
NASA
LANDSAT NINE
KSC • GSFC • ERC

1
00:00:07,130 --> 00:00:04,550
live from the Central Coast of

2
00:00:16,450 --> 00:00:07,140
California this is NASA's launch

3
00:00:35,389 --> 00:00:26,590
[Music]

4
00:00:35,399 --> 00:00:39,540
foreign

5
00:00:56,709 --> 00:00:51,180
[Music]

6
00:01:02,150 --> 00:00:59,510
just about 40 minutes this Atlas V

7
00:01:05,090 --> 00:01:02,160
rocket will launch landsat 9 into space

8
00:01:07,969 --> 00:01:05,100
to show us Earth from above and help us

9
00:01:10,190 --> 00:01:07,979
take better care of our home planet the

10
00:01:13,010 --> 00:01:10,200
Earth observation satellite will add to

11
00:01:15,950 --> 00:01:13,020
a decades-long portfolio of data on our

12
00:01:17,990 --> 00:01:15,960
forests Farms cities and water

13
00:01:20,270 --> 00:01:18,000

welcome and thank you for joining us

14
00:01:23,210 --> 00:01:20,280
here at Vandenberg space force base on

15
00:01:25,670 --> 00:01:23,220
the Central Coast of California for the

16
00:01:29,090 --> 00:01:25,680
2000th launch from this military base

17
00:01:31,670 --> 00:01:29,100
since 1958. I'm your host Marie Lewis

18
00:01:34,730 --> 00:01:31,680
socially distanced and fully vaccinated

19
00:01:37,429 --> 00:01:34,740
against covet 19. that is why I am not

20
00:01:39,830 --> 00:01:37,439
wearing a mask launch is set for 11 12

21
00:01:42,649 --> 00:01:39,840
this morning Pacific time and that puts

22
00:01:45,289 --> 00:01:42,659
us at L minus 40 minutes 20 seconds and

23
00:01:48,170 --> 00:01:45,299
counting the first landsat satellite

24
00:01:50,210 --> 00:01:48,180
launched in 1972 kicking off an

25
00:01:52,850 --> 00:01:50,220
uninterrupted stream of data for almost

26
00:01:55,730 --> 00:01:52,860
50 years and landsat 9 will continue

27
00:01:57,469 --> 00:01:55,740
that streak today right now we are go

28
00:01:59,810 --> 00:01:57,479
for launch but we'll get an update from

29
00:02:01,969 --> 00:01:59,820
launch control in just a minute first

30
00:02:04,850 --> 00:02:01,979
some key things to know about today's

31
00:02:07,150 --> 00:02:04,860
Mission at least one landsat satellite

32
00:02:10,309 --> 00:02:07,160
has been in orbit continuously since

33
00:02:12,410 --> 00:02:10,319
1972. the program holds the record for

34
00:02:14,809 --> 00:02:12,420
the longest continuous observation of

35
00:02:17,030 --> 00:02:14,819
Earth from space the satellite monitors

36
00:02:19,490 --> 00:02:17,040
natural and economic resources from

37
00:02:21,350 --> 00:02:19,500
orbit leaders around the world use

38
00:02:24,110 --> 00:02:21,360

landsat data to understand climate

39
00:02:26,390 --> 00:02:24,120
change manage agriculture allocate water

40
00:02:29,150 --> 00:02:26,400
resources and respond to natural

41
00:02:31,490 --> 00:02:29,160
disasters and the entire landsat archive

42
00:02:33,710 --> 00:02:31,500
is free and open to the public

43
00:02:35,990 --> 00:02:33,720
landsat is a joint Mission between NASA

44
00:02:38,330 --> 00:02:36,000
and the U.S Geological Survey and we'll

45
00:02:40,130 --> 00:02:38,340
talk to a representative of the USGS in

46
00:02:41,990 --> 00:02:40,140
just a little bit we'll also tell you

47
00:02:44,390 --> 00:02:42,000
about a woman known as the mother of

48
00:02:46,670 --> 00:02:44,400
landsat and how her work changed the way

49
00:02:49,009 --> 00:02:46,680
we see Earth will show you how the

50
00:02:51,110 --> 00:02:49,019
satellite works turning light into data

51
00:02:53,270 --> 00:02:51,120
for scientists and researchers we'll

52
00:02:55,190 --> 00:02:53,280
take a closer look at how the data is

53
00:02:57,949 --> 00:02:55,200
used for mapping the shrinking

54
00:02:59,930 --> 00:02:57,959
rainforest to glacial recession to

55
00:03:02,149 --> 00:02:59,940
managing our food supply and measuring

56
00:03:04,070 --> 00:03:02,159
the impact of natural disasters which

57
00:03:06,589 --> 00:03:04,080
have been particularly devastating in

58
00:03:08,570 --> 00:03:06,599
recent days so we've got a ton of signs

59
00:03:10,910 --> 00:03:08,580
to get to and NASA Edge's Blair Allen

60
00:03:13,369 --> 00:03:10,920
and Franklin Fitzgerald are standing by

61
00:03:15,589 --> 00:03:13,379
hi guys are going to help us with some

62
00:03:17,509 --> 00:03:15,599
of that science and also NASA's Daryl

63
00:03:20,149 --> 00:03:17,519

nail and Mick woltman who you see in the

64
00:03:21,649 --> 00:03:20,159
masks inside Mission Control they are

65
00:03:23,149 --> 00:03:21,659
there monitoring the countdown and guys

66
00:03:24,830 --> 00:03:23,159
we're going to go over to you to see how

67
00:03:26,869 --> 00:03:24,840
it's going Daryl and Mick yeah welcome

68
00:03:28,670 --> 00:03:26,879
into the mission director Center Marie

69
00:03:30,229 --> 00:03:28,680
where behind me you can see the big

70
00:03:32,869 --> 00:03:30,239
screens of everything that's happening

71
00:03:35,149 --> 00:03:32,879
we have the top leadership of NASA here

72
00:03:37,130 --> 00:03:35,159
along with USGS and the Secretary of the

73
00:03:39,770 --> 00:03:37,140
Interior along with other special guests

74
00:03:42,649 --> 00:03:39,780
as you mentioned we are now L minus 38

75
00:03:47,630 --> 00:03:42,659
minutes and Counting until launch at 11

76
00:03:50,750 --> 00:03:47,640
12 a.m Pacific Time 2 12 p.m eastern

77
00:03:52,729 --> 00:03:50,760
time and we've got a 29 minute window so

78
00:03:54,949 --> 00:03:52,739
far things have been going pretty good

79
00:03:56,869 --> 00:03:54,959
but Mick it's been reported it's out on

80
00:03:59,030 --> 00:03:56,879
social media there was a little issue

81
00:04:01,009 --> 00:03:59,040
that they were working yeah the team was

82
00:04:02,449 --> 00:04:01,019
performing uh cryogenic tanking and

83
00:04:05,449 --> 00:04:02,459
during that tanking what we call our

84
00:04:07,550 --> 00:04:05,459
fast fill sequence the team had to work

85
00:04:09,350 --> 00:04:07,560
through some issues with the valve they

86
00:04:11,570 --> 00:04:09,360
were able to resolve that get out of

87
00:04:13,670 --> 00:04:11,580
fast fill and into slow fill or what we

88
00:04:15,710 --> 00:04:13,680

refer to as topping now for cryogenics

89
00:04:17,390 --> 00:04:15,720
and everything is back on track we're

90
00:04:19,670 --> 00:04:17,400
running roughly about five to six

91
00:04:21,469 --> 00:04:19,680
minutes behind for one of ours but that

92
00:04:23,270 --> 00:04:21,479
is exactly why we're in this coming up

93
00:04:25,129 --> 00:04:23,280
hold we'll be able to use some of that

94
00:04:26,689 --> 00:04:25,139
hold time to finish up that work let's

95
00:04:28,129 --> 00:04:26,699
talk about that hold because that's a

96
00:04:29,990 --> 00:04:28,139
good time to go ahead and mention that

97
00:04:33,770 --> 00:04:30,000
right we are just minutes away from

98
00:04:36,230 --> 00:04:33,780
going into an L minus 34 hold and the

99
00:04:37,969 --> 00:04:36,240
t-clock and the L clock will be a little

100
00:04:39,890 --> 00:04:37,979
different can you explain that yeah

101
00:04:42,290 --> 00:04:39,900
absolutely Daryl the L clock is what we

102
00:04:44,090 --> 00:04:42,300
refer to as time to launch this is this

103
00:04:46,249 --> 00:04:44,100
clock continues to count throughout all

104
00:04:47,810 --> 00:04:46,259
the operations and it includes the

105
00:04:49,909 --> 00:04:47,820
built-in hold times that we talked about

106
00:04:52,430 --> 00:04:49,919
the T minus four hold being 30 minutes

107
00:04:54,650 --> 00:04:52,440
the T clock is what we refer to as the

108
00:04:56,270 --> 00:04:54,660
terminal clock which tells the team to

109
00:04:58,850 --> 00:04:56,280
prepare their tests at certain times

110
00:05:02,570 --> 00:04:58,860
keep things going but this clock does

111
00:05:05,150 --> 00:05:02,580
stop during those 30 minute holds both

112
00:05:07,550 --> 00:05:05,160
clocks will sync up at L minus and T

113
00:05:09,590 --> 00:05:07,560

minus four minutes where everything then

114
00:05:12,650 --> 00:05:09,600
starts happening pretty fast by the team

115
00:05:14,330 --> 00:05:12,660
and we get down to t0 or lift off this

116
00:05:16,550 --> 00:05:14,340
morning and for the purposes of our

117
00:05:18,830 --> 00:05:16,560
audience and our broadcast you will see

118
00:05:20,990 --> 00:05:18,840
that L clock in the upper left hand part

119
00:05:23,870 --> 00:05:21,000
of your screen currently counting down

120
00:05:25,129 --> 00:05:23,880
at 36 minutes and Counting we will have

121
00:05:26,990 --> 00:05:25,139
that for you that will go all the way

122
00:05:29,990 --> 00:05:27,000
down to zero a convenient way to see

123
00:05:31,790 --> 00:05:30,000
that also our mission Milestones we've

124
00:05:34,249 --> 00:05:31,800
got listed across the bottom of the

125
00:05:35,930 --> 00:05:34,259
screen we will then make our way and

126
00:05:37,909 --> 00:05:35,940
progress through each of those

127
00:05:40,909 --> 00:05:37,919
Milestones some of the big ones the

128
00:05:43,790 --> 00:05:40,919
polling liftoff of course booster cutoff

129
00:05:46,430 --> 00:05:43,800
and Centaur cut off a look out at the

130
00:05:49,189 --> 00:05:46,440
pad and you can see Atlas 5 is stacked

131
00:05:52,790 --> 00:05:49,199
and ready to go landsat 9 at the very

132
00:05:55,370 --> 00:05:52,800
top today Mick this is flying in the 401

133
00:05:57,469 --> 00:05:55,380
configuration explain that for me real

134
00:05:59,870 --> 00:05:57,479
quick yeah Daryl the 401 configuration

135
00:06:01,969 --> 00:05:59,880
is the most common configuration flown

136
00:06:04,969 --> 00:06:01,979
by United launch Alliance it first flew

137
00:06:06,890 --> 00:06:04,979
in August of 2002 and the 401 what that

138
00:06:09,529 --> 00:06:06,900

designates is the size of the payload

139
00:06:11,390 --> 00:06:09,539
fairing that's used it also the number

140
00:06:13,430 --> 00:06:11,400
of solid rocket boosters that are

141
00:06:16,249 --> 00:06:13,440
required for the mission or what mission

142
00:06:17,990 --> 00:06:16,259
in boot extra boost that is needed and

143
00:06:21,110 --> 00:06:18,000
then the last number being the number of

144
00:06:23,029 --> 00:06:21,120
Centaur or second stage engines that are

145
00:06:25,909 --> 00:06:23,039
needed for the mission today so for

146
00:06:29,029 --> 00:06:25,919
landsat 9 we are flying to 401 which is

147
00:06:31,189 --> 00:06:29,039
a 4 meter fairing zero solids and one

148
00:06:33,710 --> 00:06:31,199
rl-10 engine to get us to space and as

149
00:06:36,830 --> 00:06:33,720
you you look outside and see that view

150
00:06:39,110 --> 00:06:36,840
it might look like the weather is bad in

151
00:06:41,749 --> 00:06:39,120
fact there are clouds there is Marine

152
00:06:43,490 --> 00:06:41,759
layer and there's some fog with even a

153
00:06:45,409 --> 00:06:43,500
little bit of smoke coming in from the

154
00:06:48,650 --> 00:06:45,419
Sequoia National Forest the fire there

155
00:06:50,870 --> 00:06:48,660
burning about 150 miles Northwest of us

156
00:06:53,629 --> 00:06:50,880
but that is not expected to impact

157
00:06:55,790 --> 00:06:53,639
launch we are 90 go with weather we'll

158
00:06:58,550 --> 00:06:55,800
talk more about that in a bit for now

159
00:07:00,770 --> 00:06:58,560
we'll send it back to Marine

160
00:07:03,890 --> 00:07:00,780
all right thanks Daryl and Mick we are

161
00:07:06,529 --> 00:07:03,900
now at L minus 34 minutes 59 seconds and

162
00:07:09,589 --> 00:07:06,539
counting and landsat 9 will collect the

163
00:07:11,749 --> 00:07:09,599

highest quality data ever recorded by a

164
00:07:14,150 --> 00:07:11,759
landsat satellite these new measurements

165
00:07:16,070 --> 00:07:14,160
can be compared to older ones to paint a

166
00:07:18,589 --> 00:07:16,080
picture of how our Earth is changing

167
00:07:20,570 --> 00:07:18,599
take a look

168
00:07:22,969 --> 00:07:20,580
soaring high above our home planet

169
00:07:25,370 --> 00:07:22,979
landsat 9 will provide critical data on

170
00:07:27,890 --> 00:07:25,380
how Earth is changing circling the globe

171
00:07:32,570 --> 00:07:27,900
every 99 minutes 14 orbits a day

172
00:07:36,110 --> 00:07:34,850
the impact of the landsat record is the

173
00:07:38,270 --> 00:07:36,120
sheer amount of information we've

174
00:07:40,309 --> 00:07:38,280
collected all across the world since

175
00:07:42,529 --> 00:07:40,319
1972.

176
00:07:44,749 --> 00:07:42,539
and it is high quality science caliber

177
00:07:47,930 --> 00:07:44,759
data enabling us to accurately track

178
00:07:52,850 --> 00:07:50,570
Now 50 years of Las Vegas expanding may

179
00:07:55,850 --> 00:07:52,860
be fairly simple to notice but we can

180
00:07:57,830 --> 00:07:55,860
also observe short-term changes like the

181
00:08:01,369 --> 00:07:57,840
growth of farm crops through a season in

182
00:08:06,170 --> 00:08:03,529
with more than one landsat satellite in

183
00:08:08,089 --> 00:08:06,180
orbit plus the European sentible II

184
00:08:10,309 --> 00:08:08,099
satellites we will get data several

185
00:08:14,930 --> 00:08:10,319
times each week improving our ability to

186
00:08:18,230 --> 00:08:16,129
the temperature measurements from

187
00:08:20,409 --> 00:08:18,240
landsat 9 will be used to calculate how

188
00:08:22,850 --> 00:08:20,419

much water was used by each farm field

189
00:08:24,589 --> 00:08:22,860
the central Platte natural resources

190
00:08:27,110 --> 00:08:24,599
District like many throughout the

191
00:08:28,969 --> 00:08:27,120
western United States relies on landsat

192
00:08:30,360 --> 00:08:28,979
data to manage irrigation and increase

193
00:08:32,930 --> 00:08:30,370
water efficiency

194
00:08:35,449 --> 00:08:32,940
[Music]

195
00:08:37,790 --> 00:08:35,459
landsat 9 will also improve monitoring

196
00:08:39,230 --> 00:08:37,800
of coastal Waters The increased

197
00:08:41,509 --> 00:08:39,240
precision and data sent back from

198
00:08:43,130 --> 00:08:41,519
landsat 9 will allow finer distinctions

199
00:08:45,530 --> 00:08:43,140
in the levels of light reflected from

200
00:08:49,370 --> 00:08:45,540
water making it easier to identify any

201
00:08:53,630 --> 00:08:51,710
around the globe growing population and

202
00:08:56,030 --> 00:08:53,640
expanding development result in higher

203
00:08:58,850 --> 00:08:56,040
amounts of runoff damaging sensitive

204
00:09:00,829 --> 00:08:58,860
near-shore ecosystems landsat's long

205
00:09:03,660 --> 00:09:00,839
history lets us look into the past to

206
00:09:06,170 --> 00:09:03,670
see the effects of land use changes

207
00:09:08,389 --> 00:09:06,180
[Music]

