

**NASA SANTA SUSANA FIELD LABORATORY ORAL HISTORY PROJECT  
EDITED ORAL HISTORY TRANSCRIPT**

DON EDDY  
INTERVIEWED BY JOY D. FERRY  
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FERRY: I'm Joy Ferry, it's July 29<sup>th</sup> 2015 at 4:10 pm, and I am interviewing Don Eddy, and I have your permission to record this interview?

EDDY: You do.

FERRY: Alright, so how about we start off just telling us how you became involved up here?

EDDY: I graduated as a mechanical engineer from the University of Idaho in June of 1951. And in June of 1951 I hired in to North American Aviation, and was assigned to Santa Susana. And I was located here for from 1955 through about 1960, and then was transferred down to the Canoga facility, and was up here off-and-on, on different test activity. That's how I wound up here, I took the highest paying job I could find, and took a cut a pay. I wound up here at \$1.87 an hour, and I'd been surveying in Idaho for \$2 an hour [laughter].

So anyway, it was a great time, the facility was growing. At one point we had 12, maybe 15, large engine test stands firing. I think there were about 2500 people up here at the time. I was initially assigned to work as a development engineer at CTL-1, which was a – the CTL of course stands for Component Test Lab, and it was right down at the bottom of the hill in Area 1. I did a number of things down there, I ran the flow bench. We calibrated all of the flow measures that were used on the Hill.

At one point, I became responsible for the component testing of the turbo pumps that were used in the early Navajo, Jupiter, Thor, and H-1 engines. And there were a couple of turbo pump test stands in CTL-1. And one test stand was built to test the sustainer turbo pumps for the Atlas, and the other was for the booster turbo pumps. And CTL-1 had a separate pump facility down there, it was – they bought three World War II electric motors, and lined them up down there. And they would drive the pump, the impellers, with the submarine motors. And they were DC motors, and they in turn were driven by a big DC generator, which had been obtained from the Pacific Electric streetcar system when the system was taken out of service. As I recall, that motor came out of the Sierra Madre substation, but it was a beautiful, beautiful big motor. And of course DC was used because you could vary the speed, and the submarine motors were DC motors, so everything fit.

I'm trying to think – there were some exciting times down there, because we were just learning how to design turbo pumps that would pump liquid oxygen and kerosene. And the liquid oxygen pumps had a tendency to blow up until we figured out what was causing it. And CTL-1 had no roof over the control consoles, in other words you were looking up through a couple of glass panes at the pump up there. And nobody paid any attention to it at the time, but I guess it was a pretty hazardous situation, although nothing ever came back and came through the roof. The very first turbo pump test I watched, I was responsible for watching the - we called them DIGRs, Direct Inking Graphic Recorders, that we recorded all the data on. And we watched the bearing temperatures, and so-forth.

I started to tell the story about the first turbo pump test I watched. I went to the data recorders - were all in what we called the East Wing and the pump test stand was in the West Wing. And you can imagine, the operators were next to the wall, and then there was a space

behind them, a walkway, and then the recorders were all behind them. Well I came down from the East Wing, I wanted to watch a turbo pump test. And I watched, I came down and as I ducked down to look up through the window, the pump blew up. And the guys at the console all flew backwards, they just jumped backwards. And of course I was down on my knees behind them, and everybody went back into the recorders. So that was my – they didn't want me to watch the tests much anymore [laughter].

But there were three test stands up on the Hill. We called it the TREE Area, Transition Reliability Experiment. And these were engine stands, and they were firing the – one stand was firing the Redstone engine, and the other two stands were firing the Jupiter and Thor engines. And the flame buckets were pointed right at CTL-1. So when those guys lit off, it was a pretty good thrill at CTL-1, because they didn't warn us, and all of the sudden you've got this explosion in your ears. The entire area, it was an exciting time up here, with all the test stands firing. And probably the firings on the test stands up here were far more spectacular, really, than the ones down in Mississippi, because of the canyons – the sound would bounce around. I worked the night shift for a while, for about a year. I think half my job was to go around and take a look at the turbine houses; we were failing a lot of the turbine blades. And of course all of the engine guys wanted to test, and I would see how many dings there were in the turbine housing, and tell them that I didn't think that they'd lost enough blades that they would lose an engine if they tested again. And pretty soon the housing was full of dings, and you knew there weren't many fresh edged blades left.

