

Field Engineering Edition

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HELPS PUT MAN ON THE MOON

BFEC plays leading role in lunar drama

Eight years after the birth of the Manned Space Flight network, the intricate tracking complex fulfilled its prime objective—supporting the spacecraft that carried the first men to the moon.

Since June, 1961, when the MSFN came into being with Project Mercury, it has been the "eyes and ears" of manned space flight.

Seventeen stations made up the Mercury network and, since speed of operations was essential, U.S. national ranges under the Department of Defense and the Australian Department of Supply were used to the maximum extent possible. When America moved into Project Gemini, the network requirement became more demanding. The MSFN had to track the two-man spaceship and a target vehicle as well. The Gemini network exchanged about 40 times the amount of information as that of Mercury.

Final step

Then America began the third and final step toward a lunar landing: Project Apollo. To and from deep space, the network was required to collect data, transmit commands and track Apollo 11 and its crew.

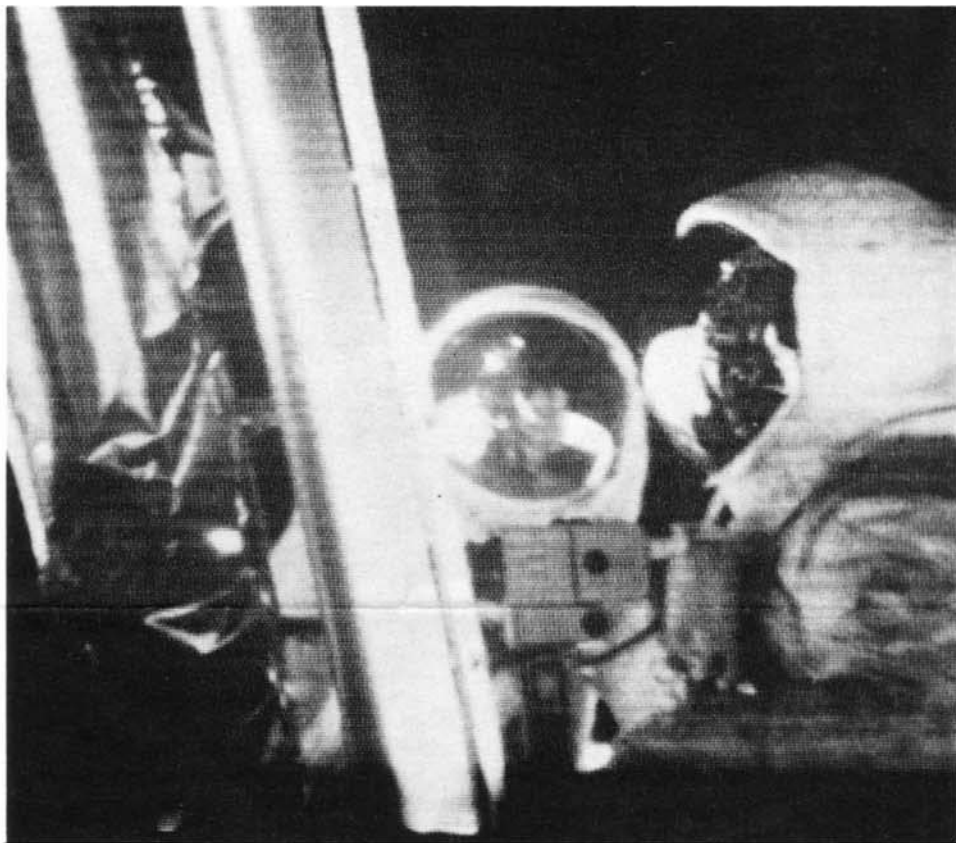
The Apollo network is under the

direct management of NASA's Goddard Space Flight Center, Greenbelt, Md.

Extensive network

For the climatic moon landing the Apollo network consisted of eight Apollo aircraft operated by the Air Force, four ships and 16 land stations, all but three of which were operated by Bendix Field Engineering Corporation. Included in the land stations were the three 85-foot-diameter antenna stations at Madrid, Spain; Honeysuckle Creek, Australia, and Goldstone, Calif.; the backup stations of the Deep Space Network at the same three locations, and the Deep Space Network's 210-foot-diameter Mars antenna at Goldstone.

