

**NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
EDITED ORAL HISTORY 2 TRANSCRIPT**

JOHN B. LEE
INTERVIEWED BY JENNIFER ROSS-NAZZAL
HOUSTON, TEXAS – 16 JANUARY 2008

ROSS-NAZZAL: Today is January 16th, 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: Thank you, Doctor and Rebecca. What I'd like to start off with is a continuation of what we did yesterday. At the end of World War II, our groups' intelligence officer, Major Ed Steiner, came to us and said, "If you will give me \$20 each, I will write a book on the group's history." About two or three years later, here came this history book named *Kings Cliffe*. It is a complete history from the time that the group left California until the end of the war. It has the name and pictures of everybody that was in the group during that period and what they did. It has all the data and the intelligence reports from every mission that was flown and shows what position every pilot flew on that flight. It has the photographs of all of the pilots with their ranks, home town, and awards, as well as the ground personnel.

We know of no other history book that was written like this after World War II. There are those that have been written about the pilots and the missions that they flew, but nothing as complete as this book. This book is now in the Library of Congress [Washington, DC]. What I have here in my hand is the fifth edition of this book, *The Kings Cliffe Memorial Edition*. Over the years, we kept publishing more copies of it because it was so popular. We knew that this *Memorial Edition* was going to be our last printing. In addition to it being in the Library of

Congress, I have also donated copies of it to the National Air and Space Museum in Washington DC and the Kitty Hawk Museum at Kitty Hawk, North Carolina. One is in the JSC Library, and one is in the Clear Lake City-County Freeman Library. They have been distributed all over the United States into those kinds of libraries. [The University of Houston-Clear Lake Neumann Library ran a search on it that shows it is now in 60 libraries including some in Germany.]

Now the 20th Fighter Wing that I told you about are the jet boys. The 20th Fighter Wing has used this book to plan how they would fly the same missions, as those we flew in combat, in jets today. They used this book as a training manual. Those are some of the reasons for this edition, and that is to get it to people that would want to read and learn from it. That's what the *Memorial Edition* is for.

On the tape that I gave you, two men from the Library of Congress came and interviewed me. I showed them my [Microsoft] PowerPoint presentation of WWII on my computer screen upstairs. They recorded that, and their interview with that presentation is now in the Library of Congress.

Now you asked me about how I got certain medals. I talked to you about one of the strafing missions with Colonel Russell F. "Gus" Gustke. I'd like to read you some excerpts here from *King's Cliffe*.

MISSION NUMBER 262. 19 February 1945. More than 1,000 Eighth Air Force heavies hit important targets in Western Germany today. Railroad yards at Gelsenkirchen, Osnabruck, Rheine and Wesel, a synthetic plant at Dortmund, an aluminum factory in Meschede and factories at Bochum and Siegen were the assigned targets for the bombers.

The 20th Group was assigned to an area in north central Germany near Halle and Magdeburg in which to destroy enemy transportation. Led by Lt. Col. Gustke the Group took off at 1120 and arrived in the area at 1330. The squadrons split up and strafed the areas between Halberstadt and Leipzig until 1415 when they withdrew. 12 locomotives were destroyed or damaged.

North of Oschersleben Col. Gustke spotted a Me410 flying north at tree-top level. Gus fired at the plane but missed and lost it in the haze. The 410 opened up with its barbette guns and Gus brought back several holes in his right wing as a result of the exchange of fire.¹

That was the mission I was telling you about when Gustke had gotten upset because he didn't get that other plane, and when he made this quick turn, had lost his wingman, and yelled at him, "Get your ass back up on my wing or I'm going to shoot you down." Well, that was the mission.

Let me continue.

Lieutenant Robert E. Murrell (77th) hit a tree with his wing while strafing a locomotive. His plane crashed into the ground and although some of the others circled the area, he was not seen to get out of his airplane.

Capt. Lowell E. Einhaus (77th) completed his tour with this mission.²

I think that's enough on that one. I was his element leader that day, with a man flying my wing.

That was one of the missions that was used to nominate me for the DFC [Distinguished Flying Cross].

Now here's one that is quite amazing. I talked to you about it from my standpoint at that time.

MISSION NUMBER 303. 10 April 1945. Approximately 850 B-17s and B-24s bombed German airfields at Parchin, Rechlin, Larz, Briest, Burg, and Zerbst while 430 forts of 1st Division attacked an aircraft assembly factory and an ordnance depot in Oranienburg.

The 20th Group was assigned to a choice spot, the escort of the first two combat groups of the 1st Division to Oranienburg. Led by Col. [Robert P.] Montgomery (A Group) and Capt. Riemensnider (B Group), the boys took off at 1150, crossed in over the Dutch Islands and rendezvoused with our big friends at Osnabruck at 1341. The target was bombed visually at 1438 with excellent results. Escort was continued to Steinhuder Lake where the group withdrew at 1530.

Just after our bombers hit the target, about 10 to 15 jets started to come through.³

Those were the jets that I broke into at 20,000 feet, and they went on up to the bombers like I said they did.

Our boys were ready for them and in the mad scramble that followed 5 twin jets were destroyed and 3 damaged. Some of the blow jobs [that is the jets] were caught at altitude and chased to the deck, another was caught trying to land, another was shot down and crashed in the heart of Berlin.

After the jets had been disposed of, the group divided its force and while some of the boys escorted the bombers, the rest hit the deck and strafed six airfields in the Berlin area and an airfield at Fossberg, 125 miles west of Berlin [which was us]. When the smoke had cleared away the 20th Group had given itself a new high planes destroyed on one mission.⁴

A total of 5 in the air and 3 damaged, and a total of 52 on the ground with 23 damaged.

Then it goes through the records of who got what planes and so forth. I thought that was a very interesting anecdote to what I told you yesterday. You get an idea of how important that we think that this particular book is. We are very proud of this book. Actually there are just a few of these books left. I have a few of them, and I know of two other people that may have some left. We have them in certain libraries, but we don't have it where you can buy it anymore, unless you get it from me or a couple of the other pilots.

I have one or two other anecdotes here. I told you about "Cliff" Jurgens; he was hit by flak, completely turned over on his back on the deck, recovered, and brought his film back, which I saw. On that mission he got eight airplanes on the ground. He set a record for the most airplanes ever destroyed by one pilot in a single day. After that we called him "Ace" Jurgens. He was one of the men in my flight and a very good friend. On this particular flight, he was flying the Colonel's wing. I was leading the second flight that went over the field. When I did, I saw nothing but burning airplanes. The Colonel, Ace Jurgens, and Lieutenant Peterburs had taken pretty good care of them.

There was another one. Vince Rudnick, who was one of my best friends, was flying my wing coming back from a mission. We had left the squadron early because he was having engine trouble, and I was trying to take him home. I took him down to the deck, and he had to crash

land with his wheels up in a field in Belgium. I circled him to try to see if the Germans were there. If they were, I would try to cover him if he wanted to try to escape. He called me on his radio, which still worked and asked, "John, am I in enemy territory?" I told him, "I don't know, but as of last night you are." It appeared that civilians were coming out of the woods. He said, "Well they look friendly, John," so I left him, and I went on back home. A few days later he showed up at the base. It turned out that they were friendly Belgians. The Germans had moved out of that area the night before. Isn't that an amazing story? We have a lot of stories like that.

On one escort mission it was so cold that my windshield and canopy froze up and I could not see out of it. I had to put my hand with the gloves on the windshield to clear it enough to see. That was very scary because I felt like I was a "sitting duck." On another mission the sky was so humid that the bomber contrails were causing a cloud bank. The bombers finally reached a natural cloud bank. We kept getting lower and lower in order to see the bombers. Finally the weather was so bad that they scrubbed the mission. We were instructed to return to base. We started making a left turn. I was banked at 90 degrees when I saw this B-17 just a little below my left wing tip. I can still see the pilot and co-pilot looking at me. I know they were as surprised as I was. I still do not know how we got through that bomber stream.

I was on one mission where there were 2,000 airplanes from the Eighth Air Force in the air at one time. I cannot remember if that was on Christmas Eve when the weather broke over the Battle of the Bulge and Europe. It could have been when we put General Montgomery across the Rhine [River]. Every day on the front page of the British newspaper they kept talking about how General Montgomery was sitting behind a smoke screen on the Rhine. On about the fourth or fifth page, it was about how Generals [George S.] Patton and [Courtney H.] Hodges were moving through France and capturing towns. Then there was more about General Montgomery

moving his troops behind the smoke screen. One morning when we went in for the group's briefing we were told, "Men, today we are going to put 'Monty' across the Rhine if it takes every airplane in the Eighth Air Force to do it." And we did.

On my longest mission of 6 hours and 40 minutes escorting British Mosquitoes over Czechoslovakia, my fuel gauge was on zero when I got close to the base. I called into the base for landing instructions. They said that the traffic was heavy, and I would have to go around. I told them I could not go around; I was out of gas. They cleared me to come on in and land. On landing, we would come in right on the deck, peel off and up to the left, and land. I came straight in and landed. My revetment was right at the end of the runway. When I pulled into the revetment my engine quit on me.

Those two mission summaries that I just read to you were the two missions that I got the DFC for. I was also awarded six air medals, which were given based on the number of missions that one flew or for a specific mission. I also received three battle stars: one for the Battle of France, one for the Battle of Ardennes [which is known as the Battle of the Bulge], and one for European Operations. I was in what they called three major battles, and that's why I received those Battle Stars. That's all the time that I want to spend on World War II.

ROSS-NAZZAL: That's very impressive, all those commendations that you won.

LEE: Thank you. I've got a copy of the DFC hanging on the wall over there. It essentially says in a short form what I just talked to you about.

ROSS-NAZZAL: Why don't we pick up where we left off yesterday, which was the NACA [National Advisory Committee for Aeronautics]. We were going to talk about how you found out about that opportunity.

LEE: I was shipped back to the States on the *Queen Mary*. It took us five days getting home, where it took us six days in a convoy on the French ship going to England. Every day we would have a fire drill with our life vests on. We would stand in the same place every day, so I started carving my initials, JBL, in the ship's railing. By the time we got to New York I had finished carving my initials in the railing. I finally got home from WWII in October 1945. I enjoyed being home with my family and friends for Thanksgiving, Christmas, and New Years, until January.