208
00:09:10,490 --> 00:09:08,399
the consequences of climate change can

209
00:09:11,690 --> 00:09:10,500
also be seen in landsat's Long data

210
00:09:13,550 --> 00:09:11,700
record

211
00:09:15,769 --> 00:09:13,560
scientists have used landsat to track

212
00:09:19,490 --> 00:09:15,779
shrinking glaciers for decades and

213
00:09:21,590 --> 00:09:19,500

landsat 9 will continue that effort

214
00:09:23,570 --> 00:09:21,600
the glaciers in the Himalayas are a key

215
00:09:24,829 --> 00:09:23,580
water source for billions of people in

216
00:09:27,290 --> 00:09:24,839
South Asia

217
00:09:29,150 --> 00:09:27,300
due to global warming the increased melt

218
00:09:31,310 --> 00:09:29,160
water collects in large lakes at high

219
00:09:33,889 --> 00:09:31,320
altitudes and poses a flooding risk to

220
00:09:35,750 --> 00:09:33,899
Downstream Villages landsat data is

221
00:09:37,910 --> 00:09:35,760
essential to monitor the growth of these

222
00:09:40,190 --> 00:09:37,920
Lakes

223
00:09:42,230 --> 00:09:40,200
because of their location Glaciers are

224
00:09:44,329 --> 00:09:42,240
not easy to study in person but

225
00:09:46,370 --> 00:09:44,339
landsat's view from space allows us to

226
00:09:48,410 --> 00:09:46,380
study glaciers all around the globe

227
00:09:50,090 --> 00:09:48,420
landsat 9's improvements will make it

228
00:09:52,490 --> 00:09:50,100
easier to see features on the glacier

229
00:09:54,949 --> 00:09:52,500
surface with that we can better track

230
00:09:57,590 --> 00:09:54,959
how fast the glacier is moving

231
00:09:59,449 --> 00:09:57,600
knowing the velocity of the ice now and

232
00:10:01,850 --> 00:09:59,459
how it has changed over the past decades

233
00:10:03,829 --> 00:10:01,860
helps us forecast likely contributions

234
00:10:08,470 --> 00:10:03,839
to rising sea levels in a changing

235
00:10:13,970 --> 00:10:11,269
landsat 9 joins landsat 8 to continue

236
00:10:15,949 --> 00:10:13,980
The Unbroken string of landsat data

237
00:10:18,170 --> 00:10:15,959
for five decades we have relied on

238
00:10:20,210 --> 00:10:18,180

landsat's High Caliber science quality

239
00:10:22,550 --> 00:10:20,220
observations to understand and protect

240
00:10:24,889 --> 00:10:22,560
our home planet

241
00:10:27,470 --> 00:10:24,899
and while landsat 9 begins sending back

242
00:10:32,569 --> 00:10:27,480
data we are already planning for the

243
00:10:35,509 --> 00:10:34,550
now that we've seen what landsat 9 will

244
00:10:39,470 --> 00:10:35,519
do

245
00:10:43,250 --> 00:10:39,480
a closer look at the space craft itself

246
00:10:46,250 --> 00:10:43,260
landsat 9 is 15 feet tall 10 feet deep

247
00:10:49,130 --> 00:10:46,260
and 10 feet long once in orbit it will

248
00:10:52,130 --> 00:10:49,140
deploy a 32 foot long solar panel and

249
00:10:55,490 --> 00:10:52,140
four foot long Earth shield with fuel it

250
00:10:57,949 --> 00:10:55,500
weighs almost 7 200 pounds the satellite

251
00:11:01,190 --> 00:10:57,959
has two main instruments operational

252
00:11:04,009 --> 00:11:01,200
land imager 2 for reflective band data

253
00:11:06,590 --> 00:11:04,019
and thermal infrared sensor 2 for

254
00:11:10,790 --> 00:11:06,600
thermal infrared bands it will capture

255
00:11:15,610 --> 00:11:10,800
700 photos each day and travel nearly 17

256
00:11:20,509 --> 00:11:18,230
all right we have a very special guest

257
00:11:23,389 --> 00:11:20,519
uh joining us who you may recognize from

258
00:11:25,250 --> 00:11:23,399
the movie Kong Skull Island actor Mark

259
00:11:27,410 --> 00:11:25,260
Evan Jackson thank you so much for

260
00:11:29,389 --> 00:11:27,420
joining us also known as landsat Steve

261
00:11:31,550 --> 00:11:29,399
in that film I was known as Lancet yes

262
00:11:35,150 --> 00:11:31,560
and you have the jacket on too I do I

263
00:11:37,490 --> 00:11:35,160

have a uh bona fide uh screen used prop

264
00:11:38,990 --> 00:11:37,500
uh screen use piece of wardrobe love it

265
00:11:40,850 --> 00:11:39,000
so in the movie

266
00:11:43,730 --> 00:11:40,860
um you played a landsat researcher

267
00:11:46,430 --> 00:11:43,740
surveying a fictional Skull Island uh

268
00:11:48,350 --> 00:11:46,440
Vandenberg looks spectacularly like that

269
00:11:50,150 --> 00:11:48,360
fictional skull uh Island this morning

270
00:11:51,829 --> 00:11:50,160
and we might see Kong coming out of the

271
00:11:54,230 --> 00:11:51,839
distance and I'll be very Vigilant

272
00:11:56,210 --> 00:11:54,240
Anything could happen so you actually

273
00:11:58,069 --> 00:11:56,220
got a chance to see the rocket up close

274
00:11:59,389 --> 00:11:58,079
yesterday tell us about that it's

275
00:12:02,269 --> 00:11:59,399
stunning I mean it's legitimately

276
00:12:05,150 --> 00:12:02,279
breathtaking and um and a really special

277
00:12:06,710 --> 00:12:05,160
opportunity to think about uh being so

278
00:12:08,650 --> 00:12:06,720
close to something that you know within

279
00:12:11,870 --> 00:12:08,660
a day is going to be headed for space

280
00:12:13,730 --> 00:12:11,880
and within the within the fairing

281
00:12:16,910 --> 00:12:13,740
something that's going to live on for

282
00:12:20,170 --> 00:12:16,920
you know many many years Gathering data

283
00:12:22,850 --> 00:12:20,180
as an uh Earth observation satellite I'm

284
00:12:24,769 --> 00:12:22,860
the the full culmination of what it

285
00:12:26,690 --> 00:12:24,779
means you know to be at this stage of

286
00:12:28,610 --> 00:12:26,700
the game ready to launch is so

287
00:12:30,470 --> 00:12:28,620
remarkable the the science and the

288
00:12:32,090 --> 00:12:30,480

engineering and the creativity and the

289
00:12:34,129 --> 00:12:32,100
Curiosity and the ambition and

290
00:12:36,050 --> 00:12:34,139
collaboration that that leads to this

291
00:12:38,389 --> 00:12:36,060
day is I mean it's legitimately

292
00:12:40,370 --> 00:12:38,399
inspiring how much did you know if

293
00:12:42,110 --> 00:12:40,380
anything about landsat before you played

294
00:12:43,490 --> 00:12:42,120
the character landsat Steve and how does

295
00:12:45,350 --> 00:12:43,500
that compare to what you know about the

296
00:12:47,509 --> 00:12:45,360
program now I'm embarrassed to admit

297
00:12:50,150 --> 00:12:47,519
that I was completely unaware of landsat

298
00:12:52,550 --> 00:12:50,160
as an entity uh prior to getting this

299
00:12:54,769 --> 00:12:52,560
role in the film but uh immediately

300
00:12:56,810 --> 00:12:54,779
began looking into what it meant to uh

301
00:12:59,329 --> 00:12:56,820
to be landsat and to be a landsat

302
00:13:01,129 --> 00:12:59,339
scientist and uh Hollywood does a very

303
00:13:02,509 --> 00:13:01,139
good job of doing their research some of

304
00:13:04,730 --> 00:13:02,519
our hand props have shown to some

305
00:13:07,310 --> 00:13:04,740
landsat actual landsat scientists and

306
00:13:08,990 --> 00:13:07,320
they are very bewildered to go like a

307
00:13:10,490 --> 00:13:09,000
lot of this is right like a lot of this

308
00:13:12,710 --> 00:13:10,500
is accurate

309
00:13:14,509 --> 00:13:12,720
um now I'm fascinated by the goings on

310
00:13:17,930 --> 00:13:14,519
at landsat like it's so remarkable to

311
00:13:20,150 --> 00:13:17,940
think about about the nearly 50 years of

312
00:13:23,750 --> 00:13:20,160
continuous observation and data

313
00:13:25,670 --> 00:13:23,760

Gathering and uh and also that all of

314
00:13:27,650 --> 00:13:25,680
landsat's data is available and free to

315
00:13:30,650 --> 00:13:27,660
the public into industry and and people

316
00:13:33,590 --> 00:13:30,660
are able to access it and use it um to

317
00:13:35,329 --> 00:13:33,600
see how our planet is sadly changing of

318
00:13:37,129 --> 00:13:35,339
course and now you're going to be

319
00:13:39,350 --> 00:13:37,139
watching launch just feet from where

320
00:13:41,210 --> 00:13:39,360
we're sitting over here hopefully uh

321
00:13:43,069 --> 00:13:41,220
this Marie layer will clear out enough

322
00:13:44,509 --> 00:13:43,079
so that we can we're starting to see the

323
00:13:46,129 --> 00:13:44,519
launch pad it's a little bit better than

324
00:13:47,750 --> 00:13:46,139
it was a couple hours ago I feel very

325
00:13:48,889 --> 00:13:47,760
good about it yeah I think I think

326
00:13:50,750 --> 00:13:48,899
things are heading in a good direction

327
00:13:52,069 --> 00:13:50,760
all right well Mark Evan Jackson thank

328
00:13:53,449 --> 00:13:52,079
you so much for joining us we hope you

329
00:13:55,850 --> 00:13:53,459
enjoyed the launch today thank you very

330
00:13:57,590 --> 00:13:55,860
much all right let's go over to Daryl

331
00:13:59,629 --> 00:13:57,600
and Mick now for a check of the launch

332
00:14:01,790 --> 00:13:59,639
weather forecast Daryl all right thank

333
00:14:03,769 --> 00:14:01,800
you Marie and good to see that landsat

334
00:14:05,870 --> 00:14:03,779
Steve is doing much better since we last

335
00:14:07,550 --> 00:14:05,880
saw him on Kong Skull Island he was

336
00:14:09,430 --> 00:14:07,560
getting flattened yeah he looks a lot

337
00:14:12,110 --> 00:14:09,440
better than he did in that final scene

338
00:14:14,210 --> 00:14:12,120

glad to have him here today yeah he was

339
00:14:15,889 --> 00:14:14,220
laying flat Steve after that movie so

340
00:14:18,050 --> 00:14:15,899
now he's back to his normal self good to

341
00:14:19,850 --> 00:14:18,060
see great interview thanks for that the

342
00:14:21,470 --> 00:14:19,860
weather briefing just happened we just

343
00:14:25,129 --> 00:14:21,480
got some news that is great of course

344
00:14:27,530 --> 00:14:25,139
the 90 go is still on our launch weather

345
00:14:29,210 --> 00:14:27,540
officer Addison Nichols saying that

346
00:14:31,250 --> 00:14:29,220
essentially we are looking great even

347
00:14:34,069 --> 00:14:31,260
though when you look outside it doesn't

348
00:14:35,449 --> 00:14:34,079
look all that fantastic our progress bar

349
00:14:38,389 --> 00:14:35,459
showing that we are at the weather

350
00:14:39,889 --> 00:14:38,399
briefing and we just had it take a look

351
00:14:41,750 --> 00:14:39,899
at the satellite we can show you a

352
00:14:43,550 --> 00:14:41,760
couple things that are in play here two

353
00:14:46,009 --> 00:14:43,560
other features along the Central Coast

354
00:14:48,710 --> 00:14:46,019
right to the left there's a upper level

355
00:14:51,290 --> 00:14:48,720
low that's squeezing to the right a

356
00:14:53,210 --> 00:14:51,300
monsoonal low and so in between we've

357
00:14:55,670 --> 00:14:53,220
got some calm winds and a thick Marine

358
00:14:58,550 --> 00:14:55,680
layer the those don't affect launch so

359
00:15:01,670 --> 00:14:58,560
right at t0 where 90 go very small

360
00:15:03,590 --> 00:15:01,680
concern for surface winds and again just

361
00:15:05,389 --> 00:15:03,600
a minor Factor Mick yeah absolutely

362
00:15:07,009 --> 00:15:05,399
Daryl these uh weather looks great here

363
00:15:08,290 --> 00:15:07,019

for us in Vandenberg today so glad to

364
00:15:11,449 --> 00:15:08,300
see weather's cooperating with us

365
00:15:13,210 --> 00:15:11,459
unfortunately the 30th space uh launched

366
00:15:15,590 --> 00:15:13,220
Delta forecast deteriorates

367
00:15:17,629 --> 00:15:15,600
significantly tomorrow which is the

368
00:15:20,090 --> 00:15:17,639
backup day because as you can see in

369
00:15:23,329 --> 00:15:20,100
this Loop that cold front will play

370
00:15:26,569 --> 00:15:23,339
bigger tomorrow than it does today and

371
00:15:29,569 --> 00:15:26,579
in fact it's only a 40 percent go

372
00:15:32,150 --> 00:15:29,579
because ground winds will be gusting up

373
00:15:34,430 --> 00:15:32,160
to 24 knots you can see in the upper

374
00:15:37,189 --> 00:15:34,440
left hand part of your screen that upper

375
00:15:39,710 --> 00:15:37,199
level low it will drop down and winds

376
00:15:42,050 --> 00:15:39,720
will increase and that will put us in a

377
00:15:43,850 --> 00:15:42,060
situation where we don't want to be Mac

378
00:15:45,769 --> 00:15:43,860
yeah absolutely those wins would be bad

379
00:15:47,629 --> 00:15:45,779
for us for the launch vehicle design and

380
00:15:49,790 --> 00:15:47,639
launch liftoff in control of the vehicle

381
00:15:52,430 --> 00:15:49,800
so let's hope we get off today

382
00:15:54,290 --> 00:15:52,440
so we hope that that will happen and

383
00:15:56,509 --> 00:15:54,300
looking back out to the pad you can see

384
00:15:58,670 --> 00:15:56,519
there's some fog there's even some smoke

385
00:16:01,069 --> 00:15:58,680
from nearby fires making a little bit of

386
00:16:02,509 --> 00:16:01,079
a haze but we are go for launch we'll

387
00:16:04,490 --> 00:16:02,519
send it back

388
00:16:07,129 --> 00:16:04,500

um actually we'll talk a little bit

389
00:16:11,090 --> 00:16:07,139
about uh LSP in a future segment but for

390
00:16:16,490 --> 00:16:13,430
all right thanks guys we are at L minus

391
00:16:19,189 --> 00:16:16,500
25 minutes 46 seconds and counting until

392
00:16:22,370 --> 00:16:19,199
liftoff of the ninth Earth observation

393
00:16:24,910 --> 00:16:22,380
satellite and as we mentioned this

394
00:16:27,470 --> 00:16:24,920
program dates back almost half a century

395
00:16:29,449 --> 00:16:27,480
here's an animation we're about to show

396
00:16:32,449 --> 00:16:29,459
you of the timeline of the landsat

397
00:16:35,389 --> 00:16:32,459
program starting with Lance at one it

398
00:16:37,670 --> 00:16:35,399
launched back in 1972 and it takes us

399
00:16:40,009 --> 00:16:37,680
all the way through landsat 9 of course

400
00:16:42,470 --> 00:16:40,019
launching today the hash lines for

401
00:16:44,389 --> 00:16:42,480
landsat 7 through 9 indicate the

402
00:16:47,030 --> 00:16:44,399
uncertain lifespan of the satellites

403
00:16:50,030 --> 00:16:47,040
landsat 6 failed to reach orbit after

404
00:16:52,249 --> 00:16:50,040
launch still it's hard to overstate the

405
00:16:54,530 --> 00:16:52,259
value of the landsat archive of the past

406
00:16:56,930 --> 00:16:54,540
49 years

407
00:16:59,569 --> 00:16:56,940
one more history lesson before our next

408
00:17:02,449 --> 00:16:59,579
guest take a look at a photo we have

409
00:17:05,210 --> 00:17:02,459
from 1971 inside the launch control

410
00:17:07,069 --> 00:17:05,220
center at Kennedy Space Center uh there

411
00:17:09,409 --> 00:17:07,079
it is over on the Florida coast this was

412
00:17:12,110 --> 00:17:09,419
when Apollo 15 Was preparing to launch

413
00:17:14,689 --> 00:17:12,120

and the man on the far right is Dr James

414
00:17:17,270 --> 00:17:14,699
Fletcher he was the NASA administrator

415
00:17:19,370 --> 00:17:17,280
at the time and as administrator he

416
00:17:21,529 --> 00:17:19,380
would go on to predict that if there

417
00:17:26,449 --> 00:17:21,539
were one Space Age development that

418
00:17:31,070 --> 00:17:29,390
50 years ago the U.S Geological Survey

419
00:17:32,810 --> 00:17:31,080
had an idea

420
00:17:36,289 --> 00:17:32,820
satellites orbiting Earth that could

421
00:17:38,990 --> 00:17:36,299
help us monitor our natural resources

422
00:17:42,110 --> 00:17:39,000
today the landsat program is jointly

423
00:17:44,090 --> 00:17:42,120
managed by NASA and the USGS providing

424
00:17:46,130 --> 00:17:44,100
an unparalleled record of Earth's

425
00:17:47,049 --> 00:17:46,140
changing landscapes for the benefit of

426
00:17:50,650 --> 00:17:47,059
all

427
00:17:55,930 --> 00:17:50,660
50 years of satellites

428
00:17:55,940 --> 00:18:03,970
one Legacy continued plants at night

429
00:18:08,930 --> 00:18:06,650
we have a special guest standing by now

430
00:18:11,330 --> 00:18:08,940
with NASA Edge's Blair Allen just

431
00:18:14,570 --> 00:18:11,340
outside Mission Control Blair

432
00:18:17,210 --> 00:18:14,580
thanks so much Marie joining us now is a

433
00:18:19,549 --> 00:18:17,220
very very special guest the first Native

434
00:18:22,490 --> 00:18:19,559
American to serve as a United States

435
00:18:25,490 --> 00:18:22,500
Secretary of the Interior and on the ca

436
00:18:27,590 --> 00:18:25,500
as in a cabinet level post Deb Holland

437
00:18:28,909 --> 00:18:27,600
Secretary Holland thanks so much for

438
00:18:30,770 --> 00:18:28,919

joining the show this morning I'm

439
00:18:33,289 --> 00:18:30,780
thrilled to be here thanks for having me

440
00:18:35,510 --> 00:18:33,299
when we think of landsat landsat's shown

441
00:18:38,950 --> 00:18:35,520
us a lot of interesting things how we're

442
00:18:41,390 --> 00:18:38,960
impacted by drought hurricanes even

443
00:18:44,029 --> 00:18:41,400
man-induced activities like Urban

444
00:18:45,890 --> 00:18:44,039
Development and deforestation how does

445
00:18:47,150 --> 00:18:45,900
this kind of data help the average

446
00:18:48,890 --> 00:18:47,160
person

447
00:18:51,049 --> 00:18:48,900
well I'll tell you what

448
00:18:54,230 --> 00:18:51,059
um those of us in the department of the

449
00:18:56,810 --> 00:18:54,240
interior and and the and the you know

450
00:19:01,070 --> 00:18:56,820
government-wide we're making policies

451
00:19:05,990 --> 00:19:01,080
every day to make sure that we can

452
00:19:09,230 --> 00:19:06,000
keep our environment safe and clean for

453
00:19:12,529 --> 00:19:09,240
generations to come and hard data like

454
00:19:15,890 --> 00:19:12,539
this helps us incredibly but also look

455
00:19:18,350 --> 00:19:15,900
we have opportunities to see those

456
00:19:20,450 --> 00:19:18,360
changes over time the landsat's been in

457
00:19:22,430 --> 00:19:20,460
existence for the last 50 years the

458
00:19:28,430 --> 00:19:22,440
technology gets better and better each

459
00:19:31,430 --> 00:19:28,440
time and so this is such a rich form of

460
00:19:33,590 --> 00:19:31,440
data that we can use that will help

461
00:19:35,810 --> 00:19:33,600
people's everyday lives they may not

462
00:19:37,789 --> 00:19:35,820
know that but there's folks working

463
00:19:41,630 --> 00:19:37,799

behind the scenes every single day to

464
00:19:43,610 --> 00:19:41,640
make sure that people can have have what

465
00:19:45,230 --> 00:19:43,620
they need moving into the future well

466
00:19:48,110 --> 00:19:45,240
it's interesting because I was going to

467
00:19:50,630 --> 00:19:48,120
segue right into how this impacts policy

468
00:19:52,549 --> 00:19:50,640
but you jump there right away so in your

469
00:19:55,789 --> 00:19:52,559
experience so far have you worked with

470
00:19:57,350 --> 00:19:55,799
lawmakers to sort of chart some policies

471
00:20:00,049 --> 00:19:57,360
that would actually be helpful in

472
00:20:03,110 --> 00:20:00,059
regards to climate change absolutely and

473
00:20:04,850 --> 00:20:03,120
of course we're in the a thick of the

474
00:20:07,909 --> 00:20:04,860
climate crisis right now we see that

475
00:20:10,370 --> 00:20:07,919
every day drought wildfires hurricanes

476
00:20:12,169 --> 00:20:10,380
hurricane Ida that devastated parts of

477
00:20:14,270 --> 00:20:12,179
the South and went all the way up to New

478
00:20:16,610 --> 00:20:14,280
England we

479
00:20:20,029 --> 00:20:16,620
um I mean images like the ones that

480
00:20:23,390 --> 00:20:20,039
landsat 9 will bring back to us will

481
00:20:25,669 --> 00:20:23,400
help us tremendously to guide us in how

482
00:20:27,710 --> 00:20:25,679
we are approaching climate change

483
00:20:30,409 --> 00:20:27,720
working to make sure that we can make

484
00:20:32,570 --> 00:20:30,419
the best decisions possible so that

485
00:20:34,970 --> 00:20:32,580
folks have water into the future that we

486
00:20:37,430 --> 00:20:34,980
can grow our food into the Future these

487
00:20:40,310 --> 00:20:37,440
are all things that will affect the

488
00:20:42,649 --> 00:20:40,320

daily lives of every single American and

489
00:20:44,210 --> 00:20:42,659
quite frankly these are pictures from

490
00:20:46,970 --> 00:20:44,220
around the world not just the United

491
00:20:48,890 --> 00:20:46,980
States so it's going to help folks all

492
00:20:53,210 --> 00:20:48,900
over the world to make those decisions

493
00:20:56,690 --> 00:20:53,220
and it's it's it's unmistakable uh

494
00:20:59,149 --> 00:20:56,700
incredible uh hard data that we can use

495
00:21:01,310 --> 00:20:59,159
every day absolutely thank you so much

496
00:21:03,850 --> 00:21:01,320
secretary Holland for being on the show

497
00:21:06,590 --> 00:21:03,860
back to you Daryl

498
00:21:08,330 --> 00:21:06,600
L minus 20 minutes and Counting until

499
00:21:10,490 --> 00:21:08,340
launch and we've been monitoring the

500
00:21:12,529 --> 00:21:10,500
launch teams with our headsets we're

501
00:21:13,850 --> 00:21:12,539
plugged in and Mick you just got some

502
00:21:15,169 --> 00:21:13,860
good news yeah we did we got to hear

503
00:21:17,330 --> 00:21:15,179
from the launch team that everything is

504
00:21:19,370 --> 00:21:17,340
good they're back on schedule uh things

505
00:21:21,409 --> 00:21:19,380
are are working well and we are green

506
00:21:22,730 --> 00:21:21,419
for our 11 12 launch opportunity this

507
00:21:24,649 --> 00:21:22,740
morning so that's exciting that we're

508
00:21:26,330 --> 00:21:24,659
getting ready to launch landsat 9.

509
00:21:27,830 --> 00:21:26,340
that's great news got a little moisture

510
00:21:29,630 --> 00:21:27,840
on the camera as you can see there

511
00:21:31,850 --> 00:21:29,640
there's a little Mist in the air there's

512
00:21:33,950 --> 00:21:31,860
some fog and there's a marine layer but

513
00:21:36,529 --> 00:21:33,960

none of it is expected to stop this

514
00:21:39,350 --> 00:21:36,539
opportunity today Nick want to talk

515
00:21:41,630 --> 00:21:39,360
about the launch time at 11 12 a.m

516
00:21:44,029 --> 00:21:41,640
Pacific time that actually moved one

517
00:21:46,490 --> 00:21:44,039
minute what was the reason for that yeah

518
00:21:48,289 --> 00:21:46,500
Daryl we uh we moved to one minute to 11

519
00:21:50,090 --> 00:21:48,299
12 this morning do in order to

520
00:21:52,850 --> 00:21:50,100
accommodate a cola or what we call a

521
00:21:54,950 --> 00:21:52,860
collision on launch assessment for the C

522
00:21:57,470 --> 00:21:54,960
train the C train is made up of two

523
00:22:00,830 --> 00:21:57,480
satellites Calypso and Cloud set that

524
00:22:02,450 --> 00:22:00,840
LSP launched back in 2006 and we want to

525
00:22:04,310 --> 00:22:02,460
make sure that when we launch landsat 9

526
00:22:06,169 --> 00:22:04,320
this morning we get in that near polar

527
00:22:08,270 --> 00:22:06,179
Sun synchronous orbit but we don't want

528
00:22:11,570 --> 00:22:08,280
to hit our fellow satellites that are

529
00:22:13,070 --> 00:22:11,580
Earth observing So to avoid that we made

530
00:22:15,409 --> 00:22:13,080
sure that landsat and I needed where to

531
00:22:17,930 --> 00:22:15,419
go we moved the launch by one minute in

532
00:22:19,730 --> 00:22:17,940
order to avoid the cloud satellite now

533
00:22:22,510 --> 00:22:19,740
to have room in space to get to space

534
00:22:25,610 --> 00:22:22,520
and so we are looking good from that

535
00:22:28,010 --> 00:22:25,620
aspect as well as we look at a shot here

536
00:22:29,930 --> 00:22:28,020
from the pad you can see the the steam

537
00:22:32,630 --> 00:22:29,940
that's coming off the rocket those are

538
00:22:35,330 --> 00:22:32,640

just vent valves right that are venting

539
00:22:37,070 --> 00:22:35,340
off excess liquid oxygen yes Daryl

540
00:22:39,470 --> 00:22:37,080
actually is uh the team is finished up

541
00:22:42,310 --> 00:22:39,480
we're in what we call topping mode and

542
00:22:45,590 --> 00:22:42,320
as the liquid oxygen liquid hydrogen

543
00:22:47,390 --> 00:22:45,600
boils off that's what you see coming off

544
00:22:49,250 --> 00:22:47,400
there and as we get ready to go into T

545
00:22:50,750 --> 00:22:49,260
minus four and Counting you will see

546
00:22:52,310 --> 00:22:50,760
those vent valves close and that will

547
00:22:54,169 --> 00:22:52,320
stop and bring us to flight pressures

548
00:22:56,270 --> 00:22:54,179
now as you look at that rocket there's

549
00:22:57,649 --> 00:22:56,280
actually a special dedication on it you

550
00:22:59,990 --> 00:22:57,659
can't see it but we're going to show it

551
00:23:02,210 --> 00:23:00,000
to you in a second there's a special

552
00:23:04,850 --> 00:23:02,220
dedication there and it's the reason is

553
00:23:07,549 --> 00:23:04,860
of this it's because of this man man uh

554
00:23:09,590 --> 00:23:07,559
Thomas heater II Peter began his 45-year

555
00:23:11,990 --> 00:23:09,600
career in the launch business at General

556
00:23:14,270 --> 00:23:12,000
Dynamics and relocated here to

557
00:23:16,909 --> 00:23:14,280
Vandenberg as a flight test engineer in

558
00:23:19,070 --> 00:23:16,919
the mid-60s he rose to director of

559
00:23:23,090 --> 00:23:19,080
Vandenberg launch operations and during

560
00:23:25,730 --> 00:23:23,100
that time supported 200 Atlas Titan and

561
00:23:28,490 --> 00:23:25,740
Athena launches Peter II passed away

562
00:23:31,190 --> 00:23:28,500
several years ago and so Ula put this

563
00:23:32,990 --> 00:23:31,200

special dedication to him on the side of

564
00:23:35,149 --> 00:23:33,000
the atlas V rocket you can see it there

565
00:23:38,029 --> 00:23:35,159
in memory of our colleague and friend

566
00:23:40,130 --> 00:23:38,039
Tom Peter II his family and friends

567
00:23:42,830 --> 00:23:40,140
gathered around the rocket as well and

568
00:23:45,230 --> 00:23:42,840
took a photo and Mick you know you had

569
00:23:47,750 --> 00:23:45,240
the privilege of working under heater II

570
00:23:50,149 --> 00:23:47,760
and me I just point out between the U

571
00:23:52,310 --> 00:23:50,159
and the a right there on the L is uh

572
00:23:55,070 --> 00:23:52,320
Thomas heater the Second Son the third

573
00:23:57,470 --> 00:23:55,080
yes Daryl Mr Heater was a remarkable

574
00:23:58,789 --> 00:23:57,480
leader humble person and you know what I

575
00:24:00,230 --> 00:23:58,799
did I had the privilege of working with

576
00:24:02,269 --> 00:24:00,240
him on many Atlas missions here at

577
00:24:04,490 --> 00:24:02,279
vandenberg's face workspace before I

578
00:24:05,930 --> 00:24:04,500
started with NASA Mr heater was the

579
00:24:07,730 --> 00:24:05,940
director of launch operations at space

580
00:24:09,950 --> 00:24:07,740
launch complex 3 but what I remember the

581
00:24:12,110 --> 00:24:09,960
most is he would always keep an eye on

582
00:24:13,909 --> 00:24:12,120
things going on at the pad but he always

583
00:24:15,710 --> 00:24:13,919
always took care of his people and

584
00:24:17,330 --> 00:24:15,720
looked out for things and as you said

585
00:24:19,310 --> 00:24:17,340
special note for us in launch Services

586
00:24:21,350 --> 00:24:19,320
Program we get to work with his son who

587
00:24:22,970 --> 00:24:21,360
is today's launch director who we will

588
00:24:25,250 --> 00:24:22,980

hear from later and he's a remarkable

589
00:24:27,350 --> 00:24:25,260
person also well great dedication to the

590
00:24:29,570 --> 00:24:27,360
heater family indeed and we'll hear him

591
00:24:31,250 --> 00:24:29,580
report out as the last in the L minus

592
00:24:34,250 --> 00:24:31,260
seven poll we'll get to that in a bit

593
00:24:36,409 --> 00:24:34,260
but first I want to talk about LSP and

594
00:24:45,669 --> 00:24:36,419
their ability to bring together the

595
00:24:50,990 --> 00:24:49,250
since the dawn of humanity we have

596
00:24:53,870 --> 00:24:51,000
looked to the stars and dreamed of

597
00:24:54,410 --> 00:24:53,880
Bridging the Gap between the Earth and

598
00:24:55,690 --> 00:24:54,420
the cosmos

599
00:24:58,070 --> 00:24:55,700
[Music]

600
00:25:01,130 --> 00:24:58,080
in the 20th century

601
00:25:03,830 --> 00:25:01,140
NASA turned that dream into a reality by

602
00:25:07,010 --> 00:25:03,840
launching Humanity into a bold era of

603
00:25:09,649 --> 00:25:07,020
scientific discovery as pioneers of

604
00:25:11,810 --> 00:25:09,659
space travel our best and brightest

605
00:25:14,450 --> 00:25:11,820
designed and built everything from the

606
00:25:16,310 --> 00:25:14,460
ground up from launch pads to Rockets

607
00:25:19,370 --> 00:25:16,320
all of which were government owned and

608
00:25:21,529 --> 00:25:19,380
operated as NASA's science and Robotics

609
00:25:24,470 --> 00:25:21,539
evolved we encouraged a competitive

610
00:25:26,570 --> 00:25:24,480
launch market to develop ushering in a

611
00:25:28,549 --> 00:25:26,580
new way to explore and discover through

612
00:25:30,710 --> 00:25:28,559
commercial space flight

613
00:25:33,169 --> 00:25:30,720

spacecraft customers from around the

614
00:25:34,909 --> 00:25:33,179
world all with the same desire reached

615
00:25:37,850 --> 00:25:34,919
out to find an expert at Nasa for

616
00:25:42,490 --> 00:25:37,860
support thus NASA's launch Services

617
00:25:46,909 --> 00:25:45,529
our mission is to centralize NASA's

618
00:25:48,950 --> 00:25:46,919
launch services and address

619
00:25:50,870 --> 00:25:48,960
state-of-the-art customer needs when

620
00:25:54,049 --> 00:25:50,880
placing their spacecraft in orbit around

621
00:25:57,230 --> 00:25:54,059
the Earth the Sun or destinations deeper

622
00:25:59,090 --> 00:25:57,240
into the solar system the LSP family is

623
00:26:00,649 --> 00:25:59,100
made up of a diverse tapestry of

624
00:26:03,169 --> 00:26:00,659
government and contractor Engineers

625
00:26:06,710 --> 00:26:03,179
analysts operation experts and business

626
00:26:08,870 --> 00:26:06,720
advisors all United by a common goal to

627
00:26:11,570 --> 00:26:08,880
get your spacecraft off the ground on

628
00:26:14,510 --> 00:26:11,580
time on budget and successfully to its

629
00:26:16,610 --> 00:26:14,520
final destination wherever that may be

630
00:26:20,090 --> 00:26:16,620
we match scientific and robotic

631
00:26:22,070 --> 00:26:20,100
spacecraft with the appropriate rocket

632
00:26:23,870 --> 00:26:22,080
and certify rocket performance and

633
00:26:25,669 --> 00:26:23,880
reliability

634
00:26:28,190 --> 00:26:25,679
we support full-service missions

635
00:26:29,630 --> 00:26:28,200
advisory services and one-of-a-kind

636
00:26:32,210 --> 00:26:29,640
contracts

637
00:26:34,250 --> 00:26:32,220
the launch Services Program is the

638
00:26:36,350 --> 00:26:34,260

common thread that Bridges the

639
00:26:39,529 --> 00:26:36,360
spacecraft organization to the rocket

640
00:26:41,049 --> 00:26:39,539
designer and the spacecraft to the

641
00:26:43,610 --> 00:26:41,059
rocket

642
00:26:45,470 --> 00:26:43,620
we provide long-term technical

643
00:26:47,510 --> 00:26:45,480
leadership and expertise from

644
00:26:50,330 --> 00:26:47,520
pre-mission planning to system

645
00:26:52,130 --> 00:26:50,340
verification and validation all the way

646
00:26:54,649 --> 00:26:52,140
through launch

647
00:26:56,750 --> 00:26:54,659
whatever the visual requirements our

648
00:26:58,610 --> 00:26:56,760
team will be there guiding our customers

649
00:27:00,710 --> 00:26:58,620
every step of the way on their journey

650
00:27:03,769 --> 00:27:00,720
through space

651
00:27:05,510 --> 00:27:03,779
we are the common thread that connects

652
00:27:07,789 --> 00:27:05,520
the Science World to the physical world

653
00:27:10,850 --> 00:27:07,799
by putting the necessary instruments in

654
00:27:12,769 --> 00:27:10,860
place the thread that weaves NASA's

655
00:27:15,169 --> 00:27:12,779
industry-leading knowledge and support

656
00:27:17,090 --> 00:27:15,179
into the fabric of the commercial space

657
00:27:19,850 --> 00:27:17,100
Market

658
00:27:22,190 --> 00:27:19,860
the unite customers capabilities and

659
00:27:24,570 --> 00:27:22,200
culture to explore space through

660
00:27:25,870 --> 00:27:24,580
unparalleled launch Services

661
00:27:29,149 --> 00:27:25,880
[Music]

662
00:27:35,570 --> 00:27:29,159
NASA's launch Services Program we are

663
00:27:40,669 --> 00:27:38,570

it is L minus 14 minutes and Counting

664
00:27:43,130 --> 00:27:40,679
until liftoff we've talked a lot about

665
00:27:45,350 --> 00:27:43,140
the history of landsat but we would be

666
00:27:47,810 --> 00:27:45,360
remiss if we did not point out the

667
00:27:50,750 --> 00:27:47,820
mother of landsat the woman who created

668
00:27:53,389 --> 00:27:50,760
and fought for it Virginia Norwood was

669
00:27:56,450 --> 00:27:53,399
an MIT graduate and physicist working at

670
00:27:58,610 --> 00:27:56,460
Hughes aircraft company in the 1960s and

671
00:28:01,490 --> 00:27:58,620
she knew NASA wanted a way to capture

672
00:28:03,710 --> 00:28:01,500
multi-spectral images from space she set

673
00:28:05,570 --> 00:28:03,720
out to solve the problem and through

674
00:28:07,909 --> 00:28:05,580
years of research development and

675
00:28:10,070 --> 00:28:07,919
testing she created the multi-spectral

676
00:28:12,710 --> 00:28:10,080
scanner system that flew on the very

677
00:28:15,110 --> 00:28:12,720
first landsat satellite as a testament

678
00:28:17,210 --> 00:28:15,120
to her Legacy there is an entire group

679
00:28:19,490 --> 00:28:17,220
of women on Twitter who call themselves

680
00:28:21,230 --> 00:28:19,500
The Ladies of landsat they draw

681
00:28:23,450 --> 00:28:21,240
inspiration from Norwood as they

682
00:28:25,610 --> 00:28:23,460
highlight the work of underrepresented

683
00:28:27,230 --> 00:28:25,620
researchers and we will hear from the

684
00:28:30,110 --> 00:28:27,240
co-founder of this group a little later

685
00:28:32,570 --> 00:28:30,120
after launch Virginia Norwood could not

686
00:28:34,370 --> 00:28:32,580
be with us today but we do have some of

687
00:28:36,590 --> 00:28:34,380
the ladies of landsat here at Vandenberg

688
00:28:39,169 --> 00:28:36,600

to see the launch up close and we hope

689
00:28:41,630 --> 00:28:39,179
they enjoy it joining me now is Dr

690
00:28:44,330 --> 00:28:41,640
Thomas associate administrator for

691
00:28:45,830 --> 00:28:44,340
NASA's Mission directorate Thomas uh

692
00:28:48,649 --> 00:28:45,840
thanks for being here it's starting to

693
00:28:51,529 --> 00:28:48,659
clear up we can actually see the pad now

694
00:28:54,250 --> 00:28:51,539
um tell us how does landsat tie into the

695
00:28:57,049 --> 00:28:54,260
entire uh science directorate portfolio

696
00:29:00,909 --> 00:28:57,059
Henry what an amazing day I'm just so

697
00:29:05,389 --> 00:29:00,919
excited and of course this is the first

698
00:29:08,090 --> 00:29:05,399
of 11 launches in Earth Science in the

699
00:29:10,730 --> 00:29:08,100
next two three years just from NASA

700
00:29:12,649 --> 00:29:10,740
alone and in many ways uh the way I

701
00:29:16,070 --> 00:29:12,659
think about landside it's really the

702
00:29:19,070 --> 00:29:16,080
foundation the contextual data in which

703
00:29:21,350 --> 00:29:19,080
we look at uh older signs we do the

704
00:29:23,510 --> 00:29:21,360
research that we're doing looking at our

705
00:29:26,870 --> 00:29:23,520
amazing I find it because of the nearly

706
00:29:30,110 --> 00:29:26,880
50-year time the way I think about it is

707
00:29:33,110 --> 00:29:30,120
almost like a painting our research is

708
00:29:35,590 --> 00:29:33,120
the paint the landsat is the canvas so

709
00:29:38,570 --> 00:29:35,600
it really belongs to better very deeply

710
00:29:40,130 --> 00:29:38,580
absolutely and landsat obviously looks

711
00:29:42,169 --> 00:29:40,140
down on Earth surveying the entire

712
00:29:44,930 --> 00:29:42,179
planet does anything we learn from

713
00:29:47,210 --> 00:29:44,940

landsat help us turn outward to explore

714
00:29:49,310 --> 00:29:47,220
further into the solar system absolutely

715
00:29:53,450 --> 00:29:49,320
you know the the work that we're doing

716
00:29:55,610 --> 00:29:53,460
in all of NASA of course expands beyond

717
00:29:58,730 --> 00:29:55,620
our science we have missions that will

718
00:30:00,769 --> 00:29:58,740
go to the Trojans the planetary Mission

719
00:30:02,930 --> 00:30:00,779
the James Webb Space Telescope launching

720
00:30:06,710 --> 00:30:02,940
this year and we used the very same

721
00:30:09,350 --> 00:30:06,720
technology that we're using for these uh

722
00:30:11,630 --> 00:30:09,360
analysis of the cosmos of other planets

723
00:30:14,090 --> 00:30:11,640
looking at our planet so yes we learn

724
00:30:15,830 --> 00:30:14,100
from there to here but very much we

725
00:30:18,649 --> 00:30:15,840
learn from the earth science instruments

726
00:30:21,769 --> 00:30:18,659
to look at how we explore outer planets

727
00:30:23,570 --> 00:30:21,779
sure I want to also ask you about this

728
00:30:25,250 --> 00:30:23,580
huge Treasure Trove of data available

729
00:30:27,350 --> 00:30:25,260
for researchers

730
00:30:32,500 --> 00:30:27,360
um it's available to the public first we

731
00:30:44,029 --> 00:30:39,789
[Music]

