COMSAT HISTORY PROJECT

Interview with Leonard Jaffe

Interview conducted by Nina Gilden Seavey

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Computer Sciences Corporation
Falls Church, VA
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September 23, 1985 9:30 a.m.

Nina Gilden: If you could just outline briefly your initial contacts [with COMSAT]. I know you were involved early on with the COMSAT Corporation. If you could just describe your first contacts with the nascent Corporation.

Leonard Jaffe: The company was formed principally on the basis of work that NASA had done in the early days of the communication satellite activity. As a matter of fact, the participants of what later became INTELSAT were first put together under the aegis of the NASA Cooperative Program developing communication satellites. That dates back to the early '60's where NASA began with the Echo Satellite, and encouraged some international involvement on the part of the United Kingdom and the Russians in cooperative experiments using that satellite. That later progressed to the low orbiting satellites RELAY and TELSTAR--TELSTAR being the AT&T venture and RELAY being the NASA/RCA satellite. Both AT&T and NASA jointly approached the European community to cooperate in the experimentation with that series of satellites. We approached the Europeans with the request that they provide ground stations abroad to experiment with the satellites in a

period when the viability of satellites at all was questionable. The Europeans felt that they were undertaking that effort at considerable risk, but nevertheless, they went along with the proposal. The English, French, German and Italians formed the nucleus of that activity. I was personally involved in the first ventures, or the first approaches to these countries, principally through the PTT's and negotiated along with Arnold Frutkin the first agreements for international cooperation. This, of course, culminated in the experiments that were conducted with TELSTAR and RELAY [which were] reasonably successful--the first transatlantic television experiments; the first experiments to test the utility of satellites for telephony across the ocean. Finally, that devolved into SYNCOM, which was the first venture into the synchronous orbit.

There was considerable controversy in the early days of the program regarding the utility of the synchronous orbit for telephony. AT&T and, to a certain extent, the Department of Defense (after they abandoned the synchronous orbit with their failure in the Advent Program to realize a synchronous satellite, which caused them to question the utility of the synchronous orbit), questioned the utility of the synchronous orbit for telephonic communications because of the time delay.

NASA had generally an open mind to these questions, and really felt, however, rather strongly that the synchronous

orbit, if it could be realized and if it were acceptable to the industry, would provider a neater and less costly approach to satellite communications.

NG: Now, this is before or after the inception of COMSAT?

LJ: This is before the inception of COMSAT, although much of this occurred in the same time [period]. The SYNCOM satellite was launched in '62 and the COMSAT Act was [passed] in '62. So, the negotiations and the formulation of the legislation was going on concurrently with these activities. As a matter of fact, the initial capitalization and the formulation of the COMSAT Corporation itself were based on the notion that they would have to go with the low altitude satellite. That's why they capitalized at the, what was it the $250 million dollar level, on the assumption that they would have to put 40 or 50 satellites into orbit in order to make a viable system.

AT&T had some data which essentially predicted the non-acceptability of the synchronous orbit time delay. We questioned it and set up an independent experiment at Stanford Research Institute, which was conducted internally on their telephone system at the Institute. That determined two things. One was that the critical factor was not so much time delay, but was the fact that the echo suppression switches, which were mechanical at that stage in life, were not adequate

for satellite use. They were too slow. They went about developing an electronic version of the echo suppressor. That was tested also in this local test, and the data that came out of the Stanford exercise indicated that time delay, per se, wasn't as critical as AT&T had thought.

NG: Although they still advocated the use of the TELSTAR system, didn't they?.

LJ: Yes. But because of [the Stanford] evidence, we convinced both the FCC and AT&T to conduct an international experiment in which we introduced time delay on the links across the Atlantic. [This also] tested the customer response to time delay with the newer versions of echo suppressors.

NG: And this occurred when?

LJ: That was about the '62 time period. I don't remember exactly, and some of those experiments involved the RELAY satellite [while] some of them used the Transatlantic cable.

NG: Okay. So, this is still pre-Early Bird?

LJ: Pre-Early Bird. Those experiments also ended up convincing the hierarchy that synchronous orbit time delay,

wasn't as bad as they'd thought. That essentially provided for the acceptability of the synchronous orbit as a tool for commercial communications satellites. Then, when COMSAT was formed they essentially bought one more SYNCOM, which became Early Bird, from Hughes and put it into operation as the first commercial venture.

