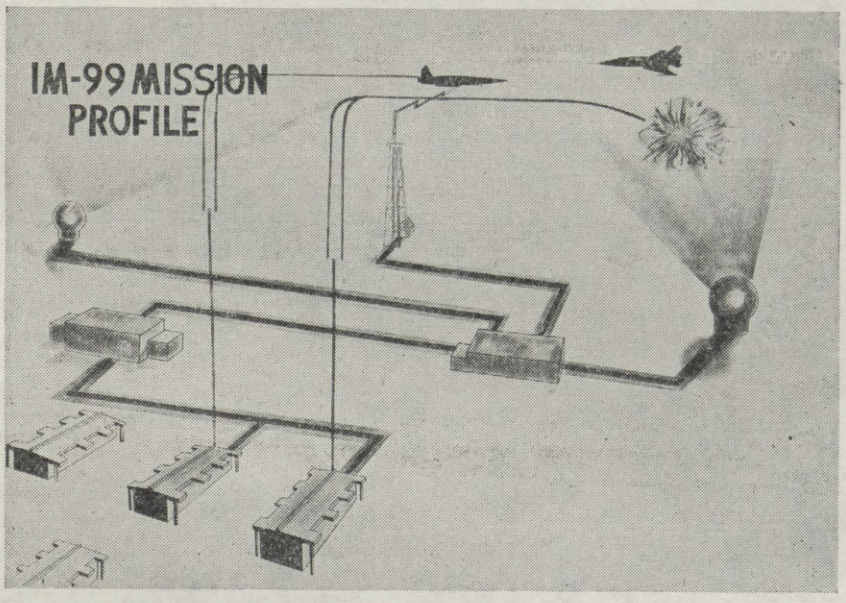
The missile leveled off and assumed a direction based on its prelaunch intelligence. The SAGE computer, having continuous information on the tracks of the hostiles, and having acquired the track of the Bomarc missile, is now computing the geometery of the intercept and is refining the Bomarc's heading in terms of midcourse guidance. SAGE is now telling the Bomarc, "Turn right a degree," or, "Turn left a degree," to do what is necessary to optimize the intercept, to keep them coming together.

The missile is so flexible that it can make really violent maneuvers, and we believe no manned bomber can outmaneuver, can escape from the Bomarc, once you have achieved this midcourse cruise situation.

Senator MUSKIE. Can you change speed?

Colonel COULTER. No, sir; it flies at a constant speed, a characteristic of the ramjet engine operation.

(Next visual aid (exhibit 9L) is referred to.)

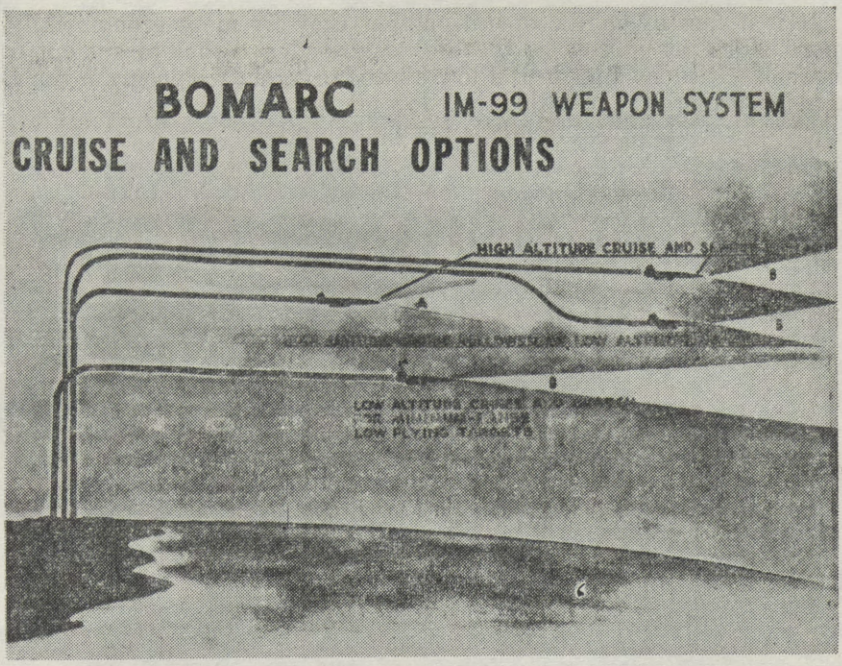


Colonel COULTER. Now you see the culmination of the attack.

I have another chart which shows the intercept situation a little more clearly. You see the first missile has attacked the first target, and the second missile is now in the midcourse phase, receiving midcourse guidance from the computer, which is doing the geometry of the intercept, and this missile now has its target seeker on and is about to transition from control by SAGE to total control within itself.

My next chart blows that situation up. Let me show you the attack situation in more detail.

(Next visual aid (exhibit 9M) is referred to.)



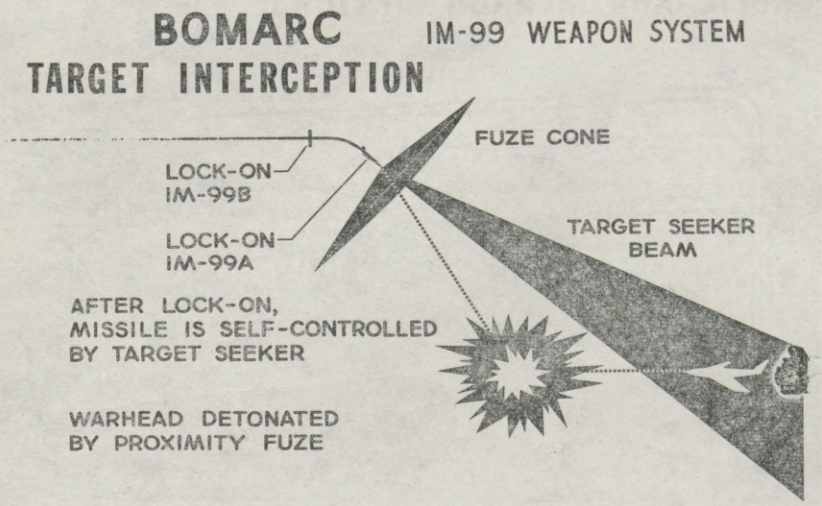
Colonel COULTER. I am sorry. I have an intermediate chart which describes the flexibility achieved in the B missile with respect to cruise and attack performance over that of the A.

The chart says that the A missile, about which I will talk first, has a single cruise altitude. It is in excess of 60,000 feet. It searches below and above, but always from this single cruise altitude. This is a derivative of ramjet engine operation. A ramjet engine is a tricky thing, and it flies best at a single altitude. In the case of the B system, however, we improved the ramjet considerably. It has three options: It can cruise and search at a high altitude, it can cruise at high altitude and search at a lower altitude, a so-called intermediate altitude, or it can cruise and search at low altitude. You see, SAGE would know the altitude and tell the missile at what altitude the probable attack would take place, so you would have a choice.

In SAGE prelaunch commands to the B missile, it would tell the missile, "Fly at your low altitude cruise option," or, conversely, "Your high altitude cruise option." The B missile can fly at high altitude first and then drop down to low altitude. This is a real advantage in a situation where you want to make the longest possible range attack on a target that is coming in at the low altitude and is therefore best searched for at the lower cruise altitude.

It is a fact of engine operation that they fly more economically, more miles per gallon, at the higher altitude, so that to get out to extreme altitudes and do the low altitude search, we program the B missile through the so-called high-low maneuver.

(Next visual aid (exhibit 9N) is referred to.)



Colonel COULTER. This chart takes a look at the intercept geometry and what goes on in the missile here. I would say, Mr. Chairman, that the chart and my words are not classified, but I could say very little more than I will say and not get on sticky ground.

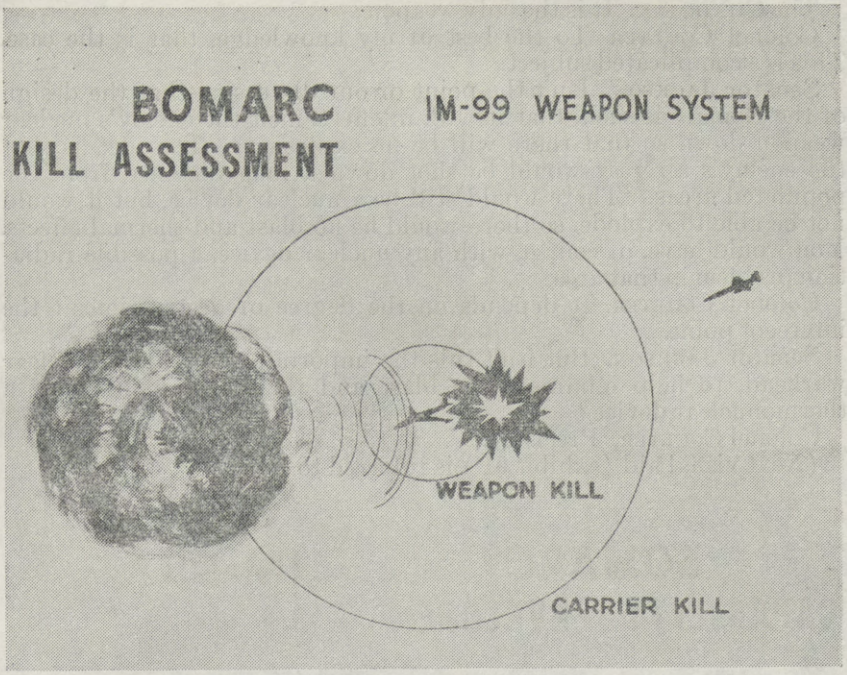
The chart depicts the missile at the point of transition into its attack dive. This cone, the dark shade, depicts the missile target seeker. It is now illuminating the target, and its onboard computer is looking at the target and is computing the intercept point.

It is then controlling the missile through its interior, internal, organic flight control system. It is programing the missile into this precise attack.

This cone [indicating] is the fuse cone. The system is equipped with a proximity fuse. It is a cone of electrical energy which, when cut by an object, like a target airplane, causes the warhead to detonate. You therefore see that the system detonates its warhead at the point of closest approach.

That is about all I can say, sir.

(Next visual aid (exhibit 9O) is referred to.)



Colonel COULTER. An important capability of the Bomarc missile is its ability to kill not only the attacking airplane but the nuclear bomb which that airplane probably carries. We then have developed a kill assessment which says that within a certain radius, if the Bomarc warhead is detonated within this line [indicating], we will achieve weapon kill. We will not only wreck the airplane, but we will disable the bomb that the airplane carries.

The CHAIRMAN. Suppose you failed to disable the bomb. What happens? Would it likely explode on contact with the earth?

Colonel COULTER. My answer is "Very probably."

The CHAIRMAN. So that unless you can destroy the bomb, you have not succeeded in the protection you desire, necessarily. It wouldn't fall on target, of course.

Colonel COULTER. It certainly wouldn't fall on target: and with the range of the system, we propose to do most of the intercepts—we are organized, we are programed to do most of the intercepts over water. I will show you the disposition and the coverage in that sense.

The CHAIRMAN. There would still be some element of danger, however, unless you can destroy the weapon.

Colonel COULTER. I might comment, sir, that the only system in our inventory with the so-called weapon-kill capability is the Bomarc missile.

The CHAIRMAN. It is the only weapon?

Colonel COULTER. To the best of my knowledge, that is the case. This is a complicated subject.

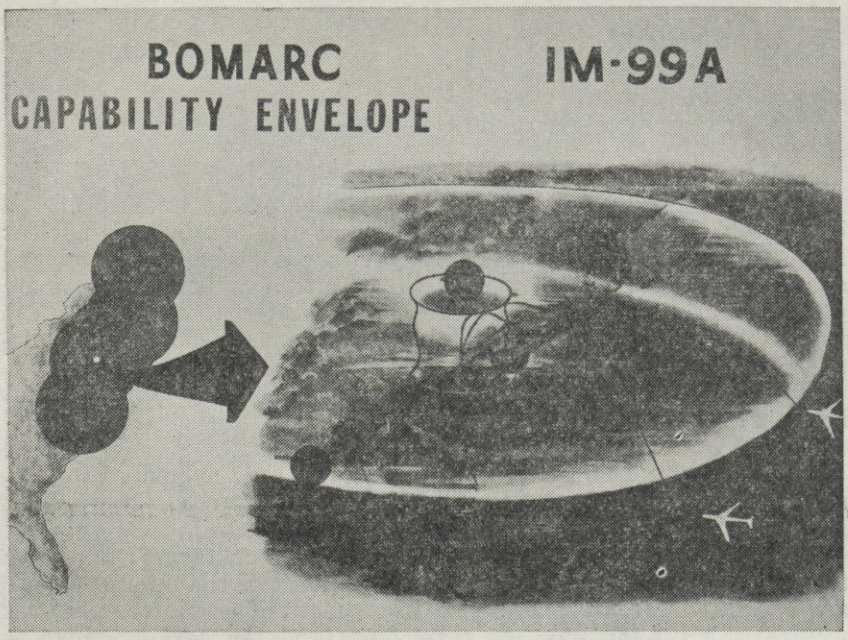
Senator JACKSON. Isn't the point of our discussion that the design of the Bomarc is such, that it will, in effect, melt the enemy's nuclear weapon down so that there will be no explosion? The idea is that the enemy's aircraft would be shot down a long distance from the populated areas. There would still be a nuclear device, but it would not be able to explode, so there would be no blast and thermal effects. You would have, of course, with any nuclear device, a possible radiation problem in that area.

Colonel COULTER. It depends on the degree of destruction at the intercept point.

Senator JACKSON. But isn't this the importance of using a nuclear warhead, to help eliminate the blast and thermal capability of a thermonuclear device?

Colonel COULTER. Precisely.

(Next visual aid (exhibit 9P) is referred to.)

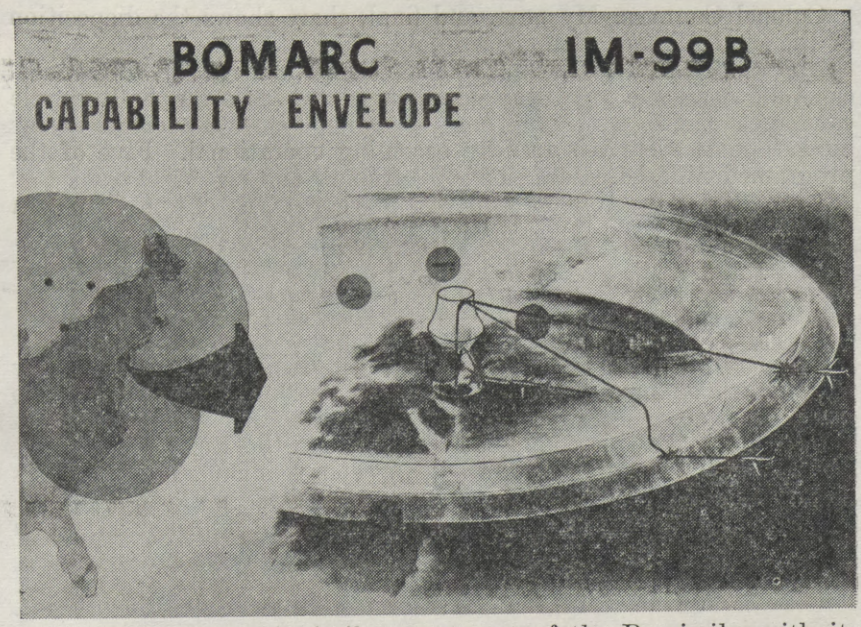


Colonel COULTER. Now I will show you the operational deployment of the A and B systems.

This chart—and look over to the left side first, please, where you have an outline of the eastern coast of the United States, from Florida to Maine, with the disposition of the five Bomarc A bases.

On the right you see the three-dimensional drawing is a blowup of the base at McGuire. You see in three dimensions the extent of the A base coverage, extending out over the water to in excess of 200 miles.

(Next visual aid (exhibit 9Q) is referred to.)

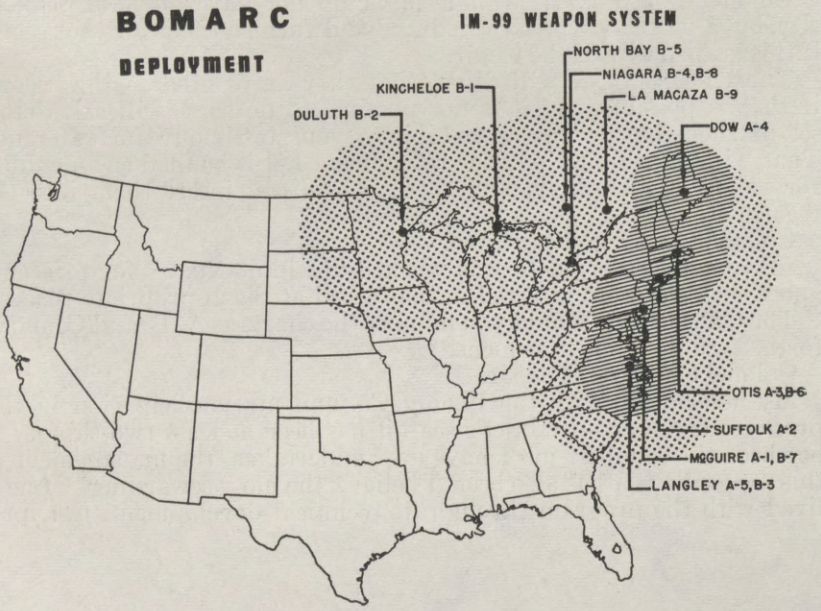


Colonel COULTER. A similar treatment of the B missile, with its better than 400-mile range, is shown here. Again you see the east coast of the United States, with six of the nine program B bases identified, the other three being off the map.

We show McGuire and blow it up in three dimensions. There will be A and B missiles at McGuire, and we have some double bases, composite bases.

The traces depict the high-altitude attack, out to over 400 miles, and the high-low, where an airplane was attacking at lower altitudes.

(Next visual aid (exhibit 9R) is referred to.)



Colonel COULTER. My next, and final, chart shows the disposition of the total planned Bomarc employment.

The red (slanted lines) and the circles are areas of coverage, indicates the A missile coverage. The blue (dots) indicates the B missile coverage. The A system has been operational since September a year ago. The B system is rapidly becoming operational. Five of the programed nine bases are now operational, and the other four will achieve that status by the end of the year. One of the Canadian bases, the one at North Bay, recently became operational.

The CHAIRMAN. I don't know whether this question should be answered, but is the coast of Florida protected?

Colonel COULTER. As far down as this circle, Mr. Chairman.

The CHAIRMAN. We didn't get to Florida with that circle.

Colonel COULTER. The subject of force disposition and whether we should have bought more Bomarc's is a whole other subject unto itself.

I should make this comment: This depicts the Bomarc coverage, not the total air defense coverage. We have manned interceptors and other missiles all around. We are not naked in Florida; no, sir.

The CHAIRMAN. In other words, Florida is not unprotected. You are just talking about this particular system.

Colonel COULTER. That is right, sir.

The CHAIRMAN. Very well. I didn't want to leave Florida out.

Colonel COULTER. In conclusion, you should recognize first from this chart that this coverage is available on automatic, 24-hour-a-day, continuous basis. I can't talk numbers, but the operational readiness, the percentage of the inventory constantly ready, is very high in the Bomarc system.

The CHAIRMAN. We can't be taken by surprise?

Colonel COULTER. No, sir; not in the air, that is right.

I would like to comment——

The CHAIRMAN. If possible, may I inquire at this point, is it possible to have these charts printed in the record?

Colonel COULTER. It is, indeed. I do not have a set of reduced size, but I will have them reproduced and furnish them for the record, if this is the desire of the Chair.

The CHAIRMAN. I will direct that they be printed in the record, if that is possible. If it is not possible to do so, I will ask that a set of them be filed as an exhibit to your testimony for reference. That will be exhibit No. 9 for reference. Let it be filed as an exhibit for reference definitely, and then, if you can insert them into the record, do so.

Colonel COULTER. I can do so.

(Document referred to was marked "Exhibit No. 9" for reference and the charts were inserted in the record at the appropriate places.)

The CHAIRMAN. Would you number the charts as A, B, and C, and so forth, so that each is in sequence?

Colonel COULTER. Yes, sir.

My association with the Boeing Co. and my participation in this program has been—well, let's see—it has been at least two things: It has been the toughest job I have ever undertaken, the management of this program. It has also been, I believe, the most rewarding. I have lived with the program through its technical development, test, pro-

duction difficulties, and have watched it grow into an operational system in-being, and essentially on schedule.

As a matter of fact, the dates of the recent activation of the B sites have been from 30 to 60 days ahead of schedule.

The CHAIRMAN. In other words, the fruits of your labors and that of your associates have brought to you considerable satisfaction and much gratification.

Colonel COULTER. Thank you, sir.

This concludes my remarks. I will be delighted to attempt to answer questions.

The CHAIRMAN. I made a comment on my opening statement about we are not depreciating the amount of work or the value of the work or the success of it. We think definitely it is a tremendous program that has been well executed and successfully developed. We are proud of it. It is not that. In a study we are making, an overall study, it is necessary to go into this aspect of our program and take a look at it, too.

All of us know that in retrospect, looking back, we could find, maybe, ways to improve in the future. That is the purpose of this. It is not to be critical, but it is to be searching and trying to find out how we can do the job better as we move forward and make progress.

You have given us a very excellent presentation, Colonel. I know all members of the committee appreciate it.

I will be glad to have my colleagues ask any questions. Senator Jackson?

Senator JACKSON. I have no questions, Mr. Chairman.

Senator MUSKIE. I have no questions, Mr. Chairman.

The CHAIRMAN. Counsel, have you a question?

Mr. ADLERMAN. Can you tell us who makes the various components on the Bomarc A? For example, who is the manufacturing designer of the target seeker?

Colonel COULTER. Westinghouse.

Mr. ADLERMAN. The electrical launch equipment and the test equipment, who makes that? Is that I.T. & T.?

Colonel COULTER. The test equipment on the A system is I.T. & T.-Farnsworth. On the B system, and I talk about a particular major piece of test equipment, it was built by Boeing, the mobile inspection unit, the van-mounted electronic test sets. The ELE electrical launch equipment—I have to look in my notes. Food Machinery made the launcher erector, but the electrical equipment, itself, escapes me. Let me see if my notes show it. If not, I will provide it for you.

Mr. ADLERMAN. I believe that was made by International Tel. & Tel.

Colonel COULTER. OK, sir.

Mr. ADLERMAN. And the coordinate converter?

Colonel COULTER. By Kearfott.

Mr. ADLERMAN. That was on the B. On the A was it Lear?

Colonel COULTER. I believe so.

Mr. ADLERMAN. Did they do the design, research, and development on those?

Colonel COULTER. Yes.

Mr. ADLERMAN. And the booster rockets in the A, who made that?

Colonel COULTER. Aerojet.

Mr. ADLERMAN. And on the B?

Colonel COULTER. Thiokol.

Mr. ADLERMAN. That is solid fuel?

Colonel COULTER. Yes, sir.

Mr. ADLERMAN. Are those the principal components of the Bomarc?

Colonel COULTER. The ramjet engines we did not mention. They were by Marquardt. Those are certainly major components.

Mr. ADLERMAN. And that is a Government-furnished item? That is not made by Boeing at all?

Colonel COULTER. The ramjet engines are GFAE, that is correct, sir.

Mr. ADLERMAN. That is not part of the Boeing contract?

Colonel COULTER. That is correct.

Mr. ADLERMAN. That is attached by Boeing or at the site?

Colonel COULTER. At the site.

Mr. ADLERMAN. These various companies, each of them, like Westinghouse, I.T. & T., Lear, Aerojet, Thiokol, including Boeing, itself, did the research and development on the various components that went into the weapon under a subcontract to Boeing?

Colonel COULTER. It is not possible, I believe, to do the total R. & D. job within the capability of the specific subcontractor. What I am saying, sir, is that the system integration aspects of the development and production of a particular subsystem, like the target seeker, requires a deep understanding of missile performance requirements and characteristics.

Mr. ADLERMAN. It has to be done with the cooperation of Boeing, is that it?

Colonel COULTER. Therefore, it requires an intense engineering interface with Boeing, and that remark applies across the board; yes sir.

Mr. ADLERMAN. But each of the components were manufactured, designed, and developed by the component manufacturer, with the assistance of Boeing?

Colonel COULTER. With the direct engineering assistance and direction, in many cases, by Boeing. I can't overstress the requirement for this deep technical direction system integration interface between the central contractor, the prime contractor.

Mr. ADLERMAN. Thank you.

The CHAIRMAN. Thank you very much, Colonel.

Colonel COULTER. Yes, sir. It has been my pleasure to appear before your committee, and if I am helpful, I am gratified. If I can be of further assistance, I would be delighted.

The CHAIRMAN. Thank you, sir. We want to commend you and others for the excellent job you have done.

Call your next witness.

Mr. ADLERMAN. Mr. Nunnally, please.

The CHAIRMAN. Mr. Nunnally, you have been previously sworn. You will remain under your oath as you testify today.

For the record give your name and identification.

TESTIMONY OF THOMAS E. NUNNALLY—Resumed

Mr. NUNNALLY. Thomas E. Nunnally. I am on assignment with the committee from the General Accounting Office.

The CHAIRMAN. Very well, proceed.

Mr. ADLERMAN. Did you make a study of the income from Government sales as related to net investment by the Boeing Co.?

Mr. NUNNALLY. Yes, sir; I did.

Mr. ADLERMAN. Is that a chart which depicts that?

The CHAIRMAN. What do we mean "Government sale," income from Government sale?

Mr. NUNNALLY. Sales to the Government.

The CHAIRMAN. They were not Government sales, they were Government purchases.

Mr. NUNNALLY. We have it here in respect of Boeing Co. "sales to the Government."

The CHAIRMAN. I thought you said from the Government. In other words, the Boeing Co. income from its sales to the Government?

Mr. NUNNALLY. Yes, sir; that is correct.

Mr. ADLERMAN. That would include not only the Bomarc, but it would include a number of other contracts as well?

Mr. NUNNALLY. Over the 11-year period that we have, it would include a number of large contracts, such as the production of B–52——

The CHAIRMAN. This chart may be printed in the record at this point.

(Chart No. 1 follows:)

CHART NO. 1

The Boeing Co.: Income from Government sales related to net investment

[Dollars in millions]

	1950		1951		1952		1953		1954		1955		1956	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Sales:														
Government			$334.6	99.2	$735.8	99.6	$917.6	99.8	$1,030.7	99.8	$850.7	99.6	$1,004.0	99.8
Commercial			2.7	.8	3.2	.4	2.1	.2	2.5	.2	3.1	.4	2.4	.2
Total			337.3		739.0		919.7		1,033.2		853.8		1,006.4	
Cost of sales:														
Government			315.2		683.2		844.3		948.4		780.2		923.4	
Commercial			1.8		2.5		1.5		1.9		2.4		1.8	
Total			317.0		685.7		845.8		950.3		782.6		925.2	
Gross profit on sales:														
Government			19.4		52.6		73.3		82.3		70.5		80.6	
Commercial			.9		.7		.6		.6		.7		.6	
Total			20.3		53.3		73.9		82.9		71.2		81.2	
Profit on Government sales related to net investment				36.0		59.2		108.6		100.1		64.4		66.3
Borrowed capital			31.1										11.5	
Net worth	$53.9		57.8		67.5		82.2		109.4		121.5		148.7	
Net investment	53.9		88.9		67.5		82.2		109.4		121.5		160.2	
Cash dividends paid			3.2		4.3		5.7		9.7		10.6		8.2	
Assessment by Renegotiation Board					10.0		7.5		10.0		6.8			

CHART NO. 1—Continued

The Boeing Co.: Income from Government sales related to net investment—Continued

[Dollars in millions]

	1957		1958		1959		1960		1961		Total	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Sales:												
Government	$1,593.8	99.8	$1,669.2	97.5	$1,222.6	75.8	$1,061.8	68.3	$1,398.1	77.6	$11,818.9	89.8
Commercial	2.7	.2	42.7	2.5	389.6	24.2	492.8	31.7	402.8	22.4	1,346.6	10.2
Total	1,596.5		1,711.9		1,612.2		1,554.6		1,800.9		13,165.5	
Cost of sales:												
Government	1,489.6		1,543.8	97.3	1,120.3	74.3	970.0	67.7	1,292.8	78.8	10,911.2	
Commercial	2.0		42.2	2.7	387.3	25.7	463.7	32.3	347.1	21.2	1,254.2	
Total	1,491.6		1,586.0		1,507.6		1,433.7		1,639.9		12,165.4	
Gross profit on sales:												
Government	104.2		125.4		102.3		91.8		105.3		907.7	
Commercial	.7		.5		2.3		29.1		55.7		92.4	
Total	104.9		125.9		104.6		120.9		161.0		[1] 1,001.1	
Profit on Government sales related to net investment		65.0		44.6		37.2		36.0		41.4		
Borrowed capital	110.0		168.5		168.5		85.8		64.6			
Net worth	178.9		201.6		208.4		237.0		259.3			
Net investment	288.9		370.1		376.9		322.8		323.9			
Cash dividends paid	6.7		7.0		7.4		9.1		13.5		85.4	
Assessment by Renegotiation Board												

[1] Before taxes.

Mr. ADLERMAN. Would you explain in your own way the nature and amount of Government sales as compared with commercial sales?

Mr. NUNNALLY. On the first line we have by year, sales from Boeing to the Government in 1951, $334 million, and there is a gradual increase of the years. It reaches $1 billion or more in 1954. In 1957, we have $1,593,800,000.

In 1958, it again increases, and we have a total for the 11-year period of $11,818,900,000, which is, for the 11 years, 89.9 percent of the Boeing business.

We can see for the first 7 years that the commercial work of the Boeing Co. is very, very small.

The CHAIRMAN. Is that the percentage shown in red?

Mr. NUNNALLY. The red figure is a percentage. It is a percentage of the total Boeing sales.

The CHAIRMAN. You are showing there the percentage of all of the Boeing Co.'s work, the percentage relating to its business with the Federal Government and the percentage of its work relating to non-Government?

Mr. NUNNALLY. Yes, sir. For instance, in the year 1954, we had 99.8 percent of the total Boeing business being with the Government, and 0.2 percent is commercial.

The CHAIRMAN. Two-tenths of 1 percent being its civilian work?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. That is a tremendous percentage. It simply was in business for the Government, was it not?

Mr. NUNNALLY. For all practical purposes, you can say from 1951 to 1957 the Government is Boeing's sole customer.

The CHAIRMAN. Almost its sole customer.

Mr. NUNNALLY. Almost its sole customer. In 1958 we see the beginning of Boeing going into commercial sales with $42.7 million, which happened to be the sale of the 707 transport planes.

The CHAIRMAN. The sale of what?

Mr. NUNNALLY. The 707 jet transport. These sales increased. For the 4 years we have a total of $1,346.6 million, or 10 percent of the entire 11-year period.

The CHAIRMAN. From 1951 to 1961, inclusively, a 10-year period, or 11—it is an 11-year period—only 10 percent of Boeing's business was commercial?

Mr. NUNNALLY. 10.2 percent.

The CHAIRMAN. And 89.8 percent was with the Government?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. In some of those years, 1952, 1953, 1954, 1955, 1956, and 1957, in those years the commercial business of the company was less than 1 percent?

Mr. NUNNALLY. Less than 1 percent. And in all but one it was less than one-half of 1 percent.

The cost of sales——

Senator JACKSON. What does the chart show to be the percentage of commercial business starting with 1959 through 1961?

Mr. NUNNALLY. The percentage of commercial business in 1958 is 2.5 percent; 1959, 24.2 percent.

Senator JACKSON. That is the big jump.

Mr. NUNNALLY. Yes, sir. And 1960 was the high year, 31.7 percent. In 1961 it was 22.4 percent.

Mr. ADLERMAN. The total Government business over the 11-year period amounts to $11 billion?

Mr. NUNNALLY. $11,818,900,000.

Senator JACKSON. What part of that was Bomarc?

Mr. NUNNALLY. Roughly 10 percent. The Bomarc program was $1.6 billion, in round figures.

Senator JACKSON. So the $10 billion figure was for airplane purchases and so forth?

Mr. NUNNALLY. Yes. It included such large contracts as the production of the B–52, the KC–135 tanker, the modification of the B–47, and other projects.

On the next line we have the cost of sales, or what it cost to produce these airplanes and missiles, broken down between the Government and the commercial work.

On the next line we have the gross profit on these sales, the Government sales and the commercial sales.

The CHAIRMAN. What do you mean "gross profit"? Is that before the cost of production?

Mr. NUNNALLY. Gross profit in this sense means, for the Government sales, all the profit that is allowable under procurement regulations.

The CHAIRMAN. I am trying to avoid the confusion that we had in the Douglas Aircraft inquiry. We would show profit and they would say it was not profit.

May I ask at this point, Is there any dispute now as between the staff of the committee and the company with respect to these profits?

Mr. NUNNALLY. There has been no dispute to my knowledge. We have discussed this with the Boeing people, and I believe they will agree with us that the profits that we show on this line are those which are allowable after deducting—I should say these are the profits after deducting all allowable costs.

The CHAIRMAN. All allowable costs?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. And you call them gross profits. Why are they not net profits?

Mr. NUNNALLY. We are treating here also the commercial sales. There happened to be other deductions of costs.

The CHAIRMAN. You have the same application of gross profits to commercial sales. It is all gross profit.

Mr. NUNNALLY. It is gross profit, but in the commercial work there are other designated expenses which are deductible before you come to a final net.

The CHAIRMAN. And which would not be deductible against a Government contract?

Mr. NUNNALLY. That is correct.

The CHAIRMAN. They would be deductible for tax purposes, but they are not deductible for the purpose of settling with the Government?

Mr. NUNNALLY. That is correct, sir.

Mr. ADLERMAN. Are all these figures before taxes?

Mr. NUNNALLY. These figures, as indicated, are all before income taxes.

On the next line we relate the rate of profit to the net investment in the company. I should explain here, when we use the term "net investment" we are including borrowed capital as opposed to net worth, which is synonymous with the stockholders' investment.

On this line you see in the later years there is a considerable borrowing of capital, which, therefore, increases the net investment in the company.

In making this computation with these 7 years, we have ignored the small part of the commercial work and merely made our computation as though this small profit did not exist.

We have taken, for instance in 1951, $19.4 million return on Government sales, compared with the beginning net investment for the year of $53.9 million, and we have a return of 36 percent.

By applying the same processes through the years we get a return of 59.2 percent; in 1957, 108.6 percent——

Mr. ADLERMAN. In other words, in that year, they had a net investment of $67,500,000; is that right? That is in 1952.

Mr. NUNNALLY. Yes.

Mr. ADLERMAN. And they made a profit of $3.3 million?

Mr. NUNNALLY. $73.3 million profit, compared with the beginning net worth or net investment, $67.5 million, gives a return of 108.6 percent.

Mr. ADLERMAN. That is the highest rate of return?

Mr. NUNNALLY. That is the highest rate of return.

It is clearly indicated in 1954, where the profit is $82.3 million, compared with $82.2 million, just barely over 100 percent.

In successive years, through 1955 we had 64.4 percent return; in 1956, 66.3; in 1957, 65 percent; and now we are getting into the years where Boeing is beginning their commercial work.

We then have to consider what portion of this net investment is applied to the commercial work as opposed to the Government work. So we have taken as a basis the relation of the cost of sales to the total cost of sales, in the first year that the Government sales were 97.3 percent of the total cost of sales, 1958, so therefore we have applied the profit to 97.3 of the net investment to get a figure of 44.6 percent return.

The same method was used in 1959 to get a return of 37.2 percent in 1959, 36 percent in 1960, and 41.4 percent in 1961.

The CHAIRMAN. Do those returns relate only to the profit made on Government sales?

Mr. NUNNALLY. These are related to the profits made on the Government sales.

The CHAIRMAN. All of them?

Mr. NUNNALLY. All of them.

The CHAIRMAN. In the last 3 or 4 years, those profits are not profits on all of its gross sales, but only as related to Government sales?

Mr. NUNNALLY. Just on the Government sales. We have not made any computation for the commercial work.

Also, this chart shows on the next line——

The CHAIRMAN. I would like to check on something else.

You say "net worth" and "net investment." Explain those. What are net worth and net investment?

You are basing the percentages of income as related to net investment. You are showing net worth. What does the net worth represent?

Mr. NUNNALLY. The net worth is the stockholder equity or the worth of the company.

The CHAIRMAN. In other words, the worth of the company, the assets of the company, and equipment of the company—that was put into operation to produce a product?

Mr. NUNNALLY. The assets of the company, less its liabilities or debts, that would be the net worth.

The CHAIRMAN. And the net investment?

Mr. NUNNALLY. The net investment takes into consideration borrowed capital. In this particular year, 1951, they had borrowed $31 million, so we have a net investment of cash and assets of $88.9 million.

The CHAIRMAN. I do not quite get your point. I have a company with its assets being worth $100 million, and I borrowed $100 million. Yet I go out and produce this product.

Actually, I have nothing invested, if you count what I owe, but I have the obligation. Would you say, then, that all of the profit I made would be related to the fact that I actually had no net worth because I owed as much as the assets were worth?

Mr. NUNNALLY. We are going to show this on another chart, the profits as related to net worth alone.

We included the borrowed capital in this instance because the Boeing Co. felt that it would be a fairer way to present this.

The CHAIRMAN. I am not questioning that. I am trying to understand it.

Mr. NUNNALLY. In this particular case, take the year 1957, where the net worth of the company, the assets less the liabilities, is $178.9 million. That is what the stockholders own.

The CHAIRMAN. Do we contend that they are not entitled to make a profit on the $100 million they have borrowed which they have to repay and on which they have to make interest?

Mr. NUNNALLY. In this case, we are showing the profit related to both the net worth and the investment capital.

Senator JACKSON. You mean the total.

Mr. NUNNALLY. The total of the two. We have related $125 to $288.9 million, which shows that they get a return in this year of 44.6 percent, in 1958, on the net worth, plus the capital necessary to run this business.

The CHAIRMAN. When you say "net worth, $178 million in 1957," they may also owe other in addition to the borrowed capital, or is that the total of it?

Mr. NUNNALLY. This is the total of the borrowed capital, the $10 million, represented by bonds in some cases——

The CHAIRMAN. Not borrowed capital to invest in that particular contract, but it is overall borrowed capital?

Mr. NUNNALLY. It is capital that they used through their overall business. It would be very difficult for me to try to assess how much of it is used on the commercial work and how much of it is used on the Government contracts.

The CHAIRMAN. But you do that by relating it to the sales made?

Mr. NUNNALLY. By relating it to the cost of sales.

Mr. ADLERMAN. Mr. Nunnally, if you would have run the percentages just on the net worth alone, the return would be higher; is that correct?

Mr. NUNNALLY. The return would be higher; yes.

Mr. ADLERMAN. But we have given them credit for the amount of borrowed capital that they have put into the company.

Mr. NUNNALLY. These computations have given Boeing credit in that we reduced these percentages by relating the profit to the total of the borrowed capital and the net worth.

Senator MUSKIE. What is the average rate of interest paid by the company on the borrowed capital?

Mr. NUNNALLY. I do not know for sure, sir. I would guess it would be about—well, perhaps 5 percent. I do not know.

Senator MUSKIE. So that these figures show a return on that borrowed capital on the order of 44.6 percent in 1958, for example, as compared with the interest paid by them of a much lower order?

Mr. NUNNALLY. Yes, sir; that is true.

The next line shows the dividends paid, year by year, and they all add up to $85.4 million for the 11-year period.

The last line shows the action by the Renegotiation Board for the years 1952, 1953, 1954, and 1955. The Renegotiation Board assessed the Boeing Co. $10 million in 1952, $7.5 million in 1953, $10 million in 1954, and $6.8 million in 1955.

The Boeing Co. has appealed this, and the case is now in litigation.

Mr. ADLERMAN. In relation to that, I notice that the return on net investment for the years 1956 and 1957 show 66.3 and 65 percent, which is still higher than the net return in 1955. But there has been no assessment made by the Renegotiation Board for those years.

Mr. NUNNALLY. That is true.

Mr. ADLERMAN. And the Renegotiation Board has cleared Boeing through 1960, has it?

Mr. NUNNALLY. As I remember, they have been cleared for 1956, 1957, and I am not sure about 1958.

Mr. ADLERMAN. I thought they went beyond 1958?

Mr. NUNNALLY. I do not believe they have been.

Mr. ADLERMAN. But they have been cleared for 1956 and 1957?

Mr. NUNNALLY. For 1956 and 1957.

Mr. ADLERMAN. Do you know how much government facilities have been made available to the Boeing Co.?

Mr. NUNNALLY. Of all the total plant in use by the Boeing Co., 57 percent is owned by the Government; 43 percent is owned by the Boeing Co. In dollars, the Government has $260 million invested in the Boeing plant, and Boeing has 198.4.

Mr. ADLERMAN. As of what year?

Mr. NUNNALLY. This is as of December 31, 1960.

(At this point Senator McClellan withdrew from the hearing room.)

Mr. ADLERMAN. Coming to the years 1952, 1953, 1954, and 1955, are those percentages after the expenses paid for renegotiation or the reserves set before renegotiation?

Mr. NUNNALLY. No, sir; these are stated, as was originally stated, and the assessment had no effect on these. In other words, the profit has not been reduced here by the action of the renegotiation.

Mr. ADLERMAN. The amounts have not yet been paid. They have been set aside as a reserve; is that right?

Mr. NUNNALLY. They have been set aside. They have been reserved for, but I do not believe they have been paid. In fact, they are still in litigation.

Mr. ADLERMAN. But the percentages do not include the possible expenditure for those assessments?

Mr. NUNNALLY. No; they do not.

Mr. ADLERMAN. Mr. Nunnally, have you prepared any other charts?

Mr. NUNNALLY. Yes.

Mr. ADLERMAN. Does this chart portray the growth of stockholders' investment in the company?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. Would you explain chart No. 2 to us, please?

Mr. NUNNALLY. Starting with the period January 1, 1951, and including all the years shown on chart No. 1, we see at the beginning that the capital stock is $13.5 million and retained earnings or surplus is $40.4 million for a total of $53.9 million.

That is the figure used on chart 1.

Senator JACKSON (presiding). Without objection, chart designated as No. 2 will be included in the record at this point.

(Chart No. 2 follows:)

CHART NO. 2

The Boeing Co.: Growth of Stockholders' investment—11-year period

[In millions]

		Capital stock	Retained earnings	Total
Jan. 1, 1951		$13.5	$40.4	$53.9
Profits before Federal income taxes	$627.1			
Federal income tax	345.9			
			281.2	281.2
Stock sold to officers and employees under incentive plan		8.2		8.2
Acquisition of Vertol, Inc.		6.6	6.5	13.1
Stock splits and dividends		98.5	(98.5)	
Cash dividends paid			(85.4)	(84.5)
Adjustment for renegotiation board assessments			(11.7)	(11.7)
Dec. 31, 1961		126.8	132.5	259.3

( ) Denotes deductions.

Mr. NUNNALLY. Profits before Federal income taxes for the 11 years was $627.1 million; income tax on that amount was $345.9 million, leaving a net income transferred to retained earnings of $281.2 million.

The only additional issue of capital stock during this period was $8.2 million sold to officers and employees of the company under the incentive plan, and the acquisition of Vertol, Inc.

On the next line we show that out of retained earnings, $98.5 million was transferred into the capital stock account by virtue of stock splits and dividends, stock dividends.

On the next line we show the reduction of retained earnings of $85.4 million in the form of cash dividends.

Of this, $11.7 million is an adjustment to take care of the payments in connection with the renegotiation.

This leaves us a total of $259.3 million as compared to the original amount of $53.9 million in January 1951.

Adding back the $85 million paid in cash dividends to the figure of $258.3 million would give you a return of practically 6½ times the original investment in 1951.

Mr. ADLERMAN. And without that, it gives you a return of about 5 times that amount?

Mr. NUNNALLY. Yes, about 5 times.

Mr. ADLERMAN. So that the value of the company has increased between 5 and 6 times in the past 10 years?

Mr. NUNNALLY. In the 11-year period, discounting the cash dividends paid, the stockholders equity has increased about 5 times.

Mr. ADLERMAN. Have you prepared a third chart which shows a comparison of the profit ratios to all manufacturing business?

Mr. NUNNALLY. Yes.

Mr. ADLERMAN. Would you explain what chart No. 3 is?

Mr. NUNNALLY. This is a chart prepared to show profit as a percentage of stockholders' equity in the Boeing Co., the Douglas Co., and an average of all manufacturing companies.

In the first two columns we show the Boeing Co. before taxes and after taxes. This is solely on Government business.

Mr. ADLERMAN. Government business for Boeing in the year 1960, before taxes, showed a return on their stockholders' equity of 65.1 percent before taxes and after taxes it came down to 31.2 percent: is that right?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. And the same type of proportion went on in 1959, right down through to 1951, and the average for the 10-year period was a return on the stockholders' equity of 74.38 percent for the 10-year period before taxes, and 35.68 percent after taxes.

That is on Government business only; is that right?

Mr. NUNNALLY. On Government business only.

Mr. ADLERMAN. Would you explain what the third column is?

Mr. NUNNALLY. Taking a look at the overall business of the Boeing Co., including their commercial work, as well as their Government work, this would be a figure interesting to investors, taken from Moody's Financial Reports, we see that the profit is 10.32 percent in 1960; in 1959, 5.96; in 1958, 14.56; 1957, 21.33; 1956, 21.6; 1955, 25 percent; 1954, 33.78; 1953, 24.72; 1952, 20.85; and 1951, 12.36; for an average of 19.05 percent.

Compared to the Douglas Co. it is quite high, primarily because in these 2 years of 1960 and 1959 Douglas had a loss, a considerable loss.

That would lower their average down to 10.23 percent.

Comparing it to an average of all manufacturing companies, and these figures are taken from the Federal Trade Commission and SEC fourth quarter financial reports, it averages 10.73 for the 10-year period for all manufacturing.

The 19.05-percent figure concerning Boeing would be compared to the 10.73 percent.

Mr. ADLERMAN. In other words, in the Boeing business, all business, including commercial and Government business, has an average rate of return on the stockholders equity of 19.05 percent, compared to the average of all manufacturing in the United States of 10.73 percent, or almost double the average of all manufacturing?

Mr. NUNNALLY. Almost double.

(At this point Senator McClellan entered the hearing room.)

Mr. ADLERMAN. When you compare the Boeing business with the Government after taxes, it shows that they get a rate of return about three times that of the average of all manufacturing companies?

Mr. NUNNALLY. Yes, sir; that is right.

Mr. ADLERMAN. That is, after taxes.

The CHAIRMAN. Let chart No. 3 be printed in the record at this point.

(Chart No. 3 follows:)

CHART NO. 3

Profit ratios—Percent of stockholders' equity

Year	Boeing Co. (Government business)		All business after taxes		
	Before taxes	After taxes	Boeing	Douglas	Average of all manufacturing
1960	65.1	31.2	10.32	[1] 16.29	8.4
1959	68.3	32.7	5.96	[1] 24.38	9.6
1958	74.0	35.5	14.56	9.5	10.8
1957	70.0	33.6	21.33	18.16	9.8
1956	66.3	31.8	21.6	21.7	12.6
1955	64.4	31.0	25.02	21.0	13.5
1954	100.1	48.0	33.78	29.91	10.6
1953	108.6	52.1	24.72	18.85	9.5
1952	91.0	43.6	20.85	12.31	11.3
1951	36.0	17.3	12.36	11.51	11.2
Average	74.38	35.68	[2] 19.05	[2] 10.23	[3] 10.73

[1] Loss.
[2] Moody's Financial Reports.
[3] FTC–SEC 4th Quarter Financial Report.

Senator JACKSON. Might I ask a question?

Do you have a chart showing the percentage on sales for the Boeing Co. and then manufacturing generally?

Mr. NUNNALLY. We did not make such a chart.

Senator JACKSON. But that is another——

Mr. NUNNALLY. That is another way of measuring profits. This is one of the acceptable ways of measuring profits.

Senator JACKSON. How many different ways are there, roughly, of measuring profits?

Mr. NUNNALLY. I think three of the most prominent ones are: As a rate of return on the stockholders equity; another would be a rate of return on sales; and in Government work there is a rate of return on cost, which is very common.

The CHAIRMAN. Is there anything further?

Senator JACKSON. I have nothing further.

The CHAIRMAN. The committee will stand in recess until 2 o'clock this afternoon.

(Members present at time of recess: Senators McClellan, Jackson, and Muskie.)

(Whereupon, at 11:45 a.m., the subcommittee recessed, to reconvene at 2 p.m. the same day.)

AFTERNOON SESSION

(The subcommittee reconvened at 2:20 p.m., Senator John L. McClellan (chairman of the subcommittee) presiding.)

(Members present at time of reconvening: Senators McClellan and Jackson.)

The CHAIRMAN. The committee will come to order.

Call your next witness.

Mr. ADLERMAN. Mr. Tierney.

The CHAIRMAN. You do solemnly swear the evidence you shall give before this Senate subcommittee shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. TIERNEY. I do.

The CHAIRMAN. Please identify yourself for the record.

TESTIMONY OF PAUL J. TIERNEY

Mr. TIERNEY. My name is Paul J. Tierney, a member of the staff of the committee, assistant counsel.

The CHAIRMAN. Proceed.

Mr. ADLERMAN. Mr. Tierney, have you prepared a chart showing the summary of all of the prime contracts in the Bomarc system?

Mr. TIERNEY. I have.

Mr. ADLERMAN. Do you have that chart before you?

Mr. TIERNEY. I do.

The CHAIRMAN. What does it show?

Mr. TIERNEY. It shows, Mr. Chairman, a summary of the major prime contracts between the Air Force and the Boeing Co. on the Bomarc missile.

The CHAIRMAN. Were there several prime contracts?

Mr. TIERNEY. We have listed here, Mr. Chairman, 13. By way of explanation, there were two other small contracts which we have not listed here.

They amount to roughly a total of $4 million, or a little above.

The CHAIRMAN. Let chart No. 4 be printed in the record at this point.

(Chart No. 4 follows:)

CHART NO. 4

Bomarc: Summary of major prime contracts between Air Force and the Boeing Co.

[In thousands]

Contract number	Contract period	Type	Description	Latest estimate of cost	Total profit [1]	Percent of profit [1]	Total cost to Government
Bomarc A:							
AF33(038)19589	1951-58	CPFF	Research and development, 49 XIM-99A missiles.	$339,589	$18,369	5.4	$357,958
AF33(600)24748	1953, 1956-57	CPFF	Production implementation	8,377	575	6.8	8,952
AF33(600)32832	1956-60	CPFF	Prototype production, 45 YIM-99A missiles: WSE and IC & C.	148,382	8,402	5.7	156,784
AF33(600)35359	1957-59	CPFF	Production, 23 IM-99A missiles: 1 base WSE and IC & C.	111,669	8,933	.8	120,602
AF33(600)36319	1958-60	FPIS	Production, 78 IM-99A missiles:				
			2 bases WSE	75,358	12,033	14.5	94,820
			Spares	7,419			
AF33(600)37861	1958-59	CPFF	Modification, 16 XY-IM99A missiles	10,640	895	8.4	11,535
AF33(600)38163	1958-60	CPFF	4 bases IC & C	35,653	1,630	4.6	37,283
AF33(600)38098	1959-61	FPIS	Production, 168 IM-99A		14,928	13.2	127,843
			2 bases WSE	99,079			
			Spares	13,836			
AF33(600)40821		FP	Mobile inspection equipment	2,000	243	.121	2,243
Bomarc B:							
AF33(600)35030	1959-61	CPIF	Research and development, 36 XIM-99B	296,358	23,754	.08	320,112
AF33(600)38101	1959-61	FPI	Production:				
			116 IM-99B, 3 bases	166,452	20,956	.11	212,438
			Spares (WSE)	25,030			
AF33(600)40033	1960-	FPIS	Production, 185 IM-99B:				
			6 bases WSE	126,654	11,909	.081	158,565
			Spares	20,002			
AF33(600)40212	1960-	CPFF	9 bases IC & C	20,921	1,583	.075	22,504
Total				1,507,429	124,210		1,631,639

[1] All profit figures are before taxes.

Mr. ADLERMAN. Would you explain what the chart shows, how many major contracts there are, the nature of the contracts, the total costs, the profits and costs and so forth?

Mr. TIERNEY. In summary, we have listed here 13 major contracts on the A version of the missile and the B version, divided according to the A and B.

The total cost of these contracts is $1,507,429,000. The total profit to Boeing on this was $124,210,000, which is 8.2 percent of the gross cost.

The total price to the Government, that is, the cost plus the profit, is $1.6 billion.

Mr. ADLERMAN. Of those contracts that we have on the chart there, have we examined in particular certain of the incentive-type production contracts?

Mr. TIERNEY. We have.

Mr. ADLERMAN. Would you point those out?

Mr. TIERNEY. They are contract No. 36319, contract No. 38098, production contracts on the A missile, and contract No. 28101, a production contract on the B missile.

Mr. ADLERMAN. Are those three contracts fixed price incentive-type contracts?

Mr. TIERNEY. They are fixed-price incentive. As we have them designated, FPIS is really a fixed-price incentive contract for reset target, a successive target.

The CHAIRMAN. What is the "S" for?

Mr. TIERNEY. Successive target. As we get along, it will be referred to as a "reset target." In other words, two targets are negotiated, two estimates of target costs.

Senator JACKSON. An estimate of the cost and then they try to get below that estimate.

The CHAIRMAN. What is a "cost plus"? You said a cost plus——

Mr. TIERNEY. Fixed-price incentive contract. Here is an FPI, fixed-price incentive contract. Here the parties negotiate one target of estimated costs and the formula is based on that particular estimate.

The CHAIRMAN. Go ahead. Maybe it will become clearer.

Mr. TIERNEY. We will have further testimony on that, Mr. Chairman.

The CHAIRMAN. All right.

Mr. ADLERMAN. The Air Force contract No. 36319, what did that call for?

Mr. TIERNEY. That was for production of 78 of the A missiles, plus weapon support equipment for 2 bases.

Mr. ADLERMAN. And that was the incentive-type contract with a target reset?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. As they went downstream, they reset the target for a further incentive?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Then contract No. 38098, the second marked with a check, was for what?

Mr. TIERNEY. 168 of the A missiles, plus weapons support equipment for 2 bases.

Mr. ADLERMAN. Is that also a fixed-price incentive with a target reset?

Mr. TIERNEY. That is correct; FPIS.

Mr. ADLERMAN. The third contract we will examine in detail is contract No. 38101?

Mr. TIERNEY. That is correct; for production of 116 of the B missiles, plus weapon support equipment for 3 bases.

Mr. ADLERMAN. That is a fixed-price incentive without a reset?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. I would like to put on another witness.

The CHAIRMAN. Very well.

Mr. ADLERMAN. Mr. Welch and Mr. Bailey.

The CHAIRMAN. Those of you who will testify, be sworn.

You and each of you do solemnly swear the evidence you shall give before this Senate subcommittee shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. BAILEY. I do.

Mr. WELCH. I do.

TESTIMONY OF CHARLES M. BAILEY AND J. E. WELCH; ACCOMPANIED BY MELVIN E. MILLER, ATTORNEY; RALPH M. KEE; AND RALPH VAN KIRK

The CHAIRMAN. Each of you identify yourself for the record, please.

Mr. BAILEY. Mr. Chairman, my name is Charles M. Bailey, Deputy Director of the Defense Accounting and Auditing Division of the General Accounting Office.

On my left is Mr. J. E. Welch, Deputy General Counsel of the General Accounting Office. On his left is Mr. Miller, an attorney in the Office. On my left is Mr. Kee, supervisor accountant. Then is Mr. Van Kirk, also a supervisor accountant in the General Accounting Office.

The CHAIRMAN. The others will accompany you and Mr. Welch?

Mr. BAILEY. That is correct.

The CHAIRMAN. They are not witnesses?

Mr. BAILEY. That is correct.

The CHAIRMAN. Mr. Bailey, do you have a prepared statement?

Mr. BAILEY. I do.

The CHAIRMAN. Do you also have a prepared statement, Mr. Welch?

Mr. WELCH. No, sir; I do not.

The CHAIRMAN. Do you wish, Mr. Bailey, to read your statement, or do you wish to have it inserted into the record and highlight it?

Mr. BAILEY. With your permission, Mr. Chairman, I would like to read it.

The CHAIRMAN. Very well. Proceed.

Mr. BAILEY. Mr. Chairman and members of the committee, pursuant to your request, our statement will outline the circumstances under which incentive type contracts are to be used and some of the problems associated with the negotiation and administration of this type of contract. First, however, I will identify myself and my associate. My name is Charles M. Bailey, Deputy Director of the Defense

Accounting and Auditing Division of the General Accounting Office. I am accompanied by Mr. J. E. Welch, Deputy General Counsel of the General Accounting Office.

Under appropriate circumstances, we believe the use of incentive type contracts is proper and can effectively serve the best interests of the Government. The basic problem therefore is to establish those conditions that should be present in a procurement before an incentive type contract is used.

The CHAIRMAN. What do you mean by that? You are saying that the basic problem is to establish those conditions that should be present in a procurement before an incentive type contract is used. What do you mean there?

Mr. BAILEY. The conditions——

The CHAIRMAN. Do you tell us a little further on?

Mr. BAILEY. Yes, sir.

The CHAIRMAN. Proceed, then.

Mr. BAILEY. In considering this question, we have found it helpful to explore the history and development of the use of incentive contracts. We believe this might also be helpful to this subcommittee.

Immediately prior to issuance of the Armed Services Procurement Regulation in May 1948, both the Army and the Air Force were subject to the provisions of the Joint Procurement Regulations. Section 4–309 of these regulations sets out an "incentive type contract article." The regulation explains the article as follows:

> (2) Under this article a target price, which should not exceed the sum of a realistic estimate of the total cost of performing the contract and a reasonable profit, is determined. Because of the advantage of the contractor in the opportunity to increase his profit by cost reductions and to be reimbursed up to a point for cost increases, his risk is less than under a fixed price contract; and therefore the profit margin at the target price will ordinarily be lower than that allowed for an equal fixed price. A maximum (ceiling) price which the final price cannot exceed is also set. The contractor and the Government share in the reduction in cost below that price. The final price consists of (i) the contractor's costs determined by negotiation and agreement after completion of all work under the contract and (ii) a profit computed by the application of an agreed formula to the difference between the maximum (ceiling) price and such negotiated costs.

However, this regulation specifically limited use of the article to fixed-price contracts in which the following conditions existed:

> (1) Sufficient experience is available to make a reasonably accurate determination of the target price.
>
> (2) The maximum (ceiling) price is as low as possible under the circumstances and affords no protection to the contractor against extravagance and inefficiency.
>
> (3) The formula for fixing the profit is so scaled that an effective premium is afforded for reducing costs below the estimate and a deterrent provided to discourage the contractor from increasing costs.
>
> (4) The contracting officer is satisfied that the contractor's accounting system is sound, since final costs will be determined by negotiation and not by audit. The contract provides for the contractor to furnish detailed cost statements which can and should be supplemented by investigation whenever and to the extent deemed desirable by the contracting officer.

The initial publication of the Armed Services Procurement Regulation in May 1948 provided in section 3–404 that—

> the incentive-type contract may be of either a fixed-price or a cost-plus-a-fixed-fee nature, with a special provision for redetermination of the fixed price or fixed fee.

This regulation also provided for a tentative base price or target price and a maximum price or maximum fee, with price or fee redetermination after completion of the contract for the purpose of establishing a final price or fee based on the contractor's actual costs plus a sliding scale of profit or fee which would vary inversely with the contractor's experienced costs but would not permit the final price or fee to exceed the maximum price or fee stated in the contract.

Additionally, this regulation advised that use of incentive-type contracts should usually be restricted to procurements (1) involving a reasonably long production run, (2) where the contractor has an acceptable accounting system and adequate manufacturing experience, and (3) when a reasonably close contract price could be negotiated.

These regulations remained unchanged until April 1955, when fixed-price incentive-type contracts and cost-plus incentive-fee contracts were first broken out separately under sections 3–403.4 and 3–404.4 of ASPR. Two subtypes of fixed-price incentive contracts were established. The first provided for initial negotiation of a firm target cost, a target profit, a price ceiling, and a final profit and price adjustment formula. The second provided for negotiation of an initial price at the outset and for establishing a production point prior to delivery of the first item at which time a firm target cost, target profit, and final profit-and-price adjustment formula and price ceiling would be negotiated.

The regulations at this time also provided that the fixed-price incentive-type contract would be considered appropriate for use only in those circumstances where targets reasonably free of contingencies and providing a fair and reasonable incentive could be established either at the time of initial contract negotiation, or at an early point in performance of the contract.

Use of fixed-price incentive contracts was specifically prohibited where (1) reliable cost estimates were not available at the time of initial contract negotiation or at a very early point in production, (2) the sole or principal purpose was to shift substantially all of the risk of performance to the Government or, (3) the contractor's accounting system was not adequate for price redetermination purposes or did not permit satisfactory application of the profit-and-price adjustment formula. Additionally, a prohibition was included against establishing either the target profit or the profit-and-price adjustment formula prior to establishing the firm target cost.

With respect to cost-plus-incentive-fee contracts, the April 1955, revision of ASPR described them as—

> suitable for use where a cost reimbursement type of contract is found necessary and where there is a probability that its use will result in lower costs to the Government than other forms of cost-reimbursement-type contracts through cost reduction incentive to the contractor.

The only other specified limitation on this type of contract was that the target fee and maximum fee would be subject to the same percentage of estimated cost limitations as were applied to cost-plus-a-fixed-fee contracts.

The regulations on fixed-price incentive contracts were again revised in May 1958. This revision redesignated the subtypes as "initial target" and "successive targets" and set out for the first time in con-

siderable detail the procedures and requirements to be observed in "successive target" fixed-price incentive contracts. The provisions relating to applicability and limitations on use were amended to read as follows:

Applicability: (1) The initial target type of incentive contract is appropriate for use where targets which are reasonably free of contingencies and which provide a fair and reasonable incentive can be established at the outset.

(2) The successive target type of incentive contract, * * * is appropriate for use where the contractor's and the Government's knowledge of probable cost of performance, though substantial, is so indefinite that fair, firm targets cannot be established at the outset, but will become sufficiently definite at an early point in the performance of the contract to permit negotiation of targets which are reasonably free to contingencies and which provide a fair and reasonable incentive.

(3) Neither type of incentive contract should be used unless there is a sufficiently long period of performance to permit achievement of substantial cost reductions.

Limitations: Fixed-price incentive contracts shall not be used unless the contractor's accounting system is adequate for price revision purposes and permits satisfactory application of the profit-and-price adjustment formulas. In no case should such contracts be used where (i) reliable cost estimates are not available at the time of initial contract negotiation or at a very early point in performance, or (ii) the sole or principal purpose is to shift substantially all of the risk of performance to the Government.

In no case shall the firm target profit or the final profit-and-price adjustment formula be established prior to the establishment of the firm target cost. * * *

The CHAIRMAN. You speak about targets. What are you talking about? Every time you use the word "target," are you talking about cost, or the time of completion?

Mr. BAILEY. There are three types of targets in an incentive contract, the target cost, the target profit, and the target price.

The target cost is the anticipated cost to perform the contract. The target profit is anticipated profit that the contractor will receive if his costs do not go above or below the target costs.

The target price is the combination of the two.

The CHAIRMAN. If it does not go above or below?

Mr. BAILEY. Yes, sir.

The CHAIRMAN. If it hits it on the mark?

Mr. BAILEY. If it hits it on the nose. This is the target profit.

The CHAIRMAN. That would be the target profit?

Mr. BAILEY. But the target profit is then adjusted at time of final negotiation of the final price to either give the contractor his share of the cost reduction or make him bear his share of the cost increase.

The CHAIRMAN. All right.

(At this point Senator Muskie entered the hearing room.)

Mr. BAILEY. A March 1962 revision redesignated the "initial target" subtype as "firm target," and advised that the formula for establishing final profit and price should reflect the relative risks involved in contract performance to provide an incentive to the contractor consistent with the circumstances. Similar provisions were inserted in the regulations on "successive target" subtypes. With respect to applicability of fixed-price incentive contracts generally the March 1962 revision advised that such contracts are appropriate when use of the firm fixed-price contract is inappropriate, and the supplies or services being procured are of such a nature that assumption of a degree of cost responsibility by the contractor is likely to

provide him with a positive profit incentive for effective cost control and contract performance. Additionally, this revision specifies that, before a successive target type of contract is used, enough information should be available to permit negotiation of initial targets and there should be reasonable assurance that additional reliable information will be available at an early point in the performance of the contract so as to permit negotiation of either a firm fixed price, or firm targets and a formula for establishing final profit and price, which will provide a fair and reasonable incentive.

As previously stated, specific regulations relative to cost-plus-incentive-fee contracts were first included in the regulations in April 1955. No change of substance was made in these regulations until March 1962, at which time the applicability of this type of contract was set out as follows:

> The cost-plus-incentive-fee contract is suitable for use primarily for development and test when a cost-reimbursement type of contract is found necessary * * *, and when a target and a fee adjustment formula can be negotiated which are likely to provide the contractor with a positive profit incentive for effective management. In particular, where it is highly probable that the development is feasible and the Government generally has determined its desired performance objectives, the cost-plus-incentive-fee contract should be used in conjunction with performance incentives in the development of major systems, and in other development programs where use of the cost and performance incentive approach is considered both desirable and administratively practical.
>
> * * *. With regard to the cost incentive provisions of a contract, the minimum and maximum fees, and the fee adjustments formula, should be negotiated so as to provide an incentive which will be effective over variations in costs of at least 25 percent from the target. Whenever this type of contract, with or without the inclusion of performance incentives, is negotiated so as to provide incentive up to a high maximum fee, the contract also shall provide for a low minimum fee, which may even be a "zero" fee or, in rare cases, a "negative" fee.

One of the substantive changes effected by this latest revision is that it placed additional emphasis under both fixed price and cost-plus-incentive-fee type contracts on the use of performance incentives as distinguished from cost-reduction incentives.

We have had no opportunity to date to evaluate performance under this revision to the regulations.

From the foregoing, it is apparent that procurement regulations have consistently recognized the need for experienced cost data and reliable cost estimates where incentives are tied to costs in order to negotiate an equitable target price relatively free of allowances for contingencies.

However, these requirements have not always been observed in the negotiation of incentive-type contracts.

Incentive-type contracts are currently being used to procure missiles and other weapons systems of great complexity. There are many uncertainties in design and development and these uncertainties extend through the production stages. Changes are made continuously as the state of the art progresses. Our audit experience shows that contractors are inclined to include in their target-cost estimates amounts to cover these uncertainties and to base their estimates on incomplete or incorrect cost information. Thus, the sharing of cost underruns below the target cost rewards the contractor not for his efficiency in effecting cost reductions but for his inability or failure at the time of

original negotiations to make a close estimate of what the contract will require and the cost to perform it.

To illustrate:

In the negotiation of a target price on a fixed-price incentive-type contract for airplanes, the contractor included in its proposal amounts for the estimated costs of materials, purchased parts, and subcontracted items which we found were about $12 million in excess of costs which the contractor knew or could reasonably have expected would be incurred.

Accordingly, about $2.4 million of the contractor's share of the cost underrun was not attributable to the contractor's efficiency in performance, and this amount plus $1 million in target profit computed on the excessive target cost or $3.4 million accrued to the contractor due to the failure of the parties to negotiate on reasonably sound cost estimates. We have been informed that the Air Force has recovered the excessive profit allowed the contractor.

In 17 reports, including the one mentioned above, which we have sent to the Congress in recent years we described situations under incentive-type contracts where target cost estimates were excessive when compared with cost information or other data available at the time of negotiations. In total, the excessive estimates in target prices disclosed in these audits amounted to more than $38 million. We estimate that the excessive profit resulting from these overestimates amounted to about $11.8 million. As far as we have been able to determine, the military departments have recovered about $10.8 million, leaving about $1 million unrecovered.

Incentive contracts generally provide that contractors will bear all costs above a stipulated ceiling price. In this connection, however, it was pointed out in House of Representative Report No. 1638, 87th Congress, that the Air Force in reporting on 171 contracts totaling $6.3 billion had but one instance where the ceiling price was exceeded and then only by $87,000. In the Navy, of 47 contracts for $2.5 billion only one contractor exceeded the ceiling price and that was by the amount of $54,000 on a $4 million contract.

We believe that incentive contracts can be of real benefit both to the Government and to the contractor when both parties properly discharge their responsibilities. When target prices are properly set both parties benefit, and properly so, from the savings resulting from genuine efficiency. It seems equally clear, however, that the contractor should not benefit from cost underruns resulting from acceptance by military departments of cost estimates and targets which were excessive in relation to information available to the contractor at the time of negotiations, or for that matter, resulting from any cause not directly related to his own efficiency.

The CHAIRMAN. Is not that a difficult thing to do? Here is a contractor you want to make a contract with on the incentive basis. He negotiates to try to get the price as high as he can, and if the Government goes along with it, it is stuck from the beginning.

Mr. BAILEY. This is right.

The CHAIRMAN. In other words, no one knows what the thing will cost to begin with?

Mr. BAILEY. That is correct.

The CHAIRMAN. There are so many ramifications to this thing, that I do not see that there is any great advantage to the Government in it.

Will you point out some advantages?

Mr. BAILEY. The basic advantage, Mr. Chairman, would be if——

The CHAIRMAN. If, yes. That is what I am talking about.

Mr. BAILEY. That is a big "if."

The CHAIRMAN. It is a big "if." Don't you recognize that, don't you agree it is a big "if"?

Mr. BAILEY. Yes, sir. If fact, we think our experience, as pointed out in this statement, shows it is a big "if."

Senator JACKSON. May I ask a question?

The CHAIRMAN. Yes.

Senator JACKSON. Do we have any figures on what the overruns are on the cost-plus-fixed-fee type?

Mr. BAILEY. I do not have any figures. They are substantial in many cases, Senator.

Senator JACKSON. In another capacity, I am serving as chairman of the Subcommittee on Military Construction, Armed Services.

One of the big items in our bill, of course, relates to the increase in the cost for missile base construction. We have a big item in the bill for about $200 million; my recollection is that those contracts primarily are cost plus fixed fee.

It seems to me that when you get into this area of Government contracts involving new weapon systems, neither the Government nor the contractor have any reasonably accurate idea of what the costs are going to be.

I wondered if we have any comparison on the other side where we are dealing with cost plus fixed fee. How much is the overrun the other way, on costs?

Mr. BAILEY. Well, I do not have any figures, Senator, but, of course, the basic difference there between an incentive-type contract and a cost-plus-fixed-fee contract is that the contractor's fee under a cost-plus-fixed-fee contract does not vary with the variation in cost.

Senator JACKSON. But he does not have an incentive to hold down the costs?

Mr. BAILEY. This is true. There is no incentive.

Senator JACKSON. We have had tremendous increases in the overall costs. I think it gets down to what is worse, an overrun on the cost or an overrun on the profits.

Is not this logically what you are dealing with? Of course, in relation to the total, the profits will be less than the overall costs.

Mr. BAILEY. Of course, you might——

Senator JACKSON. The result is the Government keeps shifting from one practice to the other. They say in effect, "In this case we will do it on a cost-plus-fixed-fee," and in another case, "We will do it on an incentive basis."

On the missile base construction the estimates on costs have been way off.

One of the reasons, of course, is because we have had a lot of trouble on these sites. The chairman has conducted extensive investigations into that.

Secondly, as you know, there are the constant change orders which just add to the costs. It would appear over the past years that the Government has been in this business that the procurement people conscientiously try one system for a while and then they move into the other. The procurement people try to apply a particular method of estimate to a given weapon system in the hope that thereby the system will cost less. They cannot, of course, know what the factors will be that will ultimately determine actual cost.

Has not this been your experience in trying to find out what the best course of action is?

Mr. BAILEY. Well, I think that is right, Senator. I think, too, that there are other aspects that recommend to contracting personnel the use of several types or different types of contracts under different circumstances.

Senator JACKSON. Mr. Chairman, I think it might be useful for the committee if the witness could later supply for the record some representative figures indicating what the overruns on costs have been on cost-plus-fixed-fee contracts.

We have the missile bases as one example. There have been, of course, a lot of others.

If you can get some of the bigger items that will give a reasonably accurate reflection on that approach to Government procurement, it would be helpful.

Mr. BAILEY. We will see what we can do.

The CHAIRMAN. Very well. When received that may be printed in the record at this point.

(The information follows:)

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, June 12, 1962.

Hon. JOHN L. MCCLELLAN,
Chairman, Permanent Subcommittee on Investigations, Committee on Government Operations, U.S. Senate.

DEAR MR. CHAIRMAN: During the testimony of Mr. C. M. Bailey in the hearing before your subcommittee on May 22, 1962, we were asked if we could furnish certain statistical information on cost overruns (the amount by which the actual cost of performance of a contract exceeds the original estimated cost) on cost-plus-a-fixed-fee contracts within the Department of Defense.

We have reviewed our audit reports on defense contracts and related files and find that we are not in possession of any statistical information on cost overruns that would be helpful to your subcommittee. In addition, we have made inquiry in the Department of Defense and were informed that statistics on overruns on cost-plus-a-fixed-fee contracts are not maintained within the Department or the military services.

Original cost estimates on cost-plus-a-fixed-fee contracts frequently need modification to provide for cost overruns or underruns. These contracts are generally used where the specific work to be done cannot be defined and there is no basis for accurate cost estimating. Where there is a reasonably valid basis for estimating costs, procurement regulations encourage the use of some form of fixed-price contract.

Modifications to cost-plus-a-fixed-fee contracts cover not only authorizations for increased expenditures necessary to complete the contract work originally contemplated but also increases or decreases in estimated costs which result from the changed scope of the work. It is extremely difficult to distinguish between the revisions in estimated costs attributable to changes in the scope of the work to be performed and those attributable to other causes. Moreover, modifications to authorize increased expenditures necessary to complete the contract work originally contemplated are made for causes other than the rela-

tive efficiency of the contractor. These causes include lack of prior cost experience upon which to base an accurate estimate and changes in cost levels of labor, materials, or subcontracted items.

If we can be of any further service to you or members of your committee, please so advise.

Sincerely yours,

JOSEPH CAMPBELL.
Comptroller General of the United States.

Mr. BAILEY. We have, on several occasions, advised committees and Members of the Congress of the administrative agencies' failure to obtain and adequately evaluate latest available cost data in establishing prices and incentive targets. We have expressed the view that complete, accurate, and timely cost information is necessary to the negotiation of fair and reasonable contract prices. We believe it is recognized that it is unlikely that the Government will, in any negotiation, have full knowledge of all the information available to the prime contractor or that either the Government or the prime contractor will have full knowledge of all information available to the subcontractor. Consequently, the contractor and subcontractors should be held responsible for submitting reasonable price proposals, reasonably free from contingencies, and supported by sufficient information to enable evaluation of them. The purchaser must assume responsibility for appropriate verification of the information submitted and for negotiation of prices which adequately protect the Government's interest.

When pertinent data known to the prime contractor are unknown to the Government, the contractor has an advantage in negotiations. Similarly, the subcontractor has an advantage over the prime contractor where the subcontractor is in possession of pertinent data which are unknown to the prime contractor. Unfortunately, we find many cases where pertinent data is not made known to all contracting parties and a seeming reluctance in some cases to make any effort to obtain such information.

In October 1959, the Department of Defense included in the Armed Services Procurement Regulation the requirement that in the absence of effective price competition, the negotiating team must make a thorough analysis of contractors' proposals and must be in possession of current, complete, and correct cost or pricing data before decisions are made on contract prices. Accordingly, the regulation provided that the contractor should be required to furnish such data promptly as it becomes available throughout the negotiation process and a certificate is required to be obtained for each separate negotiation when the amount of the procurement action exceeds $100,000 and the price negotiated is based more on the contractor's actual or estimated cost than on effective competition, established catalog or market prices, or prices set by law or regulation. The regulations also require the prime contractor to obtain a similar certificate from first-tier subcontractors under like conditions.

In executing the certificate, the contractor or first-tier subcontractor certifies, to his best knowledge and belief, that in the preparation of its price proposal all actual or estimated costs or pricing data available as of a certain date had been considered in the preparation of the proposal and made known to the contracting officer or his representative, and any significant changes in the data which may have occurred since the preparation of the proposal were disclosed to the purchaser during price negotiations.

The current Armed Services Procurement Regulation also prescribes a contract clause entitled "Price Reduction for Defective Pricing Data" to be inserted in any negotiated fixed-price-type contract which is expected to exceed $100,000, unless the contract price is based mainly on adequate price competition, established catalog or market prices or prices set by law or regulation, and may be inserted in other contracts or modified to apply to subcontracts at any level. It provides that if the contracting officer determines that any price negotiated in connection with the contract was overstated because the contractor, or any first-tier subcontractor in connection with any subcontract in which the clause is inserted, either (i) failed to disclose any significant and reasonably available cost or pricing data, or (ii) furnished any significant cost or pricing data which he knew or reasonably should have known was false or misleading, then such price shall be equitably reduced and the contract shall be modified in writing accordingly. These requirements should prove beneficial in that they require the contractor to furnish reliable data and provide the Government with a basis for adjusting the contract prices when it is found that the contractor either deliberately or unintentionally failed to disclose significant pricing data.

However, we believe that incentive-type contracts should further provide that any additional fees or profits for reduction of costs below negotiated targets be limited to those reductions which are attributable to some effort on the part of the contractor to earn such additional fees or profits. Under present contract provisions a contractor is in a position to share in all reductions, regardless of how generated, except those which are a result of initial targets having been based on inaccurate, incomplete, or noncurrent cost data, and such facts are subsequently discovered by the contracting officer. In other words, the contractor shares in all cost reductions whether or not attributable to his effort or efficiency, unless the Government demonstrates that he is not entitled to share in such cost reductions. We are of the opinion that it should be incumbent upon the contractor to demonstrate his entitlement to additional incentive fees or profits.

Moreover, we believe that the following conditions should prevail before the incentive-type contracts as presently constituted can suitably be used:

1. There should be a reasonably definite understanding by both parties as to the scope of the contract, methods of performance, and probably success in achieving desired goals.
2. There should be a reasonably definite understanding between both contracting parties as to the make-or-buy structure.
3. There should be either reliable cost estimates reasonably free of contingencies available for both the prime contractor's and subcontractor's portion of the contract or exclusion of those elements not subject to close pricing from the target-fee computation and the profit-sharing arrangements.
4. There should be adequate cost systems for prime contractors and subcontractors subject to cost determinations, flexible pricing arrangements, and incentive formula adjustments.
5. The work should require a sufficiently long performance time to permit the contractor to achieve substantial cost reductions.

Mr. Chairman, this concludes my statement.

We will be glad to try to answer any questions you or the members of the committee may have.

The CHAIRMAN. Is this cost-plus-incentive-fee contract a hazardous undertaking, a risky undertaking on the part of the Government?

I mean, hazardous in the sense of economics.

Mr. BAILEY. I do not believe that it would be any more hazardous than a straight cost-plus-fixed-fee-type contract, Mr. Chairman.

The CHAIRMAN. What is the device for discovering that the cost target was set too high to begin with, thus, permitting the undercost and a sharing of the benefits therefrom?

Mr. BAILEY. Mr. Chairman, this can be done through an appropriate review of cost and pricing data that are available at the time of the negotiation of the contracts.

This is the method that we have used in proceeding in these cases that I mentioned in my statement.

The CHAIRMAN. Is not the only device for the protection of the Government in such contracts the renegotiation authority?

Mr. BAILEY. Mr. Chairman, I believe that an even better device is the thorough and adequate review at the time of negotiation of the contract.

In other words, setting the target properly to start——

The CHAIRMAN. At the time of the negotiation, as you keep repeating, that is the very time when they do not have all the information. Maybe the contractor is withholding information, or they did not have accurate cost factors upon which to base their target?

Mr. BAILEY. Yes, sir; but I think it can be obtained at that point in time, is my point. In other words, I think in the past in many instances on the Government side of the negotiation——

The CHAIRMAN. The Government's what?

Mr. BAILEY. The Government side of the negotiating parties have gone into the negotiations without having all of the data available to them.

The CHAIRMAN. Are you charging, then, there has been inefficiency or neglect of duty, this failure to be alert and take the initiative necessary to protect the Government interest?

What are you charging?

Mr. BAILEY. I think there are many factors that enter into it, Mr. Chairman.

I would not be prepared to say it is any one of these things or that these are the only things that are involved.

For example, we know that in many instances, the negotiating teams have had to operate under very close deadlines and time factors.

The CHAIRMAN. You have all those problems. That is what I am saying. I think if I were a contractor negotiating one of these contracts, I would want to get that estimated price, that target price, the cost price, up just as high as possible, if I was going to benefit in ratio to the amount of undercost.

Mr. BAILEY. It certainly is to the contractor's advantage to get it as high as possible.

The CHAIRMAN. Of course, first, he has the incentive to get it as high as possible, and then he has the incentive to turn right around and build it much cheaper.

Mr. BAILEY. Yes, sir.

The CHAIRMAN. He is moving in both directions. I am not criticizing. I think in theory it sounds good. Sounds very good. We get a target price here, we get an estimated cost of what it is going to cost, and we say, "If you get out and go to work, use your ingenuity, efficiency, and skill and bring this cost down, we will give you more profit than the 6 or 8 percent, whatever we promise you now."

I think in theory it sounds good. But in practice, I do not know how you are going to get that target, the cost target, fixed with any degree of accuracy in the beginning.

Mr. WELCH. Mr. Chairman, the contractor in this situation is in an advantageous position. He knows what his costs are. He perhaps has estimates from his subs that he is going to use if he gets the job.

What we say is that being in that situation, he should not come in in the negotiations and represent that his costs are going to greater than he knows, or has reasonable basis to think, they are going to be.

The CHAIRMAN. But what is the practical experience?

Mr. WELCH. In an effort to get at that problem, we have recommended, and the Armed Services Procurement Regulations have been changed, as we stated in our statement, to provide that he shall certify that his costs are complete and accurate to the best of his knowledge, and also he has to agree to apprise adjustment if on subsequent audit it is found that his costs were not accurate.

The CHAIRMAN. You may be improving this situation by your modifications and amendments to regulations. You may be moving in the direction toward better contracting systems.

I do not know. I can well see just on the basis of if you could get here, and if the contractor does what we say the contractor should do, actually submit his costs on the basis of apparently what the best information at the time indicates the costs will be, and then you agree on a fixed fee of 6 percent or 8 percent of that cost, then you say, "But if you work harder and do this job more efficiently and effectuate savings under that estimated cost we will let you share. We will give you a percentage of that as an incentive to do it."

Thus, he would make more profit than if just held to the estimated cost. In theory, it sounds good. But I do not know how you are going to be able to say you can get the contractor to come in and put his costs right down at the bottom to begin with.

I am just thinking out loud here a little.

Mr. WELCH. This is a very difficult problem, Mr. Chairman.

The CHAIRMAN. Senator Jackson.

Senator JACKSON. Mr. Chairman, it seems to me that, generally speaking, when we talk about this particular area of Government expenditures involving current obligations of about $50 billion, excluding Atomic Energy and NASA, we talk about two different types of situations.

One is where the Government is procuring or buying Chinese copies. In such a situation, a lot of people can bid, and the Government can get a fixed price contract on a competitive bid basis. I am thinking of contracts for naval ships that are subject to considerable competition, and certain specific types of construction, cantonments, and so on, that are pretty well set as a pattern. That is one area.

The second area is that found in the development of complicated weapon systems. It starts with the research and development effort.

No one knows for sure what it is going to cost. There are two parties trying to determine costs. One is the Government and the other is the contractor. It is at this point, I think, when you have to ask yourself, in conforming these points that you have in your statement, who is in the best position to determine what the costs are going to be.

This gets back to what we talked about earlier, Mr. Chairman, the lack of inhouse capability on the part of the Government.

The Government is negotiating with a contractor that is in big business and is in a position to know the cost. The Government does not have an equal inhouse capability. It never will have.

I think the Government could improve its position substantially, but we have a salary structure that limits the number of top people that you can get into Government.

I am sure you are aware of that.

It limits the number of top people you can get into Government to deal with truly complicated systems. I think it is in this area where you run into trouble. This is why the Government alternates from time to time, trying to decide whether they are going to hire a company to be the weapon system manager, or whether they can build up enough inhouse capability to do the job.

As you know, in our great atomic energy program we have turned over the operation and management to the great corporations of the country. Out in my State it is General Electric that runs Hanford; Union Carbide, I believe, runs Oak Ridge; Du Pont runs Savannah River, Goodyear Tire runs the gaseous diffusion plant in Ohio.

Is not this part of the real problem behind your remarks?

