
NASA SCIENCE LIVE
LAUNCHING
LUCY
TO THE TROJAN ASTEROIDS

1
00:00:48,470 --> 00:00:09,440
[Music]

2
00:01:15,749 --> 00:00:48,480
foreign

3
00:01:15,759 --> 00:01:19,050
so

4
00:01:45,350 --> 00:01:36,000
[Music]

5
00:01:49,749 --> 00:01:47,510
hello and welcome to another episode of

6
00:01:51,830 --> 00:01:49,759
nasa science live i'm your host megan

7
00:01:54,149 --> 00:01:51,840
cruz and i am so happy you could join us

8
00:01:56,550 --> 00:01:54,159
here live from kennedy space center in

9
00:01:58,550 --> 00:01:56,560
florida believe me you could feel the

10
00:02:01,109 --> 00:01:58,560
excitement in the air here as nasa

11
00:02:03,270 --> 00:02:01,119
prepares to launch lucy early tomorrow

12
00:02:06,230 --> 00:02:03,280
morning lucy will be the very first

13
00:02:09,109 --> 00:02:06,240

spacecraft to study the trojan asteroids

14
00:02:11,029 --> 00:02:09,119
which orbit the sun in two groups one in

15
00:02:14,949 --> 00:02:11,039
front of jupiter's path and the other

16
00:02:17,350 --> 00:02:14,959
behind it will take 12 years to visit

17
00:02:20,150 --> 00:02:17,360
eight different asteroids that's the

18
00:02:22,710 --> 00:02:20,160
most destinations of any space mission

19
00:02:25,670 --> 00:02:22,720
ever and you might be wondering why are

20
00:02:27,990 --> 00:02:25,680
we studying asteroids asteroids are

21
00:02:30,550 --> 00:02:28,000
truly pristine remnants of a time when

22
00:02:33,589 --> 00:02:30,560
the planets were forming this makes them

23
00:02:35,509 --> 00:02:33,599
prehistoric treasures that hold the lost

24
00:02:37,750 --> 00:02:35,519
tales about the origin of our solar

25
00:02:40,869 --> 00:02:37,760
system and the more we study them the

26
00:02:43,589 --> 00:02:40,879
more we can decipher how life came to be

27
00:02:45,270 --> 00:02:43,599
and trojan asteroids are particularly

28
00:02:46,550 --> 00:02:45,280
fascinating throughout the show today

29
00:02:47,910 --> 00:02:46,560
i'm going to meet up with some special

30
00:02:50,229 --> 00:02:47,920
guests who can tell us more about the

31
00:02:52,949 --> 00:02:50,239
trojans but in the meantime this might

32
00:02:52,959 --> 00:02:59,910
what are the trojan asteroids

33
00:03:05,430 --> 00:03:02,790
well let's begin by going back over 4

34
00:03:08,309 --> 00:03:05,440
billion years when the newly formed

35
00:03:11,670 --> 00:03:08,319
solar system consisted of trillions of

36
00:03:14,229 --> 00:03:11,680
tiny little rocky and icy objects many

37
00:03:17,030 --> 00:03:14,239
of these objects came together to form

38
00:03:19,110 --> 00:03:17,040

the planets the majority of the others

39
00:03:22,710 --> 00:03:19,120
were scattered into the distant reaches

40
00:03:25,030 --> 00:03:22,720
of our solar system and beyond but not

41
00:03:28,229 --> 00:03:25,040
all of them some of them are pristine

42
00:03:31,990 --> 00:03:28,239
asteroids that now orbit with jupiter in

43
00:03:34,229 --> 00:03:32,000
two huge swarms leading and trailing the

44
00:03:36,710 --> 00:03:34,239
planet they're known as the trojan

45
00:03:39,830 --> 00:03:36,720
asteroids they're really really

46
00:03:42,390 --> 00:03:39,840
mysterious and we think that they come

47
00:03:45,509 --> 00:03:42,400
from the outer solar system they're also

48
00:03:47,750 --> 00:03:45,519
really special in terms of understanding

49
00:03:49,750 --> 00:03:47,760
the evolution of the solar system and

50
00:03:53,030 --> 00:03:49,760
understanding the evolution of the

51
00:03:55,750 --> 00:03:53,040
planets because they have remained

52
00:03:58,309 --> 00:03:55,760
gravitationally stable for over billions

53
00:04:00,710 --> 00:03:58,319
of years and astronomers have only been

54
00:04:03,670 --> 00:04:00,720
able to study these distant and

55
00:04:06,309 --> 00:04:03,680
enigmatic small bodies from earth but

56
00:04:09,350 --> 00:04:06,319
all of that is about to change nasa's

57
00:04:11,750 --> 00:04:09,360
lucy mission will embark on a 12-year

58
00:04:13,429 --> 00:04:11,760
journey to visit these primitive

59
00:04:15,429 --> 00:04:13,439
asteroids and it's going to be really

60
00:04:19,030 --> 00:04:15,439
exciting because it'll be the first time

61
00:04:19,909 --> 00:04:19,040
that we are able to see these objects up

62
00:04:21,909 --> 00:04:19,919
close

63
00:04:24,310 --> 00:04:21,919

so what are the trojan asteroids they're

64
00:04:26,790 --> 00:04:24,320
asteroids that orbit with jupiter around

65
00:04:29,440 --> 00:04:26,800
the sun that ultimately hold the clues

66
00:04:36,390 --> 00:04:29,450
to the formation of our solar system

67
00:04:40,710 --> 00:04:38,390
and i bet some of you at home have even

68
00:04:43,030 --> 00:04:40,720
more questions that's wonderful we want

69
00:04:45,909 --> 00:04:43,040
them please send them in just remember

70
00:04:47,909 --> 00:04:45,919
to use the hashtag asknasa or drop those

71
00:04:50,150 --> 00:04:47,919
questions in the comment boxes wherever

72
00:04:51,749 --> 00:04:50,160
you're watching this show but i actually

73
00:04:53,270 --> 00:04:51,759
have some questions of my own and that's

74
00:04:55,990 --> 00:04:53,280
why i have these two joining me here

75
00:04:57,990 --> 00:04:56,000
today this is dr carly howitt she's the

76
00:05:00,390 --> 00:04:58,000
assistant director of the department of

77
00:05:03,590 --> 00:05:00,400
space studies at the southwest research

78
00:05:06,310 --> 00:05:03,600
institute that is a mouthful

79
00:05:08,629 --> 00:05:06,320
and will santiago deep space exploration

80
00:05:10,310 --> 00:05:08,639
engineer at lockheed martin space thank

81
00:05:12,469 --> 00:05:10,320
you guys for joining me today thanks

82
00:05:13,670 --> 00:05:12,479
it's great to see you absolutely and now

83
00:05:15,990 --> 00:05:13,680
i want to talk about the fact that you

84
00:05:18,230 --> 00:05:16,000
know nasa has visited asteroids before

85
00:05:20,629 --> 00:05:18,240
we even have a bit of one coming back to

86
00:05:22,870 --> 00:05:20,639
earth as we speak what's special about

87
00:05:25,350 --> 00:05:22,880
lucy is that lucy is not just visiting

88
00:05:28,070 --> 00:05:25,360

one asteroid not two but a

89
00:05:30,070 --> 00:05:28,080
record-breaking eight asteroids carly

90
00:05:31,909 --> 00:05:30,080
can you tell me why that's significant

91
00:05:33,990 --> 00:05:31,919
well we don't know much about jupiter's

92
00:05:36,390 --> 00:05:34,000
trojan asteroids and so by going to

93
00:05:38,150 --> 00:05:36,400
visit a large number eight asteroids

94
00:05:40,790 --> 00:05:38,160
in total over the mission lifetime uh

95
00:05:43,590 --> 00:05:40,800
we'll really better understand all about

96
00:05:45,270 --> 00:05:43,600
the asteroids so if you only see one you

97
00:05:47,029 --> 00:05:45,280
maybe you got sort of a bit of a funny

98
00:05:49,029 --> 00:05:47,039
