1
00:00:07,590 --> 00:00:19,269
[Music]

2
00:00:23,590 --> 00:00:20,870
you're looking at a live view of the

3
00:00:26,310 --> 00:00:23,600
spacex falcon 9 rocket and cargo dragon

4
00:00:27,910 --> 00:00:26,320
at launch complex 39a set to lift off

5
00:00:29,349 --> 00:00:27,920
this afternoon to the international

6
00:00:31,189 --> 00:00:29,359
space station

7
00:00:33,030 --> 00:00:31,199
good afternoon and welcome to nasa's

8
00:00:35,350 --> 00:00:33,040
kennedy space center in florida i'm

9
00:00:36,790 --> 00:00:35,360
megan cruz with nasa communications

10
00:00:39,750 --> 00:00:36,800
today's cargo mission known as

11
00:00:41,990 --> 00:00:39,760
commercial resupply services mission 22

12
00:00:44,389 --> 00:00:42,000
is scheduled to launch at 1 29 pm

13
00:00:46,549 --> 00:00:44,399

eastern time it will be the second

14
00:00:49,350 --> 00:00:46,559
resupply mission to the space station on

15
00:00:50,950 --> 00:00:49,360
the upgraded cargo dragon spacecraft we

16
00:00:52,869 --> 00:00:50,960
will show you some of the incredible

17
00:00:56,229 --> 00:00:52,879
technology headed to space today

18
00:00:59,270 --> 00:00:56,239
including brand new solar arrays to give

19
00:01:01,189 --> 00:00:59,280
the station a power boost but first we

20
00:01:04,469 --> 00:01:01,199
are really excited to be simulcasting

21
00:01:06,870 --> 00:01:04,479
today's live coverage on nasa tv and the

22
00:01:08,310 --> 00:01:06,880
spacex webcast with our partners based

23
00:01:10,230 --> 00:01:08,320
at the company's headquarters in

24
00:01:12,789 --> 00:01:10,240
hawthorne california let's bring in

25
00:01:14,469 --> 00:01:12,799
shiva bharavaj now shiva it's so nice to

26
00:01:16,950 --> 00:01:14,479
have you with us today

27
00:01:18,870 --> 00:01:16,960
thanks megan it's really exciting to be

28
00:01:21,270 --> 00:01:18,880
covering today's mission in partnership

29
00:01:22,950 --> 00:01:21,280
with nasa it's the fifth dragon flight

30
00:01:25,270 --> 00:01:22,960
to the international space station since

31
00:01:27,590 --> 00:01:25,280
may 2020 with many more planned for the

32
00:01:29,670 --> 00:01:27,600
upcoming year and as you mentioned this

33
00:01:31,990 --> 00:01:29,680
will be the second cargo resupply

34
00:01:34,950 --> 00:01:32,000
mission for our upgraded dragon this

35
00:01:37,030 --> 00:01:34,960
cargo vehicle will be joining the crew 2

36
00:01:38,789 --> 00:01:37,040
vehicle on orbit making it just the

37
00:01:40,630 --> 00:01:38,799
third time that we've had two dragons

38
00:01:42,710 --> 00:01:40,640

docked at the space station

39
00:01:45,270 --> 00:01:42,720
now you're looking at a live view of a

40
00:01:46,789 --> 00:01:45,280
brand new falcon 9 booster this is

41
00:01:48,950 --> 00:01:46,799
actually the first new booster that

42
00:01:51,990 --> 00:01:48,960
we're using this year and the vehicle

43
00:01:55,109 --> 00:01:52,000
stands 229 feet tall or slightly taller

44
00:01:57,830 --> 00:01:55,119
than a 21 building now falcon 9 is a

45
00:02:00,149 --> 00:01:57,840
reusable two-stage rocket designed and

46
00:02:02,149 --> 00:02:00,159
manufactured by spacex for the reliable

47
00:02:05,030 --> 00:02:02,159
and safe transport of both people and

48
00:02:07,030 --> 00:02:05,040
payloads into earth orbit and beyond

49
00:02:09,749 --> 00:02:07,040
this falcon 9 rolled out to the pad and

50
00:02:12,790 --> 00:02:09,759
went vertical on tuesday june 1st around

51
00:02:14,390 --> 00:02:12,800
3 p.m eastern time and actually

52
00:02:16,630 --> 00:02:14,400
just before the program started at

53
00:02:18,869 --> 00:02:16,640
around t minus 35 minutes we began

54
00:02:20,790 --> 00:02:18,879
loading propellants onto falcon 9.