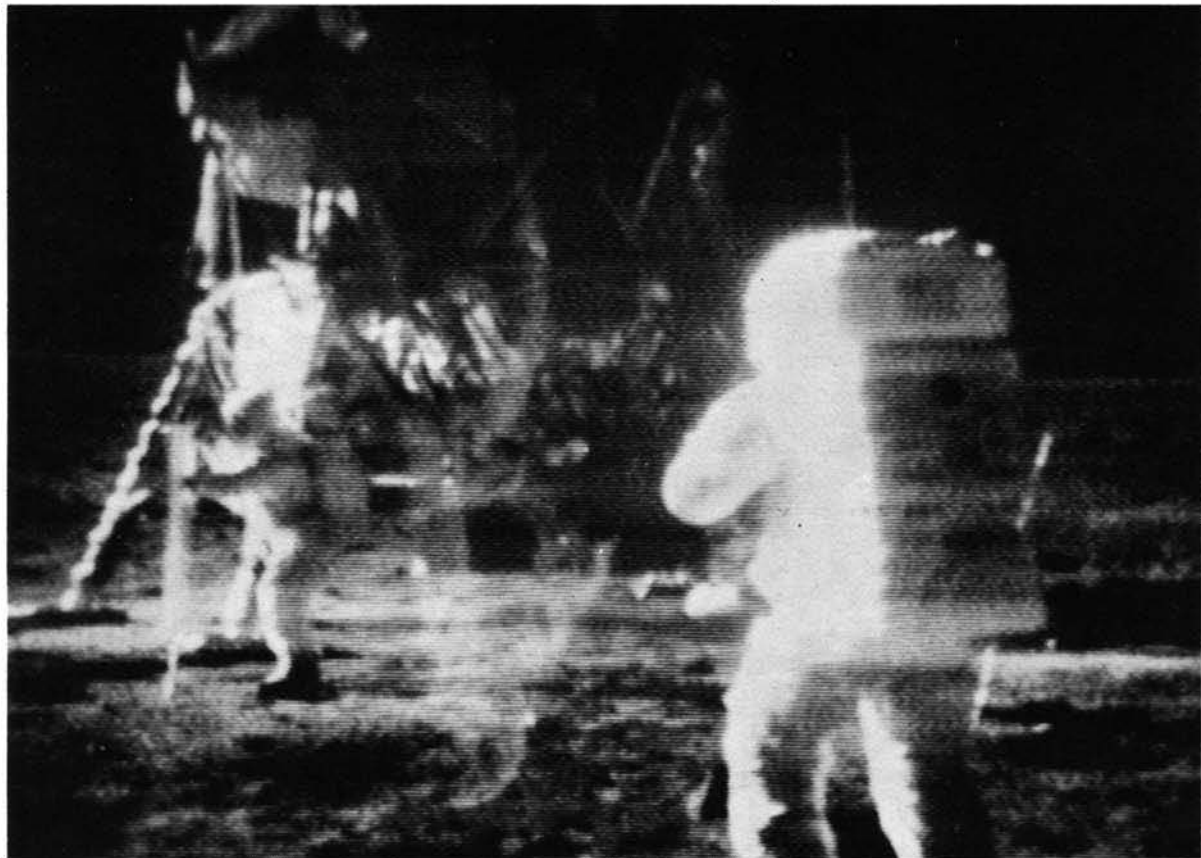
Mission highlights at Goldstone include the Command Module and Lunar Module undocking, the LM powered descent and touchdown. Neil Armstrong's comment upon landing, "Houston, Tranquility Base here. The Eagle has landed," was received by Goldstone. Then at 10:56 p.m. (EDT), Armstrong stepped onto the moon with his long-remembered words: "That's one small step for a man, one giant leap for mankind."



ALDRIN AND ARMSTRONG

... 'We came in peace for all mankind.' Collins flew overhead.

