

**MOTOROLA
Government
Electronics
Division**



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VIDEO

TIME

AUDIO

JOE PATRICK AND PHIL
WRIGHT

Joe: "Phil, I understand that Motorola has produced equipment for just about every stage and every phase of the mission. Where do we begin if we want to discuss all this?"

PHIL WRIGHT

Wright: "I guess maybe we should start at the ground and work up because we also built some very sophisticated ground checkout equipment which is used to check out the on board equipment immediately prior to launch."

SLIDE: Apollo/Saturn on
the pad

Wright: On board both the Saturn booster and the Apollo spacecraft Motorola has equipment which is mainly concerned with communications, tracking, and range safety. We have a total of 12 electronic units on board.

JOE PATRICK

Joe: "What happens first, Phil? As far as Motorola equipment is concerned, when does your equipment first come into play after the launch?"

SLIDE: Launch

Wright: Immediately after launch there are six Motorola units called command receivers on the Saturn that begin functioning.

SHOT (CU) of Command
Receiver

"There are two of these command receivers on each of the three stages of the Saturn. If something should go wrong during the launch, a signal will be sent to this unit to initiate an abort."

VIDEO	TIME	AUDIO
JOE PATRICK:		Joe: "Now, when you say initiate an abort, exactly what will happen in that case?"
PHIL WRIGHT: SPACECRAFT MODEL		Wright: "The Command Receiver gets the signal, passes it on to other equipment that willfire this launch escape system on top of the command module. This pulls the spacecraft up and away from the Saturn booster. It roars up to a higher altitude, large chutes open up and let the spacecraft down to earth gently."
JOE PATRICK:		Joe: "Then what happens to the Saturn booster?"
PHIL WRIGHT:		Wright: "It is blown up. If this wasn't done, the gigantic Saturn (which stands 33 stories high) would come smashing down perhaps somewhere in Florida...or maybe on top of the Russian fleet cruising around off the Florida coast."
SLIDE: Apollo on the way up.		Joe: "You must have rested easier when that equipment wasn't needed. Now what happens next?"
PHIL WRIGHT:		Wright: "At this point Motorola units called C-band radar transponders begin operating up in the Instrument Unit which is a section on top of the third stage."
JOE PATRICK:		Joe: "What function does these transponders perform?"
PHIL WRIGHT: Shot of SST-136 Unit		Wright: "They are used for precision tracking. There aretwo of these in the instrument unit, and Motorola also built another transponder

VIDEO	TIME	AUDIO
<p>PHIL WRIGHT:</p>		<p>(Contd.) Wright: called a command communications transponder which is also installed in the Instrument Unit for command telemetry and tracking."</p>

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JOE PATRICK		Joe: "Okay, let's move on up to the actual spacecraft, Phil. Did Motorola provide any communications equipment that is installed in the spacecraft with the astronauts?"
SLIDE: Interior of spacecraft		Wright: "Yes, we most certainly did. Probably the most important electronic unit on the entire mission is one we call an airband S-band transponder Motorola built for Apollo. This is really.....
SHOT OF THE S-BAND TRANSPONDER	A TWO way radio, and it is installed in the command module in the in the lower equipment bay bay right at the feet of the astronaut in the right hand couch."
JOE PATRICK:		Joe: "Now, Phil, you say this is a two way radio. Does this function like the two way radios we use on airplanes?"
PHIL WRIGHT		Phil; "Yes and no. It does a lot more than an aircraft radio. This unit sends voice, television signals, and scientific data."
JOE PATRICK		Joe: "Does this work in conjunction with other communications equipment on board the spacecraft?"
PHIL WRIGHT		Wright: " When the apollo is launched they are operating on VHF with other communications equipment -- I mean other than Motorola equipment. When the spacecraft reaches a point about 30,000 about 30,000 miles out, they lose their VHF communications and this unit.....
SHOT OF THE S-BAND TRANSPONDER	becomes their <u>only communications link with earth.</u>

VIDEO	TIME	AUDIO
JOE PATRICK		Joe: "You mean they have no backup? If this Motorola unit fails, they have no other way of communicating with Earth Earth?"
PHIL WRIGHT		Phil: "That's right. If this unit goes out, the astronauts will be talking to themselves and nobody else in the universe."
JOE PATRICK		Joe: "This is what people talk about when they say reliability, isn't it? How reliable is this transponder, Phil?" "In other words, what are the chances of its failing to operate?"
PHIL WRIGHT		Phil: "It works out to something like 99.99999999 or something like that. Motorola is batting 1000 on the operation operation of our equipment in space. We have produced equipment for every manned space mission and most of the major unmanned unmanned missions, and we have never had a failure of any of our equipment in space."
JOE PATRICK		Joe: (Indicating the Up Data Link) "What is this Odd shaped unit here, Phil? Is that another transponder?"
SHOT OF THE UP DATA LINK		Phil: "That is a unit we call an up data link. It receives data coming up from the earth to the spacecraft -- it is installed on the Command module also. It receives signals from Earth and passes them on automatically to other systems and equipment on the spacecraft. It automatically handles 67 different functions. ^{space} Some/officials have said having the Up data link on board is like having a fourth astronaut along on the mission because it really is a lot of help to these three busy astronauts."

