
Biography of Robert (Bob) Elliot

Began modeling in 1932

Compiled by JF (9/04), Updated and edited by JS (10/07)

The following is an autobiography by Bob Elliot

Biography of Bob Elliot

I started building model airplanes in 1932 at the age of ten. I first made solid models, but soon became more interested in flying models. What inspired my interest in aviation was Lindberg's flight to Paris; at age five, I listened to the report of his landing at Paris on an early General Electric radio.

The local YMCA offered a model airplane class in the early 1930s where I learned how to build flying models. It was in these formative years that various small built-up models were offered at gas stations, on cereal boxes, and other places. I do not remember all the models that I made, but I remember a *Wakefield* by Dick Korda that taught me a great deal about constructing rubber-powered models.

After graduating from high school in 1940, I took a job with General Electric (GE) in Pittsfield, Massachusetts. I entered the apprentice course to learn mechanical and electrical drafting. I graduated in August of 1943 as journeyman drafter.

During my training at GE, I became acquainted with Dean Haywood. We built similar models. One I particularly remember was a flying wing that was very unstable. We also went to the top of Mount Greylock in western Massachusetts and threw some planes from the cliff, which did not do the planes any good. In the early 1940s, I was able to purchase a Carl Goldberg *Sailplane*, which will be covered later.

While in the apprentice course, I was given a deferment from the draft. In 1943, an Army representative came to the area, seeking candidates for the Army Specialized Training Program (ASTP). In this program, I eventually was sent to college to become a Mechanical Engineer. After an IQ test and other exams, I became qualified. I tried to get a dismissal of the deferment. After a difficult time, I was able to get the dismissal. I resigned from GE and volunteered for the draft.

I built models almost continuously until I entered the Army on October 28, 1943 at Fort Devens, Massachusetts. After some tests I was assigned to the ASTP. I was sent to Fort Benning, Georgia for my first Basic Training. At the end of Basic, the ASTP was disbanded and we all were sent to infantry divisions. I was sent to the 87th Infantry Division at Fort Jackson, South Carolina. Since we were replacements for those who were sent to other divisions in Europe, I went through my second Basic Training. During the last 10-mile march, due to my Captain's failure to follow orders not to double time, we were ordered to double time in sand. As a result, I broke two bones in the metatarsal arch in my left foot and went to a hospital for some weeks. This is more commonly called a "march fracture."

It was during my stay in the hospital that my name was listed as a replacement to Europe, but since I was in a hospital, my name was removed. When I returned to the 87th, I went through my third Basic Training, after which the division was sent to Europe. I crossed the Atlantic Ocean on the *Queen Elizabeth*. After a few weeks in England, we were sent across the English Channel to France, landing at the port of Le Harve.

I served in combat in France, Luxemburg, Belgium, and Germany, for which I was awarded three battle stars and the Combat Infantry badge. When the European campaign was over, we returned to the states and were given a 30-day en route furlough. I was sent to Fort Devens, then went home to be with my family in Pittsfield.

During the 30 days, I built and flew the Goldberg Sailplane with great success. That was my first real experience in flying Free Flight. I returned to Fort Devens on the day after the Japanese surrendered, and was then sent to Fort Benning again. After a short time, the 87th Division was among the first to be disbanded.

After that, I returned to Fort Devens, where I served as a Finance Clerk until I was discharged in March of 1946. I returned to work at GE. While there, my friend Dean Haywood persuaded me to study at Rensselaer Polytechnic Institute (RPI) in Troy, New York.

I graduated in January of 1950 as an Electrical Engineer and returned to GE as an Electric Design and Development Engineer. I worked on an original design and was awarded a patent (with others) on a solid-state control for feeder voltage regulators. I also designed a transistorized control for light dimmers. I studied electronics and devoted myself to becoming an Electronic Engineer. At RPI, no electronics engineering courses were specifically offered and transistors were invented while I was in college.