one right but by seeing eight you get to

99
00:05:51,110 --> 00:05:49,039
really understand what's going on in

100
00:05:52,310 --> 00:05:51,120
this population it's really exciting

101
00:05:54,629 --> 00:05:52,320
we're going to see them up close

102
00:05:56,309 --> 00:05:54,639
understand their color their composition

103
00:05:58,230 --> 00:05:56,319
try and look for what they might be like

104
00:06:00,309 --> 00:05:58,240
inside we're going to learn so much

105
00:06:02,150 --> 00:06:00,319
about the asteroid population as a whole

106
00:06:04,629 --> 00:06:02,160
throughout this mission absolutely and

107
00:06:06,870 --> 00:06:04,639
lucy is interesting because it ties into

108
00:06:08,629 --> 00:06:06,880
nasa's overall asteroid research can you

109
00:06:10,150 --> 00:06:08,639
talk to us about those other projects

110
00:06:12,150 --> 00:06:10,160
yeah so there's a lot going on in

111
00:06:14,150 --> 00:06:12,160
asteroid science right now in nasa so of

112
00:06:16,150 --> 00:06:14,160
course the osiris-rex mission is

113
00:06:18,230 --> 00:06:16,160

bringing back a sample of an asteroid so

114
00:06:19,830 --> 00:06:18,240
that's on route and there's going to be

115
00:06:21,749 --> 00:06:19,840
the dart mission which is going to try

116
00:06:23,749 --> 00:06:21,759
and redirect her asteroid and then lucy

117
00:06:25,430 --> 00:06:23,759
has a sister mission called psyche

118
00:06:28,629 --> 00:06:25,440
that's going to go to the asteroid

119
00:06:30,950 --> 00:06:28,639
psyche which we think is a remnant of an

120
00:06:32,550 --> 00:06:30,960
asteroid so it's a metal core we think

121
00:06:34,469 --> 00:06:32,560
previously it might have been a larger

122
00:06:36,550 --> 00:06:34,479
planet that had the outsides blown away

123
00:06:38,629 --> 00:06:36,560
and we're going to look at the inside of

124
00:06:40,710 --> 00:06:38,639
this asteroid with with that mission and

125
00:06:42,390 --> 00:06:40,720
it's just going to be a great few years

126
00:06:43,990 --> 00:06:42,400
for asteroid science it's really

127
00:06:46,390 --> 00:06:44,000
fascinating and i love that there's so

128
00:06:49,510 --> 00:06:46,400
much going on with asteroid research now

129
00:06:51,909 --> 00:06:49,520
will lucy is set to launch tomorrow 5 34

130
00:06:55,189 --> 00:06:51,919
a.m eastern time soon after we're gonna

131
00:06:57,589 --> 00:06:55,199
see her two very large solar arrays

132
00:06:59,510 --> 00:06:57,599
deployed why are they so big

133
00:07:00,790 --> 00:06:59,520
well um you you know we were talking a

134
00:07:02,870 --> 00:07:00,800
little bit earlier about breaking

135
00:07:04,710 --> 00:07:02,880
records uh so lucy's going to be the

136
00:07:06,469 --> 00:07:04,720
record breaker to the juno spacecraft

137
00:07:08,309 --> 00:07:06,479
that's currently orbiting jupiter and

138
00:07:11,189 --> 00:07:08,319

it's going to go further away on solar

139
00:07:14,550 --> 00:07:11,199
power than ever before the trojans are

140
00:07:17,029 --> 00:07:14,560
very far from the sun so we have over 7

141
00:07:18,710 --> 00:07:17,039
000 solar cells that give us the energy

142
00:07:20,950 --> 00:07:18,720
that we need to

143
00:07:23,430 --> 00:07:20,960
run the instruments from the spacecraft

144
00:07:26,230 --> 00:07:23,440
you know out there at that distance we

145
00:07:28,309 --> 00:07:26,240
run the spacecraft with about 500 watts

146
00:07:30,629 --> 00:07:28,319
so much less than the power you know we

147
00:07:32,230 --> 00:07:30,639
could not run a microwave out there wow

148
00:07:33,350 --> 00:07:32,240
that's really interesting i think to put

149
00:07:35,350 --> 00:07:33,360
that that really puts it into

150
00:07:36,950 --> 00:07:35,360
perspective right how far

151
00:07:39,029 --> 00:07:36,960
it's going to be from the sun and how

152
00:07:40,550 --> 00:07:39,039
much power it actually has to work

153
00:07:41,589 --> 00:07:40,560
now you know those were my questions but

154
00:07:43,430 --> 00:07:41,599
i hear we're getting some really

155
00:07:45,189 --> 00:07:43,440
interesting ones from viewers which is

156
00:07:48,390 --> 00:07:45,199
wonderful keep them coming again a

157
00:07:50,390 --> 00:07:48,400
reminder use that hashtag ask nasa or

158
00:07:52,230 --> 00:07:50,400
just drop them in the comment box i

159
00:07:53,510 --> 00:07:52,240
promise it'll be will and carly

160
00:07:54,790 --> 00:07:53,520
answering those questions i will bring

161
00:07:56,550 --> 00:07:54,800
them back later in the show because i

162
00:07:59,270 --> 00:07:56,560
know i will not be able to answer all of

163
00:08:01,270 --> 00:07:59,280

your questions in the meantime what do

164
00:08:03,430 --> 00:08:01,280
you say about taking a closer look at

165
00:08:05,029 --> 00:08:03,440
the rocket that's going to launch lucy

166
00:08:07,550 --> 00:08:05,039
take a look at this video now by my

167
00:08:15,510 --> 00:08:07,560
colleague james trayley

168
00:08:18,950 --> 00:08:16,950
oh my gosh

169
00:08:19,990 --> 00:08:18,960
all right we are just around the corner

170
00:08:21,749 --> 00:08:20,000
right now i just got like a little

171
00:08:23,189 --> 00:08:21,759
glimpse of the

172
00:08:24,309 --> 00:08:23,199
launch pad i can see it right here in

173
00:08:25,950 --> 00:08:24,319
front of me

174
00:08:27,670 --> 00:08:25,960
oh wow

175
00:08:28,950 --> 00:08:27,680
[Music]

176
00:08:30,469 --> 00:08:28,960
it's right there

177
00:08:31,670 --> 00:08:30,479
oh my goodness

178
00:08:32,709 --> 00:08:31,680
all right

179
00:08:35,509 --> 00:08:32,719
we are

180
00:08:38,230 --> 00:08:35,519
literally like maybe 300 feet away from

181
00:08:39,269 --> 00:08:38,240
the lucy spacecraft on the ls5 rocket

182
00:08:41,269 --> 00:08:39,279
from what i understand i think we're

183
00:08:43,990 --> 00:08:41,279
gonna be actually taking an elevator up

184
00:08:46,310 --> 00:08:44,000
to the top of this uh launch here the uh

185
00:08:47,990 --> 00:08:46,320
vif the critical integration facility to

186
00:08:50,949 --> 00:08:48,000
see lucy up close and we are some of the

187
00:08:52,470 --> 00:08:50,959
last people to be seeing lucy before she

188
00:08:54,870 --> 00:08:52,480

blasts off into space it's a long

189
00:08:55,670 --> 00:08:54,880
mission ahead and

190
00:08:57,350 --> 00:08:55,680
yeah

191
00:08:58,870 --> 00:08:57,360
super super thrilled to

192
00:09:02,070 --> 00:08:58,880
share this moment with you and take you

193
00:09:07,030 --> 00:09:04,150
how's it going so nice to meet you it's

194
00:09:08,470 --> 00:09:07,040
going good good to meet you as well

195
00:09:11,030 --> 00:09:08,480
thanks so much for taking us around this

196
00:09:15,829 --> 00:09:11,040
is incredible

197
00:09:19,190 --> 00:09:17,130
oh my god

198
00:09:20,070 --> 00:09:19,200
[Music]