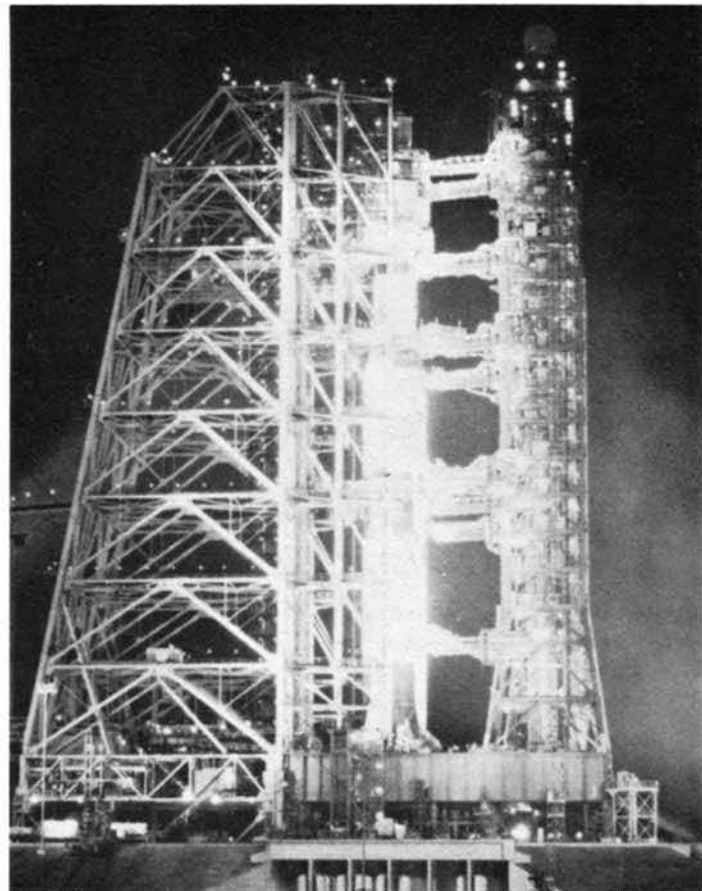
NASA Photo



'WE CHOOSE TO GO TO THE MOON IN THIS DECADE': JOHN F. KENNEDY, MAY 25, 1961.

... Astronaut Edwin Aldrin deploys the solar wind experiment and is photographed by Astronaut Neil Armstrong (foreground)

NASA Photo



APOLLO 11 ON THE PAD

... Next stop, the moon

Bendix instruments guide Apollo

Charles Lindbergh used a plumb bob—a weight on the end of a string—to help maintain balanced flight during

his Atlantic crossing. Apollo 11 astronauts Buzz Aldrin and Neil Armstrong were also assisted by a weight on the

end of a string to make their descent to the moon's surface.

The string, of special silk suture thread, and its weight constitute an integral part of the thrust-to-weight-ratio indicator, a flight instrument designed and built by the Instruments and Life Support Division, Davenport, Ia.

The instrument measures lunar acceleration and deceleration in terms of moon "g's." (Moon "g's"—gravitational force units—are about one-sixth that of an earth "g.") The measurement reveals the rate at which the Lunar Module descent engine is slowing down the spacecraft as it approaches the moon's surface.

One of its kind

This is the only purely mechanical instrument aboard the Lunar Module. All others are at least partially electrical. The tension of a spring balances the weight when the instrument is at rest or moving at a constant velocity. An increase or decrease in speed is sensed by the weight, which moves in the opposite direction. The string's role, along with a series of pulleys, is to scale the weight translation into readable units of lunar "g's."

Another helpful instrument, produced by Navigation and Control Division, Teterboro, N. J., was the descent throttle actuator, built to ensure a soft landing.

The throttle actuator has been designed with a passive redundant circuitry so that it will continue to operate even if a component fails or shorts. The descent engine's servo system controls the position of the descent engine's fuel and oxidizer flow valves. Varying the actuator output shaft position controls the descent engine's thrust, providing the proper rate of descent.



APOLLO PLUMB BOB — A thrust-to-weight-ratio indicator was used by Apollo 11 astronauts to monitor the thrust of ascent and descent engines during the lunar landing phase of the epic moon flight. The pointer moves along a fixed vertical scale that is calibrated from zero to 6.5 lunar-gravity-units.

Helms praises BFEC for work on Apollo 11

Upon completion of the Apollo 11 mission on July 24, J. Lynn Helms, vice president and group manager of the Bendix Aerospace-Electronics Company, congratulated Bendix Field Engineering Corporation for its participation in the historic flight.

In a telegram to Leister F. Graffis, Field Engineering's president, Helms said: "Our company is very proud of the BFEC contribution to this historic achievement and mindful that such events only occur when every employee accepts his responsibility and satisfactorily fulfills it."

Helms commented on the spirit of dedication and personal effort displayed by Field Engineering, saying that this spirit "is factually measured by the high levels of preparation and achievement in all departments."

Helms extended the compliments of all corporate officers to every employee of Field Engineering "on the occasion of man's first landing on the moon."

Helms concluded: "We ask each employee to accept that element of personal pride that duly accompanies his fulfillment of assigned tasks, and which made the event possible."



J. LYNN HELMS

Cronkite news team visits Goldstone

Heads turned in Goldstone, Calif. as the man in the khaki outfit walked by. Sure enough, it was Walter Cronkite, anchorman for the nationwide CBS news program.

