1
00:00:02,066 --> 00:00:06,066
Announcer: “Ten, nine, eight, seven -

2
00:00:06,066 --> 00:00:08,233
Ignition sequence started.

3
00:00:08,233 --> 00:00:10,066
All engines are started.

4
00:00:10,066 --> 00:00:11,300
We have ignition.

5
00:00:11,300 --> 00:00:14,400
Two, one, zero. We have a liftoff.

6
00:00:14,400 --> 00:00:17,766
We have a lift off
and it's lighting up the area -

7
00:00:17,766 --> 00:00:20,100
it’s just like daylight here
at Kennedy Space Center.

8
00:00:20,100 --> 00:00:21,400
The Saturn five is moving off

9
00:00:21,400 --> 00:00:24,000
the pad. It is now clear of the tower.”

10
00:00:24,700 --> 00:00:28,300
NASA's now celebrating the 50 year
anniversary of Apollo 17.

11
00:00:29,066 --> 00:00:32,400
This was the final mission
of the Apollo program and most notably,

12
00:00:32,633 --> 00:00:35,133

the last time
humans set foot on the Moon's surface.

13
00:00:36,233 --> 00:00:39,666
The landing site in the Taurus-Littrow
Valley was selected so that astronauts

14
00:00:39,666 --> 00:00:41,100
could collect samples of the lunar

15
00:00:41,100 --> 00:00:45,000
highlands and investigate
the volcanic history of the area.

16
00:00:45,000 --> 00:00:47,866
So - what was it
like to actually be there, and

17
00:00:47,866 --> 00:00:51,133
how does this mission connect with NASA's
current exploration of the Moon

18
00:00:51,133 --> 00:00:54,333
and our future plans
to return humans to the surface?

19
00:00:55,900 --> 00:01:00,100
These questions are best answered
by the Lunar Module pilot for Apollo 17,

20
00:01:00,100 --> 00:01:03,000
Jack Schmitt,
whose background as a geologist offers

21
00:01:03,000 --> 00:01:05,333
unique insight
about studying the lunar terrain.

22
00:01:06,000 --> 00:01:09,333
For Jack, being on

the Moon was an unparalleled experience,

23
00:01:09,600 --> 00:01:12,000
and future astronauts
should expect the same.

24
00:01:12,333 --> 00:01:15,733
The experience is going to be more
than you ever anticipated,

25
00:01:15,733 --> 00:01:19,500
and it was that way
for me to get onto the Moon.

26
00:01:20,933 --> 00:01:22,866
Seeing this valley of Taurus-Littrow,

27
00:01:22,866 --> 00:01:26,900
which is deeper than the Grand Canyon,
as a matter of fact, mountains

28
00:01:26,900 --> 00:01:31,066
to six and seven thousand feet above you
on either side of the valley,

29
00:01:32,033 --> 00:01:34,300
all silhouetted against a

30
00:01:35,433 --> 00:01:39,000
black sky with brilliantly illuminated
mountain slopes.

31
00:01:39,466 --> 00:01:44,633
And the Earth, of course, in one spot
above the southern part of the Massifs -

32
00:01:44,966 --> 00:01:47,266
that all was a new experience, of course.

33

00:01:47,266 --> 00:01:48,333
And you can’t . . .

34
00:01:48,533 --> 00:01:52,400
you can hear people talk about it, but
you can't absorb it until you're there.

35
00:01:52,833 --> 00:01:55,700
Being there is the essential human ingredient

36
00:01:55,700 --> 00:01:59,233
in any kind of experience of that kind.

37
00:01:59,233 --> 00:02:03,066
Schmitt: “As I step off at the surface at Taurus-Littrow,

38
00:02:03,066 --> 00:02:05,800
I'd like to dedicate the first steps

39
00:02:05,800 --> 00:02:08,033
of Apollo 17

40
00:02:08,033 --> 00:02:10,733
to all those who made it possible.”

41
00:02:10,733 --> 00:02:14,566
Schmitt and Commander Gene Cernan
completed three moonwalks on the surface,

42
00:02:14,566 --> 00:02:17,900
taking rock samples
and deploying scientific instruments.

43
00:02:17,900 --> 00:02:21,433
Difficult work considering the surface
gravity is only about one-sixth

44
00:02:21,433 --> 00:02:22,400
that of Earth's.

45
00:02:22,400 --> 00:02:24,433
Cernan: “What are you working on, Jack?”
Schmitt: “I'm taking a pan.”

46
00:02:24,800 --> 00:02:28,100
Cernan: “Very good. I'm coming right now . . .

