

**NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
EDITED ORAL HISTORY 4 TRANSCRIPT**

JOHN B. LEE
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is January 18th, 2008. This oral history with John Lee is being conducted for the Johnson Space Center Oral History Project in Houston, Texas. The interviewer is Jennifer Ross-Nazzal assisted by Rebecca Wright. Thanks again for joining us this morning.

LEE: I appreciate the homework that you sent me last night. Based on the list of questions you gave me, it made me dig deeper. Going over some of my biographies, I ran into this piece which talked about the 12 technical papers that I had written. One was a TM [Technical Memorandum] called, "Earth Landing Systems for Manned Spacecraft." It was co-authored by John [W.] Kiker, [James] Kirby Hinson, and myself. John Kiker was hired from US Army Aviation Transportation Research and Engineering Command and took over the parachute systems after I became Dr. Maxime A. "Max" Faget's technical assistant.

John Kiker and I both went to Turin, Italy, to give a presentation to AGARD [Advisory Group for Aeronautical Research and Development], which was a subcommittee to NATO [North Atlantic Treaty Organization]. I gave the presentation on the subject. What it covered was the parachute systems on Mercury, Gemini, and what we were proposing for Apollo. What was interesting about this, Radioplane, which provided our parachutes, provided the life support systems and the parachutes for the Italian Air Force. Tom Beresford with Radioplane set it up for me to go down to talk to their people on Saturday in Rome, Italy.

Kiker went back to Paris, France, and Friday I went on down to Rome. When I arrived at the hotel that night, there was a young Italian boy who introduced himself to me. He asked, “Could you stay over until Monday to give your presentation instead of tomorrow?” I said, “Yes, I’ll be glad to do that.” He said, “I will be your guide for this weekend.” I had my own personal guide. He took me around the five hills of Rome. I got to see Rome as probably few other people get to see it. I got to go in places like his private clubs and to some of Rome’s best restaurants. I was taking lots of pictures of churches and some very famous statues. Sometimes he would stop me and say, “No no, Mussolini!” I did not know the difference but he made it very clear that they did not think much of the statues that Mussolini had built.

The following Monday I gave the presentation to them. At that time the communists were trying to take over the Italian government. The Italians were very cautious about discussing how they stood on anything like that. After that presentation, one of the executives took me to the airport. When we were walking from the terminal building out to the airplane and when there was no one around us, he turned to me and he said, “You all beat those Russians to the Moon.” That was a real thrill to find out how the Italians felt about the US and the strain they must have been under. That made the trip very much more worthwhile. That was very interesting and exciting.

ROSS-NAZZAL: What classes did you teach at the University of Texas [Austin, Texas]?

LEE: I talked to them about the parachutes and the Earth landing systems on the three manned spacecraft. My main thrust was to show them how we designed, developed, tested a system, and

wrote the final reports. At that time, the three-parachute system for Apollo was still under development.

Now let's go back to some of the other questions that you asked me about what sort of materials or concepts I was looking at when designing the Space Station. I talked to you about the design concept of how we would put the Space Station up with the Saturn booster, and we could do it all in one launch. I didn't really get into developing the materials for it.

The materials had been pretty well established. I just helped to develop the concept of putting the Space Station up with the Saturn Booster and then the Shuttle. It was a 12-man Space Station that would orbit the earth for 10 years. That was the concept for the one which we could put up with the Saturn booster. The crew could stay up there for a long time.

This was also done under Dr. Faget's Advanced Planning Group headed up Rene [A.] Berglund, and I was the deputy project manager and head of E&D [Engineering and Development Directorate] technical support. I had the support of the subsystem managers from the divisions. Jack [C.] Heberlig was also his administrative assistant and took care of all the finances. Both of those Space Station designs were run under a contract with North American. I cannot remember if it was still North American and not Rockwell. North American has gone through several evolutions. Now it's Boeing. At that time their study group was at Seal Beach, south of Los Angeles in California.

