From WWI to the Space Shuttle, Allen-Bradley played a significant role in aerospace & defense

By Robert A. Smith

After all that's been written about Allen-Bradley, it's remarkable that so few words have been devoted to its role in aerospace and defense. In some ways its impact in those arenas – answering America's call in its time of need – has been as significant as its contributions to manufacturing.

It began in 1917, when America entered World War I and the government ordered up thousands of electrical apparatus for munitions plants and battlefield equipment. When its demands overwhelmed the capacity of General Electric, Westinghouse and other giants, the military turned to second-tier electrical suppliers. There it found Allen-Bradley, a small Milwaukee firm with a growing reputation for rugged, reliable products.

Within months, 70 percent of A-B's output was channeled into the war effort, including electrical switchboards for destroyers and submarines and motor controls for domestic defense plants. Revenue went through the roof, reaching nearly a half million dollars. To meet orders, the Bradley brothers hired scores of employees, ran shifts day and night, established a research laboratory and built a three-story plant near their original machine shop. To hold together their growing empire, the Bradleys published their first organizational chart and launched an employee newsletter.

A generation later, defense work led to even greater growth. By 1942, Allen-Bradley had become a well-known supplier of radio parts, including hot-molded carbon-composition fixed resistors – tiny, revolutionary new electronic components that gave birth to the modern electronics industry. A-B manufactured these resistors by the millions, using a proprietary automated process invented by Allen-Bradley engineers. In fact, the machinery and know-how to make the resistors existed only in A-B's Milwaukee plant – no where else on earth.

Thus, it was no surprise that once America entered WWII, the military came calling again. In short order, the government harnessed virtually the entire company – 80 percent of its total output – for the war. Fortunately Allen-Bradley's off-the-shelf products needed no special modifications; they were already battlefield-ready. Soon its resistors were embedded in walkie-talkies, field radios, aircraft guidance systems and RADAR. Its switches and relays went into aircraft, jeeps, tanks, ships and submarines. And its motor controllers were installed in defense plants across the country, where they helped manufacturers keep factories humming round the clock, optimizing production and minimizing downtime.

Government demand for Allen-Bradley products was phenomenal. At the insistence of the military, production of fixed resistors quadrupled from 30 million units in 1940 to 121 million in 1945. Production of variable resistors grew even more – 100-fold! – from 48,000 units in 1940 to more than 5 million in 1944. To gain the needed manufacturing capacity, the Bradleys staged 7 wartime building projects, growing their Walker's Point plant to mammoth size, eventually dwarfing the little neighborhood where it was born.

But the Second World War was different than the first one. This time, when conventional war ended, a *Cold* War began. The Berlin Blockade, the Korean War and the Soviet invasion of Eastern Europe led to an unprecedented build up in nuclear weapons, jet fighter fleets and intercontinental ballistic missile systems. For all this, the U.S government relied heavily on its WWII military suppliers, including Allen-Bradley.

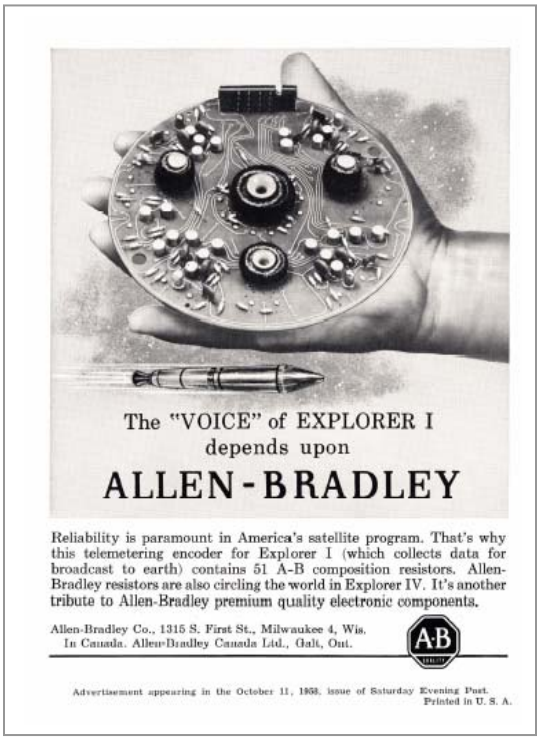
Ironically, Allen-Bradley's connection with the defense industry led to its role in one of the world's greatest peacetime endeavors – the space race of the 1960s, 70s and 80s. While A-B's contributions to aerospace and defense have never been fully documented, a history of sorts can be pieced together from a series of advertisements it ran in trade and general interest magazines, and from articles it published in its employee publications.

