James Alvin "Al" Shaffer

By Vaughan Askue

[Editor's note: We often read about the lives of the pilots and crewmembers associated with aviation, but seldom about the journeymen engineers that help create the aircraft systems that these crews operate or fly. The following story outlines what is a fairly typical life of an aviation engineer from WWII to the 1970s]

Al Shaffer lived through one of the most exciting periods in aviation development. His story is typical of the thousands of engineers, draftsmen, maintainers and builders who gave their time and skill to make the famous designers, test pilots and airplanes…well…famous.

Family Background and Early Life

James Alvin Shaffer (Al) was born on October 14, 1926, in Sharon, Pennsylvania. His father, Alfred O. Shaffer, was a builder specializing in plaster and stucco. Unfortunately, no construction was taking place as this was the Depression, so Alfred wound up as the Superintendent of Buildings and Grounds at Westminster College in New Wilmington, Pennsylvania. Al's mother, Dorothy Steel, whose great-grandparents had come from Northern Ireland, was the youngest of 11 children. He had a brother who is two years older and a sister two years younger.

Al entered the first grade in Sharon, Penn., where he was born and graduated from New Wilmington High School in 1944. He joined the U. S. Army Reserve while in high school. After graduating, he entered the Army Student Training Program at the University of Maryland that consisted of two 3-month sessions. In January 1945, he was sent to Camp Blanding in Florida for Infantry Basic Training. He promptly came down with scarlet fever and spent seven weeks in the hospital. Once he was deemed fit enough to return to duty, he rehabbed by cutting bamboo for bayonet training dummies.

Shortly after returning to his unit, he was called out during roll call and informed that he was going to Virginia Tech for technical training. This turned out to involve two 3-month terms with six days a week in class or lab training. While he was at Virginia Tech WWII ended. Following this training, Al was sent to Wright-Patterson AFB in Dayton, Ohio, and put to work testing aircraft electrical components (starters, generators, relays, etc.). In August 1946, he was sent to Fort Meade, Md., for separation from the Army.

Early Career

Al applied to Virginia Tech and graduated in 1949 with a degree in electrical engineering. He started working for General Electric (GE) and entered a training program which involved classes and 3-month rotating assignments in various GE divisions:

- Diesel-electric locomotives in Erie, Pennsylvania,
- Lynn, Massachusetts steam turbine ship facility where he worked on copper oxide rectifiers,
- High voltage power transformers in Pittsfield, Massachusetts, and
- B-36 fire control computers at Johnson City, New York.

In November 1950, he finally settled down to a permanent position in Dallas-Fort Worth working on the B-36 fire control system and gun turrets as a field service engineer. Al was to continue in this position until August 1952.