NG: Now, what was the response of the Europeans to this research and the testing that had gone on? They had very good contacts with AT&T, and AT&T still wanted to see a TELSTAR system. Were they, at that point, did you perceive ready to accept the synchronous orbit satellite?

LJ: Not at the beginning [because] I think that they took their lead largely from AT&T. [Now], remember [that] the PTTs abroad had a long history of working with AT&T and accepting the technical lead of AT&T for the formulation of systems. As a matter of fact, the French for this experimental period duplicated the Andover, Maine, ground station that was built by AT&T. It was a horribly expensive capability that was [based] on the notion that one had to have the best and the most sensitive ground receiver that one could dream up at the time. The French decided to duplicate verbatum [the Andover station], and as a matter of fact, hired AT&T to help them install the first ground station in France. The British took a different

approach, did it themselves, at Goonhilly as did the Germans. The Italians didn't put up an immediate ground station, but followed the progress of the program for the first few years.

I'm not sure that the Europeans really felt convinced at the outset that satellites were viable in any event. But they were going along with it on the basis that they'd better be a part of the action than stay out of it. They certainly didn't want to loose competitive position. The French didn't want to give the British the edge and vice versa. So, they all took part in the program, because they felt it was necessary to protect their position. The time delay was a factor. I think they were taking AT&T's lead at the outset. I think that they later became convinced as a result of some of the NASA experiments and certainly as a result of this co-sponsored NASA/FCC/AT&T test that took place across the Atlantic.

NG: Do you think that this desire to get involved in the technology, even though they were hesitant about the technology, ultimately brought them into the ICSC at the beginning of INTELSAT, or do you think that there were some other reasons why they decided to ultimately become United States partners in a system whereby they actually participated and supported the system?

LJ: By the time INTELSAT was formed, SYNCOM had been put into

orbit; satellite launchings had become more routine and more successful; and they had had the experience of RELAY, TELSTAR and SYNCOM under their belts. So, at the time of the negotiations of INTELSAT, I think that they were ready to accept the notion that satellites had a role to play and since the [United States] government had set up this monopoly as the sole entity that would be involved in satellites for the U.S., the other nations, I think, readily seized on the opportunity to invest. They were really handed something on a silver platter. They were allowed to capitalize on the U.S. investments, and the investment of the British and French and the Germans, in the future of international communications satellites and the formulation of a new technology and new capabilities with a relatively small investment. They saw this at that time as just a good business venture. It also preserved their position in the communications arena. Now, the fact that the program was started as a cooperative program with NASA and the British, French, Germans and Italians, and that [these European countries] had agreed to take part in that program established a European capability very early in the game, which became the nucleus of the INTELSAT capability when it was formed. Had that not been in existence [when INTELSAT was being formed] it would have taken several more years, I'm sure, to establish the technical structure of the physical plant that was in place in the 1962-'63 time period.

NG: So, what you're saying is that the European skepticism of the system was really allayed before the development of the ICSC, before Early Bird.

LJ: Oh, yeah. As a result of the experimental program, I think they gained confidence.

NG: Let's talk a little bit about the development of the monopoly--about handing over what had been NASA's R&D to a private corporation. What was the inside view, if you will, of this as the debate over a public versus private corporation was occurring?

LJ: I think the view in NASA always was that communications had traditionally been a private enterprise undertaking within the United States. This was not true in the rest of the world. The rest of the world had national post and telegraph organizations which were government entities. So, we were an anomaly, really, certainly with regard to the European community. But nevertheless, within the United States traditionally communications had been a private undertaking. NASA's viewpoint was that, yes, when private enterprise was up to undertaking the funding and the risk associated with running a communications business, then it would be appropriate to have

a private enterprise become the operating entity and invest their money in the establishment of commercial communications satellites.

NG: How did NASA view it's role in that business/government interface?