Cronkite visited NASA's Goldstone space tracking complex on July 4 to interview the area's personnel and obtain background information and films on Apollo 11 preparations for use on his evening TV news broadcast. Cronkite and the CBS news team, under the direction of Ron Bunn, flew into the nearby Goldstone dry lake from which the area has taken its name.

Briefing Given

Bendix Field Engineering Corporation's Thomas C. Turnbull, the Manned Space Flight station's maintenance and operation supervisor, briefed Cronkite on the Goldstone complex' assignment for the Apollo 11 mission. Afterwards, Cronkite said he was surprised at the number of antennas in the complex. "I always thought of Goldstone as one antenna," he said.

The day's activities included interviews with Richard Kephart, assistant NASA director of the Apollo-Goldstone MSFN station, and Bill Gill, assistant NASA director of the 210-foot-antenna Mars station, one of four deep space facilities at Goldstone.

Interview conducted

Cronkite also interviewed Mrs. Robert Burton and her two children. Mrs. Burton is the wife of the Bendix employee assigned as dispatcher and general mechanic for the MSFN station.

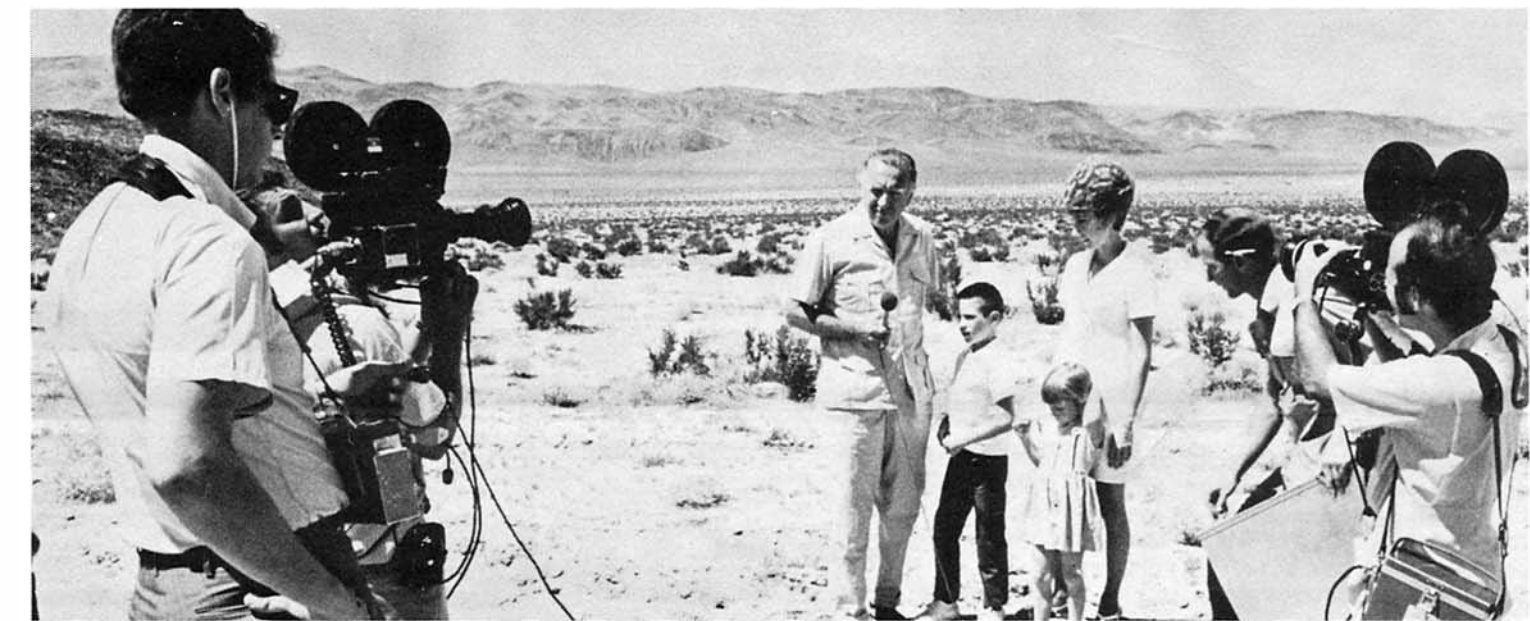
Also included in the trip was a visit to the old mining town of Goldstone, a thriving community during the late 1800's.