The night shift was interesting, because the bus service was not working at night. During the day there was a shuttle bus that went around the entire area, to all the test stands. It ran every 15 minutes or so, and you could jump on the bus and get from where you were to a test stand.

And the engineering building that I was in was right up here at the top of the hill, right over here from where you trailer is. In fact, it looked to me like the old Fire Station building is still there. About the only one I think, or it may not be the old building, but it's in the old location, and we were right across the road from that. And going down to CLT-1, or walking anywhere on the roads at night, was a little bit dicey, because the snakes liked to come out and lie on the road at night. The road was warm, especially in the wintertime; they'd come out on the road to stay warm. I was never bothered by them, I just steered clear of them.

They built a big LOX plant between Area 1 and Area 2. I don't know when that occurred, but it was probably late 50s, early 60s. It had to be late 50s because I was still up here. Prior to that time, our liquid oxygen was all brought up the hill on tanker trucks, as was the kerosene, which evolved to RP-1. But anyway they built a facility to generate our own liquid oxygen, and then they of course didn't have to bring the liquid oxygen up in tankers. Funny story, I was touring the area with an Air Force officer. And one of the program managers that was with me in the car, I don't remember who all was there, but he told the Air Force officer, he says "You know, we take so much oxygen out of the air around here that the birds don't fly over that plant." [Laughter] I could hardly contain myself in the back seat.

I don't know how much I've really got to offer to you. It was an interesting time. As part of the turbo pump group, I visited every test stand, because invariably when they tested an engineer, why we'd lose a turbo pump, and I was asked to go out and figure out what went wrong.

FERRY: Who did you work with?

EDDY: Well the fellow that I first reported to was a guy by the name of Bob Ashmead. He headed up the turbo pump group up here. My first lead man was a guy by the name of Jim Hale. And Jim is still around, he lives down in the San Juan Capistrano area. He had just gotten out of the Navy. Jim became a program manager in the F-1 program later on. And a great guy to work for, and he was - in fact, as it turned out, probably the better part of my career I reported to him. But that was a great time. The turbo pumps were great for me. I was a mechanical engineer and I had a turbine to fuss with, and bearings, and gears, and pumps, and all of the magical stuff that mechanical engineers study. We had quite a large group up here. While I was on night shift, I was responsible for the testing of the Mark 6 turbo pump, it was a turbo pump designed to go in the E-1 engine, which never went into production. But we were testing the turbo pump over on Delta 2, and we had a lot of trouble with it. Turbine welds would fail, and we'd blow out hot gas all over the test stand. I think the program - I'm a little bit vague on the Mark 6 - I think it might have been designed to be a replacement engine for the Atlas booster, but I'm really not sure of that.

The G-26 engines used liquid oxygen and alcohol, and the turbines were really nice and clean to work with. When they switched to kerosene, the turbines were very sooty, and you couldn't work on a turbine without getting a lot of soot all over yourself.

FERRY: You said there was a large group up here, when you were up here. Were you able to form close relationships with the other people?

EDDY: Oh sure. We had - the turbo machinery group probably was one of the best social organizations around. We worked hard, but we played hard. We'd go down to Orchid Park, and once a week we'd have a tennis game down there, with the guys from up here. And remember

the Canoga Park plant wasn't occupied until late 1955 or early 1956, they were just building it. And it was sort of fun when I'd come off the hill, off the night shift, all of the lights at the Canoga plant would just look like a little galaxy in the middle of nowhere because it was all farm fields around it, and Canoga Park was a very small community then. There was very little development out on this end of the valley until Rocketdyne started staffing up, and people started flowing in here to work, and then gradually the valley expanded. I tell people that – you know I lived over on Sepulveda Boulevard for a while – I would pick up Devonshire at Sepulveda, and drive to Topanga Canyon and Devonshire. It was a two-lane road, there were no stop signs, it was ranches on either side of the road. I tell people that, and they can't envision that it was that sparsely populated.

