INTERVIEW OF 10-8-74 WITH DR. WERNHER VON BRAUN
VICE PRESIDENT, ENGINEERING & DEVELOPMENT
FAIRCHILD INDUSTRIES, INC.

(David L. Christensen) This is October 8, 1974. We are meeting with Dr. Wernher von Braun in the Alabama Space and Rocket Center conference room in Huntsville, Alabama. Attending the interview are Dr. Harry A. Engle, Mr. Sandy Campbell, and myself, David L. Christensen. The purpose of the meeting is to discuss with Dr. von Braun the utilization of educational satellites for the Space Shuttle and Space Transportation Systems of the future. This effort is part of a continuing research program at the University of Alabama in Huntsville. The project title is ED-PLUSS, which stands for Educational Planning for Uses and Users of the Space Shuttle and is funded by NASA.

(Dr. von Braun) I am pretty well familiar with what you are trying to accomplish and as I understand it, you want me to put my two bits in here and there.

(DLC) Right. We have gone beyond the mid-term report, which you have reviewed. We want to show you very quickly what we have been doing in the interim. We will discuss the current ATS-6 satellite educational programs, its potential follow-on, and then - this is of interest to us - a marketing discussion on techniques and methods for utilizing educational satellites. I know you have been involved in all of this. Then, if we could, let's brainstorm a little at the end, and look into the crystal ball for future ideas.

(WvB) The area in which I could probably most directly contribute to what you are trying to do here is to tell you about our practical experience with satellite users. Maybe we could discuss their problems and the hang-ups they have about this thing

and where one could improve things a bit. My comments would cover not only some experience with foreign countries but also remote areas within the United States, in particular Alaska. I recently visited some villages in Alaska where health care and educational television by ATS-6 are presently in use and talked to a lot of people to get their feeling. We have been telling ourselves so often what great things direct broadcast T.V. could do for such people in remote areas that we were eager to find out what the impact really was.

(DLC) Could we just tell you briefly the background on the ED-PLUSS program? These are our final briefing charts which we can review very quickly with you. We performed several tasks and we did this as a Phase I study. We worked with three other contractors, Battelle, Arthur D. Little, and Stanford Research. We are all working as a team to investigate uses of the Space Shuttle for new applications beyond what NASA has identified. So now it goes into a Phase II program. We looked at different levels of education. We structured this and we looked at different expenditures and funding as a sort of market survey. This is all discussed in detail in the report. Then we identified some basic needs common to all these levels to consider something pertinent and related to the space program. We then arrived at certain conclusions, which I won't go into but these were pulled right out of the report, as shown on this briefing chart. Then we looked at NASA to see what they had been doing with the field of education, identified certain groupings, you might say, and recommended certain activities which could have an impact in the future on the space shuttle program. We also developed a scenario to help explain how all this fits together. Here we show educational satellites, such as the ATS-6, and we show how it could be interfaced with Level 1, 2, and 3 educational activities, involving teleconference rooms,

libraries, student instructions - the things you are very familiar with. Then we went into the dissemination program, also going through this loop to help support activities on space shuttle. Here we get into the student investigations such as on the Skylab Student Experiment Program, and all the research people in educational institutions involved in experiment programs. Then we looked at educational experiments from orbit where, for example, you might evaluate environmental parameters with ground truth measurements, using students on the ground and trying to loop together. You link these things, of course, in real time through an educational satellite program so that it becomes a working system that is self-sustaining or self-supporting. That is the scenario we would like to evolve out of this.

Then we worked up a systems approach to develop techniques and methodology to apply these ideas in a very systematic way. These are all described again in the report, so we basically suggested to NASA, "Look, here's your tool and this is what we think you should do to arrive at the next step." Then we developed a matrix showing the educational categories and the interfaces and also, the NASA offices and their educational capabilities and tried to relate these things to each other. Of course, this has to be applied to the futures context so it becomes three-dimensional, which makes it very complex to weave your way through the whole pattern. Out of this we also came up with some different techniques for stimulating educational use and we describe the use of consultants, seminars, workshops, and particularly, demonstrations, such as ATS-6. It is valuable when you can actually see these things demonstrated. Teachers here in Huntsville really reacted favorably to this whole program. We sat in on the press conference here and it was really an eye opener. Dr. Engle might want to comment on this.