What follows is that history, in their words.

"Allen-Bradley Relays for Wartime Service. Here is a line of exceptionally rugged solenoid relays, designed for war service on aircraft, boats, tanks, etc. that meets Army Air Corps specifications. All relays withstand 10G acceleration, operate in any position and have dust-tight contact covers. Contacts are special Allen-Bradley cadmium silver alloy. High contact pressure positively prevents chatter under Air Corps vibration test. All current ratings are good for elevations up to 50,000 feet."
– A-B Ad, fall 1942

"For War Service – Use these solid molded resistors, unaffected by cold, heat or moisture. The resistor element in Allen-Bradley Type J Bradleyometers has substantial thickness (approximately 1/32-inch thick) … is molded as a single unit with insulation, terminals, face-plate and threaded bushing. There are no rivets, welded or soldered connections, or unreliable conducting points. Allen-Bradley resistors are therefore reliable under all extremes of service conditions . . . the only commercial type adjustable resistor that will consistently stand up under the Army-Navy AN-QQ-S91 salt spray test." Fixed resistors: "Bradleyunits are molded, fixed resistors with lead wires embedded in homogenous resistor material. They will sustain an overload of ten times rating for a considerable period of time without failing. No special wax impregnation is necessary to pass the salt water immersion test." – A-B Ad, *Electronics* Magazine, Jul 1944

"The 'Voice' of Explorer I depends upon Allen-Bradley Reliability is paramount in America's satellite program. That's why this telemetering encoder for Explorer I (which collects data for broadcast to earth) contains 51 A-B composition resistors. Allen-Bradley resistors are also circling the world in Explorer IV. It's another tribute to Allen-Bradley premium quality electronic components."
– AB Ad, *Saturday Evening Post*, Oct 11, 1958



"Allen-Bradley develops new filter that gives 'Minuteman' three simultaneous voices! Permits three telemetry messages to earth – at the same time – from one antenna! This A-B triple filter, employed in the Minuteman Test Program, was designed to permit three transmitters to send in-flight performance data simultaneously from a single antenna without mutual interference. Lightweight and compact, the Triplexer is so ruggedly constructed that it withstands the shock of launching and vibration in flight. This highly advanced filter system illustrates Allen-Bradley extensive expertise in creative electronic research and its capabilities in precision manufacturing. Allen-Bradley scientists and engineers will be pleased to cooperate with your electronic program. Please write today."
– A-B ad, *National Review,* Sep 1960.

Minuteman Missiles.
"A Quality product requires Allen-Bradley Electronic Components. Ampex's Advanced Recorder/Reproducer, the FR-600 is used for testing the Minuteman Missile. In the design of the highly sophisticated circuitry for this advanced recorder, engineers at Ampex selected Allen-Bradley quality electronic components to meet the critical requirements for reliability, long life, and quiet operation. For example, the use of Allen-Bradley potentiometers – with their exclusive solid, hot-molded resistance element – assures smooth control at all times. There are never any abrupt changes in resistance during adjustments, as in wire-wound resistors. Also, the 'noise' factor is extremely low initially, and it decreases with use.

"Allen-Bradley composition fixed resistors – also made by an exclusive hot molding process – are fantastically uniform. Their electrical characteristics are so consistent from resistor to resistor that performance over long periods of time can be accurately predicted. And catastrophic failure is unheard of . . .

"A-B quality electronic components used in the Ampex Wide Range Recorder (include):

- Fixed composition resistors
- Adjustable Fixed resistors
- Type G Potentiometers
- Type J Potentiometers

Pictured: One of 14 CRT monitors, each of which contained 8 A-B Type G Potentiometers."
– Ad in *Electronics*, May 19, 1961

You may sometimes wonder where the product you help make is used. The letter below tells where some electronic components were applied.

A-B Components Go Into Supersonic Bomber

The company does not always receive letters such as this from customers, but rest assured that quality products and prompt delivery are always appreciated.

B-58 "Hustler" Statistics

A-B Products go into supersonic bomber

"You may sometimes wonder where the product you help make is used. The letter below tells where some electronic components were applied.