I would have nightmares about the war. One night I woke myself up hollering. I asked my mother the next morning if she had heard me yelling. She said she had, but she did not know what she should do. I told her, "For God's sakes if you hear me hollering at night, please wake me up!" I didn't know that they had told the people back home, "Don't ask the men in the military about their experiences when they come back home." I didn't know that.

My father never asked me. As I said, I never talked about my World War II experiences for 40 years. My family, my wife, and my children never knew what I had done in World War II. If my father had asked me I would have told him. Maybe if we had talked about it, I wouldn't have waited another 40 years. I didn't know that was what had happened.

I got home in October, and in January I was back at VPI [Virginia Polytechnic Institute, Blacksburg, Virginia]. At that time I had a choice of staying in the Service, which I wanted to, but I knew that I had to get an education so I went back to VPI. By that time, the Air Force was

just bringing the F-80 jets on board at Langley Field, in Hampton, Virginia. Later I got checked out in the F-80.

In January, VPI had forgiven me and my brother for going AWOL [absent without leave] from school, and we were reinstated. At VPI we applied for funds under the veteran's program to go to college. That was a big help. The government has gotten the money spent on veteran's education back many times over on income taxes. Also, I got credit for a lot of things that I'd learned in the Service. I was having a hard time passing when I was there before the war. After the war, when I went back, I guess I had grown up some, and I had a lot more training and experience. I just breezed through VPI [which is now known as VT, Virginia Tech]. I graduated from Virginia Tech in mechanical engineering with options in aeronautical engineering. I stayed on an extra quarter to take some electives in aeronautical engineering. That was a relatively new department at that time. I finally graduated with the class of 1948, three years later than the class of 1945 that I was in before I left to go into the Service. *VPI was my launch pad to the future.*

Why did I choose the NACA? I had applied to North American Aviation for a job in engineering and as a test pilot. I dearly loved the airplanes that they had built that I had flown. I did receive an offer from them as an engineer. In the library I found a NACA technical memorandum on the design of the P-51 inlet [air scoop] written by Paul [R.] Hill at the NACA at Langley Field. I used that to write my thesis on airplane inlets.

I took a trip to the NACA at Langley Field. I got to visit their facilities and wind tunnels. They had the Flight Research Division that was flight testing jet aircraft. I was fascinated when I saw models of airplanes in their wind tunnels with supersonic airflow over their wings. That was where I wanted to be, where the future airplanes were being developed! Also, I wanted to be a test pilot. Furthermore, I could be in the Air Force Reserves right there at Langley. It did not

pay as well as North American but it was in Virginia, close to my roots. It seemed like the best of all worlds.

Money was never one of my big drivers. I wanted to do the things I loved. When I took the job, my father could not understand it. He said, "No one should work for the government under civil service."

When I left VPI, I went to work at the NACA, the forerunner of NASA. My first stop was to see test pilot Bob [Robert] Hoover at Flight Research Division, to try to be a test pilot. I was told that they did not have any job openings at that time, but if they got an opening, they might consider me. I realized that we were now in the jet age and that "time" had passed me by. Personnel then sent me over to the Pilotless Aircraft Research Division (PARAD), headed by Robert "Bob" R. Gilruth.

Bob Gilruth hired me as an aeronautical engineer, grade P-1, at a salary of \$2,974.80 per year. Bob Gilruth had been in the Flight Research Division. He had experimented with putting models on the wings of an airplane, to tests these models at supersonic speeds. Gilruth then started PARAD. He had developed and had built a test facility at Wallops Island, Virginia. They would fly rockets and models of airplanes at subsonic, transonic, and supersonic speeds in free flight out over the Atlantic Ocean. Chuck Yeager had just broken the sonic barrier the year before I got there so we were now in the supersonic age. When I arrived, the division was flying models of rocket and jet airplanes at subsonic, transonic, and supersonic speeds of Mach numbers 1 and 2.

Gilruth put me in the Propulsion and Flight Dynamics Branch headed by Paul Hill. Paul Hill seemed to be pleased to find out that my thesis in college on inlets had been based on his TM [technical memorandum] so I got off to a good start with him. Can you believe that?

Maxime “Max” A. Faget was there. Paul [E.] Purser was head of the Aerodynamics Branch. [Joseph] Guy Thibodeaux was head of the Propulsion Branch, and he was providing the rocket motors to boost these models. He was our rocket motor expert, as you probably know. I did some flight testing of the Navaho Rocket airplane with Aleck [C.] Bond. We went through ten years of testing things like that after I got there.

Gilruth had also built a free flight wind tunnel at Wallops Island. It was called the “blow down jet” wind tunnel because the nozzle just blew out into the atmosphere, out over some marshland. The flow was not contained in a building like the wind tunnels were at the Langley Research Center, which were in great big buildings. I was later assigned to working on wind tunnel tests of jet engine inlets and ram jets.

Max then gave me the job of developing a method for dropping models of warheads [or stores] from the F-100 series of airplanes: the F-101, F-102, F-103, F-104, F-105, F106, and the F-107, as well as from the B-52 Bomber. Caldwell [C.] Johnson’s division did a lot of work helping me develop and build this test set up. It included the designs of the models of the stores tested so that we could properly simulate the full-scale models. I would have those models built with different types of materials such as iron or molybdenum to give them the weight that was needed to simulate the full-scale model. Caldwell Johnson and his branch would design the models, and then I would have the models built in the NACA shops. That was quite a feat, but I had people that helped me to do that.

Max Faget showed how the airplane model would have to be accelerated up when the stores were dropped in order to simulate the proper trajectories from the full-scale airplanes. What we did was to set up a test stand at the exit of the wind tunnel so that we could test the configuration of the airplane dropping their warheads in free flight. Some were dropped from

the airplane's wings and some from the bomb bays. We could change the nozzles on the wind tunnel to get a range of Mach numbers from 0.80 to 2.0. I also dropped models of warheads that were conical or blunt-shaped. The blunt-shaped stores were models of atomic warheads so I had to get an Atomic Energy Clearance [AEC] to run these tests.

I first started out using a movie camera to get the trajectories of the stores. This was not a very accurate way of doing it. One night I was reading a trade magazine, and it showed photographs using a strobe light system that showed a sequence of photos on one sheet of film. I went to Wallops Island and asked them if they could develop a strobe system for me. Charles "Tom" Augustus Hulcher had developed a camera at the NACA. The NACA had allowed him to patent that camera. It was known as the Hulcher Camera. It could take very good pictures at very high rates of speeds. The newspapers started using it to take excellent high-speed photos in sports. They developed a system using this camera with a strobe light system. It was excellent at showing the complete trajectory on one piece of film.

Some of the stores would drop cleanly from the wings and the blunt-shaped stores from the bomb bays. There were some problems with the conical-shaped stores. When dropping a model from a bomb bay, some conical stores looked like it was flying back up and hitting the airplane so we cut off the tail fins on one of the models. From this we found out that the airflow coming out of the bomb bay was impinging on the fins and that caused the nose to rotate up causing the store to hit the bomb bay. From that we found out that we would have to eject the conical-shaped stores nose down from some of the airplane's bomb bay.

This technique was developed and used for testing some of the early models of the F-100 airplanes used in combat. Airplane companies came to us to test drop their stores from their airplane models, so I got a reputation of being an expert in bomb drops. I wrote a total of twelve

research memoranda at the NACA, and I think nine or ten of them were on the bomb-drop test program. The first one established the test technique for running these tests, and the rest of the reports were on the different airplane models that we tested. It was a very interesting program.

As part of my oral history rewrite, I have gone back to my personnel files and have added some references of my promotions and some of my other commendations. I think these will cover more in detail some of what my responsibilities and accomplishments were that may be of interest instead of describing them in detail in my interview.⁵

At that time the branch was doing a lot of work on the blunt shape. Nine years after I got there, PARD was flying models of nose cones and ballistic missiles at Mach 15 into outer space. They were models of atomic warheads for the Air Force. These tests were to develop the heat shield material so that the models could reenter the Earth's atmosphere safely without them burning up. During that period of time, Max had found out that we could not get an airplane to go much faster than Mach 6, and we would have to go in a different direction to put a man in space. Then Max Faget came up with the idea that using the blunt reentry vehicle with which we could put a man into outer space and return him safely to Earth.

I can remember it very well one day when Max called me into his office and said, "John, I want you to go to work with me on putting a man in space." I asked, "Max, how are we going to do that?" He said, "I don't know; that's what we have got to find out." Well, what I didn't know was that he and Gilruth had already gone to see Center Director Floyd [L.] Thompson who then sent them to see NACA Headquarters Director Dr. Hugh [L.] Dryden. He liked the idea.

They tried to sell the idea to the Air Force. The Air Force had been working on a winged vehicle named the Dyna-Soar for three years. The Air Force said, "No, we want a winged vehicle so that we will be able to come in and land on land." Max told them, "You do not have

the capability to put up a winged vehicle. It would be too heavy for any of the boosters available in the Air Force arsenal because of the guidance systems and everything you have to have on it. Also, you have not developed the know-how to reenter a winged vehicle. You don't know how to do that yet. I can use the available Air Force boosters. I can put the blunt shape in orbit, and I can land it anywhere you want it to land it." The Air Force said, "No, we don't want to do that," and they turned them down.

The three of them Max, Gilruth, and Dr. Dryden then went to see President Dwight D. Eisenhower. [President Eisenhower was a five-star general, head of the Allies in WWII in England; General Jimmy [James H.] Doolittle was the head of the Eighth Air Force, when I was there. That is General Doolittle's picture there on the top of my book case and featured below.]



President Eisenhower liked the idea, and he sent them over to see Congress. [I got this story from both Max and Gilruth.] When President Eisenhower sent them over to Congress, Sputnik had just been launched. As Max put it, "Congress was in a panic. They had gone ape!" You have probably heard that before. Congress had a small subcommittee on space at that time. I think U.S. Senator Lyndon [B.] Johnson headed up that committee. When Congress heard

there were two young engineers that were going to talk about putting a man up in space, they filled the conference room and the hallways waiting to hear what would come out of that meeting.