Mr. BAILEY. I think this certainly is a part of the problem; yes, sir, Senator.

Senator JACKSON. So many times neither side really knows. Naturally, this weapon system went through changes. Every one of these systems go through continuous changes, which is a thing we are all looking for, because you start with a model that is the mere beginning of something and you want to improve it.

So when you try to figure out what the costs are going to be, you have the Government people, in many cases with limited resources, trying to figure out what it is going to be.

The contractor, trying to be conscientious, in most cases does not know what the cost is going to be, but he naturally is going to protect himself.

You thus have neither side knowing for sure, especially the Government being in the position of not having the facts available to pass on the costs.

Is not that about the situation?

Mr. ADLERMAN. I think there is a little something more to it than that.

The CHAIRMAN. I believe the witness started to respond.

Mr. BAILEY. I would like to add that this is part of the problem.

Senator JACKSON. I am not referring to those cases where there is a clear, willful, and flagrant overcharging of the Government.

I am speaking of those situations in which a prudent businessman looking at the situation at the time would say, "This is the best estimate I can give you on the cost."

Mr. ADLERMAN. But the question comes up, Should they enter into this type of contract?

Senator JACKSON. I am not going into that. I am dealing with the problem relating to this kind of contractual situation.

The CHAIRMAN. That was the question I wanted to ask: Since everything is so uncertain and there can be no accuracy, even if both contracting parties desire to find something substantial that they can tie to, they cannot because, as Senator Jackson pointed out, changes are being made.

You do not know today what changes will be made tomorrow. How is there any way to determine that an incentive effort was made to reduce the price, and how can you award on that basis?

Mr. BAILEY. That is why we feel that the contractor should at least have some responsibility to demonstrate why his efficiencies have led this cost reduction.

The CHAIRMAN. But I do not see how in a missile program such as this, where you have constant changes, how you can at any time, certainly in the beginning, fix any target price and say this thing is going to cost only $300 million.

When changes come along, as they have and do, it may upset that and run it much higher. And changes might make it lower. What then becomes the base from which you measure the incentive and the reward for accomplishing something?

Mr. BAILEY. That is why we say as we do in there on the last page of my statement, that there should be reliable cost estimates, reasonably free of contingencies available, before this type of contracting issues.

The CHAIRMAN. The only thing I am pointing out is it seems to me in this contracting where there are so many contingencies, and where changes are anticipated—and you cannot know what the changes will be—I am wondering if such a type contract is practical and feasible?

Mr. BAILEY. Where there are many contingencies, and where there are many unknowns, the incentive type contract, based on cost incentives, becomes very difficult to make any determination that it is due to efficiencies and economies.

The CHAIRMAN. I am wondering if we have some experiences.

May I ask the staff, are we going to have some demonstrations of contracts here and experiences under them?

Mr. ADLERMAN. Yes.

The CHAIRMAN. I am not arguing the point, I am only raising a question.

I think we are all seeking, certainly all of us in Government should be seeking and I think all good citizens should be seeking, to find ways to economize in the cost in this tremendous defense program, if we can do it to do so.

I think we should all desire to do so. We may have to experiment, with the experimentation being well and good. But it seems to me like there are a lot of difficulties in this incentive price system where you go out and more or less experiment, trying to develop something, and where changes are going to be constantly occurring.

Mr. BAILEY. Particularly where you tie the incentive to an end result, no matter what the cause of that end result.

The CHAIRMAN. Senator Muskie.

Senator MUSKIE. Mr. Bailey, you said the incentive type contract is not useful—or this I gather is your point—is not useful if there are too many contingencies?

I understood that the purpose of the incentive type contract was to try to solve the problem of profits and costs in the developments of these new weapon systems where there are a great many uncertainties.

Am I wrong in that respect?

Mr. BAILEY. It is difficult to set a realistic target price.

Senator MUSKIE. I agree. But on this point—the situation where the incentive type contract is useful—I understood that it was devised for the purpose of meeting these situations where there are a great many uncertainties?

Mr. BAILEY. I do not believe, Senator, that the regulations, the military services' own regulations, on the use of this contract contemplates the use of this type of contract where there are many contingencies involved.

Senator MUSKIE. Then you are saying that the incentive type contract ought not to be used in this kind of situation, where it is involved in the development of a new weapon system?

Mr. BAILEY. One of the requirements for the use of that type contract is that reliable cost estimates should be available.

Senator MUSKIE. That would mean, when you are dealing with this type of a weapon system, it should never be used?

Mr. BAILEY. Well, they certainly, according to their own criteria, the military departments' own criteria, they should not use this type of contract where there are many unknowns that go to setting the target cost of performing the contract.

Senator MUSKIE. That is your own judgment, too, as I understood?

Mr. BAILEY. Yes, sir. I think this is right.

Senator MUSKIE. Let me ask you this: On the middle of page 7, you make the statement that—

> Thus, the sharing of cost underruns below the target cost rewards the contractor, not for his efficiency in effective cost reduction, but for his inability or failure at the time of original negotiation to make a close estimate.

These contracts that you have reviewed, is the absence of effective target estimates due more often to inability or to failure?

Mr. BAILEY. Well, in the cases we mentioned in our statement, each one of those cases—in each one of those cases the contractor had in his possession information which he should have known.

Senator MUSKIE. These are the 17 reports?

Mr. BAILEY. Yes, sir. It would have indicated that his cost estimates were too high.

Senator MUSKIE. In those cases, it was due to failure to provide information that was available. I was interested in the other aspect of this.

In how many instances, by comparison, was the absence of a sound target estimate due to inability to provide the information?

Mr. BAILEY. We have not reported anything in that area, Senator.

Senator MUSKIE. You have never found anything?

Mr. BAILEY. I think this is indicated by the extent to which we will find, sometimes, that contingencies are included in a target price.

Senator MUSKIE. So that if I may gather your point, in this type contract, its failure to accomplish the objective is due more often to failure to provide available information than it is to ability to provide available information?

Mr. BAILEY. There is a substantial number of these contracts that do contain estimates for contingencies included in the target price.

This is a judgment factor on the part of the negotiator and the contractor at the time the contract is agreed to. For us to come in on a postreview basis and say they should or should not have allowed contingencies at the time of negotiating the contract, is kind of like Monday morning quarterbacking on our part.

Senator MUSKIE. If it is like doing it on a Monday morning quarterbacking basis, it would be difficult to do it at the time of the negotiation?

Mr. BAILEY. We try to put ourselves in the position of the parties at the time we make our reviews. This is the reason we have stuck basically to the areas where there has been a failure to disclose the information rather than an inability to disclose it.

Senator MUSKIE. It seems to me, then, that you have made a complete case against the use of this type of contract, because you say in situations where there are many uncertainties, it ought not to be used, and you say the regulations say this, too; that in those cases where there are no uncertainties, there apparently is a pretty habitual failure to provide cost information that is available.

Mr. BAILEY. This failure to provide would not necessarily cover all areas. If I gave that impression, I am wrong.

Senator MUSKIE. I wanted to be sure that you understood that this is the impression I had.

Mr. BAILEY. I would like to correct it, because it may involve one element, let us say, of the production costs, such as material, or subcontracted items, something of this kind, as contrasted with other relevants in the contract, such as labor, overhead, various other things that go to make up the total cost of performing the contract.

Senator MUSKIE. Let me ask you for this judgment: Which type of contract do you think is more effective in reducing the costs, the cost-plus-fixed-fee or this incentive-type contract?

Mr. BAILEY. I do not believe I could qualify to judge that.

Senator MUSKIE. We have to try to form a judgment, so we thought we would like to ask the experts.

Mr. ADLERMAN. Is not it the fundamental principle or fundamental basis for a cost-plus incentive contract the fact you must have the information which will give you accurate cost data so that you can fix a realistic target price?

Mr. BAILEY. You should have sufficient information on which to base a realistic estimate, and one of these things that provides that basis would be previous experience cost data or cost information, cost estimates.

Mr. ADLERMAN. A contract officer has at his choice several different modes of contract. For example, the cost plus fixed fee, the cost plus incentive fee, and so forth. But where you do not have the realistic figures, where you cannot get enough information, where you have never been in production in this particular item—we have

only had research and development—where you have no production experience, nothing to base a realistic target on; would you think it would be wise to go into an incentive-type contract where you do not have a realistic target figure?

Mr. BAILEY. Well, I——

Mr. ADLERMAN. Let me put it this way: If you had a contractor you were negotiating with who feels he would rather go into a cost-plus contract rather than an incentive-type contract, because he does not know exactly what the costs are; as a contracting officer, which would you recommend?

Mr. BAILEY. I think if it were me, personally, I think I would—and there were no production costs on which to make a judgment, no real good cost estimates on which to base a judgment—I think I would be inclined to agree with the contractor in a situation of this kind that maybe the best mode of contracting would be the cost-type contract.

Mr. ADLERMAN. Then, it might be cheaper for the Government had it been done that way?

Mr. BAILEY. Yes. This is a judgment factor.

Mr. ADLERMAN. We talk about the incentive features in these contracts as though it were carried forward with a view to bring down costs of a price, to induce them to make a smaller profit.

Ordinarily in a cost-plus contract, you do not have that incentive for further reduction by way of a profit, but, at the same time, is the contractor under a cost-plus contract under the same obligations to watch his costs, to be a careful contractor, to bring down his costs as low as possible?

Is not that implied in every contract you have with the Government?

Mr. BAILEY. I think all contractors are under a best estimate requirement or mandate when they take the contract. They certainly should put forth their best effort to produce properly.

In addition to this factor under a cost-type contract, the contractors are under rather strict administrative surveillance and control, both by technical personnel and administering personnel in the purchasing service.

Mr. ADLERMAN. I think, and I believe, that a cost-plus-incentive contract has a proper place. But it has a proper place only where you have a realistic target, and where the contractor will have to assume some risk of overrunning the contract where he will have to pay part of the burden of that cost.

On the contrary, if he does succeed by efficiency or good methods of working, underrunning it, he will get additional profits.

Mr. BAILEY. Of course, the cost-plus-incentive fee also provides an incentive to lower costs, but is not subject, generally, to profit fluctuations of a fixed-price-incentive type.

Mr. ADLERMAN. You mentioned something before about contingencies being put into a cost-plus-incentive contract and you were opposed to that, I take it, principally?

Mr. BAILEY. I was thinking basically of a fixed-price-incentive contract where they had the contingencies.

Mr. ADLERMAN. In other words, when you put the contingency in, you take away the risk that the contractor has as an inducement for

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him to get extra profits. The Government puts a little bit of the risk in it if he overruns; is that right?

Mr. BAILEY. That is right.

Mr. ADLERMAN. So if you put these incentives in, a 10-percent incentive or a 15-percent incentive, contingency, rather, you put a little fat in that contract on the target and there is not the risk; is that correct?

Mr. BAILEY. He has a greater incentive.

Mr. ADLERMAN. And he has a greater incentive to increase his profit?

Mr. BAILEY. That is right.

Mr. ADLERMAN. In the usual incentive contract, they have a base for the fee which is larger than the cost-plus contract; is that so? The fee is generally a couple of percentages higher than a cost-plus contract?

Mr. BAILEY. I think ordinarily the fee under a fixed-price-incentive contract would be higher.

Mr. ADLERMAN. And they have a sharing arrangement?

Mr. BAILEY. They have a sharing arrangement from underruns or overruns.

Mr. ADLERMAN. If it goes over a certain percentage of the target figure, then the contractor has to pay a part of the overrun; is that right, generally speaking.

I know it varies in every contract.

Mr. BAILEY. Actually, he loses part of his profit if it runs over the target cost. If the cost of the contract runs over the target cost, he loses part of his profit. His profit is diminished generally, in the same percentage as his profit would be increased if it ran under.

However, they are subject, still, to a ceiling price which, in many cases, runs 120 percent, let us say, of the target cost, and anything above the ceiling price then is at 100 percent of the contractor's responsibility.

Mr. ADLERMAN. I believe in your statement you have found only two instances where there was overage of that nature?

Mr. BAILEY. Where it ran above. Well, this is the House committee report.

Mr. ADLERMAN. It is rather unusual. It is rather a rare bird; is it not?

Mr. BAILEY. Yes, sir.

Mr. ADLERMAN. I mean, it is a rare occurrence to see an overrun on the fixed-price-incentive contract?

Mr. BAILEY. Above the ceiling price.

Mr. ADLERMAN. On the other hand, we do find that there are numerous instances of overruns on cost-plus contracts?

Mr. BAILEY. This is correct.

Mr. ADLERMAN. Cost plus fixed fee?

Mr. BAILEY. This is correct.

Mr. ADLERMAN. It is not unusual?

Mr. BAILEY. Correct.

Mr. ADLERMAN. So the contract does have its place provided the conditions are met, such as a realistic target cost and firm figures set?

Mr. BAILEY. We definitely feel this; yes, sir.

Mr. ADLERMAN. That is all.

The CHAIRMAN. Are there any further questions?
If not, thank you, gentlemen.
Mr. ADLERMAN. Mr. Tierney.
The CHAIRMAN. Proceed.

TESTIMONY OF PAUL J. TIERNEY—Resumed

Mr. TIERNEY. Mr. Chairman, as we previously indicated, we are going to look into three incentive contracts which were negotiated between Boeing and the Air Force.

Mr. ADLERMAN. Do you have before you an incentive-type contract chart on contract No. 36319?

Mr. TIERNEY. I do.

Mr. ADLERMAN. And that is the first one checked on chart No. 4?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. It calls for the production of 78 Bomarc missiles?

Mr. TIERNEY. That is right; Bomarc A missiles.

Mr. ADLERMAN. At a cost to the Government of $94.8 million?

Mr. TIERNEY. That is correct; the final cost.

The CHAIRMAN. That will be chart No. 5.

(Chart No. 5 follows:)

CHART No. 5

BOMARC

AF 33(600) 36319(FPIS)

Initial Provisions	Reset Provisions
1. Basis Fee, 8% of Initial Target	1. Incentive of 5% of Cost Underruns
2. 85/15 Sharing	2. Penalty of 10% of Cost Overruns
3. Profit not to exceed 10% of initial target & in no event to be less than 6%	3. Price not to exceed 135% of target cost

Dollars in Thousands

				Profit Summary* Basic	Profit Summary* Incentive
(April 10, 1958)	Initial Target	$112,108			
(Oct. 12, 1959)	Reset	82,261			
	Underrun	$ 29,947			
	Basic Profit	8,969		$8,969	
	Incentive Profit	2,226			$2,226
(Nov. 19, 1959)	Reset Target		$82,261		
(Feb. 19, 1962)	Est. Final Cost		75,368		
	Underrun		$ 6,893		
	Incentive Profit		306		$ 306
	Total Underrun	$36,740	(32.7%)		
Spare Parts Cost $7,419 Profit 532				$ 532	
				$9,501	$2,532
	Total Estimated Final Cost	$82,787			
	Total Profit	$12,033	(14.5%)		

* All Profits Are Before Taxes

Mr. ADLERMAN. Explain how the figures work out, would you, Mr. Tierney?

Mr. TIERNEY. The parties at their initial negotiations negotiate various elements in the contract.

The CHAIRMAN. They did what?

Mr. TIERNEY. They negotiate various elements of the contract.

Mr. ADLERMAN. They have a basic fee of 8 percent?

Mr. TIERNEY. Yes. First, they negotiate an initial target. That is an agreement by the parties as to what the estimated cost of this particular contract will be, what the estimated cost of the performance will be.

In this particular instance, they negotiated a target of $112,108,000.

The CHAIRMAN. That was to be the cost?

Mr. TIERNEY. That is correct. That has been referred to as the initial target.

The CHAIRMAN. The initial cost target?

Mr. TIERNEY. That is correct; the initial estimated cost target.

Senator JACKSON. Does that include the profit?

Mr. TIERNEY. It does not. It is just the cost.

(At this point Senator Muskie withdrew from the hearing room.)

Mr. TIERNEY. They next negotiate a fee, an initial fee or a basic fee. In this instance, 36319, the Air Force and Boeing agreed to a basic fee of 8 percent. That basic fee is 8 percent of the initial target. It is the target fee, the firm fee.

The CHAIRMAN. That would have been what?

Mr. TIERNEY. In this particular instance, it works out to $8,969,000, 8 percent of $112,108,000.

They then agree to a sharing arrangement. In this instance, they agreed to an 85–15 sharing arrangement. In the event the costs were less than the target figure, the Government and Boeing would share at the proportion of 85–15.

That is the incentive fee.

The CHAIRMAN. On the undercost, the Government got the benefit of 85 percent of it, and the contractor 15 percent?

Mr. TIERNEY. That is correct.

The CHAIRMAN. In other words, for every dollar that could be saved on the contract under the target of $112 million, the contractor would get 15 cents?

Mr. TIERNEY. That is correct, Mr. Chairman.

The CHAIRMAN. So that was an incentive to the contractor, "You can make 15 percent more than the 8 percent on any part of it that is saved under the $112 million"?

Mr. TIERNEY. That is correct. That is the theory behind this type of contract, that that is an incentive to him.

The CHAIRMAN. That is not only theory, but that was the type of contract made in this instance?

Mr. TIERNEY. This is the actual contract made. These are the actual provisions.

The third element in this agreement was that the profit would not exceed 10 percent of the initial target.

In other words, the total profit which Boeing would receive could not exceed $11.2 million.

(At this point Senator Muskie entered the hearing room.)

The CHAIRMAN. No matter how much saving, the total profit could not be more than 10 percent of the original target estimate of cost?

Mr. TIERNEY. That is correct. That is the profit ceiling.

There was also in this particular contract a profit floor. The agreement was that Boeing would receive no less than 6 percent of this initial target, which was roughly $6.7 million.

The CHAIRMAN. I thought it said up there it received 8 percent?

Mr. TIERNEY. That was in the event of overruns. If there are overruns, Mr. Chairman, they are shared on an 85–15 proportion or ratio.

If there are overruns, Boeing's profit is reduced 15 cents on each dollar.

Mr. ADLERMAN. But not less than 6 percent of the target figure.

The CHAIRMAN. In other words, if there is an overrun, 15 cents out of every dollar would have to be paid by the contractor, and the 15 cents on the overrun, whenever it got to the point where it was about to reduce profits below 6 percent of the original total, then the Government would pick up the tab from there on?

Mr. TIERNEY. That is right.

Mr. ADLERMAN. Mr. Tierney, at that point, when this contract was negotiated, from your study of the contract provisions and negotiation records was there any indication whether or not the Boeing Co. stated that they preferred to have a cost-plus contract rather than a cost-plus-incentive-fee contract?

Mr. TIERNEY. Yes. They wanted a cost-plus-fixed-fee contract.

Mr. ADLERMAN. Had they come in and requested at that time a cost-plus contract at 6 percent rather than an incentive-fee contract at 8 percent?

Mr. TIERNEY. They had proposed that; that is correct.

Mr. ADLERMAN. Was one of the reasons that they have the 6-percent floor is that they wanted to be guaranteed that they would not make less than 6 percent on this contract?

Mr. TIERNEY. I think that was the situation. The parties were in that situation. They were apparently, at this stage, when their costs were based on research and development only, with no production costs and experience; they were afraid of overrunning.

The CHAIRMAN. I am not blaming the company, but obviously if they had a provision in there that they could never lose, or that their profits could never be less than 6 percent on the original target; they were protected.

They could never lose beyond what they were willing to do it for on the basis of a cost-plus contract.

Mr. TIERNEY. That is essentially right. Actually, the target proposed under the cost-plus-fixed-fee basis was a little bit higher than this. But still, the difference in fee amounted to about $2 million.

It was 6 percent of the target proposed by Boeing, as compared to 8 percent of the target.

Senator JACKSON. As I understand it, in this particular contract that we are talking about, the one on the chart marked "5"; the Boeing people had proposed a cost plus fixed fee?

Mr. TIERNEY. That is correct.

Senator JACKSON. And the incentive-type contract which eventually was entered into was the proposal of the Air Force?

Mr. TIERNEY. That is correct.

The CHAIRMAN. It may have been that they wanted to experiment. I do not know. Let us see what the outcome was.

Mr. ADLERMAN. Had they entered into the fixed-fee contract at even a higher target price, the Government would have saved quite a bit of money on that fee; would it not?

Mr. TIERNEY. On the fee; that is correct.

Mr. ADLERMAN. We will get into the figures at a future date.

I wonder if you could then discuss the reset provisions?

Mr. TIERNEY. At the time the parties agreed to these initial provisions, they also agreed that at a certain point in production they would negotiate a new target or a reset target.

Mr. ADLERMAN. In other words, after they went downstream and had some experience in production, where they had some more information as to the costs and so forth; they would then sit down and negotiate a new target for which the company would aim at to try to reduce the price underneath that; is that it?

Mr. TIERNEY. Yes. I think in this particular case it was something to the effect that it would be within 90 days after they received delivery on the first production contract, which was 35359; and that would have given them that production cost experience.

This initial target was negotiated on April 10, 1958. Events occurred upon which they based the reset target and that was negotiated on October 12, 1959.

Mr. ADLERMAN. That was about 6 months later?

Mr. TIERNEY. No, it is about a year and a half later.

As of this time, they have this previous production cost experience and they reevaluate what the contract will cost, the entire contract; and based on their cost experience now they find it will cost them less.

So, the new target agreed to by the parties is $82,261,000.

The CHAIRMAN. That was a reduction of $30 million?

Mr. TIERNEY. That is correct, $29.9 million.

As of this point, Mr. Chairman, Boeing's fee, based on the initial provisions, are calculated. In other words, as of this point, Boeing's fee is 8 percent of the target, $8,969,000, plus 15 percent of the underrun.

However, the ceiling was 10 percent. They can only get a total of $11.2 million. Therefore, their incentive profit is limited to $2.2 million. That is figured as of the time they reset the target.

The basic fee is $8.9 million and the incentive fee is $2.2 million.

Senator JACKSON. Ten percent of what item?

Mr. TIERNEY. Of the initial target.

Mr. ADLERMAN. At the point of reset, they already had a reduction of almost $30 million. They got the incentive profit which was limited to $2,226,000 because they could not go more than 10 percent of the original target.

So they, at that point, made $11.2 million.

They had the reset provisions.

Mr. TIERNEY. At reset they negotiated a new target and negotiated a new formula. In this particular instance, they negotiated a formula whereby Boeing would receive an incentive fee of 5 percent of the cost underruns; that is, below $82 million, and a penalty of 10 percent of cost overruns, that is over $82 million, and a price not to exceed 135 percent of target cost.

That is, the target cost, plus the profit, cannot exceed 135 percent of $82 million. If it does exceed that, then Boeing will bear all the cost.

Mr. ADLERMAN. What was the total underrun on the final estimated cost?

Mr. TIERNEY. The total underrun? The final estimated cost, the latest figures being as of February this year, is $75,368,000. That is approximately what the contract calls.

Mr. ADLERMAN. So your final underrun ran $36,740,000?

Mr. TIERNEY. $36,740,000, the total underrun. It is the target minus the actual cost.

Mr. ADLERMAN. And that represents 32 percent of the original target?

Mr. TIERNEY. That is right.

Mr. ADLERMAN. That is in underruns.

The CHAIRMAN. How much incentive payment did the company receive on that contract? Incentive profits, I mean.

Mr. TIERNEY. A total of $2.5 million. They received on the basis of the underrun of the reset target, which was $6.8 million, Senator, an incentive of 5 percent of that amount, $306,000; and that is in addition as an incentive on the underrun of the reset target.

Mr. ADLERMAN. On the original underrun they received $2,226,000. On the second reset incentive profit they made $306,000, which gives a total of $2,532,000 on incentive fees alone, other than the 8-percent profit that they made as a basic fee, which came out to $8,969,000.

The CHAIRMAN. Let us go back another way. What was the total cost to the Government of that contract?

Mr. TIERNEY. The total price?

The CHAIRMAN. The total cost to the Government, including profits and all.

Mr. TIERNEY. I want to explain one more thing before we get into that.

On spare parts, the cost of the spare parts, were not included in the incentive features of this contract.

This was just a straight CPFF contract for the $7 million figure only, at a fixed fee, which happened to be 8 percent of the initial target cost, and they got a profit on that of $532,000, on spare parts. The total profit on the incentive portion is $12.033 million.

The CHAIRMAN. Let us leave out the parts for a moment. Over there you have $7,532,000. Leave that out. Let us get the total amount that the Government paid out on that contract, including profits.

Mr. TIERNEY. $82,787,000.

The CHAIRMAN. How much of that $82,787,000 was profit?

Mr. TIERNEY. $12,033,000.

The CHAIRMAN. In other words, a contract that cost the Government $70 million, in round numbers——

Mr. ADLERMAN. $75 million.

The CHAIRMAN. The cost was $70 million. That was cost and $12 million was profit.

Mr. TIERNEY. $75 million was cost, Senator.

The CHAIRMAN. You have not given me the right figures, then. The whole thing cost $82,787,000. Then you show total profit of $12,033,000. Does that include the spare parts?

Mr. TIERNEY. This $82 million includes the spare parts.

The CHAIRMAN. The $82 million includes the spare parts?

Mr. TIERNEY. That is correct.

The CHAIRMAN. And so does the $12,033,000; that includes the profit on the spare parts?

Mr. TIERNEY. That is right.

The CHAIRMAN. In other words, it came to about 14.6 percent?

Mr. TIERNEY. 14.5 percent profit.

The CHAIRMAN. 14.5-percent profit that the company made on a contract that cost the Government $70 million in round numbers?

Mr. TIERNEY. No, $82 million, Senator.

The total profit includes the two, the spare parts and the Bomarcs'. In other words, the total estimated final cost includes the spares of $7 million. You see, it is $7 million plus $75 million.

The CHAIRMAN. In other words, the company got a profit of $12,033,000 on a contract that cost $82,787,000; 14.5 percent profit?

Mr. TIERNEY. That is correct, sir.

The CHAIRMAN. It offered to negotiate a contract, a cost-plus-fixed-fee contract, for 6 percent?

Mr. TIERNEY. That is correct.

The CHAIRMAN. Have you figured out what that would cost?

Mr. TIERNEY. Roughly, $6.8 million.

The CHAIRMAN. And 8.5 percent profit——

Mr. TIERNEY. But the estimated cost figure was different from this. The estimated cost figure was $114.5 million, I believe.

The CHAIRMAN. Well, any way you calculate this, on this basis the Government paid about twice the profit or roughly, twice the profit as it would have paid on a cost-plus-fixed-fee contract?

Mr. TIERNEY. Yes.

Mr. ADLERMAN. $6.8 million would be paid at the 6-percent rate, and it did pay $12,033,000. So there was an excess fee paid of approximately $5,250,000.

The CHAIRMAN. I do not know that it will run this way in every cost-plus-fixed-fee contract, but in this instance, obviously, the contractor profited greately by reason of the arrangements.

Senator MUSKIE. But the contractor preferred the cost plus fixed fee.

The CHAIRMAN. He did originally.

Mr. TIERNEY. In effect, he has it here.

The CHAIRMAN. I guess he is not complaining now.

Senator MUSKIE. No, I do not believe so.

Senator JACKSON. Mr. Chairman, this just corroborates what I have said earlier, that I do not think either side knows what the costs are. That was my point earlier.

In other words, obviously, a private company would want to earn as good a profit as possible. I think this corroborates the point that neither the Government nor the private contractor always know what the costs are going to be or what is the best approach.

The CHAIRMAN. Let me ask you this question: Has this contract been renegotiated or is it still subject to renegotiation?

Mr. TIERNEY. This one is still subject to renegotiation. It has not been renegotiated.

The CHAIRMAN. This one is still subject to renegotiation and there still may be the opportunity for the Government to recoup some of that profit.

I am advised by chief counsel that they do not renegotiate individual contracts, but renegotiate with the company on a year-round basis. Is that right?

Mr. TIERNEY. That is correct, Senator.

The CHAIRMAN. In other words, this contract, as such, will not be renegotiated?

Mr. TIERNEY. As such, it will not be.

The CHAIRMAN. But the overall profits of the company in its work for the Government for that year, whatever the year, may be renegotiated?

Mr. TIERNEY. That is correct.

Senator MUSKIE. May I ask a question, Mr. Chairman?

The CHAIRMAN. Surely.

Senator MUSKIE. Is there any basis upon which to make an estimate of what the cost, the total cost, including profit, on this contract would have been if the company's offer of a cost-plus-fixed-fee arrangement had been accepted?

Mr. TIERNEY. This is the controversial area. The problem now, Senator, is: Are these underruns as a result of cost consciousness or the result of an inflated target?

To the best of our ability, we are going to try to get into that in depth. That is always the difficult area in these contracts and that is what causes the controversy on fixed-price contracts.

Senator MUSKIE. May I ask this question: If it were possible to get realistic costs under both types of contracts eventually as the cost to the Government, then the cost, the total cost, to the Government under cost-plus-fixed-fee contracts would be less than this figure by the difference between $6.8 and $12 million profit?

Mr. TIERNEY. Not necessarily. Let us assume we can get good cost information. I think it would be fair to assume then if there are some incentive features in the contract it might stimulate the contractor to make greater efforts to reduce costs.

Conceivably under that circumstance, the Government would get the entire package at a little less cost.

Senator MUSKIE. What you are saying is that under a cost-plus-fixed-fee contract, the cost tends to be higher than they would be if there was some tendency to reduce them?

Mr. TIERNEY. Conceivably, it depends. It depends entirely on the target which is negotiated. I do not know, but maybe there is not as much incentive to negotiate a higher target or to protect yourself in a cost-plus-fixed-fee contract than there would be in an incentive contract, because generally in the incentive contract you have risk features.

You have price ceilings, they lose on overruns. In a cost-plus-fixed-fee contract, you do not lose on overruns, you get your fixed fee.

Maybe it would behoove the contractor to demand as high a target as he would if he were negotiating a fixed-price-incentive contract.

The CHAIRMAN. Are there further questions?

Mr. ADLERMAN. Not at this time.

The CHAIRMAN. Call the next witness.

Mr. ADLERMAN. We have further questions of this witness, Mr. Chairman.

The CHAIRMAN. Very well.

Mr. ADLERMAN. Mr. Tierney, do you have a chart you prepared on the record of contract summary showing the dates when the contracts were entered into, the delivery dates, and the reset dates, and so forth?

Mr. TIERNEY. I have.

Mr. ADLERMAN. Would you explain that chart?

Mr. TIERNEY. These are the major research and development contracts and production contracts of the Bomarc missile.

The original research and development contract was 19589, entered into in 1951. The contract date was signed June 26, 1951. This is chart No. 6.

The solid blue area shows the period when the contract was in existence. The area with diagonal lines indicates when missiles were delivered.

On 19589, for example, an R. & D.-type missile, and various missiles, were delivered in this period. There were 50 of them, the XIM, the R. & D.-type missile.

Under contract 24748, it was a production implementation contract. The purpose of it was to study the best way and the smoothest way of going from research and development into production.

(At this point Senator McClellan withdrew from the hearing room.)

Mr. TIERNEY. That contract ran from June of 1953 to the beginning of 1958. The majority of the funds in this contract were spent in the 1956–57 area.

Contract 32832 was a contract for a preproduction, a prototype model of the missile, not a production model. In effect, it is an R. & D. model. It is a missile used to test the missile and the entire system, prior to production.

Mr. ADLERMAN. But that is not yet a production model?

Mr. TIERNEY. No. In effect, this is really part of the research and development of the missile. It is the third stage.

Mr. ADLERMAN. That contract was entered into in March of 1956?

Mr. TIERNEY. March 1956.

Mr. ADLERMAN. And no deliveries were started until about January 1958?

Mr. TIERNEY. That is correct.

Contract 35359 is the initial production contract, a cost-plus-fixed-fee contract.

Mr. ADLERMAN. That is the first production contract?

Mr. TIERNEY. Of the A missile, the first contract. That contract was negotiated on April 8, 1957, and the contract was actually signed on May 15, 1957. The production of the missiles began in 1959.

Mr. ADLERMAN. The earliest delivery was about the spring of 1959?

Mr. TIERNEY. That is right. That is correct.

Contract 36319, which is the one we referred to in chart 5, was negotiated on April 10, 1958, as you see on chart 5. This chart will demonstrate the production cost experience which the parties had at the time they negotiated contract 36319.

Mr. ADLERMAN. Let me see if I can understand this. At the time that 36319 was negotiated on an incentive type basis, there had been no deliveries of any production missiles; is that correct?

Mr. TIERNEY. That is correct. As you run the line up from the date of negotiation, April 10, 1958, they had a little bit of production of the prototype missile.

Mr. ADLERMAN. That is not a production missile. There is quite a difference between a preproduction prototype and the production missile, itself?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. One is sort of handmade and maybe had different configurations and so forth. It is made for research and development, essentially, for testing.

Mr. TIERNEY. It is the cost experience in research and development.

Mr. ADLERMAN. So at that point it is clear that they had no production on any missiles on which to base any estimates of cost?

Mr. TIERNEY. They had no production cost experiences; that is correct.

Mr. ADLERMAN. So it had to be, at best, an estimate?

Mr. TIERNEY. That is correct. That is based on your research and development experience.

Mr. ADLERMAN. The next contract we are interested in was 38098; is that correct?

Mr. TIERNEY. That is right.

Mr. ADLERMAN. That called for the production of 168 missiles?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. The previous contract, 319, was for 78 missiles?

Mr. TIERNEY. Yes.

Mr. ADLERMAN. Again here, do you find at the point when the negotiations were conducted——

Mr. TIERNEY. March 27, 1959.

Mr. ADLERMAN (continuing). Had they still received a single production missile?

Mr. TIERNEY. They had not yet. They still had not delivered a missile on the initial production contract, 35359.

Mr. ADLERMAN. So in 1959, at the time they entered into this contract, they still had no production experience on which to base cost figures?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Was this known to the Air Force at the time?

Mr. TIERNEY. Yes.

Mr. ADLERMAN. Was this the subject of discussion in negotiations?

Mr. TIERNEY. Yes, it was.

Mr. ADLERMAN. At this point, was there also some talk of cost-plus type contracts as opposed to incentive-type contracts?

Mr. TIERNEY. Not at this time, no. There was a proposal for another type contract, but eventually an incentive-type contract was proposed.

Mr. ADLERMAN. Now we go to the first of the B missile productions, and that was 38101?

Mr. TIERNEY. Yes.

Mr. ADLERMAN. That is a fixed price incentive contract?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. When was that negotiated?

Mr. TIERNEY. 38101 was negotiated May 7, 1959.

Mr. ADLERMAN. Prior to that—and just above it is 35030 contract, an R. & D. contract, calling for 36 experimental missiles in the B program.

Mr. TIERNEY. That is right, this is the research and development contract in the B series of missiles.

Mr. ADLERMAN. Had they made any deliveries of any of the research missiles at that time?

Mr. TIERNEY. No. As a matter of fact, they had not yet delivered the research missiles. This was their experience at the time they negotiated contract 38101.

Mr. ADLERMAN. They negotiated contracts within a short period of each other; is that correct?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. So when they went into a contract on an incentive plan for the 116 missiles of the B series, they still had no production experience on a B missile at all?

Mr. TIERNEY. That is right. In fact, very little on the A. There were very few deliveries on the A, on the initial contract.

Mr. ADLERMAN. Had there been any discussion at that time of whether or not they should go into a cost-plus-fixed-fee contract or an incentive-type contract?

Mr. TIERNEY. Yes. In this contract, Boeing proposed a cost plus fixed fee.

Mr. ADLERMAN. The company proposed a cost plus fixed fee?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. At what fee?

Mr. TIERNEY. At, I think, $179 million. But we will get into that.

Mr. ADLERMAN. In other words, the Boeing Co. suggested that instead of an incentive-type contract, they, themselves, suggested a cost plus fixed fee at 6.5 or 6.7 percent?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Is that your recollection?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. However, the Air Force insisted on an incentive-type contract?

Mr. TIERNEY. Yes.

Mr. ADLERMAN. And just as they did in the other two cases?

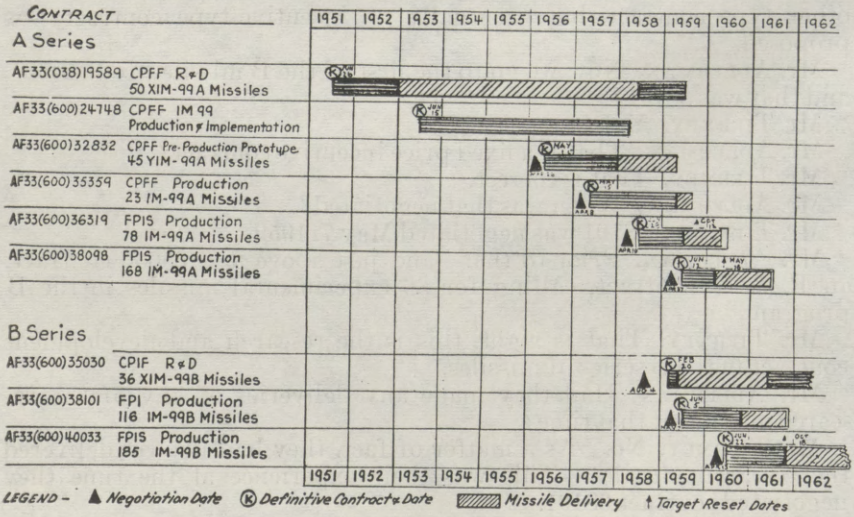
Mr. TIERNEY. That is correct.

Senator MUSKIE (presiding). The chart No. 6 will be printed in the record at this point.

(Chart No. 6 follows:)

CHART NO. 6

BOMARC MAJOR CONTRACT SUMMARY



Mr. ADLERMAN. Could you put up the contract chart on 38098?

Mr. TIERNEY. Yes. This is chart No. 7.

Mr. ADLERMAN. Does this portray the provisions and the figures relating to the fixed price, incentive, and reset provisions on contract 38098?

Mr. TIERNEY. It does.

Mr. ADLERMAN. Could you tell us what the target figure is that was negotiated on that?

Mr. TIERNEY. First of all, I might say that the initial provisions, with the exception of No. 4, are the same as the other contract. No. 4 on the initial provisions has the total price limited to 135 percent of the target cost.

This actually contradicts No. 3.

Mr. ADLERMAN. In other words, you have an inconsistency in that contract, one which says the profits shall not exceed 10 percent of the initial target nor be less than 6 percent?

Senator MUSKIE. Chart No. 7 may be printed in the record at this point.

(Chart No. 7 follows:)

CHART No. 7

BOMARC

AF33(600) 38098 (FPIS)

Initial Provisions

1. Basic Fee, 8% of Initial Target
2. 85/15 Sharing
3. Profit not to exceed 10% of initial target nor be less than 6%
4. Total price not to exceed 135% of target cost

Reset Provisions

1. Incentive of 20% of cost underruns
2. Penalty of 20% of cost overruns
3. Price not to exceed 136% of target cost

Dollars in Thousands

Profit Summary *

			Basic	Incentive
(Mar. 27, 1959)	Initial Target	$135,277		
(May 16, 1960)	Reset Target	100,479		
	Underrun	34,798		
	Basic Profit	10,821	$10,821	
	Incentive Profit	2,679		$2,679
(Jun. 20, 1960)	Reset Target	$100,479		
(Feb. 19, 1962)	Est. Final Cost	99,079		
	Underrun	1,400		
	Incentive Profit	$ 309		$ 309
	Total Underrun		$36,198 (26.6%)	
Spare Parts				
Cost	$13,836			
Profit	1,119		$ 1,119	
			$11,940	$2,988

* All Profits are before Taxes

Total Est. Cost	$112,915	
Total Est. Profit	14,928	(12.2%) *

Mr. TIERNEY. It could not be less than 6 percent and there could be no ceiling on it. If there were a ceiling on it, it could be less than 6 percent.

(At this point Senator McClellan entered the hearing room.)

Mr. ADLERMAN. So you have the inconsistency there between the provision that there shall not be less of a profit than 6 percent, and the condition that the total price shall not exceed 135 percent of the target cost?

Mr. TIERNEY. As events turned out, that was of no importance.

Mr. ADLERMAN. It became academic?

Mr. TIERNEY. Yes. The initial target negotiated between the parties on March 27, 1959, was $135,277,000.

Mr. ADLERMAN. When was the reset negotiated?

Mr. TIERNEY. May 16, 1960, at $100,479,000, or an underrun of $34,798,000, which is 26.6 percent of the initial target.

As of the time of the negotiation of the reset target, Boeing's profit is calculated, based on the initial provisions as in the other contract.

The basic fee was 8 percent, and 8 percent of $135 million is $10,821,000. The incentive fee is 15 percent of the underrun. You have a situation here that is the same as under contract 36319, where it was limited to 10 percent of $135 million.

Therefore, it would be $13.5 million profit. So the incentive fee works out to be $2,679,000.

Mr. ADLERMAN. They had an underrun of $36 million out of $135 million estimated cost?

Mr. TIERNEY. That is correct.

(At this point Senator Muskie withdrew from the hearing room.)

Mr. ADLERMAN. And that represented 26 percent of the contract?

Mr. TIERNEY. Of the initial target; that is correct.

The CHAIRMAN. In that contract, and the other one that was testified to while I was absent from the committee a moment ago, did the contractor in those instances also seek to have a cost-plus-fixed-fee contract?

Mr. TIERNEY. Not in this one; the best I can interpret the record. From what I understand, they did ask for what is known as a letter contract, which is really merely that they agree to do business, and after the performance they negotiate a cost and a profit.

There is no basis for comparison. Thereafter, they did propose a fixed price incentive contract, according to the record.

The CHAIRMAN. I thought on chart 5 they had sought to negotiate a cost-plus-fixed-fee of 6 percent?

Mr. TIERNEY. They did.

The CHAIRMAN. That was true in that one, but it is not true in this one?

Mr. TIERNEY. That is correct.

The CHAIRMAN. Very well.

Mr. TIERNEY. The reset target, which was negotiated May 16, 1960, at a figure of $100,479,000. The estimated final cost in this contract was $99,079,000, or an underrun of the reset target of $1.4 million.

According to the reset provisions, Boeing would receive an incentive fee of 20 percent of the underruns, or 20 percent of $1.4 million, which is $309,000.

We have the same situation with respect to the spares on this contract. This portion does not have the incentive portion allowed to it.

The CHAIRMAN. In this contract, you have 20 percent of the underruns instead of 15 percent; is that correct?

Mr. TIERNEY. No, they had 15 percent on the initial target, Senator, but 20 percent on the reset.

The CHAIRMAN. When they reset it, they got a fee of 20 percent?

Mr. TIERNEY. That is correct. The reason for that is, of course, that they both assumed that at this point, with much better cost information, their estimate is a tighter figure, a much better figure. They know they are pretty close to the actual cost.

Mr. ADLERMAN. Just assume that the company would have been willing to enter into a cost-plus-fixed-fee contract at the same basic fee of 8 percent.

Their fee would have been $10.7 million; is that correct?

Mr. TIERNEY. $10,821,000.

Mr. ADLERMAN. And that would have constituted a savings to the Government of about $2.5 million?

Mr. TIERNEY. On the fees.

Mr. ADLERMAN. That is, if they had been willing to enter into a cost-plus contract?

Mr. TIERNEY. That is right.

Mr. ADLERMAN. There was a subsequent contract to this, I believe?

Mr. TIERNEY. Yes, there was.

Mr. ADLERMAN. Could you bring up the chart on that?

Mr. TIERNEY. Yes, sir.

Mr. ADLERMAN. Incidentally, the total profits in this case amounted to $14,928,000, or a profit ratio of 13.2 percent.

The CHAIRMAN. How much?

Mr. TIERNEY. 13.2 percent. That is on costs.

Mr. ADLERMAN. This is a similar contract for the production of 116 "B" missiles, shown in chart 8?

Mr. TIERNEY. This is the first "B" missile production contract. This particular contract is distinguished from the others in that it has no reset target. It is a simple fixed price incentive target.

The CHAIRMAN. Chart No. 8 may be printed in the record at this point.

(Chart No. 8 follows:)

CHART NO. 8

ROMARC

AF 33(600) 38101 (FPI)

Provisions

1. Basic Profit, 8% of Target
2. Incentive of 15% of Underruns
3. Total Profit not to exceed 11% of Target
4. Penalty of 15% of Overrun up to 5% of Target
   Thereafter penalty of 5% of overruns
5. Total price not to exceed 140% of Target

Dollars in Thousands

				Profit Summary * Basic	Incentive
(May 7, 1959)	Initial Target	$191,119			
(Feb. 19, 1962)	Est. Final Costs	166,462			
	Underrun	24,667	(12.8%)		
	Basic Profit	15,288		$15,288	
	Incentive Profit	3,678			$ 3,678
Spare Parts Cost $25,030 Profit $ 1,990				1,990	
				$17,278	$ 3,678
	Total Cost	$191,482			
	Total Profit	20,956	(11%) *		

* All Profits Are Before Taxes

Mr. ADLERMAN. Mr. Tierney, at the time this contract was negotiated, do the negotiated records indicate that the Boeing Co. wished to enter into a cost-plus-fixed-feet contract?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And was that fee to be at 6.7 percent?

Mr. TIERNEY. 6.7 percent, that was the proposal.

Mr. ADLERMAN. I think I may have made an error in the record previously when I was referring to contract 38098, where I said they wanted a fixed fee of 6.7 percent.

It was really on this contract, 38101.

Mr. TIERNEY. This contract, 38101.

Mr. ADLERMAN. They offered to make a contract for 6 percent on a cost-plus-fixed-fee?

Mr. TIERNEY. 6.7 percent on a cost-plus-fixed-fee.

Mr. ADLERMAN. That would have meant the fee would have run on the basis that they wished to make the contract at that time to approximately $12.9 million?

Mr. TIERNEY. Well, I think about $12 million. The problem was at the time of the negotiation of this initial target, the target price eventually agreed to was $176 million, but there were some revisions which increased the target to $191 million.

At that time, Boeing proposed a target of $179 million, and a cost-plus-fixed-fee contract with a fee of 6.7 percent.

Mr. ADLERMAN. That would mean that there would have been a saving there of approximately——

Mr. TIERNEY. You would have to calculate it on $191 million.

Mr. ADLERMAN. It would have meant a savings of approximately $5.9 million to the Government had they accepted it on the basis of the cost-plus-fixed-fee?

Mr. TIERNEY. If you are calculating on this figure of 191—you have to calculate on the figure of $191 million.

Mr. ADLERMAN. What was the initial target? $191 million?

Mr. TIERNEY. That is correct.

That is the initial target as eventually agreed to, $191 million.

Mr. ADLERMAN. And the final costs were what?

Mr. TIERNEY. $166 million.

Mr. ADLERMAN. And underrun of what?

Mr. TIERNEY. $24,667,000.

Mr. ADLERMAN. That was an underrun amounting to 12.8 percent of the target?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And the basic profit at 8 percent was $15 million?

Mr. TIERNEY. $15,288,000. And the incentive profit has an 85–15 sharing arrangement on underruns, so they received 15 percent of $24,667,000, because in this particular contract the underruns were not such that they would exceed the 11 percent, in this case, ceiling.

As you observe in this particular contract, the overrun provision provides that there will be a penalty of 15 percent of overrun up to 5 percent over the target and from thereafter only a 5-percent penalty, which, in effect, reduces the risk of the contractor because it is not the ordinary sharing arrangements, where it is 85–15 above and 85–15 below.

Senator JACKSON. Why should not it be the other way around?

Mr. TIERNEY. I do not understand.

Senator JACKSON. Fifteen percent of the overrun up to 5 percent of the target, and thereafter the penalty of 5 percent of overruns. I mean the greater the overrun, the less the penalty.

Mr. TIERNEY. That was the contract negotiated. The reason for that was that, in effect, it reduced the risk to the contractor.

We have another situation here where Boeing came in and wanted a CPFF contract, and this further reduced the risk when you put this in there.

Mr. ADLERMAN. The total fee in this case amounted, then, to $20,956,000; is that correct?

Mr. TIERNEY. That is the total profit, including the profit on the spares.

Mr. ADLERMAN. And the incentive profit, I think was $3,678,000?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. The profit that they made on spare parts amounted to not quite $2 million?

Mr. TIERNEY. That is correct, $1,990,000.

Mr. ADLERMAN. So, eliminating the spare parts profit, the profit to Boeing on the essential pieces of that contract would be $18.9 million?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. It is practically $19 million?

Mr. TIERNEY. $18.8 million, eliminating the profit on the spare parts.

Mr. ADLERMAN. The total profit of $20,956,000 represents a profit return of 11 percent on that contract?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Referring to that contract, we go back to the bar chart, chart 6, they had absolutely no experience on the basis of any production on which to base their cost data?

Mr. TIERNEY. There were no production deliveries at that time.

The CHAIRMAN. The committee will stand in recess until 10 o'clock in the morning.

(Members present at time of recess: Senators McClellan and Jackson.)

(Whereupon, at 4:15 p.m., the subcommittee recessed, to reconvene at 10 a.m., Wednesday, May 23, 1962.)

PYRAMIDING OF PROFITS AND COSTS IN THE MISSILE PROCUREMENT PROGRAM

(Bomarc Program)

WEDNESDAY, MAY 23, 1962

U.S. SENATE,
PERMANENT SUBCOMMITTEE ON INVESTIGATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D.C.

The subcommittee met at 10:15 a.m., in room 3302, New Senate Office Building, pursuant to Senate Resolution 250, agreed to February 7, 1962, Senator John L. McClellan (chairman of the subcommittee) presiding.

Present: Senator John L. McClellan, Democrat, of Arkansas; Senator Henry M. Jackson, Democrat, of Washington; and Senator Edmund S. Muskie, Democrat, of Maine.

Also present: Jerome S. Adlerman, general counsel; Paul J. Tierney, assistant counsel; Thomas Nunnally, investigator; and Ruth Y. Watt, chief clerk.

(Members present at time of reconvening: Senators McClellan and Jackson.)

The CHAIRMAN. The committee will come to order.

Call your next witness.

Mr. ADLERMAN. Mr. Tom Nunnally.

The CHAIRMAN. Mr. Nunnally, you have been previously sworn. You may proceed.

TESTIMONY OF THOMAS NUNNALLY—Resumed

Mr. ADLERMAN. Mr. Nunnally, have you prepared a chart which depicts the cost of the subcontract effort?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. And the subcontractor's profits, the amount invoiced to Boeing and Boeing's profit on the subcontract effort?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. Would you explain what chart 9 shows?

The CHAIRMAN. This chart No. 9 may be printed in the record at this point.

(Chart No. 9 referred to follows:)

CHART NO. 9

Boeing profits as related to major subcontract effort

[In millions]

Subcontractor	Cost	Subcontractor profit [1]	Invoiced to Boeing	Boeing profit on subcontractor effort [1]
Westinghouse Electric	$143.4	$12.2	$155.6	$12.6
I.T. & T.-Federal Laboratories	77.7	6.2	83.9	6.9
Thiokol Chemical	25.2	2.3	27.5	2.4
Aerojet General	24.5	2.4	26.9	1.9
Marquardt	25.3	1.6	26.9	1.5
FMC Corp	22.8	2.6	25.4	2.6
Motorola	17.0	1.3	18.3	1.6
Lear, Inc	16.1	1.2	17.3	1.4
Thompson-Ramo-Wooldridge	18.3	1.2	19.5	1.7
Kearfott	13.2	1.0	14.2	1.3
Electrical subcontractors	33.2	.9	34.1	1.9
Others	70.6	3.9	74.5	5.8
Total	487.3	36.8	524.1	41.6

[1] All profit figures are before taxes.

Mr. NUNNALLY. Chart 9 shows the major subcontractors selected on a dollar volume basis, and it includes the subcontractors who furnished the major parts of the Bomarc. It shows the subcontractors cost, the profit or fee earned by the subcontractor, and the total of these two is what is billed to Boeing, and Boeing's profit apportioned to that amount on the basis of cost.

The amount of fee earned by Boeing on each of their prime contracts has been applied to the subcontractors work on the basis that the prime contractor earned his fee.

Mr. ADLERMAN. Are all of these figures before taxes?

Mr. NUNNALLY. These figures, again, are all before taxes.

The CHAIRMAN. Let me see. Boeing is the prime contractor?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. And this is just one tier down now of subcontractors?

Mr. NUNNALLY. Just one tier.

The CHAIRMAN. Westinghouse is a subcontractor, I.T. & T., Thiokol, Aerojet, Marquardt, FMC Corp., Motorola, and so forth, all of those are subcontractors?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. And this chart shows what cost they incurred in carrying out the subcontract?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. And the amount of profit they added to it and billed Boeing for, the amount that Boeing paid out on the subcontract, and the amount of profits that it added?

Mr. NUNNALLY. The profit has been applied on these costs in the same percentage that the profit was negotiated with the Boeing Co.

The CHAIRMAN. When you say the same percentage, what do you mean? Can you identify the actual profit that Boeing charged on each of these subcontracts, or is that some estimated or related calculation, that is not actually accurate as to the individual contracts identified there?

Mr. NUNNALLY. It can be identified to each of the major contracts. Take, for instance, this contract with the Boeing Co., 35359, this percentage of 8 percent was negotiated on the basis of cost of this contract.

The CHAIRMAN. I am talking about chart 9. Let us stick to that.

Mr. NUNNALLY. I am trying to relate it. Therefore, when the subcontractors' costs come in, we have applied that percentage to the subcontractors' costs.

The CHAIRMAN. In other words, you are taking a percentage of the Boeing contract of its profits and relating them to these in the ratio that they charged total profits; is that the way you are doing it?

Mr. NUNNALLY. Yes, sir.

The CHAIRMAN. Very well.

Is there any complaint on the part of Boeing for making the estimate that way or making the charges that way?

Mr. NUNNALLY. Well, I believe that Boeing will contend that they have earned their fee or profit on the overall job that they have done, which is what the other contractors have contended.

But, nevertheless, these contracts have been negotiated on the basis of cost, and I believe this is a reasonable way to apply the profit.

The CHAIRMAN. They will be given the opportunity, of course, to make any explanation or point out any errors in it. I was trying to find out if there is any controversy. In the beginning of these hearings, we did have a controversy on profits that we charged the contractor, the prime contractor, the subcontractors in some instances, and I wanted to know if these figures have been discussed with Boeing's representative, and if there has been a serious complaint about them.

Mr. NUNNALLY. They have been discussed with Boeing representatives and I have heard no serious complaint about them.

The CHAIRMAN. Very well. You may proceed.

Mr. ADLERMAN. Does that chart show that on the subcontractors efforts on the return to the subcontractors, they received a fee which totaled $36.8 million on $487 million worth of work?

Mr. NUNNALLY. The total of the subcontractors profit or fee is $36.8 million, which was earned on $487.3 million of costs.

Mr. ADLERMAN. And they invoiced in total, all the subcontractors together, the amount of the cost plus their profit, and they invoiced that amount of $524.1 million to Boeing?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. And Boeing's share, if you apportion their ratio of profit to their cost, to the subcontractors costs, would run $41.6 million?

Mr. NUNNALLY. That is correct, sir.

Mr. ADLERMAN. Therefore, it would appear that they made more than the subcontractors, based upon the return on costs?

Mr. NUNNALLY. In most instances Boeing's profit is larger here than the subcontractors. For instance, on the Westinghouse subcontract, the Westinghouse profit is $12.2 million and Boeing's is $12.6 million.

Mr. ADLERMAN. One of the factors that enter into it is the fact that Boeing collects a profit on top of the profit of the subcontractor; is that so?

Mr. NUNNALLY. Yes. These original costs are increased by the profit, bringing $143 million up to $155 million.

The CHAIRMAN. Let me ask: What are these subcontracts? How much engineering and technical skill, supervision, and so forth, had to be contributed in the production of the subcontract services or goods?

How much had to be contributed by the prime contractor, Boeing in this case?

Mr. NUNNALLY. I am not in a position to answer that question, but I do know that there has been considerable engineering coordination between the subcontractor and the prime.

The CHAIRMAN. They will be able to give that explanation later as to why the prime contractor was entitled to charge as much profit as was the subcontractor who produced the goods?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. Whatever effort Boeing had in this case, as far as their coordination with the subcontractor and working with the subcontractor, and there was considerable effort expended, that has been paid to Boeing in the rest of the contract?

Mr. NUNNALLY. Yes; Boeing would take those costs onto its own books and that would be shown in a later charge.

Mr. ADLERMAN. This reflects a little less than one-third of the total contract figure; is that right?

Mr. NUNNALLY. It is about one-third.

Mr. ADLERMAN. I think the total contract on the total cost of the Bomarc is about $1.6 billion.

Mr. NUNNALLY. The total cost is about $1.5 billion, and profit added to that brings it to about $1.6 billion.

Mr. ADLERMAN. And the total profit made by Boeing was $124 million.

Do you have another chart which contains a summary of the Air Force contracts with Boeing?

Mr. NUNNALLY. Yes. This is chart No. 10. It shows a summary of the Air Force contracts with Boeing, broken down as to Boeing's in-house effort, major subcontract effort, which is summarization of chart 9, and other costs which include minor subcontracts and purchases.

The CHAIRMAN. That chart No. 10 may be printed in the record at this point.

(Chart No. 10 referred to follows:)

CHART NO. 10

Bomarc—Cost summary of Air Force contracts with the Boeing Co.

[In millions]

Total Boeing price to the Air Force $1,631.6

BREAKDOWN

	Cost	Percent of total cost	Boeing profit [1]	Total
Boeing in-house effort	$806.0	53	$67.7	$873.7
Major subcontract effort	524.1	35	41.6	565.7
Minor subcontracts and purchases	177.3	12	14.9	192.2
Total	1,507.4	100	124.2	1,631.6

[1] Profit figures are before taxes.

Mr. ADLERMAN. According to that chart, Boeing performed more than half of the work itself; is that right?

Mr. NUNNALLY. On the basis of cost as we have it here, Boeing has performed 53 percent of the work.

Mr. ADLERMAN. And the major subcontract amount of the work done under the Bomarc program comes to 35 percent?

Mr. NUNNALLY. Thirty-five percent.

Mr. ADLERMAN. And the miscellaneous subcontracts and purchases amounts to 12 percent?

Mr. NUNNALLY. Twelve percent; yes, sir.

Mr. ADLERMAN. The profit that Boeing made on its own effort or portion would be $67.7 million?

Mr. NUNNALLY. We have taken the $41.6 million and applied that to the subcontractor effort, and we have apportioned the balance between minor subcontracts and purchases and the Boeing in-house effort.

Mr. ADLERMAN. So that the total profit came to $124.2 million?

Mr. NUNNALLY. The total profit is $124.2 million.

Mr. ADLERMAN. The coordination costs of Boeing that it might have had with the subcontractors is in the $67.7 million profit figure?

Well, it is in the $806 million cost.

Mr. NUNNALLY. All of Boeing's costs, including any coordinating or any coordination with its subcontractors is included in the $806 million.

The CHAIRMAN. Are there any questions?

Very well, call the next witness.

Mr. ADLERMAN. Mr. T. M. Douglas and Mr. George A. Banino, of International Telephone & Telegraph.

The CHAIRMAN. You two who will testify, please be sworn.

Do you and each of you solemnly swear that the evidence you shall give before this subcommittee shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. DOUGLAS. I do.

Mr. BANINO. I do.

The CHAIRMAN. Identify yourself for the record, please, beginning on my left.

TESTIMONY OF T. M. DOUGLAS AND GEORGE A. BANINO, ACCOMPANIED BY JOHN F. GALARDI AND WILLIAM T. RAPP

Mr. BANINO. I am George A. Banino, vice president and general manager of I.T. & T.-Kellogg, a unit of I.T. & T. not connected with this program.

During the life of this program, I was vice president and comptroller of I.T. & T. Federal Laboratories.

To my right is Mr. T. M. Douglas, presently vice president of I.T. & T. Federal Laboratories and the other witness.

To my left is Mr. John Galardi, manager of cost accounting of I.T. & T. Federal Laboratories, and Mr. William Rapp, vice president and comptroller, presently, of I.T. & T. Federal Laboratories.

The CHAIRMAN. Very well. Proceed, Mr. Counsel.

Mr. ADLERMAN. Mr. Douglas, did you have a subcontract with the Boeing Co.?

Mr. DOUGLAS. Yes, we did.

Mr. ADLERMAN. Was that on the Bomarc program?

Mr. DOUGLAS. That was on ground support——

The CHAIRMAN. When you say "you", you mean your company. Identify the company.

Mr. DOUGLAS. ITT Federal Co. had a subcontract for the ground support equipment for the Bomarc missile.

The CHAIRMAN. Very well.

Mr. ADLERMAN. What was the scope of the work that you had on the Bomarc?

Mr. DOUGLAS. The scope covered the development and design of two major categories of support equipment, the electrical launching equipment and the operational test equipment, plus additional service checkout equipment.

Mr. ADLERMAN. And what was the cost of your work? How much did you invoice to Boeing?

Mr. DOUGLAS. We invoiced to Boeing $83.9 million.

Mr. ADLERMAN. As reflected on Chart No. 9, it is the next to the last figure.

Did you make a profit of $6.9 million?

Mr. DOUGLAS. $6.2 million, sir.

Mr. ADLERMAN. Could you describe the equipment that was made by your company? Describe what it was supposed to do, what part it played.

Mr. DOUGLAS. The electrical launching equipment was located at the missile shelter. The function of the electrical launching equipment was upon receipt of a signal from a control center to interrogate the missile to assure its readiness, and in the event it received a "go" signal, it would open the shelter and elevate the missile.

Mr. ADLERMAN. There were two parts, were there not?

Mr. DOUGLAS. Yes, sir.

Mr. ADLERMAN. One was the——

Mr. DOUGLAS. Operational test equipment. It was used at the missile base to test all of the missile or the major assemblies of the missile.

In addition, there was functional checkout equipment to check, or, rather, service test equipment, to check the OTE, or operational test equipment.

Mr. ADLERMAN. Did you have the initial research and development on both the electrical launching system and the operational test equipment?

Mr. DOUGLAS. Yes. ITT Federal Division did both of those.

Mr. ADLERMAN. You had the research and development design of both of these types of equipment?

Mr. DOUGLAS. That is correct.

The CHAIRMAN. Was that included in this contract?

Mr. DOUGLAS. Yes, sir.

The CHAIRMAN. That is a part of this contract?

Mr. DOUGLAS. It is a part of these contracts.

The CHAIRMAN. Those we are now discussing?

Mr. DOUGLAS. Yes, sir.

Mr. ADLERMAN. And you also had the production of the items for the operational bases for the operational missiles?

Mr. DOUGLAS. That is correct.

Mr. ADLERMAN. This was only on the A missile. Your company did not do any work on the B missile?

Mr. DOUGLAS. That is also correct. We did no work on the B missile.

Mr. ADLERMAN. You were given certain specifications, were you not, by the Boeing Co.?

Mr. DOUGLAS. Yes, we were, performance specifications.

Mr. ADLERMAN. They gave you what was required from your company to produce. It would have to have a capacity to do certain things: Raise the launch equipment so that the doors could open up, and ready to fire off, and test it out so that you know it is ready to fly if the time came?

Mr. DOUGLAS. That is right.

Mr. ADLERMAN. They gave you the outside specifications, the broad specifications?

Mr. DOUGLAS. The performance specifications.

Mr. ADLERMAN. And it was up to you to make the design and make the component parts?

Mr. DOUGLAS. That is correct.

Mr. ADLERMAN. Did you have any resident engineers in your plant from the Boeing Co.?

Mr. DOUGLAS. Yes, we did. We had at various times from 5 to 30 or 35 Boeing people in our plants, both at Fort Wayne, and at Clifton.

Mr. ADLERMAN. So there was considerable coordination between your company and the Boeing Co. on the design and development, even though you had the responsibility for that design and development?

Mr. DOUGLAS. That is correct.

Mr. ADLERMAN. Did you have any resident engineers at the Boeing plant?

Mr. DOUGLAS. Yes, we did.

Mr. ADLERMAN. How many did you have there?

Mr. DOUGLAS. That varied also, but generally two or three all the time, and visiting as required.

Mr. ADLERMAN. Do you recall entering into a contract with Boeing for the production under base 2 and base 3 equipments?

Mr. DOUGLAS. Yes.

Mr. ADLERMAN. And was that under the Air Force Contract No. 36319?

Mr. BANINO. Yes, it was.

Did you get your answer to that question?

Mr. ADLERMAN. Are you the one that is going to answer these questions?

Mr. BANINO. No, sir. I just did not realize whether you had received the answer.

Mr. ADLERMAN. I asked you whether or not you had offered any prices or made any contracts to Boeing, with Boeing, on base 2 and base 3 launching equipment?

Mr. BANINO. Yes, we did.

Mr. DOUGLAS. Yes, we did.

Mr. ADLERMAN. And did you furnish them with any information or any prices prior to June 1958 on those particular items?

Mr. DOUGLAS. Only budgetary prices.
Mr. ADLERMAN. Budgetary items?
Mr. DOUGLAS. Pardon?
Mr. ADLERMAN. What you called budgetary prices?
Mr. DOUGLAS. Yes.
Mr. ADLERMAN. Would you explain what a budgetary price is?
Mr. DOUGLAS. A budgetary price is a price which is put together to, in general, describe the area of cost which can be expected. It is not a binding price and it is not in such detail as the final proposal would be.
Mr. ADLERMAN. Do you recall what that price was that you furnished to them?
Mr. BANINO. It was approximately $19 million, but that did not include—I should say it included a larger number of equipments than were ultimately purchased.
Mr. ADLERMAN. At that time, had you had any production experience of the production items?
I do not mean the research and development items, but the production items.
Mr. DOUGLAS. No, we had not.
Mr. ADLERMAN. At best, this was an estimate on your part?
Mr. DOUGLAS. It was a complete estimate on our part.
Mr. ADLERMAN. Did you enter into a firm figure with Boeing on June 9 to 13, 1958?
Mr. DOUGLAS. Yes, we did, on the ELE, but not on the OTE.
Mr. ADLERMAN. On the OTE you entered into a firm figure with them in November 1958?
Mr. DOUGLAS. November 1958.
Mr. ADLERMAN. What was that?
Mr. DOUGLAS. November 1958.
Mr. ADLERMAN. November 10, 1958?
Mr. DOUGLAS. That is right.
Mr. ADLERMAN. What was the total price of those two?
Mr. DOUGLAS. The total price of the final target price negotiated of those two was $13,233,000.
Mr. ADLERMAN. This was a price-redeterminable contract?
Mr. DOUGLAS. That is correct, sir.
Mr. ADLERMAN. And you had a 10-percent up——
Mr. DOUGLAS. And unlimited downward.
Mr. ADLERMAN. In other words, your costs could be reduced downward, unlimited, depending on what your actual expenditures were, but you could not make a higher price than 10 percent?
Mr. DOUGLAS. Than 10 percent above this figure.
The CHAIRMAN. Was this one of those incentive contracts?
Mr. DOUGLAS. No, sir.
Senator JACKSON. Have you yourself had an incentive contract with the Government?
Mr. DOUGLAS. Do we have any incentive contracts, Senator? Is that the question?
Senator JACKSON. Yes.
Mr. DOUGLAS. No, we do not.
Senator JACKSON. Have you had any?
Mr. BANINO. I would like to correct this statement for the record.

This unit of the ITT does have, but there are other units, my unit, specifically today, that do have incentive contracts.

Senator JACKSON. I was not sure of your position. I gather from Mr. Douglas he was violently opposed to them, but I wanted to find out if you actually had them.

Mr. ADLERMAN. Mr. Tierney, I would like you to refer to chart No. 5, on contract 36319.

Would you give us the date when the initial target was set in that date?

Mr. TIERNEY. The parties negotiated an agreement for initial target on April 10, 1958.

Mr. ADLERMAN. We just heard testimony that the price redetermination contract was entered into with ITT between June 9 and November 10, 1958, for $13.2 million.

Is that reflected in part of that $112 million?

Mr. TIERNEY. That is right. This is the initial target negotiation between the Air Force and the Boeing Co. At the time they negotiated that target, Boeing would propose certain cost figures for various elements, including subcontractors.

Included in this target was an amount for ITT Federal as well as the other subcontractors.

Mr. ADLERMAN. From your examination of the records, how much did Boeing put in on its target figure of the $112 million for the ITT portion of the work?

Mr. TIERNEY. For the ITT portion, for OTE and ELE, the operational test equipment and the electrical launching equipment which we are discussing here, they proposed a figure of $16.9 million on April 10, 1958.

Mr. ADLERMAN. Did they also include in addition to that a 13-percent contingency figure?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. So that the final figure that came to the Air Force as their proposal for that share of the work, target proposal, was $19.2 million?

Mr. TIERNEY. That is correct.

I might explain that the contingency figure or a factor which was proposed at this time by Boeing because of the timing——

The CHAIRMAN. Because of what?

Mr. TIERNEY. Because of the timing of the negotiation, Senator.

They were negotiating this contract, as we explained yesterday, on research and development cost experience. It was unsettled. It was anticipated that there would be changes but they were not sure what they would be.

So, as a result, there was an agreed contingency factor affecting the subcontract elements.

The CHAIRMAN. Let me see if I understand.

The prime contractor, Boeing, was taking an incentive contract?

Mr. TIERNEY. That is correct.

The CHAIRMAN. But the subcontractors had no incentive?

Mr. BANINO. That is right. No incentive contract.

The CHAIRMAN. I mean in the same sense. In other words, if you produced yours for less, you got no more profit.

Is that right?

Mr. BANINO. That is correct, sir.

The CHAIRMAN. In other words, you produced yours at a negotiated profit; is that correct?

Mr. BANINO. The profit, sir, was negotiated, or the contract provision provided for a profit negotiation at the completion.

The CHAIRMAN. What did you finally produce this for?

Mr. DOUGLAS. $10,523,000.

The CHAIRMAN. How much?

Mr. DOUGLAS. $10,523,000.

The CHAIRMAN. $7 million?

Mr. DOUGLAS. $10 million.

The CHAIRMAN. $10,523,000; is that right?

Mr. DOUGLAS. That is correct.

The CHAIRMAN. Whereas, taking into account the contingency of 13 percent, Boeing had estimated that this would cost $19.2 million?

Mr. DOUGLAS. I cannot answer that.

The CHAIRMAN. I am not asking you to answer. Is that correct?

Mr. TIERNEY. That is correct.

The CHAIRMAN. So there was, on this small contract, about a 90-percent reduction from the original estimate. I am talking about in the incentive.

You can answer it. Is that right?

Mr. TIERNEY. That is correct.

The CHAIRMAN. I have not figured it exactly, but that was the difference between $19.2 million and $10,523,000. Now, for that saving, as in the initial target, because it would be effected in that, Boeing would be entitled to receive 15 percent of it.

Mr. TIERNEY. That is part of the underrun, the total underrun here.

The CHAIRMAN. That is part of the underrun. In other words, this is one of the subcontracts that was produced at much less than estimated in the original target, and by reason if it being produced that much less, this is one of a number of them, there was an incentive payment represented in the red figures you have there on the chart No. 5, of $2,226,000.

Mr. TIERNEY. That is correct.

The CHAIRMAN. That is the way the incentive payments operate. That is what they represent, the undercost of that originally anticipated and reported and established as a target in the negotiations.

Mr. TIERNEY. That is correct.

The CHAIRMAN. So when a subcontractor—I do not know if we will get to that in a moment, whether these folks had been consulted or whether they had already submitted a tentative suggestion or estimate of what the cost would be on it——

Mr. ADLERMAN. It is the budget estimate.

The CHAIRMAN. We will get to what a budget estimate is in a minute. But at any rate, to help set the overall target cost, I presume the prime contractor gets an estimate from his probable subcontractors and on the basis of that arrives at the prime target?

Mr. TIERNEY. That is correct, Mr. Chairman.

The CHAIRMAN. By adding to that a percentage also for contingencies of 13 percent, as was done in this case?

Mr. TIERNEY. That is correct.

The CHAIRMAN. Now, then, if the prime contractor is able to get the subcontractor, or if it develops that later the cost is much less than that set in the prime target, then the prime contractor gets a further profit of 15 percent of those sales.

Is that correct?

Mr. TIERNEY. That is correct.

The CHAIRMAN. Now, let us get back to the budget estimate which was submitted by your company.

Prior to this date of April 10, 1958, Mr. Douglas, had your company submitted to Boeing an estimate on this work?

Mr. BANINO. Throughout the program, Mr. Chairman, throughout the initial program, we had been asked many times to supply budgetary quotations in varying quantities, fluctuating quantities.

Apparently the requirements of the number of units were not firm; we do have—I should say, we had submitted eight budgetary quotes approximately during that period of time prior to April 10 for approximately $19 million, but the units that we quoted, the number of units that we quoted on, were greater than we ultimately had placed on us in June, in the June negotiations.

We cannot answer, sir, specifically which of our budgetary quotes were used. We do not know.

The CHAIRMAN. In other words, from time to time in the development of this matter as a prospective subcontractor, you had submitted different figures on different requests that may have been made of you?

Mr. BANINO. Yes, sir.

The CHAIRMAN. And upon the basis of that, apparently, Boeing made its estimate and included that in its original target?

Mr. BANINO. We cannot say which one, sir.

The CHAIRMAN. I say presumably. It had not developed at the time you submitted your estimates; it had not developed far enough that you knew exactly what you would be called upon to do or to produce as to quantity; is that correct?

Mr. BANINO. Well, the quantities, sir, are always dictated, obviously, by the prime contractor. We did know the general configuration of the equipment.

The CHAIRMAN. You knew what?

Mr. BANINO. The general configuration of the equipment.

The CHAIRMAN. You knew generally the object or the goods, the implementation, whatever it is, the instrument that you were going to produce. You knew generally what that was?

Mr. BANINO. Yes, sir.

The CHAIRMAN. But you did not know, yourself, at the time, exactly what it would cost you to produce it?

Mr. BANINO. No, sir.

The CHAIRMAN. You anticipated on one basis, if you were going to produce one quantity, the cost would be less than if you produced a much lesser quantity, I assume?

Mr. BANINO. Yes, sir.

The CHAIRMAN. So those were indeterminable factors at that time?

Mr. BANINO. Yes, sir.

The CHAIRMAN. That is another reason why it seems to me that a prime contractor who is asked to bid on the basis of an incentive contract naturally must, in order to protect himself, since these things cannot be known must put the prime target, the early target, up pretty high to be sure that he does include all of the costs. Would not you say?

Mr. BANINO. It would seem so, sir; yes, sir.

The CHAIRMAN. To rationalize, if I were asked to do a lot of these things on a contingency, and so forth, and I was going to get an incentive payment if I got the cost down much lower, I would have a temptation to be sure I took care of all costs in my original statement.

I think that is human nature, and I am not blaming anyone for it. I am just talking about a system, whether this is a good system to use or not a good system.

That is the only question at issue here.

Senator Jackson?

Senator JACKSON. What does ITT do in situations such as this?

Mr. BANINO. Do you mean insofar as pricing, sir?

Senator JACKSON. Yes. You folks have prime contracts and then you subcontract out various things, too, don't you?

Mr. BANINO. Yes, sir.

Senator JACKSON. What percentage of I.T. & T.'s business is defense work?

Mr. BANINO. Today, sir——

Senator JACKSON. I know it is International Telephone & Telegraph, but you are in the defense business.

Mr. BANINO. I can answer that two ways, worldwide or United States only.

Senator JACKSON. United States only.

Mr. BANINO. Seventy percent approximately, today, sir. I do not recall what it was during the period this contract referred to.

Senator JACKSON. But I meant you are in the defense business?

Mr. BANINO. Yes, sir.

Senator JACKSON. What I am getting at is that you, as a prime contractor, have similar problems in connection with incentive contracts, where you have to get estimates.

Could you relate to the committee how you approach these matters? I think it would give a picture as to how this type of contract actually functions.

Mr. BANINO. Mr. Douglas will answer this question, Senator. I do want to, for the record, indicate, however, that I presume that your question relates to a weapon system of this type, not the bulk of I.T. & T. business, which is not in the weapon system area.

Senator JACKSON. I want to be fair. I am just asking the general question. I am not pinning you down to any contract. Is your system any different than what Boeing goes through, for example?

Mr. DOUGLAS. In general, to describe very briefly our method, we have two kinds of costs, material and labor—that is, in general. We estimate our labor costs and on the purchase material we obtain quotations from the vendors of that material.

Senator JACKSON. What I am getting as is that when you subcontract out a given component of the system, such as we are talking about here, how do you supervise or advise or handle that part of it?

Mr. DOUGLAS. We subcontract these most generally, if it is a production item, on a fixed-price basis.

Senator JACKSON. Let us be specific again and refer only to similar situations.

I am not talking about buying Chinese copies. I am talking about a component that has to be developed, such as occurred in this case. Just what do you do?

Mr. BANINO. I will attempt to answer your question, sir. On those elements of our business which are purchased, but which are not strictly hardware, exclusive of major developments, if you will, the normal way we do it is to send out the specifications to the supplier or two or three suppliers.

We receive back proposals and estimated prices. Our engineering personnel evaluate them for quality and our cost analysis people evaluate them for price and we narrow it down to one or two qualified suppliers or vendors.

Then we sit down, examine their costs, and thoroughly negotiate with them, with the assistance of our production personnel, to get as close to the ultimate configuration as possible, and reach a mutually agreeable fixed price.

Senator JACKSON. Even though you have an incentive contract, we will say in a given situation, the same rule applies?

Mr. BANINO. Yes, sir. Where we have an incentive contract, essentially that is done, except there are a few instances in which we do have CPFF subcontracts with proper Department of Defense approvals.

Senator JACKSON. That will vary, but I mean you do have incentive contracts as a prime, and your subs may have a fixed price or they may have a cost plus a fixed fee, depending upon the item purchased?

Mr. BANINO. Yes, sir.

Senator JACKSON. So, in general, I assume you follow somewhat the same procedures?

Mr. BANINO. I would say, sir, that this is pretty general.

Senator JACKSON. That would be the same procedures that the Boeing people followed here, which is applicable to this type of contract in general?

Mr. BANINO. Yes, sir.

The CHAIRMAN. The only thing on my mind at the moment is that these incentive contracts are not desirable, or would appear to me not to be desirable from a Government standpoint, until you have had enough experience that you can have a pretty good idea of what the cost is.

If you do it on a speculative basis like this all the time, I do not think until it has developed far enough to where you have a general idea, some experience as to what the cost is, that an incentive contract is in the interest of the Government.

It may be in the interest of the contractor, but I do not believe it is in the interest of the Government. I do not believe it is the best procedure. I may be wrong. Somebody may be able to show us we are wrong. But that is the thought that occurs to me at this stage.

Proceed.

Mr. ADLERMAN. You had a fixed price redeterminable contract with an upward 10 percent?

Mr. DOUGLAS. Yes, sir.

Mr. ADLERMAN. That means that if your estimates were too low and you exceeded the 10 percent of your estimates, you would have to stand the burden of that cost; would you not?

Mr. DOUGLAS. We would have to stand the burden of everything above the 10 percent above target.

Mr. ADLERMAN. Above target and 10 percent?

Mr. DOUGLAS. Target and 10 percent.

Mr. ADLERMAN. So as prudent businessmen, when you make your estimate, you take good care to see that you do not put too low a figure down?

Mr. DOUGLAS. Can I say that as such, on target ceiling contracts, we do not put in a contingency.

Mr. ADLERMAN. What was that?

Mr. DOUGLAS. Sir?

Mr. ADLERMAN. I did not quite hear you.

Mr. DOUGLAS. I say, on target ceiling contracts, we do not put in a contingency as such.

Mr. ADLERMAN. That is what I mean. When you make your estimate, you make sure that you do not have an overrun of more than 10 percent. You figure on that, do not you?

Mr. BANINO. Mr. Adlerman, I assure you that no contractor will intentionally quote an overrun.

Mr. ADLERMAN. It is good business sense not to do it.

Mr. BANINO. Yes, sir. The point, however, is that in this situation, as in others like it, our costs, while estimated as closely and as realistically as possible without contingencies, the contingencies being assumed as being contained in the 10 percent, we attempt to get our costs as closely related to it as possible.

There are, obviously, cases in which you can underrun or overrun, because not necessarily of contingencies, but because of the problems that you would run into in an R. & D. program.

It can operate both ways is what I am talking about.

Mr. ADLERMAN. But as ordinary good prudent businessmen, you put in an estimate that assures you you will not lose out and go over that 10-percent figure?

Mr. BANINO. As prudent businessmen, sir, we would not put in an estimate to which our customer would not agree.

Mr. ADLERMAN. Anyhow, you were price redetermined; were you not?

Mr. BANINO. Yes, sir.

Mr. ADLERMAN. And at your price redetermination your cost came down to $10,523,000?

Mr. BANINO. $1.7 million; yes, sir.

Mr. ADLERMAN. Which is $8.7 million underrun from the initial target figure that Boeing presented to the Air Force as part of its target figure of $112 million on contract No. 36319?

Well, you would not know the answer to that.

Mr. BANINO. I would not know the amount Boeing put in as its target, sir.

Mr. ADLERMAN. Did you have another contract, 38098?

Mr. BANINO. Yes, we did, sir.

Mr. ADLERMAN. And did you present to Boeing any figures prior to March 27, 1959, on that contract?

Mr. BANINO. I believe we also gave them budgetary prices all along the line, sir; always.

Mr. ADLERMAN. Did you give them a budgetary price on that?

Mr. BANINO. Yes, sir; we did give them a budgetary price, but it included bases 4 to 10, not bases 4 and 5. They requested a budgetary price for——

Mr. ADLERMAN. Did you give them a unit price, also?

Mr. BANINO. We do not have that information here, sir. We can extract it.

The CHAIRMAN. Tell me what you mean by a budget price?

Mr. BANINO. A budget price—I will define it. It is common practice for either the Department of Defense procuring people or first-year subcontractors to request a ballpark figure to which they can commit, or presumably get funds, or provide for funds, to make their own planning possible. It is not binding on either party.

The CHAIRMAN. It is nothing in the world but an estimate; is that correct?

Mr. BANINO. In many cases, sir, it is a fly-by-night estimate, if you will, depending on the amount——

The CHAIRMAN. But it is not binding?

Mr. BANINO. It is not binding on either party.

The CHAIRMAN. It is not binding and not a part of the contract?

Mr. BANINO. No, sir.

The CHAIRMAN. It just gives you something to make a calculation?

Mr. BANINO. That is correct.

The CHAIRMAN. If I call you up and say, "For what amount can you produce this for me?" I may need a thousand, and then end up with 1,000 or only 50. But if I call you up and ask what price you can produce this item for me: What will it cost? What will you supply them for? You will make a rough calculation and give it to me. But it is not binding on you and not binding on me?

Mr. BANINO. That is right.

The CHAIRMAN. That is what you are calling a budget price?

Mr. BANINO. Yes, sir.

The CHAIRMAN. I thought that is what it was.

Mr. ADLERMAN. Did you have a budget price at all on 38098, either a unit cost or a fixed budget price?

Mr. BANINO. Our support people here, sir, are not sure. We will have to investigate that and supply it to the committee upon request.

Mr. ADLERMAN. Did you enter into a contract with Boeing on August 25 or 27, 1959?

Mr. BANINO. Yes.

Mr. ADLERMAN. And what price did you fix for the components to be made by your company under contract No. 38098 for bases 4 and 5?

Mr. BANINO. $10,519,000.

Mr. ADLERMAN. $10.5 million?

Mr. BANINO. Yes, sir.

Mr. ADLERMAN. Mr. Tierney, on chart No. 7, contract No. 38098; what was the initial target price set in that contract?

Mr. TIERNEY. The initial target price is $135,277,000.

Mr. ADLERMAN. And when was that fixed?

Mr. TIERNEY. This was negotiated between the Air Force and the Boeing Co. on March 27, 1959.

Mr. ADLERMAN. In other words, that was negotiated about 5 months prior to the item that a definitive contract was entered into between ITT and Boeing on the components manufactured by ITT under this contract?

Mr. TIERNEY. Yes.

Mr. ADLERMAN. What was the price that Boeing had placed on their contract or into their contract for the ITT portion of the work?

Mr. TIERNEY. The proposal to the Air Force was $11,618,470; $11.8 million.

Mr. ADLERMAN. Did that include a contingency?

Mr. TIERNEY. That is right. At this time—under this contract—Boeing proposed a 15-percent contingency factor, and the Air Force felt that it should not be that high.

The best we can determine is that a 10-percent factor was agreed to in the subcontractor area. So we have calculated and used a 10-percent factor for our calculations.

Mr. ADLERMAN. So the Boeing initial target cost to the Air Force including a 10-percent contingency, amounted to $12.8 million? Is that right?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And they negotiated a fixed price redeterminable contract with ITT on August 25–27, 1959, at $10.5 million, which would be roughly about $2.3 million under that cost. But this was 5 months later.

Mr. TIERNEY. That was the initial target, subcontract target negotiated; that is correct.

Mr. ADLERMAN. The contract with ITT was entered into 5 months after the initial target was fixed?