LJ: We assisted in writing the legislation. At the time we viewed the role as being one of providing assistance where it was desired and necessary in the eyes of the administrator of NASA to the corporation, or if requested by the corporation to provide assistance on a reimbursable basis. We also viewed the notion that launchings of satellites would probably be held in the perview governments for at least the foreseeable future, [because there was] a certain amount of liability associated with launching satellites. We were liable to drop something on a foreign nation and certainly many of the technologies involved in the launching of satellites were of military interest. So, we felt that the launching of boosters, per se, would remain the perview of the government. The government would provide these launches on a reimbursable basis to private enterprise. So, we were actually party to the development of that concept. I think initially, we would have been just as happy had one of the existing entities risen to the occasion--like AT&T and General Motors put together a proposal that was

quite nice in that time scale to formulate a new entity to take over the business. I'm not sure that legislation was required, personally, but I guess in the wisdom of Congress and the politics of the situation, they decided to establish a new entity. It is reasonably clear to me that AT&T would have risen to the occasion and funded communications satellites after the initial exposure, as would General Electric, RCA, Hughes Aircraft, anyone of a number of other people. As a matter of fact, there were proposals at that time to do just that. It was decided, and I'm sure who decided that legislation was in order to establish a new entity which would embrace all of these organizations. As you know, the original concept was to have the international carriers, the common carriers own 50% of the stock and the public own the other 50% of the stock. That later proved to be inconvenient, I guess, and I doubt if any of the common carriers own any stock in COMSAT Corporation anymore.

NG: No, they don't own any stock. Did NASA ever see it's role in relationship to this new entity as having any kind of governings over the R&D of that new entity? Say, for example, what was NASA's response to the development of COMSAT labs? Had it ever been envisioned that COMSAT would be engaging in that kind of research and development?

LJ: We always considered that there would be a requirement for the government to conduct independent research and development to advance the state of the art and that COMSAT would do those things that were necessary for its survivability. It would do the R&D that it felt necessary to support the commercial system. NASA felt that it would do the R&D that commercial industry would not perform, which was either too far out or too expensive, but we would do the R&D, which was far enough in advance that it would keep the country technically in the lead. That worked for a number of years. We cooperated with COMSAT Corporation and with the laboratories. When I was in charge of the program at NASA, we held at least annual meetings with the people at COMSAT and our laboratories to exchange information on what they were planning to do for the next year or so and what we were planning to do to make sure that there was no duplication or conflict of interest. Frankly, COMSAT Corporation undertook to make very, very minor improvements in the technology rather conservative steps were taken. They were important but nevertheless conservative. If you look at the series of satellites that were launched over the early years of COMSAT Corporation, they were essentially extensions of the Hughes SYNCOM technology and there was very little dramatic improvement.

The applications technology series that NASA launched following the formation of COMSAT I think [advanced] the state

of the art quite [a bit]. As a matter of fact, even some of that technology was later incorporated into COMSAT's satellites. There was, however, very close cooperation with the people at COMSAT Corporation. Sig Reiger, who was the first engineering VP of COMSAT Corporation--he actually came from Rand--he was introduced and brought into the communications satellite program via the NASA program, by me essentially. He was involved in the early days of the Echo Programs, and there was a very close relationship between that technical capability and the NASA capability. As a matter of fact, when Sig Reiger died there were discussions between myself and the Corporation as to whether or not I should take over the laboratories, which didn't materialize for a variety of reasons. But there was cooperation between NASA and COMSAT Corporation.

Within NASA, we never felt that we should totally abandon the development of technology until, I guess it was the early '70's. What with a budget crunch that NASA was facing, the NASA Administrator decided to essentially get out of communications R&D. I think, to a certain degree, they later revamped their ideas on the subject as exhibited by the current program which has had a resurrection within NASA. I think we've seen over the last few years, since NASA made that decision, a considerable emphasis abroad, both in Europe and in Japan, on the development of technologies that have put the

technology abroad rather than in the United States in large measure. So, that's being reconsidered now.

NG: Let's talk a little bit about the early foreign relations aspect of this. As you mentioned, NASA had already been involved in significant cooperative efforts with the Europeans. Here comes this new entity, this new kid on the block--COMSAT--who has no real experience, per se, in the conduct of foreign relations and certainly of international cooperation on communication satellites. What at that time was NASA's role in the development of those contacts, and ultimately the development of the interim arrangements or the ICSC?