'29 November 1961
Allen-Bradley Company
136 W. Greenfield
Milwaukee, Wisconsin

'Gentlemen: The communications Division of the Hughes Aircraft Company has been presented with a Certificate of Commendation from General Dynamics, Fort Worth, Texas for our "contributions in the design, development and production of reliable electronic equipment and as a member of the nationwide industry team responsible for producing the only supersonic bomber in the free world – the B-58 Hustler. We are pleased to share such credit with you for your cooperation in helping us to meet our needs for quality, reliability, schedules and costs. Without such support from you, this commendation would not have been possible.

'Hughes Aircraft Company
Ralph B. Reade, Manager
Communications Division'

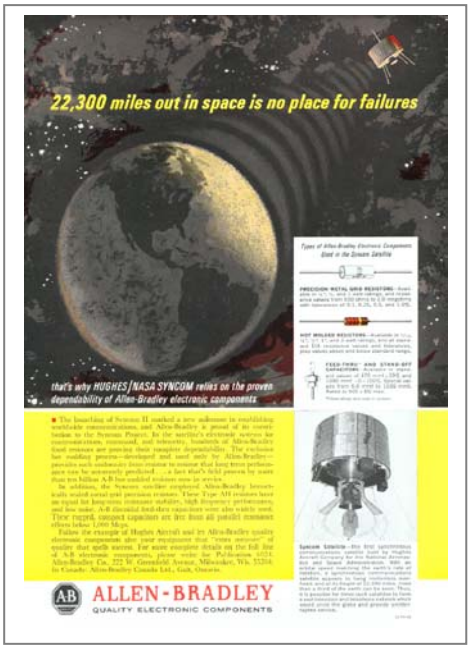
"The newest and fastest deterrent force in the Strategic Air Command inventory is the supersonic B-58 Hustler bomber, built by the Fort Worth, Texas, Division of General Dynamics Corporation. Air Force B-58s, flown by crews from SAC's 43rd Bomb Wing of the 19th Air Division at Carswell Air Force Base, Texas, have set eight world speed and payload records since January 1961. Five of the records previously were held by the Soviet Union. In January, two B-58s set three records each in runs of 1000 and 2000 kilometers over a closed-circuit course. For its record run, one of the crews was awarded the Thompson Trophy.

"In May a B-58 won the coveted Bleriot Trophy (named for the famous French aviator and aeronautical engineer, Louis Bleriot) by flying 30 minutes over a closed course at an average speed of 1302 mph. Later the same month, a B-58 flew New York-to-Paris in 3 hours, 19 minutes, and 51 seconds, one-tenth the time of Lindberg's famous flight . . . Manned by a crew of three and powered by four General Electric J-79 engines, the Hustler is designed to operate at altitudes over 50,000 feet. It is 96 feet 9 inches long and has a wingspan of 56 feet 10 inches.

"Note: This is the plane that recently caused the 'sonic booms' that we heard. Rather than thinking of these booms as an annoyance, think of them as a reminder that those are *our* planes up there protecting us."
– *A-B Gossip* article, Feb 1962, p. 8

"Allen-Bradley Hot Molded Resistors prove their complete reliability in the brilliant success of Telstar. The satellite Telstar was designed and built by American Telephone & Telegraph Co.'s Bell Telephone Laboratories, and AT&T paid for the cost of launching by NASA. In their latest engineering achievement, the Telstar satellite, Bell Telephone Laboratories took a bold new design approach that emphasized the use of high reliability components with virtually total elimination of redundancy. All apparatus packages for Telstar were built 'in-house' by Bell Labs, and they were carefully designed and tested for long life. Thus, the use of A-B Type CB (1/4 watt) and Type EB (1/2 watt) hot molded resistors for this important project *clearly* acknowledges their ability to meet the most severe operating conditions. Allen-Bradley resistors are made by a unique hot molding process – developed and used exclusively by A-B – which assures such uniform and stable characteristics that their performance is accurately predictable in service… and they are completely free from catastrophic failures. You can obtain this same outstanding performance only when you insist on A-B fixed resistors." – A-B Ad, 1962

"Brush Direct Writing Recording System in use at NASA Laboratories. Brush Instrument's Recorder channel amplitude control uses A-B hot molded resistors. At NASA, a Brush Recorder was used to design a control system which would bypass the pilot and project the plane into prolonged zero gravity flight. Brush uses Allen-Bradley hot molded resistors because their reliability is established by years of experience. To insure consistently accurate readout of their recorder, Brush insists upon the ultimate in component reliability. For this reason, Allen-Bradley hot molded resistors are their standard for their direct writing recording system. The complete reliability of A-B hot molded resistors is proved by an 'in service' recorder of more than ten billion resistors without a single instance of catastrophic failure." – A-B Ad, 1963