55
00:02:23,750 --> 00:02:20,800
falcon 9 uses two propellants the first

56
00:02:25,830 --> 00:02:23,760
of those is a fuel a refined form of

57
00:02:28,470 --> 00:02:25,840
kerosene known as rp1 or rocket

58
00:02:31,110 --> 00:02:28,480
propellant one and for our oxidizer we

59
00:02:33,750 --> 00:02:31,120
use super chilled liquid oxygen referred

60
00:02:35,509 --> 00:02:33,760
to as locks we chill the locks well

61
00:02:37,750 --> 00:02:35,519
below the boiling point which helps

62
00:02:40,070 --> 00:02:37,760
increase its density so we can load more

63
00:02:42,229 --> 00:02:40,080

of it into the first and second stages

64
00:02:44,790 --> 00:02:42,239
now to start the engines we also need an

65
00:02:47,750 --> 00:02:44,800
ignition source for that falcon 9 uses a

66
00:02:50,070 --> 00:02:47,760
chemical igniter called t-tab you'll see

67
00:02:51,670 --> 00:02:50,080
a characteristic green spark around the

68
00:02:54,390 --> 00:02:51,680
t-minus zero

69
00:02:56,550 --> 00:02:54,400
mark right before the rocket takes off

70
00:02:58,390 --> 00:02:56,560
now the bottom two thirds of the vehicle

71
00:03:00,229 --> 00:02:58,400
is what we refer to as the first stage

72
00:03:01,910 --> 00:03:00,239
its objective is to accelerate the

73
00:03:03,990 --> 00:03:01,920
vehicle through the earth's atmosphere

74
00:03:06,070 --> 00:03:04,000
to space and then it'll separate from

75
00:03:08,229 --> 00:03:06,080
the rest of the rocket today we will be

76
00:03:10,070 --> 00:03:08,239
attempting to recover this first stage

77
00:03:11,910 --> 00:03:10,080
on our drone ship named of course i

78
00:03:13,670 --> 00:03:11,920
still love you that's stationed out in

79
00:03:15,910 --> 00:03:13,680
the atlantic ocean and if you've been

80
00:03:18,070 --> 00:03:15,920
keeping town at home if we successfully

81
00:03:20,949 --> 00:03:18,080
land the falcon 9 today it'll mark our

82
00:03:22,390 --> 00:03:20,959
86th successful landing of an orbital

83
00:03:24,070 --> 00:03:22,400
class rocket

84
00:03:26,789 --> 00:03:24,080
now on top of the first stage we have

85
00:03:29,350 --> 00:03:26,799
falcon 9's second stage it has a single

86
00:03:31,830 --> 00:03:29,360
merlin vacuum or mvac engine that

87
00:03:33,430 --> 00:03:31,840
ignites after the first stage separates

88
00:03:35,750 --> 00:03:33,440

the second stage is ultimately what will

89
00:03:37,670 --> 00:03:35,760
carry dragon into its intended orbit

90
00:03:39,589 --> 00:03:37,680
allowing dragon to then separate and

91
00:03:40,949 --> 00:03:39,599
then eventually for it to continue with

92
00:03:43,350 --> 00:03:40,959
its rendezvous to the international

93
00:03:45,350 --> 00:03:43,360
space station now finally at the very

94
00:03:47,750 --> 00:03:45,360
top of the rocket is the dragon

95
00:03:49,990 --> 00:03:47,760
spacecraft dragon was designed from the

96
00:03:51,990 --> 00:03:50,000
beginning to be reused this new version

97
00:03:53,910 --> 00:03:52,000
of dragon was designed for up to five

98
00:03:56,149 --> 00:03:53,920
flights while the previous version could

99
00:03:58,550 --> 00:03:56,159
only support three just like today's

100
00:04:00,710 --> 00:03:58,560
falcon 9 we're flying a brand new dragon

101
00:04:02,630 --> 00:04:00,720
spacecraft which will hope to fly again

102
00:04:04,789 --> 00:04:02,640
in the future a bit later on in the

103
00:04:06,869 --> 00:04:04,799
broadcast i'll share some details on the

104
00:04:08,949 --> 00:04:06,879
advancements we're making with reusing

105
00:04:11,429 --> 00:04:08,959
certain aspects of the vehicle

106
00:04:14,070 --> 00:04:11,439
now today is a cargo mission and we are

107
00:04:15,990 --> 00:04:14,080
delivering nearly 7 000 pounds of cargo

108
00:04:17,830 --> 00:04:16,000
to the international space station that

109
00:04:19,509 --> 00:04:17,840
includes critical material to support

110
00:04:21,590 --> 00:04:19,519
dozens of science and research

111
00:04:23,510 --> 00:04:21,600
investigations that'll happen on board

112
00:04:25,510 --> 00:04:23,520
the orbiting laboratory to this day

113
00:04:27,430 --> 00:04:25,520

dragon remains the only spacecraft

114
00:04:29,110 --> 00:04:27,440
currently flying that's capable of

115
00:04:32,070 --> 00:04:29,120
transporting significant amounts of

116
00:04:33,990 --> 00:04:32,080
cargo to and from planet earth we'll get

117
00:04:36,070 --> 00:04:34,000
a little more into detail on what some

118
00:04:38,390 --> 00:04:36,080
of that research is later on in today's

119
00:04:40,390 --> 00:04:38,400
webcast but first why don't we check in

120
00:04:41,990 --> 00:04:40,400
at the launch site kennedy space center

121
00:04:42,710 --> 00:04:42,000
with marie marie how are things over

122
00:04:44,790 --> 00:04:42,720
there

123
00:04:46,469 --> 00:04:44,800
hey shiva nice to see you uh things are

124
00:04:48,870 --> 00:04:46,479
looking actually much better than they

125
00:04:50,390 --> 00:04:48,880
were just an hour ago at the launch site

126
00:04:53,270 --> 00:04:50,400
if we could take a live look again at

127
00:04:55,830 --> 00:04:53,280
launch complex 39a you can see some

128
00:04:58,469 --> 00:04:55,840
cumulus clouds in the area weather still

129
00:05:00,790 --> 00:04:58,479
standing at about 60 percent favorable

130
00:05:03,189 --> 00:05:00,800
for launch and it's been trending in a

131
00:05:05,430 --> 00:05:03,199
better direction in fact just an hour

132
00:05:07,510 --> 00:05:05,440
ago we had no go conditions for weather

133
00:05:08,710 --> 00:05:07,520
we were in violation of the cumulus

134
00:05:10,870 --> 00:05:08,720
cloud rule

135
00:05:12,870 --> 00:05:10,880
but the threat seems to be diminishing

136
00:05:14,870 --> 00:05:12,880
at this hour uh the weather teams are

137
00:05:16,629 --> 00:05:14,880
watching a couple of cells south of uh

138
00:05:18,390 --> 00:05:16,639

patrick space force base that's a little

139
00:05:19,909 --> 00:05:18,400
bit south of the cape here and they are

140
00:05:22,070 --> 00:05:19,919
headed north but

141
00:05:24,310 --> 00:05:22,080
it's looking like it's not going to be a

142
00:05:26,390 --> 00:05:24,320
show stopper so again trending in the

143
00:05:27,749 --> 00:05:26,400
right direction the threat of lightning

144
00:05:30,390 --> 00:05:27,759
remains low

145
00:05:31,990 --> 00:05:30,400
so we are 60 percent go for weather um

146
00:05:33,670 --> 00:05:32,000
and that's been most of the chatter that

147
00:05:35,350 --> 00:05:33,680
we've heard uh so far in these last

148
00:05:37,590 --> 00:05:35,360
couple of hours

149
00:05:40,390 --> 00:05:37,600
uh technically speaking we have heard uh

150
00:05:41,909 --> 00:05:40,400
spacex working no major issues and again

151
00:05:43,909 --> 00:05:41,919
we're looking live at the launch pad

152
00:05:46,390 --> 00:05:43,919
there you can see some of that liquid

153
00:05:49,189 --> 00:05:46,400
oxygen venting off of the first stage

154
00:05:51,029 --> 00:05:49,199
falcon 9 booster one other really cool

155
00:05:53,830 --> 00:05:51,039
thing about this first stage booster if

156
00:05:56,309 --> 00:05:53,840
spacex successfully recovers it and

157
00:05:59,510 --> 00:05:56,319
refurbishes it this is the same booster

158
00:06:01,350 --> 00:05:59,520
slated to launch uh for the next four

159
00:06:03,990 --> 00:06:01,360
astronauts to the international space

160
00:06:07,029 --> 00:06:04,000
station in october uh those will be nasa

161
00:06:09,830 --> 00:06:07,039
astronauts raja chari thomas marshburn

162
00:06:12,469 --> 00:06:09,840
kayla baron and european space agency

163
00:06:14,629 --> 00:06:12,479

astronaut matthias maurer so nasa's

164
00:06:16,710 --> 00:06:14,639
commercial crew program folks watching

165
00:06:19,270 --> 00:06:16,720
this mission closely with a particular

166
00:06:21,110 --> 00:06:19,280
interest in that first stage booster

167
00:06:23,110 --> 00:06:21,120
so we have fueling again well underway

168
00:06:25,510 --> 00:06:23,120
that began on the first stage at t minus

169
00:06:27,430 --> 00:06:25,520
35 minutes uh we're standing by for

170
00:06:29,830 --> 00:06:27,440
fueling on the second stage at t minus

171
00:06:31,909 --> 00:06:29,840
16 minutes and then as we move a little

172
00:06:34,070 --> 00:06:31,919
bit closer to launch the falcon 9

173
00:06:36,390 --> 00:06:34,080
pre-launch engine chill will begin at t

174
00:06:39,270 --> 00:06:36,400
minus seven minutes followed by the

175
00:06:41,189 --> 00:06:39,280
transition to internal power at t minus

176
00:06:42,790 --> 00:06:41,199
five minutes and that period those last

177
00:06:45,189 --> 00:06:42,800
five minutes before launch are what we

178
00:06:47,189 --> 00:06:45,199
call terminal count and then as we close

179
00:06:49,589 --> 00:06:47,199
in on that final minute before launch

180
00:06:52,150 --> 00:06:49,599
the propellant tanks will be pressurized

181
00:06:54,629 --> 00:06:52,160
for flight uh the space spacex launch

182
00:06:56,870 --> 00:06:54,639
director frank messina will verify

183
00:06:58,469 --> 00:06:56,880
whether the team is go for launch and

184
00:07:02,390 --> 00:06:58,479
finally uh we'll be standing by for

185
00:07:04,230 --> 00:07:02,400
liftoff at 129 and 15 seconds pm

186
00:07:06,309 --> 00:07:04,240
eastern daylight time

187
00:07:08,070 --> 00:07:06,319
uh and falcon 9 has just that single

188
00:07:09,990 --> 00:07:08,080

second to launch today in order to

189
00:07:12,710 --> 00:07:10,000
rendezvous and dock to the space station

190
00:07:14,790 --> 00:07:12,720
as scheduled uh that is tracking for

191
00:07:17,270 --> 00:07:14,800
approximately 5 a.m eastern time

192
00:07:18,790 --> 00:07:17,280
saturday morning june 5th so we'll

193
00:07:20,309 --> 00:07:18,800
continue to keep an eye on the weather

194
00:07:22,230 --> 00:07:20,319
and give you an update as we get a

195
00:07:24,469 --> 00:07:22,240
little bit closer to liftoff for now

196
00:07:26,070 --> 00:07:24,479
megan back to you murray thank you all

197
00:07:27,909 --> 00:07:26,080
right as promised it's now time to check

198
00:07:29,909 --> 00:07:27,919
out some of the fascinating payloads

199
00:07:31,430 --> 00:07:29,919
packed inside dragon today we'll first

200
00:07:42,629 --> 00:07:31,440
look at some of the science experiments

201
00:07:45,189 --> 00:07:44,150
more than 900 pounds of research and

202
00:07:47,430 --> 00:07:45,199
supplies are launching to the

203
00:07:49,189 --> 00:07:47,440
international space station on spacex's

204
00:07:51,430 --> 00:07:49,199
22nd commercial resupply services

205
00:07:54,629 --> 00:07:51,440
mission including several investigations

206
00:07:56,070 --> 00:07:54,639
sponsored by the u.s national laboratory

207
00:07:57,589 --> 00:07:56,080
this mission has everything from

208
00:07:58,950 --> 00:07:57,599
fundamental and applied research the

209
00:08:00,710 --> 00:07:58,960
payload is dedicated to in-space

210
00:08:01,990 --> 00:08:00,720
production applications recognizable

211
00:08:03,909 --> 00:08:02,000
private sector partners supporting

212
00:08:05,589 --> 00:08:03,919
research and development and student-led

213
00:08:06,869 --> 00:08:05,599

experiments let's take a deeper look

214
00:08:11,350 --> 00:08:06,879
into some of the investigations that are

215
00:08:14,629 --> 00:08:13,189
colgate palmallo the global household

216
00:08:16,230 --> 00:08:14,639
and consumer products company will

217
00:08:18,070 --> 00:08:16,240
launch the first private sector oral

218
00:08:19,110 --> 00:08:18,080
healthcare investigation to the iss on

219
00:08:20,629 --> 00:08:19,120
this mission

220
00:08:22,550 --> 00:08:20,639
the project aims to identify the

221
00:08:24,469 --> 00:08:22,560
molecular characteristics of a healthy

222
00:08:25,990 --> 00:08:24,479
and diseased oral microbiome the

223
00:08:27,830 --> 00:08:26,000
research team will study unique plaque

224
00:08:29,990 --> 00:08:27,840
pathologies in relation to oral health

225
00:08:31,830 --> 00:08:30,000
status examining microgravity's effects

226
00:08:34,310 --> 00:08:31,840
on biofilm formation and comparing

227
00:08:35,909 --> 00:08:34,320
responses to common oral care agents

228
00:08:37,589 --> 00:08:35,919
results could help colgate palmolive

229
00:08:39,589 --> 00:08:37,599
develop more effective products for

230
00:08:41,509 --> 00:08:39,599
consumers on

231
00:08:43,269 --> 00:08:41,519
each year 25 million metric tons of

232
00:08:44,949 --> 00:08:43,279
cotton are grown around the world and

233
00:08:46,870 --> 00:08:44,959
each kilogram requires thousands of

234
00:08:48,790 --> 00:08:46,880
liters of water to produce in an effort

235
00:08:50,870 --> 00:08:48,800
to minimize water consumption used for

236
00:08:52,310 --> 00:08:50,880
cotton production target corporation has

237
00:08:54,070 --> 00:08:52,320
funded a project from the university of

238
00:08:55,350 --> 00:08:54,080

wisconsin to examine the response of

239
00:08:57,509 --> 00:08:55,360
cotton plants to the stress of

240
00:08:59,190 --> 00:08:57,519
microgravity and evaluate effects on

241
00:09:01,190 --> 00:08:59,200
growth and root behavior this

242
00:09:03,030 --> 00:09:01,200
investigation seeks to better understand

243
00:09:04,790 --> 00:09:03,040
the genetics involved in root system

244
00:09:06,710 --> 00:09:04,800
development which could lead to the

245
00:09:08,350 --> 00:09:06,720
production of cotton plants that use

246
00:09:10,070 --> 00:09:08,360
water more efficiently on earth

247
00:09:11,430 --> 00:09:10,080
[Music]

248
00:09:13,750 --> 00:09:11,440
the national center for advancing

249
00:09:15,430 --> 00:09:13,760
translational sciences one of the 27

250
00:09:16,949 --> 00:09:15,440
institutes and centers of the national

251
00:09:18,630 --> 00:09:16,959
institutes of health continues to work

252
00:09:20,310 --> 00:09:18,640
with the iss national lab to fund

253
00:09:21,750 --> 00:09:20,320
projects as part of the tissue chips and

254
00:09:23,509 --> 00:09:21,760
space initiative

255
00:09:25,350 --> 00:09:23,519
tissue chips contain human cells grown

256
00:09:27,509 --> 00:09:25,360
on an artificial scaffold to model the

257
00:09:29,350 --> 00:09:27,519
structure and function of human tissue

258
00:09:31,030 --> 00:09:29,360
using tissue chips in space researchers

259
00:09:32,630 --> 00:09:31,040
can develop better models of disease and

260
00:09:34,790 --> 00:09:32,640
more accurately test potential new

261
00:09:36,070 --> 00:09:34,800
therapeutics for patients on earth this

262
00:09:37,829 --> 00:09:36,080
mission includes a tissue chips and

263
00:09:39,670 --> 00:09:37,839

space investigation from the university

264
00:09:41,509 --> 00:09:39,680
of washington the research team will use

265
00:09:43,509 --> 00:09:41,519
tissue chip systems to model the human

266
00:09:45,910 --> 00:09:43,519
kidney to better understand kidney stone

267
00:09:47,269 --> 00:09:45,920
formation the body's use of vitamin d

268
00:09:49,509 --> 00:09:47,279
and a condition in which a person's

269
00:09:51,670 --> 00:09:49,519
urine contains unusually high amounts of

270
00:09:53,590 --> 00:09:51,680
protein

271
00:09:55,190 --> 00:09:53,600
pharmaceutical giant eli lillian company

272
00:09:56,949 --> 00:09:55,200
has a history of sending research and

273
00:09:58,470 --> 00:09:56,959
development to the orbiting laboratory

274
00:10:00,150 --> 00:09:58,480
on this mission the company will launch

275
00:10:02,150 --> 00:10:00,160
an investigation to examine the effects

276
00:10:03,670 --> 00:10:02,160
of gravity on the physical state and

277
00:10:05,670 --> 00:10:03,680
properties of freeze-dried

278
00:10:07,190 --> 00:10:05,680
pharmaceutical products results could

279
00:10:09,030 --> 00:10:07,200
help lily improve the chemical and

280
00:10:13,509 --> 00:10:09,040
physical stability of pharmaceutical

281
00:10:16,790 --> 00:10:14,870
the investigations launching on this

282
00:10:18,949 --> 00:10:16,800
mission aim to bring value to our nation

283
00:10:20,949 --> 00:10:18,959
and drive a robust sustainable market in

284
00:10:22,150 --> 00:10:20,959
low-earth orbit to learn more about all

285
00:10:24,230 --> 00:10:22,160
the payloads on this mission that are

286
00:10:25,509 --> 00:10:24,240
sponsored by the iss national lab and to

287
00:10:26,710 --> 00:10:25,519
learn about current opportunities to

288
00:10:28,150 --> 00:10:26,720

become part of the space station

289
00:10:31,070 --> 00:10:28,160
research community please visit

290
00:10:34,389 --> 00:10:31,080
issnationallab.org

291
00:10:35,910 --> 00:10:34,399
[Music]