Basically most of the evolution of the Space Station came from the Manned Spacecraft Center [MSC]. I knew that von Braun had proposed putting up a revolving Space Station in order to simulate artificial gravity on the crew. That would have been very complicated. We had proved in the Skylab missions that artificial gravity would not be required. On one study we had two study contractors: one at JSC, and one at MSFC [Marshall Space Flight Center,

Huntsville, Alabama]. When we were putting up the Space Station with the Saturn booster, we used the solar arrays and they used the nuclear energy for the power supplies. We showed that you should use solar arrays and not nuclear energy for Earth orbit. So here, once again, I think that we out-engineered Marshall.

Putting the Space Station up with the Shuttle and its many individual modules made it much more complicated and a lot more expensive. We have had to fly so many more Shuttle missions, and then we have had to put them together in orbit like a Tinker Toy set. That has really complicated things. As you know, it has been a very slow a complicated process. It's taken them many years to do it, whereas we could have done it so much quicker, less complicated, and cheaper with the Saturn booster.

During the Apollo-Soyuz Test Project, I was the lead engineer from Engineering on the docking module for the flight. Once again, we did this in the same study group with Rene Berglund, and I had the same position for that as I did for the Space Station. I was responsible for the engineering part of it. This was also a study contract with Rockwell. I have talked about designing the concept, what the problems were, and how we were going to dock. At that time we had two different docking mechanisms on the two spacecraft, so you had to have a specific docking mechanism: one for the Command Module and one for the Soyuz. Once we developed that concept, it went to Caldwell [C.] Johnson in Engineering, and he designed the actual docking mechanism hardware and module. That was the difference between doing the concept design and the design and building of the actual hardware. Glynn [S.] Lunney was made the program manager, and he ran the program between the U.S. and Russia.

The KGB was the organization that was the sleuths for the Russians. I don't know if you've heard the story or not, but it's very interesting. Stop me if have. Caldwell Johnson and

Dr. Robert R. "Bob" Gilruth made a trip to Russia with a model of our proposed docking system. Caldwell and Dr. Gilruth were going to show this model to the Russian engineers the next day. Dr. Gilruth had a suitcase that he never locked because he didn't have a key for it. They went out for dinner, and the KGB came in and took that model apart; they couldn't get it back together. The KBG also locked Dr. Gilruth's suitcase, so he had to break it open.

At that time, the Russians would always have at least three people in a group, which included a KGB agent, so the group would not know who the KGB agent was and who the actual engineers were because they all acted like they were engineers. I think that was an interesting story about some of the problems they had working with the Russians. I'm sure Glynn Lunney and some of the others have told you a lot better stories than that, but that was one that Caldwell and Dr. Gilruth both told me.

I will try to tell you some of the things that I know about the universal docking mechanism. When Dr. Faget started designing the Shuttle, he asked for a design concept using the Apollo spacecraft to fill the gap between the end of the Apollo Program and the first Shuttle flight, which Dr. Faget assigned to Rene Berglund's Advanced Study Group. We came up with a plan to put the Apollo spacecraft into a more northerly Earth orbit. We planned to map the whole Earth in 24 hours using some of the new and most advanced classified photography equipment. Some of it was from the Air Force. At that time, the Air Force had not been able to map the United States with their airplanes. We got the approval from Dr. Faget and Dr. Gilruth to show the results of the study to NASA Headquarters [Washington, DC], which turned it down.

They said that they wanted a plan to dock the Apollo spacecraft with the Russian Soyuz spacecraft. I think that George [M.] Low was at the NASA Headquarters at that time. I do not know this for certain, but I think he had a lot to do with this decision. Dr. Faget gave this task to

Rene's study group so we ended up developing the concept for docking the Apollo spacecraft with the Russian Soyuz.

I didn't have anything to do with working with the Russians. I did not travel to Russia. I probably could have gotten involved with them if I had gotten on Glynn Lunney's team, but I wanted to stay with Max. I felt like I could learn more in one day working with Max than I could working a long time with some other people. He was so brilliant.

ROSS-NAZZAL: That's a nice compliment.

LEE: Once again I was off doing something else at that time of the flight, but I was very elated, because Donald K. "Deke" Slayton finally got to fly on that flight. He was also a good friend of mine. The flight opened up a new era for us in spaceflight. We would now work with other countries around the world. I have talked to some engineers, and I was told that we almost lost that flight. Because of the good support by our engineers, they were able to save the flight. I had better not go into that because other people that you've probably talked to, or should talk to, have more information on that.

