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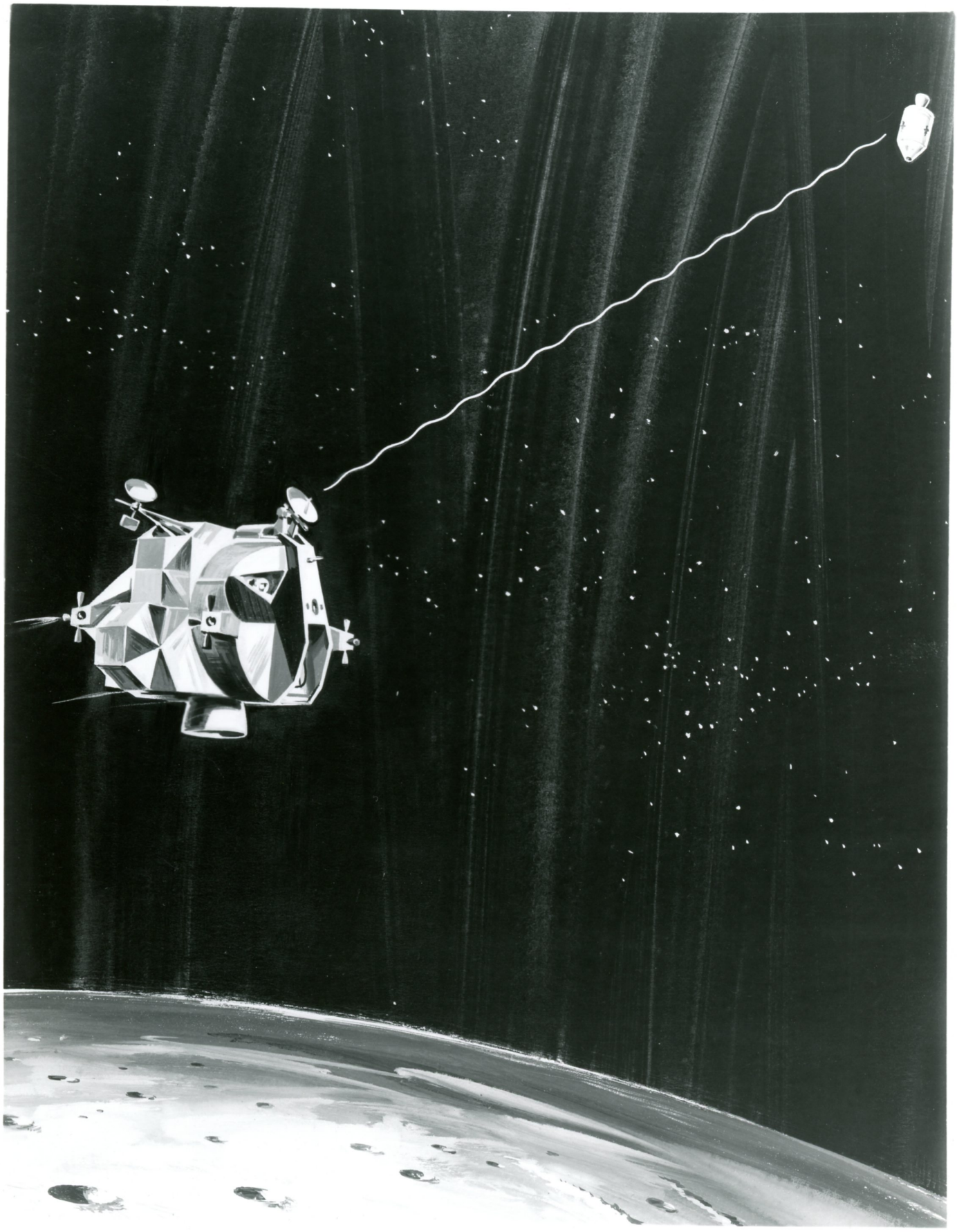

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SPACE RADAR -- This RCA artist's concept illustrates how the Lunar Module (LM) rendezvous radar will track the Command/Service Module (CSM) in lunar orbit when the LM is returning from its Moon landing. The radar can determine position and velocity of the LM relative to the CSM, providing important data to enable the Moon-lander to maneuver back to a rendezvous and docking with the command ship. RCA Defense Electronic Products builds the radar in Burlington, Mass., and Moorestown, N.J., for Grumman Corporation, prime contractor to NASA's Manned Spacecraft Center for the LM.