Mr. TIERNEY. That is right.

Mr. ADLERMAN. Mr. Banino, was your contract finally redetermined in the fall of 1960?

Mr. BANINO. Yes, sir.

Mr. ADLERMAN. I guess it was in March 1960?

Mr. BANINO. March 1960.

Mr. ADLERMAN. What was the final price redetermined?

Mr. BANINO. $8,647,000.

Mr. ADLERMAN. And that represented a figure of about $2 million less than your initial price on the redeterminable contract entered into in August 1959?

Mr. BANINO. Yes, sir.

Mr. ADLERMAN. Mr. Tierney, does that represent a total underrun on the figures presented to the Air Force of $12.8 million, and the final price redetermined at $8.6 million, of the underrun of $4.1 million on that part of the contract?

Mr. TIERNEY. Yes, sir.

The CHAIRMAN. Percentagewise, it makes about a 50-percent underrun of the original cost; is that right?

That is the original target.

Mr. TIERNEY. The original target?

The CHAIRMAN. It would be about 33⅓ percent?

Mr. TIERNEY. That is correct, sir; about a third.

The CHAIRMAN. About a 33⅓-percent underrun.

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Could you tell us the principal reasons why these figures underran your original price?

The CHAIRMAN. What was the principal factor in that underrun?

Mr. DOUGLAS. The principal factor in this was the job that we did and the industrial engineering in connection with laying this job out, running it in a factory. This is particularly true on the ELE, which is in a fair-size quantity, 196 units.

It was not so applicable to the OTE because the OTE's are in small quantities. There is only 1 of each, generally, or at the most, 2 each, of 27 different types of equipment at each base.

So the total quantity for the 5 bases—I think the total maximum quantity of any OTE equipment was 13 equipments. Also, we merged the Fort Wayne and the Clifton operations which sharply reduced our overhead. We developed a labor utilization scheme for improving the efficiency of the factory labor, and we did a pretty sharp buying job on the material.

The CHAIRMAN. It can be summed up, I guess, that it was due primarily to the ingenuity, skill, and efficiency of your company; was it not?

Mr. BANINO. There was one other factor, sir. This other factor I mention would not be in that category.

The CHAIRMAN. Give us the one that does not come in that category.

Senator JACKSON. You are not denying, though, what the chairman said?

Mr. BANINO. No, sir.

The CHAIRMAN. Very well.

Mr. BANINO. The other category is related also to this area, and that is that there were some materials which were unknown, or left over, shall we say, from the X and Y prototype and development programs, and which we found use for in the production equipment.

This enabled a saving to Boeing and to the Air Force.

The CHAIRMAN. I thought when I asked the question you would say, "Well, it is a good company. We operate a good company."

Mr. BANINO. We think we are sir. We do not deny it.

Senator JACKSON. I wanted to make one point here, if I might, Mr. Chairman. It is pertinent because I.T. & T. I believe, is providing the ground control equipment, or part of it.

Mr. BANINO. Yes, sir.

Senator JACKSON. Are you familiar with the ups and downs of this program from the standpoint of requirements?

Do you recall that the programing originally involved 32 bases?

Mr. BANINO. Yes, sir.

Senator JACKSON. Then it went down to 16 bases?

Mr. BANINO. Yes, sir.

Senator JACKSON. Then it went down to eight bases?

Mr. BANINO. Yes, sir.

Senator JACKSON. Did this have any impact on your planning and trying to make estimates?

Mr. BANINO. Senator, our quotations were always based on the quantities requested from us from Boeing. However, knowing about the program, ELE's, as an example; because of the initial planning being reduced, we finally ended up delivering 196 units, where at one time we were talking about as many as 4,400.

Senator JACKSON. This is what I am getting at. So, as you looked at this program, it started out at a 32-base level?

Mr. BANINO. Yes, sir.

Senator JACKSON. And, as a matter of fact; is it not correct that at one juncture some of the bases that were already under construction were abandoned?

You will recall there were several bases.

Mr. BANINO. Yes, sir. Plus another factor, we did not participate in the B program, whereas originally it was contemplated that we would after the A program went through.

Senator JACKSON. I merely raise this point because there were so many uncertainties in the planning for some items an initial estimate of a high level of requirements originally programed later had to be drastically revised.

This is certainly a factor in making it difficult to determine what the costs are going to be when you make such drastic cuts.

Mr. BANINO. Yes, sir.

Mr. ADLERMAN. I have no further questions.

The CHAIRMAN. Gentlemen, there are no further questions so far as I know. Do either of you have any comments that you feel would be helpful, any suggestions?

Is there anything further you want to state?

Mr. BANINO. No, sir.

The CHAIRMAN. Very well. Thank you very much.

Call the next witness.

Mr. ADLERMAN. I would like to offer into evidence some of the documentation on which we based these charts.

The CHAIRMAN. Proceed.

Mr. ADLERMAN. Mr. Tierney, would you take these documents and explain what they are?

The CHAIRMAN. Mr. Tierney, you may proceed.

Mr. TIERNEY. This is a document——

Mr. ADLERMAN. We have not put this into evidence yet. I want it explained.

The CHAIRMAN. Very well.

Mr. TIERNEY. This is a status report, which is dated November 1961, and prepared by the Boeing Co.

Mr. ADLERMAN. On what contract?

Mr. TIERNEY. On contract 36319 of the Bomarc program. In essence, the report shows the target price of the principal cost elements of the contract and the estimated total cost, and what it is anticipated they will underrun or overrun on those elements.

The CHAIRMAN. This is quite bulky. I believe I will let it be printed in the appendix of the record as exhibit No. 10.

(Document referred to was marked "Exhibit No. 10" for reference and will be found in the appendix on pp. 909–915.)

Mr. TIERNEY. That also contains the figures on the initial proposal to the Air Force.

The CHAIRMAN. In other words, this is the source of information from which you prepared the chart?

Mr. TIERNEY. From which I testified this morning, Mr. Chairman; that is correct, and from which I prepared the chart, also; that is correct.

This document is the same type of report, dated November 1961, and on contract No. 38098.

The CHAIRMAN. It may be made exhibit No. 11, giving it proper identification.

(Document referred to was marked "Exhibit No. 11" for reference and will be found in the appendix on pp. 916–924.)

Mr. TIERNEY. This is a letter from the Air Force, dated April 2, 1962, which contains the information relating to the contingency factors proposed by Boeing as to certain subcontracts.

The CHAIRMAN. The letter and the accompanying document and information with it may be made exhibit No. 12.

Have it properly identified and printed in the appendix.

(Document referred to was marked "Exhibit No. 12" for reference and will be found in the appendix on pp. 924–926.)

The CHAIRMAN. Is there anything further?

Mr. ADLERMAN. The next witness is Mr. Joseph A. Walsh.

The CHAIRMAN. Mr. Walsh. Come forward, please.

Is anyone else going to testify with you?

Mr. WALSH. Yes, sir.

The CHAIRMAN. Those of you who expect to testify, be sworn.

Do you and each of you solemnly swear that the testimony you are about to give before this subcommittee will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. WALSH. I do.

Mr. LONG. I do.

Mr. BROWN. I do.

Mr. MEDLEY. I do.

The CHAIRMAN. Beginning on my left, will you gentlemen identify yourself for the record?

TESTIMONY OF JOSEPH A. WALSH, CHARLES A. LONG, WALTER BROWN, AND E. H. MEDLEY

Mr. LONG. I am Charles A. Long, comptroller of the instrument division of Lear, Inc.

The CHAIRMAN. The next one, please.

Mr. WALSH. I am Joseph A. Walsh, vice president of Lear, Inc., and general manager of the instrument division.

Mr. MEDLEY. I am E. H. Medley, of the contract division.

Mr. BROWN. I am Walter Brown, and I represent the contract division.

The CHAIRMAN. Counsel, you may proceed.

Mr. ADLERMAN. Mr. Walsh, you are vice president and general manager of Lear, Inc.?

Mr. WALSH. Vice President of Lear, and general manager of the instrument division of Lear.

Mr. ADLERMAN. Are you one of the major subcontractors for the Boeing Co. on the Bomarc program?

Mr. WALSH. On Bomarc A; yes, sir?

Mr. ADLERMAN. Was the Lear Co. responsible for the design, research and development, and production of a component known as the coordinate converter?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. Will you explain what a coordinate converter is?

Mr. WALSH. The coordinate converter is a three axis gyro stabilized platform containing two sets of resolvers on each of the platform gimbal axis. Supporting this equipment is an electronic——

Senator JACKSON. Could you get away from the specifications and just give a simple explanation without getting into the detail?

Mr. WALSH. It is a significant part of the guidance system which provides a reference for the missile to the earth that is used.

The command signals go through this to move the missile in its various attitudes.

Senator JACKSON. In other words, it is a part of the guidance system, but it does not get into the last phase as much where you get involved with the homing device and you zero in on the target?

Mr. WALSH. Yes, sir.

Senator JACKSON. But you are the piloting part of the pilotless aircraft; is not that about it?

Mr. WALSH. It provides the reference for the autopilot, which we do not make.

Senator JACKSON. You take the place or part of the place of the man who might be in a manned interceptor?

Mr. WALSH. We feel that they should have guidance systems in manned interceptors, too.

Mr. ADLERMAN. Were you given the duty or job of doing all the research and development on it?

Mr. WALSH. There was preliminary research and development done by the Boeing Co. prior to entering the contract with us, which determined feasibility and the type of approach, general approach, they would like to take.

Mr. ADLERMAN. So they gave you some material to base your own research and development on?

Mr. WALSH. Yes, sir. They did preliminary work.

Mr. ADLERMAN. Did they give you the outside specifications of what they required by way of performance and so forth?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. Size, weight, characteristics?

Mr. WALSH. Right.

Mr. ADLERMAN. And did you work pretty closely with the Boeing Co. on the production and design and development of this?

Mr. WALSH. Yes, sir; we did.

Mr. ADLERMAN. Did you have any engineers at their plant or did they have any engineers at your plant?

Mr. WALSH. We had an engineer at their plant during a large part of the program. We also had an engineer in the field on the program. They had engineering reputation in our plant during the early days of the program, and intermittently through that time we had groups of engineers both from our plant going to Boeing and from Boeing into our plant.

Mr. ADLERMAN. When it came to production, did you have any engineers from the Boeing Co. in your plant?

Mr. WALSH. At certain stages we did, on coordination visits, and we also had a quality representative full time during the program.

Mr. ADLERMAN. There is less need for coordination. I mean by way of having a resident engineer and so forth, in the plant once production starts; is that correct?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. But you do have an integration problem that has to be met, an interphasing problem which has to be met, and in that you have to have guidance and control by Boeing on that?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. Did you work out pretty well with Boeing on it?

Mr. WALSH. We felt it was one of the best programs we have ever worked on as far as total coordination of our equipment into the total weapon system.

Mr. ADLERMAN. What was the price of your work to Boeing on the converter systems?

Mr. WALSH. The total price, which agrees with your chart, is $17,283,000.

Mr. ADLERMAN. $17.3 million?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. And that included your profit of $1.2 million?

Mr. WALSH. Our profit—we have a slight disagreement on profit because of total cost versus allowed cost. Our profit based on actual cost was $1 million—negotiated cost, which is what we were allowed, was $1,207,000. It was less than that as far as the company's net profit was concerned on the program.

The CHAIRMAN. You say actual profit was less than that?

Mr. WALSH. Certain costs in all Government contracts—there is a disagreement as to whether they are applicable to a specific program. They certainly represent a cost to the company and reduce our total profit on our business.

The CHAIRMAN. We had one example of that. There is no implication here that you have reference to something comparable, but we had an example of that with Douglas Aircraft, where they were trying to charge against the Government contract and saying it was costs they were not allowed for the production of some commercial planes.

You are not referring to anything so unrelated as something like that, are you?

Mr. WALSH. No, sir. Our plant is almost totally military.

The CHAIRMAN. Are you charging some other cost where you lost money on something to this contract?

Mr. WALSH. No, sir; a disagreement largely on the applicability of certain engineering costs which we have on all programs.

The CHAIRMAN. In other words, it is a matter of prorating the costs, where the Government folks said, "You ought not charge that much. That is too big a percent. Ten percent of your time or 20 percent of your time is all that you should be permitted to charge to this contract."

Is that it?

Mr. WALSH. Yes, sir.

The CHAIRMAN. It is items in that category; is that what you are referring to?

Mr. WALSH. Right.

The CHAIRMAN. That would be comparatively small, would it not, small items?

Mr. WALSH. On this particular program, it represented about $300,000.

The CHAIRMAN. About $300,000. You thought you ought to have had $300,000 more allowed to you for cost of production?

Mr. WALSH. Yes, sir.

The CHAIRMAN. Very well.

Mr. ADLERMAN. You do almost all Government work; do you not?

Mr. WALSH. In our division, in our part of the company.

Mr. ADLERMAN. And you know in advance, doing Government work, what the regulations of the Defense Department are as to what is an allowable cost and what is not an allowable cost; do you not?

Mr. WALSH. I think we know what the regulations are. Then the judgment factor enters in.

Mr. ADLERMAN. You know certain things, for example, they will not allow any advertising except for labor purposes, they will not allow interest charges, and so forth.

You know exactly what you can bid on some of those contracts, as to what you are allowed; is that not right? You go into those things with your eyes open.

Mr. WALSH. We know there are certain problem areas that come up.

Mr. ADLERMAN. I do not know why this comes up, when you know in advance that that is what you will get?

Mr. WALSH. I am not complaining. I am only pointing out what the net profit of the business is under our system of accounting.

The CHAIRMAN. You are not complaining. You are still willing to do it, aren't you?

Mr. WALSH. That is correct, sir.

The CHAIRMAN. Go ahead.

Mr. ADLERMAN. Were you requested by Boeing Co. under contract 36319, some time prior to April 10, 1958, to furnish them with an estimate or a cost of the coordinate converter?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. And did you furnish such estimates to them?

Mr. WALSH. Yes, we did.

Mr. ADLERMAN. Had you produced any of these on a production basis before that?

Mr. WALSH. We had not.

Mr. ADLERMAN. Did you have any cost data as a result of any production, on a production basis?

Mr. WALSH. As production we did not. We certainly had some experience.

Mr. ADLERMAN. This would be an estimate on your part, the best that you could give?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. And what price had you suggested to Boeing at that time?

Mr. WALSH. The quoted system price per system?

Mr. ADLERMAN. Yes.

Mr. WALSH. Per system it would be $40,822 per system.

The CHAIRMAN. Is this what you call a budget price as has been testified to here this morning?

Mr. WALSH. No, sir; this is a quoted price, a firm price.

The CHAIRMAN. What is the difference between a quoted price and a budget price? Is this a firm price?

Mr. WALSH. Yes, sir.

The CHAIRMAN. This you were making as a firm offer, to do it for that?

Mr. WALSH. Yes, sir.

The CHAIRMAN. That is the difference. The budget price is an estimate that is not binding, but this was a quoted price which was binding?

Mr. WALSH. Yes, sir.

The CHAIRMAN. Very well.

Mr. ADLERMAN. Mr. Tierney, could you refer to chart No. 5, please?

From your examination of the records as to the target price set on contract 36319, of the $112 million proposed or which was agreed upon between Boeing and the Air Force on April 10, 1958, what was the amount proposed by Boeing for the Lear work, as of that date?

Mr. TIERNEY. $3,188,000, in round figures, which corresponds to the firm proposal of Lear to the Boeing Co.

Mr. ADLERMAN. That was for 78 units?

Mr. TIERNEY. For 78 units; that is correct.

Mr. ADLERMAN. The testimony we just heard was that they had offered a unit price of $40,822 per unit.

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Had Boeing added to that a contingency, or what they call a PRR factor?

Mr. TIERNEY. Yes, a PRR factor was added to the subcontractor area. On this contract, 36319, including Lear, it was 15 percent.

Mr. ADLERMAN. That unit price came to $47,007; is that it?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Which is 15 percent more than the unit price quoted by Lear?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. For a total of $3,366,000?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. Mr. Walsh, in May 1959, did you voluntarily offer to reduce, or did your company voluntarily offer to reduce the price per unit because you found your costs were much less than you anticipated?

Mr. WALSH. That was August 1959.

Mr. ADLERMAN. And how much did you voluntarily reduce your figure to?

Mr. WALSH. The price was reduced from $40,822 to $31,522 per system.

Mr. ADLERMAN. In other words, that was a reduction of about $16,000 below the unit price of $47,000 which Boeing had negotiated with the Air Force, is that right?

Mr. WALSH. Our quoted price was $40,822. We are talking about 36319, are we?

Mr. ADLERMAN. Yes. The price quoted and testified to just now was $47,000 by Boeing, which you would not have any knowledge of, but that would represent a difference of about $16,000.

This was a voluntary reduction on your part?

Mr. WALSH. The contract we entered into with Boeing was a fixed price redetermination contract.

Mr. ADLERMAN. So that if you got more money than you expended, you would have to repay it, is that right?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. And you did not want to be embarrassed by making a large repayment at the end of the contract, by receiving more money than you should have; is that right?

Mr. WALSH. It is usual practice to notify the contractor of any condition where your costs become significantly less.

Mr. ADLERMAN. So where you had a significant or large amount, roughly about $10,000 a unit as far as you are concerned, you voluntarily reduced it and notified Boeing that you wished to accept a lesser amount?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. You finally went through a price redetermination; did you not?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. When was that?

Mr. WALSH. The final date was November 1959.

Mr. ADLERMAN. November 1959?

Mr. WALSH. 1959.

Mr. ADLERMAN. And what was your price per unit fixed at on the final redetermined price?

Mr. WALSH. $24,167.

Mr. ADLERMAN. And that represented about a 50 percent cut; is that right, in your price?

Mr. WALSH. Just to keep it in round numbers, it was $41,000 a system to $32,000 a system to $24,000 a system. So it is 24 compared to 40 from the initial price.

Mr. ADLERMAN. Anyhow, it was some $16,000 below your original offer per unit, and some $23,000 below the price that Boeing had fixed with the Air Force per unit?

Mr. WALSH. I know our part of it. I do not know Boeing's.

Mr. ADLERMAN. Your final price that was paid to you was $2,090,000?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. And I believe that represents the difference between the initial target cost fixed between Boeing and the Air Force of $3,366,000, and $2,090,000, which amounts to $1,570,000 underrun.

Did you have another contract with Boeing, 38098?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. And did you, again, offer them an estimate of the cost prior to March 27, 1959?

Mr. WALSH. Yes, sir. We had a quote on September 1958.

Mr. ADLERMAN. September 1958?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. What was your proposal there?

Mr. WALSH. $40,427 per system.

Mr. ADLERMAN. And did you voluntarily reduce the price on that to $31,552, also?

Mr. WALSH. At the same time we handled the preceding contract.

Mr. ADLERMAN. And were you finally redetermined at $19,947 per unit?

Mr. WALSH. Yes, sir. We had one additional interim reduction, to $25,500 a system, and then a final redetermination of roughly $20,000.

Mr. ADLERMAN. So there, again, you had a drop in price of one-half; is that right?

Mr. WALSH. There we did have a drop of one-half.

Mr. ADLERMAN. And your final redetermined price was $3.3 million?

Mr. WALSH. Approximately $3.4 million, $3,398,000.

Senator JACKSON. Might I ask a question, Mr. Chairman?

The CHAIRMAN. Senator Jackson.

Senator JACKSON. When you are turning out a quantity of any given item, you do have the learning curve; do you not?

Mr. WALSH. Yes, sir.

Senator JACKSON. At some point during your production schedule you are able to reduce costs quite rapidly; is this correct?

Mr. WALSH. Yes, sir.

Senator JACKSON. Is it easy or difficult or hard to try to anticipate what your learning curve experience is going to be?

This is one of the things that I assume you give some consideration to when you are trying to estimate a quantity cost?

Mr. WALSH. That is right.

Senator JACKSON. Have you, in your estimates—did you crank all of that into it?

Mr. WALSH. We had learning curves applied to those units made under our research and development program, which are made under conditions quite different from production, and we were able to realize significantly greater——

Senator JACKSON. You have a learning curve at both, don't you?

Mr. WALSH. Yes, sir.

Senator JACKSON. Both in the research and development items you turn out, and also in the production items?

Mr. WALSH. In research and development sometimes you do not, as you make modifications and changes. You can actually go up in cost. But once you finalized design and go into production, and get your initial figures, your possibilities of forecasting the learning curve are much better.

Senator JACKSON. What total number were you talking about originally when the program started, and what did you end up with?

Mr. WALSH. Under development programs, we produced 91 systems.

Senator JACKSON. Ninety-one systems?

Mr. WALSH. Yes, sir.

Senator JACKSON. This is all on the "A" program?

Mr. WALSH. Yes, sir.

Senator JACKSON. How many had you contemplated producing originally? What was the estimate?

Mr. WALSH. We made a great number of studies. I guess we were into the possibility of thousands of units. We had as high as 5,000 units anticipated, and 100 a month.

Senator JACKSON. What I am getting at is you got the cost down to how much per unit?

Mr. WALSH. $20,000, roughly.

Senator JACKSON. But if the quantity had gone up, the cost per unit would have been down even much less than the 20; would it not?

Mr. WALSH. Yes, sir. Our biggest savings are when we have large quantities and high levels of production per month. We never quite reached high levels of production in this program.

Mr. ADLERMAN. Mr. Tierney, on contract 38098, the testimony was that Lear & Co. had proposed a figure of $40,427 per unit. I take it that was for——

Mr. TIERNEY. 168 units.

Mr. ADLERMAN. What was the price that Boeing fixed with the Air Force?

Mr. TIERNEY. They proposed a total price of $6.7 million, and we are using for our calculations, plus a 10-percent PRR or contingency factor.

Mr. ADLERMAN. That came to $7,747,000?

Mr. TIERNEY. Or a total of $7,470,000.

The CHAIRMAN. Is that the original target estimate?

The TIERNEY. That is in the original target estimate; that is correct.

Mr. ADLERMAN. That was compared to a unit price of $44,469, as compared to the proposal by Lear of $40,427?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. The final price redetermination was at $19,947 per unit, which was a reduction of some $24,500 per unit.

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And the final redetermined price was how much?

Mr. TIERNEY. The final redetermined price was a total of $3.3 million.

Mr. ADLERMAN. So that there was an underrun there of $4.1 million out of the proposed target figure of $7,470,000?

Mr. TIERNEY. That is right.

The CHAIRMAN. That is an underrun of more than 50 percent, is it not?

Mr. TIERNEY. That is correct, Mr. Chairman.

The CHAIRMAN. Out of $44,000, is that the total original target?

Mr. TIERNEY. The total original target——

The CHAIRMAN. That is, on this item.

Mr. TIERNEY. On this item, under this contract, the total original target plus the 10-percent factor was $7.4 million.

The CHAIRMAN. $7.4 million on this item?

Mr. TIERNEY. That is correct.

Senator JACKSON. That was the total. What was it per unit?

Mr. TIERNEY. Per unit it was $44,469.

The CHAIRMAN. On the final adjustment of it, what did it cost per unit?

Mr. TIERNEY. The final redetermined price was $19,947 per unit.

The CHAIRMAN. Let me ask another question.

Were you experienced enough in making this thing and developing it at that time to have an idea of what it would cost?

Mr. WALSH. Yes, sir. Could I explain the largest part of the difference?

The CHAIRMAN. Yes. I want to understand.

What did you submit as your estimate?

Mr. WALSH. Our estimate was $40,427.

The CHAIRMAN. And they added 10 percent to that.

Mr. TIERNEY. That is correct.

The CHAIRMAN. There was a factor in that, the reason you submitted it so high. What was that factor?

Mr. WALSH. Two major factors. First of all, we had no experience on production items when both of these programs were quoted. They were not running in order so that we had experience under one program.

So we had no experience in going into production. The first and most important, which resulted in 50-percent reduction in cost, was the fact that we had a new provision in the production contracts of a warranty, warranting this equipment for a year.

We had no experience at that time, other than the experience of the returns of items under the research and development program, which was at an extremely high rate.

Our repairs at that time were quite expensive. We used that as the best basis we had for forecasting the warranty costs during the production program.

As a result of integrating our training programs and improvement in our particular product, working with Boeing, we were able to cut the number of returns down significantly, and this reduced the cost approximately 50 percent.

It was 50 percent of the difference in price between our original quote and what the final redetermination was.

The CHAIRMAN. Did not you have in your original estimate $8,600 to cover that guarantee, or some figure like that?

Mr. WALSH. That is approximately correct.

The CHAIRMAN. In other words, if you had to guarantee it and had to take changes on that, you put in a substantial figure to make sure you did not lose money on the guarantee?

Mr. WALSH. Yes, sir. It is a very complicated piece of equipment and repairs can be very expensive if the internal workings are involved.

The CHAIRMAN. I am not questioning that. But that goes in, too, to add up to an underrun, on these incentive contracts. Things like that go into it.

Well, of course you put in enough to be sure that you did not lose money on the guarantee.

Mr. WALSH. We do our very best not to lose money.

The CHAIRMAN. I know that.

You are the one that makes the amount or the offer.

But, again, I repeat that until these things are further developed so that you can have a pretty substantial idea of what the cost is going to be, it seems to me these incentive contracts are not in the best interests of the Government.

It is not the best procurement system for the Government to have to pay, and it does have to pay, a cost plus, and you have a cost plus here.

It seems to me like this is a very bad business practice for the Government to undertake to get procurement with such a contract, an incentive contract.

You were able, were you, after getting all of these reductions, getting it down to the redetermination price of $19,947, you were able to make a profit out of it on those terms, at that price?

Mr. WALSH. Yes. sir.

The CHAIRMAN. And did that price of $19,947 include a consideration to cover the guarantee of the equipment for a year?

Mr. WALSH. Yes, sir. We then had experience under which to be able to forecast it pretty accurately.

The CHAIRMAN. It seems to me that after having had experience like this you would now be in a position, and Boeing would now be in a position, having produced a number of these, to determine in advance something reasonably accurate upon which to give a bid to the Government and then take an incentive contract.

In other words, the Government has something here to base an incentive figure on, or a target figure, after they have been produced. But before that, it seems to me like an incentive contract puts the Government at all of the disadvantage, and generally the contractor, who has such a contract, having all of the advantage.

What do you say about that? Do you disagree with me?

Mr. WALSH. I think any time you say Government contracts put the contractors at all the advantage and the Government at the disadvantage, it is not quite true.

But I do feel that the one big variable that made the largest percentage of our particular change in price, to reduce price, was a pretty wide variable, which was this warranty, and I think certain of those items can be taken out.

If I had the problem of getting out a major weapon system, I would certainly like ceilings placed on a large part of the program, and incentives certainly give a real incentive to the company to do a better job.

The CHAIRMAN. I think we want to do that. I think it ought to be done, after you have gotten somewhere, where you can determine what we know from past experience is something near a reasonable price.

Then you can give an incentive, if you can find other ways to cut this down. There might be some incentive payment for doing that.

Using this as a crude illustration if you go out to buy 1,000 trucks, or automobiles, of a given kind, with a little change in the design of the body or with some special equipment on it you know originally what it costs to produce those trucks generally. You have a background of experience for that. There have been some few of this particular equipment produced and attached to a truck.

One might very well submit a bid that, based on past experience, would be reasonable. But if you are going to produce them in great quantities, then there might be some incentive payment if you produce these in quantities and get that price down a little more, then to have a percentage of the profit.

You might negotiate a firm contract on that basis. There might be an advantage in it to both the Government and the contractor under those circumstances. But these incentive contracts in the area of the unknown, seem to me to place the Government at a disadvantage.

Mr. ADLERMAN. I would like to offer for the record their own preparation.

The CHAIRMAN. I hand you here a table of figures which I believe was prepared by your company.

Will you please examine these figures, this statement, and see if you identify it?

(The document was handed to the witness.)

Mr. WALSH. Yes, sir.

The CHAIRMAN. What is it?

Mr. WALSH. It represents an analysis of the program profit on our part of the program as applied to our company. That is on the first page.

The second page is a schedule showing the fixed-price-redetermination contracts, showing the dates of quotations, the number of systems quoted, the prices, the revised prices, and the final redetermined prices.

The CHAIRMAN. It was prepared by your company and so far as you know it is accurate and correct?

Mr. WALSH. Yes, sir.

The CHAIRMAN. It may be printed in the record at this point.

(Document referred to follows:)

Lear, Inc., Instrument Division—Bomarc program: Analysis of program profit

	Actual total cost	Negotiated total cost	Negotiated selling price	Profit based on selling price		Profit based on actual costs		Profit based on negotiated costs	
				Amount	Percent of sales	Amount	Percent of cost	Amount	Percent of cost
CPFF:									
AF 33(038) 19589	$5,645,277	$5,645,277	$5,940,323	$295,045	4.97	$295,045	5.22	$295,045	5.22
AF 33(600) 32832	3,872,705	3,872,705	4,107,887	235,182	5.73	235,182	6.07	235,182	6.07
AF 33(600) 24748	244,250	244,250	263,426	19,177	7.28	19,177	7.85	19,177	7.85
Total CPFF	9,762,232	9,762,232	10,311,636	549,404	5.33	549,404	5.62	549,404	5.62
Redeterminable:									
Hardware:									
AF 33(600) 35359	822,849	783,235	877,223	54,374	6.20	54,374	6.61	93,988	12.00
AF 33(600) 35030	302,819	291,256	326,207	23,388	7.17	23,388	7.72	34,951	12.00
AF 33(600) 36319	1,910,741	1,904,203	2,094,623	183,882	8.79	183,882	9.62	190,420	10.00
AF 33(600) 38098	3,353,046	3,089,264	3,398,190	45,144	1.33	45,144	1.35	308,926	10.00
Subtotal	6,389,455	6,067,958	6,696,243	306,788	4.58	306,788	4.80	628,285	10.35
Tooling and test equipment: AF 33(600) 35359	262,484	245,833	275,333	12,848	4.67	12,848	4.89	29,500	12.00
Total redeterminable	6,651,939	6,313,791	6,971,576	319,636	4.58	319,636	4.81	657,785	10.42
Grand total	16,414,171	16,076,023	17,283,212	869,040	5.03	869,040	5.29	1,207,189	7.51

Bomarc fixed-price redetermination contracts

Contract No.	Number of systems	Original quote date	Final quote date	Purchase order date	Quoted system price	Interim	Revisions	Redetermined system price	Redetermination date	Approximate number of R. & D. systems shipped at time of firm quote
AF33-600-35359	23	December 1956	May 1957	December 1957	$44,523	$42,908	$34,588	$31,368	November 1959	33
AF33-600-35030 (less resolvers).	13	February 1958	March 1958	March 1958	31,595	29,447		25,092	do	62
AF33-600-36319	78	December 1957	do	April 1958	40,822	31,552		24,167	do	62
AF33-600-38098	168	July 1958	September 1958	November 1958	40,427	31,552	25,457	19,947	June 1960	86

NOTE.—Lear quoted prices include $8,640 per system for warranty coverage (282 systems.) Redetermined price included average of approximately $670 per system for warranty coverage (282 systems). First system on contract AF33-600-35359 was shipped on Oct. 29, 1958.

Mr. ADLERMAN. Mr. Walsh, does your company have any contracts with the Government on a price incentive contract basis?

Mr. WALSH. None that I know of.

Mr. ADLERMAN. Are you familiar with those types of contracts?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. Is one of the principal elements in that type of contract the fact that the contractor takes the risk, the calculated risk?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. Going over, going under, making a profit, or paying something to the Government for overrun?

Mr. WALSH. That is right.

Mr. ADLERMAN. In this case, where you inserted the warranty of $8,640, was that responsibility for the performance of that particular item, the coordinate converter put on you?

Were you responsible for performance, and you had a warranty for 1 year?

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. So that Boeing did not have that particular risk, did it? You were the one that assumed that risk?

Mr. WALSH. On our equipment, we assumed the risk.

Mr. ADLERMAN. On the basis of your experience on this thing, you found that you did not have to use the warranty because your equipment worked pretty well.

Mr. WALSH. Yes, sir.

Mr. ADLERMAN. I think, according to the record, you only have in reserve $670 per system for repairs and so forth.

So that on the 246 systems that were involved in your manufacturing of coordinate converters, there amounted to an underrun of $1,960,000 on the savings of the warranty alone; is that correct?

Mr. WALSH. I do not have those figures right in front of me.

Mr. ADLERMAN. Your original figure was $8,640, and you manufactured 246 systems under the two contracts. So you only expended $670 per system instead of $8,640. That resulted in an underrun of $1,960,000, just on that item alone?

Mr. WALSH. The multiplication should be right, sir, approximately.

Mr. ADLERMAN. No further questions.

The CHAIRMAN. Is there anything further?

Senator JACKSON. I believe you testified already on this, but if you did you do not have to answer it. I gathered that there was close integration between your operation and the Boeing Co. from the point of manufacture, and also through the test period which went on for a long time; is that correct?

Mr. WALSH. Yes, sir.

Senator JACKSON. Did you go to Cape Canaveral on some of these matters?

Mr. WALSH. We had representatives at the cape.

Senator JACKSON. At Cape Canaveral?

Mr. WALSH. Yes. sir.

Senator JACKSON. So that the integration started from the time of procurement on through to the long period of testing, which went on for several years; is that correct, did it not?

Mr. WALSH. Yes. sir.

Senator JACKSON. That is all.

The CHAIRMAN. Is there anything further, gentlemen, that you wish to state in connection with this?

Mr. WALSH. No, thank you.

The CHAIRMAN. Very well. Thank you.

The committee will be in recess until 2 o'clock this afternoon.

(Members present at time of recess: Senators McClellan and Jackson.)

(Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 2 p.m., the same day.)

AFTERNOON SESSION

(The subcommittee reconvened at 2 p.m., Senator John L. McClellan, chairman of the subcommittee, presiding.)

(Members present at time of reconvening: Senators McClellan and Jackson.)

The CHAIRMAN. The committee will come to order.

Call the next witness.

Mr. ADLERMAN. Mr. N. V. Petrou, general manager of the Air Arm Division of Westinghouse Electric Corp.

The CHAIRMAN. All right, gentlemen.

Do you and each of you solemnly swear that the testimony you are about to give before this subcommittee will be the truth, the whole truth and nothing but the truth, so help you God?

Mr. PETROU. I do.

Mr. KIRBY. I do.

Mr. HOWLAND. I do.

The CHAIRMAN. Please identify yourself, beginning on my left.

TESTIMONY OF N. V. PETROU, R. E. KIRBY, AND JOHN HOWLAND

Mr. HOWLAND. I am John L. Howland, assistant general counsel, Westinghouse Electric Corp.

Mr. PETROU. N. V. Petrou, general manager of the Air Arm Division.

Mr. KIRBY. R. E. Kirby, general manager of the Electronics Division of Westinghouse.

The CHAIRMAN. Mr. Petrou, you have a prepared statement, have you?

Mr. PETROU. I do, sir.

The CHAIRMAN. Do you wish to file it and have it printed in the record, or do you want to read it?

Mr. PETROU. I would like to read it, if I may.

The CHAIRMAN. You may proceed.

Mr. PETROU. As requested by the subcommittee, I am glad to describe the role of Westinghouse in the Bomarc missile program.

The principal Westinghouse contribution to this program is threefold: (1) the airborne target seeker, developed and produced at our Air Arm Division; (2) ground control equipment, and (3) what is called missile-status processing equipment. The latter two have been developed and produced by our Electronics Division, also located at Baltimore. Mr. R. E. Kirby, who is here with me, is general manager of this division.

The target seeker is basically a radar unit installed in the missile to search for, locate, and provide guidance signals to the flight con-

trols of the missile so it will automatically intercept and destroy the target.

The ground control is a combination of radar processing, tracking, computation, and communication equipment. This equipment directs the missile from its launching site to the vicinity of the target where the airborne target seeker assumes control to complete the interception.

The missile-status processing equipment provides information on missile-readiness status at the missile bases, transmits missile availability reports to remote control centers, and simulates status and firing signals.

TARGET SEEKERS

At the outset, Mr. Chairman, I would like to point out that the guidance system for the Bomarc consists of tremendously complex equipment. I will not attempt to give you all of the technical details, but I think it would be helpful to trace the history of its development.

Westinghouse was introduced to the Bomarc program in 1951 when an APQ–41 radar which we had developed for Navy manned interceptors was selected by the Boeing Co. as the target seeker in existence that would require the least amount of redesign to meet Boeing system requirements for the Bomarc missile, which was then in the planning stage. Under the initial development order, we provided one modified unit of the APQ–41 radar which in early 1953 demonstrated the ability to detect a flying target and automatically direct the flight of the missile to the target. Almost simultaneously with this first order, Boeing placed orders with Westinghouse for additional samples of two other versions of the seeker, one of which subsequently became the first in a series of experimental target-seeker radars known as X–A's.

During 1954 a new specification was developed jointly by Boeing and Westinghouse which defined the performance required of the Bomarc target seeker, without prescribing the technical means by which these performance requirements should be attained. This new specification, in effect, placed Bomarc target seeker design and development responsibility with the Westinghouse Electric Corp. We then established, and maintain today, an effort for design and analysis which includes test and evaluation programs to insure that the missile operational requirements are reflected in the target seeker design.

In the period 1955 through 1959, Westinghouse and Boeing evolved a series of design modifications which afforded improvements in reliability and antijam capability. These improvements were incorporated from time to time in the XA series, and resulted in periodic redesignation of the series as XA–2, XA–3, XA–4, XA–5 and eventually the XA–6. Concurrently with these development programs, we delivered varying quantities of the XA–2, XA–3, and XA–4 for use in test missiles.

In 1956, Westinghouse proposed a new model target seeker which incorporated various improvements resulting from our engineering studies. This new equipment would provide an improved antenna, still higher reliability and better antijam capability. This proposal resulted in an order for 23 target seekers designated as the DPN–34B. Additional orders for 246 target seekers designated as model DPN–34V followed soon thereafter. The last of these models, used in the Bomarc A, was delivered in 1960.

Turning now to the Bomarc B missile, the history of its target seeker actually began during the early development of the DPN–34 target seeker, when Westinghouse initiated a company-sponsored program to develop a new type of airborne radar designed to detect and track higher speed, lower altitude targets by applying the pulse doppler principle. We successfully built and operated a developmental model of such a radar in the fall of 1955 and at about the same time, initiated further company-sponsored development work toward adapting this new pulse doppler principle to an automatic target seeker for missile application.

In April 1958, the Boeing Co. awarded us a contract to produce 17 missile-flyable target seekers of the new type for use in the Bomarc B. These were subsequently designated the DPN–53. We accomplished this major engineering and manufacturing undertaking successfully with the on-schedule delivery of the first DNP–53 unit just 12 months later; April 1959.

The development of the basic DPN–53 target seeker has now been completed. Currently, our principal efforts are directed toward still further improvements in target seeker performance and the manufacture of the remaining DPN–53 target seekers on order.

The CHAIRMAN. How many are on order? That is not confidential or secret; is it?

Mr. PETROU. No, it is not, sir; but I will have to look it up. We are in the process of delivering on the last contract.

Our work on ground control equipment related to the Bomarc began when Boeing awarded us a contract for the development of the GPA–35 ground control system in January 1953.

The first system was designed for controlling a large number of Bomarc A missiles suitable for use at each heavy radar site in the decentralized air defense concept. Manufacture of a prototype model of this system was begun, since SAGE equipment for testing and evaluating Bomarc A missiles would not be available for several years.

A scaled down prototype of this equipment was delivered for installation, calibration, and checkout by Westinghouse prior to its use at Patrick Air Force Base in 1955. In 1956, the first Bomarc A controlled by GPA–35 made a successful intercept, and subsequent Bomarc A flight tests were conducted using the GPA–35 equipment. In late 1955, we were awarded a prime contract by the Air Force to recommend changes to the GPA–35 necessary to incorporate manned interceptor control in addition to missile control. This study was completed in 1956 and a specific design was recommended which provided simultaneous control for both types of weapons.

In 1956, our contract with Boeing was augmented to include a study and test program to investigate the jamming vulnerability of the Bomarc A weapon system ground equipment and to make recommendations for improvements. This study continued over a 3-year period. Some of the recommendations of this program have been incorporated in the current production air defense radar program to improve antijam capability.

In 1957, Boeing awarded us a contract for an improved GPA–35 (XW–2) to be used in the engineering and suitability testing (EST) of the production Bomarc A at the Eglin Gulf Test Range. This equipment was capable of controlling six Bomarc A's simultaneously

and was delivered for installation, calibration, and checkout by Westinghouse at Eglin in 1958. It was used throughout this test program until SAGE equipment became available in late 1959.

With the range from the Bomarc A to the Bomarc B, a more advanced ground control was necessary to handle the increased range and revised altitude and intercept program of the Bomarc B missile prior to the availability of SAGE control equipment.

As a result, we were awarded a contract in 1958 to develop the GPA–35 (XW–3) which could handle either Bomarc A or Bomarc B missiles and provide simultaneous control for a number of missiles in the one-missile-on-one-target mode and many more missiles against a mass jamming raid in the antijam mode. A prototype of this system was built in 1959 and installed at the Eglin Gulf Test Range for the Bomarc B missile testing.

Missile-status processing equipment for both Bomarc A and Bomarc B squadrons have been developed and produced by Westinghouse under contract to Boeing concurrently with the development of the ground control equipment. This equipment displays the operational status of all missiles at the respective bases on a central console so that base-readiness can be continuously monitored and maintenance action taken rapidly when required. This same status data are automatically relayed to the SAGE Direction Center where "ready" missiles can be selected for firing.

This equipment also has built-in missile status simulators which can report synthetic status to SAGE centers so that operators and equipment of SAGE can be exercised without firing real missiles.

The first status equipment was built in 1955 for use at Patrick Air Force Base to work with the GPA–35 ground control system.

Five sets of Bomarc A and eight sets of Bomarc B status reporting equipment have been manufactured and installed at operational Bomarc bases.

These are the items Westinghouse contributed to the Bomarc program. However, to tell the full story we must mention the systems engineering, or "interface" problems for which Boeing was and is responsible. Designing and building the seeker or the ground control equipment required by the Bomarc is quite a different, and substantially harder task, than building a seeker, a status processor or a ground control equipment.

For example, the target seeker must perform its function in the environment of the missile and as demanded by the weapon system. It works from a particular power source; provides proper and accurate information in a useful form to control the missile; is compatible with the fusing system employed; is coordinated electrically with the telemetering system when used in test flights, and is in effect, an integral and essential part of the overall weapon system.

The Bomarc program like many others was, and is, one in which urgency demanded telescoping of development and production. The circumstances and events which mark this feature add to the difficulty of "interfacing."

Solving problems made up in part of engineering design, production programing, reliability, maintainability, quality control, radar performance, mutual interference with another subsystem, and effects external to the weapon system requires intuitive analysis, good judgment, and above all, a great amount of effort. Coordination between

Boeing and Westinghouse has been continuous throughout the program. Boeing has maintained resident engineering and inspection representatives in the Westinghouse plant. Frequently, teams of specialists were interchanged as specific problems arose. Conferences of a coordination nature, many attended by Air Force representatives, occurred with regularity on at least a weekly basis both at Westinghouse and at Boeing. Westinghouse looked to Boeing for the handling of these problems.

In summary, under the weapon system management of Boeing, Westinghouse successfully designed, developed, and produced a series of complex ground control equipment used throughout the critical development and suitability test phases of the Bomarc missile—developed and produced the status processing and command linkage now used by the Bomarc and the SAGE system—and designed, developed, and produced the highly effective target seekers of both Bomarc A and Bomarc B missiles.

The development and production phases were telescoped through the united efforts of Boeing and Westinghouse to bring to service use at the earliest possible date the most advanced weapon system.

In addition to providing an early effectiveness, this affords the significant economy of a weapon system having longer service life.

(At this point Senator Muskie entered the hearing room.)

Mr. PETROU. Mr. Chairman, I have a chart here, if I may refer to it at this point, to show this telescoping quickly.

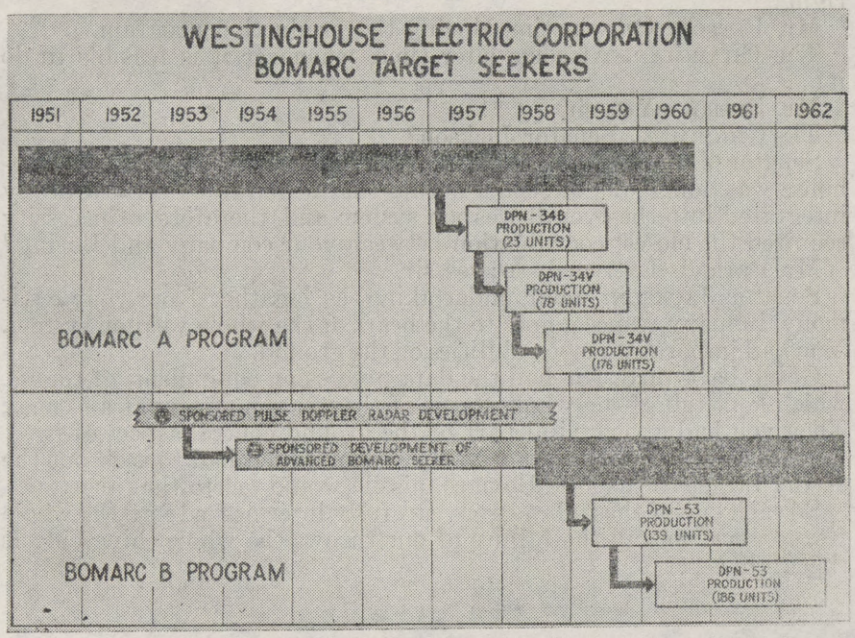
The CHAIRMAN. You may present your chart. I assume this chart can be printed in the record?

Mr. HOWLAND. We have copies.

The CHAIRMAN. It may be printed in the record at this point as an appropriately numbered exhibit.

(Chart No. 11 referred to follows:)

CHART NO. 11



Mr. PETROU. I wish to point out that the research and development programs extended over the time indicated in the Bomarc A. There were three lots of so-called production units. Most of the initial pricing was done for each one around the times indicated as the early part of 1958 for these two lots, and the latter part of 1958 for the so-called 176 lot.

The first units that were delivered on these contracts occurred in the 23 lot and it was in the latter part of 1958.

In the Bomarc B program, the R. & D. phase continued. While we have already completed the first of the 139 lot units, and are now in the progress of finishing the 186 lot units.

The CHAIRMAN. Those 186 are the number that I asked you about a few moments ago that you did not have?

Mr. PETROU. It would be less than that, sir, because we have been delivering these for some time. That is the number you are looking for and we will supply it.

The CHAIRMAN. You still have some of the 186 yet to deliver, but you are in process of finishing up the contract?

Mr. PETROU. That is right.

The CHAIRMAN. Did you have what we have called an incentive contract?

Mr. PETROU. Not on this one; no, sir.

The CHAIRMAN. This was a straight cost plus fixed fee or negotiated profit?

Mr. PETROU. No, the so-called production lot units were a fixed price redeterminable type of contract.

The CHAIRMAN. Which is that, the A?

Mr. PETROU. Both in the A and the B.

The CHAIRMAN. In other words, you had a fixed price that you would produce them for and then you would redetermine whether that was a fair price or not at the conclusion of the production; is that right?

Mr. PETROU. Or sometime during the production program.

The CHAIRMAN. At some later time, whenever it is feasible to do it?

Mr. PETROU. Yes, sir.

The CHAIRMAN. Senator Jackson?

Senator JACKSON. I take it, Mr. Petrou, that the work Westinghouse was doing was of such a nature that it had to be very carefully integrated into the overall weapon system and, therefore, of necessity required the closest coordination between your company and Boeing?

Mr. PETROU. Extremely so; yes, sir.

Senator JACKSON. Your undertaking, as I gather from your testimony, in many respects goes to the heart of the whole weapon system. You had important responsibilities on the ground.

Going backward, you had the data processing equipment, of course, which kept tab of the whole status of the weapon system at all times. Then you had a very vital part of the ground control aspect of it.

The third one was, of course, the seeker which had to seek out the enemy target so that the Bomarc missile would get to the target.

So each one of these three were carefully intermeshed into the whole weapon system and the failure of one throws the whole thing out; is that right?

Mr. PETROU. That is correct, sir.

Senator JACKSON. Do I understand in doing this that close coordination and integration would start from the beginning and go right through until the system became completely operational?

Mr. PETROU. I am quite sure that is exactly the way it is.

Senator JACKSON. In other words, the research and development phase involved a lot of testing. I assume you folks were involved at Cape Canaveral during the several years of testing of the A missile and subsequently the B missile?

Mr. PETROU. Yes, sir; and we are.

Senator JACKSON. That is all.

The CHAIRMAN. All right, Mr. Counsel.

Mr. ADLERMAN. Mr. Petrou, on that chart where you have the first production, that was under contract 35359, Air Force contract 35359?

Mr. PETROU. That is the 23 lot; yes, sir.

Mr. ADLERMAN. Is that correct?

Mr. PETROU. That is right.

Mr. ADLERMAN. And the next one on your chart which relates to the 78 units, 34–V, that refers to contract No. 36319; is that correct?

Mr. PETROU. That is correct, sir.

Mr. ADLERMAN. And the following one refers to 34–V, 176 units, referring to contract No. 38098?

Mr. PETROU. That is correct.

Mr. ADLERMAN. On the B program, the first one there of DPN–53 referred to the production of 139 target seekers and other equipment under the B missile program, contract 38101?

Mr. PETROU. Yes, sir.

Mr. ADLERMAN. And then the following one, the last one, DPN–53, 186 units, refers to contract 40033; is that correct?

Mr. PETROU. That is correct.

Mr. ADLERMAN. At the time you entered into a contract with Boeing to produce 34–V, the second one of 78 units; how many units had you produced under the preceding contract?

Mr. PETROU. None.

Mr. ADLERMAN. Did you have any cost data on which to base an estimate or a production cost to Boeing of those 78 units?

Mr. PETROU. We had no production information or data on which to base our costs, although we had built similar kinds of missile seekers in the development contract.

The CHAIRMAN. Do I understand by this that at the time you got the contract for the 78 units, you had not produced any of the 23 units?

Mr. PETROU. That is correct, sir.

The CHAIRMAN. You got the second contract before you had performed any of the first, insofar as completing any units?

Mr. PETROU. Yes, sir.

Mr. ADLERMAN. This was on a concurrency basis, where you are going into research and development and trying to produce the units because you want to get the missiles out; is that right?

Mr. PETROU. That is right.

Mr. ADLERMAN. But you did not have any production on which to base your costs. You had to make estimates?

Mr. PETROU. That is correct.

Mr. ADLERMAN. And the only estimate you could make was on the basis of what you produced under research and development, an entirely different sort of thing than a production line?

Mr. PETROU. That is correct.

The CHAIRMAN. Do you call it estimates of cost or do you call it budget?

Mr. PETROU. I will call the figures that finally related to the production lots as initial prices. These were, as far as we were concerned, fixed——

The CHAIRMAN. Everyone has a different name for it.

Mr. PETROU. These were prices, sir.

The CHAIRMAN. In other words, it is supposed to be an estimate upon which you can risk your judgment the best you know how?

Mr. PETROU. That is correct, sir.

The CHAIRMAN. Where you have the experience to come up with, you can come up with a firm figure and even make an offer on it, but in this area, at the time, under the circumstances, you could not do that.

You simply had to give an estimate, not on production of the item but based on your experience in the production of other comparable equipment, I assume?

Mr. PETROU. That is right. And it was our best estimate at the time.

Mr. ADLERMAN. This was one that you were willing to stand by and make a contract for?

Mr. PETROU. That is correct.

Mr. ADLERMAN. And what price did you quote to Boeing along about April 1958? I think that was in February 1958 on 36319.

Mr. HOWLAND. I would appreciate it, Mr. Adlerman, if you would recognize that these are not quotations but they are the initial negotiated prices.

These are preceded by quotations but they are the initial prices in the contract paper.

Mr. ADLERMAN. These are the prices that you agreed with Boeing to undertake to do the contract for?

Mr. HOWLAND. As the initial prices in a price redetermination contract; yes, sir.

Mr. ADLERMAN. What was your price on that?

Mr. HOWLAND. The first pricing action at that time was for the 23 lot, under Air Force 35359——

Mr. ADLERMAN. I am referring to 36319.

Mr. HOWLAND. 36319, the price was set in February of 1958, February 6. Do you want the unit price?

Mr. ADLERMAN. Give us the unit price and the total price.

Mr. HOWLAND. The unit price at that time for 78, DPN–34–B target seekers was $71,436.

Mr. ADLERMAN. Was not that changed?

Mr. HOWLAND. That was changed some months later, in September, to prorate some tooling costs and to make some changes in the equipment, itself, to a unit price for 78 of the same seekers, or the different configuration, at $74,569.

Mr. ADLERMAN. That was in September?

Mr. HOWLAND. That is correct.

Mr. ADLERMAN. But the original one that you gave in February was for $71,000?

Mr. HOWLAND. That is right.

Mr. ADLERMAN. That came to $5,810,000; is that it?

Mr. HOWLAND. That is correct.

Mr. ADLERMAN. Along about May 1959, did you enter into a voluntary reduction on that?

Mr. HOWLAND. Yes, sir; we did.

Mr. ADLERMAN. And you reduced it down to what?

Mr. HOWLAND. $79,610 per unit. This was on April 30.

Senator JACKSON. It is not 79.

Mr. HOWLAND. $49,813; I am sorry.

Mr. ADLERMAN. In other words, that is about $25,000 under or $24,000 under your original estimate?

Mr. HOWLAND. Yes, sir.

Mr. ADLERMAN. That was a voluntary reduction on your part?

Mr. HOWLAND. That was a voluntary reduction made at the time that we made the proposal.

Mr. ADLERMAN. And did you enter into an agreement subsequent to that at a further reduction of the price?

Mr. HOWLAND. Yes. We had the final redetermination of prices on this order.

Mr. ADLERMAN. And was the final redetermination price $43,500 per unit?

Mr. PETROU. That is correct, sir.

Mr. ADLERMAN. And for a price of $3,339,000?

Mr. PETROU. $3,393,000, I believe.

Mr. ADLERMAN. $3,393,000; that constituted a reduction of about $31,000 from your initial price per unit?

Mr. PETROU. That is correct.

Mr. ADLERMAN. And a reduction of $2½ million on your total price?

Mr. PETROU. That is right.

The CHAIRMAN. What I wanted to get at: The initial price of $74,000 per unit—was that the figure used by Boeing in its submission?

Mr. PETROU. I do not know.

The CHAIRMAN. You do not know. Do we know?

All right, Mr. Tierney. You have followed this testimony and are familiar with these figures.

Mr. TIERNEY. Yes, sir.

The CHAIRMAN. What I want to know, now: was the $74,569 figure the figure used by Boeing in making its——

Mr. TIERNEY. Its proposal to the Air Force? Its estimate and proposal to the Air Force?

The CHAIRMAN. The contract; that is what I mean.

Mr. TIERNEY. The figures included in the initial target agreed to. That is right.

The CHAIRMAN. This was a part of the initial target figure?

Mr. TIERNEY. That is correct, sir.

The CHAIRMAN. Again we come back to this: Why would your figures be such a tremendous difference? That is again running about 80-odd percent reduction in the original estimate. Why would that be so great?

Mr. PETROU. I think, Mr. Chairman, in that case the reasons were probably twofold.

First, I believe that the clarification of the configuration of the Seeker was made finally after our initial prices. In other words, the Seeker configuration had not really been frozen or determined completely.

And secondly, there were cost reduction items that we performed on the contract to lower the final cost.

So I would say really there were two reasons, first the finalization of the configuration, and second, cost reductions.

The CHAIRMAN. It did not make an 80-percent difference, did it?

I say 80 percent. I am thinking in terms of 100 percent. The reduction would be some 40-percent reduction. I said 80. I am sorry. It would be somewhere around a 40-percent reduction.

Now, the change in the configuration certainly could not amount to that?

Mr. PETROU. Oh, yes. That probably was one of the largest ones, I would say, sir.

The CHAIRMAN. Would it be that much?

Mr. PETROU. Yes, sir.

The CHAIRMAN. What kind of change in configuration would that be?

Mr. PETROU. I think this might be indicated by the fact that there were some 4,000 engineering changes, for instance, when the final configuration was made.

The CHAIRMAN. That might run the price up—4,000 changes.

Mr. PETROU. But it can also mean that the configuration was simpler than that which we had initially estimated.

The CHAIRMAN. You do not mean there were 4,000 changes in that one item, do you?

Mr. PETROU. Sir, I am talking about configuration changes.

The CHAIRMAN. It would not be 4,000?

Mr. PETROU. These are engineering changes.

The CHAIRMAN. Well, I am talking about engineering changes in a configuration. There would not be 4,000 changes. I do not know, but that seems to me like a whopper.

Mr. PETROU. The configuration changes themselves did not amount to 4,000 engineering changes. However, the configuration changes caused 4,000 engineering changes.

Mr. ADLERMAN. What was the nature of the changes?

Mr. PETROU. The nature of the changes were, for instance, giving the Seeker a different kind of antijam capability than it was originally intended to give it. This helped simplify the Seeker. There is a typical one which could cause a considerable amount of reduction. In other words, the enemy did not look as big at the later-on stages as he did at the beginning.

The CHAIRMAN. I really do not mean to be challenging what you say, but I could not understand 4,000 engineering changes would occur in simplifying a weapon costing more than even the original cost, $74,000.

Senator JACKSON. May I ask a question here for clarification?

The CHAIRMAN. Surely.

Senator JACKSON. Just for clarification.

You are talking about changes prior to production of the R. & D. Seeker, are you not?

Mr. PETROU. I am talking about the configuration changes from the time that the initial prices were negotiated with Boeing.

Senator JACKSON. I think what strikes Senator McClellan, as it would us all, is that the changes occurred after you had developed the entity.

The CHAIRMAN. I mean after you produced a model—they would cost more, not less. But what you are saying is that you approached it initially and made your estimate of $74,000 based on a certain philosophical approach to the solution of the problem; right?

Mr. PETROU. That is right.

Senator JACKSON. After you submitted an estimate based on approach 1, you then decided that you would solve this problem on approach 2, which was entirely different, more simplified, and less costly hardware. In order to pursue approach, you would have to make all these design changes on paper and work out your plans. Is that right?

Mr. PETROU. The design changes from the conceptual stage. The so-called concept is not quite right, because there were actual models that we had built during the developmental stages, and as you notice in my red bar, up there, there were at least some 11 different configurations.

Senator JACKSON. It was a complex change to make something simpler?

Mr. PETROU. Yes. Very nicely put, sir.

The CHAIRMAN. I still want to try to understand where there is an advantage, if any, or where it is fair to the Government, if it is fair to the Government, to make the kind of an incentive contract on figures that are so unreliable taking into account the reductions that we have been establishing here.

How is it that it would be of advantage in any way to the Government to make these contracts? Because here is a reduction that you found, and I do not question the reduction; I think we all welcome the reduction—but I am thinking now about the contracting, the practices of contracting, and this incentive contract.

Here you get a reduction of $31,000 from the original estimate, and for that reduction, on the basis of the incentive contract, the prime contractor gets—if it is 10 percent, he will get over $3,000 in reduction profit there, and if it is 15 percent, he will get $4,500 to $5,000 profit.

Now, I cannot rationalize how the Government is being prudent—its representatives—in making that kind of a contract.

What do you think about it?

Mr. PETROU. Well, I have not studied this, Mr. Chairman. I cannot really answer.

The CHAIRMAN. The point I am making is: I can understand that at the stage you were in, you could not understand what it was going to cost you, and you naturally put in, on a basis like this, an estimate that you thought would protect you. That is understandable. And I can understand that you cannot let this thing out on bid. You have to hire somebody just to go out and do the work and then try to make a fair settlement and a fair adjustment of the profits and the cost, and so forth. I can understand that.

But I still cannot understand how it is prudent for the Government, in the face of those circumstances, to go out and have the contractor set up targets of possible cost and then say, "Well, if you get it down lower than that, we will give you a percentage of it for profit." I just do not believe it is a good system.

Mr. PETROU. I think one should really address himself to the total cost, also, in addition to just the profits. I think this is important. I am sure I cannot really answer that basic question you are raising.

The CHAIRMAN. We are trying to make a study of this thing now. If this is the practice, if it is costing the Government money, and if the practice is not sound, we hope that our responsible procurement officials will pursue some other course, some other practice, in procurement, rather than this practice, this kind of a contract.

As a businessman, put yourself in the position. You are the Government. You would not want to be making those kinds of incentive contracts, would you?

Mr. PETROU. I really do not know; although I would certainly still look at total cost. This would be the thing I would be really worried about.

The CHAIRMAN. You start off looking at that, and yours is going to be $74,000 a unit.

Mr. PETROU. At the end. Total cost at the end is I think the important thing, here.

The CHAIRMAN. Very well.

Senator MUSKIE. Mr. Petrou, if I may: At these various points of reduction in the unit price, who took the initiative? Who took the initiative to reduce the unit price? Does the Government take the initiative? Do you take the initiative?

Mr. PETROU. Well, we certainly made voluntary reductions ourselves.

Senator MUSKIE. That is, as you simplified the design, you recomputed the cost and voluntarily made the reductions?

Mr. PETROU. I wish to point out that the design was simplified not only by ourselves, but the configuration was established also by Boeing, too.

Senator MUSKIE. When I say you, I meant——

Mr. PETROU. Yes; both Boeing and Westinghouse did; so that we both simplified the design.

Senator MUSKIE. And your objective was to produce a more effective and more efficient system?

Mr. PETROU. That is right. According to the requirements at that time.

Senator MUSKIE. The reason I raised the point is that in discussing these incentive-type contracts, I take it that we are concerned as to the incentive for minimizing cost in the original target figures, and also in subsequent cost figures. And here, in this type contract under which you operated, there was no incentive for you to minimize cost, except your desire to produce a more simplified and more effective and efficient product.

Mr. PETROU. And to stay in business.

Senator MUSKIE. And to stay in business?

Mr. PETROU. Yes, sir.

Senator MUSKIE. It would be your view, then, that perhaps the same incentive would apply to the incentive-type contract.

Mr. PETROU. I would assume so.

Senator MUSKIE. There is some fear, and I think this is what underlies the committee's inquiry, that by using the incentive-type contract, at a point in the development of a weapon system, when there are many uncertainties, the incentive is to set as high a target cost figure as possible, rather than the reverse; and from that point on, then the incentive is to reduce the cost in order to increase the profit.

From the point of view of a businessman who is motivated by incentives of one kind or another, would you think this is a proper concern?

Mr. PETROU. It certainly is a proper concern. On the other hand, it would also be interesting to find out what a program like this would have cost on, say, a straight CPFF kind of contract. Certainly I do not know what it would have done, but it would be interesting to see.

Senator MUSKIE. I do not know whether we would be able to come up with that kind of a figure or not.

Mr. ADLERMAN. I think we showed that in some of these contracts—I am not sure now if it is 36319—the Boeing Co. was very anxious to go into a cost plus fixed fee at 6 percent, I believe it was.

Senator MUSKIE. Initially?

Mr. ADLERMAN. Yes. And so their fee would have been probably half of what they made in that. I think they made a fee there of $12 million on this contract, and at the rate of 14 percent, they were willing to undertake the contract at a cost plus fixed fee, at a fixed fee of 6 percent, I think it was, and the fee would have necessarily been about half that much.

Senator MUSKIE. This is on the assumption that your ultimate cost figures would have been the same under both types of contracts.

This is the point. I think the question that is in my mind is whether or not you would have arrived at the same cost figure.

One of the criticisms of cost plus fixed fee, as counsel knows, is that there is less than proper concern with cost.

Mr. ADLERMAN. His contract, for example, was not on incentive. His contract was fixed price redeterminable.

Senator MUSKIE. I understand.

Mr. ADLERMAN. So the actual costs were as though it were on a cost-plus contract, anyhow. So his reduction, you see, is the natural reduction. It does not matter to him whether Boeing has a fixed-price incentive or not. His cost reduction came through, because their honest dollar costs came down by that amount.

Senator MUSKIE. I understand that. And I am not concerned, and I take it the committee is not concerned, with the validity of his cost figures. You are trying to utilize his experience to evaluate the validity of the incentive-type contract and the cost-plus-fixed-fee contract. This is why I am asking these questions: By these three types of contracts, which type is the best type for producing minimum cost figures consistent with the product that we want to produce?

At the moment I am not entirely sure.

Mr. ADLERMAN. I would like to point out here for a moment, if I may: On 35359——

Senator MUSKIE. That is this one?

Mr. ADLERMAN. No, the other one up there. This is a cost plus fixed fee. Still they had a $12 million underrun, you see.

Senator JACKSON. Mr. Chairman, I wonder if I might just make an observation here. Maybe it will be helpful. Maybe it will not.

The CHAIRMAN. Very well.

Senator JACKSON. In going back now we must keep in mind that at the time when these systems were under consideration, there was a critical need for developing these weapon systems in time. Bear in mind that every month delayed is money wasted, because if we develop these systems over a long period of time, and they come into being when they have no value, the whole investment is lost.

Now, it seems to me that you might keep in mind that what the Defense Department was trying to do was to take parallel action, run the risk of working on your hardware while you still were working on a solution to the problem.

It would seem to me that the logical approach that should have been followed, if we want to look back on the basis of hindsight, is that the initial undertaking should have been on a cost-plus-fixed-fee basis; the point being that while research and development is going on, and hardware is being produced, there are going to be enormous changes. This is as simple as a, b, c.

Now, as I understand it, the Boeing people wanted it on a cost-plus-fixed-fee basis, because although I have not asked them about this. I am sure they did not know what the costs were going to be.

Eventually, as you get the experience and as you really get to the point where more and more of your components become Chinese copies that you can produce on a mass basis, without subjecting each item to continuous change through research and development, then you can get a real, honest target price.

I merely want to make this statement, so that we can view this whole situation in the proper setting. Any time we have a crucial weapons system at stake, we have to take this parallel course of action.

And I agree with the chairman's concern, and I know we want to make this observation, that logically you should start out not on a fixed target basis, with this type of development, because you have no way of knowing.

The CHAIRMAN. I do not think it can be real at all.

Senator JACKSON. That is right. I just thought this statement would seek at least to put this in proper perspective. And the lesson that we have learned here from the testimony from the Westinghouse people I think corroborates this point. In other words, they initially set a target of $74,000-plus for this system, and then, through the process of research and development which was going on continuously, the price was cut down to $59,000 in a relatively short period of time.

My only point is—and I am sure this sort of thing was going on continuously, not only in this weapons system but in other weapons systems—some items will quite reasonably enough go up in price; simply because the situation remains fluid and price is not determinable in an exact sense because it is all subject to research and development.

The CHAIRMAN. I do not think anyone can question that it had to be done on a cost-plus basis. No one questions that. I certainly do

not. I think we want to get it as reasonable as possible, but it has to be done in that way when you are in an exploratory stage and the thing can be developed to the point where you get it to where it is of such a nature that you can call for competitive bids on it.

In this field, I do not know whether you will ever get to where you can do that or not. Our progress comes so rapidly, developments and so on, and changes.

But I just cannot see, I have not found anything to indicate to me, that there is any prudent or any practical reason why the Government should make incentive contracts in this area of development.

Senator JACKSON. At this stage of development.

The CHAIRMAN. At this stage, yes.

When the thing becomes settled and fixed and you can give a blueprint of what you want, and take bids on it, yes, very well.

And again, maybe the Government representatives thought, "We will test this thing out." But I think we are getting a demonstration here now, conclusive proof, that it has been tested about far enough.

Mr. ADLERMAN. Mr. Tierney, have you examined the negotiation papers in regard to contract 36319?

Mr. TIERNEY. Yes, I have.

Mr. ADLERMAN. And found the proposal that was made by Boeing on the initial target cost? Westinghouse had proposed to Boeing $5,800,000 for the 78 units. Is that right?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. What was the price that Boeing gave to the Air Force for that? How much of a contingency?

Mr. TIERNEY. To this they added a 15-percent factor.

Mr. ADLERMAN. And that brought the figure up to $6,700,000?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And the final figure, added to the price redetermination, and the figure fixed with the Air Force on payment, is $3,300,000?

Mr. TIERNEY. That is right.

The CHAIRMAN. That was more than 50 percent.

Mr. ADLERMAN. That is a difference of $3.4 million.

Mr. TIERNEY. A difference of $3.3 million.

Mr. ADLERMAN. Now, Mr. Petrou, on contract No. 38101, what was your figure with the Boeing Co. at the outset of that contract, before May 7, 1959?

Mr. PETROU. For 38101, the initial unit price target figure was $98,520.

Mr. ADLERMAN. And what was the total price on that?

Mr. PETROU. $11,428,320.

Mr. ADLERMAN. And in addition to that, you also had an order for the DPN C–53 seeker, tooling?

Mr. PETROU. This is the DPN C–53 target seeker I am talking about.

Mr. ADLERMAN. And then you had tooling for it?

Mr. PETROU. There was tooling then, in addition, which was added on a different order.

Mr. ADLERMAN. And that amounted to $6,449,000?

Mr. PETROU. That is right.

Mr. ADLERMAN. So the total figure to Boeing on your proposal, your willingness to contract, was $17,900,000?

Mr. PETROU. Essentially correct.

Mr. ADLERMAN. Is that correct?

Mr. PETROU. Yes, sir.

Mr. ADLERMAN. All right.

And, Mr. Tierney, do you know what factors were added on by Boeing to that?

Mr. TIERNEY. On the $17.9 million figure proposed by Westinghouse, 35 percent was added on for the hardware. That is the $11 million figure.

Mr. ADLERMAN. That is for the target seeker itself?

Mr. TIERNEY. Yes. And 15 percent was added for tooling.

Mr. ADLERMAN. And what was the amount agreed upon between Boeing and the Air Force for both the tooling and the target seeker?

Mr. TIERNEY. A total figure of $22.9 million.

Mr. ADLERMAN. That is approximately $5 million more than the proposed figure of Westinghouse?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And was that the PRR factor? Do you know what that means?

Mr. TIERNEY. Yes. I think it is a production revision factor. I think it is just a name given. Various names are given to it. It is a factor which is added under circumstances such as these, where parties are negotiating a contract and the contractor is in the research and development stage, and he is not sure what this particular subsystem is going to cost him after he gets finished. So in order to protect himself, he adds a contingency.

Mr. ADLERMAN. Now, Mr. Petrou, were your prices finally redetermined on this contract?

Mr. HOWLAND. Mr. Adlerman, when there were 23 additional seekers brought under this contract at roughly the same time as the 116, they were bought at the same initial unit price. And then as to the final pricing, when this entire quantity of 149 was price, some of these——

Mr. ADLERMAN. Are you talking about contract 38098?

Mr. HOWLAND. No; contract 38101.

Mr. ADLERMAN. Just 38101. All right. What was your final redetermined price on the target seeker?

Mr. HOWLAND. There were two unit prices, because there were changes in 42 of the seekers. So we had, in effect, two unit prices.

Mr. ADLERMAN. Well, regardless of the unit price, what was the total price?

Mr. HOWLAND. $13,286,582 for 139.

If you are talking in relation to the 116 units, the total is $11,096,492.

Mr. ADLERMAN. And then did you have a tooling redetermination?

Mr. HOWLAND. The tooling final price was $6,209,412.

Mr. ADLERMAN. And you came up with a final figure, then, of $17,290,000?

Mr. HOWLAND. For the 116 units and the tooling, in addition to which we had 23 other units, the same final price, under that same contract.

Mr. ADLERMAN. That came up to $17,200,000?

Mr. HOWLAND. The 116 plus the tooling; yes, sir.

Mr. ADLERMAN. Your initial proposal was $17,900,000, but you say you had additional target seekers in there?

Mr. HOWLAND. No; the additional target seekers are over and above that, but at the same unit prices.

Mr. ADLERMAN. I see. But for the number that you bid, that is, the 116, your price finally ended up with $17,290,000?

Mr. HOWLAND. That is correct.

Mr. ADLERMAN. And your proposal to Boeing originally was $17,900,000; is that correct?

Mr. HOWLAND. That is correct.

Mr. ADLERMAN. This results in a figure of the difference between $17,290,000 as the final redetermined price between yourself and Boeing and the initial target figure given by Boeing of $22,900,000, showing an underrun, on the basis of those figures, of $5,700,000.

Now, did you have another contract, 38098?

Mr. HOWLAND. Yes, sir.

Mr. ADLERMAN. What was your proposal there, or what was your original contract?

Mr. HOWLAND. We originally proposed 175. At that price, 7 were subsequently terminated, leaving 168 on order, which is, I believe, the figure that is in your chart. Eight more were subsequently added on a separate order.

But in relation to the 168, using the initial unit prices, the unit price was $59,593.

Mr. ADLERMAN. Now, the total of that was $10,011,000?

Mr. HOWLAND. That is correct.

Mr. ADLERMAN. And you established that on September 5, 1958; is that right?

Mr. HOWLAND. That is correct.

Mr. ADLERMAN. That was prior to the date of the contract which was March 17, 1959. I mean the Boeing contract.

Mr. HOWLAND. That is right.

Mr. ADLERMAN. And, Mr. Tierney, how much of a factor did Boeing add to that figure?

Mr. TIERNEY. We are calculating on a 10-percent factor.

Mr. ADLERMAN. So that contract 38098—their initial target included $11 million for this item?

Mr. TIERNEY. That is right.

Mr. ADLERMAN. As compared to the price offered by Westinghouse of $10 million?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. That was $1 million more.

Now, what was your final redetermined price on this contract?

Mr. HOWLAND. Again, there were 2 final unit prices, because there were 67 in the one configuration and 101 of a different configuration.

The total for the 168 units was $6,222,215.

Mr. ADLERMAN. That represents a difference or an underrun of $4,800,000 on a figure given as a target cost by Boeing to the Air Force, and a final cost to Boeing of $6.2 million?

Mr. HOWLAND. I do not know their underrun; I know ours.

Mr. ADLERMAN. Mr. Tierney, coming back to contract 38101, was any part of that contingency used in that contract?

Mr. TIERNEY. Apparently it was. It is difficult, from an accounting standpoint, I gather, to determine exactly how much was used. The records are contradictory on that. One record indicates none of these factors were used, and there is another one that indicates as far as this contract was concerned, apparently sufficient was used to result in an underrun of just $2½ million, approximately $2½ million.

Mr. ADLERMAN. So there is some dispute as to the amount of underrun on contract 38101, whether it is $5,700,000 or $2,500,000.

Mr. TIERNEY. That is right.

Mr. ADLERMAN. And that may be where they may have used some of those contingency figures as far as Boeing is concerned in its own operation.

Mr. TIERNEY. That is correct, because it would appear clear that on the final price, on 116 units, our figure is clear on that. We have a $17.2 million figure on the total, final price, for the 116 units.

Mr. ADLERMAN. Mr. Petrou, under this contract 38098, where there is this underrun of $3.8 million, or as far as you are concerned $3.8 million, that is a 33-percent underrun. What accounted for that underrun?

Mr. PETROU. I think it would be wise, if I may, to show another chart, which will explain, I think, a little bit this business.

Mr. ADLERMAN. Was it a fact that you did not have a fixed configuration? You were still in research and development, and still trying to make a production item at the same time?

Mr. PETROU. That is correct; because the difference between 919 and 098 was only a matter, in terms of time, of very small time, when we made our initial pricing.

Mr. ADLERMAN. In other words, you really did not have any way to base what your actual costs were going to be when you entered into this contract?

Mr. PETROU. There was no production experience.

Mr. ADLERMAN. And would it have made any difference? Did you know what kind of a contract Boeing had, whether they had an incentive contract or a fixed-price or a cost-plus contract?

Mr. PETROU. At that time, no.

Mr. ADLERMAN. So that your price had no relationship to Boeing's contract, whether it was an incentive contract or a cost-plus contract?

Mr. PETROU. No, sir. We just made the best estimate that we knew.

Mr. ADLERMAN. You entered into this contract. You did the best you could. You came up with the costs, and you had these underruns, and it had no relationship as far as you know to the type of contract that Boeing had?

Mr. PETROU. We did not even know what type of contract they had.

Mr. ADLERMAN. These underruns or savings, or whatever you want to call them, had nothing to do with the incentive features of Boeing's contract?

Mr. PETROU. No; because we did not know it existed at the time.

The CHAIRMAN. Any further questions?

Senator MUSKIE. One question, Mr. Chairman.

Going back to the question of the type of contract: One of the complaints frequently heard about cost-plus contracts is that the

contractor has too little concern for elements of cost. He is not as concerned as he should be with the amount of overtime, for example, or excess personnel, or productivity of personnel, and so on.

Have you had any experience with that type contract?

Mr. PETROU. With cost plus fixed fee? Yes, sir.

Senator MUSKIE. Now, on the question of the incentive of the contractor to keep the cost down, is that incentive greater on the type of contract that you operated with here, or under the cost-plus-fixed-fee contract?

Mr. PETROU. I would say that the incentive under this kind of a contract is just a little bit more so than on the CPFF kind.

I wish to point out that on a CPFF, one gets a fixed fee, and if he able to reduce his costs considerably, his percentage of fee increases, because his cost decreases.

Senator MUSKIE. On this type of contract?

Mr. PETROU. On the CPFF type of contract.

I think perhaps Mr. Kirby might add something to this, because my interests are only in one division.

Mr. Kirby, do you want to comment on that?

Mr. KIRBY. I almost felt like I was forgotten here, for a minute. I was afraid somebody would catch up with me.

As far as the incentives in our type of operation are concerned, Mr. Petrou is correct. The price redetermination gives a somewhat greater incentive. However, the goals under which we use these two types of contracts are normally somewhat different.

And under the CPFF contract, these are normally development and very, very early production type contracts, and under this one you are trying to produce the most useful thing that you can get out. That stage—and one-price redetermination can be used for the greatest incentive—is the stage where you go to a more continuous production. And here the incentives are quite great.

Senator MUSKIE. Are you saying that these two types of contracts ought to be used, and are not necessarily adaptable to the same situations?

Mr. KIRBY. Generally not, as a matter of fact.

Senator MUSKIE. You think the fixed-fee redeterminable-type contract is more useful in the research and development-type contract problem than would be the cost plus fixed fee?

Mr. KIRBY. In any development program of the nature we undertake, that is, where we are out on the fringe of an unknown area, a cost-plus contract is really the only realistic way to attempt something like this, in most cases.

Senator MUSKIE. But this is not the type of contract you had in this case.

Mr. KIRBY. This was a production contract. The development part of the contract was CPFF, cost plus.

Senator MUSKIE. I am disturbed. I either misunderstand what you are now saying, or I misunderstood the previous testimony.

I understood that with contract 319, the reductions in unit price were explainable by the fact that research and development was a continuous process which resulted in a marked change in the configuration of the weapons system. If that is so, you were not strictly in the production operation here.

Mr. KIRBY. Well, the research and development was being carried out under a different contract.

Senator MUSKIE. I think I am going to need a little more explanation than that.

Mr. KIRBY. Well, it is Mr. Petrou's order.

Mr. HOWLAND. The yellow blocks were the price redetermination contracts, so-called production lots.

Senator MUSKIE. But nevertheless, as a result of the work done in the yellow part, the result was a drop of $36,000 in the unit price of the seeker under that contract.

Mr. HOWLAND. All the changes came out of the orange line and dropped down into the yellow line whenever they occurred, and went into the yellow blocks.

Senator MUSKIE. We are talking about which type of contract is more useful in this type of problem, the cost plus fixed fee, talking now about the yellow blocks, or the production blocks; which type of contract is more useful there, the cost-plus-fixed-fee or the fixed-price redeterminable contract which you had.

Now, as I understand Mr. Kirby's view on that, it is the kind of contract you had that was the most useful.

Mr. KIRBY. No, sir; I was not applying it to this specific case. I thought you were asking the general question. And I pointed out that after you had gone through the research and development stage to a certain point, where the design was reasonably set, then the price redetermination contract would become most applicable.

I did not intend to infer that it applied to that particular contract.

Senator MUSKIE. Well, now, will you apply it to this contract?

Mr. KIRBY. I am really not very familiar with the contract, but my guess is with such very early pricing, it was probably a little too early to use it. But I think things worked out quite successfully in this case, as far as getting the equipment out at a reasonable price.

Senator MUSKIE. Have you also worked under the incentive type contract?

Mr. KIRBY. Yes, sir. I personally have. I have some contracts with the Government that are incentive.

Senator MUSKIE. How would you compare the incentive to keep costs down under that contract with the incentive to keep costs down under these other two types of contract?

Mr. KIRBY. There is somewhat more incentive. It is not nearly as much as the straight fixed-price contract, however.

Senator MUSKIE. Is it enough to warrant the additional profit to the contractor?

Mr. KIRBY. That is a very difficult question to answer, because the terms of an incentive contract go rather wide, and a sharing ratio makes considerable difference in what the contractor gets to keep. So a broad statement is rather difficult.

Senator MUSKIE. In other words, you do have to be careful, because the additional incentive provided might not be justified by the results in keeping costs down?

Mr. KIRBY. The justification for keeping costs down is always present. This is not something that you turn on and off. I would hope. At least we do not.

Senator MUSKIE. I guess it has been the case right up to this point in the discussion that it is easy to arrive at generalities, and hard to nail it down.

The CHAIRMAN. Anything further?

All right, gentlemen. Thank you very much.

Call the next witnesses.

Mr. ADLERMAN. Mr. Emerson Reichard, Aerojet-General Corp.

The CHAIRMAN. All right, gentlemen.

Do you and each of you swear that the evidence you shall give before this Senate subcommittee shall be the truth, the whole truth, and nothing but the truth, so help you, God?

Mr. REICHARD. I do.

Mr. CATE. I do.

Mr. ODELL. I do.

The CHAIRMAN. Will you be seated?

Beginning on my left, will you identify yourself for the record, please, sir?

TESTIMONY OF EMERSON REICHARD, L. W. CATE, AND C. G. ODELL

Mr. CATE. L. W. Cate, department manager and project engineer on the Bomarc program.

Mr. REICHARD. Emerson S. Reichard, Jr., vice president-administration, Aerojet-General Corp.

Mr. ODELL. C. G. Odell, supervisor of contracts with the contract administration division, liquid rocket plant.

The CHAIRMAN. All right. Do you have a statement?

Mr. REICHARD. Mr. Chairman, I do have a prepared statement, which I would be willing to file as if read at this time.

The CHAIRMAN. The statement will be received and printed in the record in full at this point.

(Statement referred to follows:)

PREPARED STATEMENT ON BEHALF OF AEROJET-GENERAL CORP. PRESENTED BY E. S. REICHARD, JR., VICE PRESIDENT, ADMINISTRATION

On behalf of Aerojet-General Corp. I wish to express our appreciation for this opportunity to present our views before this subcommittee. We understand that your subcommittee is primarily interested at this time on Government procurement of missile systems and that you are interested in the relationships between the Boeing Co. and Aerojet-General Corp. where our firm has served as a subcontractor to Boeing in the Bomarc missile program. To assist your subcommittee in understanding the nature of the business and working relationship between our companies, I would like to review briefly the research and development program and the production phases of the Bomarc liquid propellant rocket engine boost system.

On the basis of competitive technical and cost proposals submitted by various companies the Boeing Co. selected Aerojet Engineering Corp. (now Aerojet-General Corp.) as a subcontractor to furnish services for the design, development, testing, and supplying of liquid propellant rocket engines and associated components for the XF–99 interceptor missile (referred to as Bomarc and now designated IM–99A for the tactical model). Aerojet's effort in the program began officially on April 11, 1951, on issue of a letter of intent from Boeing. An executed contract, Boeing P.O. 371355–9526 under prime contract AF 33(038)–19589, effective that date, was received a few months later.

The overall Bomarc missile concept, as well as the design features of the rocket engine, represented considerable advances in state-of-the-art in 1951. Throughout the development program Aerojet was frequently required to re-

direct its efforts, design changes and perform new items of work. This was necessary because we encountered problems in components and subsystems. We also had problems in compatibly incorporating subsystems being developed by Boeing, Aerojet, and others. Problems were also encountered because new concepts, higher performance and changes in operational conditions were constantly being investigated and incorporated into the system. During the period of performance on the R. & D. program, April 1951 to January 1958, 40 amendments or supplements to the contract were executed which affected the scope of work. Close coordination, extensive intercompany liaison and, in many instances, combined efforts between Aerojet and Boeing were necessary to gain solutions to problems and incorporate required changes in the minimum possible time and without possible disadvantages to other phases of the program.

Initially the rocket engine was of medium thrust and duration. Propellants were fed to the thrust chamber by chemically pressurizing the propellant tanks; that is, by directing the exhaust from gas generators directly into the main propellant tanks. Aerojet was responsible for developing and supplying the thrust chamber and gimbal assembly, the thrust chamber valve, gas generators, the pressurization and firing control components and the tank system for supplying propellants to the gas generators.

