1
00:00:30,310 --> 00:00:12,640
[Music]

2
00:00:32,310 --> 00:00:30,320
we are just 34 minutes away from

3
00:00:34,310 --> 00:00:32,320
launching this atlas 5 rocket you see

4
00:00:36,229 --> 00:00:34,320
right there on your screen on board are

5
00:00:38,389 --> 00:00:36,239
several payloads including nasa

6
00:00:41,430 --> 00:00:38,399
technology that could revolutionize how

7
00:00:42,790 --> 00:00:41,440
we communicate to and from space

8
00:00:44,869 --> 00:00:42,800
thank you for joining me for today's

9
00:00:47,190 --> 00:00:44,879
live launch coverage of nasa's laser

10
00:00:49,590 --> 00:00:47,200
communications relay demonstration or

11
00:00:51,750 --> 00:00:49,600
lcrd i'm megan cruz and i'm joining you

12
00:00:54,069 --> 00:00:51,760
live from nasa's kennedy space center in

13
00:00:57,270 --> 00:00:54,079

florida today's two hour launch window

14
00:00:59,110 --> 00:00:57,280
opens at 404 a.m eastern time and that

15
00:01:01,670 --> 00:00:59,120
rocket you just saw sitting on space

16
00:01:03,510 --> 00:01:01,680
launch complex 41 at cape canaveral

17
00:01:06,469 --> 00:01:03,520
space force station which is just behind

18
00:01:08,789 --> 00:01:06,479
me across the water here now lcrd is

19
00:01:12,469 --> 00:01:08,799
hitching a ride on the u.s space force's

20
00:01:14,149 --> 00:01:12,479
space test program 3 mission or stp 3.

21
00:01:16,870 --> 00:01:14,159
you can think of the space test program

22
00:01:18,789 --> 00:01:16,880
as a ride share to space it's primarily

23
00:01:21,350 --> 00:01:18,799
for the department of defense to send up

24
00:01:23,670 --> 00:01:21,360
science and technology experiments but

25
00:01:26,630 --> 00:01:23,680
if there's room others can share that

26
00:01:28,789 --> 00:01:26,640
ride and that's what nasa is doing today

27
00:01:30,630 --> 00:01:28,799
so what does lcrd look like well there

28
00:01:33,830 --> 00:01:30,640
it is in the middle of your screen there

29
00:01:36,069 --> 00:01:33,840
about as big as a king-size mattress

30
00:01:38,069 --> 00:01:36,079
sharing a spacecraft with other payloads

31
00:01:39,830 --> 00:01:38,079
it will showcase the unique benefits of

32
00:01:42,710 --> 00:01:39,840
laser also known as optical

33
00:01:44,469 --> 00:01:42,720
communications nasa has relied on radio

34
00:01:46,870 --> 00:01:44,479
communications since we first started

35
00:01:49,109 --> 00:01:46,880
exploring space but as we fly more

36
00:01:50,950 --> 00:01:49,119
missions that generate more data and as

37
00:01:53,190 --> 00:01:50,960
we work to establish a presence on the

38
00:01:55,030 --> 00:01:53,200

moon and send humans to mars we are of

39
00:01:57,510 --> 00:01:55,040
course going to need a communications

40
00:02:00,230 --> 00:01:57,520
upgrade lasers can transfer a lot more

41
00:02:02,950 --> 00:02:00,240
data at once how much more we'll say

42
00:02:05,670 --> 00:02:02,960
there's a high resolution map of mars it

43
00:02:08,150 --> 00:02:05,680
would take about nine weeks yes nine

44
00:02:10,790 --> 00:02:08,160
weeks to send that map to earth using

45
00:02:12,790 --> 00:02:10,800
radio waves but using lasers would only

46
00:02:14,550 --> 00:02:12,800
take nine days

47
00:02:16,710 --> 00:02:14,560
now coming up i'll introduce you to two

48
00:02:18,949 --> 00:02:16,720
people who played critical roles in

49
00:02:20,070 --> 00:02:18,959
bringing lcrd to life

50
00:02:21,750 --> 00:02:20,080
but first let's check in with our

51
00:02:23,430 --> 00:02:21,760
friends at united launch alliance we

52
00:02:28,949 --> 00:02:23,440
have andrea lenhoff here with me this

53
00:02:33,030 --> 00:02:30,790
thanks megan everything is going well

54
00:02:35,430 --> 00:02:33,040
here in the asoc the atlas 5 is fueled

55
00:02:36,949 --> 00:02:35,440
and ready to launch sdp3 in just about

56
00:02:38,869 --> 00:02:36,959
30 minutes

57
00:02:41,030 --> 00:02:38,879
the launch count is about to enter a 30

58
00:02:42,630 --> 00:02:41,040
minute hold this planned hold gives our

59
00:02:44,229 --> 00:02:42,640
team extra time to address any

60
00:02:46,070 --> 00:02:44,239
last-minute issues

61
00:02:47,750 --> 00:02:46,080
at this time the team is not working any

62
00:02:50,949 --> 00:02:47,760
issues and we are proceeding towards an

63
00:02:52,869 --> 00:02:50,959

on-time liftoff at or four a.m eastern

64
00:02:54,550 --> 00:02:52,879
the space launch delta 45 weather

65
00:02:56,550 --> 00:02:54,560
officer will provide a final brief to

66
00:02:57,910 --> 00:02:56,560
the team shortly

67
00:02:59,350 --> 00:02:57,920
as you know though megan the weather's

68
00:03:00,949 --> 00:02:59,360
been beautiful here and we're not

69
00:03:04,710 --> 00:03:00,959
expecting that to change during our

70
00:03:06,550 --> 00:03:04,720
two-hour launch window today back to you

71
00:03:08,869 --> 00:03:06,560
all right thanks so much andrea now we

72
00:03:11,509 --> 00:03:08,879
are about 30 minutes and counting about

73
00:03:14,070 --> 00:03:11,519
six and a half hours from liftoff today

74
00:03:16,309 --> 00:03:14,080
we will see lcrd's host spacecraft

75
00:03:18,710 --> 00:03:16,319
separate from the payload fairing it

76
00:03:22,070 --> 00:03:18,720
will make its way to an orbit of around

77
00:03:23,750 --> 00:03:22,080
22 000 miles above the earth's surface

78
00:03:25,670 --> 00:03:23,760
that's about a tenth of the way to the

79
00:03:27,910 --> 00:03:25,680
moon for those wondering by early

80
00:03:31,190 --> 00:03:27,920
january researchers will begin powering

81
00:03:33,110 --> 00:03:31,200
on lcrd and by march they hope to begin

82
00:03:34,869 --> 00:03:33,120
conducting the first experiments you can

83
00:03:37,190 --> 00:03:34,879
see a graphic right there an animated

84
00:03:39,270 --> 00:03:37,200
graphic of lcrd again that's what it's

85
00:03:42,869 --> 00:03:39,280
going to look like once we launch it and

86
00:03:44,710 --> 00:03:42,879
we start conducting experiments in march

87
00:03:47,830 --> 00:03:44,720
now researchers will spend the next two

88
00:03:50,550 --> 00:03:47,840

years testing lcrd by beaming invisible

89
00:03:52,630 --> 00:03:50,560
near infrared lasers to and from two

90
00:03:55,190 --> 00:03:52,640
ground stations on earth one in

91
00:03:58,390 --> 00:03:55,200
california and one in hawaii these

92
00:03:59,910 --> 00:03:58,400
remote high altitude locations were

93
00:04:02,470 --> 00:03:59,920
chosen for their clear weather

94
00:04:03,750 --> 00:04:02,480
conditions as clouds can disrupt laser

95
00:04:06,070 --> 00:04:03,760
signals you can see some of the ground

96
00:04:09,190 --> 00:04:06,080
stations there if all goes as planned

97
00:04:11,750 --> 00:04:09,200
lcrd will be nasa's first two-way

98
00:04:15,509 --> 00:04:11,760
end-to-end optical relay because it can

99
00:04:16,870 --> 00:04:15,519
both send and receive data at once

100
00:04:18,629 --> 00:04:16,880
and now i'd like to bring in kathy

101
00:04:20,629 --> 00:04:18,639
leaders associate administrator of

102
00:04:21,990 --> 00:04:20,639
nasa's space operations mission

103
00:04:23,830 --> 00:04:22,000
directorate thank you for carving out

104
00:04:25,990 --> 00:04:23,840
the time to be here with me thank you

105
00:04:27,670 --> 00:04:26,000
for having me very very exciting day

106
00:04:29,830 --> 00:04:27,680
yeah absolutely tell me a little bit

107
00:04:31,909 --> 00:04:29,840
about the direct reading role there

108
00:04:34,390 --> 00:04:31,919
so i get to be lucky enough to be in

109
00:04:36,950 --> 00:04:34,400
charge of space operations which means

110
00:04:38,950 --> 00:04:36,960
we get to work on the operational

111
00:04:40,870 --> 00:04:38,960
missions that were that are in play

112
00:04:43,350 --> 00:04:40,880
today but also getting ready for

113
00:04:45,670 --> 00:04:43,360

exploration missions and this one's a

114
00:04:47,590 --> 00:04:45,680
very important one that to get us ready

115
00:04:49,270 --> 00:04:47,600
to go back to the moon yeah so tell me

116
00:04:52,150 --> 00:04:49,280
what are we hoping to learn with lcrt

117
00:04:54,950 --> 00:04:52,160
today well we actually need to improve

118
00:04:57,510 --> 00:04:54,960
our com systems to be able to do human

119
00:04:58,629 --> 00:04:57,520
space flight activities around the moon

120
00:05:00,310 --> 00:04:58,639
and so

121
00:05:02,870 --> 00:05:00,320
this demonstration is very very

122
00:05:04,550 --> 00:05:02,880
important to get our new systems going i

123
00:05:06,550 --> 00:05:04,560
was just talking to baja eunice in

124
00:05:09,270 --> 00:05:06,560
charge of our scan group and he said you

125
00:05:11,749 --> 00:05:09,280
know this demonstration if it doesn't

126
00:05:14,070 --> 00:05:11,759
work could push push us back five to ten

127
00:05:16,390 --> 00:05:14,080
years so this is very very very critical

128
00:05:18,469 --> 00:05:16,400
for us to be able to prove out the

129
00:05:21,830 --> 00:05:18,479
systems that we're going to need to get

130
00:05:24,310 --> 00:05:21,840
ready for both artemis ii artemis iii

131
00:05:26,390 --> 00:05:24,320
are our very very complicated missions

132
00:05:27,909 --> 00:05:26,400
and getting ready even to be able to

133
00:05:29,990 --> 00:05:27,919
prove the systems that we'll need to go

134
00:05:32,150 --> 00:05:30,000
to mars right and it is so critical that

135
00:05:34,469 --> 00:05:32,160
lcrd isn't the only mission right that's

136
00:05:37,510 --> 00:05:34,479
studying laser communications absolutely

137
00:05:39,749 --> 00:05:37,520
on artemis ii we actually have o2o which

138
00:05:43,110 --> 00:05:39,759

is a critical system for us to be able

139
00:05:46,469 --> 00:05:43,120
to prove out can we do calm between the

140
00:05:48,870 --> 00:05:46,479
relays and the artemis ii spacecraft the

141
00:05:51,350 --> 00:05:48,880
orion spacecraft that'll be carrying our

142
00:05:53,909 --> 00:05:51,360
our first crew demonstration mission and

143
00:05:55,749 --> 00:05:53,919
then we've got illumina that's going up

144
00:05:58,150 --> 00:05:55,759
to the space station that will be doing

145
00:06:00,230 --> 00:05:58,160
our space to space con between lcrd and

146
00:06:02,150 --> 00:06:00,240
the international space station and then

147
00:06:03,909 --> 00:06:02,160
next summer we have psyche that's going

148
00:06:06,950 --> 00:06:03,919
up that will be taking our deep space

149
00:06:09,110 --> 00:06:06,960
com unit so we'll be practicing it and

150
00:06:12,070 --> 00:06:09,120
in our deep space area so

151
00:06:14,629 --> 00:06:12,080
it is going to be like an exciting next

152
00:06:16,230 --> 00:06:14,639
year of calm and and checking the system

153
00:06:17,909 --> 00:06:16,240
out but we need to get the system

154
00:06:19,830 --> 00:06:17,919
checked out before we do our moon

155
00:06:22,629 --> 00:06:19,840
missions right and laser communications

156
00:06:24,070 --> 00:06:22,639
wouldn't completely um go in place of

157
00:06:26,070 --> 00:06:24,080
radio right this would supplement our

158
00:06:27,990 --> 00:06:26,080
radio communications absolutely but it's

159
00:06:30,230 --> 00:06:28,000
going to be a workhorse for us when you

160
00:06:33,110 --> 00:06:30,240
see what we need to be able to have calm

161
00:06:35,510 --> 00:06:33,120
for human systems it's it's it's a big

162
00:06:37,430 --> 00:06:35,520
deal right one of my favorite analogies

163
00:06:39,350 --> 00:06:37,440

of how this system improved you you

164
00:06:40,870 --> 00:06:39,360
talked about a few things but you know

165
00:06:42,870 --> 00:06:40,880
for those of us that have been working

166
00:06:45,990 --> 00:06:42,880
at home during covid this is the

167
00:06:48,629 --> 00:06:46,000
difference between dial-up com and you

168
00:06:50,629 --> 00:06:48,639
know high-speed internet so i know when

169
00:06:53,350 --> 00:06:50,639
my internet starts going down i'm in big

170
00:06:54,950 --> 00:06:53,360
trouble in my workplace so this is this

171
00:06:56,230 --> 00:06:54,960
is going to be an important system for

172
00:06:58,070 --> 00:06:56,240
us yeah well we don't want nasa's

173
00:07:00,469 --> 00:06:58,080
internet to go down right no we do not

174
00:07:01,990 --> 00:07:00,479
want nasa it's not it's moon internet

175
00:07:03,749 --> 00:07:02,000
right kathy thank you so much i really

176
00:07:05,909 --> 00:07:03,759
appreciate you being here today thank

177
00:07:08,150 --> 00:07:05,919
you all right so getting more data back

178
00:07:09,990 --> 00:07:08,160
faster is of course a plus but there are

179
00:07:15,430 --> 00:07:10,000
other benefits to laser communications

180
00:07:21,270 --> 00:07:19,110
since 1958 nasa has relied on radio wave

181
00:07:23,029 --> 00:07:21,280
technology to talk with missions in

182
00:07:25,029 --> 00:07:23,039
space

183
00:07:28,230 --> 00:07:25,039
today we're developing a better way to

184
00:07:29,990 --> 00:07:28,240
get spacecraft data back to earth

185
00:07:31,589 --> 00:07:30,000
that's where the laser communications

186
00:07:34,469 --> 00:07:31,599
relay demonstration

187
00:07:36,390 --> 00:07:34,479
or lcrd comes in

188
00:07:37,990 --> 00:07:36,400

built and managed by nasa's goddard

189
00:07:40,710 --> 00:07:38,000
space flight center

190
00:07:43,670 --> 00:07:40,720
lcrd will send and receive near-infrared

191
00:07:46,390 --> 00:07:43,680
laser beams to and from earth

192
00:07:48,790 --> 00:07:46,400
as nasa's first long-duration test of

193
00:07:50,629 --> 00:07:48,800
optical communications technology the

194
00:07:52,610 --> 00:07:50,639
mission aims to perfect space and

195
00:07:54,150 --> 00:07:52,620
ground-based technologies

196
00:07:56,150 --> 00:07:54,160
[Music]

