# COMSAT HISTORY PROJECT

## Interview with Louis Pollack

Interview conducted by Nina Gilden Seavey

Interview with Louis Pollack
COMSAT Headquarters
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NBG: Why don't we get started then? And why don't you just tell me briefly when and in what capacity you were most closely associated with COMSAT?

LP: Okay. Well, I joined COMSAT in February of 1967. I joined, actually, the beginnings of COMSAT Labs. My initial position there was manager of what was called RF Techniques Laboratory or RF Techniques Department, I think it was, specifically. [Sidney] Metzger was the Acting Lab Director. COMSAT had, about a year earlier, decided that they needed a research and engineering facility. There was a Board resolution, which I mentioned earlier, to establish COMSAT Labs. I continued at COMSAT Labs for about thirteen years until 1980 and moved up the chain and was Executive Director of COMSAT Labs, I guess starting about 1978. Then in August of '80, I took another job down at the [L'Enfant] Plaza here as a new organization was set-up called, "INTELSAT Technical Services." I became Vice-President of that activity and continued in that activity until July of '84 when I retired--June of '84, June 3 of '84. So most of my career was at COMSAT Labs.

NBG: What were the technological innovations that you were most closely related to and responsible for?

LP: Well, let's see. There are a number of things that come to mind. I'm not sure they're necessarily in chronological order.

NBG: It doesn't have to be.

LP: One of the early developments at COMSAT Labs was a series of ongoing developments; but it started modestly, I guess around 1968. This was in what was later to become multi-beam antennaes. This was, as I say, an ongoing research whose aim was to increase the traffic capacity of satellites by allowing the frequency spectrum to be reused. What that simply means is that you have so much radio frequency spectrum that's assigned to satellite communications and this can be used to transmit information to a geographical area. If you can make the geographical area very small, you can then use that same band to transmit other information to another geographical area. In that way, you can reuse those assigned frequencies several times. To do this required antennae designs that were not readily available, or were not even well-known, at that time. So we started a number of projects--initially at COMSAT Labs

and sponsored by COMSAT Corporation, and then later sponsored by INTELSAT as well as COMSAT Corporation--which incrementally built on the technology, or developed the technology, to result in better and better performance of these multi-beam antennaes. Incidentally, I'm sure if you've interviewed Burke, he must have mentioned an INTELSAT document called, "Ten Years of R&D at INTELSAT."

NBG: I'm familiar with it. I am familiar with it.

LP: Okay. That, I'm sure, mentions the multi-beam antennae development. Incidentally, that was another thing I was looking for. There was an original version that was written at COMSAT Labs which....and I'm assuming we can speak quite frankly....

NBG: Oh, absolutely. I would like to encourage you to speak candidly.

LP: Since that document was concerned with COMSAT....well, with INTELSAT R&D--which involved COMSAT Labs as well as other organizations--we originally wrote it at COMSAT Labs, but then had to coordinate that with INTELSAT. They were kind of slow in approving it and they wanted to edit it. They finally did after about a year and a hilf or almost two, I think, did issue

it; but it was severely edit and, essentially, has very little reference, if any, to COMSAT Labs. I think there's a little piece that they buried someplace about COMSAT LABS. And, you know, it's a little parochial aside, but the original document was much more interesting.

NBG: Is there a copy of that document still in existence?

LP: I couldn't find it. There must be. One person you might try is Pierre Bargolini who served as sort of editor/coordinator. He might know where there's copy of that. But, to go on with your question, another notable development that I feel was a project we started--it must have been late in '69 or early '70, probably more likely '70--which was called, initially, Reliable Earth Terminal Development. It was often referred to as the RET. Then later on that became the Unattended Earth Terminal; it became the UET. The objective here was to develop an improved design which would be sufficiently reliable...well, first, sufficiently reliable so it could operate for long periods of time unattended because there's no people in attendance. Just aside, at that time and even today, earth terminals that are operated by COMSAT--be it international, or still operated, by COMSAT international earth terminals--generally are manned with anywhere from twenty to thirty people. That represents a fairly large expense. We

felt it was possible to improve the technology, not only the microwave technology, but the control and monitoring of the operations in the earth terminal so that you didn't have to have people in attendance at the earth terminal.

NGB: Sure.

LP: You could at some central location and observe the performance and that it was sufficiently reliable so that there'd be a high confidence that you could operate for, let's say, several months without having to go there to do something.

NBG: Let me just ask you one question. Is this the same thing as a remote terminal? Remote antennae? Or not?

LP: Not quite. That's a, let's say, a version or subset.

NBG: Okay.

LP: The concept here was to have an entire earth terminal with all the normal facilities for international transmission to a satellite that indeed was operated remotely but essentially was operated as a self-contained unit automatically.

NBG: I see. Oh, I do see the difference.

LP: Now that development took several years also, but finally resulted in a demonstration model which we built at COMSAT Labs. As a matter of fact, it's still standing there. I'm not sure how much use it's getting. But, it was used for not only to demonstrate that the technology, but that it does work, it's operated with satellites in several demonstrations and so on. There's a whole issue of COMSAT Technical Review that's devoted to describing the earth terminals and the series of developments. Now, I have a copy of that with me. So I can give you that after awhile.

NBG: Right.

LP: An interesting aside perhaps that might be worth noting is that this project came out of a somewhat historical meeting that Doctor [Sig] Reiger organized. I'm sure you've heard his name mentioned many times.

NBG: At least once.

LP: This was a meeting at the homestead. I believe it was in 1970. It was either very late '69 or early '70. The reason the marker I have for the year is that we moved out to Clarksburg and, you know, officially COMSAT Labs in September

of '79. [sic. '69]

NBG: Right.

LP: My recollection is that this meeting must have occurred, I think, the following spring. The purpose of it [the meeting] was to take a look at a comprehensive view of the R&D that we should be doing. Dr. Reiger and Mr. Pritchard, who had become the Director in mid-68, I guess it was and the Lab directors attended this meeting. Then Dr. Charyk joined later. We tried to formulate sort of a five-year plan. Well, there was a number of core projects we called them, that were initiated at that time. This Reliable Earth Terminal was one of those core projects in which we tried to focus a number of related R&D activities into a system, if you wish. And there was another one for a multi-frequency satellite. And there was one for a digital transmission, time division multiple access. That was a very productive meeting. It sort of set a stage for R&D at COMSAT for the next several years; certainly, the following five years.

NBG: Are you saying that you at, that point got, for example, got more involved in digital technology?

LP: No. That had started earlier. But at that point, several

little projects grouped together to become better focused toward some system application.

NBG: So there was sort of a coalescence....

LP: That's right.

NBG: of these programs into a body of programs.