292
00:10:37,910 --> 00:10:35,920
now you heard in that video about an

293
00:10:39,590 --> 00:10:37,920
experiment with cotton let's take a

294
00:10:42,550 --> 00:10:39,600
closer look at that one because you

295
00:10:43,910 --> 00:10:42,560
might be amused by its name tick tock

296
00:10:46,150 --> 00:10:43,920
and no it has nothing to do with the

297
00:10:47,670 --> 00:10:46,160
social media app tic tac here to help us

298
00:10:49,750 --> 00:10:47,680
understand the name and why this

299
00:10:52,230 --> 00:10:49,760
research is so significant is principal

300
00:10:53,590 --> 00:10:52,240
investigator dr simon gilroy dr gilroy

301
00:10:55,269 --> 00:10:53,600
thank you so much for joining us my

302
00:10:57,030 --> 00:10:55,279
pleasure to be here well obviously we've

303
00:10:59,030 --> 00:10:57,040
said tick tock your tick tock is

304
00:11:00,949 --> 00:10:59,040
different from the tick tock most of us

305
00:11:03,910 --> 00:11:00,959
know so what is your tick tock yep yep

306
00:11:06,150 --> 00:11:03,920
we definitely came second so um

307
00:11:08,470 --> 00:11:06,160
it's a acronym for targeting improved

308
00:11:09,590 --> 00:11:08,480
cotton through orbital cultivation and

309
00:11:11,269 --> 00:11:09,600
what does that mean what are you trying

310
00:11:13,190 --> 00:11:11,279
to do here uh so we've got the

311
00:11:15,190 --> 00:11:13,200
opportunity to understand a little bit

312
00:11:16,710 --> 00:11:15,200
more about how cotton grows

313
00:11:18,150 --> 00:11:16,720

by growing on the space station and

314
00:11:19,829 --> 00:11:18,160
doing you know the kind of experiments

315
00:11:20,790 --> 00:11:19,839
you just simply can't do when you're on

316
00:11:22,790 --> 00:11:20,800
the earth

317
00:11:24,389 --> 00:11:22,800
and how are you actually going to grow

318
00:11:25,990 --> 00:11:24,399
cotton on the space station and how much

319
00:11:27,829 --> 00:11:26,000
of it are you trying to grow right so

320
00:11:29,829 --> 00:11:27,839
cotton gets to be a really big plant so

321
00:11:32,150 --> 00:11:29,839
we're not going to grow full-sized

322
00:11:34,389 --> 00:11:32,160
cotton plants you know six foot tall

323
00:11:36,470 --> 00:11:34,399
this is actually the chamber that we are

324
00:11:37,750 --> 00:11:36,480
going to send up so there are 12 of

325
00:11:39,910 --> 00:11:37,760
these which are going to go up onto the

326
00:11:42,310 --> 00:11:39,920
space station each one of them has four

327
00:11:43,910 --> 00:11:42,320
cotton seeds in there and we set it up

328
00:11:46,710 --> 00:11:43,920
so they'll actually germinate while

329
00:11:48,710 --> 00:11:46,720
they're on the station and they'll fill

330
00:11:50,949 --> 00:11:48,720
this chamber after about six days wow

331
00:11:52,949 --> 00:11:50,959
that's amazing and how so what exactly

332
00:11:54,790 --> 00:11:52,959
are you trying to figure out in space

333
00:11:57,590 --> 00:11:54,800
that can hopefully help us here on earth

334
00:11:59,509 --> 00:11:57,600
uh yeah so cotton is an incredibly

335
00:12:00,949 --> 00:11:59,519
thirsty crop it uses tremendous amount

336
00:12:02,629 --> 00:12:00,959
of water hundreds of gallons just to

337
00:12:06,310 --> 00:12:02,639
make one t-shirt

338
00:12:08,150 --> 00:12:06,320

uh and it also uses a lot of inputs like

339
00:12:09,430 --> 00:12:08,160
nutrients that the farms have to add

340
00:12:12,069 --> 00:12:09,440
pesticides

341
00:12:13,030 --> 00:12:12,079
uh and a lot of those those features of

342
00:12:15,269 --> 00:12:13,040
cotton

343
00:12:17,030 --> 00:12:15,279
they are root traits so they're things

344
00:12:19,190 --> 00:12:17,040
that you know the root takes up the

345
00:12:20,870 --> 00:12:19,200
water the root takes up the nutrients

346
00:12:22,710 --> 00:12:20,880
and so what we're hoping to do on the

347
00:12:24,870 --> 00:12:22,720
space station is learn a little bit more

348
00:12:27,269 --> 00:12:24,880
about how that root system develops with

349
00:12:29,030 --> 00:12:27,279
the idea that if we can very

350
00:12:31,430 --> 00:12:29,040
specifically for us understand how

351
00:12:33,350 --> 00:12:31,440
gravity directs that that root system to

352
00:12:35,350 --> 00:12:33,360
grow and spread throughout the soil we

353
00:12:37,350 --> 00:12:35,360
might be able to target features there

354
00:12:39,350 --> 00:12:37,360
that then we can give that information

355
00:12:41,269 --> 00:12:39,360
to breeders who will then be able to go

356
00:12:43,350 --> 00:12:41,279
down the road of improving cotton yeah

357
00:12:45,030 --> 00:12:43,360
basically to make better cotton right

358
00:12:46,710 --> 00:12:45,040
yeah absolutely that's amazing how does

359
00:12:48,790 --> 00:12:46,720
it feel to have science going up to

360
00:12:51,430 --> 00:12:48,800
space today i mean it is it is an

361
00:12:52,949 --> 00:12:51,440
amazing opportunity uh we've shot a

362
00:12:54,069 --> 00:12:52,959
couple of experiments up to the space

363
00:12:57,269 --> 00:12:54,079

station before

364
00:12:59,190 --> 00:12:57,279
every single time it's it's it's it's a

365
00:13:00,790 --> 00:12:59,200
rush to see your stuff going up on the

366
00:13:01,990 --> 00:13:00,800
on the rocket i got to ask you why

367
00:13:02,790 --> 00:13:02,000
cotton

368
00:13:03,990 --> 00:13:02,800
um

369
00:13:05,350 --> 00:13:04,000
cotton

370
00:13:07,110 --> 00:13:05,360
partly because

371
00:13:08,790 --> 00:13:07,120
we have the opportunity to understand a

372
00:13:11,030 --> 00:13:08,800
little bit more about a really important

373
00:13:13,750 --> 00:13:11,040
economic crop with a big environmental

374
00:13:15,190 --> 00:13:13,760
footprint on earth so using the

375
00:13:16,790 --> 00:13:15,200
facilities of the space station to do

376
00:13:17,750 --> 00:13:16,800
things that we just could never do on

377
00:13:18,870 --> 00:13:17,760
earth

378
00:13:20,550 --> 00:13:18,880
and also

379
00:13:21,910 --> 00:13:20,560
there have been a lot of plant biology

380
00:13:24,069 --> 00:13:21,920
experiments done by a lot of great

381
00:13:27,350 --> 00:13:24,079
researchers on the station but on a

382
00:13:28,389 --> 00:13:27,360
relatively few species of plants and so

383
00:13:30,710 --> 00:13:28,399
cotton is going to give us this

384
00:13:32,310 --> 00:13:30,720
fantastic tool to ask

385
00:13:34,310 --> 00:13:32,320
how different is it from these other

386
00:13:35,990 --> 00:13:34,320
plants and how similar what do all

387
00:13:38,389 --> 00:13:36,000
plants do when they're in space and what

388
00:13:40,230 --> 00:13:38,399

does very specifically particular to

389
00:13:41,430 --> 00:13:40,240
each kind of plant doctor i'm so excited

390
00:13:42,790 --> 00:13:41,440
to see what you find out thank you so

391
00:13:44,629 --> 00:13:42,800
much for joining us today great thank

392
00:13:46,230 --> 00:13:44,639
you thank you and one more notable

393
00:13:48,150 --> 00:13:46,240
payload i wanted to tell you about is

394
00:13:50,389 --> 00:13:48,160
the first satellite developed by the

395
00:13:52,230 --> 00:13:50,399
island nation of mauritius that's east

396
00:13:54,550 --> 00:13:52,240
of madagascar if you didn't know that

397
00:13:56,550 --> 00:13:54,560
it's cubesat which is a small satellite

398
00:13:58,150 --> 00:13:56,560
about this big will photograph the

399
00:13:59,750 --> 00:13:58,160
region and conduct experimental

400
00:14:00,870 --> 00:13:59,760
communication with other islands so

401
00:14:02,710 --> 00:14:00,880
really cool there

402
00:14:04,389 --> 00:14:02,720
again you know just really fascinating

403
00:14:08,949 --> 00:14:04,399
payloads on today's mission now let's

404
00:14:13,910 --> 00:14:11,590
thanks megan uh we're just under t minus

405
00:14:16,150 --> 00:14:13,920
15 minutes and counting to the liftoff

406
00:14:18,069 --> 00:14:16,160
of a falcon 9 carrying cargo dragon on

407
00:14:20,230 --> 00:14:18,079
the next commercial resupply mission to

408
00:14:22,069 --> 00:14:20,240
the international space station now as

409
00:14:24,389 --> 00:14:22,079
we talked about earlier dragon was

410
00:14:26,949 --> 00:14:24,399
designed with reusability in mind to

411
00:14:29,030 --> 00:14:26,959
date nine of our cargo resupply missions

412
00:14:31,110 --> 00:14:29,040
have launched on flight proven dragon

413
00:14:33,430 --> 00:14:31,120

spacecraft and while we have a history

414
00:14:35,430 --> 00:14:33,440
of re-flying cargo vehicles and now crew

415
00:14:38,389 --> 00:14:35,440
vehicles with the successful launch of

416
00:14:39,910 --> 00:14:38,399
crew 2 as of today we will also reuse

417
00:14:41,910 --> 00:14:39,920
dragon's heat shield structure for the

418
00:14:44,150 --> 00:14:41,920
first time the heat shield of flying

419
00:14:46,310 --> 00:14:44,160
today safely returned astronauts bob

420
00:14:48,790 --> 00:14:46,320
bankin and doug hurley to earth on the

421
00:14:50,949 --> 00:14:48,800
demo 2 mission last year usability

422
00:14:52,949 --> 00:14:50,959
allows spacex to refly the most

423
00:14:54,629 --> 00:14:52,959
expensive parts of the spacecraft and

424
00:14:57,509 --> 00:14:54,639
that in turn drives down the cost of

425
00:14:59,269 --> 00:14:57,519
space access so wild dragon today is a

426
00:15:00,949 --> 00:14:59,279
new vehicle there are a handful of

427
00:15:03,110 --> 00:15:00,959
components flying that have seen some

428
00:15:05,750 --> 00:15:03,120
space before the heat shield structure

429
00:15:07,750 --> 00:15:05,760
just being one example now speaking of

430
00:15:09,670 --> 00:15:07,760
new technologies the astronauts on board

431
00:15:11,829 --> 00:15:09,680
the international space station are

432
00:15:13,590 --> 00:15:11,839
eagerly awaiting this next delivery of

433
00:15:15,670 --> 00:15:13,600
science to keep them busy on the world's

434
00:15:17,110 --> 00:15:15,680
only orbiting laboratory we had a chance

435
00:15:18,870 --> 00:15:17,120
to catch up with a couple of them to

436
00:15:20,710 --> 00:15:18,880
hear about the work they've been doing

437
00:15:23,750 --> 00:15:20,720
since they arrived safely on the crew 2

438
00:15:26,310 --> 00:15:23,760

mission back in april

439
00:15:29,990 --> 00:15:26,320
hi everyone welcome to the international

440
00:15:33,910 --> 00:15:30,000
space station i'm aki hoshide and we're

441
00:15:35,590 --> 00:15:33,920
here doing expedition 65 and i'm megan

442
00:15:37,910 --> 00:15:35,600
macarthur one of the flight engineers

443
00:15:39,910 --> 00:15:37,920
for the mission and you probably know we

444
00:15:42,949 --> 00:15:39,920
have a cargo mission coming up real soon

445
00:15:44,150 --> 00:15:42,959
spacex 22 and i'm excited to see what

446
00:15:45,670 --> 00:15:44,160
that's going to be like i think it's

447
00:15:48,069 --> 00:15:45,680
going to affect our pace and everything

448
00:15:50,069 --> 00:15:48,079
that we've got going on aki you've seen

449
00:15:52,710 --> 00:15:50,079
this before you captured actually the

450
00:15:54,710 --> 00:15:52,720
first cargo resupply mission from dragon

451
00:15:56,629 --> 00:15:54,720
about nine years ago so tell me what was

452
00:15:59,269 --> 00:15:56,639
that like yeah nine years ago that's a

453
00:16:02,389 --> 00:15:59,279
long long time ago well that was my

454
00:16:04,629 --> 00:16:02,399
first uh time to actually capture a

455
00:16:07,189 --> 00:16:04,639
cargo vehicle with a robotic arm and so

456
00:16:08,949 --> 00:16:07,199
it was a horrifying two minutes you know

457
00:16:10,230 --> 00:16:08,959
holding my breath and trying to capture

458
00:16:12,790 --> 00:16:10,240
it without

459
00:16:14,150 --> 00:16:12,800
making any mistakes this cargo dragon

460
00:16:15,990 --> 00:16:14,160
will be actually a little bit different

461
00:16:18,550 --> 00:16:16,000
so what's different about this one this

462
00:16:20,949 --> 00:16:18,560
time it's just gonna dock so without the

463
00:16:23,990 --> 00:16:20,959

help of the robotic arm it's gonna

464
00:16:25,590 --> 00:16:24,000
automatically dock to the international

465
00:16:27,590 --> 00:16:25,600
space station of course it will be

466
00:16:29,269 --> 00:16:27,600
similar to our crude vehicle that we

467
00:16:31,430 --> 00:16:29,279
came up in so everything should look

468
00:16:33,110 --> 00:16:31,440
pretty much the same just there won't be

469
00:16:35,710 --> 00:16:33,120
people there'll be uh there'll be cargo

470
00:16:37,189 --> 00:16:35,720
and a lot of science experiments

471
00:16:39,189 --> 00:16:37,199
[Music]