197
00:07:58,309 --> 00:07:56,160
so why lasers

198
00:08:00,950 --> 00:07:58,319
laser communications can transmit up to

199
00:08:02,790 --> 00:08:00,960
100 times more data per second than

200
00:08:05,029 --> 00:08:02,800
previous systems by using a shorter

201
00:08:07,189 --> 00:08:05,039
wavelength of energy

202
00:08:09,990 --> 00:08:07,199
with this increased bandwidth missions

203
00:08:12,710 --> 00:08:10,000
can send larger files and even live high

204
00:08:15,189 --> 00:08:12,720
definition video from space

205
00:08:16,790 --> 00:08:15,199
laser communication systems are smaller

206
00:08:18,869 --> 00:08:16,800
and more efficient than radio wave

207
00:08:20,790 --> 00:08:18,879
technology they leave more room for

208
00:08:23,029 --> 00:08:20,800
science instruments are cheaper to

209
00:08:25,430 --> 00:08:23,039
launch and require less energy on board

210
00:08:27,589 --> 00:08:25,440
the spacecraft

211
00:08:29,110 --> 00:08:27,599
these benefits extend to receivers on

212
00:08:30,710 --> 00:08:29,120
the ground

213
00:08:33,190 --> 00:08:30,720

earth-based laser communication

214
00:08:36,310 --> 00:08:33,200
receivers can be up to 44 times smaller

215
00:08:38,709 --> 00:08:36,320
than the current radio antennas

216
00:08:40,389 --> 00:08:38,719
lcrd is the next step in making these

217
00:08:42,310 --> 00:08:40,399
technologies a reality

218
00:08:45,590 --> 00:08:42,320
helping nasa to push the boundaries of

219
00:08:47,829 --> 00:08:45,600
scientific discovery and exploration

220
00:08:50,230 --> 00:08:47,839
eventually nasa will integrate this

221
00:09:00,150 --> 00:08:50,240
technology into future missions as well

222
00:09:03,750 --> 00:09:01,829
all right we're now about 25 minutes

223
00:09:06,230 --> 00:09:03,760
away from launch joining me now is glenn

224
00:09:08,790 --> 00:09:06,240
jackson he's the one leading the lcrd

225
00:09:10,310 --> 00:09:08,800
team how are you glenn very exciting

226
00:09:12,070 --> 00:09:10,320
it's very hard when you have two two

227
00:09:13,430 --> 00:09:12,080
first names you know what i mean

228
00:09:15,030 --> 00:09:13,440
um so how long have you been working on

229
00:09:16,949 --> 00:09:15,040
some of these years yeah it's been a

230
00:09:17,990 --> 00:09:16,959
long time in the making yeah yeah and

231
00:09:19,430 --> 00:09:18,000
thank you so much for bringing these

232
00:09:21,509 --> 00:09:19,440
models i think this will really help to

233
00:09:22,870 --> 00:09:21,519
demonstrate to our viewers what lcrd so

234
00:09:25,590 --> 00:09:22,880
can you walk me through this oh

235
00:09:28,870 --> 00:09:25,600
certainly so on the left here i have the

236
00:09:30,630 --> 00:09:28,880
whole sat6 spacecraft lcrd is this part

237
00:09:33,750 --> 00:09:30,640
of the spacecraft it's about the size of

238
00:09:35,430 --> 00:09:33,760

a king-sized bed it has two optical

239
00:09:37,509 --> 00:09:35,440
modules they're basically telescopes

240
00:09:39,590 --> 00:09:37,519
that look down to the earth and look at

241
00:09:42,630 --> 00:09:39,600
our two ground stations in hawaii in

242
00:09:45,910 --> 00:09:42,640
california so this is tenth scale but

243
00:09:47,269 --> 00:09:45,920
this is a full scale optical module this

244
00:09:49,030 --> 00:09:47,279
is the telescope that will do

245
00:09:51,190 --> 00:09:49,040
bi-directional communication so the

246
00:09:53,430 --> 00:09:51,200
lasers come into this telescope and will

247
00:09:55,190 --> 00:09:53,440
be going to the earth and coming back

248
00:09:57,670 --> 00:09:55,200
right now it's in the launch latch

249
00:10:00,070 --> 00:09:57,680
position so over on the rocket right now

250
00:10:03,269 --> 00:10:00,080
it is launched ready to fly

251
00:10:04,870 --> 00:10:03,279
once we fly and reach geo-orbit that

252
00:10:06,949 --> 00:10:04,880
latch will release

253
00:10:09,269 --> 00:10:06,959
we will slew over and there's the

254
00:10:12,790 --> 00:10:09,279
telescope the telescopes can now

255
00:10:13,990 --> 00:10:12,800
look at california or hawaii also later

256
00:10:15,269 --> 00:10:14,000
on the mission will be looking at

257
00:10:17,190 --> 00:10:15,279
illumity

258
00:10:19,829 --> 00:10:17,200
on the international space station so we

259
00:10:21,590 --> 00:10:19,839
can slew left and right right up and

260
00:10:23,990 --> 00:10:21,600
down and track the space station and

261
00:10:25,910 --> 00:10:24,000
again this is a full-size model of what

262
00:10:27,670 --> 00:10:25,920
we see here right that is correct okay

263
00:10:29,670 --> 00:10:27,680

this is full scale and this is where

264
00:10:32,230 --> 00:10:29,680
this is where the lasers will actually

265
00:10:34,550 --> 00:10:32,240
come to in and out of right exactly it's

266
00:10:36,389 --> 00:10:34,560
bi-directional and by that i mean we can

267
00:10:38,310 --> 00:10:36,399
communicate with the lasers in and out

268
00:10:40,310 --> 00:10:38,320
of the same telescope through the

269
00:10:42,630 --> 00:10:40,320
earth's atmosphere this is very unique

270
00:10:44,630 --> 00:10:42,640
for lcrd right and again the lasers are

271
00:10:46,389 --> 00:10:44,640
invisible but we're talking about uh the

272
00:10:48,550 --> 00:10:46,399
diameter of what we see here yes this is

273
00:10:51,190 --> 00:10:48,560
10 centimeter diameter and this will be

274
00:10:55,190 --> 00:10:51,200
going 22 000 miles through the earth's

275
00:10:56,150 --> 00:10:55,200
atmosphere to jpl's octal lab and to

276
00:10:57,430 --> 00:10:56,160
hawaii

277
00:10:59,350 --> 00:10:57,440
and do you think this could be a game

278
00:11:01,190 --> 00:10:59,360
changer for how we do business

279
00:11:03,430 --> 00:11:01,200
definitely a game changer so it's a game

280
00:11:05,750 --> 00:11:03,440
changer for exploration in science

281
00:11:07,829 --> 00:11:05,760
optical com has the potential to reduce

282
00:11:10,870 --> 00:11:07,839
the weight of communication systems

283
00:11:13,430 --> 00:11:10,880
decrease the power use and we get 10 to

284
00:11:15,750 --> 00:11:13,440
100 times the bandwidth capability

285
00:11:17,590 --> 00:11:15,760
that's a huge game changer for those

286
00:11:19,030 --> 00:11:17,600
people planning missions and getting

287
00:11:21,269 --> 00:11:19,040
ready for a

288
00:11:23,110 --> 00:11:21,279

presence at the moon and exploring mars

289
00:11:24,710 --> 00:11:23,120
wow how hard was it to come up with

290
00:11:26,310 --> 00:11:24,720
something like this again to move us

291
00:11:28,949 --> 00:11:26,320
from radio communications to hopefully a

292
00:11:30,790 --> 00:11:28,959
laser community it is a lot of hard work

293
00:11:32,710 --> 00:11:30,800
we have an amazing team great

294
00:11:35,269 --> 00:11:32,720
partnership with lincoln laboratory and

295
00:11:37,190 --> 00:11:35,279
a technology transfer activity uh the

296
00:11:39,030 --> 00:11:37,200
team has been working for about a decade

297
00:11:40,550 --> 00:11:39,040
on this we're very excited tonight to

298
00:11:42,870 --> 00:11:40,560
start the mission oh perfect and you

299
00:11:44,069 --> 00:11:42,880
know kathy alluded to to um you know to

300
00:11:46,150 --> 00:11:44,079
think of this as kind of like our

301
00:11:47,910 --> 00:11:46,160
internet at home but i do want to know

302
00:11:49,910 --> 00:11:47,920
will this technology

303
00:11:51,750 --> 00:11:49,920
benefit us here on earth sitting at home

304
00:11:53,670 --> 00:11:51,760
that's a good question so over the next

305
00:11:55,269 --> 00:11:53,680
two years we're going to do experiments

306
00:11:57,509 --> 00:11:55,279
when we do those experiments we're going

307
00:11:59,430 --> 00:11:57,519
to try different operational techniques

308
00:12:01,509 --> 00:11:59,440
we're going to operate through the

309
00:12:03,350 --> 00:12:01,519
atmosphere we're also going to do

310
00:12:05,030 --> 00:12:03,360
pointing acquisition and tracking so

311
00:12:08,069 --> 00:12:05,040
basically pointing a laser beam through

312
00:12:09,430 --> 00:12:08,079
the atmosphere over 22 000 kilometers 22

313
00:12:12,470 --> 00:12:09,440

000 miles

314
00:12:14,389 --> 00:12:12,480
all of that data will inform future nasa

315
00:12:15,910 --> 00:12:14,399
and commercial

316
00:12:17,750 --> 00:12:15,920
missions coming up for optical

317
00:12:20,389 --> 00:12:17,760
communication now

318
00:12:22,870 --> 00:12:20,399
greater communication bandwidth benefits

319
00:12:24,310 --> 00:12:22,880
business and the public yeah absolutely

320
00:12:25,910 --> 00:12:24,320
no i'm so excited for you again you've

321
00:12:27,430 --> 00:12:25,920
been working on this for seven years you

322
00:12:29,750 --> 00:12:27,440
know i'm sure this is a labor of love

323
00:12:31,750 --> 00:12:29,760
coming to fruition today so i know

324
00:12:33,910 --> 00:12:31,760
you'll have your eyes to the sky as lcrd

325
00:12:36,629 --> 00:12:33,920
launches today thank you much thank you

326
00:12:38,150 --> 00:12:36,639
so much glenn all right so

327
00:12:39,910 --> 00:12:38,160
after the experimental phase you kind of

328
00:12:42,629 --> 00:12:39,920
heard glenn talk about it lcrd will

329
00:12:44,710 --> 00:12:42,639
begin supporting in-space missions in

330
00:12:46,150 --> 00:12:44,720
2023 there will be a laser

331
00:12:48,230 --> 00:12:46,160
communications terminal on the

332
00:12:49,670 --> 00:12:48,240
international space station called

333
00:12:51,829 --> 00:12:49,680
illuma t

334
00:12:53,910 --> 00:12:51,839
aluma t will conduct data or will

335
00:12:55,269 --> 00:12:53,920
collect data i'm sorry from science

336
00:12:57,509 --> 00:12:55,279
experiments aboard the orbiting

337
00:12:59,990 --> 00:12:57,519
laboratory and then transmit that data

338
00:13:01,430 --> 00:13:00,000

to lcrd which will then send that data

339
00:13:03,829 --> 00:13:01,440
to one of the two ground stations we

340
00:13:05,670 --> 00:13:03,839
talked about for research on earth to

341
00:13:08,230 --> 00:13:05,680
begin studying

342
00:13:09,590 --> 00:13:08,240
and now with only about 20 minutes left

343
00:13:11,670 --> 00:13:09,600
to launch we are going to kick it over

344
00:13:14,470 --> 00:13:11,680
to ula to take us through liftoff and

345
00:13:16,710 --> 00:13:14,480
ascent of the stp-3 mission carrying

346
00:13:19,070 --> 00:13:16,720
nasa's laser communications relay

347
00:13:29,750 --> 00:13:19,080
demonstration

348
00:13:34,990 --> 00:13:31,990
liftoff of the united launch alliance

349
00:13:40,550 --> 00:13:35,000
atlas v rocket

350
00:13:44,710 --> 00:13:42,629
good morning i'm andrea linhoff i'm a

351
00:13:47,350 --> 00:13:44,720
systems engineering lead at ula and your

352
00:13:49,350 --> 00:13:47,360
host for today's atlas v stp 3 launch

353
00:13:51,110 --> 00:13:49,360
for the united states space force

354
00:13:53,430 --> 00:13:51,120
i'm here in mission control at the atlas

355
00:13:56,230 --> 00:13:53,440
space flight operations center at cape

356
00:13:58,069 --> 00:13:56,240
canaveral space force station in florida

357
00:13:59,829 --> 00:13:58,079
welcome to our nasa viewers and those of

358
00:14:02,389 --> 00:13:59,839
you just now tuning in

359
00:14:04,230 --> 00:14:02,399
liftoff is scheduled for 404 am eastern

360
00:14:05,990 --> 00:14:04,240
time though we do have a two-hour launch

361
00:14:07,910 --> 00:14:06,000
window available today

362
00:14:09,990 --> 00:14:07,920
in addition to watching our webcast you

363
00:14:12,230 --> 00:14:10,000

can also follow live mission progress at

364
00:14:13,910 --> 00:14:12,240
ula launch dot com

365
00:14:15,990 --> 00:14:13,920
the countdown is currently in a 30

366
00:14:17,910 --> 00:14:16,000
minute planned hold we have two planned

367
00:14:19,990 --> 00:14:17,920
hold in our seven and a half hour launch

368
00:14:21,910 --> 00:14:20,000
count which give our team additional

369
00:14:23,910 --> 00:14:21,920
time to resolve any issues prior to

370
00:14:25,829 --> 00:14:23,920
entering the terminal count

371
00:14:27,350 --> 00:14:25,839
at this time the team is not working any

372
00:14:29,509 --> 00:14:27,360
issues and we are proceeding towards an

373
00:14:31,269 --> 00:14:29,519
on-time liftoff

374
00:14:33,189 --> 00:14:31,279
stay tuned after liftoff when i'll be

375
00:14:34,710 --> 00:14:33,199
joined by ruacx emma codes to discuss

376
00:14:37,750 --> 00:14:34,720
the first flight of a new payload

377
00:14:39,990 --> 00:14:37,760
fairing in northrop grumman's stp sat6

378
00:14:41,670 --> 00:14:40,000
program director ray crowe

379
00:14:43,670 --> 00:14:41,680
the ascent to orbit is more than seven

380
00:14:46,069 --> 00:14:43,680
hours so we'll wrap up about 15 minutes

381
00:14:49,269 --> 00:14:46,079
after liftoff sending it back to nasa's

382
00:14:53,030 --> 00:14:51,030
the launch team recently received a

383
00:14:55,509 --> 00:14:53,040
final weather briefing here's space

384
00:14:58,150 --> 00:14:55,519
launch delta 45 weather officer brian

385
00:14:59,990 --> 00:14:58,160
sisik to give us the forecast thanks

386
00:15:02,550 --> 00:15:00,000
andrea the weather is certainly setting

387
00:15:04,150 --> 00:15:02,560
the stage for a beautiful early morning

388
00:15:05,990 --> 00:15:04,160

launch here from cape canaveral that's

389
00:15:08,069 --> 00:15:06,000
all thanks to the fact that we're really

390
00:15:10,550 --> 00:15:08,079
in between two boundaries one well off

391
00:15:12,389 --> 00:15:10,560
to our east well off the coast and then

392
00:15:13,829 --> 00:15:12,399
a cold front draped to our north but

393
00:15:15,670 --> 00:15:13,839
we're kind of right in the middle of

394
00:15:17,430 --> 00:15:15,680
those as i mentioned really the only

395
00:15:19,350 --> 00:15:17,440
thing we're watching right now just some

396
00:15:21,350 --> 00:15:19,360
high upper level cirrus clouds moving

397
00:15:22,870 --> 00:15:21,360
over and then if you look very closely

398
00:15:24,790 --> 00:15:22,880
you can see this dark area kind of

399
00:15:26,710 --> 00:15:24,800
approaching from the west to the east

400
00:15:28,629 --> 00:15:26,720
and that's an area of fog but that's

401
00:15:31,110 --> 00:15:28,639
expected to stay inland and even if it

402
00:15:33,749 --> 00:15:31,120
did get here really not going to be a

403
00:15:35,269 --> 00:15:33,759
concern for for our launch window so as

404
00:15:37,509 --> 00:15:35,279
you look there's a live look at the pad

405
00:15:39,829 --> 00:15:37,519
right now weather looking great less

406
00:15:41,749 --> 00:15:39,839
than a 10 percent probability of

407
00:15:43,990 --> 00:15:41,759
violation so that's greater than a 90

408
00:15:46,230 --> 00:15:44,000
percent chance of go ground winds 10 to

409
00:15:49,269 --> 00:15:46,240
15 knots from the west northwest

410
00:15:51,829 --> 00:15:49,279
temperature at 65 degrees feeling nice

411
00:15:54,069 --> 00:15:51,839
out here in florida so the stage is set

412
00:15:56,870 --> 00:15:54,079
the weather looking great for to light

413
00:16:00,389 --> 00:15:56,880

up the night sky here at cape canaveral

414
00:16:05,910 --> 00:16:03,269
thanks brian ula is launching stp 3 for

415
00:16:08,069 --> 00:16:05,920
the space forces space systems command

416
00:16:11,350 --> 00:16:08,079
let's learn more from captain ryan burnt

417
00:16:12,629 --> 00:16:11,360
sse's mission integration manager

418
00:16:15,189 --> 00:16:12,639
thanks andrea

419
00:16:16,949 --> 00:16:15,199
space test program number three or scp-3

420
00:16:18,870 --> 00:16:16,959
is comprised of two spacecraft both

421
00:16:20,389 --> 00:16:18,880
built by northrop grumman together the

422
00:16:22,710 --> 00:16:20,399
spacecraft are designed to mature

423
00:16:24,949 --> 00:16:22,720
technology and reduce future space

424
00:16:27,269 --> 00:16:24,959
program risk by advancing warfighting

425
00:16:28,870 --> 00:16:27,279
capabilities in the areas of nuclear

426
00:16:31,269 --> 00:16:28,880
detonation detection

427
00:16:33,350 --> 00:16:31,279
space domain awareness weather and

428
00:16:35,829 --> 00:16:33,360
communication the first spacecraft to

429
00:16:38,069 --> 00:16:35,839
deploy after our long coaster geo stp

430
00:16:40,069 --> 00:16:38,079
sat6 hosts the national nuclear security

431
00:16:42,310 --> 00:16:40,079
administration's space and atmospheric

432
00:16:43,990 --> 00:16:42,320
burst reporting system number three and

433
00:16:46,790 --> 00:16:44,000
nasa's laser communication relay

434
00:16:48,870 --> 00:16:46,800
demonstration experiment or lcrd

435
00:16:50,629 --> 00:16:48,880
lcrd will test laser communications

436
00:16:53,110 --> 00:16:50,639
which could enable the ability to send

437
00:16:55,030 --> 00:16:53,120
and receive data over infrared lasers at

438
00:16:57,030 --> 00:16:55,040

1.2 gigabits per second from

439
00:16:58,710 --> 00:16:57,040
geosynchronous orbit to earth the second

440
00:17:01,269 --> 00:16:58,720
spacecraft to deploy is the long

441
00:17:03,670 --> 00:17:01,279
duration propulsion aspa number one or

442
00:17:05,350 --> 00:17:03,680
ldpe one carrying several small

443
00:17:06,390 --> 00:17:05,360
experimental science and technology

444
00:17:08,309 --> 00:17:06,400
payloads

445
00:17:10,150 --> 00:17:08,319
scp-3 is a vital national security

446
00:17:11,429 --> 00:17:10,160
mission made possible only through

447
00:17:13,429 --> 00:17:11,439
strong government and industry

448
00:17:15,590 --> 00:17:13,439
partnerships i'm honored to have played

449
00:17:17,429 --> 00:17:15,600
a role in bringing it to launch and look

450
00:17:29,190 --> 00:17:17,439
forward to the important work we will

451
00:17:35,909 --> 00:17:32,710
ula's atlas v 551 rocket the largest in

452
00:17:38,230 --> 00:17:35,919
the atlas v fleet is launching stp3

453
00:17:40,789 --> 00:17:38,240
this is the 90th atlas v launch and

454
00:17:43,830 --> 00:17:40,799
ula's 147th launch

455
00:17:46,150 --> 00:17:43,840
built-in ula's 1.6 million square foot

456
00:17:48,310 --> 00:17:46,160
production facility in decatur alabama

457
00:17:51,029 --> 00:17:48,320
the atlas v common core booster is

458
00:17:51,990 --> 00:17:51,039
powered by an npo inergomosh rd-180

459
00:17:54,070 --> 00:17:52,000
engine

460
00:17:56,789 --> 00:17:54,080
the centaur second stage is powered by

461
00:17:58,710 --> 00:17:56,799
an aerojet rocketdyne rl10 engine and

462
00:18:00,630 --> 00:17:58,720
five northrop grumman solid rocket

463
00:18:02,789 --> 00:18:00,640

boosters provide additional thrust at

464
00:18:05,350 --> 00:18:02,799
liftoff the two spacecraft are

465
00:18:07,190 --> 00:18:05,360
encapsulated in a five meter diameter

466
00:18:09,029 --> 00:18:07,200
ruag payload fairing

467
00:18:11,270 --> 00:18:09,039
these rocket components travel from

468
00:18:12,390 --> 00:18:11,280
alabama to cape canaveral on ula's

469
00:18:14,630 --> 00:18:12,400
rocket ship

470
00:18:16,390 --> 00:18:14,640
once in florida a series of events lead

471
00:18:19,110 --> 00:18:16,400
to today's countdown

472
00:18:21,510 --> 00:18:19,120
preparations began by lifting the 107

473
00:18:23,750 --> 00:18:21,520
foot booster onto the mlp in the

474
00:18:26,630 --> 00:18:23,760
vertical integration facility at space

475
00:18:28,870 --> 00:18:26,640
launch complex 41. then the srbs are

476
00:18:31,270 --> 00:18:28,880
mated to the booster next the centaur

477
00:18:33,029 --> 00:18:31,280
was lifted into position and finally the

478
00:18:35,029 --> 00:18:33,039
payload fairing with the spacecraft

479
00:18:36,630 --> 00:18:35,039
already encapsulated was mated to the

480
00:18:38,470 --> 00:18:36,640
atlas v rocket

481
00:18:40,310 --> 00:18:38,480
once the rocket is assembled or as we

482
00:18:42,230 --> 00:18:40,320
like to say stacked we begin the

483
00:18:43,990 --> 00:18:42,240
countdown procedure by moving it from

484
00:18:45,830 --> 00:18:44,000
the vif to the pad

485
00:18:48,230 --> 00:18:45,840
six components are used for the 20

486
00:18:50,470 --> 00:18:48,240
minute third of a mile trip to the pad

487
00:18:52,870 --> 00:18:50,480
the mlp weighs approximately two million

488
00:18:54,789 --> 00:18:52,880

pounds supports the rocket and contains

489
00:18:56,390 --> 00:18:54,799
air conditioning electrical and

490
00:18:57,990 --> 00:18:56,400
commodities lines

491
00:19:00,950 --> 00:18:58,000
undercarriages bear the weight of the

492
00:19:03,110 --> 00:19:00,960
mlp and the rocket two rail cars lead

493
00:19:05,110 --> 00:19:03,120
the move the payload band provides the

494
00:19:07,750 --> 00:19:05,120
spacecraft communication and the ground

495
00:19:09,270 --> 00:19:07,760
band provides the support for the rocket

496
00:19:11,350 --> 00:19:09,280
at the rear of the convoy is an

497
00:19:13,110 --> 00:19:11,360
environmental control system providing

498
00:19:14,230 --> 00:19:13,120
air conditioning to the payload and the

499
00:19:16,630 --> 00:19:14,240
rocket

500
00:19:18,230 --> 00:19:16,640
trackmobiles power the nearly 3 million

501
00:19:21,350 --> 00:19:18,240
pound convoy

502
00:19:23,669 --> 00:19:21,360
the atlas v rocket stands 196 feet or

503
00:19:27,990 --> 00:19:23,679
about 60 meters and weighs just under

504
00:19:30,230 --> 00:19:28,000
1.3 million pounds or more than 587 000

505
00:19:31,830 --> 00:19:30,240
kilograms fully fueled

506
00:19:33,669 --> 00:19:31,840
with the rocket on the pad the launch

507
00:19:43,029 --> 00:19:33,679
team then transitions to fueling and

508
00:19:47,830 --> 00:19:45,909
ula's atlas 5 551 rocket has several

509
00:19:50,070 --> 00:19:47,840
unique features that enable it to take

510
00:19:51,750 --> 00:19:50,080
both stp-3 spacecraft directly to

511
00:19:54,670 --> 00:19:51,760
geosynchronous orbit

512
00:19:57,270 --> 00:19:54,680
let's learn more about today's flight

513
00:20:00,549 --> 00:19:57,280

[Music]

