



1  
00:00:04,999 --> 00:00:02,330  
the moon our nearest celestial neighbor

2  
00:00:07,639 --> 00:00:05,009  
has intrigued and inspired us since the

3  
00:00:10,730 --> 00:00:07,649  
dawn of humanity during the Apollo

4  
00:00:12,860 --> 00:00:10,740  
program 12 astronauts landed on its cold

5  
00:00:16,430 --> 00:00:12,870  
and cratered surface but they couldn't

6  
00:00:19,730 --> 00:00:16,440  
stay now NASA's constellation program

7  
00:00:21,769 --> 00:00:19,740  
begins a new journey to live and work on

8  
00:00:25,460 --> 00:00:21,779  
the moon setting the stage for future

9  
00:00:28,519 --> 00:00:25,470  
long-duration human exploration today

10  
00:00:31,220 --> 00:00:28,529  
two spacecraft Scouts are poised to lift

11  
00:00:33,290 --> 00:00:31,230  
off together aboard a powerful Atlas 5

12  
00:00:33,830 --> 00:00:33,300  
rocket on the first launch at this new

13  
00:00:35,420 --> 00:00:33,840

era

14

00:00:38,240 --> 00:00:35,430

they are the lunar reconnaissance

15

00:00:42,639 --> 00:00:38,250

orbiter and the lunar crater observation

16

00:00:46,670 --> 00:00:42,649

and sensing satellite or LRO and L cross

17

00:00:49,340 --> 00:00:46,680

one rocket one destination two critical

18

00:00:58,029 --> 00:00:49,350

missions together they're helping us

19

00:01:03,650 --> 00:01:01,069

welcome to the show I'm your host George

20

00:01:04,939 --> 00:01:03,660

Diller I'm here at NASA's Kennedy Space

21

00:01:08,330 --> 00:01:04,949

Center in Florida

22

00:01:11,600 --> 00:01:08,340

inside the Apollo Saturn v Center behind

23

00:01:14,240 --> 00:01:11,610

me is an actual massive 363 foot long

24

00:01:15,950 --> 00:01:14,250

Saturn 5 rocket just like those but

25

00:01:17,749 --> 00:01:15,960

boosted the Apollo astronauts on

26

00:01:21,139 --> 00:01:17,759

America's first human missions to the

27

00:01:21,950 --> 00:01:21,149

moon today NASA is preparing to return

28

00:01:23,529 --> 00:01:21,960

to the moon

29

00:01:26,090 --> 00:01:23,539

beginning with the Lunar Reconnaissance

30

00:01:29,240 --> 00:01:26,100

Orbiter and a lunar crater observation

31

00:01:31,820 --> 00:01:29,250

and sensing satellite this upcoming

32

00:01:33,410 --> 00:01:31,830

launch aboard an Atlas 5 rocket is the

33

00:01:36,559 --> 00:01:33,420

critical first step in the new

34

00:01:38,389 --> 00:01:36,569

constellation program on today's show

35

00:01:40,790 --> 00:01:38,399

we're going to take you inside both of

36

00:01:42,740 --> 00:01:40,800

these exciting missions and find out

37

00:01:45,529 --> 00:01:42,750

what it takes to launch two spacecraft

38

00:01:47,809 --> 00:01:45,539

at once our first guest is Kathy petty

39

00:01:50,210 --> 00:01:47,819

deputy project manager for the Lunar

40

00:01:52,100 --> 00:01:50,220

Reconnaissance Orbiter she stopped by

41

00:01:54,440 --> 00:01:52,110

the NASA direct studio to give us the

42

00:02:00,979 --> 00:01:54,450

inside story on this moon mapping

43

00:02:05,389 --> 00:02:00,989

mission the lunar reconnaissance orbiter

44

00:02:08,570 --> 00:02:05,399

project or LRO's main goal is we're

45

00:02:11,869 --> 00:02:08,580

really the first mission the first step

46

00:02:14,660 --> 00:02:11,879

that NASA's taking back to exploring our

47

00:02:17,660 --> 00:02:14,670

universe and so what we really need to

48

00:02:19,910 --> 00:02:17,670

do is have a reconnaissance mission you

49

00:02:22,250 --> 00:02:19,920

know get more data one of the things

50

00:02:25,640 --> 00:02:22,260

that we want to do is is go back to the

51  
00:02:29,000 --> 00:02:25,650  
moon you know we've been there before we

52  
00:02:32,509 --> 00:02:29,010  
we have really awesome datasets from our

53  
00:02:34,430 --> 00:02:32,519  
previous missions from the Apollo era to

54  
00:02:36,229 --> 00:02:34,440  
to the other spacecraft that have gone

55  
00:02:38,900 --> 00:02:36,239  
so we want to build upon those datasets

56  
00:02:40,820 --> 00:02:38,910  
that we already have and and most of

57  
00:02:42,650 --> 00:02:40,830  
those datasets really focused on the

58  
00:02:45,710 --> 00:02:42,660  
equatorial region of the Moon so now we

59  
00:02:47,690 --> 00:02:45,720  
want to go back and say hey let's map

60  
00:02:49,640 --> 00:02:47,700  
the entire moon so so have more of a

61  
00:02:53,030 --> 00:02:49,650  