199
00:09:20,829 --> 00:09:20,080
i mean

200
00:09:24,230 --> 00:09:20,839
that's

201
00:09:27,590 --> 00:09:24,240
cool i mean this rocket is massive

202
00:09:31,110 --> 00:09:27,600
yeah the scale of it i mean i 200 feet

203
00:09:35,670 --> 00:09:33,350
i'm joined today by isaac and dania and

204
00:09:38,150 --> 00:09:35,680
we're standing directly in front of the

205
00:09:39,350 --> 00:09:38,160
lucy spacecraft atop an atlas v rocket

206
00:09:41,269 --> 00:09:39,360
we're just talking on the way up about

207
00:09:42,790 --> 00:09:41,279
the scale of this thing it's really

208
00:09:44,790 --> 00:09:42,800
pretty impressive to just take a step

209
00:09:46,949 --> 00:09:44,800
back and appreciate the sheer magnitude

210
00:09:48,150 --> 00:09:46,959
and scale of this rocket so can you tell

211
00:09:50,550 --> 00:09:48,160
us a bit more about the dimensions of

212
00:09:52,070 --> 00:09:50,560
this thing and kind of what is all

213
00:09:54,150 --> 00:09:52,080

powering lucy on its burning out to the

214
00:09:56,710 --> 00:09:54,160
trojans yeah so lucy's actually right

215
00:09:58,310 --> 00:09:56,720
now sitting on our 401 atlas 5

216
00:10:00,550 --> 00:09:58,320
configuration

217
00:10:03,509 --> 00:10:00,560
fully stacked to the top of the payload

218
00:10:05,590 --> 00:10:03,519
bearings about 190 feet tall

219
00:10:08,389 --> 00:10:05,600
so we have the entire vehicle right now

220
00:10:11,509 --> 00:10:08,399
sitting on our mobile launch platform a

221
00:10:13,670 --> 00:10:11,519
1.3 million pound steel structure we

222
00:10:15,509 --> 00:10:13,680
have our atlas booster our single engine

223
00:10:18,150 --> 00:10:15,519
centaur and then the lucy spacecraft on

224
00:10:19,910 --> 00:10:18,160
top of that and the lucy spacecraft it's

225
00:10:21,509 --> 00:10:19,920
it's not a small spacecraft itself it's

226
00:10:23,269 --> 00:10:21,519
pretty large as well

227
00:10:25,430 --> 00:10:23,279
no it's not a small spacecraft it's

228
00:10:29,110 --> 00:10:25,440
about the size of a standard car it

229
00:10:30,550 --> 00:10:29,120
weighs 3 300 pounds and half of that is

230
00:10:32,949 --> 00:10:30,560
the fuel

231
00:10:34,630 --> 00:10:32,959
um and so i want to talk a little bit

232
00:10:36,630 --> 00:10:34,640
about the solar rays yeah which are

233
00:10:39,910 --> 00:10:36,640
solar arrays

234
00:10:42,710 --> 00:10:39,920
um so they're about four inches thick

235
00:10:44,949 --> 00:10:42,720
but when they're deployed they're 7.2

236
00:10:46,790 --> 00:10:44,959
meters in diameter so if you were to

237
00:10:49,350 --> 00:10:46,800
take the spacecraft and the solar rays

238
00:10:51,350 --> 00:10:49,360

deployed and tip it on its side it'd be

239
00:10:52,949 --> 00:10:51,360
as follows the four-story building and

240
00:10:54,389 --> 00:10:52,959
why do the solar panels need to be that

241
00:10:56,230 --> 00:10:54,399
massive they're specifically designed

242
00:10:59,829 --> 00:10:56,240
for this mission for this exact reason

243
00:11:01,829 --> 00:10:59,839
too yes so lucy is going to travel 4

244
00:11:03,509 --> 00:11:01,839
billion miles through its journey it's

245
00:11:05,190 --> 00:11:03,519
12 years journey

246
00:11:07,190 --> 00:11:05,200
and it's traveling

247
00:11:09,110 --> 00:11:07,200
far from the sun as a matter of fact

248
00:11:11,590 --> 00:11:09,120
it's going to be the farthest

249
00:11:14,630 --> 00:11:11,600
spacecraft traveling on solar power and

250
00:11:16,310 --> 00:11:14,640
so that's why we need massive solar rays

251
00:11:18,470 --> 00:11:16,320
and so i mean it's a long journey ahead

252
00:11:20,230 --> 00:11:18,480
12 year long mission but there's already

253
00:11:21,590 --> 00:11:20,240
been quite a journey on the back end

254
00:11:23,030 --> 00:11:21,600
here just to get us prepared can you

255
00:11:25,509 --> 00:11:23,040
walk us through i guess the past like

256
00:11:27,750 --> 00:11:25,519
you know 14 months during the pandemic

257
00:11:29,670 --> 00:11:27,760
here well how's that exciting so we

258
00:11:31,110 --> 00:11:29,680
actually started spacecraft integration

259
00:11:32,949 --> 00:11:31,120
and testing

260
00:11:36,310 --> 00:11:32,959
in um july

261
00:11:38,389 --> 00:11:36,320
of 2020 think about it 14 months to

262
00:11:41,350 --> 00:11:38,399
fully integrate

263
00:11:42,389 --> 00:11:41,360

the spacecraft and the payload the

264
00:11:45,110 --> 00:11:42,399
instrument

265
00:11:47,750 --> 00:11:45,120
during a pandemic testament through an

266
00:11:49,990 --> 00:11:47,760
entire environmental test campaign which

267
00:11:51,509 --> 00:11:50,000
stimulates space which gives us

268
00:11:54,069 --> 00:11:51,519
confidence that it's going to survive

269
00:11:55,750 --> 00:11:54,079
the full mission that's amazing yeah and

270
00:11:57,750 --> 00:11:55,760
then also just the journey to get the

271
00:11:59,910 --> 00:11:57,760
spacecraft from all its individual parts

272
00:12:01,350 --> 00:11:59,920
assembled on the c17 that you have to

273
00:12:02,629 --> 00:12:01,360
ride with and then take here i mean

274
00:12:05,829 --> 00:12:02,639
what's in the process like on the ground

275
00:12:08,389 --> 00:12:05,839
in ksc yeah so once we landed we had

276
00:12:10,310 --> 00:12:08,399
about seven weeks in which we

277
00:12:14,550 --> 00:12:10,320
reintegrated hardware like a high vane

278
00:12:17,030 --> 00:12:14,560
antenna and um updated flight software

279
00:12:18,870 --> 00:12:17,040
um and did functional testing to verify

280
00:12:21,110 --> 00:12:18,880
that we didn't break anything during

281
00:12:22,870 --> 00:12:21,120
shipment it's important and then we

282
00:12:26,949 --> 00:12:22,880
fueled

283
00:12:28,710 --> 00:12:26,959
spacecraft and um did our final on pad

284
00:12:30,550 --> 00:12:28,720
functional and the spacecraft is

285
00:12:35,190 --> 00:12:30,560
currently powered up and we're

286
00:12:36,389 --> 00:12:35,200
monitoring its data how uh 24 7.

287
00:12:37,750 --> 00:12:36,399
and then what is it going to be like the

288
00:12:39,910 --> 00:12:37,760

day of the launch as well kind of

289
00:12:41,910 --> 00:12:39,920
getting the spacecraft ready really long

290
00:12:43,590 --> 00:12:41,920
before sunrise even to get it ready to

291
00:12:47,190 --> 00:12:43,600
yeah so we'll our crew will actually be

292
00:12:50,710 --> 00:12:47,200
coming in uh 10 o'clock the night before

293
00:12:53,590 --> 00:12:50,720
yeah yes exactly um for our pre-launch

294
00:12:56,389 --> 00:12:53,600
securing so we'll go through all of the

295
00:12:58,870 --> 00:12:56,399
final close-outs at the pad our final

296
00:13:01,350 --> 00:12:58,880
pad preps pulling the cover over the

297
00:13:03,829 --> 00:13:01,360
flame bucket where the um the exhaust

298
00:13:06,550 --> 00:13:03,839
will go for launch doing all our final

299
00:13:08,870 --> 00:13:06,560
preps and then clearing the pad

300
00:13:11,269 --> 00:13:08,880
at roughly 2 30 in the morning so they

301
00:13:15,430 --> 00:13:11,279
can go into cryogenic tanking and then

302
00:13:17,509 --> 00:13:15,440
at liftoff of 860 000 pounds of thrust

303
00:13:18,550 --> 00:13:17,519
at sea level will take lucy on its

304
00:13:19,990 --> 00:13:18,560
journey

305
00:13:21,269 --> 00:13:20,000
and then we're on our way i mean it's a

306
00:13:22,629 --> 00:13:21,279
12 year long journey and we were just

307
00:13:24,150 --> 00:13:22,639
talking about this on the way up yeah

308
00:13:25,269 --> 00:13:24,160
it's super exciting obviously a long

309
00:13:27,990 --> 00:13:25,279
mission ahead a lot of really cool

310
00:13:29,509 --> 00:13:28,000
discoveries waiting for us out there but

311
00:13:30,710 --> 00:13:29,519
at the same time i mean a little bit of

312
00:13:32,069 --> 00:13:30,720
sadness here because this is the last

313
00:13:33,990 --> 00:13:32,079

time that we're gonna be this close

314
00:13:35,190 --> 00:13:34,000
humans gonna get this close to the lucy

315
00:13:37,509 --> 00:13:35,200
spacecraft

316
00:13:39,110 --> 00:13:37,519
it is i mean as the project manager

317
00:13:41,670 --> 00:13:39,120
right um

318
00:13:44,550 --> 00:13:41,680
my my 10 year old lucy is going to be

319
00:13:48,230 --> 00:13:44,560
ending soon so it is a little sad

320
00:13:49,910 --> 00:13:48,240
um but it's also exciting it's exciting

321
00:13:51,829 --> 00:13:49,920
and i will be

322
00:13:53,990 --> 00:13:51,839
waiting with baited breath as we

323
00:13:56,710 --> 00:13:54,000
encounter those trojans

324
00:13:59,590 --> 00:13:56,720
i know what we think we're gonna find

325
00:14:01,509 --> 00:13:59,600
but i'm excited for the new discoveries

326
00:14:03,670 --> 00:14:01,519
the unexpected that's what i'm looking

327
00:14:05,829 --> 00:14:03,680
forward to um and we'll be following

328
00:14:08,470 --> 00:14:05,839
this mission and waiting for it to

329
00:14:10,069 --> 00:14:08,480
rewrite our science quotes yeah and

330
00:14:11,910 --> 00:14:10,079
obviously not your first rodeo you've

331
00:14:13,189 --> 00:14:11,920
sent many missions up the space what i

332
00:14:14,629 --> 00:14:13,199
mean keeps it exciting what keeps you

333
00:14:16,870 --> 00:14:14,639
coming back every single time to launch

334
00:14:18,150 --> 00:14:16,880
another mission up on the atlas v it's

335
00:14:20,870 --> 00:14:18,160
something where you'd think it would get

336
00:14:23,030 --> 00:14:20,880
routine and benign and it's just every

337
00:14:24,150 --> 00:14:23,040
mission every launch that final

338
00:14:25,430 --> 00:14:24,160

countdown if you're not getting

339
00:14:27,030 --> 00:14:25,440
butterflies then you're in the wrong

340
00:14:28,829 --> 00:14:27,040
business i mean the view alone up here

341
00:14:30,470 --> 00:14:28,839
just checking it out before i mean it's

342
00:14:32,629 --> 00:14:30,480
exciting kind of just take them on and

343
00:14:36,389 --> 00:14:32,639
just enjoy what you see and take pride

344
00:14:38,310 --> 00:14:36,399
in all the hard work that folks everyone

345
00:14:40,470 --> 00:14:38,320
have done to contribute to the success

346
00:14:42,310 --> 00:14:40,480
of this mission it takes

347
00:14:44,150 --> 00:14:42,320
thousands and thousands of people to get

348
00:14:45,350 --> 00:14:44,160
us to where we are today from all the

349
00:14:47,030 --> 00:14:45,360
different teams all the different

350
00:14:48,470 --> 00:14:47,040
organizations

351
00:14:50,389 --> 00:14:48,480
and on top of that it's something that

352
00:14:52,470 --> 00:14:50,399
beyond those that directly contributed

353
00:14:55,509 --> 00:14:52,480
it's something a mission that as special

354
00:14:57,350 --> 00:14:55,519
as this that really everyone is able to

355
00:14:58,389 --> 00:14:57,360
share a part of and everyone's able to

356
00:14:59,990 --> 00:14:58,399
follow

357
00:15:03,189 --> 00:15:00,000
for its entire journey so it's something

358
00:15:04,790 --> 00:15:03,199
where even people at home can experience

359
00:15:07,030 --> 00:15:04,800
the launch experience the mission and

360
00:15:08,470 --> 00:15:07,040
follow along with it it's really special

361
00:15:09,750 --> 00:15:08,480
wishing you guys the best of luck and i

362
00:15:11,269 --> 00:15:09,760
want to thank both of you for taking

363
00:15:13,269 --> 00:15:11,279

some time out of your incredibly busy

364
00:15:14,629 --> 00:15:13,279
schedules here and we're just minutes

365
00:15:16,550 --> 00:15:14,639
hours i guess away over the next couple

366
00:15:18,470 --> 00:15:16,560
days here from lucy blasting off away

367
00:15:19,910 --> 00:15:18,480
from us so thank you both

368
00:15:21,910 --> 00:15:19,920
congratulations on all that's happened

369
00:15:23,189 --> 00:15:21,920
so far and best of luck over the next 12

370
00:15:24,949 --> 00:15:23,199
years on this long journey thank you

371
00:15:26,550 --> 00:15:24,959
very much thank you so much thank you

372
00:15:28,790 --> 00:15:26,560
appreciate it

373
00:15:30,790 --> 00:15:28,800
[Music]