Late in the afternoon, the CBS news team left Goldstone for Los Angeles from which Cronkite traveled to the ranch of former President Lyndon Johnson and then to Kennedy Space Center.



PRELAUNCH ACTIVITIES of Apollo 11 at the Goldstone Manned Space Flight station included a briefing for CBS News Correspondant Walter Cronkite. From left are Harry

Day, PCM telemetry technician, and R. A. Bunton, television technician, both of whom are Bendix Field Engineering Corporation employees, and Cronkite.



CBS NEWS CORRESPONDANT Walter Cronkite interviews Mrs. Robert Burton and her two children. The CBS news team "canned" the July 4 interview for rebroadcast during

Apollo 11. Robert Burton works for Bendix Field Engineering Corporation at the Goldstone Manned Space Flight station in California.

Tech writers document ships' intercoms on two oceans

A sea cruise, a ringside seat for Apollo 10 and a visit to the beaches of Hawaii. These are the "fringe benefits" of being a writer in Bendix Field Engineering Corporation's technical publications and graphic arts department.

Just ask Technical Writers Ray Buchheister and Bob Runion. They'll tell you.

They'll also tell you that such luxuries are rather short-lived and that their jobs involve hours of diligent research.

Recently, the two technical writers responded to a NASA request to provide technical documentation aboard the USNS Vanguard and the USNS Redstone, two of NASA's Apollo tracking ships.

So it was off to Port Canaveral, Fla.

to board the Vanguard. Neither writer had ever been to sea but, to complete the documentation in the most expeditious manner, NASA selected several weeks which included the Apollo 10 lunar mission.

Their trip took them to Bermuda for two days and then to the mission support station in the middle of the Atlantic ocean, 1700 miles east of Cape Kennedy. "We experienced no seasickness," said Runion, "and developed our sealegs rapidly." Runion and Buchheister sailed the Atlantic for 17 days.

Document intercom

In the midst of the 1000 relays of the Interphone subsystem of Apollo communications, the ship's intercom, Buchheister and Runion prepared drawings of the subsystem as it appeared in use, gathered wiring and cabling data and made applications schematic drawings of the interface between the communications system and the Interphone subsystem. The two writers also verified each step of their work against the actual operation of the equipment.

"Being aboard ship during Apollo 10," said Buchheister, "adds a differ-

ent aspect to space flight. Although there is no television coverage, you have access to all conversations between the astronauts and Mission Control. It's like the play-by-play of a baseball game over radio."

The cruise ended back at Port Canaveral and the technical writers-turned-sailors returned to Field Engineering's offices in Owings Mills, Md. They had two weeks to prepare for an identical documentation for the USNS Redstone, but this time they would be traveling to Pearl Harbor, Hawaii.

Work in Hawaii

By the time Runion and Buchheister arrived at Pearl to board the Redstone, they were seasoned by experience. The Interphone was well known to them and the documentation took only three weeks instead of the five aboard the Vanguard.

"We had the weekends and evenings to ourselves," said Runion. "In that time, we toured the island, basked on the Waikiki beach and enjoyed Hawaii's field-ripened pineapples."

When asked if they like to travel as part of their work, the writers gave the ageless field engineering response, "We're ready to go anywhere, anytime to do any job."

Spanish engineers now manage station

Spanish engineers formally took over operation of the Deep Space tracking facility near Madrid, Spain in a ceremony attended by officials of the Spanish and American governments June 14.

Located in the village of Cebreros about 44 miles east of Madrid, the Deep Space station (DSS-62) had been operated for NASA and the Spanish Instituto Nacional de Tecnica Aeroespacial (INTA) by Bendix Field Engineering Corporation under the management of Sy Brumer, manager, Madrid DSIF operations (Bendix Today, March 10, 1969).

Heading the list of dignitaries were Gen. Luis Azcarraga, president of the Spanish Space Research Council; U. S. Ambassador Robert C. Hill; Gen. Antonio Perez-Marin, President of INTA, and Dr. Thomas O. Paine, administrator of NASA.

Authority changes hands

To mark the changeover, Dr. Paine sent the final American signal to an unmanned probe orbiting the sun. A short time later, Gen. Azcarraga sent the first signal under Spanish control.

While the signal traveled some 100 million miles to the spacecraft and back, the NASA and Spanish national flags were unfurled. The ceremony took place while the 85-foot-diameter antenna was locked onto the Pioneer 8 space probe in a 12-hour pass.