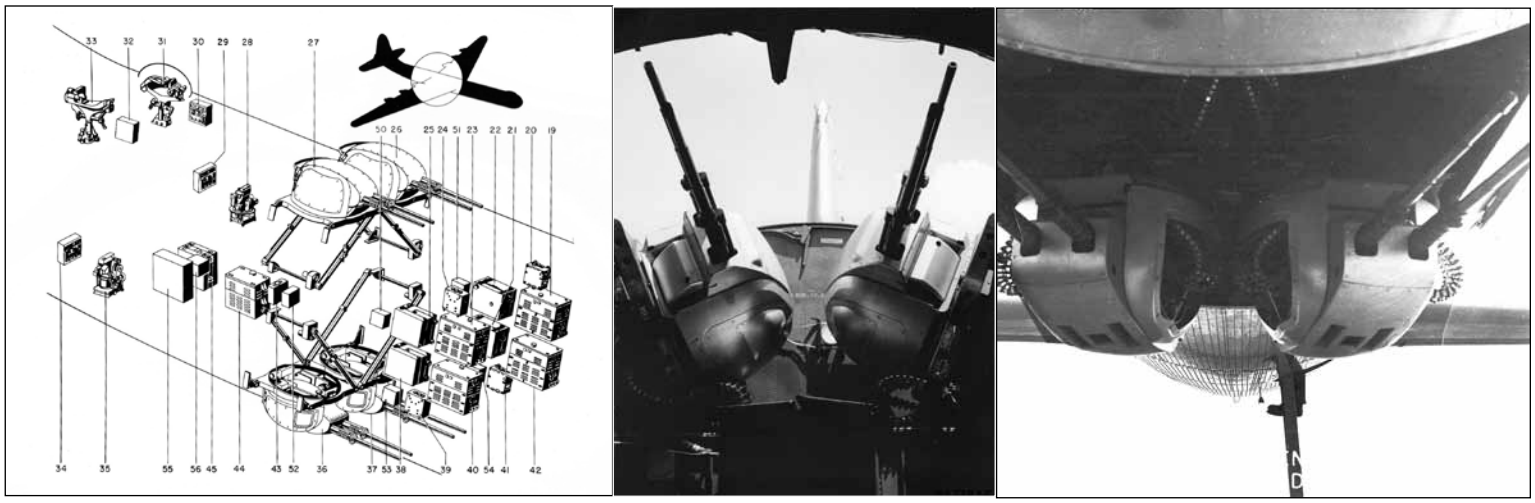
The B-36

The B-36 defensive system consisted of a turret in the nose, six retractable, remotely-controlled turrets in the fuselage and a radar-controlled turret in the tail. Each turret contained two 20-mm cannons. The fuselage-mounted turrets were controlled by optical sights located in blisters on the top and sides of the fuselage. Unlike the B-29, each gunner was dedicated to one individual turret. The nose turret was controlled by a gunner in the nose who peered through a sight resembling a three-foot-long periscope with a hemispherical head located behind the nose transparency. The tail turret was controlled by the navigator in the nose using the aft-facing radar located immediately above the guns. The fire control system was derived from that of the B-29. However, the mechanical computers that calculated lead, drop and convergence were replaced with analog electrical computers based on vacuum-tube technology. The turrets also contained contour and cut-off followers to keep the guns from hitting parts of the B-36. Power for the turrets was supplied by vacuum-tube-based Thiotron controllers.

As part of his job, Al participated in two test flights on the B-36 that were dedicated to engine and armament testing. Engine reliability was poor and the most common failure mode was failure of the rear crankshaft oil seal. This usually resulted in copious amounts of oil going back into the pusher propellers that then slung the oil against the fuselage. Al remembers it as sounding like rain hitting a tin roof. Return flights with one or more engines shut down were common. Not all the engines on the B-36 had alternators, so sometimes the crew was faced with a difficult choice because shutting down a failing engine would result in the loss of alternating current (AC) power.

The B-47

In late 1952, Al moved to Johnson City where he began work as a systems design engineer and eventually project engineer on the A-5 and MD-4 Fire Control Systems for the



LEFT: *Drawing showing the B-36 retractable waist cannon and their electronic control components. MIDDLE: Top waist armament in the retracted position. RIGHT: Bottom waist armament position with weapons in their deployed position. (GE drawing from the author's collection; Middle: From the AAHS photo collection, AAHS-D022487, Right: Photo from the author's collection)*

B-47. GE was building the entire radar-controlled tail gun system that consisted of controls located behind the copilot and the last eight feet of fuselage that contained the radar, ammunition storage and the gun turret. The gun turret contained two, single-barrel 20mm cannons.

The structure was completed by a vendor in Michigan. The turret and junction boxes were built by GE in Burlington, Vermont. All parts were shipped to Johnson City for assembly. The B-47 system used Amplidyne motor-generator sets for AC power which, although heavy, were more reliable than the Thiotron power supplies. Assembly of the tail turret by GE was done in a one-million-square-foot, all-wood factory that had been originally been used for making propellers. Aluminum or magnesium dust from the propeller manufacturing process had accumulated on the rafters and an occasional spark would ignite it "like a flashbulb going off."

Because GE was manufacturing the entire system, they were able to complete end-to-end testing on their own ranges before delivery. GE had two ranges, one of which allowed testing the turret at wide deflections and one of which did not. Once testing was completed, the systems belonged to the Air Force that shipped them to factories in Wichita, Kan., Marietta, Ga., and California where they were installed on the aircraft.

Eventually GE licensed Crosley to manufacture the system. The only significant difference between the two was that the skin and castings in the GE system were magnesium and the Crosley parts were aluminum. One of the Crosley turrets fell off a B-47 in flight. As often happens in these situations, the manufacturer (Crosley) blamed the design (created by GE). At Al's urging, a field service rep was able to obtain a portion of the failed part that Al sent to the GE materials lab for analysis. The analysis showed that the failure was due to poor granular structure resulting from improper heat treatment (to Crosley's considerable embarrassment).

From mid-1956 to September 1957, Al participated as a systems design engineer on the B-47 Improvement Program. This was a wide-ranging effort to upgrade or improve all the major B-47 systems. Unfortunately, the program was cancelled because it became too expensive and the B-52 was planned as a replacement for the B-47 in the long-range bomber role.

GE did compete for the defensive system for the B-52 and built several prototype radar-controlled gun systems that were flight tested but lost the competition.

One of the greatest threats to any program is the proliferation of "Engineering Changes." Although well intentioned, a flood of "ECs" that is not carefully controlled can (and has) brought a program to a standstill. Al participated in an Air Force committee that was writing a specification for weapons systems to improve the management of ECs. From late 1957 through mid-1958, Al was responsible for controlling the flow

The stinger end of the Boeing B-47 with weapon radar in the pod just above turret. (Photo from the AAHS photo archives, AAHS-D022535)

An F-105's Vulcan 20mm cannon being serviced. (Photo from the AAHS archives, AAHS-D024159)

Douglas F4D Skyray, for which Shaffer was the project engineer on the HUD and gun firing box. (Photo from the AAHS archives, AAHS-P006246)

of engineering B-47 changes focusing mainly on their effect on field maintenance, spares and handbooks.