LP: These core projects that were directed at some eventual application in a system as was foreseen at that time. Since my area was the microwave areas (I think by that time it had been called the Microwave Laboratory) the things I focused on were in that field. The Reliable Earth Terminal was that sort of core project which brought together work in antennae design, microwave receivers, and transmitters, into a more focused activity. Then we had a related satellite portion which looked at some of the same issues for satellite. This project I mentioned earlier, the multibeam antennae, branched off into two areas: one for the earth station. As a matter of fact, out of that Reliable Earth Terminal came a unique antennae that COMSAT received a patent for an earth station with multibeams. We also then proceeded with a satellite antennae to achieve multiple beams where you have the added requirement of also achieving very light weight.

NBG: Let me ask you a question. So are you saying that before 1969, that there really wasn't a cohesive plan of R&D? That there was a number of projects....

LP: That's right.

NBG: ....that was somewhat nondirected in terms of how they might interface with each other? And then this meeting in 1969 actually brought these ideas together in some kind of a coherent program?

LP: Yes, I think that was exactly the case. Since the Labs was very young at that time--and as a matter of fact, really had officially been existence only about a year and a half or two at the most--most of the R&D projects at that time were either suggested by the staff in the sense of, "Well, we can make an improvement here or an improvement there," or suggested by the operations that we ongoing at the time. But there wasn't a sort of long range look at, "Well, what will we need to remain in the forefront of satellite communications five years from now, ten years from now. And what then should we develop to meet those needs in the future?" And that really was the purpose of that Homestead meeting.

NBG: Did that idea of planning for the future continue on during your tenture at COMSAT Labs? Or was that a break in time, so to speak, and then so you went about business as usual? What became the modus operandi for that?

LP: Well, I'm sure that on this you'll get several opinions. But my feeling is that, yes, it did continue, not in quite as formal a sense. For instance, we never did have a repeat of that Homestead meeting, well, for quite a long time, as a matter of fact. I guess the next really formal meeting like that didn't occur until perhaps the very late '70s--just before I left COMSAT Labs there was one. But nevertheless, that meeting did set the stage for, as you put it, a modus operandi--a way of looking at the R&D. Internally, the Lab Director and the staff would get together primarily prior to budget time and reformulate the R&D objectives--look at what had been done, and look at what new thoughts there were, and which tasks should be dropped, and any new ones which should be added, and so on. There also came into being, I think as a result of that meeting, the R&D Committee of the Board. This was, I believe, four of the members of the Board were appointed to a committee to oversee the R&D activities at the Labs. Bill Hagerty was the first Chairman of the Board and remained Chairman for a long time. The other members came and went, so I won't bother with that. But annually, they would review the

activities, the program of R&D at COMSAT Labs. That helped continue this planning. But as I say, for a long time after that meeting there wasn't a, let's say, a special two or three days set aside where you would try to thrash out a long-range plan. But it later was revived and I'm not sure what they're doing right now. But about three or four years ago, there was such a meeting.

NBG: So what you're saying is that that '69 meeting was really, in essence, a turning point for the way that the Labs really did their own planning. Even though there wasn't a formalized structure in terms of a series of meetings which came subsequent to that, there was at least a change in the way the planning was done; and that it was much more coherent.

LP: Right. It set a pattern and a style, if you wish.

NBG: And obviously, it developed some objectives which were continually reviewed.

LP: That's right. It emphasized the aspect of, "Let's look at what COMSAT's needs would be as far in the future as we can and address those." Incidentally, this is an old article from the New York Times which mentions this Reliable Earth Terminal and the antennae that came about as a result of that.

NBG: What were some of the other great achievements that you feel like you were involved in, in terms of R&D?

LP: Well, let's see. There were two others that I think are especially important. One was the....many of us at COMSAT Labs felt we wanted to develop the hardware that's used in space. Of course, there were many developments aimed at that. But we wanted to direct--let's see, what would be the right set of adjectives--a direct demonstration of that development; such as a satellite being launched that COMSAT built. That was one of the things that come out of that core project but it never succeeded. In the sense that we never got authorization from COMSAT management to embark on putting together a whole satellite and launching it -- which was probably a wise decision at that time.

NBG: Why do you think so?

LP: Well, it simply was too costly an undertaking to do for the size of the company. There was concern that it would tend to push the Labs into the position of being a competitor to spacecraft manufacturers....

NBG: Exactly my thinking.

LP: ....which I don't personally feel was a problem. As a matter of fact, on the contrary, it would have given us a very excellent, credible, measure to use in judging contracted work to spacecraft manufacturers. But anyway, that battle, or I should say, that discussion proceeded every year.

NBG: So you're saying that COMSAT had the technology and had the ability to construct their own satellites if they had decided that they wanted to get into that business?

LP: Yes. Oh, yes.

NBG: And then that was just an ongoing decision that they did not feel that they wanted to make that move?

LP: That's right.

NBG: I see.

LP: So we took a partial step, though. In the early '70s, NASA was in the process of launching a series of advanced technology satellites--and ATS-6 was one of them; that was, as a matter of fact, the last of the series. COMSAT had proposed to NASA to put on-board the satellite what was called a

propogation experiment. This was a set of transmitters that would radiate a signal to the earth -- and this was a very high frequencies at centimeter waves -- which weren't used yet and also which weren't too well understood in terms of propogation. Earth stations within the beam of that satellite could measure signal level versus time and measure how much the signal was attenuated by rain and clouds and sleet and so on. NASA accepted that proposal and we actually received a contract from NASA for several million dollars -- I believe it was in the order of four or five million dollars -- to build the package to go on-board ATS-6 as well as a number of earth terminals that would be distributed primarily in the eastern portion of the U.S. That was restricted to the eastern portion, simply because the antennaes on ATSF limited the coverage. So, we at COMSAT Labs -- and a large portion of it was done in the Microwave Lab which I headed -- designed and fabricated three ATS-6 transmitters. Again, this was described in some detail in one of the COMSAT Technical Reviews. As a matter of fact, let me see, I have little certificate here which dates it.

NBG: Oh, alright.

LP: It was launched in June of 1974. That I want to have back, so you'll have to make a copy of it.

NBG: Sure. Certainly.

LP: So this was actual flight hardware that COMSAT Labs designed and built. It was installed on somebody else's satellite -- Fairchild, I think, built the satellite -- and operated....well, as far as I know, it's still operating, even though ATS-6 is not being used anymore. It operated very reliably.

NBG: So you really did have the capability and actually were in a sense, in the business of putting this stuff into orbit.

LP: That's right. Then as a result of the success of that contract, later on we went on and did a similar thing for one of the COMSTAR satellites. When COMSAT entered into a contract with AT&T to supply the COMSTAR series of satellites .... you may have heard of those.

NBG: Oh, absolutely.