Max Faget showed his hand sketches to the committee members at the table. The committee then passed them around the room, out the door, and down the hallways for all of the congressmen to see. At the end of that review, the committee told them that since the Air Force had their winged vehicle, and you, the NACA, have a different approach, we will continue with both of them. When Max, Gilruth, and Dr. Dryden walked out into the hallway, they looked at each other and asked, "Have they told us to go do it?" They finally decided, *yes* they had!

Max and Gilruth came back to the Langley Research Center, and then Gilruth sat down and wrote the famous one-page memo that started the Space Task Group for Project Mercury. He and Max handpicked 35 people from around the Center, which included Chris [Christopher C.] Kraft. I was fortunate enough to be in that group. That was the first official piece of paper that started the manned spaceflight program.⁶ As you probably know, Chris Kraft said at the end of Apollo Program, we had something like 450,000 people on the space program. That is how large that group of 35 people grew. You know the old song that said, "Give me ten, who are stout hearted men, and I will soon give you 10,000 more?"

ROSS-NAZZAL: I've never heard it.

LEE: "Give me ten stout hearted men, and I will soon give you 10,000 more." But the group of 35 was not just engineers. It contained some of the staff, the secretaries, and people like that.

Really it was just a small group of people assigned the Space Task Group to get it started.



This is a photograph of a Mercury Space Task Group Planning Session; seated from left is Charles Donlan, Robert Gilruth, Max Faget, Robert Piland. The NACA and thereafter the NASA Centers were also doing a lot of research work for the manned spaceflight program. When NASA went out with the RFP [Request for Proposal], they gave industry four weeks to reply. The industry had already been to NASA and getting all of the information that they could from us. We had essentially designed the spacecraft at that time. We received the proposals and reviewed them. In two weeks' time we had signed a contract with McDonnell [Aircraft Corporation] to build the Mercury spacecraft. All of this had been done in six weeks. No RFPs,

before or since, have been done that fast. That's how fast we were moving. We were ready for the challenge.

Before we let the contract for proposal, Max already had me working on the parachute system. I was responsible for the parachute system on the spacecraft. That was a very interesting project. Radioplane had won the contract for providing the parachutes for us. We had tried dropping the Mercury capsule with the parachute that they had proposed and that failed. They came back with a new parachute design that they called the "ring-sail" parachute that had positive opening characteristics. We liked the idea, and we reviewed it with Bob Gilruth. He liked the idea and that was the parachute that we developed for the Mercury Project. We designed the deployment system so that we had a second parachute if the first one failed. That made it a completely redundant system. If one failed, you had the other one. We never had a failure on this parachute system.

At first we weren't too well organized, but kind of organized. After the Mercury Project started, I started looking around at the things that had to be done. Bill [William M.] Bland from Reliability and Quality Control had come to see me and pointed out that no one seemed to be following the propulsion systems so I picked them up. The next thing I knew I not only had the parachute systems, but I had the responsibility for *all* of the propulsion systems on the spacecraft, which included: 1) the launch escape rocket motor with its posigrade rocket motor, 2) the retro-rockets package to reenter from space, 3) the hydrogen peroxide jets that controlled the attitude of the spacecraft in orbit, and also 4) the pyrotechnics that cut the Mormon clamps for both the escape rocket motor and for the heat shield.

So I went in to see Bob Gilruth. [I'm still calling him Bob Gilruth because at that time he was Bob Gilruth. Everybody called him Bob.] I told him, "I've got this responsibility for all of these rocket motors, and I don't know anything about rockets. What should I do?"

Instead of saying, "Well John, we'll give it to somebody else," he said, "Why don't you go over and talk to Guy Thibodaux." He was a man of few words, but they were very powerful. So I went to see Guy Thibodaux, and he became my teacher and my mentor. He helped me with some of the problems we were having on developing the rocket motors. We ended up having no failures of the propulsion systems on the spacecraft flights.

There were certain people who were trying to be power builders and to build bigger organizations. Al [Alan B.] Kehlet, the head of the Aerodynamics Section, had gone in and convinced Max that I needed to be under him because I had the parachutes, which was aerodynamics, and they were the aerodynamics people. I was told that by Bob [Robert O.] Piland. I went home that night, and I laid in bed and I thought, and thought, and thought. The next morning I got up, and I made a list of everything that I was responsible for. I took that sheet of paper to Bob Piland and said, "Look Bob, this is what I'm doing, and they want to put me under aerodynamics?" He jumped up and said, "Come with me, John." We went in to see Max. Max looked at it, and then he said, "John, we will make you head of Mechanical Systems Section." Here, all of a sudden, I am the head of the Mechanical Systems Section. After I became head of the Mechanical Systems Section, Bob Piland wrote me up for my promotion from GS-13 to GS-14.⁷

So anyway, I picked up these responsibilities, not waiting for somebody to assign them to me. I was just seeing the things that had to be done, and nobody else was doing them.

That was the kind of flexibility that we had in those days. That was what was so good about Max and Gilruth; they knew how to pick their leaders and to organize around them. I just loved both of those men. Of course you've heard many times that Dr. Gilruth was like a father to so many of us. I was just fortunate enough of being in the right place at the right time with the right people, but I also took advantage of this luck. I didn't just wait for people to tell me what to do. I had learned that you had to make yourself needed. I guess that's what they were looking for, people who were needed.

I learned early in the game not to take an idea to Max or Bob Piland that you were not prepared to handle. If I went in and described a problem to them they would say, "Well, go fix it." You had better have an idea of what you could do when you went in and talked to them about a problem. That was how they worked. The people that came out of the NACA that did the work got credit for what they did. They were also held responsible if the work was not done correctly. Some manager or some division chief would not take credit for it. As I have said, at the NACA in many cases we would design, build a model, fly, review the data, and write the final reports. We took these projects from birth to grave.

We were people who grew up in the field, and we knew how to do things because of our experience. When we got to working with the contractors, we were able to go and sit down and talk to them. We already knew more about designing the spacecraft than they did. At first, they couldn't believe it. They'd been used to working with the Air Force. The Air Force would give them a set of specifications that would tell the contractors they wanted them to design and build a plane with the capability that flies so high, so fast, with so much of a load, etc. Then they would go home and later they would go back and get a progress report from the contractor.

We didn't work this way. We sat down with the contactor and helped them design the spacecraft hardware right from the beginning. It turned out to be a real good working relationship with the contractor doing it that way. On the Mercury Program I had my counterparts for the parachute and the propulsion systems at McDonnell. This was in the days before the subsystem managers on Apollo. That's one reason that we were so successful. I developed some very good friends with the contractors.

As an example, one of the things that I did was I took a model of the Mercury spacecraft just like this [shows model] home with me. I put it in my bathtub, and I found out that it had two neutral buoyancy points. That is, it would float with the apex up this way, or it would float with the apex down with the heat shield out of the water this way. [Demonstrates]

ROSS-NAZZAL: Not the way you want to be sitting in the capsule.

LEE: Exactly. The astronauts would not be able to get out of the spacecraft with its apex down so I went back, and I reported this to Max. He sent me over to the full scale water tank that the NACA used to test seaplanes landing in the water. The man put in charge of the tests was Bob [Robert G.] McKann. He became a good friend of mine for many years. I told him what the problem was. He took a full-scale model of the capsule, and sure enough he proved what I had found out in my bath tub with a model this size. My findings were right.

Also it had been learned that when the Mercury capsule would land in real rough seas, you could get very high Gs on impact. These impacts could sometimes be higher than the 14 Gs for which the spacecraft was designed. In order to take care of the buoyancy problem and the high G impact on landing, we had to develop a method where the heatshield would be lowered

on landing. This also required that a Mormon clamp be developed to hold the heatshield on with pyrotechnics to cut it on landing. The pyrotechnics was also one of my responsibilities. That's how a lot of things came together.

That's the kind of engineers we were. We didn't wait for somebody else to tell us what to do or how to do it. You can see how well Gilruth, Faget, and others had trained their people at the NACA. It was the kind of training that you probably could not find anywhere else. We were doing things that had never been done before. In fact, Gilruth developed that Flight Test Facility at Wallops Island before the Air Force ever had a test facility down at Cape Canaveral, Florida. They came to him for help in designing their facility.

In reviewing my files there were a number of projects that I worked on that are covered in more detail in my promotions from: 1) GS-12 to GS-13 written by Carl A. Sandahl [see Endnote 5], and 2) GS-13 to GS-14 written by Robert O. Piland [see Endnote 7].

ROSS-NAZZAL: I have some questions, if you don't mind.

LEE: Yes, go ahead.

ROSS-NAZZAL: You made an interesting statement just a few minutes ago that Gilruth was like a father to so many of you. Could you explain that in more detail?

LEE: Well, he was such a fine gentleman. Later, I'll get into the foresight I was able to have in management meetings with him. This man just knew how to work with people, bringing out the best in them. One weekend after Dr. Gilruth and I both had retired, we met at Walter Hall's

Ranch up in mid-Texas on the other side of San Antonio near Johnson City. Walter Hall had a beautiful 2400-acre ranch up there. He would invite a bunch of us from the Johnson Space Center up there ever so often. On one particular trip, there was also Dr. Faget, Caldwell Johnson, and Wes [Wesley L.] Hjernevik, with their wives. [I am now referring to both Bob and Max as doctors, which they were at that time, but I still called them Bob and Max unless I was at work.] I asked Dr. Gilruth, "I don't know if you remember when I came to work at the NACA."

He stopped me and said, "Yes, I do. I hired you. You were a boy that had grown up on a farm during the Depression, had become a fighter pilot, been in combat, and you had come to the NACA because you wanted to design airplanes. I was impressed." Evidently I had made a good impression with him, and he still remembered it. That was amazing. God, they were just so nice to you, they were so nice.

ROSS-NAZZAL: How helpful do you think that your World War II experience was in helping you in your NACA career?