732
00:30:46,370 --> 00:30:44,039
landsat archives its 9 millionth theme

733
00:30:49,970 --> 00:30:46,380
each scene is a satellite image from

734
00:30:52,549 --> 00:30:49,980
space about 115 miles wide

735
00:30:54,409 --> 00:30:52,559
researchers and well just about anyone

736
00:30:58,009 --> 00:30:54,419
can download scenes from the landsat

737
00:30:59,690 --> 00:30:58,019
archive managed by USGS landsat holds

738
00:31:03,590 --> 00:30:59,700

the title for the longest continuous

739
00:31:06,169 --> 00:31:03,600
space-based record of Earth in existence

740
00:31:08,630 --> 00:31:06,179
that's 50 years of scenes like these

741
00:31:10,669 --> 00:31:08,640
helping scientists and researchers

742
00:31:12,169 --> 00:31:10,679
understand how our planet is changing

743
00:31:14,090 --> 00:31:12,179
over time

744
00:31:16,029 --> 00:31:14,100
yeah

745
00:31:19,549 --> 00:31:16,039
so we just saw a video there about

746
00:31:21,649 --> 00:31:19,559
landsat having archived nine million

747
00:31:24,529 --> 00:31:21,659
images and Counting we're adding 700

748
00:31:27,230 --> 00:31:24,539
every day to that until the earlier

749
00:31:30,350 --> 00:31:27,240
2000s this data was not free uh people

750
00:31:32,269 --> 00:31:30,360
had to pay per per scene now that's

751
00:31:34,430 --> 00:31:32,279
completely free it's available to anyone

752
00:31:36,649 --> 00:31:34,440
who wants it why is that so significant

753
00:31:38,509 --> 00:31:36,659
all right it's absolutely essential to

754
00:31:41,330 --> 00:31:38,519
unleash the power of the data that we

755
00:31:43,549 --> 00:31:41,340
have of course our partnership with USGS

756
00:31:45,889 --> 00:31:43,559
remains strong they are our if you want

757
00:31:47,750 --> 00:31:45,899
translators so freely to be images to

758
00:31:50,210 --> 00:31:47,760
the application spaces in our world

759
00:31:53,110 --> 00:31:50,220
whether it's agriculture fisheries and

760
00:31:55,490 --> 00:31:53,120
Beyond but by making the image Republic

761
00:31:57,470 --> 00:31:55,500
what happens is that companies

762
00:32:00,289 --> 00:31:57,480
non-for-profit or for-profit companies

763
00:32:02,930 --> 00:32:00,299

can take those data and put their own

764
00:32:05,090 --> 00:32:02,940
data on top of it and actually add to

765
00:32:07,130 --> 00:32:05,100
the value of the landsat data and waste

766
00:32:09,110 --> 00:32:07,140
that otherwise would not occur so it's a

767
00:32:11,269 --> 00:32:09,120
huge stimulant on entrepreneurial

768
00:32:14,210 --> 00:32:11,279
thinking of the type that us is known

769
00:32:16,430 --> 00:32:14,220
for and Beyond landsat we're looking

770
00:32:18,470 --> 00:32:16,440
forward to launch in 10 minutes or so

771
00:32:19,789 --> 00:32:18,480
but real quickly what else are you

772
00:32:21,950 --> 00:32:19,799
looking forward to this year for the

773
00:32:24,230 --> 00:32:21,960
science Mission directorate wow it's an

774
00:32:26,750 --> 00:32:24,240
amazing year frankly there's hardly ever

775
00:32:28,970 --> 00:32:26,760
being one like this just uh two three

776
00:32:31,250 --> 00:32:28,980
weeks from now around mid October we're

777
00:32:32,990 --> 00:32:31,260
gonna launch Lucy to the troach and say

778
00:32:35,389 --> 00:32:33,000
they're out there at Jupiter distances

779
00:32:37,730 --> 00:32:35,399
bodies of the solar system we've never

780
00:32:40,430 --> 00:32:37,740
observed the James Webb Space Telescope

781
00:32:43,490 --> 00:32:40,440
and two missions while looking at uh

782
00:32:45,470 --> 00:32:43,500
Island Universe in X-rays and then the

783
00:32:48,230 --> 00:32:45,480
first Coalition experiment of a

784
00:32:50,269 --> 00:32:48,240
spacecraft with a nearest object all

785
00:32:52,789 --> 00:32:50,279
right Dr Tom Mr Buchan thank you so much

786
00:32:54,470 --> 00:32:52,799
for joining us enjoy the launch uh and

787
00:32:56,330 --> 00:32:54,480
with that let's send it over to Daryl

788
00:32:58,669 --> 00:32:56,340

and Mick to take us through these final

789
00:33:00,049 --> 00:32:58,679
minutes before liftoff guys all right

790
00:33:01,730 --> 00:33:00,059
thank you Marie and welcome back into

791
00:33:03,289 --> 00:33:01,740
the mission director's Center we've been

792
00:33:05,149 --> 00:33:03,299
listening to the launch Team and just

793
00:33:07,669 --> 00:33:05,159
got some great news from NASA launch

794
00:33:10,130 --> 00:33:07,679
manager Tim Dunn who declared that

795
00:33:11,450 --> 00:33:10,140
landsat 9 is now on internal power that

796
00:33:14,149 --> 00:33:11,460
means things are looking really good

797
00:33:16,070 --> 00:33:14,159
yeah Tim Duncan completed his poll with

798
00:33:18,049 --> 00:33:16,080
the team uh notified him the weather

799
00:33:19,850 --> 00:33:18,059
looks good the range is good spacecraft

800
00:33:22,669 --> 00:33:19,860
is internal power like you said Daryl

801
00:33:24,590 --> 00:33:22,679
and those are all good indications that

802
00:33:26,810 --> 00:33:24,600
we are go for launch at 11 12 this

803
00:33:28,850 --> 00:33:26,820
morning so excited to hear about that

804
00:33:31,130 --> 00:33:28,860
the next up we will hear from United

805
00:33:33,590 --> 00:33:31,140
launch Alliance launch conductor Scott

806
00:33:36,710 --> 00:33:33,600
Barney he will perform at L minus seven

807
00:33:38,690 --> 00:33:36,720
the Ula uh teams poll where we will hear

808
00:33:40,370 --> 00:33:38,700
the team give their go ready to enter

809
00:33:42,289 --> 00:33:40,380
terminal count and as we mentioned

810
00:33:45,110 --> 00:33:42,299
earlier launch director Tom heater will

811
00:33:46,730 --> 00:33:45,120
give that final proceed to Launch and of

812
00:33:49,070 --> 00:33:46,740
course a dedication going up on the

813
00:33:51,110 --> 00:33:49,080

rocket with his name on it his son as

814
00:33:52,730 --> 00:33:51,120
you mentioned the launch director will

815
00:33:54,649 --> 00:33:52,740
be listening for that poll which is

816
00:33:56,750 --> 00:33:54,659
coming at L minus seven minutes if you

817
00:33:58,250 --> 00:33:56,760
look across the bottom of the screen you

818
00:34:01,250 --> 00:33:58,260
can see we're at weather briefing coming

819
00:34:03,529 --> 00:34:01,260
up is pulling and we'll hit that at L

820
00:34:05,990 --> 00:34:03,539
minus seven as we count down 60 more

821
00:34:08,389 --> 00:34:06,000
seconds until that moment as we look out

822
00:34:10,069 --> 00:34:08,399
at the rocket we see that they've had a

823
00:34:12,109 --> 00:34:10,079
little bit of clearing that doesn't

824
00:34:13,909 --> 00:34:12,119
affect the chance for launch but make

825
00:34:16,550 --> 00:34:13,919
it's nice to see that there's a little

826
00:34:18,889 --> 00:34:16,560
more visibility four miles visibility

827
00:34:21,470 --> 00:34:18,899
which is exactly the distance between

828
00:34:23,569 --> 00:34:21,480
this rocket and our host desk where

829
00:34:25,250 --> 00:34:23,579
Maria is in the launch viewing area yeah

830
00:34:26,990 --> 00:34:25,260
I'm feeling a lot better seeing some of

831
00:34:28,310 --> 00:34:27,000
that fog clear off that Marie will be

832
00:34:30,290 --> 00:34:28,320
able to actually see something from

833
00:34:32,510 --> 00:34:30,300
where she's located with all the guests

834
00:34:33,889 --> 00:34:32,520
she has up there that's exciting like we

835
00:34:35,690 --> 00:34:33,899
said the weather is is really

836
00:34:37,369 --> 00:34:35,700
cooperating with us this morning and is

837
00:34:39,589 --> 00:34:37,379
this fog here in Vandenberg moves out

838
00:34:42,470 --> 00:34:39,599

weather Still Remains go and the United

839
00:34:44,389 --> 00:34:42,480
space force has assured us that we have

840
00:34:46,609 --> 00:34:44,399
a green all the way through launch and

841
00:34:49,490 --> 00:34:46,619
once they go green and once this thing

842
00:34:52,609 --> 00:34:49,500
launches it will be the 2000th launch

843
00:34:56,510 --> 00:34:52,619
from Vandenberg space Force Base as well

844
00:34:58,730 --> 00:34:56,520
as the 300 Atlas let's listen in now as

845
00:34:59,630 --> 00:34:58,740
they conduct that poll minus seven

846
00:35:01,490 --> 00:34:59,640
minutes

847
00:35:03,950 --> 00:35:01,500
status checks proceed with terminal

848
00:35:08,089 --> 00:35:03,960
count Atlas system propulsion go

849
00:35:11,510 --> 00:35:08,099
Hydraulics go pneumatics go hello two go

850
00:35:16,970 --> 00:35:11,520
water go Centaur systems propulsion go

851
00:35:20,270 --> 00:35:16,980
pneumatics go lo2 go lh2 go has gas no

852
00:35:26,089 --> 00:35:20,280
electrical systems Airborne go ground go

853
00:35:30,829 --> 00:35:26,099
facility go rffts go flight control gcq

854
00:35:31,849 --> 00:35:30,839
so operation support go Tom go

855
00:35:37,069 --> 00:35:31,859
umbilicals

856
00:35:40,010 --> 00:35:37,079
so ECS go Red Line monitor go quality go

857
00:35:42,890 --> 00:35:40,020
op safety manager go you're a safety

858
00:35:46,329 --> 00:35:42,900
officer go vehicle system engineer go

859
00:35:49,130 --> 00:35:46,339
I'm not my chief go range coordinator

860
00:35:55,450 --> 00:35:49,140
proceed launch director

861
00:36:03,950 --> 00:35:59,829
is set for 1812 Zola verified

862
00:36:06,650 --> 00:36:03,960
1812 Zulu that's UTC time and we are go

863
00:36:09,410 --> 00:36:06,660

and I gotta tell you it was nice to hear

864
00:36:11,150 --> 00:36:09,420
Tom heater III give that go right there

865
00:36:12,829 --> 00:36:11,160
at the end absolutely I got goosebumps

866
00:36:14,569 --> 00:36:12,839
here Daryl uh every time we get to this

867
00:36:17,150 --> 00:36:14,579
point in a launch it is great to hear

868
00:36:19,670 --> 00:36:17,160
the team give their goes and this is

869
00:36:22,430 --> 00:36:19,680
special for me too to dedicate this to

870
00:36:25,490 --> 00:36:22,440
Mr Tom heater II and here Tom heater

871
00:36:27,349 --> 00:36:25,500
give that proceed to launch that is so I

872
00:36:29,270 --> 00:36:27,359
can't even explain how I'm feeling right

873
00:36:30,950 --> 00:36:29,280
now I'm so excited for landsat nine this

874
00:36:33,410 --> 00:36:30,960
morning uh looking forward to this

875
00:36:36,530 --> 00:36:33,420
launch his family and friends also here

876
00:36:38,510 --> 00:36:36,540
present to watch this with all of us we

877
00:36:40,550 --> 00:36:38,520
are now counting down to the T minus

878
00:36:42,650 --> 00:36:40,560
four hold where we're gonna get those

879
00:36:44,930 --> 00:36:42,660
clocks synced up with a t clock and the

880
00:36:46,550 --> 00:36:44,940
L clock this has kind of been a windy

881
00:36:49,430 --> 00:36:46,560
road to get to this point though make

882
00:36:52,910 --> 00:36:49,440
this launch originally scheduled for

883
00:36:54,290 --> 00:36:52,920
September uh 16th it moved to the 23rd

884
00:36:56,150 --> 00:36:54,300
there were some issues with liquid

885
00:37:00,950 --> 00:36:56,160
nitrogen getting into the pad because of

886
00:37:03,770 --> 00:37:00,960
a covid-19 induced issue with liquid

887
00:37:07,190 --> 00:37:03,780
oxygen back in Florida so it created a

888
00:37:08,569 --> 00:37:07,200

shortage here move past that also had a

889
00:37:11,089 --> 00:37:08,579
little issue with the spacecraft getting

890
00:37:13,970 --> 00:37:11,099
it up because of the Winds but launch

891
00:37:15,650 --> 00:37:13,980
Services Program stuck with it stayed

892
00:37:17,390 --> 00:37:15,660
the course and got us to the launch day

893
00:37:18,829 --> 00:37:17,400
today yeah you know I could I'm I'm very

894
00:37:20,510 --> 00:37:18,839
proud of the team NASA's launch Services

895
00:37:22,970 --> 00:37:20,520
Program our commercial partner United

896
00:37:25,130 --> 00:37:22,980
launch Alliance the United States space

897
00:37:27,170 --> 00:37:25,140
force they worked hard to get through

898
00:37:29,150 --> 00:37:27,180
this it has been a windy road to get

899
00:37:31,250 --> 00:37:29,160
here but you know the team's dedicated

900
00:37:33,349 --> 00:37:31,260
this is just part of the rocket business

901
00:37:34,849 --> 00:37:33,359
and these guys have maintained their

902
00:37:37,190 --> 00:37:34,859
processes followed through their

903
00:37:39,290 --> 00:37:37,200
procedures and worked diligently to get

904
00:37:40,550 --> 00:37:39,300
us here today Daryl so I can't say

905
00:37:42,050 --> 00:37:40,560
enough about the teams that have

906
00:37:44,390 --> 00:37:42,060
continued to get bring us here for

907
00:37:46,010 --> 00:37:44,400
landsat's launch this morning as we

908
00:37:47,690 --> 00:37:46,020
approach the T minus four minutes what

909
00:37:49,609 --> 00:37:47,700
do we expect to hear so we're going to

910
00:37:55,130 --> 00:37:49,619
hear them pick up the count time will be

911
00:38:01,730 --> 00:37:59,690
three two one more so we just heard now

912
00:38:04,550 --> 00:38:01,740
the L clock and the T clock will sync up

913
00:38:06,650 --> 00:38:04,560

we are now entering terminal count at T

914
00:38:08,390 --> 00:38:06,660
minus three we will hear the team secure

915
00:38:10,790 --> 00:38:08,400
topping and verify that everything's at

916
00:38:12,050 --> 00:38:10,800
flight levels around two minutes and 50

917
00:38:13,970 --> 00:38:12,060
seconds we will hear that the flight

918
00:38:15,950 --> 00:38:13,980
termination system will go to internal

919
00:38:17,390 --> 00:38:15,960
power making sure that all the safety

920
00:38:19,250 --> 00:38:17,400
Protocols are on the rocket as we

921
00:38:20,810 --> 00:38:19,260
launched this morning and around two

922
00:38:22,849 --> 00:38:20,820
minutes we'll hear that the atlas and

923
00:38:25,670 --> 00:38:22,859
Centaur vehicle go internal on battery

924
00:38:27,349 --> 00:38:25,680
power which means is a clear signal that

925
00:38:29,510 --> 00:38:27,359
we will be launching on time this

926
00:38:31,550 --> 00:38:29,520
morning and then at one minute we will

927
00:38:35,270 --> 00:38:31,560
hear the United States space force give

928
00:38:37,550 --> 00:38:35,280
us a range go or green thumbs up and we

929
00:38:39,530 --> 00:38:37,560
will then proceed into our t0 Mark for

930
00:38:41,690 --> 00:38:39,540
landsat 9 this morning as you can see

931
00:38:44,450 --> 00:38:41,700
there the rocket against uh dreary

932
00:38:46,490 --> 00:38:44,460
backdrop with a marine layer and a

933
00:38:48,829 --> 00:38:46,500
little bit of fog it's 93 percent

934
00:38:52,370 --> 00:38:48,839
humidity here along the Central Coast of

935
00:38:54,410 --> 00:38:52,380
California it's about a little less than

936
00:38:57,290 --> 00:38:54,420
60 degrees and the temperature that's

937
00:38:59,210 --> 00:38:57,300
outside none of that is a factor over

938
00:39:02,329 --> 00:38:59,220

the past few days he's also seen some

939
00:39:04,190 --> 00:39:02,339
smoke from a nearby Wildfire at Sequoia

940
00:39:06,950 --> 00:39:04,200
National Forest there you're looking

941
00:39:08,569 --> 00:39:06,960
right down the side of the booster the

942
00:39:11,210 --> 00:39:08,579
atlas V booster and seeing that

943
00:39:13,430 --> 00:39:11,220
condensation coming off that super

944
00:39:15,170 --> 00:39:13,440
chilled skin of the rocket yeah I love

945
00:39:16,730 --> 00:39:15,180
that shot that rocket cam shot that'll

946
00:39:18,710 --> 00:39:16,740
be a great shot as we lift off this

947
00:39:21,290 --> 00:39:18,720
morning and as you said seeing that

948
00:39:23,569 --> 00:39:21,300
super chilled tank as it filled with

949
00:39:25,910 --> 00:39:23,579
liquid oxygen liquid hydrogen on the

950
00:39:27,589 --> 00:39:25,920
Centaur tanks this morning uh we are

951
00:39:30,349 --> 00:39:27,599
just excited about this and we just

952
00:39:32,450 --> 00:39:30,359
heard from the team that they're going

953
00:39:34,370 --> 00:39:32,460
to flight levels on the top on the tanks

954
00:39:36,290 --> 00:39:34,380
and so that's a good sign that we are

955
00:39:38,390 --> 00:39:36,300
getting ready to close those vent valves

956
00:39:41,030 --> 00:39:38,400
and move into what we call step three

957
00:39:43,370 --> 00:39:41,040
for flight pressures once that rocket

958
00:39:45,890 --> 00:39:43,380
lights that orange fire will certainly

959
00:39:48,230 --> 00:39:45,900
change the light and change the mood of

960
00:39:50,150 --> 00:39:48,240
many of the folks who are watching this

961
00:39:51,530 --> 00:39:50,160
certainly on TV you're going to see all

962
00:39:54,290 --> 00:39:51,540
of that we've got all the cameras

963
00:39:57,349 --> 00:39:54,300

focused in all the angles on this rocket

964
00:40:00,430 --> 00:39:57,359
you can see on the progress bar we are

965
00:40:03,230 --> 00:40:00,440
go for launch our next appointment

966
00:40:05,750 --> 00:40:03,240
vehicle internal so we just heard the

967
00:40:07,069 --> 00:40:05,760
call Daryl for vehicle internal that's a

968
00:40:08,809 --> 00:40:07,079
good sign

969
00:40:10,450 --> 00:40:08,819
we're going to hear the last poll here

970
00:40:15,530 --> 00:40:10,460
to verify everything

971
00:40:18,589 --> 00:40:16,910
there's where they're securing and

972
00:40:20,030 --> 00:40:18,599
shutting off the vent valves and they're

973
00:40:24,790 --> 00:40:20,040
securing the vehicle

974
00:40:30,290 --> 00:40:28,130
FTS armed flight termination system is

975
00:40:32,270 --> 00:40:30,300
armed we are getting closer and closer

976
00:40:35,510 --> 00:40:32,280
to that t0 marked arrow and there's a

977
00:40:37,790 --> 00:40:35,520
big moment at T minus 45 seconds what do

978
00:40:40,910 --> 00:40:37,800
we hear there we're going to hear the uh

979
00:40:43,130 --> 00:40:40,920
launch conductor Scott verified lat from

980
00:40:44,990 --> 00:40:43,140
the last minute that everybody's ready

981
00:40:47,329 --> 00:40:45,000
to go and we get a green to go for

982
00:40:48,470 --> 00:40:47,339
launch it's been a lot of work to get to

983
00:40:51,410 --> 00:40:48,480
this point

984
00:40:53,390 --> 00:40:51,420
a lot of preparation

985
00:40:54,770 --> 00:40:53,400
let's listen in there we just heard vent

986
00:40:56,750 --> 00:40:54,780
valves locked and as you saw it there

987
00:40:58,670 --> 00:40:56,760
you pointed out earlier that steaming

988
00:41:01,250 --> 00:40:58,680

off the vehicle has now stopped the vent

989
00:41:02,870 --> 00:41:01,260
goes up Rock report range status

990
00:41:05,030 --> 00:41:02,880
the range is green

991
00:41:11,150 --> 00:41:05,040
that is a great sign to hear ranges

992
00:41:20,329 --> 00:41:13,069
coming up on that poll from launch

993
00:41:20,339 --> 00:41:33,349
stable at step three

994
00:41:39,589 --> 00:41:34,730
25

995
00:41:42,650 --> 00:41:39,599
status check go Centaur go landsat 9.

