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MOTOROLA PLAYS KEY ROLE
IN APOLLO SPACE
PROGRAM

When daring American astronauts step on the moon, probably this year, their first words back to an eagerly awaiting earth will be carried over some of the Motorola Inc. communications equipment involved in the nation's space program.

Thirteen major communications units plus thousands of semiconductor products made by Phoenix, Arizona based divisions of the corporation ride aboard each of the Apollo/Saturn missions.

Long before launch, Motorola equipment goes into action. During countdown, for example, the Digital Test Command System and several other of the firm's units are used in the tedious task of checking out on-board equipment.

In each of the three stages of the Saturn booster vehicle are two command receivers made by Motorola's Government Electronics Division. During launch and the early phases of the mission, any one or all of these units could be called upon to provide a vital safety function should difficulty develop.

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Precision tracking information during the flight of Apollo is flashed to Earth stations through Motorola-made transponders -- literally combination radio transmitters and receivers in a single unit. One transponder is located in the first stage, two in the Instrument Unit atop the third stage.

Another transponder in the Instrument Unit is especially important, particularly in the recent Apollo-8 mission around the moon, since it establishes and maintains communications between that section of the launch vehicle and the Manned Space Flight Network Stations on earth.

As important as all of these electronic communications units are to the success of the Apollo program, of vital significance is the transponder located in the command module which is the "cockpit" of the Apollo spacecraft. This compact Motorola unit is the only communications link the Apollo astronauts have with Earth after they pass a point approximately 30,000 miles into space. In essence, it is their communications lifeline.

With 24 instruments, 566 switches, 40 mechanical event indicators and 71 lights to occupy their time and efforts in the command module, the astronauts can get pretty busy. To help them, a Motorola-made unit called an "Up-Data-Link" is included in the command module. This device receives and decodes information coming up from earth and automatically provides 67 different functions as it passes on information to other on-board systems. This is like having a fourth astronaut on board to help with the many in-flight chores.

Because it was doubtful that intelligible television pictures could be received from Apollo-8 as it hurtled through space, NASA officials called upon Motorola's Government Electronics Division for help. In October of last year, NASA asked if some new FM demodulators could be produced in time for the Christmas time launch. These demodulators receive and convert the space signals into useable TV signals.

A team of Motorolans swung into action and produced the units from rough assembly model to finished product in the remarkable period of less than 60 days. Without the new demodulators installed at the receiving stations, viewing on home TV sets of the exceptional telecasts of the moon and earth would not have been possible.

Hidden from sight, but used throughout the myriad of communications and electronic systems in the Apollo/Saturn equipment, are thousands of transistors, integrated circuits and other solid-state devices produced by Motorola's Semiconductor Products Division. These tiny, lightweight and extremely reliable devices not only have made possible the elimination of thousands of pounds of additional weight from the Apollo mission spacecraft, but provide the precision, performance and reliability necessary for space flight.

According to the official New Reference Guide for the Apollo spacecraft, if just 1/32 of an inch too much wire and an extra drop of solder were left on each of the two and one-half million solder joints in the Saturn V launch vehicle, the excess metal would double the weight of the payload.

Since it now takes the thrust equivalent to 543 jet fighter planes to lift the Apollo/Saturn off the Cape Kennedy launching pad, it is easy to see how any substantial increase in weight could affect the mission. From that standpoint, integrated circuits and associated semiconductor devices have contributed greatly to the overall space effort.

In a sense, Motorola began preparing for its role in the Apollo missions when it pioneered the first successful commercial auto radio in the early 1930's. Building on this experience, the firm, through the years, developed an extensive line of electronics for the home, auto, business, industry and for the government.

Today, the firm still serves its traditional markets while it continues its probing of new frontiers through its participation in the nation's space programs and its pioneering work in semiconductor technology.