# NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
# ORAL HISTORY TRANSCRIPT

DAVID L. PIPPEN
INTERVIEWED BY REBECCA WRIGHT
LAS CRUCES, NEW MEXICO – 22 JANUARY 2003

*The questions in this transcript were asked during an oral history session with David L. Pippen. Mr. Pippen has amended the answers for clarification purposes. As a result, this transcript does not exactly match the audio recording.*

*This presentation consists of three parts: the oral history interview; Appendix A, photographs linked from within the oral history interview; and Appendix B, a special section on what Mr. Pippen calls the "Visionaries," which lists individuals that he believes provided the vision and work ethic necessary for the White Sands Test Facility Laboratories Office to be successful and approach his expressed objective of it becoming a "world-class" test facility.*

WRIGHT: Today is January 22nd, 2003. This oral history with Dave Pippen is being conducted in Las Cruces, New Mexico, for the NASA Johnson Space Center Oral History Project. The interviewer is Rebecca Wright, assisted by Jennifer Ross-Nazzal and Sandra Johnson.

We thank you again for coming today to spend some time with us and for this project. We'd like to start out by asking you, when you were growing up, what type of interest did you have in engineering?

PIPPEN: Well, when I was growing up, I was raised on a dry-land farm where we couldn't raise many crops due to the weather. We tried to raise cotton, grain sorghums, and things like that. Our crops were mostly those that provided feed for the few cattle that my parents raised. It was just too hot and there was little rain during the summer months to successfully raise anything. My Dad farmed, raised cattle, drove a school bus, and worked at an automobile service station in Cisco, Texas, which is a very small town in Central Texas. My Mom was a homemaker, supervised the school lunchrooms, and raised calves obtained from my Granddad's Dairy. So I didn't know what an "engineer" was, except those that drove trains. But I was always interested in building airplane models and everything mechanical. I was one boy among five sisters, and my Dad was uneducated so I didn't have any external influence outside of farm and dairy life—and we lived way out from the town on the farm and our contacts were mostly neighbors who were farmers and ranchers.

When I reached high school age, I worked for my uncle and my granddad who owned a dairy, so I would get up early in the morning I mean like three, four o'clock, before school, ride on the back of the little pickup truck and deliver milk, one quart at a time, all through the little town of Cisco [Texas]. I was paid five dollars a week and was considered one of the richest kids in school.

I was a football player and basketball player and ran track. I knew of no engineers, as we are called today, in that town! You just didn't hear that word, "engineer" except associated with trains. I worked as a farm kid and a dairyman and roofer and all that kind of stuff that was available in the area. My sister talked me into joining the military after graduating from college. I've jumped way ahead here. After college and when I got into the military, I got into guided missiles, and the electronics part just fascinated me. I had a degree in mathematics, but electronics just fascinated me. And, from then on, I began to understand what engineering was about and worked as an engineer even though my degree was in math

In the military I received a direct commission, in May 1959, having been promoted from a U.S. Army private to a lieutenant. I was sent to Huntsville, Alabama, as part of my initial training as a guided missile officer, and that was in the Sputnik [satellite] days. (Refer to Photo A-1.) This was kind of exciting. I can vividly remember being on the square in Huntsville, Alabama, when it was a small place and hearing the announcement, "The [Department of the

Navy, Vanguard rocket] exploded," and how sad I was because we were trying to catch up with the Russians in space exploration. I really became interested in electronics and missiles and those sorts of things while in the army Guided Missile School at Huntsville, Alabama.

Then, after graduating from that school, I wanted to get back to New Mexico where I was previously stationed as a private, or at least get close to my home state of Texas. So I wrote Colonel Redmon at White Sands Missile Range, New Mexico, and said, "I want to come back." As I previously mentioned I was now an officer after having received a direct commission in the Army, as a 2nd lieutenant. When I was a private, I saw on the bulletin board an announcement with the headline, "Be an officer," and I said to myself, "Well, that beats this enlisted man status." And I applied, and got that direct commission. On the date the commission took effect, I just took off my PFC [Private First Class] stripe and pinned on my gold bar. It really shocked the noncommissioned officers who had been ordering me around for several months.

After Officer's boot camp in Aberdeen, Maryland, and following guided missile school in Huntsville, Alabama, I was assigned to the White Sands Missile Range [WSMR, New Mexico]. At White Sands Missile Range, I was involved in testing guided missile systems as an officer. When I got through with that, that is, when my time was up in the military, WSMR hired me as a civilian in the same position I held in the military. I did vibration testing and shock testing, and all kinds of laboratory oriented testing on guided missile systems including the Lacrosse surface-to-surface and Hawk surface-to-air guided missiles.

And then NASA came to town. Space activities just kind of intrigued me. That's when I went to work for NASA. It was at the time when the Little Joe II test vehicle and the launch escape system for the Apollo [command module] were being developed at the White Sands Missile Range, WRIGHT: Did someone tell you that there was an opening over at the test facility with NASA, or did you just apply?

PIPPEN: NASA's arrival was well known by all the employees at White Sands. White Sands Missile Range is not a very large place, and when NASA came, everyone knew NASA's mission, and they made it known that they were looking for people. In fact, I believe they were a little desperate. Well, they were desperate enough to hire me! And I say that because I was in test engineering, but I didn't have a degree in engineering. I was—quote—a mathematician—end quote—by college degree but I had never worked in the math field. I didn't have my master's degree then in electrical engineering.

So I just walked over to where NASA was recruiting and the guy's name who interviewed me was Oscar Tarango. I remember Oscar well because he was a good boss. We talked about the job and its responsibilities, and he found out what we were doing in the lab where I worked at WSMR, and it was the same type of tasks that NASA needed to have done. He hired me on the spot.

WRIGHT: What was the work atmosphere like at the test facility at that time?

PIPPEN: Are you talking about the NASA WSMR Site?

WRIGHT: Yes.

PIPPEN: It was really hectic. NASA and the prime contractors worked as a team in completing the testing. The work was performed at WSMR's Launch Complex [LC] 36, which was located north of the main post. As I remember, LC 36 consisted of a Vehicle Assembly Building called the VAB, several house trailers for personnel offices, and a launch pad with a gantry. Initial work was done in the VAB on the individual components of the system, that is, the Little Joe II booster and attitude control system, launch escape system, and Apollo command module.
(Refer to Photos A-2, A-3, and A-4) Once all the preliminary assembly and individual checkouts were performed, these components were then assembled on the launch pad. (Refer to Photo A-5.)

The launch escape system sat on top of the Apollo command module, and its goal was to pull [if the main engines or anything went awry] the Apollo command module from the booster. The launch escape system would separate from the command module a little bit later on, and then the Apollo command module would come floating down by parachute and land. (Refer to Photos A-6, A-7, A-8 and A-9.)

One mission called BP23A tested the launch escape system's separation capability without the booster system, which simulated a booster failure at launch. (Refer to Photos A-10, A-11, A-12, and A-13.)

Well, what we were trying to do with all this testing was to make sure that that launch escape system would work at different angles from the launch attitude if the main engine went off course—they called these angles, High-Q abort positions, where the system underwent higher than normal dynamic pressure. These tests verified that the system would work under all those abnormal stress conditions that could be expected should a launch failure occur. As I mentioned before, we worked as a team with prime contractors. We had North American [Aviation, Inc., now Boeing North American] who was responsible for the launch escape system, and we had

General Dynamics [Corporation] who was responsible for the Little Joe II test vehicle. The personnel from these companies would build these systems at their respective plants and then ship them to WSMR. We, NASA, would put them all together with the prime contractors and test them. You'd work twelve, fifteen hours a day. Even sometimes we didn't go home while the launch was imminent, and then once the launch occurred all WSMR activities would just stop. Then you had to kind of tread water until the next WSMR test. During these lulls, I was authorized to work on my Master's degree in electrical engineering. So, that's the way it was, and it lasted about two years.

WRIGHT: What were some of your first duties during those first two years?

PIPPEN: When I first started to work, I was one of the several engineers in the Electrical [Systems] Branch, and what we would do is, since I had ties back with the White Sands Missile Range's Guidance and Control Laboratory, which I came from, knew all the people there, and we needed to test several Little Joe II guidance components. So I interfaced the autopilot with the lab equipment and those kinds of things, and we would test them. One of the things that comes to mind is, we would test for what they call infant mortality. When you build something new, the likelihood of it failing early within a statistically established time is very—if it's going to fail, it's very high. So you run it a certain number of hours just after it has been manufactured, and the number that sticks in my mind, which I don't know if this is it, is about sixty hours for the particular components we were testing. I think we ran them about sixty hours. And if they survived the sixty hours, statistics indicated that it would be safe to launch it, that is, it would function correctly during the several minutes of the launch and flight. So that was primarily my job during pre-launch activities. We had a little branch of about five or six electrical engineers, and I was promoted to head that group. We would pre-check the vehicle and then launch it, and then, of course, get all that launch data. I wasn't involved in the data analysis, but it was my job to get the vehicle ready to launch as far as the electronic systems in the Little Joe II and the launch escape system itself, were concerned

WRIGHT: Could you share with us some of the details of the pre-check procedures and how you developed those procedures?

PIPPEN: That's one thing NASA is good at, is developing paperwork. And I can remember, we had all these different groups, and in those days money was no object. That changed in Shuttle, but I tell you, after [President John F.] Kennedy made the proclamation, "We're going to get to the Moon in ten years," or whatever that was, we had money to burn, so we could buy anything we wanted, or at least nearly anything we wanted, certainly everything we needed. And if we needed one, we'd buy two, because we couldn't afford to have a component break and not have a replacement. So we had all that stuff to write test procedures for.

So we would develop—we would lay out, "Well, here's the way the system's going to work. This is the way it works." So then we would lay out a process by which we would check all of those systems. We'd put the systems together. We'd test them separately, and we'd do some lab tests, and go out on the launch pad, and check them out individually, then put it all together, and then we'd test it out as a system, perform the dry runs as we called them. We'd have a couple of dry runs before we'd launch, and then we would go into a fairly long step-by-step countdown to launch. .

We had, a little mini operations room there but nothing like at JSC. There were Operations Directors or OD's, and they'd take over once the launch sequence started they would carry this through, and then we engineers would just monitor the instruments on the panels. So my people, the electrical engineers, would be in there watching all their stuff, everybody on headsets. (Refer to Photo A-14.)

In those days, it wasn't like it is now—it's really easy today in electronics since reliability has greatly improved, but in those days, things would quit for no apparent reason. It was tough to keep things going. But everybody was really dedicated and gung-ho.

The attitude in the space program in those days was exciting, because we had a well-defined mission. We had a goal. I don't guess I can remember anybody complaining about having to work long hours. We didn't get paid overtime. We just worked till it was done. So that's what we did. We'd check out individual systems, we'd go to the laboratory, do the infant mortality and those kinds of tests, take it out into the field, do the functional checks, put it together, and all of this time we're developing the procedures, step-by-step procedures. And if you ever had a problem, you'd have to get contractor and NASA quality assurance involved.

There were people everywhere. We had about at least three times more people than we needed to do the task. You had to get three or four NASA people [involved] for every task. Then we'd have to get the three or four contractor counterparts involved, and also your supervisor. And all of these had to sign these papers even if they may have no idea about the specific things listed in the document they were to sign. They had test preparations sheets or TPSs for each activity, and discrepancy records for things that failed. The paperwork was really rough to keep up with, and when you think about not having word processors, you did it all either by hand, or if you could talk someone into typing it, which it seemed you never had time to do. There would be carbon copies, two or three layers, and Quality Assurance [QA] always kept the top and best copy for the record, and we'd be reading off of those third-generation carbon copies. Safety would have to have a copy, and QA would have to have a [copy] and the engineering would have to have a [copy], but we got through it, and it was very successful. Every minor change required the paper to be "redlined." The redlines were changes written on the original document and had to have initials from the same folks who initially signed the paper. And, of course, we always thought that QA was more interested in dotting the "I"s and crossing the "T"s than technical content.

WRIGHT: Would you share with us some of the problems that were detected as you were going through some of those check procedures?

PIPPEN: There're two that come to mind. One of them was on the autopilot system. We were doing this infant mortality testing, and as I recall, we were a little bit behind schedule, and everybody was pressuring us, especially the non-technical people, to shorten the test cycle. And we were working around the clock. In fact, I can remember having hurt my back some way, and I couldn't hardly move, but we were there to launch a "bird." I spent three days, just catnapping between tests, trying to get all of those autopilots tested and get the minimum number of run time hours.

I'll say sixty hours, but I'm not sure of that. But as we approached this statistical "hours" that said it was going to be good for the flight, we got more and more pressure from the operations directors to quit testing early, say, at forty hours into the test, and then after fifty hours and so forth. By the time we got to fifty-five hours into test, we were behind schedule for the launch, and the pressure was tremendous. I was kind of an obstinate fellow, and I said, "You don't want to do that," and kept on and kept on, and I wouldn't ever shorten the test cycle—and I had the signature authority to allow the testing to stop. I would never sign that waiver.

And [at] fifty-nine hours into the test, the autopilot failed. If they had launched the vehicle, if they had launched that thing when they wanted to, it would've been a multimillion-dollar failure and it might have thrown the whole Apollo program into a schedule loss that we couldn't have tolerated. But I remember that incident well.

Another one I remember was, I had large college class ring on my ring finger. When you work with electronics things, you develop a whole lot more intuition than you do theory, if you're good. And I'm not saying I'm really all that good, but I had a lot of intuition, and I didn't have a degree in electrical engineering at that point. I was a mathematician, but I had worked in electrical engineering for the DoD for the Department of Defense, for White Sands Missile Range in the lab, and I was very—pretty good in electronics. I'd been to a very good school in electronics through the Department of the Army, when I was a second lieutenant in the Army.

We were testing this autopilot, and we were running it through its pre-checks. The autopilot system just didn't seem intuitively right, but everything met specs [specifications]. But they'd give it a command, and I could just sense that when the fins would go over into position, they wouldn't go over and lock in position. They'd go over and they'd shake a little bit. Nobody paid any attention to that. And I said, "Man, that's just not right."

So the vehicle was on the stand, the test stand, and we were running through these checkouts, just right before we were going into the final countdown and the fins were all just about, oh, about seven feet above my head, and you could touch them as you reached up. As I mentioned before, I had a class ring, which has since worn out, a large college class ring. I had authority to go around that vehicle, but, boy, you didn't do anything to the vehicle that wasn't written down and approved by all those folks I mentioned before. You followed the rules or suffer the consequences. As I'd mentioned this possible instability problem to the operations directors and others, they just wouldn't pay any attention. You just couldn't get anybody's attention at this time during a mission because everyone was busy doing their own thing.

So one day I was walking around the launch platform, and I said to myself, "There's just something wrong with the stability of this control system." So I just quickly reached up and hit that fin with my hand, with my ring, just whap! And when I hit it, that thing went unstable, and it shook so badly that we thought it was going to fall off of the pad. If they'd launched with this unstable control system in that condition, then they'd have lost the vehicle, no doubt.

Well, we fixed it, you know, but now the QA was there and the safety was there, and everybody was there, and I was the object of a lot of ridicule, because they didn't seem to care about the vehicle. They cared that I had broken the rules and done something that was not authorized because I knew they would not let me hit the fin with my ring. Can you imagine how these people would have reacted if I had said, "I want to hit that fin"? They'd have laughed. It just wouldn't have happened.

But then we went to the flight readiness review. That's where all the big shots got up on the stage of a large conference room and peered down on all us underlings. I can still see this in my mind just as clear. And there I was, little peon me, you know. We were required to go to this flight readiness review, and all these people went through all these documents, looking all the DRs, the discrepancy records, and all the problems, and the flight readiness review board personnel were buying off or approving all the solutions to the problems, saying, "Okay. Your solution was satisfactory," blah, blah, blah, blah, and they got to mine. When this instability thing came up, and they just stopped. This guy said, "Who is this David Pippen? Is he here?" Well, I raised up my hand, you know. They guy said, "What in the world did you do?"

I said, "Well, sir, I just gave it the old ring test."

He said, "Did you have the authority to do that?"

I said, "Absolutely not."

Then I just talked about the subject for a minute or so, describing the whole thing. After I was through and they asked what we did to fix it, and they didn't really get on me any more than that, I think because they recognized how close to a launch failure it was. When we got through with it the FRR, the whole gist was to make sure that I didn't do that again. But then we fixed the control system, and went back out, put it up on the vehicle. Everything checked out and, again, we determined we were ready for launch. And then we had the next review, which was after the first one. There were a couple of these reviews for every mission. The first question they asked, "Is Dave Pippen here?" They said, "Did you give it the ring test?"

I said, "Well, sort of, but I did it under controlled conditions"—Everybody was willing to perform the test now, "and I used a rubber mallet," and they all laughed, and we went on, and the control system was accepted as flight ready. But I can remember that very vividly. In fact, the "ring test" with a rubber mallet became a standard test for control system stability on all subsequent flights.

WRIGHT: During those early days, did you travel much?

PIPPEN: NASA engineers traveled a lot. However, I established a philosophy then that I would let my people that were closely involved do most of the traveling. I mean, I didn't want to be—

one thing I never did like was when the boss went and would return and tell me what I should've learned if I had gone. So I said to myself, "I'm not going to do that. If an engineer is going to be involved and responsible for some aspect of the mission, I want him to go and perform the work, and then they can report to me what was done. ."

So my people went all the time. I would go about a fourth of the time. We would go during those periods of time when the contractor had finished the control system or some other system, and they were doing a mating—they called them a mating, there at the plants when the contractor connected the individual systems together ---, and we would go and make sure that all the individual components within a system were functional and within specifications. So I would go for the final integrated checkout. But my people would go to all of them. So they traveled all the time. I would travel much less. And they would go to the plant and stay for weeks and weeks at a time, and I would kind of go at the end and make sure everything was going right, and just kind of check up on the overall progress and give them a little moral support.

But the people I had working for me loved to travel. Oh, they thought that was the greatest thing in the world, and they traveled all the time without fussing about it. One of the fellows, I remember his name was Gilbert Goode. I'll never know what happened to Gilbert, but he just loved to travel. [Laughs] He took great pride in the number of miles he flew and that he was a member of the air carrier's president club. And all these engineers, they were good people. They were really good people. Very dedicated to NASA. You don't see that dedication much anymore in most work situations. But in those days, you had a mission, and you just did was necessary to do to meet its objectives, and they gave us, generally gave us, the authority and the money to do the job, which was a very expensive approach, but it produced a pretty good product.

WRIGHT: Let's talk for a few minutes about the relationships, one, between the Army and White Sands Test Facility, and then if you'd follow that up with the relationship that White Sands had with the Johnson Space Center [JSC, Houston, Texas], which at that time was the Manned Spacecraft Center [MSC]. So let's start with the Army relationship.

PIPPEN: From my perspective, we really had a good relationship with the Department of the Army. Of course, I had come from the Department of the Army, and I had come from the WSMR laboratories, where they did a whole lot of testing of guidance and control components and systems, and I had a good relationship with all the people in the Guidance and Control Laboratory there. They don't call it by that name anymore. I had used all of the equipment that was in the lab. I was familiar, of course, with the NASA stuff too, and I was familiar with the equipment that was in these laboratories, and they trusted that I knew how to use it so they just kind of gave me a key to their lab and gave me the authority to run it myself just like I did when I was employed there.

So we would take the items to be tested over to the lab, and I kept in contact with those responsible for the lab and told them what NASA was doing. As a result we just had an outstanding relationship with them. They'd let me do most anything that NASA wanted to do. Of course, we paid our way and we did have money. In fact, as an example, we were having trouble with— the silver zinc batteries that powered all the electronics and even fired the squibs that ignited the solid rocket motors. And when it would get cold, those batteries didn't have enough energy to ignite the solid rocket motors. They wouldn't fire the squibs. Being an electrical engineer, which I wasn't by degree, but I was by assignment, you know, I figured out, what the problem was. The prime contractor wouldn't admit that a NASA fellow knew what the problem was since they considered themselves as the real experts and NASA more of a pain they had to live with.

So I went into the WSMR Guidance and Control lab and asked the responsible people if I could have some old parts that they'd gotten out of some of those missiles that had crashed out in the desert. I remembered that the La Crosse missile, it was a surface-to-surface missile, had a big old power relay in it, which is the thing that transferred battery power to the missile's electronic—is having a remote controlled light switch, where an electrical signal could make the lights come on. I designed a little circuit using this relay that would remotely put these batteries under load for a certain period of time. They called it "detusking." It would prepare or condition the batteries for cold operation. So I put that thing together, and it worked, and we just had one relay.

Since we needed several, the contractor I said, "We want your drawings and stuff." I said "that's fine with me". So they took the schematics and the box I had put together and went back to the plant and made GSE out of them; that's ground support equipment. I put the thing together for less than $50, to be extravagant, and they charged the government $20,000 apiece for them or something like that. But that's the way it was in those days; we had a lot of money and very few checks and balances. It was in a pretty little box. [Laughs] I learned a lesson there, you know – because I was given none of the design credit, but that's another thing that's vivid in my memory.

But the relationship between the Department of the Army and NASA I remember was good. They did all the post flight recovery operations. When we'd launch the vehicle, then it would do its separation, do all of its thing, and then the command module would come down to the ground. It was on a parachute

The Department of the Army would furnish [and operate] all of the big heavy lift equipment and get the launch vehicle and command module back to the VAB and do all those kinds of support operations. But we, NASA, just went out and observed and analyzed the impact area and the parts we collected. We didn't have any of that heavy equipment.

The Army also performed range scheduling and flight safety. When NASA would launch a vehicle, the DOD's flight safety would say when it was off course. If it was, they would destroy it in the air, that kind of stuff. . That was all they did, as far as I remember, and as far as my relationship with them, it was good and they provided just really good support. We just had a great relationship.

WRIGHT: Talk to us about the relationship with the Manned Spacecraft Center.

PIPPEN: Well, in those days, I was just kind of a peon, and I didn't know anything about the Manned Spacecraft Center, because I'd never been there. Didn't know anything about it except that they called it "our organization," as I recall, the Resident Apollo Spacecraft [Program] Office [RASPO], and it was run locally by the guy named Henry Van Goey, and he would go to Houston. We knew that. Right in this period of time, they were building the White Sands Test Facility, and Martin [L.] Raines was over there as NASA Site Manager, but we didn't go over there much, because we were on the White Sands Missile Range and not associated with their mission. However, we did have some FRRs [Flight Readiness Reviews] at WSTF in their auditorium, and they occurred right before we'd launch —All the FRR members would all come, there'd probably about thirty or forty of them, of different people from NASA MSC, in those days, Manned Spacecraft Center. They would all come down, to put the final stamp of approval on what we had done, and they were kind of our gods. [Laughs] You know what I mean? That's the way we operated, but I really didn't know anybody there at MSC, and I never traveled to Houston at that time, because we always went to the West Coast to the prime contractor's plants.

WRIGHT: In 1966, you became the Laboratories Manager.

PIPPEN: When the Apollo testing was finished, then what do you do with all these WSMR people that worked for NASA? And we all were to be dispersed to various NASA centers, and I didn't want to leave the area, this part of the country So they said, "We'll put you over to the Apollo. Site." They called WSTF the Apollo Site in those days. And they assigned me to the laboratories, and that was my first task there. I was called a Laboratory Manager, but that didn't mean I managed anything [of significance]. That was a title.

WRIGHT: Okay.

PIPPEN: They assigned to me the responsibility of the calibration, of the electrical calibration, repair shop, and there was a fabrication area. That was my function. There were probably twenty-five or so contractor people there, and my job was to make sure that the site support contractor fulfilled the obligations of the contract. The laboratories at that time from the NASA organization, wasn't even hardly a branch. It was a small group of NASA engineers un one of the NASA WSTF site organizations, and I don't recall which one it was, but there were a lot of people there at the test facility at that time. I think there were well over a thousand people, and they were doing all the Apollo engine testing, and we [in the laboratory] were doing strictly work to support the propulsion effort. All the instruments that were used up in the test stands would come to our lab for calibration periodically, and we would repair them.

In the fabrication area, I was kind of a design engineer, too. The contractor never had any real electronic circuit designers. They had a lot of real good workers and they worked hard, but nobody that could take a concept and come up with a design of a test system, and I did that.

WRIGHT: Would you share with us some of the designs that you made?

PIPPEN: I'm trying to remember some of the things. I know that the test stand intercom system became nonfunctional in a lot of the stations. Everybody would sit around with their little intercom headset on their head, an all interconnected intercom kind of a thing, and then an outside contractor that had built those, it was custom-made, and the contractor that had built those was no longer in existence, and after such hard use they were kind of dysfunctional—but they had to have replacements. So I just designed it [a new one] from scratch, it was fabricated in the lab and took it to the test stands, and it worked.

I also wrote some technical papers on some of them, like an amplitude compression device, and what that was all involved in this intercom. Of course, when somebody talks loud over an intercom system but another on the net talks softly, you want to not to have to adjust the volume control all the time. So this was a little circuit that did that automatically. Nowadays, with computers and with integrated circuits, most all of that kind of technology is now encapsulated in one little circuit, and it's very straightforward to build them, but in those days, we had to use individual transistors, individual resistors, and it was quite a task, and these systems weren't available commercially. So we built them in-house.

WRIGHT: You also talked to us a little bit about your shutter valve circuit. Can you talk to us about that?

PIPPEN: Yes. The shutter valve is very large valve used in propulsion's high altitude test chambers the propulsion high altitude test chambers were real large things and were located in the 400 area of WSTF. When they evacuated the test chambers to simulate high altitude, they had a big steam engine that when you fired the steam engine, it aspirated the air out of the test chambers, and that created a vacuum, which simulated higher atmospheres, as you evacuated. If they ever had a problem during evacuation if something bad happened [like the steam generator failed], then if you're evacuated, then the air would backflow into that test chamber with such velocity that it could just destroy everything in it. So they had this large shutter valve, they called it, and if they detected a failure, that thing would close so quickly that it would keep the rapid pressure change from damaging the test article inside the chamber. Now, that's my present understanding, here many years later. You get people who know propulsion better than I, they really may describe it differently—but that was my concept, as I recall. And the shutter valve actuation circuitry they were using was too slow [in activating]. So I designed several circuits that would speed that process up, and they worked. (Refer to Photo A-15)

WRIGHT: How about your transducer instrument, the differential pressure transducer instrument?

PIPPEN: Yes. What that does is, you have pressure inside the cans [high altitude test chambers] or, inside this vacuum chamber, and you have a different pressure on the outside. So you want to measure the differential of these two pressure signals, and when the difference in pressure in one of them and the pressure in the other got to a certain limit, you wanted things to happen, for example, close the shutter valve. Now [presently] you could buy differential pressure measuring instruments off the shelf, but in those days, you couldn't. So I designed and developed one that would do the job for them, just measure the differential pressure between the evacuated part of the chamber and the outside pressure and provide an output signal.

WRIGHT: And then one other that I know that you had listed was your timing circuit for the test stands.

PIPPEN: Yes, and it was all a part of this. You know, it's really amusing now, being in electrical engineering and teaching electrical engineering [at New Mexico State University] what we thought was so hard in those days, because we had to use discrete components, individual little components, today it's just easy, but in those days, they needed a precision timing circuit. As I recall, on some of their data acquisition systems, they needed to, after a certain period of time, extract some data off of a magnetic tape or something, and you just didn't go buy a timer chip or microcontroller like you do today, so I designed a little timer [circuit] that at the precise time would allow them to extract that data that they needed.

WRIGHT: Pretty interesting. Would you share with us the organization of the Electrical Calibration and Standards Lab, and what your mission was?

PIPPEN: Yes. That's going way back, and the accuracy of my memory is kind of weak here, because we had so many reorganizations, and we called each organization doing the same things so many different names. But I can remember sort of the functions, and that's when I first got there, like I was saying a while ago. When I first got there, I was pretty low on the totem pole — I had gone from a supervisor [at WSMR.] In fact, I've got a letter from Martin Raines saying, "We are now taking your supervisory stuff away, and we're making you an engineer now." They didn't reduce my rank, but I went from supervising a bunch of people to just being one of the troops, which I didn't mind at all. People are your problems anyway, right? Never the technical parts of a project.

So I went to WSTF, and I was the NASA laboratory manager—we had a contractor that generally did all the actual physical work. They had their own management and they had their technicians, but the NASA person [lab manager] set priorities, verified that the work that they did was correct, and I had the advantage there, because there were no design engineers. I even got to design the stuff, like we were talking about previously.

