Prepared remarks from Diana Webb, daughter of Dr. Harold D. Webb of the original Diana Project, for the 75th Anniversary, January 10, 2021

I appreciate the opportunity to share a few memories of my late father, Dr. Harold D. Webb, on this, the 75th anniversary of the remarkable achievement of the Diana Project. Dr. Webb was one of the first two people to hear the echo of their radar beam as it bounced back from the moon, and was a major contributor to the success of the project. I am his daughter, Diana Webb, and was proudly named after the Diana Project.

My father was a physicist who had a life-long interest in radios and astronomy. Following the completion of the Diana Project, he left New Jersey to become a Professor of Radioastronomy in the Electrical Engineering Department, University of Illinois, a position he held until his retirement.

Dad was a quiet man, and humble. He grew up on a farm in central Indiana. Even after graduating from college, he continued to do chores and milked the cows every morning before changing from his barn overalls to his suit, then headed into town to teach at the local college. He married my mother, Margaret, in 1937 and soon after received his PhD in Physics from Indiana University. He continued to teach physics and math until he was recruited to join the Army Signal Corps in the early '40's and joined the Diana Project team at Camp Evans as a civilian scientist.

Growing up on the farm, Dad had lots of time to observe things around him. He read about the radio pioneer Marconi and built his own radio out in the barn. He would skip

stones across the little pond in "the back forty," near the railroad track, and listened to the train whistles as the long freight trains passed by the farm. Later, he would tell me, these experiences came to mind while he was working on the Diana Project, and helped turn the project from potential failure to an astounding success.

Why? Well, Dad explained it to me this way.

Dad felt that two of his most significant contributions to the Diana Project were his idea that the shot should be conducted at moonrise, and his calculations regarding the Doppler effect on the radar beam.

Dad realized that, like the train whistle changing its musical note as it passed the farm, any attempt to bounce a radio beam off of an object as far away as the moon would have to take into account the fact that the beam would change frequencies as it travelled all the way to the moon, hit it, and travelled all the way back. This change in frequency over time, called the Doppler effect, is why a train whistle appears to change pitch as it gets farther away. The Doppler effect had to be taken into account and precisely calculated for the Diana Project, or else the men sitting at the radio receiver would not know what frequency to tune their apparatus in order to receive the echo, if they were to hear it at all. "Simple physics," Dad would say with a grin.

Dad also made a major contribution by determining which way to point their large, awkward "box spring" antenna, the big square antenna that is now the visual icon for the Diana Project. He told me that at first, they were trying to point the antenna at the

moon when it was overhead, but they were not having any success in getting their radio beam to penetrate the outer limits of the Earth's atmosphere and come back to Earth. Some people, he told me, "pooh-poohed" the idea that a radio beam could even make it out of the prison of the Earth's atmosphere. But he remembered, as a boy, how he had skipped stones across the pond at the farm, and suggested that they try contacting the moon at moonrise, just when the moon came up over the Atlantic ocean. That way, he explained to me, they could "skip" the beam at a low angle, and take advantage of the greater antenna gain over the surface of the ocean, to make it past the Earth's ionosphere. Dad's knowledge of how to construct a radio also came in handy as he helped fine-tune the equipment allotted to the Diana Project.

By late 1945, the Diana Project was foundering. No success had been made in reaching the moon with their radar beam, and some of the project leaders began to talk of giving up or trying a different type of equipment. Dad suggested to the project leader, Col. DeWitt, that they should try the antenna pointed at a lower angle, and DeWitt gave him one week to try out his new idea.

After they adjusted the antenna, Dad kept his notes of the new attempts in a little "Pocket Secretary" notepad, with a maroon and white cover, designed to slip into the inner pocket of a man's suit jacket. Dad started his notes in his new notepad on the morning of January 10, 1946, the third day of their week-long attempt after adjusting the angle of the antenna. Dad and Mr. Kaufman were the only two in the room with the radio receiver that day. "Moon Data," the first line on the notepad reads, in Dad's familiar scrawl. "Moon rise Jan. 10 – 11:48," is the first entry. "Heard echo at 11:58 & 12:09. Audible only." Not quite sure of what they heard, they wanted visual

confirmation of the echo on their oscilloscope, but didn't see it. The next day they tried again: "Moon rise Jan. 11 – Heard & saw echo at 10 & 20 min. after moon-rise." Now they could see the tell-tale "blip" of the screen; now they knew for sure that they had contacted the moon.

Dad described the event like this, in a little write-up he prepared shortly after the event. "We Saw the Moon by Radar," he titled it.