The Madrid installation is one of the major units of

NASA's Deep Space network used primarily for tracking, communication and control of the unmanned spacecraft flying more than 10,000 miles from earth. The network also assists with Apollo manned flights and provides TV reception.

BFEC runs DSS-61

A second station near Madrid, in the village of Robledo de Chavela (DSS-61), is still operated by Field Engineering. Bendix provides about 39 engineers and technicians for the maintenance and operation of the station.

On his first visit to the Madrid station, Dr. Paine said, "I should like to mention the outstanding work done here (at DSS-62) by JPL and its industrial contractor, the Bendix Field Engineering Corporation." Dr. Paine was referring to the Jet Propulsion Laboratory which operates the Deep Space network for NASA and for whom Bendix has worked since 1960.

Praises Spanish

Dr. Paine praised the Spanish INTA for achievements on many spacecraft flights, including full photo coverage and first picture release of the moon by three Lunar Orbiters, Mariner flights to Venus and Mars and four Pioneer interplanetary probes.

"Spanish determination to participate in this exciting 20th Century form of exploration reminds us that five centuries ago Columbus' great voyage of exploration was carried out under the flag of Spain," said Dr. Paine.



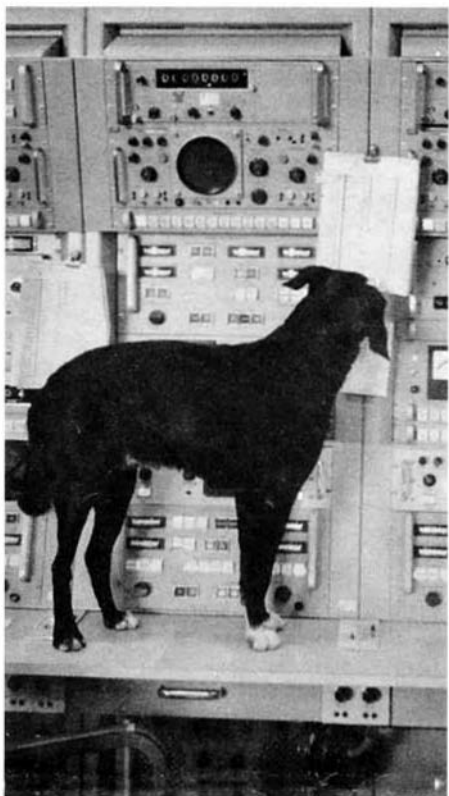
'VERIFY, PLEASE' — Technical Writers Ray Buchheister (left) and Bob Runion check the relays in the Interphone subsystem onboard NASA's Vanguard tracking ship.

Safety reminder leads dog's life

By HAROLD DEUTCH

Long before NASA adopted Charles Schulz's comic strip beagle as the symbol of crew safety and mission success, a dog served to remind Bendix Field Engineering Corporation personnel at the Apollo site on Ascension Island that excellence was a must for success.

Snoopy is his name and always has been. His mother was a Labrador Retriever. His dad? He was a way-



CHECKING UP — "Snoopy," mascot of crew safety and mission success for Bendix personnel at the Ascension Island Manned Space Flight station, checks the systems test results on the receiver system.

faring stranger who passed by the island in 1966.

Starts early

Now he's three, and every morning he awakes at 6 a.m. Snoopy arouses his roommate Harry Turner, the track data and antenna position programmer. Together they go to the NASA site for breakfast and prepare for the day's work.

Bendix M&O Supervisor Jim Murphy assigned Snoopy as doorman. He greets every man good morning with a lick and a paw but only after he responds to the dog's signal with, "Whip one on me."

Emphasizes safety

Snoopy's greatest responsibility is reminding the team each morning that its efforts for perfection, its struggle against carelessness, will mean success on the next Apollo flight.

Now, don't let anyone tell you that life on Ascension is hard or that there's nothing for a dog to do. Why, VHF Telemetry Operator Emil Voigt loves to romp in the hills around the station with Snoopy. John Staudt and Norman Israel of the receiver/exciter group will always accompany him fishing. In fact, they say Snoopy's the best fisherman and swimmer on the island.

Then there's Servo Technician Marsden Wofford. What a pushover. He's always ready to challenge Snoopy with a rag tug-of-war.