LJ: Officially, we were assisting State Department, who was the principal interfacer, if you will, with the international community. As a matter of fact, that was a rather awkward situation, because the Europeans, who carried governmental status, weren't particularly interested in talking to anybody other than the State Department. COMSAT did not carry international status, and many of the early negotiations for INTELSAT were carried out under the aegis of the State Department. NASA, of course, supported those discussions from a technical point of view. We took part in many of the discussions. At least one of the NASA lawyers, Bob Nunn, was

involved in some of these discussions.

NG: What was your perception of the orally interim cooperation between COMSAT, NASA, and the State Department as they began to embark on these negotiations? What were some of the European concerns outside the technical concerns that we've already discussed about geo-synchronous versus medium orbit systems? Do you think the Europeans understood this relationship of COMSAT to the government, considering in their own government that relationship did not exist?

LJ: I think they understood it. It was new and different, and there were questions raised, I'm sure, along the lines of the Europeans, as to how it was all going to turn out. Of course they were all vying for position within this new entity. In the past, prior to INTELSAT, negotiations were always two party negotiations. It was AT&T and one other foreign entity, one other PT&T. There was never really a requirement for multi-lateral negotiations, or multi-lateral business deals. If one wanted to set up a contract to terminate a cable on England's shores, you negotiated with the English PT&T and not with anybody else. So, I think this was a new experience in this regard. There was a lot of political end fighting to try to determine position and share the corporation.

NG: You mean the sharing of INTELSAT?

LJ: The sharing of INTELSAT.

NG: How do you feel that those issues were resolved? Do you recall about some of the ways in which the European concerns of the European interests would have been met?

LJ: I think they were resolved in an interim way [generally] satisfactorily. But one of the things that you have to remember is that that negotiation took place at a time when there was still argument as to whether or not the synchronous orbit satellite would survive. Unfortunately, the entire basis for INTELSAT, the negotiations, the notion that there would be one global system, which is stated over, and over, and over again was predicated on a low altitude, multi-satellite system, and had nothing to do with the current reality of synchronous orbit satellites. So, the entire formulation was based on a concept that didn't materialize. I think that that today is being tested. I suspect that we're going to find that, particularly with the divestiture of AT&T, a number of entities [will get] into the international communications business, and compete with INTELSAT. As a matter of fact, we see INTELSAT now providing for domestic services. So, the whole area is certainly not consistent with the original premise on which

INTELSAT was based, which was namely that there would be one global system and there would be no competition with it and that global system would serve the entire international community.

NG: Although as I've been reminded in these interviews on more than one occasion, COMSAT was never given a monopoly in express terms by Congress for the international system. As an adjunct to that, the Europeans and the rest of the world did not have the ability to develop that capability at the time that we did.

LJ: I don't understand what you're saying. COMSAT was given the responsibility by Congress in the Act of '62. [The Act] did that very expressly. It said, "there would be a single entity. COMSAT was the chosen entity.

NG: ...was the chosen instrument, but it never gave to them a monopoly over the international space. That is now the argument...

LJ: Over international space?

NG: That's right. And that's the argument...

LJ: It said they were the chosen instrument to represent the

United States for international satellite communications. You can go back and read the language. I think I'm pretty close to right.

NG: You are right. I think the interpretation that is now being made by the FCC is that that did not give them a monopoly in perpetuity.

LJ: You can always change the law. The law is expressly very clear. I don't know what they're driving at. Obviously the situation is very different today. I said that the basic problem with the COMSAT Act, and the establishment of COMSAT Corporation, was based on a technical concept which didn't materialize. That, in my view, is one of the principal reasons for having to reconsider that notion. That's one of the principal reasons that we will see it convenient to establish competition. COMSAT will not remain, I'm reasonably sure--this is for other people to say--but certainly is not going to be the single entity for the United States which continues to have control of all communications satellites. They are not now. Originally it was contemplated that they would be the only one in orbit. I don't think we thought in terms of domestic satellites at the time.

NG: That's another issue that I want to get into in maybe

about five minutes. Let's just finish up this idea of the development of INTELSAT. In the INTELSAT negotiations, was there a difference between what COMSAT wanted in regard to ownership and management, and what NASA and the State Department wanted?