"23,000 miles out in space is no place for failures. That's why Hughes / NASA Syncom relies on the proven dependability of Allen-Bradley electronic components. Syncom satellite – the first synchronous communications satellite built by Hughes Aircraft Company for the National Aeronautics and Space Administration. With an orbital speed matching the earth's rate of rotation, a synchronous communications satellite appears to hang motionless overhead; and at its height of 22,300 miles, more than a third of the earth can be seen. Thus it is possible for three such satellites to form a vast television and telephone network which would circle the globe and provide uninterrupted service.

"The launching of Syncom II marked a new milestone in establishing worldwide communications and Allen-Bradley is proud of its contribution to the Syncom Project. In the satellite's electronic systems for communications, command, and telemetry, hundreds of Allen-Bradley fixed resistors are proving their complete dependability. The exclusive hot molding process – developed and used only by Allen-Bradley – provides such uniformity from resistor to resistor that long term performance can be accurately predicted . . . a fact that's field-proven by more than ten billion A-B hot molded resistors now in service. In addition, the Syncom satellite employed Allen-Bradley hermetically-sealed metal grid precision resistors. These Type AH resistors have no equal for long-term resistance stability, high-frequency performance and low noise. A-B discoidal feed-thru capacitors were also widely used. These rugged, compact capacitors are free from all parallel resonance effects below 1,000 Mcps. Follow the example of Hughes Aircraft and let Allen-Bradley quality electronic components give your equipment that 'extra measure' of quality that spells success."
– A-B Ad, circa 1963

Ranger 7, 8, 9 unmanned moon missions. The company's 1965 ad campaigns for electronic components informed readers that A-B's hot molded resistors went to the moon with the Ranger 7, 8 and 9 space vehicles. The Ranger 7, which took 4,304 photos of the lunar surface, was considered a brilliant scientific accomplishment at the time and paved the way for the first man landing on the moon four years later. A-B sold its hot molded resistors to RCA which used them in the Ranger spacecrafts.
– Source: A-B Ad campaign, 1965

"Allen-Bradley hermetically sealed hot molded resistors help guidance computer in Saturn I space vehicle put payload into orbit. Saturn I guidance computer continuously determined the vehicle's course to achieve orbit. In six test flights, these computers in the NASA Saturn I vehicle controlled the direction and thrust of six second-stage engines. The computer on four of the flights controlled four of the first-stage engines as well, and also timed engine cut-off.

"From the instant of "blast-off" this guidance computer set the course of the space vehicle. The ultimate precision was essential, for even the slightest misdirection could mean total failure. Reliability had to be maintained under hardly believable conditions of shock and vibration. Given such conditions, it is small wonder that the A-B hermetically-sealed hot molded resistors were selected for this assignment.

(Pictured) "One of the logic modules that performs arithmetic logic, interrogation, and command functions, consists of four units, incorporating Allen-Bradley hermetically-sealed hot molded resistors, mounted on a common interconnecting base." – A-B Ad, 1965

"A-B Shares in Surveyor Success. The men and women of Departments 310, 350, 370 and 390 can share a special pride in their contribution to America's great stride toward a manned voyage to the moon. Surveyor, the picture-taking spacecraft which soft-landed on the moon on Thursday, June 2 at 1:17 A.M. Milwaukee time, contained A-B quality electronic components.

"Once close-up pictures of the moon started coming back to earth, the engineers and scientists in command of the Surveyor program cheered – it had been a textbook mission. All systems had performed to perfection on the first try.

"Allen-Bradley has received congratulations and thanks from the Surveyor subcontractors for the important part our electronic components played in this spectacular venture. Because of their exceptional dependability, A-B resistors (Types BB, CB, EB, GB and HB), potentiometer (Type R) and FA5C feed-thru capacitors were selected to take the 230,922 mile ride to the moon. As part of the navigational and camera control circuitry they certainly helped to make another successful space venture.