514
00:20:02,870 --> 00:20:00,559
the rd-180 main engine five solid rocket

515
00:20:05,029 --> 00:20:02,880
boosters ignite to lift the atlas v

516
00:20:07,750 --> 00:20:05,039
rocket away from the pad

517
00:20:09,750 --> 00:20:07,760
together the main engine and five srbs

518
00:20:14,789 --> 00:20:09,760
generate a combined liftoff thrust of

519
00:20:16,870 --> 00:20:14,799
2.4 million pounds or 11.5 mega newtons

520
00:20:18,710 --> 00:20:16,880
shortly after liftoff atlas begins a

521
00:20:20,470 --> 00:20:18,720
pitchover to attain the proper flight

522
00:20:22,230 --> 00:20:20,480
path while minimizing the dynamic

523
00:20:23,510 --> 00:20:22,240
pressure the vehicle experiences during

524
00:20:26,070 --> 00:20:23,520
flight

525
00:20:28,470 --> 00:20:26,080
the atlas v reaches mach 1 the speed of

526
00:20:30,710 --> 00:20:28,480
sound at 35 seconds

527
00:20:33,430 --> 00:20:30,720
the first two srbs are jettisoned at one

528
00:20:35,270 --> 00:20:33,440
minute 47 seconds followed nearly two

529
00:20:37,590 --> 00:20:35,280
seconds later by the remaining three

530
00:20:39,590 --> 00:20:37,600
srbs approaching payload fairing

531
00:20:42,149 --> 00:20:39,600
jettison the atlas v is burning

532
00:20:45,029 --> 00:20:42,159
propellant at a rate of 2000 pounds or

533
00:20:48,789 --> 00:20:45,039
907 kilograms per second traveling more

534
00:20:52,470 --> 00:20:48,799
than 7500 miles or 14 000 kilometers per

535
00:20:55,789 --> 00:20:52,480
hour and located 64 miles or 119

536
00:20:59,029 --> 00:20:55,799
kilometers in altitude at 150 miles or

537
00:21:00,870 --> 00:20:59,039
277 kilometers downrange

538
00:21:03,190 --> 00:21:00,880

during ascent the spacecraft is

539
00:21:05,350 --> 00:21:03,200
protected inside a five-meter diameter

540
00:21:07,590 --> 00:21:05,360
payload fairing this two-piece

541
00:21:09,669 --> 00:21:07,600
out-of-autoclave composite shell

542
00:21:12,070 --> 00:21:09,679
encapsulates both the centaur upper

543
00:21:14,230 --> 00:21:12,080
stage and the two spacecraft at

544
00:21:15,830 --> 00:21:14,240
approximately three minutes 30 seconds

545
00:21:17,830 --> 00:21:15,840
when the rocket is climbed above the

546
00:21:20,310 --> 00:21:17,840
densest part of earth's atmosphere the

547
00:21:22,870 --> 00:21:20,320
payload fairing is jettisoned

548
00:21:24,710 --> 00:21:22,880
at four minutes 27 seconds propellant

549
00:21:26,870 --> 00:21:24,720
levels are depleted and the main engine

550
00:21:29,029 --> 00:21:26,880
shuts down

551
00:21:31,110 --> 00:21:29,039
six seconds later the atlas centaur

552
00:21:33,510 --> 00:21:31,120
separation system activates to release

553
00:21:35,350 --> 00:21:33,520
the booster stage the vehicle now weighs

554
00:21:37,669 --> 00:21:35,360
a little more than five percent of what

555
00:21:40,230 --> 00:21:37,679
it did at liftoff

556
00:21:42,710 --> 00:21:40,240
at four minutes 43 seconds the first

557
00:21:45,270 --> 00:21:42,720
centaur main engine burn begins

558
00:21:47,350 --> 00:21:45,280
centaur's rl10 main engine will perform

559
00:21:49,750 --> 00:21:47,360
three burns over nearly six and a half

560
00:21:51,669 --> 00:21:49,760
hours the first two burns each last

561
00:21:53,909 --> 00:21:51,679
approximately six minutes and are used

562
00:21:55,590 --> 00:21:53,919
to circularize centaur's parking orbit

563
00:21:59,510 --> 00:21:55,600

and then move into geosynchronous

564
00:22:04,390 --> 00:22:01,909
at approximately six hours 25 minutes

565
00:22:07,029 --> 00:22:04,400
after liftoff the rl10 ignites for a

566
00:22:08,470 --> 00:22:07,039
final burn this burn enables centaur to

567
00:22:12,549 --> 00:22:08,480
make a plane change to its

568
00:22:16,710 --> 00:22:14,630
two and a half minutes later centaur

569
00:22:19,190 --> 00:22:16,720
completes its final engine cut off

570
00:22:21,430 --> 00:22:19,200
following a guidance commanded shutdown

571
00:22:24,470 --> 00:22:21,440
this capability ensures a very precise

572
00:22:26,870 --> 00:22:24,480
injection lifespan of both spacecraft is

573
00:22:28,950 --> 00:22:26,880
further increased by a centaur provided

574
00:22:30,870 --> 00:22:28,960
in-flight power system which ensures

575
00:22:32,549 --> 00:22:30,880
both spacecraft have fully charged

576
00:22:34,310 --> 00:22:32,559
batteries during the longest sent to

577
00:22:37,750 --> 00:22:34,320
orbit

578
00:22:40,710 --> 00:22:37,760
at 6 hours 30 minutes 15 seconds centaur

579
00:22:42,890 --> 00:22:40,720
releases stp sat6 into geosynchronous

580
00:22:44,310 --> 00:22:42,900
orbit for the space force

581
00:22:46,310 --> 00:22:44,320
[Music]

582
00:22:48,870 --> 00:22:46,320
following an approximately 40 minute

583
00:22:51,590 --> 00:22:48,880
coast centaur releases the space force's

584
00:23:15,510 --> 00:22:51,600
ldpe one completing the longest mission

585
00:23:19,190 --> 00:23:17,669
this is atlas mission control the hold

586
00:23:21,270 --> 00:23:19,200
will be extended for at least a few

587
00:23:22,710 --> 00:23:21,280
minutes to wait for additional upper

588
00:23:24,470 --> 00:23:22,720

level wind data

589
00:23:42,950 --> 00:23:24,480
a new launch time has not yet been

590
00:23:47,750 --> 00:23:45,029
today's flight is dedicated to ula

591
00:23:50,549 --> 00:23:47,760
employees alex hanson and dean thompson

592
00:23:52,870 --> 00:23:50,559
alex hansen's 25-year career as a ground

593
00:23:55,029 --> 00:23:52,880
electrical engineer included 12 years

594
00:23:57,430 --> 00:23:55,039
with the titan rocket program and 13

595
00:23:59,510 --> 00:23:57,440
years supporting the atlas v program

596
00:24:02,470 --> 00:23:59,520
including activation of space launch

597
00:24:05,909 --> 00:24:02,480
complex 41 for the first atlas v flight

598
00:24:08,310 --> 00:24:05,919
in 2002. alex was a power systems expert

599
00:24:10,310 --> 00:24:08,320
who worked to develop install and test

600
00:24:12,630 --> 00:24:10,320
multiple power supplies which are a

601
00:24:14,549 --> 00:24:12,640
critical part of the pad ground system

602
00:24:16,549 --> 00:24:14,559
alex was also instrumental in the

603
00:24:18,870 --> 00:24:16,559
development of the ground systems used

604
00:24:21,269 --> 00:24:18,880
to roll the atlas 5 to the launch pad

605
00:24:23,269 --> 00:24:21,279
with such significant contributions alex

606
00:24:26,230 --> 00:24:23,279
hansen's legacy is evident with every

607
00:24:28,549 --> 00:24:26,240
role to pad and launch from slick41

608
00:24:30,470 --> 00:24:28,559
dean thompson's more than 30-year career

609
00:24:32,470 --> 00:24:30,480
began at boeing's commercial airplane

610
00:24:34,470 --> 00:24:32,480
division in wichita kansas

611
00:24:37,110 --> 00:24:34,480
he joined boeing's international space

612
00:24:39,190 --> 00:24:37,120
station division in huntsville alabama

613
00:24:41,350 --> 00:24:39,200

followed by a move to ula's decatur

614
00:24:43,350 --> 00:24:41,360
alabama production facility where he was

615
00:24:45,750 --> 00:24:43,360
an electrical engineer serving as the

616
00:24:48,870 --> 00:24:45,760
certified responsible engineer delegate

617
00:24:51,350 --> 00:24:48,880
for delta iv in atlas v avionics dean

618
00:24:53,909 --> 00:24:51,360
had delegations for the boosters upper

619
00:24:56,310 --> 00:24:53,919
stages and payload accommodations which

620
00:24:58,630 --> 00:24:56,320
made him a key part of the decatur team

621
00:25:00,549 --> 00:24:58,640
as a hands-on engineer dean was well

622
00:26:09,750 --> 00:25:00,559
respected by his colleagues and missed

623
00:26:14,070 --> 00:26:11,750
this is atlas mission control a new

624
00:27:24,710 --> 00:26:14,080
launch time has been coordinated for 503

625
00:27:29,430 --> 00:27:26,630
atlas rockets have launched many of the

626
00:27:31,110 --> 00:27:29,440
world's vital space assets let's take a

627
00:27:35,909 --> 00:27:31,120
look at the impressive legacy of the

628
00:27:41,510 --> 00:27:39,350
and the rd-180 engine roars to life and

629
00:27:44,070 --> 00:27:41,520
liftoff with a maiden flight of the

630
00:27:46,789 --> 00:27:44,080
atlas v rocket with a hot bird six

631
00:27:49,350 --> 00:27:46,799
spacecraft on board as the inaugural

632
00:27:52,710 --> 00:27:49,360
flight of the atlas v lifted off on

633
00:27:54,870 --> 00:27:52,720
august 21 2002 it carried with it the

634
00:27:56,789 --> 00:27:54,880
dreams and aspirations of thousands of

635
00:27:59,830 --> 00:27:56,799
rocket pioneers who had laid the

636
00:28:02,149 --> 00:27:59,840
foundation that made it possible atlas 5

637
00:28:03,909 --> 00:28:02,159
continues the atlas legacy of innovation

638
00:28:05,669 --> 00:28:03,919

and accomplishment that has been vital

639
00:28:06,870 --> 00:28:05,679
to our nation for more than half a

640
00:28:08,870 --> 00:28:06,880
century

641
00:28:10,789 --> 00:28:08,880
named after the mighty giant of greek

642
00:28:12,950 --> 00:28:10,799
mythology who carried the world on his

643
00:28:15,750 --> 00:28:12,960
shoulders atlas was conceived as a

644
00:28:17,750 --> 00:28:15,760
weapon and a deterrent but evolved into

645
00:28:19,990 --> 00:28:17,760
a system that pushed the envelope with

646
00:28:23,590 --> 00:28:20,000
trailblazing innovation and steadfast

647
00:28:27,669 --> 00:28:25,909
at the request of the air force charlie

648
00:28:29,510 --> 00:28:27,679
bossert and his san diego-based

649
00:28:31,909 --> 00:28:29,520
engineering team began work on a

650
00:28:33,990 --> 00:28:31,919
demanding set of requirements to design

651
00:28:36,149 --> 00:28:34,000
an intercontinental ballistic missile

652
00:28:41,110 --> 00:28:36,159
capable of delivering a 1500 pound

653
00:28:43,830 --> 00:28:41,120
warhead to a target 5500 miles away

654
00:28:47,269 --> 00:28:43,840
their answer which became known as atlas

655
00:28:49,190 --> 00:28:47,279
was the top national priority in 1955 as

656
00:28:50,460 --> 00:28:49,200
the race with the soviets engulfed the

657
00:28:53,350 --> 00:28:50,470
country

658
00:28:57,190 --> 00:28:53,360
[Music]

659
00:29:00,149 --> 00:28:57,200
on june 11th 1957 the first atlas flight

660
00:29:02,549 --> 00:29:00,159
lifted off from space launch complex 14

661
00:29:05,110 --> 00:29:02,559
in cape canaveral florida

662
00:29:07,510 --> 00:29:05,120
the flight ended 38 seconds later but

663
00:29:09,510 --> 00:29:07,520

bossert's team had taken the first step

664
00:29:11,350 --> 00:29:09,520
and proven the structural integrity of

665
00:29:12,930 --> 00:29:11,360
their innovative pressure stabilized

666
00:29:15,110 --> 00:29:12,940
steel tank

667
00:29:17,110 --> 00:29:15,120
[Music]

668
00:29:19,510 --> 00:29:17,120
complete success for the air force and

669
00:29:23,350 --> 00:29:19,520
bossard's team come just five months

670
00:29:28,520 --> 00:29:23,360
later on december 17 1957.

671
00:29:33,510 --> 00:29:31,430
[Music]

672
00:29:35,269 --> 00:29:33,520
though the soviets had beaten the us to

673
00:29:38,230 --> 00:29:35,279
space with the launch of sputnik in

674
00:29:40,870 --> 00:29:38,240
october 1957 president eisenhower would

675
00:29:43,029 --> 00:29:40,880
counter a year later when atlas 10b

676
00:29:45,880 --> 00:29:43,039
delivered his holiday message of peace

677
00:29:47,750 --> 00:29:45,890
from orbit 180 miles above earth

678
00:29:50,149 --> 00:29:47,760
[Music]

679
00:29:52,149 --> 00:29:50,159
known as project score the orbiting

680
00:29:55,350 --> 00:29:52,159
atlas booster became the world's first

681
00:29:58,230 --> 00:29:55,360
communication satellite

682
00:30:01,590 --> 00:29:58,240
of the united states speaking

683
00:30:04,980 --> 00:30:01,600
through the marvels of scientific events

684
00:30:06,700 --> 00:30:05,550
[Music]

685
00:30:13,470 --> 00:30:06,710
[Applause]

686
00:30:20,310 --> 00:30:17,430
1959 atlas 12d became america's first

687
00:30:23,590 --> 00:30:20,320
operational icbm following launch from

688
00:30:27,110 --> 00:30:23,600

california's vandenberg air force base

689
00:30:30,210 --> 00:30:27,120
in all 350 atlas icbms were built and

690
00:30:32,950 --> 00:30:30,220
stood on operational alert through 1965.

691
00:30:35,029 --> 00:30:32,960
[Music]

692
00:30:37,430 --> 00:30:35,039
the surplus boosters were refurbished

693
00:30:40,149 --> 00:30:37,440
and used by the air force the army the

694
00:30:43,190 --> 00:30:40,159
navy and nasa the last refurbished

695
00:30:45,669 --> 00:30:43,200
booster was launched in 1995.

696
00:30:47,350 --> 00:30:45,679
by the early 1960s the atlas booster had

697
00:30:50,549 --> 00:30:47,360
made the transition from missile to

698
00:30:52,389 --> 00:30:50,559
space launch vehicle in 1962 proved to

699
00:30:54,710 --> 00:30:52,399
be a pivotal year

700
00:30:57,190 --> 00:30:54,720
riding atop an atlas booster in project

701
00:30:59,430 --> 00:30:57,200
mercury's friendship 7 capsule john

702
00:31:05,010 --> 00:30:59,440
glenn became the first american to orbit

703
00:31:11,669 --> 00:31:09,669
[Music]

704
00:31:13,990 --> 00:31:11,679
three additional mercury flights

705
00:31:16,549 --> 00:31:14,000
carrying astronauts scott carpenter

706
00:31:18,389 --> 00:31:16,559
wally shura and gordon cooper set the

707
00:31:22,310 --> 00:31:18,399
stage for the gemini flights and the

708
00:31:27,430 --> 00:31:24,710
later that year atlas scored another

709
00:31:29,669 --> 00:31:27,440
first when atlas 179d

710
00:31:32,070 --> 00:31:29,679
equipped with an agena upper stage

711
00:31:33,990 --> 00:31:32,080
lifted off from space launch complex 12

712
00:31:36,789 --> 00:31:34,000
in cape canaveral

713
00:31:38,789 --> 00:31:36,799

its payload nasa's mariner 2 became the

714
00:31:41,750 --> 00:31:38,799
first successful interplanetary

715
00:31:44,310 --> 00:31:41,760
spacecraft 1962 also marked the debut of

716
00:31:46,549 --> 00:31:44,320
the centaur upper stage the first to

717
00:31:49,029 --> 00:31:46,559
harness the power of liquid hydrogen the

718
00:31:51,750 --> 00:31:49,039
centaur upper stage to this day remains

719
00:31:54,149 --> 00:31:51,760
a hallmark of the atlas system

720
00:31:56,389 --> 00:31:54,159
together with its agina and centaur

721
00:31:58,789 --> 00:31:56,399
upper stages the atlas booster went on

722
00:32:00,630 --> 00:31:58,799
to play a significant role in america's

723
00:32:02,710 --> 00:32:00,640
exploration of the solar system

724
00:32:06,149 --> 00:32:02,720
launching virtually every exploration

725
00:32:07,909 --> 00:32:06,159
mission in the 1960s and 1970s

726
00:32:09,750 --> 00:32:07,919
it was the first spacecraft that was

727
00:32:12,230 --> 00:32:09,760
launched from earth that had enough

728
00:32:15,110 --> 00:32:12,240
energy to escape the entire solar system

729
00:32:17,110 --> 00:32:15,120
during the late 1970s and 1980s atlas

730
00:32:18,549 --> 00:32:17,120
continued to play important roles in the

731
00:32:21,590 --> 00:32:18,559
development of our nation's space

732
00:32:25,269 --> 00:32:23,110
in addition to building our national

733
00:32:27,029 --> 00:32:25,279
security presence in space converted

734
00:32:29,669 --> 00:32:27,039
atlas boosters also launched the air

735
00:32:31,590 --> 00:32:29,679
force's navstar demonstration satellites

736
00:32:34,870 --> 00:32:31,600
leading to the navigation system known

737
00:32:37,430 --> 00:32:34,880
today as gps

738
00:32:38,950 --> 00:32:37,440

in the late 1980s general dynamics saw

739
00:32:40,870 --> 00:32:38,960
an opportunity to bring commercial

740
00:32:45,350 --> 00:32:40,880
payloads back to expendable launch

741
00:32:47,509 --> 00:32:45,360
vehicles and on july 25th 1990 ac69 the

742
00:32:50,149 --> 00:32:47,519
first atlas one ushered in a new

743
00:32:51,909 --> 00:32:50,159
commercial era perhaps

744
00:32:54,950 --> 00:32:51,919
the commercial era brought eight new

745
00:32:59,430 --> 00:32:54,960
atlas configurations over a 14-year span

746
00:33:02,870 --> 00:33:01,110
the commercial program has enabled

747
00:33:05,350 --> 00:33:02,880
breakthroughs in communications

748
00:33:08,230 --> 00:33:05,360
meteorology broadcast technology

749
00:33:11,350 --> 00:33:08,240
navigation and national security

750
00:33:14,230 --> 00:33:11,360
in 1995 development of the atlas 3

751
00:33:16,230 --> 00:33:14,240
vehicle began in a bold move the atlas

752
00:33:20,310 --> 00:33:16,240
booster engine system was replaced with

753
00:33:22,149 --> 00:33:20,320
a powerful rd180 which generates 860 000

754
00:33:24,149 --> 00:33:22,159
pounds of thrust and has throttle

755
00:33:31,430 --> 00:33:24,159
capability resulting in a smoother and

756
00:33:37,590 --> 00:33:33,190
making its debut from space launch

757
00:33:39,509 --> 00:33:37,600
complex 36 on may 24 2000 the atlas 3

758
00:33:42,230 --> 00:33:39,519
provided a substantial performance

759
00:33:44,630 --> 00:33:42,240
improvement over the atlas 2as

760
00:33:47,029 --> 00:33:44,640
reliability was increased by reducing

761
00:33:49,509 --> 00:33:47,039
the number of engines from 8 to 2 and

762
00:33:52,549 --> 00:33:49,519
the elimination of 5 staging events as

763
00:33:54,310 --> 00:33:52,559

well as more than 10 000 parts this is

764
00:33:56,789 --> 00:33:54,320
atlas mission control

765
00:33:58,310 --> 00:33:56,799
in 1998 the atlas team embarked on a

766
00:33:59,990 --> 00:33:58,320
development project for the united

767
00:34:02,630 --> 00:34:00,000
states air force that would forever

768
00:34:06,070 --> 00:34:02,640
change the atlas vehicle and the rd-180

769
00:34:07,909 --> 00:34:06,080
engine roars to life and liftoff with a

770
00:34:10,470 --> 00:34:07,919
maiden flight of the lockheed martin

771
00:34:13,270 --> 00:34:10,480
atlas v rocket with a hot bird six

772
00:34:14,310 --> 00:34:13,280
spacecraft on board for a unison paris

773
00:34:16,790 --> 00:34:14,320
france

774
00:34:18,629 --> 00:34:16,800
for more than 40 years atlas vehicles

775
00:34:20,950 --> 00:34:18,639
had relied on the pressure stabilized

776
00:34:22,069 --> 00:34:20,960
steel tank developed by charlie bossert

777
00:34:23,669 --> 00:34:22,079
and his team

778
00:34:25,589 --> 00:34:23,679
in a departure from conventional

779
00:34:27,349 --> 00:34:25,599
thinking the atlas v development

780
00:34:29,990 --> 00:34:27,359
replaced the tank with a structurally

781
00:34:32,230 --> 00:34:30,000
stable common core booster

782
00:34:34,310 --> 00:34:32,240
in addition to vehicle modifications the

783
00:34:36,869 --> 00:34:34,320
team took a new approach to processing

784
00:34:39,190 --> 00:34:36,879
and launch atlas v processing is done

785
00:34:41,190 --> 00:34:39,200
vertically and the mobile service tower

786
00:34:43,430 --> 00:34:41,200
has been replaced by a mobile launch

787
00:34:45,510 --> 00:34:43,440
platform which carries the entire

788
00:34:48,950 --> 00:34:45,520

assembled vehicle to the launch pad

789
00:34:51,430 --> 00:34:48,960
ready to fuel and launch the atlas v has

790
00:34:53,750 --> 00:34:51,440
expanded to multiple payload fairing and

791
00:34:55,190 --> 00:34:53,760
solid rocket booster configurations as

792
00:34:57,190 --> 00:34:55,200
well as re-establishing a launch

793
00:34:59,270 --> 00:34:57,200
capability from the west coast at

794
00:35:01,910 --> 00:34:59,280
vandenberg air force base

795
00:35:02,700 --> 00:35:01,920
the atlas vehicle has a long legacy of

796
00:35:07,990 --> 00:35:02,710
accomplishment

797
00:35:10,390 --> 00:35:08,000
[Music]