As a laboratory manager, there were several others with that title in the labs. We had like the electrical laboratories, electrical and fabrication lab, calibration lab; we had the mechanical calibration and fabrication labs. We had the chemistry lab, and we had the metallurgy lab. We had several different NASA people that managed the efforts of these laboratories, and they were all designed to support the test stand. And they, [the test stand] pulled our chains. All the requirements came from the test stand, except our own internal calibrations.

We had people like Martin Raines as the NASA Site Manager, and then he would have his first line usually called "offices", and under that there would be a Branch Supervisor, and then I was under a branch. I was way under there. And that's where I started, in the labs.

WRIGHT: In [19]'67, the Apollo 204 [Apollo 1] fire occurred. How did that affect or impact the work at White Sands?

PIPPEN: Just a little bit before that, as time went on, they [NASA} had a fire problem with an oxygen system, and I can't recall where or what it was. I can find out; I've got it in one of my documents. But we began to do some materials testing to support the failure analysis of this system. By that time, the lab organization, which we had—we had fifteen or so NASA people in the labs, as I recall. I mean, I was just one of those people.

But then Apollo left—well, Apollo hadn't left, but as Apollo was maturing and the engines required less testing at WSTF, a lot of the lab functions went away [since the lab's prime function was to support the propulsion activities], and it had gotten down to just a very few of us in the lab, because they had reduced the staffing during this period of time, and we were just getting involved in some testing on materials as mentioned before. This was six months to a year before this 204 fire happened, and a lot of people [NASA and contractor] were concerned about this hazard of — having flammable materials in the presence of 100% oxygen in the habited portion of the Apollo command module. I don't know, have you ever observed materials burning in oxygen? I mean, we live in about a 20 percent environment of oxygen with the balance mostly nitrogen and some things burn rapidly, but when you get into 100 percent oxygen, then these same things burn nearly explosively.

The command module was stuffed full of all kinds of metallic and nonmetallic, and plastics, and wire harness insulations, all that kind of stuff, and there it was, exposed to a 100% oxygen environment. People at NASA were a little bit concerned about that, but they had not had any real major problems except this one thing had happened that I mentioned before

And they got us involved to an extent, because we had a unique kind of a capability to do testing in oxygen since we were in a remote location, and I happened to be there at the right time to get involved in this new type of testing. And I was heavily involved in the setup of the initial tests and wrote the test procedures, and the NASA folks at JSC were pretty well pleased with what we in the WSTF laboratories were doing. One thing we did, my philosophy was, respond to the customer fast with good data. So it started there, and like I say, I was way down in the organization but then the fire occurred. Of course, panic ensued in the NASA hierarchy, and then everybody realized that the habited portion of the spacecraft had many flammable materials in an oxygen environment where a small electrical spark could cause a catastrophic fire —so when they looked around and asked, "well, who's done any testing to determine which materials are flammable?" Well, we in the WSTF labs had done a little bit of testing. I'll not forget this, because [Dr.] Leonard Schluter and I were really the only NASA people in the labs that were doing any materials testing. They had other people from NASA that would come in to use the lab facilities, but we were the only resident people in this lab building

I can remember, just as plain as day, Martin Raines called, and he was the head of Reliability and Quality Assurance at JSC, Houston. He had left White Sands [as the NASA Site Manager] by that time. He was in Houston, and he had called Leonard Schluter, my compadre. We were the only two in the lab at the time, and said, "Okay, Leonard, I'm going to name you Mr. Materials Test," and that made old Leonard so proud. He was tickled to death with that title.

But in the process, JSC said, "We've got to gear up to test every non-metallic material that is in the inhabited portion of the spacecraft Every material had to be tested, and it had to be tested fast. So we went from just a little bitty test organization to a full-blown 3-shift operation—We had to design our own test chambers. We had to design our own test fixtures that went into the test chambers. We had to develop the test methods. We had to develop the procedures, and there was nobody there to help us who had any experience, because nobody had ever done this before.

Leonard and I, and the Site Support Contractor developed all these processes and procedures and got the basic flash and fire test apparatus, where you'd put a material in a chamber, backfill with oxygen, apply heat, and put a flash—flash a spark over it to see if the offgassed material was flammable. See, we were running about, as I recall, 16-something psi [pounds per square inch] oxygen, 100 percent oxygen. And you'd spark that spark, and if it caught things on fire, that would be like an electrical arc in a spacecraft.

And we asked the question, "Well, will an external ignition source ignite this material?" So Leonard and I developed little igniters that produced a constant heat output for about 20 seconds as I recall, to use to ignite the material being tested. We went through a real interesting process developing igniters that would be consistent in BTU [British Thermal Unit], from test to test. You know, repeatable heat content, to light these test materials. We would light these materials from the bottom and the top and measure the flame propagation rate. In fact, we were in such a hurry that we were always trying to improve the test methods. Once the technicians asked, "How are we going to clamp these materials so that we can rapidly test?" You'd put a material in there, and you'd test it, and you put a material in there, and test it, just over and over and over. And, we tested 3 samples of each material. The fixture at the time used several bolts and nuts that had to be operated for every sample change.

I was carrying a clipboard when this question was asked. I said to the tech, "Let's just take some of these clips off, and then we can just clip the materials under them, and we can change test materials real quickly." So we took the metal clamps off, mounted them on a test fixture that was installed in the chamber, clamped the test material under there and tested. To my knowledge, this same type clamp is in use at WSTF today.

We ended up designing a variety of test chambers and fixtures, set up all the instrumentation, and developed the test criteria, to establish the burn rate or flame propagation rate of nonmetallic materials. And NASA Houston personnel worked closely with us. Of course, they gave us the general requirements for passing or failing, but we'd put the technical inputs in to them fellows like Mike Steinthal and several other people that were at our level. Howard Kimzey, Fred Dawn, Dr. Dawn, Henry Pohl. Never forget those people because they were so dedicated to the Apollo mission—and we worked closely—never did meet them personally for years, but they just like worked with us and helped us get this thing going.

We worked three shifts. Like I say, there were two NASA people at first, working a three-shift operation, and it was one hectic thing, but we did it. We tested over 4,000 materials over this time period, 4,000 for Apollo alone! I can't remember whether it's materials or tests; 4,000 just popped into my mind. But we did it. We did everything required of us. See, it was just very basic testing even in those days. It's very basic. (Refer to Photo A-16.)

And then—I don't know whether you're ready for this [at this point in the interview], but then that was when Leonard, Dr. Schluter, later he got his degree, his Ph.D., and I got my master's degree. I was going to school after hours just when I could, and they [administrators at New Mexico State University] gave me an ultimatum, said, "You've either got to finish—." See, I took courses even when I was in the Army, and I'd exceeded my five-year [time] limit, and I lacked two courses, and they said, "You've either got to finish those two courses, or we're going to make you start over." So there I was in the middle of all this priority testing, but I got my master's. But Leonard took a leave of absence in this period of time to get his Ph.D., a little bit later than this hectic time. Well, when Leonard returned, the Labs had been elevated to the office level and I was appointed Chief. I don't think he ever really accepted me as boss since he had more time than I and had reached GS 14 before I did. Ken Gilbreath was the NASA Site Manager when this reorganization took place. (Refer to Photo A-17.)

But those were really interesting times. The contractor, we had some people that were really dedicated in those days, but in the labs, the NASA people were the drivers [for the projects]. We were the ones that had the—we had good contractor people, but they were more like it was a job for them. To us, it was something more. This word "world class" started coming in Leonard and I's vocabulary, and that's the thing [the world-class concept] that we used to motivate these people. We said, "Look, if we're going to do any work, let's do it the best that anybody in the free world could do." And that's what we were trying to do, is to instill in these people the importance of producing a product where we didn't get into a [Apollo] 204 again, you know. And I think we did pretty well.

WRIGHT: With the fast pace and with the lack of precedent, no one had ever done this before, how were you able to judge when you knew you had the best data, since you had to be able to provide a fast response for your customer?

PIPPEN: Well, I guess, as engineers, you know when you're getting good data. You know mostly, not always, but in general. And we had the authority to change things and improve things as we were going along because, see, that's one of the big advantages of being at the White Sands Test Facility. We were little. And when you don't have all this bureaucracy—and there's one thing that the Manager's office did at White Sands. They were more interested in propulsion. So what did they do with us? They just left us alone. We had no encumbrances, and we established our own paperwork system. We did all of that, you know, and nobody really knew what we were doing, and we sure didn't tell them, because we knew what would happen. And as long as we were producing data, the people [at MSC] were really content.

I'll never forget that one day we were testing—and I looked at all the data, and Leonard, he was mostly involved in the chemistry part, odor testing and all of that. I was involved in all of the flash and fire and propagation rate [testing] and we kind of split those [split these from chemistry like functions] up. We were never given any official assignments to these things, but we just knew our expertise and our strengths and then we kind of overlapped to cover each other.

But I was walking in the lab there one day, and they were running flash and fire tests on paper. They were testing paper, because you put flight documents, you have all that flight document stuff. We [NASA] were worried about the flammability of paper. And I said, "Well, how's your data going?"

And they said, "Fine." They showed me paper, and it had a flashpoint of a temperature that was lower than if it was lying out in the sun, out there in the New Mexico desert.

And I said, "There's something wrong here." So I watched that test and found out what was the matter. The techs were mounting the paper in such a way that they were causing this spark to go right through the material, and it was igniting it, and it had [was promoted by] the oxygen there [in the test chamber].

So that's when I redesigned the flash and fire apparatus. That's when I went into my office and redesigned this whole thing, put it together, and called Houston and said, "I got a better system here." And that's when I got my patent on my temperature controller. That's a little temperature thing that caused the test chamber to heat up linearly while a spark jumped across a gap every few seconds. You couldn't buy that kind of equipment in those days. Today with the computer [technology], boy, you can just do it easy.

With the NASA co-op, we developed that system, and I got my master's thesis on that little temperature controller—and that's the only way I could get my master's degree thesis completed, because I'd work on it during duty hours—I was doing something that I had to do anyway; and New Mexico State University let me write my master's thesis on that. But that's why we were given freedom, and NASA Management trusted us, I guess. Most of it, I think it was because they were preoccupied.

Now, when [Kenneth B.] Ken Gilbreath, was appointed as the NASA site Manager he was very, very interested in what we were doing [in the lab], but most of the time the manager was a propulsion or facility oriented, and naturally you're going to favor your interest—that's what people do. I mean, you didn't hear of the labs. That wasn't even a word that was spoken until Ken Gilbreath made us an office, and that was the thing that put us in gear.

WRIGHT: When you first started out, did you have a facility, or where were you housed, and then how did that evolve?

PIPPEN: In the labs [area], they had three buildings that are all attached, and on one end was the clean room, and they had big high bays on each end where they did the prep for the test articles to be tested by the propulsion office, the Apollo test articles, before they would go up into the test stand and test these engines and things. Well, in the middle was what they call the laboratory, and it housed Building 200 and 201 and 202, as I recall. It might have been 203. I can't remember those numbers. But there was a small section in there where we had offices, and I had a cubicle and Leonard had a cubicle, and they separated the contractor, of course, from NASA. So we had nice little places to work in the lab. (Refer to Photo A-18.)

We always, later on, we had a Laboratories Branch Chief, later on, and then they would be there in the 200 area in a NASA office. That was the way it started out initially, and then when the site population decreased when the Apollo engine testing ended, all those people left [WSTF] and left Leonard and I there in the lab. Then the population returned a little bit later as materials testing began and a Branch Chief was again assigned; and one of those was Ken Gilbreath, and that's when he learned the value of the lab. And there was probably five or six of us in the lab when Ken was there.

WRIGHT: Can you tell us how you came up with the design for the test chambers? How were you able to determine what you needed for that part of that facility?

PIPPEN: Well, it was mostly a scrounging mission, if you understand my words. The propulsion had a lot of containers around, and different sizes and those kinds of things, and Leonard was good at chemistry and combustion chemistry, and he said, "Man, we have to have a certain size chamber to do this and this," and we would go searching around for a good-looking vessel, and then take it down [to the labs] and then design it to accept the appropriate test fixture. The contractor, they have mechanical engineers, and once we would set up the requirements—I didn't actually draw the plans –they would draw them. They would set up the things [test chambers], and then they did stress studies, because they [the test chambers] were pressurized, and you had to have observation ports [to observe the tests], and so you had to worry about all of that, and you didn't want that glass view port to blow out on you.

So we would come up with these concepts and make sure that we had enough gas volume in there that a burning material wouldn't get into what they call oxygen starvation, and we'd calculate all that kind of stuff and take the chambers down to the machine shop, and they'd build it. And take it back to the lab, and we'd put all the test fixtures in. And the contractor, of course, did most of the actual putting it together, and Leonard and I, and then later our NASA people, were there to make sure that it met what we thought was right, and then we would run basic baseline tests on it, and we decided the quantity of the material based upon what the test data showed us, and we just came up with the process. And people accepted it, and it was right [proved to be correct].

(Refer to the following photos of some of the test chambers designed by Laboratories personnel used for Apollo and Shuttle testing; Photos A-19, A-20, A-21, A-22, A-23, A-24, and A-25.)

Again, engineering intuition is a great thing. You know, you have an intuitive feel. Whatever field you're in, if you're interested in it, you develop an intuition, and you just kind of know when things are not right, although sometimes you're fooled, but you learn to follow that intuition—I call it an internal flag. I've always taught my people, I'd say, "When the flag comes up in your mind, stop and investigate it, because if you go past—if that little red flag's waving in there, it's telling you something. That's your engineering intuition. That's telling you something is amiss. Now, investigate it. You may find there's nothing to it, but you investigate it."

And we kind of developed that philosophy, and it kept us out of a lot of trouble, a lot of trouble. In fact, we didn't have any significant accidents in the lab. All the time we were there, we were running with the most hazardous toxic fuels and oxidizers, and high pressures, and every kind of thing. Now, on the test stand they had an accident, and that's one of the reasons we got in the materials business. It wasn't anybody's fault. It was mostly ignorance, and not stupidity. Ignorance is different. And it was a sad thing. A person nearly got killed.

After that, that's what started the 800 area [hazardous test area called the category J test fluids]. We [labs and local NASA Site Management] said, "Well we're just doing things too haphazardly. We'd better centralize it, localize it, or we're going to really kill somebody." And they [MSC and the NASA Site Manager] gave us—built us the test cells in the 800 area. That was where we started our hypergolic testing, the kinds of testing like—really it's the hydrazine and the $N_2O_4$, fuels and oxidizers that's used in the Shuttle, in Apollo, really in Apollo, in the Shuttle. I have to remember that [which systems they were used on]. It's been too long. I'm not a chemist. (Refer to Photos A-26, A-27, A-28, A-29, A-30, A-31, A-32, and A-33.)

WRIGHT: What type of precautions did you institute to make sure that safety was a major factor in your work?

PIPPEN: Well, the thing that always my philosophy was, the safety organization wasn't responsible for safety [in the lab area]. The Safety organization, it was an overseeing operation that would tell us if we're going off on the wrong track, but safety [test safety] is the individual's responsibility, and especially with NASA's [operations], because I was NASA and responsible for the labs. Before we would ever institute a procedure, we would have a little pretest review, and I had a committee, and I was the chairman, and we would sit in there, and the responsible test people would come and present to us how they were going to assure that this thing [test operation] was going to be safe. We had some good people on there [on the committee], as contractor and NASA. We would just really beat up on the proposed procedure until we were sure it was safe.

There was one time we came very close to hurting someone. I can remember that we had a test chamber that was mounted vertical, and it had a glass top [view port] where you could look down into it and observe as you were testing, as a flash and fire chamber, and the technician kind of didn't follow procedure, turned the pressure up too high [when backfilling with the test gas], and he was looking into that chamber, and it blew the sight glass out. A piece of the viewport glass just nicked his nose, just nicked his nose, and it just bled—once that happened, word got to me. I was in my office just right around the corner, and the word got to me just immediately, and I went roaring down there, and he was just bleeding like a shaving cut. I said, "Oh, no. This guy is—." But then when we looked a little closer, he'd just nicked his nose, and we said, "Man, there is the warning. There is the warning." So we were very, very careful from then on and made sure people followed the procedures that we wrote and tested before, and had those pre-reviews.

And then I made a practice just walking around watching test activities. I've considered myself a safety officer and I wanted my NASA people to do likewise—we were safety officers. We were quality; we were safety; we were everything. But we had the help from these other people [contractor and NASA safety personnel] if they happened to be around, but we didn't wait on them.

WRIGHT: Before we move off of the Apollo era, I wanted to ask you about a Group Achievement Award that you got for developing a new technique and materials for conducting those tests to help minimize the fire hazard. Could you share with us what those procedures and those techniques were?

PIPPEN: Really, I think it would be more enlightening to describe what it was for —the award was for [performing] the complement of tests that we did. It was for a flash and fire test. There was an upward propagation test. There was an upward and downward propagation flame test, and several other tests all in there that we developed [for the space programs]. We started out with the very basic test, and then we just developed these pneumatic impact tests, and we went into gaseous oxygen, we call it the GOX test. We ended up with over 15 standard tests for materials testing. The main document was issued by the Office of Manned Space Flight, Washington. Its title was NHB 8060.1 "Flammability, Odor, and Offgassing Requirements and Test Procedures for Materials in Environments that Support Combustion". This document was revised twice while I was with NASA. The original was originally written by personnel at JSC. [MSC]. However, the last revision, NHB 8060.1C was completely revised and our Laboratories Office was responsible for this revision. We coordinated with all other NASA centers who performed/were interested in materials testing. This included Johnson Space Center, Marshall Spaceflight Center, Lewis Space Center, and Kennedy Space Center and perhaps others. (Refer to Photos A-34 and A-35.)

People in different places had toyed with testing materials, but no one had really developed a process where you could do a large quantity of repetitive, rapid testing like we had to do. So we developed test processes that you could do—what would you call it? Assembly line kind of testing. And think what's involved in that. You just don't go out and pick up a material and stick it in there [in a test system]. You've got to prep it. You've got to make sure you don't contaminate it. You've got to have real precise prep procedures. We had a little prep room, and we had technicians that we had to train, and we didn't know how to do this at first, but we had some people that thought, were good thinkers. [For example, to test paints that were received in liquid form, they had to be painted on a Teflon sheet, and peeled off to test after they dried.]

So we'd go in [evaluate each material]. "Here's the way you prep this material." And we not only tested materials like your clothes are made of. We tested paint. We tested everything that went into that inhabited portion of that spacecraft.

And a little bit later on, we started testing materials [used] outside the spacecraft that were involved in the fuels and oxidizers, you see. Then that's when our 800 area and all that stuff started coming into play, and the lab now was growing by leaps and bounds. Now, they [local management] didn't let us have many more people. In about [19]'68 is when Jack Stradling came to work for us, and I mention Jack's name because, to me, he was a genius kind of a guy, very quiet, laid back, but if you had something to do, Jack could do it. He's a mechanical engineer, certified airplane mechanic, stunt pilot, just a quiet fellow that worked probably fifteen hours a day every day that I knew him, and got paid for eight.

I'd stay around late just to run him home, because he'd overwork himself. A lot of times the wives would blame me for their husbands not coming home, but he was just that dedicated, and had a photographic mind and could remember data. Everything he checked, he could remember. And you'd get into a meeting, he won any arguments about testing, because he knew the data and he could interpret it. But he came to the labs from the test stand, and we just bonded real quickly. So now we had Leonard and Jack and I and a couple or three others that were doing some of the other things, and that's when it started growing. (Refer to Photo A-36.)

WRIGHT: The same year that Jack came, in '68, there was a recommendation to George [M.] Low that a possible phase down needed to take at White Sands. Share with us the impact of that.

PIPPEN: Well, here we were. The reason they were doing that [considering closing WSTF] is because we [WSTF] were a propulsion site, and propulsion activity had dropped to nothing. And they [propulsion managers] were desperate for work, to keep their many people busy, as I recall. But in the labs, it was a different thing, but we had no recognition, see. See, we didn't become an office until about [19]'71, as I recall. So we were there, and we were doing all this stuff [materials testing], but we were not getting recognized outside of the people that needed the data.

Then the money crunch came about then. See, there was a big money crunch. So naturally, Low was going to say, "Why have all these little peripheral things out there that have no function anymore? Let's shut them down."

In fact, I spent as much time—all of my tenure, from that time on, until I left, essentially, justifying our existence because we had people wanting to shut us down. And I'm not saying they shouldn't try. You ought to be able to verify your existence, but I tell you, we did [verify our existence]. And you get people like Leonard Schluter and Jack Stradling, and I'd like to say myself, and a guy like Frank Benz, and these people that were just technical dynamos and were really sold on their selves—not on their personal selves, but on the job that they had and the importance of that job. They'd come in from Houston by busloads with a skeptical face, and by the time it was over, they were our buddies. They'd come around and tell you, pat you on the back and say, "Man, we can't shut you guys down."(Refer to Photos A-37 and A-38.)

Then when that happened, as we got notoriety, we grew more, and more people would give us more work, and that's when I decided, if we're going to survive here, after this kind of stuff [people continually wanting to shut us down], if we're going to survive, we've got to get other people than JSC involved to a big way. And that's when we got what they [local accounting people] call—when people pay their own way, they called it in those days "funny money." I hated that. I hated that. I said, "We're not going to call it 'funny money.' We're going to call it 'reimbursable.'" So I renamed that so it would sound more professional.

But to get back to your main question, boy, the morale was bad. Were we afraid? Yes. I was asked to go to Houston, and everybody else—and most of these people did, and I said, "Well, no, I think I'll stay." And Ken Gilbreath asked me to stay. He was the WSTF NASA Manager at that time, as I recall. We were also close to being closed several times during the time Jesse Jones was NASA Site Manager

And I got tickled at Jack Stradling. Jack told them, he said—you have to know Jack to appreciate him, but he said, "I'll go, but there's going to be claw marks all the way across Texas." [Laughs] I'll never forget that. So he said he'd stay. So our little core stayed, and we fought, and we'd go out and talk to like Paul Ordin at [NASA] Langley [Research Center, Hampton, Virginia] and say, "Paul, we need so and so." We developed a hydrogen safety manual. We did an oxygen safety manual. We developed all of those things. Jack went off and gave presentations to all of these people

Then these people began to say, "Hey, maybe these people are real." They'd come down to WSTF Labs and observe our work. There'd be just a little old handful of people, and the work productivity was tremendous, and that's why people kept saying—"How do you guys get all this done?"

We said, "We work."

The government's not known for working, to be honest with you. In fact, I never thought I'd stay with the government for my entire career. I just never thought I would. When I got out of the military at WSMR there weren't any jobs, and they said, "Well, you just stay right here. We'll give you a job," and I took a temporary job, and then it just blossomed, and I told you the rest of the story.

But I had a wonderful career. Oh, I just had more fun, more fun than you ought to have. It was fun every day I went to work, you know. Of course, you had a lot of things that bothered you, but when you'd look at it, I wouldn't change it, except my last month of employment. But other than that, it was fun. And for the most part I was rewarded for my efforts. (Refer to Photos A-39 and A-40.)

WRIGHT: What are those projects that you were working on back in the late sixties, early seventies? Did you do some work for the Air Force's Manned Orbiting Lab, the MOL?

PIPPEN: Oh yes, we did.

WRIGHT: Can you talk to us about that?

PIPPEN: The Manned Orbiting Lab, it was coming into focus because the Air Force was trying to get in the outer space business, and we did all their testing. We talked them into doing all the testing on all of their material, and we were really going good, and then they cut the program.

But it's strange. When we did, there was all this material [materials that had been received for test] that we were just dumping, and I'm an electronics guy, and I went by the trash can—and this was a long time ago—and there was a little can, little jar of—we call it heat transfer material. It's material that you put between transistor cases, thermal compound, we call it, that transfers the heat from the transistor into its heat sink. And I picked that up, and I was looking in my shop today, and I've still got it. [Laughter] And I still use it every once in a while, and that's been years and years ago. So I put a little bit of Manned Orbiting Laboratory in anytime I hook a transistor to a heat sink. Just a little dab it takes, and I don't did do that much in the shop, but I've got that—probably illegal, but I've got it. [Laughs] But they can have it back anytime they want.

WRIGHT: We'll pass that on.

The Apollo missions were up and going during that time. What type of interaction with the Apollo missions, if any, did you have, on your lab hat?

PIPPEN: Hardly any, because we did all of our work before the Apollo flights occurred, but if they got into a problem—I can remember Apollo 13. That just sticks out in my mind. That was a scary time. But, see, this was after—as we [the astronauts] were coming back—they said, "Well, you know, the fire could've started in one of the oxygen tanks." So I got involved in determining the lowest voltages in the particular atmosphere that you could draw electrical arcs of sufficient intensity to ignite the material that the wire was [insulated with]—the wiring [insulation] in those tanks had is Teflon, as I recall. So I got back in the laboratory with my own little smock, and designed those tests and determined that for them [NASA JSC]. (Refer to

Photo A-41)

And there were others. They don't come to mind, but in Shuttle there were several, like the oxygen-flow control valve and all of those things. (Refer to Photos A-42, A-43 and A-62.)

But if they had a materials problem, you know—and I'm trying to remember whether all these flight documents that we had was Apollo or Shuttle, and I can't remember, but they had a bunch of flight documents that some way or another the ink, when it offgassed—and I think it was Apollo, but I'm not sure of that—and the astronauts got blisters in their noses. So we ran a long series of tests to determine the cause for the blisters—they didn't know what caused the blisters, and so we had WSTF Laboratory volunteers in our odor test to sniff different inks and allow their noses to get blistered so that we [NASA] could change ink if necessary—that's the kind of people that WSTF test personnel were. I'll not forget that. I wish I could remember what [the ink type was]—I can't remember the details. I just remember the incident.

But these whole [odor] panels would get together, and they'd sniff that stuff. They'd put that right up to your nose, and you'd take a deep sniff. I was on the odor panel. And we'd sniff, and the doctors or nurses would come [from the WSTF dispensary], and look in your nose. "Ah! There's the bad one." One nurse I remember was called "Chappie." She was particularly dedicated. And we found out that it was a particular ink, and we found out that if you changed that ink, it would not blister your noses. Isn't that something? (Refer to Photo A-44.)

WRIGHT: What other types of tests did you need volunteers for?

PIPPEN: Well, that was the main one. In fact, we didn't do any other human experiments, as such. But that was the one that we—you volunteered, and so we had to develop a way to motivate folks to be testers—volunteer is fine, but is there some incentive? And what we did was, on the incentive, we would every Friday or—I think it was every Friday, if you went through so many sniffs, you'd get treated with a steak dinner. Of course, that all came through the contractor, and so we had that, and you became a "smeller feller" after a certain number of sniffs.

I remember the guy that had the most sniffs whose name was Abe Chavez. Whatever good that is, that was his name. He had hundreds and hundreds of sniffs by the time I left. But you'd volunteer [to be on the odor panel]. It was interesting that [at first] women couldn't be on the odor panel, because their sniffing was inconsistent, the results [were inconsistent]. We found out that it was because of the lipstick and because they put perfume on, and they had makeup on, and they were smelling that rather than the material being tested. So we said, "Okay, if you want to be on the odor panel, you have to scrub your face." And some of them did. And we said, "That's great." So they became odor panel members. But they had to do that [scrub their faces]. You had to make sure they didn't have any kind of makeup on, and that cleanser stuff you put on, that my wife uses, that I don't know what it is. You know what I mean?

WRIGHT: Right.

PIPPEN: Y'all know. I don't. [Laughter]

WRIGHT: But once we did [figure out the problem], you know, that was fine [to have female odor panel members]. We had—her name was Chris. Her [last] name changed a couple of times, but her first name was Chris. She administered this test for years, and she was really,

really good, a real dedicated person. In fact, the picture, the photograph you saw was her. (Refer to Photo A-45.)

She was administering odor sample. But a lot of people would not serve on the odor panel. I'd say to them, "I don't blame you." [But a lot of people would serve.] Because you don't know the effects of the sample on your health. Maybe that's why I'm so lightheaded today. [Laughter]

WRIGHT: Would you share with us the lunar cleaning tools? You talked about the tools. And also while you're talking about the cleaning of the tools, also about the Viking Project [Mars Lander] as well.