global perspective or a comprehensive

62  
00:02:55,430 --> 00:02:53,040  
atlas of the moon and help whoever wants

63  
00:02:58,280 --> 00:02:55,440

to to join us in exploring our universe

64

00:03:01,759 --> 00:02:58,290

or or taking that next step back they

65

00:03:03,350 --> 00:03:01,769

need to have a more comprehensive atlas

66

00:03:06,050 --> 00:03:03,360

of the moon so that they know where to

67

00:03:08,449 --> 00:03:06,060

go what to do what to expect that

68

00:03:14,630 --> 00:03:08,459

they help them out we're like a scout

69

00:03:16,580 --> 00:03:14,640

mission for the for the exploration well

70

00:03:20,270 --> 00:03:16,590

well roughly a couple of days after

71

00:03:22,220 --> 00:03:20,280

we've we've launched we will begin what

72

00:03:25,550 --> 00:03:22,230

we call the lunar orbit insertion burn

73

00:03:28,130 --> 00:03:25,560

and and that burn will help us or help

74

00:03:32,030 --> 00:03:28,140

the moon and us get captured by the moon

75

00:03:34,490 --> 00:03:32,040

and so what happens during that burn is

76  
00:03:37,670 --> 00:03:34,500  
LRO starts to get closer to the moon and

77  
00:03:40,460 --> 00:03:37,680  
the moon will capture LRO and once once

78  
00:03:41,960 --> 00:03:40,470  
once we have that confirmation that the

79  
00:03:44,720 --> 00:03:41,970  
moon is captured as we call that lunar

80  
00:03:47,479 --> 00:03:44,730  
acquisition and then after we have lunar

81  
00:03:49,309 --> 00:03:47,489  
acquisition for we're sure that we have

82  
00:03:52,130 --> 00:03:49,319  
a stable orbit then we will begin a

83  
00:03:54,530 --> 00:03:52,140  
series of burns that are roughly a day

84  
00:03:57,440 --> 00:03:54,540  
apart from each other series of four or

85  
00:04:00,559 --> 00:03:57,450  
five burns that begin to lower LRO into

86  
00:04:03,170 --> 00:04:00,569  
her final orbit which is roughly 50

87  
00:04:06,380 --> 00:04:03,180  
kilometers above the moon or 31 miles

88  
00:04:08,600 --> 00:04:06,390

and that's LRO's polar orbiting orbit

89

00:04:10,580 --> 00:04:08,610

we're where we lower the spacecraft low

90

00:04:12,319 --> 00:04:10,590

enough so that so that the instruments

91

00:04:14,300 --> 00:04:12,329

can focus on the surface of the moon and

92

00:04:16,460 --> 00:04:14,310

begin the data collection that that is

93

00:04:21,409 --> 00:04:16,470

what our mission is all about to create

94

00:04:23,659 --> 00:04:21,419

that comprehensive atlas of the moon now

95

00:04:25,610 --> 00:04:23,669

an interesting offshoot of our data is

96

00:04:28,630 --> 00:04:25,620

that our data will also be made

97

00:04:31,670 --> 00:04:28,640

available to Google moon so that anyone

98

00:04:34,820 --> 00:04:31,680

that has access to the web or Google

99

00:04:36,500 --> 00:04:34,830

will be able to punch in I don't know

100

00:04:38,990 --> 00:04:36,510

one like Shackleton crater and be able

101  
00:04:41,120 --> 00:04:39,000  
to see all the cool data from LRO pop up

102  
00:04:46,310 --> 00:04:41,130  
radon they're their own personal

103  
00:04:49,520 --> 00:04:46,320  
computers at home NASA we're all about

104  
00:04:52,730 --> 00:04:49,530  
exploring and pushing our our knowledge

105  
00:04:54,350 --> 00:04:52,740  
across the boundaries and and LRO even

106  
00:04:55,940 --> 00:04:54,360  
though taking us back to the moon where

107  
00:04:58,430 --> 00:04:55,950  
we've been before that there's a lot

108  
00:05:00,620 --> 00:04:58,440  
about our moon that we don't know and a

109  
00:05:03,350 --> 00:05:00,630  
lot about our moon that we want to use

110  
00:05:05,330 --> 00:05:03,360  
as we begin to look out into the

111  
00:05:07,730 --> 00:05:05,340  
universe and decide you know where we

112  
00:05:09,590 --> 00:05:07,740  
want to go next so having a

113  
00:05:12,379 --> 00:05:09,600

reconnaissance or a scout mission that

114

00:05:14,690 --> 00:05:12,389

that that begins to take us out is is a

115

00:05:17,450 --> 00:05:14,700

perfect fit into what NASA is all about

116

00:05:19,730 --> 00:05:17,460

and what what people like me who've

117

00:05:22,000 --> 00:05:19,740

dreamed about working for NASA they've

118

00:05:24,649 --> 00:05:22,010

always wanted to do you know explore

119

00:05:28,399 --> 00:05:24,659

look out beyond who and what we are

120

00:05:33,440 --> 00:05:28,409

today and LRO is the perfect fit for