996
00:41:47,809 --> 00:41:42,660
and there it is the word to Launch

997
00:42:01,550 --> 00:41:52,490
pretty much ten nine eight seven six

998
00:42:06,349 --> 00:42:03,950
and lift off

999
00:42:09,710 --> 00:42:06,359
lift off of an atlas five rocket and

1000
00:42:12,710 --> 00:42:09,720
landsat nine continuing the legacy of an

1001
00:42:19,150 --> 00:42:12,720
Irreplaceable 50-year record on our

1002
00:42:23,870 --> 00:42:22,010
control system response looks good

1003
00:42:28,430 --> 00:42:23,880
party 180 engine operating parameters

1004
00:42:33,230 --> 00:42:30,530
vehicle has begun the pitch over

1005
00:42:35,270 --> 00:42:33,240
maneuver body rates look good

1006
00:42:37,250 --> 00:42:35,280
that pitch over maneuver heading it to

1007
00:42:39,829 --> 00:42:37,260
the South towards Southern California

1008
00:42:41,809 --> 00:42:39,839
and down to Mexico now passing 40

1009
00:42:43,910 --> 00:42:41,819
seconds into flight engine operating

1010
00:42:45,290 --> 00:42:43,920
parameters continue to look good

1011
00:42:50,270 --> 00:42:45,300
um speeds and injector pressures all

1012
00:42:55,490 --> 00:42:52,250
there's a shot from our tracker cam

1013
00:42:57,170 --> 00:42:55,500

above the Marine layer now 55 seconds

1014
00:42:58,490 --> 00:42:57,180
into flight vehicle is now completing

1015
00:43:02,390 --> 00:42:58,500
the pitch over maneuver body rate

1016
00:43:05,510 --> 00:43:03,829
three minutes remaining in the Boost

1017
00:43:07,130 --> 00:43:05,520
phase of flight

1018
00:43:15,170 --> 00:43:07,140
on speeds and injector pressures on the

1019
00:43:15,180 --> 00:43:20,329
body rates continuing to look good

1020
00:43:24,589 --> 00:43:22,130
and a one minute 20 seconds into flight

1021
00:43:26,150 --> 00:43:24,599
Atlas is now supersonic vehicle passing

1022
00:43:27,770 --> 00:43:26,160
Mach 1

1023
00:43:29,510 --> 00:43:27,780
a critical moment for the right and

1024
00:43:37,190 --> 00:43:29,520
vehicles now passing Max Q maximum

1025
00:43:41,690 --> 00:43:39,589
Rd 180 performance continues look good

1026
00:43:43,309 --> 00:43:41,700
throughout boost phase engine's now

1027
00:43:45,170 --> 00:43:43,319
throttling down slightly as expected

1028
00:43:47,270 --> 00:43:45,180
engine response looks good

1029
00:43:49,849 --> 00:43:47,280
that Throttle Down reduces the stress on

1030
00:43:53,630 --> 00:43:49,859
the 19-story tall vehicle one minute 50

1031
00:43:57,609 --> 00:43:53,640
seconds into flight vehicle is now 10.7

1032
00:44:00,410 --> 00:43:57,619
correction 13 miles in altitude

1033
00:44:07,069 --> 00:44:00,420
7.9 miles downrange distance traveling

1034
00:44:15,589 --> 00:44:08,690
now just under two minutes remaining in

1035
00:44:20,510 --> 00:44:18,770
at two minutes 18 seconds the atlas 5

1036
00:44:22,910 --> 00:44:20,520
vehicle now weighs just one half of its

1037
00:44:25,190 --> 00:44:22,920
liftoff weight

1038
00:44:26,329 --> 00:44:25,200

and vehicle has gone to closed loop

1039
00:44:27,829 --> 00:44:26,339
guidance

1040
00:44:29,990 --> 00:44:27,839
body rates indicating a slight

1041
00:44:31,250 --> 00:44:30,000
adjustment can be expected for this

1042
00:44:33,109 --> 00:44:31,260
phase of flight

1043
00:44:37,069 --> 00:44:33,119
there's a beautiful shot right there

1044
00:44:41,569 --> 00:44:37,079
looking back towards the planet

1045
00:44:44,750 --> 00:44:43,430
and the reaction control system on the

1046
00:44:46,309 --> 00:44:44,760
Centaur is now pressurizing the flight

1047
00:44:47,870 --> 00:44:46,319
levels there's some pressure response

1048
00:44:49,609 --> 00:44:47,880
looks good

1049
00:44:50,809 --> 00:44:49,619
so the reaction control system on

1050
00:44:53,270 --> 00:44:50,819
Centaur

1051
00:44:54,470 --> 00:44:53,280
they're prepping it operating parameters

1052
00:44:57,290 --> 00:44:54,480
continue to look good throughout boost

1053
00:44:59,390 --> 00:44:57,300
phase body rates remain stable

1054
00:45:01,730 --> 00:44:59,400
coming up in 60 seconds the booster

1055
00:45:03,349 --> 00:45:01,740
engines will cut off approximately one

1056
00:45:11,750 --> 00:45:03,359
minute remaining now until booster

1057
00:45:15,530 --> 00:45:13,910
our tracker shotgun you know great and

1058
00:45:18,770 --> 00:45:15,540
now three minutes 15 seconds into

1059
00:45:20,510 --> 00:45:18,780
flights Atlas is 48 miles an altitude 70

1060
00:45:22,609 --> 00:45:20,520
miles downrange distance traveling at

1061
00:45:24,530 --> 00:45:22,619
5600 miles per hour

1062
00:45:27,050 --> 00:45:24,540
great shot as it goes out over the

1063
00:45:28,550 --> 00:45:27,060

Southern Pacific

1064
00:45:30,170 --> 00:45:28,560
on speeds and injector pressures on

1065
00:45:35,930 --> 00:45:30,180
rd-180 continue to look good throughout

1066
00:45:39,349 --> 00:45:37,609
and the atlas 5 is now throttling to

1067
00:45:44,690 --> 00:45:39,359
maintain a constant 5G acceleration

1068
00:45:44,700 --> 00:45:52,309
speed currently 7 700 miles per hour

1069
00:45:56,690 --> 00:45:54,050
now throttling to maintain a constant

1070
00:45:59,390 --> 00:45:56,700
4.6 T acceleration limit in preparation

1071
00:46:01,069 --> 00:45:59,400
for Vico

1072
00:46:03,530 --> 00:46:01,079
this is where the booster engine cuts

1073
00:46:05,510 --> 00:46:03,540
off and then separates

1074
00:46:09,470 --> 00:46:05,520
and we have Biko booster engine cut off

1075
00:46:13,550 --> 00:46:11,510
and we have good indication of Atlas

1076
00:46:15,770 --> 00:46:13,560
entire separation

1077
00:46:17,870 --> 00:46:15,780
we have pre-start on the rl-10

1078
00:46:21,470 --> 00:46:17,880
standing by for ignition and there you

1079
00:46:25,370 --> 00:46:23,510
we have ignition and full thrust on the

1080
00:46:27,109 --> 00:46:25,380
rl-10 chamber pressure looks good body

1081
00:46:28,849 --> 00:46:27,119
rates look good

1082
00:46:30,109 --> 00:46:28,859
beautiful shot of the booster falling

1083
00:46:32,630 --> 00:46:30,119
away as you're looking down good

1084
00:46:34,010 --> 00:46:32,640
indication of payload bearing jettison

1085
00:46:35,270 --> 00:46:34,020
and you should see the payload

1086
00:46:40,569 --> 00:46:35,280
experience Sometimes they come around

1087
00:46:45,290 --> 00:46:42,710
performance continues to look good in

1088
00:46:47,930 --> 00:46:45,300

the early part of this first burn

1089
00:46:49,849 --> 00:46:47,940
now passing four minutes 47 seconds into

1090
00:46:54,170 --> 00:46:49,859
flight

1091
00:46:56,930 --> 00:46:54,180
looking good we're going to monitor the

1092
00:46:58,130 --> 00:46:56,940
situation here but uh what a beautiful

1093
00:47:00,230 --> 00:46:58,140
launch

1094
00:47:01,370 --> 00:47:00,240
what a beautiful flight so far five

1095
00:47:03,170 --> 00:47:01,380
minutes but there's still a lot of work

1096
00:47:04,910 --> 00:47:03,180
to do yeah absolutely a lot of work to

1097
00:47:07,670 --> 00:47:04,920
go on but beautiful shot there of the

1098
00:47:09,530 --> 00:47:07,680
rl-10 engine in space uh sending landsat

1099
00:47:11,870 --> 00:47:09,540
9 onto its orbit a great launch this

1100
00:47:14,030 --> 00:47:11,880
morning so excited for this

1101
00:47:16,670 --> 00:47:14,040
we're getting some of that uh orbital

1102
00:47:18,470 --> 00:47:16,680
sunrise on the uh engine Bell there and

1103
00:47:21,049 --> 00:47:18,480
that's just a neat look as you look back

1104
00:47:22,609 --> 00:47:21,059
at our planet

1105
00:47:24,049 --> 00:47:22,619
all right Marie we'll keep track of

1106
00:47:26,030 --> 00:47:24,059
things in here but for the meantime

1107
00:47:28,670 --> 00:47:26,040
we'll send it back out to you on the

1108
00:47:32,630 --> 00:47:30,470
all right thanks guys we did get lucky

1109
00:47:34,430 --> 00:47:32,640
enough for that Marine layer to clear so

1110
00:47:35,990 --> 00:47:34,440
we could see liftoff from here at the

1111
00:47:37,670 --> 00:47:36,000
Gravel Pit

1112
00:47:39,349 --> 00:47:37,680
um earlier I had the opportunity to

1113
00:47:41,930 --> 00:47:39,359

speak with NASA administrator Bill

1114
00:47:43,430 --> 00:47:41,940
Nelson about today's launch take a

1115
00:47:45,890 --> 00:47:43,440
listen

1116
00:47:47,510 --> 00:47:45,900
NASA administrator Bill Nelson thank you

1117
00:47:50,390 --> 00:47:47,520
so much for joining us you have

1118
00:47:52,970 --> 00:47:50,400
described climate change as in all hands

1119
00:47:55,970 --> 00:47:52,980
on deck Global challenge that requires

1120
00:47:58,549 --> 00:47:55,980
action now tell us how does the landsat

1121
00:48:01,730 --> 00:47:58,559
program help leaders take action now to

1122
00:48:04,609 --> 00:48:01,740
address climate change uh we best get on

1123
00:48:07,670 --> 00:48:04,619
the business of doing it right now

1124
00:48:11,030 --> 00:48:07,680
and what landsat does

1125
00:48:14,089 --> 00:48:11,040
it is the longest continuous global

1126
00:48:16,849 --> 00:48:14,099
satellite record of the Earth's surface

1127
00:48:19,549 --> 00:48:16,859
and these satellites have documented

1128
00:48:23,809 --> 00:48:19,559
Earth's changing landscape

1129
00:48:28,130 --> 00:48:23,819
it helps Farmers scientists understand

1130
00:48:31,430 --> 00:48:28,140
and manage land resources and all of

1131
00:48:36,170 --> 00:48:31,440
that is needed to sustain human life

1132
00:48:39,710 --> 00:48:36,180
such things as food and water and Forest

1133
00:48:43,010 --> 00:48:39,720
and of course landsats long-term record

1134
00:48:46,970 --> 00:48:43,020
of our home planet allows us to track

1135
00:48:49,670 --> 00:48:46,980
the changes and the impacts of climate

1136
00:48:53,750 --> 00:48:49,680
change and President Biden's fiscal year

1137
00:48:55,910 --> 00:48:53,760
2022 budget request 24.8 billion dollars

1138
00:48:58,549 --> 00:48:55,920

for NASA that's a six percent increase

1139
00:49:02,089 --> 00:48:58,559
from last year and also the strongest

1140
00:49:04,609 --> 00:49:02,099
budget NASA has ever had for science how

1141
00:49:08,530 --> 00:49:04,619
do you quantify the value of NASA's

1142
00:49:11,690 --> 00:49:08,540
science missions it is a very strong

1143
00:49:15,290 --> 00:49:11,700
budget request

1144
00:49:17,930 --> 00:49:15,300
the value is immense

1145
00:49:20,990 --> 00:49:17,940
and when you're talking about data like

1146
00:49:23,390 --> 00:49:21,000
this it's hard data that arms decision

1147
00:49:27,670 --> 00:49:23,400
makers with the tools they need to make

1148
00:49:31,190 --> 00:49:27,680
tough decisions about our future

1149
00:49:34,970 --> 00:49:31,200
it's exploration on other planets

1150
00:49:38,690 --> 00:49:34,980
helping to answer the age-old questions

1151
00:49:41,569 --> 00:49:38,700
how did we get there are we alone

1152
00:49:43,069 --> 00:49:41,579
it's the inspiration of the Next

1153
00:49:46,190 --> 00:49:43,079
Generation

1154
00:49:47,690 --> 00:49:46,200
uh that is what this science budget is

1155
00:49:50,690 --> 00:49:47,700
all about

1156
00:49:52,970 --> 00:49:50,700
and besides landsat in what other ways

1157
00:49:55,010 --> 00:49:52,980
is NASA making it a priority to

1158
00:49:59,150 --> 00:49:55,020
understand and respond to climate change

1159
00:50:03,349 --> 00:49:59,160
well we are doubling our efforts uh to

1160
00:50:05,270 --> 00:50:03,359
lead when it comes to climate science

1161
00:50:08,690 --> 00:50:05,280
earlier this summer

1162
00:50:11,150 --> 00:50:08,700
we announced a new Earth Systems

1163
00:50:13,010 --> 00:50:11,160

Observatory it's going to be five great

1164
00:50:17,690 --> 00:50:13,020
observatories

1165
00:50:22,970 --> 00:50:17,700
that will look at the land the oceans

1166
00:50:27,230 --> 00:50:22,980
the ice and the atmosphere and combine a

1167
00:50:30,770 --> 00:50:27,240
3D composite of what is happening very

1168
00:50:33,349 --> 00:50:30,780
precisely to our atmosphere that

1169
00:50:36,410 --> 00:50:33,359
combined with all of our other existing

1170
00:50:38,829 --> 00:50:36,420
assets such as the landsats

1171
00:50:42,410 --> 00:50:38,839
it's going to develop

1172
00:50:44,630 --> 00:50:42,420
the ability for us to really measure

1173
00:50:47,329 --> 00:50:44,640
what is happening

1174
00:50:50,710 --> 00:50:47,339
and also we're continuing to develop

1175
00:50:53,990 --> 00:50:50,720
resources for sustainable Aviation

1176
00:50:55,609 --> 00:50:54,000
that is less pollution in the air from

1177
00:50:59,589 --> 00:50:55,619
aircraft

1178
00:51:02,750 --> 00:50:59,599
and it will keep industry in U.S

1179
00:51:05,809 --> 00:51:02,760
competitive and drive fuel efficiency

1180
00:51:07,730 --> 00:51:05,819
that helps the environment

1181
00:51:10,130 --> 00:51:07,740
administrator Bill Nelson thank you so

1182
00:51:13,430 --> 00:51:10,140
much for your time thanks a lot have a

1183
00:51:18,049 --> 00:51:15,470
all right there is a live view on your

1184
00:51:20,150 --> 00:51:18,059
screen now of landsat on its way into

1185
00:51:22,849 --> 00:51:20,160
orbit turning now to one of the many

1186
00:51:25,010 --> 00:51:22,859
practical applications of landsat the

1187
00:51:27,770 --> 00:51:25,020
U.S department of Agriculture uses it to

1188
00:51:30,230 --> 00:51:27,780

track annual yield of every crop grown

1189
00:51:32,390 --> 00:51:30,240
in the United States disaster managers

1190
00:51:33,890 --> 00:51:32,400
can see impacts from floods and other

1191
00:51:36,230 --> 00:51:33,900
natural disasters

1192
00:51:38,809 --> 00:51:36,240
resource managers can use the data to

1193
00:51:41,569 --> 00:51:38,819
direct crop rotation and monitor water

1194
00:51:45,190 --> 00:51:41,579
use take a look

1195
00:51:48,530 --> 00:51:45,200
America has always been a fertile land

1196
00:51:50,630 --> 00:51:48,540
grasslands and forests and Farms from

1197
00:51:53,510 --> 00:51:50,640
sea to shining sea

1198
00:51:56,510 --> 00:51:53,520
the U.S department of Agriculture tracks

1199
00:51:58,670 --> 00:51:56,520
how many acres and the annual yield for

1200
00:52:03,170 --> 00:51:58,680
every crop produced

1201
00:52:06,250 --> 00:52:03,180
from the big ones like corn wheat soy

1202
00:52:10,130 --> 00:52:06,260
to Regional crops like cotton rice

1203
00:52:12,250 --> 00:52:10,140
Citrus they track every year using data

1204
00:52:14,870 --> 00:52:12,260
from landsat satellites and others

1205
00:52:16,549 --> 00:52:14,880
combined with data from surveys on the

1206
00:52:18,250 --> 00:52:16,559
ground

1207
00:52:21,890 --> 00:52:18,260
foreign

1208
00:52:23,630 --> 00:52:21,900
see detail at the human scale about the

1209
00:52:27,890 --> 00:52:23,640
size of a baseball diamond

1210
00:52:31,309 --> 00:52:27,900
and can image individual Farm fields

1211
00:52:33,829 --> 00:52:31,319
the program started in 1997 with North

1212
00:52:36,170 --> 00:52:33,839
Dakota as an experiment

1213
00:52:37,549 --> 00:52:36,180

other States became interested in the

1214
00:52:41,210 --> 00:52:37,559
program grew

1215
00:52:44,450 --> 00:52:41,220
in 2008 landsat data became free to use

1216
00:52:46,430 --> 00:52:44,460
and the USDA could afford to map 48

1217
00:52:49,130 --> 00:52:46,440
states

1218
00:52:51,950 --> 00:52:49,140
during the growing season the data helps

1219
00:52:54,950 --> 00:52:51,960
estimate crop yields which helps farmers

1220
00:52:58,190 --> 00:52:54,960
and Traders set prices for the Harvest

1221
00:53:01,910 --> 00:52:58,200
thanks to landsat's detailed view the

1222
00:53:04,609 --> 00:53:01,920
USDA tabulate stats crop by crop county

1223
00:53:07,190 --> 00:53:04,619
by county and state by state

1224
00:53:09,349 --> 00:53:07,200
at the end of each year the data set is

1225
00:53:10,910 --> 00:53:09,359
released to the public and it is a

1226
00:53:13,790 --> 00:53:10,920
beautiful site

1227
00:53:17,089 --> 00:53:13,800
the patchwork of corn in yellow and

1228
00:53:19,670 --> 00:53:17,099
soybeans in Green in the Midwest

1229
00:53:21,230 --> 00:53:19,680
the diversity of crops in California's

1230
00:53:24,470 --> 00:53:21,240
Central Valley

1231
00:53:26,569 --> 00:53:24,480
the clusters of citrus in Florida and

1232
00:53:28,849 --> 00:53:26,579
California and Texas

1233
00:53:31,849 --> 00:53:28,859
we can see changes in farming through

1234
00:53:34,430 --> 00:53:31,859
the years the easiest to see is crop

1235
00:53:37,190 --> 00:53:34,440
rotation in the midwest cycling between

1236
00:53:39,770 --> 00:53:37,200
corn and soybeans

1237
00:53:42,170 --> 00:53:39,780
in Northern North Dakota there is a

1238
00:53:44,089 --> 00:53:42,180

shift from barley and wheat to soybeans

1239
00:53:46,430 --> 00:53:44,099
and canola

1240
00:53:51,230 --> 00:53:46,440
and we see an increase in Cotton Fields

1241
00:53:56,450 --> 00:53:53,690
thanks to the free and open access to

1242
00:53:59,089 --> 00:53:56,460
landsat data the U.S department of

1243
00:54:02,150 --> 00:53:59,099
Agriculture is providing our Farmers

1244
00:54:10,069 --> 00:54:02,160
with accurate data and helping maintain

1245
00:54:14,210 --> 00:54:12,109
all right we want to bring in a special

1246
00:54:16,250 --> 00:54:14,220
guest now from Northrop Grumman the

1247
00:54:19,130 --> 00:54:16,260
company that actually built the landsat

1248
00:54:21,650 --> 00:54:19,140
9 satellite Frank tomorrow you are the

1249
00:54:24,290 --> 00:54:21,660
vice president of tactical uh Space

1250
00:54:25,549 --> 00:54:24,300
Systems for North Northrop Grumman uh

1251
00:54:27,530 --> 00:54:25,559
and I understand this is your first

1252
00:54:29,450 --> 00:54:27,540
launch out here at Vandenberg how was it

1253
00:54:31,250 --> 00:54:29,460
it was really special really special to

1254
00:54:33,109 --> 00:54:31,260
see that rocket lift off yeah when I

1255
00:54:35,030 --> 00:54:33,119
tell you uh we got a little lucky it's

1256
00:54:36,950 --> 00:54:35,040
also my first one so we shared that

1257
00:54:38,990 --> 00:54:36,960
together uh but the last couple days

1258
00:54:40,670 --> 00:54:39,000
it's been the Marine layer has been so

1259
00:54:43,010 --> 00:54:40,680
thick it's been very hit or miss our

1260
00:54:44,870 --> 00:54:43,020
view from uh here to the launched at

1261
00:54:46,609 --> 00:54:44,880
four miles away so we lucked out I'm

1262
00:54:49,130 --> 00:54:46,619
glad glad you got to see it yeah it was

1263
00:54:51,049 --> 00:54:49,140

a special time special special time so

1264
00:54:52,849 --> 00:54:51,059
this is the actually landsat 9 is the

1265
00:54:54,890 --> 00:54:52,859
fourth satellite that North Ark Ramen

1266
00:54:56,690 --> 00:54:54,900
has built for NASA tell us about the

1267
00:54:58,670 --> 00:54:56,700
process you know what goes into building

1268
00:55:00,589 --> 00:54:58,680
a landsat satellite and integrating it

1269
00:55:02,390 --> 00:55:00,599
with the instruments yeah well of course

1270
00:55:04,010 --> 00:55:02,400
the satellite that we build the platform

1271
00:55:05,569 --> 00:55:04,020
part of it is really there to carry

1272
00:55:08,210 --> 00:55:05,579
these special instruments to do the work

1273
00:55:09,289 --> 00:55:08,220
that landsats lines going to do and so I

1274
00:55:11,089 --> 00:55:09,299
have a dedicated team of engine

1275
00:55:12,770 --> 00:55:11,099
engineers in Gilbert Arizona where we

1276
00:55:14,569 --> 00:55:12,780
actually built design and built the

1277
00:55:16,190 --> 00:55:14,579
satellite working closely with our NASA

1278
00:55:17,630 --> 00:55:16,200
customer to make sure that the

1279
00:55:19,970 --> 00:55:17,640
structures and the power and all the

1280
00:55:21,410 --> 00:55:19,980
data transfer systems are all in place

1281
00:55:23,089 --> 00:55:21,420
to be able to accommodate the

1282
00:55:25,309 --> 00:55:23,099
instruments and then once we put that

1283
00:55:26,510 --> 00:55:25,319
all together and put the instruments on

1284
00:55:28,670 --> 00:55:26,520
the spacecraft it goes through a

1285
00:55:30,109 --> 00:55:28,680
rigorous test process so so that when we

1286
00:55:32,270 --> 00:55:30,119
deliver it here and it gets launched

1287
00:55:34,970 --> 00:55:32,280
like you saw today it's ready to go

1288
00:55:37,130 --> 00:55:34,980

there are so many things as you know

1289
00:55:39,470 --> 00:55:37,140
that have to go right for a rocket

1290
00:55:41,089 --> 00:55:39,480
launch to happen and certainly the

1291
00:55:42,950 --> 00:55:41,099
workers that you described in Gilbert

1292
00:55:45,289 --> 00:55:42,960
Arizona are a big part of that you know

1293
00:55:47,150 --> 00:55:45,299
all of the meticulous work I'm sure they

1294
00:55:49,010 --> 00:55:47,160
had to do to get to this point can you

1295
00:55:50,510 --> 00:55:49,020
talk a little bit about that team you

1296
00:55:52,849 --> 00:55:50,520
know what it's been like working through

1297
00:55:55,309 --> 00:55:52,859
the covid pandemic and any impact that's

1298
00:55:56,569 --> 00:55:55,319
had at all well it's it's been it's a

1299
00:55:58,789 --> 00:55:56,579
really special team and they're so

1300
00:56:00,109 --> 00:55:58,799
dedicated to this Mission the fact that

1301
00:56:02,089 --> 00:56:00,119
this is our fourth landsat Mission

1302
00:56:03,289 --> 00:56:02,099
partnering with NASA all these years and

1303
00:56:05,690 --> 00:56:03,299
this type of mission is really special

1304
00:56:07,190 --> 00:56:05,700
and the team understands that and as

1305
00:56:09,410 --> 00:56:07,200
they've worked through the past year and

1306
00:56:12,170 --> 00:56:09,420
a half they've just continued to work

1307
00:56:14,089 --> 00:56:12,180
through the covid period being dedicated

1308
00:56:15,710 --> 00:56:14,099
to this Mission knowing what's what it

1309
00:56:17,870 --> 00:56:15,720
really means to NASA what it really

1310
00:56:20,150 --> 00:56:17,880
means to the nation to get this data

1311
00:56:22,010 --> 00:56:20,160
down to the ground so they've they've

1312
00:56:24,710 --> 00:56:22,020
persevered they've worked really hard

1313
00:56:26,390 --> 00:56:24,720

and I'm really so proud of them mainly

1314
00:56:28,069 --> 00:56:26,400
that's the main thing I'm most excited

1315
00:56:30,170 --> 00:56:28,079
for today is what the team gets to see

1316
00:56:31,849 --> 00:56:30,180
well congratulations to you and the

1317
00:56:32,930 --> 00:56:31,859
Northrop Grumman team well thank you

1318
00:56:35,630 --> 00:56:32,940
very much appreciate it you're welcome

1319
00:56:38,390 --> 00:56:35,640
thanks for being here all right uh we

1320
00:56:41,089 --> 00:56:38,400
are now at launch plus 14 minutes 37

1321
00:56:43,609 --> 00:56:41,099
seconds and counting we expect landsat 9

1322
00:56:45,650 --> 00:56:43,619
to reach orbit uh its intended orbit in

1323
00:56:47,870 --> 00:56:45,660
just a few minutes and and here's some

1324
00:56:50,089 --> 00:56:47,880
things to know about that

1325
00:56:54,910 --> 00:56:50,099
it will circle the Earth at an altitude

1326
00:56:59,210 --> 00:56:54,920
of 438 miles it will travel at 16

1327
00:57:01,730 --> 00:56:59,220
760 miles per hour or 4.6 miles per

1328
00:57:04,490 --> 00:57:01,740
second each orbit around the Earth will

1329
00:57:07,190 --> 00:57:04,500
take 99 minutes so landsat 9 will

1330
00:57:09,770 --> 00:57:07,200
complete 14 orbits per day

1331
00:57:14,990 --> 00:57:09,780
landsat 9 will take more than 700

1332
00:57:19,010 --> 00:57:16,670
all right and as I mentioned we are

1333
00:57:21,109 --> 00:57:19,020
approaching that orbit Milestone so

1334
00:57:22,970 --> 00:57:21,119
let's get over to Daryl and Mick to take

1335
00:57:24,710 --> 00:57:22,980
us through uh the next few minutes guys

1336
00:57:27,109 --> 00:57:24,720
that's right Marie we are just seconds

1337
00:57:29,569 --> 00:57:27,119
away from Main engine cut off Centaur

1338
00:57:31,910 --> 00:57:29,579

has been burning now uh for several

1339
00:57:35,030 --> 00:57:31,920
minutes it's really close when this

1340
00:57:36,470 --> 00:57:35,040
happens we're going to be in orbit

1341
00:57:38,630 --> 00:57:36,480
it's a little bit higher you just heard

1342
00:57:39,890 --> 00:57:38,640
we're just about a minute out yeah so

1343
00:57:42,109 --> 00:57:39,900
what's happening is we have this first

1344
00:57:44,329 --> 00:57:42,119
burn and we're trying to get a slightly

1345
00:57:46,490 --> 00:57:44,339
lofted orbit this morning into that near

1346
00:57:48,049 --> 00:57:46,500
polar Sun synchronous orbit Daryl so

1347
00:57:49,609 --> 00:57:48,059
that we can get landsat 9 up there what

1348
00:57:52,490 --> 00:57:49,619
will happen is main engine cutoff will

1349
00:57:55,609 --> 00:57:52,500
occur and then we will Coast for uh

1350
00:57:56,990 --> 00:57:55,619
several minutes uh at the get landsat 9

1351
00:57:59,990 --> 00:57:57,000
into the orbit it needs to be and then

1352
00:58:03,049 --> 00:58:00,000
we will get spacecraft separation at uh

1353
00:58:05,569 --> 00:58:03,059
L plus one hour and 20 minutes

1354
00:58:07,250 --> 00:58:05,579
to burn hard to believe we're just a few

1355
00:58:09,710 --> 00:58:07,260
seconds away from Main engine cutoff but

1356
00:58:11,450 --> 00:58:09,720
hard to believe this spacecraft and this

1357
00:58:15,289 --> 00:58:11,460
rocket have gone almost completely

1358
00:58:19,069 --> 00:58:15,299
around the planet currently coming up

1359
00:58:21,589 --> 00:58:19,079
through Eastern Africa over turkey we're

1360
00:58:32,150 --> 00:58:21,599
just seconds away let's listen in to the

1361
00:58:38,150 --> 00:58:35,870
and we have Mikko managing cut off

1362
00:58:42,770 --> 00:58:38,160
body rates look good the vehicle is now

1363
00:58:45,890 --> 00:58:44,390

and there you go Daryl we heard from

1364
00:58:48,109 --> 00:58:45,900
United launch Alliance commentator

1365
00:58:50,630 --> 00:58:48,119
Patrick Moore who's done a fantastic job

1366
00:58:52,069 --> 00:58:50,640
since liftoff of filling Us in on all

1367
00:58:53,990 --> 00:58:52,079
the activities that have been going on

1368
00:58:56,210 --> 00:58:54,000
and we just got confirmation of main

1369
00:58:58,910 --> 00:58:56,220
engine cutoff so landsat 9 and the

1370
00:59:01,130 --> 00:58:58,920
Centaur will uh Coast for a little bit

1371
00:59:03,230 --> 00:59:01,140
and then we're about an hour and three

1372
00:59:05,390 --> 00:59:03,240
minutes from landsat 9 separation yeah

1373
00:59:06,770 --> 00:59:05,400
it'll cost for a lot a bit right because

1374
00:59:08,870 --> 00:59:06,780
as you can see in the bottom of the

1375
00:59:11,569 --> 00:59:08,880
screen we have removed our progress bar

1376
00:59:13,609 --> 00:59:11,579
with the milestones and now have a new

1377
00:59:16,130 --> 00:59:13,619
progress of bar which will show you the

1378
00:59:18,770 --> 00:59:16,140
time to spacecraft separation which you

1379
00:59:20,569 --> 00:59:18,780
can currently see is set in an hour and

1380
00:59:22,910 --> 00:59:20,579
three minutes we'll be monitoring

1381
00:59:25,789 --> 00:59:22,920
everything here but once again we'll

1382
00:59:29,510 --> 00:59:25,799
send it back out to the hill with Marie

1383
00:59:34,730 --> 00:59:31,849
all right thanks guys joining me now is

1384
00:59:37,849 --> 00:59:34,740
landsat 9 project scientist Jeff masick

1385
00:59:39,710 --> 00:59:37,859
uh Jeff thanks for being here uh how was

1386
00:59:42,289 --> 00:59:39,720
the launch ah this is incredibly

1387
00:59:45,170 --> 00:59:42,299
exciting yeah and successful so you know

1388
00:59:48,170 --> 00:59:45,180

everybody's happy how much work uh has

1389
00:59:51,589 --> 00:59:48,180
gone into getting to this point uh well

1390
00:59:53,510 --> 00:59:51,599
six years plus the Preparatory period

1391
00:59:55,849 --> 00:59:53,520
um you know plus working for covid so

1392
00:59:57,109 --> 00:59:55,859
you know it's the team I'm really happy

1393
00:59:58,549 --> 00:59:57,119
for the team right I mean this is

1394
01:00:00,049 --> 00:59:58,559
thousands a thousand people probably

1395
01:00:02,210 --> 01:00:00,059
have been working on this Mission from

1396
01:00:03,470 --> 01:00:02,220
multiple contractors the government USGS

1397
01:00:06,410 --> 01:00:03,480
NASA

1398
01:00:08,510 --> 01:00:06,420
um and uh under tough circumstances and

1399
01:00:10,910 --> 01:00:08,520
so I'm just thrilled that it it went off

1400
01:00:13,190 --> 01:00:10,920
absolutely I want to ask you more

1401
01:00:15,170 --> 01:00:13,200
specifically about uh landsat 9's two

1402
01:00:18,049 --> 01:00:15,180
main instruments the operational Lan

1403
01:00:20,030 --> 01:00:18,059
imager 2 and the thermal infrared sensor

1404
01:00:22,069 --> 01:00:20,040
to a little bit of a mouthful but we

1405
01:00:24,230 --> 01:00:22,079
have a quick video about those and then

1406
01:00:26,630 --> 01:00:24,240
I want to ask you about them sure

1407
01:00:31,309 --> 01:00:26,640
there are two instruments aboard landsat

1408
01:00:34,250 --> 01:00:31,319
9. oli2 is all about light

1409
01:00:37,549 --> 01:00:34,260
once in orbit Oli 2 collects sunlight

1410
01:00:39,230 --> 01:00:37,559
reflected off-earth's surface

1411
01:00:41,270 --> 01:00:39,240
the light passes through a set of

1412
01:00:44,809 --> 01:00:41,280
filters to separate out nine specific

1413
01:00:47,390 --> 01:00:44,819

wavelength bands invisible and infrared

1414
01:00:49,849 --> 01:00:47,400
frequencies each band provides different

1415
01:00:51,950 --> 01:00:49,859
pieces of information about what is down

1416
01:00:54,230 --> 01:00:51,960
on the surface

1417
01:00:57,289 --> 01:00:54,240
the second instrument aboard landsat 9

1418
01:00:59,809 --> 01:00:57,299
called tiers 2 collects thermal infrared

1419
01:01:02,870 --> 01:00:59,819
wavelengths or temperature signatures

1420
01:01:04,190 --> 01:01:02,880
emitted by the Earth itself

1421
01:01:07,010 --> 01:01:04,200
thank you

1422
01:01:08,750 --> 01:01:07,020
so that was a really quick breakdown if

1423
01:01:10,730 --> 01:01:08,760
you're a lay person like me you have to

1424
01:01:13,010 --> 01:01:10,740
watch that several times to absorb the

1425
01:01:14,690 --> 01:01:13,020
information can you help us understand

1426
01:01:16,549 --> 01:01:14,700
how those two instruments take

1427
01:01:18,950 --> 01:01:16,559
measurements and work together and then

1428
01:01:20,870 --> 01:01:18,960
send it back to Earth sure

1429
01:01:23,569 --> 01:01:20,880
um so as the video said we have two

1430
01:01:25,549 --> 01:01:23,579
instruments um one is uh looks at the

1431
01:01:27,410 --> 01:01:25,559
shorter wavelengths and so it basically

1432
01:01:29,270 --> 01:01:27,420
looks at light that's comes from the sun

1433
01:01:31,430 --> 01:01:29,280
is reflected back off the Earth to the

1434
01:01:33,370 --> 01:01:31,440
ole2 instrument the other instrument

1435
01:01:35,210 --> 01:01:33,380
tiers too looks at the longer

1436
01:01:37,190 --> 01:01:35,220
wavelengths which are sensitive to

1437
01:01:39,589 --> 01:01:37,200
surface temperature

1438
01:01:40,970 --> 01:01:39,599

um and uh and basically by combining the

1439
01:01:43,010 --> 01:01:40,980
data from all the different spectral

1440
01:01:44,569 --> 01:01:43,020
bands you can fingerprint materials on

1441
01:01:47,030 --> 01:01:44,579
here so you can tell what's vegetation

1442
01:01:48,589 --> 01:01:47,040
what soil what type of soil

1443
01:01:50,809 --> 01:01:48,599
um and that's really what the the

1444
01:01:53,089 --> 01:01:50,819
scientists use the the analysis that

1445
01:01:55,069 --> 01:01:53,099
they do all right and I also want to ask

1446
01:01:57,710 --> 01:01:55,079
you specifically about the the different

1447
01:02:01,190 --> 01:01:57,720
kinds of light that landsat collects we

1448
01:02:03,890 --> 01:02:01,200
have another quick video to explain that

1449
01:02:07,069 --> 01:02:03,900
true color images are made by combining

1450
01:02:09,289 --> 01:02:07,079
red blue and green light combined

1451
01:02:11,049 --> 01:02:09,299
together these visible bands of light

1452
01:02:14,930 --> 01:02:11,059
make up all the colors in the rainbow

1453
01:02:17,329 --> 01:02:14,940
and all of landsat's true color images

1454
01:02:19,910 --> 01:02:17,339
landsat also captures light that we

1455
01:02:21,829 --> 01:02:19,920
can't see that type of light can reveal

1456
01:02:23,809 --> 01:02:21,839
some incredible things when you look at

1457
01:02:25,849 --> 01:02:23,819
a false color image like the difference

1458
01:02:28,069 --> 01:02:25,859
between types of plants how healthy

1459
01:02:30,170 --> 01:02:28,079
those plants are healthy coral reefs and

1460
01:02:32,990 --> 01:02:30,180
even dead coral reefs fire tracking

1461
01:02:36,230 --> 01:02:33,000
ocean pollution the possibilities are

1462
01:02:41,270 --> 01:02:38,270
okay so in that clip we heard about

1463
01:02:42,950 --> 01:02:41,280

visible light versus non-visible light I

1464
01:02:44,990 --> 01:02:42,960
didn't even know non-visible light was a

1465
01:02:47,029 --> 01:02:45,000
thing true color versus false color

1466
01:02:50,089 --> 01:02:47,039
again didn't know false there was a even

1467
01:02:51,109 --> 01:02:50,099
such a term as false color so why do

1468
01:02:54,109 --> 01:02:51,119
those things matter when you're

1469
01:02:56,809 --> 01:02:54,119
interpreting data right so we really

1470
01:02:58,789 --> 01:02:56,819
only can see three uh channels of light

1471
01:03:01,250 --> 01:02:58,799
with our eyes at once and so we have 11

1472
01:03:03,230 --> 01:03:01,260
channels on landsat that we can put into

1473
01:03:06,950 --> 01:03:03,240
any of those red green or blue

1474
01:03:08,750 --> 01:03:06,960
um sort of layers to actually inspect so

1475
01:03:10,849 --> 01:03:08,760
a false color image is simply one where

1476
01:03:12,230 --> 01:03:10,859
we take one of the infrared wavelengths

1477
01:03:14,210 --> 01:03:12,240
that we normally can't see with our eyes

1478
01:03:17,270 --> 01:03:14,220
and we turn it into a red green or blue

1479
01:03:19,490 --> 01:03:17,280
channel on an image to to look at in

1480
01:03:21,230 --> 01:03:19,500
fact when people are actually analyzing

1481
01:03:23,270 --> 01:03:21,240
their landsat data they may look at all

1482
01:03:25,069 --> 01:03:23,280
11 channels at once using something like

1483
01:03:27,470 --> 01:03:25,079
an artificial intelligence algorithm on

1484
01:03:29,210 --> 01:03:27,480
a computer so actually looking at the

1485
01:03:30,650 --> 01:03:29,220
image while it's beautiful isn't always

1486
01:03:33,529 --> 01:03:30,660
necessary for getting the information

1487
01:03:35,569 --> 01:03:33,539
out all right Jeff masick lives at nine

1488
01:03:38,029 --> 01:03:35,579

project scientists thank you so much for

1489
01:03:40,069 --> 01:03:38,039
joining us we hope you enjoy the rest of

1490
01:03:41,930 --> 01:03:40,079
your afternoon and I think you maybe

1491
01:03:43,490 --> 01:03:41,940
deserve some time off after getting

1492
01:03:45,770 --> 01:03:43,500
through that launch yeah it was great

1493
01:03:47,569 --> 01:03:45,780
congratulations to you

1494
01:03:49,430 --> 01:03:47,579
all right turning our attention now to

1495
01:03:51,890 --> 01:03:49,440
landsat's Imaging of the largest

1496
01:03:53,930 --> 01:03:51,900
tropical rainforest in the world of

1497
01:03:55,970 --> 01:03:53,940
course I'm talking about the Amazon it's

1498
01:03:59,270 --> 01:03:55,980
nearly as big as the continental United

1499
01:04:01,670 --> 01:03:59,280
States but every year deforestation is

1500
01:04:03,289 --> 01:04:01,680
shrinking the rainforest and landsat

1501
01:04:10,670 --> 01:04:03,299
satellites have been documenting the

1502
01:04:15,710 --> 01:04:13,010
the Amazon is the largest tropical

1503
01:04:17,809 --> 01:04:15,720
rainforest in the world at over 6

1504
01:04:20,210 --> 01:04:17,819
million square kilometers the Amazon

1505
01:04:22,430 --> 01:04:20,220
basin and the tropical forests that it

1506
01:04:25,430 --> 01:04:22,440
holds are about the same size as the

1507
01:04:28,069 --> 01:04:25,440
entire continental United States home to

1508
01:04:32,089 --> 01:04:28,079
millions of people and tens of thousands

1509
01:04:35,210 --> 01:04:32,099
of species landsat is NASA's longest

1510
01:04:36,890 --> 01:04:35,220
running record of our changing planet

1511
01:04:39,829 --> 01:04:36,900
data have been taken from landsat

1512
01:04:43,130 --> 01:04:39,839
satellites since 1972 and that allows us

1513
01:04:46,430 --> 01:04:43,140

to go back in time over several very

1514
01:04:48,589 --> 01:04:46,440
important decades the landsat archive is

1515
01:04:50,750 --> 01:04:48,599
perfectly timed to capture many

1516
01:04:52,910 --> 01:04:50,760
different waves of colonization across

1517
01:04:55,569 --> 01:04:52,920
the Amazon it's very powerful in this

1518
01:04:58,210 --> 01:04:55,579
sense because it's not just an image

1519
01:05:01,510 --> 01:04:58,220
it's actually a bunch of information

1520
01:05:04,069 --> 01:05:01,520
what happens with Lancet is that it have

1521
01:05:06,349 --> 01:05:04,079
several bins which have specific

1522
01:05:07,849 --> 01:05:06,359
information so pixel by pixel but you

1523
01:05:10,490 --> 01:05:07,859
have at least seven pieces of

1524
01:05:12,770 --> 01:05:10,500
information that can be combined in

1525
01:05:14,950 --> 01:05:12,780
different ways to see different things

1526
01:05:17,750 --> 01:05:14,960
so if you are interested to see

1527
01:05:19,370 --> 01:05:17,760
vegetation there is one combination that

1528
01:05:21,309 --> 01:05:19,380
you made that can give you more

1529
01:05:23,990 --> 01:05:21,319
information about vegetation

1530
01:05:26,930 --> 01:05:24,000
landsat satellite data are the most

1531
01:05:29,210 --> 01:05:26,940
important Source we have about how much

1532
01:05:31,970 --> 01:05:29,220
deforestation happens each year across

1533
01:05:34,970 --> 01:05:31,980
the Amazon 40 years ago we see

1534
01:05:36,289 --> 01:05:34,980
small-scale deforestation creating roads

1535
01:05:38,630 --> 01:05:36,299
that look like fish bones into the

1536
01:05:41,029 --> 01:05:38,640
forest but by the middle of a landsat

1537
01:05:42,950 --> 01:05:41,039
record we see large-scale commodity

1538
01:05:45,289 --> 01:05:42,960

production taking hold so today's

1539
01:05:48,289 --> 01:05:45,299
deforestation across the Amazon Frontier

1540
01:05:50,390 --> 01:05:48,299
isn't a single family it's tractors and

1541
01:05:52,549 --> 01:05:50,400
bulldozers clearing large swaths of

1542
01:05:56,029 --> 01:05:52,559
rainforest to make room for industrial

1543
01:05:58,549 --> 01:05:56,039
scale cattle ranching and crops

1544
01:06:00,829 --> 01:05:58,559
so far the amount of area that's been

1545
01:06:03,410 --> 01:06:00,839
deforested in the Brazilian Amazon alone

1546
01:06:06,289 --> 01:06:03,420
is equivalent to the size of the State

1547
01:06:11,990 --> 01:06:09,109
deforestation in the Amazon happens with

1548
01:06:14,750 --> 01:06:12,000
fire today is deforestation looks like

1549
01:06:17,270 --> 01:06:14,760
the large-scale clearing of swaza

1550
01:06:19,630 --> 01:06:17,280
rainforest using heavy machinery and

1551
01:06:23,089 --> 01:06:19,640
then the land is burned and burned again

1552
01:06:25,490 --> 01:06:23,099
to remove all of the tropical trees and

1553
01:06:30,410 --> 01:06:27,829
if we think about the size of a soccer

1554
01:06:32,510 --> 01:06:30,420
field we think about deforestation in

1555
01:06:34,430 --> 01:06:32,520
those same size categories so

1556
01:06:36,349 --> 01:06:34,440
deforestation in the early part of the

1557
01:06:38,930 --> 01:06:36,359
landsat record might have been numbered

1558
01:06:41,930 --> 01:06:38,940
in a single soccer field today's

1559
01:06:46,309 --> 01:06:41,940
deforestation happens in tens if not

1560
01:06:52,130 --> 01:06:49,370
the value of the landsat archive is that

1561
01:06:53,510 --> 01:06:52,140
we have a long-term memory of the

1562
01:06:56,440 --> 01:06:53,520
changes that have occurred across the

1563
01:06:56,450 --> 01:06:59,809

[Music]