Boeing supplied the main propellant tanks and engine mounting structure (integral parts of the missile fuselage), the propellant feed lines, and miscellaneous fittings and control components. Aerojet initially performed all static firing tests of the booster system at the Experimental Rocket Test Station, Edwards Air Force Base, and later (beginning June 1956) at the Aerojet Sacramento plant test facility.

An interim rocket engine, Aerojet model AJ10–22, using gaseous nitrogen under high pressure for pressurization of the propellant tanks, was developed and delivered early in the program in order to permit testing of missile systems and components in a rocket flight environment before development of the prototype engine would be completed. The AJ10–22 engine was of lower thrust and, where prototype engine components were not available, utilized suitable components commercially available or from other rocket programs to the greatest extent practical. Components for two AJ10–22 engines were delivered to Boeing in May 1952, approximately 1 year after initiation of work on the contract.

The chemically pressurized rocket engine (Aerojet model AJ11–9) development program progressed, and the first engine was delivered to Boeing in December 1952. The major problem encountered was the development of a thrust chamber injector to give smooth, stable operation during the rocket starting transient and shutdown yet provide adequate performance during steady state operations. (Currently a frequent problem area in development of new rocket engines.) To a large extent the problem was attributable to use of the nonhypergolic propellants, JP–3 and WFNA, which do not ignite instantly on contact. Extensive development was also required in sequencing and control of the chemical pressurization system to provide a suitable rocket starting sequence.

The problems were satisfactorily resolved, and it was demonstrated that the system met all operational requirements in static tests. However, in missile flight tests, sloshing of propellants caused cooling of the pressurizing gases in the propellant tanks, resulting in reduced pressure in the tanks. The essentially constant flow system could not compensate for this pressure reduction and failure of the missile resulted in each flight test. In spite of "crash" joint and individual efforts by Boeing and Aerojet in which several new designs were fabricated, and tested within a short period of time, no immediate solution to the problem was forthcoming.

To provide a boost rocket so that missile flight tests could proceed while problems with the chemically pressurized rocket system were being resolved, a helium pressure-fed rocket engine was developed. The usable rocket components for the model AJ10–22 system were combined with the applicable components of the chemically pressurized system and new components were added where required to make up this interim system. A high pressure helium storage tank and a pressure regulating valve (with appropriate controls) replaced the gas generators and reactant tanks. Commercially available components were used whenever practical to provide a suitable rocket with the least possible delay.

Through use of a new hypergolic propellant combination, JP–X (a mixture of jet fuel and unsymmetrical dimethylhydrazine) and RFNA (red fuming nitric

acid), already undergoing development testing on the program, the thrust chamber stability and operational problems were greatly alleviated. Development programs were continued, however, for improvement of the rocket start transient, system stability, and thrust chamber performance.

At this time unsymmetrical dimethylhydrazine (UDMH) was produced only in laboratory quantities and its price seemed prohibitive for the application. Aerojet devised a method to produce the required quantities, reducing the costs to a value one-tenth of the prior cost, and continued production until an adequate supply was commercially available. Also, by extensive corrosion, compatibility, and performance testing it was demonstrated that by adding a small quantity of hydrofluoric acid to the RFNA, corrosion effects were almost eliminated, making it possible to store a loaded missile in ready-to-fire condition for periods in excess of 6 months without damage to the missile or affecting performance. This inhibited acid (IRFNA) was adopted a short time later.

During development of this interim rocket, programs were undertaken to develop and evaluate a pump fed system and a heated helium pressurized system as possible alternatives for the chemically pressurized system. Feasibility of using these systems to provide higher thrust and longer duration for an advanced Bomarc of greater range was also evaluated. Neither of these systems was ever adopted, and the problems with the chemically pressurized system were not suitably solved although effort was continued until mid-1954.

The development program for the IM–99A cold helium pressurized rocket engine system continued through a series of five interim models, being terminated on satisfactory completion of preliminary flight rating tests of the prototype tactical model in July 1957. Design of an advanced rocket system under a new Boeing purchase order was begun, but all Aerojet development work on the Bomarc program was terminated by January 1958, while production and delivery of hardware continued.

Qualification tests of the IM–99A rocket subsystem were begun at our Sacramento facility in Feburary 1959, under a new contract (Boeing P.O. No. 5–024358–7075, prime contract AF 33(600)–35359), and were completed in March 1960. All parts of the rocket subsystem satisfactorily met qualification requirements although need for improvement was indicated for some components.

In summary, through the combined efforts of the Boeing Co. and Aerojet-General Corp. a suitable booster rocket for the IM–99A missile was developed and was put into production for tactical service. In addition, the research and development work performed for this program greatly advanced the art of rocketry, and the technical knowledge gained is of inestimable value for current and future rocket projects.

For instance, the Bomarc was the first engine to use UDMH. The manufacturing techniques we developed in producing and using UDMH have greatly enhanced the work on such systems as Vanguard, Able, Ablestar, and Titan II. Considerable economies in these latter programs were direct reflections of our work in the Bomarc program.

Upon the completion of the research and development phases of the Bomarc boost rocket program conducted at the Azusa plant, the Aerojet-General liquid rocket plant, Sacramento, Calif., began the production phases of this program and successfully completed the qualification testing of the systems. The liquid rocket plant was engaged in these segments of the Bomarc program from May 1956 through November 1960. A brief description of this effort is provided in the following summary of Air Force prime contracts and the Boeing Co. fixed price, redeterminable subcontracts:

A. AF 33(600)–32832: Boeing P.O. 5–004235–7000. Aerojet entered into this subcontract for the production of 38 boost systems in May 1956. The schedule required delivery of the systems from February through October 1958. However, because of the urgency of the program, accelerated deliveries were accomplished in December 1957 and January 1958. The redetermination proposal was submitted as required, and negotiations were completed in October 1958. The target price was $26,338 for each boost system, and the negotiated redeterminable price was $29,282; this increase from target to final price was the result of increased costs due to acceleration of the program and higher production costs than first anticipated.

B. AF 33(600)–35359: Boeing P.O. 5–004250–7000. This subcontract was entered into in January 1958 and called for 23 boost systems. The schedule required that these be delivered from October 1958 through February 1959. Timely delivery was accomplished and production was completed on schedule.

The redetermination proposal was presented in October 1959. Negotiations were completed in December 1960. The target price was $24,500 for each boost system, and the final redeterminable price was $21,063 per system.

C. AF 33(600)-36319: Boeing P.O. 5-013849-7075. This subcontract was executed in March 1958 and required Aerojet-General to produce 78 boost rocket systems. The schedule required delivery of the systems from February through August 1959. The delivery schedule was satisfactorily accomplished. The redetermination proposal was submitted to the Boeing Co. in October 1959, and redetermination negotiations were completed in December 1960. The target price for the system was $25,420, and final redeterminable price was $21,424 per system.

D. AF 33(600)-38098: Boeing P.O. 5-036633-7075. This subcontract was dated March 1959 and covered the final quantities of the boost rocket systems to be produced for the Bomarc A. The schedule required 168 boost systems to be delivered from September 1959 through October 1960. The redetermination proposal was forwarded to the Boeing Co. in October 1959, and final negotiations were completed in December 1960. Target price for the systems produced under this subcontract was $25,300 per system, and the final redeterminable price was $19,932 per system. Deliveries under this subcontract were accomplished in a timely manner. However, because of production difficulties in manufacturing the last lots of thrust chamber assemblies, the subcontract was completed approximately 30 days behind schedule.

It is noted that the redetermination proposals and negotiations for the latter three subcontracts discussed above were coincidentally accomplished on the same dates. This was considered prudent by Boeing and Aerojet in order that the redetermination proposals and negotiations could be accomplished with considerable savings in administrative efforts. The Boeing Co. conducted an extensive audit of the costs incurred by Aerojet-General and comprehensive negotiations were conducted. In the negotiations of the final prices of the above listed subcontracts, Aerojet-General consistently revealed the latest cost information to the Boeing Co. The Boeing Co. endeavored to establish realistic target prices, and we believe this was accomplished. Through exercising sound management controls and through the incentive afforded by the subcontracts, Aerojet-General was able to effect cost reductions.

Concurrent with a portion of the production work, the qualification test program was performed at Aerojet's plant. The tests were under Boeing prime contract AF 33(600)-35359 and Boeing's CPFF P.O. No. 5-024358-7075 to Aerojet dated June 3, 1959. The qualification test program was concluded in March 1960.

The target prices for the four production-type subcontracts totaled $7,970,484. These target prices were reduced by approximately $1,377,000 to $6,593,406 by the price redetermination negotiations. Aerojet's profit on these four subcontracts approximated 9.8 percent of the target prices, or about 11.9 percent of the redetermined prices. Aerojet's total participation in the Bomarc research and development and production efforts under Boeing subcontracts was about $26,900,000 of which approximately $2,362,000 was fee or profit, or 8.8 percent. The percentages given are against the total prices rather than percentages of the costs before profit.

Since the completion of the production of the boost systems, Aerojet-General has continued to supply logistic services to the Boeing Co. and the Air Force in the form of spare parts and technical data. We have eagerly entered into the study of operational complexities of the Bomarc missile and at this time are involved in conferences with the Boeing Co. and the Air Force concerning current operational matters. It is our intent to continue these services as long as the Bomarc weapon system is in use.

In all our business affairs with the Boeing Co., Aerojet-General has found Boeing to be fair and reasonable and highly effective and efficient in negotiations. We have had our differences of opinion, but these differences have been satisfactorily resolved for the mutual benefit of Boeing, the Air Force, and Aerojet.

The CHAIRMAN. Now, would you care to highlight it briefly?

Mr. REICHARD. I would like to state that Aerojet's relationship with Boeing was that of a subcontractor in the design, development, testing,

and ultimately production of the liquid propellant boost rocket system employed in the Bomarc A missile.

Our initial efforts with the Boeing Co. started in early 1951, when we were first awarded the research and development program.

Our production efforts were concluded during November 1960.

During this total period of time, over 9 years, Aerojet performed a total subcontract value for Boeing of approximately $26,900,000. The types of contracts which were employed with us by Boeing were CPFF for the research and development program and fixed-price-redeterminable for the production program.

I would like to state that throughout our relationship with the Boeing Airplane Co., or the Boeing Co., we felt that our business affairs resulted in a very fair and reasonable relationship between the two companies, and we found Boeing quite effective and efficient in their procurement negotiations, and that the entire research and development and technical program necessitated a very close management and engineering relationship between the two companies.

The CHAIRMAN. All right, Mr. Counsel.

Mr. ADLERMAN. Mr. Reichard, the total business you did with Boeing amounted to $26.9 million?

Mr. REICHARD. That is correct.

Mr. ADLERMAN. Your profit on that was $2,400,000?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. And you were the one that designed and developed and did the research work and the production work on the liquid rocket for the A missile?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. That was discontinued on the A missile and you went into a solid rocket on the B missile. Is that right?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. And did you have any production contracts for the A missile?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. Did you have a contract 36319?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. Or, rather, I mean: Did you have a contract under that Air Force number?

Mr. REICHARD. Yes, a subcontract under that prime.

Mr. ADLERMAN. And did you make a proposal or enter into an agreement with the Boeing Co. for the production of the liquid booster under that contract number?

Mr. REICHARD. Yes, sir, we did.

Mr. ADLERMAN. What was the price that you arranged with Boeing?

Mr. REICHARD. For a quantity of 78 boost rocket systems, we negotiated a target price of $25,420 per unit.

Mr. ADLERMAN. At a total price of—that would be $1,980,000?

Mr. REICHARD. It is approximately $1,980,000, yes, sir.

Mr. ADLERMAN. And was your price finally redetermined at $1,640,000?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. So you had an underrun there of approximately $300,000?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. Mr. Tierney, under that contract with Aerojet, did the Boeing Co. have any contingency factor to the amount set by Aerojet of $1,098,000?

Mr. TIERNEY. Yes, a factor of 15 percent was added.

Mr. ADLERMAN. And did that come to $2,280,000?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And so the total underrun under that situation was $632,000?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And, Mr. Reichard, under contract No. 38098, what was your price with Boeing in 1959, prior to March 27, 1959?

Mr. REICHARD. We had a subcontract in which we arranged or negotiated a target price of $25,300 per system for a quantity of 168 boost rocket systems.

Mr. ADLERMAN. And did that total $4,250,000?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. Mr. Tierney, did Boeing add any contingency to that when it made a price with the Air Force?

Mr. TIERNEY. A 10-percent factor was added to that.

Mr. ADLERMAN. And that came to $4,670,000?

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And, Mr. Reichard, did your contract finally get redetermined?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. And what was your redetermined price?

Mr. REICHARD. On a unit basis, $19,932 per system.

Mr. ADLERMAN. And the total redetermined price? Was that $3,340,000?

Mr. REICHARD. Yes, sir.

Mr. ADLERMAN. All right. This represents an underrun of $1,320,000, based on a cost of $4,670,000.

The CHAIRMAN. Any questions?

Thank you very much, gentlemen.

Mr. ADLERMAN. Mr. Moxley and Mr. Davis, of Thiokol, and other representatives.

The CHAIRMAN. All right, gentlemen. Come around, please. Those of you who are going to testify will be sworn.

Do you and each of you swear that the evidence you shall give before this Senate subcommittee shall be the truth, the whole truth, and nothing but the truth, so help you, God?

Mr. MOXLEY. I do.

Mr. DAVIS. I do.

Mr. RAWLS. I do.

Mr. BRANDT. I do.

Mr. TAYLOR. I do.

The CHAIRMAN. Just be seated there, please.

Beginning on my left, will you give your names and identify yourselves, please, for the record?

TESTIMONY OF CHARLES J. MOXLEY, ROBERT E. DAVIS, ALFRED RAWLS, JR., WILLIAM BRANDT, AND LAWRENCE C. TAYLOR

Mr. MOXLEY. Charles J. Moxley.

Mr. DAVIS. Robert E. Davis.

The CHAIRMAN. What is your position, Mr. Moxley?

Mr. MOXLEY. Director of contracts, materiel-legal, for the Thiokol Chemical Corp.

Mr. DAVIS. Robert E. Davis, manager of Thiokol's eastern district office.

Mr. RAWLS. Alfred Rawls, Jr., treasurer and comptroller, Thiokol Chemical Corp.

Mr. BRANDT. William Brandt, project manager.

Mr. TAYLOR. Lawrence C. Taylor, Wasatch Division, Thiokol Chemical Corp.

The CHAIRMAN. Do you have a prepared statement?

Mr. RAWLS. We do not have a printed statement. I have a few remarks.

The CHAIRMAN. Very well. You may make a brief statement.

Mr. RAWLS. First off, our work involved the solid booster unit in the Bomarc missile. The work originally was performed on a CPFF research and development contract, under Boeing, and the work was performed at our Redstone division in Huntsville, Ala. That initial contract also involved a qualification program; and because of quantity and distance regulations, workload, and so forth, our Redstone division placed an interdivisional work order with our Wasatch division located near Brigham City, Utah, under which that division performed the qualification program.

That work was done on the CPFF contract, and that contract is in the final closeout stages at this time.

The total estimated cost, or the total actual cost, known at this time, approximates $12,928,000, and the fixed fee negotiated was $702,000, an effective fee-to-cost relationship of 5.43 percent. Actually, there was an overrun of about $2,600,000 in this portion of the development program.

In addition to the performance of our qualification program under the original contract, our Wasatch division negotiated separate contracts with Boeing for different production units.

I believe there were three contracts involved. One called for 16 engines, which were similar to qualification runs. The next 2 orders involved 116 engines and 185 engines.

The 3 production contracts, the ones for 16, 116, and 185 units, were on a fixed-price, price-redeterminable basis.

As was mentioned by I think the Westinghouse people, there was concurrency in connection with our work under the development contract and the production contracts.

Between the concurrency problem and also the question of long leadtime procurements, the production contracts were negotiated before the development contract was completed.

One evidence of the overlap, I think, can be seen as a result of knowledge that the last qualification engine under the qualification program was fired in about April of 1961, and the final report was

written in June of 1961, whereas the first production engine was completed in October of 1960.

In view of our relationships as a subcontractor to Boeing, and thinking back over the long relationships we have had with Boeing on this program, I believe that it is proper to state that Boeing has performed a service that was helpful to the overall advancement of the Bomarc B missile.

Boeing, for instance, had representatives at our Redstone and Wasatch Divisions, who kept very much on top of developments; and as soon as problems were encountered, the Boeing people at Seattle were made aware of such problems, and they were always ready to come in, send specialists, and do everything they could to help overcome the difficulties at the earliest possible time.

Now, along those lines, the biggest assistance, as I view it, in the work and the relationships and surveillance at Boeing, was brought about by being present, having the proper technical or other skills available, so that as our people endeavored to resolve the problems which we had encountered, they had people ready to give a decision as to "Yes, we concur. Go ahead."

Remembering again the fact that our solid B booster was to replace the liquid A booster, there were further complications, in that this booster unit that we were making should be put into the bird, or the missile, in such a manner that it did not disturb all of the other preceding design work and development work on the missile itself, so that we were confronted with living with certain design characteristics or dimensions and performance requirements that had been determined substantially in advance of the time our work on the program began.

I believe that summarizes my highlighting of our arrangement with Boeing and our work on the Bomarc program, and our representatives here will be glad to entertain any questions that you or your staff might want to put.

The CHAIRMAN. All right, Mr. Counsel. Any questions?

Mr. ADLERMAN. Mr. Rawls, are you familiar with the total cost of the contract between Thiokol and Boeing?

Mr. RAWLS. We are working toward finalizing some figures on that. One of our problems in giving you a specific answer is that not one of the three fixed-price, price-redeterminable contracts have been redetermined.

Mr. ADLERMAN. Could you give us the estimates?

Mr. RAWLS. Yes. I will give you the target price, as a matter of fact. And I must plead that this is, to the best of my knowledge, correct. We did not have all our files with us, and we were scrambling just to get some numbers.

The R. & D. contract of qualification, as I mentioned before, on a CPFF basis, was a total, including fee, of approximately $13,600,000.

The target price on the 16 units, production quality units, was $895,000. The target price on the 116 unit quantity was $6,317,000.

And the target price on the 185 units was $8,643,000.

Is that correct?

Mr. MOXLEY. That is correct.

Mr. ADLERMAN. We have a figure, supplied us by your company I think, which shows that the total cost of the contract with Boeing ran $27,500,000. Does that meet with your understanding?

Mr. RAWLS. As I said, the fact that the redeterminable contracts have not been redetermined—we have to deal with estimates. And this I believe is a reasonably good estimate.

Mr. ADLERMAN. And is your estimated profit $2,290,000?

Mr. RAWLS. I am sorry. Would you repeat that?

Mr. ADLERMAN. Is your estimated profit $2,290,000?

Mr. MOXLEY. That is correct.

Mr. RAWLS. That is correct, sir.

Mr. ADLERMAN. And that shows a rate of return of about 9 percent?

Mr. RAWLS. A rate of return?

Mr. ADLERMAN. On sales.

Mr. RAWLS. On sales? Yes. That is approximately it.

Mr. ADLERMAN. Now, your business is principally in solid fuels, solid rockets; is that right?

Mr. RAWLS. That is correct, sir. We have three operating divisions, a chemical division—or we have three operating groups—chemical operations, specialty operations, and rocket operations. The rocket operations have five divisions, four of which are engaged in solid propellant work and one engaged in liquid engine work.

Mr. ADLERMAN. Now, in the solid propellant field, what other missiles are you working on, besides the Bomarc?

Mr. RAWLS. First stage engine for the Minuteman, the Bomarc, Pershing first and second stages, Nike-Zeus first, second, and Kinard motor, the various Falcon engines—there has been a whole series of them. We are working on the Nike-Hercules sustainer, the Matador, the Mace, the Sergeant, the Lacrosse. We are doing development work on the Surveyor program and on the Dyna-Soar program, the Sublock program for the Navy, the sub to Goodyear Corp.

Mr. ADLERMAN. In other words, you are one of the biggest in the field of solid propellants as far as the missile industry is concerned.

Mr. RAWLS. Yes, sir.

Mr. ADLERMAN. And what kind of a contract did you have with Boeing? By that I mean was it a research and development contract?

Mr. RAWLS. The initial contract on the Bomarc B with Boeing was research and development and qualification, and it was a cost-plus-fixed-fee type.

Mr. ADLERMAN. And a production contract?

Mr. RAWLS. We have 3 production contracts, 1 for 16 units, 1 for 116 units, and 1 for 185 units. Each one of those contracts is on a fixed-price, price-redeterminable basis.

Mr. ADLERMAN. Now, when the Bomarc went from an A to a B, that is when you came into the picture. Is that right?

Mr. RAWLS. Exactly.

Mr. ADLERMAN. And were you given the specifications that would be required of your company, as far as performance is concerned, as to weight and other characteristics?

Mr. RAWLS. I am not positive of that, and I am going to pass the question to Mr. Brandt, the project engineer. But my general answer would be that Boeing sent out an invitation to bid, and all of that type of information would have been set forth in the request or would have been made available to us in a prenegotiation meeting.

Bill, you have the floor.

Mr. BRANDT. We were given what was called a procurement specification, and that procurement specification established all of the design objectives to which we were to work.

Mr. ADLERMAN. In other words, they wanted you to produce something that would lift that rocket at such speed and to such height, and to be of such size and dimensions, and of such weight, and so forth. But the research and development and the design of the rocket was left to you.

Mr. BRANDT. That is correct.

Mr. ADLERMAN. Or to your company, I mean. Is that right?

Mr. BRANDT. Again, please?

Mr. ADLERMAN. The research and development and the design of this was left to your company?

Mr. BRANDT. That is correct.

Mr. ADLERMAN. You did have certain interfacing factors that they had to work with you closely on; is that right?

Mr. BRANDT. Very much so, on the case, and in terms of the thrust actions control mechanism.

Mr. ADLERMAN. Now, are you familiar with the Air Force procurement regulation, 70–9?

Mr. BRANDT. Yes; I am.

Mr. ADLERMAN. And what does that call for?

Mr. BRANDT. It states that under normal practices a propulsion system will be procured under a category 2 system unless a specific deviation is taken.

Mr. ADLERMAN. By that category 2, does that mean that the Air Force has certain specific items which they feel should be broken out, and they spell it out that at the earliest possible moment you should break out a propulsion system and move it from a category 1, which would be subcontracting, and move it to a category 2, which would put it in the class of associate contractor, or into category 3, which would put it in the class of a competitive bid and a direct contract between the Government and the contractor? Is that right?

Mr. BRANDT. That is the intent.

Mr. ADLERMAN. And if it went to category 2, it goes to a contract between the Air Force and the man that makes it as an associate contract; is that right?

Mr. BRANDT. That is correct, under category 2.

Mr. ADLERMAN. And there is a certain limitation on the right of the Air Force to give out contracts for propulsion systems without getting permission to do so to a prime contractor, who will in turn subcontract it? In other words, they must get a deviation, they must get an exception, to those rules. Is that correct?

Mr. BRANDT. They must have a deviation taken to the regulation, concurred in by both Headquarters ARDC and the Air Materiel Command Headquarters.

Mr. ADLERMAN. Mr. Davis, I think you are familiar with the transactions that occurred between the Air Force and your company and Boeing on the attempts to change this procurement from category 1 to category 2, which would be breakout to Thiokol as an associate contractor.

Mr. DAVIS. That is correct.

Mr. ADLERMAN. And did you attend any conferences at Dayton, Ohio, relating to such breakout?

Mr. DAVIS. Yes, I did. On September 24, 1959, and again we attended several conferences with Air Force personnel during a time period of approximately October 13, 1959.

Mr. ADLERMAN. Would you tell us briefly what was the nature of those conferences, and what occurred there, and what was said?

Mr. DAVIS. Basically, Thiokol during this time attempted to break out the procurement of the Bomarc rocket motor for the Bomarc B as a category 2 item defined in Air Force Regulation 70–9.

We contacted various top echelon personnel within the Air Force, namely, Gen. Samuel Anderson, who was then commander of the Air Materiel Command.

Mr. ADLERMAN. Anderson, did you say?

Mr. DAVIS. Anderson, yes. He was the commander of the Air Materiel Command.

We also had discussions with General Rolman, who was deputy for procurement, if my memory is correct, who was on a staff position to General Anderson.

We had conversations with Maj. Gen. Beverly Warren, who at that time was the commander of the Aeronautical Systems Division, which represented the procurement aspects of weapons systems being controlled at the Dayton complex.

In addition to this, we had discussions with General Holzapple, who is head of the ARDS Detachment 1, also located at the Dayton complex.

During our conversations with General Anderson, we explained to General Anderson that the solid rocket industry, namely, Thiokol Chemical Corp. at that time, felt it necessary to maintain control over the entire solid propellent rocket motor, including the rocket motor case, nozzle, insulation, as well as the propellant.

Our basic reason along these lines was that since we had the responsibility for the performance and reliability of the motor, we should be vested with the procurement and control of the entire rocket motor.

General Anderson, at this time, indicated to us that he thought this to be a desirable situation, and we then proceeded in our contacts with the other people previously mentioned.

General Warren, who, as I mentioned, represented the procurement aspects of the Bomarc program at Dayton, was given basically the same type of story. However, General Warren took a position that he felt that Boeing should maintain responsibility for procurement of the Bomarc solid rocket motor not only during the research and development phases, but also during the production run.

The reason provided to representatives of Thiokol during the period of approximately October 13, 1959 was that the Bomarc B missile encountered severe aerodynamic loads during flight maneuvers, and inasmuch as the rocket motor case was also a part of the airframe, he felt that the complete responsibility of engineering, coordination, and procurement of the rocket motor should remain with the Boeing Co.

At this time, there was apparently no consistency within the Air Force as to how the solid propellent motor should be procured, whether

Government-associated Air Force equipment, or whether it should be contractor-furnished equipment.

I hope that summarizes briefly some of the aspects of our contracts during this late 1959 time period.

Mr. ADLERMAN. One of the principal elements that was debated was as to whether or not it would be feasible to break out and make a separate contract with Thiokol; the fact that the casing of the engine, the one that contained the fuel, was the air skin or the part of the frame and air skin of the missile itself?

Mr. DAVIS. The airframe and the rocket motor case were one and the same on the Bomarc B.

Mr. ADLERMAN. Would you just point out where it will be in that?

Mr. DAVIS. In back.

Mr. ADLERMAN. Back of the wing and before the tail?

Mr. DAVIS. That is right. Back in the aft section, here, and the rocket motor proper was located up in this section, here, just after the wings.

Mr. ADLERMAN. That entire part of the bird would be the casing which would contain the fuel for the rocket?

Mr. DAVIS. That is correct.

Mr. ADLERMAN. And does Boeing contend that they should control that, because they had the aerodynamic features?

Mr. DAVIS. That was the contention.

Mr. ADLERMAN. Were there any particular stress factors or bend factors they felt it was necessary for them to control?

Mr. DAVIS. I can only relate at that time that this was the predominant factor provided to Thiokol why the decision was given to continue with Boeing on the solid fuel motor.

We did not know what the bending loads were, at the junction of the rocket motor case with the rest of the airframe. The rocket motor case during that period of time was manufactured by Boeing, and sufficient strength was provided in the case due to the aerodynamic factor to also take care with adequate safety factor of the pressure developed during the burning of the solid propellent rocket motor.

Mr. ADLERMAN. Now, if Thiokol had been given these stress factors, the strains, and the specifications, that would be required for that, could Thiokol have manufactured or caused to be manufactured through proper subcontractors that part of the missile?

Mr. DAVIS. Given performance specification on the aerodynamic load, we could have provided a rocket motor case through proper design to meet these factors.

Mr. ADLERMAN. Now, is that true in the case of the Minuteman, for example?

Mr. DAVIS. It is.

Mr. ADLERMAN. The casing in the Minuteman, first stage—is that part of the skin and the outside of the missile, or part of the frame itself?

Mr. DAVIS. Yes, it is.

Mr. ADLERMAN. And is that the contract where Boeing is the prime integrating contractor?

Mr. DAVIS. Boeing is known as the integration test contractor on the Minuteman missile.

Mr. ADLERMAN. And you are an associate contractor?

Mr. DAVIS. We are an associate contractor to the Ballistics Systems Division, California.

Mr. ADLERMAN. Now, do you have a similar situation in the Pershing?

Mr. DAVIS. Yes, we do.

Mr. ADLERMAN. And the Pershing—would you describe what missile that is?

Mr. DAVIS. A Pershing is a medium-range two-stage solid propellent missile to support the ground personnel of the Army. It has a range that is classified, but I would be willing to supply this to the committee at a later date.

Mr. ADLERMAN. It is a ground-to-ground missile?

Mr. DAVIS. It is.

Mr. ADLERMAN. And is the solid booster in that missile?

Mr. DAVIS. Yes; it is a two-stage solid propellent motor.

Mr. ADLERMAN. And is the outside skin or the airframe itself——

Mr. DAVIS. One and the same.

Mr. ADLERMAN. The same?

Mr. DAVIS. Yes; very similar to the Minuteman, except for the Minuteman being the three-stage intercontinental ballistic missile.

Mr. ADLERMAN. Do you know of any others where they have the same factors?

Mr. DAVIS. There is one smaller rocket motor which we are involved on, and this is what we call the M–46 solid propellent motor. It is commonly known as the Falcon, or the 3–A–4–E series of missiles. And there the rocket motor case is an integral part of the airframe itself.

Mr. ADLERMAN. In each of those cases, has the rocket motor been broken out and given as a separate propulsion contract?

Mr. DAVIS. In the Minuteman, for example, the propulsion system in all three stages is on an associate contractor basis from the Ballistics Systems Division. The Pershing is a direct contract from the Martin Co., rather than from the Army Ordnance Missile Command at Huntsville, Ala. However, in the case of the Pershing, Thiokol retained complete design rights to the rocket motor case and even procures the rocket motor case at this time along with its nozzle and equipment such as thrust factor control and also the thrust determination.

Mr. ADLERMAN. In other words, in the Pershing, the rocket company does have the manufacture of the casing itself?

Mr. DAVIS. The rocket manufacturer, namely, Thiokol, on the Pershing, does procure that.

Mr. ADLERMAN. From the Martin Co.?

Mr. DAVIS. That is correct.

One additional missile system which also utilizes a solid propellant rocket motor, or where the rocket motor case is an integrate part of the airframe is the Sublock missile provided to the Navy by contract with Goodyear.

Mr. RAWLS. I would like to make just a point.

Your question, I think, was: Does Thiokol produce the motor case?

Mr. ADLERMAN. No; you usually subcontract that.

Mr. RAWLS. Right. I wanted to make that clear.

Mr. ADLERMAN. There are certain companies that are specialists in this type of subcontract work, who are specialists in making casings of this type. I think Allison Division——

Mr. DAVIS. Well, there are several companies involved in the manufacture of rocket motor cases.

Mr. ADLERMAN. I would just like to call your attention to this chart No. 9. I notice there that your estimated profit will be $2.3 million. Is that right?

Mr. RAWLS. That is right. That is essentially the figures.

Mr. ADLERMAN. And that includes the research and development, as well as the production and everything?

Mr. RAWLS. As well as the production of these three different quantities.

Mr. ADLERMAN. We have already put these figures in, and that reflects that on your share of the contract, your costs, the ratio of profits that Boeing would get would amount to about $2,400,000. Now, if this rocket were broken out, had been broken out—I guess it is rather late now to do it—if it had been broken out, a considerable part of that $2,400,000 would have been eliminated. Is that so?

Mr. RAWLS. I guess we have to say that we really do not know, because there were certain functions that the Boeing people did that someone else would have had to do, and it may have meant more work for Thiokol.

Mr. ADLERMAN. In other words, somebody had to coordinate work on this thing?

Mr. RAWLS. The liaison and coordination.

Mr. ADLERMAN. So that part of this integration work may be found in the cost that Boeing would have had, or that Boeing did have, rather.

Mr. RAWLS. I believe that that is a proper statement.

Mr. ADLERMAN. But that cost is in their own cost, and not based on the cost of your effort?

Mr. RAWLS. That is right.

Mr. ADLERMAN. So it would still not eliminate or pertain to this $2.4 million?

Mr. RAWLS. Yes. The Boeing people had a representative in our facility.

Mr. ADLERMAN. The cost would be the same. The question is: Would the profits be there?

Mr. RAWLS. Yes. We cannot even say that the cost would be the same, because we do not know what it would have cost the Air Force had they elected to do the coordination that Boeing did.

Mr. ADLERMAN. Now, Mr. Davis, are you familiar with this memorandum of October 13, 1959?

Mr. DAVIS. 1959?

Mr. ADLERMAN. Yes.

Mr. DAVIS. Yes, I am.

Mr. ADLERMAN. And who is Mr. Marquard?

Mr. DAVIS. Mr. Marquard at that time was the manager of Thiokol's Dayton office.

Mr. ADLERMAN. And were you present with Mr. Marquard at these meetings?

Mr. DAVIS. Yes, I was.

Mr. ADLERMAN. And were you present at the time that he had the discussion with General Warren?

Mr. DAVIS. I was.

Mr. ADLERMAN. And was there a statement made by General Warren when he opposed breaking out the contract, to the effect—and I am not quoting him exactly, but I am just quoting him from the memorandum, here, referring to General Warren:

He let it be known that he was very much in favor of allowing prime complete missile responsibility in weapons systems manufacture. He pointed out that Boeing Airplane needs the Bomarc casework.

Mr. DAVIS. The motor case for the Bomarc B solid rocket.

Mr. ADLERMAN. The solid fuel case, the casework. [Reading:]

because they had just lost a wing subcontract on North America's canceled F–108.

Are you familiar with that statement?

Mr. DAVIS. Yes, I am.

Mr. ADLERMAN. Do you think that is a good reason for not breaking out a unit?

Mr. DAVIS. I would have to say that it is not a good reason.

Mr. ADLERMAN. One of the reasons that was advanced by General Warren was that he pointed out that the Boeing Co. needs the Bomarc work because they had just lost the wing subcontract on North American's canceled F–108 contract?

Mr. RAWLS. I would like to add a comment, there.

I do think that there is some merit, and serious consideration has to be given by the Department of Defense and/or the three services to keeping a good industrial base. And whether something of the nature about which you just read or quoted falls into that category or not, I am not qualified to tell, or even to voice an opinion; but I do believe there is merit in the maintenance of a good industrial mobilization base.

The CHAIRMAN. In other words, if it sustained a loss in one area, even outside of Government contracts, the Government should take that into account in making contracts with that company? Is that what you are saying?

Mr. RAWLS. Well, you are making my statement say a little more than I intended to say.

The CHAIRMAN. I think maybe that is true, too. And I am trying to get just what we did intend, so that we would not exaggerate.

Mr. RAWLS. What I am saying really is that a contractor develops facilities. He expends money on facilities. He develops a capability. There are perhaps Government facilities involved. There is the work force, the technology. And I do think that very serious thought ought to be given before you permit a facility to go out.

The CHAIRMAN. In other words, before you break out, you ought to consider what impact—notwithstanding it may be cheaper for the Government to do it, it might well break out and get more economy, but it ought to also take into account other factors that might produce an impact adverse to the original contract?

Mr. RAWLS. Yes. It is not too much different than the clause that is inserted in contracts that says, "You should do as much work with

small business concerns as you possibly can," or that you should utilize labor distress areas.

Now, this is a facility distress area, perhaps.

The CHAIRMAN. Very well. Anything further?

Mr. ADLERMAN. I just would like to put these three into evidence.

The CHAIRMAN. The three memorandums referred to by counsel——

Have you identified them, Mr. Davis?

Mr. DAVIS. I have seen these memos, and I have seen copies of them.

The CHAIRMAN. They may be inserted as exhibits 13, 14, and 15.

(Documents referred to were marked "Exhibits Nos. 13 and 14" and will be found in the appendix on pp. 927–936. Exhibit 15 may be found in the files of the subcommittee.)

The CHAIRMAN. All right. Anything further?

Mr. Tierney, did you receive this letter that I hand you from Mr. Mechesney of the Westinghouse Electric Corp.?

I believe he is vice president or administrative assistant to the vice president, the letter being dated May 18, 1962.

Mr. TIERNEY. I did, Mr. Chairman.

The CHAIRMAN. The letter may be inserted in the record at this point.

(Letter referred to follows:)

WESTINGHOUSE ELECTRIC CORP.,
Baltimore, Md., May 18, 1962.

Subject: Westinghouse Bomarc subcontracts.

COMMITTEE ON GOVERNMENT OPERATIONS,
SENATE PERMANENT SUBCOMMITTEE ON INVESTIGATIONS,
Washington, D.C.
(Attention of Mr. Paul J. Tierney, assistant counsel).

DEAR MR. TIERNEY: Pursuant to our conversation of Wednesday, May 16, 1962, the following data applies to the initial and final pricing of certain of the target seeker subcontracts in which you are interested.

AF33(600)–36919 (78 units, Boeing purchase order 5–013831)

The initial unit price of $71,436 was established on February 6, 1958, for a total of 78 DPN–34 target seekers. The subsequent proration of tool operation charges and a model change which became effective September 22, 1958, increased this initial price to $74,569×78=$5,816,382 per unit. On May 15, 1959, Westinghouse voluntarily reduced this unit price, including tooling charges, to $49,813.

Final redetermination of this purchase order was negotiated in August 1959 at a price of $43,500 per unit for a quantity of 78 units giving a total redetermined price of $3,393,000.

AF33(600)–38098 (168 units, Boeing purchase order 5–024368)

A temporary unit billing price of $59,593 was established on September 5, 1958, for a quantity of 175 DPN–34 target seekers. Subsequently, 7 units were terminated, leaving a balance of 168 seekers on order at a temporary unit billing price of $59,593, which extended is $10,011,624.

The firm fixed price for the 168 units on this purchase order was negotiated in August 1959 at $36,500 per unit for a total of $6,132,000. Subsequent changes affecting the last 67 of this 168-unit order increased the total price for these 168 units to $6,222,215.

As a result of a separate Boeing purchase order placed soon after the termination of the 7 units above, Westinghouse supplied 8 seekers, the purchase order for which shows the same preliminary billing price and final unit price as the order for 168 units ($59,593 and $36,500, respectively).

AF33(600)–38101 (116 units, Boeing purchase order 5–035515)

The initial unit price of $98,520 for 116 DPN–53 target seekers was established on December 29, 1958, giving a total of $11,428,320. Also on December 29, 1958, production tooling for the DPN–53 seeker was placed on order at an initial price of $6,449,165 under this same prime contract.

Twenty-three additional DPN–53 seekers were ordered by separate Boeing purchase order under this same prime contract in March 1959. These were priced at the same initial unit price as the original quantity of 116 target seekers.

The final redetermined price of $95,230 per unit for 116 seekers was negotiated in May 1961. Subsequently, changes made to the last 42 units of this quantity resulted in an increase in the unit price of these 42 units to $96,416 making a new total price of $11,096,492 (74 units at $95,230 and 42 units at $96,416). The final redetermined price for the production tooling was established during these negotiations in May 1961 and became $6,209,412.

AF33(600)–40033 (185 units, Boeing purchase order 5–071730)

The initial price of $71,740 was established for 185 DPN–53 target seekers on February 29, 1960. The total initial price for these 185 units was $13,271,900. Subsequently, one unit was added to this order at the same initial price.

The final redetermined price for these 185 units was established on May 1, 1962, at a total price of $13,528,316. The final redetermined total price is comprised of 56 units at $68,383 per unit and 129 units at $75,184, the difference being occasioned by changes in configuration effecting the last 129 units of this quantity. The additional unit was finally priced the same as those of the latter configuration at a unit price of $75,184.

We trust that this provides you with the information that you required. Should you have any questions, please do not hesitate to call us.

W. A. MECHESNEY,
Administrative Assistant to the Vice President.

The CHAIRMAN. Very well. Thank you, gentlemen, very much.

The committee will stand in recess until 10 o'clock in the morning.

(Members present at time of recess: Senators McClellan, Jackson, and Muskie.)

(Whereupon, at 4:20 p.m., the subcommittee recessed, to reconvene at 10 a.m. Thursday, May 24, 1962.)

83778--62--pt. 4---10

PYRAMIDING OF PROFITS AND COSTS IN THE MISSILE PROCUREMENT PROGRAM

(Bomarc Program)

THURSDAY, MAY 24, 1962

U.S. SENATE,
PERMANENT SUBCOMMITTEE ON INVESTIGATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D.C.

The subcommittee met at 10:15 a.m., in room 3302, New Senate Office Building, pursuant to recess, Senator John L. McClellan (chairman of the subcommittee) presiding.

Present: Senator John L. McClellan, Democrat, of Arkansas; Senator Henry M. Jackson, Democrat, of Washington; Senator Carl T. Curtis, Republican, of Nebraska; Senator Karl Mundt, Republican, of South Dakota; and Senator Edmund Muskie, Democrat, of Maine.

Also present: Jerome S. Adlerman, general counsel; Paul J. Tierney, assistant counsel; Thomas Nunnally, investigator; and Ruth Y. Watt, chief clerk.

The CHAIRMAN. The committee will come to order.

Call your witness.

Mr. ADLERMAN. General Davis?

The CHAIRMAN. General Davis, will you be sworn? Will the others testify?

Do you and each of you solemnly swear that the testimony you are about to give before this subcommittee will be the truth, the whole truth, and nothing but the truth, so help you God?

General DAVIS. I do.

Colonel LINNEROOTH. I do.

Colonel COULTER. I do.

Major WEINSTEIN. I do.

The CHAIRMAN. Be seated, gentlemen.

General Davis, I believe you have a prepared statement, have you?

TESTIMONY OF MAJ. GEN. W. A. DAVIS, LT. COL. WARREN K. LINNEROOTH, COL. JOHN M. COULTER, AND MAJ. ROBERT M. WEINSTEIN

General DAVIS. Yes; I do, Mr. Chairman.

The CHAIRMAN. Would you like to read it?

General DAVIS. I would like very much to read it into the record; yes, sir.

The CHAIRMAN. Very well. You may proceed.

General DAVIS. Mr. Chairman, members of the committee——

The CHAIRMAN. First, fully identify yourself for the record, and let your associates also identify themselves for the record.

General DAVIS. I am Maj. Gen. W. A. Davis, the commander of the Aeronautical Systems Division, the Air Force Systems Command, located at Wright-Patterson Air Force Base.

On my right is Col. John Coulter, Chief of the Program Office, which has the responsibility for the Bomarc program.

On my left is Lieutenant Colonel Linnerooth, who is presently in the Air Force Logistics Command, but who was negotiator in the Bomarc program negotiations during the time in which the committee is interested.

And on my extreme left is Major Weinstein, now attending the Command and Staff School of the Air University, who was also involved in negotiations during the time you are concerned with.

The CHAIRMAN. Very well.

Is there any further identification you gentlemen wish to give?

Very well. We will proceed.

General DAVIS. Mr. Chairman, members of the committee; we appreciate the opportunity to appear before your committee regarding subjects so vital to our Nation's interest. I know that it may seem unnecessary to state at this time that Air Force procurement is an extremely complicated and complex business. I'm sure that in your travels and study this fact has been made abundantly clear. But I think it proper to introduce my remarks with this note because it so vividly characterizes the environment in which our day-to-day decisions are made. Expanding technology, urgent demands of national defense, the need for concurrent development of systems, the changing mixture of Government skills and industrial capabilities—all have significant influence on the management approach we select for placing a new system in our inventory. And in such an atmosphere we have learned that there is no single solution, no panacea, for handling this vast variety of complex considerations.

The dynamic evolutions which have taken place in Air Force systems and management can best be appreciated by taking a very brief excursion into some very important history.

Prior to World War II, the state-of-art advancement in weapons was conducted in a rather nonurgent fashion proceeding through a series of incremental improvements within a physical environment that was certainly quite narrow and limited by today's standards. To show the tenor of the times, it is only necessary to relate that, upon the crash of the first B–17 during test in 1935, there were many statements made that this was just "too much airplane" for men to handle and that we had taken too big a step forward.

With incremental steps being taken, the subsystems and components became semistandardized and were used—or better still—"accommodated" by the system designer. Within a reasonably narrow environmental frame of reference, this scheme of developing systems worked fairly well. In fact, by outproducing the enemy with these "fairly good" systems, we defeated him during World War II. And because we did win, many were led to believe that we, therefore, were better in every respect than our enemies, and that we made all the right moves during and prior to the war.

But, gentlemen, despite the victory and despite radar and the atom bomb, there were technological battles that we lost—hands down. This became fully apparent to the Air Force as it took stock of the situation during the latter part of 1945.

We all know about the missiles—the HS–293 glide bomb used in the Mediterranean, the V–1 and the V–2, with the latter being a real eye opener for which the only defense was to keep it from leaving the ground. On the aircraft side, there was the Messerschmidt, ME–262, a jet of remarkable performance and the rocket-powered Messerschmidt, ME–163. And in the German wind tunnels were the swept-wing models and data, later to show up as the F–86's and MIG's of the United States and the U.S.S.R. And even more important to engineers of the Air Force were the many examples of the excellent integration, particularly by the Germans, of systems and components with the airframe into a weapon system. Equipments were part of the structure, not appendages added as if by second thought. They saved weight and space and money. Finally, we looked at the bomb and radar—our bomb and radar, mentally added them to the V–1's and V–2's attacking London, and to the larger rockets yet to come.

Then we looked to jet engines for our strategic strike aircraft. And it all added up to the monumental decisiveness of single elements of striking power—the placing on a single target anywhere in the world, more destructive firepower than was ever exerted by all the combatants in history.

Further review of our own experience in the problems associated with such aircraft as the B–26, the B–29, and finally the B–36 convinced the Air Force that entirely new concepts were needed for managing, developing, and procuring Air Force programs. The B–36 really "iced the cake." Here was a truly gigantic intercontinental piston-engine airplane, still "accommodating" subsystems and equipments as things that had to be added instead of integrated. To handle it, new runways and hangars were needed, as well as a complete new class of support equipment. Moreover, some of the subsystems to be accommodated had development timespans considerably greater than that for the basic airplane. In short, the problem of managing "concurrency" was upon us. We had emerged from the war of production and were now engaged in a battle of technological, managerial, and procurement developments to meet the challenge of new frontiers.

With greater demand for performance and the increased complexity of our programs, it became apparent that emphasis had to be placed on near-optimum performance of numerous subsystems functioning within the frame of reference of total systems performance. Our focus had to shift to state-of-the-art advancement with a premium placed on minimizing the timespan from the conception of a program to its operational employment.

To meet these new demands, the Air Force evolved the "weapon system concept." Although frequently misconstrued to mean a method of procurement, the "weapon system concept" is a management approach. Its purpose is to insure that all elements of a weapon system are given proper direction and thus meet all operational objectives on a planned date and at a minimum of cost. The concept does

not dictate, nor even propose, that there is one best method of procurement or management with which to accomplish our mission. In its application, many techniques have been developed—two of which are the single prime weapon system contractor approach and the associate contractor approach.

General Gerrity has already described to you our handling of associate contractor procurements. The techniques he described have been extremely successful for use with certain of our systems both at the Ballistic Systems Division (BSD) and Aeronautical Systems Division (ASD). As you know, at ASD we also employ the prime weapon system contractor approach.

Very briefly stated, under the prime weapon system procurement technique, the Air Force contracts directly with a single major contractor to develop the major portions of an overall weapon system. Under Air Force surveillance, the contractor is charged with the responsibility not only for his own production efforts, but also for the performance and integration of subsystems and components.

In actual fact, I know of no major program in which either the associate or the prime contractor arrangements have been exclusively employed. The associate contractor approach is used to some degree in almost every weapon system procurement—even those termed "single prime." All of our aircraft engines, for example, are procured in this manner, reference the B–58, B–70, C–141, and so forth.

Likewise, the associate contractor approach is not entirely free of certain aspects of the prime contractor connotation. This is true, of course, because any associate contractor must subcontract certain components and equipment for ultimate incorporation in his own development and production effort.

Under either system, however, there is one most important ingredient—the need for placing contractual responsibility for the integration and ultimate operational success of the total endeavor. At the same time, I wish to state emphatically, that while the Air Force seeks the assistance of various organizations and attempts to achieve contractual responsibility, it in no case relinquishes its authority to direct their efforts and to participate actively in the day-to-day decision-making process.

Just a word now about our operation under the prime weapon system contractor approach. Although the prime contractor is given initial responsibility for the ultimate performance and integration of a variety of subsystems, it does not follow that the scope of his responsibility will go unchanged for the life of a program.

At this point, I would like to quote Air Force policy from AFR 70–9 which states in part—

* * * The normal practice for the Air Force will be to accomplish weapon system development through weapon system contractors.

The regulation further provides that—

Sufficient control will be established and maintained by the Air Force to insure that:

(1) A vigorous and healthy equipment industry be maintained.

(2) A proper industrial base in the equipment industry is maintained to provide for rapid production expansion in the event of mobilization.

(3) Only reasonable profits and costs are allowed.

(4) Government recognized standards are used to the maximum practical extent.
(5) Duplication of development is avoided.
(6) Deviations are reviewed annually.

Looking over our history at Aeronautical Systems Division, I noted that there has, in fact, been constant growth in the percent of total dollars expended in Government furnished aeronautical equipment (GFAE) procurements. For example, in fiscal year 1959, 21 percent of our weapons system budgets were in GFAE purchases. By fiscal year 1962, this ratio had increased to 29 percent.

I would like to submit for the record as a part of this statement some figures showing several cases in which this philosophy has been applied by the Air Force.

The CHAIRMAN. It may be submitted and printed.

(The data referred to follow:)

Percentage of GFAE costs to net flyaway costs by program, Aeronautical Systems Division

[Percent]

System	Fiscal year				System	Fiscal year			
	1959	1960	1961	1962		1959	1960	1961	1962
KC–135	28	31	33	35	IM–99B	21	25	0	0
B–52	30	32	41	0					
C–130B	25	29	30	33	Percent all ASD systems	21	25	29	29
T–38	20	25	39	40					
T–39	17	18	30	29					
F–105	25	27	34	32	Total number GFAE items	2,540	1,843	1,783	1,709
GAM–77	16	24	24	25					

General DAVIS. The decision as to whether we should place responsibility for a subsystem with a prime weapon system contractor or go direct to the source (as in the associate and GFAE approaches) is not a matter of preference, but one dictated by circumstances. The judgment is made largely on technical requirements and involves thoughtful and thorough evaluation of the following considerations:

1. Complexity of the job.
2. Advancement in the state of the art.
3. Importance of interface of subsystems and components.
4. Internal Air Force skills.
5. Industrial capabilities.
6. Cost.
7. Logical divisibility of the system.

For example, on a modern system at Aeronautical Systems Division, four of the major elements of the Dyna-Soar program are being procured on the associate contractor basis—the communication subsystem, the guidance subsystem, the glider, and the Titan III booster. The Titan III booster, I might add, is further divided among several associate contractors. The systems engineering and technical direction (SE/TD) for the booster is delegated to Aerospace Corp., while we at ASD perform this function for the remaining subsystems.

Just as we have alternatives open to us in the management arrangement we employ, we also have various alternatives open to us on the types of contracts we select to implement the procurement. To understand the background against which this selection process takes

place, we must first understand the objective which we are attempting to accomplish. We believe this objective to be as follows:

To procure weapons systems and related equipment which meet all technical requirements and operational schedules at a reasonable price to the U.S. Government.

With this as our stated goal, what are our alternatives? Basically, there are two.

First, we could enter into the weapon system business ourselves—developing and manufacturing these systems solely with in-house skill. This has been referred to in the past as the arsenal concept. We thus would have direct control over operations and could theoretically insure that costs are kept at a minimum. It is our feeling that this method, on the massive scale required in today's aerospace procurement, would be largely incompatible with the principles and practices of our free enterprise system.

Secondly, we can develop a contractual arrangement which will insure that the defense industry will be motivated to strive toward our objective of minimum cost in his operations. This means that we must work within the framework of the free enterprise system, attempting to identify the incentives which will truly give desired goals to our contractors. In our opinion, one of the most important incentives that stands as the common denominator for all free enterprise is the opportunity to realize a profit.

If we are to use incentives as an effective tool, we must understand their basic ingredients. Very simply, the criteria for incentives are as follows:

(1) There must be a goal toward which to direct efforts;

(2) There must be provisions for rewarding the accomplishment of this goal;

(3) There must be penalty for failure; and

(4) There must be a means by which, after the fact, we can measure progress or accomplishment in terms of quality, time and cost.

(At this point Senator Edmund S. Muskie entered the room.)

General DAVIS. Let's look at our three basic types of contractual arrangement—the cost contract, the incentive contract, and the straight fixed-price contract—and compare them with our established criteria.

The cost contract in most cases, lacks the very desirable ingredient of reward for success or penalty for a contractor's failure to meet a goal. The contractor's profit is fixed in dollars and his costs are reimbursed in total, subject of course, to minor disallowances. Nevertheless, during early stages of a program, when specifications and delivery schedules are highly vulnerable to unforeseen developments in the state of the art, the CPFF contract provides desired flexibility.

Such a contractual arrangment allows the Government to revise and amend a basic contract to better suit its interests with a minimum of administrative problems. In addition, in highly speculative programs, where extensive development is required, and ultimate costs are totally unpredictable, the risks inherent in the incentive or straight fixed-price type contracts would be far too severe for a contractor to undertake. This is a pure problem of economics. There are few, if

any, contractors who possess the financial strength to endure the catastrophic losses (possibly in the millions of dollars) that failure under any but a cost contract could bring. Where we use the cost contract, of course, the lower profit rates we allow reflect the Government's participation in a large portion of the risk.

At the other extreme, when specifications are firm, where problems can be reasonably predicted, and particularly where competition for a procurement exists—the straight fixed-price contract becomes applicable. This contractual arrangement has the added advantage that it minimizes the day-to-day requirement for Air Force cognizance and administration. Its limitation, however, is that such a contract restricts our opportunity to conduct after-the-fact measurement of performance—a deficiency which tends to block our use of past cost experience in negotiating future procurements.

This leaves the incentive type contract as the one which seems most nearly suited to our purpose—it has a goal (the target cost), a reward or penalty (the profit or loss), and the right to measure performance after the fact. For this reason we have found it desirable to use this type of contract whenever applicable.

The variety of incentive type contracts is extensive and their individual selection depends on the specific case at hand. The two basic types are, of course, the CPIF (cost plus incentive fee) and FPI (fixed price incentive). While each of these contract types have a provision for a target cost and a sharing by the Air Force and contractor of any underrun or overrun, the fixed-price-incentive contract is distinguished by the fact that it has a price ceiling. The lack of such a ceiling in a CPIF contract, relieving the contractor of the risk of out-of-pocket loss, is normally acknowledged by allowing a lower profit rate under such a contract.

In addition to cost incentives incorporated in our contractual arrangements, the Air Force also uses, when applicable, performance and schedule incentives. Under these provisions, a contractor is awarded or penalized based on his meeting certain predetermined development goals, technical requirements or delivery dates.

There are, of course, a wide variety of refinements and variations that can be applied to these contract types I have discussed. But, the objective in their application is the same: to provide a contractual arrangement which will most nearly insure the accomplishment of our ultimate goal—to insure that the contractor performs his assigned task at the lowest reasonable price to the Government.

During the visit by your committee representatives to Dayton, Ohio, the question was raised as to how we compute profit for Government contracts. Before discussing this point, I would like to point out that here we are dealing with one of the smallest elements of the total price paid for the production of a weapon system. But its importance as an incentive to reduce costs must never be underestimated. As stated in our procurement objective, our first concern is with the overall price of a system. This price, of course, has essentially two components; costs to the manufacturer and the profit which he earns.

Perhaps I should briefly describe the methods used by the Air Force to determine what this price should be. In each of our major negotiations, we employ what we refer to as the Air Force "team concept." Under this system the Air Force draws upon the skills

of many specialists: engineers, auditors, price analysts, attorneys, contract specialists, and personnel stationed at or near the contractor's plant. It is the responsibility of this latter group to keep abreast, through day-to-day observation, of the contractor's cost experience, his accounting methods, his estimating systems and his operations as a whole. The information provided by all of these specialists—many of whom are physically present during the negotiation conference—is utilized in the evaluation of the contractor's proposal and in the independent calculation of an Air Force estimate. This estimate thus reflects the specialized knowledge of highly skilled individuals as well as the use of industry comparisons, economic forecasts and statistical projections. I must stress, however, that in every negotiation, we are faced with the formidable task of anticipating future events and forecasting future costs.

Thus, regardless of the sophistication of our technique and the specific knowledge made available by our specialists, the ultimate success of an Air Force negotiation rests with the proper use of an indispensable human resource—intelligent, realistic judgment.

In the negotiation of profit, this ingredient "judgment" must be applied with equal proficiency. And, we have a number of tools and techniques which help us in our evaluation. Among the factors we weigh in determining a reasonable level of profit are the following:

1. Contractor's risk.
2. Nature and complexity of the work to be performed.
3. Extent and complexity of subcontracting.
4. Contractor's investment.
5. Government investment.
6. Current and potential volume of the program.
7. Possible commercial application.
8. Contractor's cost reduction experience on this and other programs.
9. Contractor's history of performance, schedule compliance, technical innovations, and so forth.
10. Contractor's total volume of Government business.

I know of no scientific way by which each of these considerations can be assessed in specific and exact weights which are not subject to serious challenge. There have been numerous approaches tried, but none have withstood the test of practical application at the negotiating table. This is not to say that we do not use every available tool to arrive at a reasonable and realistic profit objective. But this is just what we develop—an Air Force objective. In the final analysis, the target cost and profit we negotiate is the product of a bilateral agreement between two parties—the Air Force and the contractor. And, under such a system, it is impossible for one of the participants to unilaterally impose terms and conditions which are totally unacceptable to the other.

Speaking specifically now to the allowance of profit on subcontracted effort, it is our opinion, after considerable research and experience, that the prime contractor is entitled to a profit on subcontracted effort.

We would not expect necessarily to pay a contractor the same profit on his subcontracted effort as on his inhouse portion.

The CHAIRMAN. General, at that point, if I may interrupt, and I want you to keep it in mind because I want you to amplify later, we have observed here that generally the prime contractor is given, or allowed, about as much profit as the subcontractor; in some instances, one or two instances, I think, more. I want some comment from you specifically about the latter, how that can be justified.

General DAVIS. All right, sir. Whether we procure directly or approve subcontracting by the prime contractor—the decision is based on our analysis that the prime contractor can perform this function more efficiently than we can ourselves. This efficiency, of course, is evaluated as described earlier—in the light of total integrated systems requirements. Thus, since the prime is performing a function which we cannot ourselves duplicate, it must be reasonably concluded that he is entitled to a reward or profit for his services.

The suggestion has been voiced on occasion that the prime contractor makes no significant contribution to justify his fee on subcontracted work. I do not believe that such a conclusion can be properly drawn. Not only does the contractor accept the responsibility for the negotiation and administration of subcontracts, which entails considerable effort and investment of working capital, but also he accepts the responsibility that the items produced will function properly when integrated into the overall system. Failure on the part of a subcontractor results in penalties to the prime. There have been cases in which subcontractors have encountered serious technical difficulties—in some instances to the extent that their contracts have been terminated and other sources established. In those cases where failure has resulted in considerable financial loss to the prime, neither his contract nor his profit has been adjusted to offset the loss. Such an eventuality stands as strong motivation for the prime contractor to exercise close surveillance and offer required assistance in dealing with his suppliers.

As stated at the outset, the intent of my remarks has been to describe the complexity and dynamic evolution of our procurement mission and to illustrate some of the techniques and philosophies we employ in making our decisions.

And now with the foregoing as background on our overall approach to weapon system procurement, I will review for you the more important aspect of the Bomarc program.

I have described for you the general procurement environment that existed in the late forties following the war and in the early fifties. It was in this environment of growing, but yet limited competence both in industry and in the Air Force in advanced weapons technology, that the Bomarc program came into being.

At that time, the air defense capability of the United States was very limited. It was recognized that limitations of available manned interceptors and lack of an adequate ground control system would have resulted in an appallingly low percentage of even subsonic manned bombers being stopped in the event of an enemy attack. No significant night and all-weather defense capability existed. Notwithstanding our limited defense capability, it was clear by the early fifties that the threat was considerable and growing.

The first contract on the Bomarc missile system program was initiated in early 1951. Many of the concepts and techniques upon which

the program is based, however, were initially conceived on several earlier research efforts. In the GAPA missile program which began in May 1945, the Boeing Co. developed many of the basic aerodynamic, propulsion, and flight-control techniques that were later used in the Bomarc system.

In March 1946, General Electric Co. undertook to develop data on a short-range collision interceptor weapon. This was the Thumper program—an antimissile system to cope with the German V–2. A month later, the University of Michigan Aeronautical Research Center began the Wizard program.

The Thumper and Wizard programs were merged; and out of this merger came a theoretical design for a two-stage, liquid-rocket, antiballistic missile as the armament for a regional defense system composed of long-range search radars, control centers, and launch sites.

In January 1951, the Boeing Airplane Co. was given a research and development contract with the University of Michigan, a subcontractor to Boeing, for the research and development of the ground control system.

Objectives were (1) to develop a boost system for launching and boosting the missile to supersonic speed; (2) to develop airborne and ground electronic controls for guiding and maneuvering the interceptor during cruise and terminal flight; (3) to develop a powerplant for propelling the missile at supersonic speeds for the required distance during the cruise phase following the boost phase; and (4) to develop an airframe capable of operating under all aerodynamic and structural conditions imposed on it.

Progress, evidenced during the experimental and prototype programs, and flight test results obtained, were sufficient to justify the calculated risk in initiating the first production contract for tactical IM–99A missiles in May 1957.

As a significant decision in the history of the Bomarc, you will be interested to know why Boeing was given the development contract in 1951.

Boeing was selected because they had competent engineering and management talent available. GAPA had been turned over to the Army as a result of the Joint Chiefs of Staff decision in October 1949 to place responsibility for short range surface launched weapons with the Army. Boeing, however, had gained a wealth of experience in developing, producing, and test-flying a total of 102 GAPA missiles. They had also gained additional experience in the joint Boeing-University of Michigan air defense system study which began in 1950.

Other companies which had sufficient technical and management talent to be considered for such a program either were already engaged in other active missile development programs, or were not interested in undertaking the program.

I should like to emphasize the significance of this latter point to gaining a full appreciation of the defense procurement environment of the early fifties. It was often necessary to "sell" contractors on the desirability of investing their resources and staking their corporate reputation on a contract commitment to develop a complex missile system.

During the visit of subcommittee representatives to the aeronautical systems division, we were asked why Boeing had been made a prime weapon system contractor.

Clearly the development programs represented significant advances in technology and would require substantial engineering breakthroughs. Boeing, as a result of its GAPA program and the joint air defense study with the University of Michigan, had the best qualified staff available for this effort.

Firm engineering discipline, product oriented—was essential to early success and cautioned against split responsibilities.

The Air Force program management capabilities were committed to the Korean conflict. It must be remembered that this was prior to the time that the use of a nonprofit technical assistance contractor had been conceived and the available military and civilian manpower in the Air Force was clearly inadequate for a task of this magnitude. A broad system management capability was what we needed. The Bomarc system embraced engineering disciplines in such diverse fields as heavy construction, automatic testing equipment, ground and airborne communication, ground and airborne electronics, airframes capable of transitioning from rocketry to high-performance conventional flight—even nuclear safety was involved.

The Bomarc program was recognized in original planning as a "high-risk" undertaking, but one in which there would be a proportionately high return in added defense capability. It was also, especially for the B model, a concurrent system acquisition program; that is, one with considerable overlap of development, test and production phases. The payoff of concurrency is both an earlier operational availability and an extension of useful service life.

It was intended to first augment our manned interceptors and subsequently to replace them in the air defense of the Northern American continent.

The early A program was a fly-before-buy program—that is, the contractor was to demonstrate a successful prototype model before production contracts would be let. In 1957, Air Force operational plans called for 5,000 or more missiles at some 40 bases. By 1958, operational plans had been revised—air defense requirements called for 1,700 missiles at 40 bases. Subsequent annual reviews further reduced the program to 1,300 missiles and then 570—our present program which will be complete this fall.

There are two points I wish to make relative to the environment which faced the men making the judgments, recommendations, and decisions we are now reviewing.

The first that all of these program reductions were implemented by reducing or eliminating followon procurements. All considered mid-1959 as the first delivery date—and pressure toward meeting this date was at no time relieved by these revisions. In fact, when we went into the B program, we used the concurrent development-test-production concept, that I mentioned previously, to further improve operational readiness dates. This calculated risk paid off in literally saving years in the "drawing board to operational status" cycle.

The second is that the Air Force was engaged in a multibillion-dollar program—with early operational dates and outstanding inter-

cept capabilities as the goals which would extract the highest value return from this tremendous investment. The consequences of poor judgment could have been catastrophic if they resulted in operational slippages and there had been an occasion requiring the use of the Bomarc defense capability. There could also have been a considerable additional program cost generated if overall program management had not been sufficiently competent. It is at this point that I wish to comment on Boeing's performance as the prime weapon system contractor.

We believe that the Boeing Co. has demonstrated exceptional performance in discharging their broad and complex responsibilities as prime weapon system contractor on the Bomarc program. The Bomarc has achieved, in conjunction with the SAGE electronic system, a major increase in our air defense posture. Tight concurrent time schedules have been met both in missile deliveries and in base site activation. Base site equipment installation, calibration and checkout on the later bases has been completed as much as 2 months ahead of schedule, thus gaining earlier squadron operational capability.

Notwithstanding the numerous, serious technical problems which were encountered in achieving the high performance specification of Bomarc, test flights have demonstrated that the missile will accomplish its complex and difficult mission successfully.

Our past missile development, test and production experience has shown a clear relationship between contractor technical and management capability and system performance achieved with operational hardware.

In the case of Bomarc, Boeing was given clear responsibility for overall system design, development and production, and program results have shown that they have done their job well.

As to the other side of the coin, that of Air Force program management, we can see from this brief history the judgments which AF management has made in the evolutions of the Bomarc program have been influenced by an extremely complex set of circumstances—circumstances requiring the close cooperation and all-out effort on the part of the contractor and Air Force alike. As you know, one of the most important tools for insuring a successful and effective relationship with any Government contractor is the contractual arrangement we choose to employ. The Bomarc program was no exception.

During early stages of research and development effort, we followed our practice of negotiating cost plus fixed fee type contracts. Later, as program direction and requirements began to take shape, we moved to incentive contracts, in an effort to begin introducing desired motivations to reduce costs. It is our opinion that Boeing responded to these incentives. Costs were reduced substantially and the profits which Boeing received under sharing arrangements were a reward for fulfilling its contracts at a reduced overall price to the Air Force.

Senator, when Mr. Adlerman and the other committee investigators visited my headquarters in early February of this year, we responded to the question:

Why did we not break away from the prime contractor and buy major components and subsystems direct, after production had begun?

We addressed our answers to the following points:

We had already, through the several years of research and development efforts, invested in the development of a highly competent group of program and engineering managers backed up by an experienced staff. There was value yet receivable from this group as evidenced by problems we did in fact encounter. It was these subsequent problems and their timely resolution that we discussed with your investigators.

We also pointed out that such a group of managers was required under any procurement technique—if not through the prime contractor, then it would of necessity have to be provided by the Air Force. We had no such capability at that time. I do not believe there is any valid method of estimating the true dollar or time costs of developing such an in-house Air Force capability, but I am confident that it would have exceeded our organization and manpower funds and our manpower ceiling. My staff has estimated that it would have required 600 full-time engineers for Bomarc alone, and we had some 40 major projects assigned to Wright-Patterson in addition to Bomarc. As I noted earlier, we had no facility such as Space Technology Laboratories and our own laboratories were component oriented.

I think that we did not sufficiently stress with Mr. Adlerman, another aspect of the problem, that is the leadtimes appropriate to the decision as to whether to buy a major component or subsystem ourselves and then furnish it to the contractor, or to have the contractor procure it and deliver it to us as a part of the end item. The necessary leadtimes require this decision to be made as much as 2 years ahead of the delivery of the end item it affects.

An appreciation of the necessity for this leadtime is most important when you realize that we had to review and make our decisions on our second procurement contract prior to the time the first XIM–99B had been flown, 18 months before the first tactical missile had been delivered under the first production contract, and 2 years before the first tactical B base had been delivered.

With your permission, I would like to introduce Col. John Coulter, and ask that he take the stand to discuss the annual reviews and leadtimes appropriate to production decisions. After Colonel Coulter has made his presentation, I will conclude my remarks.

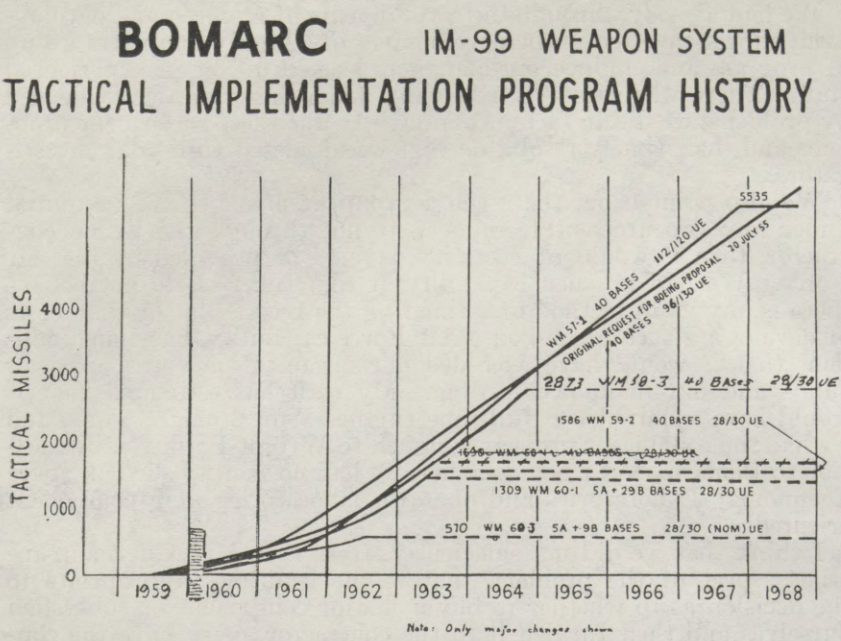
The CHAIRMAN. All right, Colonel Coulter.

Colonel COULTER. Mr. Chairman, Senators, I will address a few remarks to the subject of the earlier size of the Bomarc program as it was considered in Air Force programing in the 1957–58 period because the size and scope of the program relates directly to the choice of a procurement mechanism that is the area of interest of the committee.

Then I will discuss the categories of contracting which were open to us and the decisionmaking process employed to achieve the correct solution.

(Exhibit No. 16A follows:)

CHART NO. 16A



Colonel COULTER. My first chart takes a look at the contemplated program size through several years. The chart says that the programing document of 1957 indicated 40 bases with 112 shelters on each base, for a total of over 5,500 missiles.

Subsequent reductions in the 1958 schedule showed 2,873 missiles on 40 bases. The 1959 schedule reduced the number of missiles to under 1,600, but still retained the 40-base outlet.

In 1960 we were programing for a 29-base program containing some 1,300 missiles. There were to be 29 B bases plus 5 A bases.

The final program resulted from the cutback of 2 years ago, about this month, into the program of the present size, 570 missiles, with 9 B bases and 5 A bases.

The CHAIRMAN. Colonel, do you have a series of charts you are going to present in your testimony?

Colonel COULTER. Yes, sir; and I will make them available.

The CHAIRMAN. These charts may be inserted in the record and identified as exhibits Nos. 16A–L and so forth, in order of their presentation.

I assume all of them can be printed in the record?

Colonel COULTER. They are so designed; yes, sir.

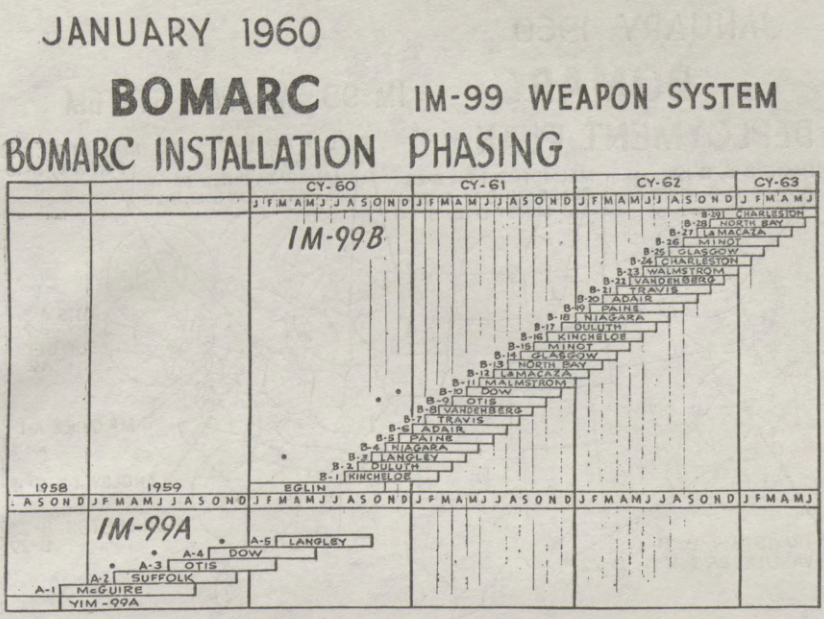
The CHAIRMAN. They may all be exhibit 16 with A, B, and C identifications.

(Exhibits 16–A through 16–L were marked for identification and inserted at the appropriate place.)

Colonel COULTER. Here is my next chart.

(Exhibit No. 16–B follows:)

CHART NO. 16B



Colonel COULTER. The 29-base program which was extant in January 1960——

The CHAIRMAN. What program?

Colonel COULTER. The 29-base program. We identify them by the number of bases as the programs change.

In January 1960 we were programing for procurement of missiles from a production facility that would provide missiles at a rate that would operationally implement 29 bases on a 1-base-per-month schedule, a large and extensive effort, running from mid-1960 to the end of 1963.

The cutback which occurred about 2 years ago, now—I am ahead of myself.

The CHAIRMAN. Those charts as they are presented will have to be numbered.

You are now presenting chart No. 16–B. You have presented 16–A, and this be 16–B.

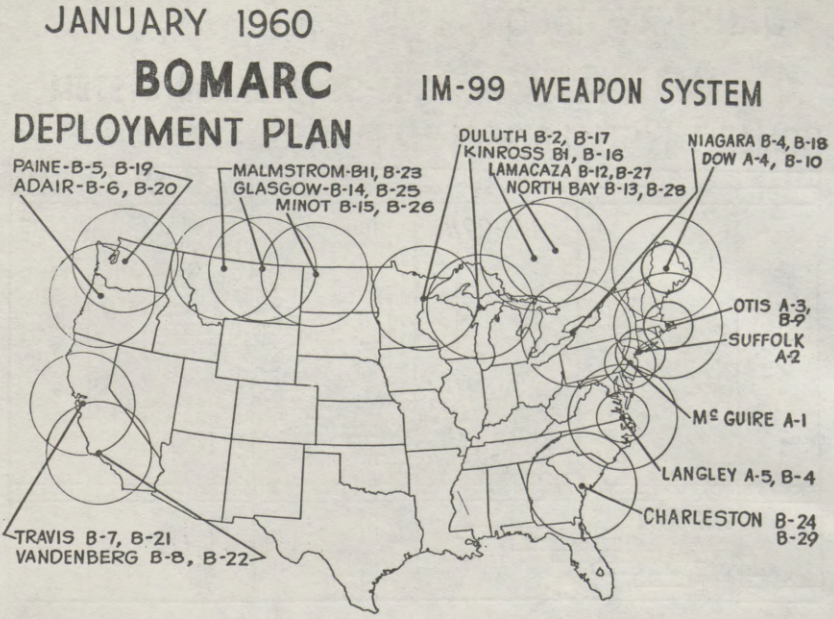
Colonel COULTER. This is C, sir.

The CHAIRMAN. Well, just so you get them numbered. I don't care whether we start with A or B.

Colonel COULTER. We are on C now.

(Exhibit No. 16C follows:)

CHART No. 16C

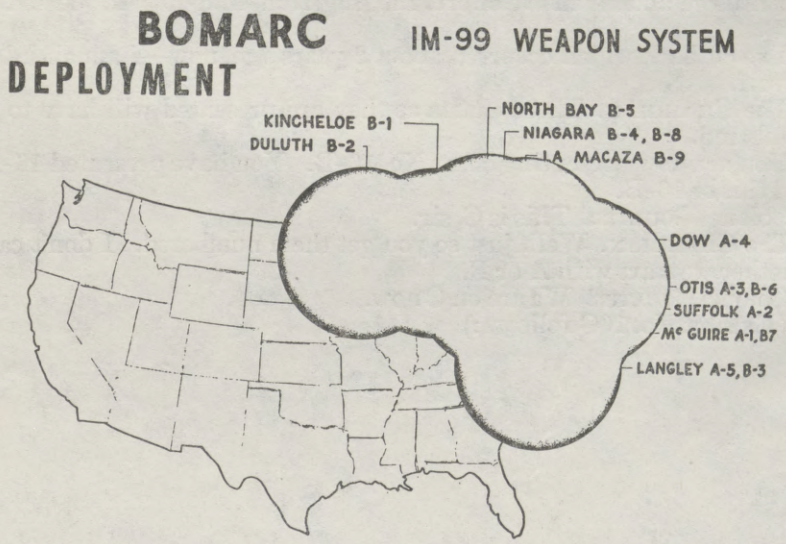


Colonel COULTER. The 29-base program was disposed geographically in this fashion:

Down to Charleston on the east coast and south as far as Vandenberg on the west coast, and completely across the northern border of the United States.

(Exhibit No. 16D follows:)

CHART No. 16D



Colonel COULTER. The reduction to the final program—and this chart you saw the day before yesterday—is repeated here.

Senator JACKSON. You are on chart D now?

Colonel COULTER. Should I identify them as I go?

The CHAIRMAN. I think you should, if we are going to have him who reads the record know which chart you are talking about.

That was 16–D. You are now passing to 16–E?

(Exhibit No. 16E follows:)

CHART NO. 16E

BOMARC IM-99 WEAPON SYSTEM

CONVERSION - CATEGORY I TO CATEGORY II
PER AFR 70-9

POLICY: The conversion to Category 2 will be put into effect in an expeditious, orderly, and economic conversion from the development phase to the production phase. (par 3.a., AFR 70-9)

PREREQUISITES

1. Adequate specifications prepared by either the Weapon System Contractor (performance specs.) or his Subcontractor (mfg specs.)
2. Design stability as evidenced by qualification & performance tests.

JUDGMENT FACTORS - Confidence that:

1. Action is in the best interest of the A/F considering cost savings and increased A/F control, versus risk to program as a whole.
2. There is time remaining to support production requirements.
3. The configuration is operationally suitable for introduction into the inventory

Colonel COULTER. With that background, with respect to the decrease in the scope of the program, we look now at the mechanics associated with determining the conversion from types of procurement.

I should say here that we employ three different categories.

The CHAIRMAN. Let me ask you:

Up to that time, had there been any production, as you made these reductions in the number of bases where they were going to be put in operation? Had there been any production prior to the reduction of the number of bases?

Colonel COULTER. A subsequent chart directly relates the production schedules with the base implementation schedule.

The CHAIRMAN. In other words, you did make decisions to reduce at different times prior to any reduction?

Colonel COULTER. No, sir—we reduced after we were in production.

The CHAIRMAN. That is what I asked.

Colonel COULTER. Yes, sir; we did reduce after we were in production. I will show you that directly on a subsequent chart.

The CHAIRMAN. Very well.

Colonel COULTER. Category 1, procurement, is a direct CFE (contractor-furnished equipment). That is the language that describes category 1.

Category 2, procurement, involves the associated contracting method wherein the Air Force, the military, contracts directly with several contractors to produce components and subsystems, of a single weapon system.

Category 3 is the GFAE procurement method, wherein the equipment, the subsystems, are bought on a competitive basis. Bids are requested and a competition is held, and the winning bidder is determined.

General DAVIS. May I interrupt a moment, Mr. Chairman?

In category 2 he failed to mention that when we go to category 2 from category 1, we buy from the source that the prime has already established, normally, and we use the drawings and specifications that have been prepared by the prime contractor.

In the case of the GFAE procurement, or category 3, we are buying components that are developed to Government specifications and furnished to him just like any other Government equipment which he would install in the vehicle.

The CHAIRMAN. But when you have a breakout from the prime contractor, if that is what I understand you to mean, and you go to the same source, the subcontractor who was supplying the prime contractor to get the product, you say, of course, that the prime contractor had already developed the design and, thus, he had made his contribution. Is that correct?

General DAVIS. That is correct. That is category 2. We use the prime contractor's drawings and specifications.

The CHAIRMAN. The point I wanted to make is that in the course of the prime contractor developing the design and doing the engineering and technical advisory work, consultant work, the prime contractor was paid for that by the Government.

General DAVIS. That is true.

The CHAIRMAN. He made a profit on it?

General DAVIS. That is true.

The CHAIRMAN. Then when you pay the prime contractor for that work and for that supervision, for that technical contribution that he makes, doesn't the Government, in effect, buy the product and, isn't it free to use it?

General DAVIS. We have no problem on proprietary rights. We can do this. But the prime's contribution isn't complete at that point. He still has the problem of integrating that subsystem or component into the complete system, because he is the prime weapon system contractor, even though we contract directly with the sources he has previously established.

The CHAIRMAN. But the prime contractor is paid for that as a part of his contract?

General DAVIS. Yes, he is.

The CHAIRMAN. The only problem that has given us concern is in cases like this, where the prime contractor develops, generally in consultation with the subcontractor, the product that is to be procured from the subcontractor, and integrates it into the system, after it is once developed it has been paid for by the Government.

Why is the prime contractor entitled—he is entitled to something, of course, for integrating it into the system, but I cannot rationalize why he is entitled to as much profit as a subcontractor who produces it.

General DAVIS. We are going to speak on that later.

The CHAIRMAN. All right. Just keep it in mind.

General DAVIS. Colonel Coulter is going to show you, I think conclusively, in a moment, that the decision to change from category 1 to category 2 is the critical decision, based on where this component or this subsystem is in its development and test cycle.

We do have a policy—as he is outlining here—at the appropriate point in time to stop contracting with the prime contractor for all of these subsystems and paying him his profits you are worried about, to go direct, but the point in time we make that decision is very critical. It is very important in the case of Bomarc, especially.

Colonel Coulter will show this very shortly.

The CHAIRMAN. All right.

Colonel COULTER. In regulating and describing the prerequisites for conversion from category 1 or CFE to category 2, we follow an Air Force regulation, which describes the policy in these words:

> The conversion to category 2 will be put into effect in an expeditious, orderly, and economic conversion from the development phase to the production phase.

The regulation prescribes that adequate specifications prepared by either the weapon system contractor (here we are talking about performance specs) or his subcontractor (manufacturing specs) must be available.

I should differentiate between performance specs and a subcontractor's manufacturing specs and procurement specs, which are required if you go to the category 3 situation where you seek competitive bidding.

You must have design stability, and this should be evidenced by a detailed qualification and performance test series. There are military specifications covering this sort of testing.

Judgment factors must apply. The action should be certainly in the best interest of the Air Force from a cost standpoint and the Air Force control matter must be looked at. I refer to General Davis' remarks about the Air Force capability to provide the overall system integration and technical direction that the prime contractor has already built up. You must make the judgment that you can provide this capability and go forward as well as the contractor has done with no losses to the schedule.

You must determine that there is time remaining to support production requirements.

The CHAIRMAN. I would like to have an explanation of that. I don't understand what that means. You already have a system. You are already procuring. What does that relate to?

Colonel COULTER. You are doing your development and your production concurrently. The prime contractor is established with his subcontractor and the subcontractor is building hardware. The situation here is that which the Air Force looks at, assesses, wherein the Air Force will get into a direct contracting relationship with the already existing subcontractor to the prime. It takes time to effect a

new contracting arrangement. It takes engineering and technical and procurement activities, and these interrupt the already established relationship between the prime and the subcontractor.

Recall, sir, that timing here is critical, that a month's losses—and we manage programs, we assess their progress, on a month-by-month basis, and we take extraordinary actions when things slip even in small increments of time, like a month. There may be dozens or even hundreds of subcontractors and their subs providing equipment, components, and subsystems to this master schedule. It is the scheduling that has the biggest effect here. You don't have any extra time to get into this other posture.

Is that a fair answer, sir?

The CHAIRMAN. Well, I think I get the general idea of what you are talking about, for just a few days, if you are talking about making a contract, because the article is already developed, you know what it is, it is in production to begin with. The matter of writing a contract and agreeing on terms as between the Government and one who has been a sub-contractor——

Colonel COULTER. It is much more than a few days. I have a chart that addresses the leadtime associated with contracting and shows the activities involved.