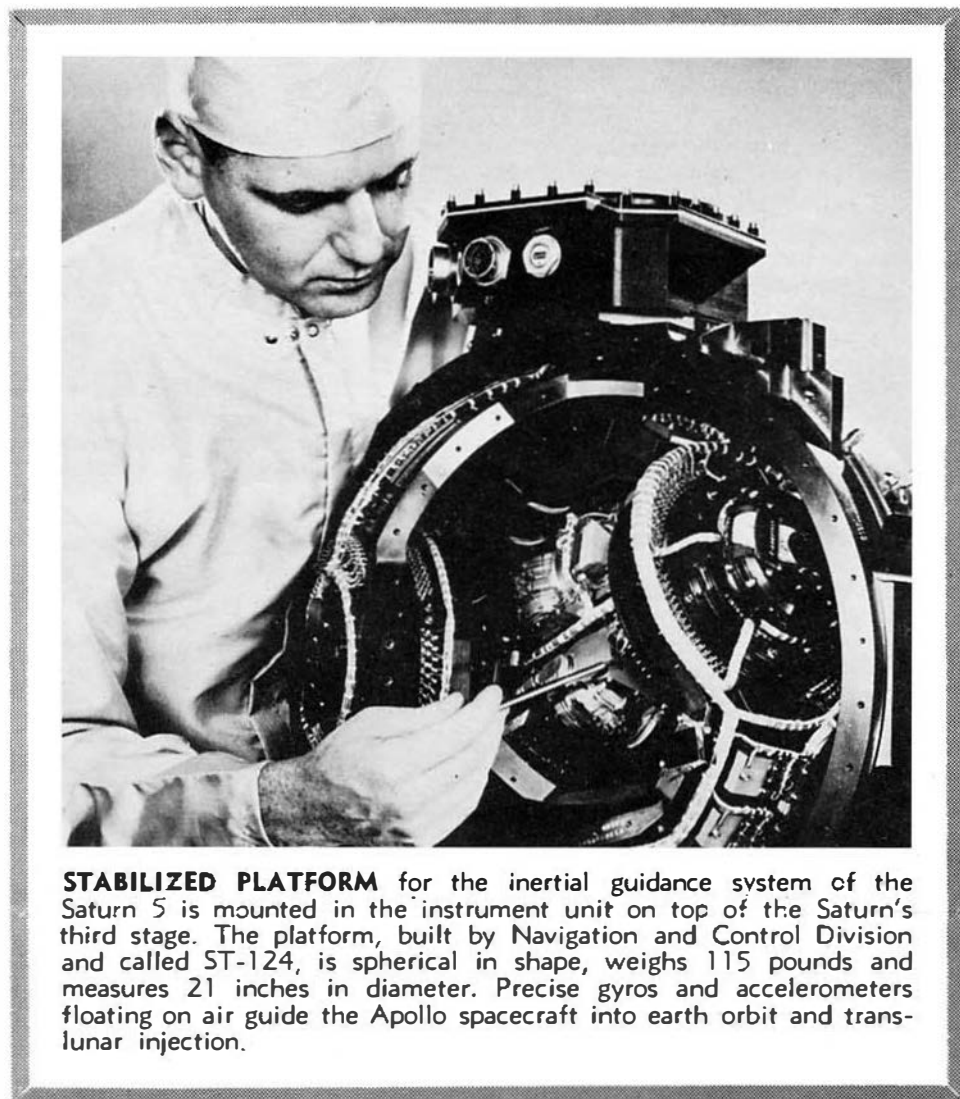
Sheepish hound

Generally, Snoopy's a mild-manner-

ed pooch, but he has one weakness: sheep. After all, he's only canine. Just the other day, Jim Murphy was awakened about 4 a.m. and informed by the authorities that Snoopy had gotten into mischief again. That was his last warning. Several times before, Rex Chapman, ranging and timing operator, had to bail Snoopy out after he had been picked up and

canned for chasing those woolly beasts.

For the sake of the space program and, of course, NASA's animated wonderdog, NASA Station Director Don Dunsmore encouraged the men of Ascension to take care of the living example of "Snoopy," the first watchdog for manned flight.



STABILIZED PLATFORM for the inertial guidance system of the Saturn 5 is mounted in the instrument unit on top of the Saturn's third stage. The platform, built by Navigation and Control Division and called ST-124, is spherical in shape, weighs 115 pounds and measures 21 inches in diameter. Precise gyros and accelerometers floating on air guide the Apollo spacecraft into earth orbit and trans-lunar injection.

Mansfield captures feelings in photo

Following the flight of Apollo 11, people everywhere expressed their feelings about the momentous event. Some flew flags from their homes. Some named their newborn after the astronauts. Some, particularly the young, created new dances.