LP: Okay. Again, I believe there was sort of a mutual interest here that suddenly came together. Bell [AT&T], was interested in measuring the same centimeter waves, but they wanted to do it in a more sophisticated way than was done in

ATS-6. Of course, we at COMSAT Labs were very interested in that, too. So, there was an agreement between COMSAT and AT&T that a centimeter wave package again would be put on-board COMSTAR. That was kind of historical, too, in the sense that up to that time, the satellite for commercial communications--certainly all of the INTELSAT satellites--and this was going to be one of the first domestic satellites....the idea of devoting some portion of the payload to an experiment was not very acceptable, because here is a revenue-producing piece of hardware that you're launching into space which is very precious as far as mass and power and to devote some of that to an experiment which not only takes up room and mass and power, but might endanger in some way the main mission, was very difficult to have that accepted. But AT&T, with COMSAT's assurances, accepted the idea that at the beginning of life of the satellite, there's a large excess power because you have to design the satellite to work for seven or ten years and the power gradually decreases. So you design it for the end of lifepower being adequate. That means that at the beginning of life you have excess power that generally just isn't used. So by using that power for this propogation experiment, you could gain important engineering information. If you designed the package carefully, you could make it very certain that it wouldn't interfere with any of the communications. Well, we at the Labs decided to put in the

bid, so to speak, for designing and implementing that package. Since Hughes was the spacecraft contractor, they, too, put in a bid. Then there was a impartial committee that evaluated the bids and finally decided that they would do it at the Labs. For one thing, we had put in an estimate that we could do it less costly. With the work we had done on ATS-6 (well, at the time it was called, ATSF rather than 6) and developments that had gone on in the Lab, we pretty much established to Bell's satisfaction (AT&T 's satisfaction) that we could indeed build superior hardware than Hughes could. So anyway, we got the authorization to proceed on that and we built the centimeter wave beacons which were launched ... well, let me see, when was it launched? In 1976 or so, '77. Well, this article appeared in the Spring of '77. So I'm sure it was sometime prior to that. Anyway, it too proved to be very successful. COMSAT, BELL Labs and several other organizations used those beacons to measure propogation at both 28 and 19 gigahertz, which where our frequencies that would be used in the future and collected a massive amount of data which provides a very excellent engineering basis for designing systems in the future. So that was another, I think, momentous project, in the sense that we demonstrated not only that we had developed new technology that could be used in satellites but that we actually built it to flight standards and integrated it so that it could be incorporated in a satellite very conveniently. It operated

successfully in orbit.

NBG: You mentioned that there was two final things that you wanted to talk about. That being one. What's the other?

LP: The other [sic. the first one] was the ATSF package and the second one was the COMSTAR. They were similar but they were somewhat different in design.

NBG: Okay. When COMSAT Labs decided or realized that it did have this in-house capability to produce flight-quality technical equipment, did that place any kind of a strain on our relationship with, say, Hughes or Ford Aerospace?

LP: Not at all. As a matter of fact, in this second contract where we had to work closely with Hughes, there was some, let's say, tug-o-war primarily in a technical sense of how we would integrate this piece of hardware into the satellite. We came up with, I think, a very nice engineering solution. First, we sat down with them and defined a set of interfaces. In other words, where these boxes (there were actually two boxes) would meet the satellite. By designing them as completely separate boxes which were ultimately mounted on an antennae mast on the satellite, we could very precisely define three important ingredients: one the mass, and the size or volume; two, the

thermal interface (you have to take into account the changes in temperature and so on); and the electrical interface. So essentially they met us at a cable and a mounting plane. It was very straightforward. They knew what they were getting and we knew what we could count on, in terms of the hardware on the satellite, the interface on the satellite. We tested the box completely and delivered it to them. They, in effect, acceptance tested it, to ensure that it wasn't going to do anything that would hurt the satellite. Then they installed it on their satellite. So it established a very clear way of operating. If anything, I think it greatly enhanced COMSAT's image to the spacecraft manufacturers because they had a, let's say, a real life demonstration that we know what we were talking about when we talked about spacecraft design.

NBG: Well, it's interesting to me that instead of becoming competitors, you actually became partners, in a sense.

LP: That's right.

NBG: And that the threat of your taking over what they could have considered their own contracting process, did that not exist?

LP: That existed. I must admit that aside from the

engineering aspects which worked very easy -- I shouldn't say very easy, but had a straightforward solution -- the reason this was successful in the contractual sense is that it was small compared to the total satellite contract and it was in the nature of an experiment. But nevertheless, I must admit that the management at Hughes was little worried about you know, how far would we go with this?

NBG: Sure.

LP: And to some extent, it did represent a potential competitor to them.

NBG: And really the only thing that stopped them from doing this--correct me if I'm wrong--is COMSAT's decision not to make that move, not to make the jump.

LP: That's right. In retrospect, in looking back over the years, I think number one, COMSAT could indeed have internally procured its own satellites. From an overall business decision, it probably would not have been a good idea.

NBG: Give me a reason--a few reasons why not.

LP: Well, number one, when you have an in-house....first of

all, it would have meant really expanding certain aspects of COMSAT's Labs operation. You know, once you develop that capability and invest in it, you don't want to have to cut it down when the project is finished. You'd like to sustain it; there's a sort of natural drive to sustain it. It becomes sort of a built-in source and you lose, to some extent, control of the ultimate cost. If the concept were to buy all satellites in-house, so to speak, it would eliminate the competitive force.

NBG: Certainly.

LP: So, and at that time and for a long time (I think maybe even today), the market isn't that large that you could sustain, let's say, two sources -- you know, buy some satellites from an outside source and some internally. So, the other thing that we have to keep in mind are the....other than....well, let's see, COMSTARs and a MARISAT satellites were essentially purchased by COMSAT, whereas the INTELSAT satellites, starting with INTELSAT-V, were really purchased by INTELSAT. COMSAT served as the manager in prior ones and did set all the procurement activity, but nevertheless had to get INTELSAT authorization. It would have been extremely difficult for COMSAT to continue in the role of being INTELSAT's technical arm and administrative arm, and then award a contract for a satellite to its own organization. Even if it went

through a very, you know, arms-length procurement process. So, I think in retrospect, as I say you know, we could do it technically and it might have established another avenue of business, that it was a prudent decision at the time to just let us go so far, so to speak.

NBG: So that it didn't create other kinds of problems....

LP: That's right.

NBG: ....business problems that may have been more important at that point than the technological problems.

LP: That's right.

NBG: Let's talk a little bit about the development of the Labs in terms of the kinds of work that they've done for COMSAT and specifically, the kinds of work that they've done for INTELSAT. My understanding initially is that initially COMSAT served almost as the sole source for R&D to INTELSAT and that over the years there has been a lot of money and research and development funds that have been drained off by INTELSAT through other decisions and have been placed with some of the other large R&D firms like Lincoln Labs or RCA or some of the other large laboratories. What do you think caused this? And

what has been the impact on the Labs since this has happened?