After working on the docking module concept for the Russians, I was put in charge of the Advanced Technology Programs for the directorate.¹ After all of the work that we had done in studies such as the Space Station, I was in a position to know what kind of technologies we should try to develop for the future space programs. That was a pretty good fit, and that was what I did for the last six years I was at NASA. Mel [Melvin] Savage at NASA Headquarters was responsible for funding the RTOPs [Research Technology Operation Procedure]. I was responsible for getting the requests from the divisions, and I would request the money from

NASA Headquarters to conduct advanced research. These studies would be funded out of NASA Headquarters on contracts called RTOPs. The divisions would assign study managers who were responsible for each of the study contracts.

One of the interesting technology programs we had at that time was to build a Beam Builder System where you would take up strips of metal in the Shuttle and then you could form them into beams that you wanted. That is you could take a flat piece of metal, and you could form it, bend it 90 degrees, or whatever form you needed. It would have been much cheaper transporting flat sheets of metal and then forming them in space. It would have saved a lot of space in the Shuttle bay. I thought it was a very good solution to putting something up where you could build it in space. Dr. [Christopher C.] Kraft was also very interested in this project. I do not know what happened to the project after I left. I know that it was never used.

Another one was that we were trying to develop the technologies for more efficient solar array panels. We had developed chips for the solar array panels that had an efficiency of about 10 percent. We had a technology program going where we were trying to increase the efficiency of those panels to 18 percent. I do not know what the efficiency is of our present day solar arrays. One of the problems was that because of the low efficiency of the solar arrays at that time, it was not feasible cost wise. At that time we were also trying to use solar arrays to get energy from outer space and beam it by microwaves down to hydrogen fuel cells on the Earth. That was going to be one of the things where we could really help the Earth. I read somewhere lately that a company was developing a chip that would have an efficiency of around 40 percent so that should make it more economically feasible with our high gas prices. That technology is being carried out today. That was a very interesting project.

Another one was that we had several studies on computers and its software. At that time they were trying to get industry to come up with common nomenclature in the software. When we would let one contract on software, the study manager would convince us that it would solve all of his problems. After that was completed he would come back with a new request to improve that study. At the time, I did not know very much about computers or its software. What I found out was how fast computers and its software were changing. Dr. Kraft was quoted as saying that the space program accelerated computers by 20 years. Those are examples of some of the ones that were very interesting.

In reviewing my records I can give you a more comprehensive record of the programs that the directorate did. Here are some examples.

MSC had built a crew habitability module. Crew Systems Division had an RTOP for studies on crew support systems. Unbeknownst to MSC, MSFC had gone to NASA Headquarters and convinced them to have this equipment sent straight from the contractor to MSFC to be put into their module. Dr. Faget gave me the job to get that decision reversed. I got with Ed [Robert E.] Smylie, the chief of Crew Systems Division. He, Frank [H.] Samonski, and some of his other engineers pulled together a test plan that showed that the hardware needed to be tested at MSC before being put in the MSFC module. It included studying electrolysis, O₂ generation, solid polymers, molecular sieves, hydrogen polarizer, containment control, CO₂ reduction, water reduction, and waste management. MSFC certainly did not have the capability to run those tests. I went to MSFC and convinced them of that. We then went together to Headquarters and got the decision reversed. After the completion of the test program, the system was finally sent to MSFC and put in their module.

Some other studies included Propulsion and Power Division on antenna arrays, cryogenic cooling, and electromechanical vs. hydraulics systems; Structures and Mechanics Division on structure material processes and materials for the Shuttle. These are just some of the examples over six years.

During this period of time there was one project called the Space Shuttle Engineering and Operations Support [SSEOS]. It was to pick a contractor for technical support to the Center. I was on the board that picked McDonnell Douglas for the job. It was my job to follow these contracts, monitor, and rate the contractor on their support for E&D.² Chuck Jacobson from McDonnell Douglas was the company's contract manager. They had an incentive contract. I kept giving them an excellent rating. Chuck was a great manager.