374
00:15:33,430 --> 00:15:30,800
if you are just tuning in we are live

375
00:15:36,550 --> 00:15:33,440
from kennedy space center just 12 hours

376
00:15:39,110 --> 00:15:36,560
away from nasa launching lucy the first

377
00:15:41,350 --> 00:15:39,120
spacecraft to visit the trojan asteroids

378
00:15:44,230 --> 00:15:41,360
to hopefully unfold the story of our

379
00:15:47,030 --> 00:15:44,240
solar system as you know lucy is on a

380
00:15:48,790 --> 00:15:47,040
12-year mission so that means we really

381
00:15:51,269 --> 00:15:48,800
need to start thinking about training

382
00:15:53,749 --> 00:15:51,279
the next generation of scientists and

383
00:15:55,990 --> 00:15:53,759
engineers so that hopefully they take on

384
00:15:58,710 --> 00:15:56,000
those leadership roles as lucy

385
00:16:01,590 --> 00:15:58,720
progresses and that's why nasa created

386
00:16:03,749 --> 00:16:01,600
the space academy a free online

387
00:16:06,470 --> 00:16:03,759
interactive program open to

388
00:16:08,870 --> 00:16:06,480

undergraduate stem students and actually

389
00:16:10,629 --> 00:16:08,880
joining me today are two formerly space

390
00:16:12,230 --> 00:16:10,639
academy students brittany wilbur nice to

391
00:16:13,829 --> 00:16:12,240
have you here thank you for having us

392
00:16:15,350 --> 00:16:13,839
awesome let's talk to me brittany i'll

393
00:16:17,749 --> 00:16:15,360
start with you talk to me about how it

394
00:16:19,670 --> 00:16:17,759
felt to be part of the space academy the

395
00:16:21,509 --> 00:16:19,680
space academy is absolutely amazing i

396
00:16:23,910 --> 00:16:21,519
think it really transformed just the way

397
00:16:26,230 --> 00:16:23,920
that i view life i was tested not only

398
00:16:27,990 --> 00:16:26,240
in terms of writing technical papers but

399
00:16:29,829 --> 00:16:28,000
also in terms of combining engineering

400
00:16:31,509 --> 00:16:29,839
with creativity which i think a lot of

401
00:16:33,829 --> 00:16:31,519
engineers sometimes might find hard to

402
00:16:36,310 --> 00:16:33,839
do and i feel like i also was able to

403
00:16:38,150 --> 00:16:36,320
just cultivate a space of mentors in a

404
00:16:39,829 --> 00:16:38,160
space of just a community that really

405
00:16:41,829 --> 00:16:39,839
wants to see me succeed and really wants

406
00:16:43,509 --> 00:16:41,839
to see each other succeed so being able

407
00:16:44,710 --> 00:16:43,519
to go through the program as a student

408
00:16:46,550 --> 00:16:44,720
and now turning around and being a

409
00:16:48,150 --> 00:16:46,560
mentor it's kind of crazy imagining that

410
00:16:51,189 --> 00:16:48,160
i can impact people's lives in the same

411
00:16:52,870 --> 00:16:51,199
way that they've impacted mine overall

412
00:16:54,949 --> 00:16:52,880
i think the space has just had literally

413
00:16:57,749 --> 00:16:54,959

a tremendous impact on my life and it

414
00:17:00,310 --> 00:16:57,759
jump started my aca or my

415
00:17:02,069 --> 00:17:00,320
my career which was insane but it also

416
00:17:04,150 --> 00:17:02,079
really had a heavy impact on my personal

417
00:17:06,069 --> 00:17:04,160
life and my academic life so it was

418
00:17:07,510 --> 00:17:06,079
life-changing yeah that's beautiful the

419
00:17:09,029 --> 00:17:07,520
way that you said that and wilbur do you

420
00:17:11,110 --> 00:17:09,039
kind of share that same life change

421
00:17:13,110 --> 00:17:11,120
absolutely livestreaming for me i was

422
00:17:15,189 --> 00:17:13,120
actually part of the first ever space

423
00:17:16,870 --> 00:17:15,199
academy back in 2018 and i've been

424
00:17:19,669 --> 00:17:16,880
waiting for this day before launch for

425
00:17:21,270 --> 00:17:19,679
three years now when i was uh in this

426
00:17:22,789 --> 00:17:21,280
academy i was in my second year of

427
00:17:25,029 --> 00:17:22,799
school and that's when i started

428
00:17:28,150 --> 00:17:25,039
learning about uh what you know what

429
00:17:30,470 --> 00:17:28,160
takes it to design and fly missions to

430
00:17:32,310 --> 00:17:30,480
space and that really gave me a scope

431
00:17:34,710 --> 00:17:32,320
that i didn't have before he gave me

432
00:17:35,669 --> 00:17:34,720
those skills and and knowledge that i

433
00:17:37,909 --> 00:17:35,679
have been

434
00:17:39,190 --> 00:17:37,919
implementing in my career now it also

435
00:17:40,710 --> 00:17:39,200
provided me with my first nasa

436
00:17:43,830 --> 00:17:40,720
internship working with the nasa lucid

437
00:17:45,750 --> 00:17:43,840
mission and it also allowed me to share

438
00:17:47,669 --> 00:17:45,760

my passion for space by being a lucia

439
00:17:49,190 --> 00:17:47,679
asteroid ambassador and communicating

440
00:17:50,950 --> 00:17:49,200
the great science is going to be done by

441
00:17:52,230 --> 00:17:50,960
this mission in the coming years yeah it

442
00:17:53,990 --> 00:17:52,240
sounds like it really opens a lot of

443
00:17:55,990 --> 00:17:54,000
doors for you and speaking of in the

444
00:17:58,710 --> 00:17:56,000
coming years right in six years august

445
00:18:01,110 --> 00:17:58,720
2027 that is when lucy is going to

446
00:18:02,789 --> 00:18:01,120
encounter her first two asteroids where

447
00:18:04,870 --> 00:18:02,799
do you think you'll be when that happens

448
00:18:07,110 --> 00:18:04,880
well uh thanks to the space academy i

449
00:18:08,630 --> 00:18:07,120
think i'll be designing building and

450
00:18:10,710 --> 00:18:08,640
flying my own missions

451
00:18:11,750 --> 00:18:10,720
nasa or another company and i'm also

452
00:18:13,190 --> 00:18:11,760
going to be

453
00:18:15,830 --> 00:18:13,200
looking forward to what lucy's going to

454
00:18:17,669 --> 00:18:15,840
discover uh in detroit asteroids yeah

455
00:18:19,029 --> 00:18:17,679
and what about you i think i'm

456
00:18:20,710 --> 00:18:19,039
definitely going to be following up on

457
00:18:23,590 --> 00:18:20,720
the science of lucy because it's

458
00:18:25,430 --> 00:18:23,600
impacted not only my life not only the

459
00:18:26,710 --> 00:18:25,440
creation of the space academy but also

460
00:18:27,909 --> 00:18:26,720
the lives of the countless people that

461
00:18:30,310 --> 00:18:27,919
have worked on it so i'm definitely

462
00:18:32,230 --> 00:18:30,320
going to be following up as for myself

463
00:18:34,390 --> 00:18:32,240

hopefully i'll have a phd or a master's

464
00:18:36,549 --> 00:18:34,400
not really sure which one yet um and

465
00:18:37,909 --> 00:18:36,559
hopefully i'll be making the next lucy

466
00:18:39,830 --> 00:18:37,919
and if i'm not doing that i'll be an

467
00:18:41,909 --> 00:18:39,840
astronaut preferably i'd like to do both

468
00:18:43,350 --> 00:18:41,919
maybe at the same time you know for so

469
00:18:45,590 --> 00:18:43,360
long i thought that my dream of being an

470
00:18:47,270 --> 00:18:45,600
astronaut was so unattainable but being

471
00:18:49,430 --> 00:18:47,280
here not only physically for the launch

472
00:18:51,750 --> 00:18:49,440
but also just in the presence of so many

473
00:18:53,430 --> 00:18:51,760
smart and talented individuals that not

474
00:18:54,950 --> 00:18:53,440
only worked on lucy but the people that

475
00:18:56,789 --> 00:18:54,960
watched the creation of lucy and

476
00:18:58,310 --> 00:18:56,799
followed up on the nasa news as well has

477
00:19:00,710 --> 00:18:58,320
just made me realize that all of my

478
00:19:02,390 --> 00:19:00,720
dreams are even closer to being reality

479
00:19:03,669 --> 00:19:02,400
than i realized

480
00:19:04,950 --> 00:19:03,679
i believe in both of you i think you

481
00:19:06,950 --> 00:19:04,960
both are going to accomplish some

482
00:19:08,549 --> 00:19:06,960
amazing things it gives me goosebumps

483
00:19:09,990 --> 00:19:08,559
listening to it so no this is really

484
00:19:11,510 --> 00:19:10,000
wonderful and you know it still just

485
00:19:13,190 --> 00:19:11,520
really blows my mind that there are

486
00:19:14,950 --> 00:19:13,200
students in middle school classrooms

487
00:19:16,870 --> 00:19:14,960
right now that could be taking part in

488
00:19:18,630 --> 00:19:16,880

lucy for kids that might be watching

489
00:19:20,549 --> 00:19:18,640
this you know what advice would you give

490
00:19:22,470 --> 00:19:20,559
them if they think that this might be an

491
00:19:23,909 --> 00:19:22,480
opportunity they want to pursue

492
00:19:25,270 --> 00:19:23,919
i think that's a great question i think

493
00:19:26,950 --> 00:19:25,280
it's a little hard to give advice

494
00:19:28,390 --> 00:19:26,960
especially because i'm so young myself

495
00:19:30,630 --> 00:19:28,400
um so i feel like i'm figuring it out

496
00:19:32,230 --> 00:19:30,640
most of the time but i will say that one

497
00:19:34,070 --> 00:19:32,240
thing that i've learned in my relatively

498