LP: Well, it's a complicated answer.

NBG: Be as complicated as you like.

LP: Bear with me if I'm a little long-winded about this, but I think there....you may have heard from the others some of the history here, so I'll try not to repeat that.

NBG: Well, don't assume that.

LP: Oh. Okay.

NBG: Give me what it is that you think is important.

LP: Okay, well, obviously, when you establish something like a laboratory, an R&D program, one of the big questions aside, from what you do technically--that's not too difficult--is how much resources do you devote to this program--dollar resource, material resources. If COMSAT had to look at its revenue at the time, it would be zero. There was no revenue. It was all money that had been raised by the original --

NBG: Stock offering

LP: Stock issue -- I must interject that I did buy a hundred shares of the original issue.....

NBG: More power to you.

LP: ....which I still have. That doesn't say much for my business sense, but it says something about my loyalties. Anyway, the revenue was zero and here we were talking about a very substantial amount of money that was gonna be plowed into R&D. When you have a bunch of engineers trying to do things, they want a lot of money. So there had to be some decisions on what funding to allow. Now, initially, this was all funded out of COMSAT funds. Then the proposal was made by COMSAT that INTELSAT establish its R&D program. This was formally established early in '68. I'm sure if somebody digs back into the....at that time, it was the Interim Communications Satellite Committee....

NBG: ICSC.

LP: The ICSC set up a technical subcommittee which was the ICSCTC. That technical committee then initiated or recommended an R&D program. That's sort of part of the procedure that has been followed every since and is still in effect. COMSAT

formulated that R&D program, presented it to INTELSAT, to the technical committee first. So, one way of, I guess, establishing a basis for funding was to say, "Well, let's see here's a sort of disinterested party," not a disinterested, "but another party that is not directly involved in the R&D or the INTELSAT technical committee. Let's see how much they'll fund." After lots of discussion, they finally agreed to....I think the initial funding (I've forgotten exactly sure how much) but it may have been in the order of a million dollars. So it was rather modest amount, it may even be something in this thing [holding up a document] about....

NBG: What is this document?

LP: This is that Ten Years of Progress.

NBG: That's the Ten Years of Progress.

LP: The one that I referred to earlier. And I think, yes....you see, it starts in '68.

NBG: [Looking at the document] It says, "Financial Aspects."

LP: Yea, for the the ten-year period '68-'77.

NBG: It doesn't tell you where you started out from?

LP: No, and let's see. Well, yea, we can look at this expenditure budget and you see in....yea, this is the dollar....so in 1968, it was two million dollars. You can see that it gradually grows. Well, that sort of set the stage. It was roughly half-INTELSAT, and half-COMSAT. So our budget started out, I don't remember exactly, but I would say roughly about four million dollars. That pattern was continued pretty much through the early '70s. In other words, the Labs, in effect, had to convince INTELSAT on a set of worthy R&D projects and the cost associated with that. Now initially, all of that money was essentially being spent within COMSAT itself. There was some outside contracting, but it was not a great deal. It was really dictated more by the engineers' perception of, "Was there some other source that, in effect, knew more abut the subject than we did at the Labs?"

NBG: So it really wasn't a competition financially, it was really who has the best brain on this issue?

LP: Right. But the INTELSAT delegates weren't to happy with that. Each year they would pressure for some share of that to be done elsewhere than in COMSAT Labs and particularly, in the U.S. France would want some.

NBG: Exactly.

LP: And so on.

NBG: So you're saying that was a sticking point with them.

LP: Yes. Now at first we tried to accommodate that by having, what was called, an INTELSAT Signee Program where any country (any INTELSAT member) could propose that an engineer be assigned to COMSAT Labs and work at COMSAT initially, for a one-year period, and it could be renewed.

NBG: So it's like a registry or something.

LP: Yea, and....

NBG: To encourage exchange.

LP: ....and they would like to have a cooperative program, having non-U.S. organizations have their staff work at COMSAT Labs. In that way, they would participate in learning about the new technology. But that wasn't enough.

NBG: Does that really address the issue that they were not

getting the contracting funds in their own countries?

LP: No. That's right. And I think around 19, maybe it was '76 or so or '75, there was a significant change in the R&D procedures with INTELSAT. It was shortly before COMSAT was supposed to turn over the reins for the management of INTELSAT to the Director General's staff. As you probably have heard there was a transition: the interim organization of INTELSAT was really supposed to operate for five years and a permanent organization set-up. Well, it ran a little longer. Finally, a procedure was worked out where the management of INTELSAT would be turned over to a permanent staff and eventually a permanent management's arrangement was documented and that is in effect now. That gradually changed the method of operation in the R&D program. At this point in '75 or '76 (I'm not exactly clear on that at the moment), there was a BG meeting and it was in Hawaii where a new procedure was hammered out. I happen to remember the number of it--of the BG document that set it forth.

NBG: Oh, excellent.

LP: That's BG9-54. That number tells you that it was after they had established the INTELSAT permanent management arrangement. Because before that, all of the documents were "ICSC" and some number.

NBG: I see.

LP: This was the ninth meeting since they had set up the new BG. Fifty-four just happens to be the number of the document.

NBG: Right.

LP: That set out a procedure where COMSAT as the....at that time we were still the manager of the R&D program, but under a contractual arrangement and as the manager the document stated we would have to propose specific projects. There were two kinds of projects: there was a development project and there were exploratory and research projects. The exploratory/research projects would essentially be done, as we called it, in-house at COMSAT Labs. The development projects had to be contracted out. We would issue a request for proposals, people would bid on it, there would be worldwide solicitation, and the best source would be selected to do that development. It wasn't specifically stated, but tacitly understood, that development projects would represent the larger part of the R&D. The exploratory projects would be a smaller part and that that larger part -- as I say, it wasn't specifically stated--but at least fifty percent or more would be to non-U.S. sources. Now I would say that never was in any

way rigorously enforced or somebody didn't keep strict tabs and say, "Well, this next contract has to go to...."

NBG: It was more of a mandate. It sounds like.

LP: Well, it was more of an understanding.

NBG: Right.

LP: We would try to find sources outside the U.S. for these development projects. So, that sort of started the initial trend of moving the R&D out of COMSAT Labs. It was recognized that you had to have some in-house work to maintain the expertise of the people. So that allowed for the exploratory research. That also was the source of formulating a requirement that you could put into a specification to an outside company for these development projects. So it was a good idea; a good plan. But nevertheless, it started the direction where COMSAT would have a smaller financial role in the INTELSAT R&D program.

NBG: Was this good or bad for COMSAT Labs? I mean, obviously, financially it wasn't good. But were there aspects of this that were beneficial to the Laboratories?