"We're swelling with pride in this accomplishment – and we pass the credit on to the men and women of Allen-Bradley who made it possible. The United States (with A-B's help) will pave the way to the moon."
– C Van Hecke, Electronic Component Sales


A-B Shares in Surveyor Success

'JUN 7 66 ND311 LA165, EL SEGUNDO CASLIFORNIA 6 NFT,
ALLEN-BRALDEY CO ATTN F LOOCK
1201 SOUTH SECOND ST. MILWUAKEE, WISC
WE WANT TO SHARE WITH YOU THE GREAT PRIDE WE FEEL IN THE SUCCESSFUL SOFT LANDING OF THE SURVEYOR SPACECRAFT ON THE MOON. YOUR COMPANY'S CONTRIBUTION TO THIS MAJOR STEP FORWARD IN THE U.S. SPACE PROGRAM IS RECOGNIZED AND DEEPLY APPRECIATED. PLEASE ACCEPT MY WARMEST CONTRATULATIONS AND EXTEND A 'WELL-DONE' TO ALL OF YOUR PERSONNEL WHO CONTRIBUTED TO OUR MUTUAL SUCCESS. – W A VAN ALLEN, HUGHES ACFT CO.

'SAN DIEGO CALIF MSG 29 6-8-66
ALLEN-BRALDYE CO MILWAUKEE WISCONSIN -- ASSN / SURVEYOR RADVS CONTRACT ADMINISTRATOR
HEARTIEST THANKS AND CONGRATULATIONS TO ALL CONTRACTORS WHO PROVIDED TRANSISTORS, DIODES, RESISTORS, CAPACITORS, MAGNETICS, SENSISTORS, KLYSTRONS OR CRYSTALS TO ASSIST RYAN AERONAUTICAL COMPANY IN DEVELOPIONG THE SURVEYOR 1 RADAR LANDING SYSTEM. YOUR CONTRIBUTION WAS INVALUABLE TO THE SUCCESS OF THE WORLD'S MOST SOPHISTICATED LUNAR LANDING RADAR SYSTEM, THE RYAN RADAR ALTIMITER AND DOPPLER VELOCITY SENSOR. PLEASE CONVEY OUR APPRECIATION TO YOUR PRODUCTION STAFF

J.R. IVERSON, DIRECTOR RYAN ELECTRONIC AND SPACE SYSTEMS, RYAN AERONAUTICAL COMPANY'

– From Article, *Gossip* magazine, summer 1966

"The Most honored resistor in the space program. Explorer I, Explorer IV, Tiros, Telstar, Syncom, Ranger VII, Ranger VIII, Ranger IX, Saturn I, Surveyor. Allen-Bradley hot molded resistors were chosen to participate in these many history making space projects for only one vital reason – a history of proven performance that dates back for more than a quarter of a century! A record more conclusive than any testing program could possibly provide!

"The widespread use of the Allen-Bradley hot molded resistors in these space programs should convince you that to include this plus value in the equipment which you produce gives it the mark of extra quality." – A-B Ad, 1967

"This is Mariner V now passing Venus. Allen-Bradley hot-molded resistors helped make the message 'loud and clear.' After a historic 217,000,000-mile journey, Mariner V probes the mysteries of Venus from a closer vantage point than ever before. The data from this successful venture into deep space will add immeasurably to our knowledge of Venus, and aid in planning future space missions.

"As with numerous other missions, Allen-Bradley hot molded resistors again justified the confidence placed in them. Their faultless performance was essential to the 'loud and clear' reports of the fly-by. . . A-B hot molded resistors meet or exceed all applicable military specifications including the new Established Reliability Specification." – A-B Ad, 1967

As for manned flights, Allen-Bradley components were on board virtually every manned mission NASA undertook through the early 1980s. The most spectacular of all, of course, was the first flight that took men to the moon. Ironically, Allen-Bradley did not trumpet this triumph – or any other manned-space mission in its advertising. In fact, it was not until 1989, the 20th anniversary of the Apollo 11 flight, that the company took public credit for its contributions. The following accounts of the Apollo program and Space Shuttle missions were taken from *Horizons,* the third generation Allen-Bradley employee magazine.

Apollo 11 - First manned landing on the moon. "Allen-Bradley contributed to the success of the Apollo 11 mission. Products such as carbon composition resistors, the sonic sifter and various other electronic componentry either made the trip on board Apollo 11, or were part of the remarkable support performance, communications systems and test equipment.