(WvB) Did you particularly concentrate on the methodology?

(DLC) Yes, at this stage.

(Dr. Harry A. Engle) Basically, yes. But our basic objective was to identify and evaluate new users and uses. The other contractors concentrated more on market methodology. We attempted to say, "Where is this market?"

(DLC) "And where do we go from here?"

(HAE) Rather than each coming up with only a methodology, we have a combination of things. We think we went one step beyond the others.

(DLC) Arthur D. Little looked at the front end problems - the policies and decisions NASA needs to address and the need for a tariff model, the pricing structure, and all those things which are essential before they get into operational programs.

(WvB) Would it be useful for you if I gave you some of my own private thoughts? I think your methodology is in perfect shape, and I don't want to add any more because I think it is very well thought through. Let me first say what my exposure was. I had quite a few talks with people in India. I saw how ATS-6 works in Appalachia, and now most recently, in Alaska. The fundamental problem is, of course, that the people say, "Well, it may take only a few weeks to demonstrate the technical soundness of the direct T.V. broadcast experiment, - the fact that you can really provide good pictures in the villages - but it will take years before you will have learned doing a good job in using this new educational tool. This is a social experiment involving thousands of people and there is a lot of trial and error involved in the development of effective

programware." Programs that may be good for one environment may be completely useless for another. Their effectiveness depends on geography, traditions, ethnic and religious hang-ups, and regional value systems. For this reason the main complaint we hear is that NASA has not completed its job, that NASA has stopped with the purely technical part of the demonstration. NASA, they complain, provided ATS-6 and said, "OK, here it is. You have it for one year in Appalachia, Rocky Mountains, Alaska. Then we will move it on to India." The critics are entirely right when they say you can't work like this when thousands of people are involved who are trying to find the best way of using this as a new educational tool. There are bitter complaints about NASA being prevented by the Office of Management and Budget (OMB) from finishing the job it had tackled with so much dedication and competence. OMB says to NASA: " Look, your NASA mission is to demonstrate the basic technical capabilities of your new applications satellites. If there is a real need for this sort of thing, then let HEW or whoever the logical user is establish an operational use program and come back to OMB and request the funds for it." Now HEW cannot possibly be expected after one year of experimentation with direct TV broadcast education to specify a long-term nationwide operational program. So, the net result is, we have this beautiful thing here, but there is no effective follow-up. The potential benefits of a highly successful $200 million experiment paid by the American taxpayer are falling between the cracks. We were told just a few days ago that any continued funding for the back-up for ATS-6, the nearly completed ATS-7, probably will now be terminated. It is a dead-ended thing. For space applications to become really useful, there must be continuity in all of this. There must be an orderly and funded transition process from the developing to the using agency.

There are also many cases where money can be saved through satellites

right now. For example, are you familiar with the Veterans Administration? There are several hundred VA hospitals in the U.S., most of them quite small. They have a perennial dilemma. They say, " We just cannot spare our only doctor here in our small-town, 10- bed hospital, to go on a training course to get an up-date on the latest treatment of diabetics or something like this." Now if you could keep that doctor in his hospital by providing him with a direct satellite-broadcast television program, where he can bone up on these things, he could continue to do his hospital job and at the same time get a professional up-date. Just think of the savings and gains in medical proficiency this could bring about. The same can be said for teachers. In Appalachia, the response we got was generally, "Well, I have been teaching classes for years, but now with this ATS-6 satellite you can get a first-class up-date the night before. They brief you once more on the topic you'll cover in the classroom and even give you a few hints on how to get the story across a little better to those kids. I feel I'm really five times as effective a teacher as I've been before."

