1
00:00:29,349 --> 00:00:22,950
dragon doesn't count down

2
00:00:29,359 --> 00:00:40,410
dragon spacex go for launch

3
00:00:40,420 --> 00:00:53,990
[Music]

4
00:00:57,990 --> 00:00:55,990
we are just under 22 minutes from

5
00:01:00,709 --> 00:00:58,000
liftoff of this falcon 9 rocket for

6
00:01:02,630 --> 00:01:00,719
nasa's and spacex's 24th commercial

7
00:01:04,789 --> 00:01:02,640
resupply services mission to the

8
00:01:07,910 --> 00:01:04,799
international space station the dragon

9
00:01:10,630 --> 00:01:07,920
spacecraft will fly about 6 500 pounds

10
00:01:12,870 --> 00:01:10,640
of science supplies and holiday treats

11
00:01:14,710 --> 00:01:12,880
for the astronauts on board

12
00:01:16,710 --> 00:01:14,720
happy holidays everyone and thank you

13
00:01:19,830 --> 00:01:16,720

for joining us for this live live launch

14
00:01:22,789 --> 00:01:19,840
coverage of crs 24 i'm megan cruz

15
00:01:25,270 --> 00:01:22,799
today's liftoff is scheduled for 507 a.m

16
00:01:27,910 --> 00:01:25,280
eastern time from launch complex 39a

17
00:01:29,910 --> 00:01:27,920
here at kennedy space center in florida

18
00:01:33,109 --> 00:01:29,920
and we are again simulcasting this live

19
00:01:34,630 --> 00:01:33,119
show on nasa tv and on spacex's webcast

20
00:01:36,710 --> 00:01:34,640
so let's bring in andy tran now live

21
00:01:40,069 --> 00:01:36,720
from spacex's headquarters in hawthorne

22
00:01:42,069 --> 00:01:40,079
california good to see you andy

23
00:01:44,069 --> 00:01:42,079
good to see you too megan it is great to

24
00:01:46,149 --> 00:01:44,079
be back covering today's mission in

25
00:01:48,550 --> 00:01:46,159
partnership with nasa and as the year

26
00:01:52,389 --> 00:01:48,560
comes to an end crs 24 will be spacex's

27
00:01:54,710 --> 00:01:52,399
31st and final mission of 2021 making it

28
00:01:56,550 --> 00:01:54,720
a record-breaking year for launches for

29
00:01:58,310 --> 00:01:56,560
us what a way to end the year andy and

30
00:01:59,749 --> 00:01:58,320
and i see that you have a live view of

31
00:02:01,910 --> 00:01:59,759
the pad right now can you walk us

32
00:02:04,230 --> 00:02:01,920
through the different parts of falcon 9

33
00:02:06,310 --> 00:02:04,240
and dragon

34
00:02:08,309 --> 00:02:06,320
yeah absolutely so

35
00:02:10,229 --> 00:02:08,319
our two-stage launch vehicle stands

36
00:02:12,550 --> 00:02:10,239
about 70 meters tall and when fully

37
00:02:14,470 --> 00:02:12,560
fueled holds just over one million

38
00:02:15,830 --> 00:02:14,480

pounds of propellant that the vehicle

39
00:02:18,390 --> 00:02:15,840
will burn through in less than three

40
00:02:20,710 --> 00:02:18,400
minutes after liftoff the bottom two

41
00:02:22,550 --> 00:02:20,720
thirds of the vehicle is the first stage

42
00:02:23,830 --> 00:02:22,560
its objective is to accelerate the

43
00:02:25,990 --> 00:02:23,840
vehicle through the earth's atmosphere

44
00:02:27,990 --> 00:02:26,000
to space and then separate from the rest

45
00:02:29,350 --> 00:02:28,000
of the rocket and while today's flight

46
00:02:31,350 --> 00:02:29,360
is going to be the first for this

47
00:02:33,509 --> 00:02:31,360
booster falcon 9 is designed to be

48
00:02:35,990 --> 00:02:33,519
reusable for the reliable and safe

49
00:02:37,270 --> 00:02:36,000
transport of people payloads and people

50
00:02:39,350 --> 00:02:37,280
and payloads

51
00:02:40,630 --> 00:02:39,360
into earth orbit and beyond

52
00:02:42,710 --> 00:02:40,640
and as usual we are going to be

53
00:02:44,229 --> 00:02:42,720
attempting to recover the first stage on

54
00:02:45,670 --> 00:02:44,239
our drone ship just read the

55
00:02:47,670 --> 00:02:45,680
instructions that's what you see on

56
00:02:49,670 --> 00:02:47,680
screen right now

57
00:02:52,229 --> 00:02:49,680
above the first stage is the second

58
00:02:53,830 --> 00:02:52,239
stage it has a single merlin vacuum

59
00:02:56,229 --> 00:02:53,840
engine which ignites after the first

60
00:02:57,750 --> 00:02:56,239
stage separates the second stage is what

61
00:02:59,350 --> 00:02:57,760
is what will carry dragon to its

62
00:03:01,110 --> 00:02:59,360
intended orbit allowing the spacecraft

63
00:03:03,350 --> 00:03:01,120

to eventually rendezvous with the

64
00:03:05,430 --> 00:03:03,360
international space station and speaking

65
00:03:08,149 --> 00:03:05,440
of dragon it is sitting at the very very

66
00:03:09,830 --> 00:03:08,159
top of the rocket dragon was designed uh

67
00:03:11,589 --> 00:03:09,840
from the beginning to be reused and this

68
00:03:13,830 --> 00:03:11,599
version of dragon is designed for up to

69
00:03:15,670 --> 00:03:13,840
five flights following a successful

70
00:03:17,509 --> 00:03:15,680
launch this dragon will dock itself to

71
00:03:19,110 --> 00:03:17,519
the international space station it will

72
00:03:21,509 --> 00:03:19,120
join another dragon capsule that's

73
00:03:23,270 --> 00:03:21,519
already attached capsule endurance this

74
00:03:25,430 --> 00:03:23,280
is the one that launched crew 3

75
00:03:26,869 --> 00:03:25,440
astronauts last month so that's a quick

76
00:03:29,190 --> 00:03:26,879
rundown of our launch vehicles i'll send

77
00:03:31,509 --> 00:03:29,200
it back to you megan thanks andy and in

78
00:03:33,670 --> 00:03:31,519
addition to spacex nasa teams both here

79
00:03:35,670 --> 00:03:33,680
in florida and in houston are monitoring

80
00:03:37,670 --> 00:03:35,680
this mission let's go to joshua santora

81
00:03:39,190 --> 00:03:37,680
here at kennedy first joshua you're

82
00:03:40,869 --> 00:03:39,200
listening in as the launch team

83
00:03:41,830 --> 00:03:40,879
considers things like weather and safety

84
00:03:45,509 --> 00:03:41,840
right

85
00:03:46,949 --> 00:03:45,519
morning to you and everybody watching uh

86
00:03:48,789 --> 00:03:46,959
santa claus and his reindeer can get off

87
00:03:51,030 --> 00:03:48,799
the ground in any weather our launch

88
00:03:52,949 --> 00:03:51,040

vehicles have launch commit criteria uh

89
00:03:54,949 --> 00:03:52,959
unfortunately we've been tracking uh we

90
00:03:56,229 --> 00:03:54,959
are currently no go on weather but the

91
00:03:57,670 --> 00:03:56,239
great news is that we are trending

92
00:03:59,350 --> 00:03:57,680
towards being go here in just a few

93
00:04:01,910 --> 00:03:59,360
minutes so we're hoping to hear that

94
00:04:03,750 --> 00:04:01,920
call uh on time for that liftoff that we

95
00:04:04,550 --> 00:04:03,760
have coming up in just about 18 minutes

96
00:04:06,309 --> 00:04:04,560
now

97
00:04:07,990 --> 00:04:06,319
uh that's thanks to the folks at space

98
00:04:09,830 --> 00:04:08,000
launch delta 45 specifically launch

99
00:04:11,589 --> 00:04:09,840
weather officer arlena moses providing

100
00:04:13,030 --> 00:04:11,599
that support for weather and range

101
00:04:14,869 --> 00:04:13,040
activities

102
00:04:16,550 --> 00:04:14,879
for the countdown operations fueling on

103
00:04:18,390 --> 00:04:16,560
the first stage began at t minus 35

104
00:04:20,229 --> 00:04:18,400
minutes and the second stage will begin

105
00:04:22,390 --> 00:04:20,239
fueling in just about two minutes at t

106
00:04:25,430 --> 00:04:22,400
minus 16 minutes that's all ahead of

107
00:04:26,870 --> 00:04:25,440
liftoff scheduled for 507.08 eastern

108
00:04:28,150 --> 00:04:26,880
time this morning that's so precise

109
00:04:29,749 --> 00:04:28,160
because we have a single second to

110
00:04:31,350 --> 00:04:29,759
launch and rendezvous with the space

111
00:04:33,110 --> 00:04:31,360
station tomorrow morning

112
00:04:34,950 --> 00:04:33,120
that autonomous docking that andy

113
00:04:36,870 --> 00:04:34,960

mentioned is scheduled for 4 30 a.m

114
00:04:38,950 --> 00:04:36,880
eastern time with coverage beginning at

115
00:04:40,469 --> 00:04:38,960
3am eastern time

116
00:04:41,830 --> 00:04:40,479
for more on space station operations i'm

117
00:04:43,590 --> 00:04:41,840
going to send you out now to the johnson

118
00:04:45,510 --> 00:04:43,600
space center in houston texas where

119
00:04:50,870 --> 00:04:45,520
shaniqua vareen is in standing by in

120
00:04:54,469 --> 00:04:52,390
thanks and welcome to the international

121
00:04:56,310 --> 00:04:54,479
space station flight control room i'm

122
00:04:58,629 --> 00:04:56,320
shaniqua raine live at johnson space

123
00:04:59,909 --> 00:04:58,639
center here in houston texas the team of

124
00:05:01,830 --> 00:04:59,919
flight controllers in mission control

125
00:05:04,230 --> 00:05:01,840
houston today has been led by flight

126
00:05:06,070 --> 00:05:04,240
director adi boulos teams here in

127
00:05:07,830 --> 00:05:06,080
mission control will really jump into

128
00:05:10,150 --> 00:05:07,840
action tonight into early wednesday

129
00:05:11,909 --> 00:05:10,160
morning as cargo dragon approaches the

130
00:05:13,670 --> 00:05:11,919
international space station

131
00:05:16,070 --> 00:05:13,680
there are currently seven crew members

132
00:05:18,230 --> 00:05:16,080
living and working aboard the station

133
00:05:21,430 --> 00:05:18,240
expedition 66 consists of nasa

134
00:05:23,990 --> 00:05:21,440
astronauts tom marshburn raja achary

135
00:05:26,790 --> 00:05:24,000
kayla baron and mark vanda high res

136
00:05:29,029 --> 00:05:26,800
cosmos cosmonauts piedra dubrov anton

137
00:05:30,870 --> 00:05:29,039
scaplerov and matthias maurer of the

138
00:05:32,310 --> 00:05:30,880

european space agency

139
00:05:33,749 --> 00:05:32,320
as cargo dragon approaches the

140
00:05:36,310 --> 00:05:33,759
international space station in the

141
00:05:39,110 --> 00:05:36,320
morning hours on december 22nd nasa

142
00:05:40,950 --> 00:05:39,120
astronauts rash achary and tom marshburn

143
00:05:42,710 --> 00:05:40,960
will be monitoring their arrival from

144
00:05:45,270 --> 00:05:42,720
the station's cupola

145
00:05:47,110 --> 00:05:45,280
cargo dragon will will remain attached

146
00:05:48,950 --> 00:05:47,120
to the international space station's

147
00:05:50,469 --> 00:05:48,960
forward port of the harmony module for

148
00:05:53,110 --> 00:05:50,479
about one month

149
00:05:55,670 --> 00:05:53,120
being one of two dragons joining crude

150
00:05:57,909 --> 00:05:55,680
dragon endurance before being packed up

151
00:05:59,590 --> 00:05:57,919
with critical science and supplies and

152
00:06:01,830 --> 00:05:59,600
will splash down off the coast of

153
00:06:03,510 --> 00:06:01,840
florida for that science to be analyzed

154
00:06:04,950 --> 00:06:03,520
back here on earth

155
00:06:06,390 --> 00:06:04,960
everything's still a go from here in

156
00:06:07,909 --> 00:06:06,400
mission control houston and we're

157
00:06:09,430 --> 00:06:07,919
looking forward to welcoming another

158
00:06:11,830 --> 00:06:09,440
vehicle to the international space

159
00:06:13,749 --> 00:06:11,840
station so for now we'll head back out

160
00:06:15,670 --> 00:06:13,759
to kennedy megan

161
00:06:17,909 --> 00:06:15,680
thanks shaniqua we're now about 16

162
00:06:21,430 --> 00:06:17,919
minutes and counting from liftoff of crs

163
00:06:23,270 --> 00:06:21,440

24 on board our more than two dozen

164
00:06:25,270 --> 00:06:23,280
science experiments here's a quick

165
00:06:28,980 --> 00:06:25,280
sample of some including technology that

166
00:06:33,250 --> 00:06:28,990
could one day help wounds heal faster

167
00:08:31,830 --> 00:06:33,260
[Music]