The CHAIRMAN. I think I understand what you are presenting, but it may need some further amplification. I can't conceive that in some instances it would take very long.

General DAVIS. He will amplify that very well very shortly in another chart.

The CHAIRMAN. All right.

Mr. ADLERMAN. Under the ASPR's or the Air Force Regulation 70–9, for example, there are certain components which, for example, the propulsion system, where you are required to go into a category 2 or category 3 and if you don't go in you are supposed to get a deviation.

General DAVIS. In most categories we do.

He will come to that, how we, on an annual measure, review every one of the exceptions.

Mr. ADLERMAN. In other words, the pressure is to get into a position where you are buying directly from the source, skipping the middleman?

General DAVIS. That is our policy. He will describe this activity for you.

Mr. ADLERMAN. And if you don't do that, you are supposed to get a deviation or an exception and state the reasons why?

General DAVIS. That is right.

The CHAIRMAN. That is one of the things we have observed. I am not being critical. But to us it presents a question of why we have to have all this middleman profit going on.

I will not say that the prime contractor is entitled to nothing. I don't mean to say that. But when we look at some of these cost figures we have seen, where a prime contractor, even down to the second subcontractor, charges a profit equal to the second subcontractor, it makes us wonder. I think it takes some explanation.

General DAVIS. We hope to clear that up for you today.

The CHAIRMAN. Very well.

Proceed.

Colonel COULTER. The configuration of the component or subsystem must be operationally suitable for introduction into the inventory. This says that there must be no remaining development.

The equipment must be debugged and operating completely satisfactorily before you can go into this posture.

The CHAIRMAN. You could never say that the configuration is perfected and you never need to make a change. You do not mean to say that.

Colonel COULTER. In these words, Mr. Chairman, the configuration can be established and the performance of the component or subsystem demonstrated as satisfactory against a set of precise tests.

The CHAIRMAN. You certainly mean to limit it as to the quantity you now have in mind to produce and use?

Colonel COULTER. That is right, sir.

The CHAIRMAN. Ultimately, you anticipate there will be further improvement?

Colonel COULTER. You may always anticipate modifications for improvements.

The CHAIRMAN. What you are limiting that to is that you know we are going to service 10 or 15 bases that year with this particular weapon?

Colonel COULTER. That is correct, sir.

The CHAIRMAN. And so far as we know now, we are going ahead with the production on the basis of the present design, and, thus, we are satisfied for this purpose, at least, to get this in there on time to meet our schedule, that the configuration of it is satisfactory.

That is what you are saying?

Colonel COULTER. Yes, sir.

The CHAIRMAN. Very well.

Colonel COULTER. My next chart is 16–F.

(Exhibit No. 16F follows:)

CHART NO. 16F

BOMARC IM-99 WEAPON SYSTEM

CONVERSION CAT 1/CAT 2 TO CAT 3

PER AFR 70-9

POLICY:

The conversion to category 3 will NORMALLY be put into effect on any new contract awarded after the first delivery of the item to the operational inventory (par 3.c., AFR 70-9 and Foot Note "2)

PREREQUISITES:

1. Qualification Testing completed.
2. Approved Procurement Specifications for a firm configuration sufficiently detailed to permit separate contract negotiations

JUDGMENT FACTORS - If considered prior to delivery of first unit:

1. There is time remaining to support production requirements.
2. The configuration is operationally suitable for introduction into the inventory.

Colonel COULTER. This chart addresses the conversion of procurement from category 1 or 2 to category 3. Category 3 is the competitive procedure.

The regulation states that the conversion to category 3 will normally be put into effect on any new contract awarded after the first delivery of the item into the operational inventory.

It is a matter of policy that we would have accepted production hardware into the operational inventory, and thereby would have achieved the confidence in the design and manufacture and performance of the item which would justify going into a competitive posture.

Present requisites are that a rigorous qualification testing program has been completed; that approved procurement specs on a firm configuration are available.

Now I address the subject of procurement specs versus performance specs that I mentioned a moment ago. In going to category 3 and buying from a list of bidders, you must have precise specifications against which you can get into contracts to produce the precise hardware that you are talking about.

This requires engineering detail in large measure. It must be available. You do not really get procurement specs until you get into acceptance of first production system hardware. Then you know the ground on which you stand.

Mr. ADLERMAN. Colonel Coulter, at this point, are you familiar with the attempts to break out or change from category 1 to category 3 on the propulsion, the solid fuel booster?

Colonel COULTER. Yes, sir.

Mr. ADLERMAN. How many qualification tests are usually required before it is accepted by the Air Force?

General DAVIS. He will cover that on a separate chart—each of the subsystems, how much testing has been done, and so forth.

Mr. ADLERMAN. I would just like to get the answer to this question. Do you know? Are there some 40 tests that have to be made?

Colonel COULTER. That is an approximate number, in the case of the Thiokol motor.

Mr. ADLERMAN. If the prime contractor comes in and says they want to do only 16 tests and say they are going to stand behind the booster rocket, will not this foreclose you from making a decision to go into category 2 because they do not have the qualification tests to meet with your satisfaction?

Colonel COULTER. I am not sure I understand, sir.

Mr. ADLERMAN. I think we have it in the record now, in the evidence now, with some papers we put in the other day, that Boeing decided they only wanted to go through 16 qualification tests and because of that the Air Force made a decision that since we have not the 40 tests, then we are not going to go into a category 2 arrangement because we will not accept responsibility that the booster rocket has passed.

In other words, Boeing can foreclose, or any company can foreclose, a category 2 arrangement by saying, "We do not want to go through 40 qualification tests."

Colonel COULTER. I do not agree with that conclusion, Mr. Counselor.

Mr. ADLERMAN. Then what happened?

Colonel COULTER. The judgment to reduce the required number of qualification tests was based on the performance of the motors in the qualification testing that had already transpired.

What this says is that Boeing looked at the performance of the Thiokol test program and judged that 40 was too large a number; that we could demonstrate satisfactorily the performance of the motor with a smaller number.

Mr. ADLERMAN. And the technical officer who had to review whether or not it should go through on the category 2 said:

In view of that fact, I do not want to take the responsibility. I am going to keep the responsibility on Boeing for the performance of that booster rocket.

And—

Therefore, we will not go into category 2.

General DAVIS. I will have to challenge that for the record, Mr. Counsel, because I can state categorically for the committee that the prime contractor does not have any method of controlling the decision to go from category 1 to category 2.

This is a decision reserved solely to the Air Force. In the case in point that you are mentioning, and notwithstanding any testimony that you have had heretofore, the decision was made not on that one factor.

There are many factors that the decisionmaker must take into account when he finally decides whether to go from category 1 to category 2.

So if it was alleged that the decision was made solely on Boeing's reduction of the number of tests, I will challenge that as being completely inaccurate.

Mr. ADLERMAN. I do not mean that it was made solely on that basis, but that was one of the reasons.

General DAVIS. It might have been one reason expounded by one man in formulating the recommendations to the commander who made the final decisions.

The CHAIRMAN. Very well. We will check it.

Mr. ADLERMAN. Can I read this into the record?

The CHAIRMAN. Is that on that point?

Mr. ADLERMAN. Yes.

The CHAIRMAN. Acquaint the general with whatever evidence it is we have on that point.

Mr. ADLERMAN. This is exhibit B–13. It was put into the record yesterday. It is a memorandum written by R. E. Davis, of Thiokol Co., of a meeting that was held at W–PAFB, Dayton, Ohio, on September 22 and 23, 1959, relating to the qualification program.

The last paragraph in this memorandum:

Captain Clark of EAFB Air Force Flight Test Center, Propulsion Division, pointed out to the Thiokol and Boeing personnel that if a 16-motor qualification test were approved by WSPO, he would, in turn, recommend that the proposal for procuring Bomarc motors GFAE during fiscal 1960 be rescinded and that Boeing, in turn, be allowed to procure the propulsion system CFE.

Captain Clark stated that he would take this position in order to throw complete responsibility back at Boeing if they insist on a reduced qualification test program. This, of course, will be playing back into the hands of Boeing since they definitely want to continue procuring Bomarc X–51 rocket motor CFE as long as possible.

The CHAIRMAN. Who is that?

Mr. ADLERMAN. Mr. Davis, who testified yesterday.

The CHAIRMAN. He is with what company?

Mr. ADLERMAN. The Thiokol Co.

General DAVIS. You read into the record a contractor representative's opinion, which has no substance.

Mr. ADLERMAN. This is not an opinion. This is his observation of a meeting.

General DAVIS. He drew a conclusion, though, from something that a captain said. He drew a personal conclusion from a remark made by a captain. The captain was not qualified, in the first place, because he was not in the decisionmaking process.

The statement could have been made in good faith. It had no bearing on the final decision. Mr. Davis drew the conclusion that Boeing did this.

Mr. ADLERMAN. This is not a conclusion. This is his report of the statement made by Captain Clark.

General Davis. But he drew the conclusion that the reason that Boeing cut it back to the 16 test firings was to hold onto the business. I say that conclusion is completely invalid.

The CHAIRMAN. Very well. Proceed.

Senator MUSKIE. Colonel, I wonder if you can give us some impression of the difference between manufacturing specs and procurement specs?

Colonel COULTER. Yes, sir. The manufacturing spec is the spec to which the subcontractor builds the hardware. These are internal engineering drawings in his plant, which he tools up for, and in which he controls the manufacturing process.

They are based usually on performance specs provided by the prime weapon system contractor and the performance specs state in general language what the equipment is to do in performance language rather than in engineering description language.

Senator MUSKIE. There is a difference between the manufacturing specs and the procurement specs so that you could not base procurement upon the manufacturing specs?

Colonel COULTER. That is a good question, Senator Muskie.

We use manufacturing specs as a basis for the development of the procurement data package, but the procurement data package must have, as an integral part, the complete military set of specifications which apply across the board to all kinds of hardware, which provide detailed specification standards, which have been developed in our laboratories and in our experience over the years.

A procurement data package comprises a voluminous detail of specifications, much broader than that contained in the manufacturing spec.

Senator MUSKIE. Is the difference between the two types of specs such as to influence significantly the movement from category 2 to category 3?

Colonel COULTER. Timing is an important point here. It takes time to develop procurement data specs.

Senator MUSKIE. Is it simply a mechanical problem?

Colonel COULTER. There is a large group of people who deal with this on a full-time basis, the production of procurement data packages. The equipment buyers do this in order to get into the GFAE posture.

It is mechanical in a sense; yes, sir.

Senator MUSKIE. If you have sufficient data or sufficient information and experience to put the manufacturing specs together, do you have enough to put procurement together?

Colonel COULTER. The manufacturing specs in the first place would probably have been put together by the prime weapon system contractor.

As General Davis said, we have rights to that material. We have, however, to take it in our own organization and process it into standard format, the mechanics of producing a procurement data package.

Senator MUSKIE. In other words, the basic information is the same for the two types of specs?

Colonel COULTER. Yes, sir; but the basic information is broader in the procurement spec by the addition of these standards.

Senator MUSKIE. Is it available at the same point in time?

Colonel COULTER. The procurement data package?

General DAVIS. Very shortly after. The fundamental data are the manufacturing data. Getting it into the format that the colonel is talking about, so that it becomes a procurement package, takes some more time in assembling it.

Fundamentally, it is all the same.

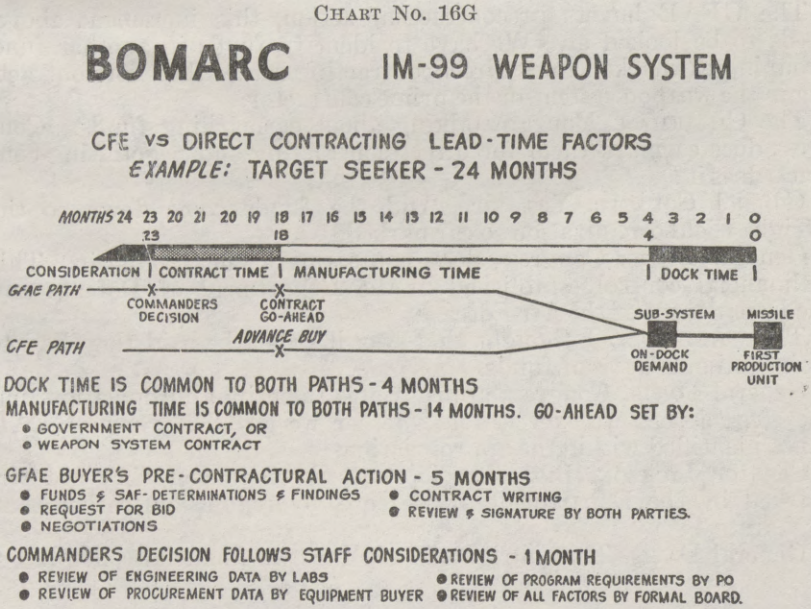
Senator MUSKIE. So it is not a significant reason for delay, moving into category 3?

General DAVIS. Not after you get the manufacturing data, that is right.

Colonel COULTER. Now, sir, the next chart, 16–G.

(Exhibit No. 16G follows:)

CHART No. 16G



Colonel COULTER. This takes some explaining. It looks into the business of lead times associated with the choice, with the decision, to go from CFE, contractor furnished, category 1, to one of the two direct contracting methods, either category 3, association, or category 3, GFAE.

You should read the chart from the right side to the left side. If you take the first point on the right, it takes the production of the first missile as time zero.

Then look at the increments of time required to get back to the point of decision between going CFE, or GFAE.

This is the sort of thing that follows.

The subsystem must be at the Boeing plant for integration, for incorporation into the production, 4 months prior to the delivery of the missile. This is the prime weapon system manufacturing time. He also tests, accepts, and schedules this thing into his production line.

A 14-month manufacturing time is a reasonable increment for the subcontractor to build the item.

There are 5 months in the case of the GFAE path contract time. I will discuss what is involved here. The decision point then for GFAE versus CFE must precede the delivery of hardware by about 2 years.

Coming back through the CFE, or prime contractor path, you see the dock time is the same if he gets it from his subcontractor, rather than the Air Force. The manufacturing time is also the same.

The prime contractor can shorten the contracting time over that that the Government can provide, inasmuch as he is already in this relationship on his prior contracts.

The remarks say that the dock time is common to both paths and the manufacturing time is common to both paths, whether Government contract or weapon system contract.

The GFAE buyers precontractual action, this increment above, needs to be looked at. We have to identify funds in another fund grouping earmarked for a direct contracting rather than for contracting in the weapon system, or the prime contractor.

The CHAIRMAN. You are talking about earmarking funds. Congress does earmark them for direct contracting and negotiating contract, does it?

Colonel COULTER. Yes, sir. And the funds come down to the Wright Field organization so earmarked.

General DAVIS. Congress does not earmark them; no, sir. This is financial control established in the Department of Defense and the Department of the Air Force.

The CHAIRMAN. I thought that was it, when he said they had to look to other sources of funds.

General DAVIS. Congress appropriates them by appropriation, but the control that we exercise on whether we go CFE versus GFAE is not identified within the appropriation.

Senator JACKSON. But when it comes down to you, they are earmarked by the Department of Defense, by regulation, rather than by statute.

General DAVIS. That is right. It is our own financial control.

Colonel COULTER. We must go out for bids. We must prepare the procurement data packages and request proposals on a bidder's list and wait 30 to 45 days for proposals. We must enter into negotiations, once we have gone through a source selection procedure, with the identified winner of the competition.

Mr. ADLERMAN. Is this category 3 you are talking about?

Colonel COULTER. Yes, sir; I am.

Mr. ADLERMAN. That is where you go out in the open market and you ask for a bid on a component like a target seeker?

Colonel COULTER. That is right.

Mr. ADLERMAN. You do not ordinarily do that in a case of this sort. You go to the people who are manufacturing it and you go into category 2, don't you? Are not we covering a lot of detail as far as category 3 goes which is not really pertinent to the hearing?

Colonel COULTER. The difference between category 2 and category 3 procurement can shorten this contract interval, this 5-month interval, by some amount, maybe a month or two.

Mr. ADLERMAN. You do not have to go out and get requests to bid on something like a target seeker. You would never do that?

General DAVIS. Yes, sir; we have to. Even if we are going to the prime's already established source, we must go to him and get a cost proposal for making so many of these things on a certain schedule, to certain specifications, already identified, and we have to have this as the basis for our negotiations.

Mr. ADLERMAN. A complicated system, such as a target seeker, where you have a producer already producing that item, you would go out on the open market?

General DAVIS. No, sir; we have to go to the contractor, and get a proposal, a cost proposal, so we can negotiate.

As the colonel said, in the case of category 2, where the source is already identified, and we do not go into a source selection, it will shorten the 5-month block he is talking about by some amount, but not significantly.

Mr. ADLERMAN. Is not he talking about category 3 now, which is a Chinese reproduction of the article, as someone here described?

General DAVIS. In the broad sense he is talking about both. However, the 5-month period would be shortened slightly if you had the sole source already established; in other words, category 2.

Mr. ADLERMAN. Actually, this category 3 has no application?

General DAVIS. He is talking about both here, Mr. Adlerman, not just category 3. He is talking about both in a broad sense.

I just said, and I will say again, that the contracting time identified on that chart, 5 months, would be modified to some extent in the case of category 2—that is, would be some shorter, 30 to 45 days shorter—if we did not have to go through a source selection procedure.

Mr. ADLERMAN. May I ask you a question?

You broke out the ramjet engine; is that right?

General DAVIS. That is correct.

Mr. ADLERMAN. Did you break that out by going out into the open market and going to——

General DAVIS. That was category 2. We went directly to the source.

Mr. ADLERMAN. How long did it take to do that?

General DAVIS. We can supply that for the record. I am sure that the files show exactly how long it took. But I know one thing, we had to go to him and get a proposal, give him time to prepare it, get it to us, analyze it, and decide what kind of contract we were going to negotiate with him.

Mr. ADLERMAN. I think this is really confusing the issue, because we are going into a lot of immaterial things, as far as category 3, which has nothing to do with the material before the committee.

General DAVIS. I just cleared that for the record.

The items he has listed, that he had his pointer on, the things that go through to make up the 5 months, are the same.

The request for bid has to be done regardless if whether or not you go to the sole source already established. Colonel Coulter used the words from the chart, that we sometimes, in the case of category 3, have to go through a source selection procedure; but he also said, if you will recall, that in the case of category 2, where we already have the source established, the time would be some 30 to 45 days shorter.

So the chart applies specifically to category 2. The words that he threw in apply to category 3.

The CHAIRMAN. You said 30 to 45 days shorter?

General DAVIS. Than the 5 months shown.

The CHAIRMAN. That is related to the 5 months?

General DAVIS. Yes, sir.

The CHAIRMAN. In other words, you save one-fifth or a little more of the time?

General DAVIS. By going directly to the source.

The CHAIRMAN. You would save one-fifth to one-fourth?

General DAVIS. Yes, sir.

Colonel COULTER. What it really says is that the 24 months could be reduced to 22½ or 23 months. But there is not a significant difference in the timing required to do a category 2 or 3 procurement.

The commander's decision, which must be made at this point, and a month or more is allowed here—I should say, sir, that these estimates of time are conservative. People that we had conversations with as we put this chart together thought that 5 months was too short a period, that 6 or 7 months was a better number.

There were other people who thought that it could be done in 5 months, and this is a nominal number and could be as long as 8 months in a complicated situation, and maybe shorter in others.

The commander, prior to making a decision, must review the engineering data, review the procurement data, review the program requirements, provided by the project office.

Here I talk about retention of schedules, primarily. We also would address the items I have talked about earlier, the configuration, precisely established, and that sort of thing, with the development completed.

Then we have at ASD a formal board comprised of senior technical people in the engineering, material, equipment, and management areas.

This board must look at each and every procurement on an annual basis, each and every procurement associated with all weapon systems,

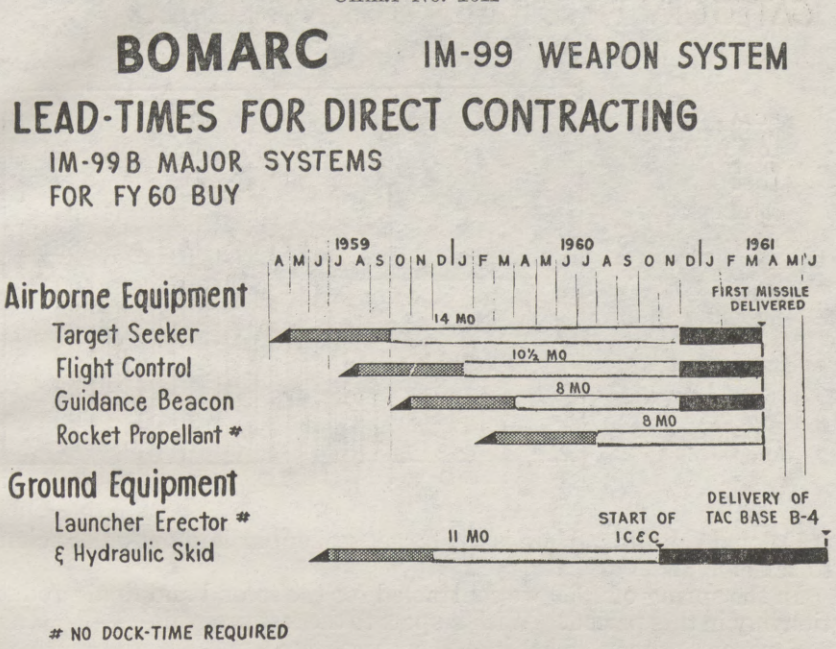
so that this sort of assessment is made annually, and in association with the annual contracting, budgeting, and contracting cycles.

Every major subcontract is reviewed each year to assure that we do progress, since it is our purpose to progress, into the direct contracting regime as rapidly as possible; progress from the development CFE posture to the direct contracting posture as soon as possible.

I will apply this leadtime standard to the specifics of the Bomarc situation and show you where the decision points were as they related to the overall program project.

(Exhibit No. 16H follows:)

CHART NO. 16H



Colonel COULTER. This chart has the calendar dates across it.

This is 16–H.

The chart looks at selected subsystems of the Bomarc missile. Here is our first missile delivery date indicated, and it shows that our delivery point is in April of 1959.

The flight control system has a shorter time in manufacture, it being manufactured by Boeing, although that is not necessarily an explanation for it being shorter, than is shown here.

The guidance beacon has a shorter manufacturing time. The rocket propellant is significantly shorter because the dock time requirement does not exist. We delivered the rocket motors directly to the missile site and assembled them into the missiles at the sites. So we save the Boeing manufacturing and production time.

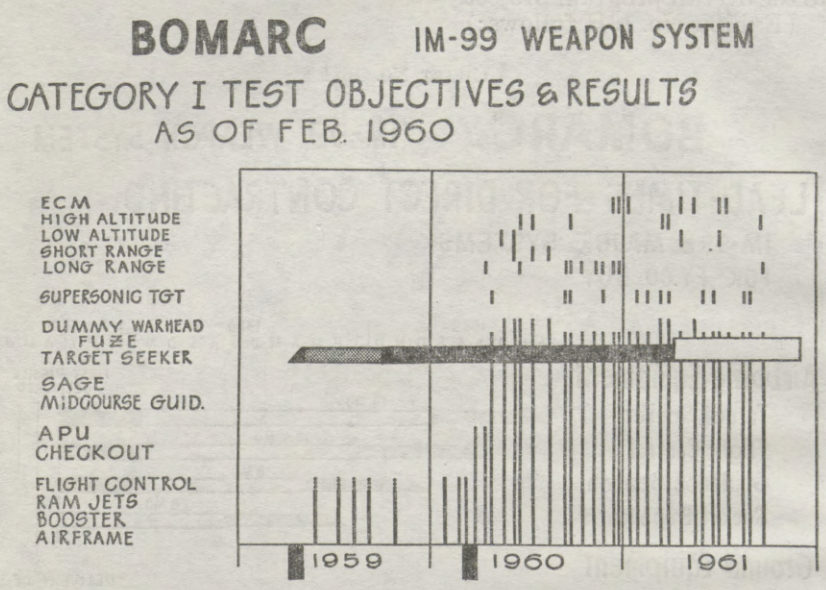
With respect to ground equipment, the launcher erector and its related hydraulic power supply, called the hydraulic skid, because it is mounted on skids, has a 22-month leadtime associated with it.

The chart says, sir, that in the contracting cycle in the spring of 1959, the decision had to be made to go into CFE posture on these major items, or, conversely, into a GFAE posture.

My next chart will relate the status of the development program as these time bars apply to that development program.

(Exhibit No. 161 follows:

CHART NO. 161I



Colonel COULTER. Here is the target seeker bar laid out on the chart to scale.

In the spring of 1959 we contracted for the second and final production buy in this period. With respect to the test program——

Senator JACKSON. That is on the A program?

Colonel COULTER. No, sir; the whole briefing is a B missile briefing. We are talking about the B missile exclusively.

The committee staff interest has been directed to that.

In calendar 1959, we did the first series, so-called block 1 series, of B missile flight tests at Patrick, Cape Canaveral, on the east coast of Florida.

We fired eight missiles there, and had a series of extreme difficulties. These were not system tests but missile tests. We were testing four major system elements; the booster motors, the ramjet engines, the flight control system, and the airframe itself.

We had six successive failures. I was there. We were in the deepest sort of trouble. Most of the failures were associated with the ramjet engine. We could not get them to ignite.

It takes a precise set of conditions, fuel flow, velocity of the missile, and so on for the engine to ignite. We had to back off and do a major reengineering effort in the fall of 1959 to achieve a fix on the ramjet engines.

I should have already remarked that these [referring to chart] are significant flight test program objectives. We were to test the missile in an ECM environment (electronic countermeasure environment) at high altitude, at low altitude, at short range, at long range, against supersonic targets. We were to test dummy warheads, target seekers, the SAGE environment, with the midcourse guidance (utilizing the ground-air transmitters), the auxiliary power unit, as well as the flight control system, the ramjets, boosters, and airframes.

We moved the test program to Eglin because the ballistic people were becoming dominant on the Patrick range, and started over again at Eglin.

The chart shows that we really did not get into serious testing of the missile as a system with targets and with midcourse guidance, with all of the subsystems working, until we were well into the Eglin test program.

Senator JACKSON. Which is 1960?

Colonel COULTER. Yes, sir. And the decision point for the 1961 buy, which was subsequently canceled, was early 1960.

The first marking [indicates] is the timing for the decision of interest. The chart simply shows that at this point in time we had achieved none of the prerequisites associated with decisions to go to other than category 1.

We did not have the design completed, we did not have it tested, we did not have configuration frozen—we were still in a heavy development phase and were running into significant development difficulties.

The CHAIRMAN. Colonel, we are going through all of this in detail, but what has that to do with the main issue? You were experimenting, paying for that experimentation, you were paying those doing it for you.

Tell me how it relates to the issues here?

Colonel COULTER. My understanding, Mr. Chairman, is that the committee's interest is in the question of why not go rapidly into direct contracting.

The CHAIRMAN. Not necessarily.

Mr. ADLERMAN. We have never questioned the target seeker, we have never questioned any of the breakout items here except one.

The CHAIRMAN. I want you to make a record, I do not want to interrupt, but I was trying to figure it out. You started something, had a bad experience, and you had to start over. That is to be expected.

Well, we can all appreciate that in an area like this, in a new experimentation and development, you are going to have some failures.

General DAVIS. I would like to interpose the comment that this chart shows, I think, that at the time we had to contract with someone, in this case Boeing, for the complete system—the red dot on that chart 16–I was before we had any real knowledge of how well the thing was going to work.

As a matter of fact, it was very developmental. So he is going to show us a chart on the status of each of these, to show that at that

point in time where the decision had to be made the risks were entirely too great to break out any one of those subsystems and contract directly.

The CHAIRMAN. I am not questioning that at all. I do not mind putting all of this into the record. You had to start. I think you had to select the company that possibly indicated it had the know-how or the possible know-how, the equipment, and the plant to do the job.

There was nothing wrong with selecting Boeing at all.

General DAVIS. I took my guidance, of course, from counsel. In my statement you will recall that when counsel was out at our place talking about this program, he said words to this effect, that the committee was not questioning the efficacy of the procurement of the Bomarc program and so on and so forth; they were primarily interested in going direct to the associate contractor versus going to the prime contractor, and that he was not questioning the fact that we should go to the prime contractor for the development and test phase, but he wanted to know why we had not broken out the subsystems in the Bomarc program earlier and contracted direct rather than from Boeing.

He asked that specifically of me just as he left the building. I thought we were being responsive to that, which we did not get a chance to say while he was there, why we did not break out earlier.

The CHAIRMAN. I wanted you to know that I do not question, and I do not suppose any member of the committee questions, the manner in which you had to go out and find ways to do this.

It was all an experimentation. You were seeking to develop something that would answer a problem and bring into being weapons that would meet the challenges of our times.

There is nothing critical about it at all, the way you had to begin. I see nothing wrong with it.

You may proceed.

(At this point Senator Muskie entered the hearing room.)

Colonel COULTER. The rest of my remarks, Mr. Chairman, are addressed in the same vein. I wonder if I have not made my point and should we not conclude this?

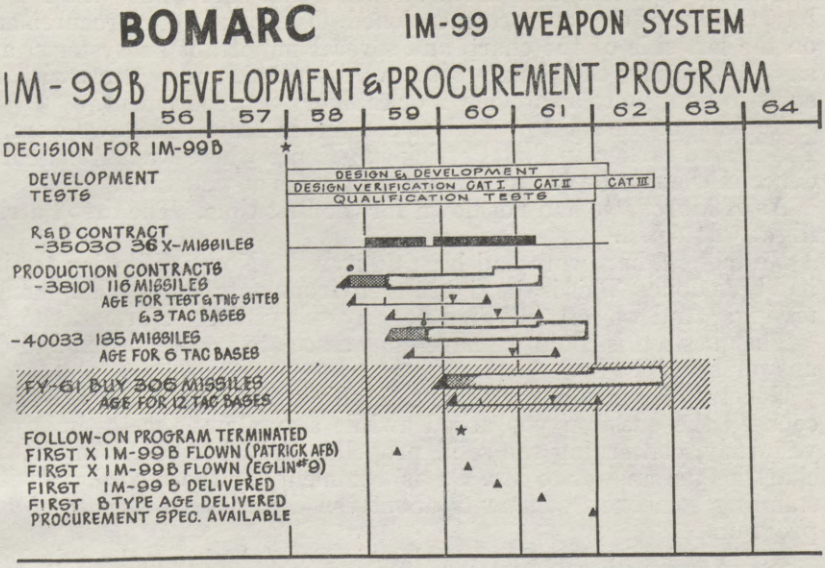
The CHAIRMAN. Go right ahead.

I wanted to get the record straight that we are not criticizing? I have commended the results achieved. You have to go out. You are experimenting. You are trying to find something that does not exist. You are trying to create something. You go to the best talent we have. There is nothing wrong with that.

Colonel COULTER. Our chart shows that the B system was brought in three major hardware contracts, the R. & D. contract, which bought the experimental missiles, used in the program, and, two production contracts.

(Exhibit No. 16J follows:)

CHART No. 16J



Colonel COULTER. The same time bars are laid out on this chart and are related to the design, development, test, and qualification test bars, to illustrate the overlap and concurrency that this situation required.

This was our 1961 buy which was terminated in the program cutback identified in May of 1960.

Here are some key milestone dates as they relate to the general timing of the procurement operation.

(Exhibit No. 16K follows:)

CHART No. 16K

BOMARC IM-99 WEAPON SYSTEM
SUMMARY SUB-SYSTEM STATUS

AS OF MARCH 1959 FY-60 BUY	SOLID PROPELLANT BOOSTER	GUIDANCE BEACON	TARGET SEEKER	FLIGHT CONTROL	HYDRAULIC SKID LAUNCHER ERECTOR
1. DEVELOPMENT STATUS	PRELIMINARY FLIGHT RATING	DESIGN	DESIGN	DESIGN VERIFICATION	DESIGN VERIFICATION
2. HAD FIRST TACTICAL VERSION BEEN DELIVERED TO WEAPON SYSTEM CONTRACTOR	NO	NO	NO	NO	NO
3. PERCENT OF QUAL TEST COMPLETE	NONE	NONE	NONE	NEGLIGIBLE	< 15%
4. DO WE HAVE SUB-SYSTEM PERFORMANCE SPEC'S	NO	NO	NO	NO	NO
Conclusions: A. COULD WE GO ASSOCIATE NOW –	NO	NO	NO	N/A UNIT MADE BY BOEING	NO

Colonel COULTER. This is the situation that surrounded the FY–60 buy, the last of the contracts mentioned. We look at our procurements on the left side of the chart, and several important subsystems, and assess, applying the prerequisites we discussed, our posture with respect to going into a category 2 or category 3 procurement.

Looking at the solid propellant booster, in March 1959, we were, as I indicated earlier, in that Patrick experience where we had not confidence in the missile or any of the subsystems at that time.

As of March, we had not flown for the first time. The first Patrick flight was April.

No tactical hardware had been delivered. No qualification testing had been done. This is the rigorous environmental and developmental testing. And we certainly had not any subsystem performance specs.

The question is could we have gone associate to category 2, and the answer has to be no.

General DAVIS. At that point, I think the record should show, counsel, the question you asked awhile ago, about the testimony of yesterday, concerning the solid propellant and booster, I think that chart is our answer to Mr. Davis' comment for the record, notwithstanding someone's comments about the duration of the flight test program.

At the point in time that we, the Air Force, had to make a decision on category 1 versus category 2, no qualification testing had been done. So whether it was a 16-shot program or a 40-shot was completely academic and had nothing to do with the decision.

Senator JACKSON. Do I understand, General, that the successive failures that occurred in March or April 1959 ——

Colonel COULTER. They continued through the summer.

Senator JACKSON. Through the summer, related primarily to the solid propellant system?

Colonel COULTER. That is not correct, sir. The trouble was with the ramjet engines.

Senator JACKSON. The booster would get off, but then there were problems in the relationship between the booster and the igniting of the ramjets.

General DAVIS. There was a problem with the solid booster. In the initial test program, it was not putting out the proper amount of thrust, I suppose, to get the ignition.

So we were in trouble on the solid booster, also.

The primary missile failures were attributable to the ramjets.

Senator JACKSON. But you have to relate the two together in order to reach a solution?

General DAVIS. That is correct.

Senator JACKSON. It was in this area, primarily, that you had your trouble; is that correct?

Colonel COULTER. Yes, sir; but the troubles are identifiable separately with the booster on the one hand and with the ramjet engines on the other.

We had fuel flow and ignition troubles with ramjet engines. We had different kinds of troubles with the solid propellant boosters.

Senator JACKSON. Then you had troubles with both the booster and the ramjet.

Colonel COULTER. Yes, sir.

Mr. ADLERMAN. This was in March 1959?

General DAVIS. Yes, sir; that is what the chart shows.

Mr. ADLERMAN. With all of this trouble, with all this incompleteness in the thing, you still went into an incentive-type contract; is that right, at that time?

General DAVIS. We were already in an incentive-type contract at that time.

Mr. ADLERMAN. In March 1959, did you go into that with the Boeing on the B?

General DAVIS. This is the B we are talking about here now, and I do not believe we are in an incentive contract on that particular one.

Mr. ADLERMAN. No, it was in May. Were any of these conditions cleared up by May?

Colonel COULTER. Not significantly. The progress between March and May——

Mr. ADLERMAN. You said that continued on through the summer, did you not?

Colonel COULTER. The booster and ramjet troubles continued on through the summer.

Mr. ADLERMAN. But that did not prevent you from going into an incentive-type contract?

Colonel COULTER. That is right, sir.

General DAVIS. There was no reason not to enter into an incentive contract.

Colonel COULTER. Well, to follow through, a similar look at the guidance beacon, the target seeker, the flight control system, the hydraulic equipment and launcher erector brings you to the same conclusion, that we could not have gone into a direct contracting posture on this contract.

My next chart looks into the future, chart 16L.

(Exhibit No. 16L follows:)

CHART No. 16L

BOMARC IM-99 WEAPON SYSTEM

SUMMARY SUB-SYSTEM STATUS

AS OF FEBRUARY 1960 FY-61 BUY	SOLID PROPELLANT BOOSTER	GUIDANCE BEACON	TARGET SEEKER	FLIGHT CONTROL	HYDRAULIC SKID LAUNCHER ERECTOR
1. DEVELOPMENT STATUS	FLIGHT TEST	RE-DESIGN	DESIGN	FLIGHT TEST	FLIGHT TEST
2. HAD FIRST TACTICAL VERSION BEEN DELIVERED:					
TO WEAPON SYSTEM CONTRACTOR	YES	NO	NO	YES	NO
TO AIR FORCE INVENTORY	NO	NO	NO	NO	NO
3. PERCENT OF QUAL TEST COMPLETE	<50%	NEW START REQ'D	NEGLIGIBLE	40%	<50%
WHEN WILL IT BE COMPLETED	DEC '60	UNK	SEP-OCT '60	DEC 60	FEB '61
4. DO WE HAVE SUB-SYSTEM PERFORMANCE SPECS?	YES	YES	YES	YES	YES
DO WE HAVE SUB-SYSTEM PROCUREMENT SPECS?	NO	NO	NO	NO	NO
5. WITH PROCUREMENT SPECS. AND NEW SOURCE WHAT ADDITIONAL TESTING WOULD BE REQUIRED BY LABS?	COMPLETE QUAL TEST	COMPLETE QUAL TEST	COMPLETE QUAL TEST	NONE	NONE
Conclusions:					
A. COULD WE GO ASSOCIATE NOW?	YES	POSSIBLY	NO	N/A UNIT MADE	YES
FY-62 BUY?	YES	YES	YES	BY BOEING	YES
B. COULD WE GO GFAE (CAT. III) NOW?	NO	NO	NO	NO	NO
FY-62 BUY?	POSSIBLY	POSSIBLY WITH AN/APX-46	NOT ADVISABLE	NOT ADVISABLE	NOT ADVISABLE

Colonel COULTER. This postulates what we might have done with the next or fiscal year 1961 buy had we not terminated that buy. We were making progress.

We take the same subsystems and apply the criteria and ask "Could we go associate now in the case of the solid booster?" and we say "Yes," that we could have gone category 2 in 1961.

This is the one that was canceled. Then we look a year further and guess at what we could have done in 1962 and the answer is "Yes." Could we have gone GFAE, and we say "No," with respect to the 1961 buy, and possibly with respect to the 1962 buy.

What I am saying is that we were organizing and were at the decision point—when we canceled the program. We were close to or we were involved in the decision-making process on these subsystems.

We said that we could go "Yes" here on propellant, "Possibly" on the guidance beacon, "No" on the target seeker.

Senator JACKSON. "No," on the target seeker?

Colonel COULTER. "No" on the target seeker. We were not up to development specifications there.

Senator JACKSON. How about the flight control?

Colonel COULTER. The flight control system was Boeing furnished, so the question is not applicable. We considered subcontracting this, and that is another subject.

However, the answer is that the flight control system is such an integral part of the system that it makes sense for the weapon system contractor to build it.

It is important to note that our decision was that we could have gone "Yes" on the hydraulic skid launcher erector, with the Food Machinery Corp. at that time.

General DAVIS. That will conclude his remarks, Mr. Chairman. I would like to conclude my remarks now, if I may.

The CHAIRMAN. Have you concluded your remarks?

Colonel COULTER. Yes, sir.

General DAVIS. On that chart, he concluded that had we had another buy, had we not had our last program canceled, had we gone ahead with the procurement as programed, we would have broken out additional subsystems.

We already had the plan to break out some of the major subsystems for that buy. But because the program was cut back, we did not get into that position to do that.

The CHAIRMAN. Very well.

General DAVIS. In concluding my remarks, I would like to summarize those points I consider most significant in this review of the Bomarc program and contract history.

First, as to changing from the prime subcontractor relationships to prime-associate, for the first Bomarc "B" procurement it clearly would have been premature since we were then only 9 months into the research and development program.

Even at the time of decision for the second procurement, which was the last buy on the Bomarc program, we did not have adequate specifications nor did we yet have demonstrated performance.

By the time for decision on the third procurement which was canceled when the Bomarc program was curtailed, we had made considerable progress in preparation for procurement of additional subsystems on an associate basis. We were still 9 months from delivery

of the first tactical unit, and we were in deep trouble over the ramjet engines—which were already being procured on an associate basis.

However, we were making good progress in the solution of the ramjet and other development problems. As Colonel Coulter has told you, we could have procured the solid booster as GFAE, but we could not have so procured the Westinghouse target seeker.

For a fourth procurement with fiscal year 1962 funds, if the program had proceeded according to the earlier schedules which called for procurements through fiscal year 1966, we would certainly have been able to use the associate concept on all major subsystems.

Such was our intention—and performance since has confirmed the validity of such intentions.

It is important to remember that when the initial decision was made as to what contractual approach to use on the Bomarc program, plans called for a total of 5,000 missiles.

The total program at the time of the last Air Force regulation 70–9 review, the one for the fiscal year 1960 buy, called for 1,300 missiles and 29 bases. As only 570 missiles were ultimately purchased, our final total buy was only 11 percent of the original program.

Gentlemen, I would like to say in closing that although I was not the commander responsible for making the contractual or other decisions on the Bomarc program, I have carefully reviewed the technical and contract management of the program.

As we have stated here today and covered previously with your committee representatives, I feel that the decisions made on the Bomarc program were proper, that the results achieved speak for themselves.

Had I been the commander responsible for Bomarc program decisions, I do not feel that I would have made decisions significantly different from those that were made. I do not believe that my foresight would have been any better than my predecessors.

Even when viewed in the light of the hindsight which time has accorded us, I feel that the Bomarc program stands up very well under close scrutiny—that the Air Force and the United States received full value for funds expended.

That concludes my statement, Mr. Chairman.

The CHAIRMAN. General and colonel, we appreciate very much your covering this in considerable detail. I think there may be some of it which will be superfluous for our consideration, but I know you wanted to present the story from your own viewpoint so that we might have a complete picture of the whole operation.

The committee will now recess until 2:30 this afternoon.

Please return at 2:30, gentlemen, and we will resume.

(Members present at time of recess: Senators McClellan, Jackson, and Muskie.)

(Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 2:30 p.m., the same day.)

AFTERNOON SESSION

(The subcommittee reconvened at 2:30 p.m.)

(Members present at time of reconvening: Senators Curtis and Muskie.)

Senator MUSKIE (presiding). The committee will come to order.

TESTIMONY OF MAJ. GEN. W. A. DAVIS, COL. JOHN M. COULTER, LT. COL. WARREN K. LINNEROOTH, AND MAJ. ROBERT M. WEINSTEIN—Resumed

Senator MUSKIE. In the temporary absence of Senator McClellan, he has asked me to convene the hearings.

General Davis is still on the stand.

Counsel, will you proceed with the questioning?

(At this point Senator Jackson entered the hearing room.)

Mr. ADLERMAN. General, in talking about incentive type contracts, is it not the fundamental principle in incentive type contracts that the Government should require a realistic target cost before it enters into that contract, or it must have data, production data, which will give it a realistic target cost before it enters into a contract, on an incentive type?

General DAVIS. These are our general criteria, yes, for entering into incentive type contracts.

Mr. ADLERMAN. Would it not be foolish and would it not be uneconomical for the Government to enter into a contract of an incentive type where it does not know exactly what the target would be?

General DAVIS. No, I do not think it would be foolish. I think it is a matter of judgment as to how well you think you can establish a target price.

Mr. ADLERMAN. I would like to quote to you from the statements made by Maj. Gen. William T. Thurmond, Assistant Chief of Production and Programing, Deputy Chief of Materiel, as of June 1961.

I think he still holds the same post. He discusses the use of the profit motive in defense procurement practices.

I would like to read what he has to say.

(At this point Senator Mundt entered the hearing room.)

Mr. ADLERMAN (reading):

> I can't emphasize too strongly that the key ingredient to all incentive contracts is realistic target costs.

And in another part:

> The so-called cost-plus-incentive-fee contracts, this type of contract, while assuring the contractor a minimum fee, permits the fee to be increased within certain specified limits if the contractor produces for less than the original estimated cost.
>
> Here, again, I want to emphasize that we must start out with a realistic target cost and establish a target fee based upon that target cost.

And, again, in another part:

> To the extent that the contractor is able to inflate his cost estimates and produce an unrealistic cost target, to that extent he begins his operation with a cushion.

Do you agree with these statements made by General Thurmond?

General DAVIS. Yes, I agree with the statements, but I would like to add that the definition of a realistic target is a little illusive.

This does not necessarily connote that you have to know exactly what they are going to cost, based on past production experience.

We have other means of what we consider to be accurate projections of what costs will be based on a similar experience and based on our wide experience in negotiating contracts for similar types of things.

We try to get into an incentive arrangement as early as we can do so. If you will recall in my statement, in talking about incentive contracts, CPFF and fixed-price contracts, I said that in situations where we can reasonably estimate a realistic target, that we would go for an incentive contract.

Where the product is reasonably well defined, the work is reasonably well defined, we would like to do this.

On the other end of the spectrum, where it is completely unknown, the work is not clearly defined, we have to use CPFF in most cases. In cases where we have detailed data, we know exactly what it costs from previous manufacturing experience, then we expect to go to a straight fixed-price contract, which we do. But in the middle are the incentives.

Mr. ADLERMAN. Of course, where you have every factor and you know exactly what the costs are, you can go into a fixed-price contract. But we are not discussing these factors here when you are dealing with a missile system which is in research and development stages, it has not gone into production yet, and still in a production contract they go into an incentive type contract.

Of course, you were not here yesterday, and I do not know whether you had an opportunity to read the record, or whether you were told what was developed yesterday during the course of the testimony.

General DAVIS. No.

Mr. ADLERMAN. If you do not mind, I would like to just give you a brief statement or summary of what was testified to yesterday as to certain subcontract costs in these contracts.

Are you familiar with Contract No. 36319?

General DAVIS. Only from our investigations and our review of it. I was not familiar with it at the time. I do have quite a few facts and figures available to me.

Mr. ADLERMAN. That was a contract which called for the production, an incentive-type contract which called for the production of 78 missiles. The figures are there.

The initial target was $112 million. The underrun on the initial target was $29 million. The basic profit at 8 percent was $8.9 million.

The incentive profit turned out to $2.2 million. On the reset target, it underrun by another $6 million, and the incentive profit was $306,000.

The total underrun was $36 million out of $112 million, representing 32 percent of the cost. The total profit that was granted in that case was $12 million, and there was testimony—pardon me, there was not testimony on that. There was comment on it.

I will bring it out a little later. There was comment that the Boeing Co. would have preferred not to have had that contract in that fashion but at a cost plus at 6 percent, which would have meant the difference between $5 million and $6 million.

The subcontractors testified on that particular contract. International Tel & Tel said that they proposed a price to Boeing before the contract was entered into, purely a proposal, of $16.9 million for the work that they were to do.

According to the record of the negotiations, Boeing added a contingency factor of 13 percent to that, and agreed with the Air Force for a prime target price of $19 million, which is part of the $112 mil-

lion. That was about $2.1 million over the subcontractor's proposed price.

The subcontractor came in on a voluntary reduction about June 9, 1958, and reduced their figure to $13.2 million. That was about 6 months later, I think, after the contract was signed.

The final cost ended up even lower, at $10.5 million. The total underrun was $8.7 million out of a prime target figure that was offered to the Air Force at $19.2 million.

Westinghouse had a similar story. They proposed a price for the work that they were to do on the target seeker of $5.8 million. Boeing added a contingency or a PRR factor of 15 percent. Their prime figure that entered into the agreement with the Air Force was $6.7 million. Westinghouse came in and made a voluntary reduction to $3.8 million.

The final cost, however, was even lower, $3.3 million, for a total underrun of $3.4 million.

Lear came in and they had proposed to Boeing a unit price of $40,822, which totaled $3,184,000. Boeing added a 15-percent contingency, and the prime target figure, as part of the $112 million, was $3.6 million.

Lear came in on a reduction and said they were getting too much money, they did not want that much money, and they had a price redeterminable, and they reduced it down to $31,552 a unit, or a difference of $9,000 from their original proposal.

Their final cost was even lower, $2.1 million. That came to an underrun of $1.5 million on the prime target figure of $3.6 million.

Senator CURTIS. Can I ask a question at this point?

This is in no sense critical, but I was unable to be here because of a conference. These facts and figures that you are reciting now, is that the staff's work or are you quoting from the testimony?

Mr. ADLERMAN. The testimony of yesterday.

Senator CURTIS. The testimony of yesterday. Thank you.

Mr. ADLERMAN. It was testified yesterday by Aerojet that they gave a proposal to Boeing of $1.9 million. Boeing added a contingency factor of 15 percent. The prime target cost came out to $2.2 million. That was the prime target that was entered into in the contract, $2.2 for their share of work.

The final redetermined cost of Aerojet was $1.6 million. So they had an underrun of $600,000. Or a total underrun of $14 million out of a prime target figure of $31 million.

Under those circumstances, and I can go on and give you the same type of figures in contract Nos. 38098 and 38101, which would come out about the same. There was a $14 million underrun out of $35 million on contract 38098.

Contract No. 38101, Westinghouse testified there that their proposal was $17.9 million. That Boeing added a contingency factor of 35 percent on the hardware, 15 percent on tooling, and their agreed price with the Air Force was $22.9 million.

Actually, the final cost came out to $17,290,000, for an underrun of $5.7 million.

Now, under these circumstances, do you feel that the Air Force should have entered into a contract, or three incentive contracts of this type, where the contractors, themselves, the subcontractors said

they had no idea what the cost was going to be, they had not produced it, some had been in prototype, some had been in research and development, but none of them had any production costs, and still the Air Force entered into an incentive-type contract, not once but three times.

General DAVIS. I think it was quite proper to enter into an incentive-type contract at this time. I think the figures that you have cited are good evidence that the incentive features did work to get our costs down.

You recited many millions of dollars that were saved, and I contend that at least to some degree the fact that the incentive contract was there caused this reduction.

I contest that they had no knowledge of costs because at the point in time in which we entered into this first incentive-type contract we already had three CPFF contracts in being with Boeing on the Bomarc.

In April 1958, when the contract was negotiated, Boeing was completing the deliveries of 48 experimental missiles. They were well into the deliveries of another contract for 45 service test missiles, which we thought were pretty close to the production configuration of the A missile at that time.

I submit that you do not have to wait until you have delivered everything until your accountants can give you cost experience, because the costs have been going on for anywhere from a year and a half to 2 years before you deliver the first completed one.

So the contractor did have cost experience in April 1958. He also had cost experience from his subcontractors.

Now, true enough there are changes that take place, and when you get into the higher rate of production, costs should go down. It might interest you to know also that the $112,108,000 initial target was not a contractor proposal that the Air Force just bought.

I would like the record to show that this is not the case. The contractor proposed at that time a cost of $118.3 million, which included——

Mr. ADLERMAN. Suppose they had proposed $250 million?

General DAVIS. We would have negotiated probably to the $112 million.

Mr. ADLERMAN. So it does not matter what they proposed?

General DAVIS. I wanted to be sure that the $112 million they showed there was not the contractor's proposal. The $118.3 million quotation was what Boeing proposed. The final target of $112 million was what we expected Boeing to work toward with the 8-percent incentive—I mean profit—of target cost.

Incidentally, you said that it was testified that Boeing proposed a CPFF contract at 6 percent. I think it should be cleared up here that although they did propose the CPFF contract at 6 percent, they proposed it on the basis of the $118 million quote.

Mr. ADLERMAN. What would that come out to?

General DAVIS. In our attempt to get an incentive feature, we could not reach agreement at a target cost figure acceptable to the Government at 6 percent on a CPIF basis.

We did get an acceptable target figure negotiated with the contractor on a fixed-price incentive basis at an 8-percent target profit. I think

you will also see that if you get all the figures out and not just use one contract out of context, see the entire performance under the Bomarc contracting, you will see that the contractor before-tax profits on all these contracts ran about 8 percent, which is what our targets were generally at that time.

Mr. ADLERMAN. Yes, we have already run into that. Unfortunately, you were not here, but we did have testimony showing what their average profit was. However, as I understand it now, you have justified, and you say it was proper, where they had no production experience, they had no knowledge of what their costs——

General DAVIS. I did not testify to that, Mr. Counsel.

Mr. ADLERMAN. You just justified that. I would like to——

Senator JACKSON. I believe, Counsel, he testified——

General DAVIS. I testified they had delivered in excess of 40 missiles, that they had delivered them, prior to the time they negotiated. They were already delivering what we call service test missiles on a second contract before this negotiation.

Mr. ADLERMAN. These deliveries that you talked about, these 40 that you say were delivered, what type of missile were they?

General DAVIS. They were the Bomarc A.

Mr. ADLERMAN. What type?

General DAVIS. Well, they were delivered against an R. & D. contract for test purposes.

Mr. ADLERMAN. That is right. That was not a production model; was it?

General DAVIS. You will have to define production model. We hoped that the first one we built was a production model, but obviously this is not the case.

Mr. ADLERMAN. There were three prototype models; were there not?

General DAVIS. I would say they were research and development test models.

Mr. ADLERMAN. They were test models which do not have the same configuration, they do not have the same elements, they are not the same thing as a production or an operational missile. Is that not so?

General DAVIS. That is true, but we never know this in advance until the last one is produced.

Mr. ADLERMAN. Unfortunately, you were not here yesterday, but the subcontractors testified that on the basis of what they had already done they had no way of judging what the actual costs would be, say, for the target seekers, for the coordinate converter, or any of these other items, because they had no production experience whatsoever.

Even at best, they were guess estimates or estimates.

General DAVIS. I do not agree with that. The techniques used in the factory are exactly the same for the birds they were building for the test program as they were going to use for the inventory program.

Mr. ADLERMAN. Do you not find it strange that here within months, or just, I think, 2 months or so, between April 1958 and June 1958 I.T. & T. came in voluntarily and said, "Our estimates are much too high, $13.2 million." Pardon me; it was a negotiated proposal. They reduced their rate to 13.2 from 16.9, to which Boeing had added a 13-percent contingency.

So within 2 months, before they had even made a single one, or maybe they had made one or two, I do not know, but certainly they

went down $6 million from the target within 2 months after the prices set in the contract were made.

General DAVIS. I suspect this was a result of a negotiation with Boeing. That is what we paid Boeing an incentive for, to negotiate those prices down.

Mr. ADLERMAN. Do you think there was a moral obligation on the part of Boeing to come in and advise the Air Force that these figures were not correct, that they were reduced to that amount before they went into any extensive production?

(At this point Senator McClellan entered the hearing room.)

General DAVIS. I believe our files show they did bring these in after negotiations were completed. On the reset, we did get these.

Mr. ADLERMAN. I am not talking about the reset. Do you not think there was a moral obligation, if not a legal obligation, on the part of Boeing to come in and say, "Our cost figures were wrong on this thing"?

General DAVIS. Possibly a moral obligation. I do not know whether they did or not. I was not the negotiator.

Mr. ADLERMAN. And you think this is good procurement experience to have entered into that kind of a contract where you have these costs dropped down like that within 2 months?

General DAVIS. We thought so at the time, and I think the record has shown that it was good for the overall program. We did get the costs down.

I grant you that it was somewhat of an experiment in this particular type of incentive contract, because it was our objective at that time to enter into the incentive contracting business as early in the cycle as we possibly could.

The fixed-price incentive contract with the successive fee or successive formula, as indicated here, FPIS, was new and experimental, and we thought it particularly appropriate to use in this particular situation.

Our foresight was not quite as good as our hindsight. It turned out that they probably did better on it than we would have liked, but it was a good experiment because we learned a lot from it in the incentive contracting business.

We had no evidence that we would have gotten the savings if we had gone CPFF. The costs may have stayed right where they were established at the outset. So those reductions could have turned out to be additional cost to the taxpayers.

Mr. ADLERMAN. On the other contract, 38098, we had an underrun there of $36,198,000 out of a total of $135 million. Do you think that is a little unusual in an incentive-type contract, entered into under the same conditions as the one that I recited before?

General DAVIS. That is certainly a larger underrun than our average experience indicates, yes. Our average experience shows that the underruns are much closer to the target than that figure.

Mr. ADLERMAN. And does not that end up in a larger profit for Boeing than it would have received had it been on a cost-plus basis?

General DAVIS. You cannot draw that conclusion.

Mr. ADLERMAN. What is that?

General DAVIS. You cannot draw that conclusion. It might have resulted in a larger profit for Boeing, but you cannot conclude that we would have gotten the product cheaper.

Mr. ADLERMAN. We had testimony yesterday from the subcontractors. One of them did not even know that Boeing had an incentive-type contract. They said the fact that Boeing had an incentive-type contract played no part whatsoever.

General DAVIS. But the fact that he had a fixed price redeterminable with a 10 percent ceiling and unlimited downward redetermination certainly gave him incentive, because he stood to lose money.

Mr. ADLERMAN. Suppose Boeing had a cost-plus contract in this case?

General DAVIS. Boeing would have had no incentive to negotiate the quotation of the subcontractors down.

Mr. ADLERMAN. You mean Boeing had no responsibility——

General DAVIS. They would have had no cash incentive.

Mr. ADLERMAN. Just a minute. Do you mean Boeing had no responsibility to the Government on a cost-plus contract to keep the costs down as much as possible?

General DAVIS. They do have a moral responsibility; yes, but no cost incentive.

Mr. ADLERMAN. Do they not have a legal responsibility, too?

General DAVIS. Yes.

Mr. ADLERMAN. Would you require them to contract with their subcontractors at as low a cost that would be possible and feasible?

General DAVIS. You would not expect a contractor to go out if he had a CPFF contract and contract on a fixed-price basis with his subs. The normal thing would be to contract on a CPFF basis like his prime. On this basis, we would have no assurance that the subs would get their costs down.

Mr. ADLERMAN. What is the Air Force doing all the time in these contracts? Do you not have to OK the contracts with the subcontractors?

General DAVIS. They OK the source, yes.

Mr. ADLERMAN. Do you look over their contracts and approve them?

General DAVIS. The administrative officer in the plant looks over the subcontracts and purchase orders, yes.

Mr. ADLERMAN. Do you not exercise any approval whatsoever over the contractors to see that they bring their costs as low as possible?

General DAVIS. We certainly do.

Mr. ADLERMAN. Would it not be natural, then, if that were the case, that you would ask the prime contractor to negotiate a contract that will bring the best return to the Government?

General DAVIS. I think he did that in this case. He brought it way down.

Mr. ADLERMAN. I am talking about a cost-plus contract.

General DAVIS. Yes, on a cost-plus they are just as obligated to get the cost down to a reasonable figure.

Mr. ADLERMAN. So it would not make any difference whether they had an incentive-type contract or not. They would still be obligated to produce the same type of contract?

General DAVIS. Theoretically that is true. There is nothing that motivates our system like the chance to make a better profit.

Mr. ADLERMAN. I agree that profit is a great motivating force, but I really feel that the Air Force should be more careful about how they spend their money, and certainly not give incentive-type contracts where they have no idea what the costs are going to be.

General DAVIS. I contend the Air Force did have some idea what the costs were going to be. We thought we did, anyway.

I would like at this point, if I may, Mr. Chairman, to clear up this point about the stigma that is being put on the incentive-type contract. The inference has been drawn by counsel that the incentive-type contract throws the taxpayers money away, and it results in excessive underruns and excessive profits.

I would like to ask Colonel Linnerooth to take a chart and show you our total experience with CPFF and fixed-price-incentive contracting and not just take one contract out of hundreds and try to paint all the rest of them black.

Mr. ADLERMAN. We are not taking a hundred. We are taking the three incentive contracts you have here.

General DAVIS. You have drawn the inference, Mr. Counsel, that with this one example incentive contracting, per se, is bad.

Mr. ADLERMAN. And I am proud to have drawn that inference because I think it is a very sharp one to draw.

General DAVIS. May I submit for the record the experience of our incentive contracting?

Senator MUSKIE. Go ahead, General.

General DAVIS. Colonel Linnerooth was a price analyst for about 10 years at Wright Field and is very well versed in this history.

Colonel LINNEROOTH. Mr. Chairman and Senators.

The CHAIRMAN. The chart may be inserted as Exhibit No. 17.

(Exhibit No. 17 follows:)

EXHIBIT No. 17

AF STATISTICS

RE: INCENTIVE VS CPFF

FINAL COSTS

TYPE	NO. CONTRACTS	TOTAL TARGETS $	FINAL COST $	DIFFERENCES (OVERRUN) $	DIFFERENCES UNDERRUN %
CPFF	730	2.047 Billions	2.196 Billions	(.149) Billions	(7.2)*
INC.	161	4.222 Billions	4.080 Billions	.142 Billions	3.4*

*Total difference of CPFF over INCV COSTS in above experience = 10.6%.

Colonel LINNEROOTH. This chart depicts the experience in CPFF and incentive-type contracts settled by the Air Force in the last 3 years, CPFF and incentive types.

It shows that in 730 CPFF contracts, in which the targets totaled $2.047 billion, the final actual cost turned out to be $2.196 billion, or an overrun of $149 million, and, in terms of a percentage, an overrun of 7.2 percent.

During the same period, and in the settlement of 161 incentive contracts with targets totaling of $4.222 billion, the final cost turned out to be $4.080 billion, or an underrun of $142 million, and a percentage of 3.4 percent.

This sample, as indicated, shows the total difference of CPFF over incentive costs incurred by contractors in this experience is 10.6 percent.

This is indicative, as far as we are concerned, not conclusive but certainly indicative, that under CPFF contracts, the final actual cost incurred by the contractors is something greater than is the final actual cost incurred under incentive contracts.

There is a second point to be made in connection with this chart. That is whereas we are looking at three incentive-type contracts in this Bomarc program that underran significantly yet generally speaking, nothing has been said about the other two incentive contracts that are hitting the targent on the nose, and the sum total of dollars in those other two contracts is approximately equal to the sum total of dollars in the three that were underrun.

Here we have experience in 161 contracts in which, overall, the final cost has turned out to be within 3.4 percent of targets.

So, generally speaking, the incentive contract is being attacked in this program on the basis of three contracts in this program that have underrun significantly, saying nothing about the other two.

It develops that these are three contracts that are the exception to the general rule. Generally speaking, our incentive contracts hit pretty close to target.

Senator JACKSON. Colonel, does this represent all of the contracts for the last 3 years in these categories?

Colonel LINNEROOTH. This represents, Senator, the incentive contracts that have been settled in the last 3 years, and, therefore, generally speaking, a lot of them are real old ones.

Senator JACKSON. But they represent all the incentive contracts that have been settled and all the CPFF contracts that have been?

Colonel LINNEROOTH. Yes, sir.

Senator JACKSON. They are not picked at random?

Colonel LINNEROOTH. No, sir.

General DAVIS. They are all of them that have been settled so that we have actual figures rather than estimates.

Colonel LINNEROOTH. To clarify that, commencing about 3 years ago we instituted a system in the Air Force of having all our buying activities make a report to a central agency whenever they settle a contract and these figures are taken from those reports.

Senator JACKSON. So these are firm figures?

Colonel LINNEROOTH. Yes, sir.

Mr. ADLERMAN. Colonel, do you know whether the targets were based upon cost production records or not?

Colonel LINNEROOTH. The targets in all of these contracts are based on estimates of cost developed by the Air Force and these estimates were based on all of the actual cost history that was available at the time they were established.

Mr. ADLERMAN. Do you know whether or not those target figures could be inflated or not?

Colonel LINNEROOTH. Do you mean the CPFF ones?

Mr. ADLERMAN. No, I am talking about the incentive-type contracts.

Colonel LINNEROOTH. Some of them probably were high and some of them probably were low, across the board.

Mr. ADLERMAN. Do you think they might be the same type of contracts that you entered into in this case?

Colonel LINNEROOTH. I did not get the question.

Mr. ADLERMAN. Were they based upon the same type of information?

Colonel LINNEROOTH. Not across the board. Some of them were targets established much later in programs. Some of them were probably established even earlier in the programs.

General DAVIS. This gives a cross section. That is the reason we wanted this chart to go in. It gives a broad area of experience. Some of them were early, some of them were late. This is what we like to use, instead of picking the exception which is an early start, or the other exception which is well after you are in production, when you know what the costs are and you expect to hit the targets right on the nose.

Mr. TIERNEY. Is it not a fact, Colonel, that in the majority of cases your CPFF contracts are for research and development?

Colonel LINNEROOTH. Generally speaking, that is correct.

Mr. TIERNEY. Ordinarily in research and development—in General Davis' statement he said it is the type of contractual arrangement which allows the Government to revise and amend a basic contract to the best of its interest with a minimum of administrative problems.

In other words, you have a situation at the outset where you are really in a design stage and you are not quite sure how far you are going to go.

Under those circumstances, I think it is more natural to overrun, more normal to overrun.

Colonel LINNEROOTH. As I indicated, this experience is not conclusive. It is only indicative. But we believe that it definitely indicates that the final actual cost—and the final actual cost is what we pay, not the estimated cost—the final actual cost, we believe, is definitely less under the incentive contracts than it is under CPFF contracts.

Senator MUSKIE. Colonel, can I ask you if you have any other criteria to judge whether or not the operation on the incentive contract is tighter, costwise, than it is under the CPFF contract?

Colonel LINNEROOTH. Senator, nothing concrete. This becomes an awfully difficult thing to prove. You get the impression, in talking to Government people that are in plants, that operations under CPFF contracts are loose, operations under fixed price and incentive type contracts are tighter.

But nothing conclusive.

Senator JACKSON. I wonder if it might clarify one point which I think counsel was getting at if I ask this question: On the incentive type contracts, do you have any kind of a breakdown on the number of contracts or the dollar amounts where you had underruns versus overruns?

In other words, I think the concern that they were expressing relates to the amount of underruns, in this case, and that this might, therefore, be the general average.

I wonder if you have any way of breaking that down to give us a clue?

General DAVIS. Do you mean numbers of contracts, the number that overran versus the number that underran?

Senator JACKSON. Yes.

General DAVIS. We do have such a study. I do not believe I have it with me. I have some examples. Take the B–52 program, for example, which we have a lot of history on. It has been in production for a long time. I happen to have a chart here that lists the eight production contracts on the B–52.

Of those eight, they were all incentive contracts, the eight I am talking about. Four of them underran and four of them overran. The net result was a net underrun of $8.9 million against a contract negotiated total price of $1.582 billion.

It is a very small variation. It is about one-half of one percent.

On the F–100 airplane program, which was also a long production run, in which we had six fixed price incentive type contracts, three of them underran and three of them overran, for a total of $26 million underrun—I do not have the percentage that is of the total, but the total negotiated target price for those contracts was $745 million.

We have a study that I can supply for the record that is broader than that.

Senator JACKSON. Was that an incentive contract on the F–100?

General DAVIS. Those were six incentive contracts, yes.

Senator JACKSON. What do you have on the cost-plus-fixed-fee?

General DAVIS. I do not have that with me. We do have a study. In fact, the figures that Colonel Linnerooth used in the chart to draw up these totals could be supplied.

The numbers of overruns and underruns. He is showing the net result there of all of them. Obviously, he had the records on 730 CPFF contracts and 161 incentive contracts.

Senator JACKSON. Would you supply that for the record?

General DAVIS. We can; yes, sir.

(Material to be supplied follows:)

Number and dollar value of contracts above and below established targets

CPFF contracts (total number reviewed, 730):	
158 contracts, overrun condition	$216,299,000
212 contracts, no deviation	0
360 contracts, underrun condition	67,036,000
Net overrun (dollars)	149,263,000

Net overrun (percent) 7.2.

NOTE.—In evaluating the above history, it should be understood that the data includes CPFF contracts of two distinctly different types:

(1) High-dollar weapon system contracts of the type discussed before the committee during Air Force testimony of May 24 and 25, 1962.

(2) Low-dollar contracts including those for pure research and study.

A review of Air Force experience during the last 6 months of calendar year 1961 reveals that approximately two-thirds of all CPFF contracts settled during that period involved estimated costs of less than $100,000 each. Extending this experience to cover the above data would suggest that approximately 475 of the 730 CPFF contracts involved costs of less than $100,000 and included contracts of the research and study type. It is evident, therefore, that the majority of contracts in the 730-contract sample are not of the major weapon system variety.

This "mix" of contract sizes is responsible for the apparent inconsistency revealed above which indicates that while the majority CPFF contracts have underrun, the dollars involved in overruns have been far greater. The reason for this phenomenon is that under the majority of small CPFF (research and study) contracts, the Air Force merely buys a contractor's time and talent for a specified period. The time span for performance is normally well defined and relatively short (6 months to a year) and the contractor is bound merely to expend best efforts toward a research objective rather than to guarantee the accomplishment of that objective or to deliver hardware. Under such contracts the Air Force is at liberty to make incremental decisions as to whether or not it will continue to procure the contractor's efforts, and thus is able to hold overruns to a minimum, or even, by terminating a contract, introduce an underrun.

Such is not normally the case with large CPFF weapon system contracts. Under these contracts the contractor is bound at virtually any cost to accomplish a development objective and/or to deliver items of equipment. Understandably, it is under this latter type of CPFF contract that large overruns have been experienced. This experience is apparent from the above data which shows a total overrun of $216,299,000 generated by only 158 out of 730 CPFF contracts. Additionally, evidence tends to indicate that had the Air Force selected only large weapon system CPFF contracts in compiling its data for the committee, the percentage of overrun would have been somewhat greater than that derived by using a cross section of CPFF contracts of all types and sizes.

Incentive contracts (total number reviewed, 161) :	
67 contracts, overrun condition	$48, 715, 000
94 contracts, underrun condition	190, 674, 000
Net underrun, dollars	(141, 959, 000)

Net underrun (percent) 3.4.

Mr. ADLERMAN. Were you the chief negotiator in the negotiations with Boeing on the incentive production contracts on 36319, 38101, and 35030?

Colonel LINNEROOTH. I was. I might clarify that slightly. I was the chief negotiator on a negotiating team that negotiated these contracts.

Mr. ADLERMAN. You were in charge of the team?

Colonel LINNEROOTH. The chief negotiator. The team captain was the WSPO Chief.

Mr. ADLERMAN. 35030 and 38101 are on the B and 36319 is on the A?

Colonel LINNEROOTH. That is correct.

Mr. ADLERMAN. 35030 is a research and development contract?

Colonel LINNEROOTH. Correct.

Mr. ADLERMAN. Are you one of the principal exponents, are you one of those that devised or invented the incentive-type contract?

Colonel LINNEROOTH. I did not invent the incentive-type contract.

Mr. ADLERMAN. With the successive or reset targets?

Colonel LINNEROOTH. The first incentive with successive formula, yes; I think I will take credit for having initiated that type of contract.

Mr. ADLERMAN. Are you generally of the opinion that where you have an incentive-type contract it will result in a lower cost to the Government?

Colonel LINNEROOTH. If it is a realistic incentive contract, in my opinion, it will result in a lower price than will result under a CPFF contract.

Mr. ADLERMAN. Predicated on the fact that you must have a target cost that is realistic?

Colonel LINNEROOTH. That is correct, at the time it is negotiated.

Mr. ADLERMAN. Was a letter contract signed which described the work of this under 36319, and which permitted the contractor to commence acquiring long leadtimes?

Colonel LINNEROOTH. I am sorry, I did not get your question.

Mr. ADLERMAN. I asked did you have a letter-type contract signed in this matter?

Colonel LINNEROOTH. Under 36319?

Mr. ADLERMAN. Yes.

Colonel LINNEROOTH. Yes.

Mr. ADLERMAN. What is the usual practice followed in negotiations for a contract? Do you first get a little signed, a letter contract signed? Is that usual or ordinary?

Colonel LINNEROOTH. In programs of this type, it is usually customary to place the procurement on a letter contract initially, and then shortly after that the contractor will submit a proposal to definitize that letter contract. I believe this was the course of action taken, or generally the course of events taken in each one of these five incentive contracts.

Mr. ADLERMAN. This proposal sets forth the type of contract, the contract desirous of being entered into, along with an estimated target figure; is that correct?

Colonel LINNEROOTH. Not always does it specify the type of contract but usually it does.

Mr. ADLERMAN. And is it usually, in addition to its estimated initial target figure, accompanied by support data backing up its estimates?

Colonel LINNEROOTH. Yes, in these major procurements that is definitely the usual practice.

Mr. ADLERMAN. The next thing that happens is that the Air Force analyzes the contract proposal.

Colonel LINNEROOTH. That is correct.

Mr. ADLERMAN. Then following that, the parties then conduct negotiation meetings which are more of a fact-finding type. I mean, you go into what the costs are, you question them about it, you find out why they are asking for this much or that much and so forth; is that right?

Colonel LINNEROOTH. That is correct. It is not a question of their asking for this much or that much because these figures that they submit are estimates of what the cost will be, and they are simply estimates of what they think the costs will be and what they think the price will be.

We evaluate those estimates very thoroughly.

(At this point Senator Curtis withdrew from the hearing room.)

Mr. ADLERMAN. Then do you arrive at an independent objective as to the type of contract and the estimated cost, the profit, the formula followed and so forth?

Colonel LINNEROOTH. That is correct.

Mr. ADLERMAN. And then a prenegotiation review presentation is made to your superiors in the Air Force?

Colonel LINNEROOTH. That is correct.

Mr. ADLERMAN. Then if they approve of it, the parties negotiate the type of contract that the Air Force desires and you get an estimated cost figure set up?

Colonel LINNEROOTH. At the prenegotiation review presentation, we present our objectives. We then go back and negotiate with the contractor and stay within those objectives.

Mr. ADLERMAN. And if you are going into an incentive-type contract, you figure out the formula that is going to be followed, whether it is going to be 85–15, 8 percent profit and so on and so on, as far as reset figures, and so on and so forth?

Colonel LINNEROOTH. That is correct.

(At this point Senator Mundt withdrew from the hearing room.)

Mr. ADLERMAN. Under contract 36319, was this the second production contract on the A missile?

Colonel LINNEROOTH. Yes.

Mr. ADLERMAN. It called for the production of 78 missiles, plus weapon support equipment for two bases?

Colonel LINNEROOTH. Right.

Mr. ADLERMAN. And did you negotiate this contract between March 24 and April 4 or 10, 1958?

Colonel LINNEROOTH. I did.

Mr. ADLERMAN. And had Boeing there proposed initially a target of $122.8 million?

Colonel LINNEROOTH. That is correct. However, that was a proposal on the part of Boeing for a work statement that differed somewhat from the one that we negotiated.

The proposal that Boeing submitted for the work statement we finally negotiated was, I think, $118 million.

Mr. ADLERMAN. 118 missiles?

Colonel LINNEROOTH. No, $118 million. At the commencement of negotiations, they adjusted their proposal to the new work statement, so it is proper to say that they proposed $118 million for the work statement that we finally negotiated at $112 million.

Mr. ADLERMAN. Was that a cost-plus-fixed-fee contract?

Colonel LINNEROOTH. They proposed a cost-plus-fixed-fee contract.

Mr. ADLERMAN. Did they propose a fixed fee of 6 percent?

Colonel LINNEROOTH. That is correct.

Mr. ADLERMAN. And that would have meant a profit to them of $7.3 million if they had no overruns or underruns?

Colonel LINNEROOTH. If that is 6 percent of $118 million, that is correct.

Mr. ADLERMAN. And the profit that they did take on this contract was $14,928,000, or just about double, is that right?

Colonel LINNEROOTH. Does that not include the spares? I do not think that is a proper comparison because we did not have the spares in this initial negotiation.

Mr. ADLERMAN. That meant that they took a profit of $11.5 million?

Colonel LINNEROOTH. Excluding the spares.

Mr. ADLERMAN. Excluding the spares.

Colonel LINNEROOTH. All right.

Mr. ADLERMAN. Which is some $5 million or so over the profit that they agreed to take, that they were willing to take, on a cost-plus-fixed-fee contract. Is that right?

Colonel LINNEROOTH. That is correct.

The CHAIRMAN. How did the Government profit out of that kind of transaction? Where is the saving and economy to the Government in that kind of transaction?

Colonel LINNEROOTH. Mr. Chairman, in my opinion, the final price that the Government paid in this procurement was less than it would have been had we made a CPFF contract.

The CHAIRMAN. That may be right. I am not arguing. But we just want to make a record. Here a company comes in here and it wanted to do this job on a straight cost plus fixed fee, and under such an arrangement it would have earned about $7.3 million.

Under the contract that you negotiated with them—I do not know whether you insisted they take it or not, but you finally worked it out—it cost the Government about $11.5 million.

General DAVIS. May I comment on that, Mr. Chairman?

The CHAIRMAN. I would be glad to have anybody comment on it.

General DAVIS. A while ago we tried to show that based on our broad, overall experience, costs under CPFF arrangements are generally higher than the target cost that we negotiate.

On the contrary, the final costs under incentive-type contracts are generally lower. The summary chart that we put into the record showed our experience. We can draw a logical assumption, anyway, that the $118 million the contractor proposed and the 6-percent fee would have given us a total estimated cost of $125 million for that contract.

Based on our experience, the contractors either equaling or exceeding the cost on a CPFF basis, we could assume, with some logic, it would have cost us $125 million to get that job done.

As it turned out, notwithstanding how much profit the contractor made, the total final cost was $75,368,000, plus this incentive profit of $12 million, or a total cost to the Government of $87 million.

So to some degree of logic, you can say that the Government actually saved $38 million by this method rather than this cost plus fixed fee.

The CHAIRMAN. I would not say it saved that. You could add another hundred million to it and say it saved one hundred and some million dollars, if you do it that way.

General, I am not trying to put anybody in a bad light. I am trying to get a record that reflects what is happening so that it can be studied and weighed with a view of if we are doing something here that can be improved on, and bring about economy in these matters, more economy, we need to do it.

We had subcontractors on here where the prime contractor had one of these fixed-fee incentive contracts, and the subcontractor, the folks who furnished him the material and so forth, who did the work and furnished their part of the hardware, had put in their target figure, their first estimate.

I remember one case it was some $47,000 per unit. Then the fixed-fee incentive contract was made on that basis. It finally worked out, as I recall, where it actually cost only about $19,000 or $20,000 a unit in the final analysis.

I asked the subcontractor in that instance if they had an incentive contract, and they said "No."

I cannot see how there is any profit to them to put the price way up and then deliver it much lower. They had no incentive to estimate the price much higher than they thought it would be at the time.

In other words, if you had not had the incentive feature in the contract with the prime contractor, I do not see any reason why they should not have furnished it and would not have furnished it at the same price they did, notwithstanding the contractor had the incentive-type contract.

General DAVIS. Our experience has shown that we generally overrun on a CPFF contract. Very seldom do we ever underrun. On the contrary, our general experience shows that we can underrun on an incentive contract, or get the costs down below what we estimate them to be. We have no evidence that we can buy anything cheaper on CPFF than we can on fixed-price incentive, no evidence whatsoever.

The CHAIRMAN. You probably cannot, from the subcontractor, the fellow who actually furnishes the hardware, but you are buying it at a much higher price from the prime contractor, who has the incentive contract plus a fixed fee, because you make your agreement with him on a target figure that is far in excess of what it is actually going to finally cost.

General DAVIS. You can draw that assumption.

The CHAIRMAN. We do not draw assumptions. These are the figures submitted.

General DAVIS. In some cases you can. But there are other cases where the overruns and the total comes out very close to the target. We think that we can and do negotiate realistic target prices under an incentive contract.

The CHAIRMAN. There were some here that certainly were not realistic. You may think that in most instances you do. I think I would be strong for the incentive-price contract after you had gotten some basis, something established, upon which to premise the anticipated cost. But where it is completely speculative, and each one has to put on a high price, and then the prime contractor adds to that 10 or 15 percent for contingencies and so forth, it seems to me we are proceeding prematurely with an incentive contract until you get these things more stable and you know what you want.

General DAVIS. Mr. Chairman, before you came back into the room, I did agree with counsel that it is our policy that we not enter into an incentive-type contract before we are reasonably sure of what the work is going to be, that we have it reasonably well defined, and we have some reasonably good experience on which to project the target costs.

It is our policy, and we stick to it pretty closely, as our experience has shown. Here is a case where in hindsight it looks like maybe we did start in too early. We were plowing some new ground with a new formula, the successive formula.

We were at that time pioneering and pushing to get into incentive contracting as early in these programs as we could.

I think you would also be interested in reviewing the hearings of 2 years ago, when the House Armed Services Committee, Mr. Vinson, explored this very subject in a lot of detail, for several days, with the Department of Defense.

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We talked in a lot of detail about incentive contracts versus cost-plus-fixed-fee and redeterminable contracts. I think the conclusion of all that testimony was that incentive contracting was a good device to protect the taxpayers' interest.

In the last year and a half, or thereabouts, the Secretary of Defense, the present administration, has come out even stronger in its advice, its admonishment, and its direction to the services to go into incentive contracting much earlier than we have in the past.

As a matter of fact, the present administration has been critical of the procurement agencies of the Department of Defense for not getting into incentive contracts earlier.

The CHAIRMAN. That might be a difference of opinion, but I think you can get into them entirely too early.

General DAVIS. We agree with you.

The CHAIRMAN. I am not complaining about getting into them when it will prove economical to do so, or likely prove economical to do so.

I have said all the way through, I think, that there is a time when such contracts may very well be employed to advantage.

General DAVIS. We agree completely, Mr. Chairman. As I said to the counsel before you came in, we thought at that time that we did have enough experience to do a fairly good job of establishing the target cost.

It turns out now, 4 years later, that maybe we were not quite ready for it as well as we thought we were.

The CHAIRMAN. In other words, there may be one or two instances here where there was a mistake of judgment?

General DAVIS. Colonel Linnerooth pointed out you are looking at three contracts where there was a substantial underrun. But there were two other incentive contracts on the Bomarc program in which the costs are coming out very, very close to the target.

Of course, we have the other 161 contracts up there under the same contracting.

The CHAIRMAN. Are they all the incentive contracts?

General DAVIS. Yes, sir. They came out within 3.4 percent of the net target.

Senator JACKSON. General, if I understand the position of the Air Force on this and of the Department of Defense, it is that over the long run, statistically and in terms of the value of experience, you feel you can save money by the incentive contract.

In other words, the profit might be more to the individual contractor than it would be under a cost plus fixed fee, but the profit is only a small part of the total cost. The total cost to the Government, the dollar cost to the Government, based on considerable experience going over a number of years, results in a greater savings to the Government under an incentive type.

Is that what you are saying?

General DAVIS. We believe that very strongly.

Senator JACKSON. You will admit, I assume, that looking back at the jumble of statistics, we will say, in the incentive-type contracts, that if you could do it over you would say, "Well, in this contract" using hindsight, "we really should have put this in cost plus fixed fee."

General DAVIS. Or we should have been smarter and gotten better targets.

Senator JACKSON. Or gotten better targets. But what you are saying is that in the aggregate it has paid off. You are not denying that you might not have made mistakes in the past?

General DAVIS. We are convinced of it.

Senator JACKSON. I find I make quite a few myself, but you feel that as an overall policy, this is the best course to pursue?

General DAVIS. We do.

Senator JACKSON. Let me ask you one other thing to get this back in perspective. In April 1958, when you negotiated the first incentive contract, you had had, prior to that, cost plus fixed fee in the research and development stage; is that correct?

General DAVIS. That is correct.

Senator JACKSON. When did you first start producing the R. & D. missiles? Do you know about when that year was?

General DAVIS. According to this chart I have in front of me, they were delivering R. & D. missiles back 2 years before that, in 1956.

Senator JACKSON. So they produced missiles from 1956 through 1958, R. & D. missiles?

General DAVIS. I would like Colonel Coulter to check that, if he can.

Major WEINSTEIN. The first R. & D. missile was delivered in 1953.

General DAVIS. I guess it happens to be the contract I am looking at in which deliveries started in 1956. There had been some prior to that, but they were strictly research and development.

Senator JACKSON. But from 1956 to 1958 you got the bulk of your deliveries of R. & D. missiles?

General DAVIS. Yes.

Senator JACKSON. How many did that total?

General DAVIS. Forty-eight on that contract.

Senator JACKSON. Forty-eight up until when?

General DAVIS. They had not delivered all of the 48 at the negotiation date, but they produced almost all of the 48.

Senator JACKSON. They produced them but had not delivered them, you mean?

General DAVIS. They had built them but had not delivered all of the 48 at the time of the negotiations.

Senator JACKSON. The next thing I want to ask is this: In April of 1958 the Air Force foresaw in the planning and the programing that this was to be a substantial production effort?

General DAVIS. Yes, sir.

Senator JACKSON. And the contractors and subcontractors were thinking in those terms; is that right?

General DAVIS. That is right.

Senator JACKSON. As a matter of fact, you were talking about 40 bases, in the general program; is that right?

General DAVIS. I believe it was still 40 in April of 1950.

Senator JACKSON. The 40 bases involved how many missiles?

General DAVIS. Originally 5,000. It was cut back.