1564
01:07:04,670 --> 01:07:02,690
and the mapioma's record of land cover

1565
01:07:08,049 --> 01:07:04,680
across the Amazon is an excellent

1566
01:07:13,490 --> 01:07:10,190
is a network

1567
01:07:16,270 --> 01:07:13,500
formed by ngos and works with science

1568
01:07:20,210 --> 01:07:16,280
universities and startups and Technology

1569
01:07:22,010 --> 01:07:20,220
our mission is to map and monitor

1570
01:07:25,190 --> 01:07:22,020
everything that is related to land cover

1571
01:07:27,650 --> 01:07:25,200
land use in Brazil always with an

1572
01:07:31,190 --> 01:07:27,660
historical perspective because back in

1573
01:07:32,210 --> 01:07:31,200
75 0.5 percent of deforestation less

1574
01:07:34,910 --> 01:07:32,220
than one percent

1575
01:07:36,529 --> 01:07:34,920
in 88 was 5 percent

1576
01:07:38,089 --> 01:07:36,539
and now we are getting close to 20

1577
01:07:40,910 --> 01:07:38,099
percent of deforestation in the Amazon

1578
01:07:43,190 --> 01:07:40,920
you know between 20 and 25 percent what

1579
01:07:44,930 --> 01:07:43,200
the science is saying that it's maybe

1580
01:07:46,970 --> 01:07:44,940
the point of no return

1581
01:07:51,049 --> 01:07:46,980
and that's very fast right

1582
01:07:53,990 --> 01:07:51,059
um 40 45 years to lose 20 of the Amazon

1583
01:07:56,150 --> 01:07:54,000
so we could precisely identify how many

1584
01:07:58,849 --> 01:07:56,160
events of deforestation happen in Brazil

1585
01:08:00,470 --> 01:07:58,859
uh what's the size who is responsible

1586
01:08:03,230 --> 01:08:00,480
what is the piece of land that is there

1587
01:08:06,710 --> 01:08:03,240
if they have an authorization or not and

1588
01:08:08,390 --> 01:08:06,720

we find out that over 99 of all the

1589
01:08:12,589 --> 01:08:08,400
deforestation that happened in Brazil in

1590
01:08:14,630 --> 01:08:12,599
2019 it was illegal this really kind of

1591
01:08:17,269 --> 01:08:14,640
a striking information that make us to

1592
01:08:19,010 --> 01:08:17,279
move and say okay we can't accept we

1593
01:08:22,010 --> 01:08:19,020
just simply can't accept that we live on

1594
01:08:24,110 --> 01:08:22,020
a place where they legality is actually

1595
01:08:26,510 --> 01:08:24,120
the norm right so this is like the type

1596
01:08:28,669 --> 01:08:26,520
of thing that we want to kind of use the

1597
01:08:31,189 --> 01:08:28,679
remote sensing data to kind of Shake in

1598
01:08:33,050 --> 01:08:31,199
the decision-making process of the

1599
01:08:34,610 --> 01:08:33,060
different agencies in the public and in

1600
01:08:36,229 --> 01:08:34,620
the private sector to take better

1601
01:08:38,269 --> 01:08:36,239
decisions for what we call the

1602
01:08:40,370 --> 01:08:38,279
stewardship of the management of our

1603
01:08:42,649 --> 01:08:40,380
natural resources which are crucial for

1604
01:08:45,649 --> 01:08:42,659
all reasons in Brazil

1605
01:08:48,649 --> 01:08:45,659
the advantage of landsat first is free

1606
01:08:51,829 --> 01:08:48,659
that's absolutely crucial for us second

1607
01:08:54,289 --> 01:08:51,839
is that there's no other sensor not even

1608
01:08:56,630 --> 01:08:54,299
with lower resolution or high resolution

1609
01:09:00,410 --> 01:08:56,640
that will have a history consistent over

1610
01:09:02,149 --> 01:09:00,420
time for 35 years of image available so

1611
01:09:04,430 --> 01:09:02,159
if you really want to have a long

1612
01:09:06,649 --> 01:09:04,440
history of understanding of any process

1613
01:09:09,169 --> 01:09:06,659

in the in the earth landsat is where you

1614
01:09:11,590 --> 01:09:09,179
should go without landsat we would not

1615
01:09:14,329 --> 01:09:11,600
have the record we have today about

1616
01:09:19,390 --> 01:09:14,339
deforestation and changing agriculture

1617
01:09:25,849 --> 01:09:23,329
all right it is now L plus 27 minutes 22

1618
01:09:28,610 --> 01:09:25,859
seconds and counting let's go now to

1619
01:09:34,130 --> 01:09:28,620
NASA Edge's Franklin Fitzgerald with the

1620
01:09:38,630 --> 01:09:36,229
Dale jinstrom who is the NASA project

1621
01:09:40,849 --> 01:09:38,640
manager for landsat 9 Bill how you doing

1622
01:09:43,610 --> 01:09:40,859
today I'm doing fine thank you now

1623
01:09:45,470 --> 01:09:43,620
landsat has been around for quite a long

1624
01:09:47,749 --> 01:09:45,480
time uh how long have you been

1625
01:09:50,450 --> 01:09:47,759
associated with this project well let's

1626
01:09:53,630 --> 01:09:50,460
see I I started working on uh landsat 8

1627
01:09:55,910 --> 01:09:53,640
back in 2005 so I've been working on

1628
01:09:59,270 --> 01:09:55,920
landsat satellites for about 16 years

1629
01:10:02,209 --> 01:09:59,280
and uh now the landsat 9 project began

1630
01:10:03,890 --> 01:10:02,219
in 2015 so we've been working on this

1631
01:10:05,330 --> 01:10:03,900
satellite we're about to launch for a

1632
01:10:08,270 --> 01:10:05,340
little more than six years

1633
01:10:10,750 --> 01:10:08,280
now there has been a landsat satellite

1634
01:10:14,149 --> 01:10:10,760
in orbit continuously since

1635
01:10:15,410 --> 01:10:14,159
1972. that's a heck of a long time how

1636
01:10:18,729 --> 01:10:15,420
do you plan to keep the streak alive

1637
01:10:22,550 --> 01:10:18,739
with landsat 9. well we're we're

1638
01:10:25,070 --> 01:10:22,560

launching landsat 9 to replace landsat 7

1639
01:10:28,550 --> 01:10:25,080
which is run run out of its uh orbit

1640
01:10:31,130 --> 01:10:28,560
station keeping Fuel and so uh uh that's

1641
01:10:34,010 --> 01:10:31,140
the urgency to get landsat 9 up there so

1642
01:10:36,410 --> 01:10:34,020
we can replenish the architecture of two

1643
01:10:40,970 --> 01:10:36,420
healthy satellites landsat 8 and landsat

1644
01:10:44,030 --> 01:10:40,980
9. now the the history of landsat is

1645
01:10:46,550 --> 01:10:44,040
very interesting and sometimes chaotic

1646
01:10:51,110 --> 01:10:46,560
um as you said the first satellite was

1647
01:10:55,610 --> 01:10:51,120
launched back in 1972 but NASA and USGS

1648
01:10:58,970 --> 01:10:55,620
haven't had a stable budget line item

1649
01:11:01,430 --> 01:10:58,980
um through much of that time until 2014

1650
01:11:03,649 --> 01:11:01,440
and so now they have the sustainable

1651
01:11:06,110 --> 01:11:03,659
land Imaging program where they can plan

1652
01:11:09,590 --> 01:11:06,120
for the future and and develop future

1653
01:11:12,350 --> 01:11:09,600
satellites so the history in the past of

1654
01:11:14,689 --> 01:11:12,360
trying to maintain that continuity of of

1655
01:11:18,169 --> 01:11:14,699
having two healthy satellites on orbit

1656
01:11:20,630 --> 01:11:18,179
uh has had many ups and twists and turns

1657
01:11:22,130 --> 01:11:20,640
and ups and downs and and the agencies

1658
01:11:25,130 --> 01:11:22,140
have been directed down multiple

1659
01:11:27,169 --> 01:11:25,140
different paths uh landsat 6 was even a

1660
01:11:31,070 --> 01:11:27,179
completely commercial Enterprise other

1661
01:11:34,130 --> 01:11:31,080
agencies that participated and so uh one

1662
01:11:36,950 --> 01:11:34,140
of the reasons that the that this

1663
01:11:39,229 --> 01:11:36,960

country has been able to maintain two

1664
01:11:41,330 --> 01:11:39,239
active landsat satellites on orbit for

1665
01:11:43,790 --> 01:11:41,340
much of the last several decades is

1666
01:11:46,669 --> 01:11:43,800
because landsat 5 and landsat 7 have

1667
01:11:49,310 --> 01:11:46,679
lasted so long landsat 5 operated for

1668
01:11:51,709 --> 01:11:49,320
almost 30 years landsat 7 has been

1669
01:11:53,810 --> 01:11:51,719
operating for more than 20 years and our

1670
01:11:56,030 --> 01:11:53,820
USGS Partners have just done a stellar

1671
01:11:58,729 --> 01:11:56,040
job of managing the on-orbit assets and

1672
01:12:01,130 --> 01:11:58,739
keeping them going and but now we get to

1673
01:12:03,350 --> 01:12:01,140
launch landsat 9 up there to to work

1674
01:12:05,390 --> 01:12:03,360
alongside landsat 8 and have two healthy

1675
01:12:08,510 --> 01:12:05,400
satellites again up there that sounds

1676
01:12:11,390 --> 01:12:08,520
great that is good news now

1677
01:12:14,510 --> 01:12:11,400
have there been any challenges to

1678
01:12:16,910 --> 01:12:14,520
getting landsat 9 in orbit well there's

1679
01:12:18,229 --> 01:12:16,920
always challenges satellites no matter

1680
01:12:21,050 --> 01:12:18,239
what project you're working on

1681
01:12:23,570 --> 01:12:21,060
satellites are are hard to build uh

1682
01:12:25,550 --> 01:12:23,580
they're always custom uh and Custom

1683
01:12:27,950 --> 01:12:25,560
Electronics and software and hardware

1684
01:12:29,750 --> 01:12:27,960
and to do whatever Mission you're trying

1685
01:12:31,610 --> 01:12:29,760
to do and so there's always technical

1686
01:12:33,530 --> 01:12:31,620
challenges and certainly in modern

1687
01:12:35,209 --> 01:12:33,540
satellites there's lots of bits and

1688
01:12:37,490 --> 01:12:35,219

bytes flying all over and lots of

1689
01:12:39,169 --> 01:12:37,500
electronics and we've had our challenges

1690
01:12:41,990 --> 01:12:39,179
with things like that especially some

1691
01:12:43,910 --> 01:12:42,000
bits and bytes and electronics but uh I

1692
01:12:45,890 --> 01:12:43,920
I think clearly the biggest challenge

1693
01:12:47,270 --> 01:12:45,900
for this project has been trying to

1694
01:12:50,030 --> 01:12:47,280
bring this mission to launch in the

1695
01:12:53,630 --> 01:12:50,040
middle of a pandemic uh developing a

1696
01:12:55,370 --> 01:12:53,640
satellite is is very interactive lots of

1697
01:12:57,649 --> 01:12:55,380
meetings and Gatherings to work through

1698
01:13:00,229 --> 01:12:57,659
designs and design trades and and

1699
01:13:01,850 --> 01:13:00,239
testing and and requirements and work

1700
01:13:03,350 --> 01:13:01,860
planning for the future working through

1701
01:13:05,330 --> 01:13:03,360
risks

1702
01:13:08,149 --> 01:13:05,340
um and suddenly we all found ourselves

1703
01:13:10,130 --> 01:13:08,159
in March 2020 you know like many people

1704
01:13:11,830 --> 01:13:10,140
sitting at home in our pajamas wondering

1705
01:13:15,050 --> 01:13:11,840
how we're going to complete this project

1706
01:13:18,350 --> 01:13:15,060
and this team has just rallied to be

1707
01:13:20,510 --> 01:13:18,360
just just a stellar group of people uh

1708
01:13:22,310 --> 01:13:20,520
to the able to pull this Mission

1709
01:13:25,010 --> 01:13:22,320
together and launch it in the in the

1710
01:13:27,410 --> 01:13:25,020
middle of the pandemic the agencies and

1711
01:13:29,870 --> 01:13:27,420
organizations involved have have done a

1712
01:13:32,149 --> 01:13:29,880
great job of building up the tools for

1713
01:13:34,310 --> 01:13:32,159

working online and remotely Northrop

1714
01:13:36,169 --> 01:13:34,320
Grumman kept their doors open to keep

1715
01:13:38,169 --> 01:13:36,179
critical work going on in the satellite

1716
01:13:41,149 --> 01:13:38,179
while still you know keeping people safe

1717
01:13:43,550 --> 01:13:41,159
and they also worked with us to be able

1718
01:13:48,050 --> 01:13:43,560
to monitor to test data separately or or

1719
01:13:50,090 --> 01:13:48,060
remotely our USGS Partners expanded

1720
01:13:51,890 --> 01:13:50,100
their ability to keep Mission operations

1721
01:13:54,229 --> 01:13:51,900
and ground system development going

1722
01:13:55,970 --> 01:13:54,239
remotely our mission integration team

1723
01:13:58,430 --> 01:13:55,980
that brings together the flight and the

1724
01:13:59,590 --> 01:13:58,440
ground system put together new tools to

1725
01:14:02,570 --> 01:13:59,600
enable

1726
01:14:04,790 --> 01:14:02,580
testing all of this together and still

1727
01:14:07,130 --> 01:14:04,800
there were lots of challenges with this

1728
01:14:08,750 --> 01:14:07,140
this has been tough on the team and

1729
01:14:11,810 --> 01:14:08,760
there's a stress level you feel that I'm

1730
01:14:14,030 --> 01:14:11,820
sure as much as anybody that uh there's

1731
01:14:16,910 --> 01:14:14,040
a stress with with this pandemic and

1732
01:14:18,649 --> 01:14:16,920
it's been hard on the team but uh and

1733
01:14:20,390 --> 01:14:18,659
we've lost some schedule because of it

1734
01:14:21,950 --> 01:14:20,400
and there are other costs and whatnot

1735
01:14:24,410 --> 01:14:21,960
we're still working through some of that

1736
01:14:26,390 --> 01:14:24,420
but I think that was by far the biggest

1737
01:14:28,729 --> 01:14:26,400
challenge because it's just gone on for

1738
01:14:30,530 --> 01:14:28,739

so long and I'm just so proud of this

1739
01:14:32,570 --> 01:14:30,540
team bringing this mission to launch

1740
01:14:35,209 --> 01:14:32,580
even still here in the middle of this

1741
01:14:37,970 --> 01:14:35,219
pandemic yes well it's a blessing to

1742
01:14:39,649 --> 01:14:37,980
have you here uh uh it's great to see

1743
01:14:42,229 --> 01:14:39,659
the launch uh go off without any

1744
01:14:43,790 --> 01:14:42,239
problems and again thanks for being on

1745
01:14:46,070 --> 01:14:43,800
the show with us today all right thank

1746
01:14:50,630 --> 01:14:46,080
you very much Dell ginstrom NASA project

1747
01:14:53,209 --> 01:14:50,640
manager for landsat 9. back to you Marie

1748
01:14:55,370 --> 01:14:53,219
thanks Franklin the images live that

1749
01:14:57,950 --> 01:14:55,380
nine will capture provide astonishing

1750
01:15:00,770 --> 01:14:57,960
detail about gradual changes that add up

1751
01:15:04,209 --> 01:15:00,780
over time this landsat will show us

1752
01:15:07,149 --> 01:15:04,219
finer detail than ever before

1753
01:15:09,770 --> 01:15:07,159
landsat's entire job is to collect light

1754
01:15:12,169 --> 01:15:09,780
how intense that light is tells us about

1755
01:15:13,790 --> 01:15:12,179
what's on the ground you can think of

1756
01:15:17,270 --> 01:15:13,800
intensity like shades of a different

1757
01:15:20,649 --> 01:15:17,280
color landsat 9 the newest satellite to

1758
01:15:24,229 --> 01:15:20,659
join the landsat fleet sees 16

1759
01:15:27,110 --> 01:15:24,239
384 Shades that's four times the depth

1760
01:15:29,270 --> 01:15:27,120
of color of the previous landsat meaning

1761
01:15:31,370 --> 01:15:29,280
we'll be able to see more detail in

1762
01:15:32,400 --> 01:15:31,380
Darker spots like Coastal Waters and

1763
01:15:34,010 --> 01:15:32,410

dense forests

1764
01:15:37,390 --> 01:15:34,020
[Music]

1765
01:15:42,830 --> 01:15:40,790
Doucette of the U.S Geological Survey as

1766
01:15:45,770 --> 01:15:42,840
we mentioned the USGS is a partner with

1767
01:15:47,330 --> 01:15:45,780
NASA in the landsat program uh now Pete

1768
01:15:49,390 --> 01:15:47,340
you just heard that video with me about

1769
01:15:52,189 --> 01:15:49,400
uh 16

1770
01:15:54,169 --> 01:15:52,199
384 different shades

1771
01:15:56,090 --> 01:15:54,179
um my kids like to color I've never seen

1772
01:15:58,370 --> 01:15:56,100
a crayon box quite that big without

1773
01:16:01,370 --> 01:15:58,380
finished Shades obviously this is uh

1774
01:16:03,470 --> 01:16:01,380
much more advanced technology why is

1775
01:16:06,950 --> 01:16:03,480
that level of detail that number of

1776
01:16:10,010 --> 01:16:06,960
Shades significant well quite simply it

1777
01:16:12,050 --> 01:16:10,020
allows us to see what what the satellite

1778
01:16:15,410 --> 01:16:12,060
is looking at at greater granularities

1779
01:16:17,810 --> 01:16:15,420
of of shade obviously the human Vision

1780
01:16:19,790 --> 01:16:17,820
system cannot detect that between that

1781
01:16:22,130 --> 01:16:19,800
number of Shades but mathematical

1782
01:16:23,990 --> 01:16:22,140
algorithms certainly can and that's what

1783
01:16:27,530 --> 01:16:24,000
we use our math algorithms to

1784
01:16:29,030 --> 01:16:27,540
distinguish between subtle changes among

1785
01:16:33,410 --> 01:16:29,040
landforms on the earth especially in

1786
01:16:35,390 --> 01:16:33,420
vegetation and various kinds of soil and

1787
01:16:39,590 --> 01:16:35,400
so it has remarkable discrimination

1788
01:16:41,870 --> 01:16:39,600

power to to tell those subtle changes in

1789
01:16:44,030 --> 01:16:41,880
those kinds of features I also want to

1790
01:16:46,010 --> 01:16:44,040
ask you about how the landsat satellites

1791
01:16:47,510 --> 01:16:46,020
work together obviously they overlap a

1792
01:16:49,850 --> 01:16:47,520
little bit and we have another quick

1793
01:16:52,250 --> 01:16:49,860
video to explain that

1794
01:16:55,490 --> 01:16:52,260
it will take glance at nine and its

1795
01:16:58,430 --> 01:16:55,500
sister satellite landsat 8 days to image

1796
01:17:00,709 --> 01:16:58,440
all of Earth's land and coastal areas

1797
01:17:04,669 --> 01:17:00,719
that means we get a complete picture of

1798
01:17:11,209 --> 01:17:06,890
in this case two satellites are better

1799
01:17:15,830 --> 01:17:13,370
plant sets eight and nine can work

1800
01:17:17,689 --> 01:17:15,840
together to provide near real-time data

1801
01:17:21,250 --> 01:17:17,699
about what's happening on the surface of

1802
01:17:26,270 --> 01:17:24,350
so uh landsats eight and now soon

1803
01:17:29,510 --> 01:17:26,280
landsat nine will be doing the job

1804
01:17:31,610 --> 01:17:29,520
surveying the planet 24 7. uh how long

1805
01:17:33,470 --> 01:17:31,620
will these two be in orbit together and

1806
01:17:36,470 --> 01:17:33,480
then are there any plans yet for Lance

1807
01:17:38,750 --> 01:17:36,480
at 10. so great question so Lance at

1808
01:17:41,990 --> 01:17:38,760
eight uh we'll continue in orbit until

1809
01:17:44,630 --> 01:17:42,000
roughly the late uh 2020s

1810
01:17:46,250 --> 01:17:44,640
which at that point uh landsat next

1811
01:17:49,130 --> 01:17:46,260
which is the follow-on mission to

1812
01:17:53,030 --> 01:17:49,140
landsat 9 right is expected to replace

1813
01:17:55,370 --> 01:17:53,040

it in orbit and uh so landsat 9 will of

1814
01:17:57,830 --> 01:17:55,380
course continue into the 2030s is the

1815
01:18:01,310 --> 01:17:57,840
expectation and so together as you saw

1816
01:18:03,890 --> 01:18:01,320
in the video These do provide a combined

1817
01:18:06,530 --> 01:18:03,900
eight day revisit which is which is a

1818
01:18:08,930 --> 01:18:06,540
minimal threshold to meet to monitor

1819
01:18:11,930 --> 01:18:08,940
what we refer to as sub-seasonal to

1820
01:18:13,729 --> 01:18:11,940
seasonal changes going on

1821
01:18:15,530 --> 01:18:13,739
and I understand this was also your

1822
01:18:17,390 --> 01:18:15,540
first launch at Vandenberg so what it

1823
01:18:20,390 --> 01:18:17,400
was like what was it like to see or

1824
01:18:21,770 --> 01:18:20,400
should I see feel the lodge it was it

1825
01:18:24,350 --> 01:18:21,780
was a great opportunity for me to

1826
01:18:27,890 --> 01:18:24,360
witness my first launch and I really

1827
01:18:30,050 --> 01:18:27,900
want to commend all the folks at USGS

1828
01:18:32,450 --> 01:18:30,060
and NASA for their dedication and

1829
01:18:35,330 --> 01:18:32,460
passion over six to seven years now

1830
01:18:38,169 --> 01:18:35,340
unremitting effort to make this day a

1831
01:18:41,930 --> 01:18:38,179
reality so it's it's really a remarkable

1832
01:18:43,790 --> 01:18:41,940
uh accomplishment and it speaks well to

1833
01:18:45,950 --> 01:18:43,800
the sustainable land Imaging agreement

1834
01:18:47,990 --> 01:18:45,960
that we do have with NASA which which is

1835
01:18:50,470 --> 01:18:48,000
a long-term commitment right to continue

1836
01:18:54,169 --> 01:18:50,480
doing these kinds of Earth observations

1837
01:18:55,850 --> 01:18:54,179
uh well into the future and I guess this

1838
01:18:58,729 --> 01:18:55,860

is a great opportunity to kind of renew

1839
01:19:02,090 --> 01:18:58,739
those those uh marriage vows in a manner

1840
01:19:03,709 --> 01:19:02,100
of speaking between NASA and USGS and we

1841
01:19:06,169 --> 01:19:03,719
even had you know a little bit of

1842
01:19:08,030 --> 01:19:06,179
fireworks to go along with it absolutely

1843
01:19:10,430 --> 01:19:08,040
well so glad you could be here to enjoy

1844
01:19:12,770 --> 01:19:10,440
the launch congratulations to you on the

1845
01:19:14,990 --> 01:19:12,780
USGS team Dr Pete Doucette thanks again

1846
01:19:16,970 --> 01:19:15,000
for being here thank you very much

1847
01:19:19,370 --> 01:19:16,980
all right we learned earlier about how

1848
01:19:22,189 --> 01:19:19,380
landsat documents deforestation in the

1849
01:19:25,010 --> 01:19:22,199
tropical rainforest now to the coldest

1850
01:19:27,350 --> 01:19:25,020
places on Earth time lapse videos of

1851
01:19:29,930 --> 01:19:27,360
glaciers and ice sheets as seen from

1852
01:19:32,510 --> 01:19:29,940
space are giving scientists new insights

1853
01:19:37,370 --> 01:19:32,520
into how our planet's Frozen regions are

1854
01:19:42,830 --> 01:19:39,649
from an observational standpoint we're

1855
01:19:45,110 --> 01:19:42,840
at a sweet spot where we can

1856
01:19:47,990 --> 01:19:45,120
see many different aspects of the

1857
01:19:50,149 --> 01:19:48,000
changing ice cover and so that the

1858
01:19:52,910 --> 01:19:50,159
problems are then

1859
01:19:54,709 --> 01:19:52,920
moving toward understanding what we see

1860
01:19:56,630 --> 01:19:54,719
changing

1861
01:20:02,090 --> 01:19:56,640
it is pretty clear that we're going to

1862
01:20:07,910 --> 01:20:04,970
I think that observational glaciology in

1863
01:20:10,550 --> 01:20:07,920

terms of remote sensing is is a very

1864
01:20:12,890 --> 01:20:10,560
data Rich field now compared to 1972

1865
01:20:14,689 --> 01:20:12,900
when you had a few images

1866
01:20:18,530 --> 01:20:14,699
so we are beginning to get a historical

1867
01:20:21,290 --> 01:20:18,540
record of the speeds of glaciers

1868
01:20:23,870 --> 01:20:21,300
and so we can watch how rapidly that

1869
01:20:26,030 --> 01:20:23,880
surface is lowering as things beat up or

1870
01:20:27,410 --> 01:20:26,040
where it's thickening and you know where

1871
01:20:30,709 --> 01:20:27,420
where the surface is actually coming up

1872
01:20:35,149 --> 01:20:30,719
where ice is actually uh thickening on

1873
01:20:37,729 --> 01:20:35,159
land with this record we can go in and

1874
01:20:40,990 --> 01:20:37,739
look at the speeds of Ice Flow over

1875
01:20:43,010 --> 01:20:41,000
decades and how it's been changing

1876
01:20:46,250 --> 01:20:43,020
[Music]

1877
01:20:48,169 --> 01:20:46,260
the reaction I get from from other

1878
01:20:50,510 --> 01:20:48,179
people that study glaciers is that I

1879
01:20:53,450 --> 01:20:50,520
watch these videos too fast

1880
01:20:55,010 --> 01:20:53,460
I like to see the fluid nature of the

1881
01:21:00,350 --> 01:20:55,020
ice

1882
01:21:02,810 --> 01:21:00,360
sort of this very active participant in

1883
01:21:05,270 --> 01:21:02,820
what's going on

1884
01:21:08,209 --> 01:21:05,280
uh one of the places that I like to look

1885
01:21:10,970 --> 01:21:08,219
at in this particular video of Hobart is

1886
01:21:13,010 --> 01:21:10,980
if you look just to the upper left off

1887
01:21:14,870 --> 01:21:13,020
the five kilometer scale bar you can

1888
01:21:18,890 --> 01:21:14,880

watch the edge of the glacier just

1889
01:21:20,149 --> 01:21:18,900
spread across the the river bed that's

1890
01:21:23,149 --> 01:21:20,159
coming out of the glacier that's

1891
01:21:26,390 --> 01:21:23,159
adjacent to it and it just moves it

1892
01:21:28,910 --> 01:21:26,400
moves trees it moves all sorts of

1893
01:21:32,890 --> 01:21:28,920
material every single year just

1894
01:21:38,030 --> 01:21:35,930
so this video that shows the Walsh

1895
01:21:39,950 --> 01:21:38,040
Glacier on the top and the Logan Glacier

1896
01:21:43,370 --> 01:21:39,960
on the bottom uh these are these are

1897
01:21:46,550 --> 01:21:43,380
huge glaciers they're uh the order of

1898
01:21:49,550 --> 01:21:46,560
four kilometers wide or so what we see

1899
01:21:52,310 --> 01:21:49,560
as we Loop through it is that the flow

1900
01:21:55,370 --> 01:21:52,320
in both of these sits there for years

1901
01:21:59,760 --> 01:21:55,380
and then it will undergo a pulse of

1902
01:22:05,209 --> 01:22:02,530
[Music]

1903
01:22:07,129 --> 01:22:05,219
what strikes me about this image of the

1904
01:22:08,990 --> 01:22:07,139
malaspina is that you can really see its

1905
01:22:10,189 --> 01:22:09,000
nature which is that it's a large puddle

1906
01:22:12,770 --> 01:22:10,199
of ice

1907
01:22:13,910 --> 01:22:12,780
you've got huge glaciers that are

1908
01:22:15,229 --> 01:22:13,920
flowing down out of a really high

1909
01:22:17,330 --> 01:22:15,239
mountain range

1910
01:22:20,030 --> 01:22:17,340
and these big glaciers reach the coastal

1911
01:22:21,950 --> 01:22:20,040
plain and the ice just spreads out in

1912
01:22:23,810 --> 01:22:21,960
this big puddle like you've taken a

1913
01:22:26,090 --> 01:22:23,820

bottle of syrup and just dumped it in

1914
01:22:28,610 --> 01:22:26,100
the middle of a plate the malaspina is

1915
01:22:31,070 --> 01:22:28,620
sort of that big pile of syrup

1916
01:22:33,950 --> 01:22:31,080
the the other thing that you see is that

1917
01:22:36,410 --> 01:22:33,960
the ice coming in will head either to

1918
01:22:38,030 --> 01:22:36,420
the left or the right of Center for a

1919
01:22:39,649 --> 01:22:38,040
while and it will string out those

1920
01:22:41,570 --> 01:22:39,659
moraines so that they get bent into

1921
01:22:43,250 --> 01:22:41,580
these Loop shapes

1922
01:22:45,110 --> 01:22:43,260
um and you know it was until I saw this

1923
01:22:48,050 --> 01:22:45,120
video that that I felt like I had a good

1924
01:22:51,420 --> 01:22:48,060
understanding of just what was producing

1925
01:22:55,430 --> 01:22:51,430
these amazing Loops in the Marines

1926
01:22:58,310 --> 01:22:55,440
[Music]

1927
01:23:03,229 --> 01:22:58,320
in compiling this landsat record from

1928
01:23:05,810 --> 01:23:03,239
landsat 1 in 1972 up through today

1929
01:23:07,669 --> 01:23:05,820
I've gone through year by year and I've

1930
01:23:10,010 --> 01:23:07,679
tried to pick out the latest melt season

1931
01:23:11,990 --> 01:23:10,020
image I can so the white snow of winter

1932
01:23:13,669 --> 01:23:12,000
is gone and you can see the detail and

1933
01:23:14,510 --> 01:23:13,679
the flow stripes and the crevasses in

1934
01:23:18,229 --> 01:23:14,520
the ice

1935
01:23:20,390 --> 01:23:18,239
and build annual mosaics they give us an

1936
01:23:22,669 --> 01:23:20,400
image of all of the ice in Alaska and

1937
01:23:24,590 --> 01:23:22,679
the Yukon and when those are all lined

1938
01:23:26,990 --> 01:23:24,600

up all 48 of them are lined up and

1939
01:23:29,030 --> 01:23:27,000
played as a movie we can see the

1940
01:23:32,149 --> 01:23:29,040
behavior of the ice over nearly half a

1941
01:23:34,910 --> 01:23:32,159
century having such a long record allows

1942
01:23:37,250 --> 01:23:34,920
us to discern long-term trends and

1943
01:23:39,169 --> 01:23:37,260
separate them from the kind of behavior

1944
01:23:39,810 --> 01:23:39,179
you might have with a couple worm or a

1945
01:23:41,270 --> 01:23:39,820
couple cold years

1946
01:23:43,610 --> 01:23:41,280
[Music]

1947
01:23:45,950 --> 01:23:43,620
to have a persistent observational

1948
01:23:48,709 --> 01:23:45,960
capability that's been in place ever

1949
01:23:51,110 --> 01:23:48,719
since the first landsat was launched it

1950
01:23:52,790 --> 01:23:51,120
really gives us a much better view of

1951
01:23:57,790 --> 01:23:52,800
this really rapidly changing part of our

1952
01:24:04,550 --> 01:24:00,830
the first landsat satellite launched in

1953
01:24:06,350 --> 01:24:04,560
July 1972. it would be the start of the

1954
01:24:10,490 --> 01:24:06,360
longest data record of Earth's

1955
01:24:15,649 --> 01:24:14,030
from 438 miles above Earth's surface the

1956
01:24:18,169 --> 01:24:15,659
newest landsat satellite will collect

1957
01:24:20,390 --> 01:24:18,179
data so detailed you can detect both

1958
01:24:22,550 --> 01:24:20,400
natural and human cause changes to the

1959
01:24:25,310 --> 01:24:22,560
landscape

1960
01:24:27,470 --> 01:24:25,320
but what really makes landsat unique is

1961
01:24:30,110 --> 01:24:27,480
the half century of data an unbroken

1962
01:24:32,649 --> 01:24:30,120
chain of observations over five decades

1963
01:24:35,870 --> 01:24:32,659

let's take a look at how we got here

1964
01:24:37,850 --> 01:24:35,880
1966 the U.S Geological Survey proposes

1965
01:24:40,669 --> 01:24:37,860
a satellite to study Earth's land masses

1966
01:24:43,430 --> 01:24:40,679
but what would that look like over the

1967
01:24:46,510 --> 01:24:43,440
next few years USGS and NASA researched

1968
01:24:50,030 --> 01:24:48,229
1970.