And you know, we were in a time when we were – it was Cold War time, and we were trying to get a vehicle that we could throw an atom bomb at the Russians before they threw one at us, or if they threw one at us, they knew that they were gonna get punished the same way. And there was a lot of money flowing into the testing up here. The government wanted the engines, and they wanted them bad. We had a lot of hardware. You'd never see that much hardware in one big program again, I don't think. Of course, I don't know what's going to happen 100 years from now. And I got a kick out of your directions to get up here, and I thought "Gee, I drove that road for five years, I could do it blindfolded." [Laughter]

FERRY: What were some of the challenges that you faced up here?

EDDY: You know, we did not design the engines up here. The engines I initially started working on were designed at a facility that we had in Slauson, it was called the Slauson Facility. And that's where all of the design work took place. And then they shipped the hardware up here to us

to test. And we would test something, and if it broke, why then we immediately told the Slauson people, and they would start a redesign. Well, what would happen is that they would lose interest in the hardware that would break, and were anxious to get the hardware with the fixes in it up here. And so a lot of times we wound up with hardware stacked up, to test on the test facilities that nobody was interested in. It was obsolete, and they told us "Go try goofy things, and let's see what happens. Let's see what works and what doesn't work." We ran some tests where we would just shut off the lubricant to the gear train, and see how long the beast would run before the gears failed.

The Air Force was interested in finding out what it took to blow up a LOX pump. When the Atlas vehicles were arriving at the cape, the tanks had quite a bit of contamination in them. And so they were getting this debris out of the bottom of the tanks, and they were worried that the debris would blow up an engine. So they asked us to run a test - we did this over at CTL-2, we had three turbo pump stands over there. And they said, "We want you to tell us what'll blow the pump up." Well, I devised a facility to flush debris into the liquid oxygen going into the pump. And we tested the kind of stuff they were getting out of the tanks, little chunks of aluminum, and sand, and all manner of things, and nothing blew it up. And so they said "We want to know what'll cause it to blow up. Blow it up." So I flushed three, quarter inch steel b-nuts through the pump, and it blew it up. And they were happy. That really is a little bit of an example of the kind of money that they were willing to spend. Because you blow up a pump, and you've not only lost the pump, but you've lost a good part of your test stand. It had to be refurbished.

The contracts were cost-plus contracts, not like today's cost-plus, incentive fee, and so forth, and so on. It was just flat-out cost-plus. It didn't matter what it cost, the government added

a fee to it. I think Dutch Kindelberger - he was our president of North American Aviation at the time - and he probably negotiated a lot of that. Dutch and his wife were very well connected in with the government people. And the employees loved Dutch; he treated the employees very well. We were treated quite well, and everybody had the impression that he cared about us. It was not that he considered us numbers.

We tested an engine over in Delta using fluorine as a propellant – as an oxidizer. And that never went very far. Fluorine was nasty stuff to handle, and it was nasty when it got loose. Fluorine, chlorine, they're all in the same family. Chlorine is what they used to gas the troops in World War I, and fluorine was a close cousin. It got loose one night out in the Delta Area, and I never suffered any ill effects from it, but it was – they didn't use it very much, it all died out. There's been a hue and cry over the contamination of the groundwater with trichloroethylene. And trichloroethylene was used all over the place, it was not considered hazardous. It was a great solvent; it was for removing machining greases and oils from the machine parts. Of course cleanliness was a problem in the early going, and it's still one that's always in the forefront of making sure that your engine's going to work - is that the oxidizer system had better be clean. And I never had any fear of trichloroethylene; because when I was in high school I had a job washing parts in a laundry tub full of trichloroethylene. No ventilation, just in there with my bare hands. It raised hell with your skin. And again, it never affected me, and I think that the most – I was talking to a chemist here a couple months ago, and he said, "Trichloroethylene was far less damaging than the solvents that they used in your dry cleaning places." And I'm sure you're aware of the move to get rid of that particular solvent, and go to a – I think they use an aqueous solution of some kind now. But he said, "Heck, trichlor was down on the scale as far as damage to your lungs, to your system."