47
00:02:28,100 --> 00:02:31,200
I bet you a dollar to doughnuts that you don’t
get a TGE reading.”

48
00:02:31,733 --> 00:02:35,366
Mission Control: “Yeah, Gene. If it’s easy enough to take it off,

49
00:02:35,366 --> 00:02:36,900
why don't you take it off the Rover

50
00:02:36,900 --> 00:02:42,266
and we’ll try and and level it in the stuff.”

51
00:02:42,266 --> 00:02:44,100
Schmitt: “Ah, come on . . . ”[Laughter]

52
00:02:44,100 --> 00:02:50,566
Cernan: “I'm not sure there's any place to put it on the ground level.”

53
00:02:50,566 --> 00:03:01,000
Schmitt: “No. You have to dig a place.”
Cernan: “Yes, I’ll do it. Okay it’s coming off.”

54
00:03:06,866 --> 00:03:09,100
Cernan: “Well, I'll set it right up here.”

55
00:03:09,100 --> 00:03:10,200
Schmitt: “It's gonna fall down the hill . . .”

56
00:03:10,200 --> 00:03:13,533

Schmitt: “You’d better stomp off a good place.”
Cernan: “Yeah.”

57
00:03:13,533 --> 00:03:16,133
The conditions on the Moon,
however, were also ripe

58
00:03:16,133 --> 00:03:19,300
for the astronauts to have a little fun
on the surface as well.

59
00:03:20,766 --> 00:03:24,900
Schmitt [Singing]: “I was strolling on the Moon one day . . .”

60
00:03:24,900 --> 00:03:27,333
Cernan and Schmitt [Singing]:
“in the marry marry month of . . .”

61
00:03:27,333 --> 00:03:28,133
Schmitt: “December!”

62
00:03:28,133 --> 00:03:30,666
Cernan: “No, May.” - Schmitt: “May. “
Cernan: ”May’s the month this year.”

63
00:03:30,666 --> 00:03:33,666
Schmitt: “May - That's right.”
Cernan: “May is the year of the Month”

64
00:03:34,866 --> 00:03:36,633
Schmitt: “Go ahead. Oh, there . . . there.

65
00:03:36,633 --> 00:03:37,600
Schmitt: “Let me throw the hammer.”

66
00:03:37,600 --> 00:03:40,266
Cernan: “Okay.”
Schmitt: “Let me throw the hammer, please.”

67

00:03:40,766 --> 00:03:41,966
Cernan: “It’s all yours.”
Schmitt: “You got the gravimeter.”

68
00:03:41,966 --> 00:03:43,866
Cernan: “You deserve it. A hammer thrower . . .”

69
00:03:43,866 --> 00:03:45,633
Cernan: “You’re a geologist. You ought to be able to throw it.”

70
00:03:45,633 --> 00:03:47,233
Schmitt: “You ready?”
Cernan: “Go ahead.”

71
00:03:47,233 --> 00:03:50,000
Schmitt: “You ready for this? Ready for this?”

72
00:03:50,000 --> 00:03:50,800
Cernan: “Yeah”

73
00:03:50,800 --> 00:03:55,400
Cernan: “Don't hit the LM . . . or the ALSEP”

74
00:03:56,766 --> 00:03:59,866
Schmitt: “Look at that! Look at that! Look at that!”

75
00:04:01,600 --> 00:04:02,866
Cernan: “Beautiful.”

76
00:04:03,900 --> 00:04:06,100
Cernan: “Looked like it was going a million miles,
but it really didn’t.”

77
00:04:06,100 --> 00:04:07,333
Schmitt: “Didn’t it?”

78
00:04:08,200 --> 00:04:11,100
The crew managed to gather around 245 pounds

79
00:04:11,100 --> 00:04:13,666
of moon rocks and dust samples
during their EVAs.

80
00:04:14,333 --> 00:04:17,633
It was an impressive collection
for scientific analysis back on Earth.

81
00:04:18,400 --> 00:04:21,400
Cernan: “Let's see if I can’t crack the corner and get that contact.”

82
00:04:21,800 --> 00:04:27,200
The quality and diversity of the Apollo
sample collection is just remarkable.

83
00:04:27,200 --> 00:04:28,300
Absolutely remarkable.

84
00:04:28,300 --> 00:04:30,266
And it's a gift that keeps on giving.

85
00:04:30,266 --> 00:04:33,400
The researchers continue
to go back to these samples.

86
00:04:33,400 --> 00:04:38,100
New analytical technology comes along
where you can apply new techniques,

87
00:04:38,100 --> 00:04:42,166
get more higher resolution information,
and that'll be going on indefinitely.