798
00:35:12,710 --> 00:35:10,400
this record of success which is nearly

799
00:35:14,950 --> 00:35:12,720
unparalleled in the launch industry is

800
00:35:17,829 --> 00:35:14,960
built on the lessons handed down for

801
00:35:19,990 --> 00:35:17,839
more than 60 years of atlas experience

802
00:35:22,069 --> 00:35:20,000
it is also a credit for the dedication

803
00:35:24,710 --> 00:35:22,079
and persistence of the atlas team and

804
00:35:27,560 --> 00:35:24,720
their passion for mission success one

805
00:35:42,870 --> 00:35:27,570
launch at a time

806
00:35:46,550 --> 00:35:44,710
this is atlas mission control the

807
00:35:48,069 --> 00:35:46,560
countdown is holding at t minus four

808
00:35:50,310 --> 00:35:48,079
minutes while the launch team awaits

809
00:35:52,550 --> 00:35:50,320
acceptable high altitude wind data for

810
00:35:54,550 --> 00:35:52,560
the atlas v rocket to launch

811
00:35:57,510 --> 00:35:54,560
the range has coordinated and approved a

812
00:35:59,270 --> 00:35:57,520
tentative new launch of 503 am eastern

813
00:38:29,990 --> 00:35:59,280

if the next weather balloon finds

814
00:38:34,710 --> 00:38:32,069
we've created a short tour of our launch

815
00:38:37,190 --> 00:38:34,720
locations here in cape canaveral florida

816
00:38:39,190 --> 00:38:37,200
let's take a look around

817
00:38:41,349 --> 00:38:39,200
with missions launched to every planet

818
00:38:43,829 --> 00:38:41,359
in the solar system as well as critical

819
00:38:46,150 --> 00:38:43,839
national security science weather and

820
00:38:48,150 --> 00:38:46,160
communication satellites ula has

821
00:38:50,630 --> 00:38:48,160
established a long-standing reputation

822
00:38:53,109 --> 00:38:50,640
for reliability and orbit accuracy in

823
00:38:55,109 --> 00:38:53,119
the space launch industry at our launch

824
00:38:57,430 --> 00:38:55,119
site in cape canaveral florida the story

825
00:39:00,310 --> 00:38:57,440
begins with ula's atlas and delta

826
00:39:02,230 --> 00:39:00,320
rockets arriving on the rs rocket ship

827
00:39:04,470 --> 00:39:02,240
the rocket ship is a specially designed

828
00:39:07,030 --> 00:39:04,480
cargo ship used to transport rockets

829
00:39:09,510 --> 00:39:07,040
from ula's 1.6 million square foot

830
00:39:11,589 --> 00:39:09,520
production facility in decatur alabama

831
00:39:14,310 --> 00:39:11,599
rocket ship is large enough to carry a

832
00:39:17,030 --> 00:39:14,320
complete delta iv heavy rocket that's

833
00:39:18,390 --> 00:39:17,040
three boosters a second stage and a

834
00:39:20,790 --> 00:39:18,400
payload fairing

835
00:39:22,870 --> 00:39:20,800
once loaded rocket ship departs ula's

836
00:39:24,870 --> 00:39:22,880
dock and travels to the tennessee river

837
00:39:26,790 --> 00:39:24,880
then onto the ohio and mississippi

838
00:39:29,190 --> 00:39:26,800

rivers then goes out into the gulf of

839
00:39:31,349 --> 00:39:29,200
mexico from there the ship travels to

840
00:39:33,430 --> 00:39:31,359
the atlantic ocean around the southern

841
00:39:35,910 --> 00:39:33,440
tip of florida and north to port

842
00:39:37,750 --> 00:39:35,920
canaveral rocket ship was designed with

843
00:39:39,910 --> 00:39:37,760
several features to ensure successful

844
00:39:41,910 --> 00:39:39,920
delivery including the ability to adjust

845
00:39:43,910 --> 00:39:41,920
its draft for shallow water and

846
00:39:45,109 --> 00:39:43,920
rudderless steering which minimizes the

847
00:39:47,190 --> 00:39:45,119
need to tug

848
00:39:49,190 --> 00:39:47,200
atlas 5 boosters are transported from

849
00:39:51,990 --> 00:39:49,200
the ship to the high bay in the atlas

850
00:39:53,829 --> 00:39:52,000
space flight operations center or asoc

851
00:39:55,670 --> 00:39:53,839
for final preparations

852
00:39:58,310 --> 00:39:55,680
delta iv boosters are moved to the

853
00:40:00,230 --> 00:39:58,320
horizontal integration facility or hif

854
00:40:03,030 --> 00:40:00,240
where they are mated together to form

855
00:40:05,109 --> 00:40:03,040
the delta iv heavy configuration with

856
00:40:07,190 --> 00:40:05,119
final checks completed the boosters are

857
00:40:11,270 --> 00:40:07,200
transported to the launch pad for launch

858
00:40:13,430 --> 00:40:11,280
vehicle on stand or lvos the 107 foot

859
00:40:15,990 --> 00:40:13,440
long atlas 5 boosters are brought to

860
00:40:18,150 --> 00:40:16,000
space launch complex 41 and are hoisted

861
00:40:19,589 --> 00:40:18,160
into a vertical position using a crane

862
00:40:21,990 --> 00:40:19,599
and placed under the mobile launch

863
00:40:24,390 --> 00:40:22,000

platform or mlp in the vertical

864
00:40:26,069 --> 00:40:24,400
integration facility or vif

865
00:40:28,069 --> 00:40:26,079
delta iv heavy rockets are raised

866
00:40:30,790 --> 00:40:28,079
vertically by a fixed pad erector at

867
00:40:33,270 --> 00:40:30,800
space launch complex 37 the fixed pad

868
00:40:36,069 --> 00:40:33,280
erector uses a single hydraulic piston

869
00:40:39,030 --> 00:40:36,079
to rotate the boosters 90 degrees inside

870
00:40:40,950 --> 00:40:39,040
the mobile service tower or mst

871
00:40:42,710 --> 00:40:40,960
elvis is followed by the addition of

872
00:40:44,069 --> 00:40:42,720
solid rocket boosters and then the

873
00:40:47,510 --> 00:40:44,079
second stage

874
00:40:49,670 --> 00:40:47,520
next comes wet dress rehearsal or wdr

875
00:40:51,109 --> 00:40:49,680
which is an end-to-end launch simulation

876
00:40:54,309 --> 00:40:51,119
from fueling through spacecraft

877
00:40:56,870 --> 00:40:54,319
separation meanwhile the ula team is

878
00:40:59,109 --> 00:40:56,880
also working simultaneously to help the

879
00:41:00,950 --> 00:40:59,119
customer encapsulate their payload into

880
00:41:02,870 --> 00:41:00,960
the rockets payload fairing the

881
00:41:05,190 --> 00:41:02,880
encapsulated payload fairing is the

882
00:41:06,950 --> 00:41:05,200
final piece to be mated to the rocket

883
00:41:08,790 --> 00:41:06,960
with the rocket stack complete the

884
00:41:10,630 --> 00:41:08,800
spacecraft team tests all of the

885
00:41:12,630 --> 00:41:10,640
interfaces with the rocket and the

886
00:41:14,950 --> 00:41:12,640
launch pad once the rockets are

887
00:41:15,829 --> 00:41:14,960
completely assembled final launch preps

888
00:41:18,150 --> 00:41:15,839

begin

889
00:41:19,829 --> 00:41:18,160
for atlas 5 rockets launch countdown

890
00:41:22,069 --> 00:41:19,839
begins with moving the rocket from the

891
00:41:23,990 --> 00:41:22,079
vip to the pad the quarter mile trip

892
00:41:26,390 --> 00:41:24,000
uses six components to complete the

893
00:41:28,710 --> 00:41:26,400
20-minute trip weighing in at about two

894
00:41:30,710 --> 00:41:28,720
million pounds the mlp supports the

895
00:41:32,630 --> 00:41:30,720
rocket and contains air conditioning

896
00:41:34,309 --> 00:41:32,640
electrical and commodities while the

897
00:41:37,109 --> 00:41:34,319
undercarriages bear the weight of the

898
00:41:38,950 --> 00:41:37,119
mlp and rocket two rail cars lead the

899
00:41:40,790 --> 00:41:38,960
move with the payload van providing

900
00:41:43,030 --> 00:41:40,800
communication to the payload while the

901
00:41:45,190 --> 00:41:43,040
ground van houses the ground support for

902
00:41:47,030 --> 00:41:45,200
the rocket at the rear of the convoy the

903
00:41:48,950 --> 00:41:47,040
portable environmental control system

904
00:41:51,829 --> 00:41:48,960
provides air conditioning to the payload

905
00:41:55,030 --> 00:41:51,839
and rocket finally trackmobiles provide

906
00:41:56,150 --> 00:41:55,040
the power to move the 3.5 million pound

907
00:41:58,309 --> 00:41:56,160
convoy

908
00:42:00,790 --> 00:41:58,319
for delta iv heavy rockets the process

909
00:42:03,510 --> 00:42:00,800
looks quite different approximately nine

910
00:42:06,069 --> 00:42:03,520
hours before t zero final preparations

911
00:42:09,349 --> 00:42:06,079
begin has 40 hydraulic cylinders and

912
00:42:12,309 --> 00:42:09,359
pressures nearing 3500 psi move the 10

913
00:42:15,109 --> 00:42:12,319

million pound mst its first raised 8

914
00:42:17,349 --> 00:42:15,119
inches and then rolled back delta uses a

915
00:42:19,430 --> 00:42:17,359
carriage transporter system traveling at

916
00:42:22,150 --> 00:42:19,440
about a quarter mile per hour it takes

917
00:42:24,870 --> 00:42:22,160
about 25 minutes to roll the mst to its

918
00:42:27,109 --> 00:42:24,880
launch position 345 feet north of the

919
00:42:31,109 --> 00:42:27,119
delta iv rocket the delta iv rocket

920
00:42:33,750 --> 00:42:31,119
stands 217 feet tall or about 21 stories

921
00:42:36,550 --> 00:42:33,760
and weighs more than 900 000 pounds

922
00:42:38,950 --> 00:42:36,560
fully fueled on the day of launch nearly

923
00:42:41,589 --> 00:42:38,960
30 engineers and managers are polled for

924
00:42:43,510 --> 00:42:41,599
system status and readiness to proceed

925
00:42:45,430 --> 00:42:43,520
status check to proceed with terminal

926
00:42:47,829 --> 00:42:45,440
atlas systems propulsion this is the

927
00:42:50,150 --> 00:42:47,839
final status check before launch for all

928
00:42:52,870 --> 00:42:50,160
atlas and delta vehicle systems ground

929
00:42:55,190 --> 00:42:52,880
systems the spacecraft and the u.s air

930
00:42:56,710 --> 00:42:55,200
force eastern range the vehicle system

931
00:42:59,589 --> 00:42:56,720
readiness pole includes electrical

932
00:43:02,390 --> 00:42:59,599
systems hydraulics pneumatics propulsion

933
00:43:03,829 --> 00:43:02,400
systems flight control and propellant

934
00:43:06,309 --> 00:43:03,839
range coordinator

935
00:43:08,470 --> 00:43:06,319
clear to proceed launch director

936
00:43:09,910 --> 00:43:08,480
launch vehicle is ready to launch

937
00:43:11,510 --> 00:43:09,920
permission director

938
00:43:13,030 --> 00:43:11,520

this is the mission director you have

939
00:43:14,550 --> 00:43:13,040
permission to launch

940
00:43:16,630 --> 00:43:14,560
proceeding with account

941
00:43:18,150 --> 00:43:16,640
if the rocket is ready for flight and

942
00:43:20,470 --> 00:43:18,160
the weather is within the launch commit

943
00:43:22,309 --> 00:43:20,480
criteria then polling will be completed

944
00:43:23,589 --> 00:43:22,319
and the team will have given the go for

945
00:43:25,670 --> 00:43:23,599
launch

946
00:43:26,630 --> 00:43:25,680
t-minus 10

947
00:43:27,670 --> 00:43:26,640
9

948
00:43:28,710 --> 00:43:27,680
8

949
00:43:29,829 --> 00:43:28,720
7

950
00:43:30,870 --> 00:43:29,839
6

951
00:43:31,990 --> 00:43:30,880
5

952
00:43:33,109 --> 00:43:32,000
4

953
00:43:33,990 --> 00:43:33,119
3

954
00:43:34,710 --> 00:43:34,000
2

955
00:43:37,990 --> 00:43:34,720
1

956
00:43:42,470 --> 00:43:40,230
and liftoff of the united launch

957
00:43:44,870 --> 00:43:42,480
alliance atlas v rocket for a typical

958
00:43:46,630 --> 00:43:44,880
atlas v flight the main engine and solid

959
00:43:48,069 --> 00:43:46,640
rocket boosters ignite to lift the

960
00:43:50,069 --> 00:43:48,079
rocket off the pad

961
00:43:52,069 --> 00:43:50,079
shortly after liftoff the rocket begins

962
00:43:54,150 --> 00:43:52,079
a pitchover to attain the proper flight

963
00:43:56,390 --> 00:43:54,160

path minimizing the dynamic pressure the

964
00:43:57,990 --> 00:43:56,400
vehicle experiences during flight within

965
00:44:00,230 --> 00:43:58,000
the first few minutes of flight the

966
00:44:02,390 --> 00:44:00,240
vehicle reaches mach 1 the speed of

967
00:44:04,950 --> 00:44:02,400
sound followed by jettison of the solid

968
00:44:06,470 --> 00:44:04,960
rocket boosters about four minutes later

969
00:44:08,710 --> 00:44:06,480
propellant levels deplete and the

970
00:44:11,109 --> 00:44:08,720
booster engine shuts down followed by

971
00:44:13,349 --> 00:44:11,119
release of the booster stage at various

972
00:44:15,030 --> 00:44:13,359
times in flight depending on the mission

973
00:44:17,670 --> 00:44:15,040
the vehicle jettisons its payload

974
00:44:19,589 --> 00:44:17,680
fairing from there the second stage will

975
00:44:21,750 --> 00:44:19,599
continue carrying the spacecraft towards

976
00:44:24,710 --> 00:44:21,760
its destination with planned engine

977
00:44:26,710 --> 00:44:24,720
starts and stops finally centaur will

978
00:45:51,109 --> 00:44:26,720
release the spacecraft in its target

979
00:45:54,710 --> 00:45:52,790
this is atlas mission control the

980
00:45:55,990 --> 00:45:54,720
countdown is still holding at t minus

981
00:45:57,990 --> 00:45:56,000
four minutes while the launch team

982
00:45:59,270 --> 00:45:58,000
awaits acceptable high altitude wind

983
00:46:00,870 --> 00:45:59,280
data

984
00:46:02,710 --> 00:46:00,880
a series of balloons have been sent

985
00:46:04,470 --> 00:46:02,720
aloft over the course of the countdown

986
00:46:06,390 --> 00:46:04,480
to measure the speed and direction of

987
00:46:08,550 --> 00:46:06,400
upper-level winds that the atlas 5 will

988
00:46:10,470 --> 00:46:08,560

experience during flight

989
00:46:12,309 --> 00:46:10,480
that data is then assessed to verify

990
00:46:14,309 --> 00:46:12,319
conditions are within the structural and

991
00:47:42,549 --> 00:46:14,319
controllability limits of the launch

992
00:47:46,549 --> 00:47:45,030
let's see in line yo

993
00:49:01,750 --> 00:47:46,559
uh i see you're on

994
00:49:07,190 --> 00:49:04,950
in october ula's atlas 5 rocket launched

995
00:49:09,510 --> 00:49:07,200
nasa's lucy on its long journey to

996
00:49:11,349 --> 00:49:09,520
jupiter's trojan asteroids

997
00:49:16,950 --> 00:49:11,359
let's take another look at that historic

998
00:49:22,230 --> 00:49:19,670
we are so excited to have been selected

999
00:49:24,470 --> 00:49:22,240
to fly this new sea mission it is

1000
00:49:26,870 --> 00:49:24,480
humbling to be entrusted with something

1001
00:49:29,030 --> 00:49:26,880
like this that is going to shed new

1002
00:49:31,829 --> 00:49:29,040
light on the origins of our solar system

1003
00:49:34,390 --> 00:49:31,839
by visiting primordial material gathered

1004
00:49:38,390 --> 00:49:34,400
by the lagrange points of jupiter

1005
00:49:40,870 --> 00:49:38,400
as it formed the early solar system

1006
00:49:43,430 --> 00:49:40,880
this is so exciting for us our team has

1007
00:49:45,750 --> 00:49:43,440
worked so hard we are honored to work

1008
00:49:49,670 --> 00:49:45,760
with the brilliant people at nasa who

1009
00:49:55,270 --> 00:49:52,470
we're starting a 12-year journey of this

1010
00:49:58,710 --> 00:49:55,280
amazing spacecraft really eight missions

1011
00:50:02,630 --> 00:49:59,670
for me

1012
00:50:04,870 --> 00:50:02,640
as we are watching this i think of the

1013
00:50:07,270 --> 00:50:04,880

amazing team that brought it together on

1014
00:50:08,950 --> 00:50:07,280
the rocket it says lucy strong for me

1015
00:50:10,470 --> 00:50:08,960
that's the battle cry that brought the

1016
00:50:12,270 --> 00:50:10,480
team together

1017
00:50:15,510 --> 00:50:12,280
congratulations to everybody

1018
00:50:18,870 --> 00:50:15,520
[Music]

1019
00:50:19,910 --> 00:50:18,880
go atlas go centaur go lucy

1020
00:50:20,950 --> 00:50:19,920
three

1021
00:50:21,750 --> 00:50:20,960
two

1022
00:50:24,829 --> 00:50:21,760
one

1023
00:50:41,900 --> 00:50:27,670
liftoff 5 takes flight sending lucy to

1024
00:50:53,109 --> 00:50:47,580
[Music]

1025
00:50:53,119 --> 00:50:56,650
has become the pitch

1026
00:51:00,630 --> 00:50:59,109
[Music]