168
00:08:33,589 --> 00:08:31,840
and you saw in that video that college

169
00:08:35,589 --> 00:08:33,599
students are sending experiments to the

170
00:08:37,829 --> 00:08:35,599
orbiting lab and i have two of them here

171
00:08:40,070 --> 00:08:37,839
with me today this is swati ravi from

172
00:08:42,070 --> 00:08:40,080
columbia university as well as caitlyn

173
00:08:44,230 --> 00:08:42,080
harvey from the university of idaho good

174
00:08:46,070 --> 00:08:44,240
morning to you guys good morning so talk

175
00:08:48,230 --> 00:08:46,080
to me i know that between your two

176
00:08:49,990 --> 00:08:48,240
universities 18 students are sending two

177
00:08:52,310 --> 00:08:50,000
experiments to space can you tell me

178
00:08:54,550 --> 00:08:52,320
about yours swati absolutely so we're

179
00:08:56,389 --> 00:08:54,560
sending up two different bacteria

180
00:08:58,550 --> 00:08:56,399
that are commonly found in space flight

181
00:09:00,949 --> 00:08:58,560
environments and also the cause of some

182
00:09:02,949 --> 00:09:00,959
previous astronaut infections and we're

183
00:09:04,550 --> 00:09:02,959
really interested in studying how they

184
00:09:06,550 --> 00:09:04,560
interact with each other and also how

185
00:09:08,550 --> 00:09:06,560
their antibiotic resistance changes in

186
00:09:10,389 --> 00:09:08,560
space oh really interesting and caitlin

187
00:09:12,470 --> 00:09:10,399
what about you yeah so for our

188
00:09:14,710 --> 00:09:12,480

experiment we're looking at how

189
00:09:17,030 --> 00:09:14,720
effective different um bacterial

190
00:09:18,949 --> 00:09:17,040
resistant polymer coatings are on high

191
00:09:20,310 --> 00:09:18,959
contact surfaces in microgravity because

192
00:09:22,389 --> 00:09:20,320
we already know how they behave on earth

193
00:09:23,670 --> 00:09:22,399
so we want to compare those yeah it

194
00:09:25,590 --> 00:09:23,680
sounds like both of your experiments

195
00:09:27,670 --> 00:09:25,600
have to do with studying how bacteria

196
00:09:30,550 --> 00:09:27,680
grows in space why is it that you guys

197
00:09:33,030 --> 00:09:30,560
wanted to hone in on that yes so

198
00:09:35,509 --> 00:09:33,040
bacterial resistance is a real problem

199
00:09:37,910 --> 00:09:35,519
both in space and here on earth and so

200
00:09:39,670 --> 00:09:37,920
for us it's important to study

201
00:09:41,509 --> 00:09:39,680
bacteria because

202
00:09:43,269 --> 00:09:41,519
for long-term future space flight it's

203
00:09:45,190 --> 00:09:43,279
important that we keep astronauts safe

204
00:09:47,269 --> 00:09:45,200
and healthy and even here on earth the

205
00:09:48,949 --> 00:09:47,279
world health organization has flagged

206
00:09:50,710 --> 00:09:48,959
antibiotic resistance as a really

207
00:09:52,070 --> 00:09:50,720
important challenge for us to solve

208
00:09:53,750 --> 00:09:52,080
right yeah and you hit the nail on the

209
00:09:55,190 --> 00:09:53,760
head you know as as these missions get

210
00:09:57,350 --> 00:09:55,200
longer and longer when we think about

211
00:09:59,590 --> 00:09:57,360
mars so and you know this is all

212
00:10:01,829 --> 00:09:59,600
possible through nasa's student payload

213
00:10:03,910 --> 00:10:01,839

opportunity with citizen science or

214
00:10:05,590 --> 00:10:03,920
spocs program can you tell us what you

215
00:10:07,430 --> 00:10:05,600
think about the fact that nasa is

216
00:10:09,509 --> 00:10:07,440
investing in stem and creating this

217
00:10:11,750 --> 00:10:09,519
opportunity for you guys yeah i mean i

218
00:10:14,870 --> 00:10:11,760
think it's an excellent incredible

219
00:10:17,430 --> 00:10:14,880
opportunity honestly once in a lifetime

220
00:10:19,110 --> 00:10:17,440
it's such an inspiring way to just get

221
00:10:21,110 --> 00:10:19,120
ourselves involved in stem as well as

222
00:10:23,430 --> 00:10:21,120
all the people watching us along for our

223
00:10:25,110 --> 00:10:23,440
journey so it's truly an inspiration and

224
00:10:26,630 --> 00:10:25,120
i think an excellent way to get our

225
00:10:28,230 --> 00:10:26,640
generation involved instead moving

226
00:10:29,590 --> 00:10:28,240
forward that's great and then very

227
00:10:31,750 --> 00:10:29,600
quickly what is it that you hope to

228
00:10:33,990 --> 00:10:31,760
learn from this experiment yes from our

229
00:10:34,870 --> 00:10:34,000
both experiments we're hoping to learn

230
00:10:37,030 --> 00:10:34,880
um

231
00:10:39,350 --> 00:10:37,040
what kinds of antibiotics are best for

232
00:10:41,350 --> 00:10:39,360
us to use with astronauts so that we can

233
00:10:42,630 --> 00:10:41,360
most effectively treat their infections

234
00:10:45,030 --> 00:10:42,640
and kayla

235
00:10:47,590 --> 00:10:45,040
we're just looking at

236
00:10:49,509 --> 00:10:47,600
potentially reducing the contact risk of

237
00:10:51,430 --> 00:10:49,519
exposing yourself to bacteria so

238
00:10:52,550 --> 00:10:51,440

learning how these polymer coatings work

239
00:10:53,990 --> 00:10:52,560
in different environments and then

240
00:10:56,069 --> 00:10:54,000
applying that to reduce bacterial

241
00:10:57,430 --> 00:10:56,079
infections that's great good luck guys

242
00:10:59,190 --> 00:10:57,440
thank you so much for joining us and

243
00:11:01,190 --> 00:10:59,200
congratulations to have this opportunity

244
00:11:03,030 --> 00:11:01,200
even thank you thank you so much

245
00:11:05,829 --> 00:11:03,040
and now let's kick it back over to andy

246
00:11:09,990 --> 00:11:05,839
and the crs 24 is the final launch in a

247
00:11:14,389 --> 00:11:11,750
yeah as the year comes to an end today

248
00:11:17,430 --> 00:11:14,399
is going to be marking the 31st launch

249
00:11:19,190 --> 00:11:17,440
of 2021 for spacex and the fifth flight

250
00:11:21,269 --> 00:11:19,200
of dragon to the international space

251
00:11:24,069 --> 00:11:21,279
station this year following the launches

252
00:11:26,790 --> 00:11:24,079
of crew 2 crew 3 and cargo respite

253
00:11:28,470 --> 00:11:26,800
missions 22 and 23. it's the most

254
00:11:30,150 --> 00:11:28,480
launches along with the most visits to

255
00:11:31,269 --> 00:11:30,160
the station we've ever attempted in a

256
00:11:33,750 --> 00:11:31,279
given year

257
00:11:35,750 --> 00:11:33,760
to give a bit of history dragon has been

258
00:11:38,710 --> 00:11:35,760
flying for 11 years now and made its

259
00:11:40,870 --> 00:11:38,720
debut in 2012 as the first private

260
00:11:42,790 --> 00:11:40,880
spacecraft in history to visit the

261
00:11:44,870 --> 00:11:42,800
international space station since then

262
00:11:46,949 --> 00:11:44,880
it's made 28 trips to and from the

263
00:11:49,110 --> 00:11:46,959

orbiting lab today it's one of the few

264
00:11:51,670 --> 00:11:49,120
vehicles that can deliver significant

265
00:11:53,990 --> 00:11:51,680
cargo to the space station and the only

266
00:11:56,230 --> 00:11:54,000
vehicle that can deliver cargo from it

267
00:11:58,310 --> 00:11:56,240
falcon 9 and dragon were both designed

268
00:11:59,910 --> 00:11:58,320
with re-flight in mind and the vehicle

269
00:12:01,509 --> 00:11:59,920
hardware is built to support multiple

270
00:12:04,230 --> 00:12:01,519
missions with minimal refurbishment in

271
00:12:06,710 --> 00:12:04,240
between to date 10 of our crs missions

272
00:12:08,629 --> 00:12:06,720
have flown on reused dragons and while

273
00:12:11,670 --> 00:12:08,639
it's the second flight for dragon today

274
00:12:14,310 --> 00:12:11,680
having previously flown on crs 22 it is

275
00:12:16,069 --> 00:12:14,320
the first flight for our booster it is

276
00:12:18,150 --> 00:12:16,079
actually the only the second time this

277
00:12:19,430 --> 00:12:18,160
year we've debuted a brand new falcon 9

278
00:12:20,870 --> 00:12:19,440
first stage

279
00:12:23,829 --> 00:12:20,880
to date we've flown

280
00:12:26,150 --> 00:12:23,839
uh we've reflown first stages 78 times

281
00:12:28,150 --> 00:12:26,160
and that includes both the falcon 9 and

282
00:12:29,750 --> 00:12:28,160
falcon heavy flights and we're planning

283
00:12:32,550 --> 00:12:29,760
to recover this one on our drone ship

284
00:12:35,030 --> 00:12:32,560
just with the instructions if successful

285
00:12:38,150 --> 00:12:35,040
today it will mark the 100th successful

286
00:12:39,910 --> 00:12:38,160
recovery of an orbital class rocket so

287
00:12:41,829 --> 00:12:39,920
we are just under team

288
00:12:43,750 --> 00:12:41,839

t minus 10 minutes and counting until

289
00:12:45,509 --> 00:12:43,760
liftoff of the falcon 9 rocket and

290
00:12:47,269 --> 00:12:45,519
dragon on the next respite mission to

291
00:12:48,389 --> 00:12:47,279
the international space station back to

292
00:12:50,470 --> 00:12:48,399
you megan

293
00:12:52,790 --> 00:12:50,480
andy thank you so much now nasa partners

294
00:12:54,870 --> 00:12:52,800
with the iss national lab to give others

295
00:12:56,470 --> 00:12:54,880
access to the orbiting laboratory check

296
00:12:59,480 --> 00:12:56,480
out this video to see which companies

297
00:13:04,069 --> 00:12:59,490
are flying experiments on this mission

298
00:13:05,670 --> 00:13:04,079
[Music]

299
00:13:07,590 --> 00:13:05,680
the international space station is an

300
00:13:09,350 --> 00:13:07,600
incredible research facility that allows

301
00:13:11,110 --> 00:13:09,360
investigators to conduct research and

302
00:13:14,949 --> 00:13:11,120
technology development in ways not

303
00:13:18,389 --> 00:13:16,629
through the iss national laboratory

304
00:13:20,310 --> 00:13:18,399
private sector companies can leverage

305
00:13:22,550 --> 00:13:20,320
the unique space environment to develop

306
00:13:24,710 --> 00:13:22,560
or improve consumer products and further

307
00:13:27,120 --> 00:13:24,720
business models both on the ground and

308
00:13:29,030 --> 00:13:27,130
in low earth orbit

309
00:13:31,590 --> 00:13:29,040
[Music]

310
00:13:33,190 --> 00:13:31,600
here's a quick look

311
00:13:35,030 --> 00:13:33,200
over the years pharmaceutical leader

312
00:13:36,790 --> 00:13:35,040
merkin company has launched multiple

313
00:13:38,870 --> 00:13:36,800

protein crystallization investigations

314
00:13:40,870 --> 00:13:38,880
to the space station

315
00:13:42,790 --> 00:13:40,880
in a recent iss national lab sponsor

316
00:13:44,949 --> 00:13:42,800
investigation focused on merck's cancer

317
00:13:47,030 --> 00:13:44,959
immunotherapy drug katruda the team

318
00:13:48,870 --> 00:13:47,040
achieved exciting results leveraging

319
00:13:50,870 --> 00:13:48,880
microgravity conditions merck was able

320
00:13:52,790 --> 00:13:50,880
to produce highly uniform concentrated

321
00:13:55,670 --> 00:13:52,800
crystalline suspensions of the active

322
00:13:57,269 --> 00:13:55,680
ingredient in ktruta merck successfully

323
00:13:59,110 --> 00:13:57,279
translated these findings to drug

324
00:14:00,949 --> 00:13:59,120
production processes back on the ground

325
00:14:03,590 --> 00:14:00,959
allowing the company to improve the drug

326
00:14:05,110 --> 00:14:03,600
formulation and delivery of ktruta

327
00:14:06,949 --> 00:14:05,120
results could lead to additional

328
00:14:08,790 --> 00:14:06,959
improvements in the manufacture and

329
00:14:11,030 --> 00:14:08,800
storage of ktruta which could both

330
00:14:12,780 --> 00:14:11,040
reduce costs and improve quality of life

331
00:14:15,509 --> 00:14:12,790
for patients on earth

332
00:14:16,949 --> 00:14:15,519
[Music]

