Interview with Frank Werner

Interviewed by Ann Pflaum

Interviewed on August 31, 1999

Frank Werner - FW
Ann Pflaum - AP

AP: This is Ann Pflaum. Today is August 31, 1999. I'm interviewing Frank Werner, who was a student in Aeronautical Engineering at the University of Minnesota and became the founding engineer of Rosemount Engineering.

Frank, I'd like to ask you where you grew up and a little, quick story about how you got to the university as a graduate student.

FW: I was born in east central Kansas in a little town named Junction City, Kansas. That was near Fort Riley, which maybe is more widely known. After I got out of high school there, I went to Kansas State University, which was only twenty miles away. In those days, it was a remarkably cheap place to go and that was very important. I got started in electrical engineering and, then, changed and, finally, graduated with a degree in physics. That was during the war and I had a brand new degree in physics and the Applied Physics Laboratory of Johns Hopkins University, located in Silver Spring, Maryland, was looking for a young physicist for their serious work on proximity fuses. I got a job there, a nice job, which I enjoyed very much. As a matter of fact, that kept me from being drafted. I was drafted actually and called right back—that was fine. I worked there for four years and the war was over. By that time, I was married and had a little daughter. I wanted to go to graduate school and looked at Johns Hopkins University, which is a famous place in physics; but some friends had gone to the University of Minnesota and had gotten jobs in the Rosemount Aeronautical Lab and through those friends, I got interested and, lo and behold! I got a good job offer from John Akerman and moved out there. Is that a sufficient background for you, Ann?

AP: Right. You had four years at Johns Hopkins and you had a baccalaureate degree when you arrived then with Akerman? Is that correct?

FW: That's right.

AP: Were you affiliated with the university or only with the Applied Lab? Did you enroll as a graduate student?

FW: Yes, I enrolled as a graduate student and worked full time at the Rosemount Aeronautical Lab. John Akerman was the chief there, as well as being department head; so, it was a nice arrangement. I also did some teaching as a graduate student in the department, but almost all the time, I was working at the Aeronautical Lab.

AP: What year would that have been that you came to Minnesota then?

FW: That would be 1947, in August, I think.

AP: Then, you began working on your Ph.D. or did you start for a master's?

FW: I started with the master's and I got that finished and, then, continued.

AP: So, it was a combination of taking courses, doing some undergraduate teaching, and working full time on some projects. Was your Ph.D. dissertation related to your later work, the sensor, in Rosemount?

FW: Not particularly, just a general relationship.

AP: What year did you get your Ph.D.?

FW: In 1955.

AP: The war had just ended. The university acquired the Gopher Ordnance Works for a dollar. What was it like to move into that facility and work there? Did a lot have to be done to change it or did it fit like a glove?

FW: We didn't have a very big budget and there were buildings that were adequately suited for office and shop and lab facilities which we used. I wasn't as close to the wind tunnel operation as others. We were in a separate building. We had some small wind tunnels facilities there, but the main wind tunnel used the power plant. They had space there and didn't have to do a lot of modification. They were spaced amid the wind tunnels and air compressors already existed there. There wasn't a big capital investment to get it going, I think.

AP: I deduce from what you're saying that your part of the research, then, was a little different from the wind tunnel. The pressure sensor, which you ultimately ended up with, was a cousin to the wind tunnel? Would that be a way of describing it? Or was it unrelated completely?
FW: As a matter of fact, that was under a contract with somebody in Arizona, a big wind tunnel facility. They wanted it for precision pressure measurements in their big heavy-duty wind tunnel testing down there. My field of interest and what my little group always specialized in, we described as aeronautical instrumentation. So, we did measure pressures and temperatures and related things of that sort, but we didn't use them ourselves directly on wind tunnels. We were developing the instrumentation needed and also for aircraft.

AP: I understand that the principle of the pressure sensitizer—if I've got the right vocabulary—...

FW: The sensor, we called it, or probe, sometimes.

AP: ...is what turned out to be a major device useful in multiple ways in the space field as well as in the aeronautical field?