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LUNAR 'UMBRELLA' -- RCA engineer Bob Mason demonstrates on earth a scene an Apollo 11 astronaut can enact on the Moon after landing there. It is the deployment of an umbrella-like antenna to beam communications signals, including "live" TV, from the Moon to earth. The antenna has more than 38 miles of hair-fine wire mesh in its reflective surface. The "umbrella" is carried to the Moon as a cylinder only 10 inches in diameter and 39 inches long, yet can be deployed to a reflector 10 feet in diameter if strength of the lunar communications signals needs boosting. RCA's Missile and Surface Radar Division, Moorestown, N.J., developed the antenna for Grumman Corporation, prime contractor to NASA's Manned Spacecraft Center for the Apollo Lunar Module.

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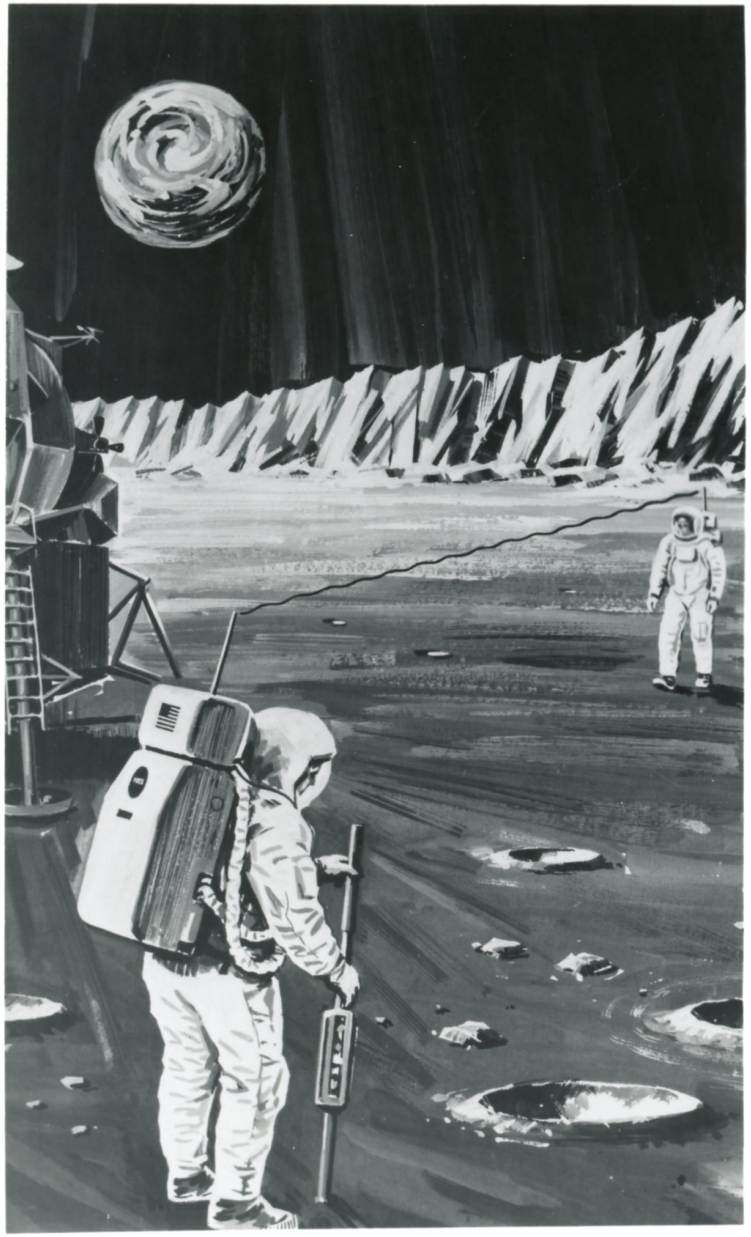