F-105

From mid-1958 through 1972, Al was deeply involved in the Republic F-105 program: first as the MA-8 fire control system project engineer and then as logistics and project engineer on the *Thunderstick* program. The *Thunderstick* was to be an improved version of the F-105. The F-105 fire control system consisted of the Vulcan 20-mm five-barrel cannon and the Head Up Display (HUD).

At the same time, GE in Johnson City was responsible for the F-105 flight control system. GE was also developing a 30-mm multi-barrel cannon that eventually became the GAU-8 found in the A-10. Al was not involved in either of these programs.

Work in the 1960s and Beyond

By 1964, Al was project engineer for the development of the HUD and gun firing box for the Navy F4D. A challenge was presented by the need to integrate the GE system and the Westinghouse radar.

In early 1967, he became program manager for the F-111 LCSS (Lead Computing Sight System).

GE submitted a very detailed proposal to McDonnell for an improved HUD and fire control system for the F-15. After several companies submitted proposals, McDonnell decided to engineer most of the system in-house. GE was contracted to produce some of the boxes that plugged into the fire control system. GE had resubmitted a proposal for the lead computing gyro and got that contract as well.

In addition, GE submitted a proposal for the rotating gunner's station for the Lockheed YAH-56 Cheyenne and Al had been designated to be the production program manager. The Cheyenne first flew in 1967 but the program was later cancelled, so GE lost the work.

The reduction in work at GE resulted in Al's position "being eliminated" in 1972. He was offered the option of finding another position within GE but chose to leave and wound up working for Dynamic Controls Corp. in South Windsor, Conn., which was producing the bombing computers, the avionics cooling system, several power supplies, the emergency power control unit and gun control unit, all for the F-15. Dynamic Controls was also producing the main rotor hub for the Sikorsky UH-60 Black Hawk.

In 1972, Dynamic Controls was struggling to deliver quality systems on time and on budget. Several McDonnell engineers who had worked with Al on other programs recommended Al to Dynamic Controls as someone who could solve the problems. At Dynamic Controls, Al gained the trust of the owner and helped streamline production and improve quality.

Al was assigned to be program manager for the F-16, responsible for the manufacture of computer power supplies, the fire control system for the cannon and the APU control box. A number of people from GE in Johnson City had migrated to Dynamic Controls so Al was surrounded by familiar faces.

On a side note, Dynamic Controls developed the bombing system for the F-117 Stealth Fighter; Al was not involved in this project.

In 1976 Beverly's dad, David Mason, retired and moved to Florida to run a swimming pool installation company. He invited Al to join him. Al left Dynamic Controls and moved to Florida. Florida law requires swimming pool installers

While with Dynamic Controls in the early 1970s, Shaffer was program manager for the computer power supplies, fire control system and APU control box for the F-16. (Photo from the AAHS archives, AAHS-P012696)

to be certified so Al went back to school and took the exam, becoming a certified swimming pool installer.

After about a year Al returned to Dynamic Controls in 1978. In the late 1970s, the Air Force required a major modernization of its suppliers' production facilities. This requirement flowed down through the vendors and Dynamic Controls, which was under contract to produce components for the F-16, submitted a proposal to General Dynamics for the required modernization. Al was put in charge of what turned out to be a huge project. The plant modernization program included:

- A doubling of the manufacturing floor space,
- Updated and refurbished buildings,
- A new plant-wide computer-controlled manufacturing system,
- All N/C machining and new inspection equipment,
- New machines, work benches and static-conductive floors,
- Semi-automatic kitting component insertion,
- Automated coating facility,
- A complete office refurbishment including new desks and moveable bulkheads and file storage,
- New computers and integrated back-up power.

Today Al looks fondly back on this period. He had complete control of the factory renovation and spent his days managing competitions for vendors and negotiating with builders, architects, purchasing and everyone else involved with the project.

Retirement

Al retired in 1991 at the age of 65 and he and wife Beverly moved to Winter Park, Florida. For several years, they moved back and forth between Florida and Connecticut where their three sons and their families lived. In Florida they moved into a condo and when the condo board found out that Al was

James Alvin "Al" Shaffer with his wife, Beverly, in a July 2016 photo. (From the author's collection)

one of the few residents who was retired they made him the Condominium Manager. Al approached the job the same way he had approached the factory upgrade at Dynamic Controls. He quickly discovered the previous manager had let a lot of things slide so he ended up managing a major construction project. This project included the construction of new roofs, support structures for porches and the replacement of up to five feet of siding on each unit.

Bev and Al moved north, eventually selling the condo in Florida, and spent a year living with their middle son in his cottage on a lake. Then, Al wound up managing a major reconstruction of the house. Do you see a pattern here? This "job" included the installation of new windows, sliding doors, insulation, and drywall, and enclosing a porch.

In March 1998, Bev and Al moved to Aspetuck Village Condominiums in Huntington, Connecticut. Al promptly completely refinished the basement (no surprise). He got immersed in genealogy, initially trying to discover his mother's real birthday. She claimed to have been born in 1897 but was actually born in 1890. Al's theory is that she didn't want to appear older than her husband who was born in 1896.

Today Al and Beverly live in Wallingford, Connecticut. ✈

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