LP: The simple answer is that it was inevitable--whether it was good or bad. The more complicated answer is that in a way it was good if you wanted to look at it from the right point of view. It did tend to focus more of the research and more of the ideas. In other words, you had to look at the kinds of things you were proposing. Here was an independent group, the technical committee of the Board of Governors, looking at it quite critically and questioning it and saying, "Well, you know, why are you doing that as an exploratory research project rather than putting it out for bid as a development project?" So it put a little more accountability into the R&D. On the other hand, it had a somewhat, I'd say, bad effect on the overall R&D program which has actually, I think, been the biggest problem. I don't think the financial part as far as COMSAT is concerned is that important. But I think it destroyed in a very gradual way the venturesome -- I'm trying to think of a better adjective than that -- the originality of the program.

NBG: Interesting.

LP: Because, you see, now you had to pick something or you have to look at a technology and say, "Can I write a specification to tell somebody to do something which will yield a result?" So you first had to know what you wanted to do and

very often when you're doing R&D, you're really not sure where it's gonna lead you. You have sort of a....

NBG: Sort of a shot in the dark sometimes.

LP: Yea, a general idea or some vague concept or you see some aspect of technology that--or some physical principle--that could lead you somewhere; and you try it. Sometimes, it's successful. Sometimes, it's not. Sometimes it leads you to another road which ultimately maybe is very productive. Well, that kind of fell apart because now you have to sit down and say, "Well, I want this kind of widgit which does this." So it means you already know that somebody can do that. In a way, it became an engineering....a very limited development kind of thing rather than a far-thinking research.

NBG: So you're saying that maybe the Labs at that point would be less able to make big strides and would make little steps instead.

LP: That's right. When he asked me why did I think that was so, I said, to me it was very simple. [In] the corporate R&D program the engineer, the scientist had such full freedom to explore what he wanted to--what he felt was productive--whereas in the INTELSAT R&D program you had to be very specific and

design it, if you wish, for bidding purposes, and [the work] was done in very small contracts that couldn't go very far. So, I think that was the most significant thing out of this process. Yes, that is, that this process had set up the development projects versus the ER&S and split it up into small chucks that could be farmed-out. That looked like a very neat bureaucratic way of doing things.

NBG: Sure.

LP: But it was not very good for the R&D per se. Now, let me just go on a minute, because I mentione corporated R&D.

NBG: Let me ask you one more question before we sort of go back into the corporate R&D aspect of this thing: which is that one of the things that I've heard about the competition that obviously COMSAT then engages in for INTELSAT R&D, is that the problem with the Laboratories is that they have (and I don't know if this is a problem or not)....that they assign their top flight engineers to actual on-hands research and development activities; that they are then paid at a much higher rate; and that instead of using them as managers for projects and having your lower level, second or third echelon engineers working on projects, with the top tier overseeing, they're actually down in the trenches doing the work. And that this has made a

difference in COMSAT Laboratories ability to compete effectively against some of the other laboratories for INTELSAT's Research and Development funds. Is this true or not?

LP: I don't think so.

NBG: Okay.

LP: I don't think so at all. It certainly wasn't true when I was running the program. I'm not sure it's even true....well, today there's an entirely different situation. I should come back to that. But I wanted to explain the corporate R&D program.

NGB: Yeah, go ahead. I just wanted to get that one issue clarified.

LP: Yes, I'll come back to that.

NBG: Okay.

LP: Because it is a good question and I can see where that kind of opinion could develop.

But remember I had mentioned a short while ago that as a

measure of what R&D funds COMSAT would allocate to R&D, we used the INTELSAT funding, as the basis. In other words, that was half the funding. The corporation would then allocate a similar amount--not necessarily exactly the same amount--but about the same order of magnitude of its corporate funds to R&D. So it was like fifty-fifty. As time moved on and the Labs's capabilities grew, we found we had developed talents that other organizations were interested in: like NASA or DOD. So from time to time, we would bid on outside programs, and won several of them. So that then became the question that the Board of Directors had to deal with: "How much outside work other than, you know, contracted outside work should be pursued?" Well, that has gone up and down over the years, but generally, the Board's direction was, "Yes, it's desirable to pursue those areas that we have special expertise in with outside organizations; but we should limit it so that it doesn't overwhelm the Lab. We should limit it in the order of twenty percent of our activities or our budget." That was sort of a rough guideline. As time went on (and I'm talking like from about in the '70s and early '80s; especially during the '70s, let's say from about '70 to '80) about forty percent of the Lab's fundings came from the Corporation and another forty percent from INTELSAT and about twenty percent from various outside sources. Obviously, that could go up and down over the years, but on a long-term average that was pretty reasonable.

Of course, in the corporate R&D, we had, I'd say, considerable freedom. That Homestead Meeting, I mentioned in the beginning was primarily aimed at the Corporate R&D; even though it looked at the total R&D program including INTELSAT. One of the principle objectives was to define the corporate R&D. Indeed these various projects like the centimeter wave beacon....some other notable ones that were not specifically in the microwave area that I should have mentioned was the nickel-hydrogen battery. That was one you see, there were certain....that was one that was done entirely on the corporate R&D. There were certain areas that INTELSAT said, "Well, we're not interested;" for one reason or another. Either they felt that it wouldn't directly benefit INTELSAT; or there was some, let's say, political motivation; or they felt that really COMSAT couldn't make much of an impact or much of an indent in the technology. We were too small. One of them was in the area of batteries which are extremely important in the satellite. So when we came up with the idea of a lighter-weight, longer-life battery using hydrogen essentially as electrolight, INTELSAT didn't accept that. We felt strongly enough abut it, so we went ahead and developed it in corporate R&D. The same is true for solar cells. They didn't think there was much we could do there. So that was another corporate R&D program that was very productive. Echo cancellers was a very interesting one because initially INTELSAT wouldn't sponsor it.

NBG: One would think that that would be an issue that they would be supremely interested in.

LP: Yes, it was very critical to satellite communications.

NBG: Exactly. I mean, that was the fundamentally complaint initially.

LP: That's right. However, you know, with people like the British -- at that time it was the government organization of the British Post and Telegraph -- and other government administrations felt, "Gee, there'd been lots of work done by big laboratories," (Bell Labs, the Bundespost and so on) "and no progress, or let's say, limited progress had been made; COMSAT's not really gonna make a great dent here." Well, some of the people at the Labs felt that indeed we could. So that we proceeded on the corporate project for the echo canceller. It's interesting in that later on, in the mid-70's or early '70's, INTELSAT did indeed pick-up R&D on that and sponsored some group.

NBG: But you're saying originally, it was a corporate project.