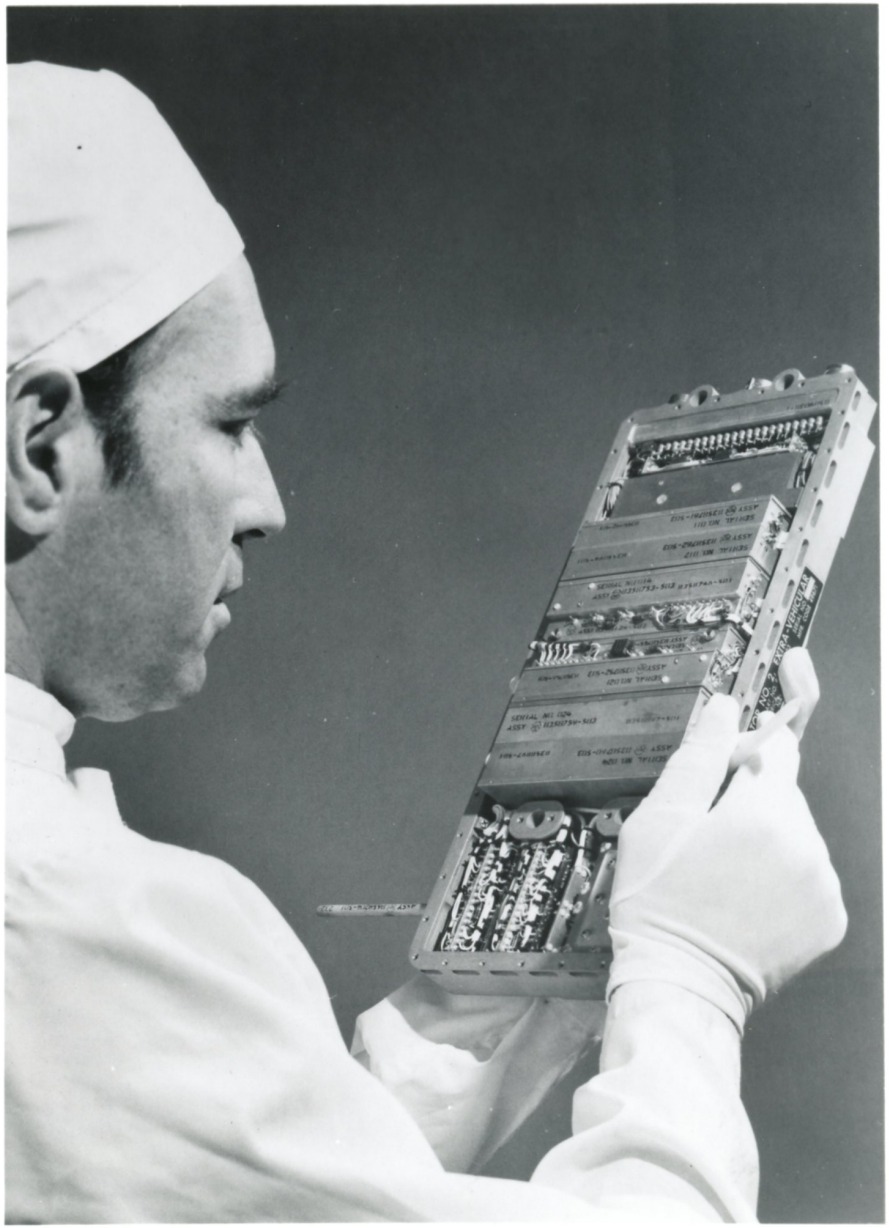

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LUNAR CONVERSATION -- As they explore the Moon, Apollo 11 astronauts Neil Armstrong and Edwin Aldrin will talk to one another, and the earth, using RCA communications sets that occupy less space than a cigar box. The RCA technician at the right is working on one of the Apollo Extra-Vehicular Communications System (EVCS) sets that weighs just 6.5 pounds and measures only 1¼ by 6 by 14 inches despite the fact it has five transmitters and receivers for voice conversations plus telemetry instrumentation to radio data on the astronaut's physical condition and status of his spacesuit systems. RCA's Defense Communications Systems Division, Camden, N.J., builds the lunar radios for NASA's Manned Spacecraft Center.

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NEW RCA ELECTRONIC SYSTEMS ON DUTY TO PROCESS TV BEAMED FROM MOON

Two new RCA electronic systems are on duty in Australia to allow home TV viewers to watch historic "live" pictures of Apollo 11 astronauts Neil Armstrong and Edwin Aldrin exploring the Moon after they land there July 20, it was announced today.

One of the new systems, which convert "slow scan" TV signals to commercial standards so they can be broadcast by the networks, is located at the NASA Manned Space Flight Network (MSFN) station, Honeysuckle Creek. The second is at Sidney for use with the Australian National Radio Observatory in Parkes, according to C.S. Constantino, Division Vice President of RCA's Astro-Electronics Division, Princeton, N.J.

RCA developed the scan converters for NASA's Goddard Space Flight Center, which manages the network. Similar RCA built systems are also located at MSFN stations in Goldstone, Calif., and Madrid, Spain.

The new systems in Australia, along with those in California and Spain, assure that at least one scan converter equipped tracking station will be in view of the Apollo 11 landing site continuously to receive and convert TV signals so they can be broadcast to home receivers.

Apollo 11 plans call for Armstrong and Aldrin to telecast black-and-white pictures of their activities on the lunar surface as they collect rock and soil samples and set up experiments. They are slated to spend about two and one-half hours outside their spaceship during the 22-hour visit to the Moon.

However, to conserve power and communications bandwidth, the Apollo camera to be used on the lunar surface transmits pictures at rates different from those of standard TV.

Instead of conventional pictures of 525 lines-per-frame broadcast at 30 frames-per-second, the Apollo camera's pictures are composed of 320 lines-per-frame broadcast at 10 frames-per-second. Without scan conversion on the ground, the Apollo pictures would flicker badly when carried on home sets.