333
00:14:18,550 --> 00:14:16,959
procter gamble one of the leading

334
00:14:20,150 --> 00:14:18,560
consumer goods companies in the world

335
00:14:22,069 --> 00:14:20,160
will be sending elements associated with

336
00:14:26,790 --> 00:14:22,079
its tide cleaning detergent brand to the

337
00:14:29,829 --> 00:14:28,389
the procter and gamble team intends to

338
00:14:31,110 --> 00:14:29,839

test the stability of cleaning

339
00:14:33,110 --> 00:14:31,120
ingredients under microgravity

340
00:14:35,509 --> 00:14:33,120
conditions and radiation exposure in

341
00:14:36,949 --> 00:14:35,519
space in doing so the company hopes to

342
00:14:38,230 --> 00:14:36,959
gain insights that can improve the

343
00:14:40,310 --> 00:14:38,240
production of tide products for

344
00:14:41,990 --> 00:14:40,320
consumers on earth while also furthering

345
00:14:43,670 --> 00:14:42,000
knowledge on the development of laundry

346
00:14:46,069 --> 00:14:43,680
detergent solutions to support

347
00:14:48,150 --> 00:14:46,079
long-duration space flight missions

348
00:14:49,750 --> 00:14:48,160
to learn more about all iss national lab

349
00:14:54,389 --> 00:14:49,760
sponsor payloads on this mission go to

350
00:14:57,590 --> 00:14:55,829
and the tide experiments is pretty

351
00:14:59,990 --> 00:14:57,600
interesting because many of us probably

352
00:15:02,790 --> 00:15:00,000
have a bottle at home right now dr mark

353
00:15:05,269 --> 00:15:02,800
civic is the ceo of fabric and home care

354
00:15:07,030 --> 00:15:05,279
at proctor and gamble you guys make tide

355
00:15:08,629 --> 00:15:07,040
good morning it's so great to have you

356
00:15:10,629 --> 00:15:08,639
here thanks for having us

357
00:15:12,389 --> 00:15:10,639
so tell us you know how do astronauts

358
00:15:13,910 --> 00:15:12,399
clean their clothes right now

359
00:15:15,750 --> 00:15:13,920
unfortunately astronauts actually do not

360
00:15:17,269 --> 00:15:15,760
clean their clothes right now and this

361
00:15:18,949 --> 00:15:17,279
resupply mission will actually supply

362
00:15:20,230 --> 00:15:18,959
clothing for them and sometimes they

363
00:15:21,509 --> 00:15:20,240

have to wear their clothing up to four

364
00:15:23,910 --> 00:15:21,519
days in advance and you can imagine

365
00:15:26,310 --> 00:15:23,920
that's pretty gross so

366
00:15:28,150 --> 00:15:26,320
for long term deep space missions nasa

367
00:15:30,710 --> 00:15:28,160
has partnered with tide

368
00:15:33,590 --> 00:15:30,720
to develop the first detergent for space

369
00:15:35,509 --> 00:15:33,600
use for long flight missions

370
00:15:37,430 --> 00:15:35,519
uh because it becomes cost prohibitive

371
00:15:39,350 --> 00:15:37,440
to send up so much clothing for a long

372
00:15:40,629 --> 00:15:39,360
long term flight yeah so then how will

373
00:15:42,470 --> 00:15:40,639
the experiment work is that the

374
00:15:43,189 --> 00:15:42,480
detergent that they were this is exactly

375
00:15:46,550 --> 00:15:43,199
the

376
00:15:49,509 --> 00:15:46,560
fly this uh this morning

377
00:15:51,590 --> 00:15:49,519
and as the consumer expects performance

378
00:15:53,430 --> 00:15:51,600
and cleaning from tide the astronauts

379
00:15:55,189 --> 00:15:53,440
will as well unfortunately astronauts

380
00:15:57,350 --> 00:15:55,199
can't go around the store to get a new

381
00:15:58,949 --> 00:15:57,360
bottle of tide when it runs out so our

382
00:16:01,509 --> 00:15:58,959
objective here is in this experiment to

383
00:16:03,749 --> 00:16:01,519
understand stability of tide and

384
00:16:05,910 --> 00:16:03,759
tide infinity specifically for this

385
00:16:07,110 --> 00:16:05,920
experiment and then we

386
00:16:08,389 --> 00:16:07,120
want to learn

387
00:16:09,990 --> 00:16:08,399
about the ingredients and their

388
00:16:12,389 --> 00:16:10,000

stability through microgravity and

389
00:16:14,069 --> 00:16:12,399
radiation for long-term flight duration

390
00:16:15,430 --> 00:16:14,079
and i would guess that if laundry's

391
00:16:17,430 --> 00:16:15,440
being done on the space station it would

392
00:16:19,430 --> 00:16:17,440
use less water right because that's a

393
00:16:20,949 --> 00:16:19,440
difficult resource up there would that

394
00:16:22,790 --> 00:16:20,959
mean that what we learned from this

395
00:16:24,710 --> 00:16:22,800
experiment could mean less water usage

396
00:16:26,949 --> 00:16:24,720
for us here on earth that's what we plan

397
00:16:28,949 --> 00:16:26,959
to learn um we're using international

398
00:16:29,829 --> 00:16:28,959
space station as a surrogate for off

399
00:16:33,189 --> 00:16:29,839
flight

400
00:16:35,829 --> 00:16:33,199
off planet uh missions and from there we

401
00:16:37,990 --> 00:16:35,839
want to learn about constrained

402
00:16:40,629 --> 00:16:38,000
constraint environments for developing

403
00:16:42,550 --> 00:16:40,639
the next best tide for the consumer

404
00:16:43,829 --> 00:16:42,560
around the globe not just in space but

405
00:16:45,430 --> 00:16:43,839
for

406
00:16:46,870 --> 00:16:45,440
situations in the world where resources

407
00:16:48,870 --> 00:16:46,880
are constrained water usage is

408
00:16:51,990 --> 00:16:48,880
constrained and so is energy

409
00:16:54,629 --> 00:16:52,000
if we can get the consumer to to use uh

410
00:16:56,310 --> 00:16:54,639
tide infinity in the future for for

411
00:16:59,030 --> 00:16:56,320
future cleaning at lower watch

412
00:17:00,310 --> 00:16:59,040
temperatures uh that'll help society in

413
00:17:01,670 --> 00:17:00,320

general mark thank you so much i can't

414
00:17:03,030 --> 00:17:01,680
wait to see what you guys uncover thank

415
00:17:04,870 --> 00:17:03,040
you thank you

416
00:17:06,710 --> 00:17:04,880
but it's not just science that's flying

417
00:17:08,949 --> 00:17:06,720
to the space station we of course send

418
00:17:10,470 --> 00:17:08,959
supplies like food to the crew and

419
00:17:12,230 --> 00:17:10,480
they'll be getting some holiday treats

420
00:17:15,029 --> 00:17:12,240
on this flight things like roasted

421
00:17:17,110 --> 00:17:15,039
turkey spicy green beans smoked seafood

422
00:17:19,029 --> 00:17:17,120
and shellfish and fruit kick to help

423
00:17:21,029 --> 00:17:19,039
them celebrate the holidays they'll also

424
00:17:22,549 --> 00:17:21,039
be getting some presents

425
00:17:23,909 --> 00:17:22,559
all right we are now t-minus five

426
00:17:25,829 --> 00:17:23,919
minutes and counting let's bring back

427
00:17:30,789 --> 00:17:25,839
andy and joshua to walk us through the

428
00:17:35,590 --> 00:17:32,789
thanks megan uh the spacex team is

429
00:17:37,110 --> 00:17:35,600
working no significant issues right now

430
00:17:38,789 --> 00:17:37,120
we're continuing to monitor weather

431
00:17:41,430 --> 00:17:38,799
although it is uh trending more and more

432
00:17:43,830 --> 00:17:41,440
towards green as we march towards t0 the

433
00:17:46,070 --> 00:17:43,840
range is also standing by to support at

434
00:17:48,390 --> 00:17:46,080
this point rp1 fuel is completely loaded

435
00:17:50,870 --> 00:17:48,400
on both stages liquid oxygen loading is

436
00:17:52,789 --> 00:17:50,880
currently underway and should complete

437
00:17:54,870 --> 00:17:52,799
around the t minus two minute mark we're

438
00:17:57,510 --> 00:17:54,880

also loading loading helium gas into

439
00:18:00,150 --> 00:17:57,520
both stages falcon 9 uses helium as a