PIPPEN: Lunar tool cleaning was really interesting. That program was not on the normal WSTF budget. We were always out looking for things, and we [Laboratories Office] had the clean room at that time. The laboratories, I talked Ken Gilbreath the WSTF Site Manager into letting me manage everything in that 200 area building. I said, "Look, I can manage it if you give it to me." As a result, the laboratories had the materials testing, had the clean room, had the {mechanical and electrical] calibration, and had all this stuff. We even had our [own] little shop, fabrication shop. We had all of this stuff going on, and one of them was the cleaning [function].

We [in the Laboratories Office] said, "If we're going to survive, and if we want to reach our goal of being the best laboratory in the world," and that's all we wanted, "we're going to have to be willing to convert normal operations to special things, to get projects in the clean room and in all areas," and we did them [ran special projects] in all areas. "We're going to have to do things outside the natural, the normal NASA budget." And that puts us in a position of strength. That's my thinking. Always operate from a position of strength, right? Never operate from a position of weakness. You're going to get beat if you do. You know? So we always got ourselves in this position of strength before these people trying to shut us down would come. And, thinking people, you can convince them, if you're right, that you can do a job and therefore survive.

Well, Leonard Schluter was a dynamic person, Ph.D., new Ph.D. at the time, dynamic, very smart. And he's an older fellow. He's older than I am, if you can believe. But he's an older fellow. Of course, we weren't that old in those days. But he established an outstanding rapport in the cleaning area with customers, and he had contacts in Houston, and they said, "These tools, lunar tools, before we go to the Moon, have got to be cleaned. You cannot take your contaminant all the way to the Moon and contaminate the Moon with Earth."

And Leonard said, "We can do it." And nobody had ever done that before. But we developed cleaning processes and procedures which were very meticulous, and we trained the people, mainly Leonard, trained those people, and then pretty soon JSC said, "Well, that's the place to do it."

We designed special containers, and we shipped those tools back and forth, using commercial transport. We had these special pressurized, as I recall, special sealed, I should say, containers, put those tools in, all kinds of little tools that you work on the lunar tools [samples], and we met their requirements. We had faster turnaround than they could get anywhere else. Even though they had this delay due to shipping time, we had them scheduled [such that it was no problem]. We had our people trained, and we said, "You don't want a dirty tool." So we had all these verification processes.

So the clean room now became notorious, not only as a test stand support [area], but as an agency resource, and that's the goal. If you're going to survive, you have got to be an agency resource, not just at the dictates of JSC, because they're selfish, naturally. It's not bad. They're going to protect their own self before they protect you, and if they get just enough funds, to operate their own programs what are they going to do? They're going to wean you off. But if we get [NASA] Marshall [Space Flight Center, Huntsville, Alabama]—and that was one of our great competitors, was Marshall. But Langley and [NASA] Lewis [Research Center, now Glenn Research Center at Lewis Field, Cleveland, Ohio] and all of these others, boy, they were our friends, because we responded to them, and we treated them as good customers should be treated. We gave them all they expected and more for the money they gave us. And the same way with the curator, out of his own budget, he gave us money that he would normally use for his own operations.

Well, then Viking came. Now, Viking was the Mars thing, and if we thought we were clean with the lunar stuff, that was not even near clean. So we set up a very, very intensive, new process. We called it, as I recall, the vacuum bake [test system]. We would clean according to our normal process, then put these components in this big vacuum chamber and heat them up and pull vacuum on it [the chamber], and that would pull all the volatiles, all of that stuff off. And we would put those Viking components in there, the mass spectrometer, all that stuff in there, and they'd be in there for days. And we would watch, because when you're offgassing material in a test chamber, you can't pull the pressure down as low, because the offgassed material keeps raising the pressure. (Refer to Photos A-46 and A-47.)

So we'd watch till we could get that pressure, the vacuum to a certain level, and then we'd know the components were clean. Then we'd package them with special packaging. I even designed a heat sealer. We were having trouble with the—we'd put these in special plastic bags made of Teflon and heat seal them. So Leonard, I remember he came up to me, "Dave we've got a problem with our heat sealer."

I said, "I'll design you one."

So I took the old one, modified it, came up with a little circuit that would allow them to go "Zap!" and seal Teflon bags. That's kind of my forte. You know, that was my thing. I could come up with those little things. And we never patented it. I look back; if we'd wanted to patent things, we'd probably had fifty patents. And we got discouraged at times when we did try to get a patent, and I won't name names here. As an example, we got discouraged because we were sent a test chamber from another Center, from JSC, and the guy who designed it was so filled with pride about it! It wouldn't work. Every time we had a reaction, the very expensive system burned to the ground. Very poor design. Very poor design.

And the people in my lab said, "We can do better." It was the pressurized mechanical impact system. So a WSTF Lab NASA mechanical engineer named Larry Davis designed a workable system. This guy, he came up to me and said, "Dave, here's the way to do it." And that's part of management, is recognizing when somebody has got a good idea. Don't douse their ideas. And he designed this test chamber, still in use today, where he used a little bitty test chamber, pressurized it, and you could counterbalance the force exerted on the impact pin the—we were running at 10,000 pounds [PSIA] and higher pressure. Of course, that high pressure pushed the diaphragm attached to the striker pin up so you couldn't externally force it down, when it was impacted —we were putting a little piece of test metal in the test chamber, and we'd impact it, or other material in there and impact it [to determine the impact force]. Well, you'd get the high pressure offset and get no dent in the metal when the striker pin was struck, so he built a little chamber that counterbalanced that pressure so that the diaphragm was free to go up and down [under pressure], and then we'd impact it. And we said, "That's patentable."

And the guy at Houston who had that other one said, "No, that's my idea." And he never would approve this totally different concept for a patent.

You know, that kind of stuff, it's that petty jealousy. So I just said, "To heck with it." But I did get one patent, and I could've gotten a dozen, easy. We just didn't have time to write them up. Our office staff was very, very time limited. And in those days, you didn't have word processors. So it was a lot of work, and we just said, "Well, we've got to get the work done." I thought about it [getting patents] many, many times. And I encouraged the contractor to patent their ideas and they got a lot of patents, because they had more resources [to prepare them] than we did. (Refer to Photo A-48.)

WRIGHT: While we're talking about different types of programs, what kind of support did you offer for Skylab?

PIPPEN: About the same. We responded to anyone that had materials that they wanted tested, now we had sent Jack and, by this time, Frank and all these people out into the world, and so we had ASTM [American Society of Testing and Materials] standards. We'd written ASTM standards for some of our test methods. We'd written all these kinds of things. So we were well known, and so they would call us. "Are you guys interested in testing so-and-so?"

We'd say, "We sure are."

One of the big problems you had was setting up the fund transfer. [Christopher C.] Chris Kraft [Jr.] didn't like us to do reimbursable work. He didn't like us to do materials testing for other agencies other than NASA. It just chapped him. He allowed us to do it , but he didn't like it, and he was always kind of wanting to stop us from doing this testing , for whatever reason, I don't know. But after budgets got tight , then we were given a little more lee way—and he finally kind of gave in when he saw the need to help others with our specialized testing, but he was always fairly critical of the reimbursable activities—I think he was opposed to it even when there was an obvious need, too, but I don't know why. But we had a hard time with him. But when he'd come out [and visit us], he'd go away, and he'd say, "Well, we just have to stay with the reimbursable projects." [Laughs]. I must add that our NASA Site Manager, Jesse Jones was always very supportive of these tests and went to bat for us as needed. But over the years we did a lot of important reimbursable work for DOD, other NASA centers, and industry. This work supplemented the JSC budget and allowed us to stay in business with high quality engineers and scientists. (Refer to Photos A-49, A-50, A-51, and A-52.)

[Maybe I shouldn't be so hard on Dr. Kraft. I remember Frank Benz had convinced someone who was involved with the Alaska gas pipeline to consider the labs doing a very large, expensive and dangerous test. As I recall, an explosion and fire had occurred on the pipeline and we at WSTF were going to simulate the events that led up to it and let it explode. I think the pipeline people had come up with a pipe design to contain the explosion or something. We were going to bury a long length of this very large diameter pipe in the desert and let 'er rip. Well, Frank and I convinced a skeptical Jesse Jones, the NASA Site Manager to sign up for this reimbursable test that would bring a lot of money to WSTF—nearly a million dollars as I remember. Someway Chris found out about our test intentions before Jesse told him about it and as I understand it, it infuriated him. I don't know it for a fact, but I think Jesse got into a bunch of trouble for this. Like I said, we would take on anything. Well, the test never materialized fully because someone nixed the pipeline design idea so we didn't do it. We in the lab were really disappointed though. The folks in Las Cruces would have likely heard this explosion, so maybe Dr. Kraft was correct in his attitude.]

WRIGHT: In [19]'71, you became Chief of the Laboratories Test Office.

PIPPEN: There's Ken Gilbreath came in and gave the lab office level status —he's my hero Even to this day.

WRIGHT: Let's talk about that time period, how your responsibilities changed. It was also the time where Shuttle was starting to impact the Center. So talk to us about those—

PIPPEN: See, Ken Gilbreath had been in the labs as one of the Branch Chiefs. Well, I had three or four Branch Chiefs while I was there. They would just kind of come and go. At one time I was an Operations Director for the Propulsion Office assigned to the labs, and I was reassigned to other NASA organizations but I always stayed in the lab I can't even remember all the titles I had. We had been reduced down to very few people, but the materials testing, you know, had come in, and now we were outside of the JSC envelope, and we were doing all of this testing for other NASA Centers, DOD, and even industry. Good old Ken, he was the visionary. He would call me into his office, and he says, "Dave, this is a good thing that you're doing up there in the lab," and he gave me the credit for it. I gave him a lot of the credit, because he was one of those kinds of people that recognized a good thing. And he said, "We're going to make you an office."

Well, now, naturally, here we were, two or three tiers down from that first line, and all of a sudden we're up there? But that did it. I mean, when we became the office, then I had direct contact [with the Site Manager's Office], and Ken worked with me, and I was able to expand my "empire" to four or five people. And we pulled in people from the contractor. Some of these people, who worked for the contractor wanted to come to work for us. They wanted to be NASA. And the good ones, you'd bring them in. So we were able to expand the organization. Everybody that I brought on, one of the unwritten rules I presented them with was, you do the standard stuff, but you get some reimbursables so that we can build this into an operation that's independent of JSC financing, because they've got their funding problems. Let's get all these other Centers, and let them help support our test team—and we did; and that's what we did.

And we were able to grow. It was a turning point, and that's when our battle cry was—the "world class," that was my coinage from way back, but with Leonard and I, we kind of came up with that "world class" thing as our Motto. But here's where we first were able to create leverage to meet our motto—when we made it to the office level, see, I was a Laboratories Office Branch Chief first, but not for very long. Then Ken came in there and raised our organization up to an office level, and put me on the same level as Propulsion. Needless to say, that was not the politically popular thing to do—because, you know, it's hard to change a culture, and we [WSTF personnel] were in a propulsion culture. But even when we were dying, people had the mindset "We started out Propulsion; we're going to die Propulsion." But I didn't have that mindset, my people didn't have that mindset, and Ken Gilbreath didn't have that mindset.

So that's what did it. That made it. Then from then on, you just watch out. And we had all that support [from the Site Manager]. Of course, we were really disappointed when Ken left. (Refer to Photos A-53 and A-54.)

But we maintained ourselves and grew even after that into a—just so close to a world class test laboratory. And "world class," to me, was when we were going to be independent of even JSC, and we could've done it. I know we could've done it, and then we would've been a separate organization and in position to be the NASA agency resource for materials testing—and we had people in Washington talking about it. We would've been a test agency for materials testing that was being funded from NASA Headquarters, to support everybody, and recognized as such, rather than getting low-level funding, funding from two or three tiers down from individual customers. That's different than getting funding out of the big NASA budget than from organizations within the different Centers.

And industry. Frank Benz had come on as staff way back, and I can't remember when he came, but he was just a college kid, but when he came on, he developed the expertise in combustion things, metals combustion and fire hazards, I guess you would call it. And he became a world resource. He went everywhere. He went to Exxon, Mobil and Exxon and Mobile and people called him all the time. "We've got a big, serious problem here." And they'd pay for his trip. He'd go. And as an expert. When you get to be an expert like that, you get a lot of calls, and these people would pay their way.

And the way we kept our site test equipment modern, we finally convinced local management to share the reimbursable "tax" money with the WSTF office that got the project — Up to then all these reimbursables were taxed by the "head-shed"[WSTF Site Manager}, and they would take that money and spend it on whatever the NASA Site Manager decided. So we finally convinced the NASA Site Manager to let us have our tax money. And boy, when that happened—there was a 10 percent surcharge on everything, which was reasonable for customers outside JSC. Then we could buy new equipment. We could keep our facility and test equipment modernized. We had the best facilities. If we needed a new instrument —new anything we could save up and get it. We had the best. And we did it with these funds. [We also funded small basic research projects associated with test development methodology and data management.] So that's the way we kept ourselves going. We just became a little industry, is kind of what we did. (Refer to Photo A-55.)

WRIGHT: We'd like to hear more details about that, but we're going to stop for just a minute and change out our tapes.

PIPPEN: I talked that long, didn't I?

WRIGHT: Tell us about your management style that you had while you were Chief of this office.

PIPPEN: Management style is an interesting thing. In all the years that I was working, very seldom did I have a supervisor or a manager that taught me anything. So I kind of learned everything on my own. But I always made this observation—in my mind, I said, you know, all the things that I didn't like managers to do, I was going to do the opposite, and a lot of those things I didn't like boiled down to a lack of delegation of authority. Most every manager will give responsibility, but most managers will not delegate the authority that goes with that responsibility. So that's what I did, I gave authority to fulfill assigned responsibilities and held people accountable for their decisions. I would search for the very, very best people that I could find that I thought would be compatible with my [management] style.

A lot of the people [that end up as employees in the lab], you didn't have any choice but take them. Here's a person [that needed a new work assignment], and they would be assigned to you. But if you had a choice I would choose someone whose talents I knew—in fact, over the years, most of the people that I had in my organization were co-ops that had worked there. Very, very important thing. But what I would do, I would say, "Okay, when you come to work here, here is your area," and I would not assign [projects to their area] without their concurrence. You want to get people in the area that they're interested in. In the early years, we had some assignments of some people that were in areas they didn't feel comfortable or they didn't want to perform, and they weren't that good [operationally]. But they were capable people [professionally]. So I observed that before I got into the management role and avoided assigning people to jobs they didn't like when I became a manager

So that's one of the things I did. I surrounded myself with competence. And when you surround yourself with competence, you give them responsibility, you give them the authority, you give them control over their project and funding. Now, you check them [their progress], and you make them report to you [concerning their decisions and progress] and we developed a means accomplishing this for the whole lab, which was kind of another little unique thing that Jack and I developed.

So when you do that and you give a person the authority or the responsibility, and he has the authority without continual management interference, you're going to find out if they're good people, and if they are they're going to excel. Then you reward them. And I'll tell you, I rewarded my people in every way I could, whether it was an outstanding performance appraisal—if they earned it or a merit pay increase. Now, if they didn't earn it, I wouldn't give it. I got a lot of criticism. I'd tell people. I said, "I've got two hats. You can be my best friend, but I'm going to tell you what I think. You can disagree with it, but I'm the boss. You might convince me I'm wrong, but communicate your displeasure to me."

You've got to communicate with these people, with all your people. You've got to tell them the truth from your perspective. Let them fuss a little bit if they want to, and if they've got personal problems, you work with them on personal problems, you work with them on professional problems, and you give them technical guidance, because as the manager, you develop an overview that as a detail person you can't. And I've got a knack for that. I can look at things, and I can say—whether I'm a chemist or not, I know what the result ought to be. I just don't know how to do it chemically.

As a result of that, I had the people that work for me [responsible for their own decisions], they weren't robots. In my opinion, you don't want people that just do what you say because you say it. You do [want] people that do what they do because they think it's right. And if they're good people, they're going to do the right thing most of the time. Then if you go look at some of the people that are good people and make sure they are recognized for their efforts, they will continue to perform well. I got real tickled at one of my employees. It's Frank, I'll tell you, Frank Benz, a tremendous guy. You ought to talk with Frank at JSC. But he was a young fellow, and he came in the office one day. I said, "Frank, I'm going to put you in for this special award."

He says, "I don't want it."

I said, "Well, why not?"

"Because old so-and-so got one just like it, and he's worthless." And I agreed. He was worthless.

Then I would go into a little lecture, telling Frank that I wasn't basing his performance on that guy's performance. I said, "I'm basing your performance on your performance."

After a while, he said, "Well, in that case, I'll accept it."

But that's the kind of trust we all had between us. We weren't personal friends as such. We didn't hobnob. That's just not my style. But we trusted each other, and we developed a trust and a dependence upon our cross-technical ability. We communicated. If I had trouble in this area, and cross-linked with individual people to help out, nobody felt jealous or protective. And it worked. You ought to have seen the crew. It was just a phenomenon.

WRIGHT: Did you have a lot of turnover in your area?

PIPPEN: Our contractor had tremendous turnover. I had no NASA turnover, hardly ever. People would stay and stay and stay. Now, every once in a while, somebody would leave, but very, very seldom. And if they left, to be honest with you, I was glad. Because if you want someone to leave in the government, you don't fire them, but you talk to them, and you make them so that either they produce or they're not going to be in favor with me, you know, and get these rare government promotions—I had one fellow one time, and just clear as day said, "I'm not going to do any more than I'm doing until you give me a promotion."

And what did I say? "I'm not going to give you a promotion until you get that attitude out of there and you produce at the level that you want to be promoted to."

Well, he left. Well, that's good.

WRIGHT: How many did you have at the peak?

PIPPEN: Fifteen. As an example, I had this young lady [Kathy Pacheco], just fantastic. She was a secretary, but she did everything non-technical in the office. She was an office manager [Manager's Assistant - even though she held the rank of secretary. Took three years to get her promoted]. Before I left, she was promoted to an office manager [Manager's Assistant]. And I got her promoted higher than office level secretarial staff could generally attain you know, above the 5- to [a GS] 7-level [General Schedule], but she was elevated. But I was just persistent [with my management], and she performed at a high level. Doing more than secretarial work. And if she performed, she ought to be promoted. Finally, they allowed me to promote her after a lot of persistence.

WRIGHT: What was your style when you are handling and dealing with your customers? Because you had a wide variety of customers.

PIPPEN: THE Customer is always first, but we were always honest with the customer, and if we didn't agree with what they wanted to do, we'd say, "Here's the way you ought to do it, but if you insist, we'll do it your way, but it's not the way to do it."

We got our technical people in there [contractor and NASA lab people met with the customer at the beginning], and we would convince them that our way to perform a test was the best way, and I never had anybody turn us down. When we showed them after a successful test that it was the best way, then by word of mouth we would get new customers—once we got a customer, we kept a customer, and we would allow those customers direct input into their test. We would say, "Look, anytime you want to come down here [to WSTF], you come down here. You can screw on the bolts if you want to." And some of them did. Or, "We'll [screw on the bolts and just] give you the data. We're going to do what you want done, and we're going to do it within the dollars that you allocate us. If we get in trouble, we're going to tell you. If the data is bad, we're going to tell you. We're going to communicate with you, and we're going to try our best to meet your schedule," and we did.

And they were really proponents. They would just come down and just really be happy with what we would do, and that gets around in the scientific communities, especially if you're specializing. One thing it took, that made a real hard management thing. Reimbursable versus funded [projects], if you're funded, like, say, from JSC, that's money you've got [that you can plan on getting in the future]. You can plan on it. Reimbursables, you can't. It's just like this [reimbursables were usually one-shot tests]. And so you had to manage this thing so that the up-and-down nature of the reimbursables didn't destroy your organization—because when you're up, you don't have enough people [to do all the testing]; when you're down, you've got too many [to support available funds], and you've got to pay them regardless. In the government system, that was tough, but we did it. We kind of developed a little way that we could handle these things, and we had these reimbursable funds that we could take care of the valley [when there was not enough work for all the employees], and put them into productive type of efforts. [We could never have done it without our WSTF financial guru, Leroy Luchini, who worked as hard as anyone for us and never complained; quite a guy. He made sure that everything we did was financially legal and above board.] The average was two to three years when you made a contact before the funding got to you, and it was really tough.

Another thing that was really hard in the management world was getting a contractor that had the same motivation that you [NASA] do, because contractors don't have that motivation, because they get the contract because they're the cheapest that they think can do the job, and they don't hire the best people. They hire the lowest-paid people they can hire that will meet the requirements as they see them, and that's not a good thing. But there's a fellow that was my counterpart, and then became this contractor's site manager, named John Schentrup, and, boy, I gave him a hard time for that, all the time. But he tried [to always hire the best people]. Higher management [than his position] just would not concede to hire the best people.

You would have a person that's outstanding [in technical competence], and that person on the contractor's side could go get a job [from another company off site] at a 30 or 40 percent increase. The contractor wouldn't give them that raise, but that person would leave, and then they would hire a replacement inexperienced person to do the job at 20 to 30 percent higher pay than the fellow that left. That nearly drove me crazy. That was the hardest thing to accept.

But then there's a guy named Craig Leisure, who was a Ph.D., [chemist] and as my support contractor counterpart understood [that we needed the best qualified people], we wanted Ph.D.'s and master's, and high-level people, because we've got to do a lot of deep technical thinking in these areas, that we've never explored before in [for example] metals combustion. We did it. He hired good people at reasonable pay and the contractor site manager, John Schentrup backed him as best he could. Nobody else ever did it. They tried. They failed. But we [NASA and the contractor] did it. That's the kind of people you need. And it was a struggle [to get them].

But the NASA people, see, my NASA people were good, and they could fill in the gaps [that the contractor should fill but couldn't] but what problems that causes. You've got the contractor and the NASA philosophy or the government philosophy is to keep them, NASA and Contractor, separate, but we couldn't work that way. We had to put them together [as a close working team], and when you put them together, you get in a lot of conflict with upper, upper, upper, upper stage – all the way to the top - management. They [upper management both NASA and contractor labor people] didn't like that. Then with my real insistence that the contractor perform and get the best people, it would've been nearly against policy—you know, it's a stressful situation. But I was pretty dogmatic and hardheaded.

WRIGHT: While you're on that subject of contractor, what were some of your responsibilities to your contractors?

PIPPEN: Well, my responsibilities, I evaluated them. I graded them. See, all the awards [contracts] that we had were incentive awards kinds of things [contracts]. There were different names [for the contracts] but what you do, at the end of the [evaluation] period, whether it's three months or two months, that changed, what you did, you wrote a detailed report card on their performance and actually gave them a grade, and that grade determined how much money they were going to get. They get a certain amount for doing the basic task, and then they get incentive on top of that. Well, that grade—and it's a considerable amount of money on a contract and was very important to the contractor: So you can imagine that the big boys, you know the upper NASA management, and the contractors wanted to award the full incentive fee even with lower than desired performance. Like I was saying a while ago, but if they didn't earn it, you were under pressure to give it to them anyway, because they [local managers] would go way above you, and put the pressure on you. But, again, I was kind of obstinate. Our grades [given to the contractor] were very good, but not good enough to suit management [NASA and contractor] in a lot of areas. I even heard more than one manager say that the grade we gave to the contractor was a reflection of our own NASA performance.

So what we would do, we'd come in, we'd say, "Here's the strengths of the contractor.

Here's your weaknesses," and we'll have a meeting, and then we'd get together, and, "Here your strengths, and here's your weaknesses, and here's why you got the grade you got." And they had an opportunity to correct them. If they'd correct them [the next report period], then we'd raise their grade. Needless to say, you could develop an animosity there between me and my [contractor] counterpart, but this guy like John Schentrup, we never did [develop resentment toward me, he was an amazing resilient fellow who understood my motivation. And I would just run him over the edge—you know, but it wasn't personal with me; it was about overall performance that would lead to "world class". But he was hog-tied because he wasn't given the latitude to hire like the quality of people that he wanted to hire because of contractor policy, that he had no control over, but I graded him like he did. So it was kind of tough, but some of the contractor managers could handle it, and some of them couldn't. John Schentrup and Craig Leisure handled it and allowed us to advance toward world class.

WRIGHT: Tell us about the impact of the Shuttle Program, where you were right before your area got involved, and how the new program for NASA affected your services there at White Sands.

PIPPEN: Okay. The Apollo Program just was progressing, and after the Apollo 204 fire, we were just testing and testing and testing, but by the last Apollo launch, we'd done most all testing, and so the materials testing effort itself had fallen off. Of course, Shuttle, here came Shuttle. Well, Shuttle was on the drawing boards, but there were no materials to be tested at this stage, and here was Apollo that used a 100 percent oxygen environment for the habited areas of the spacecraft and here was Shuttle that that was more like the air we breathe here on Earth.

So the test systems, you know, that was a whole new area of concern. But you can see the manpower, then, from the Apollo was really falling off, and the Propulsion area was getting very low on personnel—because there was no Shuttle engines that were to be tested [in the propulsion test area]. Even though later on, the reaction control systems and things like that would require testing. So their test activities were falling off. The Apollo was falling off. So there was just an inactivity curve [versus time]. You could see it [activity] going down.

Well, at this same time, this is when we decided, and mostly that was my orientation is, "We've got to subsidize our efforts if we're going to survive this thing." This is when these people [from JSC and NASA Headquarters] started coming in and trying to close us. So we started going out after reimbursable work. At first, we went to Lewis and Langley and a little bit in industry, but industry was tough because there was no way for them to get money to us until later. But finally we worked that out, too.

But these other [government] people would fund us, and we were able to just hang on by the skin of our teeth, and I believe—Propulsion probably wouldn't agree with this—they would've closed that site at least twice if it hadn't been for us, because prime contractors could not find other facilities to do the specialized materials and component testing—there was no one else had the capability [comparable to WSTF's]. The testing had to be done, and to move [to another center or organization] that [the WSTF test capability] without the expertise, and it was all our stuff, and we knew how to run it, and nobody else did; and we knew how to interpret data from it, and no one else did, you know, down into the testing.

We had the largest database of all this [test] information in existence. We had the [test] expertise in our NASA Laboratories staff. We had all of that, even with our contractor. And if you would've moved it to anywhere else, you'd have lost it. It'd have taken years, if ever, to recover, and the management people saw that. Now, I don't know that for a fact, but that's the gist that I get from the feedback that I had.

So we just held on. And then the reimbursable [effort] got larger and larger and larger. Pretty soon, it was just about equal to the total JSC funding, with a lot of problems, like I was telling you before, with the peaking [and valley] nature of it. But during that period of time, it was really tough. We didn't know whether we were going to be there or close. There was no security, job security. I would tell the people, "The only job security we have is do the best job you can. What else can you do? We can sit around and fuss about it and cry about it, and worry about it, and that's not going to change a thing. But if we do the best job we can, give the best product we can, and go out and make these customers happy, we've got a chance."

WRIGHT: What type of changes did you have to make to your lab to do work for the Shuttle Program?

PIPPEN: Mostly, it was generally additions. See, for the standard materials test, all we did was change the test atmosphere, the gas atmosphere that we tested. But there was one test in particular that kind of hurt my heart, because I was involved in my master's thesis with this one. We called it a flash–and-fire, but when you go to an air environment, it's not a good test. But with 100 percent oxygen, it was a wonderful test. We ran a lot of tests, but we weren't getting any reactions. That tells you there's something wrong with the method. If not maybe with the method itself, but it's telling you that that method is not good for evaluating materials in that particular test condition and that's where our business was.

And we were rewriting the test documents. We went from some of the old test documents, and by that time, we were just responding to JSC, but by this time, we were writing the test procedures that were accepted in the NHB-8060.1 standard test document, we were writing them. We would have people from Marshall and all these other people from JSC, Kennedy Space Center, and other Centers come in, and we were in competition with Marshall. They wanted the whole pie. Of course, we weren't going to give it to them. But we kind of, I think, outsmarted them. If they wanted a piece of equipment, I always said, "We'll build it for you," knowing full well—and they gave us a lot of funding to build them the special metals testing apparatus, but we were the experts [in using the equipment]. So they'd go run it, but they'd have to come back to us to keep it going and to supply them new ones and all of that, and if they had to interpret the data they couldn't, so we did it for them. So we would take their money, so to speak, but give them what they wanted, but we would prosper from it.

But our quarrel with them, really, was fairly good natured. It would get pretty hot [verbally] at some of the meetings where they would want to take over—but some of the people there, you know, they were buddies to us, but we just had a different goal for our capability.