472
00:16:41,030 --> 00:16:39,199
some of the science samples will arrive

473
00:16:42,949 --> 00:16:41,040
in powered payload lockers so they can

474
00:16:45,590 --> 00:16:42,959
be frozen temperatures but some of the

475
00:16:46,790 --> 00:16:45,600
samples will arrive in this cooler type

476
00:16:48,790 --> 00:16:46,800
of

477
00:16:51,110 --> 00:16:48,800
bag which is called a double cold bag

478
00:16:52,710 --> 00:16:51,120
it's a super insulated bag and we put

479
00:16:53,990 --> 00:16:52,720
ice bricks in there along with the

480
00:16:55,350 --> 00:16:54,000
samples to keep them at the right

481
00:16:59,350 --> 00:16:55,360
temperature so i'll show you what that

482
00:16:59,360 --> 00:17:02,870
oh looks like we have a stowaway

483
00:17:07,110 --> 00:17:04,630
these are the ice bricks and they can

484
00:17:09,990 --> 00:17:07,120
maintain a temperature um between minus

485
00:17:11,270 --> 00:17:10,000
32 and plus 37 celsius they're they're

486
00:17:13,270 --> 00:17:11,280
just room temperature right now or i

487
00:17:14,870 --> 00:17:13,280
wouldn't be holding them with bare hands

488
00:17:15,829 --> 00:17:14,880

but you can see we would fill that up

489
00:17:17,029 --> 00:17:15,839
with the

490
00:17:19,590 --> 00:17:17,039
ice bricks

491
00:17:21,350 --> 00:17:19,600
as well as the samples we also send

492
00:17:22,870 --> 00:17:21,360
samples home this way

493
00:17:24,309 --> 00:17:22,880
and they have a certain amount of time

494
00:17:25,909 --> 00:17:24,319
that they will stay at temperature

495
00:17:27,350 --> 00:17:25,919
before they're recovered by the team on

496
00:17:28,549 --> 00:17:27,360
the ground

497
00:17:30,070 --> 00:17:28,559
you know i'm excited about the

498
00:17:31,830 --> 00:17:30,080
tardigrades i told you about the water

499
00:17:33,990 --> 00:17:31,840
bears super excited about that they're

500
00:17:36,230 --> 00:17:34,000
little microscopic creatures that can

501
00:17:38,470 --> 00:17:36,240
survive in extreme environments and the

502
00:17:41,350 --> 00:17:38,480
um the cell science four experiment is

503
00:17:42,789 --> 00:17:41,360
looking at um how like what can we see

504
00:17:44,230 --> 00:17:42,799
by looking at their genes how do they

505
00:17:45,990 --> 00:17:44,240
survive and adapt to extreme

506
00:17:48,549 --> 00:17:46,000
environments and then the hope is that

507
00:17:50,470 --> 00:17:48,559
that information can be used to um to

508
00:17:52,230 --> 00:17:50,480
look at stress factors in humans when

509
00:17:54,310 --> 00:17:52,240
we're living in space

510
00:17:56,549 --> 00:17:54,320
another one i think is really exciting

511
00:17:58,830 --> 00:17:56,559
that has benefits both for us in space

512
00:18:01,669 --> 00:17:58,840
but also on earth is a new ultrasound

513
00:18:03,830 --> 00:18:01,679

experiment the butterfly ultrasound and

514
00:18:06,070 --> 00:18:03,840
it's looking at portable ultrasound

515
00:18:07,830 --> 00:18:06,080
technology with mobile tech some really

516
00:18:16,230 --> 00:18:07,840
exciting stuff that kind of covers a big

517
00:18:19,750 --> 00:18:17,830
and that was nasa astronaut megan

518
00:18:21,909 --> 00:18:19,760
mcarthur and jack's astronaut aki

519
00:18:23,430 --> 00:18:21,919
hoshide aboard the international space

520
00:18:24,789 --> 00:18:23,440
station and welcome into the

521
00:18:26,549 --> 00:18:24,799
international space station flight

522
00:18:28,950 --> 00:18:26,559
control room at the johnson space center

523
00:18:30,630 --> 00:18:28,960
here in houston texas the team of flight

524
00:18:32,230 --> 00:18:30,640
controllers in mission control houston

525
00:18:34,230 --> 00:18:32,240
today is being led by flight director

526
00:18:35,669 --> 00:18:34,240
rebecca wingfield the teams here in

527
00:18:37,430 --> 00:18:35,679
mission control will really jump into

528
00:18:39,510 --> 00:18:37,440
action tomorrow night into saturday

529
00:18:41,270 --> 00:18:39,520
morning as cargo dragon approaches the

530
00:18:43,350 --> 00:18:41,280
international space station and enters

531
00:18:45,270 --> 00:18:43,360
the approach ellipsoid which we like to

532
00:18:47,029 --> 00:18:45,280
think of as an imaginary sphere around

533
00:18:49,270 --> 00:18:47,039
the space station that helps us monitor

534
00:18:51,830 --> 00:18:49,280
the approach and departure of visiting

535
00:18:53,350 --> 00:18:51,840
vehicles there are currently seven crew

536
00:18:55,430 --> 00:18:53,360
members living and working aboard the

537
00:18:57,909 --> 00:18:55,440
international space station expedition

538
00:18:59,830 --> 00:18:57,919

65 consists of nasa astronauts shane

539
00:19:02,390 --> 00:18:59,840
kimbrough megan macarthur and mark

540
00:19:05,110 --> 00:19:02,400
vandehei rose cosmos cosmonauts peter

541
00:19:07,350 --> 00:19:05,120
dubrov and oleg novitskiy aki hoshide of

542
00:19:10,070 --> 00:19:07,360
jaxa and tomah pasquee of the european

543
00:19:12,150 --> 00:19:10,080
space agency one major component flying

544
00:19:14,630 --> 00:19:12,160
in dragon's trunk today is the first

545
00:19:17,029 --> 00:19:14,640
pair of boeing made irosa solar arrays

546
00:19:19,430 --> 00:19:17,039
which will be installed to the 2b and 4b

547
00:19:21,510 --> 00:19:19,440
channels of the p6 truss by tomah

548
00:19:23,590 --> 00:19:21,520
pasquee and shane kimbrough over two

549
00:19:25,830 --> 00:19:23,600
spacewalks planned for june 16th and

550
00:19:27,990 --> 00:19:25,840
june 20th this will be the first of

551
00:19:30,150 --> 00:19:28,000
three deliveries of these irosa solar

552
00:19:31,830 --> 00:19:30,160
arrays there will be six in all to

553
00:19:33,990 --> 00:19:31,840
upgrade and augment the power for the

554
00:19:35,029 --> 00:19:34,000
six of eight power channels on the

555
00:19:36,470 --> 00:19:35,039
station

556
00:19:37,750 --> 00:19:36,480
as crew dragon approaches the

557
00:19:39,669 --> 00:19:37,760
international space station in the

558
00:19:41,270 --> 00:19:39,679
morning hours on june 5th nasa

559
00:19:43,669 --> 00:19:41,280
astronauts shane kimbrough and megan

560
00:19:45,750 --> 00:19:43,679
macarthur will be monitoring the arrival

561
00:19:47,350 --> 00:19:45,760
from the station's cupola and once

562
00:19:48,710 --> 00:19:47,360
dragon arrives to the station it will

563
00:19:50,470 --> 00:19:48,720

dock to the zenith port on the

564
00:19:52,470 --> 00:19:50,480
space-facing side of the station's

565
00:19:55,750 --> 00:19:52,480
harmony module and will join four other

566
00:19:59,750 --> 00:19:55,760
spacecrafts crew dragon cygnus 15 the

567
00:20:01,029 --> 00:19:59,760
soyuz ms-18 and progress 77 cargo dragon

568
00:20:02,630 --> 00:20:01,039
will remain attached to the

569
00:20:04,310 --> 00:20:02,640
international space station for about

570
00:20:06,310 --> 00:20:04,320
one month before being packed up with

571
00:20:08,149 --> 00:20:06,320
critical science and supplies and will

572
00:20:10,149 --> 00:20:08,159
splash down in the atlantic ocean for

573
00:20:12,230 --> 00:20:10,159
that science to be analyzed back here on

574
00:20:14,230 --> 00:20:12,240
earth again everything is still a go

575
00:20:15,590 --> 00:20:14,240
from here in mission control houston and

576
00:20:17,270 --> 00:20:15,600
we're looking forward to welcoming

577
00:20:19,029 --> 00:20:17,280
another vehicle to the international

578
00:20:20,710 --> 00:20:19,039
space station so for now we'll head back

579
00:20:22,789 --> 00:20:20,720
out to kennedy megan

580
00:20:24,789 --> 00:20:22,799
it is now t minus eight minutes and

581
00:20:26,789 --> 00:20:24,799
counting until liftoff of the falcon 9

582
00:20:28,470 --> 00:20:26,799
rocket and cargo dragon on the next

583
00:20:30,230 --> 00:20:28,480
resupply mission to the international

584
00:20:32,149 --> 00:20:30,240
space station now you heard courtney

585
00:20:34,230 --> 00:20:32,159
just mention the new solar arrays again

586
00:20:36,070 --> 00:20:34,240
so let's take some time to go more in

587
00:20:37,750 --> 00:20:36,080
depth about those because they're really

588
00:20:39,669 --> 00:20:37,760

important to the station and what

589
00:20:41,990 --> 00:20:39,679
happens there take a look at your screen

590
00:20:45,350 --> 00:20:42,000
now this is the first pair of the new

591
00:20:47,590 --> 00:20:45,360
boeing made iss roll out solar arrays

592
00:20:49,990 --> 00:20:47,600
known as irosa they are made up of

593
00:20:54,470 --> 00:20:50,000
compact panels you see there that roll

594
00:20:56,470 --> 00:20:54,480
open like a huge yoga mat 63 by 20 feet

595
00:20:57,990 --> 00:20:56,480
each here they are inside the space

596
00:21:00,149 --> 00:20:58,000
station processing facility at the

597
00:21:02,149 --> 00:21:00,159
kennedy space center before being packed

598
00:21:03,990 --> 00:21:02,159
inside dragon the space station

599
00:21:06,549 --> 00:21:04,000
currently has eight pairs of solar

600
00:21:10,149 --> 00:21:06,559
arrays the oldest pair has been in use

601
00:21:11,990 --> 00:21:10,159
for more than 20 years the two new solar

602
00:21:14,830 --> 00:21:12,000
arrays plus four more to be delivered

603
00:21:18,149 --> 00:21:14,840
later will produce a total of more than

604
00:21:22,630 --> 00:21:18,159
120 kilowatts of electricity that is

605
00:21:24,789 --> 00:21:22,640
enough to power more than 40 u.s homes

606
00:21:27,190 --> 00:21:24,799
once combined with the eight original

607
00:21:30,470 --> 00:21:27,200
arrays the new ones will boost power to

608
00:21:32,470 --> 00:21:30,480
the station up to 30 percent maximizing

609
00:21:33,510 --> 00:21:32,480
use for the orbiting lab for many years

610
00:21:35,510 --> 00:21:33,520
to come

611
00:21:37,430 --> 00:21:35,520
and these new new solar arrays like

612
00:21:39,190 --> 00:21:37,440
courtney said are going to be installed

613
00:21:43,510 --> 00:21:39,200

this summer now let's head back over to

614
00:21:48,310 --> 00:21:46,070
thanks megan uh we're just over t minus

615
00:21:50,310 --> 00:21:48,320
seven minutes to go the spacex team

616
00:21:52,710 --> 00:21:50,320
currently working no significant issues

617
00:21:55,350 --> 00:21:52,720
with the vehicles at this point rocket

618
00:21:57,510 --> 00:21:55,360
propellant one fuel is nearly fully

619
00:22:00,310 --> 00:21:57,520
loaded on the first stage completely

620
00:22:02,070 --> 00:22:00,320
loaded on the second stage liquid oxygen

621
00:22:04,310 --> 00:22:02,080
loading is underway on both of the

622
00:22:06,470 --> 00:22:04,320
stages as well and that'll complete at

623
00:22:08,950 --> 00:22:06,480
about t minus two minutes to launch

624
00:22:11,510 --> 00:22:08,960
we're also loading helium gas into both

625
00:22:13,350 --> 00:22:11,520
of the stages falcon 9 uses helium as a

626
00:22:15,750 --> 00:22:13,360
pressure ant that's to backfill the

627
00:22:18,390 --> 00:22:15,760
propellant tanks as we consume liquid

628
00:22:20,789 --> 00:22:18,400
oxygen and rp1 by the merlin engines

629
00:22:22,710 --> 00:22:20,799
during ascent the helium loading began

630
00:22:24,549 --> 00:22:22,720
before the webcast went live and we'll