440
00:18:02,630 --> 00:18:00,160
pressure to barely fill the vapor

441
00:18:05,029 --> 00:18:02,640
as locks and rp1 are consumed by the

442
00:18:06,710 --> 00:18:05,039
merlin engines during ascent uh helium

443
00:18:08,549 --> 00:18:06,720
load began before the broadcast went

444
00:18:10,549 --> 00:18:08,559
live and we'll continue to top that off

445
00:18:12,310 --> 00:18:10,559
as well until about a minute and a half

446
00:18:13,830 --> 00:18:12,320
before launch

447
00:18:15,350 --> 00:18:13,840
and you mentioned that liquid oxygen

448
00:18:17,750 --> 00:18:15,360
being loaded it's super chilled liquid

449
00:18:20,310 --> 00:18:17,760
oxygen and uh to make sure the engine

450
00:18:22,470 --> 00:18:20,320
startup goes well they perform uh engine

451
00:18:24,870 --> 00:18:22,480
chill this began at t minus seven

452
00:18:26,310 --> 00:18:24,880
minutes and a small amount of that locks

453
00:18:28,950 --> 00:18:26,320
is flowed through the merchant the

454
00:18:31,270 --> 00:18:28,960
merlin engines turbo pumps to avoid

455
00:18:32,630 --> 00:18:31,280
thermal shock to that system uh to allow

456
00:18:34,789 --> 00:18:32,640
the full flow of superchilled liquid

457
00:18:36,870 --> 00:18:34,799
oxygen when the strike when the clock

458
00:18:38,710 --> 00:18:36,880
strikes zero dragon also began at

459
00:18:40,630 --> 00:18:38,720
startup sequence at t minus 35 minutes

460
00:18:42,470 --> 00:18:40,640
when it coordinated timing with falcon 9

461
00:18:44,630 --> 00:18:42,480
it's currently undergoing vehicle health

462
00:18:46,150 --> 00:18:44,640
checks with the next big step happening

463
00:18:47,669 --> 00:18:46,160

just a moment ago

464
00:18:51,029 --> 00:18:47,679
when dragon transitioned to internal

465
00:18:54,710 --> 00:18:52,870
what we're seeing on screen right now

466
00:18:56,789 --> 00:18:54,720
the clamp arms just underneath the

467
00:18:58,549 --> 00:18:56,799
dragon have

468
00:19:01,669 --> 00:18:58,559
begin to open up and they should be

469
00:19:04,630 --> 00:19:01,679
completing fully open right now and the

470
00:19:06,870 --> 00:19:04,640
strong back which is the truss structure

471
00:19:09,270 --> 00:19:06,880
right next to falcon 9 is beginning to

472
00:19:11,830 --> 00:19:09,280
recline away to its pre-launch position

473
00:19:13,510 --> 00:19:11,840
about two degrees away from the vehicle

474
00:19:14,470 --> 00:19:13,520
it will continue to recline all the way

475
00:19:15,990 --> 00:19:14,480
back

476
00:19:17,590 --> 00:19:16,000
as we

477
00:19:19,350 --> 00:19:17,600
reach t0

478
00:19:23,510 --> 00:19:19,360
to provide clearance for the vehicle to

479
00:19:26,710 --> 00:19:24,789
in these

480
00:19:28,230 --> 00:19:26,720
last few minutes falcon 9 is performing

481
00:19:30,789 --> 00:19:28,240
final health checks on his primary

482
00:19:33,029 --> 00:19:30,799
communications avionics and propulsion

483
00:19:34,630 --> 00:19:33,039
systems in preparation for flight we

484
00:19:36,789 --> 00:19:34,640
also may hear callouts that the engines

485
00:19:39,270 --> 00:19:36,799
are sufficiently chilled as we get

486
00:19:41,029 --> 00:19:39,280
closer to liftoff

487
00:19:42,789 --> 00:19:41,039
the checkouts of the second stage thrust

488
00:19:44,950 --> 00:19:42,799

vector control actuators should begin

489
00:19:46,950 --> 00:19:44,960
right about t minus two minutes thirty

490
00:19:48,390 --> 00:19:46,960
seconds uh that's referred to as the

491
00:19:50,310 --> 00:19:48,400
engine wiggle test a fairly

492
00:19:52,310 --> 00:19:50,320
self-explanatory name uh this is where

493
00:19:54,310 --> 00:19:52,320
spacex will move the thruster nozzle not

494
00:19:55,510 --> 00:19:54,320
the thrust nozzles slightly to make sure

495
00:19:57,029 --> 00:19:55,520
the guard the guidance hardware is

496
00:19:58,470 --> 00:19:57,039
locked

497
00:20:00,549 --> 00:19:58,480
the gopher flight

498
00:20:02,470 --> 00:20:00,559
spacex will do the exact same checkouts

499
00:20:04,549 --> 00:20:02,480
on the first stage engines just seconds

500
00:20:07,270 --> 00:20:04,559
before ignition this is all still on

501
00:20:08,750 --> 00:20:07,280
track weather being go now for a liftoff

502
00:20:11,669 --> 00:20:08,760
scheduled for

503
00:20:13,750 --> 00:20:11,679
507.08 eastern time this morning as we

504
00:20:15,110 --> 00:20:13,760
track towards the space station with

505
00:20:17,190 --> 00:20:15,120
rendezvous and docking scheduled for

506
00:20:19,430 --> 00:20:17,200
tomorrow morning space station now

507
00:20:21,029 --> 00:20:19,440
tracking over central europe

508
00:20:28,789 --> 00:20:21,039
and we'll be there with this mission for

509
00:20:33,029 --> 00:20:30,950
so at this point we are wrapping up

510
00:20:35,350 --> 00:20:33,039
liquid oxygen loading once that is done

511
00:20:37,350 --> 00:20:35,360
that is all of the properties

512
00:20:38,789 --> 00:20:37,360
of the vehicles

513
00:20:40,789 --> 00:20:38,799

and that is the collar right there so

514
00:20:43,190 --> 00:20:40,799
all all propellants are loaded onto the

515
00:20:46,310 --> 00:20:44,870
we're starting to have

516
00:20:49,110 --> 00:20:46,320
some white clouds building around the

517
00:20:50,870 --> 00:20:49,120
vehicle that is condensed liquid auction

518
00:20:52,549 --> 00:20:50,880
as that super chilled liquid auction

519
00:20:54,230 --> 00:20:52,559
reaches the warmer ambient air

520
00:20:56,710 --> 00:20:54,240
temperatures of florida it will start to

521
00:20:58,549 --> 00:20:56,720
form those clouds uh normal and expected

522
00:21:01,110 --> 00:20:58,559
for us at this stage in the countdown

523
00:21:04,070 --> 00:21:01,120
yeah both continue to go smoothly as we

524
00:21:06,149 --> 00:21:04,080
march towards t0

525
00:21:08,710 --> 00:21:06,159
at t minus one minutes we'll get the

526
00:21:09,990 --> 00:21:08,720
dragon transition to internal power call

527
00:21:11,990 --> 00:21:10,000
the falcon 9 computers will enter

528
00:21:13,110 --> 00:21:12,000
startup mode and begin final pre-launch

529
00:21:14,230 --> 00:21:13,120
checks

530
00:21:26,230 --> 00:21:14,240
guiding the rocket through the last

531
00:21:31,990 --> 00:21:28,870
falcon 9's in startup

532
00:21:34,470 --> 00:21:33,029
so there are a couple great call outs

533
00:21:36,789 --> 00:21:34,480
both stages are now pressurizing for

534
00:21:39,350 --> 00:21:36,799
launch uh range remains go the weather

535
00:21:43,190 --> 00:21:39,360
did clear earlier and has remained green

536
00:21:44,870 --> 00:21:43,200
um so all things also falcon 9 crs-24

537
00:21:46,470 --> 00:21:44,880
go for lunch

538
00:21:48,149 --> 00:21:46,480

that's the launch director calling go

539
00:21:49,909 --> 00:21:48,159
for launch we'll get in all systems go

540
00:21:54,310 --> 00:21:49,919
here in just a few seconds and then

541
00:21:54,320 --> 00:22:09,590
anyways 30 seconds

542
00:22:09,600 --> 00:22:14,870
t-minus 15 seconds

543
00:22:16,870 --> 00:22:15,830
10

544
00:22:17,830 --> 00:22:16,880
9

545
00:22:18,870 --> 00:22:17,840
8

546
00:22:20,070 --> 00:22:18,880
7

547
00:22:21,029 --> 00:22:20,080
6

548
00:22:21,990 --> 00:22:21,039
5

549
00:22:23,029 --> 00:22:22,000
4

550
00:22:23,909 --> 00:22:23,039
3

551
00:22:24,710 --> 00:22:23,919
2

552
00:22:27,710 --> 00:22:24,720
1

553
00:22:29,190 --> 00:22:27,720
0 ignition

554
00:22:31,510 --> 00:22:29,200
[Music]