00:19:35,750 --> 00:19:34,080
short 21 years of life is that the

499
00:19:37,190 --> 00:19:35,760
environment that you're in really shapes

500
00:19:38,470 --> 00:19:37,200
the way that you think and it really

501
00:19:40,549 --> 00:19:38,480
shapes the way that you navigate the

502
00:19:42,390 --> 00:19:40,559
world so i would say to young kids if

503
00:19:43,909 --> 00:19:42,400
they're able to find a teacher or find a

504
00:19:46,390 --> 00:19:43,919
parent or find a friend's parent or a

505
00:19:47,830 --> 00:19:46,400
friend whoever just finding a group of

506
00:19:49,190 --> 00:19:47,840
people that are going to support you and

507
00:19:50,230 --> 00:19:49,200
your dreams and your passions and the

508
00:19:51,990 --> 00:19:50,240
people that are going to tell you to

509
00:19:53,110 --> 00:19:52,000
keep going even on rainy days they're

510
00:19:54,630 --> 00:19:53,120
going to remind you that the sun is

511
00:19:57,110 --> 00:19:54,640
going to come out again i feel like

512
00:19:58,710 --> 00:19:57,120
cultivating that type of community is

513
00:20:01,110 --> 00:19:58,720

extremely important as well as just

514
00:20:02,789 --> 00:20:01,120
making sure that you have people who

515
00:20:04,149 --> 00:20:02,799
teach you how to have grit and teach you

516
00:20:05,590 --> 00:20:04,159
how to have perseverance you know and

517
00:20:07,590 --> 00:20:05,600
just kind of keep you going even through

518
00:20:09,270 --> 00:20:07,600
the tough times because stem is

519
00:20:10,870 --> 00:20:09,280
very hard at times even though it's very

520
00:20:12,470 --> 00:20:10,880
rewarding um and i feel like i've

521
00:20:14,070 --> 00:20:12,480
definitely kind of had that in my own

522
00:20:16,549 --> 00:20:14,080
life i mean i never thought that i would

523
00:20:18,310 --> 00:20:16,559
be here talking for a nasa program i

524
00:20:19,909 --> 00:20:18,320
never thought that i would even have the

525
00:20:22,310 --> 00:20:19,919
opportunity to work at nasa's jet

526
00:20:23,830 --> 00:20:22,320
propulsion laboratory and here i am so i

527
00:20:25,510 --> 00:20:23,840
hope that young people are able to look

528
00:20:26,950 --> 00:20:25,520
up to me especially my young black girls

529
00:20:28,149 --> 00:20:26,960
i hope that they see themselves in me

530
00:20:29,990 --> 00:20:28,159
and know that if i made it they

531
00:20:31,350 --> 00:20:30,000
definitely can make it too yeah yeah

532
00:20:32,710 --> 00:20:31,360
it's good to have that support system

533
00:20:34,310 --> 00:20:32,720
well would you say that that's important

534
00:20:37,590 --> 00:20:34,320
definitely

535
00:20:39,430 --> 00:20:37,600
um being a latino and you know uh being

536
00:20:41,110 --> 00:20:39,440
in space is really important to me uh

537
00:20:42,390 --> 00:20:41,120
through the all space academy i have

538
00:20:43,669 --> 00:20:42,400

been able to

539
00:20:45,270 --> 00:20:43,679
get to know a lot of people in space

540
00:20:47,110 --> 00:20:45,280
such as will santiago and

541
00:20:49,350 --> 00:20:47,120
some some amazing people that come from

542
00:20:51,430 --> 00:20:49,360
puerto rico and other countries and i've

543
00:20:53,110 --> 00:20:51,440
also found a lot of support people that

544
00:20:54,870 --> 00:20:53,120
have allowed me to persevere and to move

545
00:20:56,950 --> 00:20:54,880
forward to achieve my goals being my

546
00:20:59,270 --> 00:20:56,960
mentors here and there and i think that

547
00:21:00,950 --> 00:20:59,280
the best advice is the one that she gave

548
00:21:03,350 --> 00:21:00,960
and it's you know to find people that

549
00:21:05,510 --> 00:21:03,360
have their same passions but also have

550
00:21:07,430 --> 00:21:05,520
different life experiences i found that

551
00:21:08,390 --> 00:21:07,440
when you have multi-disciplinary teams

552
00:21:10,870 --> 00:21:08,400
people that come from different

553
00:21:13,990 --> 00:21:10,880
countries different academic majors you

554
00:21:15,909 --> 00:21:14,000
will have a better team and a better

555
00:21:17,270 --> 00:21:15,919
product a better system a better mission

556
00:21:19,669 --> 00:21:17,280
and that is you know crucial for

557
00:21:21,830 --> 00:21:19,679
everything both in space and on earth

558
00:21:23,750 --> 00:21:21,840
and just to you know leave your your

559
00:21:26,070 --> 00:21:23,760
life and achieve your dreams and work

560
00:21:27,750 --> 00:21:26,080
for it every day yeah diversity

561
00:21:29,029 --> 00:21:27,760
different perspectives it's so important

562
00:21:30,390 --> 00:21:29,039
and i'm glad that both of you really

563
00:21:32,070 --> 00:21:30,400

pointed that out today so thank you so

564
00:21:33,029 --> 00:21:32,080
much for the great advice thank you for

565
00:21:35,590 --> 00:21:33,039
having me

566
00:21:37,510 --> 00:21:35,600
so lucy that's right and uh you know you

567
00:21:40,390 --> 00:21:37,520
heard them really think about it lucy is

568
00:21:41,750 --> 00:21:40,400
again a 12-year long mission so if

569
00:21:43,270 --> 00:21:41,760
you're an undergrad or if you're in high

570
00:21:45,909 --> 00:21:43,280
school or if you're even in middle

571
00:21:48,070 --> 00:21:45,919
school there might be an opportunity for

572
00:21:49,669 --> 00:21:48,080
you so look up at your screen right now

573
00:21:53,029 --> 00:21:49,679
take a look at what's on the screen it

574
00:21:55,430 --> 00:21:53,039
says the space.asu.edu

575
00:21:56,549 --> 00:21:55,440
check out that website again it's the

576
00:21:59,909 --> 00:21:56,559
letter l

577
00:22:02,950 --> 00:22:01,430
so launch tomorrow just the beginning

578
00:22:07,190 --> 00:22:02,960
right let's find out what happens to

579
00:22:09,190 --> 00:22:07,200
lucy after she lifts off the launch pad

580
00:22:11,350 --> 00:22:09,200
nasa's lucy mission is going to be the

581
00:22:13,750 --> 00:22:11,360
first mission to explore the trojan

582
00:22:16,149 --> 00:22:13,760
asteroids these are asteroids that live

583
00:22:17,990 --> 00:22:16,159
in two swarms one that's ahead of

584
00:22:20,070 --> 00:22:18,000
jupiter and another that's behind

585
00:22:22,149 --> 00:22:20,080
jupiter and we want to go and look at

586
00:22:23,990 --> 00:22:22,159
these building blocks of the planets the

587
00:22:26,230 --> 00:22:24,000
ones that didn't get accumulated into

588
00:22:28,789 --> 00:22:26,240

the planets to really learn about the

589
00:22:30,950 --> 00:22:28,799
evolution of our solar system

590
00:22:33,750 --> 00:22:30,960
early in the solar system the giant

591
00:22:36,870 --> 00:22:33,760
planets were migrating outward away from

592
00:22:38,710 --> 00:22:36,880
the sun and at one point there was chaos

593
00:22:41,110 --> 00:22:38,720
in the solar system some small bodies

594
00:22:43,350 --> 00:22:41,120
were ejected out of the solar system

595
00:22:46,149 --> 00:22:43,360
others could have been trapped in these

596
00:22:49,270 --> 00:22:46,159
lagrange points and that's one theory

597
00:22:51,510 --> 00:22:49,280
for how the trojan asteroids came to be

598
00:22:54,310 --> 00:22:51,520
where they are today

599
00:22:56,549 --> 00:22:54,320
lucy has three scientific instruments on

600
00:22:59,110 --> 00:22:56,559
board the spacecraft and we'll also be

601
00:23:00,310 --> 00:22:59,120
using two of the spacecraft's subsystems

602
00:23:02,470 --> 00:23:00,320
to contribute to the science

603
00:23:04,470 --> 00:23:02,480
investigation with the lori instrument

604
00:23:07,430 --> 00:23:04,480
we'll be able to get panchromatic images

605
00:23:09,430 --> 00:23:07,440
which will tell us about the geology and

606
00:23:11,669 --> 00:23:09,440
the crater history which gives us the

607
00:23:13,110 --> 00:23:11,679
age of the surface with the test

608
00:23:14,710 --> 00:23:13,120
instrument we'll be able to measure the

609
00:23:16,710 --> 00:23:14,720
temperature of the surface at different

610
00:23:19,110 --> 00:23:16,720
points and with the ralph instrument

611
00:23:20,710 --> 00:23:19,120
we'll be able to measure the composition

612
00:23:23,110 --> 00:23:20,720
of the surfaces

613
00:23:25,590 --> 00:23:23,120

we really have never seen

614
00:23:28,310 --> 00:23:25,600
trojan asteroids up close before and we

615
00:23:30,390 --> 00:23:28,320
want to understand their geology look at

616
00:23:32,789 --> 00:23:30,400
the craters on the surface to understand

617
00:23:34,710 --> 00:23:32,799
the history of their surfaces understand

618
00:23:36,630 --> 00:23:34,720
the composition of their surfaces so we

619
00:23:39,190 --> 00:23:36,640
can maybe learn something about where

620
00:23:41,909 --> 00:23:39,200
they formed and all of those will be

621
00:23:43,260 --> 00:23:41,919
clues to help us understand how the

622
00:23:47,430 --> 00:23:43,270
solar system evolved

623
00:23:49,750 --> 00:23:47,440
[Music]