631
00:22:26,710 --> 00:22:24,559
continue to top it off until about a

632
00:22:28,789 --> 00:22:26,720
minute and a half before launch

633
00:22:31,029 --> 00:22:28,799
now to make sure that the engine startup

634
00:22:32,950 --> 00:22:31,039
goes well we also perform what's called

635
00:22:35,350 --> 00:22:32,960
engine chill it started at about t minus

636
00:22:37,350 --> 00:22:35,360
seven minutes we flow a small amount of

637
00:22:39,430 --> 00:22:37,360
that super chilled liquid oxygen into

638
00:22:41,110 --> 00:22:39,440

the merlin engine turbo pumps and we do

639
00:22:43,350 --> 00:22:41,120
that to avoid thermal shock to the

640
00:22:45,909 --> 00:22:43,360
mechanical components once we get that

641
00:22:48,549 --> 00:22:45,919
full flow of super chill liquid oxygen

642
00:22:50,710 --> 00:22:48,559
on engine start dragon also began its

643
00:22:52,070 --> 00:22:50,720
startup sequence at t minus 35 minutes

644
00:22:54,070 --> 00:22:52,080
when it coordinated timing with the

645
00:22:55,990 --> 00:22:54,080
falcon 9. it's currently undergoing a

646
00:22:58,070 --> 00:22:56,000
set of vehicle health checks with its

647
00:23:00,390 --> 00:22:58,080
next major milestone happening just

648
00:23:02,870 --> 00:23:00,400
before liftoff when it'll transition to

649
00:23:05,029 --> 00:23:02,880
internal battery power now the range is

650
00:23:07,510 --> 00:23:05,039
standing by ready to support today's

651
00:23:10,390 --> 00:23:07,520
mission launch weather is continuing to

652
00:23:12,230 --> 00:23:10,400
continuing to trend favorably we had a

653
00:23:13,669 --> 00:23:12,240
60 chance of go and we're still

654
00:23:16,630 --> 00:23:13,679
continuing to monitor some of those

655
00:23:19,190 --> 00:23:16,640
clouds and precipitation in the area

656
00:23:21,830 --> 00:23:19,200
so with that the launch team a falcon 9

657
00:23:25,270 --> 00:23:21,840
dragon the range all looking good

658
00:23:27,909 --> 00:23:25,280
weather also trending good and at about

659
00:23:30,310 --> 00:23:27,919
t minus five minutes to go i'm now

660
00:23:31,669 --> 00:23:30,320
joined by marie to help me walk through

661
00:23:33,750 --> 00:23:31,679
these final moments of the terminal

662
00:23:35,350 --> 00:23:33,760
count marie yeah shiva as you said

663
00:23:37,909 --> 00:23:35,360

whether i'm trending in the better

664
00:23:39,590 --> 00:23:37,919
direction it was a little bit

665
00:23:40,630 --> 00:23:39,600
a little bit hairy for a couple minutes

666
00:23:43,269 --> 00:23:40,640
there

667
00:23:45,190 --> 00:23:43,279
within the last oh i want to say maybe

668
00:23:46,070 --> 00:23:45,200
13 minutes or so it was right around t

669
00:23:48,310 --> 00:23:46,080
minus

670
00:23:50,390 --> 00:23:48,320
19 or 18 minutes we heard about some

671
00:23:52,789 --> 00:23:50,400
lightning strikes in the area not coming

672
00:23:55,190 --> 00:23:52,799
within that 10 mile radius of the pad

673
00:23:57,510 --> 00:23:55,200
but that was a watch item it looks like

674
00:23:59,590 --> 00:23:57,520
they're not expecting lightning to be an

675
00:24:01,269 --> 00:23:59,600
issue to come that close um and that

676
00:24:02,710 --> 00:24:01,279
cell that i mentioned to the south of

677
00:24:15,510 --> 00:24:02,720
the pad looks like dragon has

678
00:24:19,350 --> 00:24:17,110
okay so we heard that call that dragon

679
00:24:21,350 --> 00:24:19,360
is now on internal power

680
00:24:23,430 --> 00:24:21,360
again as shiva mentioned the team has

681
00:24:25,669 --> 00:24:23,440
already conducted its pre-launch engine

682
00:24:27,669 --> 00:24:25,679
chill again not this is when spacex

683
00:24:29,750 --> 00:24:27,679
injects a small amount of super chilled

684
00:24:32,230 --> 00:24:29,760
liquid oxygen to prepare those merlin

685
00:24:42,549 --> 00:24:32,240
engines inside the first stage to allow

686
00:24:46,710 --> 00:24:44,470
and we can hear the hissing from some of

687
00:24:49,510 --> 00:24:46,720
that liquid oxygen venting off the side

688
00:24:53,269 --> 00:24:49,520

of the rocket as it meets that um

689
00:24:57,990 --> 00:24:55,590
we just heard the call out there as well

690
00:25:00,870 --> 00:24:58,000
for strong back retract the strong back

691
00:25:03,430 --> 00:25:00,880
is the truss structure next to

692
00:25:05,350 --> 00:25:03,440
falcon 9 that provides propellants and

693
00:25:07,590 --> 00:25:05,360
power to the vehicle so you can see the

694
00:25:08,549 --> 00:25:07,600
clamp arms are opening around the second

695
00:25:10,230 --> 00:25:08,559
stage

696
00:25:12,630 --> 00:25:10,240
and the strong back will retract a

697
00:25:14,549 --> 00:25:12,640
couple of degrees away from the vertical

698
00:25:16,549 --> 00:25:14,559
position helping to clear the way for

699
00:25:18,630 --> 00:25:16,559
falcon 9's ascent in these last few

700
00:25:20,310 --> 00:25:18,640
minutes falcon 9 is performing a set of

701
00:25:22,710 --> 00:25:20,320
health checks on its primary

702
00:25:24,789 --> 00:25:22,720
communications avionics and propulsion

703
00:25:27,029 --> 00:25:24,799
systems in preparation for flight we'll

704
00:25:29,110 --> 00:25:27,039
continue to hear call outs the engines

705
00:25:30,630 --> 00:25:29,120
are sufficiently chilled in and for some

706
00:25:32,630 --> 00:25:30,640
of these milestones that are coming up

707
00:25:34,870 --> 00:25:32,640
next and there you can see

708
00:25:51,029 --> 00:25:34,880
the strong back starting its retraction

709
00:25:55,750 --> 00:25:53,190
and so we saw that strong back or

710
00:25:58,230 --> 00:25:55,760
transporter erector retract ever so

711
00:26:03,430 --> 00:25:58,240
slightly from the falcon 9 rocket it

712
00:26:08,230 --> 00:26:05,110
just as we get to the moment of liftoff

713
00:26:10,549 --> 00:26:08,240

to allow for falcon 9 to clear the pad

714
00:26:12,789 --> 00:26:10,559
also happening now are some checks of

715
00:26:15,750 --> 00:26:12,799
the second stage thrust vector control

716
00:26:17,750 --> 00:26:15,760
actuators uh that is often referred to

717
00:26:21,350 --> 00:26:17,760
as an engine wiggle test and this is

718
00:26:23,590 --> 00:26:21,360
when spacex moves the thrust nozzles

719
00:26:25,830 --> 00:26:23,600
we just heard the call for the stage one

720
00:26:27,510 --> 00:26:25,840
locks load complete again that engine

721
00:26:29,430 --> 00:26:27,520
wiggle test happening

722
00:26:31,830 --> 00:26:29,440
now to make sure that the guidance

723
00:26:33,909 --> 00:26:31,840
hardware is go for flight

724
00:26:35,990 --> 00:26:33,919
spacex will do the exact same checkouts

725
00:26:37,510 --> 00:26:36,000
on the first stage engines and that will

726
00:26:42,390 --> 00:26:37,520
happen just a few seconds before

727
00:26:46,470 --> 00:26:44,230
and we just heard that call out for

728
00:26:48,310 --> 00:26:46,480
first stage locks load complete

729
00:26:50,070 --> 00:26:48,320
next major activity here will be second

730
00:26:51,669 --> 00:26:50,080
stage locks load complete usually

731
00:26:53,750 --> 00:26:51,679
happens around the t minus two minute

732
00:27:01,590 --> 00:26:53,760
mark and that wraps up propellant

733
00:27:19,029 --> 00:27:03,990
dragon also continuing to perform final

734
00:27:23,909 --> 00:27:21,669
weather continuing to trend favorably as

735
00:27:46,149 --> 00:27:23,919
dragon transitions into

736
00:27:50,470 --> 00:27:48,630
and weather remaining uh go as we are

737
00:27:52,549 --> 00:27:50,480
approaching the t-minus one minute mark

738
00:27:59,190 --> 00:27:52,559

when dragon will transition to internal

739
00:28:12,149 --> 00:28:01,669
falcon 9's in startup

740
00:28:12,159 --> 00:28:15,750
ld go for launcher

741
00:28:15,760 --> 00:28:20,310
launch director pulled bail for lunch

742
00:28:25,430 --> 00:28:22,389
so that's not all systems are currently

743
00:28:28,870 --> 00:28:25,440
go we're just over t minus 30 seconds to

744
00:28:30,389 --> 00:28:28,880
lift off t minus 30 seconds

745
00:28:32,230 --> 00:28:30,399
and at t zero the rocket will be

746
00:28:34,389 --> 00:28:32,240
released from the hold down clamps at

747
00:28:36,470 --> 00:28:34,399
the pad and as i mentioned earlier that

748
00:28:38,470 --> 00:28:36,480
strong back right next to the to the

749
00:28:40,470 --> 00:28:38,480
rocket will retract the rest of the way

750
00:28:42,830 --> 00:28:40,480
clearing the way for lift off days you

751
00:28:45,190 --> 00:28:42,840
want pressure plate t minus 15

752
00:28:46,950 --> 00:28:45,200
seconds falcon 9 is configured for

753
00:28:47,750 --> 00:28:46,960
flight

754
00:28:48,710 --> 00:28:47,760
n

755
00:28:49,669 --> 00:28:48,720
9

756
00:28:50,710 --> 00:28:49,679
8

757
00:28:51,669 --> 00:28:50,720
7

758
00:28:52,630 --> 00:28:51,679
6

759
00:28:53,669 --> 00:28:52,640
5

760
00:28:54,630 --> 00:28:53,679
4

761
00:28:55,669 --> 00:28:54,640
3

762
00:28:56,549 --> 00:28:55,679
2

763
00:29:02,389 --> 00:28:56,559

1

764
00:29:07,909 --> 00:29:05,510
spacex cargo resupply mission bringing

765
00:29:12,710 --> 00:29:07,919
new solar arrays to the international

766
00:29:12,720 --> 00:29:40,310
stage more proportions

767
00:29:44,470 --> 00:29:42,870
we're at t plus 40 seconds into flight

768
00:29:47,110 --> 00:29:44,480
awesome shot looking

769
00:29:49,830 --> 00:29:47,120
pretty nominal uh the cape our falcon 9

770
00:29:51,990 --> 00:29:49,840
has launched we're coming up on the next

771
00:29:55,029 --> 00:29:52,000
major milestone that's the point of

772
00:29:56,310 --> 00:29:55,039
maximum aerodynamic pressure

773
00:29:57,990 --> 00:29:56,320
that's when the

774
00:30:03,190 --> 00:29:58,000
stresses on the vehicle will be the

775
00:30:03,200 --> 00:30:06,710
magnitude

776
00:30:10,389 --> 00:30:08,389
so in preparation for maximum

777
00:30:12,149 --> 00:30:10,399
aerodynamic pressure we throttle down

778
00:30:13,909 --> 00:30:12,159
those merlin 1d engines now that we're

779
00:30:16,070 --> 00:30:13,919
through that point we'll continue to

780
00:30:18,710 --> 00:30:16,080
we'll throttle back up and continue on

781
00:30:20,230 --> 00:30:18,720
to the next of our sequence of events we

782
00:30:22,470 --> 00:30:20,240
have several happening in rapid

783
00:30:24,789 --> 00:30:22,480
succession that'll be main engine cutoff

784
00:30:26,549 --> 00:30:24,799
followed by a stage separation then

785
00:30:29,110 --> 00:30:26,559
we'll have a first stage flip maneuver

786
00:30:31,430 --> 00:30:29,120
second engine start number one and then

787
00:30:33,750 --> 00:30:31,440
a boost back burn on the first stage now

788
00:30:36,470 --> 00:30:33,760

main engine cutoff or miko that's where

789
00:30:38,230 --> 00:30:36,480
all nine of the merlin 1d engines on the

790
00:30:40,070 --> 00:30:38,240
first stage will shut down that's

791
00:30:42,230 --> 00:30:40,080
followed shortly after by stage

792
00:30:44,470 --> 00:30:42,240
separation when both the first and the

793
00:30:46,470 --> 00:30:44,480
storms will separate

794
00:30:48,870 --> 00:30:46,480
from there the first stage will flip to

795
00:30:51,110 --> 00:30:48,880
prepare itself for entry a few seconds

796