LEE: It was a big help because, before the war, I was having a hard time at college because I had graduated from a non-accredited high school, believe it or not. I was getting some Cs and Ds and not many As and Bs. When I came back after the war and went back to VPI, I just breezed through most everything. In the Air Corps, we had a lot of training, and I had grown up a lot so that was a big help.

When I went to the NACA, I said, "God, I have lost three years from being in the Service." There were guys younger than I, who had already been working for the NACA for several years. I said, "Well, I'm behind the eight ball." But it didn't turn out that way at all

because much of the experience that I had gotten in the service had really helped. There were others in the same boat as I was.

Max Faget had been in the Navy in submarines, and they snuck into Tokyo Harbor. I don't know if Max told you this story or not. There was a Japanese airplane over the top of them. Max knew that they had a fix on them because they could hear the ping, ping, of the Japanese sonar on their submarine. About that time another airplane dropped a bomb somewhere else; their airplane left and went over there, so they were able to escape. That is how close Max Faget was to not being here after the war. He would not talk about his experiences, but he told me that story himself.

Doug [Douglas H.] Foland was at Pearl Harbor. He had just walked out of the mess hall when the Japanese attacked Pearl Harbor. There was Gene [Eugene D.] Schult, who I had roomed with at "Club 55." I didn't know that he had been a bomber pilot in the war. I don't think he knew that I had been a fighter pilot. I might have escorted him on missions over Europe in the Eighth Air Force. Then there was Woody [Willard S.] Blanchard who had been a bomber pilot. Jim [James R.] Hall was with the Canadian Air Force, went to England, and had flown bombers in the war. Guy Thibodaux was in the Army Corps of Engineers, and he helped to build the Lido Road in the China Burma Theatre under General "Vinegar" Joe Stillwell, just to name a few. Those were the kind of people that Bob Gilruth had collected around him and who I was working for and with. It didn't take long to become needed.

ROSS-NAZZAL: Would you tell us what it was like in Hampton after the war? For instance, did you have a car when you first started working for NACA? Where did you live?

LEE: Yes, I got my first car after I had gotten out of college, and I was going to work for the NACA. It was a nice new red Chevrolet. I lived in a house named the Club 55. It was named Club 55 because that was the house number on that street. Let me see, how many people were there? There were about six or seven of us that roomed in the house together. Gene Schult and I were in the same room until we separated to get married.

When we were working for the NACA, the community called us, “Those crazy NACA [pronounced NAKA] nuts.” We were doing things nobody had ever done before. We were flying these models of airplanes and rocket models at supersonic speeds, putting the models into outer space, and reentering them to develop their heat shields for reentry. We were the “crazy NACA nuts.”

ROSS-NAZZAL: You mentioned that you got married when you were working at the NACA. Will you tell us about meeting your wife?

LEE: Yes, we had a Computer Section. Do you know what a Friedan calculator was? To explain it here, it was just like a cash register where you would type in the data or the numbers. You would pull a crank handle, and the data would come out on this piece of paper. Then it would have to be plotted by hand. My ex-wife Dottie [nickname De De] had gone to Randolph-Macon Women’s College in Lynchburg, Virginia and had gotten her degree in mathematics. Excuse me. That brings something to mind. Let me back up a minute.

When I was at VPI before the war, I was in the same class with Chris Kraft and Bob [Robert F.] Thompson. During the war they had stayed there and had gotten their degrees, and then they went to work at the NACA. Well, it turned out that Bob Thompson’s wife, Dorothy,

and De De went to Randolph-Macon Women's College at the same time. They did some double dating together at college. As I said, Bob Thompson married Dorothy. So when I got to the NACA, there was Chris Kraft, Bob Thompson and his wife Dorothy, and De De. She, Bob, and Dorothy were very good friends.

But anyway, to get back on point—the Computer Section was running the calculations on the models for us. We would design a model and fly it, and they would take the telemetry data and run the aerodynamic calculations for it. When it got into the heat transfer for reentering the vehicles, well, heat transfer was mathematics. De De was a mathematician. She did some of the first calculations to show that the Mercury spacecraft with its blunt shape could reenter without burning up using certain kinds of materials. She was very valuable in the beginning of the space program.

Max ended up making her an aeronautical engineer and moved her out of the computer section into PARD. Max later made her an aeronautical research scientist. That computer section stayed in PARD. PARD was still flying rocket models after we left so I had met De De there. I went there in August of 1948, and she had arrived there in June of 1948. Soon after that I started dating her. We were married in 1950, and there is another story about that. She transferred from PARD when we moved to Houston. When we moved down here we had two daughters, Laurie and Dottie.

So where are we now? We were just about ready to fly the first Mercury spacecraft. Bob Piland came into my office and asked me to be one of his three study managers on how to send a man to the Moon. What a shock. I asked him if we could go in to see Max. I was a section head, and I thought that that was a pretty good job. I did not know what being a study manager would entail. I asked, "Max, how am I going to do that?" Max replied, "I don't know,

that's what you have to find out." For some reason that was good enough for me. It had gone from: "That is what *we* have to find out" to "That is what *you* have to find out."

Bob Piland was the project manager for the three contractor studies. I ran one of the three feasibility studies to show that man could go to the Moon. I did not realize it then, but I was now on the fast track for advanced designs for the space program. I ran the study for the Martin contract in Baltimore, Maryland; Bill [William A.] Petynia ran the Convair contract in San Diego, California; and Bill Patterson ran the G.E. contract in Philadelphia, Pennsylvania. The results of these studies started the Apollo Program.

Before we moved down here to Houston from Langley Field, we had flown two suborbital flights with the Mercury spacecraft. The pilots were "Al" [Alan B.] Shepard who flew the first flight and "Gus" [Virgil I.] Grissom who flew the second flight. McDonnell was already cutting hardware for the Gemini spacecraft, which was a larger two-man model of the Mercury spacecraft. We had signed the contract with North American for the Command and Service Module on the Apollo Program. I was on the evaluation committee for the parachutes and the propulsion systems from E&D [Engineering and Development Directorate] that picked the McDonnell Aircraft Company for the Mercury spacecraft. I was on the management committee from Engineering for the Apollo Spacecraft Command and Service Module that picked North American Aviation as the contractor.

On the Apollo contract, I thought that technically the Martin Company had come in with the best technical report on how to build a spacecraft and fly it. They had also pointed out that reliability and quality control would be a big cost factor, which it was. No other contractor considered that. It turned out that North American got the contract even though they were not one of the three study contractors. They were considered to have had more management

experience in building and flying flight hardware than Martin and the other two contractors had. North American did have a lot of experience building the Bell X-1, the first supersonic rocket airplane. That was a joint project between North American and the NACA. That was when I learned that there were other things to consider than just engineering in evaluating a contractor. Anyway, that was my evaluation of it. Other people might tell you differently.

When we moved down from Langley Field to Houston, we had been flying the Mercury spacecraft, we were building the Gemini spacecraft, and we had already signed the contract with North American for the Command and Service Module for the Apollo spacecraft. The Space Task Group had grown from 35 people to about 750 people. We had the choice to stay at Langley or to move down here and start a new Center, the Manned Spacecraft Center. About 480 of us were the cadre of people that chose to move down here. After we moved down here President [John F.] Kennedy said, "We're going to go to the Moon in this decade." What most people did not know at that time was that he was able to say that because we had already signed a contract with North American on the Command and Service Module. We still had to hire a contractor for the Lunar Excursion Module [renamed the Lunar Module or LM], which was won by the Grumman Aircraft Company on Long Island, New York. During that period of time, we were running three spacecraft programs. It turned out that the Manned Spacecraft Center was built halfway between the three major Apollo contractors, Grumman on the East Coast, North American on the West Coast, and McDonnell in the central U.S.

Gilruth and his staff had to hire the staff to run those three space programs, to build the Space Center, to build all of its laboratories, and to organize his directorates with their different divisions required. He made Dr. Faget head of the Engineering and Development Directorate. Max was responsible for the design, development, and testing of the spacecraft and its hardware

and to support all of the flight missions. Dr. Chris Kraft was made head of the Flight Operations Directorate [FOD] and therefore responsible for building the Mission Control Center and for flying the spacecraft. Astronaut Deke [Donald K.] Slayton was made the head of the Astronaut's Office. He had been grounded because of a heart condition.

We were working 10 to 12 hours a day, sometimes 6 and 7 days a week, and flying all over the country. I was having a ball. One night when I came home from a trip, my wife said, "Your daughter Laurie said that she wanted to get a new daddy." When she asked her why, Laurie said, "I want one that stays home sometimes." That was a real wakeup call. We were really working hard. *We had to beat those Russians to the Moon.*

You can see how much we had to do in a very, very short period of time. For Dr. Gilruth and his staff to build the Space Center, to pull the team together to build the Mission Control Center and its shops and test facilities, including the Environmental Test Chamber was a great, great feat. At that time the chamber was the largest in the world. I don't think that Dr. Gilruth and Dr. Faget were ever given the credit for what they were able to do in that short period of time and for the success of the manned spaceflight program. And to think that I was there when all of this was being done!

Dr. Gilruth's Deputy Director, Jim [James C.] Elms, came up with the idea of assigning managers to each of the subsystems on the Apollo Spacecraft. I helped Bob Piland set up the E&D subsystem managers to cover every subsystem on the spacecraft such as propulsion, guidance and control, etc. Dr. Faget made me his technical assistant as the head of his project office. It ended up that I was responsible to Dr. Faget for the directorate's support of 36 subsystem managers. It was later increased to 42 subsystem managers. Those subsystem managers worked directly under their divisions, like Guy Thibodaux who was the head of the

Propulsion Division and Ralph [S.] Sawyer who was the head of the Electronics Division. I would be Max's eyes and ears on their progress, what support the subsystem managers may need, or whether it was working right or not. I was on committees and boards that reviewed, with the subsystem managers, the status of their subsystems to see if their systems were ready to fly. If not, what still had to be done?