Senator JACKSON. There were more missiles per base originally, but it was as high as 5,000 missiles, was it not?

General DAVIS. That is right, sir.

Senator JACKSON. In the end we had about 278 of the A missiles and 301 of the B missiles; is that right?

General DAVIS. Right, sir.

Senator JACKSON. What I am trying to get at is that this program really did not get into the full contemplated production schedule. You got into production, but you did not reach the maximum that you had planned and programed when you were talking about the first contract back in 1958; is that right?

General DAVIS. That is right. We had not reached the planned production.

Senator JACKSON. So when you add it all up here, we are talking about 579 missiles available for operational use, and when you entered the contract you already had production experience of about how many? Forty?

General DAVIS. We had contracts for more than 48. I do not know what contract preceded this one.

No; they had contracts for considerably more than that. They had actually delivered some 45.

Senator JACKSON. Some 45 had been delivered, and additional ones had been produced. I am trying to get your production experience, even though it was R. & D., at the time your contract on an incentive basis was signed in April of 1958.

You understand what I am trying to get clear?

General DAVIS. Yes. I am looking at the chart Colonel Coulter has and we had already contracted for 95 missiles at that point in time and between 45 and 50 had actually been delivered.

Senator JACKSON. Ninety-odd had been contracted for as of April of 1958?

General DAVIS. On a CPFF basis; yes, sir.

Senator JACKSON. On a CPFF basis. And of that 90-odd——

General DAVIS. No, it was more than that on the contract.

Colonel LINNEROOTH. 118 had been contracted for on 3 previous CPFF contracts.

Senator JACKSON. The staff tells me that as of April 1958, 46 R. & D. missiles had been actually delivered, plus 5 prototype, making a total of 51.

There remained under contract, however, about 40-odd additional ones; is that right?

You said there were a total of 90 under total contract, of which, it turns out, 51 had been delivered.

Colonel LINNEROOTH. It was 51 out of 118 that had been delivered. There were 50, 45, and 23, respectively, on the 3 prior contracts.

Senator JACKSON. Are they all R. & D?

Colonel LINNEROOTH. Those delivered were R. & D.

Senator JACKSON. No, I am talking about the total of the 118.

Colonel LINNEROOTH. Of the total of 118, the last 23 were production.

Senator JACKSON. The last 23 were production?

Colonel LINNEROOTH. That is right.

Senator JACKSON. What I am trying to get at here is that you have that much production experience from the company, even though

they were to be used, as a matter of fact, as test missiles. As a matter of fact, the testing has gone on continuously; has it not?

General DAVIS. That is correct.

Senator JACKSON. That is as a parallel action with the production of the missile?

General DAVIS. That is true.

(At this point Senator McClellan withdrew from the hearing room.)

Senator JACKSON. There is one other thing I want to clarify.

In your statement at page 23, you mention at the top of the page that—

> We were still 9 months from delivery of the first tactical unit and were still in deep trouble over ramjet engines which were already being procured on an associate basis.

I wanted to ask you on this point if you can explain to the committee the relationship between the prime contractor and an associate contractor, and the relationship between a prime contractor and a sub that is directly under him as to managerial control, technological control, and so on.

Could you explain that?

General DAVIS. Yes, sir.

Senator JACKSON. As I understand it, there had been a breakout—I do not know when—on the ramjet engines.

That was being procured directly on an associate contract basis?

General DAVIS. That is correct.

When we go on an associate basis, we have a contractual arrangement with the prime contractor and the associate contractor to coordinate their activities and work together.

In other words, the prime contractor still assumes some responsibility to the Government for, you might say, looking over the shoulder of the associate. But we have relieved the prime of the ultimate responsibility for performance of that subsystem.

If this producer of the subsystem is a subcontractor to the prime, the Government has no direct or legal relationship with the subcontractor, so the prime contractor is totally responsible to the Government for performance of that subsystem.

Senator JACKSON. So in this case——

General DAVIS. In this case, we were in trouble with the associate. It is the associate's responsibility to the Government and although the contractor, the prime contractor, has a moral obligation, and also an obligation as a system contractor to try to get this trouble fixed, if he does it he is doing it as added work to the work statement of his contract.

In other words, he has to throw a lot of men in the field to try to solve a technical problem of an associate contractor and that is work that he is doing that was not anticipated when he signed his prime contract.

Senator JACKSON. So, as I recall the testimony of this morning, the trouble that occurred in 1959, when you had six or seven successive failures, related to the problem posed by an associate contractor for the ramjet?

General DAVIS. Yes, sir; ramjet was an associate contractor.

Senator JACKSON. Under the terms of the agreement, the prime contractor technically is not responsible. As you say, he has a moral obligation. But that particular failure is the prime responsibility of the Air Force; is that right?

General DAVIS. That is right.

Senator JACKSON. And under a prime and sub relationship, the prime contractor does have the managerial and technological control?

General DAVIS. That is right. And he is totally responsible to the Government for performance.

Senator JACKSON. That is all.

Mr. ADLERMAN. I am sure yo do not want to leave the implication that this was the only trouble that you had in the program?

General DAVIS. No, sir.

Mr. ADLERMAN. Or that this was caused by the fact that you had an associate contractor on this?

Senator JACKSON. Clearly they had a lot of problems, but I wanted to focus on the relationship between the prime contractor and the associate and between a prime and a sub, because the committee has gone into this question of breakouts, and I thought this was a point that would help to make clear what the relationship between the two was in this given situation.

They had other problems with Bomarc, as they virtually had with every other weapon system.

Mr. ADLERMAN. Actually, in this case Boeing did work together with Marquardt?

General DAVIS. They certainly did.

Mr. ADLERMAN. And if they put a staff of engineers on to make sure that the Bomarc was compatible with the ramjet engine, they charged that to the Government as part of their costs; is that so?

General DAVIS. If they were under a CPFF contract, that is true, getting reimbursement of their costs.

Mr. ADLERMAN. If it was under a cost-plus-incentive contract, they would be reimbursed for their costs too, would they not?

General DAVIS. They would, if we gave a change order to cover it. I do not know what we did at that point in time. But if we gave them a change order to the contract to provide this service, they would have gotten their costs.

Mr. ADLERMAN. Under this particular circumstance, is it your impression that there was a change order given?

General DAVIS. I will have to ask Colonel Coulter. Sometimes we do and sometimes we do not.

Colonel COULTER. We had to provide a change order in this case, and there was no question, because they provided a worthwhile service.

Mr. ADLERMAN. How much did the change order amount to?

Colonel COULTER. The figure is not available to me at the moment. I will furnish it for the record.

(Information to be supplied follows:)

Due to ramjet failures on missiles 631–1 through 631–6 the Air Force, the Boeing Co. and the Marquardt Corp. agreed November 9, 1959, to an accelerated test program. The change order proposal from Boeing included an estimated cost of $529,960 and a profit of $42,397 for a total sales price of $572,357. An allowable item of cost letter, which would bear no fee, was issued in lieu of a

change order. The period covered by the allowable item of cost letter was November 9, 1959 to May 31, 1960. The amount actually invoiced by the contractor for this work was $527,418.

These costs include only those specifically identifiable with the support provided during the accelerated test phase. The actual effort provided by the Boeing Co. in support of the Marquardt Corp. in the ramjet development substantially exceeds the above amount and extended beyond the period of the accelerated test.

Mr. ADLERMAN. Marquardt had come under the subcontract to Boeing in this case. That contract amounted to how many millions of dollars?

Colonel COULTER. The Marquardt contracts?

Mr. ADLERMAN. Yes. Was it in the neighborhood of $114 million?

Pardon me, $177 million after breakout?

Colonel COULTER. The figure is not available to me at the moment. I do not know if from memory.

Mr. ADLERMAN. Mr. Nunnally, do you know what the figure is?

Mr. NUNNALLY. Yes.

Mr. ADLERMAN. Will you state it for the record?

Mr. NUNNALLY. Approximately $177 million.

Mr. ADLERMAN. I assume if this had been kept in under the contract with Boeing, Boeing would have been entitled to a fee; is that right?

It is either yes or no.

Colonel COULTER. The subcontract costs are a part of the total weapon system cost, yes.

Mr. ADLERMAN. What would you feel would be a fee to Boeing for $177 million subcontract?

Colonel COULTER. This is properly a subject for the negotiation process.

Mr. ADLERMAN. Colonel Linnerooth, you are the expert in the field. What would you allow?

Colonel LINNEROOTH. I am sorry. I have not followed your exact question.

General DAVIS. Let me answer it.

Mr. ADLERMAN. All right.

General DAVIS. We do not establish profit rates on individual elements of cost, counsel. This is illogical. As a matter of fact, the Armed Services Procurement Regulations specifically forbid us to do this.

We negotiate a profit rate based on the total effort that the contract calls for, what we consider an equitable profit. Now, he may make nothing on his subcontract effort, and he may make the average of the profit on the total contract. But what he makes on his subcontract is not negotiated separately.

Mr. ADLERMAN. Suppose he had this in the subcontract. Would you allow him anything by way of cost on it?

General DAVIS. Would we have allowed it?

Mr. ADLERMAN. Yes.

General DAVIS. Obviously. It would have increased his cost base by $177 million.

Mr. ADLERMAN. How much would you have allowed him on it?

General DAVIS. I do not know. I cannot go back in time.

I imagine if we had followed your implication of specifically taking out a subcontractor's effort and saying how much you are entitled to on this, I would say 3½ to 4 percent.

Mr. ADLERMAN. That would run about $7 million?

(At this point Senator McClellan entered the hearing room.)

General DAVIS. Roughly.

Senator JACKSON. I do not think you can prove anything by this method either way. What is the value of each one of these birds that was lost? What was the rough value at that time?

It would run into a lot of money. If you apportion it properly, what would be the value?

Colonel COULTER. It is very hard to estimate because you have the tremendous cost of the operation of the test program and this sort of thing. It is in the area of several million dollars per firing.

Senator JACKSON. Thus, if you want to argue that had you had better overall managerial control you might have saved the valuable birds that were lost in the seven successive misfirings, you are arguing a point which is not subject to proof or disproof.

Colonel COULTER. That is a subject that the Air Force speculated upon seriously at that time.

Mr. ADLERMAN. But there was no way of proving it.

Colonel COULTER. No way of proving or disproving.

Mr. ADLERMAN. It could have happened either way?

Colonel COULTER. That is the point.

Mr. ADLERMAN. Did you have any other failures?

Colonel COULTER. Many other failures.

Mr. ADLERMAN. Attributable to the ramjet engine?

Colonel COULTER. No. We got the ramjet straightened out.

Mr. ADLERMAN. So even though Boeing is a good manager, you did have other failures?

Colonel COULTER. You cannot draw any conclusions here.

Mr. ADLERMAN. I agree you cannot draw conclusions there.

Colonel Linnerooth, in this negotiation, did Boeing strenuously pursue a cost-plus-fixed-fee contract?

Colonel LINNEROOTH. Yes, sir; they did. I think I can clarify that by reading from my negotiation memorandum.

As a matter of fact, this happened 4 years ago and my independent recollection of this is rather vague. However, I find that I have this negotiation very well documented, and my comments in this memorandum are as follows:

I find that in this part of my memorandum that is designated "negotiation summary" I made the following comments which are apropos, too, of the situation that existed at the time we negotiated this contract:

The Bomarc program started in 1951. To date, all effort has been under CPFF contracts.

Bear in mind, this is 1958, and here we have had contracts in operation since 1951, CPFF contracts.

The contractor proposed and strenuously pursued obtaining a CPFF contract in this procurement. The effort under this program is and has been 100 percent of the entire business in the Pilotless Aircraft Division of the Boeing Co.

The Pilotless Aircraft Division is practically an organization in itself in that it is physically separated from other Boeing activity in the Seattle area and is

an entity possessing its own management, engineering department, tooling department, production department, purchasing department, and so forth.

In view of the foregoing, the buying team concluded that in this procurement, a determined attempt should be made by the Government to put some "dollar profit incentive" into operations and effort in this Bomarc program so that this Pilotless Aircraft Division would no longer be solely a CPFF operation.

At the initial negotiations, week of March 24–27, the Government therefore proposed what was believed to be a good tight CPIF contract. A target cost of $108 million, a target fee of 6.5 percent maximum fee of 8.5 percent, minimum fee of 4.5 percent, and a share of 85–15.

These fees include, incidentally, a fee for financing a 20-percent cost holdback that was effective in cost-reimbursement contracts at that time.

An immediate stalemate resulted and negotiations were suspended for 1 week. When negotiations resumed on April 4, the contractor proposed an estimated cost totaling $114.5 million, and insisted that the risk of overrunning this estimate very significantly was too great for them to accept any CPIF contract that used this estimate as a target cost and with normal CPIF target profits of 6 or 6.5 percent, including financing fee.

The contractor therefore again proposed and strenuously pursued a straight CPFF contract. At this second negotiation, the contractor also returned with additional supporting information which convinced the Government that a good 50–50 estimate was a figure totaling $109 million in lieu of the $108 million estimate developed at the previous negotiations.

In order to reach an agreement on an incentive basis, the Government at this second negotiation then proposed a successive formula form of the incentive fixed price contract which has been authorized under ASPR as follows: Initial target cost of $109 million, initial target profit of 8 percent, maximum profit, 10 percent; minimum profit, 6 percent; share 85–15.

After considerable further discussions during which contractor's negotiators consulted with management in Seattle, a successive formula type of incentive fixed price contract was agreed upon containing initial incentive formula terms as set forth in paragraph 1 herein—

and the terms set forth in paragraph 1 are those that you have submitted for the record.

The CHAIRMAN. I am sorry, but we have got double duty, as Members of Congress, but triple, quadruple, and so forth.

So we will have to stand in recess until in the morning at 10 o'clock.

(Members present at time of recess: Senators McClellan, Jackson, and Muskie.)

(Whereupon, at 4 p.m., the subcommittee recessed, to reconvene at 10 a.m., Friday, May 25, 1962.)

PYRAMIDING OF PROFITS AND COSTS IN THE MISSILE PROCUREMENT PROGRAM

(Bomarc Program)

FRIDAY, MAY 25, 1962

U.S. SENATE,
PERMANENT SUBCOMMITTEE ON INVESTIGATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D.C.

The subcommittee met at 10:05 a.m., in room 3302, New Senate Office Building, pursuant to Senate Resolution 250, agreed to February 7, 1962, Senator John L. McClellan (chairman of the subcommittee) presiding.

Present: Senator John L. McClellan, Democrat, of Arkansas; Senator Henry M. Jackson, Democrat, of Washington; Senator Sam J. Ervin, Jr., Democrat, of North Carolina; Senator Edmund S. Muskie, Democrat, of Maine; Senator Karl E. Mundt, Republican, of South Dakota; and Senator Carl T. Curtis, Republican, of Nebraska.

Also present: Jerome S. Adlerman, general counsel; Paul J. Tierney, assistant counsel; Thomas Nunnally, investigator; and Ruth Y. Watt, chief clerk.

(Members present at time of reconvening: Senators Jackson and Muskie.)

Senator JACKSON (presiding). The committee will come to order. The chairman will be here in a few moments. We will proceed, however, since we have a quorum.

TESTIMONY OF MAJ. GEN. W. A. DAVIS, LT. COL. WARREN K. LINNEROOTH, AND MAJ. ROBERT M. WEINSTEIN—Resumed

Senator JACKSON. Mr. Counsel.

Mr. ADLERMAN. General, I think we were discussing yesterday what weight to put on the various factors, such as subcontracting, risk, the factor of Government-furnished facilities, and so forth.

The weights given to those factors set forth in the negotiation reports, or are they delineated anyplace in the record?

General DAVIS. Not as a matter of normal procedure. In some cases, the buyer or the negotiator does this, arrives at his objective by trying to weigh the various factors. They are not directed to do so. I would say that very few of the files would reflect specific weights that he had given to elements in work in arriving at what he considered a reasonable profit to offer the contractor because in the final analysis he would not discuss with the contractor these elements of cost in relation to profit.

He would talk to the contractor in gross profits. So I doubt if you will find very many cases where the files are documented to show an arithmetic solution to his profit objective.

Mr. ADLERMAN. We have been hearing a lot about the fact that we cannot say how much profit is being attached to the subcontract work, how much profit is being attached to the inhouse work.

In other words, your records or the Defense Department records, Air Force, Army, Navy, do not contain any weight factors, mentioned weight factors, in the record; is that right?

General DAVIS. I believe that is correct. At least the files that I am familiar with would not contain this. As a matter of fact, we are precluded from negotiating individual elements of cost by the Armed Services Procurement Regulations.

By the same token, we would not negotiate elements of profit on the individual elements of the work. We negotiate the total price.

As you recall in my statement, I made the remark that we have found no solution to finitely weighing each of these considerations that has stood the test of time and the test of the negotiating table.

This has been tried, experimentally by various negotiators, I am sure with some success, but it is not the normal procedure to do so.

Mr. ADLERMAN. Do you know whether or not there is in contemplation or there has been put into effect any changes in the regulations which provide for specification of weight factors by the negotiating officers?

General DAVIS. I am aware of a study that is going on in the Air Force Systems Command. I am not sure if there is any regulation in preparation. There may be. It is asking us to experiment with documenting or attempting to weigh the various factors and document the file.

Mr. ADLERMAN. In other words, at the present time you say it is a very difficult thing to do, it is a question of judgment and so forth, and it is very difficult to weigh these factors, and there is no record right now kept of any weight given to these factors.

So actually, the Air Force in looking at a contract, after negotiations, cannot tell whether or not they gave this amount of weight to the amount of Government-furnished facilities or to the subcontractor work and so forth?

General DAVIS. As a general rule, that is true. I should say here that the reason we have not directed this as a normal procedure is while one buyer in one set of circumstances might weigh these factors one way, this does not set the pattern nor can it be the final pat solution.

The very next situation, the very next negotiation, will require a different set of weighing weights for each of those same factors. In other words, you just cannot can it and hand it to a buyer and say "apply these."

Mr. ADLERMAN. But on each individual contract, can they not give some weight——

General DAVIS. I think we can have our buyers as part of their normal procedure explain in the file the offer that was made to the contractor of a particular percent fee or a profit of the target cost, and explain in the memorandum for the record how he arrived at that particular percentage.

I am sure we can do this. We probably will do this in the future. This does not mean that in each case the weights will be the same.

Mr. ADLERMAN. I understand that. But let us take an example where you have a contract given to a company that has Government-furnished facilities—assuming that a contractor is given 90 percent Government-furnished facilities for the use of this work and he only has 10 percent in-house.

The next contract may have just the reverse. Would there be any mention of the weight given to that in negotiation reports?

General DAVIS. Our present files, I am sure, would outline these situations, but these would not contain statements such as, "I gave this man this percentage of profit, or I negotiated this percentage of profit because I added so many points for this, that, and the other."

These do contain the kind of information you are talking about, and the things I outlined in the statement yesterday, all the elements, the risk, and so on.

Mr. ADLERMAN. Have you noticed in the contracts, at least in this case, that the rates are exactly the same regardless of whether the subcontract work is two-thirds or one-third, and so forth?

General DAVIS. That is not exactly right. Rates appear so because the spread is fairly narrow. Within the fixed-price-incentive contracts, rates are not all exactly the same and vary from 7½ to as high as 10 percent.

A very large percentage of the contracts will fall into the 8½-percent bracket these days, at this particular point in time.

Mr. ADLERMAN. I had Mr. Nunnally make a study.

Mr. Nunnally, did you prepare a study?

Mr. NUNNALLY. Yes.

Mr. ADLERMAN. Would you give the general a copy of that?

Mr. NUNNALLY. Yes, sir.

Mr. ADLERMAN. We have a series of contracts here in the Bomarc case, and the estimated final cost varies in each case. The first several are related to the cost plus fixed fee.

You will notice that each one of those from 19589 down to 40212, which are the cost-plus-fixed-fee contracts, in those the negotiated profit ratio is exactly the same, 6 percent. And if you will notice the percentage of subcontracting, we have a variance between 5 percent subcontracting and 66 percent subcontracting.

Regardless of that, the profit ratio is exactly the same. Of course, you have a variation of 41, 34, 38 percent, and so forth, and in some cases there appears to be no subcontracting.

General DAVIS. I think the pattern does get very close when we are dealing with the same contractor, first, because it establishes this judgment factor in the negotiator's mind, and second, because the conditions other than the subcontracting in this particular plant probably remain the same throughout that period.

Mr. ADLERMAN. Would this indicate to you that actually the weight factor given to subcontracting does not really find its way into the negotiated profit ratio?

General DAVIS. From these figures it would appear so. But I did not negotiate the contracts, and I do not know what the negotiator had in his mind when he negotiated this.

Major Weinstein would like to comment on that. He has negotiated contracts.

Major WEINSTEIN. I think, sir, you will notice that the percentage of subcontracting in this series of contracts is quite close among all these contracts. There are only a couple that are out of line. They are all within the 30- to 40-percent bracket.

Mr. ADLERMAN. Let us take the first one, 19589, that is 41.4 percent, the percentage of subcontracting. And the ratio of profit is 6 percent. In the 24748 contract the ratio of subcontracting is only 5 percent.

Major WEINSTEIN. Yes, but look at the amount of the contract. We are comparing $340 million versus $8 million.

Mr. ADLERMAN. Does it make much difference whether you have a contract for $20 million or $1 million? Do you not pay the same rate of profit?

Major WEINSTEIN. No, sir. That is part of our judgment. In other words, the greater the amount, the greater care you have to take in evaluating all the items. After all, it is the Government's money we are spending and the greater the amount of money we are spending the more care we necessarily have to take.

Mr. ADLERMAN. You have a variance between 41 percent subcontracting on $339 million, a contract of that size, and a 34-percent ratio of subcontracting on $148 million, which is just half of that amount, and still you give the same ratio of profit.

Major WEINSTEIN. That is right.

Mr. ADLERMAN. So does it mean that you measure the amount of subcontracting?

Major WEINSTEIN. No, sir. We have tried—I have personally experimented with this weighing problem which you have brought up, and all we are doing here, in my opinion, is transferring the areas of our judgment. In other words, in one case we are looking at the overall picture and making one judgment. In the other case, we may be making four or five individual judgments, strange as it may seem, in the cases where we have tried to weigh things, and I have seen other people do it, the overall profit comes up about the same.

General DAVIS. May I make a comment?

Mr. ADLERMAN. In just one moment, please.

You mentioned it is my measurement. It is not my measurement. It is a part of the regulations.

Major WEINSTEIN. Yes, sir; but the regulation puts the judgment in the hands of the negotiator.

I have negotiated for 5 years, approximately $5 billion worth of contracts, and in my opinion, for what it is worth, and I think it is worth something, I think that either way it is a matter of individual judgment, just like any other business decision.

Mr. ADLERMAN. Now we come to the cost-plus incentive-type contract. You come to a percentage of 8 percent on $296 million, with 27 percent subcontracted.

Of course, you have the incentive feature there.

Senator JACKSON. May I interrupt a second?

The last item referred to will be marked for identification as exhibit No. 18.

Mr. Nunnally, did you prepare this?

Mr. NUNNALLY. Yes, sir.

Senator JACKSON. You prepared it from the records?

Mr. NUNNALLY. Yes, sir.

Senator JACKSON. It will be printed in the record at this point.

(Document referred to was marked "Exhibit No. 18" for reference and appears below:)

EXHIBIT No. 18

Bomarc negotiated profit rates and percentage of subcontracting

Contract No.	Type	Estimated final cost	Negotiated profit rate	Percentage of subcontracting	Amount of of subcontracting
		Millions	*Percent*	*Percent*	*Millions*
19589	CPFF	$339.6	6	41.4	$140.6
24748	CPFF	8.4	6	5.0	.4
32832	CPFF	148.4	6	34.3	50.9
35359	CPFF	111.7	6	38.3	42.8
37861	CPFF	10.6	6		
38163	CPFF	35.6	6	66.8	23.8
40212	CPFF	20.9	6		[1] 1.9
35030	CPIF	296.4	8	27.5	81.4
36319	FPI	82.8	8	35.6	29.5
38098	FPI	112.9	8	30.2	34.1
38101	FPI	191.5	8	26.3	50.3
40033	FPI	146.7	8	32.3	47.4
40821	FP	2.0	9	70.0	1.4

[1] Incomplete—Subcontracts for only 5 of 9 bases of IC & C.

Mr. ADLERMAN. I notice there is an 8-percent fee attached to that.

Major WEINSTEIN. Yes, sir.

Mr. ADLERMAN. Going down the line on fixed price incentive contracts, we have four of those from 36319 down to 40033, and the amount involved there varied from $82 million to $191 million, and the variance in subcontracting runs from 26 to 35 percent.

I see that the ratio of profit that is negotiated in each of those is exactly 8 percent.

Major WEINSTEIN. Yes, sir; and I would like to point out for the record that all these contracts and the percentage of subcontracting involved are in the same small range.

I will also point out that in every one of these cases the contractor was trying to obtain a greater profit than 8 percent, and a greater percentage of the profit of a higher proposed cost.

Mr. ADLERMAN. That is the normal, usual thing that you would meet in any business arrangement, to try to get as much as they can by way of a return?

Major WEINSTEIN. Of course.

Mr. ADLERMAN. But is it a coincidence that the ratio of profit is exactly the same in these cases?

Major WEINSTEIN. No more a coincidence than the fact that we are buying all the Bomarc's from the Boeing Aircraft Co.

Mr. ADLERMAN. But here you have variations in the amounts. You say it is not large. Well, I do not know. When you talk about large, 27 percent of $3 million amounts to quite a large sum of money; does it not?

Major WEINSTEIN. I am not sure what you are driving at. Will you try that again, please?

Mr. ADLERMAN. You are talking as though these things are marbles. These are millions of dollars that you are dealing with.

Major WEINSTEIN. I did not. I talked about $8 million versus $340 million.

Mr. ADLERMAN. Let us see. In these contracts the variation is between $82 million and $296 million, on the incentive-type contract.

Major WEINSTEIN. That is correct. And I consider all of those large.

Mr. ADLERMAN. You are not dealing with small sums. When you measure the difference between 26 and 35 percent, that is 9 percent, and even if you take a small contract running into $100 million, you are dealing with a difference of $9 million in subcontracting costs; are you not?

Major WEINSTEIN. I think you misunderstood what I mean by small. I do not consider any of these contracts you mentioned as small.

Mr. ADLERMAN. I do not think I misunderstood you. You said that the difference, the variation, between the amount of subcontracting is small.

Major WEINSTEIN. It is relatively—the differences are relatively small.

Mr. ADLERMAN. Relatively small happens to come to 11 percent.

Senator MUSKIE. May I ask a question at this point?

We are talking, as I understand it, of 1 of the factors among 10 that are involved in negotiations; is that not so?

Major WEINSTEIN. That is correct.

(At this point Senator McClellan and Senator Mundt entered the hearing room.)

Senator MUSKIE. Let me ask you this: Might the differences in the percentage of subcontracting as an influence upon the rate of profit be offset in part by weights given to others of these 10 factors?

Major WEINSTEIN. Yes, sir; definitely.

Senator MUSKIE. I wonder if you could illustrate that in any way that would be meaningful for us. I notice that in General Davis' testimony, these factors are listed on pages 12 and 13.

Major WEINSTEIN. That is correct. I think that any mathematical weight you put on each one of these factors, again, is but a matter of judgment in each individual case.

Senator MUSKIE. Let me ask you this as a general proposition: Since the amount of subcontracting is a factor, what is the impact of it?

For example, if the amount of subcontracting is relatively high, would that mean that the effect on the profit rate should be to lower it or to increase it?

Major WEINSTEIN. Generally, I would say the profit rate would go down as the subcontracting goes up. Now, sir, it is normal in these large procurements for aircrafts and missiles to have 35 to 40 percent subcontracted effort.

That is a normal pattern in our business. We encourage subcontracting.

Senator MUSKIE. In your testimony, you refer to ranges in the percentage of subcontracting. Do you have in your work, in evaluating this factor, do you have brackets, any fixed brackets that you use as a guide?

Major WEINSTEIN. Not formally, but in my own mind, I would say a 30- to 40-percent subcontracting percentage I would consider in one range. Now, when the subcontracting goes up to 60 to 70 per-

cent, I would consider the situation entirely different and evaluate it differently.

Senator MUSKIE. Then let us use the last contract on this exhibit. Here you have 70 percent subcontracting, which suggests that the profit ratio should have been lower.

On the contrary, it is the highest of the list of rates on this exhibit.

Could you give me some explanation?

Major WEINSTEIN. Yes, sir. Senator, I believe if you note on this piece of paper, the last contract is a straight fixed-price contract, no incentive, no reset.

General DAVIS. Maximum risk.

Major WEINSTEIN. Generally, on a straight fixed-price contract, I would say this type, if it were either all in-house or a small percentage of subcontracting, it would be in a 10- to 11-percent range. This is more normal. During this negotiation, which happens to be one of mine, we had quite a discussion about this, and I pointed out to Boeing that 70 percent of this was subcontract.

I believe at that time, due to the administration that the Air Force would not have to do under a fixed-price contract, it was to our advantage to go straight fixed price at 9 percent rather than fixed-price incentive at 8 percent.

In the long run, the Air Force would benefit by a lower overall price.

Senator MUSKIE. On the cost-plus-fixed-fee contracts, what is the range of profit rates? What is the lowest that you negotiate and the highest?

Major WEINSTEIN. It has been as low as 5 percent when there has been a great proportion of subcontract. Generally, though, I would say the range is more normally between 6 and 7 percent.

Senator MUSKIE. Is there ever a negotiated rate higher than the 8 percent? We do not have an 8-percent figure on cost plus fixed fee. Does it ever reach 8, 9, or 10 percent?

Major WEINSTEIN. We have a policy, or had a policy in ASD, that we could not negotiate a CPFF contract at a higher rate than 7 percent.

Senator MUSKIE. So actually, you are talking about a very narrow range of profit rates from 5 to 7 percent?

Major WEINSTEIN. Yes, sir.

Senator MUSKIE. How about the incentive-type contracts? What is the range?

Major WEINSTEIN. Generally, I think I would agree—the general answered this a little earlier this morning that the normal range, in my experience, has been between 8 and 9 percent, and occasionally goes up to possibly 9½ to 10, in very unusual cases.

Senator MUSKIE. So that actually, these factors bearing upon the profit rate are unimportant. The range in your profit rate is not great enough, is it?

Major WEINSTEIN. No, sir; it may be relatively unimportant but a 1-percent profit factor can make a difference of quite a few dollars in profit to the contractor, and, of course, quite a few dollars in what the Air Force pays.

Senator MUSKIE. The range is so narrow that actually you cannot use a micrometer to measure.

Major WEINSTEIN. That is correct. That is my point. There is a large judgment factor in all of this.

Senator MUSKIE. Going to your 10 factors again, I think it is rather obvious what impact each of them might have on the profit rate, but it might be useful to put it into the record.

The first factor is contractor's risk.

Here the profit rate would vary directly with the risk; is that correct?

Major WEINSTEIN. Yes, sir.

Senator MUSKIE. On the question of the complexity of the work, the same is true?

Major WEINSTEIN. That is very true, sir.

Senator MUSKIE. On the question of subcontracting, the same is true?

Major WEINSTEIN. That is true.

Senator MUSKIE. On the question of contractors investment, the same would be true?

Major WEINSTEIN. Yes, sir.

Senator MUSKIE. On the question of Government investment, the profit would vary directly?

Major WEINSTEIN. That is true, sir.

Senator MUSKIE. On the question of volume of the program, what would be the impact here?

Major WEINSTEIN. The greater volume, I believe, the lower the profit rate. In other words, it is illustrated in this example we talked about, the small, straight fixed-price contract versus the larger incentive contract.

Senator MUSKIE. So, again, it is an inverse relationship?

Major WEINSTEIN. Yes, sir.

Senator MUSKIE. The possible commercial application. I would be interested in a discussion of that. How do you anticipate the possible commercial applications of a contract?

Major WEINSTEIN. I personally—there are very few products that I have negotiated—well, I have been primarily in the aircraft and missile field, where the products are more of the highly technical type.

The few products I can think of are possibly commercial aircraft, that is conversions of military to commercial aircraft. Frankly, I think I am not the man to answer that question, Senator.

Senator MUSKIE. Let me ask you this at this point: These 10 factors listed—are they all actually given weight or considered in every negotiation or are there some of them that are used more than others?

Major WEINSTEIN. I believe generally the financial risk, complexity of the work, and the amount of subcontracting are the three most important. The facilities do have something to do with it—Government facilities versus contractor facilities.

But they are a fairly fixed thing over a period of time. Very seldom, except in highly complex products, are a great amount of additional facilities supplied by the Government.

In fact, our policy has been in the last few years to evaluate very carefully additional facilities the contractor requests from the Government.

Senator MUSKIE. Would you list those three again, those three used most often?

Major WEINSTEIN. This is my opinion again, sir. I would say the financial risk, the complexity of the product, and the amount of subcontracting are the three most important that I have considered.

Senator MUSKIE. Of the eight, this factor, which is described as contractors cost reduction experienced on this and other programs with respect to the incentive type contract, do you have a procedure once a contract has been performed to analyze the major cost underrun to determine whether or not it was due to an unrealistic estimate rather than an effort on the part of the contractor to really reduce costs?

Major WEINSTEIN. I do not know of any method except, again, judgment.

Senator MUSKIE. Is there any postaudit of the contract?

Major WEINSTEIN. Yes, sir. We get a report. We get periodic reports on the progress of the program and what elements are being overrun and underun.

General DAVIS. I might add a comment there, Senator. Since Major Weinstein left our organization we have instituted a study of trying to devise a better means of this after the fact assessment.

Obviously, we have the data, the audit data. It is going to be very difficult to positively conclude how much of the underrun was attributable to efficiency and how much was attributable to miscalculation or erroneous projections of cost estimates, as you can well understand.

It is very difficult. But we do believe that we can devise a better method than we have had in the past. It is our intention to establish a formal procedure for going through an analytical process after the completion of each incentive contract for this purpose.

This was brought about, I might add, by our hearings, Department of Defense hearings, on incentive contracts, by Congressman Vinson two sessions ago.

I think you will recall those hearings. This was one of the things that the Department of Defense pledged themselves to do.

Senator MUSKIE. Let me ask you this; it may be a hypothetical or a real question, I do not know: Let us say we have a contractor whose experience shows consistent major underruns.

Would you conclude from this that he overestimates, or do you conclude from this that he has such an efficient operation that he manages to get costs down? Depending upon which of those two conclusions you reach, how does that effect the profit rate that you allow him the next time?

General DAVIS. Well, I would say that if we concluded, as you hypothesized, that he was exceptionally efficient in getting costs down——

Senator MUSKIE. Do you draw any conclusion from the fact that he has consistently had major underruns?

General DAVIS. No, sir; I do not think you can do that. But if you do draw the conclusion that he is consistently an efficient operator and consistently does each program or project that you buy from him very efficiently and gets the cost right down fast, faster than his com-

petitors, I think we certainly would be amenable to giving him a higher target profit than the inefficient producer.

Senator MUSKIE. Suppose you have two contractors, one of whom has a consistent record of relatively small underruns, and another a consistent record of relatively large underruns.

What conclusions do you draw as to the efficiency of each from that one fact alone?

General DAVIS. I do not think you can draw any conclusions from that one fact alone, Senator. I do not think it is possible. In fact, I think you have used a hypothetical example that does not exist, particularly the one where the contractor consistently has major underruns.

If it is a series of contracts, particularly on the same program, he may have a pretty sizable underrun early in the game, but pretty soon either his efficiency curve starts to flatten out and/or if his cost estimating and the negotiating was not tight enough, the negotiating team gets wise and tightens down further.

So his chance of continually having major underruns particularly on the same program are very, very remote.

Senator MUSKIE. What you are saying, then, is that as you develop long experience with particular contractors, your evaluation of his operation becomes more accurate and his operation tends to tighten up so that in the long run you are closer together more than you were at the outset?

General DAVIS. That is correct.

I would like to add one thing on the previous line of questioning of Major Weinstein.

It has not been emphasized since I put it into the record in my statement. These profit rates that we talk about are things that we finally end up negotiating. We talk about establishing a profit objective prior to the negotiation, and we take these factors into consideration, in a judgment manner, to arrive at something that we think we would like to negotiate.

As the major pointed out, you do not always get that, because this is a bilateral situation. Neither party is in the position of unilaterally forcing his desires on the other, not in our system of government.

In the final analysis, the end contract that results from this negotiation is going to have to be signed by both parties.

We cannot dictate, regardless of how strongly we feel, we cannot dictate a rate of profit to a contractor, we cannot force him to sign that piece of paper.

This is a very real fact of life. I think our negotiators do a pretty good job of getting a reasonable settlement for both the Government and the contractor, but they do not do it with a lead pipe. They just cannot do it.

(At this point Senator Ervin entered the hearing room.)

Senator MUSKIE. General, on this one question of the amount of subcontracting, it seems to me that the variation in the profit rates is not wide enough to reflect a major difference in the amount of subcontracting. For example, if the amount of subcontracting is only 5 percent of the total contract, it seems to me that the rate should be far different, using the same type of contract, than when the amount of subcontracting is, say, 70 to 80 percent.

And yet, your variation here in your CPFF contracts is only 2 percent, and in your incentive-type contracts may be 1 percent.

General DAVIS. I can postulate on that one. I imagine that on that small contract you are looking at there——

Senator MUSKIE. That is not the best example of what I had in mind.

General DAVIS. To use that one for an example, I would say that because we were dealing with the same contractor, that is, Boeing, and because they have a pattern established in their approach vis-a-vis the Government, that they probably offered to take this at 6 percent on a CPFF basis. Probably had they insisted on a higher rate, because it was a small contract—at a higher rate because of the low subcontracting, the negotiator probably would have granted it.

I would also say that I suspect that these 6 percents on the CPFF and the 8 percents on the fixed-price incentive were the rock bottom that the Boeing Co. would go to.

I suspect our negotiators spent days in attempting to get something lower than that, but in the final analysis, as I say, two people have to sign the contract.

They have a pattern established. When their negotiator comes to the table, they have guidance from their bosses in the company, and I suspect most of them have been directed, "You will not accept a contract with a profit below a percentage of a certain amount."

Senator MUSKIE. Thank you.

The CHAIRMAN. Colonel Linnerooth, I present you herewith three negotiation reports, all of them on contract series 33(600), the first ending with the numerals 098; the second with numerals 319, and the third with 101.

I suppose these refer to different contracts. I ask you to examine them and state if you identify them as being photostatic copies of those negotiating reports?

(The documents were handed to the witness.)

Colonel LINNEROOTH. I am assuming they are copies. I have seen them before, similar ones. I assume they are copies of the negotiation reports.

The CHAIRMAN. They were furnished, I believe, to the committee by your office?

Colonel LINNEROOTH. That is correct.

The CHAIRMAN. Very well. They may be made exhibits for reference, exhibits 19–A, B, and C, in the order which I identified them.

(Documents referred to were marked "Exhibit's No. 19–A, 19–B and 19–C" for reference and may be found in the files of the subcommittee.)

(At this point Senator Curtis entered the hearing room.)

Mr. ADLERMAN. Colonel Linnerooth, do you know how much Government-furnished facilities have been furnished to the Boeing Co.?

Colonel LINNEROOTH. I do not happen to have that information.

Mr. ADLERMAN. Do you know that?

Major WEINSTEIN. No, sir.

Mr. ADLERMAN. The amount of the Government-furnished facilities?

Major WEINSTEIN. I saw it presented here earlier this week, but I do not know.

Mr. ADLERMAN. Was it in the neighborhood of about $600 million?

The CHAIRMAN. Do you mean Government plant?

Mr. ADLERMAN. Facilities: $260 million; I am sorry, $260 million worth of Government-furnished plants have been furnished to Boeing Co., and it was done in many other cases in Government work; is that right?

Major WEINSTEIN. Yes.

The CHAIRMAN. Does that enable them to have the plant facilities to produce the contract?

Mr. ADLERMAN. Yes.

Do you know what the in-house plant is of Boeing on this work?

Colonel LINNEROOTH. Do I know what the what is?

Mr. ADLERMAN. The amount of in-house plant facilities that Boeing uses in the Government work?

Colonel LINNEROOTH. No; I do not.

Mr. ADLERMAN. It varies from time to time, but I think, according to the record that we have here, as of December 31, 1960, the Boeing Aircraft Co. had, Aerospace Division, Transport Division, Wichita Division, Industrial Products Division, Allied Research Associates, and Boeing International, the total amount of their facilities, according to our records, is $198 million and, at the same time, in most of these same locations the Government had furnished facilities valued at $260 million, or a ratio of 43 percent on the part of Boeing to 56 percent on the part of the Government.

General DAVIS. May I comment on those figures at this point?

I believe I am correct in saying that the value of the Government facilities that you quoted is traditionally a nondepreciated acquisition value.

Mr. ADLERMAN. Would you explain that to us?

General DAVIS. Well, it is what the Government paid for them and they have not had any depreciation applied to them. They are still on the books at what the Government paid for them.

They may be worthless, actually. On the contrary, I think the contractor facility figure is depreciated from book value at the point in time that you quote.

Further, I do not think we should just compare the facilities in use, because you should include the other assets the contractor is using.

I am sure that if you look at the long-term debt and the short-term borrowing, and the working capital that the stockholders have in performing the company's work, it will go several times the figure that you quoted for the facilities. That facility only includes real estate and machine tools, furniture, and that sort of stuff.

I am in error. I just got a note up from the back of the room that says the facilities you quoted are gross figures and not depreciated. That is unusual.

Mr. ADLERMAN. At any rate, we can get the records and find out exactly what the values are. But they are substantial facilities, as I understand it. I mean their plants and so forth are of great value.

I mention this only because, in evaluating what rates are to be given, you did mention Government facilities as one of the components given particular weight in computing profit.

General DAVIS. This is considered; yes.

Mr. ADLERMAN. It is considered, but I think you gave greater weight to subcontracting, greater weight to experience and so forth.

Under questioning by Senator Muskie you mentioned the three.

General DAVIS. Major Weinstein said in his personal experience, he felt that he gave heavier weight to those three things.

I should have commented there that the 10 things that I listed in my statement are representative of the kinds of things that an average negotiator would consider.

He might not have all those things apply in every situation. Some will apply in one situation, some will apply in another situation, and in some cases all 10 of these factors might apply.

I do not think Major Weinstein intended to imply that he did not consider the amount of Government facilities supplied the contractor.

Mr. ADLERMAN. I did not mean he did not consider it. I referred to the weight given to it.

General DAVIS. In my prenegotiation briefings that I get from these people, which the Colonel mentioned yesterday, this is one of the specifics that they have to include in their briefing, the amount of Government facilities, the amount of contractor facilities that will be used in the performance of the contract.

So it is given weight at every level of management when they are reviewing the negotiation objectives.

Major WEINSTEIN. I would like to comment on that, sir. I did not mean to infer that I neglected to consider facilities, except——

Mr. ADLERMAN. I did not mean that at all. I just said you did not consider that to be one of the three important ones.

Major WEINSTEIN. When the division of Government and company facilities are out of line, it would become an important consideration. These figures that you give that are possibly 50–50, 43–57 percent, are fairly normal with defense contractors in the aircraft and missile industry. If these got out of line, if we were dealing with a contractor that had, say, 70 percent Government facilities and only 30 percent of their own facilities, I believe that we would give this far more importance in the consideration of a profit rate than we would in a fairly normal situation.

Mr. ADLERMAN. In other words, I gather you feel this is sort of a stable situation, and the weight consideration has been given fundamentally, so you do not consider it in the negotiations?

Major WEINSTEIN. I would like to point out, sir, that these Government facilities that Boeing is using have been acquired over a long period of years. This is not an overnight situation.

Mr. ADLERMAN. I understand.

Mr. Tierney.

Mr. TIERNEY. Colonel Linnerooth, on contract 36319, if I could review briefly what we got into yesterday, during your negotiations on the initial target, Boeing at this time desired a CPFF type of contract; is that correct?

Colonel LINNEROOTH. That is correct.

Mr. TIERNEY. At the same time, the Air Force was desirous of entering into an incentive-type contract?

Colonel LINNEROOTH. That is correct, for the reasons that I stated yesterday, as I read from my memorandum.

Mr. TIERNEY. Your reasons were, as I understand it, that all prior contracts on the Bomarc as of that time were of the CPFF type, and that you had been experiencing overruns.

You felt that if you got into an incentive-type contract there was more of likelihood to cost reductions for the Government?

Colonel LINNEROOTH. That is correct. And one more and very important aspect was that all prior Bomarc work, all prior Bomarc work—and when you look at these contracts you will find that there was, I think, around $500 million or $600 million of the total cost on those first two or three CPFF contracts—all of this work had been 100 percent of the effort of a separate Boeing missile division, a sort of separate company.

They have their own management, their own purchasing department, their own production department, their own tooling department, and so forth, and, therefore, we were, in effect, dealing with a separate entity, a separate company, which has been operating since 1951 on strictly CPFF contracts, with no incentives, theoretically, no profit incentives to minimize the cost.

They had been overrunning in the first couple of these contracts. That was the situation in 1958 when we negotiated this fourth major contract, the second production contract, in this program.

Mr. TIERNEY. On a CPFF basis, Boeing's last proposal to the Air Force was a target of $114.5 million at a 6-percent figure?

Colonel LINNEROOTH. That is correct. However, I believe that fee excluded the fee for financing.

Mr. TIERNEY. I would assume that the incentive fee later negotiated would also exclude that?

Colonel LINNEROOTH. No, it included it. This becomes difficult to explain, but we ended up negotiating a fixed price contract. The cost of interest is not an allowable cost even under a fixed price type contract.

Therefore, the 6-percent fee proposed by Boeing for the CPFF contract was one that excluded the fee for financing the 80-percent cost reimbursement to be put into effect, and to make a proper comparison, I think you would have to say that the fee they proposed was either 6.5 or possibly 6¾ or 7 percent if it covered the fee for financing, to make it comparable.

Mr. TIERNEY. There is no way we can calculate that precisely right now?

Colonel LINNEROOTH. Well, we cannot do it right at the moment. However, I will call attention to the fact that on the very next contract, 35030, the fee for financing, I believe, was 1 percent of the total cost.

In other words, that 8-percent fee that we find in that CPIF contract, had we been reimbursing the contractor 100 percent of his costs, the fee would have, instead, been 7 percent.

Mr. TIERNEY. Nevertheless, then actually in attempting to negotiate a fixed price contract, you got into a fixed price type of contract with a successive target?

Colonel LINNEROOTH. That is right.

Mr. TIERNEY. In that particular type of contract, were they more agreeable in negotiating that type of incentive contract as compared with the straight fixed price incentive contract?

Colonel LINNEROOTH. That is very difficult to answer. I do not believe the negotiation record indicates that we ever did offer them what is commonly referred to as an FPIF, fixed price incentive firm, throughout the course of the negotiations.

I believe our first offer was a CPIF, and then we went to the FPIS.

Mr. TIERNEY. As of this time the question is why was the successive type incentive contract used?

Colonel LINNEROOTH. This gets to the matter of judgment to be used in these negotiations. The buying team concluded that by using this form of contract with the incentive terms that we were trying to achieve, we were likely to get a lower final cost to the Government, price to the Government, final cost-plus profit, which would be less than it would be under some other form of contract.

General DAVIS. Mr. Tierney, I would like to postulate a second on that. I remember when we approved the FPIS approach as an approved method of contracting, it seemed to me that this was an experiment, this type of contract was an experiment, to bridge the gap between the CPFF and the fixed price incentive firm, where you were reasonably confident that you should go into an incentive situation but you were still a little early in the game and you are not as firmly convinced as you would be if you were going for a firm at the outset.

You still wanted to hedge the bet, so to speak. This successive formula thing was thought to prove valuable because it provides for a reset of the target. So if you badly missed at the outset, you would have a chance to do something about it during the course of the performance of the contract.

This is strictly my personal opinion, and whether the negotiator was thinking that at the time, I do not know.

Mr. TIERNEY. As I understand it, this type of contract was more adaptable to a situation, or was intended to be used in a situation, where your initial cost experience was not as firm as it would have been or required to be for the use of a fixed price incentive contract without the reset target?

Colonel LINNEROOTH. Generally, that is correct. When this type of contract is thoroughly analyzed, it becomes apparent that the contractual arrangement during the initial period of performance, prior to what we refer to as the reset, is, in effect, a CPIF type of contractual arrangement.

At reset we actually convert the contractual arrangement to an FPIF, fixed price incentive firm, we call it, type of contract, with ceiling. We try to make it as tight as possible, and so forth.

(At this point Senators McClellan, Mundt, and Ervin withdrew from the hearing room.)

Mr. TIERNEY. Do you feel this type of contract is working out? Is it achieving the purpose for which it was intended? The reason I asked that question is because I apply it to these particular contracts where you still have the problem of either overestimating or underestimating the target at the outset.

Colonel LINNEROOTH. We believe it has worked out. At this point, I would like to call your attention to the fact that you are now referring to contract 36319, which is an FPIS contract we negotiated with Boeing in March 1958.

The week prior to the negotiation of this contract, I find that we actually negotiated the final formula, or reset if you will, in the third contract on the KC–135 program, and that had been an FPIS contract. Let me give you the overall figures in that contract.

A year and a half prior, or roughly November 1956 the contractor on that contract, which was for, I believe, 118 KC–135 airplanes, had come in with an estimated cost of $188 million.

I am going to change that to $195 million because it later developed that there was $7 million worth of changes added to this contract from the time in November 1956 until it was finally settled.

So I am going to give you all of the figures with the changes added so that they are comparable.

(At this point Senator McClellan entered the hearing room.)

Colonel LINNEROOTH. The contractor came in in October–November 1956 with an estimated cost or proposal of $195 million.

Senator JACKSON. Was that 1956 or 1958?

Colonel LINNEROOTH. 1956, the third contract on the KC–135 program.

I do not even know what he proposed initially in this one, but during the course of negotiations he did propose the $195 million on an incentive-type contract at, I believe, 8 percent.

We thoroughly evaluated his estimated cost, just as we did in this 36319 contract, the type of evaluation was comparable. We spent a week or so in factfinding, going over every element of cost thoroughly, looking at all of his supporting information, using everything we might have on the outside to evaluate his estimates, and we came up with an estimate of $185 million, or roughly $10 million less.

No, we negotiated $185 million. I am trying to find what we developed. I think we developed something a little bit less. I do not happen to have that figure right here.

In any event, he proposed $195 million, and we negotiated an initial target, just as the $112 million in this 36319, of $185 million.

That was the situation in October–November 1956 when we negotiated the initial target in that contract.

The week prior to the negotiation of the initial target in 36319 we had had the factfinding in the negotiation of the second target or reset of that KC–135 contract.

At that time, the contractor had proposed $237 million as the reset target cost in that contract. We finally negotiated $219 million as a reset target. The final cost turned out to be $203 million.

Here we have a comparable situation, as follows: We have an initial $186 million negotiated target cost comparable to the $112 million in 35359; we have a final cost here of $203 million as compared to the $75 million final in the 36319.

This KC–135 contract was an FPIS contract. We frankly believe that the $203 million, plus the profit we added to that, on that KC–135 contract, was a much lower price to the Government for that third contract than that price would have been had we, instead, made a CPFF contract.

Similarly, in 35359, even though there is significant underrun, we feel that the final price was less than it would have been had we made a CPFF contract. That is because we believe that it is reasonable

to conclude that the final contractor cost of the contract was so much less than it would have been that this amount more than offsets the additional profit that was paid in that price.

Mr. TIERNEY. I think that gets back to the problem involved here, Colonel. On this particular contract, for example, the time you negotiated 36319, I believe at that time you had no production experience from a cost standpoint?

Colonel LINNEROOTH. That is correct.

Mr. TIERNEY. And that your experience was of the research and development nature?

Colonel LINNEROOTH. Yes, but let me call your attention to the fact that at the time in October or November 1956 at which time the initial target cost in this third contract in the KC–135 program was negotiated, at that time, as far as I can determine, approximately one or two KC–135—the first one or two KC–135 aircraft had been produced, and that was all the cost information we had at that time.

Mr. TIERNEY. But here we are dealing first of all with a missile as distinguished from an aircraft.

Colonel LINNEROOTH. Right.

Mr. TIERNEY. I think from our prior discussions, it was admitted that you found out that the production experience in the missile was found to be different than it was on aircraft, generally?

Colonel LINNEROOTH. I left this program in 1959 so I have not been able to evaluate that. But let me refer you to the fact that at the time we negotiated this we certainly did not have this information that you are saying now exists.

Mr. TIERNEY. I am sure of that. The only point I am making is that in this type of contract, depending on the circumstances, admittedly maybe your costs may exceed or maybe they will underrun, but if we do not have good cost experience that possibility is greater.

On this particular contract where you had, as we pointed out, an underrun of some $36 million, as I understand it, there is no way of actually determining to what extent that underrun was attributable to an overestimation, because of lack of experience at the time of the negotiation, or attributable to efficiencies or stimulated cost consciousness.

Colonel LINNEROOTH. You are correct that there is no way of proving, but there is also no way of disproving that the final actual cost of that contract was not less than it would have been had it been a CPFF.

Mr. TIERNEY. Is there some way of analyzing the elements of cost where there are great cost underruns?

Colonel LINNEROOTH. After the fact it is possible to compare the actual, by element, with what was estimated, by element.

Senator JACKSON. Maybe counsel is getting at this: When you take a look at their target price, do you analyze at least in some detail the factors that they have cranked into it that results in that particular target price objective?

I assume you ask them to break it down so that you have some idea of whether or not there is justification for their price target, or target price?

Colonel LINNEROOTH. Very definitely, Senator. That is what we do during this week or 2 weeks or sometimes 3 weeks of factfinding.

Senator JACKSON. Do you go into it in detail?

Colonel LINNEROOTH. Very thoroughly, very much in detail. We cross-examine the contractor's estimators who have developed the figures very thoroughly, and we have our own people at the plant that have done some checking before they come to negotiations.

They bring in their information, cost analysts, auditors, and so forth, that have been checking into this even before it left the plant, the proposal.

They come to the negotiations and participate in this factfinding and negotiation.

Mr. TIERNEY. That is true, but the point I am trying to make is that at the time of the negotiation on this contract, you were at the stage in the game where it was difficult to project certain cost figures accurately.

You were in that position; is that true?

(At this point Senator Curtis withdrew from the hearing room.)

Colonel LINNEROOTH. Yes, definitely. But when you are estimating, you are always in a position of wondering whether or not you have an accurate estimate.

Mr. TIERNEY. That is true, but under certain circumstances there is less wondering if you have better cost experience?

Colonel LINNEROOTH. Right.

Mr. TIERNEY. The only thing I would like to point out here is we have broken down the elements of major cost underruns.

I would like to introduce this chart, Mr. Chairman, No. 13.

The CHAIRMAN. It has not previously been introduced?

Mr. TIERNEY. It has not been.

That is chart No. 12.

(Chart No. 12 referred to follows:)

CHART NO. 12

Bomarc: Major underruns by categories on 3 incentive contracts

[In millions]

	36319			38098			38101		
	Contract target	Estimated actual costs	Under	Contract target	Estimated actual costs	Under	Contract target	Estimated actual costs	Under
Subcontracts and purchases	$66.4	$40.5	$25.9	$70.1	$49.60	$20.5	$69.8	$60.9	$8.9
In-house production	20.6	12.9	7.7	28.4	20.70	7.7	45.8	40.9	4.9
Tooling	3.9	1.3	2.6	4.9	1.30	3.6	15.5	5.7	9.8
Special test equipment	9.4	1.5	7.9	5.6	.68	4.9	17.9	15.4	2.5

Mr. TIERNEY. If we confine ourself to contract 36319, which we are now discussing, you can see the major area of underrun is in the subcontract and purchases area.

The initial target included a figure of $66.4 million.

The CHAIRMAN. What you are saying now, you are testifying to. You are now in the capacity of a witness testifying; is that correct?

Mr. TIERNEY. That is correct, sir; yes, sir.

We have here the estimated actual costs, but the entire contract is practically completed; so, for all intents, they are the actual costs.

It is $40.5 million or an underrun of $25.9 million. This is some 70 percent of the total underrun on contract 36319. That was in the subcontract area. At the time the estimates were made, this was the area where it was necessary also to add these contingency factors because of the uncertainty at the time. The subcontractors also were in the research and development stage.

The second major area is in-house production, which is a total underrun of $7.7 million. I would like to point out the special test equipment, where an initial estimate of $9.4 million was given, included in the initial target, and actually it only required $1.5 million to perform the contract.

The point is to what extent these estimates at the beginning were attributable to a lack of knowledge on both of the parties because of the nature of the program.

When they got into the program, they found out that maybe efficiency was attributed to part of it or they found out that actually they did not need the equipment anticipated at the time the initial target was negotiated.

Senator MUSKIE. Is it correct that as a percentage of the initial estimate of the cost of any of these four elements, as a percentage, the variations in final costs were greater with respect to the in-house production, tooling, and special test equipment than with respect to subcontracts?

Mr. TIERNEY. Percentagewise?

Senator MUSKIE. Subcontracts and purchases, the ratio was 25.9 to 66, in-house production was 7.7 to 20, and so on.

Mr. TIERNEY. That is correct, sir.

Senator MUSKIE. So the subcontractors apparently did a better job of estimating than the contractor did with respect to these other three elements?

Mr. TIERNEY. I am not sure.

Senator MUSKIE. That is what these figures appear to suggest.

Mr. TIERNEY. That is right, or they had a firmer knowledge of what was expected in a particular area.

Colonel LINNEROOTH. May I ask a question? What elements are missing? I find the contract target cost there totals $99 million. There is about $12 or $13 million missing.

Where is that?

Mr. TIERNEY. On this particular contract, 36319, there were overruns in the engineering areas particularly which compensated for these underruns; that is correct.

Mr. ADLERMAN. Are these the major categories of underruns?

Mr. TIERNEY. These are the major categories of underruns, and what we are doing here is examining those major categories of underruns.

Senator JACKSON. What percentage of the total were the overruns?

Mr. TIERNEY. I do not know the total, but since you have a figure here of $36.1 million of underruns, this total——

General DAVIS. In total, I think the contractor underran about 7.5 percent, the total final cost.

Senator JACKSON. On this contract?

General DAVIS. As I recall, yes.

Mr. TIERNEY. Seven and a half percent?

Mr. ADLERMAN. 32.7 percent, General.

General DAVIS. The final target cost, they underrun the final target cost about 7½ percent, not the initial.

This is one of those successive target incentive contracts.

Mr. TIERNEY. That is right. I wanted to get into the reset target on that.

Mr. ADLERMAN. I would like to point out on the special test equipment, the original estimate on 36319 was $9.4 million.

Mr. TIERNEY. That is correct.

Mr. ADLERMAN. And they actually expended only $1.9 million.

Mr. TIERNEY. That is right.

General DAVIS. On the question you asked about what happened in the other areas where there was an overrun, that points up the fallacy of looking at individual elements of total cost in relation to profit.

Here we tend to concentrate our attention on where there was an underrun and we forget to give the contractor credit someplace where he had an overrun.

In the final analysis, what is in the total contract is what is important to the stockholders and also what is important to the Government, the total price.

So there are some of these elements that we are going to underestimate and some we will overestimate. We hope that the final cost comes out close to what we estimate it, and the final profit comes out close to what we estimate it, notwithstanding what the individual pieces turn out to be.

The CHAIRMAN. If my calculation is correct, you have three contracts on chart No. 13. The total contract targets on the three was $206.3 million. Somebody can check this with me.

The total underrun, according to the figures listed on the three, amounts to 106—I think I have my totals wrong.

I am sorry.

Mr. TIERNEY. Senator, the best way is to add the net underruns we have shown on each of these three contracts, as far as the underruns are concerned, because, as I explained in 36319, these are merely pointing out the major areas of the underruns.

In addition to that, on 36319 there were overruns in certain areas, certain categories, and the net underrun on that contract was $36.7 million.

On 38098 it was 36.1, and on 38101 it was 24.6.

Mr. ADLERMAN. The three underruns are $36,740,000 on contract 36319, $24,667,000 on contract 38101, and $36,198,000 on contract No. 38098.

Mr. TIERNEY. That is a total of $96.8 million.

Senator MUSKIE. It is nearly $97 million in all out of $438 million in initial target, roughly—very roughly.

Colonel LINNEROOTH. As a matter of fact, I have the figure on all three contracts. The total underrun was $75 million. This excludes the spares.

Senator JACKSON. Out of a total of what?

Colonel LINNEROOTH. Out of a total of $376 million.

Mr. TIERNEY. On these three contracts? Our figures are $96.8 million.

Senator MUSKIE. Thirty-six, twenty-four, and thirty-six.

Colonel LINNEROOTH. These are FPIS contracts, aren't they? No, wait a minute. One of these is the FPIF contract. I am sorry.

I do not have that total figure for those particular three contracts readily available.

Mr. TIERNEY. The total is $96.8 million.

General DAVIS. It is $438.5 million, I believe, according to the three charts.

Senator JACKSON. $438 million.

Major WEINSTEIN. That is correct. According to a quick calculation here, $438.5 million was the negotiated initial target for these three contracts. The actual costs are coming out to about $341 million.

All these numbers exclude spares, by the way. It will be a net underrun of $97.5 million on these three contracts.

The CHAIRMAN. Where are you getting these other figures? According to the chart there, chart 13——

Mr. ADLERMAN. This chart represents underruns in only four categories, Senator. It is not the total underruns. These are only four underruns. We do not have all the categories. But we have all the underruns on the three contracts.

The CHAIRMAN. This chart is designed to show only the underruns?

Mr. ADLERMAN. Only the underruns on four classes, the subcontracts, the inhouse production, the tooling, and special test equipment.

The CHAIRMAN. Only on those four categories?

Mr. ADLERMAN. That is right. But we do have the total for the three contracts. The total underrun is $97 million out of $438 million worth of contracts.

General DAVIS. It is 22 percent.

The CHAIRMAN. Do you have a chart showing that?

Mr. ADLERMAN. No, but it is a total of these figures from the three charts.

The CHAIRMAN. From comparing the charts and calculating on the basis of the figures revealed by the charts, the total underrun is what?

General DAVIS. About $97.5 million.

The CHAIRMAN. On the basis of a total original target of what?

General DAVIS. 438.5. That is 22 percent.

The CHAIRMAN. And the underrun is what, around 97?

General DAVIS. 97.5.

Senator JACKSON. Or an underrun of 22 percent.

Colonel LINNEROOTH. May I call attention to the fact that this is showing only three of the incentive contracts. There were two more. The total targets, in all five incentive contracts——

The CHAIRMAN. What percent of this underrun of $97 million under the contract was the contractor entitled to receive on these three contracts?

Colonel LINNEROOTH. In terms of cost, Senator, he did not receive one nickel of the underruns. We did not pay a nickel of the underruns. He received more profit than he would have received had he not had underruns of that magnitude.

The CHAIRMAN. That is what I am talking about, the cost to the Government. The Government paid out profits. That is cost to the Government. What I am trying to understand is your incentive contracts provide in these instances for some payment to the con-

tractor for holding the cost down below, for the underruns, for achieving that goal.

What percentage was paid on these three contracts?

Senator MUSKIE. What was the additional profit, based on the underruns?

The CHAIRMAN. We will get that if we get the percentage.

General DAVIS. On the one contract, he made an additional profit of $2.57 million.

The CHAIRMAN. Just the percentage, General. What was your contract originally? Did you have a contract he was to get a percentage of whatever he is able to reduce it?

General DAVIS. Yes, sir.

Colonel LINNEROOTH. Yes, sir; 15 percent. However, there was a ceiling on that.

The CHAIRMAN. I understand. It could not go over what percent?

Colonel LINNEROOTH. I think it was 10 percent.

The CHAIRMAN. What I am pointing out is now he gets up to the 10 percent. He gets 15 percent of the $97 million. That would be about $14 million.

General DAVIS. The total earned profit was approximately $12 million on 36319.

Mr. TIERNEY. Senator, I think we can just add the total, as far as the incentive fees are concerned, just add the total on the three charts.

The CHAIRMAN. I want to get the percentage. He earned, actually, on the basis of the contract; if he got all of the 15 percent, he earned over and above the 10-percent limit, did he not? Do you mean he did not achieve the 10 percent?

Major WEINSTEIN. Senator, our 10-percent limit was based on 10 percent of the negotiated cost, not 10 percent of the final actual cost.

The CHAIRMAN. He either makes more money by having one of these contracts or he makes less or it does not make any difference.

Major WEINSTEIN. Let us add up the underruns on these charts.

The CHAIRMAN. To start off with, on these charts and on these contracts, the estimated target was $438.5 million total. When they are actually performed, according to the best estimate, they will perform for $97.5 million less.

The incentive contract that we speak of here was to take into account and to reward the contractor for the underruns on the estimated cost; was it not?

Major WEINSTEIN. That is correct, sir.

The CHAIRMAN. In other words, by reducing the cost from the original anticipated $438 million plus, by reducing it by $97 million plus, he is entitled to some reward. Your contract so states. Is that not true?

Major WEINSTEIN. That is correct.

(Reference charts 5, 8, and 13.)

The CHAIRMAN. Originally, it started out that he was to get 15 percent of that underrun; is that correct, in your contract?

Major WEINSTEIN. That is correct, sir.

The CHAIRMAN. But then you have another clause which says that although he may get the 15 percent, that, together with his other fee, shall not total in excess of 10 percent of the total cost. Am I correct?

Major WEINSTEIN. That is correct.

The CHAIRMAN. Of the initial estimated cost?

Major WEINSTEIN. That is correct.

The CHAIRMAN. So it is not the total cost, but the initial estimated cost. In other words, under this incentive contract, the contractor could never earn more than $43,850,000 on them?

Major WEINSTEIN. That is correct, sir. Now I just——

The CHAIRMAN. What did he actually earn?

Major WEINSTEIN. I just made a quick calculation. I will not stand on these exact figures, but I believe he earned about $8.3 million added profit for the underruns, which would be about 8.4 percent of the underruns.

The CHAIRMAN. That brought him up to 10 percent of the target figure?

Major WEINSTEIN. That is true.

Mr. ADLERMAN. It is very easy to calculate that.

The CHAIRMAN. Just a moment. In other words, if you had not had the ceiling of 10 percent it would have run considerably over?

Major WEINSTEIN. That is correct.

The CHAIRMAN. But the ceiling of 10 percent brought down the extra reward, the incentive reward, from about $14 million to $8 million, in round numbers.

Major WEINSTEIN. That is correct. That is why we put it in.

Mr. ADLERMAN. It is $2.5 million, $2.9 million, and $3.6 million, that totaling $10 million profits as a result of the incentive.

The CHAIRMAN. We have it down somewhere between $8 million and $10 million.

Major WEINSTEIN. $8,198,000——

General DAVIS. No. It is $9,190,000.

Colonel LINNEROOTH. I have a different one. I have $7,160,000.

Mr. ADLERMAN. It is easy to calculate.

Colonel LINNEROOTH. Let me briefly say what I have done. I have taken the initial targets for the elements shown on your charts for all three of the contracts. On the first one, the total of the initial target is $100.3 million. On the next one, the total of the initial target is $149 million and on the third it is $108.7 million. The total of those is $358 million. The target profit is 8 percent of that, the ceiling profit is 10 percent of that, so that the maximum he could have earned on that was 2 percent of $358 million which is $7.16 million.

Major WEINSTEIN. You used the wrong figures for the initial target.

General DAVIS. He is excluding the spare parts that they included in their charts.

Colonel LINNEROOTH. I am using the contract targets you have on these charts.

Senator MUSKIE. Not on these charts.

The CHAIRMAN. I believe after all of this and the charts and the other figures and the contracts and the negotiation records, ultimately we can come out with the accurate figure.

I will not spend any more time on it.

General DAVIS. Will the chairman accept my arithmetic from these charts? It is $9.191 million.

The CHAIRMAN. We will take your estimation into account also, General.

General DAVIS. My addition.

The CHAIRMAN. Anyway, I know we are all doing the best we can, but figures do get complicated for all of us.

The only issue here, as I see it, is a question about these incentive contracts. There may be a time when they can be made without hazard, without any serious hazard, for the Government, and they may be made advantageously, after the thing has developed and stabilized sufficiently to where from there on it is a matter of learning how to more efficiently produce the item and thus get the cost down.

But I do believe there is an inherent hazard in them when you try to make them when there is not enough production experience to give you a basis of calculation with some reasonable estimate as to what the ultimate cost is going to be.

General DAVIS. I will agree with that.

The CHAIRMAN. I do not mean to criticize. You go through these things. You all have to get experience. We do.

But the point about this whole thing is let us examine it and see if now in the future we cannot find ways, based upon this examination of these things, and based upon your experience, find ways to effectuate some economies.

That is all we are trying to do here. I know figures get complicated. It is hard for me to follow them. There is no reflection if we do not all come out with the same figures at the moment.

General DAVIS. We agree completely with your conclusion, Mr. Chairman, and I would like to assure you on behalf of the Secretary of the Air Force that our objectives are exactly as you have outlined. We are working very hard implementing this incentive policy in the Department of Defense, and we trust that in the future we will have a reasonably sound basis for entering into what I will call a realistic target price in our contracting.

The CHAIRMAN. I am sure you will want to work to that end.

Again, I hope that in these examinations where we all sit down and try to make a study together, some good will come from it.

Let us proceed.

Senator Muskie.

Senator MUSKIE. Colonel Linnerooth, you started to refer to two other contracts earlier. I wonder if we might have the figures on those for the record?

Colonel LINNEROOTH. Yes, sir.

Senator MUSKIE. That is, if you have accurate figures.

Colonel LINNEROOTH. I can give you the total of all five incentive contracts. The final target—and this all excludes spares— was $863.7 million. The final actual cost was $764 million.

Therefore, the total underrun on all five incentive contracts was $99.6 million.

Senator MUSKIE. In other words, the underrun on the additional two contracts was only $2 million.

Colonel LINNEROOTH. Was only $2 million.

Senator MUSKIE. Were those contracts later in time than the three we are talking about?

Colonel LINNEROOTH. No, sir. The 38101 contract that was on the right on that chart of underruns was the fourth contract. The 35030 contract, the CPIF, contract, came in between the second and the third one that were on that chart.

That was, incidentally, the largest one, roughly a $280 or $300 million contract.

Senator MUSKIE. What is the total underrun figure, percentagewise, on the total initial targets?

Colonel LINNEROOTH. I have it calculated. It is $99.6 million as compared to $863.7.

Senator MUSKIE. Roughly 17 percent——

Colonel LINNEROOTH. No; it is about 12 percent.

Senator JACKSON. How does that compare with your other incentive contracts on other programs?

Colonel LINNEROOTH. It compares with the figures that I showed you yesterday.

Senator JACKSON. Just for the record.

Colonel LINNEROOTH. The total of 161 contracts that have been settled in the last 3 years that we had records of showed a total underrun of 3.4 percent.

I would like at this time to call attention to the fact that I have not been able to run down all of the past history in the negotiations in which I participated, but over the period of roughly 10 years, 1950–60, I was involved in the negotiation of something between probably 5 and 10 of this type of contract, of this magnitude, per year.

As far as I can determine, the 36319 contract, which is the very first one we made in the Bomarc program, the estimate that I and the team developed was the highest estimate compared to the final actual cost that I have ever experienced in that 10 years of experience, so that this is the worst one, let us say, if you want to put it that way.

We prepared the worst estimate as an Air Force objective. I do not have the figures on what they have averaged, but generally speaking, on the basis of the ones that I have looked at, some have overrun, some have underrun.

I have just related to you the pertinent facts in one contract, in the KC–135 program that ended up overrunning by about 5 to 10 percent. Generally speaking, I do not think there is any question that a greater number have underrun the targets than have overrun them, but none of them have an underrun of the magnitude of this one, 36319.

You will notice that 38101, the other one I was involved in, has underrun significantly less, 10 or 15 percent. It is not as bad, as I see it.

Senator JACKSON. Do you have an explanation for the difference?

Colonel LINNEROOTH. I think my basic explanation is as follows:

As was disclosed in the previous chart Mr. Tierney put up on 36319, the major portion of the underrun was in the subcontracting area. I will be frank that in coming back a month or so ago from my other duties and looking into these contracts on a hindsight basis, I was extremely surprised to find the magnitude of difference between our estimates of the subcontracts and the final cost.

I would like to make this comment: As I think has been brought out in these hearings, the principal tools that we used in estimating the subcontract cost on 36319, 38101, and other contracts were primarily of three types. In some instances we had the subcontractor's budget quote, or Boeing had the subcontractor's budget quote, and in other instances they had a firm subcontractor proposal, and in other instances Boeing had already negotiated a contract with the subcon-

tractor and had the subcontract on an FPR redeterminable-type contract, renegotiable upward to 10 percent and unlimited downward.

In estimating the subcontract cost in these programs, we have found, or at least I have found, that the quotes and proposals of subcontractors are usually excellent tools in estimating what we think the subcontracting is going to cost. We can usually make the assumption that the subcontractors have proposed to the prime contractor probably a figure a little bit inflated. This is just normal business practice as far as I am concerned. We always expect them to ask for more than they expect to get.

Senator JACKSON. They do that in the Government, too.

Colonel LINNEROOTH. We are always faced with it; yes, sir, and they do that, generally speaking, whether they are proposing CPFF or fixed-price contracts. This doesn't make any difference. They are businessmen and we try to be businessmen on the other side. These estimates, proposals, and contracts with the subcontractors we have usually found to be good tools in estimating what we think the subcontracting effort is going to cost, and usually that tool is within 5, 10, or 15 percent of what the final cost is likely to be.

I have been amazed, frankly, in this program to find that we could not, based on hindsight, place that confidence in the subcontract budget estimates, proposals, and deals that Boeing had made with the subcontractor. I had considerable experience in dealing with Boeing on the KC–135 program prior to this Bomarc negotiation. As I indicated, a week prior to the 36319 negotiation we had negotiated the final formula in the third contract in the KC–135 program.

I had been in on the negotiation of the first, second, third, and fourth contracts in the KC–135 program prior to the reset of the third contract in that program. When you go back over the records, you will find that Boeing's estimates—except I think in the case of the first contract, which we considered to be a little bit on the high side and we negotiated something less—came out pretty close. So we had had considerable experience, or at least I had had considerable experience, in negotiating contracts with the Boeing Co. prior to this Bomarc negotiation.

Frankly, I developed a great deal of confidence in the ability of Boeing's estimators to come in with fairly realistic figures. I have had some experience with other companies in which we just know they are way off all the time. But with Boeing, I expected to find their figures only 5 or 10 percent on the high side.

It amazed me that I found that hindsight showed us that the subcontract estimates were high by 35 or 45 percent. But as we go back into it, we find that it was primarily in the subcontracting area. To me, that is the explanation.

Generally speaking, we just don't miss them this much. We haven't missed them this much in the past. We will in the future, however, have some rare instances in which this will happen again, but in my opinion that should not deter us from trying to put this good old dollar-profit incentive into these contractual relations as early as possible in these programs.

Having been out of this business now for 2 years, and going back to this program and looking over the facts we have been going over here, as a representative of the taxpayer in trying to get the lowest prices possible in these programs, frankly, I have to say that if I had it to

do over again, I would do the same thing, because I think we, at the time, made the best deal we could have for the taxpayer.

The CHAIRMAN. You do not mean that on these, surely.

Colonel LINNEROOTH. Definitely, sir. I think we paid a lower price in these five contracts than we would have paid.

The CHAIRMAN. I think that is absolutely ridiculous. I do not see how you can say it. I really don't.

Colonel LINNEROOTH. Senator, in the overall on these five contracts, we find, when we make some calculations, that it can be contended we paid a higher price on these five contracts, and only a 3-percent higher price, only if it can be concluded that the final contractor costs under all five incentive contracts would have totaled the same amount had we made them CPFF.

The CHAIRMAN. If you are going to insist that whenever it costs the Government more, you will do the same thing again in the light of your hindsight, I can't understand it.

Colonel LINNEROOTH. Senator, I don't believe that this contract cost us more. We paid more profit, but I don't believe the price was higher.

General DAVIS. Sir, may I rationalize what I think is in his mind but he is not saying?

The CHAIRMAN. I beg your pardon?

General DAVIS. I would like to take a crack at rationalizing what I think is behind his statement, but which he is not saying.

The CHAIRMAN. He needs something behind it, I believe.

General DAVIS. I will talk for a moment about a human frailty, and I hope you will accept it as that. In our experience with CPFF contracts, dealing in a developmental situation, which you are in this program particularly, engineers being what they are, the way they think, the way they act, will spend every nickel a manager will let them spend on developing a product, because they want it to be perfect. They will test and test it and improve it and refine it. I think business experience will back that statement up.

The manager at some point in time has to stop the refinishing, the goldplating, whatever you call it, and say, "We are going to build it this way, to build it cheaper."

I think he is saying that if we had gone to CPFF on these contracts, and even if we had gotten the CPFF at a lower figure, which we couldn't have, because of this natural tendency on the part of developmental people, they would have spent every nickel of that because it was there to spend. There was no incentive, there was no lid placed on them by management to say, "You will not spend that much." I think this is just a fact of life. I cannot document it, but for the 18 years that I have been in the procurement business, I have concluded that that is a fact of life, in a cost-plus-a-fixed-fee situation.

If there is no incentive to hold the cost down to the absolute minimum and to really get costs down, until you put a ceiling on that contract, until you give that man a dollar incentive, he is going to spend right up to what you have on the face of that contract, and in some cases more. He is going to overspend it if it is a CPFF because he will be reimbursed.

Senator MUSKIE. What you are saying is that if you had had the CPFF contract here, the final costs would have been higher than the final costs of these contracts, in that the increase in cost would have

more than offset the amount of additional profit that you paid under this incentive-type contract?

General DAVIS. We are saying that the $97.5 million underrun would have been spent had these contracts been CPFF, from our experience. We paid the contractor in incentive profits $9.19 million. So we are concluding that we saved, that the Government saved, as a result of this gamble, if you want to call it that, $88 million, and the contractor made an extra $9 million.

Mr. ADLERMAN. That is assuming that your target figure is accurate, though.

General DAVIS. That is what I said. I explained how I made that assumption.

Mr. ADLERMAN. It is just as if your wife goes to the department store and comes back and says, "General, I just bought a coat for $400. It was priced at $800 and reduced to $400. So I saved you $400." Isn't that what it amounts to?

General DAVIS. I am sure you didn't accept my explanation of why we rationalize this way. Our experience, and believe me I have been in nothing else for 17 years, 5 months but Air Force procurement, and I have seen literally thousands, hundreds, and hundreds of millions of dollars go over my desk in all kinds of contracts——

Senator JACKSON. You mean billions, don't you?

General DAVIS. I have drawn this conclusion that with a CPFF contract, to underspend is an unheard-of situation. They will either spend all of the money on the face of that contract or they will overrun it. So I have logically concluded that had we been in a CPFF situation here rather than an incentive situation, that the $97 million underrun would not have happened—with much more logic than you can assume that it would have happened.

The CHAIRMAN. Are you saying it wouldn't have happened? Let me point out to you that the subcontractors didn't have any incentive contract, and it was the subcontractors whose work went down. They had no incentive. How do you account for that? Here is a subcontractor, and I remember this case very well, where he presented his estimate, that it was going to cost about 40-some-odd-thousand dollars per unit, and he finally produced them at $19,000 per unit. But he had no incentive contract. His was just a negotiated deal.

Major WEINSTEIN. Sir, I would like to attempt to explain this a little better.

The CHAIRMAN. I don't see how not having an incentive contract, it would have brought his down any more.

Major WEINSTEIN. Yes, sir. I heard the testimony of the subcontractor saying that as far as they were concerned, they didn't even know that Boeing had an incentive contract. But they also stated, every one of them, categorically, that Boeing had men at their plant. They also had very close coordination with Boeing at all times.

The CHAIRMAN. They have that under any contract, don't they?

Major WEINSTEIN. Yes, sir. But I feel that the Boeing personnel, when they were evaluating any changes, any changes in programing, took into consideration that every dollar the subcontractor spent was 15 cents out of Boeing's pocket, and the subcontractors did not even realize that they were under an incentive. But Boeing did, and I am sure that that was one of their important considerations in any management decision they made with the subcontractor.

The CHAIRMAN. If it worked with Boeing as the prime contractor, why wouldn't it work on down the line with the subcontractor?

Major WEINSTEIN. If we had been dealing directly with the subcontractors, I think we would have put them on incentive contracts, too.

The CHAIRMAN. I think there is one thing further that ought to be called attention to, for the record. These contracts carry with them a floor of 6 percent on the estimated cost, do they not?

Major WEINSTEIN. That is correct, sir.

The CHAIRMAN. So your target price of $438 million carried a floor with it in the negotiated contract of 6 percent of it.

Major WEINSTEIN. Well, sir, that was not the Air Force's desire. That was part of the negotiation process. We couldn't sell Boeing. Boeing was not that sure of their own figures to take the risk that we wanted them to take.

The CHAIRMAN. But that eliminated the risk.

Major WEINSTEIN. Eliminated part of their risk, but it is not our business——

The CHAIRMAN. Let me point out to you what that does. He gets a guarantee of 6 percent on the target price that was originally negotiated, doesn't he, under the contract?

Major WEINSTEIN. Yes, sir.

The CHAIRMAN. Then if the cost comes down by $97 million, he has actually made nearly $5 million over and above. Six percent of $97 is more than $5 million, and in addition to 6 percent on what it actually cost.

Major WEINSTEIN. But I believe that the Government saved more than the $5 million extra profit.

The CHAIRMAN. I guess there is no way to argue it out. On the face of it, it actually shows that, doesn't it?

Major WEINSTEIN. Yes, sir. But our objective was not the profit or the cost. Our objective was to get the best price, a combination of profit and cost, for the Government. As far as we were concerned, looking at this theoretically, and we can't prove this, I will admit, but as Colonel Linnerooth said earlier I have never found anybody to disprove this theory. We feel that by putting this incentive, and it is being done in other areas beside Government procurement, we feel, even if they overrun the cost and only make the 6 percent, at least we have put this carrot, if you want to call it that, in front of the contractor, and they have made their absolute best effort, costwise. That is our objective in all of these incentive negotiations.

The CHAIRMAN. Of course, these are contingencies that can arise in connection with any contract, that is unforeseen, that might cause the cost to go up.

Major WEINSTEIN. Yes, sir.

General DAVIS. Mr. Chairman, Colonel Linnerooth has an interesting comparison of what he has drawn of what could have happened under CPFF versus incentive, that I think you will find quite interesting.

The CHAIRMAN. All right.

Colonel LINNEROOTH. Senator, let's take contract 36319, the first contract. How much did the Government actually pay for that procurement? It paid, did it not, and all of these figures exclude the spares, $75.4 million, plus 11.6 in profits, or $87 million. Here is

the cost to the Government. This is the price. This is what we finally paid on that contract, under the incentive contract, $87 million. This is what the taxpayer paid out on the contract.

Let's assume that we had instead made a CPFF contract, cost-plus-fixed-fee contract. I believe all of the testimony here has indicated that it is reasonable to assume——

The CHAIRMAN. This was a cost-plus-fixed-fee contract of 6 percent of the estimated target.

Colonel LINNEROOTH. No, sir. This is the final price we paid under an incentive-fixed-price contract. The final contractor cost was $75 million, adding $11.6 million to it in profit, and the final Government cost is $87 million.

The CHAIRMAN. What percentage is that on the cost?

Colonel LINNEROOTH. I believe it is 14.6, is it not?

The CHAIRMAN. Without arguing, that indicates a pretty good percent.

Colonel LINNEROOTH. Right, but the $87 million is the price the Government paid. Now let's assume we made a CPFF contract. It is reasonable to assume, is it not, that had we done so, we would have had an estimated cost of $114.3 million? This is the original $112 million plus the changes added to it, and it is also reasonable to assume, is it not, that we probably would have agreed to a fee based on 6 percent of that figure? So that the profit or fee would have beeen $6.9 million. Am I making myself clear so far?

All right. Let's make some assumptions. First let us assume——

The CHAIRMAN. Let me ask you at this point what Boeing offered to do it for on a fixed-fee basis. They wanted that kind of a contract.

Colonel LINNEROOTH. I believe their final offer was $114 million which is not this $114 million, and they probably would have taken $112 million, which is the target we established in the incentive contract.

The CHAIRMAN. I am talking about on fixed fee.

Colonel LINNEROOTH. That is what I am saying. We ended up negotiating a target——

The CHAIRMAN. Didn't they offer to do it at 6 percent?

Colonel LINNEROOTH. On $114 million.

General DAVIS. That is essentially what they offered.

Colonel LINNEROOTH. $6.9 million of fee.

If we make the assumption that Boeing's final actual cost under the CPFF contract would have been the same under the CPFF contract, cost plus fixed fee, as it was under the incentive, or $75 million, we would have paid a price of $75.4 million, plus $6.9 million, or $82.3 million, would we not?

