

One small step... 40 years ago

Boeing engineer talks with Apollo veterans about moon mission



PHOTOS: (ABOVE) Astronaut Edwin E. "Buzz" Aldrin Jr., Lunar Module (LM) pilot for the first lunar landing mission, is shown on the LM footpad during an Apollo 11 extravehicular activity on the lunar surface. He and astronaut Neil A. Armstrong, commander, descended in the LM *Eagle* to explore the Sea of Tranquility region of the moon while astronaut Michael Collins, Command Module pilot, remained with the *Columbia* Command and Service modules in lunar orbit. **(INSET)** A close-up view of an astronaut's boot-print in the lunar soil. NASA

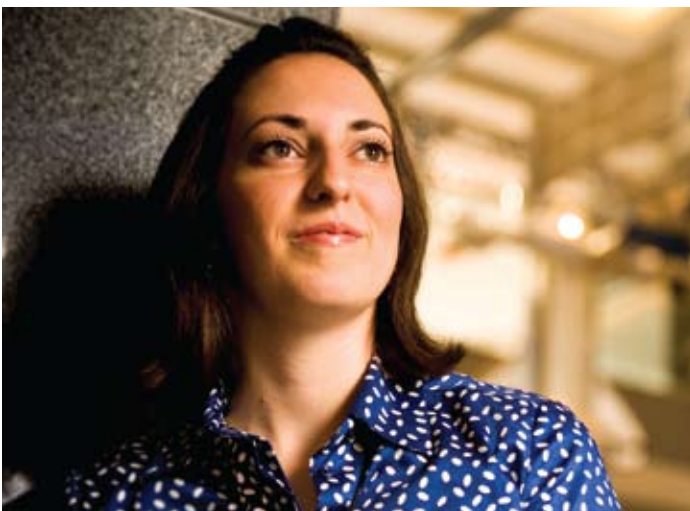
By Melissa Mathews

When Neil Armstrong first set foot on the moon—40 years ago this summer on the Apollo 11 mission—it was a crowning achievement, and one that would not have been possible without The Boeing Company. Boeing and its heritage firms built nearly every major component that went into that "one small step."

In the words of Robert Gilruth, who then directed NASA's Manned Spacecraft Center, Apollo required "the kind of people who will not permit it to fail." (See related story on Mercury program, Page 8.)

At Cape Kennedy (as NASA's Kennedy Space Center, Fla., was then known), two newly hired Boeing employees were

among those who accepted Gilruth's challenge. Norm Buchert took his first job out of engineering school with the space program, and Susan Floyd—just 17 years old when she joined the Gemini and Apollo efforts as a scheduler and data processor—was so inspired by her experiences that she went on to earn multiple degrees in computer science and engineering. Both still work for Boeing: Buchert as Boeing's director of Advanced Engineering for Florida Space Shuttle Operations and Floyd as senior manager of Systems Engineering. Recently, they shared their experiences with Natalie Dixon, a Boeing structural engineer who's working on the International Space Station program, as NASA once again eyes the moon.



PHOTOS: (TOP) Boeing space shuttle engineers and Apollo veterans Norm Buchert and Susan Floyd hold Buchert's Apollo Firing Room jacket from the Saturn rocket days. **INDYNE (ABOVE)** Boeing International Space Station engineer Natalie Dixon, who interviewed Buchert and Floyd. **BOB FERGUSON/BOEING (RIGHT)** Apollo 11 is launched from Kennedy Space Center on July 16, 1969. **NASA**

How did you come to work on the space program?

Buchert: I had been through five years of engineering school, but had no clue what being an aerospace engineer was all about. I took a summer job as a contractor at Kennedy Space Center, then in 1967 I was hired by North American Aviation [now part of Boeing] to work on the second stage of the Saturn V rocket as a radio-frequency and telemetry engineer.

I was hired on in the morning, and that evening NASA had the Apollo 1 fire, which killed three astronauts training for the first crewed Apollo mission. That shut the program down for about a year. From a new-hire standpoint, that gave me time to learn my new job.

Floyd: My father was the head of aircraft operations for NASA and I became interested in what was going on. I watched Mercury and Gemini and thought, yep, I want to be part of this. This is too good.

In 1966, I went to work for Douglas [now part of Boeing], as

a data entry operator on the third stage of the Saturn V rocket. I supported hands-on engineering in a data entry role and reviewed engineering documents. I also met my husband, an electrical engineer and the only single man in that office. I got very interested in engineering and determined I was going to do that.

What's it like to watch Saturn V launch, compared with the space shuttle?

Buchert: If you look at the Saturn rocket, it looks like a skyscraper. You think, there is no way that vehicle is going to fly.

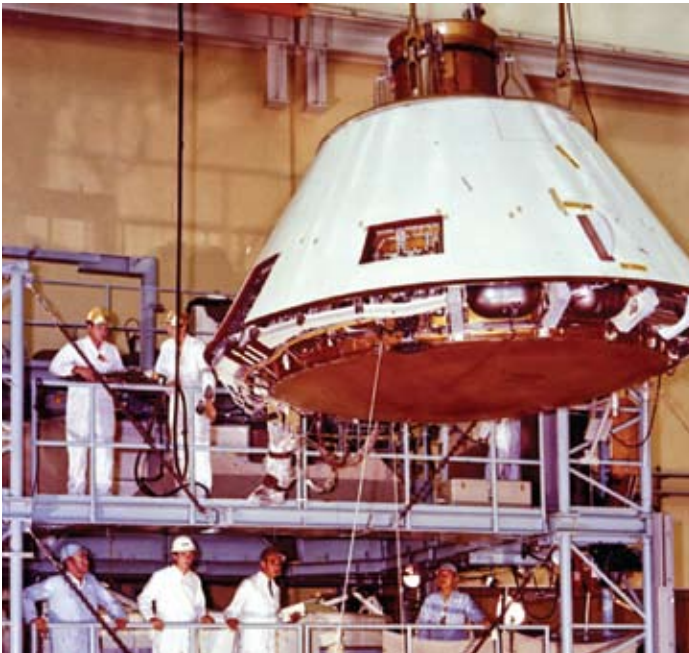
Floyd: My sentiments exactly.