1027
00:51:03,800 --> 00:51:00,640
we have indication of successful

1028
00:52:40,790 --> 00:51:03,810
separation of the lucy spacecraft

1029
00:52:40,800 --> 00:57:07,910
l minus 40 minutes

1030
00:57:11,670 --> 00:57:09,750
this is atlas mission control the

1031
00:57:13,030 --> 00:57:11,680
countdown is still holding at t minus

1032
00:57:15,589 --> 00:57:13,040
four minutes while the launch team

1033
00:57:17,430 --> 00:57:15,599
awaits high altitude wind data

1034
00:57:19,349 --> 00:57:17,440
today's available launch window which is

1035
00:57:21,990 --> 00:57:19,359
determined by orbital requirements of

1036
00:57:24,950 --> 00:57:22,000
the stp-3 payloads remains open through

1037
00:57:26,710 --> 00:57:24,960
604 am eastern time for the atlas v

1038
00:57:29,030 --> 00:57:26,720

rocket to launch from cape canaveral

1039
00:57:30,710 --> 00:57:29,040
space force station in florida

1040
00:57:32,710 --> 00:57:30,720
at the present time the launch team is

1041
00:57:34,390 --> 00:57:32,720
postured to resume the countdown for a

1042
00:59:44,230 --> 00:57:34,400
launch in the middle of the window at

1043
00:59:48,230 --> 00:59:46,549
the ula team continues to make progress

1044
00:59:52,549 --> 00:59:48,240
on development of our vulcan centaur

1045
00:59:57,190 --> 00:59:54,710
vulcan centaur production begins with

1046
00:59:58,870 --> 00:59:57,200
aluminum sheets expertly machined to

1047
01:00:00,789 --> 00:59:58,880
remove more than two-thirds of the

1048
01:00:03,510 --> 01:00:00,799
weight resulting in the structurally

1049
01:00:08,549 --> 01:00:03,520
strong yet lightweight ortho grid panels

1050
01:00:12,470 --> 01:00:10,789
the panels are then bump pressed to form

1051
01:00:13,430 --> 01:00:12,480
the curves required to complete the

1052
01:00:15,750 --> 01:00:13,440
tanks

1053
01:00:17,190 --> 01:00:15,760
at the same time rings adapters and

1054
01:00:18,870 --> 01:00:17,200
other structural components are

1055
01:00:21,430 --> 01:00:18,880
precision milled

1056
01:00:23,270 --> 01:00:21,440
next the aluminum domes panels and other

1057
01:00:25,750 --> 01:00:23,280
structures that form vulcan's propellant

1058
01:00:28,470 --> 01:00:25,760
tanks are first cleaned and etched to a

1059
01:00:31,030 --> 01:00:28,480
smooth even surface and then anodized to

1060
01:00:33,589 --> 01:00:31,040
harden and prevent corrosion

1061
01:00:35,270 --> 01:00:33,599
following an ultrasonic inspection five

1062
01:00:38,390 --> 01:00:35,280
completed panels for the liquefied

1063
01:00:40,710 --> 01:00:38,400

natural gas or lng tank are assembled

1064
01:00:43,270 --> 01:00:40,720
and joined together using friction stir

1065
01:00:44,789 --> 01:00:43,280
welding unlike traditional welding where

1066
01:00:47,430 --> 01:00:44,799
filler material is used to join

1067
01:00:49,510 --> 01:00:47,440
components friction stir welding uses a

1068
01:00:51,910 --> 01:00:49,520
head to stir the metal of the two panels

1069
01:00:54,390 --> 01:00:51,920
together as it moves down the seam the

1070
01:00:57,430 --> 01:00:54,400
resulting joint is stronger and produces

1071
01:00:59,430 --> 01:00:57,440
a lighter weight higher performing tank

1072
01:01:02,309 --> 01:00:59,440
the process is repeated to create the

1073
01:01:05,109 --> 01:01:02,319
liquid oxygen or lox tank followed by

1074
01:01:07,349 --> 01:01:05,119
attaching domes to complete the tanks

1075
01:01:09,270 --> 01:01:07,359
circumferential friction stir welding is

1076
01:01:13,109 --> 01:01:09,280
then used to join the two propellant

1077
01:01:15,030 --> 01:01:13,119
tanks that comprise the vulcan booster

1078
01:01:17,510 --> 01:01:15,040
as production continues on the booster

1079
01:01:19,270 --> 01:01:17,520
stage stretch forming gore panels for

1080
01:01:20,950 --> 01:01:19,280
the centaur's second stage propellant

1081
01:01:22,789 --> 01:01:20,960
tanks is underway

1082
01:01:24,630 --> 01:01:22,799
the stainless steel gore panels are

1083
01:01:27,109 --> 01:01:24,640
welded together to create the propellant

1084
01:01:28,870 --> 01:01:27,119
tank domes the gore welder is one of

1085
01:01:30,390 --> 01:01:28,880
several highly specialized welding

1086
01:01:31,430 --> 01:01:30,400
stations in the centaur production

1087
01:01:34,309 --> 01:01:31,440
process

1088
01:01:36,470 --> 01:01:34,319

just down the aisle centaur 5's massive

1089
01:01:39,109 --> 01:01:36,480
intermediate bulkhead is mated to its

1090
01:01:41,270 --> 01:01:39,119
ultra thin tank once both propellant

1091
01:01:45,750 --> 01:01:41,280
tanks are welded they're mated together

1092
01:01:50,390 --> 01:01:47,910
once the propellant tanks are joined the

1093
01:01:52,230 --> 01:01:50,400
5.4 meter booster is sprayed with foam

1094
01:01:53,270 --> 01:01:52,240
insulation before moving to final

1095
01:01:56,069 --> 01:01:53,280
assembly

1096
01:01:58,390 --> 01:01:56,079
twin ve-4 engines are hot fired and then

1097
01:02:00,309 --> 01:01:58,400
mated to vulcan's thrust structure

1098
01:02:02,789 --> 01:02:00,319
with production complete the booster

1099
01:02:06,549 --> 01:02:02,799
makes its way onto ula's rocket ship for

1100
01:02:08,630 --> 01:02:06,559
its journey to the launch site

1101
01:02:11,349 --> 01:02:08,640
meanwhile at cape canaveral space launch

1102
01:02:13,510 --> 01:02:11,359
complex 41 the water suppression system

1103
01:02:15,990 --> 01:02:13,520
has been upgraded and tested along with

1104
01:02:17,589 --> 01:02:16,000
other modifications including new larger

1105
01:02:19,670 --> 01:02:17,599
fuel storage tanks

1106
01:02:21,910 --> 01:02:19,680
in the vertical integration facility or

1107
01:02:24,950 --> 01:02:21,920
vif platforms have been modified to

1108
01:02:26,549 --> 01:02:24,960
accommodate the larger vulcan rocket

1109
01:02:28,710 --> 01:02:26,559
following the eight day journey to cape

1110
01:02:30,390 --> 01:02:28,720
canaveral the booster is offloaded and

1111
01:02:32,630 --> 01:02:30,400
transported to the vip where it is

1112
01:02:35,109 --> 01:02:32,640
lifted onto the newly constructed vulcan

1113
01:02:37,510 --> 01:02:35,119

launch platform or vlp

1114
01:02:39,670 --> 01:02:37,520
the first vulcan booster then travels a

1115
01:02:42,069 --> 01:02:39,680
third of a mile to the pad for testing

1116
01:02:44,230 --> 01:02:42,079
followed by 2.7 miles to the space

1117
01:02:47,270 --> 01:02:44,240
flight processing operations center or

1118
01:02:49,190 --> 01:02:47,280
spock for additional testing

1119
01:02:51,430 --> 01:02:49,200
this launch site testing culminates with

1120
01:02:53,589 --> 01:02:51,440
another trip to the pad where the locks

1121
01:06:43,990 --> 01:02:53,599
and lng tanks will be filled and chilled

1122
01:06:44,000 --> 01:06:47,430
lc ld channel gentlemen

1123
01:06:51,029 --> 01:06:48,789
go audi

1124
01:06:53,430 --> 01:06:51,039
roger please load our contingency

1125
01:06:56,230 --> 01:06:53,440
address file

1126
01:06:58,630 --> 01:06:56,240
roger and do you have to file them

1127
01:07:01,430 --> 01:06:58,640
writer server file number is zero six

1128
01:07:05,029 --> 01:07:01,440
roger that

1129
01:07:06,870 --> 01:07:05,039
flight control lc that one

1130
01:07:09,829 --> 01:07:06,880
you had the select tool

1131
01:07:13,750 --> 01:07:09,839
for operation 6d step 220

1132
01:07:15,349 --> 01:07:13,760
load contingency file adjust av093

1133
01:07:40,549 --> 01:07:15,359
underscore zero six

1134
01:07:40,559 --> 01:07:50,470
l minus 25 minutes

1135
01:07:54,230 --> 01:07:52,309
this is atlas mission control the

1136
01:07:55,430 --> 01:07:54,240
countdown is still holding at t minus

1137
01:07:57,670 --> 01:07:55,440
four minutes while the launch team

1138
01:07:59,430 --> 01:07:57,680

awaits high altitude wind data

1139
01:08:03,190 --> 01:07:59,440
we are proceeding towards the new launch

1140
01:08:05,190 --> 01:08:03,200
time of 503 a.m eastern

1141
01:08:06,870 --> 01:08:05,200
on board the atlas v rocket there are

1142
01:08:08,870 --> 01:08:06,880
several payloads including nasa

1143
01:08:11,510 --> 01:08:08,880
technology that could revolutionize how

1144
01:08:13,910 --> 01:08:11,520
we communicate to and from space

1145
01:08:16,309 --> 01:08:13,920
here's more on nasa's nasa's laser

1146
01:08:21,189 --> 01:08:16,319
communications relay demonstration or

1147
01:08:27,030 --> 01:08:24,870
since 1958 nasa has relied on radio wave

1148
01:08:28,789 --> 01:08:27,040
technology to talk with missions in

1149
01:08:30,789 --> 01:08:28,799
space

1150
01:08:33,990 --> 01:08:30,799
today we're developing a better way to

1151
01:08:35,749 --> 01:08:34,000
get spacecraft data back to earth

1152
01:08:37,349 --> 01:08:35,759
that's where the laser communications

1153
01:08:40,229 --> 01:08:37,359
relay demonstration

1154
01:08:42,149 --> 01:08:40,239
or lcrd comes in

1155
01:08:43,749 --> 01:08:42,159
built and managed by nasa's goddard

1156
01:08:46,470 --> 01:08:43,759
space flight center

1157
01:08:49,349 --> 01:08:46,480
lcrd will send and receive near-infrared

1158
01:08:52,149 --> 01:08:49,359
laser beams to and from earth

1159
01:08:54,550 --> 01:08:52,159
as nasa's first long-duration test of

1160
01:08:56,390 --> 01:08:54,560
optical communications technology the

1161
01:08:58,370 --> 01:08:56,400
mission aims to perfect space and

1162
01:08:59,910 --> 01:08:58,380
ground-based technologies

1163
01:09:01,910 --> 01:08:59,920

[Music]

1164
01:09:03,990 --> 01:09:01,920
so why lasers

1165
01:09:06,709 --> 01:09:04,000
laser communications can transmit up to

1166
01:09:08,550 --> 01:09:06,719
100 times more data per second than

1167
01:09:10,789 --> 01:09:08,560
previous systems by using a shorter

1168
01:09:12,950 --> 01:09:10,799
wavelength of energy

1169
01:09:15,749 --> 01:09:12,960
with this increased bandwidth missions

1170
01:09:18,470 --> 01:09:15,759
can send larger files and even live high

1171
01:09:20,950 --> 01:09:18,480
definition video from space

1172
01:09:22,550 --> 01:09:20,960
laser communication systems are smaller

1173
01:09:24,630 --> 01:09:22,560
and more efficient than radio wave

1174
01:09:26,550 --> 01:09:24,640
technology they leave more room for

1175
01:09:28,789 --> 01:09:26,560
science instruments are cheaper to

1176
01:09:31,189 --> 01:09:28,799
launch and require less energy on board

1177
01:09:33,349 --> 01:09:31,199
the spacecraft

1178
01:09:34,870 --> 01:09:33,359
these benefits extend to receivers on

1179
01:09:36,390 --> 01:09:34,880
the ground

1180
01:09:38,950 --> 01:09:36,400
earth-based laser communication

1181
01:09:42,070 --> 01:09:38,960
receivers can be up to 44 times smaller

1182
01:09:44,470 --> 01:09:42,080
than the current radio antennas

1183
01:09:47,030 --> 01:09:44,480
lcrd is the next step in making these

1184
01:09:48,630 --> 01:09:47,040
technologies a reality helping nasa to

1185
01:09:51,349 --> 01:09:48,640
push the boundaries of scientific

1186
01:09:53,590 --> 01:09:51,359
discovery and exploration

1187
01:09:55,990 --> 01:09:53,600
eventually nasa will integrate this

1188
01:10:03,820 --> 01:09:56,000

technology into future missions as well

1189
01:10:03,830 --> 01:11:13,110
[Music]

1190
01:11:18,550 --> 01:11:14,229
ld

1191
01:11:23,189 --> 01:11:20,630
now the other one okay you are tracking

1192
01:11:24,470 --> 01:11:23,199
for our new t-zero of one zero zero

1193
01:11:26,790 --> 01:11:24,480
three zero

1194
01:11:28,390 --> 01:11:26,800
and l twenty i'm expecting asp to go

1195
01:11:30,709 --> 01:11:28,400
internal and uh

1196
01:11:33,350 --> 01:11:30,719
we'll reevaluate uh

1197
01:11:40,790 --> 01:11:33,360
when's prior to go to ifps palp

1198
01:11:40,800 --> 01:15:34,550
l minus 21 minutes

1199
01:15:41,430 --> 01:15:36,229
ld

1200
01:15:43,750 --> 01:15:41,440
roger sir we've uh got a report that

1201
01:15:45,590 --> 01:15:43,760
upper level winds will be red at the

1202
01:15:47,750 --> 01:15:45,600
open of our window stand by for

1203
01:16:40,390 --> 01:15:47,760
coordination of a new teaser

1204
01:16:40,400 --> 01:16:46,790
spacecraft coordinator elsie that one

1205
01:16:46,800 --> 01:16:51,430
scn1

1206
01:16:55,750 --> 01:16:54,310
you see on one go yeah um so

1207
01:16:57,990 --> 01:16:55,760
we'll stand by until i get further

1208
01:16:59,270 --> 01:16:58,000
direction on t0 for spacecraft uh

1209
01:17:03,750 --> 01:16:59,280
coordination

1210
01:17:08,470 --> 01:17:05,830
lc ld channel one

1211
01:17:12,630 --> 01:17:08,480
go lt roger sir please coordinate a new

1212
01:17:15,270 --> 01:17:12,640
t0 with the range of 10 colon 19 z

1213
01:17:17,189 --> 01:17:15,280

that's 1 0 colon 1 9

1214
01:17:20,870 --> 01:17:17,199
z roger

1215
01:17:23,830 --> 01:17:20,880
rc lc net one rcn1 please coordinate a

1216
01:17:25,110 --> 01:17:23,840
new t0 of one zero cone one nine zero

1217
01:17:27,350 --> 01:17:25,120
roger and work

1218
01:17:41,189 --> 01:17:27,360
plc please set the clock over one zero

1219
01:17:41,199 --> 01:17:45,990
spacecraft coordinator elsie

1220
01:17:50,870 --> 01:17:48,870
is sc on one yeah if uh

1221
01:17:58,470 --> 01:17:50,880
i need to understand the uh sp

1222
01:18:02,070 --> 01:18:00,070
lc alt

1223
01:18:17,070 --> 01:18:02,080
go countdown clock has been set with new

1224
01:18:23,750 --> 01:18:20,630
lcscn1 yeah both spacecraft external and

1225
01:18:34,149 --> 01:18:23,760
standing by for the new t0 or 1019

1226
01:18:34,159 --> 01:19:15,990
l minus 30 minutes

1227
01:19:20,229 --> 01:19:18,070
this is atlas mission control the launch

1228
01:19:22,310 --> 01:19:20,239
director james whalen has instructed the

1229
01:19:42,550 --> 01:19:22,320
team to coordinate a new launch time of

1230
01:19:47,030 --> 01:19:45,030
space communications infrastructure in

1231
01:19:49,350 --> 01:19:47,040
space and on the ground enables the data

1232
01:19:51,910 --> 01:19:49,360
collected by missions to reach earth

1233
01:19:54,470 --> 01:19:51,920
upgrading our capacity for discovery

1234
01:19:55,990 --> 01:19:54,480
since the dawn of space exploration nasa

1235
01:19:57,510 --> 01:19:56,000
missions have relied on radio

1236
01:19:58,950 --> 01:19:57,520
frequencies for this transfer of

1237
01:20:01,270 --> 01:19:58,960
information

1238
01:20:03,750 --> 01:20:01,280

nasa's laser communications relay

1239
01:20:06,149 --> 01:20:03,760
demonstration will launch to space

1240
01:20:08,390 --> 01:20:06,159
showcasing the vast benefits of laser

1241
01:20:11,110 --> 01:20:08,400
communications

1242
01:20:13,510 --> 01:20:11,120
lcrd's ground stations known as optical

1243
01:20:19,500 --> 01:20:13,520
ground station 1 and 2 are critical to

1244
01:20:44,629 --> 01:20:40,200
[Music]

1245
01:20:44,639 --> 01:20:55,500
foreign

1246
01:20:55,510 --> 01:21:07,830
[Music]

1247
01:21:45,590 --> 01:21:10,220
do

1248
01:23:32,470 --> 01:22:00,400
[Music]