FW: Yes, that's generally, true, Ann. The thing called the total temperature probe is used to this day almost exactly as we first designed it. The precision pressure and temperature measuring heart of this stuff was modified this way and that way and variations were used and adapted for the specific purposes in space flights and aircraft and so on.

AP: Could you describe a little bit for a lay audience the different ways in which this general technology was used? When I talked with Vern [Heath], he was describing a use on the space suit, different aspects of the space program. He said that, at one time, he thought that there might have been on one of the launches as many as three variations of your device in space. I think that's quite an interesting story. If it's true—he said, "Please, check with Frank because he's the expert on that"—it would be very interesting to hear.

FW: I think, probably, we had even a lot more than three applications on many of the space shots and, probably, they still are—although, I've been out of touch with it for some years. There were temperature measurements on the pressurized suits that the astronauts wore. They needed to know the pressure inside their suits and the temperatures. I don't remember all of those details. But it wasn't just on that, really. Our products were more generally applied to temperatures of the fuel going into the rocket engine and to all sorts of surface temperatures...how hot is the skin and things of that sort. The pressures were also needed. We were involved in the specialized needs there.

It might interest your readers, Ann, that we made one temperature sensor, or probe as you might call it, which is probably one of the more unusual ones in the world. It was a platinum resistant thermometer using the basic principles we had developed, a very rugged version. There were three of them knotted in a slender tube of platinum. I don't remember why that was platinum, but I believe that was the case. Some one bored a hole in the surface of the moon about six feet deep. This long slender temperature sensor of ours went down the hole and stayed there after they left and its temperature measurements were telemetered back to earth. People wanted to know about the temperature variations from the surface of the moon downward. They wanted to study heat flow in and out of the moon. That was kind of a different application. It had to be very rugged to stand the flight, the shocks of landing and launching, and being packed into the surface. They wanted a very high precision, which we were able to provide.

AP: Could you describe, Frank, your basic devise, which is, still to this day, on most jet airplanes?

FW: You'd like a description of the little temperature probe?

AP: Yes, a little amplification.

FW: That thing is mounted on the lower front end of the airplane fuselage, along with other things I didn't mention, such as Rosemount's pitot, p-i-t-o-t, static tubes. These are the prongs that you can always see hanging out, like, under the chin of the airplane. As you enter the passenger door, if you look down below the door and forward, typically, there you see these things. If you enter the airplane by stairs, as we do out here in Wyoming, you see them more readily. They stick out about six inches. The centerpiece for our early business was that total temperature probe. That one sticks out about three or four inches. It's got a shell around it where the air enters on the front side and is brought to rest. That heats it up. It's called frictional heating or compression heating. That's the total temperature which we measure. We had to have the shell to bring the air to rest with the temperature sensor, more or less, in the middle of it all. Then, we had to heat that shell, so ice couldn't build up on it. We had a porous surface so that the heat didn't bother the temperature sensor in the middle. Now, I don't know if that helps your readers, but I hope it does.

AP: It does, indeed. It's, obviously, very complicated in precision.

FW: Somewhat complicated, yes.

AP: In talking with Vern... About 1956, you incorporated the company and your first offices were in a converted chicken coup, three rooms, near the Rosemount Engineering station where the labs were. That's fundamentally correct?

FW: That's right. It was in the little town of Rosemount and the laboratories were a half a mile or a mile east. Of course, it wasn't a chicken coup when we were in it. [laughter]

AP: It was a converted chicken coup.

FW: It had been, yes, converted to apartments, which were pretty usable and they hadn't rented them all, so we used three or four of them for our business for a year or so.

AP: Now, if we could figure... You and Vern were in your mid twenties at this time when you were doing this phenomenal thing?

FW: By that time—that would be 1956—I was thirty-four years old. Vern was just a kid; I don't think he was thirty yet. I still think of him as a kid, but I think he's grown up.

AP: That's a remarkable story in American industry to be able to make such an extraordinary contribution very early in your career.

FW: It's probably not unique. We were very fortunate to have a product that bigger firms didn't have. It wasn't a big enough market for them to be interested in. We weren't much bothered by competition and we were very lucky—along with having done, I think, a fairly good job—to have a need out there. Those things happen. I think luck is a big part of it.