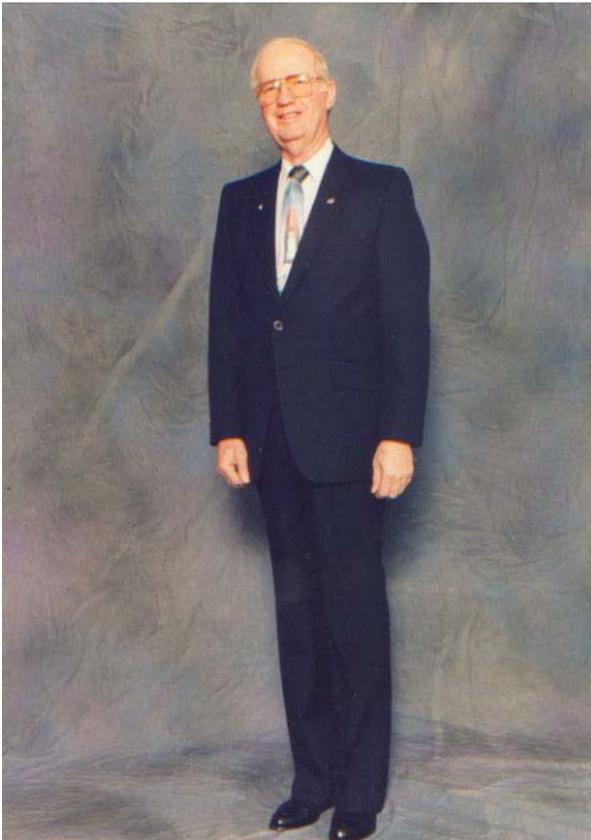
I chose to retire in 1980 because I had gotten to the point, and a lot of other people had also gotten to the same point, where it wasn't much fun anymore. We were being driven by Headquarters rather than Headquarters getting their ideas from the field Centers. The other reason was at that particular time Congress wasn't giving any raises to the government employees. The interest rates were so high at that time that by retiring, with the COL [Cost of Living] raises, within a few years I'd be making more than I was making at NASA. I ran the figures on it, and sure enough it worked, so I retired. I told Max about it, and he showed Dr. Kraft what was happening. Both of them stayed on until after the first Shuttle flight then they both retired from NASA.

Later on Congress finally started giving raises. Where we were working in the \$50,000–\$70,000 range, people are now making over \$100,000 for the same grade level. I think that they are now getting paid much better. Some of the people that I knew stayed there for many, many

more years, and they really made out. It would have taken me a few more years to get where they have gotten. Anyway, I'd had enough. I was tired.

ROSS-NAZZAL: Time to retire.

LEE: Time to retire. [Photo below taken in 1980, the same year as retirement.]



ROSS-NAZZAL: Did you ever work for any contractors?

LEE: No, I never did. There was one time, when Rockwell wanted me to be a consultant for them. That was when they were getting ready to bid on the Space Station contract. It turned out that they didn't get the contract on the study. McDonnell Douglas won it, so that job fell through. What they wanted me to do was be their interface with Engineering because they knew

that I knew Engineering in all depths, backwards and forwards. I felt like I could have done that job with one hand tied behind me. That was as close as I got to working for a contractor.

I've gotten involved in community things like being on the board of directors for the Citizens State Bank, on the board of directors and being president of the Dickinson Country Club, on the board of directors of the NASA Alumni League, and I am a member of the Space Center Rotary Club. I was in management and marketing for a while. Other than that, I haven't gone to work for anybody, but I find that I am still very busy. In retirement, I have enjoyed hunting, fishing, bowling, dancing and playing golf.

ROSS-NAZZAL: Sounds like it. What do you consider your most challenging milestone in your career working with the space program? Also, what do you consider your most significant accomplishment in your career?

LEE: Well, that's a hard one to answer, because everything we did, every accomplishment, and every milestone was so challenging. We were always doing things that had never been done before. We were always expanding the envelope. Putting man in space was so very, very interesting and challenging. Having been on the team that started the Mercury Project before it was Mercury and to be part of the development of the program and its hardware; having been a study manager to show that man could go to the Moon that became the Apollo Program; to be a part of a program where a man could leave Earth orbit and go to another "planet," the Moon, was overwhelming; being a part of the development of the Apollo Program and its hardware; also to develop the concept of docking with the Russians, that was the start of a new era of international space programs.