Therefore, if we can assume that that is what would have happened, we did pay $4.7 million more than we would have paid under this incentive contract.

The CHAIRMAN. Colonel, is that the most favorable explanation you can make of it? That is on the basis of assumptions.

Colonel LINNEROOTH. First, I believe that reasonably prudent men would conclude that under a cost-plus-fixed-fee contract it is not likely that the final cost would have been less than $75 million. So we needn't take that into consideration. But it is possible that someone might conclude that it could have been the same. If it was, we did pay $4.7 million too much. But let us make the assumption that the final cost

would have been only 5 percent greater under CPFF than it was under the incentive contract. Then the contractor's final cost, instead of being $75.4, would have been $79.2. We would have added the fee of $6.9. We would have paid $86.1. This is still less than the $87 million.

But let us assume that his final cost would have been 10 percent more. Then his costs would have been $82.9, and our price would have been $89.8. This CPFF price is $2.8 million more than the $87 million incentive price we finally paid, the cost to the Government.

If we make the assumption his final cost would have been 20 percent more, we paid an incentive price that was $10 million less. If we make the assumption, which I don't think based on all the testimony we have heard—frankly, my own opinion is that it is not likely it would have cost $114 million, I am sure it would have cost something less than that, the prior CPFF contract ended up costing less, but assuming it would have cost that, we would have ended up paying a CPFF price that was $34 million more than the incentive price.

We have now made the assumptions that the contractor cost under CPFF would have been 5 percent, 10 percent, and 20 percent more than it was under the incentive contract and these are the differences in the final price.

You will recall that we displayed some statistics yesterday showing that the overall difference between contractor costs under incentive and CPFF contracts was 10.6 percent. Again, we indicated yesterday this history is not conclusive, but maybe it is an indication. If this is any indication at all, and we make the assumption that the final contractor cost would have been 10 percent more, it then develops that we bought for a price of $2.8 million less under the incentive contract, and we bought for that much less even though hindsight now indicates that we did have, apparently, a high and inflated target.

The CHAIRMAN. That chart will be made No. 20, and it can be printed in the record. It will be exhibit 20.

(Document referred to was marked "Exhibit No. 20" and follows below:)

EXHIBIT NO. 20

COMPARISON
INCENTIVE VS CPFF PRICES

EXAMPLE

MILLIONS

CONTRACT 36319 FPIS	FINAL INCENTIVE PRICE	FINAL CPFF PRICES IF BOEING FINAL COSTS WERE: SAME AS COL. 1	5% OVER COL. 1	10% OVER COL. 1	20% OVER COL. 1	SAME AS INITIAL TARG. COST
BOEING COST	75.4	75.4	79.2	82.9	90.5	114.3(2)
BOEING PROFIT	11.6	6.9	6.9	6.9	6.9	6.9(2)
PRICE (GOV'T COST)	87.0	82.3	86.1	89.8	97.4	121.2
DIFFERENCES(1) $'s		4.7	.9	2.8*	10.4*	34.2*
DIFFERENCES(1) %		5.4%	1%	3.2%*	11.9%*	39.3%*

(1) AMOUNTS CPFF PRICES ARE UNDER/OVER* INCENTIVE PRICE.
(2) ASSUMPTION – CPFF CONTRACT TERMS WOULD HAVE BEEN:
EST. (TARG) COST 114.3 (SAME AS IN INITIAL INCENTIVE CONT.)
FEE AT 6% = 6.9

Colonel LINNEROOTH. We picked here the worst example of these contracts. This is the one that underran the initial target by the greatest amount.

Now let's look at the other four contracts in addition to this one, and make similar calculations. What did we end up paying overall? Rather than show you all of this detail on each of the other four contracts, you will find in the next chart only the price differences for each contract in each column plus the totals for all five contracts.

The CHAIRMAN. Let the second chart be made exhibit 21.

(Document referred to was marked "Exhibit No. 21" and follows below:)

EXHIBIT No. 21

COMPARISON
INCENTIVE VS CPFF PRICES
ALL BOMARC CONTRACTS

MILLIONS

CONT. NO.	TYPE	FINAL INCENTIVE PRICE	DIFFERENCES (1) ONLY IF BOEING FINAL COSTS WERE: SAME AS COL. 1	5% OVER COL. 1	10% OVER COL. 1	20% OVER COL. 1	SAME AS INITIAL TARG. COST
36319	FPIS	87.0	4.7	.9	2.8*	10.4*	34.2*
38098	FPIS	112.9	5.7	.8	4.2*	14.1*	30.6*
38101	FPIF	185.5	7.5	.8*	9.1*	25.7*	17.1*
35030	CPIF	320.1	5.9	8.9*	23.7*	53.3*	5.9
40033	FPIS	136.9	2.6	3.7*	10.1*	22.8*	.4
TOTAL		842.4	26.4 3.1%*	11.7* 1.4%*	49.9* 5.9%*	126.3* 15.0%*	75.6* 9.0%*

(1) AMOUNTS CPFF PRICES UNDER/OVER * INCENTIVE PRICES.

Colonel LINNEROOTH. When we make these same calculations for all five incentive contracts, what do we find? We find that the total price that we finally paid, for all five incentive contracts, was $842.4 million. If we now make the assumption that the final contractor cost under CPFF contracts would have been the same, we ended up paying $26.4 million more under these incentive contracts than we would have paid had we made a CPFF contract.

General DAVIS. But the Government got half of that back in taxes.

The CHAIRMAN. Let's don't get taxes involved in this. It is complicated enough.

Colonel LINNEROOTH. Senator, this becomes important here. The point I am making now is in final cost to the Government. Had we made CPFF contracts, and had the contractor actual cost been the same as under the incentives, this $26.4 million difference in price is actually a profit that Boeing would not have made. They actually returned half of that additional profit to the Government in taxes, so the real difference in cost to the Government is only half of that figure.

But this does show that if we make the assumption that the final actual cost that Boeing incurred would have been the same under CPFF contracts as it was under incentive, the most we could be criticized for is that we paid $26.4 million too much. If we make the assumption that the final cost would have been only 5 percent greater, we ended up buying for $11.7 million less. If we assume a cost figure 10 percent greater, based on the figures on the other chart, we actually ended up buying for $50 million less.

If we assume 20 percent, we bought for $126 million less. And if we assume a cost the same as the initial target, we bought for $75.6 million less.

The CHAIRMAN. I am very sorry, but there is a rollcall on. We have to recess. We will resume at 2 o'clock this afternoon.

(Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 2 p.m. the same day, with the following members present at the taking of recess: Senators McClellan, Jackson, and Muskie.)

AFTERNOON SESSION

The subcommittee reconvened at 2:10 p.m., Senator John L. McClellan (chairman of the subcommittee) presiding.

(Members present at time of reconvening: Senators McClellan and Jackson.)

The CHAIRMAN. The committee will come to order.

Call your next witness, Mr. Counsel.

Mr. ADLERMAN. Mr. Tharrington.

The CHAIRMAN. Come forward, please, sir.

Do you and each of you solemnly swear the evidence you shall give before this subcommittee will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. THARRINGTON. I do.

Mr. NEFFNER. I do.

Mr. HELBERG. I do.

The CHAIRMAN. Will each of you identify yourself for the record, please?

TESTIMONY OF R. W. THARRINGTON, H. W. NEFFNER, AND R. J. HELBERG

Mr. THARRINGTON. I am R. W. Tharrington, assistant general manager of the Aero-Space Division, the Boeing Co.

Mr. NEFFNER. I am H. W. Neffner, director of military contracts for the Boeing Co. and director of contract administration, Aero-Space Division.

Mr. HELBERG. I am R. J. Helberg, Bomarc program manager, Aero-Space Division, the Boeing Co.

The CHAIRMAN. Mr. Tharrington, I understand you have a statement.

Mr. THARRINGTON. Yes, Mr. Chairman; I have a brief statement.

The CHAIRMAN. Would you like to read it or insert it into the record?

Mr. THARRINGTON. It is fairly short. I would like to read it, if I may.

The CHAIRMAN. Very well. You may proceed.

Mr. THARRINGTON. Senator McClellan and members of the committee, I am R. W. Tharrington, assistant general manager of the Aero-Space Division, the Boeing Co., located in Seattle, Wash. With me today are H. W. Neffner, director of military contracts for the company and director of contract administration for the Aero-Space Division, and R. J. Helberg, Bomarc program manager, Aero-Space Division.

As Senator McClellan and members of the committee have observed, the people of the United States have every right to know how effectively our country is spending its billions for defense. For our part, we are dedicated to producing the most defense per dollar. We are never completely satisfied with our own performance and continually seek the better way. We all have much to gain by dispassionate review of past performance.

The security of our Nation demands that we use the best methods that can be devised for the acquisition of advanced and reliable high performance weapon systems at the earliest possible date and for the least possible total cost to the Government. We therefore recognize the great importance of the task to which your committee is addressing itself, not only from the standpoint of profits, but also from the standpoint of promoting the most effective processes for the acquisition of the advanced weapon systems so critical to our survival. We hope that our testimony will assist the committee in arriving at valid, practical, and constructive conclusions relative to this process.

Before proceeding with our summary remarks on Bomarc IM–99, we must express two points of concern which directly bear on the subject matter before the committee.

First, emphasis should be placed on the total costs of a weapon system to the Government. By "total" we mean the costs not only for all contractors, but also of all Government agencies involved in the projects. It certainly would not be in the public's interest to simply transfer to Government agencies responsibilities which private industry, given sufficient profit incentive, has proven it can discharge effectively and economically.

Second, serious consideration should be given as to whether the profits now competed for by industry are high enough—high enough, that is, to foster the competition and attract the caliber of management, the technical skills, and the capital which will result in the acquisition of the best possible defense equipment at the earliest possible date and for the least total cost. There is great danger to our Nation's continuing ability to protect itself if profits are established at too low a level to generate sufficient competition for defense contracts.

Coming now to Bomarc, we appreciate the opportunity to discuss our responsibilities and performance in conceiving and bringing the IM–99 Bomarc program into operational use. This program is in many respects representative of the tremendous efforts which must be mobilized and focused for the protection of our Nation.

The IM–99 weapon system was initiated to fulfill a requirement of the Air Force to defend the continental United States from air attack. In the late 1940's the imminent access by a potential enemy to nuclear weapons and high-speed, high-altitude bombers immediately and completely outmoded the entire air defense technology previously amassed

and presented a problem of staggering proportions. To meet this challenge the development of an entirely new concept was required which involved the scheduled and concurrent invention of a full complement of equipment to perform the task.

The IM–99 weapon system was created in this environment and is now a major and powerful element of the Nation's defense system.

It was no accident that the Boeing Co. was in a position to provide an ingenious and practical answer to this complex problem.

The excellence of Boeing products is known throughout the world to friend and foe alike. The achievements of the B–17 Flying Fortress and the B–29 Super Fortress during World War II are known to every person in this room. The effectiveness of the B–47 and B–52 as the striking power of the Strategic Air Command's deterrent capability is equally well known.

Development and production of each of these systems required the mobilization and integration of a broad spectrum of the Nation's industrial resources and capabilities. They required truly outstanding scientific and engineering contributions and the creation and utilization of new skills and techniques in development and production. Further, those programs were made possible by the company's annual reinvestment for many years of about 70 percent of its profit after taxes, in research, development and facilities.

In the years following World War II, these basic capabilities were complemented by the extensive experience gained by the company working with the Air Force, and others in the development of specific solutions to the air defense problem. The company acquired special competence in the fields of supersonic aerodynamics, guidance, control, electronics, propulsion, and structure pertinent to the new range of problems at hand.

In addition, Boeing's extensive knowledge of bombers and their defensive equipment placed the company in unique position to design a counter system.

The system determined as a result of studies conducted in 1950 by Boeing and the University of Michigan was designated the IM–99 weapon system and in 1951, Boeing was authorized to proceed with its development.

Today, the IM–99 defense system is in being. It is in continuous 24-hour readiness and capable of destroying—within a few minutes of detection and hundreds of miles from our shores—any single or multiple air-breathing enemy vehicles intruding from sea level to extreme altitudes. The supersonic IM–99 is a deadly force to be reckoned with by an aggressor—and a real protector of over 100 million people and the industrial heartland of the United States. This system offers more effective protection than would one composed entirely of the available manned interceptors—and for less than one-half the annual operation and maintenance cost of those interceptors.

With respect to the costs and profits on this program, we offer the following observations. By the end of this year (1962) when the present contracts are essentially complete—

1. The U.S. Air Force will have paid the Boeing Co. $1.636 billion over a 12-year period for its major part in the conception, design, development, production, testing and installation of the IM–99 weapon system.

2. The Boeing Co., prime contractor, will have received $124 million (of the $1.636 billion) as profit before taxes. This is equivalent to 7.6 percent on sales before taxes or 3.6 percent after taxes.

3. With respect to the profit pyramid on this program we offer the following analysis. The total gross profit paid to all tiers of the entire subcontract structure administered by Boeing approximates $63 million. Therefore, the profit of the prime contractor ($124 million) plus that of all subcontractors will have totaled $187 million before taxes or 11.4 percent of the total sales price ($1.636 billion).

4. Recognizing that over one-half of the profit paid returns to Government via income taxes, the net cost to the Government of the sum total of profit for all tiers, prime and subcontract, will be approximately $90 million. Therefore, the cost to the Government of this total profit approximates 5½ percent of the total price paid Boeing.

Through fixed-price incentive-type contracts which conditioned the amount of profits on minimizing costs, the total cost to the Government will have been decreased by approximately $95 million from contract target amounts. This reduction alone is greater than the total after-tax profits paid to the prime contractor and all his tiers of subcontractors.

With respect to the method of procurement utilized for the IM–99 weapon system, we offer these observations:

FIXING OF RESPONSIBILITY

The Boeing Co., as prime contractor for the IM–99 weapon system, was clearly responsible to the USAF and to the people of the United States for bringing this system to operational status in the shortest possible time and for the lowest cost. Failure to perform on call, by any one of tens of thousands of critically interrelated parts, would render the system impotent in preventing an enemy nuclear bomb from finding its mark. This was a heavy responsibility and heavily felt.

During the long and difficult development and testing period, it mattered not whether a cause of failure was in a target seeker, a rocket engine, a radar device, or a special alloy—Boeing was in a sufficiently strong position to see the problem properly and promptly fixed.

Close control of the physical configuration must be maintained during R. & D. production and operational phases of a new weapon system if the thousands of separate groups and enterprises involved are to most effectively concentrate their energies in the direction that will result in the earliest operational date for the entire system. In addition to irreplaceable time, thousands, even millions of dollars can be wasted in well meant but diversionary explorations. The Boeing Co. was in position to and did provide this essential configuration control for almost all elements of the entire program.

The centralization of these responsibilities in Boeing relieved the Air Force System Project Office from a multitude of coordination problems. It left them free to judge the adequacy of the Boeing di-

rected effort in meeting Air Force technical and time requirements within fiscal limitations. It left them free to maintain broad configuration control and to handle the relatively few but highly important interrelations between and among the GFE suppliers, the associate contractor, and the prime contractor.

QUICK REACTION TIME

Under this management arrangement, overall direction and control was initiated by the project office, with implementation and integration effectively accomplished by the prime contractor through authoritative direction of subcontractors. Problems were resolved by direct coordination; decision and approval times were minimized and made in a framework consistent with the integrity of the system.

BALANCING THE CONFLICTING DEMANDS OF PERFORMANCE, SCHEDULES, AND COSTS

The prime contractor was in a position with sufficient purview and responsibility to make sound, responsible judgment on the inevitable compromises between performance, schedules, and costs that arise constantly between elements of every system during its development and early production.

SYSTEM COSTS

The total of all profits earned by Boeing as prime contractor, plus the profits earned by all tiers of Boeing subcontractors will represent, after taxes, 5½ percent of the total Boeing sales price. These profits operated to effectively mobilize a complex of competent and specialized industrial concerns under direct and authoritative management for the conception and production of a vitally needed defense system in the shortest possible time and at the least total cost to the Government.

To recapitulate: It is our belief that the U.S. Air Force and its agencies and the Boeing Co., with the industrial complex it brought to bear on the task, have completed a defense system of truly amazing capability for not only a reasonable initial cost, but also one with a minimum of continuing cost to the U.S. taxpayer. The profits paid clearly operated in the Government's favor to produce the quickest and most defense per dollar. Further, we believe the profit received by Boeing and by the subcontract structure administered by Boeing to have been well earned and, in fact, minimal if it is desired to keep such an industrial complex pressing the state of the art and its capabilities available to our Defense Establishment.

The Boeing Co. earned its profits on the IM–99 program, not on the efforts of others but partly for the risk of its own resources and of its technical and management reputation on the execution of a project which all knew was extremely difficult; partly as a reward for cost reductions effected; partly for its services in mobilizing and directing the great cross section of American industry brought to bear on the project; and partly as a reward for its part in the conception and design and production of the system.

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The profit arrangements were negotiated with the customer in total sums or summary formulas for each contract. Under these arrangements there is no meaningful basis for attributing portions of the total profit to any specific element of cost.

Boeing is proud not only of its own role and performance in making the IM–99 weapon system a reality but also of the many subcontractors who contributed so greatly to the success of an almost impossible undertaking.

I have two additional short items that I would like to state for the record in connection with certain of the points that have been brought out during the hearing.

The CHAIRMAN. Very well.

Mr. THARRINGTON. Certain data has been submitted showing profit ratios to net investment for our total military business. Another exhibit displayed comparative profit to stockholders' equity—net worth—ratios for Boeing's military business, and for Boeing's total business, with similar data for Douglas and for the average of all manufacturing.

The ratios in both exhibits are very similar in nature, with the only differences being due to the inclusion of borrowed capital in the base for the total investment data.

While such ratios may be used as one of many measures in a careful and comprehensive analysis of the adequacy of profits, their limitations should be carefully observed.

Conclusions drawn solely from such ratios cannot be relied upon as accurate indicators of the adequacy of a company's profit.

In applying these ratios to a company similar to Boeing which is heavily committed to the defense system business (with all that means in terms of requirement for research, development, production and testing) these limitations, especially, should be noted:

1. They give no recognition to the accumulated know-how in hundreds of human skills—skills which spell the difference between a low-cost job and a high-cost job; between on schedule or late performance; or between technical excellence and technical mediocrity.

2. They give no recognition to the size, or difficulty of the work performed.

3. They give no recognizition to the profits which should obviously be earned for large amounts of work performed in Government-furnished facilities.

For example, suppose a contractor made $3 million profit on a $100 million job for the Air Force and the job was done entirely in a Government-furnished plant with only $300,000 of private capital involved.

In such a case, the profit on sales would have been only 3 percent but the return on investment would have been 1,000 percent. Such factors are considered by procurement representatives in establishing contractual profit frameworks and it is recognized that in cases where Government-owned facilities are used, returns on investment will be higher.

4. They give no recognition to what may be called the grand risks of the business, as differentiated from the normal risks of doing business.

For example, we submit that the reason such companies are supplied major portions of their facilities by the Government is simply that the risk of continuity of the business through the years is so great, and the potential reward so small, that private capital can find an endless number of much more attractive opportunities.

As related to sales, profit rates for Boeing and the aerospace industries are lower than those normally earned by the manufacturing industry generally. With respect to Bomarc, the facts of the matter have been stated:

First, a tremendously difficult and vital defense problem was solved at minimum cost to the Government; and

Second, the Boeing Co. earned, after taxes, 3.6 percent profit on the Bomarc sales price for its primary role in this accomplishment.

This compares with the 7.8-percent return on sales earned by the companies included in the Dow-Jones industrial averages.

Several questions have been raised by the committee with respect to the use of incentive contracts in general and on the Bomarc program in particular.

We believe that the Bomarc program demonstrates with great authority that incentive-type contracts can result in dramatic savings to the Government and, at the same time, reasonably reward the contractor for his outstanding performance. Incentive contracts were designed to accomplish exactly these objectives:

The summary results have already been provided in the prepared statement. Since there seems to be some difference of opinion on this matter, however, I would like to offer some observations on the practical working of this tool, drawing not on theory, but on 15 years of practical experience.

Our business is naturally oriented to technical excellence and on-schedule performance. In addition, we try to make the Air Force objective of more defense per dollar come true.

We undertake very large and comprehensive projects requiring tens of thousands of employees and we do business with nearly 20,000 suppliers.

In the course of any one of these large projects, literally millions of decisions must be made on the way to design this, the best form in which to procure material for that part, the best way to fabricate a part, the best assembly sequence, the amount and type of testing that will insure a reliable part or assembly or the end product itself.

Under a CPFF contract, with the fee established and almost all costs borne by the customer, it is very easy to make these decisions in the safe, low risk, but sometimes more costly way.

It is very easy to add small amounts of additional performance or schedule insurance in each of these decisions. The dollar importance of each decision by itself does not appear an overly serious matter. But multiply a million decisions by a $10 premium for making them the safe, no-risk way, and you have a $10 million cost—some part of which would not have been necessary, had the economics of the situation been given a little more attention.

This, then, points to the great secret of the incentive-type contract. Under these contracts, we have been able to bring home to thousands of our employees in decisionmaking positions, that of each dollar they

spend 15 cents, in an 85–15 sharing contract, belongs to the company and, thus, is likely to enhance their own personal welfare.

If, by the exercise of better balanced judgment on a design problem, a planning problem, or a procurement decision, the proper function, quality, and reliability can be obtained—but for less money—the company will have more profit.

More profit means a stronger company, one better able to fund its own research or to buy the research equipment, the new laboratory, or factory equipment—in short, a successful company.

This sounds almost too simple, but we are convinced that it lies at the heart of many of the dramatic cost improvements we have seen.

As to the applicability of the incentive-type contracts to any particular procurement, we would only generalize as we would with respect to variations of the prime-sub and associate contractor alternatives.

The answer to both lies in sound judgment. The conditions for each procurement vary in a multitude of ways.

It is our belief that the procurement service is closest to the picture, possesses more facts than can be covered in a thousand new regulations, and has the required judgment to make the best decision.

They should be left at least as free as under present regulations to select contract type and the most effective, lowest cost, Government-industry management structure.

Now I have three or four charts, the first of which speaks to this matter of incentive, if I may be permitted to do so.

The CHAIRMAN. You may introduce the charts and then we will want to ask you a few questions.

Let me ask you a question first at this point before we go to the charts, on one aspect of what you just said.

You said something about in considering profits, in calculating profits, no recognition was given to accumulated know-how.

Just what do you mean by that?

Mr. THARRINGTON. I did not mean to say——

The CHAIRMAN. I maybe misunderstood you.

Mr. THARRINGTON. Let me try to explain what I meant there.

I was not referring to the calculation of profits, but I was referring to the matter of dividing them by net worth or by investment and arriving at a ratio that says we made 25 percent on investment or 30 percent on investment.

I say that that ratio cannot give the right kind—well, the kind of decision that is due to the know-how of the company, in addition to the amount of dollars.

The CHAIRMAN. In other words, the know-how is an asset as well as the machinery of the plant?

Mr. THARRINGTON. That is right.

The CHAIRMAN. And that should be taken into account, also?

Mr. THARRINGTON. That is one of the additional factors.

The CHAIRMAN. That is what I really thought you meant.

Let me ask you now, in developing this system, your own company did a lot of the research: did it?

Mr. THARRINGTON. Yes, a very great amount of the research.

The CHAIRMAN. A very great amount of it?

Mr. THARRINGTON. Yes, sir.

The CHAIRMAN. Were you paid for that?

Mr. THARRINGTON. Yes, sir. The costs of all of the work that we performed we were paid for and we were paid a profit on those costs.

The CHAIRMAN. In other words, for the research you did, you were paid the cost of it, and in addition, you were paid the profit thereon?

Mr. THARRINGTON. Yes, sir.

The CHAIRMAN. I guess, in doing this research work, that further improved your know-how assets, did it not?

Mr. THARRINGTON. Yes, it did, sir.

The CHAIRMAN. What I mean is that the Government paid you to do research and from that you learned. That also enhances the know-how assets of your company at the conclusion of the contract?

Mr. THARRINGTON. Yes, it does.

The CHAIRMAN. And is that not a factor that might well also be taken into account when we analyze profits, as well as analyzing the investment?

Mr. THARRINGTON. Yes, I think it can certainly be given consideration, but at the same time in doing that research, we were delivering to the Government a greatly needed system.

So we were also furnishing the Government something as well as, in doing that work, further developing our own capabilities.

The CHAIRMAN. I am not questioning what you said. I just thought it ought to apply on the other side of the coin as well. You come out after one of these contracts, after the production, after doing the research and production, your company comes out far better equipped in know-how than in the amount of know-how it had at the beginning of the research and development contract.

Mr. THARRINGTON. Yes. Everything we do improves our capabilities.

The CHAIRMAN. So that enhances the assets of the company in the know-how?

Mr. THARRINGTON. Yes.

The CHAIRMAN. And that should be considered along on the profit said, as well as your having had know-how to begin with to be considered on the asset side.

I think it is fair both ways.

Mr. THARRINGTON. Yes. I do not know how to give weight to that.

The CHAIRMAN. When you said you got 3.5 percent after taxes, that did not take into account the advantages you had in increased know-how?

Mr. THARRINGTON. No. That is a fact, that we did get 3.5 percent after taxes, as compared with what the Dow-Jones industrial gave of 7.8 percent.

The CHAIRMAN. Not after taxes.

Mr. THARRINGTON. Yes, after taxes.

The CHAIRMAN. They do not pay that kind of dividend on the stock I may have.

Mr. THARRINGTON. Yes, those are the actual figures. The Dow-Jones industrials on the average for this 10-year period made 7.8 percent after taxes. It must be recognized that the Dow-Jones industrial companies in pursuing their own work, for which they made 7.8 percent, also increased their know-how and capability with every job that they performed for their customers.

Senator JACKSON. Could you supply that breakdown for the record? Not now, but would you supply it?

Mr. THARRINGTON. Yes, we certainly can.

Senator JACKSON. Just on sales.

Mr. THARRINGTON. Yes.

(The information requested was subsequently supplied to the subcommittee, and is as follows:)

Net earnings as a percent of sales (after taxes)—Dow-Jones industrials and the Bomarc program, 1951–60

Year	Dow-Jones industrials	Bomarc program	Year	Dow-Jones industrials	Bomarc program
1960	8.0	4.9	1954	7.9	2.8
1959	8.0	3.5	1953	7.0	1.8
1958	7.6	3.6	1952	7.7	1.1
1957	8.3	2.3	1951	7.2	2.0
1956	8.3	2.5			
1955	8.9	3.0	Weight average	7.8	3.6

The CHAIRMAN. You are presenting a chart for the record now, are you?

Mr. THARRINGTON. Yes, I am.

The CHAIRMAN. Identify it. It is "Incentive Profit and Cost Savings"; is that it?

Mr. THARRINGTON. Yes.

The CHAIRMAN. It may be printed in the record as committee exhibit 22.

(Document referred to was marked "Exhibit No. 22" for reference and follows below:)

EXHIBIT No. 22

INCENTIVE PROFIT AND COST SAVINGS

IM-99 Program

(Dollars in Thousands)

CONTRACTS	FINAL DELIVERED PRICE	PRICE REDUCT. & TAX INCOME TO GOV'T.	INCENTIVE PROFITS
36319	$ 94,820	$ 34,208	$ 2,532
38098	127,843	33,210	2,988
38101	212,438	20,989	3,678
*40033	158,565	2,209	
TOTALS	$593,666	$ 90,616	$ 9,198
GOV'T TAX INCOME AFTER TAXES		4,783	4,783
		$ 95,399	$ 4,415

INCENTIVE PROFITS AS % OF PRICE REDUCTION: $\frac{\$\ 4,415}{95,399} = 4.6\%$

AFTER-TAX INCENTIVE PROFITS AS% OF FINAL DELIVERED PRICE $\frac{\$\ 4,415}{593,666} = .74\%$

* CONTRACT NOT COMPLETE

The CHAIRMAN. I believe the committee has another chart to get into the record at this point.

Mr. ADLERMAN. This chart was put into the record as chart No. 3. But column 3 shows the business after taxes of the Boeing Co. according to Moody's financial reports.

It reflects from 1960 down to 1951 averages of their business after taxes, all business, both Government and private, of 19.05 percent.

The average for all manufacturing during that same period came to 10.73 percent, according to the Federal Trade Commission and Securities and Exchange Commission reports.

Senator JACKSON. Why do you not put the two charts side by side?

The CHAIRMAN. Has this one been placed in the record yet, chart No. 3?

Mr. ADLERMAN. Yes, sir.

The CHAIRMAN. It is in the record as what?

Mr. ADLERMAN. As chart No. 3.

The CHAIRMAN. There is no use to print it into the record again.

Therefore, Mr. Tharrington, as you testify regarding the chart you are presenting, we will have before you also chart No. 3, which has already been put into the record, so that if any comparisons need to be made, they can be.

Senator JACKSON. Mr. Chairman, I have asked Mr. Tharrington to supply the breakdown on the Dow-Jones averages based on sales.

If that could be put into the record alongside of the chart, based on the other approach, we would have them both.

The CHAIRMAN. That may be placed in the record when available.

Mr. THARRINGTON. I would like to speak to chart No. 3 for a moment and identify, again, that these are the returns on net worth or stockholders' equity that I was referring to.

It is very difficult, with this one ratio, to draw conclusions for the reasons I mentioned in my statement a moment ago.

The CHAIRMAN. Now you will give the other side of it from your viewpoint.

Mr. THARRINGTON. Yes, sir.

I would like to point out one thing with respect to these figures. This percentage is a percentage that has been developed from a simple averaging of the annual percentages rather than a weighted average return over the 100-year period, dividing the total returns by the total average net worth for the period.

If done on a weighted basis, which I think is a more appropriate way of doing it, this figure of 35.68 would be 28.8 percent, and 74.38 would be 64.4 percent.

The CHAIRMAN. 35.68 percent would be what?

Mr. THARRINGTON. 28.8.

The CHAIRMAN. And the average of 74.38 percent on chart No. 3 would be what?

Mr. THARRINGTON. 64.6.

This chart—exhibit 22—would have been helpful this morning when we were trying to figure out the incentive profit and cost savings that were incurred on incentive-type contracts.

The first column of figures lists the final delivered price of the four fixed-price incentive-type Bomarc contracts totaling $593.666 million.

Those are the prices that developed on the basis of the actual final resulting costs, plus the actual final resulting profits after adding the incentive profit to it.

The CHAIRMAN. That is what it finally cost the Government?

Mr. THARRINGTON. For the four fixed-price incentive-type contracts.

The next column, price reduction and tax income to Government. This represents the portion of cost underruns that served to reduce the prices from their original target prices.

The next column, "Incentive profits," indicates the portion of those underruns that served to increase our profits, and which are called the incentive profits.

Adding them up, then, the price reductions to the Air Force totaled $90.6 million, and the incentive profits to Boeing totaled $9.198 million.

A point was made this morning which I think is one that needs careful consideration. It relates to the fact that in Government procurement a dollar of cost finally results in a dollar of Government expenditure.

But a dollar of profit in Government procurement represents only 48 cents with respect to a Government expenditure.

Therefore, in addition to this result, 52 percent of the incentive profits were returned to the Government in the form of tax income, so that the final result to the Government of the price reductions and the tax income from the incentive profits represented $95.399 million, and the final incentive profits after taxes to the company was $4.415.

This, then, represents 4.6 percent of the total price reductions to the Government, and represents three-quarters of 1 percent of the final delivered prices to the Government.

In addition to the incentive profits, there was the differential between the 6- and the 8-percent profits that were paid between CPFF and fixed-price-incentive contracts.

That differential amounted to $11.5 million, which, after taxes of $5.9 million, left the company with $5.4 million for that 2-percent differential.

Adding these together, then, it indicates that the after-tax profit improvement to the company, because of the use of incentive-type contracts, was $9.8 million.

Dividing it by the final delivered price, that is about 1⅔ percent of the $593 million figure.

The point I am trying to illustrate by this chart is that if the actual cost, the actual final resulting cost under a CPFF contract were as much as $10 million higher, then they actually resulted working under the incentive-profit motives that were applied to these contracts, at that point it would have been approximately a break-even proposition for the Government.

If the incentive-profit motive applied to these contracts resulted in underruns greater than $10 million, then they are obviously—well, it turned out to be a good deal for the Government.

As had been mentioned repeatedly through this testimony, it is hard to prove or disprove these things. I can only say that from my experience, and I have been associated with these matters now for 15 years, I think that the actual cost, had we continued to oper-

ate under CPFF contracts on this program, would have been far greater than $10 million more than these figures shown on this chart.

That is a personal opinion.

The CHAIRMAN. Just why is it so much more? The incentive factor does not reach down to your subcontractors. They have no such incentive. Yet, they are the ones and that is the source where the great reductions were made, according to the testimony here.

Mr. THARRINGTON. Actually, there were large reductions made in all elements of cost.

The CHAIRMAN. Well, all down the line, but certainly they did not have the incentive.

Mr. THARRINGTON. Well, except the engineering element, which overran.

The CHAIRMAN. Let me get something else straight. We found in our investigation that when you have a cost-plus contract and you let out subcontracts, and generally we have found that the prime contractor charges just about as much profit as does the third-tier subcontractor who actually produces the profit, and the middle contractor usually gets about the same and the prime contractor about the same—what I cannot understand is you say, "If you have an incentive contract, although these subcontractors have no incentive, it does not go down to them, you can save a lot of money."

Why is that?

Mr. THARRINGTON. There were incentives that were operated in connection with the subcontractors. One of the important incentives was the type of contract that we did give to the subcontractors which was a ceiling-price type contract.

In a program such as this program was, in order to assure himself, that is, the subcontractor, that he would not exceed the ceiling price that was applied to his subcontract, he must work very hard and aggressively throughout that program to minimize his costs or else he has no assurance that something would not develop that will throw him, sometime during the course of that program, over the ceiling price that was established.

This is one important incentive.

The CHAIRMAN. Did he have a fixed ceiling price?

Mr. THARRINGTON. Yes; he did. We fixed his ceiling price. We negotiated in these cases a target price with him, and generally had a 110-percent ceiling of that established as a ceiling price.

The CHAIRMAN. 110 percent?

Mr. THARRINGTON. Yes, sir.

The CHAIRMAN. In other words, he could go over 10 percent? Or could he go over at all? Did you take the 10 percent?

Mr. THARRINGTON. What?

The CHAIRMAN. I am trying to figure out who got the 10 percent over for contingencies. He submitted you a price, say, of $45,000 a unit. When you submitted it to the Government, you added on 10 or 15 percent for contingencies in order to fix the prime target, did you not?

Mr. THARRINGTON. As was testified in the earlier testimony, we used the target prices, not the ceiling prices, that were established with the subcontractor, and then we added an allowance that we thought was appropriate and that was negotiated and worked with and agreed

to by the Air Force as an allowance for additional changes that we thought might have to be developed to produce the subcontractor portions of the program to meet the weapon system specifications that we were responsible for meeting.

The CHAIRMAN. That is for contingencies you call it, whether changes or whether miscalculated or not?

Mr. THARRINGTON. That is right.

The CHAIRMAN. Did you pass that contingency down to your subcontractors?

Mr. THARRINGTON. I do not believe I clearly understand the question.

The CHAIRMAN. When your subcontractor submitted to you for a given product a proposal upon which you predicated your submission of a target price, he gave you a fixed amount. To use an illustration, I remember one particularly of some 40-odd-thousand dollars, we will say $45,000.

You added to that when you submitted it to make up your prime target price, you added a percentage onto that of either 10 or 15 percent, I do not recall which, as a contingency.

Mr. THARRINGTON. That is correct.

The CHAIRMAN. You got that contingency in your contract on the target price?

Mr. THARRINGTON. That is correct.

The CHAIRMAN. Did you pass that contingency on down to the subcontractor who submitted you the price on the article?

Mr. THARRINGTON. I think the answer to that question is "Not immediately." That was an allowance for future changes that we thought——

The CHAIRMAN. He might have to make a change just as much as you?

Mr. THARRINGTON. That is right, a change to his parts, that we would have to increase his purchase order price for.

The CHAIRMAN. Did you allow him the same increase that you were going to get? You said he had a fixed price?

Mr. THARRINGTON. He bid on a fixed specification, or gave us a proposal on a fixed specification, as of the time that we worked out that arrangement.

The CHAIRMAN. If there was a change that increased the price that you had to pay for it, you were taken care of by a contingency?

Mr. THARRINGTON. By a contingent; that is correct.

The CHAIRMAN. You were, as the prime contractor?

Mr. THARRINGTON. That is correct.

The CHAIRMAN. But was he taken care of by a similar proposal or obligation from you as the prime contractor?

Senator JACKSON. In other words, what did it average out? I think obviously it would vary in cases, I assume.

How much did you have to increase the subcontract prices over the period of the contract?

Mr. THARRINGTON. I would like to ask Mr. Neffner to answer that, if I may.

Mr. NEFFNER. If I may, I would like to answer that.

The CHAIRMAN. The only point is that in this kind of a contract, in order for the contractor to play safe, and I am not questioning the

necessity for it, he gets a bid from a subcontractor that is going to produce and provide him with one of the instruments essential in this system, and in order to try to fix a target price to the Government he takes that subcontractor's bid that comes to him.

But to make certain, in view of there may be changes and in view of some other contingencies that may arise, instead of submitting it for $45,000 a unit he submits it for $50,000 a unit.

The point I am making is if it turns out that the subcontractor cannot produce it for the 45, but his cost runs over to the $50,000, does he get the $50,000, or did the other $5,000 stop with the prime contractor?

Mr. NEFFNER. I think in that context he did receive the 10-percent contingency factor. I would like to explain it in this way, if I may, Senator.

The CHAIRMAN. You ought to know. You had some kind of a contract. Did his contract provide for a 10-percent contingency, or 15 percent?

Mr. NEFFNER. Since in the majority of our subcontracts we establish the target price of $45,000, using this as an illustration, at the same time we told them that the maximum price that we would pay would be 10 percent in excess of that, or, roughly, $50,000.

So that if his actual performance was $50,000, he would suffer, then, a loss.

Consequently, to that extent, if you will, a contingency factor or a PR factor was permitted or accorded in our subcontractor's prices.

The CHAIRMAN. Let me ask you one other question.

You say you would take care of him if he had an overrun. Did he profit? Did he benefit from the underrun? Was he rewarded?

Mr. NEFFNER. On an incentive type of participation?

The CHAIRMAN. Yes.

Mr. NEFFNER. In terms of dollars, no.

The CHAIRMAN. What?

Mr. NEFFNER. In terms of dollars, no. However, as Mr. Tharrington has testified, there are very definite incentives in any type of a fixed-price contract, which is not present in the normal CPFF type of contract.

The CHAIRMAN. Here the Government is making an incentive contract. For your company to profit and get a profit on down the line, the efficiency has to come from the subcontractors as well as from your own organization?

Mr. NEFFNER. Very definitely.

The CHAIRMAN. But the subcontractor in these instances gets no reward in dollars as does the prime contractor?

Mr. NEFFNER. I think that he probably does receive a reward in various fashions, sir. One is that at the time of reset under this type of contract, a rate of profit, an effective rate of profit, may be larger as a reward for establishing that.

Now, once having established the firm fixed price, then any subsequent savings that he can generate inure to his benefit entirely.

The CHAIRMAN. But you are profiting as the prime contractor. Yours is not measured down on the savings. Yours is fixed to the prime target price.

Mr. NEFFNER. Yes, sir.

The CHAIRMAN. I am not questioning that an incentive contract cannot sometimes be advantageous. But in this instance, in the way this thing is arranged, obviously, from my standpoint the reward is not calculated nor obligated so as to go all the way down.

Mr. NEFFNER. If I may comment, Senator, I think that the contract, being between the prime contractor and the Government, is one of the responsibilities for which perhaps you pay us a profit, and you look to us to negotiate with our subcontractors and with our employees.

In the performance of the contract, it is to the best of our ability, and to the overall interest of the Government, our customer.

The CHAIRMAN. I think that in these contracts you should get your share of the reward, that is true. You may take the position, and apparently you do, as a prime contractor that flow from undercut or undercosts and so forth ought to go to you directly.

Mr. NEFFNER. I would like to add this one thing. I think this is true, and in the recent past or in the past few months, anyhow, we are entering into incentive type contracts with our subcontractors.

We expect to receive benefits in this area.

The CHAIRMAN. I think that is the minimum.

Senator JACKSON. Actually, if I interpret this correctly, it was the prime contractor, pursuing managerial responsibilities, rather than the subcontractor who had the main incentive to keep the subcontractor from expending the 10-percent contingency allowance; was it not?

Mr. NEFFNER. Yes, sir.

Senator JACKSON. So that the incentive actually was not with the sub, but rather was vested in the prime contractor.

I am just trying to reason this out based on the nature of the agreement here. Probably it is better to provide an incentive for both the subcontractor and the prime. But the way it worked out it forced the incentive responsibility to be vested in the Boeing Co., or the prime contractor.

This meant that it was in your interest to supervise carefully the costs of the sub.

Is this a correct assumption on my part?

Mr. NEFFNER. We consider our administration of our subcontract structure, Senator, as one of the more important features of any of our contracts.

Senator JACKSON. Did you have the kind of supervision of the subs on a cost basis that was reasonably stringent?

What sort of supervision was there?

Mr. THARRINGTON. I think one of the answers to that is the testimony that was given by some of the subcontractors with respect to the intensive efforts of both Boeing and the subcontractor to redesign and to design the components that were being manufactured by the subcontractor to enable them to be produced at the minimum possible cost.

There were examples given by the subcontractors.

Senator JACKSON. Yes, I can understand, but what the chairman was asking about seemed to me to be the monetary situation. In this situation, it seemed that the monetary incentive was vested primarily in the prime contractor, to carefully supervise the costs of the sub

when there is a reward flowing to the prime contractor to reduce the costs of the sub.

Is this not the point? Of course, it is even better to have the monetary incentive vested in two places.

Mr. NEFFNER. Through periodic visitations to him if not all of our major subcontractors, through the performance of the contracts, this type of surveillance, this type of monitoring, this type of recognition, was accomplished.

We had this through the media of engineering-manufacturing assistance and material supervision.

The CHAIRMAN. Let me ask you one further question. If you had just a straight cost-plus-fixed-fee contract, as a citizen and as a contractor with the Government, do you not feel quite an obligation to produce and to deliver just as cheaply as you can?

Mr. THARRINGTON. Yes, Senator, we certainly do. I think the reputation of the Boeing Co. indicates the great feeling that we have in this respect over the years.

The CHAIRMAN. I think that is probably true. May I ask you, is that why you tried to get that kind of a contract in the beginning?

Mr. THARRINGTON. On the CPFF contract?

The CHAIRMAN. Yes.

Mr. THARRINGTON. First, I would like to say one more thing, and then I would like for Mr. Neffner, who negotiated for the company that contract, to answer why we felt we needed the CPFF contract.

The CHAIRMAN. Then you did try, as has been said here, to get the cost-plus-fixed-fee contract instead of the incentive contract?

Mr. THARRINGTON. Yes, sir.

Mr. Neffner, why do you not answer why we wanted the CPFF contract?

Mr. NEFFNER. While Mr. Tharrington has already indicated that we do attempt, we try our best, to administer a cost-reimbursement-type contract just as efficiently, just as economically as other types of contracts——

The CHAIRMAN. Do you put the same effort in it, the same skill?

Mr. NEFFNER. Yes. [Continuing:] And Mr. Tharrington will augment or supplement my remarks in this area.

The CHAIRMAN. I am only trying to clarify as we go along. You put in the same effort, the same skills, the same ingenuity in a cost plus fixed fee as you do in an incentive contract?

Mr. NEFFNER. I will say "Yes."

The CHAIRMAN. Very well.

Mr. NEFFNER. At the time or times that the particular contracts were negotiated, it was our opinion that the estimates developed by both the Air Corps and by Boeing were reasonable, certainly reasonable in the light of the knowledge that we had at that time, and we believed at that time supported with a great deal of experience and cost information, not only from our own efforts but from our subcontractors. Notwithstanding that, it was recognized that there was very real risk as to whether or not we accomplish the overall total effort within the cost structure that would be acceptable to the Air Force. Accordingly, we desired the protection accorded by CPFF

contracts. That is, the assurance that we would be reimbursed in large part the costs that we incurred in the performance of the contract, and earn some fee. In addition, and this was touched upon by the Air Force this morning, the division charged with the responsibility of performing this effort had generally performed under the cost-plus-type contracts. Accordingly, the rigid controls that are exercised, we believe, under fixed-type contracts, and the excellent engineering and manufacturing, was not completely available at as early a point as would otherwise be desirable.

The CHAIRMAN. In fact, you thought it was too early to make an incentive-type contract on the basis of the then known facts?

Mr. NEFFNER. I wouldn't put it that way, Senator, if I may. I would put it that we considered the risk of entering into that type of contract at that particular time as perhaps greater than we were willing to assume.

The CHAIRMAN. Did you not have a floor, a 6-percent guarantee no matter what the cost and how much over it went?

Mr. NEFFNER. Under the fixed-price-incentive contract?

The CHAIRMAN. Yes, sir.

Mr. NEFFNER. Yes.

The CHAIRMAN. You couldn't get very bad, could you?

Mr. NEFFNER. I say that was one of the things that was considered and led us to accept the incentive-type contract.

The CHAIRMAN. To get you to take an incentive-type contract, you have to have or you did procure a guarantee, a floor, that your profit would be 6 percent?

Mr. NEFFNER. In these particular incentive contracts we did. In other incentive contracts, we have no floor. And it must be recognized that at the time of the subsequent reset, that floor is taken away. We no longer have it.

The CHAIRMAN. I would think this, No. 1, that when you go into one a bit prematurely and nobody can tell how it is going to come out, the natural thing would be for the supplier, the primary contractor and subcontractor, knowing that, to be sure they got their price up high enough, to try to make sure of that. I don't mean out beyond all reason, but I mean you would be thinking in terms of "I better get this up. It might cost more than I think." That is natural.

The second thing is from your standpoint certainly you felt and secured some guarantee that you wouldn't go in and lose money and, therefore, you got a floor of 6 percent.

Mr. NEFFNER. I want to emphasize, if I may, that that floor continued only for a portion of the total accomplishment of the particular contract.

The CHAIRMAN. What portion?

Mr. NEFFNER. The floor.

The CHAIRMAN. What portion? You said it continued for only a portion.

Mr. NEFFNER. Calendarwise, it continued until the point when the final firm target cost was established.

The CHAIRMAN. Then did you have a guarantee of the 6 percent?

Mr. NEFFNER. No, sir.

The CHAIRMAN. What purpose did the guarantee of 6 percent serve?

Mr. NEFFNER. It carried through this initial period of time, which gained us a little bit more, perhaps even a great deal more, of experience in the performance of the particular work so that both the Air Force and ourselves would not receive windfalls.

Senator JACKSON. Mr. Neffner, you folks wanted a cost-plus-fixed-fee contract. The Air Force wanted an incentive contract. Is that right?

Mr. NEFFNER. Yes, sir.

Senator JACKSON. So what happened was that you bargained or you negotiated, did you not, for a longer period of time?

Mr. NEFFNER. Over several weeks, yes.

Senator JACKSON. You were pushing a cost-plus-fixed-fee proposal. The Air Force was pushing an incentive proposal. As it turned out, you had some of both?

Mr. NEFFNER. That is correct.

Senator JACKSON. That is the answer. In other words, they have——

The CHAIRMAN. I don't blame you for getting the 6-percent clause.

Senator JACKSON. Your incentive contract was not the full incentive contract. It was compromise and blended in with a portion of the cost plus fixed fee, which was to be found in the floor of 6 percent that you were guaranteed. Isn't that a fair résumé of what probably went on?

Mr. NEFFNER. This is true, Senator.

Senator JACKSON. I mean it was a compromise then between the Air Force and yourself of two different approaches.

Mr. NEFFNER. It should also be pointed out in connection with these particular contracts, and using 36319, your chart No. 5, that at the time we negotiated the initial target cost, we not only had a floor, but we also had a profit ceiling.

The CHAIRMAN. What was that profit ceiling?

Mr. NEFFNER. We could not earn or accrue as profit in excess of 10 percent of the initial target cost.

The CHAIRMAN. Did that go out, too?

Mr. NEFFNER. I believe, sir, that was increased very slightly, I believe from 10 to 11 percent.

The CHAIRMAN. When you fixed the firm price, the floor went out and the ceiling went up?

Mr. NEFFNER. Yes, sir. May I be sure that this is completely understood. We therefore gave up a floor, perhaps of 6 percent, but in turn we received very little additional consideration in the way of a saving.

Senator JACKSON. How much did the roof go out?

Mr. NEFFNER. One percent.

Senator JACKSON. And you lost 6 percent of the floor?

Mr. NEFFNER. That is right. That is not a good deal.

The CHAIRMAN. Let's see if you did. By that time you knew what it was going to cost, did you not? That is why you could fix a final price. Therefore, you knew what your profit would be?

Mr. NEFFNER. I don't believe, Senator, that any time in negotiating a contract we know what it is going to cost. I think that inherent in every negotiation of a contract, where we have estimates to complete, that then it becomes a matter of estimating. So, consequently we obviously don't know what the actual results are going to be.

The CHAIRMAN. By that time, some of your subcontractors had already been reducing their price to you, hadn't they?

Mr. NEFFNER. But even so, not all of those subcontractors had entered into the firm, fixed prices, even as of that time. So, accordingly, this represented our best judgment, yes, and I think it was pretty good.

The CHAIRMAN. We had something awhile ago about a financial comparison, the Bomarc program, with Dow-Jones industrial. Did you make mention of that?

Mr. THARRINGTON. Yes, I did, but I haven't talked about that particular chart yet.

The CHAIRMAN. I wanted to get it into the record, that is all.

This chart of such comparisons may be printed in the record along with exhibit No. 22. The comparison of the Bomarc program with Dow-Jones industrials—well, we will make that exhibit No. 23.

(The document referred to was marked "Exhibit No. 23" and follows below:)

EXHIBIT No. 23

Financial comparisons—Bomarc program with Dow-Jones industrials

[In percent]

	Conventional profit ratios—				Profit to effort ratios [1]	
	To sales		To costs			
	Before taxes	After taxes	Before taxes	After taxes	Before taxes	After taxes
Bomarc program	7.6	3.6	8.2	3.9	19.9	9.6
Dow-Jones industrials (1951–60 averages)	16.2	7.8	19.4	9.3	[2] 50.2	[2] 24.1

[1] Total profits divided by the portion of costs comprised of salaries, wages, and depreciation.
[2] Data available on 16 of the 30 Dow-Jones industrials.

Mr. THARRINGTON. I would like to add a bit to your question of: Do we exert as much effort in attempting to control costs on CPFF contracts as we do on fixed-price incentive? We have answered "Yes, our management exerts the same degree of effort on both types of contracts." But there is one other thing that should be understood. A fixed-price-incentive-type contract actually helps management, actually helps management to get throughout its organization a greater cost consciousness with respect to a proper balance in all of the decisions that have to be made as between the matter of schedule and performance on which there are always overwhelming pressures, and the matter of cost. This is an assist to management.

General Davis mentioned this morning the tendency of engineers, both in the contractor's organization and in the customer's organization, to get something that is absolutely perfect. A fixed-price-incen-

tive contract assists management in striking a proper balance in those areas of cost.

The CHAIRMAN. Mr. Tharrington, I thought there must be some factor there. You would not admit, and I don't think anyone would want to admit, that you wouldn't work just as faithfully on a cost-plus contract and try to do your job as well as you would if you were given the incentive contract. Except there are certain factors that do operate in an incentive contract, just a natural force, so to speak, that might cause you to get it down a little lower.

Mr. THARRINGTON. And it helps us, in working with all of our employees, in getting this message across.

The CHAIRMAN. It has a psychological factor, too, has it not?

Mr. THARRINGTON. That is exactly right.

The CHAIRMAN. Very well.

Mr. THARRINGTON. This chart, "Financial Comparisons," exhibit 23, has been prepared. It indicates the percentage of profit before taxes and after taxes to sales, on the Bomarc program as related to the Dow-Jones industrials, and then the same ratios with respect to costs.

In the early part of these hearings, there were discussions relating profits to contractors' in-house effort. It is a little difficult to determine comparative information as between companies with respect to this type of data. But we have done it by defining in-house effort in its purest sense. That is defining it as salaries, wages, and depreciation. This excludes all purchases of all types, subcontract, raw materials, purchased equipment, supplies of all kinds, paper, pencils, et cetera.

We have been able to obtain that information on 16 of the 30 Dow-Jones industrials, as well as making a comparison on our own in-house effort.

On the Bomarc program, when we relate the profits that we made on Bomarc to the salaries, wages, and depreciation that we had on Bomarc, it represents 19.9 percent before taxes or 9.6 percent after taxes.

With respect to the 16 Dow-Jones industrials on which we can obtain the information, the same figures are 50.2 percent before taxes and 24.1 percent after taxes.

This is something that I do not believe is really generally understood, that all industry, not just the aerospace industry, but all industry, all companies, a very, very large proportion of their total sales, actually, buy from lower tier people, and this is an indication of how we relate in that particular respect.

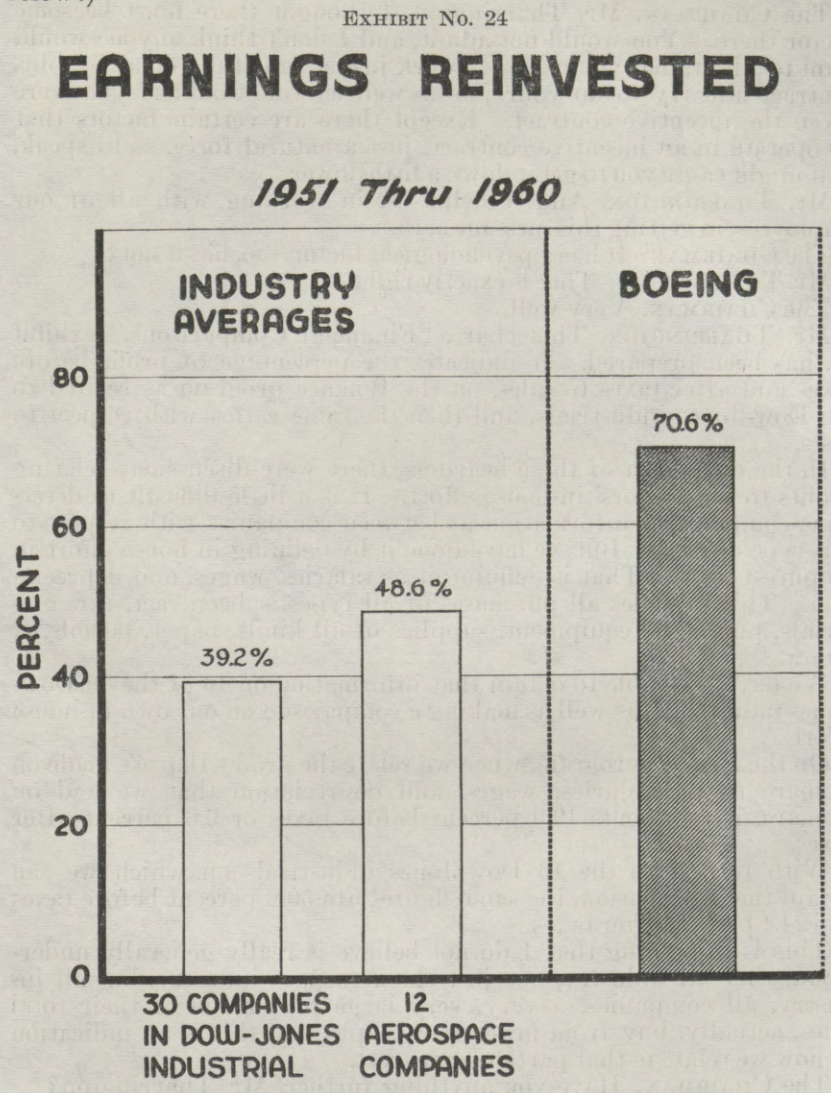
The CHAIRMAN. Have you anything further, Mr. Tharrington?

Mr. THARRINGTON. Yes, one more chart I would like to present.

The CHAIRMAN. This chart the witness presents may be made exhibit No. 24.

(Chart referred to was marked "Exhibit No. 24" and follows below:)

EXHIBIT No. 24



Mr. THARRINGTON. This chart, "Earnings Reinvested," exhibit 24, shows the average earnings reinvested in the business for R. & D. research, laboratories, et cetera, and for the increased working capital that is required. The 30 companies in the Dow-Jones industrial average, on the average, reinvest 39 percent of their earnings. The 12 other aerospace companies reinvest on the average 48.6 percent of their earnings, and Boeing over the 10-year period 1951 through 1960 reinvested on the average 70.6 percent of its earnings back into its facilities.

The CHAIRMAN. What does that prove? How does that have any impact on the question?

Mr. THARRINGTON. We think it is an indication of how we have used our profits to build a greater capability to produce the needed weapon systems for our country.

The CHAIRMAN. In other words, in your wisdom the company policy is simply to try to plow it back into the business to build a stronger and bigger plant and, thus, the Government profits from that because it has a better source, an improved source, for future needs?

Mr. THARRINGTON. That is right.

The CHAIRMAN. I guess any investment-backing plan would have a tendency to do that, particularly where some Government procurement is had.

I think if I were going to make an investment in the stock of a company, I would want to invest in one that had the wisdom and business judgment in most instances to plow it back into the business, keep the business growing, expanding, and keeping its capability marching with progress, and so forth. I think you should be commended for that.

Are there any questions, Mr. Counsel?

Mr. TIERNEY. In your statement, Mr. Tharrington, on page 5, you refer to the fact that through fixed-price-incentive-type contracts the total cost to the Government will have been decreased by $95 million. I would assume you are referring there to the total underruns on these three contracts we have been discussing here; is that correct?

Mr. THARRINGTON. On the four contracts that I had listed on the first chart that I showed, exhibit 22, the $90.6 million in the second column, and the $4.7 million income taxes, adding up to the $95 million reduction of cost to the Government.

Mr. TIERNEY. Isn't the implication of that remark, that there is, in effect, a savings to the Government of $95 million on the contracts?

Mr. THARRINGTON. Savings from what had been agreed with Government initially was a fair and reasonable estimate of the work which needed to be performed.

Mr. TIERNEY. Was it also a fair and reasonable estimate as of the time these contracts were negotiated?

Mr. THARRINGTON. Yes, sir.

Mr. TIERNEY. Did the Boeing Co. prepare for the Air Force a pricing review on these incentive-type contracts, principally 36319, 38098, and 38101, where there were the principal underruns?

Mr. NEFFNER. We submitted to the Air Force in great detail the bases upon which the estimates were prepared. The information was made available to the Air Force; yes, sir.

Mr. TIERNEY. And was there an explanation of your reasons as to where the underruns occurred?

Mr. NEFFNER. My first answer may have been based upon a misunderstanding of your question. At the time that the estimates were prepared, submitted and negotiated, the company prepared in great detail the supporting data for the estimates as submitted; yes, sir.

Mr. TIERNEY. Mr. Chairman, could this be made an exhibit?

The CHAIRMAN. This booklet will be marked for identification as exhibit No. 25 and will be included for purposes of reference in the record.

(Document referred to was marked "Exhibit No. 25" for reference and may be found in the files of the subcommittee.)

The CHAIRMAN. Would you identify it, Mr. Neffner?

(The document was handed the witness.)

Mr. NEFFNER. Yes, we identify this document as having been prepared by Boeing.

Mr. TIERNEY. On the initial page of this document, Mr. Neffner, I notice that in the last sentence it says:

> As will be shown during this presentation, the timeliness of contract pricing will receive emphasis as related to information available and to costs incurred as of those dates.

I would gather from that as far as this document is concerned, you were directing your attention really to the timeliness of negotiations. In effect, what cost information was available at the time these negotiations were entered into.

Mr. NEFFNER. Yes.

Mr. TIERNEY. I have these pages numbered, and I want to refer to page 11, chart No. 5, in this exhibit. The first sentence reads:

> As indicated in the opening statement, timeliness of negotiation, as always has its part to play in contributing to cost variance between initial estimates and final or actual costs.

My question is: To what extent would you say, would it be the greatest extent, or to what extent would the underruns on these three contracts be attributable to the nature of the cost information or the absence of firm cost information which you had at the time of negotiating these contracts?

Mr. NEFFNER. Well, sir, if we waited until all the costs had been incurred, all costs were known, it is obvious that there would be no variance. The degree of variance, necessarily, relates to time. The earlier the estimate is, the greater the possibility, of course, of differences. The later the estimate is, obviously, the closer you will come to what was actually realized. If you waited, as I said, until completion, there should be no significant variances.

Mr. TIERNEY. In fairness, of course, in this type of contract, at the time you negotiated this contract, conceivably there could have been overruns. By the same token, as it had to happen, there were extensive underruns in this contract. Because of the time you were negotiating, because you were depending on, in effect, research and development pricing data, it was necessary to place in the contract certain contingencies. Conceivably, those contingencies might occur or they might not occur.

I am wondering if there was any arrangement made in contracting with the Air Force under these circumstances as to a closer analysis after negotiation as to whether or not the underruns affecting the contingencies had actually occurred or contributed to the contingencies or not.

Mr. NEFFNER. Certainly there is, Mr. Tierney. As you will note, the PR factor, or contingency, as you call it, was reduced in 38098, I believe, over that which was contained in 36319, and certainly the contingency or PR factor in 40033, which is our last production contract, was reduced substantially over that contained in 38101.

Mr. TIERNEY. The point I am making is that after actual performance, do you know whether or not any of these contingencies provided for were actually expended?

Mr. NEFFNER. This is a difficult one of recording. We have certain instances which are clearly recognized as consuming a portion of the contingency factor. There are a number of things which get into this which are not subject, perhaps, to definition. In connection with 36319, I believe we were called upon to correct certain shelter equipment as a result of an incident at Maguire, which we corrected. We had no change in contract price. That is a part of the contingency which, you might say, was used.

Mr. TIERNEY. As I understand it, from a review of the records, what we have here concerning some of these contracts, where you list the PR factor, the contingency factor—for example, on 36319 you list a figure of 5.9 million as included in the initial target, and your estimate of the actual use of this is zero. Is that an accurate description of what was or was not used of that contingency factor?

Mr. NEFFNER. No, sir. May I continue?

It isn't accurate for two or three reasons. In a discussion with the staff as of last evening it was pointed out that where we received a part from a subcontractor, which comes in, which is at minor variance with the part which should have been delivered, ofttimes it is quite less expensive in the overall to correct that part inplant and, therefore, utilize inplant effort rather than returning it to the subcontractor, and, accordingly, in those areas inplant costs are increased, and the price of the subcontracted item remains basically the same.

The CHAIRMAN. Again we will have to go to vote.

Are we through with these witnesses?

Mr. ADLERMAN. I think there are still a couple of questions to be asked.

The CHAIRMAN. Very well.

We will have to be in recess for a few minutes.

(At 3:55 p.m. a brief recess was taken, with the following members present at the taking of the recess: Senators McClellan and Jackson.)

(The subcommittee reconvened at 4:10 p.m., with the following members present: Senators McClellan and Jackson.)

The CHAIRMAN. The committee will come to order.

You may proceed, Counsel.

Mr. TIERNEY. Mr. Tharrington, I wonder if you can explain what the second contract, the production implementation contract, is, on chart 6.

Mr. THARRINGTON. I will ask Mr. Neffner to explain that.

Mr. NEFFNER. Perhaps, Mr. Counsel, the best way of explaining or saying what that was is to simply read portions, pertinent portions, of the statement of work of that contract.

Primarily, it was to conduct a preliminary review of components of the XIM–99 defense system in order to develop what might be production problems in later programs, to study production design and special production tooling requirements in certain areas, and to analyze certain selected components with respect to alternating methods of design and tooling, to establish a basis of detailed engineering and tooling, conduct studies, production manufacturing plans, conduct studies of methods and design equipment for functional test-

ing, fabricate and evaluate certain prototype items, investigate production methods for fabrication of selected items, procure sample parts for test specimens in certain areas, conduct studies of simplified inspection techniques, application of quality control, conduct a study to determine the optimum method of incorporating all levels of IM–99 maintenance procedures.

I believe basically that was the statement of work.

Mr. TIERNEY. Would I be correct, if I summaized, in effect, that this contract provided you with funds to study the best way of making a transition from research and development to production?

Mr. NEFFNER. In certain areas. I don't think that it was comprehensive. Perhaps Mr. Helberg can add to that, but it was on certain selected areas in the study development.

Mr. HELBERG. This was, as indicated here, not a comprehensive transfer from research and development into production. It was, however, a means of conducting a lot of production studies and establishing of plans for production prior to the implementation of an anticipated production contract.

Mr. TIERNEY. I have here your document on a Bomarc contract history, and in explaining this contract, you also say the purpose of it was to reveal and take advantage of production cost reduction opportunities. Would that be a correct statement?

Mr. HELBERG. That would certainly be a part of the study. The Air Force invested their money in this program. They wanted to be set for the heavier production that we anticipated having on the program, before it was cut back, and they felt that this was an investment against that production program.

Mr. TIERNEY. As I read this, and correct me if I am wrong, the majority of the funds under this contract were spent during the period 1956 and 1957, as you were approaching the production time?

Mr. HELBERG. That is correct. The contract was initiated, as indicated in your chart there, about mid-1953. It was quite active for a period of time, of almost a year there, after which it was fairly dormant because of difficulties being experienced in the R. & D. program. We did not go ahead with this production study until sometime later. I believe it was probably about 1955 when we reactivated the study.

Mr. TIERNEY. Would these funds be used also in conjunction with contract 32832, where you are producing a preproduction prototype missile?

Mr. HELBERG. No, sir. These funds were for the purpose of studying the productionization, if you will, and providing production plans for production programs.

Mr. TIERNEY. Would it be a fair assumption—well, I will ask you whether or not you feel that particular contract made any great contribution to the underruns which occurred in the later incentive contracts, your production contracts?

Mr. HELBERG. The results of the studies that came from this 24748 contract were not implemented very early in the 32832 program. I believe that you, if you will look at your chart, can see that this contract did not finish up until about 1958. It is true that that is the report. The actual study effort was not particularly active from about, I don't know, September–October 1957 on. We did wrapping

up of the report from that time forward. But you will note there that much of our engineering work had been behind us on contract 32832 by the time this particular study was completed.

Mr. TIERNEY. Maybe you misunderstood me. I am referring to contracts 35359, 33619, 38098.

Mr. NEFFNER. I think it would be safe to say yes, we did receive some benefit from the study conducted under that contract. We can't place a tangible value on them. I guess that would be a matter of judgment and opinion.

Mr. TIERNEY. The point I am making is that you had the benefit of a study which was paid for by the Government, which permitted you or assisted you in becoming more efficient in your production area. I think it would have contributed somewhat to the reductions that occurred in the later production contracts, the cost reductions that occurred.

Mr. NEFFNER. I certainly think that it would. I think that the studies that are conducted continually throughout the evolution of a program contribute, and obviously these are reflected in the learning curves and the cost of performance throughout a program.

Mr. TIERNEY. Just one other point I want to make. With respect to the targets on these contracts, the initial targets, say, on your incentive targets, taking 36319, for example, the initial target was 112 million, and you get a basic fee on that of 8 percent. I think that was the provision in the contract.

Mr. NEFFNER. A target profit of 8 percent, yes, and cost.

Mr. TIERNEY. For example, in that figure are your subcontract figures or other proposals which you had, or maybe the Air Force, in that $112 million negotiated figure.

Mr. NEFFNER. As a portion of the total cost estimated to be incurred; yes.

Mr. TIERNEY. And if you negotiated or reached a lower target figure, your profit, 8-percent profit, based on that lower target would be lower, or if it was higher, your basic profit would be higher.

Mr. NEFFNER. It works both ways.

Mr. TIERNEY. That is right. What I am directing this to is the contract or subcontract proposal that Boeing made to the Air Force on the effort of I.T. & T. Federal on the operating test equipment and the electrical launch equipment. Your initial proposal to the Air Force was $16.9 million, and you added a factor of 13 percent, 19 point some million, the total, in the initial estimate of the Air Force. Between a month and 6 months afterward, you negotiated an initial target with the I.T. & T. Federal on your subcontract with them. That is the initial target with them at a figure of some $13 million, I think that is correct, roughly $6 million less than the proposal made, or $4 million less than your proposal minus the contingency factor, we will say.

Do you think at that time, because you had negotiated that target firmly, do you think there should be a proportionate reduction in the initial target?

Mr. NEFFNER. No.

Mr. TIERNEY. May I ask why not?

Mr. NEFFNER. I think that (1) when you place a contract with us, that you ask us to administer our subcontract structure to the best of

our ability, and it is on that assumption that you have developed your target profit. So, accordingly, it would be falacious, I think, to suggest that in performing our duty, in performing our responsibility, that adjustments would be made in the overall profit factor.

Conversely, had the situation been changed, instead of by our efforts, instead of a reduction accomplished through our efforts, had an increase in the cost of I.T. & T. Federal's subcontract occurred, 1 month or 6 months after definitization, then I am sure that no adjustment in cost, estimated cost or target profits, would have been available.

Mr. TIERNEY. That is correct. The point I am making is under circumstances such as these. Ordinarily, for example, when you proposed the Lear price to the Air Force, it was based on a firm negotiated price that you had made with Lear on this particular contract.

Mr. NEFFNER. That may have been. I am not sure. All during the process of a contract, firm orders are placed with subcontractors. I believe the Air Force indicated that at the time of negotiating with a prime contractor, and with Boeing, at that time some of the subcontracts had been placed and firmed up, firmed up from the standpoint of pricing.

On others we have proposals, firm proposals, from the subcontractors. Others, we have budget estimates from. I believe that term was used. And on others we prepare an estimate ourselves, by reason of the fact that the specifications are such, although the structure calls for it being subcontracted, the specifications are such that it is not in such form that we can go out and get competitive bids or bids from selected sources, as the case might be.

So it runs that spectrum, from firm price purchase orders, subcontracts, to those which represent estimates, budget estimates, or in-house estimates.

I would like to add one thing further just for the sake of the record in describing the preparation of an estimate for a contract such as this.

It takes hundreds of people, literally hundreds of people, in the contractor's organization, to prepare and submit an estimate. That complement of personnel is comprised of estimating people, our materiel department, our engineering departments, our manufacturing departments, quality control, finance, contract administration. All of these people contribute their best judgment, their experience, their knowledge in developing this estimate. The team which negotiates with the Air Force is selected from that complement, and we are sure that the Air Force has at their command the same type of people, perhaps even more qualified than the contractor because of the question of amount of experience that they have, far greater than ours, in negotiating with all contractors.

I find it awfully hard from my experience in negotiating contracts with the Air Force to have any great sympathy with them because of lack of knowledge. I find that they have the highest caliber capability and qualifications.

Mr. TIERNEY. The point I was making on this target is that both for the benefit of the contractor and for the benefit of the Government, when you get into these areas where you have a minimum of good cost data, and there are contingencies added, would you not think it would be better to arrange for an adjustment after performance when it is found out that the contingencies are not needed?

Mr. NEFFNER. I am afraid that I don't believe it would be appropriate to hold a contract open for adjustments, both up and down, until completion of the contract. I think if we were to do that, that the benefits which I feel are inherent in formalizing a program, in getting a definitive contract, in establishing the incentives, can only work to the greatest advantage and the fullest advantage if you can impose those at a very early date.

The CHAIRMAN. Is there anything further?

Mr. TIERNEY. That is all.

Senator JACKSON. I have no further questions, Mr. Chairman.

The CHAIRMAN. All right, gentlemen, thank you very much.

Mr. THARRINGTON. Thank you.

The CHAIRMAN. Secretary Morris, come forward, please.

Be sworn, please, Mr. Secretary. Will both of you testify?

Do you and each of you solemnly swear the evidence you shall give before this subcommittee will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. MORRIS. I do.

Mr. BANNERMAN. I do.

The CHAIRMAN. Mr. Secretary, would you identify yourself for the record, please, sir?

TESTIMONY OF THOMAS D. MORRIS AND G. C. BANNERMAN

Mr. MORRIS. I am Thomas D. Morris, Assistant Secretary of Defense for Installations and Logistics.

The CHAIRMAN. And you have an associate with you?

Mr. BANNERMAN. I am Graeme C. Bannerman, Deputy Assistant Secretary of Defense for Procurement.

The CHAIRMAN. Do you have a prepared statement, Mr. Secretary?

Mr. MORRIS. Yes; I do.

The CHAIRMAN. Do you want to read it, or insert it into the record and highlight it?

Mr. MORRIS. I am prepared to do whichever you wish.

The CHAIRMAN. For the happiness of all of us, I think it would be well to insert it into the record, and highlight it.

(The statement is as follows:)

STATEMENT OF THOMAS D. MORRIS, ASSISTANT SECRETARY OF DEFENSE (INSTALLATIONS AND LOGISTICS)

Mr. Chairman and members of the committee, we have studied with great care and appreciation the findings which have emerged from the excellent hearings of this committee since April 3, 1962. Secretaries McNamara and Gilpatric have devoted continuous personal attention, since January 1961, to our procurement policies, and I consider this subject to be the most important and complex area of my responsibilities and that of my counterparts in the military departments. Hence, we appreciate this opportunity to comment on the issues which have been posed during these hearings, and to outline actions already taken, or now in process, to achieve our mutual objectives of applying more effective controls over the cost to the Government of developing and producing the complex weapon systems of the missile era.

THE KEY ISSUES

In order to be directly responsive to the interests of this committee, as we understand them, I would like to discuss three key questions:

First, in respect to weapons acquisition policies.—When is it desirable to break out major subsystems and components for direct procurement?

Second, in respect to incentive contracts.—Is the application of incentive rewards and penalties suitable for use in the developmental phases of new weapons systems?

Third, in respect to fees.—What should be the basis for establishing the rates of profit or fee covering both work done by the prime contractor and that which he subcontracts?

Our problem today is to establish guidance and ground rules which assure sound decisions in answer to these questions by those who are responsible for the design, development, production, and operational readiness of the approximately 200 major new weapon system programs that are in process of acquisition.

I would like to review the progress we have made in establishing such ground rules, as well as our objectives for future progress.

MANAGING THE ACQUISITION PROCESS

On April 13, 1962, Deputy Secretary Gilpatric addressed a directive to the service Secretaries calling on each to assure that the following basic policies govern Defense procurements:

"1. Our first and paramount objective is to acquire weapons and materiel which fully meet our qualitative, quantitative, and delivery requirements—at the lowest overall cost.

"2. To this end we must stress full and free competition, with equal opportunity to all interested qualified suppliers, and we must continuously seek to minimize sole-source procurement for end items, major subsystems, spare parts, and supplies. Whenever our specifications are sufficiently precise, we must obtain competition through formal advertised bidding procedures as required by law."

I believe that it is important to stress the considerations which underlie a decision to break out subsystems and components for direct procurement—and competition whenever possible—and the steps being taken to assure that such decisions are soundly made at the earliest practical time.

Planning for breakout must be initiated early in the development cycle in order to assure the availability to the Government of the necessary production drawings and data required for direct procurement.

The Assistant Secretaries responsible for procurement in the military departments have instituted reviews under which definite target dates are required to be established to identify the date by which technical data will be available to facilitate breakout.

We are stressing strict enforcement of contract provisions for timely delivery of technical data, which will provide for withholding of payments for nondelivery.

We believe that a decision as to whether it is wise to effect direct procurement is one that must be taken at a high level in each military department, so as to assure that the performance and reliability of the end item or overall system will not be jeopardized. A precondition of this decision is the existence of proven capability within the military departments to direct the effort of the prime and associate contractors, and to assume responsibility for the exercise of technical engineering control required to assure compatibility of the subsystems and components which are broken out.

One of the important keys to future progress must be the existence of fully trained weapons project managers, and an intimate knowledge of the progress and status of the entire program. This requirement was stressed in the recent report to the President, prepared by a top-level committee which studied contracting for research and development. This report states that "With programs of the size and complexity now common, this requires that the Government have on its own staff exceptionally strong and able executives, scientists, and engineers fully qualified to weigh the views and advice of technical specialists, to make policy decisions concerning the types of work to be undertaken, when, by whom, and at what cost, to supervise the execution of work undertaken, and to evaluate the results."

The following steps are being taken to this end:

Training of project managers. During the past year a major study has been made, utilizing outside professional assistance, of the manner in which our highest priority weapon system programs are being managed. On the basis of these studies, a training program for senior project managers will begin in the near future in the Army, and this training will be progressively extended to all Departments.

Secondly, we will shortly issue to all Departments a manual describing in detail the time-scheduling and cost control system which will be applied to major weapons projects, showing the planned and actual results by individual components of the system. The elements of this system, known as PERT,[1] were first pioneered in the management of the Polaris program and have been tested on major Air Force projects. The system will provide management—from the contractor up to the Secretary of Defense—current knowledge of time and cost performance, together with predictions of time slippages and cost overrun difficulties.

To assure consistent and vigorous implementation of our objectives in respect to timely, sound breakout decisions for direct procurement, each military department is establishing a procurement operations review staff to conduct period surveys of the practices of our 68 major procurement organizations, reporting their findings to the departmental assistant secretary responsible for procurement. One of the early goals of this program will be to evaluate, and make more uniform, present policies and practices in identifying components and subsystems to be directly procured.

In summing up this discussion, Mr. Chairman, we should note that the management of weapons systems acquisition is one of the most significant responsibilities of the Navy bureaus, Army technical services, and Air Force commands. Policies alone cannot achieve the results which your committee or the Department of Defense are seeking. Rather, we must continue to discover and perfect better techniques of organization, planning, and control. We believe that the best talents available within the OSD and the military departments are being applied to this end.

USE OF INCENTIVE CONTRACTS

In fiscal year 1953, missiles and electronics represented less than 12 percent of our annual hard-goods deliveries. Last year these items constituted almost 52 percent of our hard-goods contracts. During the same era, annual obligations for research and development have risen from $2.4 billion to the level of almost $7 billion budgeted for fiscal year 1963.

Accompanying this swing away from mass production weapons there has been a rapid decline in use of fixed-price contracts, and a proportionate increase in the use of cost-plus-fixed-fee contracts as shown by the following:

[In percent]

Type of contract	Fiscal year 1951	Fiscal year 1961
Fixed price	78	47
Incentive	9	14
Cost plus fixed fee	13	39

It is with weapons programs of the type which have emerged during the past decade that your committee has been concerned. It is noted that these programs have typically involved very large awards not subject to direct price competition, with the resultant contract being made on some from of cost-reimbursement basis.

In 1961 $8.9 billion in contract awards were made under the CPFF type of contract. Recent studies of experience under such contracts show actual costs frequently exceed target costs by as much as 20 percent, with many programs running much higher. Thus hundreds of millions of dollars of reimbursed costs are in excess of those anticipated at the outset of the contract. Much of this is sheer waste.

It is the judgment of our best informed policy executives that a significant part of these cost overruns is a direct result of the fact that risks are not being shared equitably by the Government and the contractor—because such contracts provide a fee which does not vary, and which thus fails to discriminate between good performance and bad, between early succesfsul completion and protracted failure, or between tight management control of costs and waste. The recent

[1] Performance evaluation and review technique.

report to the President on research and development contracting made the following findings on this subject:

"* * * This type of contract has well-known disadvantages. It provides little or no incentive for private managers to reduce costs or otherwise increase efficiency. Indeed, the cost-plus-fixed-fee contract, in combination with strong pressures from governmental managers to accomplish work on a rapid time schedule, probably provides incentives for raising rather than for reducing costs. If a corporation is judged in terms of whether it accomplishes a result by a given deadline rather than by whether it accomplishes that result at minimum cost, it will naturally pay less attention to costs and more attention to speed of accomplishment. On the other hand, where there is no given deadline, the cost-plus-fixed-fee contract may serve to prolong the research and development work and induce the contractor to delay completion."

To sharply reduce the use of such contracts we issued, on March 15, 1962, a complete revision of the Armed Services Procurement Regulation (sec. III, pt. 4). This revision establishes the firm fixed-price contract as the most preferred type, because here the contractor accepts full cost responsibility, and the relationship between cost control and profit dollars is established at the outset of the contract. This regulation limits the use of cost-plus-fixed-fee contracts to basic research or study contracts or a few development contracts where the unknowns are so great that feasibility cannot be clearly established.

In all other cases—which will apply to most future contracts for the development and overlapping production of new weapons systems—we have established the objective of employing incentive contracts which will have these features:

Establishment, in advance of contracting, of specific goals for the required performance of the weapon, for the time of completing the development, and for its costs.

These goals will be incorporated in such contracts and there will be provision for an increase in fee if the goals are exceeded, and a decrease if they are not met.

To encourage maximum sharing of risk, the penalty applied for failure or poor performance will be as great as the reward for superior performance. An application of these new principles to a major program is now in process. It provides for an incentive fee ranging from zero (meaning an out-of-pocket cost to the contractor) to the maximum fee allowed by law of 15 percent.

In the early development of new weapons, only a fraction of the incentive will hinge on cost. For example, in a missile, performance factors (such as range, payload, accuracy, reliability) might constitute about one-half of the incentive, and time of completion another one-third. That portion of fee based on cost reduction would then contribute only one-sixth. However, by the time development has reached the stage of production for test, performance, and time might be expected to control about half the fee, and costs incurred the remaining half.

As you can see, we would now hinge our incentive arrangements around targets having to do with the quality and timeliness of performance as well as the cost of performance until we had reached a stage in development where quality and timeliness were assured. In this respect our present practice differs from the practice of some years ago when we frequently went to straight cost reduction incentives before we had completed the development.

During recent years the estimating of target costs has become increasingly more precise because such negotiations are preceded by more intensive price and cost analyses.

We have just completed a review of the incentive contracts settled before and after fiscal year 1959 which revealed the following:

Contracts settled between—	Percent of final costs falling below target	Percent of final costs falling above target
1954–59	64.6	35.4
1959–61	51.0	49.0

We conclude that the relatively even spread of final costs, in the 1959–61 contracts, above and below targets is a clear indication of a satisfactory advance analysis by the Government of cost risks, and the negotiation of a reasonable distribution of those risks between the contractor and the Government.

Under a revised approach to weapons development contracting, contractors will be invited to submit competitive proposals citing the incentive plan under which they are willing to undertake the development. Thus, contractors submitting unduly conservative proposals, which involve little or no risk, will endanger their competitive position. Conversely, contractors who are unduly optimistic in their promises will be in danger of being awarded the contract at a very low profit or even a loss. Accordingly it can be expected that these arrangements will compel more clarity and integrity in the preparation and submission of proposals for development contracts.

I would like to comment specifically on the case discussed before the committee on May 23 where subcontract costs were redetermined during the performance of the contract and were substantially less than estimated prices to which the incentive formula was applied. Our regulations now provide that where the likelihood of such subcontract reductions exists, we shall reserve the right, by specific contract clause, to negotiate an adjustment of the total amount paid or to be paid under the contract.

We have thoroughly reviewed our plans for expanding the use of incentive contracts with the Bureau of the Budget, the Renegotiation Board and the General Accounting Office. We were pleased to note the comments of Mr. Charles M. Bailey of the GAO before this committee in which he stated that "Under appropriate circumstances we believe the use of incentive-type contracts is proper and can effectively serve the best interests of the Government." On April 17, 1962, Chairman Lawrence Hartwig of the Renegotiation Board issued a press release which contained the following statement:

"The Renegotiation Board has followed with interest the formulation of the Department's incentive program and recognizes its objectives. The Board understands that the new program represents an expansion and modification of past incentive arrangements. The Board is aware that the Department hopes to achieve its aim of greatly reducing the cost of new weapons, improving their quality and speeding their development, by encouraging and rewarding performance efficiency and by penalizing inefficiency. The Board believes that the Renegotiation Act does not impede the proper acomplishment of these objectives."

We believe, Mr. Chairman, that we are capable of protecting the Government's interest in negotiating incentive contracts and that, once negotiated, they provide the contractor with very strong motivation for performing the contract in a manner that will be most advantageous to the Government.

CONTROL OF PROFITS OR FEES

There are, and undoubtedly will continue to be, a number of situations were we place large prime contracts knowing that the prime contractor will, in turn, place fairly large subcontracts which require varying degrees of responsibility on the part of the prime. We are in full agreement with the committee that fee policies must fairly and accurately reflect the degree of the prime contractor's responsibility and contribution.

Before discussing this subject, I would like to note that we do not distinguish the meaning of the words "profits" or "fees." To us, these words are virtually synonymous. Traditionally we designate as a "fee" the fixed amount of profit, determined in advance under a CPFF contract. In other types of contracts, any amount by which the final price exceeds costs (computed by the same cost allowance principles) is referred to as the "profit." A "fee" is simply a "profit" of predetermined amount.