555
00:22:33,990 --> 00:22:31,520
cargo dragon soars with the final supply

556
00:22:43,350 --> 00:22:34,000
run in 2021 to the astronauts aboard the

557
00:22:43,360 --> 00:23:07,350
stage one chamber pressure is nominal

558
00:23:12,630 --> 00:23:10,789
t plus 40 seconds into flight uh falcon

559
00:23:14,149 --> 00:23:12,640
9 and dragon happy birthday now you can

560
00:23:15,350 --> 00:23:14,159
see him passing through the cloud layers

561
00:23:17,750 --> 00:23:15,360
right now

562
00:23:19,750 --> 00:23:17,760
next up in just a few seconds here is

563
00:23:21,750 --> 00:23:19,760

max q this is where the vehicle will

564
00:23:24,770 --> 00:23:21,760
experience the highest amount of

565
00:23:46,310 --> 00:23:24,780
aerodynamic pressures

566
00:23:50,789 --> 00:23:48,710
through that period of high pressure on

567
00:23:53,190 --> 00:23:50,799
the vehicle the engines on the first

568
00:23:55,590 --> 00:23:53,200
stage are now throttling back up

569
00:23:56,710 --> 00:23:55,600
as we continue to make our journey to

570
00:23:58,470 --> 00:23:56,720
orbit

571
00:24:01,110 --> 00:23:58,480
coming up in about a minute are three

572
00:24:03,669 --> 00:24:01,120
events in rapid succession uh first up

573
00:24:06,310 --> 00:24:03,679
is main engine cutoff also known as

574
00:24:08,549 --> 00:24:06,320
engine children stage separation

575
00:24:10,390 --> 00:24:08,559
and then second engine start also known

576
00:24:12,549 --> 00:24:10,400
as ses1

577
00:24:14,950 --> 00:24:12,559
main engine cutoff is where all nine

578
00:24:16,789 --> 00:24:14,960
engines on the first stage will shut off

579
00:24:19,350 --> 00:24:16,799
in preparation for the second defense

580
00:24:21,110 --> 00:24:19,360
stage separation during stage separation

581
00:24:22,390 --> 00:24:21,120
the first and second stages will

582
00:24:24,710 --> 00:24:22,400
separate from one another the first

583
00:24:26,549 --> 00:24:24,720
stage makes its way back to the drone

584
00:24:28,789 --> 00:24:26,559
ship for a landing attempt and the

585
00:24:31,430 --> 00:24:28,799
second stage will ignite its merlin

586
00:24:39,750 --> 00:24:31,440
vacuum engine and continue to boost

587
00:24:43,669 --> 00:24:41,350
again those are going to be happening in

588
00:25:00,390 --> 00:24:43,679

rapid succession in about 15 seconds

589
00:25:11,029 --> 00:25:02,070
nico

590
00:25:11,039 --> 00:25:16,870
in recognition

591
00:25:21,350 --> 00:25:18,390
you heard the callouts we see it on

592
00:25:23,430 --> 00:25:21,360
screen successful main engine cutoff

593
00:25:26,310 --> 00:25:23,440
followed by successful stage separation

594
00:25:30,630 --> 00:25:26,320
and then ignition of our merlin vacuum

595
00:25:33,990 --> 00:25:32,070
on the left hand side of the screen the

596
00:25:35,990 --> 00:25:34,000
first stage again it's making its way

597
00:25:38,230 --> 00:25:36,000
back to earth but it's still being

598
00:25:40,390 --> 00:25:38,240
illuminated by the second stage merlin

599
00:25:41,750 --> 00:25:40,400
vacuum engine there

600
00:25:44,710 --> 00:25:41,760
so if you are just joining us you're

601
00:25:46,870 --> 00:25:44,720
watching a live webcast for the 24th

602
00:25:48,390 --> 00:25:46,880
commercial resupply mission to the

603
00:25:51,669 --> 00:25:48,400
international space station for nasa

604
00:25:53,430 --> 00:25:51,679
this is spacex's 31st mission for 2021

605
00:25:55,990 --> 00:25:53,440
and the fifth dragon flight to the

606
00:25:57,750 --> 00:25:56,000
international space station this year a

607
00:25:59,269 --> 00:25:57,760
couple of views on the screen the right

608
00:26:03,029 --> 00:25:59,279
hand side of the screen

609
00:26:04,950 --> 00:26:03,039
is a view of the merlin vacuum engine

610
00:26:07,190 --> 00:26:04,960
on the second stage

611
00:26:09,190 --> 00:26:07,200
the dragon capsule

612
00:26:11,510 --> 00:26:09,200
carrying all of the wonderful

613
00:26:14,070 --> 00:26:11,520

holiday treats and science is on the

614
00:26:16,470 --> 00:26:14,080
opposite end of that engine again that

615
00:26:18,950 --> 00:26:16,480
is continuing to run smoothly as it

616
00:26:21,190 --> 00:26:18,960
makes its way to orbit on the left-hand

617
00:26:23,830 --> 00:26:21,200
side of the screen is the first stage

618
00:26:25,430 --> 00:26:23,840
you'll notice some

619
00:26:29,350 --> 00:26:25,440
structures there's two of them on screen

620
00:26:31,029 --> 00:26:29,360
right now those are our

621
00:26:32,789 --> 00:26:31,039
hypersonic grid fins they're positioned

622
00:26:34,630 --> 00:26:32,799
at the top of the first stage booster

623
00:26:37,269 --> 00:26:34,640
there are four of them actually

624
00:26:39,350 --> 00:26:37,279
and those will start to

625
00:26:41,830 --> 00:26:39,360
swivel and move around to make sure that

626
00:26:45,029 --> 00:26:41,840
they are guiding the first stage back

627
00:26:46,630 --> 00:26:45,039
to its targeted landing zone uh for for

628
00:26:48,470 --> 00:26:46,640
today's mission it's going to be the

629
00:26:49,510 --> 00:26:48,480
drone ship just read the instruction

630
00:27:02,870 --> 00:26:49,520
which is

631
00:27:06,870 --> 00:27:04,870
next event for our mission today is

632
00:27:09,190 --> 00:27:06,880
going to be the first stage entry burn

633
00:27:10,630 --> 00:27:09,200
it's going to be the first of two burns

634
00:27:13,110 --> 00:27:10,640
in order to make its way back to our

635
00:27:14,870 --> 00:27:13,120
drone trip um the first stage has to

636
00:27:17,110 --> 00:27:14,880
execute these two burns the first again

637
00:27:19,669 --> 00:27:17,120
is the entry burn where three of our

638
00:27:21,990 --> 00:27:19,679

merlin engines will reignite this helps

639
00:27:24,789 --> 00:27:22,000
to slow the stage down as it re-enters

640
00:27:26,870 --> 00:27:24,799
the upper part of the earth's atmosphere

641
00:27:28,950 --> 00:27:26,880
the second burn is the landing burn this

642
00:27:31,110 --> 00:27:28,960
happens about a minute later

643
00:27:33,110 --> 00:27:31,120
this is a single engine burn that will

644
00:27:35,350 --> 00:27:33,120
bring the vehicle speed down rapidly in

645
00:27:37,510 --> 00:27:35,360
order to land on the drone ship so again

646
00:27:40,470 --> 00:27:37,520
the first stage has two burns before it

647
00:27:53,830 --> 00:27:40,480
can make its first landing attempt

648
00:27:57,029 --> 00:27:55,830
as we wait for that event you might be

649
00:27:58,870 --> 00:27:57,039
interested to know that in order to get

650
00:28:00,549 --> 00:27:58,880
into space the rocket actually has to do

651
00:28:03,269 --> 00:28:00,559
more than go up it actually has to go

652
00:28:05,269 --> 00:28:03,279
sideways really really fast

653
00:28:07,750 --> 00:28:05,279
at liftoff gravity is pulling straight

654
00:28:09,750 --> 00:28:07,760
down on the rocket and as we ascend we

655
00:28:11,750 --> 00:28:09,760
tilt the engines a a term called

656
00:28:14,149 --> 00:28:11,760
gimbling and that turns the rocket

657
00:28:16,310 --> 00:28:14,159
horizontally so we're still going up but

658
00:28:17,669 --> 00:28:16,320
we're also heading horizontally away

659
00:28:30,630 --> 00:28:17,679
from the launch pad

660
00:28:35,750 --> 00:28:33,430
stage one fps is safe

661
00:28:37,750 --> 00:28:35,760
things continue to go smoothly

662
00:28:40,230 --> 00:28:37,760
for both the first and second stages

663
00:28:43,430 --> 00:28:40,240

again the first stage entry burn follow