LJ: Certainly NASA was not interested in competing with COMSAT Corporation. It was not an issue, and certainly State Department was not competing with COMSAT. Everyone was attempting to assist COMSAT in getting off the ground and getting started. The competition, if you will, was not between COMSAT and anybody within the United States, but between COMSAT and the international members of INTELSAT.

NG: To the best of your recollection, did you believe at the time that the Europeans were satisfied with the 60% ownership by the U.S. and the management being carried out wholly by the COMSAT Corporation?

LJ: I'm sure they weren't.

NG: But do you recall any specific negotiating positions that the Europeans might have taken that would have obviated, if you will, that arrangement? The Europeans didn't have the capability the United States had at the time. Did they get

pushed to the back seat, or do you think they accepted that as viable opinion?

LJ: They accepted this as an interim arrangement, that was later renegotiated. I'm sure that's one of the reasons for the acceptance of an interim situation. I don't know whether there was any action that they took. They were obviously trying to establish as strong a position as they could. Fortunately for the United States, the United States held most of the cards.

NG: Do you recall what the activities of AT&T were at that time? Or, do you recall your interaction with AT&T at the time?

LJ: AT&T were also assisting the process. They were after all a stockholder in COMSAT Corporation. I think once the legislation was passed, that that was the end of competition or the end of any attempt to establish something different than COMSAT Corporation. I think there is no question that AT&T would have preferred that they became the chosen instrument. I'm not sure that wouldn't have been a bad idea. That wasn't in the cards and once the legislation was established they cooperated with COMSAT Corporation. As a matter of fact, I think they provided the assistance of one of their international VP's...

NG: Jim Dingman.

LJ: ...to work with COMSAT Corporation, and to help them through that period. So, there was all sorts of cooperation.

NG: Let's talk then, a little bit about the domestic issue. That actually comes up fairly early on after the success of the Early Bird launching. ABC floats a proposal to put up their own satellite for domestic television transmission. What was the reaction of NASA to that proposal and the domestic systems?

LJ: The NASA position on any of this was always that we were ready to launch a commercial satellite for anybody who was willing to pay for it. Our question, in this case, was one merely of having whoever wanted to operate in space get the authority from the FCC to operate or transmit. So, that from a jurisdictional point of view, it was really FCC's responsibility. NASA was ready, and would welcome anybody paying for a launch.

NG: Did this include foreign governments who ultimately wanted to put up their own systems?

LJ: Yes.

NG: One of the issues that comes up during the negotiations for the permanent arrangements is the issue of regionalization. Specifically, the French wanted to put up their own satellite system which would be a French speaking satellite, if you will, between France and Quebec. Did you ever come into any conflict with COMSAT over NASA's desire to put up any satellite for any customer?

LJ: NASA was not involved in that controversy, if there was one. I don't know of any. If there was a proposal to launch a French speaking satellite to work between Canada and France I don't know about it. In the early days of the program there was still the notion that there should be a single international carrier or satellite carrier--that we had established an entity, we had established an international organization called INTELSAT--and because of that, anyone who wanted to launch a satellite had to essentially verify the fact that they were not going into competition with INTELSAT. So, that was established as a national ground rule, not a NASA ground rule necessarily. That if somebody wanted to launch a commercial satellite that it would essentially be something that was not going to be used to compete with the INTELSAT capability.

NG: Okay. INTELSAT has been established under the ICSC

interim agreements, and Early Bird has been launched and is a functioning system. What was NASA's involvement in communications satellites following these two events? And, what was your involvement on an operational level with COMSAT during this time period?

LJ: On an operational level, it was that of supporting COMSAT Corporation, the FCC and the Department of State. We [NASA] had a very clear mandate in the law that said we were to support COMSAT Corporation with launches on a reimbursable basis. We were to do R&D as we felt necessary in the national interest or to do it on a reimbursable basis if COMSAT asked for it. We were to support the FCC in technical consultation, and we were to advise the Department of State regarding the viability of providing satellite services to various parts of the globe. They contemplated at the time that there may be some reason to ask COMSAT to provide services to parts of the globe that weren't particularly economically viable. NASA was providing information to the Department of State. So, we were a technical arm of the government apprising all these people. That's so far as the operational system was concerned. I indicated that so far as the development of technology was concerned we certainly had the responsibility for continuing to develop the nations capabilities in advanced technology space flight. We continued to develop launch vehicles. We continued

to develop all sorts of space technology that would certainly be useful to COMSAT or anybody else that operated in space. [In addition] we developed some communications capabilities that were very directly useful to future communications satellites.