LP: Right. If we wanted to be selfish about it, we should

have kept it as a corporate program so that we maintained all the patents within COMSAT. However, that wasn't done and INTELSAT did pick it up and ultimately shared in all the patents and it kind of weakened COMSAT's patent position. But, I don't think the....well, let me add another footnote. The aspect of the shift in management from COMSAT to the INTELSAT executive organ over the years -- the main effect of that, as I said earlier, has been to set up a what you call, a bureaucracy but to conduct the R&D program for INTELSAT. As this engineering capability, if you want to call it that, grew, more and more they wanted to do the R&D within their resources. Now, at first they had no laboratories. So they had to come to COMSAT for that. They really hadn't developed the know-how, so indeed they had to depend on COMSAT for that too. We went from the management services contract when that expired and INTELSAT finally had set up their internal organization. We then entered into a technical service contract with them. There were two parts to that. One for the technical work that was done in the day-to-day engineering and the procurement of satellites. Then another part for the laboratory work, the R&D work and that was called the Laboratory Services Contract. Well, initially, all the ER&S work was automatically, if you wish, fully supported by COMSAT. Even [for] the project development tasks COMSAT wrote the specifications and then turned them over to INTELSAT to go to through procurement; and

then [COMSAT] did the follow-up and so on -- the testing. But as the staff of INTELSAT grew, that staff began to take over these development project functions. And this is--we're getting close to like '79-'80 period -- that discouraged many people in the Labs. Indeed, in some cases, the effort was reduced somewhat that was applied to INTELSAT work. That just, you know, tended to accelerate the process of the transfer. As INTELSAT began to further grow and looked to have its own headquarters where they could have the necessary facilities -- have a laboratory -- they further cut-back on what was contracted to COMSAT in the R&D sector. Well, I think this year....well, let's see, the last year I really was connected with it was in '80--well with the R&D part in '80--but with the entire technical activity was in '83, As I understand it in '84, it's down to very low level as far as the R&D. But meanwhile, as I say, COMSAT has had the time to look for other resources; which they've done. But nevertheless, the complexion of the lab -- not the complexion, that's not the right word -- the resources available to the Lab in terms of money, certainly, had to shift.

NBG: Exactly.

LP: ....had to move from....certainly, eliminate the INTELSAT funding and there was a limit to how much the corporate funding

Could pick up. So they had to look for outside work. Now as far as....

NBG: Has that commercialized COMSAT Labs? I mean, commercialized in a connotation of making them more business-oriented.

LP: Well, I'm sure they're trying. I don't know that they've quite accomplished it yet. But it did....that whole process...well, I'm trying to phrase this correctly....the process of INTELSAT picking up their own thing should have encouraged a more aggressive and knowledgeable approach to the INTELSAT R&D. But I'm afraid it went the other way because of the frustration of trying to deal with the bidding process and to some extent, you might even say the perceived attitude of the INTELSAT people.

NBG: It seems that there was a large barrier to entry there.

LP: Well, it was certainly a problem to be overcome in the sense that the INTELSAT staffs were trying to establish their independence of COMSAT. They were trying to spread the R&D as widely as possible. So that the feeling was that, you know, COMSAT was intentionally being judged more harshly and was being denied -- not denied--but not being given an equal

break. Well, I can understand that frustration having lived with part of it. There 's a reaction, you say, "Well, ok, someone who lacks the time to pursue that." But probably we should have done just the opposite; we should have said, "Ok here's a difficult customer, let's try to see what we can do to meet the customer's requirements so we can maintain a fair share of work."

NBG: Let me ask you a question about--you just brushed over this--but one of the issues that come up again and again in some of these interviews is that sense that as the transition to INTELSAT becoming a much more coherent entity unto itself as opposed to its being so dominated by COMSAT, that there have been quite a few people--a number of people, I should say--who have felt that we gave an enormous amount of technology over to INTELSAT, over to the international organization that was developed by COMSAT, funded initially by COMSAT, and that they basically took our technology and ran with it in their own direction and cut COMSAT out. Do you agree with that?

LP: Well, I don't agree with the, let's say, the connotation it has.

NBG: OK, let's....but there was some kind of a technology giveaway there that COMSAT didn't protect itself enough.

LP: That's a--well, I don't want to use equally perjorative words--but that is a simplistic point of view. The important thing about international communications is that it's a two-way street. You don't have COMSAT, or the U.S. can't have communications with itself. Indeed COMSAT took the U.S., and with COMSAT as its instrument, took a great leap forward in pushing satellites for international communications by taking initiative and setting-up an international organization, nurturing it and so on. Indeed we gave a great deal to it. But that was an essential element to establishing an international activity. We had to do something to give it birth. You can't do it by saying, "Well, this is my technology. I will let you use it on my terms." It just wouldn't work that way. I think the U.S. and COMSAT has benefited tremendously. For instance, if we were to count up all the business that COMSAT/the US garnered as a result of establishing communication satellites, it runs into the billions of dollars. The Hughes' and the Ford's and TRW's got the bulk of contracts for satellites. We had an earth station industry built-up--unfortunately it didn't sustain itself, but you can't say that was because COMSAT gave it away. That was because the foreign competition, in particular, the Japanese were better. So, no I don't think COMSAT gave it away. It was a part of the process of establishing and maintaining

international communications that you had to have this kind of exchange.

NBG: So you're saying they brought as many ingredients to the recipe, if you will....

LP: Yes, you can't look at it just that they, you know, on the technology itself, they brought their communications to the process. They brought their telephones and telexes. A long time ago I worked for someone who pointed something very elementary out to me--that in a simplistic way the communication system depends on telephones and they guy who owns telephone has the control. So, on the other end of the stick the French, the British, the Australians, etc., own the telephones and you have to work with them. So, no, I don't think COMSAT gave anything away, in that sense. But it did what was necessary and was proper to establish a international system. Now, you can quibble with little things: how far we have to go. One of them, I know from, let's say, my perspective on the R&D side, one of the things we kind of fussed about was in the process of negotiating the current management arrangements, there certainly had to be a give and take on what was COMSAT's position and what was, let's say, the foreign partners position. There were certain things that in the initial negotiations were established as elements that

COMSAT would continue--like in the implementation of the satellites it was very clear that the COMSAT organization would contine to be the technical source for designing and implementing and overseeing the contracts for the satellites. That's eventually what was incorporated into this INTELSAT Technical Services that I headed for a while. On the other hand, the R&D was given up, essentially given up. In the permanent management arrangements it was specifically stated that the INTELSAT R&D would be conducted by the INTELSAT staff. It just was matter of time of transition from COMSAT doing it to INTELSAT and INTELSAT doing it to COMSAT and that he taken a period of about seven or eight years. But some people have argued that, "Well, we needn't to have given it up, we could have continued it." I think certainly, in hindsight, we could not continued that indefinitely. Once the arrangements developed to the point where you have an independent organization called INTELSAT where COMSAT is essentially a minority member (we went from a majority member to a minority member) that function would have gradually gone away. So as I said, [inaudible] it was inevitable and the only thing is perhaps COMSAT was a little slow to react to it and plan for it and do things that would sustain some degree of R&D influence.