1969
01:24:52,550 --> 01:24:50,040
NASA gets the green light to build an

1970
01:24:54,290 --> 01:24:52,560
Earth Resources technology satellite an

1971
01:24:56,470 --> 01:24:54,300
experiment to study and monitor our

1972
01:24:59,209 --> 01:24:56,480
planet's land surface from space

1973
01:25:01,729 --> 01:24:59,219
launched in 72 this was the first

1974
01:25:03,470 --> 01:25:01,739
Digital Data of Earth repeated at

1975
01:25:05,270 --> 01:25:03,480
regular intervals with geometric

1976
01:25:06,220 --> 01:25:05,280
Fidelity to allow comparison between

1977
01:25:08,030 --> 01:25:06,230
observations

1978
01:25:10,729 --> 01:25:08,040
[Music]

1979
01:25:12,950 --> 01:25:10,739
this changed how we drew Maps tabulated

1980
01:25:14,990 --> 01:25:12,960
agricultural production and assessed

1981
01:25:17,990 --> 01:25:15,000
damage after disasters

1982
01:25:20,450 --> 01:25:18,000
in 1975 NASA launched a second satellite

1983
01:25:22,970 --> 01:25:20,460
similar to the first now they were

1984
01:25:25,070 --> 01:25:22,980
collecting twice as much data with

1985
01:25:27,830 --> 01:25:25,080
landsat 3 replacing the Aging original

1986
01:25:30,770 --> 01:25:27,840
in 78 Focus shifted to the advanced

1987
01:25:32,930 --> 01:25:30,780
technology plan for the 80s

1988
01:25:35,570 --> 01:25:32,940

the Thematic mapper instrument launched

1989
01:25:38,990 --> 01:25:35,580
on landsat 4 in 1982 and on its twin

1990
01:25:40,970 --> 01:25:39,000
Lance at 5 and 84 was a major step Folk

1991
01:25:43,370 --> 01:25:40,980
collecting seven different wavelengths

1992
01:25:45,350 --> 01:25:43,380
at better ground resolution and with

1993
01:25:47,090 --> 01:25:45,360
higher Precision this was the Beating

1994
01:25:50,390 --> 01:25:47,100
Heart of the satellite and became the

1995
01:25:52,490 --> 01:25:50,400
Workhorse for a generation of scientists

1996
01:25:55,129 --> 01:25:52,500
for the first time landsat data had

1997
01:25:57,710 --> 01:25:55,139
three visible bands red green and blue

1998
01:26:01,129 --> 01:25:57,720
allowing natural color composite fringes

1999
01:26:03,169 --> 01:26:01,139
[Music]

2000
01:26:04,910 --> 01:26:03,179
with the addition of shortwave infrared

2001
01:26:07,910 --> 01:26:04,920
wavelengths the data could better

2002
01:26:12,649 --> 01:26:07,920
highlight flooded areas mineral deposits

2003
01:26:16,610 --> 01:26:14,689
the thermal bands were also upgraded

2004
01:26:20,330 --> 01:26:16,620
allowing individual Farm fields to be

2005
01:26:24,649 --> 01:26:22,490
sixth landsat was intended to be another

2006
01:26:27,530 --> 01:26:24,659
big step forward but it never reached

2007
01:26:29,570 --> 01:26:27,540
orbit after launch in 1993. plans

2008
01:26:31,729 --> 01:26:29,580
immediately began for landsat 7 which

2009
01:26:34,729 --> 01:26:31,739
would carry an even more improved sensor

2010
01:26:36,169 --> 01:26:34,739
at the time the enhanced thematic mapper

2011
01:26:38,149 --> 01:26:36,179
plus was the most stable Earth

2012
01:26:40,310 --> 01:26:38,159
observation instrument ever sent into

2013
01:26:42,229 --> 01:26:40,320

orbit and the calibration could be

2014
01:26:44,209 --> 01:26:42,239
updated while in space

2015
01:26:46,610 --> 01:26:44,219
for the first time we had an instrument

2016
01:26:48,530 --> 01:26:46,620
robust enough to collect lots of data

2017
01:26:51,830 --> 01:26:48,540
and we had a plan to thoroughly record

2018
01:26:54,169 --> 01:26:51,840
the entire globe landsat 7 was put to

2019
01:26:55,610 --> 01:26:54,179
work mapping coral reefs and even

2020
01:26:58,320 --> 01:26:55,620
produced the first high-resolution

2021
01:27:01,610 --> 01:26:58,330
natural color map of remote Antarctica

2022
01:27:05,810 --> 01:27:03,350
improvements to the thermal bands on

2023
01:27:07,850 --> 01:27:05,820
landsat 7 allowed States and counties to

2024
01:27:10,310 --> 01:27:07,860
gauge how much water was used by crops

2025
01:27:12,229 --> 01:27:10,320
this helps them manage Water Resources

2026
01:27:14,810 --> 01:27:12,239
efficiently

2027
01:27:17,390 --> 01:27:14,820
an important Milestone occurred in 2008

2028
01:27:19,310 --> 01:27:17,400
when the USGS made the data available to

2029
01:27:21,410 --> 01:27:19,320
download for free

2030
01:27:23,149 --> 01:27:21,420
users were able to get the data they

2031
01:27:25,610 --> 01:27:23,159
needed and not just what they could

2032
01:27:27,530 --> 01:27:25,620
afford it really unlocked a ton of

2033
01:27:32,290 --> 01:27:27,540
innovation and created about two billion

2034
01:27:36,770 --> 01:27:34,850
the modern era of landsat observations

2035
01:27:38,750 --> 01:27:36,780
began with the launch of landsat 8 in

2036
01:27:40,729 --> 01:27:38,760
2013.

2037
01:27:43,010 --> 01:27:40,739
having a push broom style sensor on

2038
01:27:45,590 --> 01:27:43,020

landsat 8 was a big improvement over the

2039
01:27:47,330 --> 01:27:45,600
older scanning sensor

2040
01:27:49,790 --> 01:27:47,340
the lands headache ground system that

2041
01:27:52,070 --> 01:27:49,800
USGS runs is capable of receiving a lot

2042
01:27:55,310 --> 01:27:52,080
more data than before we're downloading

2043
01:27:57,350 --> 01:27:55,320
over 725 scenes each day that just

2044
01:27:58,370 --> 01:27:57,360
wasn't remotely possible until landsat

2045
01:28:01,070 --> 01:27:58,380
8.

2046
01:28:03,110 --> 01:28:01,080
the two European Sentinel 2 satellites

2047
01:28:04,970 --> 01:28:03,120
were designed to mesh with landsat so

2048
01:28:06,950 --> 01:28:04,980
that users can treat data from all the

2049
01:28:09,410 --> 01:28:06,960
satellites as if it came from one single

2050
01:28:13,850 --> 01:28:09,420
Source now we get observations every two

2051
01:28:20,149 --> 01:28:17,149
2021 is the launch of landsat 9 the next

2052
01:28:22,010 --> 01:28:20,159
step forward it will collect the best

2053
01:28:23,870 --> 01:28:22,020
data ever recorded by a landsat

2054
01:28:27,709 --> 01:28:23,880
satellite while still integrating

2055
01:28:30,830 --> 01:28:27,719
seamlessly with the extensive archive

2056
01:28:32,450 --> 01:28:30,840
since the early 1970s landsat satellites

2057
01:28:34,010 --> 01:28:32,460
have allowed us to better manage our

2058
01:28:35,990 --> 01:28:34,020
resources

2059
01:28:37,970 --> 01:28:36,000
landsat data has enabled countless

2060
01:28:39,709 --> 01:28:37,980
Innovations and will let us track the

2061
01:28:43,430 --> 01:28:39,719
effects of climate change into the

2062
01:28:48,110 --> 01:28:45,290
over the past 50

2063
01:28:50,570 --> 01:28:48,120

landsat satellites eventually run out of

2064
01:28:53,750 --> 01:28:50,580
power and need to be replaced by another

2065
01:28:56,030 --> 01:28:53,760
newer landsat satellite but NASA is

2066
01:28:58,370 --> 01:28:56,040
currently working on a new technology to

2067
01:29:00,709 --> 01:28:58,380
refuel dead satellites in order to

2068
01:29:02,330 --> 01:29:00,719
extend their lifetime let's go back to

2069
01:29:04,430 --> 01:29:02,340
Daryl and Mick with more on this

2070
01:29:06,470 --> 01:29:04,440
exciting new Mission Daryl yeah that's

2071
01:29:09,590 --> 01:29:06,480
right Marie the target satellite is

2072
01:29:11,990 --> 01:29:09,600
called landsat 7 and it has enough fuel

2073
01:29:14,629 --> 01:29:12,000
to let it last the rest of the year

2074
01:29:17,149 --> 01:29:14,639
beyond that it's going to run out and

2075
01:29:19,550 --> 01:29:17,159
its orbit will begin to Decay and when

2076
01:29:21,290 --> 01:29:19,560
that happens Mick it's impossible for it

2077
01:29:23,570 --> 01:29:21,300
to continue the mission yeah exactly

2078
01:29:26,570 --> 01:29:23,580
right satellites are designed for a

2079
01:29:29,030 --> 01:29:26,580
limited life a mission life and landsat

2080
01:29:31,790 --> 01:29:29,040
7 is coming to the end of its life as

2081
01:29:33,350 --> 01:29:31,800
far as orbit keeping fuel so that is

2082
01:29:34,910 --> 01:29:33,360
going to be an important thing for us to

2083
01:29:36,709 --> 01:29:34,920
look at in the future of how we can baby

2084
01:29:38,330 --> 01:29:36,719
help these things well and that's why

2085
01:29:40,729 --> 01:29:38,340
NASA is exploring some new technology

2086
01:29:43,430 --> 01:29:40,739
called osam one it's a pretty cool

2087
01:29:45,169 --> 01:29:43,440
spacecraft it stands for on-orbit

2088
01:29:47,990 --> 01:29:45,179

servicing assembly and manufacture

2089
01:29:50,390 --> 01:29:48,000
extreme Mission it's being built it is

2090
01:29:52,250 --> 01:29:50,400
designed by engineers at Goddard space

2091
01:29:54,590 --> 01:29:52,260
flight center and it's pretty cool

2092
01:30:00,350 --> 01:29:54,600
because it'll be the first time that we

2093
01:30:06,229 --> 01:30:03,770
landsat 7 was lost in 1999 from

2094
01:30:08,510 --> 01:30:06,239
Vandenberg space force base and since

2095
01:30:10,810 --> 01:30:08,520
going into orbit the satellite far

2096
01:30:14,930 --> 01:30:10,820
exceeded its five-year Mission lifespan

2097
01:30:16,790 --> 01:30:14,940
but now it's running low on fuel instead

2098
01:30:20,570 --> 01:30:16,800
of becoming yet another piece of space

2099
01:30:23,270 --> 01:30:20,580
junk landsat 7 has a new mission

2100
01:30:26,110 --> 01:30:23,280
as the host satellite for an on-orbit

2101
01:30:29,090 --> 01:30:26,120
refueling spacecraft called oh Sam one

2102
01:30:31,790 --> 01:30:29,100
which stands for on-orbit servicing

2103
01:30:34,790 --> 01:30:31,800
assembly and Manufacturing one

2104
01:30:37,610 --> 01:30:34,800
here's how it'll work landsat 7 will

2105
01:30:40,790 --> 01:30:37,620
lower its orbit while waiting for osam 1

2106
01:30:44,149 --> 01:30:40,800
to launch Once In Space osm1 will

2107
01:30:46,729 --> 01:30:44,159
autonomously rendezvous with landsat 7.

2108
01:30:49,010 --> 01:30:46,739
and when osam one gets close enough the

2109
01:30:51,410 --> 01:30:49,020
robotic arm will attach the gripper tool

2110
01:30:54,290 --> 01:30:51,420
from off of its payload deck

2111
01:30:56,149 --> 01:30:54,300
with a shoulder elbow and a wrist the

2112
01:30:59,030 --> 01:30:56,159
robotic arm has a range of motion

2113
01:31:01,689 --> 01:30:59,040

similar to a human arm making it ideal

2114
01:31:04,850 --> 01:31:01,699
for this complex and dexterous Mission

2115
01:31:07,070 --> 01:31:04,860
osam1 then catches landsat 7 by the

2116
01:31:09,470 --> 01:31:07,080
Marvin ring which is how it attached to

2117
01:31:12,169 --> 01:31:09,480
the rocket when it launched once ground

2118
01:31:14,090 --> 01:31:12,179
operators Nestle the satellite onto osam

2119
01:31:17,270 --> 01:31:14,100
one's three birthing posts the

2120
01:31:19,550 --> 01:31:17,280
autonomous pit stop in space begins

2121
01:31:21,590 --> 01:31:19,560
a cutting wheel removes the thermal

2122
01:31:23,810 --> 01:31:21,600
blanket off the original fuel valve

2123
01:31:26,330 --> 01:31:23,820
panel which was never intended for a

2124
01:31:28,970 --> 01:31:26,340
refueling ground operators will then use

2125
01:31:31,370 --> 01:31:28,980
osam's Advanced tool drive system to

2126
01:31:33,470 --> 01:31:31,380
prepare the valves the first will cut

2127
01:31:36,290 --> 01:31:33,480
the lock wire that secures the valves

2128
01:31:38,930 --> 01:31:36,300
then a removal tool will spin the cap

2129
01:31:42,470 --> 01:31:38,940
off and stow it safely on the servicer

2130
01:31:44,570 --> 01:31:42,480
now it's time to fill her up the hyper

2131
01:31:47,570 --> 01:31:44,580
Gall refueling tool is connected by a

2132
01:31:49,729 --> 01:31:47,580
hose to an onboard fuel tank so when the

2133
01:31:52,430 --> 01:31:49,739
nozzle is guided over the original fuel

2134
01:31:55,189 --> 01:31:52,440
valve more than 100 kilograms of

2135
01:31:58,790 --> 01:31:55,199
hydrazine similar to jet fuel will be

2136
01:32:01,310 --> 01:31:58,800
pumped into landsat 7. be on orbit

2137
01:32:04,550 --> 01:32:01,320
refueling is expected to give landsat 7

2138
01:32:11,629 --> 01:32:04,560

enough fuel to safely deorbit to make

2139
01:32:18,290 --> 01:32:14,870
and that extra fuel will allow landsat 7

2140
01:32:20,149 --> 01:32:18,300
to continue on and re-enter Earth's

2141
01:32:22,610 --> 01:32:20,159
atmosphere which is important keeping

2142
01:32:24,590 --> 01:32:22,620
space junk clear out that'll send it

2143
01:32:27,770 --> 01:32:24,600
back down into Earth's atmosphere where

2144
01:32:30,590 --> 01:32:27,780
it will burn up and then that makes way

2145
01:32:33,050 --> 01:32:30,600
for another spacecraft to then take its

2146
01:32:35,030 --> 01:32:33,060
place in that orbit absolutely uh Daryl

2147
01:32:36,709 --> 01:32:35,040
and that'll be able to keep things going

2148
01:32:38,270 --> 01:32:36,719
in the future that I just think that's

2149
01:32:40,070 --> 01:32:38,280
some cool technology that NASA is

2150
01:32:41,390 --> 01:32:40,080
working on that we'll be able to do

2151
01:32:43,550 --> 01:32:41,400
something in the future with that not

2152
01:32:45,530 --> 01:32:43,560
only refuel the spacecraft but maybe

2153
01:32:47,990 --> 01:32:45,540
even do some Manufacturing in spacecraft

2154
01:32:50,149 --> 01:32:48,000
that would be really cool technology

2155
01:32:51,590 --> 01:32:50,159
that we could use for future missions it

2156
01:32:54,590 --> 01:32:51,600
certainly would and of course launch

2157
01:32:56,629 --> 01:32:54,600
Services Program whom you work for is it

2158
01:32:58,370 --> 01:32:56,639
going to be finding a rocket for this

2159
01:33:00,590 --> 01:32:58,380
spacecraft what can you tell us about

2160
01:33:03,050 --> 01:33:00,600
that yeah so osim1 is on our current

2161
01:33:05,510 --> 01:33:03,060
flight planning board manifest and we're

2162
01:33:06,950 --> 01:33:05,520
looking at around January 2025 and we

2163
01:33:09,350 --> 01:33:06,960

are working through all the requirements

2164
01:33:11,570 --> 01:33:09,360
right now and as you said we will Broker

2165
01:33:13,669 --> 01:33:11,580
up and and match osam one with the right

2166
01:33:15,709 --> 01:33:13,679
white rocket that is needed so we can

2167
01:33:18,229 --> 01:33:15,719
get it on its way to help out landsat 7.