The Apollo camera also operates in a high resolution "still" mode, sending a picture of 1,280 lines each 1.6 seconds.

The scan converters, through an instantaneous recording playback process, transform pictures transmitted at both Apollo rates to commercial standards so they can be carried by conventional sets.

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COUNTDOWN COMPUTERS PLAY KEY ROLE IN LAUNCH OF APOLLO 11 ASTRONAUTS

CAPE KENNEDY, Fla. -- A pair of specially designed RCA countdown computers will play a major role in sending the Apollo 11 astronauts into space for their historic landing on the moon.

The computers, developed by RCA's Electromagnetic and Aviation Systems Division, Van Nuys, Calif., for NASA's Marshall Space Flight Center, will help NASA launch directors check out the mammoth Saturn V rocket before it thunders aloft.

One computer is located within the mobile launcher from which the 364-foot tall, more than 6-million-pound Saturn V will lift off. It will check out the Saturn V by commanding the rocket to exercise valves, engines, relays and similar components and measuring the resultant performance.

Although well protected, the mobile launcher computer will have to withstand enormous vibration and sound forces as the Saturn V generates 7.5 million pounds of thrust rising from the launcher.

The second Saturn ground support computer is in the Launch Control Center. It controls the sequence of checkout and launch countdown programs performed by the mobile launcher computer.

The two computers are joined by a digital data link that enables them to "talk" to each other much like two individuals converse on a telephone. Should the mobile launcher computer detect a problem, it is designed to inform its "twin" in the Launch Control Center, which will then initiate a search to pinpoint the trouble and specify what corrective action must be taken.

Use of the RCA computers in the Saturn V countdown is necessitated by complexity of the space program, according to Sidney Sternberg, Division Vice President and General Manager of RCA Electromagnetic and Aviation Systems.

"The computers allow the effective handling of a greater number of parameters and an increased frequency of checks in a limited time than is possible with other methods. This results in the rapid and accurate determination, on a continuous basis, of the condition of the rocket and its hundreds of thousands of components," he said.

The computers will monitor more than 3,000 parameters, or functional aspects of the Saturn V during the countdown. Their information will be flashed on displays before the NASA mission directors, who control the countdown and who can break in and direct the action manually at any time.

To assure that the mobile launcher computer can withstand the crushing forces that will pound the launcher when the Saturn V ignites and lifts off, the computer has been put through a rigorous series of tests at NASA's Marshall Space Flight Center, Huntsville, Ala. The tests included shaking the computer on a vibration table at a rate equalling the estimated punishment it will take when the Saturn V pushes skyward. The computer also was placed in a horn-shaped building and subjected to 140 decibels of sound screaming from a huge siren.

The computer withstood these tests satisfactorily.

The computers used in the launch of the Saturn V are part of 30 such systems developed by RCA for NASA's Apollo/Saturn program. They are installed at NASA's Kennedy Space Center, Marshall Space Flight Center, Michoud Assembly Facility in Louisiana and the Mississippi Test Facility to check out uprated Saturn I and Saturn V rockets during development and launch.

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RCA RADAR 'EYES', ADVANCED ELECTRONICS TO HELP APOLLO 11 MAKE HELICOPTER-LIKE LANDING ON MOON

Apollo 11 astronauts Neil Armstrong and Edwin Aldrin will employ a set of RCA radar "eyes" and other advanced electronics to make a helicopter-like landing on the Moon July 20.

Virtually every electronic system aboard the nimble Lunar Module -- the most maneuverable spacecraft ever built -- represents a major achievement in incorporating high capability and reliability into lightweight, compact designs, according to Irving K. Kessler, Vice President of RCA Defense Electronic Products.

"For example, the assembly that will throttle the Lunar Module descent engine so that the Apollo 11 crew can settle to a gentle touch down on the Moon could fit into a shoebox with room to spare," Mr. Kessler said.

RCA has developed Lunar Module control electronics, radar and communications for Grumman Corporation, builder of LM for NASA's Manned Spacecraft Center. Each RCA system has an intricate role in the complex Apollo manned lunar landing plan.

After the docked Command/Service Module (CSM) and LM enter orbit around the Moon, Armstrong and Aldrin will transfer to the spider-like LM, undock and descend to the Moon.

During the flight, RCA radars will give the LM astronauts long range and precise electronic vision.

After firing their engine to initiate descent, the LM pilots will activate their rendezvous radar and track the CSM in lunar orbit to check the accuracy of their burn. This will assure them they are on course for landing.

The radar, able to "see" the CSM from more than 400 nautical miles away, operates by sending signals to a CSM-borne transponder, which retransmits the signals back to the LM. By calculating time between transmission and receipt of the return, and by measuring other characteristics of the signals, the radar can determine distance, direction and velocity of LM relative to the CSM.

