

## U.S. Army Signal Corps Laboratories Inventions and Equipment

Radar – COL William Blair, director of the Signal Corps Laboratories, was awarded the patent for radar, titled “Object Locating System” in 1957, 20 years after the successful demonstration of the technology to the Secretary of War at Fort Monmouth, NJ. Radar was one of the most important technologies of World War II, and its use in detecting incoming aircraft is credited with helping the Allies win that war. Today, radar is still widely in use, from military applications, to weather forecasting, to hand-held detectors used by police that were first prototyped by the Signal Corps Laboratories in 1962 as experimental ten-pound hand-held sets.

Diana Radar – The Signal Corps Laboratories at Camp Evans, NJ, successfully bounced a radar signal off the moon and received the signal back in 1946, ushering in the age of Space Communications. Dr. Walter S. McAfee was the pioneering African-American physicist who completed the calculations for the experiment. The Diana experiment proved the feasibility of communicating across vast distances of space. The radar techniques used in Project Diana, named in honor of Diana, Greek goddess of the moon, also led to the more accurate measurement of distances in the solar system.

Electronic weather forecasting (radio equipped weather balloon/weather radar/weather satellite) – In 1928, the first radio-equipped weather balloon was launched at Fort Monmouth. This was the first major development in the application of electronics to the study of weather, and of conditions in the upper atmosphere. The Signal Corps’ military weather forecasting mission led to further developments, including the first weather radar, developed at Fort Monmouth in 1948, which for the first time observed a rainstorm from a distance of 185 miles, and tracked the storm as it passed over the fort, and in 1959, the first weather satellite, the Vanguard II was launched with electronic equipment developed at the Fort to map the earth’s cloud patterns by a varying infrared scanner. The TIROS-1 satellite launch in 1960, developed under the technical supervision of the Fort Monmouth Laboratories, sent the first televised weather photographs of the earth’s cloud cover and weather patterns to the giant sixty-foot “Space Sentry” antenna at Camp Evans, NJ.

Transistor crystals – The first synthetically produced large quartz crystals were grown by researchers at Fort Monmouth in 1948. The crystals could be used in the manufacture of electronic components, and made the U.S. largely independent of foreign imports for this critical mineral. By 1953, Fort Monmouth scientists discovered transistor action in silicon and invented a floating zone refining process to produce inexpensive, chemically pure silicon crystals. By 1964, silicon was the Army’s principal transistor material

Printed circuits/miniaturization – A technique for assembling electronic parts on a printed circuit board, developed by Fort Monmouth engineers in 1949, pioneered the development and fabrication of miniature circuits for both military and civilian use. This led the way for the development of miniature electronic gadgets, such as the “Dick

Tracy” transistor watch radio and the “cigarette case” radio, showing the possibilities of making power electronic communications devices small enough to carry around.

Radio (FM radio adoption/ back-pack radios) – It was MG Roger B. Colton who, in 1938, made the historic decision to employ FM in all future military radios. The laboratories at Fort Monmouth had been experimenting with FM transceivers since 1936, but had continued to develop AM radios. FM signals are of shorter range than AM counterparts, but are less susceptible to interference. The static-free communication provided by the FM radios was credited with giving the Allies an advantage during World War II. The laboratories developed the SCR-510 in 1941, which was the first FM backpack radio. The labs worked closely with former Signal Corps officer Edwin Howard Armstrong, whose WWI-era experiments gained him four patents for Frequency Modulation, which he allowed free use of by the military.

Satellite Communications/ Project SCORE/Courier – The first communications satellite, Project SCORE, was developed in 1958. Launched on December 18, Project SCORE (Signal Communications via Orbiting Relay Experiment) broadcast President Eisenhower’s Christmas greeting, proving that voice and code signals could be relayed over vast distances using satellite communication technology developed at Fort Monmouth. The active-relay type satellite could receive both voice and teletypewriter signals from the ground and either relay them directly or store them on magnetic tape and carry them onto the next station, to be released on command. The Courier Satellite, developed and built under the supervision of the Fort Monmouth Laboratories was an experimental communications satellite that proved high-volume communications, up to 100,000 words per minute, could be relayed through space. Courier could either relay directly or store and forward nearly 400,000 words – about three novels worth – in one four-minute pass over a ground station.

Night-vision – Fort Monmouth developed and deployed passive night vision devices to Vietnam in 1968 that, by using image intensifier tubes, made targets almost as visible at night as in daylight. , Night Vision research personnel came to refer to the development of this early equipment as the First Generation Image Intensifier Program. Scientists and engineers would go on to improve upon this technology to deliver a second and third generation of night vision equipment under the directions of Dr. Robert S. Wiseman, director of the Night Vision Laboratory. In the 1970s, the technology would lead to targeting and navigation systems known as Forward Looking Infrared (FLIR) systems. FLIR systems provide the advantage of 'seeing' not only at night but also through many smokes, fogs, and other obscuring conditions.

Solar cells– In 1959, the Fort Monmouth laboratories developed solar cells for satellite power in space, which powered the Vanguard I satellite for more than five years. In 1960, the Signal Corps laboratories achieved the first two-way coast-to-coast radio conversation powered entirely by the sun. No standard electrical power was used at all in the experiment. Both stations were equipped with giant 20 square foot panels of solar batteries, designed to convert the sunlight into electricity. The panels were the most powerful solar arrays ever assembled for ground applications, and could each provide

up to 100 watts of electricity. It was one of the first non-space applications for solar batteries.

Homing pigeon program- In 1917, upon his arrival in France, General Pershing ordered the establishment of a homing pigeon program, under the direction of the U.S. Army Signal Corps. The Army's Pigeon Breeding and Training center was established at Fort Monmouth after the Armistice, and continued there until the program was discontinued in 1957. The pigeoneers trained thousands of birds, and developed night-flying birds, the ability to train to mobile lofts, and pigeons that would fly over water. Hero pigeons of both World War I and World War II, credited with saving the lives of hundreds of soldiers, were housed at the storied "Churchill Lofts."