VIDEO	TIME	AUDIO
<p>MEM SLIDE: LUNAR MODULE DESCENDING TO THE MOON</p>		<p>Joe: "Phil, let's talk now about the actual landing on the moon. What part does Motorola equipment play in that operation?"</p>
<p>SLIDE: Astronauts inside the Lunar Module descending to the moon.</p>		<p>PHIL: "We are just as importantly involved in that mission phase of the mission as we are in the trip to and from the moon."</p>
<p>SLIDE: Astronaut looking out the window at another astronaut on the moon</p>		<p>Phil: "The first voice and television picture that comes back to the Earth from the moon will come through another Motorola unit installed on the Lunar module."</p>
<p>SLIDE: Astronauts (2) out on the surface of the moon.</p>		<p>Joe: "You have a transponder on board the Lunar Module Too? Is it the same type of unit you provided for the Command Module?"</p>
<p>SHOT OF THE LUNAR MODULE TRANSCEIVER</p>		<p>Phil: "Just about the same type, but this unit is Officially called a "transceiver". That's just another name for transponder, or to simplify it, "two-way radio".</p>
<p>HOLD THE SHOT ON THE TRANSPONDER</p>		<p>Joe: "Phil, why is this unit painted gold color?"</p>
<p>PHIL AND JOE AND THE TRANSCEIVER</p>		<p>Phil: That isn't just gold paint, Joe. That is actually gold plated.</p>
<p>JOE PATRICK</p>		<p>Joe: "You mean this is real gold? Why is that?"</p>
<p>PHIL WRIGHT</p>		<p>Phil: "There is a very good reason for it. It is to prevent radio frequency interference. In other words, it will prevent any foreign signals from entering the unit and fouling up the operation."</p>
<p>JOE PATRICK</p>		<p>Joe: "That runs up the cost a little bit, doesn't it."</p>

VIDEO

TIME

AUDIO

SHOT OF THE LUNAR
MODULE TRANSCIEVER

Phil: "Not really too much, but that reminds me of an interesting thing that happened sometime ago at a conference with Dr. Werner Von Brahn. Someone asked him why an electroic unit was gold plated, and he said, 'Because it would be too darned heavy and too expensive it we made it solid gold."

SLIDE: Astronaut out on
the moon using a
camera.

JOE: "Phil, what happens to the signals that are sent back to the Earth from the moon. Do they.....

..... just come right back in here and right into our radios and TV sets at home?"

SLIDE: Earth as seen
from the moon.

PHIL: "Oh no. The are received at one of three tracking stations located at Madrid, Spain, Canberra, Australia, and Goldstone, California."

PHIL WRIGHT

Joe: "Does Motorola equipment play any part in this operation?"

JOE PATRICK

Phil: Very definitely. We provided some very sophisticated "works in a drawer" equipment called.....

.....FM demodulators. These are installed at the receiving stations in Spain, Australia, and California. They convert the signals received from the moon and turn them into something and hear intelligible that we can see/on our TV ~~sets~~ sets at home.

PHIL WRIGHT

SHOT OF THE FM D_emod
ulator

JOE PATRICK

Joe: "That's fascinating, Phil, but let me ask you, where do we go from here? What's up after This Lunar mission. Are we going out beyond the moon?"

VIDEO	TIME	AUDIO
PHIL WIRHGT		<p>Phil: "Well, we already have been out into deep space. Motorola provided equipment for the famous Mariner Mars and Mariner Venus spacecraft that sent back valuable scientific data about the planet Venus and actually sent back photos of the planet Mars."</p>
JOE PATRICK		<p>Joe: There is another Mars mission going on right now isn't there?</p>
PHIL WRIGHT		<p>PHIL: "Yes, we built some equipment for Mariner 6 and 7 that will fly by Mars in August and maybe tell us even more about the possibility</p> <p>.....</p>
<p>RECORDED MINI-TAP</p> <p>JOE PATRICK AND PHIL WRIGHT</p>		<p>,.....of life on that planet.</p> <p>Every time we fly a mission we learn more and more about the universe, and I believe that many new and exciting missions are possible as our technology progresses. These missions, I believe, will include space stations, possibly regular shuttle trips to the moon, and manned exploration of other planets.</p>