When we got into Shuttle, NASA started having problems [hardware]. They'd have problems with [components] like the oxygen flow control valve. They were failing. Well, we developed a test method to test them. See, metal, like aluminum, metal in oxygen, some metals are just like paper in air. They burn that way. Even with oxygen K-bottles that they use to supply welder's oxygen, a lot of people get hurt because the valves blow up because of incompatible materials [used in the valves.].

But we became experts in the compatibility of materials in these different media, like oxidizers in oxygen. And this oxygen thing really caught on because industry was [also] vitally interested in it. But we were the experts [in compatibility testing of materials in oxygen]. So we started getting a lot of industrial work, and we even developed our own valves. We even developed our own oxygen flow control valve for the Shuttle. They never did accept it, because they changed technology some way, but we had one that would not cause them problems, and we got into component development. That's what we did.

Not only did we do the testing, but we developed an expertise so that we could give them information and tell them how to do it right. In fact, one of the guys, named Barry Newton, worked for me, and he's working here in town for a forensic investigator, and what he's doing now is, he just patented an oxygen valve for industry, not associated with NASA, but based upon what he learned when he was working for NASA, because we just tested everything. In fact, we even developed what we call an oxygen safety technical course, and my people—I didn't do it, but my people went all over the industry, to JSC, to KSC [NASA Kennedy Space Center, Florida], Vandenberg [Air Force Base, California], ASTM, everywhere, to teach them how to use—how to be safe in an oxygen environment, how to design your facilities, what [materials] you don't use, what you use. And it's [the oxygen safety course] widely accepted and the course is still taught today.

In fact, we were involved in evaluating Vandenburg as a Shuttle launch facility—do you remember, they were going to put—Vandenberg Air Force Base, they were going to have launches [Shuttle] out there? If the truth were known, and I'm just saying this off the cuff, but our capability is the thing that told them they had a tremendous hazard after they built that facility and [as a result] they never used it. They called us [the Lab's hazard assessment team] out there, several of us. I went out there, and we looked at it, and we told them, "You've got a bomb," because they were venting their excess hydrogen into a tunnel—you know when you first start to fire the engines, hydrogen fuel is dumped—they had a big tunnel [to direct the exhaust gasses from the vehicle during launch], and we said, "Boy—." We ran tests to show them that the sparkler system, to burn the excess hydrogen, was not enough to prevent some gas from getting into the tunnel. They could blow that thing [the Shuttle] sky high. They could've blown that Shuttle right off the launcher. When that stuff [hydrogen] goes down there [in the tunnel], the unburned fuel, it could be ignited, and the tunnel would act just like a shotgun barrel

And we were involved in it. See, anytime they had that kind of a problem, they called us. But the transition to Shuttle was interesting—and then we got into the metals testing, you know, work in Apollo was mostly with—with nonmetals. We got into how you evaluate metals for oxygen and oxidizer service, and that all came as Shuttle requirements. So Shuttle just broadened us up, and on the bottom end, the regular standard materials testing, it became just kind of a fixed entity [work load], so many materials to test per week using an established standard test method. As I recall, we tested about twenty materials a week or something like that. These materials just kind of came in on a regular basis like that. We called them "routine" materials.

But all this other activity grew and allowed us to expand into technologies that in time—we were the world experts. In fact, in one case, we sent one guy to Japan—Japan wanted their materials test facilities certified. Who do you think certified them? I Sent Dr. Harry Johnson over there, and he certified this Japanese facility for their materials testing for the Shuttle. They had some relationships with NASA JSC, and so we did that [certified their test facilities]. So we were just pretty well known for our expertise, especially when the testing was generally hazardous.

Another thing we had and developed was a hazards assessment team, and anytime—like when the T-38 that got lightning struck, all of these kind of things, they'd request that the WSTF Laboratories hazards assessment team come in, this team would assess the hazards, and that's [the way it was] when the Shuttle 51-L, *Challenger*, accident occurred. We were heavily involved in the aftermath of that, trying to determine whether the event was an explosion, a deflagration or detonation. Did it detonate or just burn? And we were right at the top of that.

WRIGHT: How long did you spend, do you recall?

PIPPEN: Oh, I think we spent several months. In fact, probably six months to—over six months. Heavily involved in that, trying to assess what caused the problem—we got all the tapes and stuff [films], and we were trying to determine the cause—all of that. That was Frank Benz' expertise, and he was good. He was really, really good. In fact, that's when we got one of the awards—like I tell you, my management style was to award. There's this Eagle Award, and I saw a little announcement one day, and it says, "NASA Eagle Awards," certain, certain time, and I says, "You know, if there's anybody in NASA that deserves an award, it's this little test team. They have done more as a group than anyone else. There's no one has done any more."

So I got busy on my little thing. I'm not a bad writer, you know, in those days. I've kind of forgotten how to do it now. So I put this thing together and picked five people that I thought—and that's tough, but you couldn't go in there with twenty, and I didn't want to go in there with one. I didn't want to do it [with just one]. I could have, but that wasn't right. So I said, "I'm going to pick the five best people."

So I talked with my NASA and Contractor insiders. I didn't want anybody to know what I was up to, but just some insiders, and we decided who those 5 people were—I mostly picked them, and picked those five people, and they were awarded, so we all got to go to Washington, D.C., and the Hilton [Hotel], that big theater—have you ever seen that place? Oh, man, that's where all the big things happen, and with all the big shots, astronauts, the NASA Administrator, and they came in there [to attend this award ceremony]. We had tuxes on, and Sheila got to go, my wife got to go, and all our wives got to go. So we went up there, and they [the 5 test team members] were awarded that award, and that was the highlight [of my career]. That was the first inclination that we were there, we were right at the edge—we were headed for it, our goal of being a world class test organization. (Refer to Photo A-56.)

The saddest part is when I got back from the awards ceremony, after I'd done all this work, [inside effort] I found out that there was one other [contractor] fellow that was as deserving as any of the five. That like to have broken my heart, and his, too. And all I could do is just apologize [to him], because I had gotten some misinformation from some of the people that I was talking about, about his role in this thing. His name was Rollin Christianson and he was a prime mover in many of the test activities associated with this award. I don't think he ever forgave me, and I never did forgive me either. Because I'd overlooked that [his important contribution]. And that's sad. When you see someone that contributes and the others get that high level award, and you make a mistake, it's kind of hurtful.

But that banquet was a grand thing. It really was. And you know the sense of accomplishment that you have at a time like that. And you don't take it like you did it alone but of the group that you're associated with—because they are the ones who really do it. I always say, "Look, if [as a manager] you've got good people, you just ride on their shoulders. If they do good, you do good." And that's what this group, this whole group had done for all these years.

WRIGHT: While you were developing all these procedures and chambers, you were also developing a unique cost-tracking system.

PIPPEN: Yes, that was really something. One of the things, [the problems was tracking projects]—imagine having a large number of activities going on at the same time—we had a hundred projects going. Some of them were $1,000, some of them $10,000, some of them were a million dollar projects. And every one of them had the same problem: if you overspent, there's no way to get any more money. You can't get more money when there's not any, because the way the government works—and I'm not talking about just JSC, but they'll come up, and they'll get some funds, and then they put that in their budget and then it's approved, and then they give it to you for testing, and then the budget process goes on. That's all the money there is for those tasks. So you say, "Man, if you miss that budget, what do you do? You have to stop right in the middle of testing," because you don't have any resources to continue.

When I first got into this problem, we were doing that [overspending], about two or three projects, and that was not only embarrassing, it's wrong to take somebody's money and not produce a product. So Jack Stradling and I were talking. I said, "Jack, we've just got to do something."

Now, he's a mechanical engineer, but he has a photographic memory, just super intelligent, like I say, very quiet, but super intelligent, and he can do anything with computers. That was when computers were just—well, we didn't even have desktops. We had big computers, and he had a little HP [Hewlett-Packard] calculator that you could program, first ones that came around, and he had one of those things. And I remember this *VP Planner*, which is a Lotus [Software] precursor spreadsheet. And I said, "Jack, is there any way—we've got a hundred of these projects going. Is there any way that we can just say we're going to start here [a point in time on a graph], and we're going to end here [another point in time on the same graph], and we've got *x* dollars, and we can draw a straight line from here to spending all that money, till it's all spent, on schedule. Then can you draw that straight line with the program, and then can you update every week with the new spending data," which was already being accumulated, "and plot in there where they are with respect to that straight line? That's all. That's all I want. And we're going to have a meeting every week, and every engineer is going to come in with their project, and they're going to show me where they are on that line. But I'm going to review them beforehand. You're going to give them to me."

In fact, first, I just was looking at this data; and so what I did, we'd go to these meetings, and everybody was in there at this weekly meeting, the contractor and NASA, and I was the mean guy. I'd sit over there [in my location as chairman], and I said "Okay. On the overhead, put up your chart." And if they were over the straight line in expenditures on the chart, I'd say, "You tell me why you're over spent on the chart." And a lot of times they'd have reasons. And I'd say, "Now, you're over the line and overspent, you tell me what from this point how you're going to project where you are in time when the money is all gone there." I'd say, "Just project."

And if it looked like they were over [budget], I made a threat. I'd say, "Look, I know how to run a project myself. I've been doing it for years and years and years. If you can't keep your project [within budget], I'm going to run it for you." Boy, you think they liked that idea? No sirree. And I don't know that I would've [had I been in their place]. I never had to try it. I never had to live up to that. And if it went lower, I would say, "Hey, look. Aren't you getting the resources you want? What's the trouble here?" And if they had a reason, I would just let it go.

But we started coming in on budget like you wouldn't believe, with just that simple little management technique. Nobody had to do anything [special]. Nobody had to write a report.

See, that's what kills your engineering [momentum]. When you start having your engineers do all this paperwork stuff to satisfy administrative requirements, you're taking away from your project and spending money.

So that's what we did. And, boy, did it work. We had all those hundred projects under control, and those engineers knew what they were doing. They knew what they were spending on. That's why we got good ratings from our customers, because we'd stay with it. In fact, generally, generally, on the project we'd end up with extra money. And guess what they would do, the customers? [The customers would usually say] "We don't have any use for it [the extra money]. Use it. [Buy] anything you want." What would we do with it? Buy a new piece of equipment. And that was just great—and if we ever needed to buy, had to buy a piece of equipment [in order to perform the testing] with that money, we'd call them [the customer beforehand] and say, "Look, we're going to use this much money for this [piece of equipment]. Is that going to give you problems—?" And they'd always, if they bought this equipment with their funds they were entitled to keep it, would let us keep it, because we sure didn't get the budget [for the equipment] from NASA.

But old Jack Stradling, with his little cost tracking thing saved the day. Then we developed it into a more and more sophisticated tracking system, and then we got … later, many years later, we got a local area network for the site, and then we put it on the local area network, and then we could call it up real time. But it was always a tremendous control thing. Jack just figured it out—and that was when it was not easy. Now—I could do it [now]. But I couldn't have done it then.

Then we got personal computers, and they came in later, and he set it up on personal computers; used Lotus. We had another group on site responsible for developing computer programs that we wanted to develop this into a more formal system, and they spent all the money I allocated them, and never came up with anything better [than Jack's system]. So I thought it [Jack's system] was kind of unique, and it worked.

WRIGHT: In 1990, your role changed at White Sands Test Facility twice. Would you share with us why those changes occurred and—

PIPPEN: Well, I'll try to do that without being bitter. I'm not bitter. I think I was not justly—they [NASA JSC and WSTF management] didn't treat me—I wasn't treated right, for whatever reason. I think I know [the reason] but it's not important. I just walked into my office one Friday, and got a call from the NASA Site Manager [to report to the 100 area – his office], and he said, "Don't report to the lab anymore." He said, "I'm making you my special assistant, and your office is right there [in the 100 area], and don't you go to the lab anymore."

And that ended my career with NASA—I became a special assistant to nothing. That was one of the old s ways you fired the unfireable; where if you're not satisfied with somebody's work, you move them laterally, and when you move them laterally, you don't give them anything to do.

I talked to the JSC head man, the Center Director of JSC, and told him the story. He had invited me up to JSC to talk to him, and after about an hour of me explaining the circumstances, he said he always backed his local managers, and he wouldn't do anything about the WSTF Manager's action [even if he knew the action was wrong. What else could I do with him having this attitude?]. So I had the choice to retire [immediately] since I had about 34 years of service, but he said, "Hang on. Things might get better for you." I could see three years added to my accumulated service would be advantageous before I retired—and I said, "I'll try it." It worked for two months. This happened in about June. June, July 1990. And I just can't be inactive—I couldn't do that.

At first I had a temporary job that was really important [to NASA]. It was with Electrical Arcing and Kapton Insulated Wire. So I delegated myself down about three tiers, and I was given a little test area in the south highbay in the 200 area. I was assigned nothing after I finished that project … the NASA Site Manager was content to let me sit in my office all day with no assignments, and so that's the way I finished my career [that last job], doing something I love to do. I loved testing [That wire.] So I was just replaced [as office chief with no notice or warning of poor performance]. And it was sad, because people [mostly contractor laboratory personnel with a few NASA personnel] at the site lined up for blocks [an exaggeration to emphasize a point] to come in to see me and express their disdain for what had happened—I had letters that were sent to the [Center] Director of JSC, [from off site customers and fellow workers] that they sent me copies of, all of that stuff that made you really feel like that maybe it was unjust. All of my employees, nearly every employee came up and said, "Dave, if you give us the word, we'll all quit."

I said, "Well, now, why would you want to do that? You've got families, don't you? And we've got something we've started [the lab attaining world-class status], and I would just rather for you to stay around and keep it going, because this thing [of being replaced] must be a personal thing aimed at me rather than a kick at you guys."

So the lab was completely reorganized after I left. They gutted it, and when they reorganized, if you see it today, you'll see [for the most part] a [typical] civil servant government laboratory, and all of my little dreams collapsed on themselves. In fact, one person, I won't give you his name in particular, even if you called him, he wouldn't talk to you About NASA. He was so bitter over this thing and things that happened after I left. He was one of the key people in the lab. I've talked to him about this oral history thing, and I asked, "What about this old organization, etc.?"

He said, "Dave, I just don't want to talk about it." He said, "I just don't want to talk about it. I don't want anything to do with them [NASA WSTF]. I don't want to ever go out there again. I do not want to see anybody related to it." And he is one of the top people that contributed as much to NASA as anybody in the agency, but embittered [because of these actions].

And these people tried to hold it [the lab] together. You'll have to talk to them to see if it happened, but it's all dispersed now and turned into—you won't see the labs of old. If you go, you won't see what we had. It was tremendous. I mean, you know, fantastic. And it was all destroyed because, I believe, that our lab would not give the highest grades [even though the grades were derived from contractor performance and totally justified using written and NASA JSC approved performance criteria], and the pressure was on the NASA WSTF Site Manager [from the contractor upper management] for a raise of the contractor's grades, and I was a little arrogant. I said, "I'm not going to raise the grades. You can raise the grades, but I'm going to write a minority report if you do because I have got a level of performance that the contractor must meet to get a higher grade—I just believed it—." And I would've written a minority report if he had changed the grade. And I would do the same thing today because it is right to stand up to ones convictions. [To this day, I have never understood why a person in a high level management position, like the NASA Site Manager, would destroy his best organization for following established NASA evaluation criteria. He often told me in my evaluations that I was doing an outstanding job with the labs, he just didn't agree with my hard-nosed approach. My response, "why change something that is producing the product you want, especially since I am hones and fair and consistent about it?" But he never, ever said or even hinted that he'd remove me if I didn't change my management approach. So, I suppose it had to be more than that. Some people just don't have the guts or character or whatever it is to communicate the real motivation behind their decisions. I guess.]

When you get into that kind of situation, and you get into that kind of a bungled up mess, something's got to give, and it was me. I didn't have any backup [support in time of crisis], except for Ken Gilbreath, again. I talked to Ken who was at Houston and he encouraged me to hang tough. I would've never realized how much something could hurt as that hurt [being replaced without a reason or notice]. But in the long run, man, I've got it made in the shade. I have never missed a lick [professionally]. I was called by New Mexico State University to teach a special Electronics course and I have been able to influence my students in a way that I could never do with NASA, and I'm an accident reconstruction consultant—I do all these investigations, and I could've never—on my other career path been able to do this. My salary didn't take a decrease at all. My retirement plus what I do exceeds what I would have made had I stayed with NASA. I'm better off financially.

So I try not to be bitter about it, but it was a despicable thing for the Site Manager to do, especially since he did not talk to me before he did it or give me a chance to correct anything he thought I was doing wrong—from my viewpoint, probably not from his, but I think the contractor forced a conspiratorial kind of an operation [because I would not increase the grade]. What really hurt me is was one of the contractor people that I had nurtured over the years who was a technician, and the contractor upper management decided this person should be the

Contractor site manager. He didn't have the qualifications. And I just wouldn't tolerate it. I just couldn't do it [support him as manager]. So he and his boss became very hostile toward me. My goal for the site would be compromised if I agreed to his [this technician] being in that position—that was not consistent with what I wanted the lab and WSTF to be, so we just got into a bad relationship—so he got [retained his position even though grades were below expectations] the job as Contractor Manager and I got replaced.

I would've never in a million years thought that would happen to me. And I guess that's arrogance, isn't it? You get yourself into a position, and you think that because of your technical competence and having set up a world-class performing organization, you have it made. And the crowning glory—the thing that just really got to me is my last performance rating by the WSTF Site Manager. After being replaced, guess what rating I got. Excellent [rating]. And I didn't accept it. I put an *X* through it and said [wrote on the form], "I will not accept this rating ". You don't do something like what I must have done to get replaced and get an excellent performance review. I ought to be over there on the bottom block marked, 'Does not meet requirements,' not 'Outstanding' as most of the [individual] performance factors were rated. Not an overall 'Outstanding' as I received last year and the year before, but of course I couldn't get 'Outstanding,' which was the next [higher rating] to it [excellent] because if rated 'Outstanding' you have to give them [the recipients] money and that would not have looked good for the NASA Site Manger. [And you know? He seemed shocked at my response, like I should have said, "why thank you for the kind evaluation."] But it was right there, and I thought that was the most inconsistent appraisal I had ever received—just like I told him, I said, "This is the most despicable thing that I've ever seen happen to anyone that I've been associated with." And it was despicable, to me.

But you live with it [being replaced] and it worked out wonderfully, but I still think about it—I don't have a warm, fuzzy feeling for NASA anymore. I just don't. It just took it [the high regard I had for NASA] away in a way that I don't want to contribute to them anymore. I have not been out to WSTF unofficially since it happened—I went out to the site one more time or two on official business. I've been invited many times, but I don't go out there because I just don't want to do it, and some of the people that were involved in this thing are still there, and I just can't look them in the eye and be friendly. They've contacted me and tried to be friends. And I'm not bitter and I'm not vindictive, but there are some times you just can't get something so wrong completely out of mind, and—like my buddy, I put an *X* through you. Just don't bother me with that kind of operation any more.

WRIGHT: Just move on.

PIPPEN: Just move on. And you have to do what you have to do. And I have no complaints about my career, though [overall]. Oh, I had more fun. Oh. Can you imagine, all that we had? While we were in there, we had stress city, but we all operated off of stress. It didn't bother us [health wise]. It didn't hurt our home life and that kind of stuff.

WRIGHT: My next question was going to ask you, as part of us closing down today, what you consider to be the most challenging time or the most challenging aspect of your job while you were there.

PIPPEN: I think the most challenging aspect of the job was trying to rescue it [WSTF when they were considering shutting us down]. When you knew—you'd have to have been blind in one eye and couldn't see out of the other to know that we weren't destined to stay open in many people's eyes but if the site was closed down, we couldn't reach our goal. So we worked where other people in other organizations would just sit around and moaned and groaned and sat on their hands, and we even tried to get projects for them, but they wouldn't perform, and so we quit doing it, because we had contacts [for reimbursable efforts]. And that was a tremendous challenge.

But the challenge didn't go away, because as you got bigger and bigger, and we were operating with—we had [were using] over 40 percent of the [total site] resources [the jobs that came to WSTF]. We just didn't have people to get the job done properly [and we were on the verge of serious safety compromises]. We just didn't have them [because the NASA WSTF Management wouldn't recognize what we were doing and really didn't seem to want us to grow anymore]. But [as it was] our people worked two jobs. Everybody worked twice as hard. But we didn't do it out of duty; we did it out of fun. So you don't mind, right? I didn't mind working another couple or three hours [every day]. We just didn't mind. Isn't that strange? It was our demeanor and our attitudes. We wanted to succeed in reaching our goal.

WRIGHT: Do you feel that's the greatest accomplishment from you and your team, is that effort?

PIPPEN: Oh, the team that we built, and I can't say it's me. But, you know, I had complete confidence in the NASA lab and contractor people on the team. Now, we had a few that didn't produce, but as an overall, we had a test team that I would put up against anyone. If somebody would say they're going to come in [to WSTF labs] on a tour of the lab—I would just be an observer —because I didn't do it [the tours by myself]. I would give a little introduction, and I'd say [to the team], "Okay. You do this, and you do that, and you tell them what you're doing and why you think it's important," and they'd just blow the visitor's socks off because the team members were so excited about what they were doing. [Some of the] people who came, they were [from] JSC, just kind of dull [unmotivated], you know, management type people. They'd come down here, and I had more than one of them come up and say, "You know, your team has reinvigorated me. I'm going back with a new attitude."

Now, that makes you feel—that's accomplishment to me, which was not rewarding with external praise from local Management—but you don't have to Have that You get your rewards from your little team, and that's what we had Going.

WRIGHT: That's a great way to work.

PIPPEN: It's great. Yes, we just did great. We had more fun. You go to them today, and they'll reminisce. "Boy, we had it going, didn't we?" [Laughs] Yes, we did. (Refer to Photo A-57.)

WRIGHT: At this time I'm going to ask Jennifer if she has any questions. Do you have anything for Mr. Pippen?

ROSS-NAZZAL: I just had one quick question.

PIPPEN: All right.

ROSS-NAZZAL: Can you talk about the relationship between White Sands Test Facility and New Mexico State University [Las Cruces, New Mexico]?

PIPPEN: Yes, you can do that [ask the question]. Now, it's limited to the relationship with NMSU and my labs [that is, not with NASA in general]. My philosophy, and I learned that well early on, is New Mexico State University was a tremendous resource, because they produced all the engineers we would ever need. They had all these engineers and all these tech [technical] writers, and all these people. So I said, "You know, what we ought to do is establish a good relationship with them." There are these special fellowships and things that they [NASA JSC] give professors. I always went to [applied for positions] JSC and got one or two of those positions, and invite the professors out to the site a summer "fellows" and I'd teach the professors [real-world] electronics in the summer, and one of the guys [professors] still talks to me about his experiences there. Give them [professors] a good project, and help them and give them the resources [equipment, etc].

Then I was a very, very strong proponent of co-ops. If they'd [NASA personnel office] give me ten co-ops, I'd take every one of them, and I took every one of them [that I was offered] under my personal wing. I didn't give my people [NASA lab employees] co-ops. I had the co-ops, and the reason is because I [personally] wanted to teach them to be engineers. And I could assign them jobs and tasks, and I'd have them come in every week or periodically they'd have to tell me what they were doing, tell me the cost [incurred on the project], they'd have to give me reports and charts and all that, just what engineers do.

As a result of that, see, I knew their capability, so about 90 percent of my people [hired staff] were co-ops [at one time]. If I could hire [regular employees]—when they [co ops] graduated, and often you couldn't—that's what I'd do, is get me [hire] a co-op, because I knew them and they knew me. They knew they could work for me, and so that's what [the relationship] we built up. But you go out there and look in the labs [the NASA laboratory personnel] at that time, all but, I think, two were New Mexico State graduates, and I never found anybody any better from Rice [University, Houston, Texas], [University of] Southern Cal [California, Los Angeles, California]. It didn't matter. The New Mexico State people were just as good [as students from these other Universities].

So we had a good relationship. Well, obviously, we did, because they hired me as a teacher [after I retired]. I guess it paid off, didn't it? [Laughs] And I still enjoy that [teaching]. I enjoy the relationship [with the university professors], although all the actors have changed [from the ones that originally hired me]. That's a very important part of my retirement stuff [activities], and they [NMSU department personnel] told me the other day [that they appreciate what I do]—I got a little award the other day, and I'm part-time [employee]. So I got a stipend and an award and a plaque for excellence in teaching and what I've done for the university by building—I built up their little [electronics] lab. When I went into their little lab, they didn't have test equipment [to speak of]. They didn't have anything [that worked well]. The students didn't have any resources [to complete their assigned lab projects]. So I fussed and moaned and groaned and [got the department head's attention and funding] built that [lab] up, and now it's one of the best laboratories in the whole facility, and those students just light up when they come there [to the lab], just light up. That's a satisfaction you get. They [the students] call you—I let them [the students] call me at home and all that stuff [and work in my home electronics shop], and they feel like we have a close bond.

WRIGHT: Sandra, did you have any questions?

JOHNSON: Yes, I was just wondering if you could tell us, if at all, how were the astronauts involved with your testing procedures?

PIPPEN: They were our encouragers. Now, when we were doing things that involved direct astronaut safety, we would even have them come out, but not often. But they'd come out and give awards. (Refer to Photo A-58.)

I'd talk to them on the phone, and when they would have something that they wanted to take on the Shuttle, or something that they were really personal about, we would talk a little bit, but generally we didn't have much direct association with them, but they knew what we were doing, and we got feedback. They depended on us in a lot of areas.

But the person [astronaut who came]—were but a few, [and they would come mostly when we'd get awards, the astronauts would do that sometimes, but I never met many astronauts personally except the ones that gave awards. But we always had the feeling from feedback that they were really, really pleased in White Sands, and they would ask, "Well, what did White Sands say? What did the materials people say?" on a lot of these safety issues, and that always makes you feel good, that they depended on you, and I always felt they did, although we didn't have personal contact with them.

JOHNSON: I was also wondering, you were talking about the cleaning process for the Viking, and how you did more in the vacuum chamber after your regular cleaning process. What was the regular cleaning process for the Moon?

PIPPEN: You would go in, and of course, in the clean room it's controlled [environment]. Your skin flakes [for example] is just totally contaminated [substance]. That's totally dirt from a clean room perspective. We were looking at very few [contaminant] particles per million [acceptable contamination level]. So what we would do, we'd go in, and we'd have vapor degreasing, and then we would have technicians scrubbing with brushes, and they'd have on their white suits, and they would go in there with everything [covered up] and go through all of this process, and then after it was over, in order to make sure it was clean, we would put it in a solvent and rinse it, analyze the rinse, and if there was any contaminant in the rinse, you'd have to run it through again, you see. This was the normal process.

So you could verify by testing, and we knew what solvents, we knew what materials would be on these parts, but, see, when you're using things for oxygen and all these [contaminants], you cannot have contaminants, because they can cause fires and all kinds of problems. And we'd developed this thing [cleaning process] down to an art. Boy, we could get stuff through there in a routine [manner], and these people [clean room techs] were really good. So we just developed a pretty doggone good reputation for cleaning things. Of course, like I said, the main thing we wanted to do is to get them [the workers] recognition [for their excellent capability], is to get outside work, and that's where the Viking came in and the lunar curator. They [laboratory personnel] even did that [got outside work] for the Cal [Electrical Calibration and Standards] lab, and I didn't mention that.

TDRSS [Tracking and Data Relay Satellite System] is just right next to them [the calibration lab], and I talked to one of the guys there [the head of TDRSS – Virgil True] out of calibrating all of their microwave equipment if he would supply us with new equipment. He did, and we did all of their [work]—big job. Every year we'd do all of his calibrations, rather than him sending it to wherever he was sending it. But that's the way you do things [if you want to grow an organization], and that was a reimbursable for them [the cal lab]. It made them feel, "Boy, we're important. We're not just "plug and chuggers." Boy, we're doing something out-of-sight." And that really helped in getting this mentality that you want your people to have.

[As for Viking, we would take the above process one step farther. We would put the item in a vacuum chamber and heat it. When contaminated, a very hard vacuum could not be attained because of the outgassed products. However, when a very hard vacuum was attained on the heated item, then we could say that the item was clean. This took days of 24 hour-a-day cleaning. Analytical equipment such as mass spectrometers and gas chromatographs were also used to identify the offgassed contaminants.]

WRIGHT: I think that's our questions. Is there anything else that you would like to add that you can think of before we—?