This not only tells the LM pilots where they are with respect to the CSM, but also provides important data for the spaceship's guidance system so the proper engine firings can be accomplished to bring LM to a rendezvous with the CSM when it is returning after the landing.

The radar, built by RCA in Burlington, Mass., and Moorestown, N.J., combines into less than 92 pounds -- including the CSM transponder-- capabilities found in earth-based systems whose weight runs into tons.

As LM approaches closer to the lunar surface, its landing radar will go into action, bouncing four radio beams off the Moon to tell Armstrong and Aldrin how far they are above the Moon and how fast they are approaching it -- data equivalent to an aircraft pilot's altimeter and speed indicator readings.

The landing radar information, like that of the rendezvous radar, will be flashed before the pilots and fed into the LM's guidance system so the descent engine can slow the spacecraft to a soft landing.

The landing radar is also an RCA responsibility. It is built by Ryan Aeronautical Company under a subcontract. RCA supplied the solid-state transmitter and also worked closely with Ryan on the systems development and design.

As they near their landing site, the Apollo 11 astronauts will throttle their descent engine much like a motorist varies the power of his auto engine. Able to operate from as little as 10 per cent thrust to full capability, the engine will enable them to travel as slow or fast as necessary and even to hover like a helicopter before landing.

Throttling signals to the engine will come from a 7.3-pound assembly developed by RCA in Burlington, Mass. Called DECA, for Descent Engine Control Assembly, it is the system that Mr. Kessler describes as able "to fit into a shoebox with room to spare".

DECA, besides sending throttling signals, also will allow the descent engine to be gimballed so its direction of thrust is properly aligned through the spacecraft's center of gravity.

Throughout its maneuvers, both during the descent and, later, the ascent from the Moon, the LM's balance relies on 16 thruster jets mounted in sets of four. These not only keep the spaceship in the proper attitude, but also allow it to shift, or translate, from side-to-side and front-to-rear -- another contribution to the LM's helicopter-like abilities.

When an attitude change or translational maneuver is dictated by the LM's guidance or astronaut controls, a compact RCA electronic system will select the jets to fire to achieve the action.

Since a host of combinations are possible among the 16 jets, the small assembly, called ATCA for Attitude Translation Control Assembly, is packed with logic circuits, literally "electronic brains", so it can select the correct thrusters and also prevent the firing of opposing pairs of jets, which would cancel one another and waste fuel.

Besides its control functions, ATCA, also built in Burlington by RCA, will send via the DECA automatic trim signals to the gimballed descent engine and provide regulated power for other LM assembles such as the rate gyro and the abort guidance system.

Throughout the mission, the LM's communications system simultaneously will keep Armstrong and Aldrin in touch with earth and with astronaut Michael Collins in the CSM. The entire communications system that must span the quarter-million miles of translunar space weighs just under 100 pounds -- about the same as many table model color TV sets.

Task of the system will be to transmit and receive voice signals, telemetry data, astronaut biomedical information, tracking signals and "live" TV between Moon and earth. At the same time, it will link LM to the CSM for an exchange of voice and data.

A unique feature of the RCA Very High Frequency (VHF) communications system that will link the LM and CSM is that it will allow Collins to calculate distance, or range, between the two spaceships simultaneously while the astronauts are talking over the radios. This VHF ranging data, along with the rendezvous radar information, is important for the landing and rendezvous/docking maneuvers.

This is the first VHF system with a simultaneous voice/ranging capability.

Flying to the Moon as part of the LM communications system will be a unique "umbrella" antenna. Packed as a cylinder only 10 inches in diameter and 39 inches long, and weighing only 14 pounds, it can be deployed on the lunar surface in 15 minutes to a reflector 10 feet in diameter if strength of the LM signal needs boosting.

The antenna springs open like an umbrella when activated by an astronaut. A key to its ability to be packed so compactly is a wire mesh that forms the reflective surface. Over 38 miles of hair-fine wire are woven into mesh for each of the parasol-type systems.

The mesh is supported by ribs that are jointed with a watch-spring type metal that allows them to be folded yet spring free into a rigid structure when the antenna is deployed.

Even smaller and lighter communications will operate when Armstrong and Aldrin step out of their LM to explore the Moon after the landing. Carried in the portable life support system back packs are cigar box size RCA communications sets with which the extra-vehicular astronauts can talk to one another and, via LM, with mission controllers on earth.

Although each back pack radio contains five transmitters and receivers plus telemetry instrumentation to radio data on the astronaut's physical condition and status of his spacesuit systems, it weighs only 6.5 pounds and measures only 1¼ by 6 by 14 inches. The sets are designed so that one astronaut will act as a radio relay point between his partner and the LM when both are outside the spacecraft.