Joe [Joseph F.] Shea was sent down from NASA Headquarters [Washington, DC] to be the Program Manager for the Apollo Spacecraft Program Office. His job was to follow the progress of the spacecraft at the contractors and their flights. He would call on E&D for his subsystem manager's support. I would go to both Dr. Faget's and Joe Shea's staff meetings representing the subsystem managers. In Dr. Faget's staff meetings, I would listen to our division chiefs discuss their problems with the Apollo Spacecraft Program Office. I'd go to the program office meetings, and I'd hear what was wrong with the subsystem managers' support. I'd go back and put all of that together and report it to Max on actions that needed to be taken. I was his eyes and ears on how we were working with the divisions and the program office.

Later on I would also go to Dr. Gilruth's staff meetings as a secretary and write the minutes of the meeting. There would be Dr. Faget, Dr. Chris Kraft, Deke Slayton, Joe Shea, Wes Hjernevik, Sig [Sigurd A.] Sjoberg, and some other people. I knew that there were a lot of problems, and I would wonder how they would be presented to Dr. Gilruth. This was where I had a chance to observe what a great manager Dr. Gilruth was. There would be some conflicts between the major directorates and organizations, such as Engineering, Flight Operations, the astronauts, and the Apollo Spacecraft Program Office.

Dr. Gilruth was an outstanding engineer himself. He would ask the different directors, "Have you looked at this, and have you looked at that?" The next time they came in, they would

have looked at these different areas, and the right answers would sift up to the top. Then everyone would be in agreement with what had to be done so they all thought that they had been part of making the right decisions. What great management skills Dr. Gilruth had. One day he told me, "A person should not only know a little bit about a lot of things, but he also needed to know about some things in depth."

One day I got to observe a real good argument. There was a doctor there that was head of the Experiments Office. When we were preparing to go to the Moon, the objectives of the first flight was to land a man safely on the Moon and to return him safely back on Earth. I was sitting on one side of the table with George [M.] Low [the Center's Deputy Director at that time], Joe Shea, and this doctor. He was fighting to get experiments on the first lunar landing, and he wasn't getting them. Dr. Max Faget, Dr. Chris Kraft, and Deke Slayton were sitting on the other side of the table. They would not let him put those experiments onboard for the first lunar landing.

He jumped up and pointed his finger at them and said, "If you don't do what I want, I'm going to fight you." I said to myself, "Dr. Gilruth, why don't you tell that guy that he's wrong?" He didn't say anything. A few months later that guy was no longer here. They brought in another doctor, who I think was Dr. [Anthony J.] Calio, to replace him. That's how Dr. Gilruth operated. How could anyone have been in a better position to see how so much of the whole organization worked? I would also go to NASA Headquarters to represent E&D. I got a great education, a great education.

I got ahead of my story in order to carry through the sequence of events. Being the head of the Subsystem Managers Office, I would sit in on all the review boards and everything when the subsystem managers would give their proposals or when they had problems. I would also go

to NASA Headquarters to represent them so I got to see a very broad base of things. I was very lucky, very lucky in my lifetime, very blessed.

John H. Glenn flew the first orbital flight after we came down here. By this time, I was working on the Apollo Program. One day I got a call from the Cape [Canaveral, Florida] saying that the light had come on in the spacecraft indicating that the heatshield had come loose. They wanted to know if it'd be all right to reenter with the retro package still strapped onto the heat shield. The retro package had been my responsibility, but I did not know for certain. What I also did not know was that Dr. Faget had already run wind tunnel tests showing that it would be all right. The decision was made to reenter the spacecraft with the retro-rocket package, still strapped on and it was okay. Max always seemed to be ahead of the game, but in running tests on the spacecraft they found out that the heat shield had not come loose. It was a malfunction of the gauge on the panel.

Let's go back in time just a little bit. When Chris Kraft was flying the Mercury flights, he would have to go down to Cape Canaveral to manage the flight of the spacecraft. von Braun and his people were responsible for the launch of the Redstone booster. von Braun and his team had developed it under the Army at White Sands, New Mexico. They were also responsible for the launch of John Glenn on the Air Force's Atlas booster. von Braun and his team kept interfering with Chris Kraft and trying to tell him what to do, but Chris knew what he had to do. That went on for those three launches.

For problems like the John Glenn one, they would have to call back here to the Space Center for the experts who'd worked on these kinds of things. The control was for von Braun to take care of his boosters, and MSC would take care of the flight operations part of it. As best that I know, those were the reasons that made it very obvious that the Mission Control Center

needed to be built here in Houston where the flight crew trained and the technical support from the divisions and their subsystem managers were available. There are still people today that say, “Oh, the Mission Control Center should have been down at the Cape.” I think that was the right decision.

Then they had to build the Control Center. They continued to control the flights from the Cape until the Mission Control Center was built here. The first flight that was controlled from the Houston Mission Control Center was the Gemini IV spacecraft with Ed [Edward H.] White. He was the first man that flew with a control system outside of the spacecraft. The Russians had put a man outside of the spacecraft on a tether but not with a control system so this was considered our first victory over the Russians on the race to the Moon. This control system was developed by Dick [Richard S.] Johnston’s Crew Systems Division in complete secrecy and delivered to the Cape in two weeks time. I even did not know about it. Ed White was having such a good time that he had to be ordered back into the spacecraft. He was using up all of his consumables.

ROSS-NAZZAL: What did you think about the Center moving to Houston? You had lived in Texas for a short time.

LEE: I had lived most of my life in Virginia. That was where my family was originally from. I loved the people in Virginia. The way I put it is that you were accepted by them when you proved yourself worthy of that acceptance. Texas people I also love. God bless them, they are great people. When we came down to Houston, the people welcomed us with open arms. You

were accepted unless you proved yourself not worthy of that acceptance. That's the way I put it. When we came down here, my wife was still working at PARD.

One day at the end of December 1961, Max came into my office and said John, "I'm going to move down to Houston on the 1st of January [in 1962]. I want you to come on down there on the 1st of February." I said, "Max I can't do that, I still have too much work to do here. I haven't sold my house; my children are in school." He said, "John, I want you down there the 1st of February." So I said, "Yes, sir." I was here on the 1st day of February. I drove down here by myself. I spent the night at a hotel in Baton Rouge, Louisiana. Someone broke into my car and stole all my clothes. I left my wife and children up there, as she was still working for PARD. My oldest was still in school, and we still had to sell our home. When I came down here, they had a shuttle that was flying between here and Langley every weekend. Every other week, I would fly up there, and on the alternate weekends my wife would fly down here.

When she first came down, we looked all over for a lot to build a home on. We could not find anything that we liked. That night when we were in our motel room, she was so distressed that she did not want to move down here. There was a knock on the door, and it was Max Faget. He was all excited and exclaimed, "I've found it; I've found it, a place to build our homes!" The next day he took us down to the Kellner Division on Dickinson Bayou, and showed us these two lots that were available for sale. They were beautiful overlooking the bayou with big oak trees with moss hanging on them. He said, "John, I'll take this lot, and you take that lot." Then soon after that he told me, "John, I've got to go on travel. I want you to buy that lot for me while I'm gone." We knew what the asking prices for the lots were. I told him that I would try to negotiate the price for him. He said, "No, you buy it for that price."

ROSS-NAZZAL: He wanted that property.

LEE: Yes, he wanted that property. No fooling around. While he was gone, I bought the lot for him. That is, I set it up so it would be his at that particular price. It turned out that the man that owned the lot was somewhere on a boat in the South Pacific so I had to negotiate the sale and get the proper papers signed by wire. When he got back he had a lot. That's how we were working together.

I bought my lot, and then De De and I sat down and designed a U-shaped house that we wanted built on that lot, on the water. When we got through designing it the way we wanted it, we showed it to a good friend of ours, Rene A. Berglund, who was a good architect himself. Instead of a U-shaped house, he designed wings on each end of it, to make it H-shaped. He designed an oriental roof which we dearly loved, and some other things that helped to improve our design. I turned the plans over to Frank Marsters, a contractor that was building a lot of homes in Taylor Lake Village including several which the astronauts were moving into.

I had some trouble with his architect from Houston. We had designed the home where both the dining room on the right wing and the master bedroom on the left wing of the house would be overlooking the bayou. The architect had put them overlooking the road because he thought that was the right way to do it. I told him he had not even seen my lot so I had Marsters fire him. He got another architect, and he told him, "Design the home the way John wants it."

We ended up with a very beautiful home on the water. That summer my wife was able to sell our home and boat. When she moved down here, we moved straight into our new home. Just about everybody else who came down had to find a home already built or lease something,

and then make the second move. I was traveling all over the country and working 10, 12 hours a day, and we still got all that done. It still blows my mind how we were able to do all of that.

ROSS-NAZZAL: That's impressive. You seemed to be very close friends with Max. What impact do you think that he had on your career?

LEE: Oh, he was the nicest man. He had a great compassion for the people who worked for him. He lifted me to levels that I never thought I could ever achieve. I'd go into his office, and I would sit down, talk to him about some problem, and how I should handle it. I would go back to my office and think, "Well I did pretty good today," and then I'd think about what had happened. He had very calmly guided me around so that the right decision was obvious; I thought that I had solved the problem, but it was with his help. He was that good. I do not think that I had ever gone in to see Max Faget on something that he had not already thought about. He was amazing.

I know you must have talked to people on how he ran the Skunk Works on the Shuttle. He'd go in at nights after they had left. He would make changes or leave notes on their drawings to do it this way or that way. He was an amazing man. I thought that there was no way that I could pick up and run with projects that I didn't know anything about and get the job done, but he and Dr. Gilruth helped and showed me how to do it.

What they were looking for were managers. Even if you didn't have all of the technical capability, but knew how to manage things and go to the right people to help get the job done, that was what they were looking for. One of the things I learned in college was that you could go to the library and get an awful lot of answers. I knew that I could not keep it all in my head. I would go to talk to people like Max Faget, Guy Thibodaux, and people like that and they were

always willing to help. That was a big help because I found out that people were willing to help people who were willing to help themselves. They did not have time for negative people. They didn't want people that are waiting for somebody to tell them what to do. They didn't have time for all that.

ROSS-NAZZAL: That's good advice. I'm wondering if you could tell us about how the Apollo Program changed when the fire broke out.