2168
01:33:20,990 --> 01:33:18,239
and you can see how important this is to

2169
01:33:24,169 --> 01:33:21,000
the Future development of uh and and

2170
01:33:25,970 --> 01:33:24,179
exploration of the Moon and Mars you got

2171
01:33:27,709 --> 01:33:25,980
to have robots in order to build stuff

2172
01:33:30,169 --> 01:33:27,719
yeah absolutely as we look forward to

2173
01:33:32,330 --> 01:33:30,179
seeing uh humans back to the moon and

2174
01:33:34,550 --> 01:33:32,340
then Mars right robotic demonstration

2175
01:33:36,229 --> 01:33:34,560
missions like this are crucial so that

2176
01:33:38,090 --> 01:33:36,239
we can build things in space repair

2177
01:33:41,149 --> 01:33:38,100
things in space do other type of things

2178
01:33:42,470 --> 01:33:41,159
in space so very excited to see this

2179
01:33:44,530 --> 01:33:42,480
kind of Technology being developed

2180
01:33:46,970 --> 01:33:44,540
across the country and then of course

2181
01:33:48,590 --> 01:33:46,980
launch Services Program launching and

2182
01:33:50,330 --> 01:33:48,600
it's on its way that's right and you

2183
01:33:51,590 --> 01:33:50,340
guys are on top of it I want to talk a

2184
01:33:53,770 --> 01:33:51,600
little bit about the mission we are

2185
01:33:56,870 --> 01:33:53,780
currently at L plus

2186
01:33:59,570 --> 01:33:56,880
52 minutes here's a look at the

2187
01:34:02,030 --> 01:33:59,580
graphical animation of what Centaur is

2188
01:34:03,950 --> 01:34:02,040

doing right now with landsat at the

2189
01:34:06,770 --> 01:34:03,960
front you're looking it's pointing down

2190
01:34:08,689 --> 01:34:06,780
you see the nozzle up you see landsat 9

2191
01:34:10,729 --> 01:34:08,699
at the other end of course it's an

2192
01:34:13,129 --> 01:34:10,739
animation but it's real time data it's

2193
01:34:15,169 --> 01:34:13,139
taking data from the Telemetry to show

2194
01:34:16,610 --> 01:34:15,179
its representation in space and

2195
01:34:18,830 --> 01:34:16,620
currently there's a reason why it's

2196
01:34:20,570 --> 01:34:18,840
positioned like that tell us yeah so

2197
01:34:22,129 --> 01:34:20,580
that we can keep the fuel on board as we

2198
01:34:23,750 --> 01:34:22,139
get ready towards the front of the

2199
01:34:26,770 --> 01:34:23,760
Centaur as we get ready to prep for

2200
01:34:30,050 --> 01:34:26,780
landsat seven uh nine sorry landsat 9

2201
01:34:31,850 --> 01:34:30,060
separation and then moving on to our

2202
01:34:34,370 --> 01:34:31,860
next part of our mission which would be

2203
01:34:36,290 --> 01:34:34,380
main engine start 2 for our cubesat

2204
01:34:39,410 --> 01:34:36,300
deployments later on in the mission

2205
01:34:40,910 --> 01:34:39,420
timeline so so far we've heard from

2206
01:34:44,750 --> 01:34:40,920
Patrick Moore as they continue to look

2207
01:34:47,270 --> 01:34:44,760
at this data that everything looks great

2208
01:34:49,129 --> 01:34:47,280
and the Centaur and landsat 7 are on

2209
01:34:51,590 --> 01:34:49,139
their proper trajectory that's right and

2210
01:34:54,709 --> 01:34:51,600
so for now though we've got to focus on

2211
01:34:55,910 --> 01:34:54,719
landsat 9 separation from Centaur and as

2212
01:34:59,030 --> 01:34:55,920
you can see at the bottom of your screen

2213
01:35:00,890 --> 01:34:59,040

or about 27 minutes away from that and

2214
01:35:03,649 --> 01:35:00,900
continuing to count down in that

2215
01:35:05,689 --> 01:35:03,659
direction landsat 9 is just one part of

2216
01:35:08,570 --> 01:35:05,699
a larger earth science Mission here at

2217
01:35:13,490 --> 01:35:08,580
Nasa and the woman leading it is NASA's

2218
01:35:15,410 --> 01:35:13,500
Karen St Germain our own NASA edges Mr

2219
01:35:18,530 --> 01:35:15,420
Fitzgerald Franklin Fitzgerald is there

2220
01:35:19,609 --> 01:35:18,540
with her live take it away yes thanks

2221
01:35:20,450 --> 01:35:19,619
Daryl

2222
01:35:22,910 --> 01:35:20,460
um

2223
01:35:25,129 --> 01:35:22,920
I'm joined back here in St Germain who

2224
01:35:27,950 --> 01:35:25,139
was the director of NASA's earth science

2225
01:35:29,629 --> 01:35:27,960
division as you've said Karen thanks for

2226
01:35:30,950 --> 01:35:29,639
joining us this afternoon it's great to

2227
01:35:32,450 --> 01:35:30,960
be here with you Franklin now I

2228
01:35:33,649 --> 01:35:32,460
understand you were on Console during

2229
01:35:36,410 --> 01:35:33,659
the launch how are things from your

2230
01:35:38,870 --> 01:35:36,420
point of view uh it is always an

2231
01:35:41,689 --> 01:35:38,880
enormous thrill to be on console for a

2232
01:35:44,990 --> 01:35:41,699
launch and today was no different it was

2233
01:35:47,930 --> 01:35:45,000
a beautiful smooth launch but in

2234
01:35:50,570 --> 01:35:47,940
addition to the thrill when I'm sitting

2235
01:35:53,330 --> 01:35:50,580
on Console I am representing the

2236
01:35:55,510 --> 01:35:53,340
hundreds of Engineers and scientists who

2237
01:35:58,370 --> 01:35:55,520
not only got us to where we are today

2238
01:36:00,070 --> 01:35:58,380

for our launch but they these are the

2239
01:36:03,649 --> 01:36:00,080
folks who will activate the instrument

2240
01:36:05,330 --> 01:36:03,659
and then uh and then take the data that

2241
01:36:08,689 --> 01:36:05,340
the instrument collects and turn it into

2242
01:36:11,030 --> 01:36:08,699
real actionable information so it's uh

2243
01:36:12,410 --> 01:36:11,040
it's not only a thrill but it's it's

2244
01:36:14,030 --> 01:36:12,420
humbling it's an honor to be

2245
01:36:16,310 --> 01:36:14,040
representing all of those folks on

2246
01:36:19,910 --> 01:36:16,320
Console today now speaking of data let's

2247
01:36:22,850 --> 01:36:19,920
talk about landsat's longevity record

2248
01:36:25,430 --> 01:36:22,860
um how does how do we use landsat to

2249
01:36:27,609 --> 01:36:25,440
understand the human impact on the

2250
01:36:31,850 --> 01:36:27,619
environment over a long period of time

2251
01:36:33,830 --> 01:36:31,860
yeah so landsat data is unique in the in

2252
01:36:37,129 --> 01:36:33,840
the world this is this is the longest

2253
01:36:39,470 --> 01:36:37,139
data set looking at land and when we

2254
01:36:43,669 --> 01:36:39,480
look at that at a time series of that

2255
01:36:46,550 --> 01:36:43,679
data we can see changes in agriculture

2256
01:36:48,709 --> 01:36:46,560
patterns in forests in urban and

2257
01:36:51,050 --> 01:36:48,719
environments we can even see changes in

2258
01:36:53,450 --> 01:36:51,060
the coastlines all of the and many of

2259
01:36:55,729 --> 01:36:53,460
these are impacted by climate change so

2260
01:36:58,250 --> 01:36:55,739
that record helps us understand not only

2261
01:37:00,770 --> 01:36:58,260
that change is happening but how fast

2262
01:37:03,229 --> 01:37:00,780
and whether it's accelerating and what

2263
01:37:06,590 --> 01:37:03,239

it means for humans

2264
01:37:09,530 --> 01:37:06,600
um disaster mitigation is a huge

2265
01:37:13,010 --> 01:37:09,540
interest a topic of Interest with

2266
01:37:15,709 --> 01:37:13,020
wildfires ravaging California year after

2267
01:37:18,830 --> 01:37:15,719
year in 2020 being on record for the

2268
01:37:19,669 --> 01:37:18,840
most named storms coming through

2269
01:37:23,689 --> 01:37:19,679
um

2270
01:37:25,870 --> 01:37:23,699
how does the data from landsat help our

2271
01:37:27,770 --> 01:37:25,880
government to respond to these disasters

2272
01:37:30,590 --> 01:37:27,780
landsat data is

2273
01:37:34,189 --> 01:37:30,600
a goal in every phase of a disaster in

2274
01:37:36,950 --> 01:37:34,199
the in prior to an event landsat data

2275
01:37:40,070 --> 01:37:36,960
can help us understand the risks so for

2276
01:37:43,010 --> 01:37:40,080
example if if we have a forested area

2277
01:37:46,010 --> 01:37:43,020
where the forest is no longer healthy

2278
01:37:49,850 --> 01:37:46,020
that can indicate that that vegetation

2279
01:37:53,209 --> 01:37:49,860
is fuel for a fire and is ripe for a

2280
01:37:56,750 --> 01:37:53,219
wildfire that can help the that can help

2281
01:37:59,870 --> 01:37:56,760
planners and responders prepare and then

2282
01:38:02,990 --> 01:37:59,880
qualifiers happening we can see it from

2283
01:38:06,709 --> 01:38:03,000
space with landsat and our other systems

2284
01:38:10,070 --> 01:38:06,719
and then after a fire we can see the

2285
01:38:13,310 --> 01:38:10,080
burn scars which are important because

2286
01:38:15,770 --> 01:38:13,320
that can be the location of a landslide

2287
01:38:17,750 --> 01:38:15,780
when precipitation does come later so

2288
01:38:20,689 --> 01:38:17,760

it's in All Phases of a disaster that

2289
01:38:23,510 --> 01:38:20,699
landsat can help us prepare mitigate and

2290
01:38:25,370 --> 01:38:23,520
respond and recover that sounds great

2291
01:38:26,390 --> 01:38:25,380
Karen thanks for being with us this

2292
01:38:27,890 --> 01:38:26,400
afternoon

2293
01:38:31,550 --> 01:38:27,900
thank you it was great to be with you

2294
01:38:33,770 --> 01:38:31,560
all right Marie back to you

2295
01:38:35,930 --> 01:38:33,780
all right thank you Franklin if you're

2296
01:38:37,910 --> 01:38:35,940
just joining us we had a spectacular

2297
01:38:39,830 --> 01:38:37,920
launch this morning in California the

2298
01:38:41,990 --> 01:38:39,840
Marine layer cleared just enough for us

2299
01:38:44,570 --> 01:38:42,000
to see I'll lift off four miles behind

2300
01:38:47,450 --> 01:38:44,580
us and NASA's landsat 9 Earth

2301
01:38:49,430 --> 01:38:47,460
observation satellite uh lifted off here

2302
01:38:52,609 --> 01:38:49,440
at Vandenberg space Force Base atop an

2303
01:38:56,390 --> 01:38:52,619
atlas V rocket that was at 11 12 a.m

2304
01:39:00,410 --> 01:38:56,400
Pacific time and it uh reached orbit uh

2305
01:39:01,850 --> 01:39:00,420
just minutes ago and in uh about uh 27

2306
01:39:04,790 --> 01:39:01,860
minutes or so we expect to hear

2307
01:39:08,270 --> 01:39:04,800
confirmation of spacecraft separation as

2308
01:39:11,149 --> 01:39:08,280
the satellite orbits 438 miles above the

2309
01:39:13,490 --> 01:39:11,159
Earth's surface at nearly 17 000 miles

2310
01:39:16,310 --> 01:39:13,500
per hour that's a view from a little bit

2311
01:39:19,430 --> 01:39:16,320
earlier today of liftoff the satellite

2312
01:39:21,470 --> 01:39:19,440
will capture 700 images per day building

2313
01:39:24,050 --> 01:39:21,480

on the last half century of Earth

2314
01:39:26,689 --> 01:39:24,060
Imaging data that has revolutionized

2315
01:39:29,510 --> 01:39:26,699
Humanity's ability to manage resources

2316
01:39:32,209 --> 01:39:29,520
and respond to climate change

2317
01:39:35,030 --> 01:39:32,219
landsat data is also being used to help

2318
01:39:37,129 --> 01:39:35,040
resource managers find algae blooms in

2319
01:39:40,430 --> 01:39:37,139
America's Lakes here's a video to

2320
01:39:44,030 --> 01:39:41,990
really an amazing Little Critter and

2321
01:39:45,890 --> 01:39:44,040
it's it's been around for over three

2322
01:39:48,649 --> 01:39:45,900
billion years

2323
01:39:51,830 --> 01:39:48,659
in 2016 Utah Lake exploded and

2324
01:39:55,430 --> 01:39:51,840
cyanobacteria blooms the problem is that

2325
01:39:57,169 --> 01:39:55,440
many cyanobacteria produce toxins

2326
01:39:59,270 --> 01:39:57,179
you may have heard it called blue-green

2327
01:40:00,890 --> 01:39:59,280
algae but it's really a kind of bacteria

2328
01:40:04,310 --> 01:40:00,900
taking in sunlight to drive

2329
01:40:07,010 --> 01:40:04,320
photosynthesis and giving off oxygen it

2330
01:40:08,930 --> 01:40:07,020
actually requires quite a bit of lab

2331
01:40:10,490 --> 01:40:08,940
testing to know whether or not it's a

2332
01:40:12,590 --> 01:40:10,500
harmful album

2333
01:40:15,410 --> 01:40:12,600
and what we're really worried about is

2334
01:40:17,030 --> 01:40:15,420
people and pets ingesting that

2335
01:40:19,490 --> 01:40:17,040
cyanobacteria

2336
01:40:22,189 --> 01:40:19,500
Dr Kate fickes is a harmful algal bloom

2337
01:40:23,450 --> 01:40:22,199
scientist at Utah State University she

2338
01:40:25,250 --> 01:40:23,460

helps the Utah Department of

2339
01:40:27,290 --> 01:40:25,260
Environmental Quality track conditions

2340
01:40:30,109 --> 01:40:27,300
in lakes and reservoirs

2341
01:40:32,209 --> 01:40:30,119
so Utah is the second dry State vedation

2342
01:40:34,970 --> 01:40:32,219
most of our major lakes are actually

2343
01:40:36,770 --> 01:40:34,980
man-made reservoirs and they're heavily

2344
01:40:39,169 --> 01:40:36,780
used for recreation they're heavily used

2345
01:40:42,050 --> 01:40:39,179
for agriculture and they're really

2346
01:40:45,290 --> 01:40:42,060
important to the state as a resource

2347
01:40:47,510 --> 01:40:45,300
in 2017 harmful algal blooms returned to

2348
01:40:49,430 --> 01:40:47,520
Utah Lake this time officials used

2349
01:40:50,510 --> 01:40:49,440
satellite data to identify troubled

2350
01:40:52,729 --> 01:40:50,520
locations

2351
01:40:54,770 --> 01:40:52,739
but how can instruments up in space tell

2352
01:40:55,970 --> 01:40:54,780
us about microscopic organisms in a lake

2353
01:40:58,209 --> 01:40:55,980
down on Earth

2354
01:41:00,649 --> 01:40:58,219
by measuring their blue-green color

2355
01:41:03,169 --> 01:41:00,659
landsat collects light invisible and

2356
01:41:04,850 --> 01:41:03,179
infrared wavelengths cyanobacteria

2357
01:41:07,310 --> 01:41:04,860
reflect more green light than plain

2358
01:41:10,550 --> 01:41:07,320
water does allowing landsat to identify

2359
01:41:14,090 --> 01:41:10,560
algal blooms from satellite what we see

2360
01:41:17,030 --> 01:41:14,100
is basically that primary pigment which

2361
01:41:20,510 --> 01:41:17,040
is chlorophyll a but the color by itself

2362
01:41:22,490 --> 01:41:20,520
could be misleading a nice picture is

2363
01:41:25,010 --> 01:41:22,500

not necessarily providing a set of

2364
01:41:26,870 --> 01:41:25,020
quantitative data

2365
01:41:27,770 --> 01:41:26,880
algal blooms can look beautiful from

2366
01:41:29,689 --> 01:41:27,780
space

2367
01:41:30,890 --> 01:41:29,699
but the numbers behind the images are

2368
01:41:33,830 --> 01:41:30,900
the important part

2369
01:41:36,169 --> 01:41:33,840
each measurement is highly accurate and

2370
01:41:37,910 --> 01:41:36,179
it's very it's very much corresponding

2371
01:41:40,010 --> 01:41:37,920
to the number of photons that are

2372
01:41:42,649 --> 01:41:40,020
leaving the body of water which could be

2373
01:41:44,149 --> 01:41:42,659
related to the biomass and the amount of

2374
01:41:46,609 --> 01:41:44,159
phytoplankton

2375
01:41:48,530 --> 01:41:46,619
Dr Nema pallavan is working with NASA in

2376
01:41:50,930 --> 01:41:48,540
the U.S Geological Survey to make sure

2377
01:41:52,910 --> 01:41:50,940
landsat users have consistent accurate

2378
01:41:54,169 --> 01:41:52,920
and ready to use data about lakes and

2379
01:41:56,270 --> 01:41:54,179
rivers

2380
01:41:58,129 --> 01:41:56,280
water is difficult to study from space

2381
01:42:00,350 --> 01:41:58,139
because only a fraction of the sunlight

2382
01:42:02,090 --> 01:42:00,360
is reflected back to the satellite but

2383
01:42:04,189 --> 01:42:02,100
engineering improvements on landsat 8

2384
01:42:07,310 --> 01:42:04,199
have leveled up its ability to measure

2385
01:42:09,890 --> 01:42:07,320
the small signals from water bodies

2386
01:42:12,169 --> 01:42:09,900
after landsat collects the data it gets

2387
01:42:14,570 --> 01:42:12,179
beamed down to the USGS Aeros Center

2388
01:42:16,910 --> 01:42:14,580

where it is archived the raw numbers

2389
01:42:20,149 --> 01:42:16,920
pass through checkpoints to align the

2390
01:42:21,950 --> 01:42:20,159
geography correct for sun strength and

2391
01:42:25,850 --> 01:42:21,960
then compensate for the effects of the

2392
01:42:28,070 --> 01:42:25,860
atmosphere so you essentially removing

2393
01:42:30,590 --> 01:42:28,080
those atmospheric scattering and

2394
01:42:32,510 --> 01:42:30,600
absorption let's break down what Nema

2395
01:42:34,310 --> 01:42:32,520
means here to measure the amount of

2396
01:42:36,470 --> 01:42:34,320
cyanobacteria you need to know how much

2397
01:42:37,850 --> 01:42:36,480
light reflected off the surface but some

2398
01:42:39,830 --> 01:42:37,860
of that light gets scattered by

2399
01:42:42,050 --> 01:42:39,840
molecules in the atmosphere on the way

2400
01:42:44,090 --> 01:42:42,060
to the satellite lessening the signal

2401
01:42:45,830 --> 01:42:44,100
received and sometimes light that never

2402
01:42:48,169 --> 01:42:45,840
made it to the surface gets scattered

2403
01:42:50,649 --> 01:42:48,179
into the satellite adding a false signal

2404
01:42:53,090 --> 01:42:50,659
like removing the haze from a photograph

2405
01:42:54,950 --> 01:42:53,100
atmospheric Corrections leave you with a

2406
01:42:57,050 --> 01:42:54,960
quantitative measurement of exactly how

2407
01:42:59,570 --> 01:42:57,060
much light left the water known as

2408
01:43:03,370 --> 01:42:59,580
aquatic reflectance you want to look at

2409
01:43:07,250 --> 01:43:03,380
the actual physical measurements to

2410
01:43:10,010 --> 01:43:07,260
derive physically meaningful products

2411
01:43:12,050 --> 01:43:10,020
from satellite data and that's the goal

2412
01:43:14,270 --> 01:43:12,060
to transform the raw materials into

2413
01:43:16,970 --> 01:43:14,280

finished products so that end users

2414
01:43:19,129 --> 01:43:16,980
don't have to build it themselves by

2415
01:43:20,709 --> 01:43:19,139
providing chronic reflectance products

2416
01:43:24,669 --> 01:43:20,719
you're

2417
01:43:26,990 --> 01:43:24,679
reducing majorly reducing the burden on

2418
01:43:29,270 --> 01:43:27,000
satellite users

2419
01:43:30,950 --> 01:43:29,280
although it is still provisional nema's

2420
01:43:33,709 --> 01:43:30,960
aquatic reflectance data product is

2421
01:43:36,109 --> 01:43:33,719
available for download from the USGS

2422
01:43:38,030 --> 01:43:36,119
scientists like Kate fickes convert the

2423
01:43:40,790 --> 01:43:38,040
data product to maps showing the amount

2424
01:43:43,010 --> 01:43:40,800
of chlorophyll a helping local officials

2425
01:43:45,590 --> 01:43:43,020
pinpoint where to test for toxins and

2426
01:43:51,229 --> 01:43:45,600
warn residents I use landsat and other

2427
01:43:56,930 --> 01:43:54,050
to the bloom and the size of the bloom

2428
01:44:00,050 --> 01:43:56,940
the spatial detail is another benefit of

2429
01:44:01,850 --> 01:44:00,060
using landsat data each pixel is only a

2430
01:44:04,729 --> 01:44:01,860
30 meter Square the size of a baseball

2431
01:44:06,050 --> 01:44:04,739
diamond yet it collects data across a

2432
01:44:08,570 --> 01:44:06,060
broad area

2433
01:44:11,090 --> 01:44:08,580
in other words there is a lot of data at

2434
01:44:12,709 --> 01:44:11,100
a fairly high resolution with landsat we

2435
01:44:14,930 --> 01:44:12,719
can get into some of the marinas that

2436
01:44:16,250 --> 01:44:14,940
are popular fishing and swimming spots

2437
01:44:18,709 --> 01:44:16,260
in order to inform local Health

2438
01:44:19,910 --> 01:44:18,719

departments about making Public Health

2439
01:44:22,550 --> 01:44:19,920
decisions

2440
01:44:24,890 --> 01:44:22,560
for the 2017 outbreak that's exactly

2441
01:44:26,750 --> 01:44:24,900
what happened satellite data gave an

2442
01:44:28,970 --> 01:44:26,760
early warning to local officials in Utah

2443
01:44:30,649 --> 01:44:28,980
the extra week of boarding saved

2444
01:44:31,820 --> 01:44:30,659
hundreds of thousands of dollars in

2445
01:44:33,109 --> 01:44:31,830
health care costs

2446
01:44:35,149 --> 01:44:33,119
[Music]

2447
01:44:37,430 --> 01:44:35,159
monitoring algal blooms from aquatic

2448
01:44:39,910 --> 01:44:37,440
reflectance data is just one example of

2449
01:44:43,189 --> 01:44:39,920
benefits from landsat's data products

2450
01:44:46,550 --> 01:44:43,199
wildfires snow cover vegetation Health

2451
01:44:47,670 --> 01:44:46,560
temperature and more are available for

2452
01:44:51,250 --> 01:44:47,680
every spot on earth

2453
01:44:55,970 --> 01:44:53,330
landsat's highly calibrated data

2454
01:44:58,129 --> 01:44:55,980
products free to download and use are

2455
01:45:00,470 --> 01:44:58,139
making detailed Earth observation data

2456
01:45:04,090 --> 01:45:00,480
more accessible to users and bringing a

2457
01:45:09,890 --> 01:45:06,950
one of the experts we just heard from in

2458
01:45:11,689 --> 01:45:09,900
that video is Dr Kate fickes and we are

2459
01:45:13,490 --> 01:45:11,699
lucky enough to have her with us today

2460
01:45:15,709 --> 01:45:13,500
I've been so looking forward to this

2461
01:45:17,649 --> 01:45:15,719
Kate thank you so much for joining us

2462
01:45:21,050 --> 01:45:17,659
thank you thank you Marie for having me

2463
01:45:24,290 --> 01:45:21,060

besides being an expert on algal blooms

2464
01:45:26,390 --> 01:45:24,300
in our country's Lakes you also are the

2465
01:45:28,189 --> 01:45:26,400
co-founder of the ladies of landsat we

2466
01:45:30,950 --> 01:45:28,199
talked about that earlier in the show

2467
01:45:33,410 --> 01:45:30,960
paying homage to Virginia Norwood but

2468
01:45:36,169 --> 01:45:33,420
tell us what exactly are the ladies of

2469
01:45:38,750 --> 01:45:36,179
landsat yeah the ladies of landsat are a

2470
01:45:40,850 --> 01:45:38,760
group that I started in 2018 and really

2471
01:45:43,310 --> 01:45:40,860
the gold ladies of landsat is to

2472
01:45:45,410 --> 01:45:43,320
increase diversity inclusion and equity

2473
01:45:46,790 --> 01:45:45,420
for women and other underrepresented

2474
01:45:49,609 --> 01:45:46,800
scientists in the field of remote

2475
01:45:51,590 --> 01:45:49,619
sensing Earth observation so we do this

2476
01:45:53,870 --> 01:45:51,600
through a bottom-up approach calling for

2477
01:45:56,090 --> 01:45:53,880
amplification under and representation

2478
01:45:58,609 --> 01:45:56,100
of those women and minority scientists

2479
01:46:00,649 --> 01:45:58,619
and then a top-down approach so asking

2480
01:46:02,810 --> 01:46:00,659
leaders who have the power to make some

2481
01:46:04,370 --> 01:46:02,820
change in the status quo or the dynamic

2482
01:46:06,350 --> 01:46:04,380
mix and leadership in the field of

2483
01:46:07,910 --> 01:46:06,360
remote sensing to help us out get more

2484
01:46:10,490 --> 01:46:07,920
women involved in remote sensing in

2485
01:46:13,129 --> 01:46:10,500
those higher up positions why did you

2486
01:46:15,229 --> 01:46:13,139
feel it was so important to start this

2487
01:46:17,149 --> 01:46:15,239
group and to make it an official group

2488
01:46:19,370 --> 01:46:17,159

on Twitter yeah I've been a remote

2489
01:46:21,590 --> 01:46:19,380
sensing ecologist for about 10 years now

2490
01:46:23,629 --> 01:46:21,600
and I would travel the world go to

2491
01:46:25,129 --> 01:46:23,639
International conferences I didn't see

2492
01:46:26,629 --> 01:46:25,139
many other women I kept asking the

2493
01:46:27,649 --> 01:46:26,639
question where are all the women in

2494
01:46:30,709 --> 01:46:27,659
these remote sensing and Earth

2495
01:46:33,229 --> 01:46:30,719
observation Sciences so I started the

2496
01:46:35,030 --> 01:46:33,239
Twitter group and then I I found my dear

2497
01:46:36,770 --> 01:46:35,040
friend and colleague Warren Crowley and

2498
01:46:38,470 --> 01:46:36,780
we saw the same thing and we needed a

2499
01:46:40,970 --> 01:46:38,480
community to help support women

2500
01:46:43,129 --> 01:46:40,980
underrepresented scientists find a place

2501
01:46:45,590 --> 01:46:43,139
in this community it's generally

2502
01:46:48,050 --> 01:46:45,600
dominated by men and that can feel

2503
01:46:49,609 --> 01:46:48,060
lonely scary it can lead to a lot of

2504
01:46:51,050 --> 01:46:49,619
women dropping out of Science and

2505
01:46:53,030 --> 01:46:51,060
especially remote sensing we didn't want

2506
01:46:55,129 --> 01:46:53,040
that we wanted a place to be inclusive

2507
01:46:57,950 --> 01:46:55,139
and a community to support each other

2508
01:46:59,510 --> 01:46:57,960
well as a mother of two daughters I'm

2509
01:47:01,669 --> 01:46:59,520
really excited about the work your group

2510
01:47:03,350 --> 01:47:01,679
does and the example that you set for my

2511
01:47:04,850 --> 01:47:03,360
kids so thank you

2512
01:47:06,709 --> 01:47:04,860
um I know you're also going to get to

2513
01:47:07,609 --> 01:47:06,719

meet with Virginia Norwood a little bit

2514
01:47:09,350 --> 01:47:07,619
later

2515
01:47:11,330 --> 01:47:09,360
um we she wasn't able to join us here on

2516
01:47:13,430 --> 01:47:11,340
the show but I want to ask you what do

2517
01:47:15,050 --> 01:47:13,440
you want to say to her I have so much to

2518
01:47:16,790 --> 01:47:15,060
say to Virginia but I think two things

2519
01:47:20,030 --> 01:47:16,800
really stand out but first is thank you

2520
01:47:21,649 --> 01:47:20,040
uh you know Virginia was able to walk so

2521
01:47:23,450 --> 01:47:21,659
that ladies of landsat can really run

2522
01:47:25,970 --> 01:47:23,460
nowadays although she was running back

2523
01:47:28,129 --> 01:47:25,980
in her time as well but she provides an

2524
01:47:29,930 --> 01:47:28,139
anchor to prove that ladies of landsat

2525
01:47:31,490 --> 01:47:29,940
have been part of this landsat program

2526
01:47:34,490 --> 01:47:31,500
from the very beginning it's just maybe

2527
01:47:35,990 --> 01:47:34,500
taken about 50 years to really find our

2528
01:47:38,090 --> 01:47:36,000
voice and show that we're here to stay

2529
01:47:40,430 --> 01:47:38,100
and we have a lot of power I think the

2530
01:47:43,070 --> 01:47:40,440
second one is congratulations still 50

2531
01:47:45,229 --> 01:47:43,080
years later after she invented the MSS

2532
01:47:46,970 --> 01:47:45,239
without the support system or a

2533
01:47:48,890 --> 01:47:46,980
community to back her up of ladies of

2534
01:47:51,229 --> 01:47:48,900
landsat back then she was a Trailblazer

2535
01:47:53,689 --> 01:47:51,239
and that's just phenomenal I'm so

2536
01:47:55,790 --> 01:47:53,699
impressed me too yeah when I read about

2537
01:47:59,030 --> 01:47:55,800
her I was like wow she is literally a

2538
01:48:00,790 --> 01:47:59,040

hero what do you want to say to

2539
01:48:02,390 --> 01:48:00,800
um women not just women but

2540
01:48:04,850 --> 01:48:02,400
underrepresented groups I mean that's

2541
01:48:06,470 --> 01:48:04,860
your your target audience who are who

2542
01:48:08,209 --> 01:48:06,480
are looking for community and how can

2543
01:48:10,250 --> 01:48:08,219
they find you they can find ladies

2544
01:48:11,990 --> 01:48:10,260
Atlanta on Twitter and I always say if

2545
01:48:13,669 --> 01:48:12,000
you're a lady of lands you're you're in

2546
01:48:16,010 --> 01:48:13,679
if you want to be a lady of landsat so

2547
01:48:17,689 --> 01:48:16,020
find us on Twitter follow like us and

2548
01:48:19,790 --> 01:48:17,699
you're in if you need support if you

2549
01:48:21,770 --> 01:48:19,800
need help we'll find somebody to help

2550
01:48:23,270 --> 01:48:21,780
you we're always there for you we want

2551
01:48:25,129 --> 01:48:23,280
to be a collaborative community and

2552
01:48:27,649 --> 01:48:25,139
choose community over competition always

2553
01:48:30,410 --> 01:48:27,659
all right Dr Kate fickas thank you so

2554
01:48:33,050 --> 01:48:30,420
much for joining us uh we have covered a

2555
01:48:34,790 --> 01:48:33,060
lot today but there's more uh landsat is

2556
01:48:36,830 --> 01:48:34,800
even helping Rescue an endangered

2557
01:48:40,510 --> 01:48:36,840
species of bird in the Western United

2558
01:48:40,520 --> 01:48:46,750
foreign

2559
01:48:52,070 --> 01:48:49,189
landsat imagery and we developed this

2560
01:48:54,169 --> 01:48:52,080
range-wide model that covers a vast

2561
01:48:57,290 --> 01:48:54,179
spatial extent and a really wide

2562
01:48:59,750 --> 01:48:57,300
temporal window to develop these fine

2563
01:49:01,550 --> 01:48:59,760

scale maps of habitat suitability for an

2564
01:49:02,689 --> 01:49:01,560
endangered species in an environment

2565
01:49:04,630 --> 01:49:02,699
that's

2566
01:49:10,629 --> 01:49:04,640
changing all the time

2567
01:49:14,330 --> 01:49:10,639
[Music]

2568
01:49:16,430 --> 01:49:14,340
so I'm a research biologist project

2569
01:49:18,350 --> 01:49:16,440
manager for the University of Idaho and

2570
01:49:21,050 --> 01:49:18,360
I work on this endangered bridgeways

2571
01:49:24,050 --> 01:49:21,060
rail in the southwestern United States

2572
01:49:26,330 --> 01:49:24,060
it's a species that needs attention it

2573
01:49:28,370 --> 01:49:26,340
is an indicator species of marsh

2574
01:49:30,229 --> 01:49:28,380
condition throughout the whole Colorado

2575
01:49:31,790 --> 01:49:30,239
River system I know they're they're

2576
01:49:34,010 --> 01:49:31,800
marsh bird they're they're like the size

2577
01:49:36,410 --> 01:49:34,020
of a chicken but they're high up the

2578
01:49:39,470 --> 01:49:36,420
food chain in these marshes and so if

2579
01:49:42,169 --> 01:49:39,480
rails are doing well it's indicative of

2580
01:49:44,030 --> 01:49:42,179
a healthy system so if we can develop

2581
01:49:45,649 --> 01:49:44,040
products that help us manage marshes for

2582
01:49:52,370 --> 01:49:45,659
the rails it's also going to help

2583
01:49:58,370 --> 01:49:56,030
and we are really focusing on okay how

2584
01:50:01,550 --> 01:49:58,380
do we take effective tools and apply

2585
01:50:03,709 --> 01:50:01,560
them in space and time to maximize their

2586
01:50:05,570 --> 01:50:03,719
benefit to the species so we paired this

2587
01:50:09,410 --> 01:50:05,580
spatially extensive

2588
01:50:12,830 --> 01:50:09,420

on the ground sampling data with really

2589
01:50:14,930 --> 01:50:12,840
extensive satellite imagery to develop

2590
01:50:17,629 --> 01:50:14,940
range-wide habitat suitability models

2591
01:50:24,109 --> 01:50:17,639
that can inform management actions

2592
01:50:29,290 --> 01:50:26,450
we needed a product that was accessible

2593
01:50:31,609 --> 01:50:29,300
available covered our area of interest

2594
01:50:38,480 --> 01:50:31,619
and our time frame of interest in

2595
01:50:42,350 --> 01:50:40,550
[Music]

2596
01:50:45,229 --> 01:50:42,360
and we built this tool that is

2597
01:50:47,270 --> 01:50:45,239
accessible to managers and they can

2598
01:50:48,410 --> 01:50:47,280
view it and it's updated annually so

2599
01:50:51,229 --> 01:50:48,420
they'll have

2600
01:50:53,209 --> 01:50:51,239
up-to-date predictions of habitat

2601
01:50:54,890 --> 01:50:53,219
suitability throughout the entire range

2602
01:50:56,450 --> 01:50:54,900
of the species so they can really focus

2603
01:50:58,790 --> 01:50:56,460
in on the areas that need management

2604
01:51:01,310 --> 01:50:58,800
that don't need management that perhaps

2605
01:51:03,290 --> 01:51:01,320
need on the ground confirmation it

2606
01:51:05,149 --> 01:51:03,300
should be a powerful tool to more

2607
01:51:07,129 --> 01:51:05,159
effectively and efficiently allocate

2608
01:51:10,010 --> 01:51:07,139
limited resources

2609
01:51:11,130 --> 01:51:10,020
to ideally one day get this species

2610
01:51:16,310 --> 01:51:11,140
fully recovered

2611
01:51:18,830 --> 01:51:16,320
[Music]