As I said when we did the Apollo contract studies, we had three study proposals with three different study contractors. Bob [Robert O.] Piland was the project manager for these study contracts. I was responsible for the Martin study. Bill [William] Petynia took care of the Convair study, and Bill Patterson was the study manager for the GE [General Electric] study. What was so unique about this contract was that generally when the Requests for Proposals came in, one of those three study groups would win the contract. In this particular case, North American who had also put in a bid, won the contract, which was unheard of. Of course that flipped out a lot of people. But they got it was because of their experience in having built the Bell X-1 for the NACA [National Advisory Committee for Aeronautics] and the Air Force. I know because I was sitting on the management evaluation committee.

Besides that, Bill Petynia and I helped Bob Piland review and pull together all of the committee reports that went before the board. I thought that technically Martin had a much better proposal and because of some of the work that they had done on boosters. Martin also pointed out in their proposal that there would be a large cost in reliability and quality control, which it was. No other contractor had considered that. I do not think that this was taken seriously in the evaluations. At least that's my interpretation of it. That being said, I think that it is an honest evaluation from an engineering standpoint. You have probably talked to the other people that have different interpretations on it.

ROSS-NAZZAL: I'm sure, yes.

LEE: One day while we were doing this, Bill Petynia turned to me and said, "John, do you remember how hard we thought the Mercury Project was going to be? We have no idea what's

ahead of us in the Apollo Program,” and we didn’t. So when I answer the question you posed, all of the different space programs were major milestones. All of them were significant accomplishments. I can just say, “Hey, being in the space program was a significant accomplishment!” I don’t know how to answer it better than that. I think that answers all of your questions. Do you have anything else you want to add to this morning?

ROSS-NAZZAL: Well, I have one more question that I like to ask people. What impact do you think that the Manned Spacecraft Center had on the area? You’ve been here since the establishment of the Center.

LEE: Oh yes, where we built the Space Center, it was in a cow pasture, as shown by this photo:



MSC SITE JANUARY 1962

We have had a number of cities built around it and some big cities. Clear Lake could have been a city in itself, and of course Nassau Bay became a city. NASA Road 1 [NASA Parkway] was just a two-lane highway going from Webster to Seabrook. On [Texas State Highway] 146, there was a draw bridge over Clear Lake from Seabrook to Kemah that held up traffic when it was

opened for boats to pass under it. This has been replaced by a very nice tall bridge. There was no other bridge across Clear Lake between Highway 146 and Texas State Highway 3 until a bridge was built on Egret Bay Boulevard on Texas State Highway 270. These two bridges helped to open up the other side of Clear Lake for the future development of Kemah and League City. Much of this development was made because of the needs for homes and additional office space for the space program.

Cities after cities have been built up. Of course League City, Seabrook, and Kemah were already here, and they have been expanded into much larger cities. Today, down toward Galveston, they are building homes from the west side of Interstate-45, all the way to Galveston Bay, nothing but homes and shopping centers. All of this used to be open land, raising cattle, dairy and chicken farms, agriculture and things like that. So today that is helping to make it one big city from Houston all the way to Galveston. The expansion has been absolutely tremendous.

This is another interesting story. I was on the board of directors for the Citizens State Bank under Walter Hall, and I told you about him and his five State Banks. He was known as Mr. Democrat in Texas. He took credit for having gotten Lyndon [B.] Johnson into Congress and a few things like that. He knew Lyndon Johnson and his wife, Lady Bird, very well. He and his wife had breakfast with them in their bedroom in the White House. That's how close they were.

When the word got out that NASA was going to build a facility here in Texas, they had just had the big hurricane Carla. Walter Hall told me this story. He called Lyndon Johnson and told him that the place was devastated; Johnson asked him, "What should I do?" He replied, "You get off your ass and come down here and take a look." So Lyndon Johnson came down. They had some of his staff, the dignitaries in this area, and the press. This required twelve

helicopters to accommodate all of these people for the flyover. Walter noted that there were thirteen helicopters. Walter Hall asked the man in charge why he had thirteen helicopters when he only needed twelve. He replied, “In case one of the helicopters goes out. With Lyndon Johnson, I had better have another helicopter ready to fly.”