664
00:28:43,440 --> 00:28:56,789
should start in about 10 seconds

665
00:28:56,799 --> 00:29:03,510
stage one entrepreneurs and startup

666
00:29:09,750 --> 00:29:05,909
and there it is three merlin

667
00:29:11,510 --> 00:29:09,760
merlin engines have reignited their uh

668
00:29:13,510 --> 00:29:11,520
engines and are now currently slowing

669
00:29:19,269 --> 00:29:13,520
down the first stage this burn is

670
00:29:21,909 --> 00:29:20,710
you can see the velocity on the bottom

671
00:29:26,389 --> 00:29:21,919
left-hand side of the screen we're

672
00:29:26,399 --> 00:29:31,990
stage one as your brand shut down

673
00:29:35,830 --> 00:29:34,710
so great news that is burn one of two

674
00:29:37,510 --> 00:29:35,840
complete

675
00:29:39,830 --> 00:29:37,520
uh the falcon 9 first stage is also

676
00:29:41,830 --> 00:29:39,840
equipped with four landing legs made of

677
00:29:43,590 --> 00:29:41,840
state of the art carbon fiber with

678
00:29:45,190 --> 00:29:43,600
aluminum honeycomb

679
00:29:47,190 --> 00:29:45,200
they're placed around the base of the

680
00:29:51,669 --> 00:29:47,200
rocket and deployed just prior to

681
00:29:54,950 --> 00:29:53,510
so we are about 60 seconds away from

682
00:29:57,029 --> 00:29:54,960
landing the vehicle

683
00:29:59,669 --> 00:29:57,039
and we're traveling

684
00:30:01,190 --> 00:29:59,679
um a significant velocity right now this

685
00:30:03,029 --> 00:30:01,200
really puts into perspective the

686
00:30:04,710 --> 00:30:03,039
deceleration that the first stage will

687
00:30:06,710 --> 00:30:04,720
experience

688
00:30:08,710 --> 00:30:06,720

in less than the span of a minute will

689
00:30:15,430 --> 00:30:08,720
reduce from twice the speed of a jet all

690
00:30:15,440 --> 00:30:19,269
h1 is transonic

691
00:30:23,750 --> 00:30:21,110
the first stage lander burn is expected

692
00:30:26,549 --> 00:30:23,760
to start here in about 20 seconds

693
00:30:28,310 --> 00:30:26,559
and last for about 25 seconds so during

694
00:30:30,710 --> 00:30:28,320
the duration of that burn we are going

695
00:30:33,350 --> 00:30:30,720
to be listening for the callout for seco

696
00:30:35,590 --> 00:30:33,360
which stands for second engine cutoff

697
00:30:37,029 --> 00:30:35,600
the merlin vacuum engine that you see on

698
00:30:38,070 --> 00:30:37,039
screen we're going to be shutting off

699
00:30:40,470 --> 00:30:38,080
that engine

700
00:30:42,470 --> 00:30:40,480
and then listening for another call out

701
00:30:44,630 --> 00:30:42,480
for a confirmation of good orbit where

702
00:30:52,549 --> 00:30:44,640
one setting stage will coast for a few

703
00:30:57,430 --> 00:30:54,789
stage two sts is they don't have views

704
00:31:00,389 --> 00:30:57,440
of the first stage right now we looks

705
00:31:11,990 --> 00:31:00,399
like we got it back and the landing burn

706
00:31:18,310 --> 00:31:13,430
in back shutdown

707
00:31:22,549 --> 00:31:21,110
so hopefully we get some visuals

708
00:31:25,110 --> 00:31:22,559
uh there it is

709
00:31:27,830 --> 00:31:25,120
so this is the first landing for this

710
00:31:29,909 --> 00:31:27,840
particular booster but the 100th

711
00:31:30,870 --> 00:31:29,919
successful landing for an orbital class

712
00:31:32,870 --> 00:31:30,880
rocket

713
00:31:35,190 --> 00:31:32,880

what a way to end off the year

714
00:31:36,630 --> 00:31:35,200
we also heard that the

715
00:31:38,789 --> 00:31:36,640
second engine

716
00:31:40,950 --> 00:31:38,799
sorry the second stage engine the merlin

717
00:31:41,909 --> 00:31:40,960
vacuum engine successfully shut off its

718
00:31:43,750 --> 00:31:41,919
engine

719
00:31:46,470 --> 00:31:43,760
and we're going to pause here to see if

720
00:31:50,549 --> 00:31:46,480
we can confirm a good orbit of the

721
00:32:02,310 --> 00:31:52,950
expect to plus the signal cape

722
00:32:06,870 --> 00:32:04,149
so again this is a view

723
00:32:08,470 --> 00:32:06,880
of the merlin vacuum engine

724
00:32:12,710 --> 00:32:08,480
the dragon capsule with all of its

725
00:32:12,720 --> 00:32:17,509
engine

726
00:32:21,590 --> 00:32:19,430
and i am getting confirmation that we do

727
00:32:23,830 --> 00:32:21,600
indeed have a good orbit so the second

728
00:32:26,710 --> 00:32:23,840
stage is going to be coasting for a few

729
00:32:28,950 --> 00:32:26,720
minutes here this is a view

730
00:32:30,389 --> 00:32:28,960
of the unpressurized cargo section of

731
00:32:32,389 --> 00:32:30,399
the dragon

732
00:32:34,549 --> 00:32:32,399
um the second stage right now is making

733
00:32:36,389 --> 00:32:34,559
some small adjustments uh during the

734
00:32:38,149 --> 00:32:36,399
coast phase prior to separation we

735
00:32:40,230 --> 00:32:38,159
should also have video of dragon

736
00:32:42,710 --> 00:32:40,240
separating from the top of the second

737
00:32:44,389 --> 00:32:42,720
stage itself should give us a nice view

738
00:32:46,070 --> 00:32:44,399

of that

739
00:32:47,830 --> 00:32:46,080
the view we just saw the unpressurized

740
00:32:49,909 --> 00:32:47,840
cargo section as dragon

741
00:32:51,190 --> 00:32:49,919
will slowly depart away from the second

742
00:32:53,590 --> 00:32:51,200
stage

743
00:32:55,430 --> 00:32:53,600
dragon is going to be joining the crew 3

744
00:32:56,870 --> 00:32:55,440
vehicle endurance that is currently

745
00:33:00,149 --> 00:32:56,880
attached to the international space

746
00:33:01,590 --> 00:33:00,159
station and on orbit and as always it's

747
00:33:03,269 --> 00:33:01,600
always exciting to see two dragons

748
00:33:11,590 --> 00:33:03,279
stocked at the space station at the same

749
00:33:14,950 --> 00:33:13,669
speaking of cargo today we'll be

750
00:33:16,230 --> 00:33:14,960
delivering

751
00:33:17,470 --> 00:33:16,240
as part of today's mission we'll be

752
00:33:20,149 --> 00:33:17,480
delivering more than

753
00:33:22,149 --> 00:33:20,159
6500 pounds of science

754
00:33:23,990 --> 00:33:22,159
research crew supplies and vehicle

755
00:33:26,310 --> 00:33:24,000
hardware to the orbiting lab and its

756
00:33:27,830 --> 00:33:26,320
crew this includes all the science and

757
00:33:29,909 --> 00:33:27,840
supplies and holiday trees that we

758
00:33:31,590 --> 00:33:29,919
talked about earlier in the broadcast

759
00:33:35,909 --> 00:33:31,600
and i'm sure the crew is looking forward

760
00:33:41,029 --> 00:33:38,870
so we're just under a minute

761
00:33:42,549 --> 00:33:41,039
for dragon to separate from the top of

762
00:33:44,789 --> 00:33:42,559
the second stage

763
00:33:47,269 --> 00:33:44,799

again this is a cargo mission so there

764
00:33:49,190 --> 00:33:47,279
are no there is no crew aboard the

765
00:33:50,230 --> 00:33:49,200
dragon as part of today's mission in

766
00:33:53,110 --> 00:33:50,240
fact we

767
00:33:55,190 --> 00:33:53,120
will modify the vehicles um

768
00:33:56,789 --> 00:33:55,200
slightly for these types of missions so

769
00:33:59,430 --> 00:33:56,799
there are no seats there are no life

770
00:34:01,909 --> 00:33:59,440
support systems this saves a weight it

771
00:34:03,830 --> 00:34:01,919
also frees up some space for more cargo

772
00:34:06,549 --> 00:34:03,840
and it also allows us to repurpose the

773
00:34:08,230 --> 00:34:06,559
dragon a little bit quicker once it

774
00:34:20,389 --> 00:34:08,240
splashes back down

775
00:34:20,399 --> 00:34:24,470
expected loss of signal bermuda

776
00:34:29,829 --> 00:34:26,950
stage separation

777
00:34:34,310 --> 00:34:32,550