We were primarily Air Force programs in the period of time that I was up here. NASA wasn't formed until sometime in the late 50s was it? In fact I think it had to be in the 1960s, because I remember flying in – going down to the facility in Alabama to brief the Army guys. Huntsville was originally an Army facility, and they had brought von Braun and all of his buddies over here. And it was called ABMA, Army Ballistic Missile Agency, and the Jupiter engine was an Army project, as was the Redstone. Redstone and Jupiter were Army, Thor and Atlas were Air Force, and then the H-1 engine was a NASA engine, but that came along a little later. It was a derivative of the Thor engine. In fact, the Thor engine was redesigned to use a lot of the components that we had developed in the H-1 engine, because it was capable of higher thrust. And Thor I think, is still flying as a Delta 2 vehicle.

At the Huntsville facility – if you ever go down there, you've got to – it's registered a National Historical Relic. But it was one of the early test stands for the Redstone engine, but I think that they were testing – we had a contract to take a German V-2 engine apart, and put it back together and test it. And then I think we had a contract to copy it, and then the Redstone was pretty much a derivative of the V-2 engine. And the only place they tested the Redstone engine was up at [Tree 2]. They had one stand running here at that time, with that engine on it.

FERRY: So, you worked there from 1951 to?

EDDY: Well, I was up here from 1955 – I graduated in 1955. Started work here in 1955, and was here for about five years, until about 1960, and then I went down below. But I was with Rocketdyne for 45 odd years, and when I was in charge of the – we called them expendable engines, because they didn't come back. The Thors and the Atlases and all of those guys. When we delivered all the engines on those contracts, why, they picked me to lead the design effort on

the Space Shuttle main engine oxidizer pumps. And so, from about 1969 until I retired - I retired in 1992, and went back to work for another eight years - but all during that period of time, I worked (on the) Space Shuttle engine. But Space Shuttle had a limited amount of testing done up here. We had an engine stand in the Coca Area, and we had a turbo pump stand over there. The turbo pump stand was really pretty limited. I think the maximum duration was about 30 seconds, compared to the Shuttle engine's duration of around 8 minutes. And that was driven primarily because we didn't have big enough high-pressure tanks to drive the turbines for very long. We had small tanks. Turbine pressures are up 6,000 psi, so you can build a small tank that'll take that, but trying to build a big propellant tank was out of the question. And it was very - at the stand it was very difficult to start, we had a lot of trouble running it. And I think in retrospect, we probably didn't learn a lot more on that than we did on the engine, the engine was easier to start than the turbo pump stand. So that was the only involvement I had at Santa Susana on the Shuttle program. And of course I was not stationed up here at the time, I was at Canoga Park.

We had an incident out at CTL-4 that killed a couple guys, but I suspect I should not discuss that. I was assigned to the investigating committee, and it wasn't a lot of fun. They only had a couple accidents up here where there were fatalities. There was one on the road between Area 1 and Area 2. I knew the guy that was killed, but a car drifted over the center-line, and it was a head-on. Had nothing to do with the testing, or anything like that. I remember the CTL-4 incident just because it was just a difficult - it was difficult for me because - enough about that.

We had a sodium pumping test going out here right at the entrance to the gate. Where the road turns in to here, there was a facility there.

FERRY: Going back to when you first started here, and you were “in an engineer’s playground,” how did it feel to be part of that during the Cold War, also?

EDDY: I loved it. I was glad to be a part of it. It was another reason, of course, that I took the job down here was – and I didn’t know where I was going to be with North American, all I knew was I’d been hired by North American. This was only 50 miles from where I grew up, so I wasn’t far from home. I wasn’t married. It worked out great for me. Graduating from the University of Idaho, I don’t know if you’re familiar with the area, but it’s in the northern part of Idaho, and it’s in a very rural area. There weren’t a lot of jobs available for mechanical engineers up there. My roommate went to work for Kaiser Aluminum in Spokane, and did quite well with them, but that was – there wasn’t much up there, there wasn’t much around. It was interesting; it was a period of time when the engineers were in high demand. They needed engineers in the various aerospace industries, and we graduated 21 mechanical engineers in my graduating class. And there were probably 50 companies that came through Moscow, Idaho, wanting engineers, and everybody had two, three, four job offers. It was really a great time to get out of school.

You’re primarily interested in Santa Susana, aren’t you? And the activity up here?