1249
01:23:32,480 --> 01:25:32,149
l minus 25 minutes

1250
01:25:37,830 --> 01:25:35,110
oh minus 23 minutes

1251
01:25:39,590 --> 01:25:37,840
flight control verify ifps power is

1252
01:27:32,229 --> 01:25:39,600
disabled

1253
01:27:32,239 --> 01:27:51,110
l minus 21 minutes

1254
01:27:54,870 --> 01:27:52,950
this is atlas mission control the

1255
01:27:56,790 --> 01:27:54,880
countdown remains holding at t minus

1256
01:27:59,590 --> 01:27:56,800
four minutes while the team continues to

1257
01:28:03,110 --> 01:27:59,600
wait on the wins aloft a new t0 is

1258
01:28:05,669 --> 01:28:03,120
planned at 5 19 a.m eastern

1259
01:28:08,229 --> 01:28:05,679
today's trajectory is long and complex

1260
01:28:09,910 --> 01:28:08,239
here's ula's president and ceo tori

1261
01:28:11,910 --> 01:28:09,920
bruno to explain the flight in more

1262
01:28:13,750 --> 01:28:11,920
detail

1263
01:28:16,950 --> 01:28:13,760

i want to talk to you about our next

1264
01:28:19,350 --> 01:28:16,960
mission stp3 it's a very very cool

1265
01:28:21,110 --> 01:28:19,360
mission i'm here in the dosc the

1266
01:28:22,629 --> 01:28:21,120
operations center in denver which is

1267
01:28:24,229 --> 01:28:22,639
going to be filled with engineers in

1268
01:28:26,830 --> 01:28:24,239
just a few days

1269
01:28:30,149 --> 01:28:26,840
this mission is a rare and unique

1270
01:28:33,270 --> 01:28:30,159
trajectory something we call a direct

1271
01:28:35,830 --> 01:28:33,280
injection into gso or geosynchronous

1272
01:28:39,270 --> 01:28:35,840
orbit we're going to use our biggest

1273
01:28:42,149 --> 01:28:39,280
atlas the 551 the bruiser five solid

1274
01:28:44,470 --> 01:28:42,159
rocket motors 2.6 million pounds of

1275
01:28:47,189 --> 01:28:44,480
thrust at liftoff to do this

1276
01:28:50,070 --> 01:28:47,199
the spacecraft is also pretty cool but

1277
01:28:52,149 --> 01:28:50,080
that's classified so back to the rocket

1278
01:28:54,390 --> 01:28:52,159
when we lift off we're going to go

1279
01:28:56,550 --> 01:28:54,400
straight up into the sky we're going to

1280
01:28:58,950 --> 01:28:56,560
be nearly orbital when the first stage

1281
01:29:00,950 --> 01:28:58,960
finishes it'll just take a few minutes

1282
01:29:03,510 --> 01:29:00,960
to consume all that propellant and then

1283
01:29:06,950 --> 01:29:03,520
centaur will take over it'll take us

1284
01:29:09,270 --> 01:29:06,960
with a very short burn just into a leo

1285
01:29:11,510 --> 01:29:09,280
parking orbit so we can coast around to

1286
01:29:13,830 --> 01:29:11,520
be perfectly aligned for the latitude we

1287
01:29:16,149 --> 01:29:13,840
want for this spacecraft then it's going

1288
01:29:19,189 --> 01:29:16,159

to do a hard burn it's going to throw us

1289
01:29:22,070 --> 01:29:19,199
out on a big elliptical orbit a home and

1290
01:29:25,270 --> 01:29:22,080
transfer that exactly intersects at its

1291
01:29:27,430 --> 01:29:25,280
highest altitude with the destination

1292
01:29:29,510 --> 01:29:27,440
normally you'd be done right now and the

1293
01:29:31,510 --> 01:29:29,520
rocket would drop you off and the

1294
01:29:34,149 --> 01:29:31,520
spacecraft would have to use its own

1295
01:29:36,629 --> 01:29:34,159
fuel to circularize that orbit

1296
01:29:38,629 --> 01:29:36,639
shortening its life but not this time

1297
01:29:42,149 --> 01:29:38,639
this time centaur is going to go all the

1298
01:29:43,990 --> 01:29:42,159
way we're going to coast for five long

1299
01:29:47,750 --> 01:29:44,000
hours because that's how long it takes

1300
01:29:50,390 --> 01:29:47,760
to get from leo to geo and then just as

1301
01:29:52,870 --> 01:29:50,400
we are intersecting that altitude

1302
01:29:55,750 --> 01:29:52,880
centaur will come back to life fire up

1303
01:29:58,070 --> 01:29:55,760
for another burn and lift that perigee

1304
01:30:00,629 --> 01:29:58,080
all the way out into a perfect circular

1305
01:30:04,790 --> 01:30:00,639
orbit at geosynchronous

1306
01:30:06,870 --> 01:30:04,800
altitude 36 000 kilometers above earth a

1307
01:30:10,390 --> 01:30:06,880
period that is exactly a day so the

1308
01:31:53,990 --> 01:30:10,400
spacecraft appears to hover in the sky

1309
01:32:01,750 --> 01:31:58,310
ld lc lc ld channel one go ahead roger

1310
01:32:03,590 --> 01:32:01,760
sir we are continuing uh to proceed uh

1311
01:32:05,110 --> 01:32:03,600
we'll have the final wins update shortly

1312
01:32:06,550 --> 01:32:05,120
but we are green at this moment and

1313
01:33:32,070 --> 01:32:06,560

continue to proceed

1314
01:33:32,080 --> 01:33:36,550
oh minus 15 minutes

1315
01:33:40,229 --> 01:33:38,950
lc this is sad six on channel one

1316
01:33:42,470 --> 01:33:40,239
go

1317
01:33:44,390 --> 01:33:42,480
stp fat six is on internal power and is

1318
01:33:45,350 --> 01:33:44,400
prepared to enable the in-flight power

1319
01:33:49,110 --> 01:33:45,360
system

1320
01:34:17,110 --> 01:33:49,120
roger flight control enables six ifps

1321
01:34:23,910 --> 01:34:20,870
sad six ifps enabled roger

1322
01:34:25,030 --> 01:34:23,920
sat six mm lc network

1323
01:34:27,750 --> 01:34:25,040
said six

1324
01:34:42,149 --> 01:34:27,760
begin telemetry verifications

1325
01:34:45,830 --> 01:34:43,830
as you heard moments ago we are

1326
01:34:48,550 --> 01:34:45,840
currently green for weather we are

1327
01:34:49,430 --> 01:34:48,560
proceeding towards a 5 19 a.m eastern

1328
01:35:32,310 --> 01:34:49,440
launch

1329
01:35:38,709 --> 01:35:35,189
l minus 13 minutes

1330
01:35:40,870 --> 01:35:38,719
lc this is ldpe on channel one go

1331
01:35:42,390 --> 01:35:40,880
ldp e1 is on internal power and is

1332
01:35:43,910 --> 01:35:42,400
prepared to enable the in-flight power

1333
01:35:44,870 --> 01:35:43,920
system

1334
01:36:21,189 --> 01:35:44,880
roger

1335
01:36:27,510 --> 01:36:22,830
enabled

1336
01:36:29,430 --> 01:36:27,520
roger ltpe mmm lc new one

1337
01:36:31,750 --> 01:36:29,440
this is ldpe

1338
01:36:36,790 --> 01:36:31,760

begin telemetry verifications

1339
01:36:42,149 --> 01:36:38,870
light control lc

1340
01:36:43,990 --> 01:36:42,159
go to the slide control form option 409

1341
01:37:45,590 --> 01:36:44,000
rp1 temp update

1342
01:38:23,270 --> 01:37:47,430
they'll see the slide control 409 is

1343
01:38:27,430 --> 01:38:25,030
now for this ten minutes all

1344
01:38:29,189 --> 01:38:27,440
communications switch to channel one all

1345
01:38:31,030 --> 01:38:29,199
personnel and visitors remain in present

1346
01:38:35,750 --> 01:38:31,040
position until launch maintain

1347
01:38:39,030 --> 01:38:37,350
terminal count briefing

1348
01:38:41,189 --> 01:38:39,040
if a condition exceeds a launch

1349
01:38:42,790 --> 01:38:41,199
constraint any time after the terminal

1350
01:38:45,109 --> 01:38:42,800
count status check

1351
01:38:47,350 --> 01:38:45,119
the observer shout outs hold hold hold

1352
01:38:48,950 --> 01:38:47,360
on channel one identified their station

1353
01:38:51,189 --> 01:38:48,960
and briefly state the reason for the

1354
01:38:52,790 --> 01:38:51,199
hold

1355
01:38:56,830 --> 01:38:52,800
flight control perform launch on time

1356
01:38:56,840 --> 01:39:00,629
roger osm

1357
01:39:05,189 --> 01:39:02,310
uh you're on that one

1358
01:39:09,189 --> 01:39:05,199
osm place the srb ignition sna switch in

1359
01:39:15,430 --> 01:39:12,709
srb ignition enabled enabled box 2

1360
01:39:17,350 --> 01:39:15,440
verify cisa purge flowing gn2 to the

1361
01:39:18,709 --> 01:39:17,360
cisa

1362
01:39:22,550 --> 01:39:18,719
verified

1363
01:39:25,270 --> 01:39:22,560

osm verify the fco roc and osm home fire

1364
01:39:27,109 --> 01:39:25,280
switches are in the proceed position

1365
01:39:29,109 --> 01:39:27,119
ready to proceed

1366
01:39:30,709 --> 01:39:29,119
rlm verify the redline monitor and event

1367
01:39:32,550 --> 01:39:30,719
table in the correct configuration for

1368
01:39:33,750 --> 01:39:32,560
terminal count

1369
01:39:35,669 --> 01:39:33,760
verified

1370
01:39:38,830 --> 01:39:35,679
l minus private

1371
01:39:56,629 --> 01:39:38,840
rc verify solar radiation acceptable for

1372
01:40:05,270 --> 01:39:58,390
launch on time verify

1373
01:40:09,750 --> 01:40:07,590
lc switch to the ready position all

1374
01:40:32,070 --> 01:40:09,760
steps are complete prior to the status

1375
01:40:32,080 --> 01:40:54,950
l minus eight minutes

1376
01:40:59,510 --> 01:40:57,109
we remain in the planned 30-minute hold

1377
01:41:01,430 --> 01:40:59,520
as we continue towards liftoff in a few

1378
01:41:03,109 --> 01:41:01,440
moments launch conductor scott barney

1379
01:41:05,270 --> 01:41:03,119
will pull the launch team for the final

1380
01:41:07,590 --> 01:41:05,280
go to pick up the countdown

1381
01:41:09,430 --> 01:41:07,600
29 engineers and managers are pulled for

1382
01:41:10,390 --> 01:41:09,440
their system status and readiness to

1383
01:41:12,310 --> 01:41:10,400
proceed

1384
01:41:15,030 --> 01:41:12,320
this is the final status check for all

1385
01:41:17,030 --> 01:41:15,040
atlas vehicle systems ground systems

1386
01:41:18,629 --> 01:41:17,040
spacecraft and the u.s space force

1387
01:41:20,390 --> 01:41:18,639
eastern range

1388
01:41:22,950 --> 01:41:20,400

the vehicle system readiness pull

1389
01:41:25,350 --> 01:41:22,960
includes electrical systems hydraulics

1390
01:41:27,109 --> 01:41:25,360
pneumatics propulsion systems flight

1391
01:41:29,109 --> 01:41:27,119
control and propellants

1392
01:41:31,990 --> 01:41:29,119
let's listen in as scott barney performs

1393
01:41:34,870 --> 01:41:32,000
the final polling

1394
01:41:36,550 --> 01:41:34,880
l minus seven minutes

1395
01:41:38,950 --> 01:41:36,560
status check to proceed with terminal

1396
01:41:40,790 --> 01:41:38,960
count atlas systems propulsion

1397
01:41:45,510 --> 01:41:40,800
go hydraulics

1398
01:41:48,070 --> 01:41:45,520
go pneumatics go lo2 go water

1399
01:41:49,750 --> 01:41:48,080
go centaur systems propulsion

1400
01:41:51,430 --> 01:41:49,760
go pneumatics

1401
01:41:54,790 --> 01:41:51,440
go lo2

1402
01:41:57,990 --> 01:41:54,800
go lh2 go has gas

1403
01:42:00,629 --> 01:41:58,000
go electrical systems airborne go

1404
01:42:03,109 --> 01:42:00,639
ground go facility

1405
01:42:06,550 --> 01:42:03,119
go rf fts

1406
01:42:10,310 --> 01:42:06,560
go fight control go gcq

1407
01:42:12,149 --> 01:42:10,320
go operation support go com

1408
01:42:16,070 --> 01:42:12,159
go umbilicals

1409
01:42:17,750 --> 01:42:16,080
go ecs go redline monitor

1410
01:42:20,070 --> 01:42:17,760
go quality

1411
01:42:22,950 --> 01:42:20,080
go app safety manager

1412
01:42:26,229 --> 01:42:22,960
go you're a safety officer go

1413
01:42:29,590 --> 01:42:26,239

vehicle system engineer go anomaly cheat

1414
01:42:30,950 --> 01:42:29,600
go range coordinator clear to proceed

1415
01:42:33,109 --> 01:42:30,960
launch director

1416
01:42:34,470 --> 01:42:33,119
launch vehicle is ready to launch

1417
01:42:36,550 --> 01:42:34,480
mission director

1418
01:42:40,470 --> 01:42:36,560
you have permission to launch

1419
01:42:41,270 --> 01:42:40,480
proceeding with account alc verify t0 is

1420
01:42:48,550 --> 01:42:41,280
set

1421
01:42:52,149 --> 01:42:50,629
polling is complete and the ula launch

1422
01:42:54,149 --> 01:42:52,159
team and the space force mission

1423
01:42:56,070 --> 01:42:54,159
director go for launch

1424
01:42:57,669 --> 01:42:56,080
from t minus four minutes until launch

1425
01:42:59,510 --> 01:42:57,679
you will be listening to scott barney

1426
01:43:01,510 --> 01:42:59,520
and his team performing the final steps

1427
01:43:03,350 --> 01:43:01,520
in the countdown procedure

1428
01:43:04,870 --> 01:43:03,360
several critical activities occur in the

1429
01:43:07,030 --> 01:43:04,880
final minutes leading to launch

1430
01:43:08,870 --> 01:43:07,040
including verifying fuel tank lever

1431
01:43:11,030 --> 01:43:08,880
levels and pressures in the booster and

1432
01:43:12,709 --> 01:43:11,040
centaur as well as arming the flight

1433
01:43:15,030 --> 01:43:12,719
termination system

1434
01:43:18,070 --> 01:43:15,040
at t minus 25 seconds you'll hear go

1435
01:43:20,629 --> 01:43:18,080
atlas gov centaur go stp 3. this is the

1436
01:43:22,629 --> 01:43:20,639
final status check of atlas centaur and

1437
01:43:24,709 --> 01:43:22,639
stp3 readiness

1438
01:43:26,149 --> 01:43:24,719

at t minus three seconds the main engine

1439
01:43:27,990 --> 01:43:26,159
ignites followed by ignition of the

1440
01:43:30,070 --> 01:43:28,000
solid rocket boosters

1441
01:43:31,669 --> 01:43:30,080
then after seeing the atlas v lift off

1442
01:43:33,669 --> 01:43:31,679
the launch pad you'll begin hearing

1443
01:44:12,709 --> 01:43:33,679
flight commentator jesse gonzalez

1444
01:44:17,189 --> 01:44:14,870
this is atlas mission control at t minus

1445
01:44:26,070 --> 01:44:17,199
four minutes and holding we anticipate

1446
01:44:30,550 --> 01:44:28,629
on my mark the time will be t minus four

1447
01:44:31,430 --> 01:44:30,560
minutes and counting

1448
01:44:32,390 --> 01:44:31,440
three

1449
01:44:33,350 --> 01:44:32,400
two

1450
01:44:38,790 --> 01:44:33,360
one

1451
01:44:42,310 --> 01:44:40,149
three fifty five

1452
01:44:49,669 --> 01:44:42,320
ground pyro clock is resumed and we are

1453
01:44:53,350 --> 01:44:51,510
with liftoff approaching we are going to

1454
01:44:55,030 --> 01:44:53,360
turn up the volume on our launch team so

1455
01:45:33,590 --> 01:44:55,040
you can hear the final preparations

1456
01:45:33,600 --> 01:45:39,830
three minutes

1457
01:45:46,470 --> 01:45:42,310
atlas thanks to flight pressure

1458
01:46:03,590 --> 01:45:46,480
securing lo2 topping 250

1459
01:46:34,070 --> 01:46:06,470
230 health ldpe 1 is configured for

1460
01:46:34,080 --> 01:46:37,350
one minute 59

1461
01:46:43,510 --> 01:46:38,950
vehicle internal

1462
01:46:47,030 --> 01:46:44,950
150

1463
01:46:53,510 --> 01:46:47,040

gearing center la2

1464
01:47:02,950 --> 01:46:55,830
140.

1465
01:47:07,990 --> 01:47:06,070
fcsr t-minus 90 seconds the launch

1466
01:47:13,430 --> 01:47:08,000
vehicle payload ground systems and

1467
01:47:17,109 --> 01:47:15,510
120

1468
01:47:18,950 --> 01:47:17,119
ocu's armed

1469
01:47:20,550 --> 01:47:18,960
fcs count started

1470
01:47:22,390 --> 01:47:20,560
115

1471
01:47:23,590 --> 01:47:22,400
reduce ccs for launch

1472
01:47:25,510 --> 01:47:23,600
roger

1473
01:47:33,430 --> 01:47:25,520
110

1474
01:47:53,270 --> 01:47:35,669
t-minus one minute rock report range

1475
01:48:05,430 --> 01:47:54,870
40 seconds

1476
01:48:09,910 --> 01:48:06,550
28

1477
01:48:11,430 --> 01:48:09,920
if she has produced for launch roger 25

1478
01:48:23,350 --> 01:48:11,440
status check

1479
01:48:25,910 --> 01:48:24,950
t minus ten

1480
01:48:26,790 --> 01:48:25,920
nine

1481
01:48:27,750 --> 01:48:26,800
eight

1482
01:48:28,790 --> 01:48:27,760
seven

1483
01:48:29,830 --> 01:48:28,800
six

1484
01:48:30,830 --> 01:48:29,840
five

1485
01:48:32,870 --> 01:48:30,840
four

1486
01:48:33,669 --> 01:48:32,880
three two

1487
01:48:35,510 --> 01:48:33,679
one

1488
01:48:38,149 --> 01:48:35,520

and we have

1489
01:48:41,030 --> 01:48:38,159
liftoff of the united launch alliance

1490
01:48:45,109 --> 01:48:41,040
atlas v rocket with the stp-3 mission

1491
01:48:48,790 --> 01:48:46,390
vehicle has cleared force tower and is

1492
01:48:50,390 --> 01:48:48,800
beginning the pitch over program

1493
01:48:52,229 --> 01:48:50,400
and the rd-180 is throttling down

1494
01:48:54,550 --> 01:48:52,239
slightly as expected engine response

1495
01:48:56,470 --> 01:48:54,560
looks good

1496
01:48:58,870 --> 01:48:56,480
and passing 20 seconds of the flight the

1497
01:49:00,629 --> 01:48:58,880
pu system has gone to close with control

1498
01:49:02,950 --> 01:49:00,639
srb chamber pressures continue to look

1499
01:49:04,390 --> 01:49:02,960
nominal rd180 pump speed and fuel

1500
01:49:09,510 --> 01:49:04,400
injector pressure fuel injector

1501
01:49:19,189 --> 01:49:13,430
mach 1 atlas 5 is now supersonic

1502
01:49:21,510 --> 01:49:19,199
[Music]