It should also be noted that our cost allowance principles are necessarily somewhat more restrictive than those applying to income tax practice. For instance, expenses related to entertainment, product advertising, corporate organization or financing, and expenses related exclusively to non-Government work of the contractor, are not chargeable as costs to our contracts, although they may be considered costs by the Internal Revenue Service. Accordingly, it is entirely possible that "profits" computed under our contracting procedures are larger than "profits" computed for income tax purposes.

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Inasmuch as the programs which have been under study by the committee have extended over a considerable number of years, I think it may be useful to sketch briefly our profit policies in existence over this period. These policies are contained in the Armed Services Procurement Regulation (ASPR) which was initiated in 1948 and has been under constant development and revision ever since.

Prior to 1957, ASPR contained only a statement of the statutory limits on fees and general guidance as to profits. This guidance said simply that consideration should be given to such matters as the extent of subcontracting; the amount of Government-furnished property, facilities, or financing; and the desirability of cost sharing.

In 1956 and 1957 it was determined from an analysis of the contracts then being made that there was a discernible tendency for each of our major purchasing activities to fall into habits with respect to the profit or fee rates. There appeared to be a standardization of such rates into a pattern which had little relation to the varying factors which should have induced widely varying rates of profit. In short, the profit rates on the vast majority of the contracts were bunched at the average.

For this reason it was decided to issue regulatory guidance on profit policy which would be considerably more detailed and explanatory and lead to a more discriminating identification of those contracts where the profit rate should be high and those where it should be low. This was done, initially in 1957 and in several revisions since then. Essentially this is the guidance which is presently in ASPR. I believe the committee has previously received a copy of ASPR 3–808 but I would like to make sure that it appears in your record. I have a copy that I can furnish to your staff.

I do not wish to dwell on this section at length but I would like to characterize it for the committee. This section lists nine factors that are of concern and must be considered in arriving at an appropriate rate of profit. It describes each in some detail and indicates the manner in which each factor should have an effect on the total profit rate. The nine factors are:

1. The effect of competition.
2. The degree of risk.
3. The nature of the work to be performed.
4. Extent of Government assistance.
5. Extent of the contractor's investment.
6. Character of the contractor's business.
7. Contractor's performance record.
8. Subcontracting.
9. Realism of estimates.

I would like to comment briefly on several of these factors.

As to the first, "the effect of competition," I think that it is clear that where there is quite extensive and effective price competition, either by formal or informal means, we should normally award a fixed-price contract to the firm offering the best price and not concern ourselves with rates of profit. This is true of over 36 percent of our procurement today.

As to the second, there are quite wide variations in profit rates which should be induced by the factor of "the degree of risk." For instance, in contracts where all costs are to be reimbursed by the Government and there is no guarantee of successful performance, there is relatively little exposure by the contractor—as contrasted with a situation where a contractor guarantees to produce a successful result for a fixed price. The negotiated profit rates should reflect this difference of risks.

Under the third factor, "nature of work," we should recognize that some contracts constitute merely a leasing of management talent as, for instance, when we hire a company to operate a Government-owned plant with an arrangement for the Government to pay the contractor's costs plus a management fee. At the other extreme we may be requiring the utmost application of the contractor's total organization, as where we seek an advanced scientific development using his own research or development facilities and his normal staff. These factors should affect the rate of fee allowed.

With regard to the factor of "subcontracting," we make it clear that when the contractor's responsibilities for subcontracted work are just as complete as those for work done in his own plant, he should earn a rate of profit commensurate with that which would be normal for work done in his plant. This would be the case where the subcontracted item was designed and developed

by the prime, and where he must make a very careful selection of the subcontractor, assisting him with production engineering, the establishment of adequate quality assurance techniques, and with financing. However, to the extent that any of these responsibilities are not assumed by the prime, he makes a lesser contribution and the profit rate, related to such subcontracts, should be lower. Finally, where production of the subcontracted item has become fully standardized and the prime contractor is no longer making any substantial contribution, but the item is not broken out for separate procurement, the profit rate related to such an item should be minimal, reflecting only the prime contractor's working capital expense, if any, material handling costs, and guarantee expense.

There are two other aspects of the establishment of profit rates that I would like to mention.

First, the fee allowed in a negotiated CPFF contract is expressed as a total number of dollars, usually considered in terms of a percentage of the total estimated cost. I am sure that this committee is aware that this fee is normally a composite of many factors. The prime contractor's profit rates determined to be aprpopriate with respect to various subcontracts may have been quite different, and all of them different from various aspects of the work done by the contractor's own force. Nevertheless all of these are lumped into a composite rate. It is, of course, not correct to assume that the prime contractor's profit applicable to a particular subcontract is at the composite rate. Our present ASPR requires that adequate records be kept as to how these composite rates were reached. This had not always been done, and this is a matter we are now taking steps to correct.

Second, where there is a clear likelihood of commercial advantage to the contractor, or some other mutuality of interest in one of our development contracts, it is our policy to make contracts which require a sharing of costs—rather than a reduction in fee. In military programs this is not common but is done occasionally.

In spite of the foregoing guidelines which are now contained in ASPR, we are still not satisfied that we are making adequate distinctions between situations which should produce a very low rate of profit and those justifying a very high rate. There is still evidence of a bunching of negotiated profit rates closely around averages. Accordingly, we have started a reexamination of the policies which I have described to determine whether they can be stated in a manner that would require more precise measurement and analysis. Needless to say, our efforts have been given impetus by the work of your committee.

In addition, we are considering whether it would be more equitable to utilize "return on capital contribution" to establish the ceiling rate of profit on each contract. This method would give assurance that the contractor would be able to earn a reasonable return on his capital contribution if his performance was good, but not an excessive return under any circumstance.

We expect that we can complete these studies, and test out their conclusions, within the next several months. At that time we will issue a revision of ASPR 3–808, and we will be pleased to furnish you a copy of our findings.

CONCLUSION

In conclusion, Mr. Chairman, I feel we are in basic accord with the key objectives which have been highlighted by this committee, and I believe that our present policies and current objectives are designed to produce the following results:

First, to assure that we are in a position to break out major subsystems and components wherever it is in the best interest of the Government to do so, and also to assure that there is a regular procedure for review and decision taking on this point.

Second, to bring development costs under much closer control through the sound use of contractual incentives covering performance and time as well as costs. We agree that incentive profits must fairly reflect the risks taken and the success or failure of the contractor's efforts and be sufficiently wide to provide the possibility of a contractor earning the maximum fee allowed by law, as well as no fee or an actual loss in the event of failure.

Third, to make more detailed and precise the factors which should be considered in setting fee and profit rates. We agree that fee rates on subcontracts must realistically measure the resources applied and the responsibility assumed by the prime contractor.

Thank you for giving me this opportunity to discuss these matters.

Mr. MORRIS. Mr. Chairman, I can summarize my statement by commenting on the three key objectives which we believe have been brought into much sharper focus by these hearings.

First, in managing the process of acquiring new weapon systems, it is important that we be in a position to break out major subsystems and components for direct procurement when it is clearly feasible and more economical to do so.

The Secretary of Defense has strongly endorsed this objective and has caused the military departments to establish procedures at secretarial level which provide for a regular review of opportunities for breakout and prompt decisionmaking where this proves to be a wise course.

The CHAIRMAN. When was that directive issued?

Mr. MORRIS. One year ago.

The CHAIRMAN. Very well.

Mr. MORRIS. It is essential that this step be taken, however, only when it is clearly evident that performance and reliability will not be jeopardized, and that we have the management, technical, and engineering capabilities to insure compatibility of the subsystems and components which are broken out.

Secondly, in the control of development costs, our analyses reveal that the sound use of contractual incentives, covering performance and delivery, as well as cost, can produce significant improvements and arrest the trend toward CPFF arrangements, which we believe apply far too little discipline and encourage high costs. We agree, however, that incentive profits must fairly reflect the risks taken and be sufficiently wide ranging to provide a contractor the possibility of earning the maximum fee allowed by law for superior performance, as well as no fee, or an actual loss, in the event of failure.

We believe that our capability for negotiating reasonable performance, delivery, and cost targets has been greatly improved in recent years and is continuing to improve. This is due, in part, to the greater emphasis being placed on competitive procurement and to the more intimate knowledge of our programs by managers at all levels from the contractor to the Secretary of Defense.

Secretary McNamara has set the goal of improving our cost estimating techniques so that we can predict overall costs on major weapon systems within 10 percent on an average. You will be interested, I believe, in the fact that whereas cost underruns on incentive contracts were exceeding overruns by 2 to 1 in the years preceding 1959, our experience since 1959 shows that costs are now evenly spread above and below target. We believe this indicates our ability to negotiate a reasonable distribution of cost risks between the contractor and the Government.

In respect to the third key objective, Mr. Chairman, it is quite clear from the findings of these hearings, as well as our own studies, that we need to make the factors considered in incentive fee and profit rates much more detailed and precise. We specifically agree that fee rates on subcontracts must realistically measure the resources applied and the responsibility assumed by the prime contractor.

Our records in contract negotiations must clearly reveal the way in which these are established for the work performed by the contractor in his own plant versus that which he subcontracts. We likewise need

to give more attention to the factor of return on capital contribution in establishing equitable rates of profit.

That concludes my summary, Mr. Chairman.

The CHAIRMAN. I may be mistaken, but I think I gather from your prepared statement and your summary, at least, that you feel like maybe by reason of these hearings and the facts that have been developed, you can profit thereby and thus make some improvement in some areas.

Mr. MORRIS. We do indeed, sir.

The CHAIRMAN. The idea of the hearings, I want to reiterate again, was not to try to put anybody on the spot, or was not to discover a rascal somewhere that should be caught, but simply to make a conscientious study of present procurement systems and practices to the end that we might point out wherein they could be improved. That is the purpose. I think the hearings have disclosed some things that can be corrected and thus there will be savings effectuated. I want to compliment you for the attitude you have about it, you and your chief, and the spirit in which you come in here, saying, "Sure, maybe we can make some improvements, and we are glad to have the information you have developed. On the basis of that, we are going to see what we can do." I appreciate that attitude and that spirit, and I trust that has been clearly the purpose of the committee in holding these hearings.

We are charged with the duty of studying Government at all levels. Of course, that includes the most expensive branch of the Government, where the cost is the greatest, the Defense Department, as well as other departments.

I think it is well for all of us to take that pause that refreshes sometimes, a pause that may inform us as we look and see and thus find where we can improve the efficiency and operation of our Government. It is getting so big, it is so cumbersome and so complex, that two Solomons could not manage it without some waste possibly. So it does behoove us, I think, at intervals, at least, to examine our policies and practices with respect to efficiency and economy.

Personally, and on behalf of the committee, I want to thank you for your attitude. I wish you to convey that message to your chief.

Mr. MORRIS. I will be happy to, sir.

Senator JACKSON. I would like to concur in the chairman's statement.

Mr. MORRIS. Thank you, sir.

The CHAIRMAN. Are there any questions?

Mr. ADLERMAN. I have just a few questions.

I think the statement is very self-explanatory, and it is an excellent statement.

I would like to comment, however, on your statement on page 16, I believe. This is in respect to the application of a contractor's profit to subcontracted work. The ASPR, the regulations governing procurement, have nine factors, I believe, do they not?

Mr. MORRIS. That is correct, sir.

Mr. ADLERMAN. That is, on how to judge what the fee should be. One of them is the nature of the work, and so on and so forth. Up to the present time, has there been any way to judge what weight was

being put to, say, the amount of subcontract work, the amount of Government facilities that are furnished, and so forth?

Mr. MORRIS. Sir, in each of the some 68 major procurement offices, very detailed records are kept of actual performance under past contracts with specific companies for purposes of future negotiations and contracting. At our level, we do, from time to time, make cross studies of the departments, to compare their practices.

One of the things we point out in our statement, is a much more vigorous program to this end, which has recently been launched. We think there is a great deal more opportunity, in other words, to exchange information of this type among our 68 major buying offices.

Mr. ADLERMAN. Do you think, Mr. Secretary, the Defense Department will, in the future, take steps to see that the weights that are given to the various factors in measuring profit will be delineated in the negotiation report so that somebody looking at that could tell why that profit was measured in that particular way?

Mr. MORRIS. Precisely, sir.

Mr. ADLERMAN. Do you think this will be helpful?

Mr. MORRIS. We are certain it will be.

Mr. ADLERMAN. We have had quite some testimony taken on incentive type contracts. I think everybody is in agreement that it is probably an excellent form of contracting and will probably result in savings to the Government. We did, however, in our testimony, go into some length on certain contracts in the Bomarc program. I think we put through testimony from subcontractors and from contractors, I believe, too, which showed that at the time these incentive contracts were arrived at, there were no records of production.

There was a contract entered into in the concurrency program where they did have some R and D missiles delivered but none of the production type. Nevertheless, the Air Force saw fit to enter into an incentive type contract based upon estimates, some of which were budget estimates. as was testified a while ago, others being estimates of the company, itself, where they estimated what the subcontracting might cost, and in some cases where they had a firm offer.

In each case, the subcontracting companies that testified acknowledged that they had, themselves, no firm base on which to predicate these estimates, but they were their best judgments. Do you feel that an incentive type contract should be entered into where you do not have a firm base upon which to come up with a cost estimate?

Mr. MORRIS. Mr. Adlerman, if I may, I would like to speak rather fully to that question, because we think it is very important. We would like to say, first of all, that we fully agree that basing the fee only on cost during the early development stage or before design standardization is completed is probably not wise or desirable as we now look at our experience in this field. We feel that what we should do during those phases is put the incentives on what it is we are trying to accomplish, namely, the accomplishment of certain performance and reliability achievements or certain time achievements, as well as certain cost achievements.

We think that mixing these elements in the earlier stages so as to get a proper balance and interaction among them is the wisest way to do this. We feel that cost discipline, to some degree, is still important, however, even in the early stages of development, because of the very

great risks that we would have to assume totally ourselves for cost overruns if we used only the CPFF approach.

One of the most important statements that we have seen in this connection has come from our Assistant Secretary for Research and Engineering, Mr. John Rubel, who for some 17 years managed defense development programs before coming to the Department about 3 years ago.

I would like, if I may, to read verbatim two paragraphs that he has recently submitted to us stating his experience in this connection. If I may have your indulgence, I think these are important statements.

Mr. Rubel says that he is convinced, based on his experience, that we have almost reversed the system of incentives in the field of defense research and development. He is convinced that the CPFF contract mechanism contributes heavily to this inversion of incentives and gross inefficiencies. He believes this because he says we have created a situation in many companies where large facilities and organizations numbering thousands of people have been built up largely out of the necessity to finish a job once begun, even though the final production is often far afield from that which was initially intended.

In effect, he says many of these expanded efforts are nothing more than overrun, even though they may not show up that way as actually negotiated.

Slipped schedules do not mean severe penalties for contractors. They generally mean more money. Performance failures do not generally mean more severe penalties. They, too, often result in more money, more people, more facilities, and expanded organizations. Even the inflation of costs, including direct costs, impose only transient penalties on the contractor who, over the long run, actually benefits to the extent the fees are computed on a percentage of the estimated cost.

He advocates very strongly, based on his experience both in the Department and outside, that we utilize this cost discipline in the sharing of risk between the Government and the contractor, even in the early stage in such contracts.

Mr. ADLERMAN. As I gather, the emphasis is on the performance factors, in other words on effort that the company is making, rather than on the basis of the cost. Am I correct in that?

Mr. MORRIS. Yes.

Mr. ADLERMAN. As to breakout, I realize, for example, in the case such as the Bomarc, where they only produce a relatively few missiles, numbering hundreds, it would not work out, but I am addressing myself to the experience that we noted in the Nike program, where they have had production runs of thousands of missiles. There was a resistance to breakout on the part of the contractor there. Do you feel that there should be some regulations set up or inserting some clauses in the contract which would compel the system manager, or whoever it is, to still perform the functions that he is supposed to perform, assume the responsibilities he is supposed to assume, and that the responsibility for breakout should rest purely with the Defense Department?

Mr. MORRIS. Sir, we feel in the first place it is our obligation in planning development programs to anticipate those components and

subsystems which might, when properly standardized, lend themselves to direct procurement.

As I believe General Davis pointed out, this may require planning up to 2 or more years in advance in order to obtain the necessary drawings and other technical data.

One year ago, in connection with Mr. McNamara's directives on procurement generally, he asked each department to set up long-range development program plans which would, among other things, specifically set dates by which a breakout decision could be made, by which date the technical data necessary for such a decision would be made in hand. This has been done. Our Assistant Secretaries for Procurement are now reviewing such plans on a periodic basis. We believe this is the most effective way to insure proper decisionmaking.

Mr. ADLERMAN. Will that mean that a company that is producing an item will have to furnish the plans, specifications and drawings so that they can be used to submit to other companies in competition at an early date?

Mr. MORRIS. That is correct, sir.

Mr. ADLERMAN. We noted in the Nike program, for example, some of the drawings were not available until after the program was finished, so it couldn't be broken out even if the Army wanted to.

Mr. MORRIS. This is the reason why we must plan well in advance and monitor the development and delivery of such data.

Mr. ADLERMAN. Thank you very much.

Mr. MORRIS. Thank you, sir.

The CHAIRMAN. Is there anything further?

Senator JACKSON. I have no questions.

The CHAIRMAN. Again I want to thank you.

I also want to thank all witnesses who have appeared and who have helped us conduct this inquiry, this study. I want to express my appreciation for the cooperation that we have received. I trust from the time and effort we have expended here that some good, some advantages, will result in the future, some benefits will be the fruits of our labor.

I want, also, to thank the members of the staff, Mr. Adlerman, Mr. Tierney, and others, Mr. Dunne, who have ably organized this evidence and worked up the case so that we might have these hearings. Staff work is tremendous in these things, as I am sure you can appreciate. Without a competent staff, we could not make any progress.

We are very grateful for all who made their contributions to these hearings. Thank you.

That will conclude this series of hearings.

(Whereupon, at 4:50 p.m., May 25, 1962, hearings in the above-entitled matter were concluded, with the following members present at the time of conclusion: Senators McClellan and Jackson.)

APPENDIX

STATEMENT OF LAWRENCE E. HARTWIG, CHAIRMAN, THE RENEGOTIATION BOARD, BEFORE THE PERMANENT SUBCOMMITTEE ON INVESTIGATIONS OF THE COMMITTEE ON GOVERNMENT OPERATIONS, U.S. SENATE

Statutory renegotiation at the present time is conducted under the Renegotiation Act of 1951, as amended. The purpose of the act is to eliminate excessive profits on defense contracts and subcontracts. The Government departments and agencies whose procurement is subject to renegotiation today are the Departments of Defense, Army, Navy, and Air Force, the Maritime Administration, the Federal Maritime Board, the General Services Administration, the National Aeronautics and Space Administration, and the Atomic Energy Commission.

Renegotiation is conducted, not with respect to individual contracts, but on an overall basis with respect to the total income and profits of the contractor in a fiscal year from all his renegotiable contracts and subcontracts. This permits loss and low profit contracts to be offset against more profitable contracts.

The act prescribes certain factors which the Renegotiation Board must take into consideration in carrying out the purposes of the act, as follows:

"* * * In determining excessive profits favorable recognition must be given to the efficiency of the contractor or subcontractor, with particular regard to attainment of quantity and quality production, reduction of costs, and economy in the use of materials, facilities, and manpower; and in addition, there shall be taken into consideration the following factors:

"(1) Reasonableness of costs and profits, with particular regard to volume of production, normal earnings, and comparison of war and peacetime products;

"(2) The net worth, with particular regard to the amount and source of public and private capital employed;

"(3) Extent of risk assumed, including the risk incident to reasonable pricing policies;

"(4) Nature and extent of contribution to the defense effort, including inventive and developmental contribution and cooperation with the Government and other contractors in supplying technical assistance;

"(5) Character of business, including source and nature of materials, complexity of manufacturing technique, character and extent of subcontracting, and rate of turnover;

"(6) Such other factors the consideration of which the public interest and fair and equitable dealing may require, which factors shall be published in the regulations of the Board from time to time as adopted."

It is apparent that a renegotiation proceeding for a fiscal year may and ordinarily will include many contracts or many subcontracts, or both. It is equally evident that the Board may determine that a contractor did not realize excessive profits in a fiscal year even though, on any single contract or subcontract, he realized an unwarrantedly high profit. This is because his high profit on that contract may be offset by a loss or low profits on other contracts. It is also important to recognize that contract performance often will begin in one year and end in a later year. Hence, not all the sales and profits on any individual contract will necessarily be included in the renegotiation of a particular fiscal year.

Each type of procurement contract involves a different degree of risk to the contractor, ranging from the cost-plus-a-fixed-fee contract to the firm fixed-price contract with its maximum risks. Therefore, although each contract is not individually renegotiated, the different types of contracts are separately examined in renegotiation. Only by such examination can a valid judgment be formed on the reasonableness of his total renegotiable profits. Our regulation on this point says:

"While renegotiation will be conducted with respect to the aggregate of the contractor's renegotiable business for the fiscal year, separate consideration will

be given to cost-plus-a-fixed-fee contracts and other cost-type contracts and to contracts, whether fixed price or cost plus a fixed fee, which contains incentive provisions or provide for escalation, redetermination, or other revision of the contract price during the life of the contract. Patent royalty income will also be separately considered."

May I now turn to a subject of concern to this subcommittee; namely, the financial consequences to the Government of the subcontracting of defense business. As you will recall, one of the statutory factors guiding renegotiation determinations is "character of business, including source and nature of materials, complexity of manufacturing technique, character and extent of subcontracting, and rate of turnover."

The Board's regulation under this factor reads as follows (sec. 1460.14(b)):

"(b) *Comment.*—(1) Consideration will be given to the character of the business of the contractor. The manufacturing contribution will vary with the nature of the product and the degree of skill and precision required in the work performed by the contractor. The relative complexity of the manufacturing technique and the relative integration of the manufacturing process are the basic considerations in evaluating this factor.

"(2) A contractor who uses customer-furnished materials generally is not entitled to as large a dollar profit as the dollar profit to which such contractor would have been entitled had it furnished the materials itself. In the latter case, the contractor would have expended effort in finding or acquiring materials, would have invested capital in the materials and would have assumed the risks of obsolescence, spoilage, or other loss inherent in owning such materials. Although the aggregate dollar profit allowed the contractor in the former case should not be as great as it would be if such contractor furnished its own materials, nevertheless the dollar profit allowed will usually result in a larger percentage of sales than the dollar profit which would have been allowed if the materials had been purchased by the contractor and, therefore, included in its sales and costs.

"(3)(i) Defense production needs and the policy of Congress require that subcontracting, particularly to small business concerns, be used to the maximum extent practicable. Although a contractor who subcontracts work may not reasonably expect to be allowed as large a profit thereon as if it had done the work itself, subcontracting of the kind described in this subparagraph, especially the extent to which subcontracts are placed with small business concerns, will be given favorable consideration in the renegotiation of the contractor.

"(ii) A contractor will be given favorable treatment when, by subcontracting it utilizes in the defense effort facilities and services, particularly of small business concerns, which might otherwise have been overlooked or passed by: when it has demonstrated its efficiency and ingenuity in finding appropriate opportunities for subcontracting; when the amount of subcontracting so accomplished is substantial; when the amount or complexity of technical engineering, and other assistance rendered by the contractor to the subcontractor is substantial; and when the price negotiated with the subcontractor is reasonable in view of the character of the components produced.

"(iii) The portion of the renegotiable business of the contractor which is subcontracted will be a part of its total sales, and separate consideration must be given in applying to this portion the factors of risks assumed, capital employed, and reasonableness of costs and profits.

"(iv) The subcontractor, of course, will receive favorable consideration in renegotiation for the successful employment of its own facilities and production skill.

"(4) The rate of turnover will indicate the use of plant, materials, and net worth. A low rate of turnover may indicate more complete integration in production or may be related to the type of the product and the nature of the manufacturing process. A high rate of turnover may indicate a relatively smaller manufacturing contribution or, by comparison with other manufacturers of similar products, a relatively greater efficiency."

You will note that this regulation includes the statement that "* * * a contractor who subcontracts work may not reasonably expect to be allowed as large a profit thereon as if it had done the work itself * * *." We believe that this policy is sound.

In conclusion, the act purposely confers broad discretion on the Board and avoids any formula approach to the determination of excessive profits. This means that the Board's determinations necessarily involve judgment, which must take into account all applicable factors set forth in the act.

EXHIBIT No. 10

Aero-Space Division—IM–99 program

Number of missiles: 78.
Bases of weapon support equipment: 2.
I.C. & C.:
Date: November 1961.

Work orders:
Model:
Contract: AF–33(600)–36319 (FPI).

LABOR, OVERHEAD, AND MATERIAL DOLLARS

Element of cost	Present contract target	Expenditures		Status of project		
		Current month	Cumulative to date	Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering labor	$5,212,053	*$1,247	$5,038,605		$5,038,605	$173,448
Engineering overhead	5,640,479	*1,330	5,688,719		5,688,719	*48,240
Base installation department labor	766,383	1,633	971,029	$19,810	990,839	*224,456
Base installation department overhead	813,430	1,264	1,103,861	8,303	1,112,164	*298,734
Developmental labor	859,789	837	648,681		648,681	211,108
Developmental overhead	1,133,461	1,692	977,662		977,662	155,799
Developmental material	1,167,250	651	681,174	3,172	684,346	482,904
Special test equipment labor	538,708		371,278		371,278	167,430
Special test equipment overhead	940,779		602,524		602,524	338,255
Special test equipment material	880,660	*5,384	523,489	6,511	530,000	350,660
Tooling labor	555,607	32	472,500	38	472,538	83,069
Tooling overhead	868,789	55	739,725	69	739,794	128,995
Tooling material	101,979	*1	85,591	409	86,000	15,979
Inspection labor	749,783	719	798,487	573	799,060	*49,277
Inspection overhead	1,313,653	1,414	1,309,578	1,121	1,310,699	2,954
Production labor	4,009,202	6,593	4,026,921	5,957	4,032,878	*23,676
Production overhead	7,095,694	13,187	7,057,048	11,810	7,068,858	26,836
Production material	1,985,642	*1,322	1,769,935	63,862	1,833,797	151,845
Purchase of equipment and outside production	46,327,808	*445,535	40,266,712	271,555	40,537,967	5,789,841
Direct charges	1,299,589	12,384	1,616,761	215,134	1,831,895	*532,306
Industrial Products Division		31	9,110	870	9,980	*9,980
Cost	82,260,738	*414,327	74,759,390	608,894	75,368,284	6,892,454
Material and equipment			43,327,000		43,142,000	

RATES

Element of cost	Present contract target		Expenditures				Status of project					
			Current month		Cumulative to date		Estimated balance to complete		Estimated total cost		Over (*) or under col. 1	
	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead
Engineering												
Base installation												
Developmental												
Special test equipment												
Tooling												
Inspection												
Production												

HOURS

Element of cost	Present contract target	Current month	Cumulative to date	Status of project		
				Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering	1,430,071	*250	1,390,078	----------	1,390,078	39,993
Base installation	210,271	493	309,888	6,045	315,933	*105,662
Developmental	279,905	294	218,974	----------	218,974	60,931
Special test equipment	192,398	----------	217,187	----------	127,187	65,211
Tooling	182,896	10	159,188	12	159,200	23,696
Inspection	274,698	246	275,204	195	275,399	*701
Production	1,487,531	2,294	1,505,312	2,054	1,507,366	*19,835

* Indicates red figures.

Aero-Space Division—IM–99 Program

No. of missiles: 78
Bases of weapon support equipment: 2
I.C. & C.:
Date: November 1961

Work orders:
Model:
Contract: AF–33(600)–36319 (FPI)

LABOR, OVERHEAD, AND MATERIAL DOLLARS

Element of cost	Initial contract target	Expenditures		Status of project		
		Current month	Cumulative to date	Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering labor	$4,844,038	*$1,247	$5,038,605	----------	$5,038,605	*$194,567
Engineering overhead	4,713,622	*1,330	5,688,719	----------	5,688,719	*975,097
Base installation department labor	55,635	1,633	971,029	$19,810	990,839	*935,204
Base installation department overhead	25,275	1,264	1,103,861	8,303	1,112,164	*1,086,889
Developmental labor	619,757	837	648,681	----------	648,681	*28,924
Developmental overhead	820,954	1,692	977,662	----------	977,662	*156,708
Developmental material	135,941	651	681,174	3,172	684,346	*548,405
Special test equipment labor	1,681,045	----------	371,278	----------	371,278	1,309,767
Special test equipment overhead	3,010,274	----------	602,524	----------	602,524	2,407,750
Special test equipment material	4,750,983	*5,384	523,489	6,511	530,000	4,220,983
Tooling labor	1,342,861	32	472,500	38	472,538	870,323
Tooling overhead	2,359,047	55	739,725	69	739,794	1,619,253
Tooling material	211,972	*1	85,591	409	86,000	125,972
Inspection labor	166,249	719	798,487	573	799,060	*632,811
Inspection overhead	290,442	1,414	1,309,578	1,121	1,310,699	*1,020,257
Production labor	6,950,163	6,593	4,026,921	5,957	4,032,878	2,917,285
Production overhead	13,009,279	13,187	7,057,048	11,810	6,068,858	5,940,421
Production material	784,529	*1,322	1,769,935	63,862	1,833,797	*1,049,268
Purchase of equipment and outside production	66,463,326	*445,535	40,266,712	271,255	40,537,967	25,925,359
Direct charges	2,042,856	12,384	1,616,761	215,134	1,831,895	210,961
Industrial products division	----------	31	9,110	870	9,980	*9,980
Cost	114,278,248	414,327	74,759,390	608,894	75,368,284	38,909,964

RATES

Element of cost	Present contract target		Expenditures				Status of project					
			Current month		Cumulative to date		Estimated balance to complete		Estimated total cost		Over (*) or under col. 1	
	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead
Engineering												
Base installation												
Developmental												
Special test equipment												
Tooling												
Inspection												
Production												

HOURS

Element of cost	Initial contract target	Current month	Cumulative to date	Status of project		
				Estimated balance to complete	Estimated total cost	Over* or under col. 1
Engineering	1,335,037	*250	1,390,078		1,390,078	*55,401
Base installation	17,096	493	309,888	6,045	315,933	*298,837
Developmental	208,985	294	218,974		218,974	*9,989
Special test equipment	592,166		127,187		127,187	464,979
Tooling	475,782	10	159,188	12	159,200	316,582
Inspection	60,146	246	275,204	195	275,399	*215,253
Production	2,570,179	2,294	1,505,312	2,054	1,507,366	1,062,813

*Indicates red figures.

CONTRACT AF–33(600)–36319

ENGINEERING DEPARTMENT OVERRUN (*)/UNDERRUN ANALYSIS

1. Program Management Office *21,741

In October 1959 the Program Management Office was established as a direct, rather than indirect, organization. The initial contract target was never revised to cover this expenditure, an accumulation of man-hours from October 1959. These man-hours were based on a level of effort during the missile delivery period of the contract.

2. Special test equipment transfer of responsibility *130,000

The engineering department acquired this responsibility from the manufacturing department. In the initial contract this was priced as a manufacturing item of effort.

3. Miscellaneous engineering underruns 96,340

The miscellaneous engineering underrun items on this initial contract were influenced by the following items, estimated with the aid of accumulated history from contracts 32832 and 35359.

A. PRR's and "no cost" ECP activity low, compared to 32382 and 35359.

B. I.C. & C. costs low, compared to 32832 and 35359.

C. Contingency for anticipated problems low, compared to 32832 and 35359.

D. Due to the history of problems experienced with subcontractors on the publication of Handbooks and Illustrated Parts Breakdown" on contracts 32832 and 35359, large items of effort were estimated and performed inplant on this contract. This resulted in lower costs, compared to the other contracts.

Total overrun:

Man-hours	*55,401
Labor dollars	*$207,917
Overhead dollars	*$227,476

CONTRACT AF–33(600)–36319

BASE INSTALLATION DEPARTMENT OVERRUN (*)/UNDERRUN ANALYSIS

	Hours
1. In November 1958 the base installation department was established with the responsibility to perform field operation functions, such as production planning, production control, scheduling, coordination, liaison, etc. These functions were included in the initial contract proposal under engineering man-hour labor. Hours assigned to the base installation department were based on the target reset in August 1959 but not shown in the initial contract. (See "Engineering" for underrun.) Result, an overrun of	193,175
2. The delivery of the I.C. & C. equipment was not received on schedule and equipment lacking necessary accuracy to measure the reliability of the installation resulted in schedule slides. Authorization was not received from the Air Force and the Corps of Engineers to make changes on a timely basis. The result of this situation at bases A–2 and A–3 necessitated the Seattle area support to be extended for base A–2 from December 1, 1959, to December 28, 1960, and on base A–3 from March 1, 1960, to September 19, 1960. Result, an overrun of	76,914
3. No most changes such as ECP–391–4 (helium tank fix) and ECP–477 (improve radar performance) resulted in an overrun of	28,749
Total overrun:	
Labor hours	298,837
Labor dollars	$933,323
Overhead dollars	$1,121,765

CONTRACT AF–33(600)–36319

DEVELOPMENTAL MATERIAL OVERRUN (*)/UNDERRUN ANALYSIS

1. Publications	*$548,405
The publications requirements on this contract were estimated as outside production and purchase of equipment in the initial contract estimate. A transfer was never made to the contract.	

CONTRACT AF–33(600)–36319

Tooling

	Contract target	Latest estimate	Over(*) or under
Labor hours	475,782	159,200	316,582
Labor dollars			$894,203
Overhead dollars			1,569,901
Tool material	$211,972	$86,000	125,972
Total			2,590,076

REASONS FOR DIFFERENCE BETWEEN INITIAL AND LATEST ESTIMATE

1. Large production underrun generated a large underrun in sustaining tooling.

Sustaining tooling was originally estimated at 18.4 percent of estimated total direct factory labor hours or 18.4 percent times 2,334,966 equals 429,634.

Present production underrun of 1,062,813×18.4=195.557.

2. Factor applied for sustaining tooling (18.4 percent) was too high. Actual percentage was 10 percent.

CONTRACT AF-33(600)-36319

Inspection overrun(*)/underrun analysis

	Man-hours	Labor dollars	Overhead dollars
Initial contract target	60,146		
Latest estimate	275,399		
Over (*) or under	*215,253	*$624,391	*$1,024,467

Prior to January 1, 1959, quality control charged their labor to overhead accounts. When certain quality control units went on a direct charge basis, a target estimate was established by use of an overhead rate differential and this amount was transferred from overhead to direct labor. This differential in overhead rates was not sufficient to absorb the impact of the large number of quality control personnel necessary in the Bomarc program.

It was soon apparent that the initial target was very inadequate for the extensive support that was necessary for quality control to give to production in the missile and weapon support equipment effort and also in support to special test equipment, missile training unit equipment, and in the operation of the calibration and certification laboratory.

In the renegotiation of the contract these factors were taken into consideration. The negotiated target plus contract changes versus the latest estimate results in an overrun of only 701 man-hours.

CONTRACT AF-33(600)-36319

Production—Missile overrun/underrun analysis

	Man-hours	Labor dollars	Overhead dollars
Initial contract target	2,467,398		
Latest estimate	1,271,579		
Over (*) or under	1,195,819	$3,224,116	$5,613,137

The initial negotiations for contract 36319 production labor were conducted at a period when historical data indicated an extremely high cost curve. This is illustrated by the cost curve presentation.

The factors which have contributed to the underruns are (1) a centralized manufacturing facility at the present missile production center; (2) the "product company" concept adopted by the manufacturing department; (3) the installation of an effective manufacturing cost control system; (4) concentration on key problem areas by manufacturing engineers and industrial methods personnel.

The possession of a unified and consolidated manufacturing facility was not evident beyond the planning stages at the time of the original estimate. The production of Bomarc hardware was scattered throughout a number of areas in the Seattle Boeing complex. The company invested $6 million in the present missile production facility for the purpose of consolidating Bomarc fabrication, assembly, and testing operations.

In March of 1959 the manufacturing department was reorganized into five "product companies": Tanks, electronics, structures, weapon support equipment, and testing. This reorganization was completed in July of 1959, and each "company" became an autonomous unit with its own manufacturing engineering group, methods and cost control group, and parts control group. This reorganization allowed full utilization of manpower and equipment and had a marked effect upon man-hour expenditures.

After manufacturing lines of responsibility were more clearly defined, manufacturing engineers and manufacturing research personnel were more easily able to determine trouble areas, and concentrate their efforts toward technical breakthroughs. These technical breakthroughs were accomplished primarily in the electronics area.

At the time of target reset for this contract, cognizance of the above items was given as evidenced by the underrun of only 14,106 man-hours to the negotiated amount.

CONTRACT AF-33(600)-36319

Production material as of Nov. 30, 1961

Contract	$784,529
Estimate	1,833,797
Net overrun	1,049,268
Percent over	133.74

Reasons for overrun:

1. ECP-391-4 work not included in the contract for which cost is being experienced		$89,197
2. Vendor tool service, repair and modification charges in excess of negotiated amount:		
Negotiated amount	$13,901	
Actuals Nov. 30	79,776	
		65,875
3. Scrap and material writeoff not in negotiated contract		27,535
4. Costs experienced on old Seattle division work orders not negotiated as production material		539,644
5. Production material procured in support of tank manufacture caused by Kaiser tank recall		327,017
Total		1,049,268

CONTRACT AF-33(600)-36319

Purchase of equipment, outside production, and others, as of Nov. 30, 1962

Item	Initial contract	Estimate	Over(*) or under
ECP-391-4	0	$400,000	*$400,000
PRR allowance	$5,904,708	0	5,904,708
Weapons support equipment on site modification	0	410,896	*410,896
Miscellaneous other	25,614,214	12,400,356	13,213,858
Subtotal	31,518,922	13,211,252	18,307,670
Major subcontrator	34,944,404	27,326,715	7,617,689
Total outside production and purchase of equipment	66,463,326	40,537,967	25,925,359

CONTRACT AF–33(600)–36319

Purchase of equipment, outside production, and others, as of Nov. 30, 1961

Item	Contract	Estimate	Over (*) or under
Canadair	[1] 0	$1,789,696	*$1,789,696
Minneapolis-Honeywell	$2,297,550	1,593,076	704,474
OTE reallocation	1,528,295	1,243,921	284,374
ECP–391–4	0	400,000	*400,000
PRR allowance	5,904,708	0	5,904,708
Weapon support equipment on site modification	3,210,128	410,896	2,799,232
Miscellaneous, other	18,578,241	10,807,073	7,771,168
Total	31,518,922	16,244,662	15,274,260

[1] Not in.
*Indicates red figures.

	Initial contract	Reset contract	Estimate	Initial over (*) or under	Reset, over (*) or under
ECP–391–4	0	0	$400,000	$400,000	*$400,000
PRR allowance	$5,904,708	$4,141,112	0	5,904,708	4,141,112
Weapon support equipment on site modification	0	3,210,128	410,896	410,896	2,799,232
Miscellaneous, other	25,614,214	8,897,485	12,400,356	15,213,858	3,502,871
Total	31,518,922	16,248,725	13,211,252	18,307,670	3,037,473

*Indicates red figures.

CONTRACT AF–33(600)–36319

Major subcontractors

Subcontract and item	Initial negotiated prime contract plus changes	Negotiated reset plus changes	Estimated total subcontracts at completion	Over (*) or under initial to subcontract	Over (*) or under reset to subcontract
MISSILE					
Aerojet: Boost rocket	$1,982,760	$1,482,078	$1,647,668	$335,092	*$165,590
Brunswick: Radomes	[1]	236,613	236,613	[1]	0
Canadair: Wings and ailerons	[1]	1,705,754	1,789,489	[1]	*83,735
Lear (astronics): Data link receiver	943,800	765,688	414,806	528,994	350,882
Lear (ground): Coordinate converter	3,188,328	2,165,748	1,885,061	1,303,267	280,687
Motorola:					
Data link decoder	1,410,084	1,137,006	1,137,006	273,078	0
Guidance transponder	719,004	514,644	514,644	204,360	0
Westinghouse: Target seeker	5,821,218	3,393,000	3,393,000	2,428,218	0
Total, missile	14,065,194	11,400,531	11,018,287	5,073,009	382,244
WEAPON SUPPORT EQUIPMENT					
FMC: Launcher erector and hydraulic skid	3,927,000	4,489,449	4,540,844	*613,844	*51,395
ITT Federal: O.T.E. & E.L.E	16,952,210	14,189,103	11,767,584	5,184,626	2,421,519
Total, weapon support equipment	20,879,210	18,678,552	16,308,428	4,570,782	2,370,124
Total	34,944,404	30,079,083	27,326,715	9,643,791	2,752,368

[1] Proposed in-plant.

EXHIBIT No. 11

Aero-Space Division—IM–99 program

Number of missiles: 168
Bases of weapon support equipment: 2
I.C. & C.:
Date: November 1961

Work orders:
Model:
Contract: AF–33(600)–38098(FPI)

LABOR, OVERHEAD, AND MATERIAL DOLLARS

Element of cost	Present contract target	Expenditures		Status of project		
		Current month	Cumulative to date	Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering labor	$5,560,473	$29,384	$5,256,270	$18,877	$5,275,147	$285,326
Engineering overhead	6,547,170	39,445	6,440,694	24,797	6,465,491	81,679
Base installation department labor	2,922,822	4,783	2,943,993	19,493	2,963,486	*40,664
Base installation department overhead	3,429,386	6,770	3,519,375	14,108	3,553,483	*104,097
Developmental labor	359,436	*326	382,948	----------	382,948	*23,512
Developmental overhead	633,376	*471	620,803	----------	620,803	12,573
Developmental material	1,637,519	60,756	1,150,945	107,666	1,258,611	378,908
Special test equipment labor	327,717	----------	219,643	----------	219,643	108,074
Special test equipment overhead	601,099	----------	399,893	----------	399,893	201,206
Special text equipment material	297,669	*153	55,931	5,069	61,000	236,669
Tooling labor	703,288	2,554	509,687	57,886	567,573	135,715
Tooling overhead	937,173	1,053	714,091	21,717	735,808	201,365
Tooling material	357,055	*1,185	61,744	25,988	87,732	269,323
Inspection labor	1,428,575	1,164	1,402,881	2,321	1,405,202	23,373
Inspection overhead	2,555,691	2,252	2,394,750	4,405	2,399,155	156,536
Production labor	5,873,460	7,343	5,929,036	4,725	5,933,761	*60,301
Production overhead	10,919,818	14,229	11,185,925	9,148	11,195,073	*275,255
Production material	3,094,185	7,907	3,435,090	211,089	3,646,179	*551,994
Purchase of equipment and outside production	50,257,703	*605,715	49,600,957	42,055	49,643,012	614,691
Direct charges	2,035,080	*29,687	1,741,535	356,926	2,098,461	*63,381
Industrial products division	----------	80	185,192	1,808	187,000	*187,000
Cost	100,478,695	*459,817	98,151,383	928,078	99,079,461	1,399,234
Materials and equipment	----------	----------	54,305,000	----------	54,697,000	----------

*Indicates red figures.

RATES

Element of cost	Present contract target		Expenditures				Status of project					
			Current month		Cumulative to date		Estimated balance to complete		Estimated total cost		Over (*) or under col. 1	
	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead
Engineering												
Base installation												
Developmental												
Special test equipment												
Tooling												
Inspection												
Production												

*Indicates red figures.

HOURS

Element of cost	Present contract target	Current month	Cumulative to date	Status of project		
				Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering	1,512,777	7,414	1,403,267	4,661	1,407,928	1,104,849
Base installation	794,313	1,543	850,645	6,288	856,933	*62,620
Developmental	123,819	----------	124,635	----------	124,635	*816
Special test equipment	111,137	----------	77,363	----------	77,363	66,774
Tooling	225,772	878	170,171	19,892	190,063	35,714
Inspection	501,899	392	472,468	766	473,234	28,665
Production	2,115,106	2,475	2,231,531	1,591	2,333,122	*118,019

*Indicates red figures.

Aero-Space Division—IM–99 program

Number of missiles: 168.
Bases of weapon support equipment: 2.
I.C. & C.:
Date: November 1961.
Work orders:
Model:
Contract: AF–33(600)–38098 (FPI).

LABOR, OVERHEAD, AND MATERIAL DOLLARS

Element of cost	Initial contract target	Expenditures		Status of project		
		Current month	Cumulative to date	Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering labor	$4,939,256	$29,384	$5,256,270	$18,877	$5,275,147	*$335,891
Engineering overhead	4,916,818	39,445	6,440,694	24,797	6,465,491	*1,548,673
Base installation department labor	3,451,279	4,783	2,943,993	19,493	2,963,486	487,793
Base installation department overhead	3,397,940	6,770	3,519,375	14,108	3,533,483	*135,543
Developmental labor	837,787	*326	382,948	----------	382,948	454,839
Developmental overhead	1,303,918	*471	620,803	----------	620,803	683,115
Developmental material	1,761,143	60,756	1,150,945	107,666	1,258,611	502,532
Special test equipment labor	1,648,508	----------	219,643	----------	219,643	1,428,865
Special test equipment overhead	2,673,871	----------	399,893	----------	399,893	2,273,978
Special test equipment material	1,298,608	*153	55,931	5,069	61,000	1,237,608
Tooling labor	1,882,275	2,554	509,687	57,886	567,573	1,314,702
Tooling overhead	2,618,259	1,053	714,091	21,717	735,808	1,882,451
Tooling material	509,389	*1,185	61,744	25,988	87,732	421,657
Inspection labor	1,334,022	1,164	1,402,881	2,321	1,405,202	*71,180
Inspection overhead	2,100,116	2,252	2,394,750	4,405	2,399,155	*299,039
Production labor	9,458,815	7,343	5,929,036	4,775	5,933,761	3,525,054
Production overhead	15,454,410	14,229	11,185,925	9,148	11,195,073	4,259,337
Production material	3,656,208	7,907	3,435,090	211,089	3,646,179	10,029
Purchase of equipment and outside production	70,100,218	*605,715	49,600,957	42,055	49,643,012	20,457,206
Direct charges	2,026,990	*29,687	1,741,535	356,926	2,098,461	*71,471
Industrial products division	----------	80	185,192	1,808	187,000	*187,000
Cost	135,369,830	*459,817	98,151,383	928,078	99,079,461	36,290,369

RATES

Element of cost	Initial contract target		Expenditures				Status of project					
			Current month		Cumulative to date		Estimated balance to complete		Estimated total cost		Over (*) or under col. 1	
	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead	Labor	Overhead
Engineering												
Base installation												
Developmental												
Special test equipment												
Tooling												
Inspection												
Production												

HOURS

Element of cost	Initial contract target	Current month	Cumulative to date	Status of project		
				Estimated balance to complete	Estimated total cost	Over (*) or under col. 1
Engineering	1,325,934	7,414	1,403,267	4,661	1,407,928	*81,994
Base installation	943,189	1,543	850,645	6,288	856,933	86,256
Developmental	289,897	----------	124,635	----------	124,635	165,262
Special test equipment	588,728	----------	77,635	----------	77,363	511,365
Tooling	631,249	878	170,171	19,892	190,063	441,186
Inspection	475,761	392	472,468	766	473,234	2,527
Production	3,439,211	2,475	2,231,531	1,591	2,233,122	1,206,089

*Indicates red figures.

CONTRACT AF–33(600)–38098

Engineering department overrun (*)/underrun analysis

1. Program Management Office ..... * 98, 675
   The Program Management Office was established as a direct, rather than indirect, organization in October 1959. The expenditures, an accumulation of man-hours from October 1959, were based on a level of effort during the missile delivery period of this contract. The initial contract was never revised to cover these expenditures.
2. Engineering design 68, 245
   The underrun in this effort was due mainly to the faster transition from the IM–99A missile to the IM–99B missile. The initial contract estimate for this last IM–99A production contract was prepared with only contract 32832 and 35359 history available. The estimate was developed from engineering group inputs, but before this program began, the engineering department was reorganized and similar functions consolidated. This eliminated duplication of effort between groups, and brought engineering functions under tighter management control.
3. Publication data ..... * 51, 564
   This area's man-hour overrun to the initial contract target was mainly due to the recall of the FCO handbooks from Farnsworth, which was a subcontract item in the initial contract. The Langley base schedule slide, also not covered in the initial contract, was another factor in this area's overrun condition.

Total overrun:

Man-hours	* 81, 994
Labor dollars	* $307, 212
Overhead dollars	$376, 534

*Indicates red figures.

CONTRACT AF–33(600)–38098

Base installation department, overrun (*)/underrun analysis

1. The delivery of the installation calibration and checkout equipment was not received on schedule. Equipment lacking necessary accuracy to measure the reliability of the installation resulted in schedule slides. Authorization was not received from the Air Force and Corps of Engineers to make changes and corrections to both equipment and shelters on a timely basis. The result of this situation at bases A–4 and A–5 necessitated the Seattle area support to be extended for base A–4 from June 1 to December 28, 1960, and on base A–5 from August 1 to June 7, 1960. Result an overrun of ..... * 42, 602
2. No cost changes at bases A–4 and A–5, such as ECP–391–4 (helium tank fix), ECP–477 (improve radar transponder performance) resulted in an overrun of ..... * 20, 018
3. This reduction is primarily due to departmental reorganization and consolidation of similar functions. This eliminated duplicatng effort between groups whch resulted in a general reduction of Seattle support personnel and brought these functions under tighter management control. Result an underrun of 148, 876

Total underrun:

Labor hours	86, 256
Labor dollars	$315, 627
Overhead dollars	$310, 752

CONTRACT AF–33(600)–38098

Tooling

	Contract target	Latest estimate	Over (*) or under
Labor hours	631,249	190,063	441,186
Labor dollars	$1,882,275		$1,315,540
Overhead dollars	2,618,259		1,829,927
Material dollars	509,389	$87,732	421,657
Total			3,567,124

*Indicates red figures.

REASONS FOR UNDERRUN

1. Since this was a sustaining program for tooling, the original estimate was prepared by application of a factor (16 percent) of the production labor hours. This rate was based on history accumulated through December 1958 in all previous Bomarc contracts. Actual experience showed that the sustaining factor of 16 percent was high and the production labor estimate was also high. It is felt this resulted from two principal factors:

(*a*) This was the last model A missile program, so the tools were allowed to drift closer to their acceptable tolerances.

(*b*) Consolidation of manufacturing activity resulted in a consolidation of tooling and permitted maintenance to be performed by fewer people.

CONTRACT AF–33(600)–38098

Inspection overrun(*)/underrun analysis

	Man-hours	Labor dollars	Overhead dollars
Initial contract target	475,761		
Latest estimate	473,234		
Over (*) or under	2,527	$7,083	$11,156

NOTE.—At the time the initial Contract target was made the scope of quality control support activities on the prior IM–99A contracts was well formulated, and very little change to the original estimate was experienced.

CONTRACT AF–33(600)–38098

Production—Missile overrun/underrun analysis

	Man-hours	Labor dollars	Overhead dollars
Initial contract target	3,284,822		
Latest estimate	1,898,122		
Over (*) or under	1,386,700	$3,697,048	$7,382,034

The initial negotiations for contract 38098 production labor were conducted at a period when historical data indicated an extremely high cost curve. This is illustrated by the cost curve presentation.

The factors which have contributed to the underruns are (1) a centralized manufacturing facility at the present missile production center; (2) the "product company" concept adopted by the manufacturing department; (3) the installation of an effective manufacturing cost control system; (4) concentration on key problem areas by manufacturing engineers and industrial methods personnel.

The possession of a unified and consolidated manufacturing facility was not evident beyond the planning stages at the time of the original estimate. The production of Bomarc hardware was scattered throughout a number of areas in the Seattle Boeing complex. The company invested $6 million in the present missile production facility for the purpose of consolidating Bomarc fabrication, assembly, and testing operations.

In March of 1959 the manufacturing department was reorganized into five "product companies"—tanks, electronics, structures, weapon support equipment, and testing. This reorganization was completed in July 1959, and each "company" became an autonomous unit with its own manufacturing engineering group, methods and cost control group, and parts control group. This reorganization allowed full utilization of manpower and equipment, and had a marked effect upon man-hour expenditures.

After manufacturing lines of responsibility were more clearly defined, manufacturing engineers and manufacturing research personnel were more easily able to determine trouble areas and concentrate their efforts toward technical breakthroughs. These technical breakthroughs were accomplished primarily in the electronics area.

At the time of target reset for this contract, cognizance of the above items was given as evidenced by the overrun of 61,933 man-hours to the renegotiated amount.

CONTRACT AF–33(600)–38098

Production material as of Nov. 30, 1961

Contract	$3, 656, 208
Estimate	3, 646, 179
Net underrun	10, 029
Percent under	0. 27

CONTRACT AF–33(600)–38098

Purchase of equipment, outside production, and others, as of Nov. 30, 1961

Item	Initial contract	Estimate	Over (*) or under
ECP–391–4	0	*$275, 092	*$275, 092
Weapon support equipment on site modification	0	254, 577	*254, 577
PRR	$2, 875, 184	0	2, 875, 184
Miscellaneous, other	21, 656, 192	16, 633, 494	5, 022, 698
Total	24, 531, 376	17, 163, 163	7, 368, 213

*Indicates red figures.

CONTRACT AF–33(600)–38098

Purchase of equipment, outside production, and others, as of Nov. 30, 1961

Item	Contract	Estimate	Over (*) or under
Canadair	$4,097,685	$3,576,338	$521,347
Minneapolis-Honeywell	1,070,440	1,081,347	*10,907
OTE reallocation	0	138,679	*138,679
ECP–391–4	0	275,092	*275,092
Weapon support equipment on site modification	0	254,577	*254,577
PRR	2,875,184	0	2,875,184
Miscellaneous, other	16,488,067	11,837,130	4,650,937
Total	24,531,376	17,163,163	7,368,213

Initial contract item	Initial contract	Reset contract	Estimate	Initial over (*) or under	Reset over (*) or under
ECP–371–4	0	0	$275,092	$275,092	$275,092
Weapon support equipment on site modification	0	0	254,577	254,577	254,577
PRR	$2,875,184	$289,175	0	2,875,184	289,175
Miscellaneous, other	21,656,192	15,879,127	16,633,494	5,022,698	754,367
Total	24,531,376	16,168,302	17,163,163	7,368,213	994,861

CONTRACT AF–33(600)–38098

Major subcontractors

Subcontract and item	Initial negotiated prime contract plus changes	Negotiated reset plus changes	Estimated total subcontracts at completion	Over (*) or under initial to subcontract	Over (*) or under reset to subcontract
MISSILE					
Aerojet: Boost rocket	$4,250,553	$3,276,000	$3,348,565	$901,988	*$72,565
Brunswick: Radomes	451,309	419,588	425,083	26,226	*5,495
Canadair: Wings and ailerons	3,811,768	3,581,595	3,576,338	235,430	5,257
Lear (Ast): Data link receiver	1,360,800	1,019,760	610,616	750,184	409,144
Lear (Gr.): Coordinate converter	6,791,782	3,528,000	3,351,079	3,440,703	176,921
Motorola:					
Data link decoder	2,658,982	2,116,800	2,075,640	583,342	41,160
Guidance beacon	1,243,200	894,096	878,640	364,560	15,456
Westinghouse: Target seeker	10,011,578	6,132,000	6,222,215	3,789,363	*90,215
Total, missile	30,579,972	20,967,839	20,488,176	10,091,796	479,663
WEAPON SUPPORT EQUIPMENT					
FMC: Launcher erector and hydraulic skid	3,370,400	3,278,125	3,206,657	163,743	71,468
ITT Federal: E.L.E. & O.T.E.	11,618,470	9,843,437	8,785,016	2,833,454	1,058,421
Total, weapon support and equipment	14,988,870	13,121,562	11,991,673	2,997,197	1,129,889
Total	45,568,842	34,089,401	32,479,849	13,088,993	1,609,552

CONTRACT AF-33(600)-38098

Direct charges

	Contract target	Latest estimate	Overrun (*) or underrun
Freight		$339,414	
Travel		517,262	
Taxes		449,837	
Termination claims		445,178	
Insurance		9,964	
Miscellaneous		90,871	
Subtotal	$1,748,932	1,852,526	*$103,594
Percent	(1.312)	(1.910)	
Canadair assist	278,058	245,935	32,123
Total cost	2,026,990	2,098,461	*71,471
Percent	(1.520)	(2,164)	

*Indicates red figures.

EXHIBIT 12

DEPARTMENT OF THE AIR FORCE,
Washington, D.C., April 2, 1962.

Mr. PAUL J. TIERNEY,
Assistant Counsel, Permanent Subcommittee on Investigations, Committee on Government Operations, U.S. Senate.

DEAR MR. TIERNEY: This is in response to your recent request for pricing data relating to three Bomarc contracts. The information which you requested is given in the enclosure.

Sincerely,

JAMES O. MCKEE,
Colonel, U.S. Air Force, Chief, Investigations Branch, Congressional Committee Division, Office of Legislative Liaison.

AF-36319

Westinghouse proposed to Boeing target seeker unit cost, $73,730

Supported by prior contracts	Latest estimate	Purchase order average unit cost
AF-19589 38XIM	$185,714	
AF-32832 45YIM	160,618	
AF-35359 23IM		$92,875
AF-36319 78IM		73,730

Boeing added 15 percent, 5 percent each for (1) deviations and waivers; (2) PRR's and upward revisions; (3) quality test program.

Total unit cost proposed by Boeing to AF, $84,791.

ITT Federal proposed to Boeing:

OTE	$1,720,400
ELE	7,519,000
Total	9,239,400

Boeing added PRR factor of 13.0543545 percent and proposed to Air Force $10,445,544 in initial proposal.

Lear proposed to Boeing coordinate converter unit cost, $40,875

Supported by prior contracts	Latest estimate	Purchase order average unit cost
AF-19589 39XIM	$89,395	
AF-32832 45YIM	52,802	
AF-35359 23IM		$44,523
AF-36319 78IM		40,875

Boeing added 15 percent, as above; proposed $47,007 to Air Force.

Lear proposed to Boeing data link receiver unit cost, $12,100

Supported by prior contracts	Latest estimate	Purchase order average unit cost
AF-19589 56XIM	$6,393	
AF-32832 45YIM	13,090	
AF-35359 23YIM		$10,152
AF-36319 78IM		12,100

Boeing added 15 percent, as above; proposed $13,915 to Air Force.

AF-38098

Westinghouse proposed to Boeing target seeker unit cost, $59,593

Supported by prior contracts	Latest estimate	Purchase order average unit cost
AF-32832 45YIM	$90,636	N/S
AF-35359 23IM	104,507	$95,006
AF-36319 78IM	85,157	73,730
AF-38098 168IM	59,593	59,593

Boeing added 15 percent, 7½ percent each for (1) PRR's and upward revisions; and (2) quality test program.

Total unit cost proposed by Boeing to Air Force, $68,531.

ITT Federal proposed to Boeing:

OTE	$7,420,788
ELE	4,371,080
Total	11,791,868

Boeing added PRR factor of 15 percent, as above; proposed to Air Force, $13,560,648 in initial proposal.

Lear proposed to Boeing coordinate converter unit cost, $40,427

Supported by prior contracts	Latest estimate	Purchase order average unit cost
AF-32832 45YIM	$52,673	$52,802
AF-35359 23IM	47,918	43,562
AF-36319 78IM	47,213	40,822
AF-38098 168IM	40,427	40,427

Boeing added 15 percent, as above; proposed unit cost to Air Force, $46,491.

Lear proposed to Boeing data link receiver unit cost, $8,100

Supported by prior contracts	Latest estimate	Purchase order average unit cost
AF-32832 45YIM	$19,365	$14,387
AF-35359 23IM	12,359	10,132
AF-36319 78IM	10,810	9,817
AF-38098 168IM	----------	8,100

Boeing added 15 percent, as above; proposed unit cost to Air Force, $9,316.

AF-38101

Westinghouse proposed to Boeing

	Total	Unit
Target seeker hardware	$11,428,320	$98,520
Tooling	6,499,165	56,027
Total	17,927,485	154,547

NOTE.—Above represents initial negotiated prime contract plus changes. Supported by P. O. prices plus comparisons to earlier contracts. Boeing add-on for PRR factor: 35 percent on hardware costs, 15 percent on tooling cost. Total proposed by Boeing to Air Force, $22,902,272 or $197,433 per unit.

DEPARTMENT OF THE AIR FORCE STAFF MESSAGE BRANCH

UNCLASSIFIED MESSAGE

(Unclassified from ASKPB-4-01 for Paul J. Tierney, assistant counsel for McClellan subcommittee.)

TO OFFICE OF THE SECRETARY OF THE AIR FORCE,
Office of Legislative Liaison, Washington, D.C.:

This message confirms our telephone conversation of April 13, 1962. Your request was for reconciliation of initial target costs for work subcontracted to ITT Federal by the Boeing Co. under contract AF-36319. In a TWX dated March 27, 1962, this Office reported that proposed initial target costs for work subcontracted to ITT Federal amounted to $9,239,000, exclusive of PRR factor. This figure did not agree with a figure from another document which indicated these costs to be $16,952,210. During the April 13 conversation, I indicated that the $9,239,400 was proposed to cover only selected long-leadtime items. Later negotiation of shorter leadtime items resulted in an upward adjustment of proposed costs for this effort.

EXHIBIT NO. 13

ROUTING	INITIALS
R. MARQUARDT	R I m
G. SMITH	Gil
R. DAVIS	
F. KOOGLER	
D. RIBAR	
A. MORONELL	

MEMORANDUM TO: DAYTON OFFICE

MEMORANDUM FROM: R. E. DAVIS

COPIES TO: W. BRANDT
D. HERBERT
H. R. FERGUSON
H. W. RITCHEY
J. WIGGINS
B. WILHITE
J. HIGGINSON

SUBJECT: BOMARC MEETING HELD AT W-PAFB ON 22 AND 23 SEPTEMBER 1959

DATE: 24 SEPTEMBER 1959

ON 22 AND 23 SEPTEMBER 1959, A MEETING WAS HELD AT W-PAFB, DAYTON, OHIO, TO PRIMARILY RESOLVE THE NUMBER OF MOTORS TO BE TESTED IN THE XM-51 QUALIFICATION PROGRAM. THE FOLLOWING PERSONNEL ATTENDED THIS MEETING:

JACK W. GREENE, BAC, BOMARC, SOLID ROCKET GROUP
HARRY DAVIDSON, BAC, BOMARC, SOLID ROCKET GROUP
N. S. RUDER, BAC, BOMARC, SOLID ROCKET GROUP
H. T. CLARK, CAPT., FTRDS, EAFB, CALIFORNIA
V. J. MORGAN, CAPT., FTRDS, EAFB, CALIFORNIA
R. M. ELLIS, WCLPBRW, WADC
R. L. MARQUARDT, TCC, DAYTON, OHIO OFFICE
R. E. DAVIS, TCC, DAYTON, OHIO OFFICE
J. P. MCGOVERN, TCC, UTAH DIVISION
J. V. WILLIAMS, BOMARC, OOAMA
L. R. RUBLE, AIRMUNITIONS, OOAMA (OOYQ)
B. D. ELSENBERGER, AIRMUNITIONS, OOAMA (OOYEE)
W. W. BRANDT, TCC, UTAH DIVISION
B. D. HERBERT, TCC, REDSTONE DIVISION
A. S. FISHER, BAC
LT. M. N. FUNNELL, LMDN-AMC, BOMARC WSPO
LT. D. W. FEDDERSON, RDZSDB-ARDC, IM-99 WSPO
J. R. KEROSEI, RDZSDB-ARDC, IM-99 WSPO

1. THE MEETING WAS OPENED BY MR. HARRY DAVIDSON OF BOEING AIRPLANE COMPANY WHO REVIEWED THE HISTORY OF THE XM51 DEVELOPMENT PROGRAM UP TO THE CURRENT TIME. SPECIFIC ITEMS DISCUSSED BY MR. DAVIDSON ARE AS FOLLOWS:

1. TYPE OF PROPELLANT, DESIGN CRITERIA, JETAVATOR DESIGN, EXPLOSIVE HAZARDS CLASSIFICATION TESTS; A DISCUSSION OF THE MOST RECENT REDUCTION IN REJECTION RATE OF THE XM51 ROCKET MOTORS; A DISCUSSION OF THE NECESSARY WEIGHT REDUCTION REQUIRED IN THE BLAST TUBE AREA TO MEET THE REQUIREMENTS SPECIFICATION.

2. A DISCUSSION OF THE ERROSION THAT HAS TAKEN PLACE ON THE JETAVATORS WHICH MAY BE A POTENTIAL PROBLEM.

3. Another area discussed by Mr. Davidson was the most recent cracking that has occurred with the L7019C (TPL-8113) propellant. The propellant has survived extended low temperature storage at minus 65 F, however upon shock exposure to temperature cycling, cracks have occurred in motors number 102 and 105. It was pointed out that it may be necessary to review the requirement for shock temperature cycling and allow the motor to be warmed up gradually from the low temperature, thus possibly relieving some of the problems that have occurred. The Air Force and Boeing Airplane Company definitely believe, at this time, that Thiokol should still pursue the requirement for providing a qualified XM51 solid propellant rocket motor which will meet minus 65°F transportation requirement. Mr. Davidson also discussed the Aerojet backup program of which four motors were fired successfully, with a modified Polaris propellant, and two motors were fired with a modified GAR-9 propellant system. Mr. Davidson pointed out that these tests were considered to be a success and that a 7th static test was being considered at Aerojet with the funds remaining from the 6 motor demonstration program.

II. Mr. Jack Green of Boeing Airplane Company presented a program by which Boeing feels a reduced qualification program for the XM51 solid propellant rocket motor could be pursued. Given below are the highlights from Mr. Jack Green's presentation:

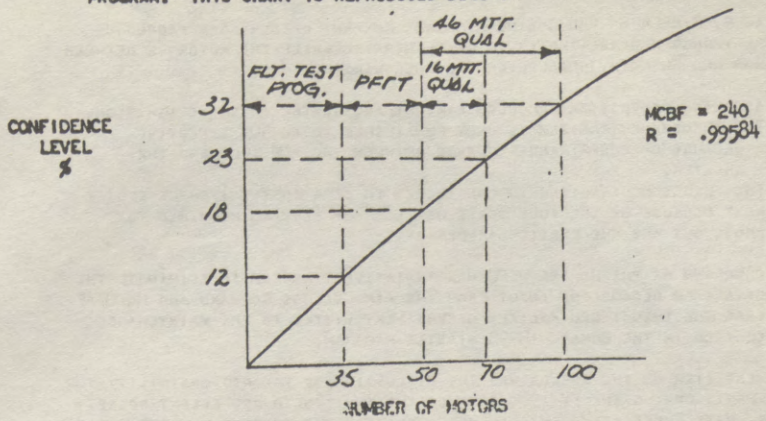
Item A. Can cost reduction be accomplished in the solid propellant rocket motor qualification test program without significant reduction in missile reliability.

Item B. There have been, up to this time, 64 development firings utilizing the XM51 rocket motor. Boeing proposes a qualification test program comprised of 16 motors vs the original requirement of 46 motors. A detailed outline of the reduced qualification test program as proposed by Boeing Airplane Company, is attached as Exhibit 1.

Item C. The various areas the qualification test program can be reduced, are as follows:

1. Reduce the number of motors in any one test condition.
2. Reduce the duplication of test conditions.
3. Eliminate test conditions that are not known to be problem areas such as altitude ignition and temperature gradient tests.
4. Eliminate test conditions not applicable to the IM99S missile.
5. Test the minimum number of rocket motors that will give the essential combinations of environmental conditions.

ITEM D. MR. GREEN PRESENTED A CHART CORRELATING THE CONFIDENCE LEVELS OBTAINABLE, WITH A RELIABILITY OF .99584, AND A MEAN CYCLE BETWEEN FAILURE OF 240 FOR VARIOUS NUMBERS OF TESTS IN THE XM51 ROCKET MOTOR PROGRAM. THIS CHART IS REPRODUCED BELOW:



UP UNTIL THIS TIME, IN XM51 SOLID PROPELLANT ROCKET MOTOR, THERE HAVE 67.5% ACCEPTABLE MOTORS WITH 32.5% REJECTED. THE REJECTION RATE IS ESSENTIALLY HIGH, HOWEVER, THIS IS PRIMARILY DUE TO THE SEVERE GASING PROBLEM ENCOUNTERED WITH L-750 COPOLYMER SYSTEM. THERE HAVE BEEN 52% OF THESE MOTORS STATIC TESTED WITH 15.5% REMAINING IN IGLOOS AT THE REDSTONE DIVISION AWAITING DISPOSITION. TEST RESULTS HAVE INDICATED THAT 44% OF THE 52% STATIC TEST MOTORS WERE COMPLETELY SATISFACTORY WITH ONLY 8% OF THE TESTS BEING UNSATISFACTORY. OF THE 8% (10 MOTORS) SIX (6) FAILURES WERE DIRECTLY RELATED TO FAILURES OCCURRING IN THE NOZZLE AND BLAST TUBE BECAUSE OF THE EXTENSIVE DEVELOPMENT PROGRAM DIRECTED TOWARD WEIGHT REDUCTION. ONE MOTOR WAS DELIBERATELY STATIC TESTED KNOWING THAT A MALFUNCTION WOULD UNDOUBTEDLY OCCUR DUE TO A VOID VISUALLY AND RADIOGRAPHICALLY APPARENT IN THE PROPELLANT. ANOTHER MOTOR WAS A FAILURE DUE TO AN INITIATOR LEAKAGE. THIS TYPE OF FAILURE WOULD NEVER BE REPRODUCED IN A QUALIFICATION TEST PROGRAM OR A PRODUCTION RUN. ANOTHER MOTOR CONSIDERED TO BE AN UNSATISFACTORY STATIC TEST WAS A MOTOR THAT HAD BEEN DAMAGED IN CUTBACK AND POTTED WITH POLYMER WHICH WOULD NEVER BE DUPLICATED IN EITHER A QUALIFICATION PROGRAM OR A PRODUCTION RUN. OF ALL THE MOTORS THAT WERE CONSIDERED UNSATISFACTORY IN STATIC TESTING, THERE WAS ONLY ONE MOTOR FULLY INSPECTED RADIOGRAPHICALLY AND VISUALLY, AND FOUND TO BE ACCEPTABLE, WHICH FAILED. THIS PARTICULAR MOTOR CONTAINED L-750 COPOLYMER PROPELLANT SYSTEM WHICH WAS KNOWN TO BE MARGINAL REGARDING PROCESSING.

ITEM E. MR. GREEN STRESSED THAT A 16 MOTOR QUALIFICATION TEST PROGRAM COULD BE ACCOMPLISHED WITH SUCCESS WITH AN INTENSIVE PROGRAM INCLUDING RADIOGRAPHIC INSPECTION, VISUAL INSPECTION, ACCEPTANCE TESTING, BATCH TESTING, AND AN ACCEPTABLE STORAGE LIFE PLAN.

III. MR. A. S. FISHER OF THE BOEING AIRPLANE COMPANY PRESENTED A PROPOSAL WHEREBY THE THRUST NEUTRALIZER IS TO BE ELIMINATED WHILE THE MOTOR IS BETWEEN THE A&M SHOP AND SHELTER, BECAUSE OF THE FOLLOWING REASONS:

A. ADEQUATE PROTECTION AFFORDED AGAINST ACCIDENTAL INTERNAL IGNITION.
B. THE THRUST NEUTRALIZER IS ONLY CONSIDERED TO BE 50% EFFECTIVE BECAUSE OF THE TIMING SEQUENCE BETWEEN THE A&M SHOP AND THE SHELTER.
C. THE THRUST NEUTRALIZER IS CONSIDERED TO BE A COSTLY ITEM OF EQUIPMENT BECAUSE OF THE FULL SCALE DEVELOPMENT TESTING REQUIRED TO PROVE OUT ANY ONE PARTICULAR DESIGN.

LT. DON FEDDERSON OF THE BOMARC WSPO HAS TENTATIVELY AGREED TO ELIMINATE THE THRUST NEUTRALIZER BECAUSE OF INPUT FROM THE AIR DEFENSE COMMAND AND HQ USAF WHO FEEL THAT THE THRUST NEUTRALIZER OFFERS VERY LITTLE TO THE MAINTENANCE CONCEPT REQUIRED IN THE BOMARC IM99B MISSILE PROGRAM.

IV. THE NEXT ITEM ON THE AGENDA WAS THE DISCUSSION OF THE RESPONSIBILITY FOR THE METAL PARTS DURING THE FY 1960 BUY FOR THE XM51 SOLID PROPELLANT ROCKET MOTOR. MR. NATE RUDER OF BOEING DISCUSSED BRIEFLY THE REASONS WHY THE BOEING AIRPLANE COMPANY FELT THAT THE METAL PARTS RESPONSIBILITY SHOULD BE THAT OF THE PRIME CONTRACTOR. THESE ITEMS ARE DISCUSSED BRIEFLY BELOW:

SINCE THE ROCKET MOTORS CASE IS AN INTEGRAL PART OF THE MISSILE BODY, IT IS FELT BY BOEING THAT THE BENDING LOADS IMPOSED DURING THE MANEUVERING OF THE MISSILE ARE MORE OF A SEVERE REQUIREMENT THAN THE REQUIREMENT OF THE INTERNAL PRESSURE DEVELOPED BY THE ROCKET MOTOR. BOEING FEELS THAT THE TEMPERATURES DEVELOPED IN THE BLAST TUBE AREA ARE SEVERE ENOUGH WHERE DAMAGE COULD BE DONE TO THE APU AND HYDRAULIC EQUIPMENT IF THE BLAST TUBE DESIGN AND MANUFACTURE WERE NOT DIRECTLY THE RESPONSIBILITY OF BOEING. BOEING ALSO FEELS THAT THE JETAVATORS SHOULD BE CONSIDERED A PORTION OF THEIR RESPONSIBILITY BECAUSE OF THE POSSIBLE NECESSITY OF TIGHTENING UP THE CONTROLS REQUIREMENT.

IN SUMMATION, BOEING FEELS THAT A GREAT DEAL OF THE INERT COMPONENTS FOR THE XM51 ROCKET MOTOR ARE NOT FIRM AT THIS TIME WHICH WILL REQUIRE CONSIDERABLE INPUT FROM BOEING. LT. FEDDERSON POINTED OUT THAT IT IS THE INTENT OF THE AIR FORCE THAT BY GOING GFAE DURING THE FY 1960 BUY OF THE ROCKET MOTORS, THE AIR FORCE WILL BE IN A POSITION TO GAIN A LOWER COST BY OBTAINING COMPETITIVE BIDS ON THE INERT COMPONENTS. LT. FEDDERSON WENT ON TO SAY THAT IT WAS HIS OPINION THAT DURING THE GFAE BUY OF THE MOTOR, THE JETAVATORS, NOZZLES, AND BLAST TUBES SHOULD BE PROCURRED BY THIOKOL CHEMICAL CORPORATION WITH CONSIDERATION TO BE GIVEN ON THE PROCUREMENT OF THE CASE. IT WOULD APPEAR FROM THE MEETING THAT THE METAL PARTS RESPONSIBILITY INCLUDING THE CASE, WOULD BE THAT OF TCC DURING THE FY 1960 BUY. BOEING POINTED OUT THAT THEY WOULD DESIRE TO HAVE THE OPPORTUNITY TO BID ON THE INERT COMPONENTS SHOULD TCC BE GIVEN THIS RESPONSIBILITY. TCC PERSONNEL INFORMED BOEING THAT EVERY CONSIDERATION

WOULD BE GIVEN TO THEM FOR MANUFACTURING THE CASE SHOULD THIOKOL HAVE THE RESPONSIBILITY FOR ALL INERT COMPONENTS DURING THE FY 1960 BUY.

THE MEETING, AS FAR AS REACHING AN AGREEMENT ON THE NUMBER OF STATIC TESTS TO BE PERFORMED IN THE QUALIFICATION TEST PROGRAM, RESULTED IN A STALEMATE. THERE WAS NO DECISION REACHED WHATSOEVER REGARDING THE QUANTITY OF MOTORS TO BE TESTED IN THE QUALIFICATION TEST PROGRAM. THE AIR FORCE WSPO, OGDEN OOAMA AND EAFB ARE GOING TO HAVE ANOTHER MEETING TO REACH AN AGREEMENT ON THE NUMBER OF TESTS TO BE PROVIDED IN THE QUALIFICATION TEST PROGRAM AND BOEING AND THIOKOL WILL BE SO ADVISED OF THESE DECISIONS.

CAPT. CLARKE OF EAFB AIR FORCE FLIGHT TEST CENTER, PROPULSION DIVISION, POINTED OUT TO THE THIOKOL AND BOEING PERSONNEL THAT IF A 16 MOTOR QUALIFICATION TEST PROGRAM WERE APPROVED BY THE WSPO, HE WOULD IN TURN RECOMMEND THAT THE PROPOSAL FOR PROCURRING BOMARC MOTORS GFAE DURING FY 1960 BE RESCINDED AND THAT BOEING IN TURN BE ALLOWED TO PROCURE THE PROPULSION SYSTEM CFE. CAPT. CLARKE STATED THAT HE WOULD TAKE THIS POSITION IN ORDER TO THROW COMPLETE RESPONSIBILITY BACK AT BOEING IF THEY INSIST ON THE REDUCED QUALIFICATION TEST PROGRAM. THIS, OF COURSE, WILL BE PLAYING BACK INTO THE HANDS OF BOEING SINCE THEY DEFINITELY WANT TO CONTINUE PROCURRING THE BOMARC XM51 ROCKET MOTOR CFE AS LONG AS POSSIBLE.

R. E. Davis

R. E. DAVIS

83778 O - 62 - 20

EXHIBIT A

Group #	I	II	III	IV				V				VI				VII
Test #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Statistical																
H	1															
N		2														
L			3													
Sequential																
Rain				4	5			8	9			12	13			
Saltspray				4	5			8	9			12	13			
Humidity				4	5			8	9			12	13			
Temp. Cycle				4	5	6	7	8	9	10	11	12	13	14	15	
Drop Test (Components)																
H (edge, corner, end				4												
N								8								
L												12				
Drop Test (Trailer)																
H				4												
N								8								
L												12				
Drop (Ignitiator in Container)																
H						6	7									
N										10	11					
L														14	15	
Rough Road																
H				4			7									
N								8			11					
L												12			15	
Static Test																
H				4		6										
N								8		10						
L												12		14		
Accel. Aging																16
Jetevator																
H					5		7									
N									9		11					
L													13		15	

EXHIBIT NO. 14

MEMORANDUM

TO: Jack Roberts
Manager, Projects & Proposals

FROM: Bill Brant

DATE: 25 September 1959

SUBJECT: Trip Report

REFERENCE: Qualification Program Scope Meeting, 23 to 23 September 1959, held in Dayton, Ohio at Wright-Patterson Air Force Base

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1. The attendance at the reference meeting is as listed below:

Jack W. Greene	BAC	Bomarc - Solid Rocket Group
Harry Davidson	BAC	Bomarc - Solid Rocket Group
N. S. Ruder	BAC	Bomarc - Solid Rocket Group
H. T. Clark, Capt.	FTRDS	Edwards AFB, California
V. J. Morgan, Capt.	FTRDS	Edwards AFB, California
R. M. Ellis	WCLPBRW	WADC
R. L. Marquardt	Thiokol	Dayton Office
R. E. Davis	Thiokol	Dayton Office
J. P. McGovern	Thiokol	Utah Division
J. V. Williams	Bomarc	OOAMA
L. R. Ruble	Air Munitions	OOAMA (OOYQ)
B. D. Ekenberger	Air Munitions	OOAMA (OOYEE)
W. W. Brant	Thiokol	Utah Division
B. D. Herbert	Thiokol	Redstone Division
A. S. Fisher	BAC	
Lt. M. N. Funnell	LMDN - AMC	Bomarc WSPO
Lt. D. W. Feddersen	RDZSDB-ARDC	IM-99 WSPO
J. R. Korosei	RDZSDB-ARDC	IM-99 WSPO

2. The purpose of this meeting was threefold and is as listed below:

A) The advisability of a forty-nine engine Qualification Program in view of associated costs was in question.

B) The usefulness of a thrust neutralizer for use on the missile during handling at the operational base.

C) Metal parts responsibility of the propulsion contractor during production of the M-51.

3. No definite decisions were reached regarding exact quantity of engines for the actual Qualification Test. Various views and opinions were stated and are as follows:

A. Boeing Airplane Company Position

That proof of the ability of the end item to withstand the environmental treatment of the Qualification Tests could be obtained with sixteen (16) engines and that adequate statistical data regarding engine performance could be obtained. In view of this, the additional expense of a forty-nine engine program did not appear justified. The primary specification requirement for statistics is that only one failure may occur out of every two hundred forty (240) engines delivered.

B. The Weapon System Project Office did not state a position but did reflect a definite desire to reduce the quantity of engines in the Qualification Program.

C. The representatives from Hill Air Force Base, WADC, and the Solid Rocket group from Edwards Air Force Base did not agree with the Boeing presentation. The primary complaint of these personnel was that adequate statistical data could not be obtained from a sixteen (16) engine Qualification Test to provide adequate acceptance data and tolerance bands for use in acceptance of production items.

D. Thiokol Chemical Corporation, in essence, backed Boeing in their position. The basic reasoning behind this position was the result of a discussion between Bob Marquardt, Deane Herbert, and Bill Brant which concluded it would be advisable to complete Qualification as early as possible and begin production. The objective of such action is to get production initiated and therefore open the door to product improvement programs and profit associated with production.

E. The Qualification Testing suggested by Boeing Airplane Company is as follows:

GROUP #	I	II	III		IV				V				VI				VII	
TEST #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Statistical																		
H	1																	
N		2																
L			3															

GROUP #	I	II	III	IV						V		VI				VII
TEST #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sequential																
Rain				4	5			8	9			12	13			
Salt Spray				4	5			8	9			12	13			
Humidity				4	5			8	9			12	13			
Temp Cycle				4	5	6	7	8	9	10	11	12	13	14	15	
Drop Test (Components)																
H				4												
N								8								
L												12				
Drop Test (Trailer)																
H				4												
N								8								
L												12				
Drop (Initiator in Container)																
H						6	7									
N										10	11					
L														14	15	
Rough Road																
H				4			7									
N								8			11					
L												12			15	
Static Test																
H				4		6										
N								8		10						
L												12		14		
Accel. Aging																16
Jetevator																
H					5		7									
N									9		11					
L													13		15	

F. The programs proposed by WADC and as presently contracted are:

Test	Quantity	
	WADC	Contracted
Statistical		
High	4	6
Normal	3	6
Low	4	6

Test	Quantity	
	WADC	Contracted
Sequential		
High	6	6
Normal	4	6
Low	6	6
Altitude Firing Test	0	3
Temperature Gradient	0	4
Accelerated Aging	0	6
Total	27	49

The WADC proposed quantity was not presented during the meeting but given to the Thiokol Chemical Corporation personnel as a side discussion.

4. No definite decisions were reached regarding quantities of engines for the Qualification Program. It is anticipated that the WSPO with the information obtained, will make the decision regarding the final quantity.

5. It should be stated that the WADC and Edwards Air Force Base personnel were extremely disturbed over the possibilities of a 16 engine program. The Thiokol Chemical Corporation personnel were told by the people in a side discussion, that should a 16 engine program be conducted, they wanted no responsibility for production and would recommend that all future production be conducted on a CFE basis.

6. The discussion of the missile thrust neutralizer ended in the conclusion that it should be deleted from the specification for the missile and no longer be a requirement. The only implication of this decision to the Utah Division, is that all proposal effort in support of Solar's RFQ for Missile Thrust Neutralizer testing should be cancelled.

7. Some discussion was held regarding metal parts responsibility of the propulsion contractor in GFAE production procurement. This discussion was pushed by representatives of the WSPO. The general conclusion was that Thiokol Chemical Corporation should definitely be responsible for all parts excluding the case and the general feeling appeared to be that Thiokol Chemical Corporation should be responsible for the case. Bob Marquardt stated that the Thiokol Chemical Corporation position was that it must be responsible for the case if we are to guarantee engine performance. After this particular meeting, Bob Marquardt made a phone call to Joe

Wiggins and discussed case procurement responsbility in production. It was concluded that should Thiokol Chemical Corporation be assigned the responsibility for the case, every effort should be made to assure that Boeing was the fabricator selected since too much of the Thiokol Chemical Corporation business is dependent upon good relations with Boeing. In view of this, Bob Davis advised Nate Ruder that should Thiokol Chemical Corporation be assigned this responsibility that every effort would be made to assure that Boeing received all possible consideration.

W. W. Brant

WWB/lbd

cc: Ed Dorsey
Jim Cole
Gene Hanson
Charles Hodges
Bob Marquardt
Deane Herbert

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