and there it goes

778
00:34:36,190 --> 00:34:34,320
again this camera view is on the second

779
00:34:37,750 --> 00:34:36,200
stage looking at the dragon's

780
00:34:39,270 --> 00:34:37,760
unpressurized

781
00:34:42,310 --> 00:34:39,280
cargo section

782
00:34:44,550 --> 00:34:42,320
the dragon has about

783
00:34:46,869 --> 00:34:44,560
a day before it makes its way and to the

784
00:34:51,750 --> 00:34:46,879
international space station and docks

785
00:34:55,510 --> 00:34:54,149
but that is going to do it for me here

786
00:34:58,150 --> 00:34:55,520
in hawthorne i'm going to i'm going to

787
00:35:03,829 --> 00:34:58,160
hand it over to shaniqua in houston for

788
00:35:07,430 --> 00:35:05,750

thanks andy and everything is still

789
00:35:10,710 --> 00:35:07,440
going well back here in mission control

790
00:35:13,349 --> 00:35:10,720
houston and right after dragon separated

791
00:35:15,109 --> 00:35:13,359
it began a series of automatic checkouts

792
00:35:17,190 --> 00:35:15,119
including small firings of the draco

793
00:35:19,190 --> 00:35:17,200
maneuvers thrusters

794
00:35:21,990 --> 00:35:19,200
the next milestone is no

795
00:35:23,670 --> 00:35:22,000
deploy the nosecone protects the docking

796
00:35:25,990 --> 00:35:23,680
hardware and rendezvous tracking

797
00:35:28,790 --> 00:35:26,000
elements of the top of dragon during

798
00:35:30,870 --> 00:35:28,800
ascent the nosecone deploy uncovers the

799
00:35:33,190 --> 00:35:30,880
four ford bulkhead thrusters which

800
00:35:34,950 --> 00:35:33,200
dragon will use for its major burn

801
00:35:37,430 --> 00:35:34,960
maneuvers to catch up with the space

802
00:35:39,349 --> 00:35:37,440
station once open the nose cone will

803
00:35:42,150 --> 00:35:39,359
stay in that position until the very end

804
00:35:44,390 --> 00:35:42,160
of its mission closing prior to re-entry

805
00:35:48,790 --> 00:35:44,400
to provide some additional protection to

806
00:35:52,790 --> 00:35:50,630
so right now we're waiting to hear

807
00:35:56,829 --> 00:35:52,800
confirmation that the nodes clone is

808
00:36:02,950 --> 00:35:59,829
deployed and after confirmation we'll

809
00:36:07,510 --> 00:36:02,960
have one of the program managers here

810
00:36:07,520 --> 00:36:32,390
join me virtually sorry

811
00:36:35,750 --> 00:36:34,310
you're currently seeing live views of

812
00:36:38,069 --> 00:36:35,760
the international space station flight

813
00:36:41,349 --> 00:36:38,079

control room you currently see flight

814
00:36:43,349 --> 00:36:41,359
director adi boulos standing as we wait

815
00:37:29,030 --> 00:36:43,359
for that final confirmation of nosecone

816
00:37:32,630 --> 00:37:31,190
now joining me on the phone is manager

817
00:37:35,270 --> 00:37:32,640
of the international space station

818
00:37:38,230 --> 00:37:35,280
transportation integration office phil

819
00:37:39,990 --> 00:37:38,240
dempsey hi phil can you outline some of

820
00:37:43,190 --> 00:37:40,000
the major activities for the crew with

821
00:37:47,829 --> 00:37:45,589
sure thanks shaniqua um first of all let

822
00:37:49,270 --> 00:37:47,839
me just say you know it's a great to

823
00:37:51,270 --> 00:37:49,280
watch this outstanding launch you know

824
00:37:53,349 --> 00:37:51,280
kind of watching through the weather and

825
00:37:55,750 --> 00:37:53,359
managed to get a shot through and uh

826
00:37:57,589 --> 00:37:55,760
great to see dragon catch up tomorrow

827
00:37:59,910 --> 00:37:57,599
you know this mission enables well over

828
00:38:01,349 --> 00:37:59,920
500 hours of research

829
00:38:03,349 --> 00:38:01,359
some of which actually has to be

830
00:38:05,829 --> 00:38:03,359
completed before the vehicle undocks

831
00:38:08,150 --> 00:38:05,839
again in about 30 days so the samples

832
00:38:10,230 --> 00:38:08,160
can be returned to investigators

833
00:38:11,829 --> 00:38:10,240
as always research is a key activity

834
00:38:13,829 --> 00:38:11,839
during this mission

835
00:38:17,349 --> 00:38:13,839
we've also got the transfer of two

836
00:38:20,790 --> 00:38:17,359
external payloads scp-87 and h8 from the

837
00:38:22,390 --> 00:38:20,800
dragon trunk to the locations on ifs

838
00:38:24,310 --> 00:38:22,400

and then there's work to prepare for

839
00:38:26,069 --> 00:38:24,320
spacewalks planned later in the

840
00:38:27,829 --> 00:38:26,079
increment the coming months

841
00:38:30,550 --> 00:38:27,839
there's several maintenance activities

842
00:38:32,630 --> 00:38:30,560
with hardware showing up on this mission

843
00:38:34,950 --> 00:38:32,640
and we have a software transition plan

844
00:38:37,270 --> 00:38:34,960
so you know overall a lot really going

845
00:38:39,430 --> 00:38:37,280
on during the 30 days or so that this

846
00:38:43,910 --> 00:38:39,440
this rs24 is on

847
00:38:47,910 --> 00:38:45,990
that's awesome thank you phil and of

848
00:38:49,750 --> 00:38:47,920
course these resupply missions and you

849
00:38:51,589 --> 00:38:49,760
you know deliver science as you

850
00:38:54,310 --> 00:38:51,599
mentioned hardware and other cargo to

851
00:38:56,470 --> 00:38:54,320
the station but with these critical

852
00:38:58,230 --> 00:38:56,480
deliveries to the station

853
00:39:00,790 --> 00:38:58,240
how important are they for the

854
00:39:03,349 --> 00:39:00,800
astronauts you said 500

855
00:39:05,750 --> 00:39:03,359
over 500 uh research activities and

856
00:39:09,109 --> 00:39:05,760
experiments how important is that for us

857
00:39:10,710 --> 00:39:09,119
to do on the international space station

858
00:39:12,069 --> 00:39:10,720
yeah so these these missions are

859
00:39:14,870 --> 00:39:12,079
absolutely critical you know the

860
00:39:17,430 --> 00:39:14,880
international space station is operating

861
00:39:19,910 --> 00:39:17,440
for the purpose of doing research and

862
00:39:22,790 --> 00:39:19,920
technology demonstration

863
00:39:26,310 --> 00:39:22,800

so uh you know we've got over 24

864
00:39:28,310 --> 00:39:26,320
different experiments going up on this

865
00:39:31,589 --> 00:39:28,320
these these five six hundred hours of

866
00:39:33,109 --> 00:39:31,599
crew time that enables are key to what

867
00:39:34,470 --> 00:39:33,119
the astronauts are there for in the

868
00:39:36,470 --> 00:39:34,480
first place

869
00:39:38,390 --> 00:39:36,480
um you know and what's unique about

870
00:39:40,470 --> 00:39:38,400
these spacex missions is that we get the

871
00:39:41,270 --> 00:39:40,480
return science back down in about a

872
00:39:43,270 --> 00:39:41,280
month

873
00:39:45,109 --> 00:39:43,280
um so operation of these experiments

874
00:39:46,230 --> 00:39:45,119
around this full mission timeline is

875
00:39:47,750 --> 00:39:46,240
critical

876
00:39:49,589 --> 00:39:47,760
um you know in addition we've got

877
00:39:51,030 --> 00:39:49,599
hardware going up as you heard which is

878
00:39:53,430 --> 00:39:51,040
critical to some of the maintenance

879
00:39:55,750 --> 00:39:53,440
activities we've got some

880
00:39:58,470 --> 00:39:55,760
some hardware that's going up to get one

881
00:40:00,470 --> 00:39:58,480
of our exercise devices uh that new

882
00:40:03,270 --> 00:40:00,480
spare back in place for it

883
00:40:05,190 --> 00:40:03,280
and some additional hardware for

884
00:40:07,190 --> 00:40:05,200
our emu's which are used for the

885
00:40:09,030 --> 00:40:07,200
spacewalks that we've got but then

886
00:40:11,510 --> 00:40:09,040