PIPPEN: No, I think I've just been drained [Laughs]

WRIGHT: We certainly have learned a lot, and we thank you for all your time today.

PIPPEN: Well, certainly. My pleasure. I enjoyed it.

[End of interview]

# NASA Johnson Space Center Oral History Project
# Appendix A - Photos

David L. Pippen


*Photo A-1 - Colonel John Redmon pinning on my 2$^{nd}$ Lieutenant bars*

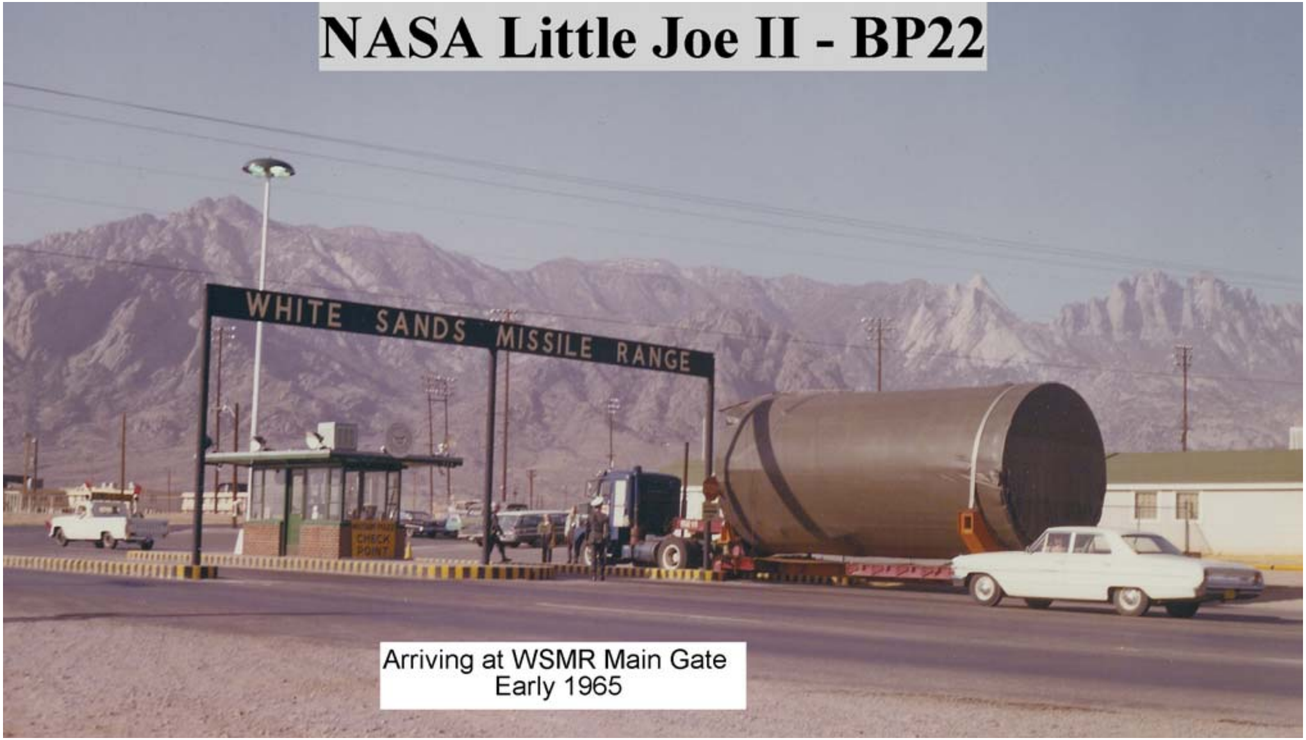



*Photo A-2 - Little Joe II booster associated with Boiler Plate 22 or BP 22 as we called it, when it arrived at the West entrance of the White Sands Missile Range.*


*Photo A-3 - BP 22 booster part of the Little Joe II being manipulated in the VAB.*


*Photo A-4 - BP 22 command module being hoisted to its launch position. I believe that this mission occurred in the April-May 1965 time frame.*

# NASA Little Joe II - BP 22 Stacked


*Photo A-5 - BP22 stacked on the launch pad in its launch position.*

*The Gantry, which allowed personnel access to the complete vertical assembly, was pulled back from the vehicle to its “launch” position when this shot was taken. As I recall, the booster assembly with attitude control fins attached was located at the bottom of the stack and is the lower silver colored part.*

*The booster consisted of several paralleled solid rockets motors, I don’t remember how many were used. The white colored section beneath the command module was where the vehicle attitude control system and hydraulic fluid accumulators were located.*

*The launch escape system, with its small solid booster rocket, sat on top of the entire stack. It was attached to the command module by explosive bolts that allowed separation from the command module. The parachutes were located in compartments at the tip of the command module. Once deployed, the parachutes allowed the module to have a soft landing.*


*Photo A-6 - PB 23 as it was launched on December 8, 1964.*


*Photo A-7 - Apollo Command Module of BP23 after it had parachuted to earth after having been separated from the Launch Escape System.*


*Photo A-8 - Post launch recovery effort of the command module from the BP23 mission.*


*Photo A-9 - Recovery effort of a Little Joe II Booster.*

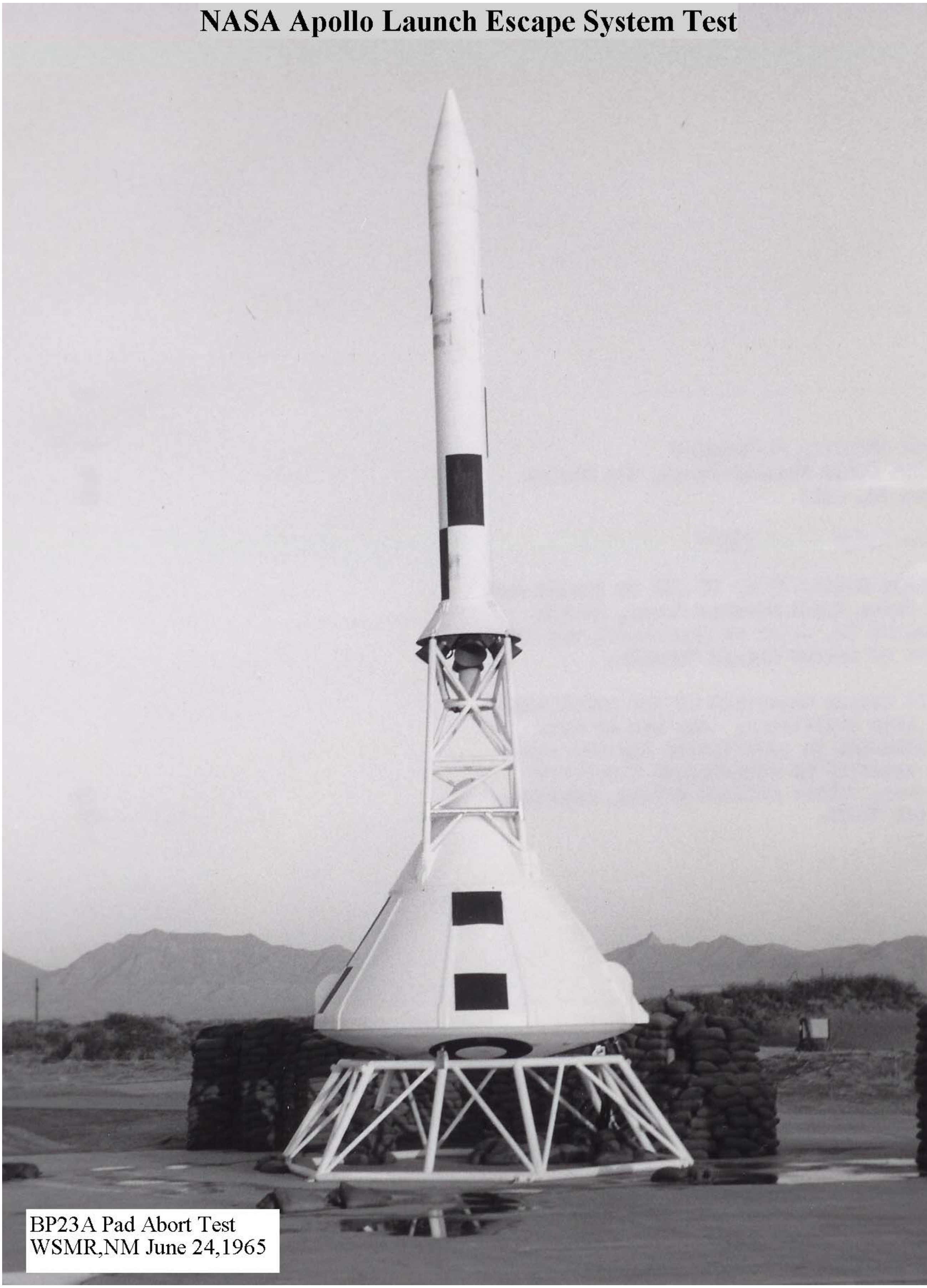



*Photo A-10 - Command module mated to the launch escape system and ready for launch.*


*Photo A-11 - Launch escape system's fired rocket motor just before the explosive bolts were energized.*

# Apollo Launch Escape System Test - Recovery

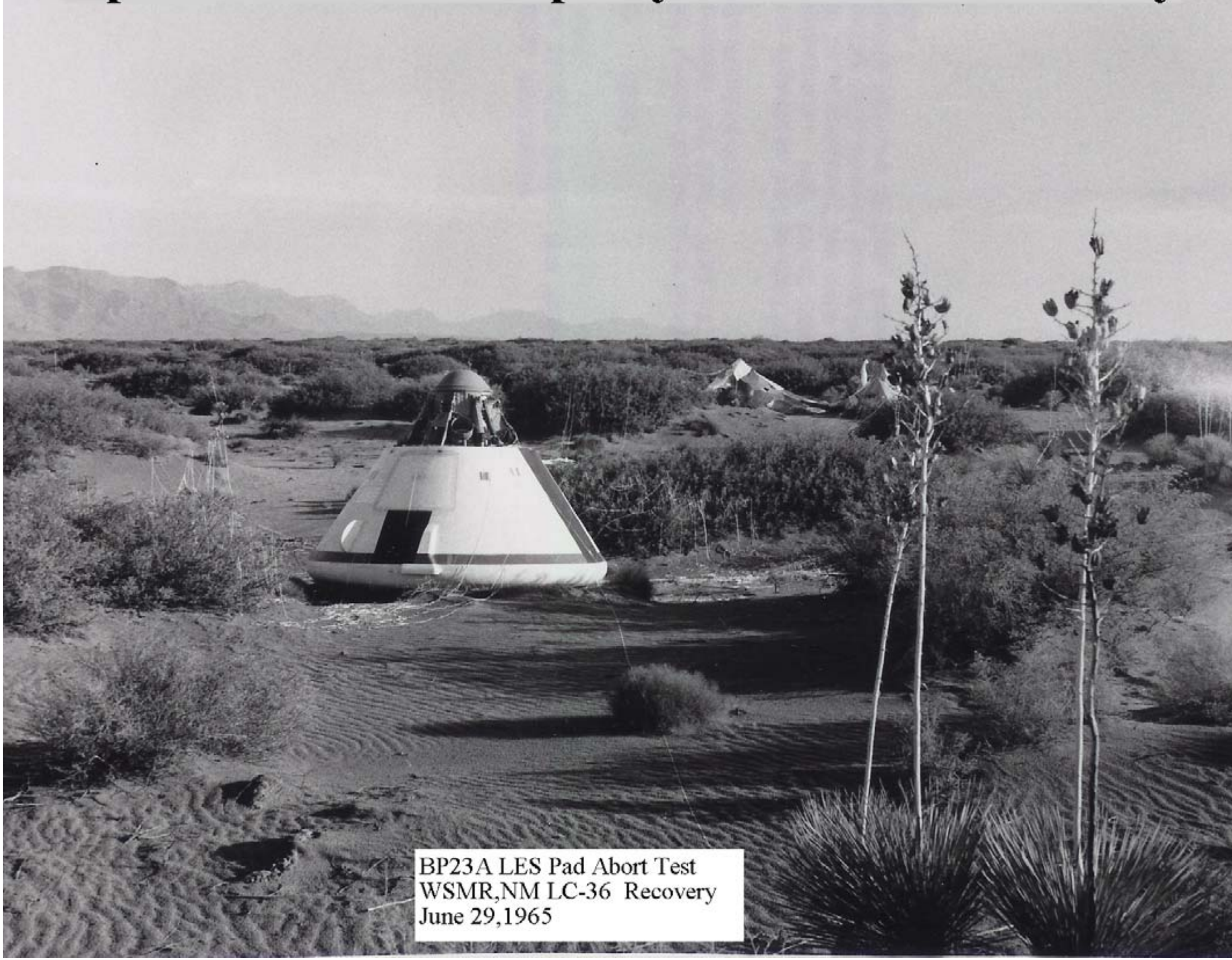



*Photo A-12 - BP23A command module at its recovery location. This mission occurred on June 29, 1965.*

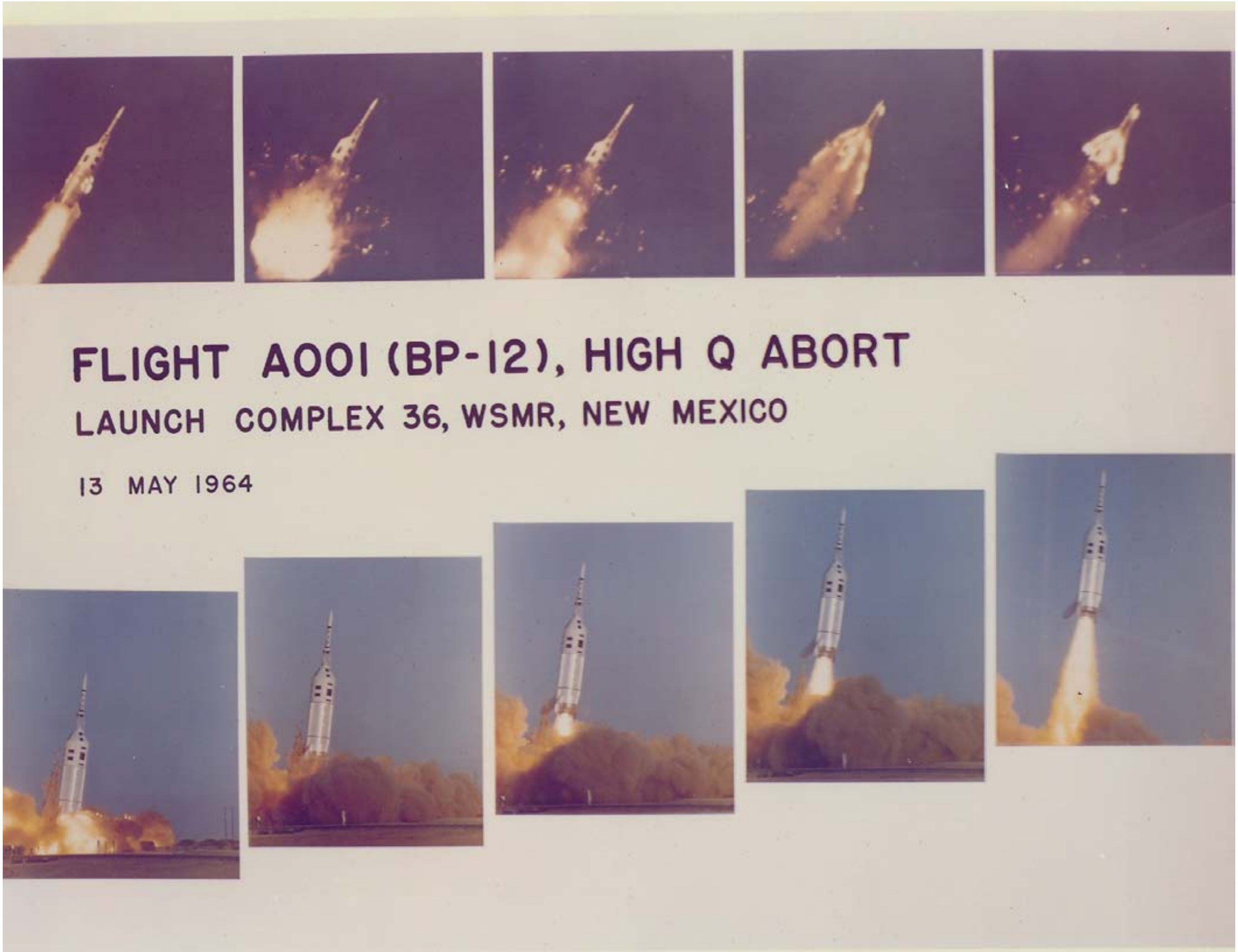



*Photo A-13 - Sequence of photographs of BP12 that occurred on May 13, 1964. The lower sequence of events shows the launch and the top sequence of events shows the launch escape system pulling the command module from the booster.*


*Photo A-14 - LC 36 Launch Operations Center*


*Photo A-15 - WSTF high altitude test chamber*


WSTF visitors being shown how the Flame Propagation Rate Test was conducted. Lockheed Technician Joe Taylor in the background is operating the controls. The tests were conducte in the 800 area Control Building under the NASA Laboratories Office. This undated photo was probably taken in the 1980's.

*Photo A-16 - Propagation Rate Test Chamber*

NASA-WSTF
0472-0331

# WSTF Senior Staff - April 1972


*Photo A-17 – Ken Gilbreath's first line supervisors*

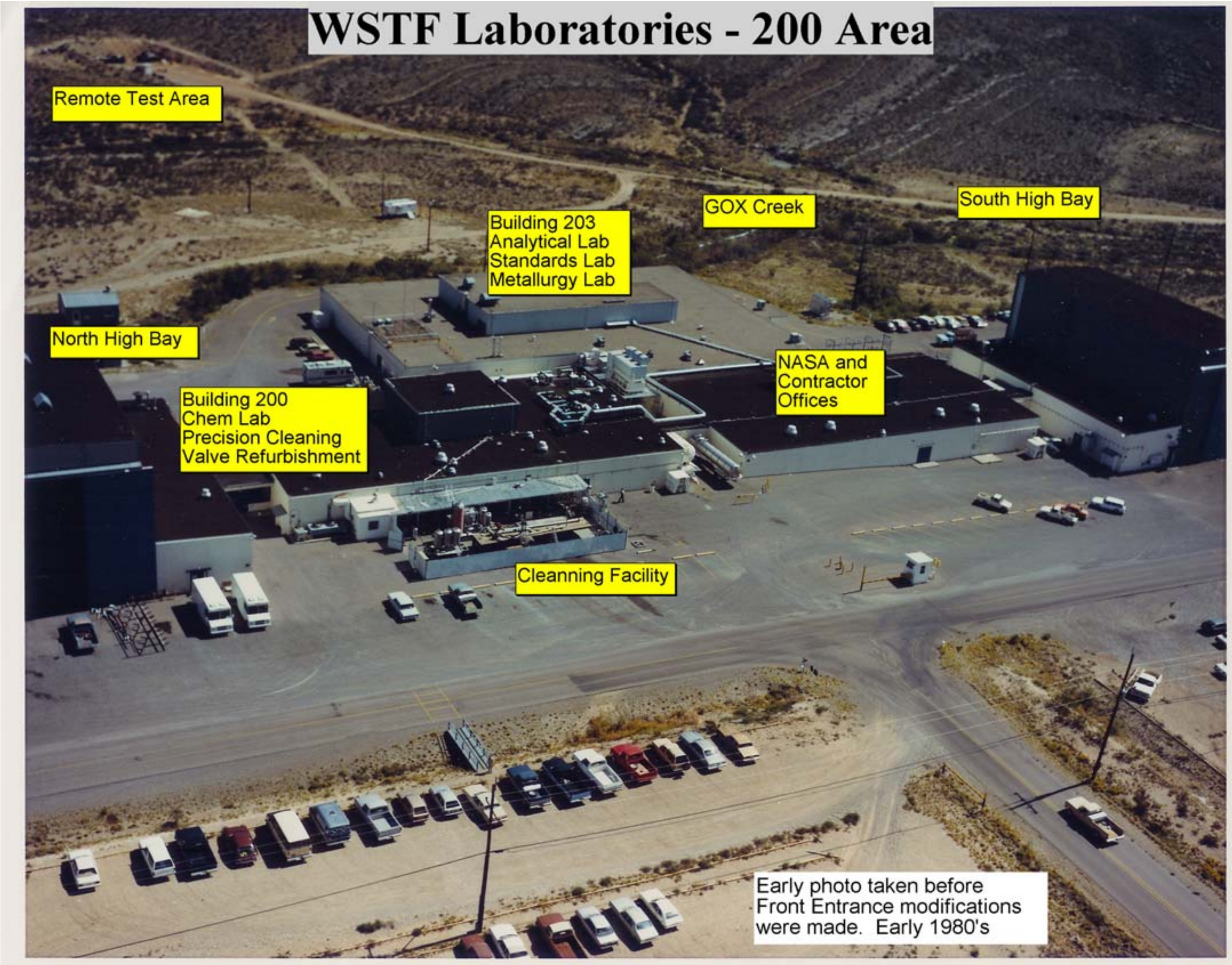



*Photo A-18 - 200 Area*

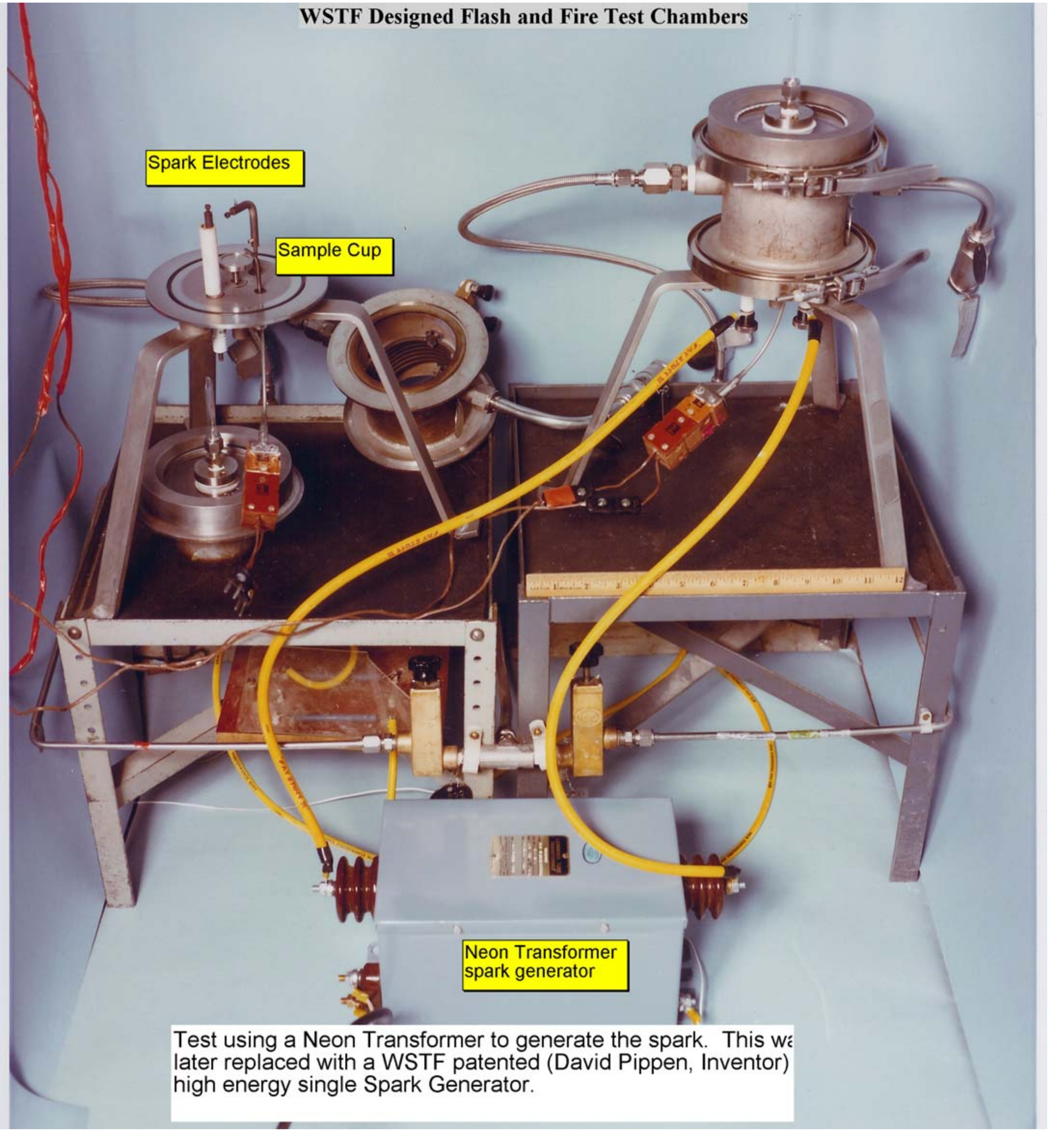



*Photo A-19 - Basic flash and fire test system used for Apollo and some Shuttle testing*