AP: I think the precision and the reputation of the program must have been also.

I understand from Vern that the Air Force encouraged you to do this, that there was a lot of encouragement.

FW: The Air Force really wanted somebody producing these products. They didn't want to do it. They were glad to see us supply their needs.

AP: Then, the university was supportive, allowing you to work evenings and weekends? Is that correct, too?

FW: That's right.

AP: How long did you continue, then, both working as...? Were you a young faculty member by 1956?

FW: Yes, I was called a lecturer, I believe.

AP: So, you were teaching. You were building a company. You must have survived on small amounts of sleep.

FW: Not a lot of sleep. [laughter] I did a lot of work. Actually, by the time we started the company, Ann, there wasn't a great deal of overlap between the direct work and the company and the employment at the university. We got one or two full-time employees for a couple of months before I actually left the employment of the university, but that overlap period was quite short. I don't think that I failed the university while I was starting the Rosemount Engineering Company work.

AP: That's a helpful clarification because it wasn't clear how long you were struggling to do both things.

FW: I think it was only a matter of a few months. Vern would probably remember quite a bit better than me, if you will be talking to him again.

AP: He gave me a pretty accurate... He wanted me to double check. Let me go back to Akerman and [Jerry] Shepherd and the university's reputation that attracted you. What was Akerman like?

FW: Akerman was a very unusual gentleman, with a very high level of activity, very people oriented, and pretty deep into the aeronautical engineering world, of course. I would say he was a great promoter. He got a good idea about the use of the Gopher Ordnance Works facility. I don't know if he hatched that idea himself or how that came about. It was somewhat underway by the time I got there. He kept an eye on us and encouraged us and really created a wonderful atmosphere for what we wanted to do. We had to provide the initiative of finding programs, government contracts, and the like. He was always there guiding us. He gave us a wonderful opportunity. It wasn't only me. I

think you're aware that MTS and Research Incorporated started there and, then, Fluidyne Engineering Company.

AP: I was not aware of that. Those initials are MTS?

FW: A very good friend of mine, Kenneth G. Anderson, really was probably the big contact that got me there. His firm, after he left, somewhat similar to the way Rosemount started, was Research Incorporated. Then, Research Incorporated was divided into two pieces, one of which is still Research Incorporated and the other is the MTS, Materials Test Systems Corporation. That's quite a substantial firm now out in Eden Prairie.

AP: So, both of them started out of the Aeronautical Lab then?

FW: That's right—at least they had heavy-duty background there.
AP: That's helpful. Would I count the Anderson as one spin-off company or two spin-off companies?

FW: The detail, as I recall, was that he joined a firm and stayed with them and, then, split off a year or two later into Research Incorporated. Then, Research Incorporated was divided off into the MTS Corporation and Research.

AP: So, that the sentence would read that in addition to the Rosemount story, there were other spin-offs from the Rosemount Aeronautical Lab. Among them would have been Ken G. Anderson's Research Incorporated, later divided into MTS. A sentence something like that would be accurate. Is Anderson still around?

FW: I believe so. I haven't been in touch, I'm sorry to say, for a couple of years. He lives in Edina.

AP: Oh, good, I'll give him a call. Terrific.

FW: Kenneth G. Anderson... I imagine with all the Andersons there, you'll still be able to find him. I may have his number right here. Yes, I have a phone number for him if it hasn't changed: (612) 929-0723.

AP: Your comments are very helpful for the point we're trying to make for the history: the university as an incubator and encourager of businesses. So, the Rosemount story and the MTS story are, in effect, variations of the same theme of applied applications of the more basic research going on at the university.

FW: There might be another mention. I don't know how far you want to pursue that aspect, Ann; but Fluidyne, F-l-u-i-d-y-n-e, Engineering Company—I believe that's what they called it—was another outgrowth and the leader there was J. Leonard Frame, F-r-a-m-e. I don't know if it's still operating or just what the recent history is. I'm not as close to that one. I think that if you dug deeper, you might find a few more, but they don't occur to me right at the moment.

AP: That is very helpful. You mentioned Jerry Shepherd, also, as being one of your advisers. Was he your thesis adviser?