Now many people are concerned about the development of programware or software. An educational satellite is a voracious thing, you know. It sits up there in the sky and demands to be fed with programs for eight hours a day. Few people realize the magnitude of that programming task. We have been telling ourselves for years that the greatest value of educational satellites is that they offer you an interacting system where the teacher does not only teach one-way, but where she can also test the kids. In the simplest form this may be done with a multiple choice answer system where the teacher asks via television channel, "What is the right answer, Option III, Option IV, II, or what?" The kids then push the appropriate button of their choice and the signal goes back to the satellite. The satellite

registers the replies and comes back after 5 seconds with the announcement that 60% of the kids say Option III is the right answer. Here again, we have something undoubtedly of tremendous potential for remote areas in this country and for developing nations.

But where is all this heading with OMB's unimaginative attitude?

In India educational satellites such as ATS-6 and its operational follow-ups will also have uses of great significance. India, too, will use them for elementary education in their 500,000 villages. But they will also use them to instruct farmers about things like better fertilizers and how to use them to grow more corn or wheat or rice. I saw a major instructional experiment along these lines recently, that involves a terrestrial TV station in Delhi and some 100 normal TV receivers distributed to nearby villages. The program I saw in one of these Indian villages was quite corny but extremely effective. You see a guy arriving in a village in a jeep. He carries a suitcase and assembles a few farmers around himself and cracks a few jokes in the local idiom. Then he opens his suitcase and says, "Look what I have here, a chemical fertilizer", - nobody had even heard the word before. He unpacks his suitcase and says, "Have you decided what you want to grow? Do you know what kind of soil you have?" Next he shows them how to make a soil analysis. He takes some bottles out of his case and scoops up some dirt and adds some of his fluids. Then he lets one of the local farmers do it, with lots of laughter and a few dumb jokes. These presentations go over beautifully because the village people can relate to what they see and hear. They may even recognize a face here and there or they may say, "Isn't that our neighboring village?" It is also very important for the presentor to use the local idiom. An Indian who knows the United States very well told me, "Suppose you wanted to teach an Alabama cotton picker via T.V. some better methods to pick cotton; would you do it in a Bostonian accent? The guy would probably feel offended or he may not even understand what was being said and turn the set off. You have this kind of problem in India all over the place." There are many dialects and even many different languages. Also, farmers have different problems in different regions. For instance, you don't talk about cotton picking to a guy growing wheat in Wisconsin or raising sheep in Wyoming. You have to pick the right subject for your specific audience and present it in a folksy idiomatic way to the people you are addressing.

(HAE) We have tried in the body of our study to talk about regionalizing needs to get the input from these people as to what their real needs are rather than someone on the national level determining it.

(DLC) We addressed that part in detail.

(WvB) I have the feeling it would be a great mistake to go to these villages with sophisticated software developed by places like the Harvard Business School. With their glib, slick language you'd simply be talking above everybody's head. Their sophisticated words, their language, their entire approach is just not corny, not folksy enough.

(DLC) That's a valuable input. Could we now look into the crystal ball a little beyond ATS-6?

(WvB) There is, of course, the big question: How do you tie the future world-wide educational and scientific satellite programs together with the future Space Shuttle? And what could the universities do to get ready for this new phase?

Let me start with a scientific program, the Large Space Telescope (LST). I think in future astronomical courses at universities, young astronomers should be exposed to the vast new research opportunities that the LST, carried aloft and supported by the Shuttle, will offer them. You see, in astronomy you have a situation where the high priests still have the first draw on the big cathedrals, the instruments. A distinquished gent who is well established and maybe has the Nobel Prize just hollers and gets the Palomar reflector for a week. But the young postgraduate student, while he may be a lot more up to date, often has a hard time to get even close to some of the choice instruments. There are lots of young astronomers today who say, "I have still one advantage going for me. That old graybeard will never go to orbit in the shuttle, but I will! And so I should try to go into astronomy programs where I, as a member of the young generation, have a unique advantage over him. I would like to prepare myself for future shuttle-supported astronomy tasks which are not suited for these older gents." This means, of course, that astronomy courses should cover future shuttle-supported astronomy research plans. They should cover science experiments that you can do on the shuttle but not on the ground. An outstanding feature of shuttle astronomy is, of course, that the entire electromagnetic spectrum is at your disposal, whereas, on the bottom of the atmosphere you can only observe the frequencies for which the earth atmosphere is transparent. That means the shuttle offers plenty of new opportunities for planetary observations, solar astronomy, infrared, ultraviolet and X-ray stellar

astronomy, etc. If I were a young astronomer and somebody offered a course in my university labeled "Astronomical Observation Opportunities Being Offered by the Shuttle-Supported Large Space Telescope", I would jump at the opportunity. Although you may not always get the precious Large Space Telescope assigned to your program there is still the more versatile Spacelab with its smaller pallet-mounted battery of telescopes. They may not match the big aperture of the LST but still offer the full spectrum capability.