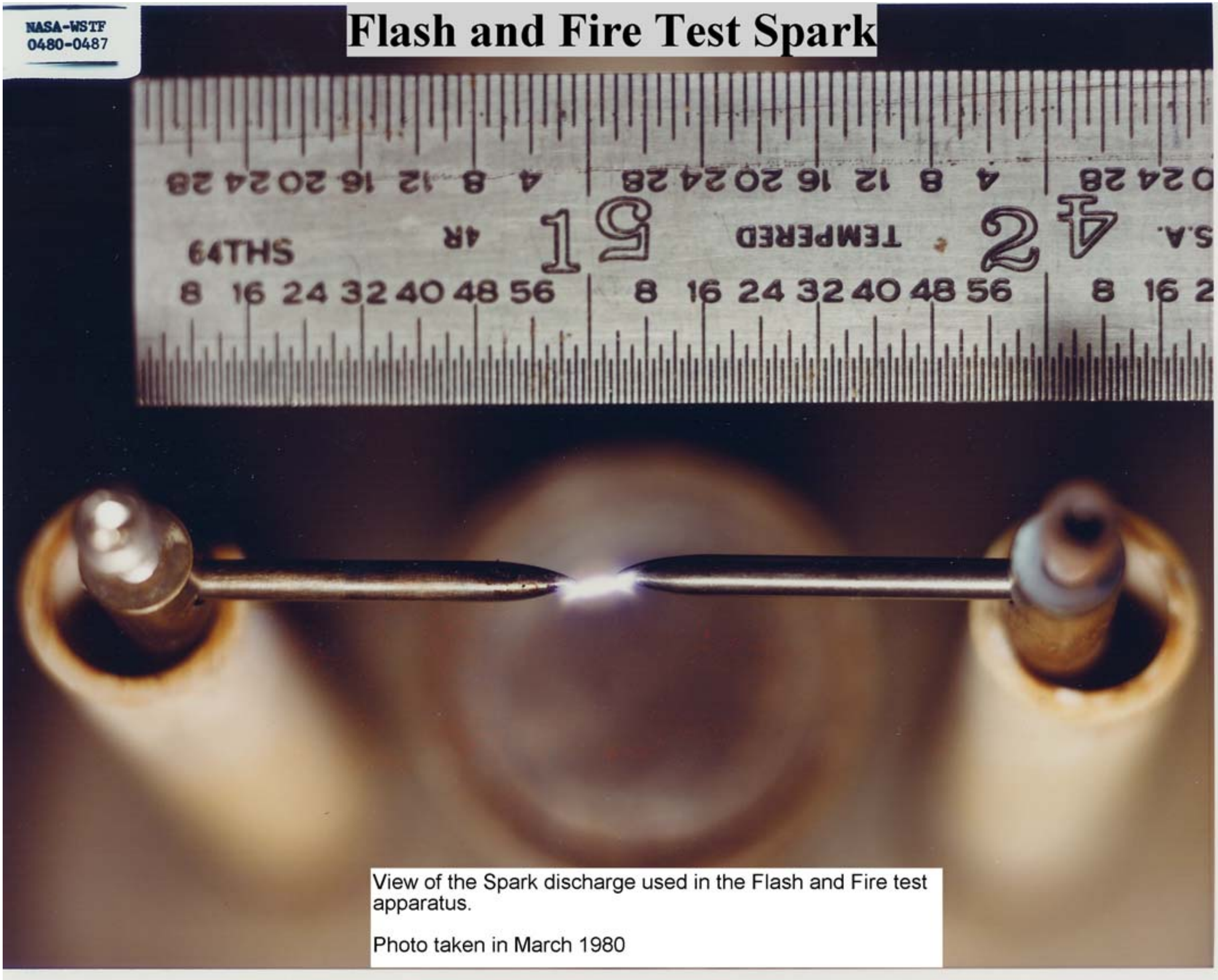



*Photo A-20 - Spark used for flash and fire testing*

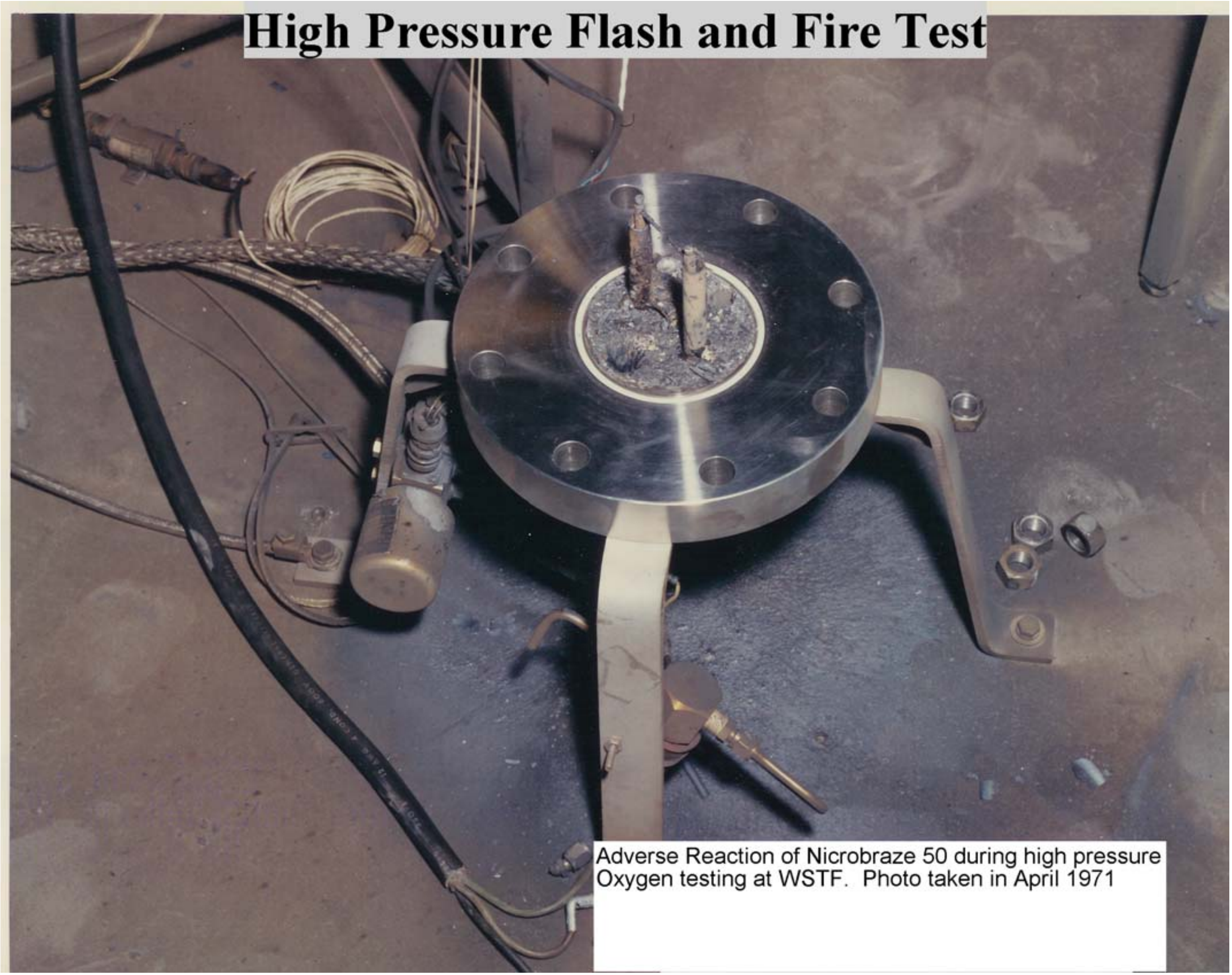



*Photo A-21 - High pressure flash and fire test chamber developed later*

# Low Pressure Oxygen Arc Test


Test to determine the susceptibility of Teflon wire insulation to ignite whensubjected to a low current electrical arc.
Date of photo: April 1980

*Photo A-22 - Test chamber that subjected materials to electrical arcs rather than electrical sparks as was done in the flash and fire test*

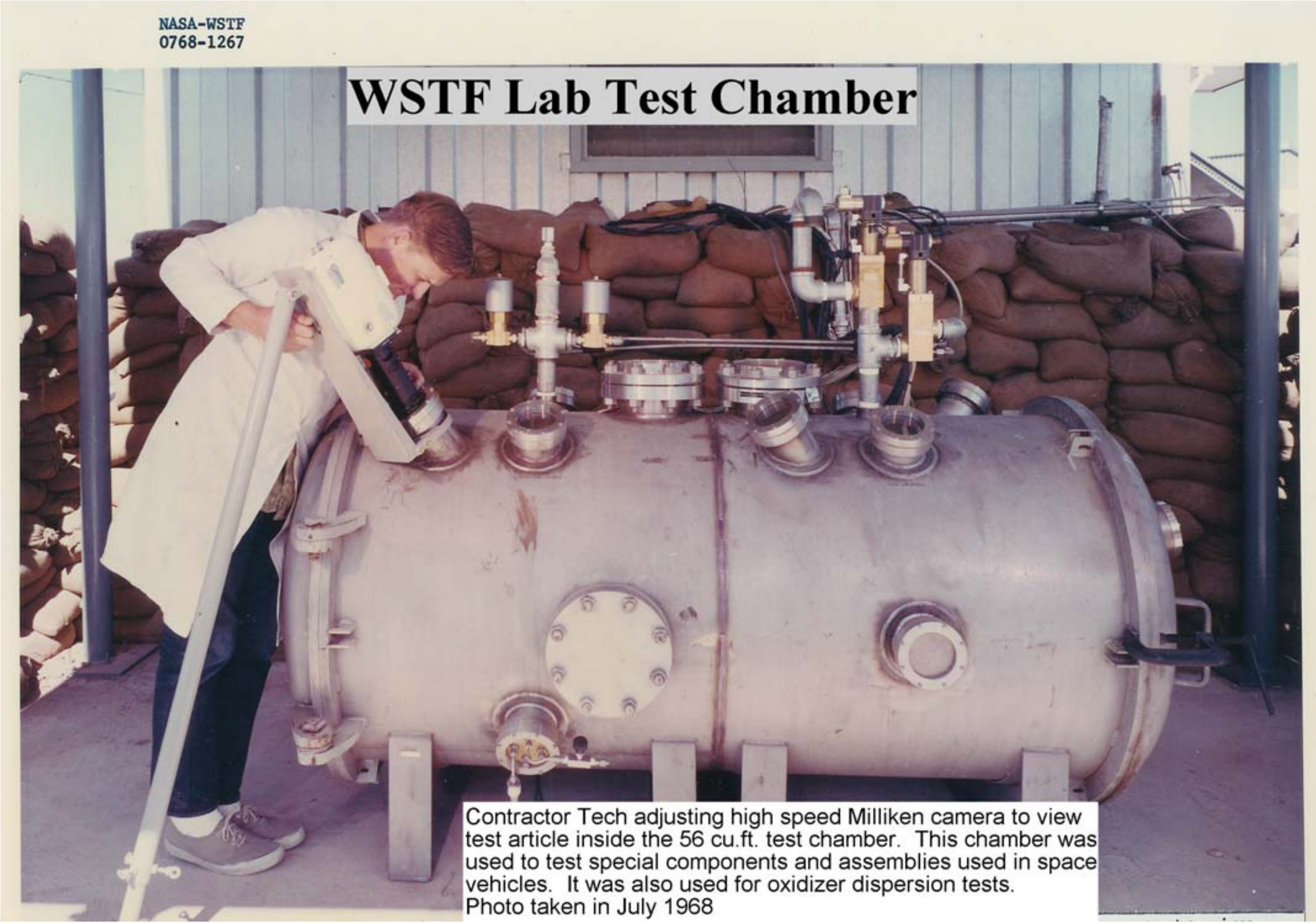



*Photo A-23 - 56 cubic foot volume test chamber used for special tests of flight hardware*

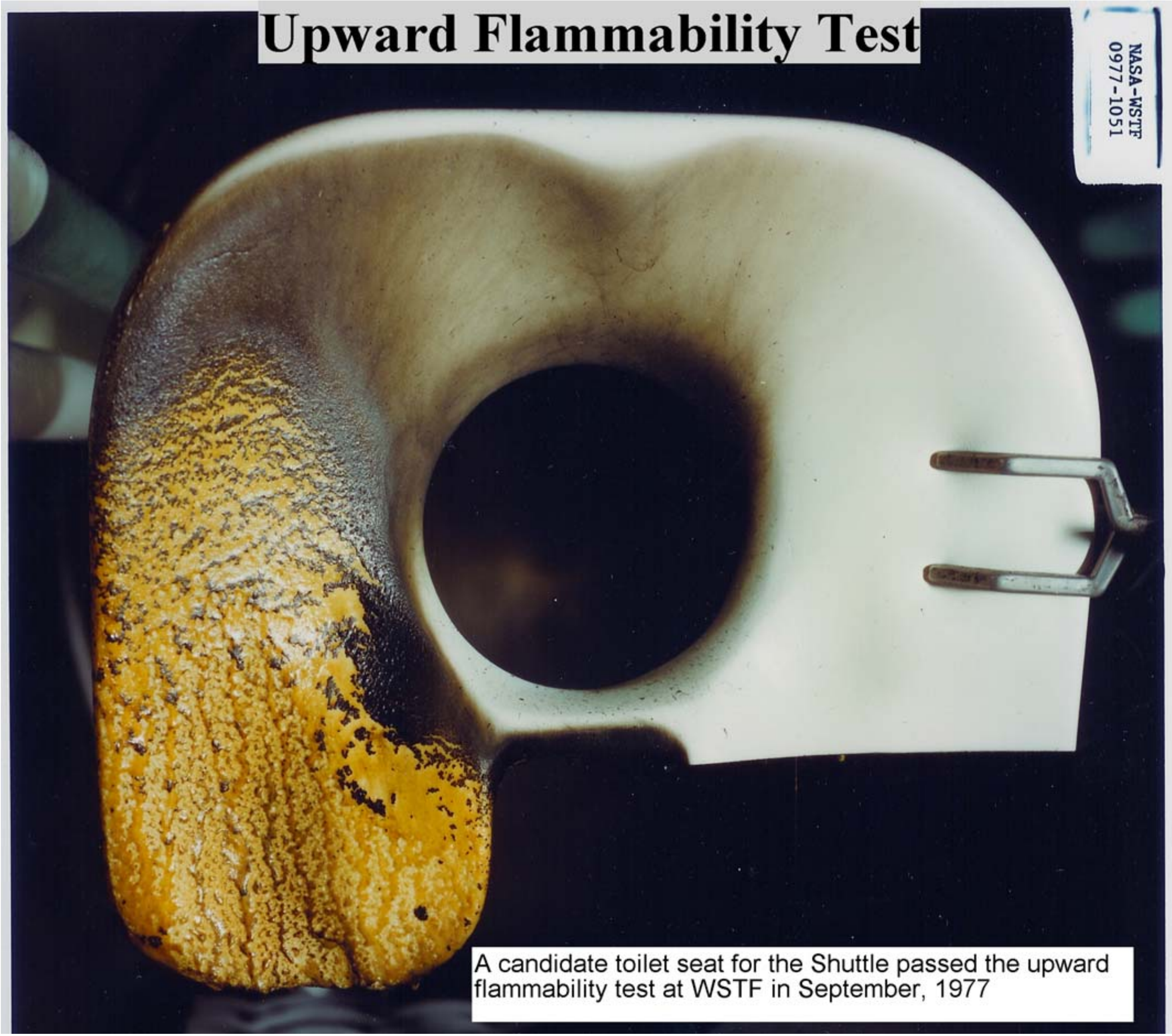



*Photo A-24 - Shuttle toilet seat that was tested in a 56 cubic foot chamber*


*Photo A-25 - Shuttle astronaut jump suit that was tested in a 56 cubic foot chamber*

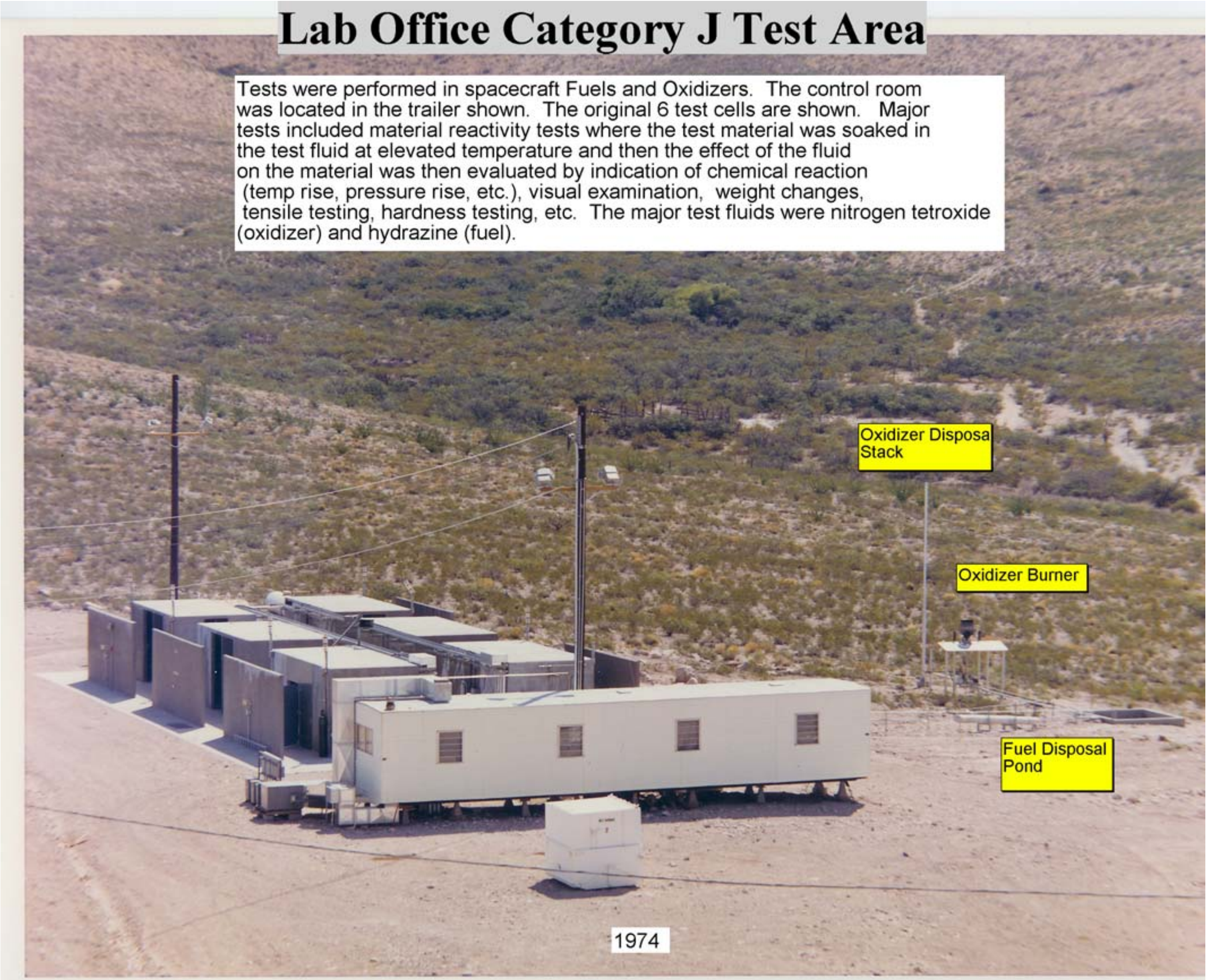
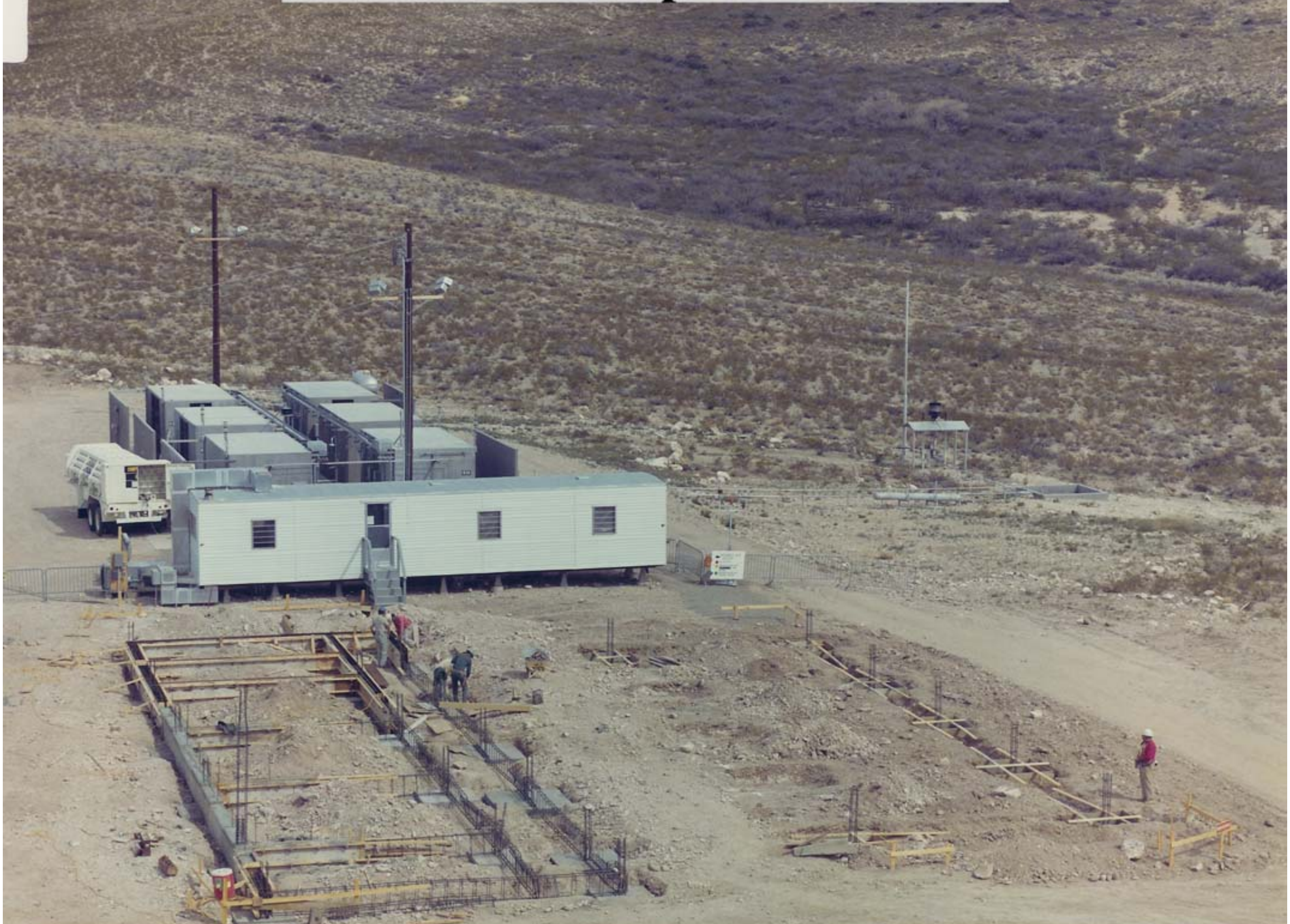



*Photo A-26 - First hazardous materials tests cells in the 800 area*


*Photo A-27 - Digging the foundation for the test control building*

# Foundation Prep for 800 Area



The building of the 800 Area test building began in early 1975. The design specifications were mainly supplied by Laboratories Office Chief, David Pippen and the Laboratory Manager of the Materials Test Facility, Jack Stradling. Larry Davis of the Technical Support Office was responsible for actual construction assisted by Archie Beckett of that same office. The 2-story building provided fortified test cells, standard low pressure flammability tests, and materials preparation on the first floor and control systems for these cells and the hazardous fluids (category J fluids) test cells seen behind the trailer.
Date of Photo: February 1975

*Photo A-28 - Foundation rebar for the 800 area test control building*


*Photo A-29 - The 800 area control building nearing completion*


*Photo A-30 - 800 area control building completed*


*Photo A-31 - Rear view of completed 800 area*


*Photo A-32 - Aerial view of the 800 area years later*


NASA Test Engineer Ron Springer directs techs performing a test in the Hazardous Fluids Test Area. NASA Quality Assurance Inspector George Ortiz validates that the OCP (operation Checkout Procedure) is accurately followed.

*Photo A-33 - Sprenger and Ortiz testing in the 800 area*


*Photo A-34 - WSTF Laboratories Materials Test Team receiving an award from JSC*


*Photo A-35 - Early materials test award given to WSTF personnel*

# Certificate of Commendation


Award presented to Jack Stradling; Laboratory Manager of the Materials Test Facility, March 1979
Left to Right: David Pippen, Chief WSTF Laboratories Office, Jack Stradling, Richard Truly, JSC Astronaut Office

*Photo A-36 - Jack Stradling Award*

NASA-WSTF
0972-0833

# MSC Personnel Tour WSTF

Determining whether WSTF should close; View from North End of Lab Bld 203 looking East
L to R: Ken Gilbreath, Bailey Chaney, Scott Simpkinson, Chris Craft, Gene Lundgren
David Pippen, Jesse Jones, Martin Raines, Leonard Schluter,
Rob Tillet (sitting), George Abbey (in background).

*Photo A-37 - A visit from JSC (MSC) Houston on the mission of finding reasons to keep WSTF open*


*Photo A-38 - David Pippen and Leonard Schluter explaining test methods to Chris Kraft, Director of NASA MSC*


*Photo A-39 - David Pippen receiving a Snoopy Award*

**Special Achievement Award**

In recognition of his outstanding leadership in the management of the White Sands Test Facility laboratories, the Lyndon B. Johnson Space Center presents this Special Achievement Award to:

# David L. Pippen

NASA

Director

JULY 1982
Date

*Photo A-40 - David Pippen's Achievement award for materials testing*

# Low Pressure Oxygen Arc Test


Test to determine the susceptibility of Teflon wire insulation
to ignite whensubjected to a low current electrical arc.
Date of photo: April 1980

*Photo A-41 - Test chamber that subjected materials to electrical arcs rather than electrical sparks as was done in the flash and fire test*

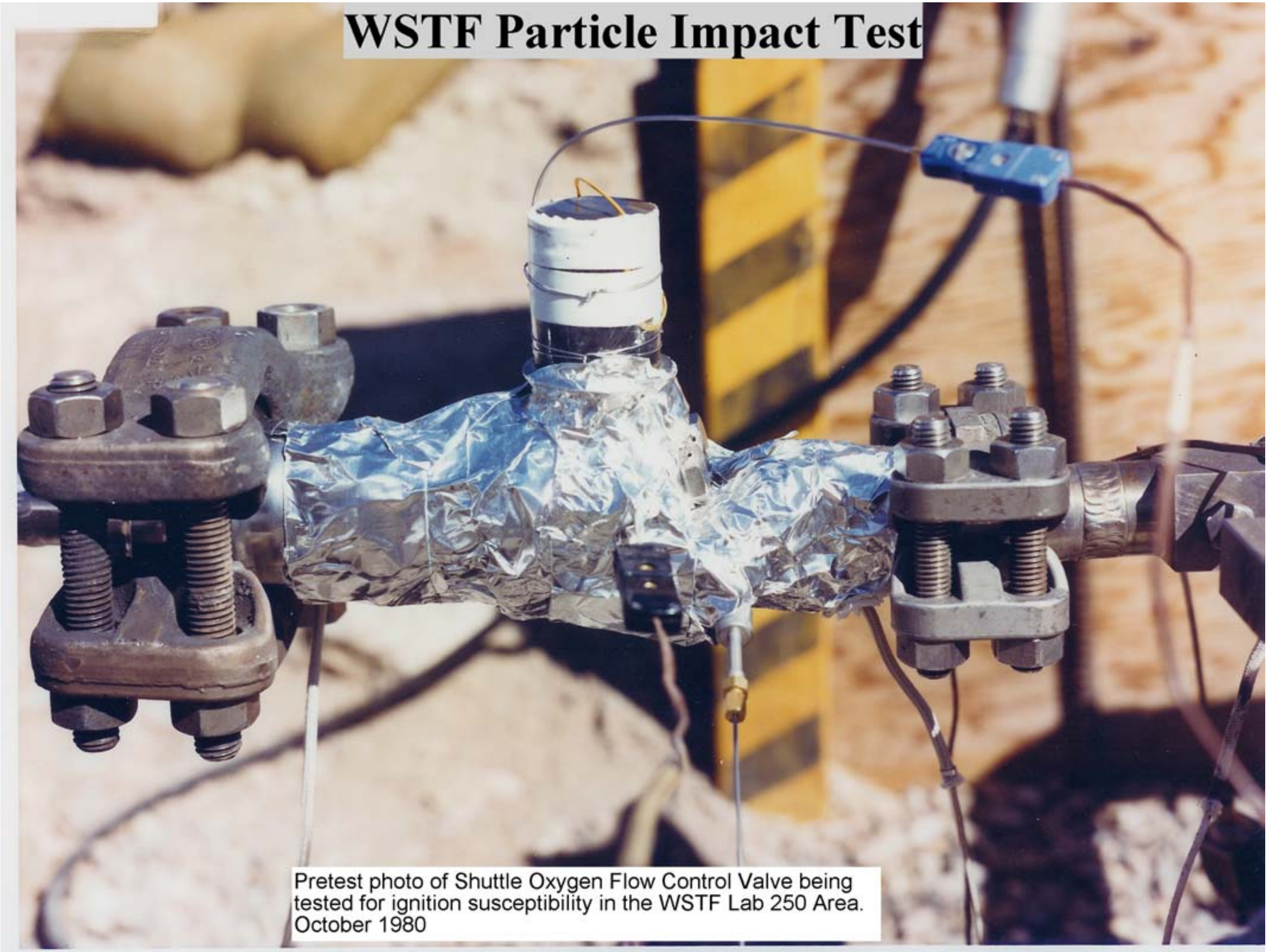



*Photo A-42 - Pretest photo of the Shuttle oxygen flow control valve*

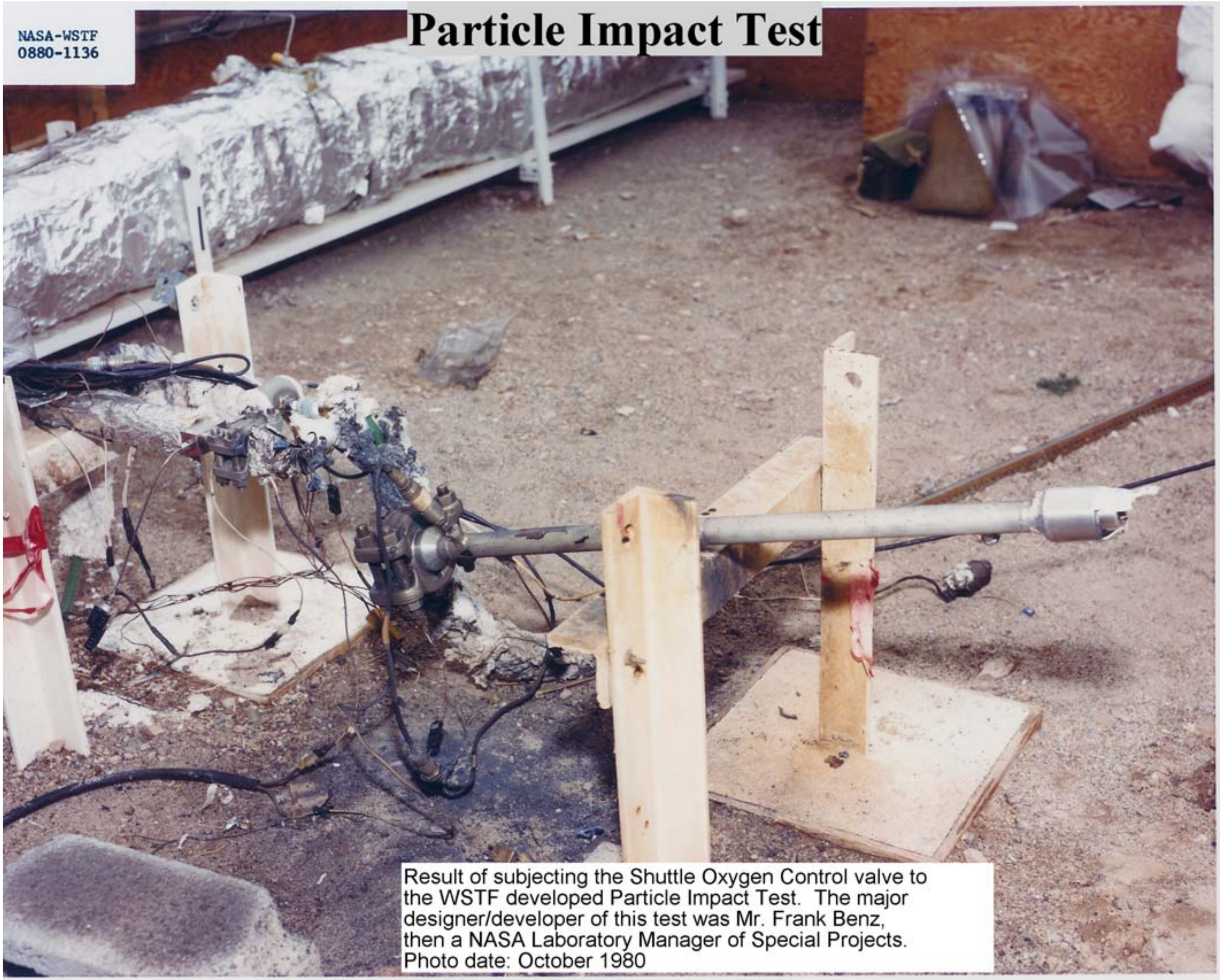



*Photo A-43 - Post-test photo of what was a Shuttle oxygen flow control valve*

# WSTF Odor Test


The Odor Test Was Developed by Laboratories Office, Chemistry Lab Manager, Dr. Leonard Schluter. Here, Lab support contractor chemist, Tom Sydlowski, administers an odor sample to contractor materials test technician, Abe Chavez. Mr. Chavez held the record at this time for the "most sniffs" at over 167 and held the title of the "Most Smeller Fella"