88
00:04:42,166 --> 00:04:46,833
I don't think the lunar sample collection
from Apollo will ever be out of date.

89
00:04:47,833 --> 00:04:50,400
Over three decades after Apollo 17,

90
00:04:50,400 --> 00:04:54,466
NASA launched the Lunar Reconnaissance
Orbiter in 2009.

91
00:04:54,466 --> 00:04:57,500
The scientific instruments
aboard this robotic spacecraft

92
00:04:57,500 --> 00:05:00,800
collect a wide variety of scientific data
on the Moon's environment,

93
00:05:00,800 --> 00:05:03,100
including surface and subsurface
properties.

94
00:05:04,300 --> 00:05:08,133
And since LRO has now been in operation
for over 13 years,

95
00:05:08,133 --> 00:05:11,666
it has provided a treasure
trove of new information about the Moon,

96
00:05:11,666 --> 00:05:15,433
as well as the capacity to help scientists
re-interpret older data

97
00:05:15,433 --> 00:05:20,633
and answer scientific questions that had
been lingering from the days of Apollo 17.

98
00:05:20,633 --> 00:05:24,633
One such case involved the debate
over the origins of a light colored mantle

99
00:05:24,633 --> 00:05:28,500
seen at the base of the South Massif
in Taurus-Littrow.

100
00:05:28,500 --> 00:05:31,200
LRO imagery provided a key discovery

101
00:05:31,200 --> 00:05:34,766
that enabled scientists to put together
the many pieces of the puzzle.

102
00:05:35,666 --> 00:05:40,266
One of the highest sun angle
LRO photographs

103
00:05:40,266 --> 00:05:45,333
made it very clear
that there was an older, slightly darker

104
00:05:45,333 --> 00:05:51,466
avalanche underlying - partially underlying-
the light colored light mantle avalanche.

105
00:05:51,466 --> 00:05:55,333
And that immediately brought into question
whether or not the light mantle

106
00:05:55,333 --> 00:06:01,333
avalanche, as people had thought,
was triggered by secondary material

107
00:06:01,333 --> 00:06:05,033
thrown from the crater Tycho, some 2000

108
00:06:05,033 --> 00:06:07,600
kilometers to the southwest.

109
00:06:08,466 --> 00:06:13,300
It would seem not impossible,
but it would seem to be very coincidental

110
00:06:13,300 --> 00:06:18,366

to have two avalanches, one of which
was triggered by those impacts.

111
00:06:18,366 --> 00:06:24,666
And that, in turn, took us to looking at
what might be an alternative

112
00:06:24,666 --> 00:06:26,100
triggering mechanism.

113
00:06:26,100 --> 00:06:31,100
And the more we began to understand
the Lee Lincoln scarp, and that it was

114
00:06:31,100 --> 00:06:36,200
indeed as a result of other LRO analyses
elsewhere on the Moon,

115
00:06:36,200 --> 00:06:39,366
that it was indeed a thrust fault scarp -

116
00:06:39,366 --> 00:06:41,933
Then you start to think, well,
maybe these are being triggered

117
00:06:41,933 --> 00:06:43,800
by seismic activity, moonquakes.

118
00:06:43,800 --> 00:06:46,233
And so it sort of snowballs.

119
00:06:46,233 --> 00:06:49,433
You see one thing,
and then you start to explain that

120
00:06:49,433 --> 00:06:53,033
and it leads you to a number of other
analyses.

121

00:06:53,033 --> 00:06:56,866
Clearly, LRO imagery and other sensor data

122
00:06:56,866 --> 00:07:00,566
has made a great difference in our ability
to augment

123
00:07:00,600 --> 00:07:04,333
the interpretation of the geology
of the valley of Taurus-Littrow.

124
00:07:05,000 --> 00:07:08,366
As the LRO mission continues
enhancing our ability to interpret

125
00:07:08,400 --> 00:07:13,300
Apollo era data while also collecting
new information about the lunar terrain,

126
00:07:13,300 --> 00:07:16,933
Jack sees a clear roadmap
for the future exploration of the Moon

127
00:07:16,933 --> 00:07:18,333
and where we should go next.

128
00:07:19,333 --> 00:07:23,800
It's apparent to me that based on

129
00:07:23,800 --> 00:07:26,200
just general considerations

130
00:07:26,200 --> 00:07:29,233
as well as the magnificent imagery

131
00:07:29,233 --> 00:07:33,600
coming from the Lunar Reconnaissance
Orbiter Camera,

132

00:07:33,600 --> 00:07:36,000
that South Pole Aiken is clearly

133
00:07:36,000 --> 00:07:39,366
the place you'd like to have an extended human

134
00:07:39,366 --> 00:07:41,800
presence for exploration.