00:30:53,029 --> 00:30:51,120
later the merlin vacuum engine on the

797
00:30:55,190 --> 00:30:53,039
second stage will ignite to boost the

798
00:30:57,509 --> 00:30:55,200
dragon into a low earth orbit that's

799
00:30:59,909 --> 00:30:57,519
called ses1 and then finally on the

800
00:31:02,310 --> 00:30:59,919
first stage boost back burns start to

801
00:31:03,590 --> 00:31:02,320
slow down the first stage in preparation

802
00:31:05,990 --> 00:31:03,600
for re-entry

803
00:31:08,389 --> 00:31:06,000
so again those five events miko stage

804
00:31:11,029 --> 00:31:08,399
separation first stage flip maneuver

805
00:31:14,630 --> 00:31:11,039
second engine start and then the boost

806
00:31:27,509 --> 00:31:14,640
back burn all coming up just in under 10

807
00:31:27,519 --> 00:31:30,389
and mikko

808
00:31:39,029 --> 00:31:33,220
stage separation confirmed

809
00:31:39,039 --> 00:31:42,630
in bag ignition

810
00:31:42,640 --> 00:31:48,870
stage one boost back startup

811
00:31:53,909 --> 00:31:51,430
so successful maryland vacuum engine

812
00:31:56,149 --> 00:31:53,919
startup first stage has begun its boost

813
00:31:59,190 --> 00:31:56,159

back burn that burn expected to last

814
00:32:02,549 --> 00:31:59,200
about 30 or so seconds here's a shot of

815
00:32:04,630 --> 00:32:02,559
the second stage maryland vacuum nozzle

816
00:32:06,310 --> 00:32:04,640
you can see it's starting to heat up

817
00:32:07,990 --> 00:32:06,320
as we begin this burn the second stage

818
00:32:09,750 --> 00:32:08,000
will continue to burn here for several

819
00:32:17,509 --> 00:32:09,760
minutes until about the t plus eight

820
00:32:17,519 --> 00:32:23,269
page one boost back shutdown

821
00:32:27,750 --> 00:32:25,430
if you're just joining us welcome you're

822
00:32:29,190 --> 00:32:27,760
watching a live webcast for the 22nd

823
00:32:31,190 --> 00:32:29,200
commercial resupply mission to the

824
00:32:34,070 --> 00:32:31,200
international space station for nasa

825
00:32:36,310 --> 00:32:34,080
this is spacex's 17th launch of the year

826
00:32:38,310 --> 00:32:36,320
and we are flying a cargo configuration

827
00:32:39,990 --> 00:32:38,320
of our new dragon spacecraft on the

828
00:32:42,389 --> 00:32:40,000
right hand side of your screen is the

829
00:32:45,269 --> 00:32:42,399
second stage which is carrying the

830
00:32:47,029 --> 00:32:45,279
dragon spacecraft into orbit

831
00:32:49,110 --> 00:32:47,039
on the left hand side of your screen you

832
00:32:51,509 --> 00:32:49,120
can see falcon 9's first stage with the

833
00:32:53,990 --> 00:32:51,519
grid fins extending

834
00:32:56,789 --> 00:32:54,000
it just completed its boost back burn

835
00:32:58,310 --> 00:32:56,799
and is making its way back to our drone

836
00:33:00,470 --> 00:32:58,320
ship

837
00:33:03,029 --> 00:33:00,480
now the rocket has to do more than just

838
00:33:04,870 --> 00:33:03,039

go up it has to go sideways really fast

839
00:33:07,029 --> 00:33:04,880
and lift off gravity is pulling straight

840
00:33:08,870 --> 00:33:07,039
down on the rocket but as we ascend we

841
00:33:10,549 --> 00:33:08,880
tilt the m the engines that's called

842
00:33:13,029 --> 00:33:10,559
gimbaling and that begins to turn the

843
00:33:15,509 --> 00:33:13,039
rocket horizontally we're still going up

844
00:33:17,029 --> 00:33:15,519
but we're also heading horizontally away

845
00:33:18,710 --> 00:33:17,039
from the launch pad that maneuver is

846
00:33:20,549 --> 00:33:18,720
called a gravity turn

847
00:33:24,310 --> 00:33:20,559
the rocket typically needs to go about

848
00:33:26,630 --> 00:33:24,320
7.5 kilometers per second or about 17

849
00:33:28,710 --> 00:33:26,640
500 miles an hour to avoid being pulled

850
00:33:30,389 --> 00:33:28,720
back down to earth and to get into orbit

851
00:33:32,149 --> 00:33:30,399
so that's what the second stage is doing

852
00:33:33,669 --> 00:33:32,159
right now

853
00:33:35,350 --> 00:33:33,679
now the first stage in order to make its

854
00:33:37,269 --> 00:33:35,360
way back to our drone ship named of

855
00:33:39,750 --> 00:33:37,279
course i still love you it has two more

856
00:33:41,990 --> 00:33:39,760
burns to do first is an entry burn it'll

857
00:33:43,509 --> 00:33:42,000
ignite three of its merlin one engines

858
00:33:45,669 --> 00:33:43,519
that'll help to slow it down as it

859
00:33:47,590 --> 00:33:45,679
re-enters the earth's atmosphere and

860
00:33:50,470 --> 00:33:47,600
then the next activity will happen much

861
00:33:52,630 --> 00:33:50,480
closer to the drone ship that is a the

862
00:33:54,870 --> 00:33:52,640
landing burn like night just the single

863
00:33:57,909 --> 00:33:54,880

center merlin engine to bring the

864
00:33:59,669 --> 00:33:57,919
vehicle speed rapidly down to zero

865
00:34:01,190 --> 00:33:59,679
you can see the grid fins that are

866
00:34:03,590 --> 00:34:01,200
extended on the left hand side of your

867
00:34:06,549 --> 00:34:03,600
screen we use those for atmospheric

868
00:34:07,990 --> 00:34:06,559
control they help steer the falcon 9 to

869
00:34:09,349 --> 00:34:08,000
make sure we make our way back to that

870
00:34:10,710 --> 00:34:09,359
drone ship

871
00:34:12,710 --> 00:34:10,720
as we get into the thicker parts of the

872
00:34:14,869 --> 00:34:12,720
earth's atmosphere

873
00:34:17,270 --> 00:34:14,879
and you'll occasionally see periodic

874
00:34:19,510 --> 00:34:17,280
bursts of a white gas

875
00:34:20,389 --> 00:34:19,520
like that that's our attitude control

876
00:34:22,389 --> 00:34:20,399
system

877
00:34:24,470 --> 00:34:22,399
giving us little corrections to our

878
00:34:26,550 --> 00:34:24,480
attitude the next major event coming up

879
00:34:28,230 --> 00:34:26,560
here for the first stage is entry burn

880
00:34:30,629 --> 00:34:28,240
three of the merlin 1d engines will

881
00:34:33,109 --> 00:34:30,639
ignite second stage burn continuing to

882
00:34:34,629 --> 00:34:33,119
look nominal second stage has a little

883
00:34:36,550 --> 00:34:34,639
ways to go it won't be done with this

884
00:34:48,950 --> 00:34:36,560
burn until about the t plus eight minute

885
00:34:48,960 --> 00:34:52,629
stage one fts is saved

886
00:34:52,639 --> 00:34:56,790
trajectory nominal

887
00:34:56,800 --> 00:35:00,829
stage one entry burn

888
00:35:06,069 --> 00:35:04,069

startup with that three marilyn 1d

889
00:35:08,230 --> 00:35:06,079
engines on the first stage igniting to

890
00:35:10,150 --> 00:35:08,240
reduce the vehicle's velocity you can

891
00:35:13,990 --> 00:35:10,160
see that on the bottom left corner of

892
00:35:14,000 --> 00:35:19,190
just burn expectations

893
00:35:22,630 --> 00:35:21,109
so from here the grid fins will continue

894
00:35:24,790 --> 00:35:22,640
to take the first stage towards our

895
00:35:26,310 --> 00:35:24,800
drone ship stationed out in the atlantic

896
00:35:27,829 --> 00:35:26,320
ocean

897
00:35:29,670 --> 00:35:27,839
at this point t plus six and a half

898
00:35:31,990 --> 00:35:29,680
minutes into flight second stage is

899
00:35:35,829 --> 00:35:32,000
making its way to the initial orbit to

900
00:35:37,750 --> 00:35:35,839
drop off the cargo dragon spacecraft

901
00:35:38,710 --> 00:35:37,760
and uh if you're just joining us

902
00:35:40,230 --> 00:35:38,720
welcome

903
00:35:42,390 --> 00:35:40,240
on your screen is a live view of falcon

904
00:35:44,870 --> 00:35:42,400
9's first stage on the left the second

905
00:35:48,230 --> 00:35:44,880
stage on the right we had a an on time

906
00:35:53,829 --> 00:35:48,240
liftoff at 1 29 p.m eastern time nominal

907
00:35:58,710 --> 00:35:55,750
talking a little bit more about the one

908
00:35:59,990 --> 00:35:58,720
transonic

909
00:36:01,910 --> 00:36:00,000
talking a little bit more about the

910
00:36:04,069 --> 00:36:01,920
first stage so the next major event

911
00:36:05,589 --> 00:36:04,079
coming up is that landing burn landing

912
00:36:14,390 --> 00:36:05,599
burn is what will bring the vehicle

913
00:36:19,910 --> 00:36:16,550

amazing shots of the first stage during

914
00:36:24,870 --> 00:36:22,230
once we get closer to the drone ship we

915
00:36:26,710 --> 00:36:24,880
will deploy our four symmetric landing

916
00:36:28,790 --> 00:36:26,720
legs around the base of the first stage

917
00:36:30,710 --> 00:36:28,800
for hopefully a nice soft touchdown on

918
00:36:31,589 --> 00:36:30,720
that drone ship you can see a shot of

919
00:36:38,390 --> 00:36:31,599
that on the right hand side of your

920
00:36:38,400 --> 00:36:48,390
stage one landing leg deploy

921
00:36:52,950 --> 00:36:50,390
picture-perfect landing

922
00:36:54,470 --> 00:36:52,960
of that falcon 930 run

923
00:36:56,870 --> 00:36:54,480
first landing

924
00:37:00,069 --> 00:36:56,880
for this first stage 86 successful

925
00:37:01,670 --> 00:37:00,079
recovery overall for spacex

926
00:37:03,510 --> 00:37:01,680
fantastic

927
00:37:05,109 --> 00:37:03,520
coming up shortly second stage is not

928
00:37:07,270 --> 00:37:05,119
done

929
00:37:09,510 --> 00:37:07,280
it will be coming up on a second engine

930
00:37:12,230 --> 00:37:09,520
cut off

931
00:37:13,589 --> 00:37:12,240
about 30. excuse me under 30 seconds

932
00:37:15,190 --> 00:37:13,599
from now

933
00:37:17,670 --> 00:37:15,200
it's been burning that whole time since

934
00:37:21,670 --> 00:37:17,680
stage separation to bring the 7 000

935
00:37:23,270 --> 00:37:21,680
pounds of cargo into the initial orbit

936
00:37:24,550 --> 00:37:23,280
around our planet

937
00:37:48,310 --> 00:37:24,560
you can see we're

938
00:37:52,230 --> 00:37:50,390

shut down of the second stage engine

939
00:37:56,950 --> 00:37:52,240
from here we'll be looking at telemetry

940
00:37:56,960 --> 00:38:01,190
nominal orbit insertion

941
00:38:05,270 --> 00:38:02,630
fantastic

942
00:38:07,109 --> 00:38:05,280
so is not the second stage has just one

943
00:38:09,430 --> 00:38:07,119
major task left

944
00:38:13,109 --> 00:38:09,440
this commanding separation of the dragon

945
00:38:15,190 --> 00:38:13,119
spacecraft just a few minutes from now

946
00:38:17,510 --> 00:38:15,200
until separation the second stage will

947
00:38:19,670 --> 00:38:17,520
be making some small adjustments

948
00:38:22,390 --> 00:38:19,680
during this coast prior to dragon

949
00:38:24,150 --> 00:38:22,400
separation and we're hoping

950
00:38:27,349 --> 00:38:24,160
we're hoping to have a video there's

951
00:38:29,990 --> 00:38:27,359
some video into the unpressurized cargo

952
00:38:32,069 --> 00:38:30,000
section of dragon this video from the

953
00:38:34,470 --> 00:38:32,079
top of the second stage we got a good

954
00:38:36,630 --> 00:38:34,480
look there at the new

955
00:38:38,069 --> 00:38:36,640
rollout solar arrays that cargo dragon

956
00:38:41,750 --> 00:38:38,079
is bringing to the international space

957
00:38:48,710 --> 00:38:43,990
so separation of the dragon spacecraft

958
00:38:52,630 --> 00:38:50,790
we have a little bit of a coast here for

959
00:38:55,190 --> 00:38:52,640
ground operators in mission control

960
00:38:56,790 --> 00:38:55,200
behind me to ensure that the vehicle is

961
00:38:58,550 --> 00:38:56,800