"In 1969 Bill Taylor, who is now Electronic Packaging, Drafting and Engineering Standards manager at our Motion Control Division, Brown Deer, Wisconsin, was an electronics designer with AC Electronics, a part of General Motors and an Apollo subcontractor. His job was overseeing the retrofit team that initially built and installed design updates in test equipment. He describes carbon comp resistors as, 'a basic building block … probably used in every circuit board installed in the Lunar Excursion Module (LEM)'

"Taylor remembers the use of the carbon comps in the test equipment he helped design and install. 'This three-bay test console 'exercised' the Apollo optics and electronic equipment,' he explained. The console was used to test other kinds of equipment installed on board the LEM and the command module. Actual testing was performed at North American Rockwell, now Rockwell International, at Downey, California. Rockwell served as the prime contractor and played a key role in the development of the equipment used to travel to the moon . . .

"Innovative thinking led to the development of the $24-billion Apollo program. Innovation was also the impetus behind the creation of the carbon composition resistor. Jack Polakowski, director of marketing, microelectronics products at A-B's Greensboro, North Carolina plant, believes that Allen-Bradley can be 'justifiably proud of what our forefathers invented.' He continued, 'The success of the mission, that is, the no-fail performance of componentry that made the trip, is a legacy of the original inventors.'

"The Apollo project could use our off-the-shelf resistors because of their reputation for rugged reliability; no special manufacturing process changes were required. Polakowski pointed out, 'The military needed the very best and we made them good, period. Our carbon comps, because of their reliability and product longevity are unmatched by any product of their type.' . . . Current annual resistor sales figures remain in the hundreds of millions of pieces.

"Another A-B product with a role in the Apollo 11 program was the sonic sifter. The sonic sifter was developed in 1958 by Charles Ward, who was a vibration and sound technician in our Special Machine Department in Milwaukee. The sifter uses sound to screen or sieve industrial powders. This process is still used to determine the particle or grain size of fine materials, such as powered paint and industrial diamond dust used for grinding … an alternative to the previously mechanical destroy the original size of the particles, the very purpose for sifting them. . .

"Ward's design uses a column of air that moves up and down to lift and disperse the particles. Once activated, 'shaking' method which would deteriorate and perhaps particles are either captured by a screen or fall through to the next smaller screen, until the sample is completely sized. Particle size is not physically altered or damaged and sifting can be done almost instantaneously . . .

"In 1969, the sonic sifter was marketed in two sizes. The P60 was targeted at the powdered metal industry and the L3P model was referred to as the 'lab size' model. In Houston, Texas, the L3P model Sonic Sifter was installed at the Lunar Receiving Laboratory in the controlled environment of the Mineral Separation Lab. Perhaps the sifter's most significant application was to 'sift the secrets of the moon.'

REACHING FOR THE MOON

1969 is rarely remembered as the year that the Concorde made its first flight, "scratch and sniff" advertising was introduced, A-B established its first production facility outside of North America in the United Kingdom or the U.S. space probe Mariner 6 sent the first pictures of Mars to Earth. The year is remembered as the "year of the moon."

JULY 19, 1969 marks the 20th anniversary of man's first visit to the moon. According to a special report in *The Americana Journal*, "In 1969 man strode upon the surface of the moon, bringing to a climax the remarkable decade of the '60s and validating a dream that goes back to mankind's earliest days on Earth."

U.S. President Richard M. Nixon described the Apollo 11 flight as "the greatest event since Creation" and heralded it as bringing the world closer together. Hundreds of millions of earthbound viewers saw Commander Neil Armstrong become the first human to step onto the moon. Armstrong described his action: "That's one small step for a man, one giant leap for mankind."

The New York Times reported that televising the mission allowed worldwide participation in an "historical turning point." Viewers witnessed history in the making. The paper said, "people in London, Paris, and Tokyo, and throughout most of the world, (were) reported as elated and awed by the lunar landing...the landing was seen as opening a new age for mankind."

Allen-Bradley products contributed to the success of the Apollo 11 mission. Products such as carbon composition resistors, the sonic sifter and various other electronic componentry either made the trip on board Apollo 11, or were part of the remarkable ground support performance, communications systems and test equipment. Today carbon "comp" resistors, which A-B has been marketing for more than 50 years, still represent a major portion of our Electronic Components Division's business.