The LM communications system and the back pack radios both were developed by RCA in Camden and Moorestown, N.J.

After spending about 22 hours on the Moon -- about two and one-half hours of which will be outside the LM -- Armstrong and Aldrin will blast off to begin their return to the CSM. Prior to the lift-off, the RCA rendezvous radar will look spaceward to track the CSM and help determine parameters for the lunar launch.

As LM ascends, the radar will continue to track, providing the astronauts and their guidance system with the all-important data that will bring them back to a docking with the CSM for the trip home and culmination of the most spectacular and historic exploratory venture ever undertaken by modern man.

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COMPACT RCA RADIO SYSTEM TO KEEP MOON-WALKING ASTRONAUTS IN TOUCH WITH EACH OTHER, EARTH DURING LUNAR EXPLORATION

As they explore the lunar surface on July 21 after the historic first manned landing on the Moon, Apollo 11 astronauts Neil Armstrong and Edwin Aldrin will communicate over cigar box-size RCA radios.

The compact Apollo Extra-Vehicular Communications System (EVCS) will keep Armstrong and Aldrin in two-way contact with one another, with earth and with astronaut Michael Collins orbiting the Moon in the Command/Service Module (CSM) while they are collecting lunar soil and rock samples and setting up experiments.

When both spacemen are outside the Lunar Module (LM), Armstrong will serve as a communications relay to the LM for Aldrin. Aldrin will transmit FM (frequency modulation)signals bearing both voice and telemetry to Armstrong's set. Armstrong's set, in turn, will combine his voice and telemetry with that from Aldrin and beam everything over AM (amplitude modulation) to the LM for relay to earth. Collins can keep in touch through a LM-earth-CSM relay link.

Besides two-way voice conversations, the RCA EVCS transmits telemetry data on the astronauts' physical conditions and status of the spacesuit systems. Each radio can sound a special tone to warn the astronaut should a critical spacesuit life support system such as oxygen supply or cooling equipment malfunction.

Although each set contains five transmitters and receivers plus telemetry instrumentation and voice processing circuits it weighs just 6.5 pounds and measures only 1¼ by 6 by 14 inches.

The lunar radios have been designed to have a mean time between failure of 61,000 hours -- or almost 7 years -- according to Roger D. DeVantier, EVCS Program Manager for RCA.

High reliability of the sets results from their all-solid-state design, use of components carefully screened for fault-free operation and extensive testing of both the individual components and the assembled system, he added.

Developed by RCA's Defense Communications Systems Division, Camden, N.J., for NASA's Manned Spacecraft Center, the compact EVCS sets are carried in the astronauts' portable life support system back-packs.

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RCA 'UMBRELLA' ANTENNA TO FLY TO MOON ON HISTORIC APOLLO 11 LUNAR LANDING

A unique RCA antenna designed to spring open much like an umbrella to beam communications signals, including live TV, from the Moon to Earth will be carried on the historic Apollo 11 lunar landing mission July 20.

Stored in the Lunar Module (LM) as a cylinder only 10 inches in diameter and 39 inches long, the antenna can be deployed on the lunar surface by an astronaut to a 10-foot diameter reflector in about 15 minutes if strength of the LM signals needs boosting. The antenna weighs only 14 pounds.

"The erectable antenna must be considered among the major innovative accomplishments of the Apollo program. It is incredible that a 10-foot diameter antenna can be packaged so compactly and weigh so little," said Philip A. Piro, General Manager of the RCA Missile and Surface Radar Division, Moorestown, N.J.

RCA developed the antenna under subcontract to the Grumman Corporation, prime contractor to NASA's Manned Spacecraft Center for the LM.

Keys to the antenna's small size and light weight are a wire mesh that resembles material now fashionable for ladies stockings and supporting ribs that are jointed with metal similar to but considerably thicker than that used for watch springs.

The mesh, which forms the antenna's reflective surface, is woven from over 38 miles of hair-fine wire only .0005 inch in diameter.

The watch spring metal -- called "Havar" -- allows the ribs supporting the mesh to be folded and then spring free to form a rigid structure.

To deploy the antenna, an astronaut removes it from its compartment on the Lunar Module spaceship, unfolds the legs, removes a cover, extends a telescoping "feed", raises the folded ribs and mesh, connects a cable from the LM and triggers the antenna mechanism so that it unfolds in umbrella fashion.

Working in conjunction with the LM communications system, the antenna then can transmit voice, astronaut biomedical data, telemetry and TV signals across the quarter-million miles from the Moon to Earth.