NG: Such as?

LJ: The whole applications technology series which ran into the '70's--matter of fact, some of the those satellites are still alive and very useful--developed space technology and propulsion systems; they developed antenna pointing systems, which are now being used by COMSAT and INTELSAT; high gain antennas, which are being used by most of the domestic satellites; and correctable structures in space. [There are] a lot of things that came out of that program that were of direct value to the communications industry. Some of it, of course, was directed to other activities, while developing the technology of the synchronous orbit. On the applications technology series, we also developed the capability for meteorological observation from synchronous orbit, on the same series of satellites. So, it wasn't dedicated one hundred percent to communications, but it was a program that was dedicated to the essentially the synchronous orbit capability and communications as well. But we clearly saw our role as

continuing to persevere the U.S. interest in the development of technology.

NG: Were you involved in INTELSAT's decisions for procuring new satellites?

LJ: Yes.

NG: What was your role?

LJ: We had to advise the FCC regarding the technical viability of anything that COMSAT or INTELSAT proposed to launch in the early days. Since we were the technical advisor of the FCC and the FCC had to essentially license COMSAT Corporation to put something in orbit [we became involved in advising on technical matters]. I guess they were also concerned with the regulation, if you will, of COMSAT's revenues. They felt that they had a responsibility to ensure the technical viability of anything that COMSAT proposed to launch. So, we provided oversight, if you will, over every satellite that COMSAT launched in the early days. I don't know, but I'm sure that's not continuing today. We were heavily involved in overviewing their preparations for launch.

NG: That sort of raises two questions in my mind: (1) Did

NASA have any input into the decision to go with TRW instead of Hughes as the contractor for INTELSAT III? (2) Do you think there was too much oversight by the government over COMSAT's activities? Please address the first question first.

LJ: We had nothing to do with that decision.

NG: ...with the TRW decision.

LJ: That was an internal decision.

LJ: All procurement decisions were internal decisions.

NG: Was NASA responsible for determining whether or not a contractor chosen by COMSAT was appropriate for a specific program?

LJ: What we did was to determine whether or not what they had built was worthy of being launched into orbit.

NG: So, it was really after the fact then?

LJ: It was after the fact. We did not get involved in a determination of whether or not TRW was a better contractor or provided a better design. That was an internal COMSAT

Corporation decision.

NG: What about the issue of government oversight? A number of people have stated that, "If COMSAT had been allowed more freedom they would have been a more profitable company and a more technologically advanced company." This seems to imply that the FCC hampered the development of the company." What's your view on that?

LJ: I'm not sure that I know what they are referring to. I don't know of any restrictions that the FCC ever placed on COMSAT Corporation in terms of what they could develop or what they couldn't develop. The only restrictions that I know of had to do with whether or not COMSAT was living within [its] charter, which was namely to provide for international communications. I think the issue of the degree to which COMSAT ought to get involved in domestic communications certainly became an issue that the FCC worried about, but that was something we didn't get involved in. There was nothing to prevent, so far as we were concerned, that prevented COMSAT Corporation from doing whatever they wanted to do. The other thing you have to remember is that COMSAT started with nothing. They didn't even have the basic infrastructure of an AT&T to back them up. They started from scratch. So, they were very limited in terms of their technical capability

internally and I think they welcomed the support of NASA and anyone else at the time to assist them in getting off the ground. That was before the days of COMSAT laboratories. So, I don't think that that was an issue [at that time]. When they did develop an internal capability that was adequate to sustain themselves, then certainly the requirement for government help or help from AT&T or wherever diminished.

NG: Let's talk a little bit about the relationship between AT&T and COMSAT. Or, I should say the international common carriers as a group and COMSAT. Was there ever any concern on the part of NASA that this relationship between AT&T or ITT and RCA or Hawaiian Telephone, who sat on COMSAT's board, would in any way have an adverse impact, if you will, on the COMSAT's ability to guide the international system?

LJ: No, I don't think we had any concerns about that. It's not something we were concerned about.

NG: Your tenure with NASA comes up to what year.

LJ: 1981.