Resisters Make Lunar Journey

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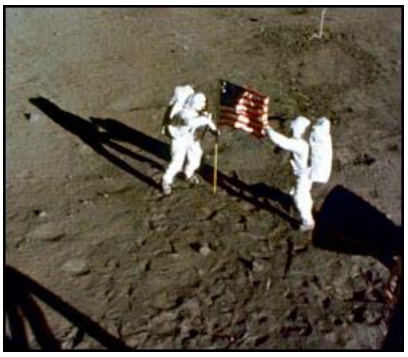
Actual testing was performed at North American Rockwell, now Rockwell International, at Downey, California. Rockwell served as the prime contractor and played a key role in the development of the equipment used to travel to the moon. "Rockwell weaved together many companies according to a master plan," explained Taylor. Propulsion, space hardware and communications tracking equipment highlight Rockwell's contributions. A North American Rockwell ad appeared in the January 5, 1970 issue of *Time* magazine, stating, "...we build the spacecraft that takes men to the moon and back. We're doing all we can to make your next trip to the stars a pleasant one."

A-B's carbon comps were selected by contractors for their reliable long-term resistor performance, Taylor said. A-B's hot-molded process delivers ongoing dependability and builds in a ruggedness that produces reliability in adverse environments. A 1969 electronic resistor component ad read, "Allen-Bradley's experience in resistor production reaches...to the moon and back...The fact that the resistors made by A-B over the years — if placed side by side — would more than reach to the moon and back may be impressive. But 'how' they are made is key."

The basic function of a resistor of this type is to control electricity flow through a circuit. This not only protects the circuit, but also causes it to perform according to its individual design. Today, manned space exploration continues to de-



"About 50 pounds of lunar soil was collected and brought back to earth by the Apollo 11 mission. Using tongs, Astronauts Neil Armstrong and Buzz Aldrin collected rock samples. Lunar soil was scooped from the surface and subsoil was extracted through metal tubes driven down with a steel hammer … Soil samples were immediately run through the L3P sifter upon their return from the moon, as recorded at the Johnson Space Center in Houston, Texas … Scientists at the Lunar Receiving Lab identified the sample material as volcanically produced rock. Additional analyses found unexpectedly large amounts of titanium, chromium, zirconium and yttrium, but no indication of water or organic material.

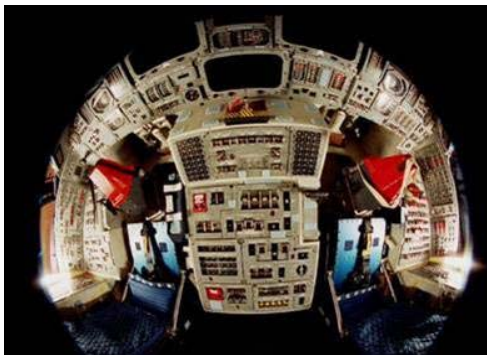
"Allen-Bradley stopped selling the sonic sifter line in 1972. Since the market for it was different from the majority of A-B's product lines, the patent was sold to Allis Tool and Machine Corp., Milwaukee … Charles Ward works with Gilson Co. Inc., Worthington, Ohio, and is involved in marketing an enhanced version of the sonic sifter. He has traveled around the globe speaking to technical audiences on the science of grain size distribution."
– *A-B Horizons* Magazine, 1989, No. 2, p. 20-21

The Space shuttle "A-B electronic components were aboard America's Space Shuttle fleet vehicles when they were first launched in the 1970s. A-B controls were also used to rotate the huge Saturn Rockets for technicians when they were being assembled prior to launches."
– Source: *AB Contact* magazine, 1982

"A visit to the Martin Marietta Aerospace Michoud operation in New Orleans offers an exciting glimpse of how A-B technology works to help the Space Shuttle literally get off the ground. It is here that Martin Marietta makes the gigantic external fuel tank portion of the shuttle.

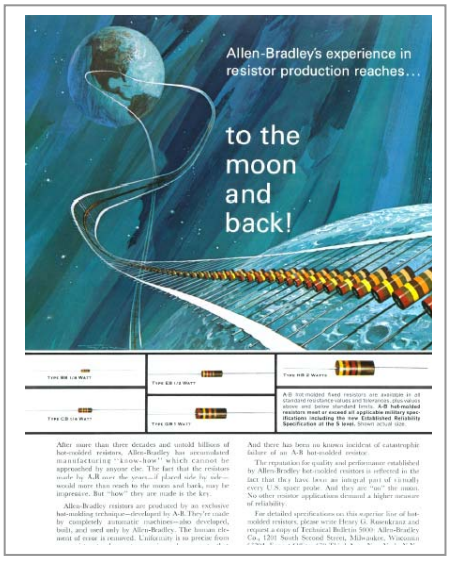
"William Le Blanc, supervisor of the Control Systems in the Design Test Operations engineering department at Michoud, explained that A-B equipment is used extensively in manufacturing and testing the 153 foot external tank – affectionately called 'E.T.' The tank, LeBlanc said, serves a dual purpose: it provides the structural backbone of the Space Shuttle during launch operations and contains and delivers liquid hydrogen and liquid oxygen propellants for the Orbiter's three main engines. 'It is one portion of the Space Shuttle that is not re-used,' LeBlanc said with a smile. 'That means we get to keep making them.'