in the right configuration that there's

962
00:39:00,150 --> 00:38:58,560
no

963
00:39:02,710 --> 00:39:00,160

conditions that we may want to watch out

964
00:39:04,790 --> 00:39:02,720
for after separation

965
00:39:07,910 --> 00:39:04,800
that dragon and the stage 2 right now in

966
00:39:12,630 --> 00:39:11,190
and coming up after that separation

967
00:39:15,670 --> 00:39:12,640
event which hopefully we'll get a view

968
00:39:16,390 --> 00:39:15,680
like this of dragon gently floating away

969
00:39:18,390 --> 00:39:16,400
the

970
00:39:20,630 --> 00:39:18,400
dragon spacecraft will begin to perform

971
00:39:23,510 --> 00:39:20,640
some of its own checkouts dragon is

972
00:39:25,670 --> 00:39:23,520
equipped with 12 service section draco

973
00:39:27,670 --> 00:39:25,680
thrusters that are used primarily for

974
00:39:30,630 --> 00:39:27,680
attitude control and proximity next to

975
00:39:32,470 --> 00:39:30,640
the space station it's also got four

976
00:39:34,630 --> 00:39:32,480
draco thrusters on the top of the

977
00:39:35,990 --> 00:39:34,640
vehicle underneath its nose cone that we

978
00:39:37,190 --> 00:39:36,000
use for

979
00:39:39,990 --> 00:39:37,200
our

980
00:39:47,910 --> 00:39:40,000
thrust maneuvers to help us rendezvous

981
00:39:53,109 --> 00:39:50,390
so again successful ascent successful

982
00:39:54,310 --> 00:39:53,119
recovery of our first stage just a few

983
00:39:57,190 --> 00:39:54,320
minutes ago

984
00:39:58,790 --> 00:39:57,200
you're looking at a live shot into the

985
00:40:01,349 --> 00:39:58,800
cargo dragon

986
00:40:02,870 --> 00:40:01,359
uh unpressurized section from the second

987
00:40:05,109 --> 00:40:02,880
stage that is

988
00:40:06,950 --> 00:40:05,119

in orbit around our planet

989
00:40:10,309 --> 00:40:06,960
our next major activity coming up

990
00:40:26,230 --> 00:40:10,319
shortly that is dragon separation from

991
00:40:30,150 --> 00:40:27,990
something a little bit different about

992
00:40:32,150 --> 00:40:30,160
uh this dragon spacecraft

993
00:40:34,309 --> 00:40:32,160
if you followed our first version of

994
00:40:36,710 --> 00:40:34,319
dragon you'd know that uh it had

995
00:40:40,150 --> 00:40:36,720
deployable solar arrays this version of

996
00:40:43,190 --> 00:40:40,160
dragon has conformal solar arrays on the

997
00:40:45,510 --> 00:40:43,200
body of the spacecraft

998
00:40:47,270 --> 00:40:45,520
so those are mounted along the exterior

999
00:40:48,710 --> 00:40:47,280
panel of the trunk that we're looking

1000
00:40:50,950 --> 00:40:48,720
into right now

1001
00:40:54,630 --> 00:40:50,960
those provide power for the spacecraft

1002
00:41:02,390 --> 00:40:54,640
as it makes its way to the space station

1003
00:41:06,309 --> 00:41:03,990
lovely planet earth on the left hand

1004
00:41:07,750 --> 00:41:06,319
side dragon floating away you can see

1005
00:41:11,190 --> 00:41:07,760
the

1006
00:41:14,550 --> 00:41:12,390
from this view

1007
00:41:17,030 --> 00:41:14,560
atop falcon 9's second stage watching

1008
00:41:19,270 --> 00:41:17,040
dragon gently float away

1009
00:41:21,430 --> 00:41:19,280
so again activities coming up for dragon

1010
00:41:22,790 --> 00:41:21,440
it will begin its service section draco

1011
00:41:26,150 --> 00:41:22,800
checkouts

1012
00:41:27,510 --> 00:41:26,160
followed shortly after that by

1013
00:41:31,190 --> 00:41:27,520

the nosecone

1014
00:41:33,829 --> 00:41:31,200
expected loss of signal opening

1015
00:41:35,829 --> 00:41:33,839
and that's going to complete my coverage

1016
00:41:37,670 --> 00:41:35,839
here from hawthorne but why don't we

1017
00:41:44,630 --> 00:41:37,680
check in with courtney at the johnson

1018
00:41:56,790 --> 00:41:46,550
thanks shiva again just standing by for

1019
00:42:01,109 --> 00:41:59,349
the nosecone deploy uncovers the four

1020
00:42:02,870 --> 00:42:01,119
forward bulkhead thrusters which dragon

1021
00:42:42,710 --> 00:42:02,880
will use for its major burn maneuvers

1022
00:42:42,720 --> 00:43:02,309
and nosecone hooks are driving now

1023
00:43:05,990 --> 00:43:03,910
and the hooks are halfway open again

1024
00:44:00,710 --> 00:43:06,000
standing by

1025
00:44:02,230 --> 00:44:00,720
that nose cone will stay open in the

1026
00:44:17,109 --> 00:44:02,240
position until the very end of the

1027
00:44:21,109 --> 00:44:19,030
and the first set of nose cone hooks are

1028
00:44:52,230 --> 00:44:21,119
open and the second set are starting to

1029
00:44:55,829 --> 00:44:54,230
again once the nose cone is open it will

1030
00:44:57,990 --> 00:44:55,839
stay in that position until the very end

1031
00:45:00,390 --> 00:44:58,000
of its mission closing prior to re-entry

1032
00:45:11,910 --> 00:45:00,400
to provide some additional protection to

1033
00:45:11,920 --> 00:45:53,430
expected lots of signal newfoundland

1034
00:45:58,069 --> 00:45:55,190
again standing by for confirmation of

1035
00:46:00,230 --> 00:45:58,079
nose cone deploy and this nose cone

1036
00:46:01,910 --> 00:46:00,240
deploy will uncover those four bulkhead

1037
00:46:04,069 --> 00:46:01,920
thrusters and that's what dragon will

1038
00:46:05,670 --> 00:46:04,079

use for its major burns

1039
00:46:07,190 --> 00:46:05,680
coming up throughout the next day to

1040
00:46:09,510 --> 00:46:07,200
catch up with the space station before

1041
00:46:32,069 --> 00:46:09,520
docking

1042
00:46:32,079 --> 00:46:38,150
and the nose cone is opening

1043
00:46:38,160 --> 00:46:50,550
and nose cone deploy confirmed

1044
00:46:55,109 --> 00:46:52,790
and with nosecone deploy now confirmed

1045
00:46:56,790 --> 00:46:55,119
now joining me on the phone is manager

1046
00:46:58,710 --> 00:46:56,800
of the international space station

1047
00:47:01,430 --> 00:46:58,720
office for systems engineering and

1048
00:47:03,829 --> 00:47:01,440
integration jeff aaron jeff one major

1049
00:47:05,910 --> 00:47:03,839
component in dragon's trunk today is the

1050
00:47:08,230 --> 00:47:05,920
first set of irosa solar arrays can you

1051
00:47:09,910 --> 00:47:08,240
tell us the importance of augmenting the

1052
00:47:13,030 --> 00:47:09,920
station's power supply through these

1053
00:47:15,510 --> 00:47:13,040
irosa spacewalks later this month

1054
00:47:16,550 --> 00:47:15,520
absolutely courtney uh how do you hear

1055
00:47:19,190 --> 00:47:16,560
me

1056
00:47:21,829 --> 00:47:19,200
perfect i hear you great okay very good

1057
00:47:23,190 --> 00:47:21,839
um yeah that's a great question um so

1058
00:47:24,870 --> 00:47:23,200
i'm gonna kind of start at the beginning

1059
00:47:27,829 --> 00:47:24,880
a little bit because the punchline at

1060
00:47:29,910 --> 00:47:27,839
the end is probably the best but

1061
00:47:32,549 --> 00:47:29,920
you know over time our our solar rays

1062
00:47:35,510 --> 00:47:32,559
age and uh so the first set of rays have

1063
00:47:38,150 --> 00:47:35,520

uh have been up there over 20 years

1064
00:47:39,829 --> 00:47:38,160
our most recent arrays we brought up you

1065
00:47:41,990 --> 00:47:39,839
know just before shuttle retirement

1066
00:47:43,109 --> 00:47:42,000
those arrays are over 10 years old as

1067
00:47:45,270 --> 00:47:43,119
well and then

1068
00:47:47,829 --> 00:47:45,280
the set in between are

1069
00:47:49,430 --> 00:47:47,839
are closer to 15 years old

1070
00:47:50,710 --> 00:47:49,440
so over time

1071
00:47:53,349 --> 00:47:50,720
the arrays aren't as efficient at

1072
00:47:55,030 --> 00:47:53,359
generating power so that's that's one of

1073
00:47:56,950 --> 00:47:55,040
the things we wanted to fix with the

1074
00:47:58,309 --> 00:47:56,960
with the augmentation

1075
00:48:01,109 --> 00:47:58,319
um

1076
00:48:03,430 --> 00:48:01,119
so when we actually the first two we do

1077
00:48:05,589 --> 00:48:03,440
are the oldest arrays which makes sense

1078
00:48:07,349 --> 00:48:05,599
we took first two that we replaced and

1079
00:48:09,270 --> 00:48:07,359
that will effectively restore those

1080
00:48:11,430 --> 00:48:09,280
arrays back to what we would call their

1081
00:48:14,230 --> 00:48:11,440
beginning of life properties

1082
00:48:15,829 --> 00:48:14,240
um and in the case of the newer arrays

1083
00:48:17,670 --> 00:48:15,839
you know the ones that are 10 to 15

1084
00:48:20,390 --> 00:48:17,680
years old that are that will eventually

1085
00:48:22,309 --> 00:48:20,400
get the the iro says they'll actually be

1086
00:48:24,710 --> 00:48:22,319
able to generate more power than they

1087
00:48:26,630 --> 00:48:24,720
than they can today

1088
00:48:28,470 --> 00:48:26,640

so this product this provides basically

1089
00:48:31,990 --> 00:48:28,480
three significant benefits i kind of

1090
00:48:34,470 --> 00:48:32,000
alluded to the to one of the two which

1091
00:48:38,309 --> 00:48:34,480
but let me let me kind of go through an

1092
00:48:40,309 --> 00:48:38,319
order here for in in my logical mind

1093
00:48:42,150 --> 00:48:40,319
so for one for our solar array

1094
00:48:44,230 --> 00:48:42,160
constraint events it makes it easier for

1095
00:48:46,470 --> 00:48:44,240
us to manage the solar rays

1096
00:48:47,750 --> 00:48:46,480
uh an example of that would be about

1097
00:48:50,309 --> 00:48:47,760
what we're going to see tomorrow so

1098
00:48:51,990 --> 00:48:50,319
visiting vehicle dockings and undockings

1099
00:48:53,670 --> 00:48:52,000
you know the arrays can't always point

1100
00:48:55,589 --> 00:48:53,680
at the sun we have to protect them from

1101
00:48:59,270 --> 00:48:55,599
plumes from the vehicles

1102
00:49:03,510 --> 00:49:00,790
some of the loads that we see on the

1103
00:49:05,589 --> 00:49:03,520
arrays so we call those in that's a

1104
00:49:07,670 --> 00:49:05,599
a visiting vehicle or solar array

1105
00:49:09,750 --> 00:49:07,680
constrained event

1106
00:49:11,670 --> 00:49:09,760
it also helps us this this augmentation

1107
00:49:13,990 --> 00:49:11,680
is going to help us to fully

1108
00:49:17,030 --> 00:49:14,000
uh to extend the life of iss and fully

1109
00:49:18,470 --> 00:49:17,040
execute our full suite of research as we

1110
00:49:20,790 --> 00:49:18,480
as we move forward

1111
00:49:22,710 --> 00:49:20,800
and probably most importantly it allows

1112
00:49:25,270 --> 00:49:22,720
allows us to power more science and

1113
00:49:27,589 --> 00:49:25,280

research especially in the form of

1114
00:49:29,589 --> 00:49:27,599
future exploration systems and

1115
00:49:31,670 --> 00:49:29,599
commercial users the one that i'm

1116
00:49:33,589 --> 00:49:31,680
thinking about in particular particular

1117
00:49:36,150 --> 00:49:33,599
would be the axiom module that we hope

1118
00:49:38,390 --> 00:49:36,160
to see later on

1119
00:49:41,750 --> 00:49:38,400
in a few years from now on on the front

1120
00:49:45,510 --> 00:49:43,430
and of course these resupply missions

1121
00:49:47,430 --> 00:49:45,520
deliver science hardware and other cargo

1122
00:49:49,109 --> 00:49:47,440
like you were just saying to the station

1123
00:49:51,990 --> 00:49:49,119
how critical are these deliveries for

1124
00:49:54,710 --> 00:49:52,000
the station and astronauts

1125
00:49:56,390 --> 00:49:54,720