LEE: Oh, that was certainly a great tragedy. I did not talk about that just like I did not talk about my WWII experiences. My wife and I, along with Sonny and Gloria Hall, had gone to New Orleans for the Mardi Gras. When we got to our rooms that night, we heard on the radio that the fire had happened on the launch pad at the Cape killing the three astronauts. I told Sonny Hall, his wife Gloria, and my wife, "I've got to go back." So the next day I got on the plane and flew back to Houston.

Max Faget took Phil [Phillip M.] Deans—who was working with me on the subsystems—to the Cape, and they investigated the fire. I was back here representing E&D. Aaron Cohen from the Apollo Spacecraft Program Office was the head of the board that had to pull together all of the action items that came into the Center from the Cape and to get them to the right people in the Center or out to the contractors. I represented E&D on that board. I think it was "Rod" [Rodney G.] Rose from operations who took care of the flight operations part of it. At that time they sent astronaut Frank Borman out to the CSM [Command and Service Module] contractor, North American, in Los Angeles, California. We were getting reports in from the Cape of the things that had to be done.

I would take the action items to the E&D Divisions. Aaron Cohen would send other action items out to Frank Borman. That was how the system worked. Of course I knew E&D inside and out because I had been working with the division and the subsystem managers for a long time for Max. One day Aaron Cohen looked at me and he said, "John, I give you a job, and you get it done." I was getting him the answers, but it was the divisions that were getting things done.

We had one man in the Apollo Spacecraft Program Office that gave me a lot of trouble. We would sit down in meetings with Aaron Cohen and we would agree upon what needed to be done and how we would do it. This person would be with his boss, Bill Bland, in these meetings. One day, I got a phone call from one of the subsystem managers asking me, "John, you said you wanted us to do this. Is that still what you want us to do?" I said, "Yes." Then I got a second call from Ralph Sawyer, the Division Chief of the Electronics Systems Division. He asked me the same thing. I asked him, "What in the hell is going on?" He replied, "Well so-and-so from the program office has been over here telling us to change things that you have told us to do."

I went in to see Tom [J. Thomas] Markley, who was the chief of ASPO's Program Control under Joe Shea. Joe Shea of course was at the Cape. Markley was running things from the Program Office. I told him what was happening. We called that person in, and Tom Markley told him, "You stay out of E&D and I don't want you to leave your office unless you let me know, even when you go to the restroom." So we stopped that. That was the kind of stuff some people would try to do.

I always had trouble with this particular person. I'd send a memorandum out that had been marked "Immediate Action Required." Bill Bland would give it to him to review. When I

did not get a reply, I'd try to find out where the memo was. His office would say, "Oh he's got it, and he's up at Grumman in Bethpage, Long Island." This guy was absolutely useless. Finally we just got him out of the loop altogether. When you have a bad egg, you have to do something about it. We could not have a person in the loop that would not follow instructions and would hold up our work that needed action. After the team came back from the Cape, Max had a staff meeting. For some reason I had missed it. Jack [C.] Heberlig came into my office later and told me that Ralph Sawyer had said that he did not know what he would have done if it had not been for John Lee's help. That compliment made my day.

Now there were some specific things that we didn't handle. Max assigned Aleck Bond as the head of the Structures and Mechanics Division at that time to test flame-retardant materials in an airplane that was for the spacecraft. These tests not only helped the space program, but it also helped the aircraft industry. That was a very tragic accident. We had to pull ourselves up by our bootstraps.

Before the fire I had been informing Max about some of the things that I thought were not being done on the spacecraft that I was worried about. I thought that costs and schedules were taking priority over doing what was good, sound engineering. I think that this proved it. I know I was not the only one that was worried about it. I think that certainly helped prove that when costs and schedules take over, you are asking for trouble. When I was in charge of the subsystem managers, and I would take them before the review boards, they would have to prove whether or not their subsystems were ready to go.

Later on, I am certain that costs and schedules were part of the problem when the Shuttle was lost because of the O ring failing on the solid fuel rocket motors on the Shuttle. I won't get into that very much because I didn't have anything to do with the Shuttle, but I watched it pretty

closely. I knew that the subsystem managers were not given money to run tests that they thought they needed because money was not available. I found out that when the subsystem managers went before the Shuttle review boards, they would have to prove that their subsystems were *not* ready to go. When they could not say if their subsystem was ready to go because of the lack of test data, the decision would be made to go ahead with that subsystem.

You can see the difference in the philosophy that was used on the Apollo versus the Shuttle Program. You can't let costs and schedules take over. When the Apollo fire happened, we conducted a major review of Apollo spacecraft. We ended up doing a lot of things differently. Of course they got rid of the pure oxygen system on the spacecraft which was one of the big problems. We really had to do a major redesign. We really had to pull ourselves up by the bootstraps.

ROSS-NAZZAL: You were able to pull everything back together, create the new Block II spacecraft, and then you actually won a number of awards. Can you tell us about some of those awards and the first Apollo flight?

LEE: Well it would probably be best to go upstairs, if you want to. I've got them hanging on the wall up there.

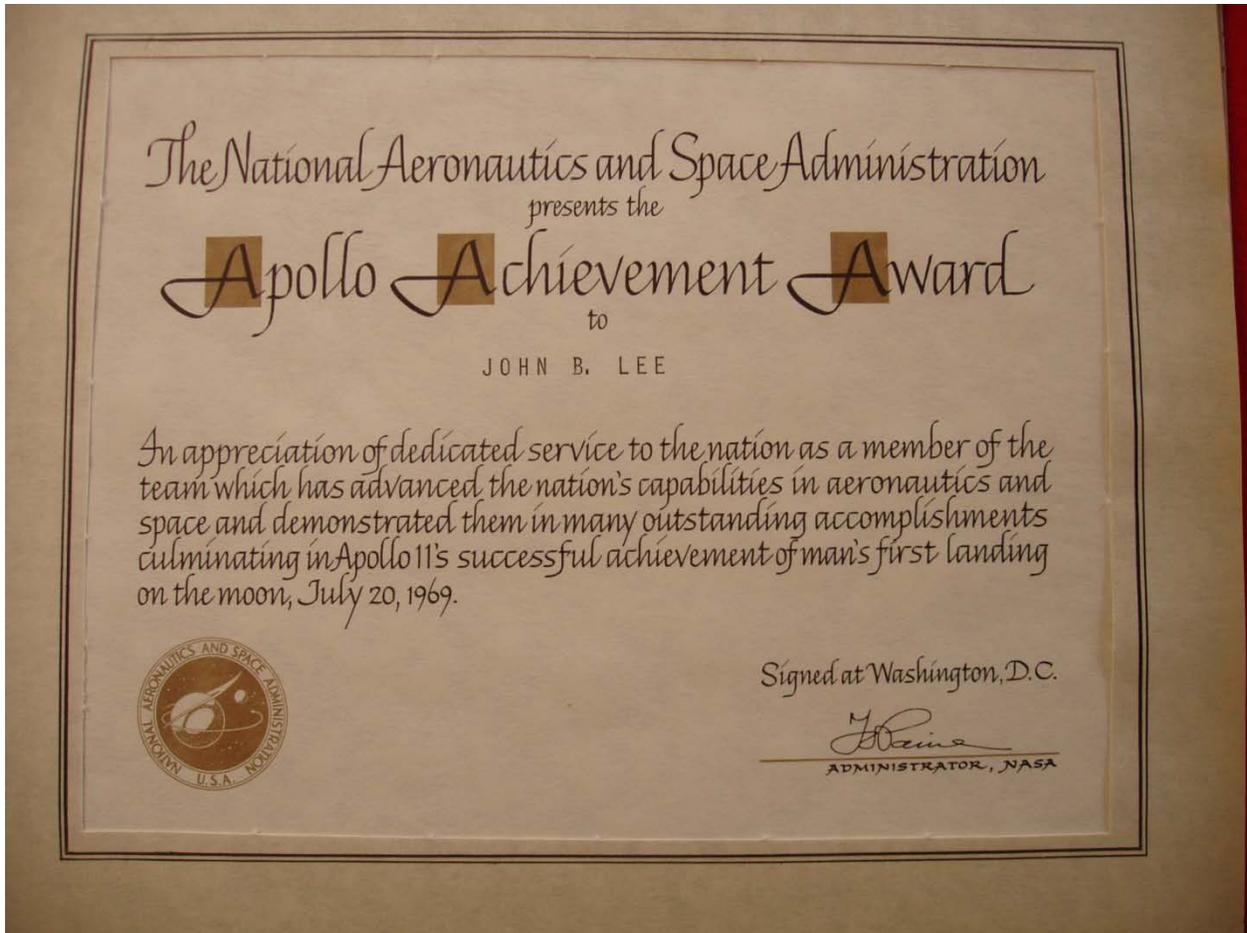
ROSS-NAZZAL: Sure.

LEE: [We are now looking at the photographs and citations that I have received on the Space Program hanging on the wall in my office.]



Max gave me this photograph, the first picture that was taken by Neil [A.] Armstrong of Buzz Aldrin on the Moon. Neil's reflection can be seen in Buzz Aldrin's visor. The inscription that Max wrote and signed reads, "In recognition for the many contributions to the Apollo Program, particularly as a member of the small team that carried out the initial feasibility studies of manned spaceflight to the Moon." I'm very proud of this one.

This [below] is a Group Achievement Award that was from the NASA Administrator Thomas [O.] Paine for my contributions to the Apollo Program for the successful landing of the Apollo 11 on the Moon.



This one [below] is a Certificate of Commendation from Dr. Gilruth for my contributions to the first successful landing on the Moon:



Here is a photo signed by the leaders of the Apollo Program that was given to me for my “outstanding contributions to the success of Apollo 11.” It was signed by (left to right) George E. Mueller, Sam C. Phillips, Kurt H. Debus, Robert R. Gilruth, and Wernher von Braun.



Now here [below] we have the Presidential Medal of Freedom, from President Richard M. Nixon for the Apollo 13 Mission Operations team:

a copy of the presentation made by President Nixon
NASA Manned Spacecraft Center on April 18, 1970.
This duplicate presented to

JOHN B. LEE

of the Mission Operations Team
by Dr. Robert R. Gilruth, Director, MSC



The President of the United States of America

Awards this

Presidential Medal of Freedom

To

The Apollo XIII Mission Operations Team

We often speak of scientific "miracles"--forgetting that these are not miraculous happenings at all, but rather the product of hard work, long hours and disciplined intelligence.