Young scientists can also pursue other objectives in the Shuttle. Looking down onto the earth they can work in meteorology or oceanography. So let's identify science programs that require man's being up there, and prepare budding students for these tasks in well-structured university courses! You will attract the young scientific generation because again they know the old men can't make it and are less of a competition. If I were a young man interested in any of these fields involving earth-observation from the Shuttle - I would hope my university offered courses to prepare me for my role in this.

I don't think I am talking here about something fantastic because I have seen a very similar trend during my 1968 visit to Antarctica. During each Antarctic summer - which is our winter - an average of 300 to 500 American young scientists and postgraduate students are down there for about three months. The typical mode of Antarctic research today is for a guy to identify a scientific objective that he wants to pursue - whether it is the love life of the penguins or something on glaciology or meteorology in Antarctica. One guy I met was studying the iron deposits on the clean Antarctic ice and snow cover caused by shooting stars! They offer a historical record on both snow deposits and shooting star abundance going back over a thousand years. There are lots of interesting topics like this. The applicant works out a study proposal and submits it to his Professor. The university passes it on to the National Science Foundation. If they like the proposal, they may underwrite it, which means they pay the fare of flying the student down there, they pay for the modification of the Antarctic house trailer that goes out there, and if the student is married, they pay a little salary to his wife who's left behind. After the guy has collected all the data he needs he returns from Antarctica, goes back to his campus, writes his thesis, and gets his doctor's degree. That's the way much Antarctic research is conducted these days.

You know, you don't go to the South Pole anymore with dog sleds. Instead, they move a well-insultaed house trailer onto your campus, say, at the University of Wisconsin. During the summer preceding your Antarctic trip you put all your research equipment into that house trailer and check it out. For example, if you want to study the aurora australis in Antarctica, you try out your instrumentation on the campus, using an artificial radiation source for calibration. By the time your house trailer is ready to be moved down to Antarctica it has become an entirely familiar environment for you. You turn the trailer over to the Navy, they put it in a cargo plane and fly it directly down to the ice. When you arrive, you find your trailer burried under the snow and ready for work. Everything is still in there, even the pin up girls you pasted on while the trailer was still on the campus. I think this is very similar to the operational mode we can foresee for the Shuttle - just replace the Antarctic house trailer by the Spacelab. Antarctic researchers don't necessarily get a brand-new trailer either. The trailer assigned to them has probably been on the ice five times before he gets it assigned for his particular program. The Spacelab, too, will be brought to the campus and prepared there with its special mission-related research gear, flown to the Cape, placed into the Shuttle orbiter, and flown up to orbit along with investigator. A week or sometimes even a month later he comes back with all his data and writes his thesis.

I think it is vital to tell young people that this sort of thing will be available to them. There will be this fabulous new opportunity to address many scientific challenges with the new powerful research tools offered by the Shuttle and the Spacelab.

(DLC) This is one we didn't include as a model, but we certainly will in our supplementary report.