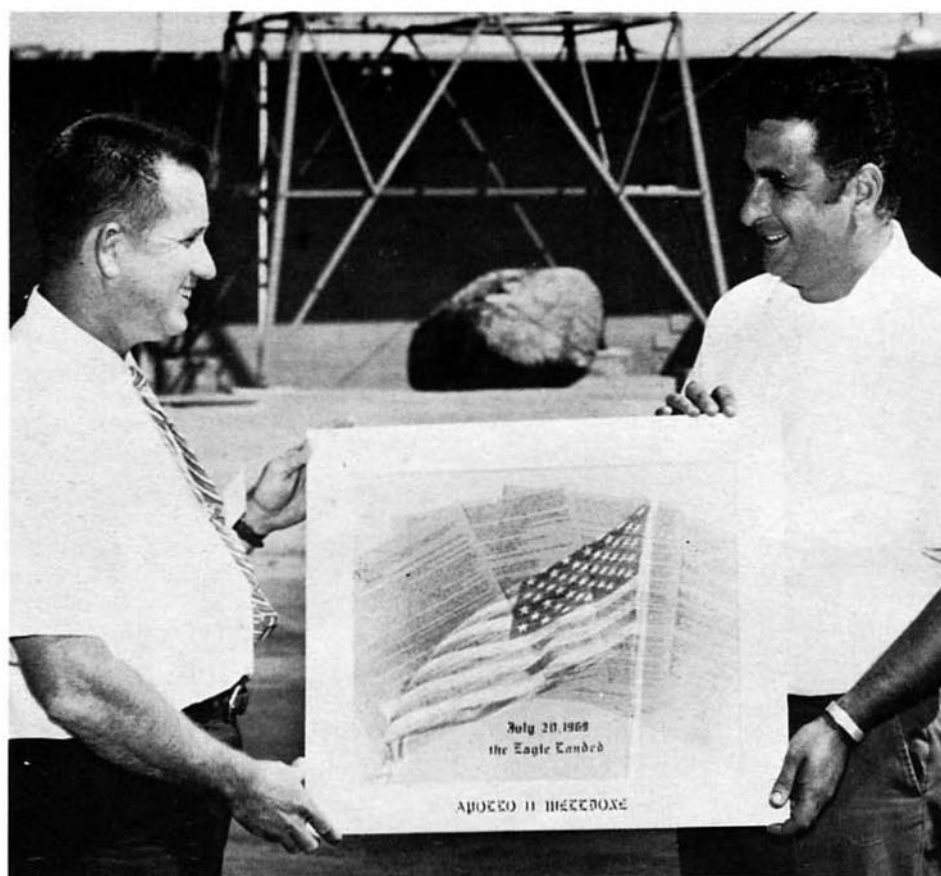
John Mansfield, a photographer for Bendix Field Engineering Corporation at NASA's Goldstone Deep Space complex in California, expressed his feelings too. Using his own equipment and time, Mansfield took a photograph of the American flag and superimposed it over a copy of the Constitution of the United States of America.

Why did he use the Flag and the Constitution?

"The Flag," said Mansfield, "symbolizes not only the free people here in America, but all the world's free people. The Constitution begins, 'We the people,' and that is how I intended the photograph: to be from all people everywhere."

Mansfield purchased the copy of the Constitution about three years ago in St. Augustine, Fla., the oldest city in the United States.

The photograph has been sent to Field Engineering executive offices in Owings Mills, Md.



COMMEMORATIVE PHOTO — Photographer John Mansfield (right) presents his creative photograph expressing his feelings on the flight of Apollo 11 to Ned Hill, Bendix M&O manager at the Goldstone Deep Space complex.

Apollo 11 photos now available

NASA has announced that full-color pictures of the historic Apollo 11 mission, including the first view of Neil Armstrong's moon walk, will be sold by the Superintendent of Documents, Government Printing Office, Washington, D.C.

Purchases can be made by mail order or in person at the U.S. Government Printing Office bookstores in Washington, San Francisco, Chicago and Kansas City, Mo.

Pictures will be available in both a set of twelve 11-by-14-inch lithographs, selling for \$1.75 a set, and a single full-color lithograph 16-by-20-inches overall, showing man on the moon for the first time. The single print will cost \$1. All pictures will be suitable for framing.

Orders should be addressed to Government Printing Office, 710 N. Capitol Street, Washington, D.C. NASA Picture Set 4, "First Manned Lunar Landing," should be ordered for the set of 12, and NASA Picture Set 5, "Man on the Moon," for the single print.