The men and women of the Apollo XIII mission operations team performed such a miracle, transforming potential tragedy into one of the most dramatic rescues of all time. Years of intense preparation made this rescue possible. The skill, coordination and performance under pressure of the mission operations team made it happen. Three brave astronauts are alive and on Earth because of their dedication, and because at the critical moments the people of that team were wise enough and self-possessed enough to make the right decisions. Their extraordinary feat is a tribute to man's ingenuity, to his resourcefulness and to his courage.

*The White House
Washington, D. C.
April 18, 1970*

For this mission I also received a Certificate of Commendation from Dr. Gilruth. This to me is more valuable than the one from the president. This is specifically to me because of my responsibilities in the Mission Evaluation Room on Apollo 13. Phil Deans and Bob [Robert P.] Burt also received this same Commendation.

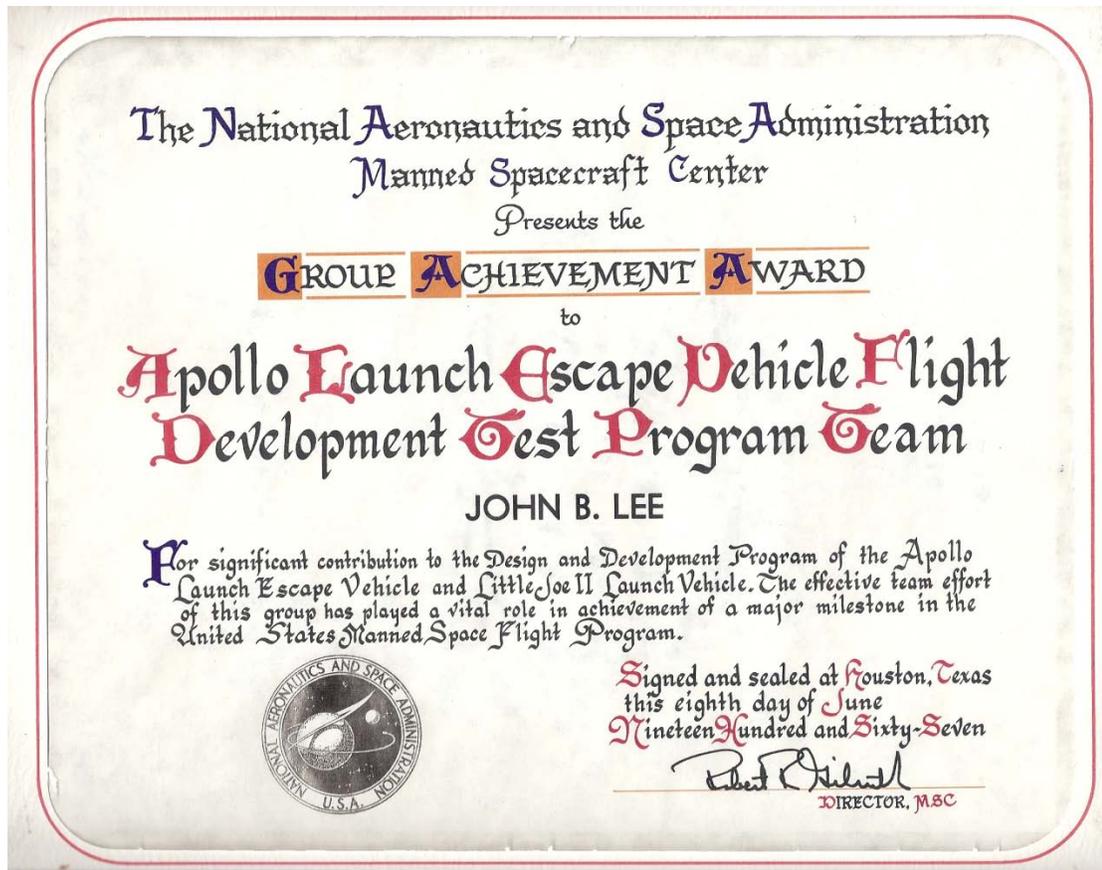


The team was headed up by the Apollo Spacecraft Program Office. We had about 100 engineers working around the clock. I was the lead engineer for E&D. I had two people, Phil Deans and Bob Burt, who helped to cover the three eight-hour shifts. We were responsible for the E&D 36 subsystem managers and their support team, which included the contractors.

The ones from Dr. Gilruth are more valuable to me than some of these others because they were recognition from the men that I dearly loved. I am certain that Max wrote them up. They knew what we were doing.

Now what I'd like to say about this flight [Apollo 13] was that within eight hours of the explosion, E&D told Mission Operations what had happened, what they had to do to stabilize the spacecraft, and how they could fly the mission using the Lunar Module as a lifeboat to bring the astronauts home safely. One of our E&D subsystem managers had presented such a proposal to Operations before we had flown Apollo 13. I cannot remember his name. Operations told him that they could not think of a scenario where they would have to use it, and they turned him down. When the accident happened they pulled out this proposal, and that's what we did to help save the astronauts. I won't go into that any more, but E&D never got credit for that.

Some of these others are Group Achievement Awards that are for projects that I was a part of. One is to the Manned Spacecraft Center for first landing men on the Moon; another one is for E&D Directorate for man's first lunar landing, and this one [next page] for the Apollo Launch Escape Vehicle Flight Development Test Program Team on the Little Joe:



I also received a Group Achievement Award for the Mercury spacecraft. This is an interesting story. They put Ham [the first chimpanzee in space] in the spacecraft to be launched for his second flight. When they ignited the booster, the spacecraft got a signal that there was a malfunction in the booster. The escape system fired and pulled the spacecraft away from the booster. When that happened, it accelerated to higher than the 14 Gs that Ham had tested in the centrifuge or had flown in the spacecraft. That was an unscheduled test of the *whole* launch escape system, parachute systems, and the pyrotechnics to cut the bolts in the Mormon clamps around the spacecraft, but everything worked. We had not scheduled such a test for that in the program. Everything worked fine.

The astronauts were upset. They said that NASA thought that a chimpanzee was smarter than they were because they got to fly first. Alan Shepard said, "The only reason that I got to fly was because Ham refused to get back in the spacecraft," which was partly true. Ham would not get back into the spacecraft because he had never flown at those high Gs before so then Alan Shepard got to fly. Isn't that a funny story?

ROSS-NAZZAL: That's interesting. I'd never heard that one before.

LEE: George Low came up with a very bold idea for Frank Borman's Apollo flight. Could we take one of the Apollo spacecraft that was supposed to fly another Earth orbit mission and upgrade it so that we could send a man to orbit the Moon? We were in a race to beat the Russians going to the Moon so they set up a committee to see what we had to do to upgrade it, if any, in order to go to the Moon. I represented E&D on that committee. With the E&D subsystem managers, we went through everything on the spacecraft with a fine-tooth comb to see what had to be done to get the spacecraft ready to go to the Moon. The divisions with their subsystem managers found out what had to be done. I'm very proud of that. Of course I'm sure it went through some other people's hands too, when we got through with it, before the decision was ever made. But I feel that we made a major contribution to it.

Last fall in September of 2007, I was inducted into the Virginia Tech Cadet Corps Wall of Fame [WOF] for both aviation and aerospace [next page].



I was the first one who received it for aerospace so now I am the first person who has received it for both aviation and aerospace. I was the tenth recipient of the award at VT. I was inducted at the same time with Major General Hank Smyth. I am very proud of that award.

ROSS-NAZZAL: Now in your presentation you mentioned that you received a [Silver] Snoopy.

LEE: Yes. I'm not sure if I told you in my review or not, but when I was developing the parachute system for the Mercury Project, we went out and tested the drogue parachute at supersonic speeds at Edwards Air Force Base at Muroc, California. The pilot who flew the airplane for us at Mach number 1.4 was Neil Armstrong. This was before he became an

astronaut. When we got ready to fly the Apollo 11 spacecraft to land a man on the Moon with Neil Armstrong, I got the Snoopy award from him.



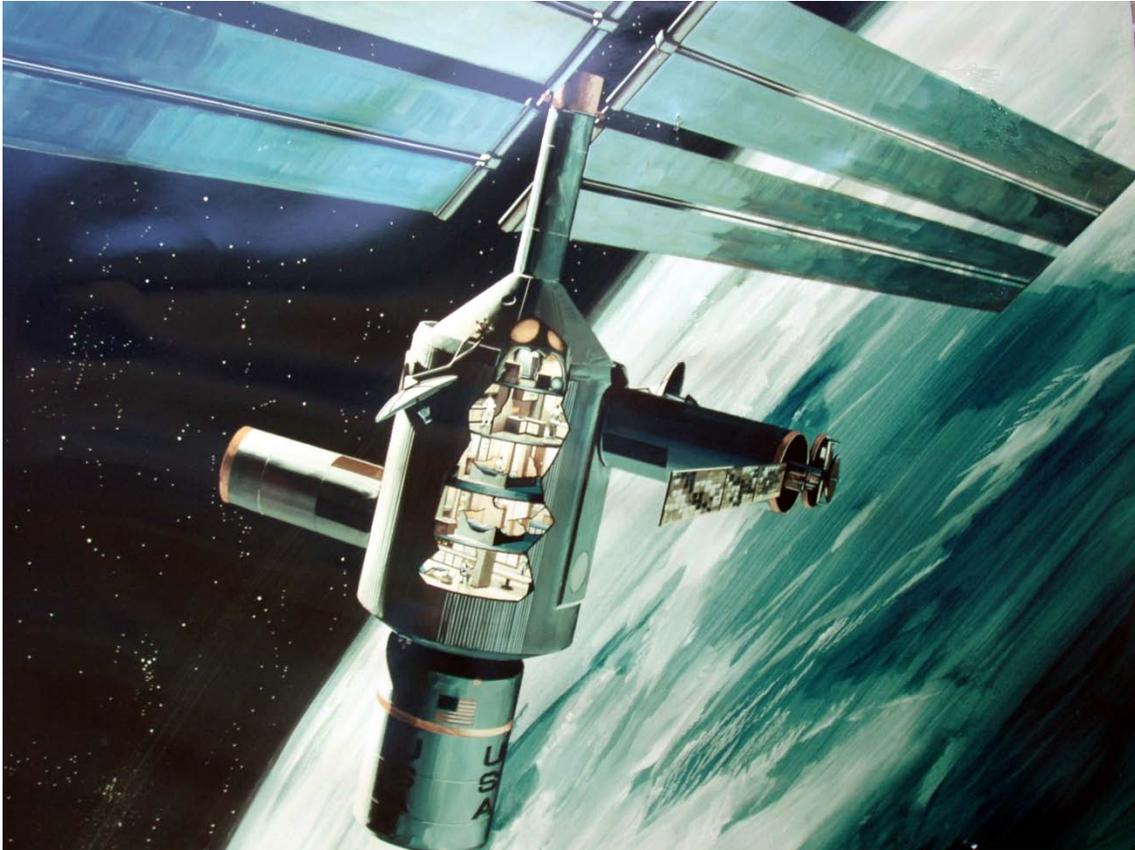
It was one of the first ones that the astronauts had given out. I was also awarded the Space Flight Awareness Award, along with Aleck Bond, from Dr. Faget. For that award we were sent to the Cape to observe the launch. At that launch, I saw grown men crying when that baby took off.