While at GE, I also worked on a shipboard gun fire control system. My assignment was to be a vendor liaison on a linkage computer. Another project was leading a team to locate a radar target for calibrating the gun fire control.

Between 1950 and 1959, I flew Control Line and early Radio Control models. I helped form the Pittsfield Flying Maniacs and I served as treasurer. I was Contest Director for a contest held at the Pittsfield airport. Events were general, but I cannot recall the specifics events. I also helped with a contest held near Little Falls, New York and was director of the Radio Control event in an area contest held in Burlington, Vermont.

I attended some DCRC (District of Columbia Radio Control Club) Symposiums held at the Johns Hopkins Research Center. At the last one I attended, I demonstrated a crude version of a servo circuit that was triggered by a relay circuit. To my knowledge, it was the first of its kind. I think it was not viewed as worth any acceptance, but was an early model of the type of servo trigger (Schmidt Trigger) action that became the accepted servo drive action. These experiments were trigger by Al Doig's Ulti Multi system published in a model magazine.

In 1959, I was offered a job in California working on the *B70* at Autonetics in Downey. The *B70* was scratched, so I was assigned to the *Minute Man II ICBM* project as the engineer in charge of solid-state components in the Inertial Navigation section. My real career took off.

I worked with the Fairchild Semiconductor Corporation in Mountain View, California on the application of silicon transistors. These contributed to an increase in the reliability of the *MMII* missile and all subsequent electronics. This plant was located at Mountain View, California in the area, which eventually became known as Silicon Valley.

In the time I was there, I was assigned to be on the committee to select the manufacture of what was the first large contract for Integrated Circuits. While on this committee, I became acquainted with the two inventors of ICs, Robert Noyce and Jack Kilby. The contract was awarded to Texas Instruments in Dallas, Texas. I wrote the first purchase specifications for all of the linear ICs. I also wrote specifications for a powered Darlington, which I personally awarded to RCA. These were used by the Inertial Navigation Section at Autonetics in *Minute Man II*.

This experience helped me in designing Radio Control components and systems since I knew the construction and physical structure of ICs. In the first ICs, they did not yet produce them with NPN and PNP transistors on one chip. This provided me with experience with integration. The circuit for the three-wire servo was designed to make it easy. The chip for it was later made for EK Products by Texas Instruments.

During my time at Autonetics, I also worked in the evenings for Howard Bonner, who was interested in making a solid-state circuit for his Duramite Servo. This was in the days when resonant reed decoding required several mechanical relays. A four-channel radio required eight relays. They required frequent cleaning of the contacts and often caused failure of the system. Since there were two relays per channel, failures were too common.

One evening, Howard called me and said he had heard that someone on the east coast developed a circuit that did not require a split reed bank. I sat down that evening, and believe it or not, I phoned him 2 ½ hours later and told him that I had it. This circuit later became the Transmite Servo. I believe this invention increased reliability and reduced the incident of crashes of Radio Control airplanes by a factor of 10 or more.

The rumor about the east coast circuit was later found to be false. Another demonstration of the old saying that "necessity is the mother of invention."

For the work on the Transmite Servo, I was given a trip to London, England to a Radio Control contest. While there, we were privileged to be shown by some English modelers a movie of outtakes of the film *Battle of Britain*. These modelers participated in making the movie by building and flying the airplanes for action photographs of the air war. While in England, I met Henry Nichols, quite memorable man. Maybe some may remember him.

While I lived in California, I belonged to the LARKS, a Los Angeles Radio Control club. A little later, Howard Bonner purchased a transmitter-encoding and receiver-decoding method and circuit. I was approached by Howard, who offered me the job of designing the whole Radio

Control system at his plant in Culver City, California. Actually, I worked for him in secret at a different location days and evenings for several months. Working sixteen-hour days, I became sick and was ordered by my doctor to do something to reduce the pressure or I would have a nervous breakdown.