ROSS-NAZZAL: Smart idea.

LEE: Lyndon Johnson came down, and he looked at the devastation from the hurricane. That got a lot of action. When this area was devastated by the Hurricane, the people were also devastated. It is my understanding that when it was announced that the Space Center would be built in the Clear Lake area, the people were elated. It seemed to have helped build up their spirits very much.

It was a real good move for us. For those of us who moved into Dickinson, Walter Hall was one of the first men that greeted us with open arms. We still had a home in Virginia that we had to sell and I didn't know how I was going to meet my financial obligations. I walked into his bank, and Walter gave me the money that I needed to buy my lot. I said, “You don't know me from Adam. I haven't even sold my home in Virginia yet.” Walter Hall said, “Don't worry about it.” So I was able to buy my lot so that I could start building my home. When my wife was able to sell our home in Virginia in the middle of the summer, we were able to move straight into our new home. Walter made it possible for us to do the things we had to do for our families that helped us so much. He and Dr. Gilruth became very good friends. Walter was able to get a lot of things done in the area for NASA, which he did. Anyway I'm getting a little off on a tangent here.

ROSS-NAZZAL: That's an interesting local story though. We like those. What was it like having a spouse work at MSC?

LEE: Well, in a way it was difficult. We had to get babysitters and had to provide transportation for them every morning and evening. Some babysitters were very good, and some were not so good. Our children had scars from one babysitter. We finally let her go. It made it hard on the family with both of us working, but somehow we survived for many years. It wasn't easy, but she accomplished an awful lot. She is now one of the top authorities in the world on heat transfer. She has been recognized by Randolph Macon Women's College [Lynchburg, Virginia] for having made major contributions to the world, not just in the United States. She has really accomplished a lot. She's a very smart lady, but it wasn't easy on the family.

ROSS-NAZZAL: Is there anything else you think that we might have overlooked that you wanted to talk about today?

LEE: In 1980, I retired from NASA before the first Space Shuttle flight in 1981. Dr. Faget and Dr. Chris Kraft stayed on until after the first Shuttle flight. I had 33 years in government service, including the Army Air Corps/Air Force, the NACA, and NASA. My whole career was as a government employee. The Shuttle uses the ring-sail drogue parachute for landing today that we developed back on the Mercury Project. We have used the ring-sail parachute design on all of our spacecraft so that is quite comforting, to think that I was involved in helping to develop

something that has stood up that long. Here's an image of the Shuttle using that parachute [below].



ROSS-NAZZAL: That's a great accomplishment.