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RCA Apollo Information

RCA Defense Electronic Products | Moorestown, N.J.
Telephone: (609) 235-8469 or 235-8383

This consolidated fact sheet contains information on the following Apollo systems developed by RCA:

- LM Communications System
- VHF Communications, LM-CSM
- Extra Vehicular Communications System
  (backpack radios for lunar exploration)
- Erectable Antenna
- Rendezvous Radar/Transponder
- LM Landing Radar
- LM Descent Engine Control Assembly
- LM Attitude Translation Control Assembly
- Saturn Countdown Computers
- Tracking Radar Support For Apollo
- TV Scan Converters

More detailed fact sheets are available on each of these from Nick Pensiero, 783-2744, Cocoa Beach, and Tom Elliott, Holiday Inn, 591-2500, Houston.

APOLLO COMMUNICATIONS

LUNAR MODULE SYSTEM: The RCA LM communications system consists of two systems: S-band for LM to Earth links and VHF (very high frequency) for LM to Command Module communications. The S-band transmits and receives voice, telemetry, biomedical data, commands, ranging signals and television. Carrier frequencies are 2101.8 MHz for receiving commands, voice signals and range interrogations from Earth, and 2282.5 MHz for transmitting voice, data, ranging and TV.

APOLLO COMMUNICATIONS (Cont.)

VHF SYSTEM: RCA VHF sets link the LM and CM when the two spaceships are separated in space. Carrier frequencies are 259.7 and 296.8 MHz. The VHF system handles voice and astronaut biomedical data. In addition, the sets can provide the CM pilot with the range between the two spacecraft. The voice and ranging functions can be performed simultaneously. The ranging is performed by sending tones from the CM to the LM, which receives and retransmits them to the CM. Range is then determined by measuring the time between transmission of the tones and receipt of the LM-retransmitted returns. Specified range for voice communications is 550 nautical miles; specified range for the ranging function is 200 nautical miles.

EXTRA VEHICULAR COMMUNICATIONS SYSTEM: The RCA EVCS system will provide communication for extra vehicular astronauts (EVA) exploring the Moon. It will link EVA's with one another, with the LM and (via LM) with mission controllers on Earth. In addition, the system will transmit biomedical data on EVA's and telemetry information on the condition of spacesuit systems. EVCS consists of backpack sets carried by each astronaut. Each set measures 14 by 6 by 1 1/4 inches and weighs 6.5 pounds. Each contains two AM transmitters, two AM receivers, either an FM transmitter or an FM receiver and telemetry instrumentation. Use of an FM transmitter in one set and an FM receiver in the other will enable one EVA to act as a radio relay point to the LM for the other EVA. The LM, in turn, will serve as a relay between the EVA's and Earth.

ERECTABLE ANTENNA: The RCA erectable antenna can be used for S-band communications between the Moon and Earth. Carried to the Moon as a cylinder 10 inches in diameter and 39 inches long, it can be set up and "popped" on the lunar surface much like an umbrella to form an antenna 10 feet in diameter. The antenna can beam voice, data and TV from the Moon to Earth. Weight is 14 pounds. Gain is 32 db. Some 38 miles of .0005 inch diameter nickel chromium wire are woven into the cloth-like mesh that forms the antenna's reflective surface. The 21 ribs that support the mesh are .01-inch aluminum, electron beam welded. The ribs are jointed with a watch spring-type metal (Havar) so they can be folded yet still spring free to form a rigid structure. The antenna's helix feed and legs telescope.

All RCA Apollo communications systems development is managed by the Defense Communications Systems Division of RCA Defense Electronic Products, Camden, N. J. The VHF sets and Extra Vehicular Communications system are built in Camden; the erectable antenna is built by the Missile and Surface Radar Division, Moorestown, N. J.

RENDEZVOUS RADAR/TRANSPONDER

The RCA rendezvous radar/transponder system serves as a critical source of data for the rendezvous of the Lunar Module and the Command/Service Module. The X-band radar, mounted on LM, sends a continuous wave (CW) signal to a CSM-borne transponder, which retransmits the signal back to the radar. By measuring characteristics of the returned signal, the radar determines range, direction and velocity of the LM relative to the CSM. For the lunar landing, the radar will track the CSM as LM descends to the Moon, prior to lift-off of the LM from the Moon to determine launch parameters and during the ascent of LM as it maneuvers back to the CSM for the rendezvous and docking. The rendezvous radar is the first gimballing radar ever flown in space. Total weight of the radar and transponder is 92 pounds. Frequency is 9832.8 MHz.

The rendezvous radar electronics and transponder are built by the Aerospace Systems Division of RCA Defense Electronic Products, Burlington, Mass.; the rendezvous radar antenna is built by the Missile and Surface Radar Division, Moorestown, N. J.