I left Bonner in 1963, and after a period of rest, took a job writing reliability analysis of electronic components in the third stage of the Saturn rocket. This experience helped me in designing Radio Control transmitters, receivers, and especially, servos.

Sometime around this time, I made a presentation at a DCRC Symposium. I do not remember the year. The subject, I believe, was solid-state servo circuits. Maybe someone can give me more information. I could be mistaken. I also had an article printed by a Radio Control magazine, but I again do not remember when, nor which magazine it was.

I had designed a Radio Control system of my own not related to Bonner's system. This system was the one that eventually became EK Logictrol and probably the standard of transmission and receiving. The servos had (roughly) the circuit introduced by Spring and Mathis that led us into the digital era.

While working on the Saturn rocket, a fellow named Jerry Krause came to work, from Tulsa I believe. I had improved the Digicon servo circuit by replacing the heavy transformer by a transistor logic circuit. Jerry became interested in seeing how my system would perform. He flew it and liked it enough to offer to form a company to make 100 systems. That was the birth of EK Logictrol in 1974.

During the second year, we introduced Logictrol II, which was a revolution in Radio Control. It had a single-deck receiver with a circuit that ignored spikes and noise pulses, which greatly improved reliability. During this early period of Radio Control, a controversy arose over feedback components between various manufactures. One tried capacitor feedback (Kraft), another introduced inductive (F&M), but I stuck to variable resistor feedback. The resistor type won out and became the standard for that time.

The capacitor and inductor feedback was bulky and heavy. I knew that we were on a course to reducing weight and size of servos, which the resistor feedback provided. Logictrol 3 was later introduced, which had plug-in servos and Integrated Circuits in the receiver.

About this time, I invented the three-wire servo, which extended the use of Nickel Cadmium batteries during flight. It eliminated the center tap battery and the automatic crash when one cell went dead. Airplanes could fly for some time with one dying cell. Usually the plane would give a warning when a cell was failing by shifting trim. This gave the pilot a chance to land the plane. This greatly improved reliability.

The servo circuit was designed to make it easy to integrate, shrinking the complexity of the servo circuit. Texas Instruments made an IC for EK Logictrol. Integration improved the reliability of our Logictrol radio. The original IC was made for me by Texas Instruments and made available to others.

While I had my plant in Texas, my dear friend and roommate at college, Dean Haywood, was killed in an airplane accident at the Albany, New York airport. I flew in a sailplane contest in Pittsfield, and while there, I worked to establish a trophy to be awarded in honor of Dean.

During these years, and many more until the 1990s, I flew in Sailplanes and Scale Sailplane competitions. I won some local contests and placed in many others. I won two National Scale Sailplane events. One was at the 44th AMA Nats in Lake Charles, Louisiana in August of 1975. The other was the August of 1978 Canadian Nationals in Winnipeg, Manitoba. I had to give up Sailplane competition when my legs gave out. The Scale Sailplane was a *Glasfugal 604*.

I continued to own EK-Logictrol until late 1979, when we could not resolve a problem with Customs in Brownsville, Texas. I was sorry to see it go. My first job in 1980 was with E Systems in Arlington, Texas, working on failure reporting on a new mail-sorting machine. Later I went to work at Motorola in Fort Worth, doing reliability and failure reports on mobile radios.

Next, I worked at a company that produced electronic surveillance systems for reporting the presence of any radio signal or any vehicle. I did reliability analysis on the electronics. I moved on to Bell Helicopters, working on reliability and failure analysis on then new *Super Cobra*.

I resigned from Bell and went job shopping. My first assignment was at General Dynamics in Fort Worth, doing reliability reports, electronic circuit tests, and repair on the *F16*. I then went to Westinghouse at Hunts Valley, Maryland, working on failure reports on the *FB222*.

I retired in 1986 but continued to compete in Sailplane contests until my health became a factor in the late 1980s. I now live in living in a retirement community but I still build model airplanes.

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