there's also updated supplies for the

887
00:40:13,109 --> 00:40:11,520
crew of course uh you know

888
00:40:14,630 --> 00:40:13,119

christmas dinner hopefully and some

889
00:40:16,230 --> 00:40:14,640
christmas presents for the crew which is

890
00:40:18,309 --> 00:40:16,240
always a treat for them to get on these

891
00:40:19,829 --> 00:40:18,319
types of missions so absolutely all of

892
00:40:21,349 --> 00:40:19,839
this is critical to keep the crew

893
00:40:24,230 --> 00:40:21,359
occupied doing what they're there for in

894
00:40:27,030 --> 00:40:24,240
the first place

895
00:40:29,750 --> 00:40:27,040
thanks phil and we did have confirmation

896
00:40:31,510 --> 00:40:29,760
currently that the nosecone is deploying

897
00:40:33,430 --> 00:40:31,520
it is opening currently and i will

898
00:40:34,710 --> 00:40:33,440
confirm with you all when it is fully

899
00:40:36,790 --> 00:40:34,720
open

900
00:40:38,309 --> 00:40:36,800
as always phil it's a busy time aboard

901
00:40:40,309 --> 00:40:38,319
the international space station with

902
00:40:43,030 --> 00:40:40,319
cargo vehicles and crews coming and

903
00:40:45,829 --> 00:40:43,040
going and you know like you mentioned

904
00:40:47,589 --> 00:40:45,839
the upgraded equipment how complex will

905
00:40:49,190 --> 00:40:47,599
the next few months be for the

906
00:40:52,390 --> 00:40:49,200
international space station program in

907
00:40:54,309 --> 00:40:52,400
the global partnership

908
00:40:55,750 --> 00:40:54,319
so you know this is we're closing out

909
00:40:57,750 --> 00:40:55,760
what's been actually a really great

910
00:40:59,510 --> 00:40:57,760
really busy year and next year looks to

911
00:41:01,430 --> 00:40:59,520
be uh no different

912
00:41:03,030 --> 00:41:01,440
you know like it starts uh really

913
00:41:05,430 --> 00:41:03,040

tomorrow with our russian partners

914
00:41:08,069 --> 00:41:05,440
following this launch with the undock of

915
00:41:10,069 --> 00:41:08,079
module that's really clean up from from

916
00:41:11,589 --> 00:41:10,079
them installing their node module on the

917
00:41:13,430 --> 00:41:11,599
russian segment

918
00:41:15,829 --> 00:41:13,440
the other three russian space walks

919
00:41:18,309 --> 00:41:15,839
planned for late january we've got some

920
00:41:19,670 --> 00:41:18,319
us spacewalks in february march time

921
00:41:21,750 --> 00:41:19,680
frame

922
00:41:23,510 --> 00:41:21,760
and that's to get ready for the the next

923
00:41:24,790 --> 00:41:23,520
set of upgraded solar arrays coming

924
00:41:26,790 --> 00:41:24,800
later in the year

925
00:41:29,109 --> 00:41:26,800
we've also got another cargo resupply

926
00:41:30,630 --> 00:41:29,119
mission our first u.s private astronaut

927
00:41:33,430 --> 00:41:30,640
mission coming up

928
00:41:35,270 --> 00:41:33,440
and additional resupply missions and and

929
00:41:37,109 --> 00:41:35,280
then then we get back into the crew

930
00:41:38,870 --> 00:41:37,119
cycle launches on the the russian and

931
00:41:41,190 --> 00:41:38,880
the us side boat

932
00:41:42,790 --> 00:41:41,200
so it's actually very busy across the

933
00:41:44,390 --> 00:41:42,800
space station program with our

934
00:41:45,829 --> 00:41:44,400
international commercial commercial

935
00:41:48,069 --> 00:41:45,839
partners both

936
00:41:49,910 --> 00:41:48,079
so while it is complex as you said

937
00:41:51,910 --> 00:41:49,920
shaniqua we have we've got outstanding

938
00:41:53,990 --> 00:41:51,920

teams across the program who do this all

939
00:41:55,829 --> 00:41:54,000
the time they do it very well so

940
00:41:57,589 --> 00:41:55,839
you know i i see it as really fitting

941
00:41:59,750 --> 00:41:57,599
that our teams close out the year with

942
00:42:04,150 --> 00:41:59,760
with the launch they get 22

943
00:42:07,750 --> 00:42:06,390
that's right and thanks says again phil

944
00:42:08,470 --> 00:42:07,760
for joining us

945
00:42:12,710 --> 00:42:08,480
and

946
00:42:15,430 --> 00:42:14,150
happy to be here

947
00:42:16,870 --> 00:42:15,440
thank you

948
00:42:18,550 --> 00:42:16,880
back here in the international space

949
00:42:20,390 --> 00:42:18,560
station flight control room flight

950
00:42:22,390 --> 00:42:20,400
controllers are monitoring the systems

951
00:42:24,950 --> 00:42:22,400
on the station itself ahead of dragon's

952
00:42:27,349 --> 00:42:24,960
arrival wednesday morning once dragon

953
00:42:29,270 --> 00:42:27,359
crosses crosses that approach ellipsoid

954
00:42:31,030 --> 00:42:29,280
which is that mythical sphere around the

955
00:42:33,109 --> 00:42:31,040
station flight controllers here in

956
00:42:35,670 --> 00:42:33,119
mission control houston will begin joint

957
00:42:37,589 --> 00:42:35,680
operations with the spacex teams in

958
00:42:39,829 --> 00:42:37,599
hawthorne california

959
00:42:41,510 --> 00:42:39,839
nasa astronauts rosh achary and tom

960
00:42:43,829 --> 00:42:41,520
marshburn will be monitoring the

961
00:42:46,069 --> 00:42:43,839
approach and arrival of dragon with a

962
00:42:49,430 --> 00:42:46,079
planned docking wednesday morning at 3

963
00:42:52,069 --> 00:42:49,440

30 a.m central time 4 30 a.m eastern

964
00:42:54,550 --> 00:42:52,079
time once cargo dragon is docked to the

965
00:42:56,790 --> 00:42:54,560
station chary and marshburn will begin

966
00:42:58,790 --> 00:42:56,800
hatch operations to open the hatches

967
00:43:05,670 --> 00:42:58,800
between the inertial space station and

968
00:43:10,710 --> 00:43:07,589
and with that we have final confirmation

969
00:43:12,950 --> 00:43:10,720
that the nose cone is open

970
00:43:14,790 --> 00:43:12,960
so with that everything is still on

971
00:43:16,710 --> 00:43:14,800
track on the international space station

972
00:43:19,430 --> 00:43:16,720
side so that'll do it for us here in

973
00:43:22,710 --> 00:43:19,440
mission control houston happy holidays

974
00:43:23,990 --> 00:43:22,720
and now heading over to kennedy megan

975
00:43:26,309 --> 00:43:24,000
and that's going to wrap up our launch

976
00:43:28,550 --> 00:43:26,319
coverage of spacex's 24th commercial

977
00:43:30,230 --> 00:43:28,560
resupply services mission cargo dragon

978
00:43:32,309 --> 00:43:30,240
as you heard her say is on course to

979
00:43:35,510 --> 00:43:32,319
dock to the international space station

980
00:43:37,109 --> 00:43:35,520
at about 4 30 a.m eastern time tomorrow

981
00:43:39,750 --> 00:43:37,119
we will have live coverage here on nasa

982
00:43:41,270 --> 00:43:39,760
tv and that will begin at 3 am in the

983
00:43:43,829 --> 00:43:41,280
meantime you can learn even more about

984
00:43:46,069 --> 00:43:43,839
this mission on nasa.gov

985
00:43:48,309 --> 00:43:46,079
commercial resupply thank you for

986
00:43:52,150 --> 00:43:48,319
joining us we leave you with a replay of

987
00:43:52,160 --> 00:43:57,430
t-minus 15 seconds

988
00:43:59,430 --> 00:43:58,390

ten

989
00:44:00,470 --> 00:43:59,440
nine

990
00:44:01,510 --> 00:44:00,480
eight

991
00:44:02,630 --> 00:44:01,520
seven

992
00:44:03,589 --> 00:44:02,640
six

993
00:44:04,550 --> 00:44:03,599
five

994
00:44:05,589 --> 00:44:04,560
four

995
00:44:06,550 --> 00:44:05,599
three

996
00:44:07,530 --> 00:44:06,560
two

997
00:44:11,829 --> 00:44:07,540
one

998
00:44:14,150 --> 00:44:11,839
[Music]

999
00:44:16,630 --> 00:44:14,160
cargo dragon soars with the final supply

1000
00:44:25,990 --> 00:44:16,640
run of 2021 to the astronauts aboard the