LANDING RADAR

The Lunar Module landing radar will provide continuous measurements of the LM altitude and velocity relative to the lunar surface during the final phases of the descent and landing. It employs a three-beam doppler velocity sensor and a single beam altimeter. The radar information will be integrated with other LM sensors, computers and control systems to aid the astronauts in making a gentle touchdown on the Moon.

The landing radar is the responsibility of the Aerospace Systems Division of RCA Defense Electronic Products, Burlington, Mass. The radar is built by Ryan Aeronautical under a subcontract; RCA Electronic Components, Harrison, N. J. builds the solid-state transmitter for the landing radar as well as a similar solid-state transmitter for the rendezvous radar.

LM CONTROL ELECTRONICS

DESCENT ENGINE CONTROL ASSEMBLY (DECA): The RCA DECA sends on and off and throttling signals to the Lunar Module descent engine, which can operate from 10 per cent thrust to full capability. (This is the first throttlable rocket engine ever flown). DECA also helps control the gimballing of the descent engine so the thrust is properly aligned through the spacecraft's center of gravity. DECA measures 4 by 7 1/2 by 5 1/2 inches and weighs 7.3 pounds.

ATTITUDE TRANSLATION AND CONTROL ASSEMBLY (ATCA): RCA's ATCA sends control signals to the LM's 16 reaction control jets. When the automatic systems or astronauts dictate an attitude or translation change, ATCA selects the proper jets to fire to accomplish the action desired. Since a host of combinations are possible among the 16 jets, ATCA has extensive logic circuits to accomplish its mission. ATCA also provides regulated ac and dc power for other LM assemblies such as DECA, rate gyro assembly and the abort guidance system. ATCA measures 5 1/8 by 7 2/3 by 17 3/4 inches and weighs 23.5 pounds.

DECA and ATCA are built by the Aerospace Systems Division of RCA Defense Electronic Products, Burlington, Mass.

SATURN COUNTDOWN COMPUTERS

Two RCA computers check out Saturn launch vehicles during the countdown leading to lift off. One computer is located in the mobile launcher about 50 feet from the rocket and the second is located in the Launch Control Center (LCC). The two are linked together. The mobile launcher computer checks out the rocket by commanding it to exercise valves, engines, relays, etc. and measuring the resultant performance. It monitors more than 3,000 parameters in this way. The LCC computer controls the sequence of checkout and launch countdown programs performed by the mobile launch computer. Should a problem arise, the mobile launcher computer informs the LCC computer which initiates a search to pinpoint the trouble and specify what corrective action must be taken.

The Saturn countdown computers are built by the Electromagnetic and Aviation Systems Division of RCA Defense Electronic Products, Van Nuys, Calif.

TRACKING RADAR SUPPORT OF APOLLO

RCA tracking radars at NASA and DOD land stations and aboard ships around the globe track Apollo/Saturn during powered flight, during Earth orbit and as the Command Module streaks back to Earth after the trip to the Moon. The radars are the AN/FPS-16, including a special shipboard version; the AN/FPQ-6 and the CAPRI (Compact All-Purpose Range Instrument). A CAPRI aboard the Apollo Ship Huntsville has been specially equipped to acquire and track the CM during re-entry to predict its splashdown point. The RCA radars are powerful enough to skin track, thus conserving power that otherwise would be expended for transponder operation.

The Missile and Surface Radar Division of RCA Defense Electronic Products, Moorestown, N. J. builds the radars that support Apollo.

TV SCAN CONVERTERS

RCA scan converters located in California, Spain and Australia can transform Apollo "slow scan" black-and-white TV transmitted from the lunar surface to commercial standards so the pictures can be carried "live" on home sets.

Apollo black-and-white TV transmits its pictures at rates different from those of conventional TV. Its pictures are composed of 320 lines-per-frame transmitted at 10 frames-per-second. The Apollo lunar surface camera also can transmit high resolution "still" pictures of 1280 lines-per-frame at one frame each 1.6 seconds. Commercial TV rates are 525 lines-per-frame, 30 frames-per-second.

The RCA scan converters can transform pictures transmitted at the two Apollo rates to commercial standards so the pictures can be broadcast by the networks. This is accomplished through an instantaneous recording-playback process.

Without scan conversion, the Apollo black-and-white pictures would flicker badly when displayed on conventional sets.

Key elements of each scan converter are a TV display, a vidicon camera, a magnetic disc recorder similar to those used for "instant replay" in sports telecasts and pulse and timing units.

The scan converters are located at NASA Manned Space Flight Network stations at Goldstone, California, Madrid, Spain, and Honeysuckle Creek, Australia. A fourth scan converter is located at Sidney, Australia, for use with the Australian National Radio Observatory at Parkes.

The scan converters were developed by the Astro-Electronics Division of RCA Defense Electronic Products, Princeton, N. J.