(WvB) Even the safety aspects of research in Antarctica and future research in the Shuttle have certain similarities. A postgraduate student in astronomy working on his doctor's thesis by using the Shuttle-supported Large Space Telescope will undoubtedly have to undergo a cram course for living in the zero-gravity environment of the Shuttle for a week. The Anarctica guys get a similar cram course on what it is like to be in Antarctica. The way it works out there for that researcher is that the Navy keeps him alive, feeds him and flies him out or brings in the doctor in case he gets sick. This logistics support is a different world

altogether from his scientific research program. There are a few things even the well supported researcher has to know, of course. For example, what do you do in case your house trailer catches fire, which, strangely enough, is considered the greatest single hazard in the Antarctica? You see, if you wake up and find the thing is filled with smoke, you may reach for the fire extinguisher. But if that fire is not out quickly and you are forced to get out with a 40 mile wind blowing outside and you get out there in your pajamas, you are good for about one minute. Yet there is a very simple solution to that problem. They just bury a big wooden crate under the snow nearby. It contains well insultated sleeping bags, a sterno cooker with some food supply, and an emergency radio. It is the equivalent of a lifeboat.

An emergency in space is really not too different. There is no immediate requirement to return to earth. If you have a fire in your spacecraft and its interior becomes unlivable, you first need an emergency cocoon. For the time being it provides you all the safety you need. You are not about to die because you are in a stable orbit. You are just as safe as in that little crate in Antarctica that keeps you warm even when there is a blizzard outside. People have to know these little tricks before they can or should go out, - to Antartica or to orbit. For your purpose, Dave, let me say that this sort of information should be presented in training courses to prepare the kids properly.

(DLC) We are even planning a proposal along this line from the University to NASA, so we do plan to pursue this.

(WvB) I have one entirely different subject which may or may not fit into your study. I believe an educational program can be of very great political value to America in what is called the Pacific Rim - the western rim of the Pacific Ocean. Are you familiar with the East-West College in Hawaii? The purpose of that school, in a nutshell, is to bring in students from Japan, Korea, the Philippines, Viet Nam, and Thailand, and expose them to the American way of life and thinking, but do it in a semi-oriental environment, namely in Honolulu. The guys are then sent back to their respective countries in the hope that they will become leaders there. Now the countries that I just mentioned are indeed sending numerous students to that East-West College. But America also has those vast territories in Micronesia, American Samoa and so forth. Most people living on these hundred of islands actually have very little evidence of being citizens of American trust territories. We don't like to call these islands colonies, but nobody knows what they really are. They

are neither fish nor fowl. They have no national identity and if they like us they do it in a vague way because they really do not know very much about America.

They have orphan status. I guess about the only way they are occasionally reminded that they belong to the American orbit is when every now and then the Navy sends a destroyer there and shows the flag. Now with the help of an educational satellite beaming a well thought out program into these Pacific Rim islands, we could really pull them into the American orbit. I think, and that may be a very personal opinion, this sort of positive approach to provide an American presence would be much more effective and lovable than fighting a war in Viet Nam. I am sure the local people would endorse such a satellite service whole heartedly. And I think even for the Department of Defense this would be a most cost-effective way of spending the defense dollar in the western Pacific.

(DLC) Have you proposed this, or is it just sort of a gleam in your eye right now?

(WvB) A very knowledgeable man brought this idea to my attention. Have you heard of Rex Lee? He used to be Governor of American Samoa during the Kennedy administration. He introduced educational television in American Samoa more than ten years ago. He wanted to set up a first class educational system in Samoa, but not by importing hundreds of American school teachers who would only deprive the children of their native heritage. He wanted to have the kids first raised in their native culture and language, and bring in the English language and the American culture later. Since there were not enough native teachers Rex Lee brought the American Educational Television Association into the act. They looked over the island and told him that it was tailor-made for educational television. They put a television transmitter on central Rainmaker Mountain on American Samoa to cover the various villages scattered around the periphery of the island. I saw that system in 1968 when I came back from Antarctica and was greatly impressed. Rex Lee later became Commissioner of the Federal Communications Commission. He also knows Alaska very well. That's why I invited him to attend a meeting we had a couple of weeks ago in Germantown, Maryland, with a group of Alaskans interested in better communicatons for social services. That's where he brought up the question of similar services for the Pacific Rim. "American Samoa was only one little island,"

he said, "and educational television was highly successful there. With the help of a satellite you could provide that same kind of service for all these many islands in the Pacific Rim".

(DLC) That would be nice joint venture between DOD and NASA for using the educational satellite.

(WvB) I would suggest that you throw it into your hopper, Dave. Maybe someone will read it and pick it up.