Buchert: When it lights, it sort of sits there and rumbles and grumbles and shakes. When it's going up, you start to hear the extreme staccato, the pulsing. ...

Floyd: You're thinking: C'mon, c'mon, you can do it.

What are your memories of Apollo 11?

Floyd: I was at home on maternity leave, lying on the couch



PHOTOS: (TOP) A special Boeing team, at what is now called Kennedy Space Center, monitored launch preparations for Apollo around the clock, ready to react should any emergency arise. **(ABOVE)** Work on Apollo began in the early 1960s. Boeing heritage company North American Aviation assembled the Command and Service modules at its Downey, Calif., plant, with astronauts dropping by to assist with cockpit design and component testing. A separate NAA facility at Seal Beach, Calif., manufactured the Saturn second stage. **BOEING ARCHIVES**

watching every minute of it while my husband was at Mission Control in Houston. It still makes me cry today. It was so exciting and so unbelievable that we were able to do it. There was such a can-do attitude. ... Nothing we couldn't accomplish.

Buchert: My work group was responsible for all the data for the Saturn V second stage. One of my jobs was to be on the console in the "firing room" for launch. Suddenly, we had a loss of data synchronization—we lost data.

I was somehow chosen to go to the launch pad at night to climb inside the inter-stage of the fully tanked fueled vehicle to pull out one of the black boxes to remove and replace. It was almost like a day in Hades. Hydrogen was venting to the burn pond—and when hydrogen gas from a Saturn vehicle vents, it's not minor. The vehicle was groaning. It was alive.

By that point in the launch sequence, all of the protective platforms had been removed. We had no tethers. ...

Floyd: Oh, they'd never let you do that today!

Buchert: But the intensity to launch was so great. Nothing was going to stop it.

For the Apollo 11 launch, there were 450 of us in the firing room. All of the contractors were given "ice cream" jackets [similar to the shirts worn by ice cream vendors in the 1950s and '60s] to identify us. We joked a lot about those jackets. I still have mine! And my skinny tie. ...

Since I worked on the rocket, once the second stage burned at launch for about six and a half minutes, our job was over. There was a great sense of relief. We were all glued to our TVs for the moon landing, of course, but my team had already celebrated.

Norm mentioned his experience changing out the data box. What are some other differences between then and now?

Floyd: Early on in Apollo, when I was working on the Saturn V third stage, our procedures were not nearly as strict as they are today. We were allowed to use a lot more ingenuity. Once on the late shift, we encountered a problem trying to run a test. The engineer working the problem needed an adhesive material, and he couldn't find any. So he used bubble gum. Today, we'd never be allowed to use bubble gum.

Buchert: Back then, you never heard the word "budget." It was never a consideration. It was all about schedule and safety. We didn't think about 10-hour workdays—that was normal—or working six or seven days a week. The message was, "Get the job done, and get it right."

What has it meant for you to work on the space program for Boeing?

Buchert: In my office on the front door, I have the decal that says, "If it ain't Boeing I ain't going." Looking back and seeing what Boeing did, and the importance of buying into a vibrant space business—that's something that no one else can match.

Floyd: I am a space girl and moved where the contract went. When I told my dad I was going to work for Boeing—he was a World War II pilot and knew their planes—he said, "Girl, you finally got it right!" ■

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Apollo up close

“Apollo taught us that if you dream something and you’ve got enough people with the desire, talent and can-do attitude, you can make it happen.”

– Mike Lombardi, Boeing historian

Apollo 11 was the fifth crewed mission of the Apollo Program, the third human voyage to the moon and the first to land. Astronauts Neil A. Armstrong and Edwin E. “Buzz” Aldrin Jr. set foot on the lunar surface July 20, 1969, while crewmate Michael Collins piloted the North American Aviation–built Command Module from the moon’s orbit.

Boeing built the first-stage of the mammoth Saturn V rocket that launched the Apollo astronauts in New Orleans. The second and third stages were built by heritage companies North American Aviation and McDonnell Douglas in California. The three stages were shipped to Florida to be joined.

Along with all three stages of the Saturn V, Boeing and its heritage firms also built the robotic probes that preceded the manned missions, the Apollo Command and Service modules, as well as the lunar rovers that helped astronauts travel on the moon’s surface.

Now that NASA is making plans to return humans to the moon, it is relying on the kind of expertise Boeing brings from Apollo and its successor spaceflight programs, such as the Space Shuttle. Boeing already has been chosen to build the upper stage and complex avionics of the Ares I, the rocket planned to carry astronauts back to the moon as part of the next-generation Constellation Program.

As Boeing historian Mike Lombardi said, “Apollo taught us that if you dream something and you’ve got enough people with the desire, talent and can-do attitude, you can make it happen. That’s what Apollo was all about, and I think that’s what Boeing is all about.”

PHOTO: Boeing, McDonnell Douglas and North American Aviation collaborated on the 363-foot- (111-meter-) tall Saturn V rocket that propelled the Apollo spacecraft to the moon in 1969. BOEING