2612
01:51:21,229 --> 01:51:18,840
we want to go over again to not

2613
01:51:23,750 --> 01:51:21,239

Allen he is standing by with a special

2614
01:51:25,729 --> 01:51:23,760
guest from the U.S space force to tell

2615
01:51:28,970 --> 01:51:25,739
us about a secondary payload on this

2616
01:51:33,649 --> 01:51:31,189
joining us now is Major Julius Williams

2617
01:51:35,030 --> 01:51:33,659
of the United States space force

2618
01:51:37,129 --> 01:51:35,040
major Williams

2619
01:51:39,470 --> 01:51:37,139
can you tell me a little bit about what

2620
01:51:41,270 --> 01:51:39,480
your role is for the space force yes uh

2621
01:51:43,370 --> 01:51:41,280
first Blair NASA Edge thanks for having

2622
01:51:45,169 --> 01:51:43,380
me so myself I'm the chief of the

2623
01:51:46,790 --> 01:51:45,179
mission manifest office is part of the

2624
01:51:48,410 --> 01:51:46,800
launch Enterprise and space systems

2625
01:51:50,270 --> 01:51:48,420
command down at Los Angeles Air Force

2626
01:51:52,490 --> 01:51:50,280
Base we essentially survey all launch

2627
01:51:54,229 --> 01:51:52,500
opportunities whether it's DOD civil

2628
01:51:55,910 --> 01:51:54,239
commercial to look for the extra

2629
01:51:57,530 --> 01:51:55,920
performances on the launch vehicle to

2630
01:51:59,450 --> 01:51:57,540
get other small satellites or larger

2631
01:52:00,890 --> 01:51:59,460
satellites of space I'm glad you

2632
01:52:02,689 --> 01:52:00,900
mentioned small satellites because

2633
01:52:05,689 --> 01:52:02,699
that's actually part of why we're here

2634
01:52:08,109 --> 01:52:05,699
today landsat the main mission but now

2635
01:52:10,490 --> 01:52:08,119
also this lesser-known Mission launching

2636
01:52:13,550 --> 01:52:10,500
microsatellites or cubesats can you tell

2637
01:52:15,890 --> 01:52:13,560
us about it yeah so the L9 EFS that's

2638
01:52:17,570 --> 01:52:15,900

the landsat 9 espa flight system was

2639
01:52:20,629 --> 01:52:17,580
essentially a joint partnership between

2640
01:52:22,850 --> 01:52:20,639
the former U.S Air Force and then NASA

2641
01:52:25,669 --> 01:52:22,860
Goddard but now the space force since

2642
01:52:28,310 --> 01:52:25,679
2019 so the SM flight system Team part

2643
01:52:30,050 --> 01:52:28,320
of NASA Goddard space flight center of

2644
01:52:31,609 --> 01:52:30,060
the U.S space force and the Parsons

2645
01:52:34,070 --> 01:52:31,619
Corporation was essentially a joint

2646
01:52:35,930 --> 01:52:34,080
effort to take an esper Grande ring and

2647
01:52:38,030 --> 01:52:35,940
essentially our Esperance sorry and then

2648
01:52:41,270 --> 01:52:38,040
actually build out a system that can fly

2649
01:52:43,250 --> 01:52:41,280
up to 18 cubesats and we are flying four

2650
01:52:45,050 --> 01:52:43,260
um successfully that's awesome now you

2651
01:52:47,689 --> 01:52:45,060
talked about a very complicated process

2652
01:52:50,870 --> 01:52:47,699
but it's a very important one how do you

2653
01:52:53,270 --> 01:52:50,880
actually launch these cubesats from the

2654
01:52:54,890 --> 01:52:53,280
rocket yeah so there's a various ways to

2655
01:52:56,270 --> 01:52:54,900
do it uh depending on the rocket system

2656
01:52:57,890 --> 01:52:56,280
that's flying at that particular time

2657
01:52:59,750 --> 01:52:57,900
we've had successful missions where

2658
01:53:01,430 --> 01:52:59,760
we've flown it on the AFT in or the AF

2659
01:53:03,530 --> 01:53:01,440
bouquet carrier on this particular one

2660
01:53:05,330 --> 01:53:03,540
as I mentioned before in a esper ring

2661
01:53:07,189 --> 01:53:05,340
we're actually taking dispensers like

2662
01:53:09,589 --> 01:53:07,199
this one right here this is a nanosat

2663
01:53:11,629 --> 01:53:09,599

launch adapter system and at the point

2664
01:53:13,490 --> 01:53:11,639
of time of the launch this door would

2665
01:53:15,050 --> 01:53:13,500
actually be closed of course but when it

2666
01:53:16,490 --> 01:53:15,060
gets time for the extra deployment and

2667
01:53:18,290 --> 01:53:16,500
electrical sequence and a lot of other

2668
01:53:20,330 --> 01:53:18,300
different variables that will happen so

2669
01:53:22,310 --> 01:53:20,340
that way it actually opens up and then

2670
01:53:24,589 --> 01:53:22,320
the the satellite at that point in time

2671
01:53:27,109 --> 01:53:24,599
will dispense and deploy at this uh

2672
01:53:29,270 --> 01:53:27,119
desired time you know it's very exciting

2673
01:53:31,729 --> 01:53:29,280
to look at this cubesat technology so

2674
01:53:33,830 --> 01:53:31,739
I'm wondering can you tell me how does

2675
01:53:36,649 --> 01:53:33,840
this kind of innovation help the space

2676
01:53:38,270 --> 01:53:36,659
force in the future a lot because it was

2677
01:53:41,089 --> 01:53:38,280
the space force for Science and

2678
01:53:42,229 --> 01:53:41,099
Technology r d prototype missions and a

2679
01:53:43,729 --> 01:53:42,239
lot of our critical operational

2680
01:53:46,310 --> 01:53:43,739
capabilities that we need to get on

2681
01:53:48,589 --> 01:53:46,320
orbit a lot of satellites are are going

2682
01:53:51,470 --> 01:53:48,599
down from the the larger well-known

2683
01:53:54,169 --> 01:53:51,480
systems down to small sets or cubesats

2684
01:53:56,089 --> 01:53:54,179
or espa class size satellite Vehicles so

2685
01:53:57,890 --> 01:53:56,099
being able to use the multi-manifesting

2686
01:54:00,649 --> 01:53:57,900
capability also known across Community

2687
01:54:01,850 --> 01:54:00,659
is Rideshare gives us the ability at a

2688
01:54:03,830 --> 01:54:01,860

cheaper cost the benefits of the

2689
01:54:06,830 --> 01:54:03,840
taxpayers dollars and everyone involved

2690
01:54:09,169 --> 01:54:06,840
so essentially Mount up dispensers like

2691
01:54:12,050 --> 01:54:09,179
this load them up with cubesats ranges

2692
01:54:13,669 --> 01:54:12,060
from various sizes up to S precise and

2693
01:54:15,169 --> 01:54:13,679
then get it on orbit so that technology

2694
01:54:16,910 --> 01:54:15,179
is going to be critical as we continue

2695
01:54:19,129 --> 01:54:16,920
to build out some of our national

2696
01:54:20,750 --> 01:54:19,139
security space launch missions and it

2697
01:54:22,310 --> 01:54:20,760
kind of helps you develop it kind of a

2698
01:54:24,770 --> 01:54:22,320
la carte right because you can do it in

2699
01:54:27,109 --> 01:54:24,780
a very small footprint exactly a very

2700
01:54:28,490 --> 01:54:27,119
small footprint and if it's the same

2701
01:54:30,410 --> 01:54:28,500
form fit or function we actually have

2702
01:54:31,609 --> 01:54:30,420
the capability to switch out those

2703
01:54:33,709 --> 01:54:31,619
satellites if we need a critical

2704
01:54:35,149 --> 01:54:33,719
capability that needs to get on orbit um

2705
01:54:36,470 --> 01:54:35,159
to meet whatever the requirement is at

2706
01:54:38,330 --> 01:54:36,480
that point in time then we can actually

2707
01:54:39,589 --> 01:54:38,340
down to L minus four depending on the

2708
01:54:41,510 --> 01:54:39,599
mission at that point in time and the

2709
01:54:42,950 --> 01:54:41,520
variables at play we can actually swap

2710
01:54:45,109 --> 01:54:42,960
out those satellites especially with the

2711
01:54:46,669 --> 01:54:45,119
band acute set size I'll tell you what

2712
01:54:48,770 --> 01:54:46,679
we're very excited to have you on the

2713
01:54:50,990 --> 01:54:48,780

show today and which wish the best of

2714
01:54:53,030 --> 01:54:51,000
luck to you the space force and the

2715
01:54:55,970 --> 01:54:53,040
cubesat program and the cubesat launch

2716
01:54:57,830 --> 01:54:55,980
yes and we're looking forward to it so

2717
01:54:59,570 --> 01:54:57,840
um about two hours or close to an hour

2718
01:55:01,370 --> 01:54:59,580
after the fact two hours and 14 minutes

2719
01:55:03,050 --> 01:55:01,380
we'll deploy these sequences out there

2720
01:55:04,310 --> 01:55:03,060
and look forward to seeing the

2721
01:55:06,290 --> 01:55:04,320
capability that's going to bring out to

2722
01:55:09,169 --> 01:55:06,300
the rest of the World Go cube sets go

2723
01:55:11,209 --> 01:55:09,179
space force thanks so much major Julius

2724
01:55:12,709 --> 01:55:11,219
Williams of the U.S space force back to

2725
01:55:14,750 --> 01:55:12,719
you guys

2726
01:55:16,310 --> 01:55:14,760
all right thank you very much Blair and

2727
01:55:18,950 --> 01:55:16,320
back inside the mission director Center

2728
01:55:20,990 --> 01:55:18,960
we are tracking landsat 9 and Centaur

2729
01:55:24,350 --> 01:55:21,000
which have been coasting for this entire

2730
01:55:26,390 --> 01:55:24,360
time for an hour and 13 minutes and as

2731
01:55:29,089 --> 01:55:26,400
you can see in your progress bar we're

2732
01:55:31,669 --> 01:55:29,099
just a few minutes away from the actual

2733
01:55:34,189 --> 01:55:31,679
separation yeah very excited about this

2734
01:55:36,950 --> 01:55:34,199
getting ready to separate landsat 9 and

2735
01:55:38,810 --> 01:55:36,960
continuing the landsat program uh

2736
01:55:40,729 --> 01:55:38,820
excellent launch today and I'm just

2737
01:55:42,589 --> 01:55:40,739
waiting for that moment when we hear the

2738
01:55:44,089 --> 01:55:42,599

confirmation of spacecraft separation it

2739
01:55:45,410 --> 01:55:44,099
certainly was beautiful from our Vantage

2740
01:55:47,089 --> 01:55:45,420
Point we've got a lot of cameras here

2741
01:55:49,550 --> 01:55:47,099
that were watching it and it was an

2742
01:55:52,430 --> 01:55:49,560
enjoyable launch to see but Mick it's

2743
01:55:54,770 --> 01:55:52,440
just the first of many launches as we're

2744
01:55:58,330 --> 01:55:54,780
going through the end of this year let's

2745
01:56:04,910 --> 01:56:01,609
since 1998 NASA's launch Services

2746
01:56:07,729 --> 01:56:04,920
Program or LSP has served as Earth's

2747
01:56:09,470 --> 01:56:07,739
bridge to space based at NASA's Kennedy

2748
01:56:11,570 --> 01:56:09,480
Space Center in Florida the program

2749
01:56:14,209 --> 01:56:11,580
matches scientific and robotic

2750
01:56:16,189 --> 01:56:14,219
spacecraft with launch vehicles for some

2751
01:56:19,129 --> 01:56:16,199
of America's most inspiring space

2752
01:56:21,350 --> 01:56:19,139
missions our mission to successfully

2753
01:56:24,050 --> 01:56:21,360
Place spacecraft in orbit around the

2754
01:56:26,209 --> 01:56:24,060
Earth the Sun and destinations deeper

2755
01:56:28,430 --> 01:56:26,219
into the solar system

2756
01:56:30,290 --> 01:56:28,440
we centralize NASA's launch Services

2757
01:56:31,850 --> 01:56:30,300
while addressing state-of-the-art

2758
01:56:34,729 --> 01:56:31,860
customer needs

2759
01:56:37,310 --> 01:56:34,739
but LSP does more than pair spacecraft

2760
01:56:38,930 --> 01:56:37,320
with the appropriate rocket the diverse

2761
01:56:41,990 --> 01:56:38,940
group of government and contractor

2762
01:56:44,870 --> 01:56:42,000
Engineers analysts and advisors certify

2763
01:56:46,550 --> 01:56:44,880

rocket performance and reliability the

2764
01:56:48,589 --> 01:56:46,560
team provides long-term technical

2765
01:56:51,830 --> 01:56:48,599
expertise and support to spacecraft

2766
01:56:54,050 --> 01:56:51,840
customers from around the world

2767
01:56:56,330 --> 01:56:54,060
the team manages launches from multiple

2768
01:56:58,790 --> 01:56:56,340
sites depending on customer and Mission

2769
01:57:01,490 --> 01:56:58,800
needs Cape Canaveral space force station

2770
01:57:04,310 --> 01:57:01,500
in Florida Vandenberg space force base

2771
01:57:06,470 --> 01:57:04,320
in California Reagan test site at

2772
01:57:08,270 --> 01:57:06,480
kwajalein atoll in the Republic of the

2773
01:57:10,870 --> 01:57:08,280
Marshall Islands and the Pacific

2774
01:57:14,990 --> 01:57:10,880
Spaceport complex in Kodiak Alaska

2775
01:57:17,689 --> 01:57:15,000
building off of past success LSP forges

2776
01:57:20,209 --> 01:57:17,699
ahead to support NASA's future the

2777
01:57:21,589 --> 01:57:20,219
program has four upcoming missions in

2778
01:57:24,649 --> 01:57:21,599
2021

2779
01:57:27,290 --> 01:57:24,659
leading off LSP slate is landsat 9

2780
01:57:29,450 --> 01:57:27,300
launching from Vandenberg a partnership

2781
01:57:31,790 --> 01:57:29,460
between NASA and the U.S Geological

2782
01:57:34,070 --> 01:57:31,800
Survey the mission will Monitor and

2783
01:57:37,010 --> 01:57:34,080
manage land resources to sustain human

2784
01:57:39,589 --> 01:57:37,020
life next up launching from Cape

2785
01:57:41,810 --> 01:57:39,599
Canaveral space force station Lucy will

2786
01:57:44,390 --> 01:57:41,820
be the first mission to study Jupiter's

2787
01:57:46,669 --> 01:57:44,400
Trojan asteroids which may be remnants

2788
01:57:49,370 --> 01:57:46,679

of the primordial material that formed

2789
01:57:51,770 --> 01:57:49,380
the outer planets of our solar system

2790
01:57:54,850 --> 01:57:51,780
it's then back to the West Coast for

2791
01:57:57,729 --> 01:57:54,860
double asteroid redirection test or Dart

2792
01:58:00,790 --> 01:57:57,739
NASA's first planetary defense mission

2793
01:58:04,430 --> 01:58:00,800
that will be followed by Imaging x-ray

2794
01:58:07,129 --> 01:58:04,440
polarimetry Explorer or XP launching

2795
01:58:09,109 --> 01:58:07,139
from Kennedy Bixby will expand our

2796
01:58:11,510 --> 01:58:09,119
understanding of X-ray production in

2797
01:58:15,229 --> 01:58:11,520
objects such as neutron stars and black

2798
01:58:19,070 --> 01:58:15,239
holes years of testing determination and

2799
01:58:22,070 --> 01:58:19,080
dedication working as one NASA's launch

2800
01:58:26,149 --> 01:58:22,080
Services Program is Earth's bridge to

2801
01:58:29,990 --> 01:58:28,310
well there you saw a preview of some of

2802
01:58:32,930 --> 01:58:30,000
the exciting moments that are coming up

2803
01:58:36,350 --> 01:58:32,940
for LSP and let's talk about the next

2804
01:58:37,910 --> 01:58:36,360
one up Miss Lucy yeah uh Lucy launching

2805
01:58:40,129 --> 01:58:37,920
on the east coast of Florida we're

2806
01:58:41,810 --> 01:58:40,139
excited about Lucy but just as much as

2807
01:58:44,149 --> 01:58:41,820
we are on landsat 9 today but Lucy

2808
01:58:46,550 --> 01:58:44,159
planetary Mission going to study the

2809
01:58:48,229 --> 01:58:46,560
Trojan asteroids out by Jupiter that is

2810
01:58:50,149 --> 01:58:48,239
so exciting some cool science that's

2811
01:58:51,589 --> 01:58:50,159
going to be going on there uh you and I

2812
01:58:53,810 --> 01:58:51,599
just actually spent a few minutes with

2813
01:58:56,270 --> 01:58:53,820

Dr Z hearing a little bit about that and

2814
01:58:57,890 --> 01:58:56,280
his excitement too we are so excited to

2815
01:58:59,570 --> 01:58:57,900
get back to Florida and then turn right

2816
01:59:01,550 --> 01:58:59,580
around come back here to Vandenberg to

2817
01:59:04,250 --> 01:59:01,560
launch the dart Mission which I think is

2818
01:59:05,750 --> 01:59:04,260
an awesome Mission also from an aspect

2819
01:59:07,609 --> 01:59:05,760
that we are doing a technology

2820
01:59:09,410 --> 01:59:07,619
demonstration for defense that we're

2821
01:59:11,570 --> 01:59:09,420
going to impact a satellite into an

2822
01:59:14,089 --> 01:59:11,580
asteroid to see if we can change the

2823
01:59:16,129 --> 01:59:14,099
course of an asteroid that one's

2824
01:59:18,109 --> 01:59:16,139
impressive that we are just doing some

2825
01:59:20,450 --> 01:59:18,119
cool science it's not just LSP that's

2826
01:59:22,250 --> 01:59:20,460
excited about these launches but NASA in

2827
01:59:23,990 --> 01:59:22,260
general as an agency and we're just

2828
01:59:25,609 --> 01:59:24,000
hoping everybody out there is excited

2829
01:59:27,470 --> 01:59:25,619
about these upcoming missions as we are

2830
01:59:29,750 --> 01:59:27,480
we have have a link for you if you want

2831
01:59:31,370 --> 01:59:29,760
to find out more about the Lucy Mission

2832
01:59:33,950 --> 01:59:31,380
which is the one right around the corner

2833
01:59:35,810 --> 01:59:33,960
on October 16th you can see it there on

2834
01:59:36,850 --> 01:59:35,820
the bottom of your screen just go to the

2835
01:59:40,430 --> 01:59:36,860
web address

2836
01:59:43,490 --> 01:59:40,440
nasa.gov forward slash Lucy again we are

2837
01:59:46,490 --> 01:59:43,500
targeting October 16th for that launch

2838
01:59:48,350 --> 01:59:46,500

time now until separation we're dealing

2839
01:59:50,570 --> 01:59:48,360
with a little bit over three minutes

2840
01:59:53,930 --> 01:59:50,580
until that moment happens and so let's

2841
01:59:56,450 --> 01:59:53,940
talk a little bit about that uh mick how

2842
01:59:58,550 --> 01:59:56,460
exactly does centaur separate from

2843
02:00:00,890 --> 01:59:58,560
landsat 9. that's actually a cool little

2844
02:00:03,950 --> 02:00:00,900
thing that happens is when it's time to

2845
02:00:07,669 --> 02:00:03,960
separate uh Centaur will send a signal

2846
02:00:09,830 --> 02:00:07,679
to a uh a device that's up there as part

2847
02:00:12,649 --> 02:00:09,840
of the barman clamp that will release

2848
02:00:15,169 --> 02:00:12,659
the separation bolts and this Marmon

2849
02:00:17,570 --> 02:00:15,179
clamp that is tied around as you saw

2850
02:00:20,629 --> 02:00:17,580
earlier in the upstam video tied around

2851
02:00:22,910 --> 02:00:20,639
on the bottom of landsat 9. it will

2852
02:00:25,129 --> 02:00:22,920
release that clamp and landsat 9 will

2853
02:00:27,589 --> 02:00:25,139
then be pushed away using some

2854
02:00:29,930 --> 02:00:27,599
separation Springs very little force

2855
02:00:33,290 --> 02:00:29,940
that is needed to get landsat 9 going on

2856
02:00:35,870 --> 02:00:33,300
its way for separation so very simple

2857
02:00:37,550 --> 02:00:35,880
design but took a long time to do our

2858
02:00:40,490 --> 02:00:37,560
mechanical engineers have been following

2859
02:00:44,750 --> 02:00:40,500
this as they mated landsat 9 to this uh

2860
02:00:46,310 --> 02:00:44,760
to the the Mormon clamp and uh it made

2861
02:00:48,830 --> 02:00:46,320
sure everything was right from attention

2862
02:00:50,510 --> 02:00:48,840
and perspective and you know we're just

2863
02:00:52,669 --> 02:00:50,520

looking forward for that set moment and

2864
02:00:55,310 --> 02:00:52,679
we're watching now an animation that is

2865
02:00:57,109 --> 02:00:55,320
tied to real-time data so we'll see that

2866
02:00:58,970 --> 02:00:57,119
moment you know it's interesting you

2867
02:01:01,310 --> 02:00:58,980
talk about Springs putting it in the

2868
02:01:02,870 --> 02:01:01,320
final moment it takes rocket engines to

2869
02:01:04,430 --> 02:01:02,880
get it up there right takes rocket

2870
02:01:07,310 --> 02:01:04,440
engines to get it close into orbit but

2871
02:01:08,810 --> 02:01:07,320
it does its final move with springs yeah

2872
02:01:10,669 --> 02:01:08,820
absolutely you know we need all that

2873
02:01:13,010 --> 02:01:10,679
thrust and power to leave Mother Earth

2874
02:01:15,470 --> 02:01:13,020
and get out of her gravitational pull

2875
02:01:17,990 --> 02:01:15,480
but once we're in space in orbit it

2876
02:01:20,270 --> 02:01:18,000
takes very little uh work to make things

2877
02:01:22,430 --> 02:01:20,280
happen as we have watched Centaur in

2878
02:01:25,070 --> 02:01:22,440
landsat 9 orbit in this Coast phase

2879
02:01:28,250 --> 02:01:25,080
we've seen the reaction control system

2880
02:01:30,589 --> 02:01:28,260
just maintain Centaur in its space so

2881
02:01:32,689 --> 02:01:30,599
we're doing we're doing good and that

2882
02:01:34,970 --> 02:01:32,699
that's uh just how rocket science works

2883
02:01:37,790 --> 02:01:34,980
yeah just about 70 seconds away now as

2884
02:01:40,310 --> 02:01:37,800
we're counting down until landsat nine

2885
02:01:42,229 --> 02:01:40,320
separation from Centaur once this

2886
02:01:44,330 --> 02:01:42,239
happens though Mick there's still a more

2887
02:01:45,950 --> 02:01:44,340
Mission uh more mission to go there's

2888
02:01:48,109 --> 02:01:45,960

some cubesats on board one minute yeah

2889
02:01:50,270 --> 02:01:48,119
absolutely landsat 9 is our primary

2890
02:01:52,790 --> 02:01:50,280
Mission today and once we once we uh

2891
02:01:55,729 --> 02:01:52,800
separate landsat 9 Centaur will begin

2892
02:01:57,890 --> 02:01:55,739
its Maneuvers in chilling down again the

2893
02:01:59,689 --> 02:01:57,900
rl-10 engine and getting ready to

2894
02:02:03,169 --> 02:01:59,699
restart or what we call Main engine

2895
02:02:05,330 --> 02:02:03,179
start two for a few second burn there

2896
02:02:07,310 --> 02:02:05,340
and then they will do Amico main engine

2897
02:02:10,129 --> 02:02:07,320
cut off again and then we will do a

2898
02:02:13,669 --> 02:02:10,139
third burn to get into the trajectory in

2899
02:02:16,550 --> 02:02:13,679
orbit that we need for to deploy the two

2900
02:02:17,810 --> 02:02:16,560
uh cubesats that are on board and Daryl

2901
02:02:20,689 --> 02:02:17,820
you had mentioned earlier in the show

2902
02:02:23,330 --> 02:02:20,699
today is a first for us also on Atlas 5

2903
02:02:26,209 --> 02:02:23,340
with a four burn we will do that fourth

2904
02:02:28,010 --> 02:02:26,219
burn to dispose Centaur and not leave it

2905
02:02:31,609 --> 02:02:28,020
basis space jump

2906
02:02:35,390 --> 02:02:31,619
a point of history for the atlas system

2907
02:02:37,010 --> 02:02:35,400
and centaur we're listening now to C and

2908
02:02:39,830 --> 02:02:37,020
standing by for spacecraft separation

2909
02:02:44,089 --> 02:02:39,840
shortly let's listen in we are expecting

2910
02:02:46,310 --> 02:02:44,099
spacecraft separation at any moment

2911
02:02:48,290 --> 02:02:46,320
and we have successful separation of the

2912
02:02:51,770 --> 02:02:48,300
landsat 9 Observatory

2913
02:02:54,229 --> 02:02:51,780

and there you go so excited for that I'm

2914
02:02:57,290 --> 02:02:54,239
so happy to hear that that is uh just uh

2915
02:02:59,810 --> 02:02:57,300
exciting to see landsat 9 on its way and

2916
02:03:02,450 --> 02:02:59,820
continue that 50 years of data and There

2917
02:03:05,030 --> 02:03:02,460
She Goes an impressive site it is an

2918
02:03:06,589 --> 02:03:05,040
animation but here at the mission uh

2919
02:03:08,390 --> 02:03:06,599
director Center there was some Applause

2920
02:03:11,030 --> 02:03:08,400
behind us where the people gathered here

2921
02:03:13,070 --> 02:03:11,040
it's a nice moment for them it's a nice

2922
02:03:15,470 --> 02:03:13,080
moment for you yeah absolutely we we

2923
02:03:17,510 --> 02:03:15,480
applaud but it wasn't a huge celebration

2924
02:03:18,589 --> 02:03:17,520
yet I mean we're very happy landsat 9's

2925
02:03:20,270 --> 02:03:18,599
on its way but as we were just talking

2926
02:03:22,669 --> 02:03:20,280
about the mission's not over yet we

2927
02:03:24,109 --> 02:03:22,679
still have Cube sets to deploy and we

2928
02:03:25,970 --> 02:03:24,119
want to follow this through for Mission

2929
02:03:28,490 --> 02:03:25,980
success for all of the payloads on board

2930
02:03:30,709 --> 02:03:28,500
today but that is a huge milestone to

2931
02:03:32,870 --> 02:03:30,719
get landsat 9 on our way and it's also

2932
02:03:36,470 --> 02:03:32,880
interesting that Centaur has to be

2933
02:03:38,030 --> 02:03:36,480
careful to as it goes on to its orbit to

2934
02:03:40,430 --> 02:03:38,040
put out those cubesats it's got to be

2935
02:03:43,189 --> 02:03:40,440
careful to avoid landsat 9 right yeah

2936
02:03:44,930 --> 02:03:43,199
absolutely we will the Maneuvers that

2937
02:03:48,770 --> 02:03:44,940
will happen is we will wait for landsat

2938
02:03:51,430 --> 02:03:48,780

9 to get a uh way and Centaur will then

2939
02:03:54,109 --> 02:03:51,440
Coast for a 30 about 30 minutes

2940
02:03:56,089 --> 02:03:54,119
allowing landsat to get in where it

2941
02:03:58,250 --> 02:03:56,099
needs to be and out of the way and then

2942
02:04:01,129 --> 02:03:58,260
we will do mess two which as I said main

2943
02:04:04,370 --> 02:04:01,139
engine start 2 allow to get everything

2944
02:04:07,490 --> 02:04:04,380
going for the cubesat separation well

2945
02:04:09,890 --> 02:04:07,500
that wraps it up for us Mick we had

2946
02:04:15,050 --> 02:04:09,900
launch here a successful on-time launch

2947
02:04:17,870 --> 02:04:15,060
at 11 12 a.m Pacific Time 2 12 p.m

2948
02:04:20,350 --> 02:04:17,880
eastern time from the Central Coast of

2949
02:04:23,689 --> 02:04:20,360
California an atlas V rocket putting

2950
02:04:26,390 --> 02:04:23,699
landsat 9 into orbit in a successful

2951
02:04:28,490 --> 02:04:26,400
separation an hour and 20 minutes later

2952
02:04:31,609 --> 02:04:28,500
that's all for us we'll send it back to

2953
02:04:34,129 --> 02:04:31,619
Marie out on the hill

2954
02:04:36,350 --> 02:04:34,139
all right thanks guys uh joining us now

2955
02:04:38,750 --> 02:04:36,360
to talk about achieving uh at least

2956
02:04:41,030 --> 02:04:38,760
Mission success so far we're not done as

2957
02:04:43,310 --> 02:04:41,040
Mick said uh but joining us now is NASA

2958
02:04:45,770 --> 02:04:43,320
senior launch manager Omar Baez Omar

2959
02:04:47,149 --> 02:04:45,780
thanks so much for coming out here uh we

2960
02:04:48,890 --> 02:04:47,159
were just watching the screen together

2961
02:04:51,709 --> 02:04:48,900
when we heard a confirmation of

2962
02:04:53,510 --> 02:04:51,719
spacecraft separation so uh what's that

2963
02:04:57,169 --> 02:04:53,520

feeling like are you reading a sigh of

2964
02:04:59,390 --> 02:04:57,179
relief wonderful it's a it's a great uh

2965
02:05:00,890 --> 02:04:59,400
great thing to hear

2966
02:05:03,050 --> 02:05:00,900
um that fund that's sitting on the desk

2967
02:05:05,270 --> 02:05:03,060
here has a control room patched into it

2968
02:05:07,729 --> 02:05:05,280
and I can hear them congratulating each

2969
02:05:10,970 --> 02:05:07,739
other so things are are doing really

2970
02:05:13,370 --> 02:05:10,980
well for us and uh it looks good for

2971
02:05:16,850 --> 02:05:13,380
landsat how did things I'm sorry go

2972
02:05:18,050 --> 02:05:16,860
ahead we um things evolved uh really

2973
02:05:19,850 --> 02:05:18,060
easily today

2974
02:05:22,250 --> 02:05:19,860
um uh worked some minor issues with

2975
02:05:24,709 --> 02:05:22,260
instrumentation

2976
02:05:26,750 --> 02:05:24,719
um and then we had a slow acting

2977
02:05:30,350 --> 02:05:26,760
um liquid oxygen valve but that's about

2978
02:05:33,350 --> 02:05:30,360
it the smooth uh boring countdown and uh

2979
02:05:34,850 --> 02:05:33,360
had it off right on time so uh we're

2980
02:05:37,550 --> 02:05:34,860
elated

2981
02:05:39,890 --> 02:05:37,560
um uh waiting for the spacecraft to

2982
02:05:43,430 --> 02:05:39,900
acquire signal which should be happening

2983
02:05:45,890 --> 02:05:43,440
just about now and then in another six

2984
02:05:49,010 --> 02:05:45,900
and a half seven minutes they should

2985
02:05:51,649 --> 02:05:49,020
have the solar arrays deployed and and

2986
02:05:53,810 --> 02:05:51,659
be well on their way to uh getting a

2987
02:05:55,669 --> 02:05:53,820
good spacecraft you mentioned a boring

2988
02:05:56,930 --> 02:05:55,679

countdown uh that's that's good news

2989
02:05:59,450 --> 02:05:56,940
that means you're not really working

2990
02:06:01,550 --> 02:05:59,460
anything significant but that really

2991
02:06:03,530 --> 02:06:01,560
speaks to the work of the people of the

2992
02:06:05,450 --> 02:06:03,540
launch Services Program um can you talk

2993
02:06:07,550 --> 02:06:05,460
a little bit about those folks and just

2994
02:06:09,950 --> 02:06:07,560
all the work that the team has put into

2995
02:06:11,870 --> 02:06:09,960
getting to a successful uh launch

2996
02:06:15,050 --> 02:06:11,880
spacecraft and and now to spacecraft

2997
02:06:19,069 --> 02:06:15,060
operation so so yeah the team has worked

2998
02:06:20,990 --> 02:06:19,079
uh phenomenally on this Mission and uh

2999
02:06:22,069 --> 02:06:21,000
it's been a long haul we had some

3000
02:06:24,290 --> 02:06:22,079
struggles

3001
02:06:26,450 --> 02:06:24,300
um uh starting up this month this

3002
02:06:28,629 --> 02:06:26,460
mission was supposed to go earlier in

3003
02:06:31,189 --> 02:06:28,639
the month and we had some issues getting

3004
02:06:33,490 --> 02:06:31,199
liquid nitrogen levels up to where they

3005
02:06:37,370 --> 02:06:33,500
should be in some technical issues that

3006
02:06:40,729 --> 02:06:37,380
we found after the wet dress rehearsal

3007
02:06:42,410 --> 02:06:40,739
occurred and so uh you know this pad has

3008
02:06:45,830 --> 02:06:42,420
not been used for the last three and a

3009
02:06:47,990 --> 02:06:45,840
half years since we did the Insight Mars

3010
02:06:50,209 --> 02:06:48,000
mission from here so there was some bugs

3011
02:06:51,770 --> 02:06:50,219
to work out of the uh the mechanical

3012
02:06:54,189 --> 02:06:51,780
stuff that's been sitting out here in

3013
02:06:57,169 --> 02:06:54,199

this beautiful salt environment

3014
02:06:59,750 --> 02:06:57,179
that takes some exercise and no matter

3015
02:07:02,350 --> 02:06:59,760
how much maintenance you do on it until

3016
02:07:05,689 --> 02:07:02,360
you fully exercise the vehicle

3017
02:07:07,490 --> 02:07:05,699
with the cryogens on board you don't

3018
02:07:09,530 --> 02:07:07,500
find everything and and the kind of

3019
02:07:11,810 --> 02:07:09,540
stuff we found was stuff with the

3020
02:07:16,569 --> 02:07:11,820
instrumentation and so forth that uh

3021
02:07:19,609 --> 02:07:16,579
needed to be recalibrated and reset so

3022
02:07:22,729 --> 02:07:19,619
the teams work phenomenally I can't be

3023
02:07:25,609 --> 02:07:22,739
more proud of them it's the start of a

3024
02:07:27,350 --> 02:07:25,619
lot of missions for us in a row uh

3025
02:07:29,810 --> 02:07:27,360
coming up so

3026
02:07:32,169 --> 02:07:29,820
um it's nice to be able to get used to

3027
02:07:35,330 --> 02:07:32,179
that pace again coming out of

3028
02:07:38,050 --> 02:07:35,340
the covet environment here and and

3029
02:07:41,629 --> 02:07:38,060
actually working and being with people

3030
02:07:42,950 --> 02:07:41,639
versus looking at them on a TV screen

3031
02:07:45,709 --> 02:07:42,960
so

3032
02:07:47,629 --> 02:07:45,719
the team has done phenomenally but I

3033
02:07:50,149 --> 02:07:47,639
need them to keep on doing a phenomenal

3034
02:07:52,430 --> 02:07:50,159
job for quite a few other missions back

3035
02:07:53,990 --> 02:07:52,440
on the other uh Coast for Lucy next

3036
02:07:56,089 --> 02:07:54,000
month and then coming back out here to

3037
02:07:57,530 --> 02:07:56,099
Vandenberg for darts you guys have a lot

3038
02:07:58,850 --> 02:07:57,540

on your schedule that's correct we're

3039
02:08:03,109 --> 02:07:58,860
doing Lucy

3040
02:08:05,089 --> 02:08:03,119
um uh October 16th so as soon as we get

3041
02:08:08,149 --> 02:08:05,099
back we do a wet dress rehearsal for

3042
02:08:09,950 --> 02:08:08,159
them uh the dart Mission the spacecraft

3043
02:08:11,810 --> 02:08:09,960
just got here today in fact they were

3044
02:08:13,089 --> 02:08:11,820
held at the gate because we were

3045
02:08:16,129 --> 02:08:13,099
launching

3046
02:08:19,250 --> 02:08:16,139
landsat nine and so that spacecraft was

3047
02:08:21,890 --> 02:08:19,260
uh delayed for a couple hours until we

3048
02:08:25,729 --> 02:08:21,900
launched but it's now on its way to its

3049
02:08:28,669 --> 02:08:25,739
processing facility here and uh we'll uh

3050
02:08:31,129 --> 02:08:28,679
attempt to launch that on November 23rd

3051
02:08:34,370 --> 02:08:31,139
and then we have the XP Mission back at

3052
02:08:37,569 --> 02:08:34,380
the cape which will attempt to launch uh

3053
02:08:41,089 --> 02:08:37,579
December 9th uh this year

3054
02:08:42,950 --> 02:08:41,099
and uh then we'll start the new year

3055
02:08:45,709 --> 02:08:42,960
with uh goes t

3056
02:08:47,930 --> 02:08:45,719
on February 16th so we have quite a few

3057
02:08:49,729 --> 02:08:47,940
missions coming up all right NASA senior

3058
02:08:51,649 --> 02:08:49,739
launch manager Omar Baez thank you so

3059
02:08:54,050 --> 02:08:51,659
much for joining us uh congratulations

3060
02:08:56,030 --> 02:08:54,060
on all the Milestones so far I know you

3061
02:08:57,830 --> 02:08:56,040
still have to get through uh cubesat

3062
02:08:59,689 --> 02:08:57,840
deployment a few other things so we'll

3063
02:09:01,370 --> 02:08:59,699

be keeping an eye on that uh good luck

3064
02:09:03,050 --> 02:09:01,380
to you on the rest of the Milestones

3065
02:09:05,209 --> 02:09:03,060
okay thank you Marie and thanks for the

3066
02:09:08,810 --> 02:09:05,219
public affairs team for making us all

3067
02:09:10,609 --> 02:09:08,820
happen and being able to to speak to our

3068
02:09:13,310 --> 02:09:10,619
citizens about the great stuff we're

3069
02:09:14,930 --> 02:09:13,320
doing here thank you thank you all right

3070
02:09:17,510 --> 02:09:14,940
food those of you at home thank you so

3071
02:09:19,669 --> 02:09:17,520
much for joining us uh for the landsat 9

3072
02:09:21,830 --> 02:09:19,679
launch we're going to wrap up our

3073
02:09:23,510 --> 02:09:21,840
television coverage for now but you can

3074
02:09:26,750 --> 02:09:23,520
keep following live Mission updates

3075
02:09:29,270 --> 02:09:26,760
online at nasa.gov uh have a wonderful

3076
02:09:35,990 --> 02:09:29,280
day and now here's a final look a replay

3077
02:09:49,790 --> 02:09:40,870
you know it's ten nine eight seven six

3078
02:09:54,470 --> 02:09:52,069
and lift off

3079
02:09:57,950 --> 02:09:54,480
lift off of an atlas five rocket and

3080
02:10:00,830 --> 02:09:57,960
landsat nine continuing the legacy of an

3081
02:10:07,790 --> 02:10:00,840
Irreplaceable 50-year record on our

3082
02:10:07,800 --> 02:10:22,000
control system response looks good

3083
02:10:49,090 --> 02:10:48,410
[Music]

3084
02:10:58,850 --> 02:10:49,100
foreign

3085
02:11:06,410 --> 02:11:04,129
that was our first view of ourselves we

3086
02:11:08,930 --> 02:11:06,420
really are the Blue Planet we're hanging

3087
02:11:13,010 --> 02:11:08,940
out here in the middle of nowhere