1503
01:49:23,189 --> 01:49:21,520
passing 45 seconds into flight vehicle

1504
01:49:30,709 --> 01:49:23,199
is now passing through max q maximum

1505
01:49:35,430 --> 01:49:32,709
and the rd-180 is throttling back up as

1506
01:49:37,350 --> 01:49:35,440
expected engine response looks good

1507
01:49:38,310 --> 01:49:37,360
passing one minute to flight the vehicle

1508
01:49:40,149 --> 01:49:38,320
is now

1509
01:49:42,470 --> 01:49:40,159
nine miles in altitude

1510
01:49:52,550 --> 01:49:42,480
uh seven miles downrange traveling at

1511
01:49:56,550 --> 01:49:54,310
and the rd-180 is throttling down again

1512
01:50:07,990 --> 01:49:56,560
as expected engine response looks good

1513
01:50:11,430 --> 01:50:09,669

and just past a minute and a minute and

1514
01:50:13,589 --> 01:50:11,440
a half into flight we have burnout on

1515
01:50:15,109 --> 01:50:13,599
all five srvs burnout pressure

1516
01:50:17,270 --> 01:50:15,119
signatures are looking good and the

1517
01:50:19,669 --> 01:50:17,280
rd180 is being throttled back up as

1518
01:50:32,310 --> 01:50:19,679
expected following srb burnout

1519
01:50:35,669 --> 01:50:33,910
and we have good indication of jettison

1520
01:50:37,350 --> 01:50:35,679
of all five srbs and the vehicle has

1521
01:50:38,390 --> 01:50:37,360
gone to closed-loop ql for limited

1522
01:50:40,390 --> 01:50:38,400
steering

1523
01:51:00,229 --> 01:50:40,400
following srb jettison

1524
01:51:03,669 --> 01:51:01,830
and coming up on two and a half minutes

1525
01:51:05,189 --> 01:51:03,679
of the flight a little over two minutes

1526
01:51:20,149 --> 01:51:05,199
remaining in the

1527
01:51:24,950 --> 01:51:22,229
and the rd-180 is now throttling to

1528
01:51:26,709 --> 01:51:24,960
maintain a constant fire or a 2.5 g

1529
01:51:28,790 --> 01:51:26,719
acceleration limit engine response and

1530
01:51:30,709 --> 01:51:28,800
vehicle response looks good

1531
01:51:35,350 --> 01:51:30,719
and the centaur reaction control system

1532
01:51:39,270 --> 01:51:36,790
passing three minutes from the flight

1533
01:51:41,430 --> 01:51:39,280
the rd-180 pump speeds and fuel injector

1534
01:51:43,030 --> 01:51:41,440
pressures continue to look good

1535
01:51:45,350 --> 01:51:43,040
the vehicle body rates look very good

1536
01:51:47,189 --> 01:51:45,360
for the stays in flight

1537
01:51:50,470 --> 01:51:47,199
and the vehicle is now

1538
01:51:55,510 --> 01:51:50,480

65 miles in altitude 150 miles downrange

1539
01:52:14,470 --> 01:51:57,270
standing by for payload fairing jettison

1540
01:52:19,750 --> 01:52:15,990
and we have good indication of pillow

1541
01:52:25,270 --> 01:52:21,589
and we have centaur forward load reactor

1542
01:52:36,229 --> 01:52:27,350
and the rd180 is throttling back up as

1543
01:52:39,990 --> 01:52:37,910
and the rd-180 is now throttling to

1544
01:52:42,149 --> 01:52:40,000
maintain a constant 5g acceleration

1545
01:52:51,109 --> 01:52:42,159
limit engine response continues to look

1546
01:52:54,790 --> 01:52:52,950
and centaur has begun the boost phase

1547
01:52:56,229 --> 01:52:54,800
chill down portion of flight to

1548
01:53:11,750 --> 01:52:56,239
thermally condition the rl10 for

1549
01:53:16,070 --> 01:53:14,470
and we've had beco booster engine cutoff

1550
01:53:17,669 --> 01:53:16,080
and we've had successful stage

1551
01:53:27,030 --> 01:53:17,679
separation

1552
01:53:29,510 --> 01:53:28,550
and we've had ignition for the first

1553
01:53:31,030 --> 01:53:29,520
burn

1554
01:53:32,550 --> 01:53:31,040
this will be the first of three centaur

1555
01:53:35,270 --> 01:53:32,560
burns for today's mission and will last

1556
01:53:37,270 --> 01:53:35,280
a little under six minutes

1557
01:53:38,070 --> 01:53:37,280
the rl10 startup parameters are looking

1558
01:53:39,589 --> 01:53:38,080
good

1559
01:53:53,830 --> 01:53:39,599
and seeing the body rates close out

1560
01:53:58,709 --> 01:53:55,990
this is atlas mission control at t plus

1561
01:54:00,629 --> 01:53:58,719
5 minutes and 21 seconds you just heard

1562
01:54:02,310 --> 01:54:00,639
our flight commentator jesse gonzalez

1563
01:54:04,390 --> 01:54:02,320

confirmed the successful completion of

1564
01:54:06,070 --> 01:54:04,400
the early phase of today's flight and

1565
01:54:07,189 --> 01:54:06,080
all systems continue to operate

1566
01:54:08,870 --> 01:54:07,199
nominally

1567
01:54:10,790 --> 01:54:08,880
our next event sent to our main engine

1568
01:54:12,229 --> 01:54:10,800
cutoff will occur in approximately five

1569
01:54:14,390 --> 01:54:12,239
minutes

1570
01:54:17,030 --> 01:54:14,400
i'm now joined by emma coates she's

1571
01:54:18,470 --> 01:54:17,040
ruag's payload fairing program manager

1572
01:54:20,470 --> 01:54:18,480
thank you so much for being here with us

1573
01:54:22,229 --> 01:54:20,480
today yes thanks so much for having me

1574
01:54:23,910 --> 01:54:22,239
it's such an accomplishment to be here

1575
01:54:25,669 --> 01:54:23,920
and to witness the jettison of our first

1576
01:54:27,350 --> 01:54:25,679
payload fairing our first out of

1577
01:54:29,109 --> 01:54:27,360
autoclave failure it's been great i mean

1578
01:54:30,470 --> 01:54:29,119
it's a huge accomplishment for the team

1579
01:54:32,310 --> 01:54:30,480
and we're going to talk a lot about what

1580
01:54:34,470 --> 01:54:32,320
that means out of autoclave

1581
01:54:36,229 --> 01:54:34,480
manufacturing but as you know

1582
01:54:38,229 --> 01:54:36,239
you guys have been producing payload

1583
01:54:40,870 --> 01:54:38,239
fairings for us for quite some time but

1584
01:54:43,189 --> 01:54:40,880
this is the first one that we've flown

1585
01:54:44,550 --> 01:54:43,199
using the out of autoclave process can

1586
01:54:47,350 --> 01:54:44,560
you explain to us a little bit about

1587
01:54:49,270 --> 01:54:47,360
what that means yeah so normally uh when

1588
01:54:51,189 --> 01:54:49,280

we talk in autoclave or out of autoclave

1589
01:54:53,510 --> 01:54:51,199
we're talking about the curing or the

1590
01:54:56,550 --> 01:54:53,520
baking process that goes into

1591
01:55:00,310 --> 01:54:56,560
um creating and out of or creating a

1592
01:55:01,910 --> 01:55:00,320
payload fairing or a composite structure

1593
01:55:04,390 --> 01:55:01,920
the autoclave itself is actually the

1594
01:55:06,709 --> 01:55:04,400
container that is

1595
01:55:10,390 --> 01:55:06,719
performing this curing or baking process

1596
01:55:13,109 --> 01:55:10,400
great so um in autoclave versus out of

1597
01:55:15,830 --> 01:55:13,119
autoclave what are some of the benefits

1598
01:55:17,430 --> 01:55:15,840
of the out of autoclave process so a few

1599
01:55:19,430 --> 01:55:17,440
of the benefits of the out of autoclave

1600
01:55:20,629 --> 01:55:19,440
process is actually the fact that we're

1601
01:55:23,510 --> 01:55:20,639
able to be a little bit lighter in

1602
01:55:25,910 --> 01:55:23,520
weight um we say like that right um so

1603
01:55:28,550 --> 01:55:25,920
we're saving time and uh cost and

1604
01:55:29,990 --> 01:55:28,560
everything also because we don't have to

1605
01:55:31,350 --> 01:55:30,000
have that same internal pressure

1606
01:55:33,669 --> 01:55:31,360
requirement that is

1607
01:55:36,310 --> 01:55:33,679
that's used in the in autoclave process

1608
01:55:39,109 --> 01:55:36,320
we're able to lay up an entire half

1609
01:55:41,270 --> 01:55:39,119
shell of a fairing with just one oven

1610
01:55:42,470 --> 01:55:41,280
cure cycle which saves a ton of time

1611
01:55:44,310 --> 01:55:42,480
that's great i mean a lot of

1612
01:55:46,149 --> 01:55:44,320
efficiencies there we're all about

1613
01:55:47,589 --> 01:55:46,159

efficiencies and making things better

1614
01:55:49,669 --> 01:55:47,599
going forward so what a huge

1615
01:55:51,030 --> 01:55:49,679
accomplishment and what a fantastic

1616
01:55:51,910 --> 01:55:51,040
process you just kind of went through

1617
01:55:54,149 --> 01:55:51,920
for us

1618
01:55:56,709 --> 01:55:54,159
so as you know

1619
01:55:59,189 --> 01:55:56,719
you have a production facility that also

1620
01:56:01,270 --> 01:55:59,199
shares our ula decatur production

1621
01:56:03,189 --> 01:56:01,280
facility this was the first fairing that

1622
01:56:05,270 --> 01:56:03,199
was actually produced there and flown

1623
01:56:07,750 --> 01:56:05,280
now um can you tell us a little bit

1624
01:56:11,109 --> 01:56:07,760
about the partnership between ruag and

1625
01:56:13,270 --> 01:56:11,119
ula gotcha yeah so we have uh many years

1626
01:56:15,589 --> 01:56:13,280
that as you mentioned before we've got a

1627
01:56:17,990 --> 01:56:15,599
ton of years of partnership with ula

1628
01:56:20,790 --> 01:56:18,000
both on our u.s switzerland on our ruac

1629
01:56:23,589 --> 01:56:20,800
switzerland side and our ruag us side um

1630
01:56:25,350 --> 01:56:23,599
but with this being the first one out of

1631
01:56:27,589 --> 01:56:25,360
hunts or out of decatur

1632
01:56:29,510 --> 01:56:27,599
this actually allowed us to be super

1633
01:56:30,629 --> 01:56:29,520
close to you guys i'm sharing that wall

1634
01:56:34,229 --> 01:56:30,639
essentially

1635
01:56:35,910 --> 01:56:34,239
so we were actually able to um issue

1636
01:56:38,149 --> 01:56:35,920
i guess better delivery i guess would be

1637
01:56:41,030 --> 01:56:38,159
the the time frame um or be the thing

1638
01:56:43,510 --> 01:56:41,040

but uh we were able to have better

1639
01:56:46,709 --> 01:56:43,520
delivery times save on logistics which

1640
01:56:48,550 --> 01:56:46,719
is again saving a lot of ton of costs

1641
01:56:49,990 --> 01:56:48,560
about efficiencies here yeah i mean the

1642
01:56:51,830 --> 01:56:50,000
one thing that's been great we obviously

1643
01:56:53,990 --> 01:56:51,840
talked about process efficiencies which

1644
01:56:56,070 --> 01:56:54,000
was awesome but i mean you're talking

1645
01:56:58,070 --> 01:56:56,080
about process flow efficiencies as well

1646
01:56:59,510 --> 01:56:58,080
we literally share a wall with our two

1647
01:57:01,030 --> 01:56:59,520
facilities so you can't get more

1648
01:57:02,790 --> 01:57:01,040
efficient than that

1649
01:57:04,149 --> 01:57:02,800
all right so um something near and dear

1650
01:57:05,910 --> 01:57:04,159
to my heart i've been lucky enough to

1651
01:57:09,109 --> 01:57:05,920
work with you on the vulcan development

1652
01:57:10,709 --> 01:57:09,119
program for a long time now um as our

1653
01:57:12,790 --> 01:57:10,719
viewers may not know you're actually

1654
01:57:14,470 --> 01:57:12,800
producing the vulcan payload fairing

1655
01:57:16,310 --> 01:57:14,480
press as well so can you give us a

1656
01:57:18,229 --> 01:57:16,320
little bit of a status on where we're at

1657
01:57:20,390 --> 01:57:18,239
with that development program sure so

1658
01:57:23,189 --> 01:57:20,400
we're actually nearing the completion of

1659
01:57:24,709 --> 01:57:23,199
our qualification process for that um

1660
01:57:26,709 --> 01:57:24,719
and of course we're gathering all of our

1661
01:57:28,149 --> 01:57:26,719
lessons learned from this launch and um

1662
01:57:30,149 --> 01:57:28,159
any of the other payload fairings we're

1663
01:57:32,390 --> 01:57:30,159

building as well um that way we can make

1664
01:57:34,629 --> 01:57:32,400
sure that vulcan is also a success as

1665
01:57:35,830 --> 01:57:34,639
well right and it's been so great to

1666
01:57:37,270 --> 01:57:35,840
watch that

1667
01:57:39,270 --> 01:57:37,280
qualification testing that we've been

1668
01:57:41,109 --> 01:57:39,280
doing at marshall space flight center so

1669
01:57:43,109 --> 01:57:41,119
excited to see that come to

1670
01:57:45,189 --> 01:57:43,119
completion and fruition and things like

1671
01:57:47,350 --> 01:57:45,199
that so it's been really great you know

1672
01:57:49,750 --> 01:57:47,360
learning more about the first out of

1673
01:57:52,310 --> 01:57:49,760
autoclave fairing i'm so happy to have

1674
01:57:54,709 --> 01:57:52,320
you here um emma thank you for joining

1675
01:57:56,950 --> 01:57:54,719
us and i hope you have a good rest of

1676
01:57:59,350 --> 01:57:56,960
your day and again congratulations

1677
01:58:01,189 --> 01:57:59,360
thanks so much for having me all right

1678
01:58:02,790 --> 01:58:01,199
um okay let's get back to the mission

1679
01:58:05,030 --> 01:58:02,800
we're coming up on the end of the first

1680
01:58:06,790 --> 01:58:05,040
of three centaur engine burns our next

1681
01:58:09,109 --> 01:58:06,800
event is the first centaur main engine

1682
01:58:55,430 --> 01:58:09,119
cutoff for mikko one once again here's

1683
01:58:55,440 --> 01:58:59,589
and standing by for miko one shortly

1684
01:59:14,390 --> 01:59:01,910
and seeing pu goes go to open loop

1685
01:59:19,189 --> 01:59:16,790
and we have miko engine cutoff pressure

1686
01:59:21,030 --> 01:59:19,199
signatures look good

1687
01:59:27,189 --> 01:59:21,040
uh centaur will code for approximately

1688
01:59:31,189 --> 01:59:29,669

and the rcs system is now commanding 100

1689
02:00:02,070 --> 01:59:31,199
settling the subtle propellant from the

1690
02:00:06,310 --> 02:00:04,229
this is atlas mission control at t plus

1691
02:00:07,910 --> 02:00:06,320
11 minutes and 30 seconds

1692
02:00:09,669 --> 02:00:07,920
jesse gonzalez just reported the

1693
02:00:12,390 --> 02:00:09,679
successful completion of the first of

1694
02:00:14,390 --> 02:00:12,400
three centaur engine burns centaur is

1695
02:00:16,470 --> 02:00:14,400
now in coasting over the atlantic ocean

1696
02:00:17,510 --> 02:00:16,480
west of africa but we still have a long

1697
02:00:19,910 --> 02:00:17,520
way to go

1698
02:00:21,910 --> 02:00:19,920
stp sat6 is scheduled to separate from

1699
02:00:23,830 --> 02:00:21,920
centaur into geosynchronous orbit in

1700
02:00:25,910 --> 02:00:23,840
just about 6 hours and 20 minutes

1701
02:00:28,709 --> 02:00:25,920
followed by 40 minutes later by

1702
02:00:30,629 --> 02:00:28,719
separation of ldpe1

1703
02:00:33,430 --> 02:00:30,639
to tell us more about the spacecraft i

1704
02:00:35,430 --> 02:00:33,440
am now joined by the stp stat 6 program

1705
02:00:37,750 --> 02:00:35,440
director ray crowe ray thank you so much

1706
02:00:39,669 --> 02:00:37,760
for being here today oh i'm absolutely

1707
02:00:41,669 --> 02:00:39,679
delighted to be here today it is a great

1708
02:00:43,510 --> 02:00:41,679
day for our nation it is a great day for

1709
02:00:45,189 --> 02:00:43,520
our nation fantastic very exciting

1710
02:00:46,790 --> 02:00:45,199
finally got off the ground which was

1711
02:00:48,390 --> 02:00:46,800
great um but thank you for taking a

1712
02:00:50,310 --> 02:00:48,400
couple minutes off console to be here

1713
02:00:52,709 --> 02:00:50,320

with us today my pleasure i'm excited to

1714
02:00:54,470 --> 02:00:52,719
learn more about stp stat six um so to

1715
02:00:55,830 --> 02:00:54,480
get us started into the questions why

1716
02:00:57,910 --> 02:00:55,840
don't you tell us a little bit more

1717
02:00:59,750 --> 02:00:57,920
about northrop grumman's role in this

1718
02:01:01,189 --> 02:00:59,760
mission uh i'll describe northrop

1719
02:01:03,109 --> 02:01:01,199
grumman's role in this mission but i'll

1720
02:01:05,270 --> 02:01:03,119
give you a bonus item oh great just got

1721
02:01:07,350 --> 02:01:05,280
a note from uh our engineers here on

1722
02:01:10,149 --> 02:01:07,360
site and we are receiving spacecraft

1723
02:01:12,390 --> 02:01:10,159
telemetry as expected oh that's amazing

1724
02:01:15,910 --> 02:01:12,400
i love the up-to-date information

1725
02:01:18,550 --> 02:01:15,920
so uh we have a very significant role uh

1726
02:01:20,390 --> 02:01:18,560
in this mission uh i'll start with the

1727
02:01:22,470 --> 02:01:20,400
northrop grumman contribution from the

1728
02:01:24,870 --> 02:01:22,480
top of the rocket to the bottom of the

1729
02:01:28,310 --> 02:01:24,880
rocket uh there are two spacecraft the

1730
02:01:32,229 --> 02:01:28,320
top spacecraft is stp sat six

1731
02:01:34,550 --> 02:01:32,239
uh sdp set six sdp set six's mission uh

1732
02:01:37,430 --> 02:01:34,560
is uh

1733
02:01:40,070 --> 02:01:37,440
to explore and to explore science that

1734
02:01:43,589 --> 02:01:40,080
will inform a generation of spacecraft

1735
02:01:46,629 --> 02:01:43,599
design and mission uh and mission design

1736
02:01:49,189 --> 02:01:46,639
northrop grumman's role for stp set six

1737
02:01:51,669 --> 02:01:49,199
design development test

1738
02:01:53,910 --> 02:01:51,679

integration of the payloads and support

1739
02:01:55,350 --> 02:01:53,920
of the mission over a 10-year uh over a

1740
02:01:57,510 --> 02:01:55,360
10-year period of time that's quite a

1741
02:01:59,589 --> 02:01:57,520
life cycle that's a fantastic life cycle

1742
02:02:02,229 --> 02:01:59,599
but you contrast that too

1743
02:02:04,629 --> 02:02:02,239
this program has been uh under motion

1744
02:02:06,149 --> 02:02:04,639
for the last seven years so this this

1745
02:02:07,830 --> 02:02:06,159
day this morning

1746
02:02:10,229 --> 02:02:07,840
yeah well punctuation point between

1747
02:02:12,629 --> 02:02:10,239
seven years of development and the first

1748
02:02:15,109 --> 02:02:12,639
hours of ten years of operation so we

1749
02:02:18,709 --> 02:02:15,119
are very excited about that as we move

1750
02:02:22,550 --> 02:02:18,719
down the stack uh ldpe number one uh

1751
02:02:26,550 --> 02:02:22,560
ldpe stands for long duration uh

1752
02:02:28,550 --> 02:02:26,560
propulsive uh eelv uh so an acronym

1753
02:02:30,470 --> 02:02:28,560
within an acronym

1754
02:02:34,070 --> 02:02:30,480
so think about uh

1755
02:02:36,629 --> 02:02:34,080
ldpe number one it is a ring however it

1756
02:02:39,750 --> 02:02:36,639
is an extremely smart ring uh it is a

1757
02:02:42,870 --> 02:02:39,760
spacecraft and you can affix payloads uh

1758
02:02:45,430 --> 02:02:42,880
to that spacecraft uh it is uh there are

1759
02:02:47,750 --> 02:02:45,440
so many advanced scientific payloads

1760
02:02:49,589 --> 02:02:47,760
that are sitting on shelves right now

1761
02:02:51,589 --> 02:02:49,599
and for lack of financial resources we

1762
02:02:54,629 --> 02:02:51,599
cannot get those in space

1763
02:02:57,589 --> 02:02:54,639

enter ldpe number one uh and the

1764
02:03:00,390 --> 02:02:57,599
platform espastar produced by northrop

1765
02:03:03,270 --> 02:03:00,400
uh produced by northrop grumman so we we

1766
02:03:06,470 --> 02:03:03,280
have an inexpensive and an easy way to

1767
02:03:09,510 --> 02:03:06,480
integrate payloads that represent uh the

1768
02:03:12,870 --> 02:03:09,520
forefront of technology a way to reduce

1769
02:03:14,229 --> 02:03:12,880
risk to test payloads in in space early

1770
02:03:16,550 --> 02:03:14,239
and even better than that the

1771
02:03:19,109 --> 02:03:16,560
opportunity for residual operational

1772
02:03:20,709 --> 02:03:19,119
capability we continue our walk down the

1773
02:03:21,830 --> 02:03:20,719
vehicle this morning

1774
02:03:24,550 --> 02:03:21,840
and uh

1775
02:03:25,990 --> 02:03:24,560
we have had uh it is a pride point for

1776
02:03:29,510 --> 02:03:26,000
us and the pride point is the

1777
02:03:31,510 --> 02:03:29,520
relationship uh with atlas over a a

1778
02:03:33,750 --> 02:03:31,520
three decade more than 30-year period of

1779
02:03:35,589 --> 02:03:33,760
time a long heritage there extremely

1780
02:03:38,629 --> 02:03:35,599
long heritage so everyone of course saw

1781
02:03:40,950 --> 02:03:38,639
those magnificent gem engines those are

1782
02:03:42,870 --> 02:03:40,960
produced by northrop grumman yes we also

1783
02:03:45,350 --> 02:03:42,880
produce some composite structures for

1784
02:03:47,750 --> 02:03:45,360
the atlas as well uh so a great deal of

1785
02:03:50,470 --> 02:03:47,760
northrop grumman content uh and

1786
02:03:52,310 --> 02:03:50,480
certainly a great deal of employee pride

1787
02:03:54,149 --> 02:03:52,320
when we see an event like this and

1788
02:03:56,229 --> 02:03:54,159

prepare for 10 years of operation it's

1789
02:03:58,550 --> 02:03:56,239
quite an integrated team effort but it's

1790
02:04:00,310 --> 02:03:58,560
really amazing to see all of the aspects

1791
02:04:02,390 --> 02:04:00,320
that northrop grumman has been involved

1792
02:04:04,470 --> 02:04:02,400
in over this long period of time so

1793
02:04:06,790 --> 02:04:04,480
again congratulations on us finally

1794
02:04:09,189 --> 02:04:06,800
getting here today um so let's let's

1795
02:04:13,510 --> 02:04:09,199
take a look now at our payload what

1796
02:04:16,790 --> 02:04:13,520
makes stpc stp sat6 unique well we'll

1797
02:04:19,510 --> 02:04:16,800
we'll start with a uh a very capable and

1798
02:04:22,870 --> 02:04:19,520
a very prestigious client uh the u.s

1799
02:04:26,069 --> 02:04:22,880
space force uh we work with uh the space

1800
02:04:28,870 --> 02:04:26,079
test program uh located at kirtland air

1801
02:04:31,750 --> 02:04:28,880
force base uh their leadership in this

1802
02:04:33,990 --> 02:04:31,760
has been absolutely remarkable uh and

1803
02:04:35,830 --> 02:04:34,000
then as we work through uh as we work

1804
02:04:39,270 --> 02:04:35,840
through the rest of the mission uh and

1805
02:04:42,629 --> 02:04:39,280
so sdp set six has set all sorts of

1806
02:04:45,910 --> 02:04:42,639
records on our dulles campus uh uh one

1807
02:04:47,990 --> 02:04:45,920
uh for today is this is our 200th

1808
02:04:49,990 --> 02:04:48,000
spacecraft congratulations from our

1809
02:04:52,550 --> 02:04:50,000
dulles canvas

1810
02:04:54,470 --> 02:04:52,560
and we'll say lepe was 201. okay that's

1811
02:04:57,030 --> 02:04:54,480
fair

1812
02:05:00,470 --> 02:04:57,040
stp set six is uh is number two hundred

1813
02:05:02,470 --> 02:05:00,480

okay uh we have set perhaps 25 records

1814
02:05:05,430 --> 02:05:02,480
uh for spacecraft that have moved

1815
02:05:09,189 --> 02:05:05,440
through our campus it is our first rad

1816
02:05:11,830 --> 02:05:09,199