MANES: I mean, the thing we’re putting together, as far as the video, is kind of a little historical background about Santa Susana, and some of those.

EDDY: Yeah.

MANES: I guess, adding on to her question, but was there a general realization and feeling of all the things that you were working on in kind of the larger context? Was that feeling every day, with you guys?

EDDY: Yeah, I think so. And the community was with us. There was a great deal of animosity towards the aerospace industry at the end 60s. And that was just about the time that Vietnam was starting to cook. In the early going, when we were testing two shifts a day, the people in the valley loved to hear the roar of the rocket engines. Because depending on the cloud cover, we could really rattle the dishes down in the valley. Eventually, people started grumbling about being woken up at night with the engine testing. So gradually we deferred to testing during the daylight. And then, as the Air Force programs ran out, there were fewer and fewer of the engine test stands firing – firing complete engines.

I think that the Bowl Area had a couple of engine stands, and a thrust chamber stand. The Bowl Area was the first area built up here. And those test stands ultimately converted to J-2 engines, which was the upper stage of the Saturn V, the moon launch vehicle. We tested the F-1 engine components, turbo pumps tested over in Bravo 2, the engines tested out at Edwards, because they were much too high a thrust for – and too noisy – for this area. And I think there was only one – maybe there were two J-2 stands, I think they were both in the Bowl Area. I'm trying to go through Alpha, Bravo, Delta - Delta had three stands. I don't know that any one of those stands was testing the Thor engines. I just don't remember. And then of course Coca was testing the Atlas, full Atlas engines, with the booster and sustainer firing at the same time.

Now that I'm talking 50s and early 60s now, as things died down, then the Shuttle became the big program for Rocketdyne. Although, we had a number of small engine programs,

and small engines were tested in the CTL-3, CTL-4, and I think CTL-5. CTL-5 I think was a hydrogen pump facility, and it was down just past the CTL-1 at the bottom of the road here, on the back road that goes over to Coca Area.

I don't know whether you guys have had a chance to roam around on some of these back roads, but they're interesting.

FERRY: I got the quick tour, the 15-minute tour.

EDDY: [Laughter] Well you didn't see everything then. But a lot of it's gone. When the stands were being dismantled, the rumor had it – although I didn't know this for a fact – that the scrap metal was being sold to Japan. And it could easily have been going over there. But aerospace declined in the late 60s.

FERRY: You mentioned a couple of the tragedies that happened out here, but do you have any memories that you'd like to share of outstanding moments or events that stuck with you?

EDDY: It's hard to think of the individual accomplishments where everybody jumped and down and cheered. We did test an experimental engine in the Alpha Area that was throttled. It was the first engine that was throttled from a low thrust to a high thrust. And I think von Braun was here to witness that. But at my desk, did I jump up and down and cheer? No, I heard about it later. But I think that – I was up here when the Soviets put their first man in space. Of course, I remember where I was living at the time, going out in the front yard to see that thing go over. And then we launched one not too long after that. I think it was a Jupiter engine, it might have been a – my memory is starting to fade on me. Anyways, that was pretty exciting. Everybody felt like they were a part of that, it was our engines.

The later launches, I'm sure I was up here for some of the early launches, but I just don't remember. From my standpoint, as soon as the engine shut down, I lost interest in the launch. My interest was I wanted to see the engine run for its full duration in any launch. Traditionally, once the vehicle got out of sight, everybody says, "Oh, it's a successful launch." Well, the engines are still burning. And you don't know whether it's successful until the engines have shut down, and the beast got in orbit, or whatever the mission was, was completed.

FERRY: So did you watch a lot of tests?

EDDY: Oh yeah. You pretty much knew when there was going to be a test, and so you could catch the shuttle bus, and go over and watch it. There was a lot of downtime between tests, because you had to digest the data, and it was all done by hand. I mentioned the Direct Inking Graphic Recorders, they were round charts like this, and they had a needle that the chart would turn, and the needle would record the data. Well, then you had to take all of that off, you took a stack of charts back up to the engineering building, and the data clerks then had to reduce that data. They had to plot the data versus time, and they had to take the calibration on the charts, and convert it to the pressure temperature measurements. And there was an army of data clerks up here that worked that data for the engineers. I think every engineer had at least one data clerk assigned to him. Him or her, we didn't have many lady engineers at that point in time. And they were pretty fast, they used a Friden calculator, and oh boy could they make those things hum. And then we had to look at the data. Well it took a day or two to do that data processing, and then the engineers had to look at it and decide - well did you hit the point you were looking for? And if not, how do you adjust it to come in closer to your design point on your test?