so over any six-month planning period

1126
00:49:58,549 --> 00:49:56,400
there are hundreds of experiments being

1127
00:50:00,870 --> 00:49:58,559
conducted on board

1128
00:50:02,549 --> 00:50:00,880
the vehicle that delivers our crews you

1129
00:50:03,990 --> 00:50:02,559
know they are the vehicles that deliver

1130
00:50:06,309 --> 00:50:04,000
our crews you know they do a great job

1131
00:50:09,030 --> 00:50:06,319
of getting the crews there safely

1132
00:50:10,870 --> 00:50:09,040
um to and from station but their cargo

1133
00:50:13,750 --> 00:50:10,880
capacity is very limited on the order of

1134
00:50:15,670 --> 00:50:13,760
100 maybe 200 kilos

1135
00:50:17,589 --> 00:50:15,680
we couldn't conduct all the science we

1136
00:50:19,190 --> 00:50:17,599
do as well as provide for our crew

1137
00:50:21,589 --> 00:50:19,200
members without

1138
00:50:23,829 --> 00:50:21,599

without our cargo resupply vehicles

1139
00:50:25,270 --> 00:50:23,839
which can carry about in this particular

1140
00:50:28,390 --> 00:50:25,280
case about two metric tons of

1141
00:50:29,750 --> 00:50:28,400
pressurized cargo in research

1142
00:50:32,230 --> 00:50:29,760
our cargo flights are vital to

1143
00:50:33,910 --> 00:50:32,240
maintaining and fully utilizing our

1144
00:50:35,990 --> 00:50:33,920
orbiting laboratory

1145
00:50:38,710 --> 00:50:36,000
in the case of this spacex 22 we're

1146
00:50:40,710 --> 00:50:38,720
bringing up about 900 kilos of research

1147
00:50:41,670 --> 00:50:40,720
supplies to support our ongoing science

1148
00:50:45,510 --> 00:50:41,680
program

1149
00:50:47,990 --> 00:50:45,520
and it will also return about 1200 kilos

1150
00:50:51,349 --> 00:50:48,000
of science samples and supplies for

1151
00:50:53,910 --> 00:50:51,359
human research biology biotechnology

1152
00:50:55,990 --> 00:50:53,920
physical science investigation education

1153
00:50:58,150 --> 00:50:56,000
studies

1154
00:51:00,549 --> 00:50:58,160
the return piece of this the science and

1155
00:51:03,270 --> 00:51:00,559
research return it can't be emphasized

1156
00:51:05,430 --> 00:51:03,280
enough because a unique service that the

1157
00:51:07,349 --> 00:51:05,440
spacex cargo vehicle provides is

1158
00:51:09,190 --> 00:51:07,359
returned cargo

1159
00:51:11,270 --> 00:51:09,200
otherwise the only way we can get car

1160
00:51:13,190 --> 00:51:11,280
return cargo down in samples is on our

1161
00:51:15,990 --> 00:51:13,200
crewed vehicle so

1162
00:51:17,430 --> 00:51:16,000
which again is fairly limited

1163
00:51:19,910 --> 00:51:17,440

these vehicles also bring critical

1164
00:51:21,030 --> 00:51:19,920
spares to help us maintain our onboard

1165
00:51:23,750 --> 00:51:21,040
systems

1166
00:51:25,670 --> 00:51:23,760
keep the space seats maintained and of

1167
00:51:28,069 --> 00:51:25,680
course provide food food and crew

1168
00:51:30,790 --> 00:51:28,079
support items so super critical to what

1169
00:51:33,030 --> 00:51:30,800
we do each and every day

1170
00:51:34,390 --> 00:51:33,040
and as always it's a busy time aboard

1171
00:51:36,390 --> 00:51:34,400
the international space station with

1172
00:51:38,870 --> 00:51:36,400
cargo vehicles and crews coming and

1173
00:51:41,270 --> 00:51:38,880
going one russian spacewalk behind us

1174
00:51:42,790 --> 00:51:41,280
and two u.s spacewalks later this month

1175
00:51:44,470 --> 00:51:42,800
can you kind of lay out how complex the

1176
00:51:47,829 --> 00:51:44,480
next few months will be for the station

1177
00:51:49,589 --> 00:51:47,839
program and the global partnership

1178
00:51:52,870 --> 00:51:49,599
complex well i hope i don't have to call

1179
00:51:54,390 --> 00:51:52,880
it complex maybe exciting fast-paced fun

1180
00:51:57,349 --> 00:51:54,400
times um

1181
00:51:59,109 --> 00:51:57,359
you know we plan everything to a t and

1182
00:52:01,190 --> 00:51:59,119
analyze it do those kind of things so we

1183
00:52:02,630 --> 00:52:01,200
like to try to limit eliminate the

1184
00:52:04,790 --> 00:52:02,640
complexity is the way i would kind of

1185
00:52:06,870 --> 00:52:04,800
describe it but you're right it's a very

1186
00:52:08,630 --> 00:52:06,880
busy time and so

1187
00:52:11,270 --> 00:52:08,640
from a visiting vehicle point of view i

1188
00:52:14,309 --> 00:52:11,280

think the up upcoming amount of traffic

1189
00:52:15,349 --> 00:52:14,319
is about as busy as we've ever had

1190
00:52:17,190 --> 00:52:15,359
there are also going to be some

1191
00:52:18,790 --> 00:52:17,200
configuration changes mostly on the

1192
00:52:21,190 --> 00:52:18,800
russian segment that will keep our

1193
00:52:23,910 --> 00:52:21,200
flight control engineering and partners

1194
00:52:25,430 --> 00:52:23,920
very busy over the next few months

1195
00:52:27,349 --> 00:52:25,440
as you pointed out we just with the

1196
00:52:29,190 --> 00:52:27,359
completion of the russian segment eva

1197
00:52:30,309 --> 00:52:29,200
which was actually yesterday it seems

1198
00:52:32,549 --> 00:52:30,319
like

1199
00:52:34,790 --> 00:52:32,559
days or weeks ago as fast as fast as

1200
00:52:36,549 --> 00:52:34,800
everything is going here lately but the

1201
00:52:38,150 --> 00:52:36,559
russian segment is now going to be ready

1202
00:52:40,150 --> 00:52:38,160
for the undock of the docking

1203
00:52:42,309 --> 00:52:40,160
compartment which is another module

1204
00:52:43,430 --> 00:52:42,319
that's been on board for about 20 years

1205
00:52:45,829 --> 00:52:43,440
or so

1206
00:52:48,230 --> 00:52:45,839
and this opens the port up for the the

1207
00:52:49,910 --> 00:52:48,240
next basically the third large module

1208
00:52:52,390 --> 00:52:49,920
that our that our russian partners will

1209
00:52:55,190 --> 00:52:52,400
be bringing to iss it's the mlm or

1210
00:52:57,589 --> 00:52:55,200
multi-purpose logistics module and that

1211
00:52:59,510 --> 00:52:57,599
docking is later in july

1212
00:53:02,069 --> 00:52:59,520
you know but before that shortly after

1213
00:53:04,309 --> 00:53:02,079

spacex stocks we'll be conducting

1214
00:53:06,230 --> 00:53:04,319
two evas ourselves one on the 16th and

1215
00:53:09,349 --> 00:53:06,240
then the other as things go well in the

1216
00:53:12,549 --> 00:53:09,359
20th of june to install the irosa the

1217
00:53:14,790 --> 00:53:12,559
irosa arrays

1218
00:53:17,510 --> 00:53:14,800
maybe this is where we where complex

1219
00:53:19,910 --> 00:53:17,520
comes into play um all evas are

1220
00:53:21,910 --> 00:53:19,920
challenging but these irosa arrays in

1221
00:53:23,750 --> 00:53:21,920
particular are probably probably more so

1222
00:53:26,150 --> 00:53:23,760
than some of our other ones

1223
00:53:27,750 --> 00:53:26,160
and then finally shortly after the mlm

1224
00:53:30,230 --> 00:53:27,760
arrives

1225
00:53:32,390 --> 00:53:30,240
at near the end of july we'll need to re

1226
00:53:35,270 --> 00:53:32,400
relocate the crew troop

1227
00:53:37,910 --> 00:53:35,280
excuse me the crew 2 vehicle from the

1228
00:53:39,030 --> 00:53:37,920
node 2 forward port to the node 2 zenith

1229
00:53:40,950 --> 00:53:39,040
port

1230
00:53:44,950 --> 00:53:40,960
which will enable the launch and docking

1231
00:53:47,270 --> 00:53:44,960
of the oft2

1232
00:53:49,190 --> 00:53:47,280
crew demonstration vehicle

1233
00:53:50,710 --> 00:53:49,200
near the end of july the first part of

1234
00:53:55,109 --> 00:53:50,720
august so

1235
00:53:56,470 --> 00:53:55,119
so yes a very busy exciting time for us

1236
00:53:58,630 --> 00:53:56,480
all right jeff well thank you so much

1237
00:54:00,150 --> 00:53:58,640
for joining us today and back here in

1238
00:54:01,670 --> 00:54:00,160

the international space station flight

1239
00:54:03,430 --> 00:54:01,680
control room flight controllers are

1240
00:54:05,190 --> 00:54:03,440
monitoring the systems on the station

1241
00:54:07,109 --> 00:54:05,200
itself ahead of dragon's arrival

1242
00:54:09,430 --> 00:54:07,119
saturday morning again once dragon

1243
00:54:11,510 --> 00:54:09,440
crosses that approach ellipsoid which we

1244
00:54:13,190 --> 00:54:11,520
see as an imaginary sphere around the

1245
00:54:15,910 --> 00:54:13,200
station flight controllers here in

1246
00:54:17,670 --> 00:54:15,920
mission control houston will begin joint

1247
00:54:19,829 --> 00:54:17,680
operations with spacex teams over in

1248
00:54:21,589 --> 00:54:19,839
hawthorne california nasa astronauts

1249
00:54:23,430 --> 00:54:21,599
shane kimbrough and megan macarthur will

1250
00:54:25,270 --> 00:54:23,440
be monitoring the approach and arrival

1251
00:54:26,950 --> 00:54:25,280
of dragon with the planned docking

1252
00:54:29,510 --> 00:54:26,960
saturday morning at four o'clock in the

1253
00:54:31,190 --> 00:54:29,520
morning central time once cargo dragon

1254
00:54:33,109 --> 00:54:31,200
is docked to the station macarthur and

1255
00:54:34,230 --> 00:54:33,119
kimbra will begin hatch operations to

1256
00:54:36,069 --> 00:54:34,240
open the hatches between the

1257
00:54:38,150 --> 00:54:36,079
international space station and cargo

1258
00:54:39,910 --> 00:54:38,160
dragon and again everything is still on

1259
00:54:41,349 --> 00:54:39,920
track in the international space station

1260
00:54:43,349 --> 00:54:41,359
flight control room so that'll do it for

1261
00:54:45,430 --> 00:54:43,359
us here in mission control houston now

1262
00:54:46,870 --> 00:54:45,440
back over to kennedy megan

1263
00:54:49,030 --> 00:54:46,880

thanks courtney that's going to wrap up

1264
00:54:51,109 --> 00:54:49,040
our launch coverage of nasa's 22nd

1265
00:54:53,190 --> 00:54:51,119
spacex commercial resupply services

1266
00:54:55,190 --> 00:54:53,200
mission cargo dragon is on course to

1267
00:54:57,349 --> 00:54:55,200
dock to the international space station

1268
00:54:59,030 --> 00:54:57,359
at about 5 a.m eastern time saturday

1269
00:55:00,789 --> 00:54:59,040
morning we will of course have live

1270
00:55:03,030 --> 00:55:00,799
coverage of rendezvous and docking

1271
00:55:05,109 --> 00:55:03,040
beginning at 3 30 a.m saturday morning

1272
00:55:07,750 --> 00:55:05,119
eastern time in the meantime you can

1273
00:55:09,349 --> 00:55:07,760
follow the mission at nasa.gov thank you

1274
00:55:10,950 --> 00:55:09,359
so much for joining us we'll leave you

1275
00:55:13,390 --> 00:55:10,960
with some beautiful views of today's

1276
00:55:19,349 --> 00:55:16,150
stage 15 seconds

1277
00:55:21,190 --> 00:55:19,359
falcon 9 is configured

1278
00:55:22,069 --> 00:55:21,200
and nine

1279
00:55:23,109 --> 00:55:22,079
eight

1280
00:55:24,069 --> 00:55:23,119
seven

1281
00:55:25,109 --> 00:55:24,079
six

1282
00:55:26,069 --> 00:55:25,119
five

1283
00:55:27,109 --> 00:55:26,079
four

1284
00:55:28,069 --> 00:55:27,119
three

1285
00:55:29,030 --> 00:55:28,079
two

1286
00:55:29,829 --> 00:55:29,040
one

1287
00:55:32,710 --> 00:55:29,839
two

1288
00:55:38,230 --> 00:55:35,510

and liftoff of the 20-second spacex

1289
00:55:40,710 --> 00:55:38,240
cargo resupply mission bringing new

1290
00:55:48,540 --> 00:55:40,720
solar arrays to the international space