624
00:23:51,830 --> 00:23:49,760
as promised i'm back with will and carly

625
00:23:53,750 --> 00:23:51,840
to answer some of your questions and you

626
00:23:55,750 --> 00:23:53,760
can actually keep the questions coming

627
00:23:58,310 --> 00:23:55,760
just remember again

628
00:23:59,830 --> 00:23:58,320
ask nasa or drop them in the comment box

629
00:24:01,350 --> 00:23:59,840
we have a team of people monitoring

630
00:24:03,430 --> 00:24:01,360
those so that we can get as many

631
00:24:05,590 --> 00:24:03,440
questions as possible during the show

632
00:24:07,510 --> 00:24:05,600
okay our first question you guys ready

633
00:24:09,669 --> 00:24:07,520
let's do it

634
00:24:12,149 --> 00:24:09,679
more enthusiasm

635
00:24:14,470 --> 00:24:12,159
gretel on facebook asks why is the

636
00:24:17,029 --> 00:24:14,480
mission named lucy that's a great

637
00:24:18,710 --> 00:24:17,039
question so most missions are acronyms

638
00:24:20,870 --> 00:24:18,720

or something like that this is just lucy

639
00:24:23,830 --> 00:24:20,880
it's a name and it's in reference to the

640
00:24:26,230 --> 00:24:23,840
hominid that was discovered in ethiopia

641
00:24:28,470 --> 00:24:26,240
by donald johansson and this fossil was

642
00:24:30,470 --> 00:24:28,480
really important to understand how

643
00:24:32,870 --> 00:24:30,480
humans have evolved right it was sort of

644
00:24:34,710 --> 00:24:32,880
a missing piece in that fossil record

645
00:24:36,149 --> 00:24:34,720
and lucy the spacecraft is going to go

646
00:24:38,070 --> 00:24:36,159
and look at these jupiter trojan

647
00:24:40,470 --> 00:24:38,080
asteroids and we think it's going to

648
00:24:43,190 --> 00:24:40,480
discover and understand these sort of

649
00:24:44,950 --> 00:24:43,200
fossils of solar system formation so

650
00:24:47,190 --> 00:24:44,960
it's a little bit of a sort of a nod

651
00:24:49,510 --> 00:24:47,200
towards the earth archaeology is we go

652
00:24:51,990 --> 00:24:49,520
and do our space archaeology yeah i love

653
00:24:54,230 --> 00:24:52,000
that tie and i think it's so appropriate

654
00:24:57,830 --> 00:24:54,240
we also have wendy on facebook what do

655
00:24:58,830 --> 00:24:57,840
you hope to learn from this mission

656
00:25:01,590 --> 00:24:58,840
so

657
00:25:02,950 --> 00:25:01,600
much we're going to these asteroids

658
00:25:05,110 --> 00:25:02,960
right because we've never been there

659
00:25:06,310 --> 00:25:05,120
before it's like going to a totally

660
00:25:07,350 --> 00:25:06,320
different world

661
00:25:09,350 --> 00:25:07,360
we're hoping to learn about the

662
00:25:11,990 --> 00:25:09,360
composition we have these instruments on

663
00:25:13,909 --> 00:25:12,000

board to give us that scientific data

664
00:25:15,669 --> 00:25:13,919
composition like things like the surface

665
00:25:16,789 --> 00:25:15,679
properties the the temperature of these

666
00:25:18,710 --> 00:25:16,799
asteroids

667
00:25:21,029 --> 00:25:18,720
potentially is their

668
00:25:22,070 --> 00:25:21,039
water ice uh or other types of exotic

669
00:25:23,669 --> 00:25:22,080
ices

670
00:25:25,590 --> 00:25:23,679
and that will tell us really about the

671
00:25:28,230 --> 00:25:25,600
whole solar system history and the

672
00:25:30,549 --> 00:25:28,240
formation where the asteroids form what

673
00:25:32,230 --> 00:25:30,559
those main ingredients were so early on

674
00:25:33,990 --> 00:25:32,240
you know four billion years ago in the

675
00:25:35,430 --> 00:25:34,000
formation of our solar system and why do

676
00:25:38,310 --> 00:25:35,440
you think it's so important to

677
00:25:39,990 --> 00:25:38,320
understand how our solar system forms

678
00:25:41,830 --> 00:25:40,000
it's part of our history right uh

679
00:25:43,430 --> 00:25:41,840
understanding how solar systems form

680
00:25:45,750 --> 00:25:43,440
what those ingredients that created our

681
00:25:47,590 --> 00:25:45,760
planets especially the outer planets

682
00:25:49,909 --> 00:25:47,600
it's like going back in time these these

683
00:25:51,510 --> 00:25:49,919
asteroids are time capsules right

684
00:25:53,590 --> 00:25:51,520
as carly mentioned you know discovering

685
00:25:55,590 --> 00:25:53,600
that fossil told us a lot about our

686
00:25:57,510 --> 00:25:55,600
human history right so understanding

687
00:25:59,990 --> 00:25:57,520
these asteroids will tell us about how

688
00:26:01,750 --> 00:26:00,000

solar systems form calibrate our models

689
00:26:03,909 --> 00:26:01,760
and potentially tell us how other solar

690
00:26:05,110 --> 00:26:03,919
systems form in our galaxy and beyond

691
00:26:07,750 --> 00:26:05,120
yeah there's a lot we can learn from

692
00:26:10,310 --> 00:26:07,760
lucy and abby on facebook asked will

693
00:26:12,310 --> 00:26:10,320
lucy have the ability to redirect or

694
00:26:14,789 --> 00:26:12,320
make course adjustments should there be

695
00:26:16,870 --> 00:26:14,799
any unforeseen object or hazard once

696
00:26:17,750 --> 00:26:16,880
separated from the atlas and in full

697
00:26:19,750 --> 00:26:17,760
flight

698
00:26:21,029 --> 00:26:19,760
that's a great question um so we are

699
00:26:23,110 --> 00:26:21,039
going to a region of space that we've

700
00:26:24,789 --> 00:26:23,120
not explored before so of course that

701
00:26:27,110 --> 00:26:24,799
whenever you explore somewhere new there

702
00:26:28,630 --> 00:26:27,120
are some hazards we've been looking at

703
00:26:30,230 --> 00:26:28,640
this region of space since lucy was

704
00:26:32,390 --> 00:26:30,240
selected with the best telescopes we

705
00:26:34,950 --> 00:26:32,400
have so we think we have an idea of what

706
00:26:37,029 --> 00:26:34,960
the risks are um as well mentioned we

707
00:26:39,750 --> 00:26:37,039
had these enormous solar panels and so

708
00:26:41,590 --> 00:26:39,760
moving that sort of big mass is going to

709
00:26:43,830 --> 00:26:41,600
be really difficult so there are things

710
00:26:45,830 --> 00:26:43,840
that we can do we will be looking ahead

711
00:26:47,430 --> 00:26:45,840
with our camera systems um to see if

712
00:26:48,630 --> 00:26:47,440
there's anything but it is going to be

713
00:26:56,390 --> 00:26:48,640

difficult we're not going to be doing a

714
00:26:59,669 --> 00:26:57,830
and actually a follow-up to that will

715
00:27:01,430 --> 00:26:59,679
lucy be able to adjust to different

716
00:27:03,269 --> 00:27:01,440
target asteroids is that the same thing

717
00:27:06,070 --> 00:27:03,279
like the way that she can't change her

718
00:27:07,669 --> 00:27:06,080
trajectory in a wide way like you can't

719
00:27:09,350 --> 00:27:07,679
make those little adjustments to maybe

720
00:27:11,110 --> 00:27:09,360
add in more asteroids

721
00:27:13,269 --> 00:27:11,120
so the nominal missions already been set

722
00:27:15,430 --> 00:27:13,279
so the next 12 years uh we know what

723
00:27:16,950 --> 00:27:15,440
targets we're gonna see the the bonus

724
00:27:18,630 --> 00:27:16,960
asteroids might come in if we discover

725
00:27:20,870 --> 00:27:18,640
maybe some of them have moons and we've

726
00:27:23,510 --> 00:27:20,880
already done that once europates which

727
00:27:25,029 --> 00:27:23,520
is lucy's first target has a moon

728
00:27:27,269 --> 00:27:25,039
discovered that only a few years ago

729
00:27:29,430 --> 00:27:27,279
conquita and so we'll when we fly past

730
00:27:31,269 --> 00:27:29,440
europe 80s we get a bonus moon so maybe

731
00:27:33,269 --> 00:27:31,279
we will be seeing more asteroids up

732
00:27:34,870 --> 00:27:33,279
close if they have moons after our

733
00:27:37,190 --> 00:27:34,880
nominal mission if everything works

734
00:27:39,029 --> 00:27:37,200
we'll be applying i'm sure for to see

735
00:27:41,190 --> 00:27:39,039
more asteroids and they'll we'll do some

736
00:27:43,269 --> 00:27:41,200
maneuvers called tcm's trajectory

737
00:27:44,870 --> 00:27:43,279
correction maneuvers to allow us to do

738
00:27:46,870 --> 00:27:44,880

other flybys but whenever you do that

739
00:27:48,549 --> 00:27:46,880
you burn fuel and so that's a limited

740
00:27:50,070 --> 00:27:48,559
resource we're very careful with that

741
00:27:52,630 --> 00:27:50,080
gotcha gotcha that was a good question

742
00:27:54,789 --> 00:27:52,640
though and uh carol on facebook asks the

743
00:27:56,549 --> 00:27:54,799
dedications on lucy to the people who

744
00:27:58,630 --> 00:27:56,559
have been so involved with the project

745
00:28:01,190 --> 00:27:58,640
are very touching and bring everything

746
00:28:02,870 --> 00:28:01,200
back to the human scale do you do this

747
00:28:05,750 --> 00:28:02,880
on every mission

748
00:28:07,430 --> 00:28:05,760
um we try to uh yes that there's a legos

749
00:28:09,510 --> 00:28:07,440
for example on the juno spacecraft

750
00:28:11,510 --> 00:28:09,520
representing the goddesses and the gods

751
00:28:13,110 --> 00:28:11,520
um we try to uh make it fun right you

752
00:28:15,029 --> 00:28:13,120
know these are these are human missions

753
00:28:16,710 --> 00:28:15,039
uh to us right they're robotic missions

754
00:28:18,549 --> 00:28:16,720
but they're human missions people spend

755
00:28:20,549 --> 00:28:18,559
their careers on this right so we're

756
00:28:22,149 --> 00:28:20,559
trying to make lucy this this cool time

757
00:28:24,630 --> 00:28:22,159
capsule that maybe the next generation

758
00:28:26,710 --> 00:28:24,640
can find orbiting you know that awesome

759
00:28:29,190 --> 00:28:26,720
beautiful orbit that is part science

760
00:28:31,430 --> 00:28:29,200
part luck it's for art

761
00:28:33,430 --> 00:28:31,440
so it's amazing you know we we we like