> "It was at 11:58 a.m., Jan. 10, 1946, just ten minutes after moonrise. I had been watching the oscilloscope connected to our special radar for some 30 minutes or more, and felt somewhat drowsy from the monotony of the clashing relays and the faintly audible noise coming out of the loudspeaker connected across our oscilloscope. Suddenly, Mr. Herbert Kaufman, a co-worker on the project, came running into the room and said excitedly, "Did you hear that?" He then turned up the speaker gain, and we both listened to a series of audible notes indicating echoes from the moon of pulses of radio frequency energy that we had aimed in that direction.
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> "This was a moment of triumph. For several months we and other army officers and engineers had been working on this experiment, but never before had any of us been sure that we had previously received echoes from the moon. We knew that this was the real thing.
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> "We decided to not tell others about our success. We were sure that we had succeeded, but there was some fear that something else might have caused the

audible notes, because the notes didn't seem to have the proper pitch, and because the signal was audible only, while we expected to see it on the oscilloscope. Mr. Kaufmann did tell his supervisor, however, and I told Mr. Mofsenson who was also working on our project.

"We were ready with enthusiasm at moonrise on Jan. 11. Mr. Mofsenson and three other persons were present besides Mr. Kauffman and I. I was working with an adjustment that previously we had not been sure of, just a few minutes after moonrise. Then suddenly we received several quite strong echoes both audibly and visually. It was ten minutes after moonrise. About twenty minutes after moonrise we received a series of several more echoes from the moon. Now everyone one present were sure that the experiment was successful."

And so, history was made.

So what was life at the Webb household like, that January, 75 years ago? Dad was 36 years old and Mom a few years younger. They lived in a two-story frame house with a big front porch in Belmar NJ, on H Street, near the Shark River. (The house is still there.) While Dad was busy trying to contact the moon, Mom was busy at home. They had three little kids then: my brother Steve, age 7; my sister Pat, about to turn 6; and my sister Sharon, who was about to be two. (I wasn't born yet.) In a letter she wrote to her brother that January, Mom spoke of making Patty a new dress, and taking all three kids to a birthday party for Cynthia and Leslie Stodola ("Elsie had lunch and ice cream and cake for all of them."). The week of the historic moon shot, all three Webb kids had chicken pox, "… so I've been pretty busy," she wrote to her parents. She discussed the

pox, the weather (rain and snow), the kid's Christmas presents, and at the end of the letter, a brief mention that Dad had been out to Camp Evans. "They have been working on a special project," she wrote, "that may be in the news some of these days. You might see something about it." That "special project," as we now know, was the Diana Project – the beginning of the space age.

Dad and the other men became famous for a while. They had to sign a notarized affidavit that they did, in fact, contact the moon by radar. No fake news here. The Diana Project made headlines in all the major newspapers of the day, was written up in magazines, became part of the popular culture of the day, was used to sell Pepsi and other products, and was featured in a Newsreel shown at movie theaters across the country – the way that people then got to see national news events in those days before television. The newspapers printed front-page drawings of Buck-Rogers-style spaceships going to the moon. Dad was even featured in a science-themed comic book.

My sister Pat, though, saw it differently. Knowing nothing of world events, but knowing everything a first-grader knows, she remembers asking our Dad about the Diana Project. Then almost 6 years old, she knew that Daddy had done something, because people kept talking about it, so she asked him what he did. "I bounced a radio beam off the moon," she remembers him telling her. "Why did you do that, Daddy?" she asked. Sparing her the astronomical details about ascertaining the exact distance of the moon from Earth, he answered, "To find out where it is." "Daddy, I know where it is!" she said indignantly, thinking that this was a stupid project for a bunch of grown men to be working on. Didn't everybody know where the moon was? "Just go outside and look up!"

The Diana Project became part of our family history; we were steeped in the details, the names, the places, the mythology behind the name. I was born in September of that year, and my parents named me "Diana" after the project that had been Dad's focus for all those months. I grew up knowing all about the Roman goddess Diana, Goddess of the Moon, and all about the moon – my moon – that had brought my Dad some degree of fame. I am glad that ISEC and InfoAge have rekindled the public interest in this project, and that all the people who worked on the Diana Project can be rightfully remembered as contributing in a meaningful way to the beginning of space exploration as we know it today. I still feel a strong attachment to the moon, and even today, now that I am almost 75 years old, when I see the full moon I think of my Dad, and say to myself, "Hi Moon! Dad touched you first."