NBG: We've talked a little bit about the achievements and some

of the good things that COMSAT Laboratories have done for both INTELSAT and COMSAT and obviously international communications, give me a few things that really just did not work out in terms of the amount of R&D funds that were put into those projects and were they eventually led COMSAT.

LP: Well, that's a tough question. First, let me say, there may be difference in perception or understanding on what was good out of the R&D COMSAT versus. what was good out of the R&D for the advancement for satellite technology. I suppose the criteria for the first point of view is: "Did COMSAT make any money out of it?" That is not a valid question. Let me explain that. The second one, I think, will be obvious. When COMSAT Labs was initially set up....and this is why I was looking for that Board Resolution and also their was a....well it's not a memo, but a little paper that was written by the R&D Committee...there was a committee set up to decide what COMSAT Lab should be; and this was back in '66 or '67. The purpose of COMSAT Labs was really to develop an engineering and scientific talent that could give strength to the Corporation. You have to remember COMSAT....here was a new organization that was coming in to the deal with the likes of AT&T, the British Post Office, the French PTT, people who have been in the business for ten....decades, [they] had great technical resources and COMSAT was going to have to sit with them and tell them, "Look

we ought to do things this way and that way," and argue with them. Well to do that you had to have at least a comparable, if not a capable engineering and scientific knowledge; not only to tell them what's sound, but to be able to support it and to support your position. The only way you can do that is to have engineers with hands-on experience; at least I believe that. I think many of the people who started COMSAT Labs believed in that. So, that was the purpose of setting up COMSAT Labs: to develop an engineering capability that could deal with the many technical issues in a competent, and if you wish, a more advanced knowledge than the entities we had to work with. I think in that respect--and it sounds self-serving to some extent, but I think the record need shows--that COMSAT was very successful in that. The influence we had in setting the technical standards, in setting the technical requirements on the satellite system--often dealing with a special interest of other administrations and even with AT&T--I think shows that COMSAT had the technical talent--or developed the technical talent--to hold their own. So, from that standpoint I think the Labs was very successful. There were very few, if any, projects that I can think of that weren't "successful," because every one of them added to the knowledge. Now from the other point of view, did we make any money? No, in a direct sense we didn't make any money. For instance, we embarked on a patent licensing arrangement. There were quite a number of patents

issued as a result of work at COMSAT and people wanted to license these patents and indeed we did enter into a number of licenses. I don't think the royalties from those licenses even paid for the paper. So from that standpoint, that didn't earn a lot of money. From the standpoint of developing products which are being sold, again we can't point to very much there; there are a few. Part of that was, again, an early decision that COMSAT Labs would not, and COMSAT as a whole, would not go into the business of developing products which we would then sell...

NBG: Manufacture.

LP: ....manufacture and sell. So, in trying to think back, I can't think of any technical endeavor that we embarked on which was a total failure. There were things that were started and then phased out, but I'd say that's a normal R&D process. On the other hand, there are some developments that have resulted in products and have led the field: echo cancellers is an obvious example. There are people, I'm sure, who would argue that we could have pursued it more aggressively, etc., and developed products earlier. But I wouldn't quarrel with that. I think the main thrust of the R&D was to establish the feasibility of eliminating echo and making it entirely unobtrusive to the user was successful and the industry, the

whole field, is following that lead.

NBG: What do you think are the challenges that COMSAT Laboratories is going to have to face, say within the next ten years or so? What are the technical issues they are going to have to deal with? What's to come and some ideas maybe on how they might deal with some of these issues?

LP: Now that's a big order that you're asking for. First, as far as the issue, I think the major issue really, is a business issue that COMSAT Labs particularly faces, and of course, COMSAT organization faces. Even though it's been examined again and again over the years, the role of COMSAT Labs must change. In these areas I'm going to be voicing my own opinion...

NBG: That's perfectly legitimate.

LP: You might say in some respects it's an objective opinion and in some respects its an uninformed opinion in the sense that I'm not directly involved in the day-to-day-activities. But certainly COMSAT, as an organization that now has a very continuing, diminishing monopoly and is entering into a very competitive field--or a field where they are going to be facing many competitors--has to, in turn, to develop a competitive

point of view. Therefore the resources they devote to R&D are very much limited by potential earnings. So, number one, they have to define what is their field of business and then based on that define what R&D would be most beneficial to pursue that field of business. If they are going to be in the, for instance, in the selling of products business (we have one organization, one part of COMSAT proceeding in that direction) then obviously a research organization should try to develop the products that would be of future profitable potential. From the service end, they would have to develop not only technology, but the kind of techniques that would provide new services--new communications service. So I'd say that the major concern is how to reorient the thinking of the Labs to much more critically appraise what R&D they should do. In turn, that requires the top management of COMSAT to define what business they're in. Then there has to be an interaction between the operating elements and the R&D people to evolve what the R&D program should be and what the extent of that R&D program should be. Now I think the Lab is also trying to pursue business independently, in a sense of contracting for engineering and research and development. To do that requires a very drastic restructuring so that their....first of all, they preserve their talents, but equally important that they get the cost of providing that service into a range that's competitive with other organizations providing that service.

In essence, the management has to decide how much of the resources are going to be retained strictly for R&D to support the service and corporate interest and how much of the resources and how the resources will be used to pursue competitive business. That's not an easy job. I think it can be done certainly, and it has been done by other organizations, but it may require that the two functions be separate; and that would be painful to do.

NBG: Are there any other issues that have just come up into your thoughts during the course of our discussion that you feel we haven't raised here, that you think would bring something to a history that I may have overlooked in developing my line of questioning?

LP: This is an area that,let's say, as an engineer am perhaps not as conversant as some other people you might talk to, but you know COMSAT, in a way, was the child of a political situation as well as a product of technology that evolved at the time, and as a political instrument, if you wish, it's had a very difficult and complicated role. We've talked about other things but that has had a more, in some ways, a more profound effect on COMSAT's history than anything else. What I am specifically referring to are the....let's say as time has gone on, the points of view of various U.S. Administrations

that were in power and the role of the FCC. That role, if you wish, for the FCC has had tremendous influence....

NBG: Yeah, I've been obviously discussing that with the people in the building or the people who have been directly involved with those things, but do you think in some ways that those political issues became clouds that hovered over COMSAT Laboratories and your activities? Did you feel them directly? In what way?