762
00:28:35,190 --> 00:28:33,440
to have fun and we like it's an amazing

763
00:28:37,029 --> 00:28:35,200

team and we're really proud to be part

764
00:28:38,549 --> 00:28:37,039
of it yeah absolutely guys i'm so

765
00:28:41,269 --> 00:28:38,559
excited for you to get to see this come

766
00:28:43,669 --> 00:28:41,279
to fruition after so much hard work so

767
00:28:45,830 --> 00:28:43,679
judy on facebook asks what is the

768
00:28:47,350 --> 00:28:45,840
timeliness for data being transmitted

769
00:28:49,269 --> 00:28:47,360
back to be analyzed we have a

770
00:28:51,350 --> 00:28:49,279
seven-year-old granddaughter named lucy

771
00:28:53,269 --> 00:28:51,360
that's amazing who is eagerly following

772
00:28:55,190 --> 00:28:53,279
this mission as she should obviously

773
00:28:57,029 --> 00:28:55,200
absolutely so yeah what's the time limit

774
00:28:58,710 --> 00:28:57,039
that you might get some data back so the

775
00:29:01,029 --> 00:28:58,720
quick answer is it depends where we are

776
00:29:03,269 --> 00:29:01,039
in the orbit so lucy launches and then

777
00:29:04,950 --> 00:29:03,279
we do two earth gravity assists so when

778
00:29:06,789 --> 00:29:04,960
we're very close to the earth it's very

779
00:29:08,470 --> 00:29:06,799
quick to get data down of course the

780
00:29:10,630 --> 00:29:08,480
further we go the longer it's going to

781
00:29:12,149 --> 00:29:10,640
take to to get that data down so as we

782
00:29:13,990 --> 00:29:12,159
move through the jupiter's trojan

783
00:29:16,950 --> 00:29:14,000
asteroids it's going to be even a little

784
00:29:19,669 --> 00:29:16,960
bit longer but it's it's quick by outer

785
00:29:21,909 --> 00:29:19,679
solar system standards so uh we'll be

786
00:29:23,269 --> 00:29:21,919
getting probably images of earth's moon

787
00:29:24,789 --> 00:29:23,279
during those gravity assists we're

788
00:29:26,630 --> 00:29:24,799

planning them right now so that'll be

789
00:29:27,909 --> 00:29:26,640
down within the next year so we're

790
00:29:29,430 --> 00:29:27,919
expecting there to be a little bit of a

791
00:29:31,350 --> 00:29:29,440
delay it does take time to bring the

792
00:29:33,190 --> 00:29:31,360
data down but we'll be starting seeing

793
00:29:35,990 --> 00:29:33,200
data from next year throughout the

794
00:29:38,470 --> 00:29:36,000
mission oh wow that's amazing shazaar on

795
00:29:40,789 --> 00:29:38,480
youtube asks what do you expect to find

796
00:29:42,310 --> 00:29:40,799
out about how the planet's formed any

797
00:29:44,149 --> 00:29:42,320
guesses

798
00:29:46,389 --> 00:29:44,159
so we're going to learn a lot about the

799
00:29:48,389 --> 00:29:46,399
composition and that's going to tell us

800
00:29:50,470 --> 00:29:48,399
sort of a lot about the

801
00:29:52,310 --> 00:29:50,480
what was available in that region of

802
00:29:54,149 --> 00:29:52,320
space when these bodies formed they're

803
00:29:55,510 --> 00:29:54,159
pristine objects they haven't changed we

804
00:29:58,149 --> 00:29:55,520
think since they're

805
00:29:59,669 --> 00:29:58,159
they were formed and so the only things

806
00:30:01,909 --> 00:29:59,679
that they have to be formed out of is

807
00:30:03,990 --> 00:30:01,919
what was in space when they formed

808
00:30:05,590 --> 00:30:04,000
there's two ideas one is that they form

809
00:30:08,389 --> 00:30:05,600
deep out in our solar system in the

810
00:30:10,389 --> 00:30:08,399
kuiper belt so think pluto right a very

811
00:30:13,190 --> 00:30:10,399
very long way and then there was this

812
00:30:14,710 --> 00:30:13,200
whole like cosmic billiards game and and

813
00:30:17,190 --> 00:30:14,720

they got kicked into the inner solar

814
00:30:19,269 --> 00:30:17,200
system and captured by jupiter so we

815
00:30:20,549 --> 00:30:19,279
might be seeing ices that are that are

816
00:30:22,630 --> 00:30:20,559
more similar to what we see in the

817
00:30:24,470 --> 00:30:22,640
kuiper belt or maybe they formed where

818
00:30:26,310 --> 00:30:24,480
jupiter is now we'll be seeing

819
00:30:29,110 --> 00:30:26,320
compositions that is a lot more similar

820
00:30:31,110 --> 00:30:29,120
to say jupiter's own moons so one of the

821
00:30:32,310 --> 00:30:31,120
things is just learning what what

822
00:30:34,549 --> 00:30:32,320
they're made from and that's going to be

823
00:30:36,149 --> 00:30:34,559
really exciting yeah the unknown right

824
00:30:38,789 --> 00:30:36,159
that's what we're actually

825
00:30:40,950 --> 00:30:38,799
that's a tall order to figure out

826
00:30:43,430 --> 00:30:40,960
abby on facebook nasa has an incredible

827
00:30:45,750 --> 00:30:43,440
track record of rover rovers orbiters

828
00:30:48,149 --> 00:30:45,760
etc still being operational past the

829
00:30:49,990 --> 00:30:48,159
prime mission are there plans for lucy

830
00:30:51,590 --> 00:30:50,000
should this be the case once all the

831
00:30:53,430 --> 00:30:51,600
target asteroids have been studied

832
00:30:54,710 --> 00:30:53,440
that's a question for you yeah here's

833
00:30:56,470 --> 00:30:54,720
the amazing thing about the lucy

834
00:30:57,509 --> 00:30:56,480
trajectory right it's it's part lock bar

835
00:30:58,630 --> 00:30:57,519
accident

836
00:31:01,269 --> 00:30:58,640
but it's going to be in the stable

837
00:31:04,549 --> 00:31:01,279
orbits between the trojans and on earth

838
00:31:06,950 --> 00:31:04,559

for millions of years right so depends

839
00:31:08,310 --> 00:31:06,960
on the systems right as you mentioned a

840
00:31:09,909 --> 00:31:08,320
lot of the missions get extended so

841
00:31:11,990 --> 00:31:09,919
we'll evaluate if are there target

842
00:31:13,430 --> 00:31:12,000
opportunities do we have enough fuel on

843
00:31:15,750 --> 00:31:13,440
board are there systems okay are there

844
00:31:17,590 --> 00:31:15,760
instruments working as expected uh this

845
00:31:19,110 --> 00:31:17,600
is a long journey right we're super

846
00:31:21,909 --> 00:31:19,120
excited we're going to be operating lucy

847
00:31:23,029 --> 00:31:21,919
for 12 years so we'll see at that time

848
00:31:24,310 --> 00:31:23,039
we're looking forward to the science

849
00:31:25,750 --> 00:31:24,320
that we get back yeah i think you

850
00:31:27,909 --> 00:31:25,760
mentioned earlier you know it might just

851
00:31:29,350 --> 00:31:27,919
be cool for somebody years and years and

852
00:31:31,350 --> 00:31:29,360
years from now to find it like as

853
00:31:33,029 --> 00:31:31,360
something that just is representative of

854
00:31:33,909 --> 00:31:33,039
the early space exploration we're doing

855
00:31:35,669 --> 00:31:33,919
now

856
00:31:39,029 --> 00:31:35,679
sock fibo on youtube

857
00:31:41,350 --> 00:31:39,039
why does the lucy mission take so long

858
00:31:42,950 --> 00:31:41,360
so out of solar system science takes a

859
00:31:44,389 --> 00:31:42,960
long time and anyone that's worked in

860
00:31:46,149 --> 00:31:44,399
the other solar system knows you have to

861
00:31:48,549 --> 00:31:46,159
learn patience it took nine years for

862
00:31:50,230 --> 00:31:48,559
new horizons to get to pluto so six

863
00:31:52,149 --> 00:31:50,240

years isn't actually too bad by other

864
00:31:54,470 --> 00:31:52,159
solar system um

865
00:31:55,990 --> 00:31:54,480
time scales but we just we just learned

866
00:31:57,590 --> 00:31:56,000
things are a long way away and it just

867
00:31:59,269 --> 00:31:57,600
takes time to get to them you know

868
00:32:00,630 --> 00:31:59,279
obviously the quicker you go the quicker

869
00:32:02,789 --> 00:32:00,640
you get there but then the faster your

870
00:32:04,310 --> 00:32:02,799
flybys are so there's a trade between

871
00:32:06,310 --> 00:32:04,320
how quick you want to go how quick you

872
00:32:08,070 --> 00:32:06,320
want to get there but also how slow you

873
00:32:09,750 --> 00:32:08,080
want to go you want to see the things as

874
00:32:11,990 --> 00:32:09,760
you pass them right so there's a little

875
00:32:13,509 --> 00:32:12,000
bit of a trade space there too right

876
00:32:15,190 --> 00:32:13,519
philip on youtube wants to know what

877
00:32:17,029 --> 00:32:15,200
time is lift off and i do also want to

878
00:32:18,549 --> 00:32:17,039
take this opportunity to talk about what

879
00:32:19,830 --> 00:32:18,559
if there's a scrub tomorrow it doesn't

880
00:32:21,430 --> 00:32:19,840
look like it honestly the weather looks

881
00:32:22,870 --> 00:32:21,440
fantastic tomorrow but what if there's a

882
00:32:24,950 --> 00:32:22,880
scrub you know what are the

883
00:32:27,750 --> 00:32:24,960
opportunities to launch yeah so uh we'll

884
00:32:29,669 --> 00:32:27,760
be launching at 5 34 uh eastern time the

885
00:32:31,509 --> 00:32:29,679
window is about an hour long

886
00:32:33,750 --> 00:32:31,519
but we have the opportunity uh for the

887
00:32:35,669 --> 00:32:33,760
next 23 days starting tomorrow to launch

888
00:32:37,830 --> 00:32:35,679

lucy and the importance there is the

889
00:32:39,909 --> 00:32:37,840
energy of the rocket to get us into that

890
00:32:41,269 --> 00:32:39,919
right awesome trajectory to go visit all

891
00:32:43,430 --> 00:32:41,279
these trojans

892
00:32:45,509 --> 00:32:43,440
so hopefully the weather's super awesome

893
00:32:47,669 --> 00:32:45,519
tomorrow we're ready to see it go the

894
00:32:50,470 --> 00:32:47,679
rocket's doing great the spacecraft it's

895
00:32:51,430 --> 00:32:50,480
doing amazing um but yeah we have 23

896
00:32:55,430 --> 00:32:51,440
days

897
00:32:57,029 --> 00:32:55,440
that opportunity doesn't happen we we

898
00:32:58,389 --> 00:32:57,039
have an opportunity about a year from

899