NG: And your involvement with COMSAT's launches extends up to that year or did your status change within NASA at any time?

LJ: No, it pretty much went through that period. However, when the launching became more of a routine matter, we obviously paid less and less attention to that particular end of the business. It was handled by our launch vehicle operating capability. But we stayed as technical contacts with COMSAT Corporation through that period.

NG: So, are you saying then that the relationship that existed up until the time that you left NASA was one of a fairly rudimentary relationship of launch provider and then client?

LJ: That's right. That's what it probably is today.

NG: Can you think of events that stand out in your mind past the period that we've been talking about, which is the initial period in general, where NASA might have had more involvement than just this low level client/customer relationship with NASA and COMSAT. Were there times when they were more blips rather than straight line in the relationship. You say that NASA wasn't really involved in the domestic satellite controversy between the FCC and COMSAT and the other international common carriers, were there times when the relationship between NASA and COMSAT did change?

LJ: As I said before, there was not...if you're looking for controversy, there really was none.

NG: No, no, I'm not. I'm saying, "Were there changes in the relationship?"

LJ: There were changes in the relationship obviously as COMSAT developed their internal capability, and became more proficient at being able to manage their own satellite developments. They relied less and less on help from NASA, expertise from NASA. So, we just dropped off that kind of support as they became more and more proficient, and it became pretty much nil during the latter days when I was there. What we did was provided them with launches, as they required them on a client relationship. They ordered up a launch. We launched it for them. This relationship continues today, I gather.

NG: So, what you're saying is, it's been sort of an ever decreasing relationship than what we saw in the beginning and then through till today a more basic relationship of just you [NASA] providing the launches and COMSAT paying for that service?

LJ: The whole business of space has become more commercial. It has become more routine, and more commercial as time goes

on. When it was highly risky and experimental, then the government, obviously, was much more attentive to the program. The requirement for that has diminished. Now, there still is an ongoing relationship between NASA and the technical elements of COMSAT Corporation. They are aware of the NASA development program, which has been reinstituted. NASA remains cognizant of what COMSAT is doing in their development program. So, I think there is still that kind of relationship, but my understanding also is, I'm not thoroughly knowledgeable about this, but that the intensity of the development, from what I've heard at COMSAT Laboratories, has sort of gone down a bit.

NG: I think that's also been the fact that INTELSAT has actually taken a lot of the research funds that were being poured into COMSAT Labs and sort of distributed them more widely throughout the world, which has then diminished the importance of COMSAT Laboratories.

The last issue I wanted to talk about, and I don't know if this is just more to document these events, were launch failures. Specifically, what comes to mind obviously was INTELSAT III, had a number of launch failures. And there had been some problems between COMSAT in getting their satellites into orbit. What, just from a procedural point of view, would happen in the case of a launch failure of one of COMSAT's satellites?

LJ: I'm not sure I know what you're asking.

NG: What would happen between COMSAT and NASA in the event of a failure? What was the organizational relationship? At what level was there an intent made to rectify the problem? Were there negotiations between NASA and COMSAT about the problem?

LJ: Depends on where the problem was. NASA, essentially, in the early days of the program, was responsible for the performance of the booster vehicle, which essentially put the satellite into low altitude orbit. Once that was done, and the vehicle was separated from the satellite, then it was somebody else's responsibility. Hughes, COMSAT Corporation, whoever took over from there. Now, its a question of where the fault was. And most of those faults, if I recall correctly, and I'd have to go back and look at the history, had to do with failure of the satellite or failure of a transfer stage, which failed to get the satellite into synchronous orbit, that was part of the satellite.

NG: So, at that point, NASA washed it's hands of that.

LJ: The general division of responsibility was that we had the responsibility for boosting this thing, whatever they supplied

to NASA, put on top of the rocket, [when that was boosted into low altitude orbit] we were done. Delta was the big launch vehicle for a long period of time. Delta was a three stage rocket, and when those three stages burned up and we separated the space craft from those three stages, that was it. Then the responsibility was transferred to somebody else. NASA controlled and was responsible for the three stage Delta performance.