LP: Oh, yes. Well, let me point out something which probably isn't discussed very much, but to me seemed very critical. When COMSAT Labs was first established, the entire operation was capitalized and, in effect, was part of the base that set the rates. That provided a healthy funding which was good and the whole process was, I think, entirely appropriate. There are many companies that in their initial start-up phase consider R&D capital investment and capitalize it. Ok. At some point, and I can't quite pinpoint the date (I'm sure others can, or you consult some legal people) the FCC began to force a....well, decided that R&D could no longer capitalized and there had to be a phase-down period, where the R&D then became an expense. So, that in itself puts a different kind of limit on how much can be devoted to R&D and also the purpose to the extent that....let me use the favorite term that gets

pushed around here: the rate payers were paying for R&D in a very direct sense as a part of the rate base, the R&D program could be--and again this is not a precise term--could be pure. It could really look at technology and what's a benefit to the whole system. Not just, "How's it going to....can we make money on it?" But, "Does it really improve communications? Does it drive the cost of the end service down?"--things like that. But as it shifted over to the point where it had to become....have pay for itself, if you wish, in fairly direct terms, "Of how much is earned by this R&D?" That tended to change the picture. That's a direct consequence of the, let's say, the political forces that began to push the R&D into a less supported role or a less supported function. Then as time went on, that political process became more and more difficult because the competition to COMSAT kept hammering away at that point that they wanted to dip into that R&D. In other words, if it's going to be paid....and in a way it is a little misguided because it's saying that if the public, the user of the telephone, is paying for this R&D that therefore it's open to the public and therefore it should be open to others in other companies who are in the [inaudible]-communication field. So that process was accepted by the FCC, if you wish, or tended to be followed--that precept. But in a way, it was a little misguided. It's like saying that because engineering work for the Department of Defense was paid for by the

taxpayer, that all the technology developed by Hughes or Ford or somebody on DOD contracts, is available to anybody in the world; that isn't the practice that's followed. On DOD contracts, the government has the right to technology and there all kinds of rules and so on, but its not directly turned-over the competition; which was the way the FCC was beginning to interpret things. So that created a very difficult situation for COMSAT Labs, in the sense that performing R&D which was being paid for by the stockholders of COMSAT but would also be available to other companies for their exploitation. So I think that, let's say, political situation--which was of course a reality that we had to deal with, but was not well-founded--has had a limiting effect on the Labs.

NBG: Let me summarize this, it sounds as if what you are saying is that these political decisions essentially forced business decisions, which then changed the way that we viewed our own research and development programs. So there was really a three-tiered approach, which was that middle decision--the business decision, the financial decision--our desire [or the lack of desire] essentially to share our innovations with other companies then changed, in essence, the way that we viewed our own research and development programs.

SP: Sure.

NBG: That's very interesting.

SP: But you know, despite all of that I think that certainly the historical record, or the record of COMSAT Labs, looked down this list of technologies that we've developed and what's in here [a list of R&D innovations] there's a more up to date list than this...

NBG: Yeah.

SP: ....which goes on to the present. They've had tremendous effect on satellite technology. I mentioned earlier about these centimeter wave projects, that was the first time an all solid state transmitter was flown in space. Since that time, of course, the use of solid state in satellites is growing very rapidly. TMA, which is now being implemented not only by INTELSAT, but by other satellite users, was essentially developed at COMSAT Labs. And I mentioned, of course, the echo cancellers, and solar cells, and nicklehydrogen batteries, the whole background of multi-beam antennaes--and what they can do and what they can't do--all that technology has been augmented in a major way by COMSAT Labs. So, I think I would like to mention one other thing.

NBG: Sure.

SP: Because, even though I spent most of my time at COMSAT Labs and I'm very proud of that, I did spend the last four years at COMSAT in this INTELSAT Technical Services function and rather than tell you a lot about it right now, there is I think, in this issues of COMSAT Magazine, an article on INTELSAT Technical Services which tells what it does. So you can certainly look through that and get what you want out of it.

NBG: We are referring here to COMSAT Satellite Corporation Magazine, 1981 No. 2.

SP: Right. The reason I want to stress this, you know, one of COMSAT's major contributions, I think, which isn't heralded too much is the way we handled procurement--the implementation and procurement--of the satellite--the space segment resource. This was something that was set by the early management, Dr. Charyk and Sig Reiger and Metzger. The basis premise is that you can write a specification for equipment, but in order to really make sure you get the equipment you're specifying, you have to have an engineering team look very closely at what the contractor is doing on the day-to-day basis. In other words, you have to prepare very carefully before hand with a draft specification that really says what you want. But then once

you get that specification and you issue it to industry and they bid on it -- you get different bids -- and they all promise the world; you finally make a selection, and now you have a contract with a particular vendor. Even though they are very good and very honorable vendors,they are there to make the profit on that contract. Even though we even tried to put incentives in the contract to make the hardware meet all the specifications and especially the life time and reliability in orbit. Having been on the contracting side, I know that when it comes down to as you approach the final delivery and you want to get paid for the work you're delivering, you are very tempted to take shortcuts. So, COMSAT's approach to -- especially in the satellite -- was after a contract was awarded there were a team of engineers that lived at the contractor's plant...

NBG: Absolutely. That was one of the big innovations that this company developed in terms of the way that it did it's contracting and I think the first one was with Hughes, that they did that on Early Bird..

LP: On Early Bird, well, maybe not quite so much with Early Bird because that was essentially Hughes' own development and we didn't have very much of a staff at that time. But certainly starting with INTELSAT II and on from there -- III's

and IV's and V's and even VI's today -- there was a very rigorous engineering effort on the contractor's premises to make sure his design was sound, that he was testing it throughly before it was shipped. There was a special organization set up for that which in the early days was called Spacecraft Engineering and then gradually went through various changes and ended up as INTELSAT Technical Services where we were essentially performing that for INTELSAT -- performing that service for INTELSAT. In the process, we set up offices on the West Coast -- one next to Hughes and one next to Ford, and that's been in operation for 16 or 17 years or so.

NBG: Yeah, we've talked to Marty Votaw and he's gone into some detail about....

LP: That's right, he was certainly one the leading lights in that. I'm sure that he, as others, have made the point that we've had, I think, a very high degree of success with those satellites, far more so than other organizations. The particular reason that I bring it up is, as I say, not only did it set a pattern which other organizations have followed but not as assiduously and have tried to cut back on the amount of engineering. There's always a debate, "Can you get away with that?" My own view of it is that you can get away with a minimum amount of engineering for a while but pretty soon that

catches up with you and then the cost of that mistake is very dear. So I think the contribution COMSAT has made there (and hopefully INTELSAT will continue to benefit from it) is the process of developing the kind of specifications and monitoring the vendor and then following through after the vendor has delivered the satellite. COMSAT Labs, incidentally, played a significant role in it too -- in that whole process -- as a supporting engineering group to the spacecraft engineering group.

NBG: Great, thank you.

LP: Okay, a pleasure.