hard bus uh it is a redundant bus uh it

1817
02:05:14,629 --> 02:05:11,840
is designed for a design for a 10 year

1818
02:05:17,350 --> 02:05:14,639
life uh and it has been uh just an

1819
02:05:19,589 --> 02:05:17,360
absolute delight to develop and to build

1820
02:05:22,069 --> 02:05:19,599
i mean that's great it's it's truly

1821
02:05:24,390 --> 02:05:22,079
amazing to hear about all of the

1822
02:05:27,030 --> 02:05:24,400
activities that went in today and how

1823
02:05:28,310 --> 02:05:27,040
unique the spacecraft is um so in terms

1824
02:05:29,830 --> 02:05:28,320
of the actual

1825
02:05:31,589 --> 02:05:29,840
mission today can you give us a little

1826
02:05:33,430 --> 02:05:31,599
bit more information about the mission

1827
02:05:36,149 --> 02:05:33,440
milestones we can expect to see

1828
02:05:38,069 --> 02:05:36,159
absolutely uh so we'll we'll start with

1829
02:05:41,510 --> 02:05:38,079
uh 20 minutes before we were launched

1830
02:05:43,350 --> 02:05:41,520
today uh we went to internal power uh

1831
02:05:45,990 --> 02:05:43,360
but internal power for us means we are

1832
02:05:48,069 --> 02:05:46,000
on our batteries uh but the centaur

1833
02:05:51,350 --> 02:05:48,079
carries batteries as well and that

1834
02:05:53,430 --> 02:05:51,360
assures us that when we are released uh

1835
02:05:55,430 --> 02:05:53,440
when we're released uh that we will have

1836
02:05:59,189 --> 02:05:55,440
let us say a full head of steam our

1837
02:06:01,430 --> 02:05:59,199
batteries will be fully charged uh so we

1838
02:06:04,149 --> 02:06:01,440

are we will be attached to the centaur

1839
02:06:05,910 --> 02:06:04,159
for another six and one excuse me six

1840
02:06:08,310 --> 02:06:05,920
and one half hours it's a very long

1841
02:06:10,390 --> 02:06:08,320
mission today it is uh actually the

1842
02:06:12,390 --> 02:06:10,400
length of this mission is a rec is a

1843
02:06:14,310 --> 02:06:12,400
record another record another record

1844
02:06:15,669 --> 02:06:14,320
yeah for both of us actually absolutely

1845
02:06:18,149 --> 02:06:15,679
absolutely so

1846
02:06:20,550 --> 02:06:18,159
also great there there too uh so after

1847
02:06:23,030 --> 02:06:20,560
six and a half hours we will pop off the

1848
02:06:25,189 --> 02:06:23,040
vehicle gently pop off the vehicle we

1849
02:06:26,870 --> 02:06:25,199
like a gentle ride

1850
02:06:29,270 --> 02:06:26,880
delivery to the right place delivery to

1851
02:06:31,750 --> 02:06:29,280
the right place uh and so on this six

1852
02:06:34,470 --> 02:06:31,760
and a half ascent uh we are in a mode

1853
02:06:36,390 --> 02:06:34,480
called all safe which means we cannot

1854
02:06:39,270 --> 02:06:36,400
accidentally deploy any of our

1855
02:06:41,990 --> 02:06:39,280
mechanical appendages uh so we will pop

1856
02:06:43,910 --> 02:06:42,000
off uh we will pop off the rocket uh at

1857
02:06:46,709 --> 02:06:43,920
that time thrusters will be enabled

1858
02:06:49,750 --> 02:06:46,719
wheels will be enabled our solar array

1859
02:06:52,069 --> 02:06:49,760
will deploy and we will find the sun

1860
02:06:54,229 --> 02:06:52,079
and then the ground segment will will

1861
02:06:56,069 --> 02:06:54,239
acquire us at that point that's when

1862
02:06:57,830 --> 02:06:56,079
it's thumbs up and the launch has been

1863
02:07:00,470 --> 02:06:57,840

completely successful when we are

1864
02:07:03,990 --> 02:07:00,480
delivered on orbit once on orbit uh we

1865
02:07:06,069 --> 02:07:04,000
will undergo a test regime 66 days

1866
02:07:08,310 --> 02:07:06,079
plus or minus a little bit longer and

1867
02:07:11,109 --> 02:07:08,320
then we will transition to government

1868
02:07:13,109 --> 02:07:11,119
operation and that puts us in a role

1869
02:07:15,990 --> 02:07:13,119
where we will support these operations

1870
02:07:17,510 --> 02:07:16,000
uh for for a decade oh great it's a

1871
02:07:20,310 --> 02:07:17,520
really long time i mean we're talking

1872
02:07:22,310 --> 02:07:20,320
about long times to get us to orbit now

1873
02:07:24,310 --> 02:07:22,320
we're talking long time in orbit i mean

1874
02:07:26,870 --> 02:07:24,320
it's truly great to hear all all about

1875
02:07:28,950 --> 02:07:26,880
the heritage the history and our mission

1876
02:07:30,470 --> 02:07:28,960
today so before we let you go is there

1877
02:07:33,589 --> 02:07:30,480
anything else you'd like to add well

1878
02:07:36,069 --> 02:07:33,599
absolutely always yeah always absolutely

1879
02:07:38,950 --> 02:07:36,079
so so here's what i would add today uh

1880
02:07:41,830 --> 02:07:38,960
i'm i will finish today with the words

1881
02:07:44,149 --> 02:07:41,840
that we use when we start every major

1882
02:07:46,390 --> 02:07:44,159
meeting with with our stakeholders and

1883
02:07:49,430 --> 02:07:46,400
when i say when i say stakeholders and

1884
02:07:51,109 --> 02:07:49,440
when i use the word team uh team uh goes

1885
02:07:53,109 --> 02:07:51,119
far beyond the boundaries of the

1886
02:07:57,750 --> 02:07:53,119
northrop grumman employee family it

1887
02:08:00,149 --> 02:07:57,760
includes the space force nsa nasa ula

1888
02:08:02,550 --> 02:08:00,159

and a broad community of stakeholders

1889
02:08:04,950 --> 02:08:02,560
and the words that we use are this if

1890
02:08:06,790 --> 02:08:04,960
you're willing to work as a team

1891
02:08:09,189 --> 02:08:06,800
anything is possible

1892
02:08:11,510 --> 02:08:09,199
that's my message today yeah i mean we

1893
02:08:13,350 --> 02:08:11,520
all know how complicated everything is

1894
02:08:15,109 --> 02:08:13,360
with this entire process so quite a

1895
02:08:17,510 --> 02:08:15,119
collaborative effort um

1896
02:08:19,109 --> 02:08:17,520
and congratulations again today i have

1897
02:08:20,870 --> 02:08:19,119
certainly appreciated all of the

1898
02:08:22,709 --> 02:08:20,880
information you've provided to us i know

1899
02:08:25,350 --> 02:08:22,719
our viewers have enjoyed it as well i

1900
02:08:27,270 --> 02:08:25,360
can certainly feel your enthusiasm

1901
02:08:28,870 --> 02:08:27,280
so i know everybody's really appreciated

1902
02:08:30,470 --> 02:08:28,880
that but certainly thank you for

1903
02:08:32,069 --> 02:08:30,480
spending some time with me today and

1904
02:08:33,589 --> 02:08:32,079
letting us know a little bit more about

1905
02:08:35,030 --> 02:08:33,599
your role in the mission thank you for

1906
02:08:36,950 --> 02:08:35,040
the opportunity i appreciate it very

1907
02:08:44,069 --> 02:08:36,960
much thank you so much have a great day

1908
02:08:47,910 --> 02:08:46,149
before i toss today's live coverage back

1909
02:08:50,229 --> 02:08:47,920
to our nasa partners where you'll hear

1910
02:08:52,950 --> 02:08:50,239
more about the laser communication relay

1911
02:08:55,030 --> 02:08:52,960
demonstration i'd like to take to thank

1912
02:08:57,109 --> 02:08:55,040
jesse gonzalez for his participation in

1913
02:08:59,830 --> 02:08:57,119

today's show as well as brian sizzik

1914
02:09:01,589 --> 02:08:59,840
from the space launch delta 45 weather

1915
02:09:03,270 --> 02:09:01,599
you can stay updated on today's long

1916
02:09:06,310 --> 02:09:03,280
ascend to geosynchronous orbit with

1917
02:09:08,310 --> 02:09:06,320
ula's live blog at ulalaunch.com

1918
02:09:09,750 --> 02:09:08,320
or join the conversation on twitter and

1919
02:09:11,430 --> 02:09:09,760
facebook

1920
02:09:13,109 --> 02:09:11,440
i'm andrea linhoff

1921
02:09:15,189 --> 02:09:13,119
thanks for joining me bright and early

1922
02:09:17,910 --> 02:09:15,199
today before we hand you back to nasa

1923
02:09:21,430 --> 02:09:17,920
coverage let's take one more look at the

1924
02:09:28,629 --> 02:09:21,440
liftoff from today at 5 19 a.m eastern

1925
02:09:31,270 --> 02:09:30,229
t minus 10

1926
02:09:32,149 --> 02:09:31,280
9

1927
02:09:33,109 --> 02:09:32,159
eight

1928
02:09:34,149 --> 02:09:33,119
seven

1929
02:09:35,189 --> 02:09:34,159
six

1930
02:09:36,149 --> 02:09:35,199
five

1931
02:09:37,189 --> 02:09:36,159
four

1932
02:09:38,149 --> 02:09:37,199
three

1933
02:09:38,950 --> 02:09:38,159
two

1934
02:09:40,790 --> 02:09:38,960
one

1935
02:09:43,510 --> 02:09:40,800
and we have

1936
02:09:46,310 --> 02:09:43,520
liftoff of the united launch alliance

1937
02:09:50,390 --> 02:09:46,320
atlas v rocket with the stp 3 mission

1938
02:09:54,149 --> 02:09:51,750

vehicle has cleared the tower and is

1939
02:09:55,750 --> 02:09:54,159
beginning the pitch over program

1940
02:09:57,589 --> 02:09:55,760
and the rd-180 is throttling down

1941
02:09:58,830 --> 02:09:57,599
slightly as expected engine response

1942
02:10:01,350 --> 02:09:58,840
looks

1943
02:10:03,030 --> 02:10:01,360
good and passing 20 seconds of the

1944
02:10:04,229 --> 02:10:03,040
flight the pu system has gone to close

1945
02:10:05,910 --> 02:10:04,239
with control

1946
02:10:08,310 --> 02:10:05,920
srb chamber pressures continue to look

1947
02:10:09,830 --> 02:10:08,320
nominal

1948
02:10:11,750 --> 02:10:09,840
if you're just joining us welcome to

1949
02:10:13,830 --> 02:10:11,760
nasa's live coverage of the laser

1950
02:10:16,390 --> 02:10:13,840
communications relay demonstration or

1951
02:10:18,709 --> 02:10:16,400
lcrd it launched about 20 minutes ago

1952
02:10:21,830 --> 02:10:18,719
from cape canaveral space for station as

1953
02:10:23,510 --> 02:10:21,840
part of the space test program 3 mission

1954
02:10:25,750 --> 02:10:23,520
lcrd will demonstrate the unique

1955
02:10:28,229 --> 02:10:25,760
capabilities of laser also known as

1956
02:10:30,790 --> 02:10:28,239
optical communications versus the radio

1957
02:10:32,390 --> 02:10:30,800
systems nasa uses now and here with me

1958
02:10:34,390 --> 02:10:32,400
this morning is jeff sheehai he's the

1959
02:10:36,709 --> 02:10:34,400
chief engineer for nasa's space

1960
02:10:38,069 --> 02:10:36,719
technology mission directorate jeff

1961
02:10:40,229 --> 02:10:38,079
wasn't that a beautiful launch oh

1962
02:10:42,870 --> 02:10:40,239
they're always amazing everybody right

1963
02:10:44,629 --> 02:10:42,880

out there the launch of the brake flash

1964
02:10:46,550 --> 02:10:44,639
and then you wait a few seconds and you

1965
02:10:47,990 --> 02:10:46,560
hear that sound it kind of beats against

1966
02:10:49,830 --> 02:10:48,000
your chest yeah

1967
02:10:51,510 --> 02:10:49,840
i've seen a number of launches now and

1968
02:10:53,270 --> 02:10:51,520
they never get old yeah definitely worth

1969
02:10:55,350 --> 02:10:53,280
the wait this morning and so talk to me

1970
02:10:57,109 --> 02:10:55,360
about uh you know lc or d again is on

1971
02:10:59,430 --> 02:10:57,119
its way now but there's still a lot we

1972
02:11:02,550 --> 02:10:59,440
need to monitor right yeah you know the

1973
02:11:03,430 --> 02:11:02,560
spacecraft is going to be delivered to

1974
02:11:06,310 --> 02:11:03,440
near

1975
02:11:07,830 --> 02:11:06,320
its final orbital home in about six

1976
02:11:09,030 --> 02:11:07,840
hours and 10 minutes from now it'll be

1977
02:11:10,550 --> 02:11:09,040
dropped off

1978
02:11:13,030 --> 02:11:10,560
from the upper stage of the launch

1979
02:11:15,030 --> 02:11:13,040
vehicle and then it'll maneuver into

1980
02:11:18,390 --> 02:11:15,040
place over the course of a a couple of

1981
02:11:19,990 --> 02:11:18,400
weeks during those couple of weeks the

1982
02:11:22,149 --> 02:11:20,000
space force will be checking out their

1983
02:11:25,750 --> 02:11:22,159
spacecraft the spacecraft is more than

1984
02:11:28,629 --> 02:11:25,760
just a a host platform right in terms of

1985
02:11:31,030 --> 02:11:28,639
a place to mount all the lcrd stuff but

1986
02:11:33,270 --> 02:11:31,040
lcrd is going to rely on spacecraft

1987
02:11:34,870 --> 02:11:33,280
systems to be working so they'll bring

1988
02:11:37,430 --> 02:11:34,880

up the spacecraft check it out make sure

1989
02:11:38,950 --> 02:11:37,440
everything's working okay yeah and then

1990
02:11:41,990 --> 02:11:38,960
when we know about two and a half weeks

1991
02:11:44,149 --> 02:11:42,000
from now when the the spacecraft is in

1992
02:11:45,990 --> 02:11:44,159
its proper orbit when the spacecraft is

1993
02:11:48,149 --> 02:11:46,000
open checked out we'll be able to turn

1994
02:11:50,069 --> 02:11:48,159
on the lcrd payload yeah that's really

1995
02:11:51,589 --> 02:11:50,079
exciting and then when do you say hey

1996
02:11:53,270 --> 02:11:51,599
this mission was a success is there a

1997
02:11:55,430 --> 02:11:53,280
threshold we need to cross there's a

1998
02:11:57,350 --> 02:11:55,440
number of objectives that we have for

1999
02:11:59,430 --> 02:11:57,360
the mission all of the technology

2000
02:12:01,350 --> 02:11:59,440
demonstrations that we do we write

2001
02:12:03,350 --> 02:12:01,360
formal requirements and we have a set of

2002
02:12:06,709 --> 02:12:03,360
mission objectives and this one's no

2003
02:12:08,790 --> 02:12:06,719
different we've got objectives that

2004
02:12:11,430 --> 02:12:08,800
will demonstrate the capability of

2005
02:12:13,830 --> 02:12:11,440
transmitting data at high data rates

2006
02:12:15,990 --> 02:12:13,840
from the ground to the spacecraft from

2007
02:12:18,950 --> 02:12:16,000
the spacecraft to the ground ultimately

2008
02:12:21,830 --> 02:12:18,960
there'll be other assets in space on the

2009
02:12:24,390 --> 02:12:21,840
iss on the orion capsule we'll

2010
02:12:28,149 --> 02:12:24,400
communicate between those and relay that

2011
02:12:29,830 --> 02:12:28,159
data to the ground the the r in lcrd the

2012
02:12:31,750 --> 02:12:29,840
relay part is yeah is really an

2013
02:12:34,550 --> 02:12:31,760

important aspect of the demonstration

2014
02:12:36,870 --> 02:12:34,560
here it's not just about being able to

2015
02:12:39,510 --> 02:12:36,880
send data from a a spacecraft to ground

2016
02:12:41,830 --> 02:12:39,520
but relay that data to other between

2017
02:12:43,589 --> 02:12:41,840
other assets in space so when we

2018
02:12:45,589 --> 02:12:43,599
accomplished that

2019
02:12:46,950 --> 02:12:45,599
basically showed that hey it works great

2020
02:12:48,629 --> 02:12:46,960
right that's what we're trying to do

2021
02:12:50,870 --> 02:12:48,639
we're trying to demonstrate how well

2022
02:12:52,870 --> 02:12:50,880
does this work anyway and so when we

2023
02:12:55,189 --> 02:12:52,880
demonstrate that it works well then

2024
02:12:57,350 --> 02:12:55,199
we'll try out different operational

2025
02:13:00,390 --> 02:12:57,360
scenarios what we want to do is

2026
02:13:02,629 --> 02:13:00,400
demonstrate the capability to a point

2027
02:13:04,790 --> 02:13:02,639
where a mission planner could say hey

2028
02:13:07,350 --> 02:13:04,800
that's a technology that i can really

2029
02:13:09,430 --> 02:13:07,360
use to benefit my mission so we'll try

2030
02:13:11,109 --> 02:13:09,440
out different operational scenarios

2031
02:13:13,510 --> 02:13:11,119
we're going to be taking a lot of data

2032
02:13:15,270 --> 02:13:13,520
on how well does the laser penetrate

2033
02:13:16,629 --> 02:13:15,280
through the atmosphere right how however

2034
02:13:19,510 --> 02:13:16,639
we receive the data at these ground

2035
02:13:21,030 --> 02:13:19,520
stations in california and hawaii yeah

2036
02:13:23,750 --> 02:13:21,040
there'll be some atmospheric

2037
02:13:25,270 --> 02:13:23,760
interference we have adaptive optics in

2038
02:13:26,950 --> 02:13:25,280

the ground station to be able to correct

2039
02:13:29,109 --> 02:13:26,960
for that so with this launch it just

2040
02:13:30,470 --> 02:13:29,119
means more more work for you guys yeah

2041
02:13:33,189 --> 02:13:30,480
we were just talking to the program

2042
02:13:34,950 --> 02:13:33,199
manager before we came on and he said

2043
02:13:36,470 --> 02:13:34,960
yeah this is tricking one thing off but

2044
02:13:37,910 --> 02:13:36,480
now the real work starts right but it's

2045
02:13:39,830 --> 02:13:37,920
exciting work and i'm so glad you guys

2046
02:13:41,270 --> 02:13:39,840
got to launch today and and yeah we'll

2047
02:13:42,790 --> 02:13:41,280
just see when the experiments start in

2048
02:13:45,109 --> 02:13:42,800
march so thank you jeff you're welcome

2049
02:13:47,669 --> 02:13:45,119
thank you so much and lcrd will be

2050
02:13:49,510 --> 02:13:47,679
nasa's first two-way end-to-end optical

2051
02:13:51,430 --> 02:13:49,520
relay because it can both send and

2052
02:13:55,470 --> 02:13:51,440
receive data at once check out this

2053
02:13:59,109 --> 02:13:56,629
[Music]

2054
02:14:01,430 --> 02:13:59,119
lcrd will relay sample data like

2055
02:14:03,430 --> 02:14:01,440
glimpses of planetary surfaces or

2056
02:14:05,189 --> 02:14:03,440
satellite health down to earth over

2057
02:14:07,910 --> 02:14:05,199
infrared lasers

2058
02:14:09,270 --> 02:14:07,920
historically nasa has used radio waves

2059
02:14:12,149 --> 02:14:09,280
to communicate

2060
02:14:14,870 --> 02:14:12,159
when we landed on the moon in 1969

2061
02:14:23,830 --> 02:14:14,880
neil armstrong's first words came across

2062
02:14:28,629 --> 02:14:25,750
when we go back to the moon we're going

2063
02:14:30,470 --> 02:14:28,639

to stay longer and explore more

2064
02:14:32,069 --> 02:14:30,480
with so many new and exciting things

2065
02:14:33,990 --> 02:14:32,079
happening on the moon

2066
02:14:35,109 --> 02:14:34,000
missions will need a better way to talk

2067
02:14:37,189 --> 02:14:35,119
with earth

2068
02:14:40,069 --> 02:14:37,199
and that's where lasers come in

2069
02:14:41,910 --> 02:14:40,079
lcrd will demo the vast capability of

2070
02:14:44,709 --> 02:14:41,920
laser communications

2071
02:14:46,790 --> 02:14:44,719
this includes transmitting 10 to 100

2072
02:14:49,270 --> 02:14:46,800
times more information to earth than is

2073
02:14:51,270 --> 02:14:49,280
possible using radio systems

2074
02:14:54,950 --> 02:14:51,280
meaning missions can send more detailed

2075
02:14:57,910 --> 02:14:54,960
photos videos and data

2076
02:14:59,589 --> 02:14:57,920
when lcrd reaches its destination it

2077
02:15:01,270 --> 02:14:59,599
will spend two years conducting

2078
02:15:03,910 --> 02:15:01,280
experiments that will be developed by

2079
02:15:06,310 --> 02:15:03,920
nasa and our friends in industry and

2080
02:15:09,030 --> 02:15:06,320
academia

2081
02:15:11,990 --> 02:15:09,040
lcrd's first orbiting experimental user

2082
02:15:13,750 --> 02:15:12,000
will be the international space station

2083
02:15:16,550 --> 02:15:13,760
astronauts live and work there

2084
02:15:20,069 --> 02:15:16,560
conducting research about life in space

2085
02:15:22,149 --> 02:15:20,079
microgravity biology and more

2086
02:15:24,229 --> 02:15:22,159
using lasers the station will be able to

2087
02:15:26,550 --> 02:15:24,239
relay more experimental data to

2088
02:15:28,470 --> 02:15:26,560

scientists on earth

2089
02:15:30,069 --> 02:15:28,480
laser systems are great for missions

2090
02:15:32,709 --> 02:15:30,079
like the space station because they

2091
02:15:34,790 --> 02:15:32,719
weigh less are smaller and use less

2092
02:15:36,790 --> 02:15:34,800
power than radio systems

2093
02:15:39,109 --> 02:15:36,800
a smaller size means more room for

2094
02:15:41,109 --> 02:15:39,119
science instruments

2095
02:15:42,229 --> 02:15:41,119
less weight means a less expensive

2096
02:15:44,069 --> 02:15:42,239
launch

2097
02:15:47,270 --> 02:15:44,079
less power means less drain on the

2098
02:15:49,350 --> 02:15:47,280
spacecraft's batteries

2099
02:15:51,030 --> 02:15:49,360
lcrd and the space station will work

2100
02:15:53,109 --> 02:15:51,040
together and demonstrate laser

2101
02:15:55,030 --> 02:15:53,119
communications near earth

2102
02:15:57,270 --> 02:15:55,040
this will help prove laser systems are

2103
02:16:02,450 --> 02:15:57,280
an option for future expeditions back to

2104
02:16:11,990 --> 02:16:10,470
[Music]

2105
02:16:14,629 --> 02:16:12,000
thanks again for joining us for this

2106
02:16:17,030 --> 02:16:14,639
live launch coverage of lcrd again it

2107
02:16:18,950 --> 02:16:17,040
will orbit about 22 000 miles above the

2108
02:16:20,709 --> 02:16:18,960
earth's surface while it conducts two

2109
02:16:23,589 --> 02:16:20,719
years worth of experiments you can

2110
02:16:25,270 --> 02:16:23,599
follow all the updates at nasa.gov

2111
02:16:26,950 --> 02:16:25,280
lasercoms you can see it right there on

2112
02:16:28,550 --> 02:16:26,960
the bottom of your screen and you can

2113
02:16:30,629 --> 02:16:28,560

never get enough video of a beautiful

2114
02:16:32,230 --> 02:16:30,639
launch so let's close out the show with

2115
02:16:38,790 --> 02:16:32,240
another replay have a wonderful day

2116
02:16:41,349 --> 02:16:40,389
t minus 10

2117
02:16:42,230 --> 02:16:41,359
9

2118
02:16:43,190 --> 02:16:42,240
8

2119
02:16:44,230 --> 02:16:43,200
7

2120
02:16:45,270 --> 02:16:44,240
6

2121
02:16:46,230 --> 02:16:45,280
5

2122
02:16:47,270 --> 02:16:46,240
four

2123
02:16:48,230 --> 02:16:47,280
three

2124
02:16:50,870 --> 02:16:48,240
two

2125
02:16:53,589 --> 02:16:50,880
one and we have

2126
02:16:56,389 --> 02:16:53,599
liftoff of the united launch alliance

2127
02:17:00,549 --> 02:16:56,399
atlas v rocket with the stp-3 mission

2128
02:17:01,830 --> 02:17:00,559
for the united states space force

2129
02:17:04,230 --> 02:17:01,840
vehicle has cleared the tower and is

2130
02:17:05,830 --> 02:17:04,240
beginning to pitch over program

2131
02:17:07,669 --> 02:17:05,840
and the rd-180 is throttling down

2132
02:17:09,990 --> 02:17:07,679
slightly as expected engine response

2133
02:17:12,150 --> 02:17:10,000
looks good

2134
02:17:14,309 --> 02:17:12,160
and passing 20 seconds of deflate the pu

2135
02:17:15,990 --> 02:17:14,319
system has gone to closed loop control

2136
02:17:18,309 --> 02:17:16,000
srb chamber pressures continue to look

2137
02:17:19,830 --> 02:17:18,319
nominal rd180 pump speed and fuel

2138
02:17:31,430 --> 02:17:19,840

injector pressure fuel injector