135
00:07:41,800 --> 00:07:45,900
With this all this new knowledge,
I think South Pole Aiken becomes

136
00:07:45,900 --> 00:07:49,866
a much higher priority
for the next human mission to the Moon.

137
00:07:51,000 --> 00:07:54,700
Sure enough, NASA has recently announced that the Artemis missions

138
00:07:54,700 --> 00:07:56,000
which will eventually have humans

139
00:07:56,000 --> 00:08:00,133
returning to the lunar surface,
will focus on the Moon's South Pole.

140
00:08:00,133 --> 00:08:03,900
In fact, the 13 landing sites
currently under consideration

141
00:08:03,900 --> 00:08:08,266
sit within the South Pole Aiken Basin,
or on its rim.

142
00:08:08,266 --> 00:08:11,566
Data shows the presence of water ice
in some of the permanently shadowed

143

00:08:11,566 --> 00:08:14,566
regions, a discovery
that is crucial for understanding

144
00:08:14,566 --> 00:08:17,733
the geologic history of the Moon,
as well as helping establish

145
00:08:17,733 --> 00:08:20,800
a sustained human presence
there in the future.

146
00:08:20,800 --> 00:08:24,733
Overall, the 50th anniversary of Apollo
17 reminds us

147
00:08:24,733 --> 00:08:29,133
that this mission was a crucial stepping
stone in the history of lunar science,

148
00:08:29,133 --> 00:08:31,766
laying the groundwork for missions
like LRO,

149
00:08:31,766 --> 00:08:35,400
which in turn help open the door
on a new era of human exploration

150
00:08:35,400 --> 00:08:37,600
with Artemis.

151
00:08:37,600 --> 00:08:40,866
And while these missions may be separated
by decades of time,

152
00:08:40,866 --> 00:08:44,066
they all interconnect
with the central premise and understanding

153
00:08:44,066 --> 00:08:47,500

of how the Moon is the cornerstone
to understanding our universe.

154
00:08:48,700 --> 00:08:51,333
The main reason
the Moon is important in the general

155
00:08:51,333 --> 00:08:54,600
understanding of the solar system
is that it has no atmosphere.

156
00:08:54,600 --> 00:08:59,000
It's never had any water erosion,
it has no dynamic plates being formed

157
00:08:59,000 --> 00:09:03,233
and eaten up as the Earth does.

158
00:09:03,233 --> 00:09:08,433
And it tells us
what the early solar system was like up

159
00:09:08,433 --> 00:09:12,800
to about three
and a half billion years ago.

160
00:09:12,800 --> 00:09:17,333
And that's information we can't really get
from any other accessible planet.

161
00:09:17,600 --> 00:09:21,400
The Apollo 17 anniversary
allows us to reflect on all the moments,

162
00:09:21,400 --> 00:09:25,500
big and small, that led to the success
of that historic mission.

163
00:09:25,500 --> 00:09:29,333
For Jack, it's a time to reflect

on those days, months and years

164
00:09:29,333 --> 00:09:33,266
spent out in the field
preparing for the duties of an astronaut.

165
00:09:33,266 --> 00:09:36,366
And it was during this time training
that Jack learned the invaluable

166
00:09:36,366 --> 00:09:40,600
scientific lesson that not everything goes
exactly as planned.

167
00:09:41,166 --> 00:09:45,033
Well, those excursions had all of their

168
00:09:45,033 --> 00:09:46,666
their interesting aspects.

169
00:09:46,666 --> 00:09:50,866
One time, I believe it was in Nevada,
we're getting off the rover, even

170
00:09:50,866 --> 00:09:57,300
without a suit, I had slipped on something
and fell onto this . . . surface.

171
00:09:57,300 --> 00:10:00,266
And my good friend, the late

172
00:10:00,500 --> 00:10:07,233
Gordon Swan, said over the communication
system, "Well, Schmitt just hit the fan!"

173
00:10:07,233 --> 00:10:08,733
[Laughing] . . .

174
00:10:08,733 --> 00:10:10,800

It was, by the way, an alluvial fan.

175
00:10:16,833 --> 00:10:13,266
[Laughing]

176
00:10:16,833 --> 00:10:18,266
Interviewer: “I’ll use that someday.”

177
00:10:18,266 --> 00:10:18,733
[Laughter]