"Building a fuel tank of such enormous proportions – particularly as it has to withstand inordinate amounts of stress and heat – takes every bit of technology available today. A-B controls, drives and systems are used in virtually every phase of the tank's construction, from welding the aluminum foundation together to administering the application of the thermal protection system. In the area where the various pieces of aluminum that make up the shell of the tank are welded together, A-B controls move the portable carriages and welding heads, and any position equipment. PCs and drives are the backbone of these systems. A-B products at Martin Marietta include a PLC-2/20 with 1771 I/O racks, a 1770 industrial terminal, a PTI Bulletin 1340, 1774 PLC, 1374 Drive units and 2100 Motor Control Center."
– Article, *A-B Contact*, "Helping the Shuttle Get off the Ground," 1983



"Allen-Bradley's experience in resistor production reaches to the moon and back. After more than three decades and untold billions of hot-molded resistors, Allen-Bradley has accumulated manufacturing 'know-how' which cannot be approached by anyone else. The fact that the resistors made by A-B over the years – if placed side by side – would more than reach the moon and back, may be impressive. But how they are made is the key.

"Allen-Bradley resistors are produced by an exclusive hot-molding technique – developed by A-B. They're made by completely automatic machines – also developed, built, and used only by Allen-Bradley. The human element of error is removed. Uniformity is so precise from one resistor to the next – year in and year out – that long-term resistor performance can be closely predicted. And there has been no known incident of catastrophic failure of an A-B hot modeled resistor. The reputation for quality and performance established by Allen-Bradley hot-molded resistors is reflected in the fact that they have been an integral part of virtually every U.S. space probe. And they are 'on' the moon. No other resistor applications demand a higher measure of reliability. A-B hot-molded resistors meet or exceed all applicable military specifications, including the new Established Reliability Specification at the S level." – A-B Ad, May 1969



Allen-Bradley was no stranger to Rockwell International in 1985, the year A-B's Board of Directors put their company on the market. At the time, Rockwell was the nation's premiere aerospace contractor. Its procurement teams, responsible for years of space missions, had to be familiar with the Allen-Bradley name and the Milwaukee firm. Four years after its acquisition by Rockwell, Allen-Bradley celebrated its parent company's role in the first manned landing on the moon.

"Rockwell International Played Major Role in Apollo 11 Success

- The Space Division was the principal contractor for the spacecraft's command and service modules, the launch escape system, spacecraft-lunar module adapter and the Saturn V second-stage unit.
- The Rocketdyne Division produced 30 rocket engines used to propel all stages of the mission's spacecraft.

- The Collins Division designed, developed and manufactured communications and data subsystems installed in the command module. Collins equipment transmitted live television signals from the moon. Aircraft and shipboard communications / tracking systems, 12 ground stations employing 30-food diameter antennas (monitoring Apollo 11's Earth orbit) and three 85-foot diameter antennas bridging the 239,000-mile lunar distance to Earth were also produced by the division."

– *A-B Horizons* Magazine, 1989, No. 2, p. 21

A Rockwell Footnote: In 1985, Rockwell International purchased the Allen-Bradley company for $1.6 billion. It was the first in a series of acquisitions taken by the aerospace and defense giant to reduce its dependence on government business. Over the next 17 years, Rockwell invested several billion additional dollars to build an industrial automation team. Using A-B as its "franchise player" it added Icom Software, Sprecher+Schuh, Reliance Electric, Dodge and other names. In the same period, it spun off its space, graphics, electronics and transportation businesses. Finally in July 2002, Rockwell International spun off Collins Avionics as a separate corporation and – with its business now focused solely on industry and manufacturing – officially changed its corporate name to Rockwell Automation. Today, Allen-Bradley is Rockwell Automation's premiere brand.

-- Rockwell Automation 2003