121

00:05:34,969 --> 00:05:33,450

that type of vision for all now that we

122

00:05:36,950 --> 00:05:34,979

know what to expect from the Lunar

123

00:05:38,870 --> 00:05:36,960

Reconnaissance Orbiter we turn our

124

00:05:40,610 --> 00:05:38,880

attention to its sister payload the

125

00:05:43,370 --> 00:05:40,620

lunar crater observation and sensing

126

00:05:45,380 --> 00:05:43,380

satellite its goal is to hunt for

127

00:05:48,469 --> 00:05:45,390

evidence of water ice using a hard

128

00:05:54,920 --> 00:05:48,479

hitting method dr. Kimberly Enic oh well

129

00:05:58,760 --> 00:05:54,930

cross payload specialist explains L

130

00:06:02,089 --> 00:05:58,770

cross mission has to impact events the

131

00:06:04,399 --> 00:06:02,099

first is the upper stage of the launch

132

00:06:07,670 --> 00:06:04,409

vehicle that we take with us on our

133

00:06:11,180 --> 00:06:07,680

four-month mission into space and we

134

00:06:14,830 --> 00:06:11,190

separate from it and it's traveling to

135

00:06:18,010 --> 00:06:14,840

hit the moon at 5,600 miles per hour

136

00:06:20,750 --> 00:06:18,020

it's going to impact one of these lunar

137

00:06:24,500 --> 00:06:20,760

permanently shadowed basins of a crater

138

00:06:26,300 --> 00:06:24,510

on the lunar poles and it's going to hit

139

00:06:28,700 --> 00:06:26,310

a particular place it's going to hit a

140

00:06:33,320 --> 00:06:28,710

place on the moon that we think there's

141

00:06:35,420 --> 00:06:33,330

water scientists who believe that there

142

00:06:39,670 --> 00:06:35,430

is water on the moon don't know whether

143

00:06:42,800 --> 00:06:39,680

it's smooth or chunky peanut butter type

144

00:06:46,610 --> 00:06:42,810

so where you hit is important the

145

00:06:48,709 --> 00:06:46,620

secondary impact is the L cross payload

146

00:06:50,870 --> 00:06:48,719

which will impact somewhere between

147

00:06:52,700 --> 00:06:50,880

three to five kilometers away from the

148

00:06:54,890 --> 00:06:52,710

first impact so we're gonna hit another

149

00:06:56,270 --> 00:06:54,900

part of that crater we've targeted this

150

00:06:59,029 --> 00:06:56,280

crater because it's got a strong

151  
00:07:02,510 --> 00:06:59,039  
hydrogen concentration we're gonna

152  
00:07:04,909 --> 00:07:02,520  
sample two parts of this crater and so

153  
00:07:08,510 --> 00:07:04,919  
the two impact events will tell us

154  
00:07:10,820 --> 00:07:08,520  
something about the distribution of this

155  
00:07:13,430 --> 00:07:10,830  
hydrogen concentration or perhaps a

156  
00:07:16,090 --> 00:07:13,440  
distribution of water if the hydrogen is

157  
00:07:23,390 --> 00:07:20,840  
the live images of our what we're taking

158  
00:07:24,890 --> 00:07:23,400  
with our science payload as we're going

159  
00:07:27,620 --> 00:07:24,900  
into the surface for the last four

160  
00:07:29,810 --> 00:07:27,630  
minutes of the mission which is 600

161  
00:07:36,980 --> 00:07:29,820  
kilometers down to the surface will be

162  
00:07:39,290 --> 00:07:36,990  
stream live on a public channel L course

163  
00:07:41,630 --> 00:07:39,300

is important because that it provides us

164

00:07:45,500 --> 00:07:41,640

a way to confirm the presence or absence

165

00:07:48,110 --> 00:07:45,510

of water ice at a particular location on

166

00:07:53,570 --> 00:07:48,120

the lunar pole there's water ice there

167

00:07:57,440 --> 00:07:53,580

or water in some form it means that for

168

00:07:59,630 --> 00:07:57,450

future missions to the moon and perhaps

169

00:08:01,730 --> 00:07:59,640

beyond there's there an institute a

170

00:08:04,700 --> 00:08:01,740

resource that's there a resource that's

171

00:08:08,030 --> 00:08:04,710

on the on the surface of that planet you

172

00:08:11,650 --> 00:08:08,040

don't need to bring it with you so for

173

00:08:15,530 --> 00:08:11,660

the human species in terms of exploring

174

00:08:19,340 --> 00:08:15,540

the rest of the solar system so getting

175

00:08:22,640 --> 00:08:19,350

out out of low Earth orbit and we need

176

00:08:27,050 --> 00:08:22,650

water with us if we can find a resource

177

00:08:29,270 --> 00:08:27,060

of water on the moon that will be an

178

00:08:31,700 --> 00:08:29,280

amazing step forward and a great

179

00:08:34,900 --> 00:08:31,710

resource to take advantage of in a very