Now, as you know, COMSAT also took out insurance. And I guess up until recently insurance wasn't prohibitive in terms of cost. I guess it's gone particularly, I guess, [after] the dual failure of the Arian in the last couple of weeks, that insurance will probably go up. But it was a very clear relationship. COMSAT was responsible for the satellite and what happened to it after it achieved orbit. NASA was responsible for getting it up there, and we worked with them like a sub-contractor. In that regard, we were a sub-contractor to INTELSAT, too. We performed a service or to COMSAT Corporation. So, I don't think NASA...we never warranted anything, if you will. Best efforts kind of relationship, and I've got to say this, NASA took as much precaution as they could possibly take, as did the suppliers to COMSAT Corporation, like Hughes or TRW.

NG: I have finished the line of questioning that I had in mind

for this interview. I was wondering if there were issues that you felt that I had overlooked? If there were events that stand out in your mind that we didn't cover, or thoughts that you may have about NASA's relationship with COMSAT that we may not have been able to talk about?

LJ: The answer is no. The relationships with COMSAT Corporation were always amicable and very good. The issue of, I still believe that the issue of the success of the synchronous orbit and the acceptance of the synchronous orbit was not planned for nor understood early enough in the sequence of events with the launching of Early Bird. They actually achieved more capacity with a single satellite than existed in the cables at that time, the early trans-oceanic cables. And heretofore, at the time, probably was something on the order of $25 or $30 million. I don't remember what the cost of Early Bird was, but it was largely a duplicate of SYNCOM, so it couldn't have cost very much, and the Delta launch vehicle was fairly cheap at the time. They had achieved a capability which far exceeded anything that existed, with one satellite. I don't think that in the early days of the program they had, neither the government nor COMSAT Corporation had understood the impact of that, and that persisted for some considerable time.

NG: Are you saying that they underestimated it's own capabilities?

LJ: Yeah.

NG: Yes, it did have a much longer lifetime than they had originally anticipated.

LJ: It wasn't a question of lifetime. It was a question of the fact that they could achieve with a reasonably small investment, a capability that far exceeded the technical capability of anything that had been established in the past. And it exceeded the capability that they had thought they would have at any point in time because again, the premise was when they formed, that they would have to go to this multiple satellite system, which didn't turn out to be the case. And that would, of course, have taken them a long time and would have been a fairly large scale investment. As a result of which, I think that COMSAT Corporation ended up putting an awful lot of their money in the bank, as opposed to using it to establish the system they originally contemplated. So...

NG: So, would you say then, the company was over capitalized to it's own detriment?

LJ: No, I wouldn't say that. I don't know if it was detriment or not. That's not for me to say. The point is that they were capitalized on the basis of an assumption that they would have to build a certain kind of system and that changed, rather dramatically, with the launch of SYNCOM and Early Bird. And they didn't need all of that initial capitalization to establish the early capability. It's up to someone else to say whether that was over investment or not.

NG: Do you think that with the experimentation that NASA had done with the Europeans, that they could have foreseen that they could have been capitalized at a lower rate?

LJ: I told you this was all happening concurrently. COMSAT Act was passed in 1962, SYNCOM was launched in 1962 for the first time and succeeded in 1963. So, it's hard to say.

NG: Capitalization didn't happen though until '64, so....

LJ: So, maybe...I don't remember exactly when that...perhaps it could have been restructured. The controversy was still continuing probably, to a certain degree, into the '63/'64 time period. But I think it took some time for them to sort out their thoughts, after having realized the capability that was represented by Early Bird. And they...I think that they

proceeded fairly rapidly. I think the important thing [coming out] of this, from my perspective, is that the early experimental program of NASA really postured the U.S. and the foreigners in a position where that industrial activity, or that commercial activity could get off the ground, very conveniently, very quickly. The infrastructure was in place. The ground stations were in place in Europe. AT&T had the ground station here at Andover. They had experimented with these things. They knew what they were like. The conversation--there were many, many difficult negotiations with regard to coordination of frequencies, coordination of technical methods of going about this interchange of communications--had already taken place. The fact that the United States had launched satellites, which were our design and our property, when I say, our design and our property, U.S. design, U.S. property, made negotiations over what those satellites looked like, a mute point. There was no negotiation. We had it. This was it. We were going to launch it. If you wanted to play in our sandlot, you played with our ground rules. And I think that was a very dynamic and beneficial foothold [and] that COMSAT Corporation was the beneficiary.