So the engineering building down here was a temporary wooden structure. I don't think it was air-conditioned. And we sat out on a - they had a porch that was added to it, and I was out on that porch for a while. I remember the first summer here, I came here they offered me a job out at Edward's Air Force Base. And I said "Oh no. I know this area, I know the desert, I know it's hot out there, I don't want to go out there." Well, that particular summer it got to be 125 (°F) up here. And people were going to the desert to cool off. We had a test facility out at Edwards we were testing; we had a rocket sled out there. And anyway, I stayed here.

FERRY: Your desk was out on the porch?

EDDY: Well, yeah, it was just a - I don't know how to describe it. They were temporary wooden buildings, like you would see on an Army base. And all of the engineers that supported Area 1 were in that building. And then there was a research building just to the east of us; there was a research building. And the research guys were there, and most of their testing was done up in - I'll call it the Research Area. As you started down the hill to CTL-1, a road took off on the left, and there were a lot of small laboratories up that road, that were run by the research people. They had an accident up there that wasn't too long ago, 15, maybe 20 years ago. But I didn't have much to do with it, except it was a shortcut if I had to go up to the Tree Area. There were two ways to get to the Tree Area, you walked, or you could ride the bus. Well, if the bus wasn't running at night, if you walked down the road to CTL-1 then you had to climb that big hill up to the Tree Area. But, you could start up here in the Research Area and walk flat ground over to the Tree Area. Well that's the way I always got there. I'm trying to think - it was a great time for me.

God really blessed me with the job assignments that I had, and they were interesting, and they were important to people. There's nothing like working a job that nobody cares about. The country and the government were very much behind us in the initial going. I think it wasn't until Vietnam started up that the love for the aerospace industry sort of died out. Because we were making weapons, and there was a great anti-war movement in that period of time. I don't know, have I burned up my hour? [laughter].

FERRY: I want to check and see if you want to add any additional questions, Lori?

MANES: I don't think so; I think we did pretty good.

FERRY: Yeah, I think that's all really great information.

EDDY: Well you know, I – coming up that road, I drove a Model A then. I had a Model A as a second car, and I drove it up here, believe it or not. And I drove it up and down the hill, and I could keep up with the traffic as long as I was in first gear. But if I had to drop down into second gear, that car wouldn't go more than 5 or 10 miles an hour in second gear, and I couldn't get it going fast enough to drop it back into first. I did have an interesting experience with it one night. We were working second shift, and we usually didn't get off until 2 or 3 in the morning. And I drove down the hill with the Model A, and I got to the bottom of the hill, and I made the right turn there to go around the lake. There was a lake there then, but it's not there now. Anyway, I took a right turn at the bottom of the hill, and the car wouldn't go. I stepped on the gas, and it wouldn't go anywhere. And I thought, "Oh boy, I busted the clutch or something." Just about that time, a friend of mine came along, and I said, "My car won't go." And he said "Well, I'll

push, I'll push you home." Well, they pushed me all the way down to where the road turns on Roscoe now. Anyway, all that area south of Roscoe was orange groves. And so I made that turn, and the right rear wheel came off. And I wound up over in the orange groves like this. And it turns out that the axle had broken. And that's why it wouldn't go at the bottom of the hill. And my friend pushed me all that distance, and probably the only thing that was keeping that wheel on was that it was running on the brake drums. The Model A didn't have disc brakes; they were the old fashioned brakes. And I've often thought about that, and thinking, "Man, I'm glad that didn't happen coming down the hill." [laughter] I would have been a bag of bones off in the canyon. Well, are we – things pop in and out of my head. It was a great career, it was a great experience. I wish every mechanical engineer could have the same experience. Every engineer, we had all kinds of engineers up here.

(End of interview)