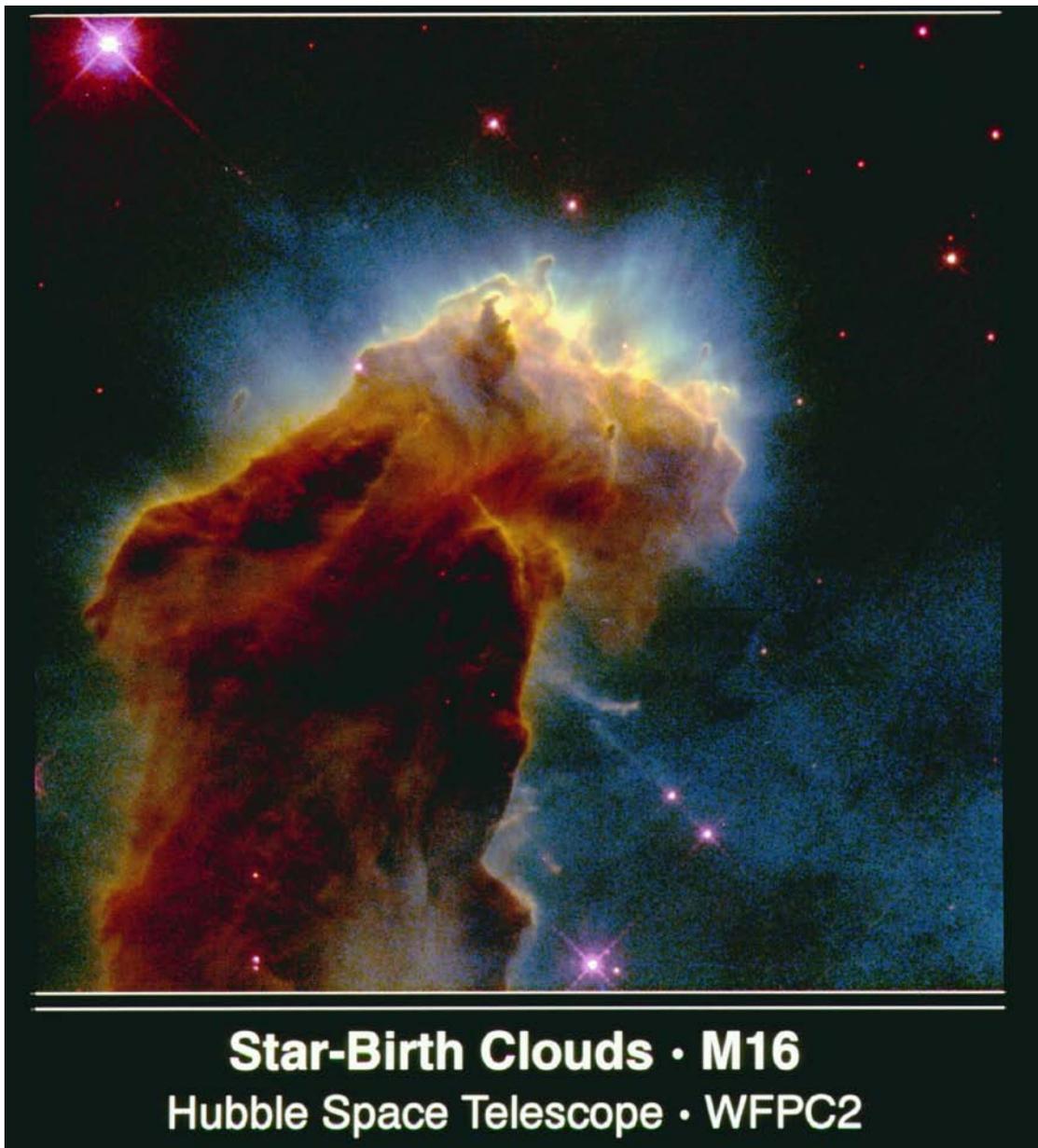
LEE: Then in summary, I've got a slide on my computer if you want to go look at it. It is an artist's drawing that shows from the days of the horse and wagon on the farm, to the open cockpit airplanes, to the space program, and going to the Moon: [next page]



I love that slide. It is one that I can relate to. It represents the many changes, things that I've seen and participated in during my lifetime. I've been very lucky and blessed. I've gone from the days of the Depression behind horses and mules on the farm, to flying open cockpit airplanes, to encountering the first operational jet aircraft in combat, seeing the V-1 guided missile, and witnessing the launching of the V-II rockets from Germany on their way to bomb England on missions over Germany, to flying supersonic jet airplanes.

I have participated in the design and development of supersonic jet and rocket aircraft, to putting a man in space and sending him to the Moon. I have worked with my WWII adversaries on the space program. I helped develop the concept to join with our Cold War adversaries, the Russians, in space. In the meantime, the Hubble [Space] Telescope has found new planets, galaxies, and solar systems. Unmanned spacecraft have landed on Mars and gone to other planets: Mercury, Jupiter, the Sun, and beyond. We have opened up the way for interplanetary space travel. We helped to write the books on aviation and space travel. I can't imagine anyone having a more exciting career than I and many others who have had the experiences of working on the space program.

I have a couple of questions for you. Is this a great country or what? We now ask the question, "What is our true place in the universe?" Think about it.



ROSS-NAZZAL: Those are good questions.

[End of interview]

¹ NASA's Position Record, AST, Project Management 770-10-S (GS-1301.1-15, dated August 13, 1973.

² Letter from SSEOS Technical Team Chairman, Wyendell B. Evans, to John B. Lee regarding his contribution to the SEB process, dated May 8, 1974.