I had grown up with the space program when we were flying rocket models at subsonic, transonic, and supersonic Mach numbers, from Mach 1 and 2 and later up to Mach number 15.

We had flown the Little Joe out at White Sands Missile Range at White Sands, New Mexico for a canard and parachute test. They worked for Al Kehlet, who had wanted me to work under him because he was the chief of the Aerodynamics Section. He was trying to develop a canard system that was on the front of the launch escape system rocket motor. With the spacecraft tumbling, he would try to open these canards which would stabilize the spacecraft with the blunt shape pointing forward, and the escape rocket would then be able to pull the parachute system out downstream.

I went out to observe that test. I told them that it wasn't going to work. I said, "You are not going to be able to time a tumbling system so that you can be certain that you will be able to deploy the parachutes downstream." Sure enough, with a tumbling spacecraft, the parachutes came out upstream and wrapped around the capsule. That got rid of the canard system. I was right on that one. That was an interesting one.

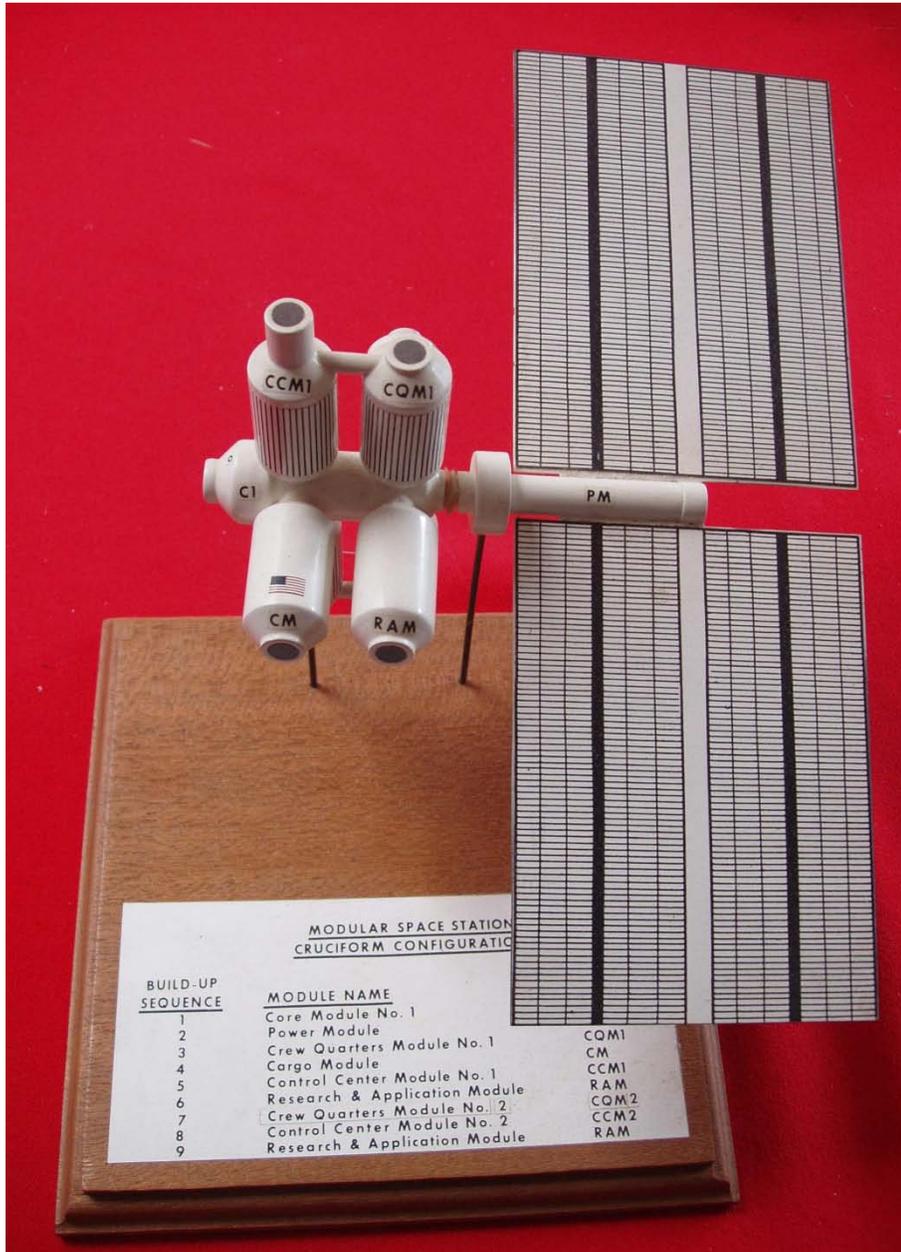
Then when Max started the Shuttle Program, he called me into his office and said, "John, I'm developing a Space Shuttle. We're going to need the Shuttle to service a Space Station. We need the Space Station to justify the Shuttle. I want you to help develop a Space Station." By this time I'd gotten smart, and I didn't ask him how I was going to do it. I knew that I had to figure it out myself. Rene Berglund was the project manager of the study. I was the lead engineer from E&D. North American was our study contractor. We developed a system where we'd put a spacecraft on top of the Saturn booster. [next page]



The booster was 30 feet in diameter, so we made the Space Station 30 feet in diameter and 40 feet tall, with floors: one would be the control center, one the astronauts' quarters, one the propulsion systems. It also included the solar arrays for its power supply. It was to be a 12-man Space Station that would stay up for about 10 years. We took that and showed it to NASA Headquarters in Washington, D.C. They said, "No we cannot do that. President Nixon has just cancelled the Saturn Booster." I think that it was a big dumb political mistake. We could have put it up with one booster, and it would have been far superior to the Russian Space Station at that time. We got rid of our big boosters, and we have been suffering from that for all of these years.

Then I went to Max and asked, "Max, what do we do now?" He said, "Well, you can put it up with a Shuttle." I asked, "How do we do that?" You see I was not very smart very long.

He said, “The Shuttle is 15 feet in diameter and 30 feet long. Design modules that are 15 feet in diameter and 30 feet long and you take them up in the Shuttle, and you put them together like a ‘Tinker Toy Set.’”



This [above] is a model of what we developed at that time, and that was in the early 1970s. We had to put it on the shelf because we didn’t have money to do the Shuttle and the Space Station at the same time. It turned out that 20 years later they started building a Space

Station. Now it has been developed into the International Space Station that is being put up by the Shuttle. I also went through an iteration of an operational Space Station with Bob Piland.

Now of course they have the one which is the International Space Station. What they're building today is the concept that we put on the shelves back in the early 1970s because we didn't have the money to do both at the same time. When they say that NASA was not forward-thinkers, that they did not think ahead and all that, it wasn't true. It was because Congress cut the funds on the space program. After we put a man on the Moon, the press went around asking people, "Do you think we ought to be spending all that money on the Moon?" People would say, "No, we should be spending it for the people right down here on Earth." Another Alan Shepard famous remark was, "We didn't spend a penny of it on the Moon. It was all spent right here on this Earth." You can see how these things go.

When I retired, Chris Kraft presented me with this framed U.S. flag that has been to the Moon: [below]



ROSS-NAZZAL: I see your bowling and golf trophies. Were you active in any organizations on the site?

LEE: Yes, that was with the NASA bowling team, and we won first place several times. We won it two years in a row, and then the next year, when we came in second place, the team was dissolved.

ROSS-NAZZAL: That's a shame.

LEE: When we were not good enough to win first place, we quit. It was almost like that but not quite. I played a lot of golf, and I got that one somewhere in some tournament. I forget where it was now.

ROSS-NAZZAL: Do you think this might be a good place for us to stop and then regroup for tomorrow?

LEE: Okay, I think I probably got way ahead of myself in some of this, because there are some things that we probably need to go back to on the spacecraft.

ROSS-NAZZAL: Yes, absolutely.

[End of interview]

¹ Edward J. Steiner, ed., *Kings Cliffe Memorial Edition* (Hanover: Sheridan Press, 2004), 212.

² *Ibid.*

³ *Ibid.*, 226–227.

⁴ *Ibid.*, 227.

⁵ Memorandum for Assoc. Director [Gilruth] from Carl A. Sandahl regarding Promotion of Mr. John B. Lee from Aeronautical Engineer, grade GS-12 to Aeronautical Research Engineer, grade GS-13, dated May 21, 1957.

⁶ Memorandum for Associate Director [Fred Thompson] from Robert R. Gilruth, Project Manager, regarding the organization of the Space Task Group to implement a manned satellite project [Mercury], dated November 3, 1958.

⁷ Memorandum for Project Director from Robert O. Piland regarding Promotion of Mr. John B. Lee from Aeronautical Research Engineer, grade GS-13, to Aeronautical Research Engineer, grade GS-14, dated November 17, 1959.