FW: No, Akerman was normally my thesis adviser. Jerry Shepherd was much heavier in the general academic world, not the entrepreneurial spirit that Akerman had, I guess. He was a very competent gentleman. When it comes thesis time and the examinations and so on, inevitably, there are things that a graduate student may need more guidance on and Jerry Shepherd did quite a bit of that with me.

AP: That's very interesting.

FW: Of course, there were other great faculty members, but those were the two I remember particularly. Is Jerry Shepherd still around? I hope.

AP: He is, indeed. He, of course, served a term as academic vice-president and in recent years, he made a remarkable contribution to the university, as a board member, helping create the Weisman Art Museum.

FW: Oh, great! Good for him.

AP: He is around and has made phenomenal contributions.

FW: Should you be in touch with him, give him my best regards, Ann.

AP: I would be happy to do that.

Are there any other courses that you remember taking, particularly at the university, outside of the sciences or outside of IT [Institute of Technology]?

FW: No. As a graduate student, you don't... Of course, I had a degree in physics so I had to have a minor in physics, which was fine. I had started in electrical engineering [EE], so I had a split minor in EE and physics. Then, of course, one needs an awful lot of math. I was trying to cover quite a few fields. But beyond the basic math courses and some good EE courses and physic courses, no other course work occurs to me.

AP: I'm thinking of writing this up for a lay audience. Is there any particular one of the numerous moon shots or space probes that would be better than others as a specific example? For example, Vern Heath said that there was a Rosemount instrument on Neil Armstrong's back when he went to the moon on July 20, 1969. Was that the first flight to the moon? I'm trying to tie it to a particular date if we can, if there was one particular time that summarizes...

FW: I think probably that was the first, but I'm afraid I can't remember that much detail. Of course, we supplied the measuring devices to the specifications. We were not in the field putting them to work on rockets or space suits or anything like that.

AP: In other words, you sent the parts to Cape Canaveral or the space people and they installed them?

FW: Yes, they took care of all of that. We agreed with them on the specs, got that all laid out, and, then, we produced them and shipped them and that was it.

AP: Right.

FW: Vern has always had a better memory than me and if he can remember some of those details, I think I would take his word for it. I do remember though that we were involved in just about everything that went up. I assume there is still quite a lot of that.

AP: Did you have the employees listening to the radio or watching television when some of those...? The whole world was watching but, here, your employees are sort of holding their breath for a very particular reason. Did you do that when those space shots went up?

FW: Yes, I believe I remember doing that. I remember worrying about a few of those things. One of our pressure instruments was absolutely essential and crucial to checking whether the rocket was leaving the atmosphere properly, whether it was pointed in the right direction basically. If that instrument failed, the flight would be aborted. We had a flaw in one of those products detected before the launch. We really caught heat on that one. We got it nicely fixed up and very quickly and understood it fully to their satisfaction and ours. That was a big attention getter.

AP: I can imagine.

FW: We did like to turn out excellent products. Sometimes, something would go wrong, but I don't know that that's a main story line.

AP: Right. The main story line is the omnipresence of the product, the success of the product. This has been exceedingly helpful, Frank. I'm just delighted that you took the time...

FW: Where will you show this story?

AP: Small pieces of it will go into the "U of M" history, assuming the editor doesn't cut them out. I will want to get your address in Wyoming. This interview will go into the archives, with your permission, so that other people in the future can turn to the interview and get background.

FW: That's fine.

AP: What is your address? I'll send you a permission form.

FW: I generally use my office address; you can have my home address if you want it.

AP: Office is just fine.

FW: It's 3975 South Highway 89, Jackson, Wyoming, 83001.

AP: Terrific. I will send you the permission form. We will keep in touch. The history is being prepared for the 150th anniversary of the University of Minnesota, which is being celebrated in 2001.

FW: Very good.

AP: The book will cover the university 1950 to 2000.

FW: Will the identity of the book be available now or you won't know exactly yet?

AP: I will keep your address and when it gets published, we would be delighted to send you a notice about it.

FW: Wonderful!

AP: Good. Thank you very much! Have a nice day. Take care.

FW: Bye.

[End of Tape 1, Side 1]

[End of the Interview]

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