*Photo A-44 - Odor test being administered*


*Photo A-45 - Chris Gillis administering an odor sample to odor panel member Dr. Eric Miller*

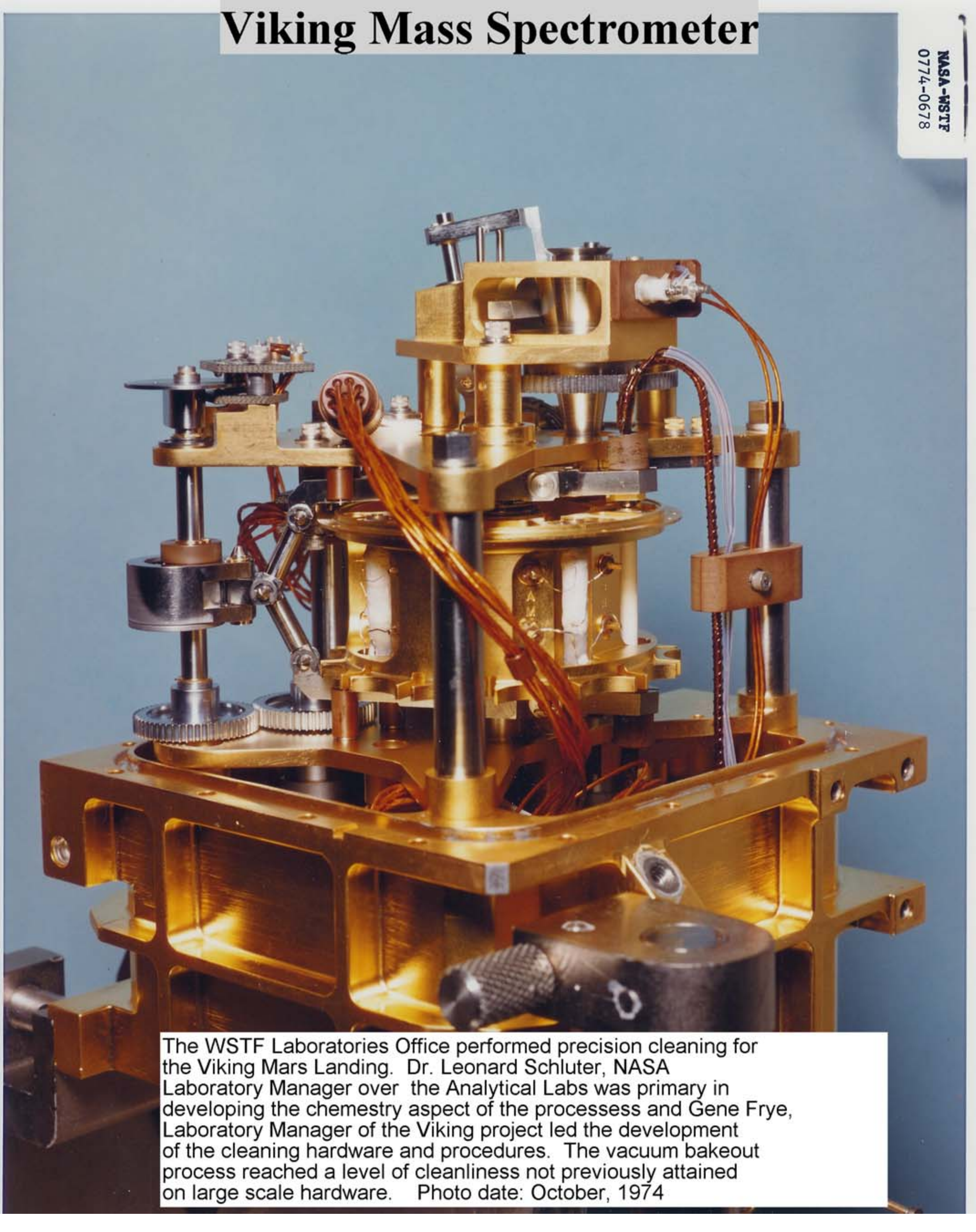
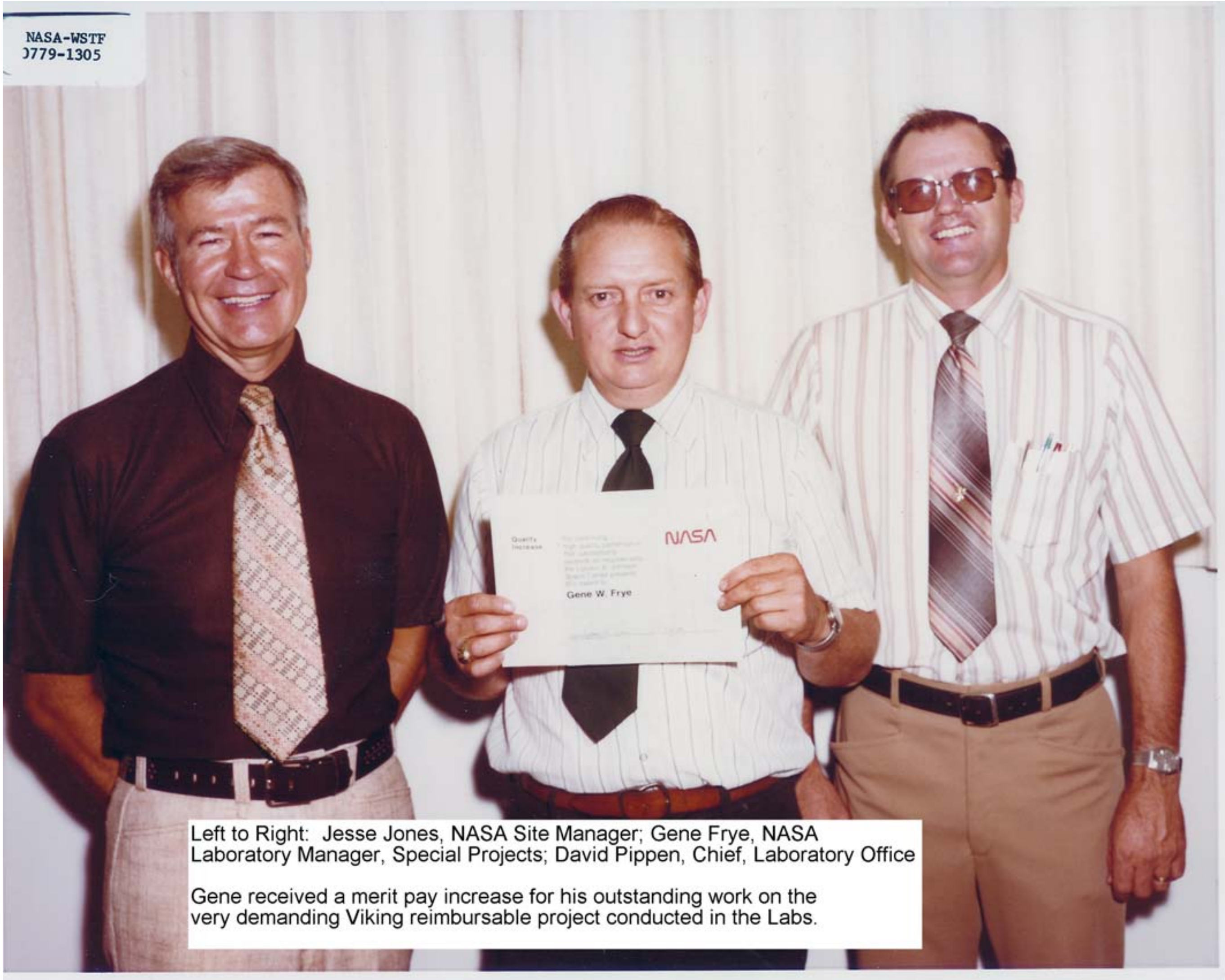



*Photo A-46 - Viking mass spectrometer that was sent to Mars to analyze the Martian soil*




Left to Right: Jesse Jones, NASA Site Manager; Gene Frye, NASA Laboratory Manager, Special Projects; David Pippen, Chief, Laboratory Office

Gene received a merit pay increase for his outstanding work on the very demanding Viking reimbursable project conducted in the Labs.

*Photo A-47 - Gene Frye receiving an award based on his Viking work*


*Photo A-48 - David Pippen, Laboratories Office Chief presenting an award to Dr. Bill Smith, Lockheed, for a patent*

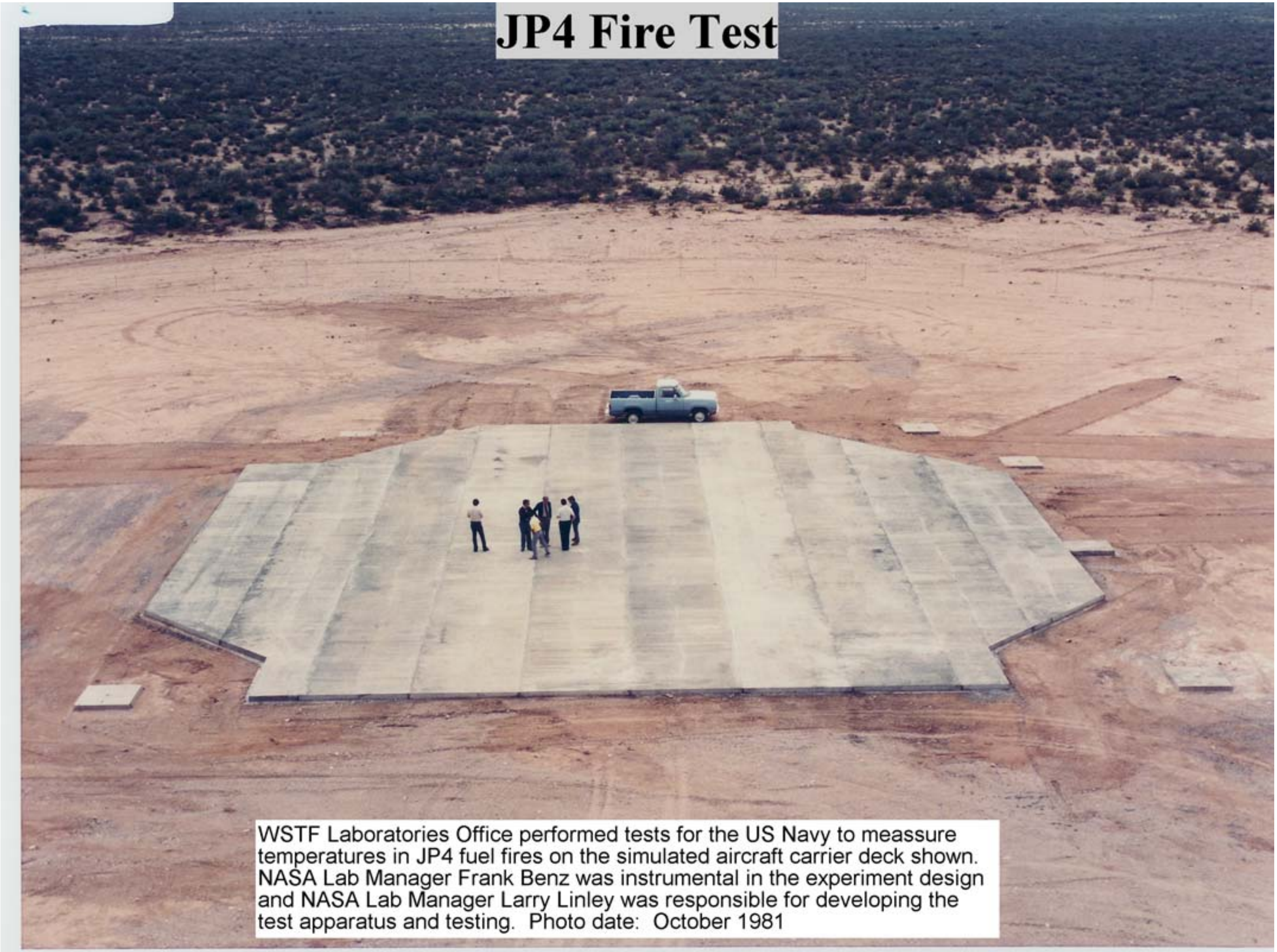



*Photo A-49 - JP4 Reimbursable test for the US Navy*

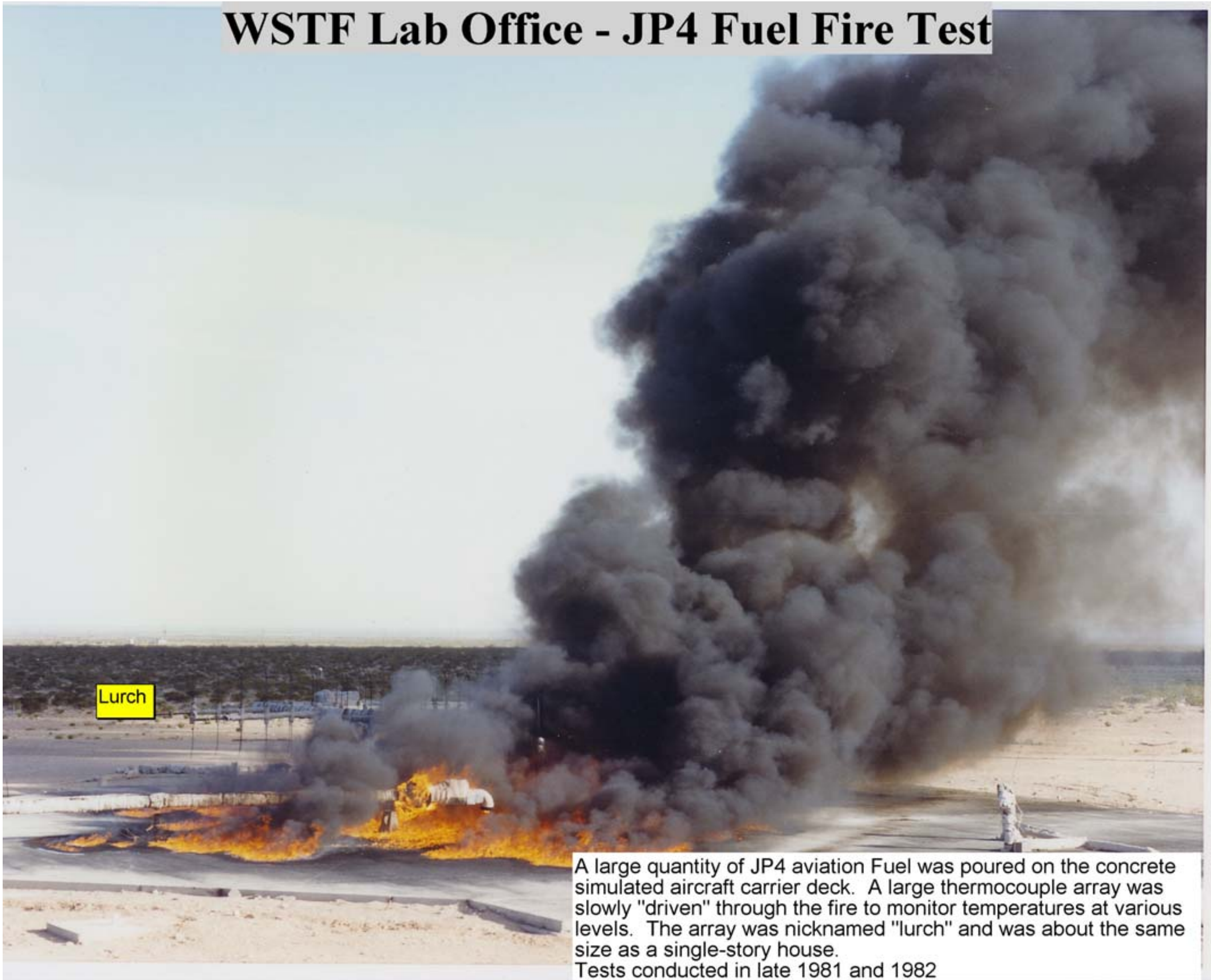



*Photo A-50 - JP4 reimbursable test fire*

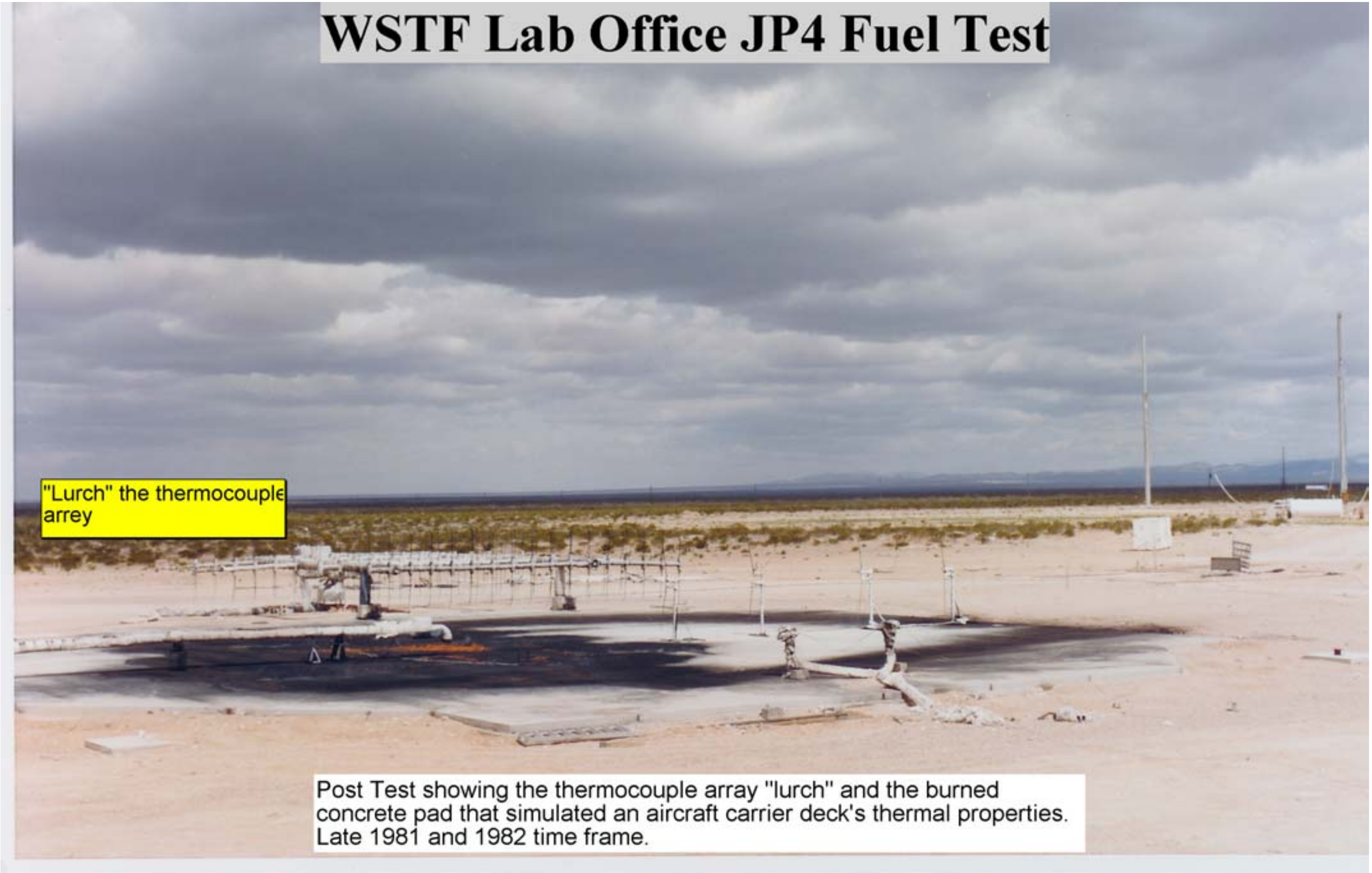



*Photo A-51 - JP4 after fire*


*Photo A-52 - Reimbursable test for the US Army (APC tests)*

NASA-WSTF
0472-0330

# Ken Gilbreath's Last Day at WSTF

David Pippen (Lab Office Chief) presenting going away cartoon to Ken Gilbreath who headed for JSC. April, 1972

*Photo A-53 - Ken Gilbreath's last day at WSTF and headed for JSC*


*Photo A-54 - The lab office staff about 10 years after Ken Gilbreath Left WSTF*

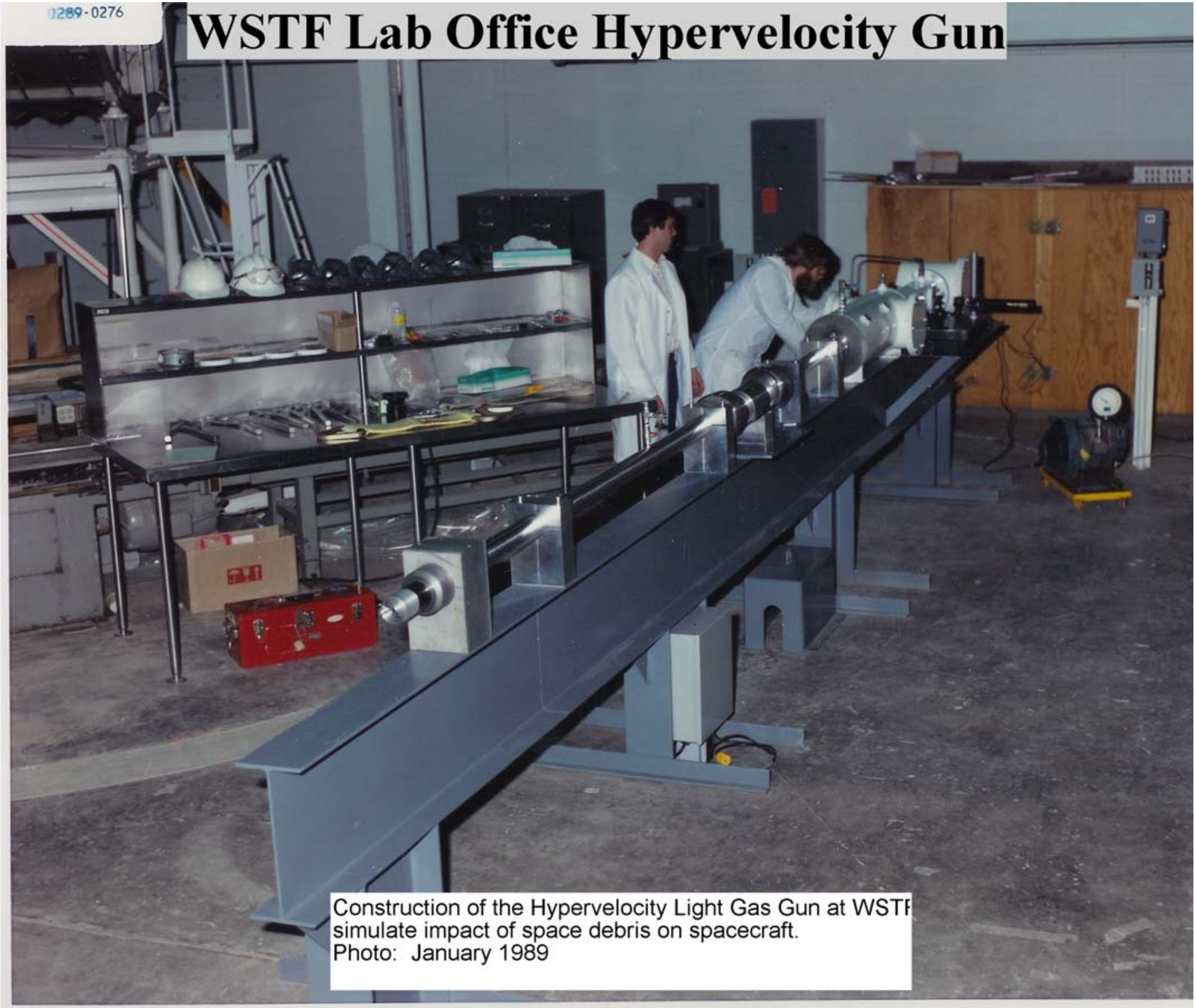



*Photo A-55 - Hypervelocity Impact testing. The last large reimbursable task I obtained (over a million dollars including a new test facility)*

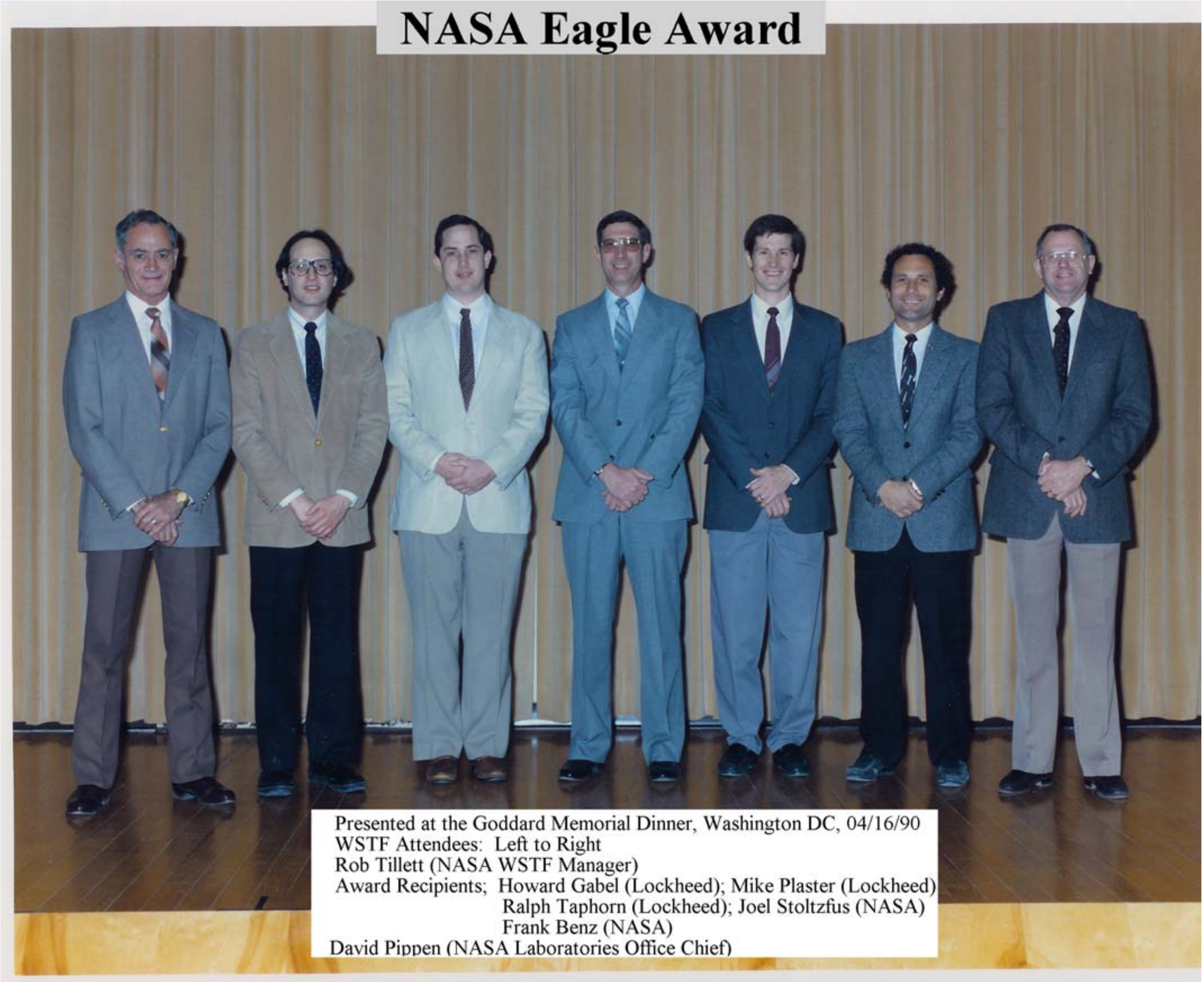



*Photo A-56 - The group that went to the Eagle Award ceremony. Rob Tillett (WSTF Site Manager) and David Pippen (Chief, Laboratories Office) were tag-alongs*

**Special Achievement Award**

In recognition of his outstanding leadership in the management of the White Sands Test Facility laboratories, the Lyndon B. Johnson Space Center presents this Special Achievement Award to:

**David L. Pippen**

Director

JULY 1982

Date

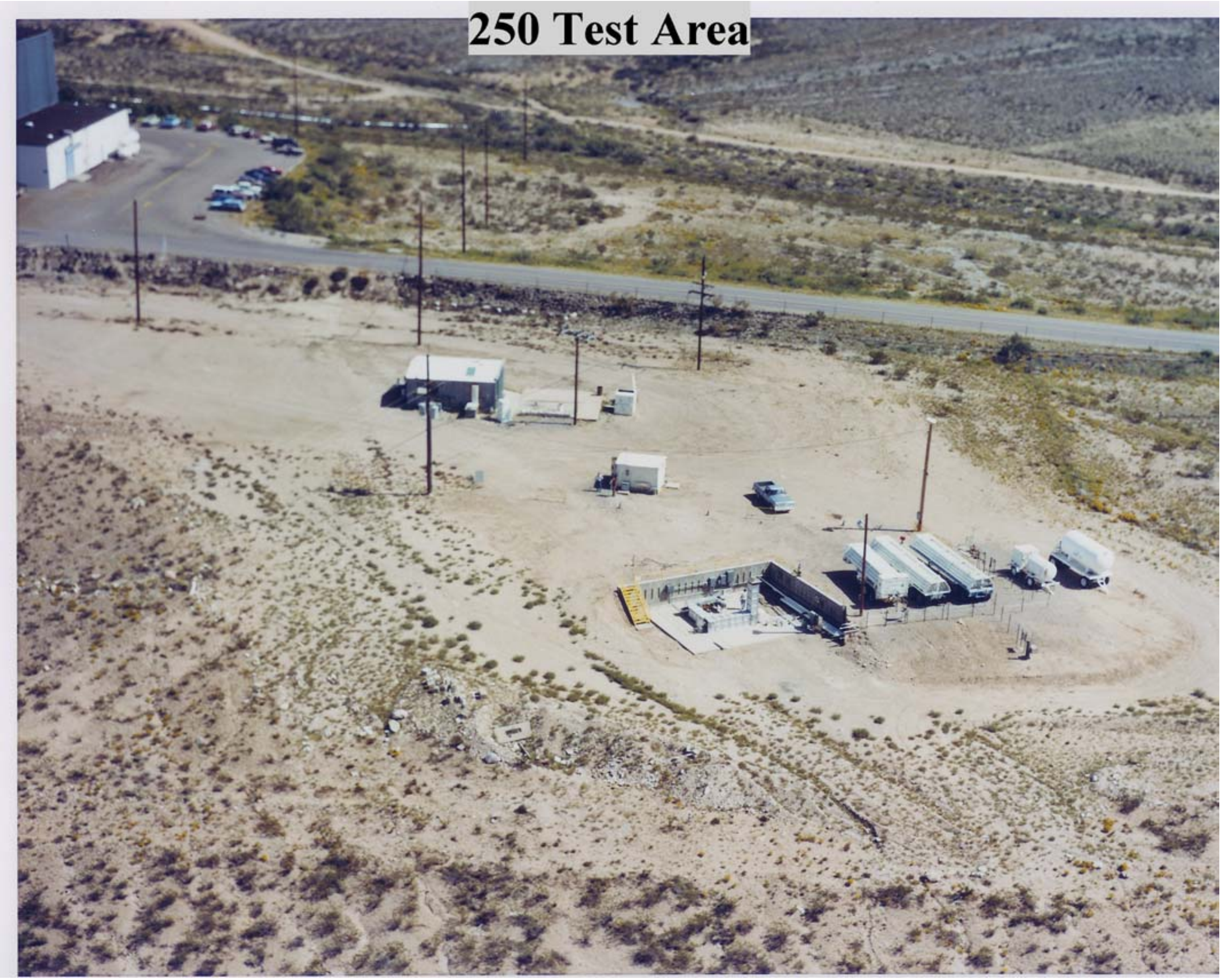
Photo A-57 - David Pippen Special Achievement Award

# Snoopy Award

Award Presented to David Pippen by Astronaut Joseph Allen, Sept 20,1969
Background personnel; L to R; Richard Truly, Gen. O'Leary (WSMR);
Jim Tooman (Lockheed)

*Photo A-58 - David Pippen getting a Snoopy Award from Astronaut Joe Allen*

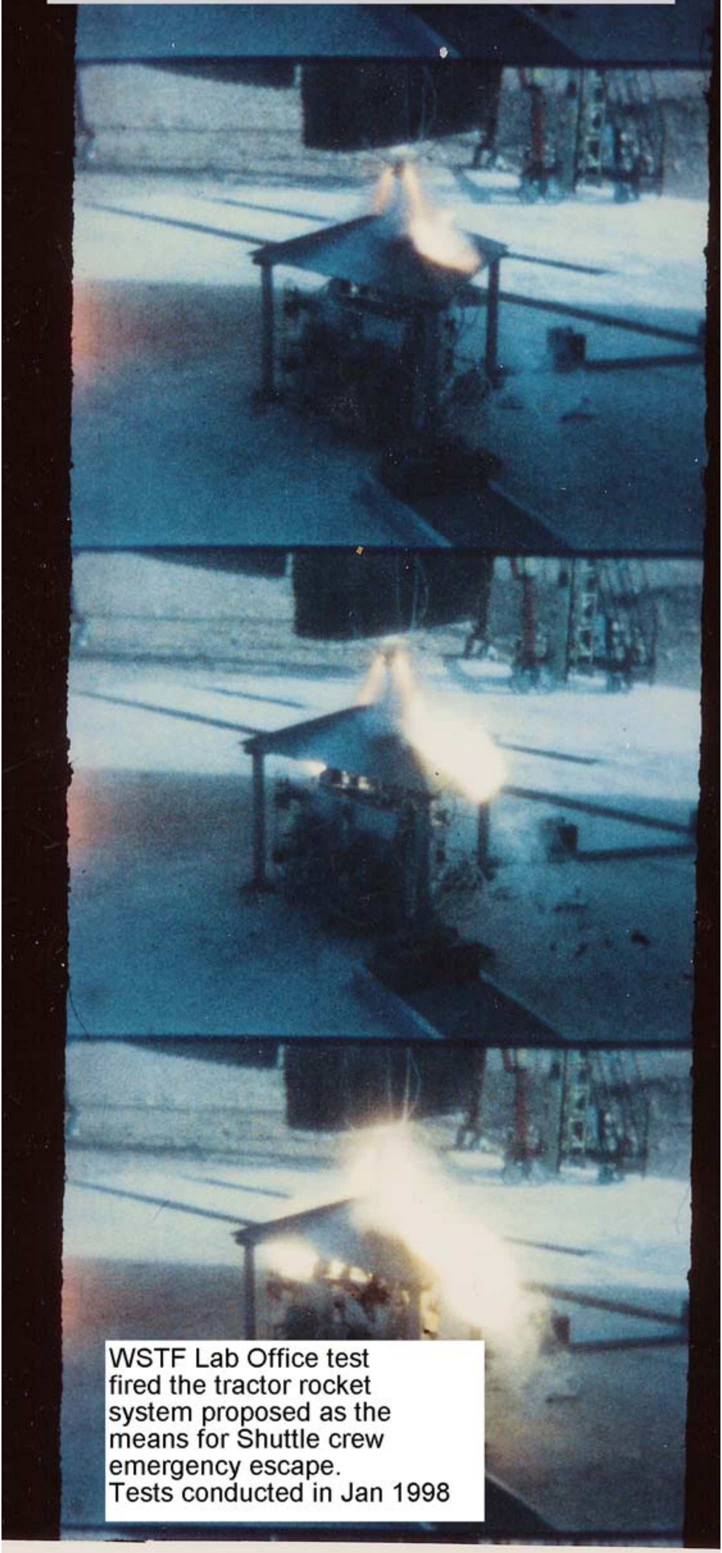

*A-59 - David Pippen - 1980*




*A-60 - 250 Area*


*A-61 - David Pippen NMSU Award*

# Tractor Rocket Test



WSTF Lab Office test fired the tractor rocket system proposed as the means for Shuttle crew emergency escape. Tests conducted in Jan 1998

*A-62 - Tractor Rocket Test*

# NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
# APPENDIX B

DAVID L. PIPPEN

The most significant contributors to the Laboratories Office success during my tenure are listed below.

During my tenure at the WSTF, the Laboratories Office progressed from an organization that supported only the local WSTF organizations to a valuable worldwide resource in hazardous materials testing. We not only supported the site's NASA Offices and the local organizations including TDRSS, we supported most of the other NASA centers, Industry the Department of Defense, Japan, Russia, and other countries.

The laboratories established a state-of-the-art non-metallic materials test capability in hazardous environments, which began shortly before the Apollo 204 fire. Over the years we performed test programs for the Apollo, Skylab, MOL, Apollo Soyuz, and Shuttle space initiatives. We developed many test methods, procedures, and test facilities and a large database of materials was established.

The capability continuously expanded to include testing of metallic materials for oxygen service at pressures exceeding 10,000 psia. Test fluids included oxygen, nitrogen, hydrogen, air, hydrazine, monomethyl hydrazine, nitrogen tetroxide, red fuming nitrogen acid, fluorine, nitrogen tetra fluoride, jet aircraft fuel, and others. A unique odor test using humans as test subjects was established along with over 15 other standard test methods. Many special tests involving high-energy explosions were performed as well as performing hypervelocity impact testing involving large light gas guns.

Laboratory personnel (NASA and site support contractor) were heavily involved in establishing standard test methods via the NASA Headquarters, Office of Manned Space Flight, published as NHB8060.1A, "Flammability, Odor, Offgassing, and Requirements and Test Procedures for Materials in Environments that Support Combustion", (and several subsequent documents) and were actively engaged in several test societies including the American Society for Testing and Materials (ASTM).

The many successes of the NASA Laboratories Office during my tenure required a tremendous effort from many people, both from NASA and NASA contractors. It would be an insurmountable task for me to remember and attempt to identify all the significant contributors to the Laboratories Office successes. However, it is possible to recognize those who were the most instrumental in the laboratories' success and who endorsed and vigorously pursued our mutual goal of attaining "world class" status. I feel compelled to attempt to recognize those who come to my mind even though I have had over 10 years to forget some highly deserving people and not provide them recognition in this document.

The WSTF professional people mentioned below were visionaries. They demonstrated the ability to "see" what we had to do to become a world class test organization and vigorously pursued attaining it. The technicians mentioned were those whose attitude, dedication, and ability set them apart from even the best technicians. Their tireless energy, high work ethic, and willingness to work extra hours on short notice to accomplish critical tests characterized their normal behavior.

***Ken Gilbreath, NASA Site Manager***. Ken Gilbreath was the founder of the Laboratories Office. He had the foresight to see that WSTF could play a more vital role in NASA by providing an agency resource in those areas that the remote desert location afforded. He worked tirelessly to set up a viable organization even in the face of those who expressed that WSTF's sole purpose was to provide propulsion testing support. This was especially critical since the new organization necessarily drew heavily from the very limited site budget and manpower resources from other areas on site. He provided the Laboratories office with strong managerial support and encouragement. He encouraged the laboratories to expand and seek reimbursable work from other agencies.

***Jesse C. Jones, NASA Site Manager.*** Without Jesse's managerial support, the laboratories would never have been able to gain international recognition with NASA, DOD, and industry. He supported our requirements for specialized laboratory equipment in times of tight budgets. He was instrumental in establishing the laboratories as JSC's site for materials testing. He worked to get the 800 area test building and many of our ancillary test areas; some contested by other site organizations. Also, he managed to convince those in NASA who would close WSTF that among other things, there was an irreplaceable resource in the Laboratories Office. He displayed trust and confidence in the NASA Laboratories Office personnel's ability to handle any task we undertook.

***Jack Stradling, NASA Laboratory Manager, Material Test Facility (Mechanical Engineer)***. Jack was a WSTF laboratories Office pioneer. He had superb technical abilities, highly self motivated, dedicated, and completely trustworthy. He was instrumental in the design of the 800 area test building and most of the facilities it contained. I believe his attention to detail, his ability to foresee potential hazards from reviewing schematics and drawings, and his high level of safety consciousness were instrumental in the materials test efforts' outstanding safety record that spanned many years. His total of assigned tasks added up to what would generally require 2 or three people. His ability to recognize material reactivity patterns and analyze test results allowed NASA to select materials that prevented equipment failure and hazards and provided safer aerospace systems. His expertise in materials compatibility issues was eagerly sought out by NASA, industry, and DOD. He gave frequent presentations, published many papers, and was a major contributor to ASTM (American Society for Testing and Materials). He was a coeditor of ASTM publication STP 1040, "Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres". He was a tireless worker and subscribed fully to our world class goal and was a major contributor to any success we enjoyed. He is among the Laboratories top 5 contributors during my tenure with the WSTF laboratories. He also was a major contributor to developing an oxygen safety course that is recognized as being unique.

***Frank Benz, NASA Laboratory Manager, Special Projects (Chemical Engineer)***. Frank came on board with the Laboratories Office after the standard materials test capability was established and successful. However, he excelled in hazardous testing involving all sorts of materials. He was highly self motivated, very innovative, and a tireless worker with outstanding technical ability. He was primarily responsible for increasing the laboratory capability from basic materials testing to state of the art advancements in particle impact in high temperature/high pressure oxygen, metals combustion in oxygen, developed combustion model of liquid-phase burning metal in oxygen, metals ignition by friction rubbing, and many others. He was considered a world expert in these and other areas and was frequently consulted by industry, NASA, and DOD in his areas of expertise. His countless contributions to the success of the laboratories cannot be adequately measured. He was responsible for obtaining many cost reimbursable projects that were "outside the box" of normal testing. His attitude was, "If anyone can do it, WSTF labs can do it better and faster." I believe he was one of the nations top contributors in solving many tough materials compatibility problems. He was selected for many outside WSTF investigative boards and headed up the WSTF hazards Assessment Team. He coauthored ASTM's fourth volume of STP1040 "Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres" and authored many articles, test procedures, and analytical reports. He is among the top 5 major contributors during my tenure with the WSTF laboratories.

***Joel Stoltzfus, NASA Laboratories Office, Laboratory Manager, Special Projects (Mechanical Engineer).*** Joel's greatest contributions were in the area of developing test methods and procedures to test metals in high temperature, high pressure oxygen. One of his greatest successes was in developing a state of the art method to evaluate alloys for their susceptibility to frictional heating. His contributions in this area alone provided the world with data that enable designing oxygen systems that are resistant to catastrophic fires due to frictional heating. He also was heavily involved in designing a universally accepted oxygen safety course and he was an author of the fourth volume of the ASTM publication, STP 1040, "Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres. "His expertise and the test methodology he developed allowed significant expansion in the range of testing performed by the Laboratories Office.

***Dr. Leonard Schluter, NASA Laboratory Manager, Analytical Laboratory (Chemist)***. Leonard was a person of great vision for the laboratories Office. He was primarily responsible for developing the early chemistry and analytical techniques and processes for non-metallic materials testing. He developed (with input from JSC and local medical personnel) the protocol for odor testing and established through analysis the threshold levels that humans could be subjected to without harm. He established an odor panel of local NASA and support contractor personnel and established the means to motivate personnel to become involved in the testing. One of his greatest contributions came in his ability to convince outside customers that the Labs were the place of choice to do special tests. He worked closely with other centers and industry to direct testing to WSTF. He was primary in developing our precision clean room capability and was the WSTF person responsible for setting up the processes and procedures for cleaning the tools for the Lunar Curator. He was tireless in his effort, promoted WSTF as a world-class operation and was instrumental in the early success of the laboratory effort. I rate Leonard among the top 5 people responsible for putting the laboratories in position to reach world class.

***Carol Irby, NASA Laboratories Office (Later Secretary to the NASA Site Manager)***. Carol was the secretary of the Laboratories Office from its beginning until our great expansion started. We were severely understaffed for the activities we undertook. Carol directed the numerous phone calls, was a one person visitors center for the constant stream of customers, kept track of time cards, and typed a mountain of test reports from handwritten manuscripts and prepared NASA presentations before the day of the word processor. Her outstanding telephone manner and ability to communicate important schedule and test information to the customer and local staff were instrumental in the early success of the laboratory. She knew what the office staff was trying to accomplish and endorsed our efforts with great commitment with an outstanding attitude under tremendous personal pressure from many different sources. We suffered greatly for a time after she left to become the NASA Site Manager's Secretary. It is doubtful that we would have been successful without her efforts.

***Kathy Pacheco, NASA Laboratories Office (Office Secretary and later Office Management Assistant)***. Kathy assumed the role of Office Management Assistant long before she was given the title. She was an outstanding "first contact" for the many customers we had. The volume of work she produced and the professionalism she displayed under perpetual high stress was outstanding. She kept the office running smoothly allowing all of us to take care of our own areas of responsibilities. I received numerous compliments on her work from customers outside WSTF. We would have sunk in our own pile of work had she not been so dedicated and willing to do whatever work was necessary for us to succeed She understood the goal of the office and endorsed it fully. It would have been very difficult to advance toward our world class goal without her dedicated and consistent efforts.

***Leroy Luchini, NASA Administration Office (Budget Management)***. Leroy was our "money man". He set up the means of handling the numerous reimbursable projects and kept us informed of our money situations. He provided council that we needed to assure that we remained "legal" when we purchased equipment for our off site customers. Because of his diligence and dedication, we always knew where we stood with NASA equipment purchases and our reimbursable funding. His efforts were instrumental in our being able to control funding for numerous simultaneous reimbursable projects.

***WSTF Site Support Contractor John Schentrup, Lockheed Program Director (and Contractor Laboratory Dept. Manager)***. John was initially the WSTF Laboratory Dept. Manager. He was very cooperative and always tried his best to implement those practices aimed at reaching "world class" status. He was hampered by Lockheed policy that prevented hiring the best personnel and paying the best personnel a salary comparable to other outside WSTF employers. He took the brunt of many negative evaluation comments with a very good attitude even though he knew the solution to the problem was outside his authority. My philosophy was that the support contractor must meet the criteria of the contract in order to make the highest grades and that the grades given were directly dependent upon performance. The site support contractor and often NASA Site Managers expressed the view that high grades were deserved of a contractor that performed in a reasonable manner. Some NASA managers even felt sorry for a contractor that performed well, but got less than an outstanding grade by NASA evaluators. John always took the Laboratories Office criticisms seriously and acted on them to the best of his ability/authority even though his superior did not always support his efforts. When he became the contactor

Program Director, The Laboratories Office experienced its most dramatic growth both in size and technical competence. He allowed the hiring of high quality people and did his best, even when discouraged by Lockheed policy and pressure from his superior to do otherwise. He always understood the Laboratories Office goal and worked diligently to reach it.

***Dr. Craig Leasure, Lockheed Laboratory Department Manager***. Craig was an outstanding technical talent even though young in years. He understood and heavily endorsed the Laboratories goal. He always tried to hire the best technical people with the highest skills and relentlessly pressured his superiors to promote his highest quality people. He responded positively to constructive criticisms presented on the contractor's evaluations and worked hand-in-glove with NASA personnel. As a result, under his guidance, the contractor reached its highest technical capability. This resulted in fast and "world-class" response to customer requirements.

***Rollin Christianson, Lockheed, (Mechanical Design Engineer)***. Rollin was a very talented design mechanical engineer. He designed many of the special complicated test fixtures required to perform special test activities. He was a primary designer of a WSTF developed Shuttle oxygen control valve that was not susceptible to ignition by particle impact. Even though not adopted by Shuttle, the design displayed his outstanding design talent. His keen insights into mechanisms provided invaluable insight into failure analyses and hazards assessments.

***Martha Benz, Lockheed (Data Office and Technical Editor)***. Martha displayed a very high level of wisdom in laboratory operations. She solved two of the most difficult and plaguing problems in the Laboratories Office. She developed a way to expeditiously generate materials test reports. The testing always seemed to be the easy part. Obtaining a quality test report in a reasonable time while being required to run many different tests simultaneously was each test engineer's nightmare. Her dedication to this task and her great desire for the laboratories to excel were instrumental in attaining the success we enjoyed. She also developed and implemented a system for reporting standard test data. She set up a very useful materials test database that enabled providing our customers test data very expeditiously. This capability enabled us not only to rapidly perform tests, but report the data in a very professional manner. This capability was a requirement for any world class organization.

***Dr. Ralph Taphorn, Lockheed, (Physicist)***. Ralph was exceptionally talented not only theoretically but experimentally. He was as much an engineer as he was a scientist. He was equally versatile in basic properties of materials, instrumentation, and experiment design. Many of his concepts were innovative and directly resulted in WSTF obtaining some very complex and rewarding projects. He mentored many of WSTF Laboratories engineers and scientists, both NASA and contractor. He was more interested in work quality and good science than position or promotion.

***Bob Horrigan, Lockheed, ESC (metallurgist)***. Bob was highly motivated, very dedicated, and an outstanding metallurgist. His ability to operate even the most complicated analytical tools allowed WSTF to excel in the area of failed component analysis. He personally developed the test methods for testing materials in oxidizers and fuels. His talents allowed the Laboratories to undertake many very complex test programs that advanced us towards our world class goal. He also was a major contributor to solving many of the engine related problems that occurred in the propulsion testing, thus enabled the laboratories to not only support outside of WSTF customers, but on site customers as well.

***Dean Whitaker, Dynaelectron, Laboratory Department Manager (physicist)***. Dean was one of the most dedicated and motivated professional personnel we ever had at WSTF. He was involved in designing and developing test methodology in the very early days of materials testing. He was instrumental in setting up and developing the initial test facility for the GOX pneumatic and mechanical impact tests. He spent many uncompensated hours at WSTF right along with his NASA counterpart. Not only was he outstanding technically, but he mentored many new engineers. He was very safety conscious but always came up a way to do even the most hazardous testing. I consider him to be among the top 5 WSTF Laboratories scientists during my tenure.

***Betty Hoffman, Lockheed (Chemist)***. Betty was the "plodder" of materials testing in the chemistry/analytical area. She excelled in assuring that the routine but exceedingly important testing was correctly performed with a high class of professionalism. Among the worst problems we had was the customer's changing priorities in the middle of testing. She handled this without anger or any display of frustration. She just consistently "got the job done".

***Dr. Eric Miller, Lockheed, (Chemist)***. Eric was a very dedicated and talented chemist who was instrumental in solving many of the very complex analytical problems presented to the Laboratories Office as we transitioned into the materials testing effort. He worked tirelessly and effectively on all assigned tasks. His work stood up under heavy scrutiny by scientists and engineers of the scientific community. His capability and motivation were major factors in the Laboratories attaining a high level of technical competence.

***William Weed, Lockheed (supervisor of machine shop)***. Bill provided machine shop support to our many lab projects. He understood the importance of precision machining and high volume work output. He worked very closely with the design engineers and voluntarily worked extra time to assure our critical schedules were met. He was able to adjust his shop priorities so that everyone received what they needed and on time. We could not have enjoyed any success without the efforts of Bill Weed. He understood where we wanted to go with our Laboratories and he was a willing partner in that endeavor.

***Elvin, Magee, STC (mechanical engineer, head of prototype development shop)***. Elvin was head of the prototype development shop in the early days of the laboratories. He was a tireless worker and designed and "haywired" as necessary from available supplies to get our unique test systems operational. He was very enthusiastic even though under consistent pressure to produce more than his manpower allotment would allow. His individual efforts were instrumental in getting our materials test equipment operational.

***Ernie Ceroky, STC, Analytical Chemist***. Ernie was a very hard working innovative analytical chemist who worked closely with Leonard Schluter in setting up the initial analytical non-materials tests (example: fuel and oxidizer compatibility tests). He also was instrumental in establishing methods to evaluate the effectiveness of cleaning processes like was required by

Viking and the Lunar Curator. He set up many of the initial analytical instruments required to assure that the odor panel was not subjected to hazardous materials. He was a mainstay in the early days of the laboratories. Without his expertise, it is doubtful if we could have developed the test techniques and procedures required to support the multiplicity of laboratories tasks.

The following technicians were all major contributors to the laboratories advancing toward world-class status. They displayed an eagerness to respond to changing requirements at a moment's notice even though this response would often take them past quitting time. They were innovative, full of excellent ideas on how to operate very complex test apparatus. Their attitude was always positive, they made very few mistakes and never watched the clock. This was amazing since WSTF was unionized and many techs considered the Labs, "just another 8 hour job." The engineers for time critical and technically challenging projects always attempted to get these people on their test team.

***Edward Denzler (mechanical technician)***
***Sammy Motto (materials test technician)***
***Jack West (mechanical technician)***
***Joe Diaz (materials technician)***
***Kenneth McCardle (electrical specialist)***
***Don Saunders (mechanical technician)***
***Norma Childers (materials test technician)***
***Carl Wright (mechanical technician)***
***Vick Boozer (Clean Room Supervisor)***
***Arnie Adams (mechanical technician)***
***Rea Adams (materials test technician)***

The following personnel enthusiastically supported WSTF Laboratories Office test activities even when WSTF faced closure. They defended our positions, had confidence in our data, and supported new facilities and equipment when needed. Many of them kept us informed of political activity and helped us prepare positions that would enhance our standing with senior JSC officials. Many of them gave us encouragement when competing centers questioned our data and/or test procedures. They helped us get projects that augmented our regular budget. Without their support, we would not have been successful.

## JSC

***Martin Raines, MSC R&QA Chief***. He assigned the WSTF laboratories the initial responsibility for performing JSC's Apollo materials testing.
***Mike Steinthal***
***Howard Kimzey***
***Norm Chaffee***
***Alex Bond***
***Michael B. Duke***
***Chester Vaughan***
***Jeanne Crews***

## JSC McDonald Douglas

***Paul LeDeaux***

## NASA Headquarters

***Wayne Frazier***

## Lewis Research Center

***Irvin Pinkel***
***Paul M. Ordin***

## KSC

***Coleman Bryan***
***Mel Olson***

## Air Products and Chemicals

***Barry Werley***