00:32:59,830 --> 00:32:58,399
now okay gotcha so there are

900
00:33:01,509 --> 00:32:59,840
opportunities but i'm really keeping my

901
00:33:02,630 --> 00:33:01,519
fingers crossed for tomorrow right well

902
00:33:05,269 --> 00:33:02,640
everybody is

903
00:33:07,430 --> 00:33:05,279
absolutely isaiah on facebook how do you

904
00:33:09,669 --> 00:33:07,440
get the gasoline to stay preserved on

905
00:33:11,669 --> 00:33:09,679
the long journey yeah so we have we have

906
00:33:14,310 --> 00:33:11,679
quite a few uh quite a bit of fuel on

907
00:33:16,470 --> 00:33:14,320
board it's uh about the half of the mass

908
00:33:18,870 --> 00:33:16,480
of the spacecraft and we need that fuel

909
00:33:20,789 --> 00:33:18,880
to to target the the earth right and

910
00:33:22,789 --> 00:33:20,799
target the trajectory as we're going out

911
00:33:24,710 --> 00:33:22,799
there uh but the fuel is liquid it's

912
00:33:26,470 --> 00:33:24,720
almost like a little bit like water so

913
00:33:27,509 --> 00:33:26,480

we have to keep it above freezing all

914
00:33:29,509 --> 00:33:27,519
the time

915
00:33:31,110 --> 00:33:29,519
so we maintain it with electric heaters

916
00:33:33,029 --> 00:33:31,120
and blanket and insulation space is

917
00:33:35,110 --> 00:33:33,039
really cold but we also have to maintain

918
00:33:37,269 --> 00:33:35,120
it cool so we get a little bit close to

919
00:33:39,669 --> 00:33:37,279
the sun so the spacecraft is designed to

920
00:33:42,149 --> 00:33:39,679
manage all that balance of energy coming

921
00:33:44,630 --> 00:33:42,159
in and out as close as we get to the sun

922
00:33:46,470 --> 00:33:44,640
and as far away as we're going uh to the

923
00:33:48,070 --> 00:33:46,480
trojan uh distance

924
00:33:49,430 --> 00:33:48,080
i'm sorry you figured all of that out in

925
00:33:50,710 --> 00:33:49,440
14 months that you built this thing

926
00:33:52,630 --> 00:33:50,720
during a pandemic is that what you're

927
00:33:54,630 --> 00:33:52,640
just telling me right now

928
00:33:55,830 --> 00:33:54,640
that's amazing i mean the solar arrays

929
00:33:57,350 --> 00:33:55,840
and then just even that was a great

930
00:33:59,509 --> 00:33:57,360
question because i didn't even think

931
00:34:01,590 --> 00:33:59,519
about that yeah it took a lot of team

932
00:34:03,990 --> 00:34:01,600
effort to pull lucy together in these 14

933
00:34:05,509 --> 00:34:04,000
months and it was a challenge right we

934
00:34:07,509 --> 00:34:05,519
had to keep the team safe protect

935
00:34:09,030 --> 00:34:07,519
everybody so it's amazing amazing team

936
00:34:10,550 --> 00:34:09,040
effort and an honor to be part of it

937
00:34:13,030 --> 00:34:10,560
yeah high five

938
00:34:15,510 --> 00:34:13,040

good job all right caleb on twitter is

939
00:34:17,669 --> 00:34:15,520
there any form of geological activity on

940
00:34:20,069 --> 00:34:17,679
asteroids it's a great question and the

941
00:34:22,869 --> 00:34:20,079
answer is we don't really know so of

942
00:34:24,950 --> 00:34:22,879
course uh we saw bennu up close with

943
00:34:26,790 --> 00:34:24,960
osiris-rex and it it looked like there

944
00:34:27,750 --> 00:34:26,800
were some things flying off of it but we

945
00:34:29,589 --> 00:34:27,760
we sort of think that might be

946
00:34:31,909 --> 00:34:29,599
meteorites coming in and making things

947
00:34:33,510 --> 00:34:31,919
play off so not activity from the core

948
00:34:34,629 --> 00:34:33,520
but sort of a response to being

949
00:34:35,829 --> 00:34:34,639
bombarded

950
00:34:37,510 --> 00:34:35,839
but that's one of the things we're going

951
00:34:39,589 --> 00:34:37,520
to be looking for and we actually have a

952
00:34:42,149 --> 00:34:39,599
working group dedicated to looking for

953
00:34:44,389 --> 00:34:42,159
activity from these um so we don't think

954
00:34:46,629 --> 00:34:44,399
so but if there is ice on there maybe

955
00:34:48,629 --> 00:34:46,639
and maybe that is slowly sublimating

956
00:34:50,230 --> 00:34:48,639
away and being lost to space so we'll

957
00:34:52,230 --> 00:34:50,240
find out we'll let you know in six years

958
00:34:53,430 --> 00:34:52,240
okay in six years yes nobody asked me

959
00:34:55,109 --> 00:34:53,440
what i'm going to be doing in 60 i don't

960
00:34:57,510 --> 00:34:55,119
have an answer as good as the students

961
00:35:00,390 --> 00:34:57,520
there though all right haiti on facebook

962
00:35:02,630 --> 00:35:00,400
where is lucy going on its long journey

963
00:35:04,069 --> 00:35:02,640

that's a great question so it's going to

964
00:35:05,750 --> 00:35:04,079
launch from the earth and then we do

965
00:35:07,349 --> 00:35:05,760
some gravity assist so it'll basically

966
00:35:09,349 --> 00:35:07,359
come back to the earth in about a year's

967
00:35:10,470 --> 00:35:09,359
time and then in three years time and

968
00:35:12,310 --> 00:35:10,480
that just gives it a little bit more

969
00:35:14,630 --> 00:35:12,320
energy we're going to be going faster

970
00:35:16,630 --> 00:35:14,640
and then we spin it out to jupiter so we

971
00:35:18,550 --> 00:35:16,640
go through the main belt

972
00:35:21,190 --> 00:35:18,560
which is the asteroids that we normally

973
00:35:23,829 --> 00:35:21,200
think of so that the asteroids between

974
00:35:25,829 --> 00:35:23,839
mars and jupiter and we see an asteroid

975
00:35:27,990 --> 00:35:25,839
there called johnno johansson that gives

976
00:35:29,510 --> 00:35:28,000
us a little bit of sort of a a test for

977
00:35:31,510 --> 00:35:29,520
all of our instruments we'll be able to

978
00:35:33,829 --> 00:35:31,520
take images and just kind of get our

979
00:35:36,470 --> 00:35:33,839
sequencing down and then we're going to

980
00:35:37,990 --> 00:35:36,480
move into the l4 swarm which is really

981
00:35:39,510 --> 00:35:38,000
where we get into the jovian asteroids

982
00:35:40,790 --> 00:35:39,520
in about six years is that what we're

983
00:35:42,550 --> 00:35:40,800
approaching right now that we see in

984
00:35:44,870 --> 00:35:42,560
that video so we're going to be going

985
00:35:47,030 --> 00:35:44,880
past our first set of targets in the l4

986
00:35:48,790 --> 00:35:47,040
swarm and then we're going to loop back

987
00:35:51,030 --> 00:35:48,800
past the earth we do another earth

988
00:35:52,470 --> 00:35:51,040

gravity assist which is actually great

989
00:35:53,670 --> 00:35:52,480
for a deep space mission because we're

990
00:35:55,510 --> 00:35:53,680
going to be able to spend that time

991
00:35:56,950 --> 00:35:55,520
downlinking all our data it

992
00:35:58,390 --> 00:35:56,960
traditionally takes a long time to

993
00:36:00,630 --> 00:35:58,400
downlink data from the outer solar

994
00:36:02,870 --> 00:36:00,640
system but the closer you are to earth

995
00:36:05,109 --> 00:36:02,880
that the higher your you know telemetry

996
00:36:06,790 --> 00:36:05,119
rates are and then we'll swing use that

997
00:36:09,109 --> 00:36:06,800
gravity assist to swing into the l5

998
00:36:13,109 --> 00:36:09,119
swarm and do our final set of flybys

999
00:36:16,150 --> 00:36:13,119
which is um of two binaries so a binary

1000
00:36:18,150 --> 00:36:16,160
pair so two um equally sized or nearly

1001
00:36:19,910 --> 00:36:18,160
equally sized objects that are circling

1002
00:36:21,270 --> 00:36:19,920
a sort of central point and those will

1003
00:36:23,109 --> 00:36:21,280
be the last targets of the nominal

1004
00:36:24,630 --> 00:36:23,119
mission but like we'll said fingers

1005
00:36:26,470 --> 00:36:24,640
crossed we'll be doing this for a while

1006
00:36:27,990 --> 00:36:26,480
yet yeah i mean it's such a complex

1007
00:36:29,670 --> 00:36:28,000
trajectory and i think that video

1008
00:36:31,109 --> 00:36:29,680
actually really simplifies it very well

1009
00:36:32,630 --> 00:36:31,119
for people to understand so i'm glad we

1010
00:36:36,310 --> 00:36:32,640
also had that to look at

1011
00:36:38,470 --> 00:36:36,320
okay leica on 65 on youtube when does

1012
00:36:39,589 --> 00:36:38,480
lucy meet up with the first asteroid on

1013
00:36:40,630 --> 00:36:39,599

its mission we kind of touched on that

1014
00:36:43,030 --> 00:36:40,640
but can you tell us a little more on

1015
00:36:44,790 --> 00:36:43,040
that yeah so so uh as carly mentioned we

1016
00:36:46,310 --> 00:36:44,800
have that practice right we want to test

1017
00:36:48,870 --> 00:36:46,320
out all the instruments all the systems

1018
00:36:50,710 --> 00:36:48,880
of the spacecraft in 2025 on that donald

1019
00:36:52,150 --> 00:36:50,720
johan sinastro which is in in our main

1020
00:36:54,870 --> 00:36:52,160
belt asteroid

1021
00:36:56,710 --> 00:36:54,880
the first encounter is actually on 2027

1022
00:36:58,870 --> 00:36:56,720
and from there we follow up in a few

1023
00:37:02,470 --> 00:36:58,880
months uh with the next uh asteroids in

1024
00:37:05,750 --> 00:37:02,480
that first l4 l4 swarm and then the last

1025
00:37:07,910 --> 00:37:05,760
one it's march 3rd 2033. so that's why

1026
00:37:09,270 --> 00:37:07,920
it takes so long it's as carly mentioned

1027
00:37:10,790 --> 00:37:09,280
long distances that we're going but

1028
00:37:13,589 --> 00:37:10,800
we're really excited to get that science

1029
00:37:15,829 --> 00:37:13,599
back awesome nelson on youtube what is

1030
00:37:18,069 --> 00:37:15,839
the possibility of lucy finding new

1031
00:37:18,870 --> 00:37:18,079
asteroids that our telescopes have not

1032
00:37:20,950 --> 00:37:18,880
seen

1033
00:37:22,950 --> 00:37:20,960
it's a great question so one of the

1034
00:37:24,390 --> 00:37:22,960
things although telescopes on the

1035
00:37:26,310 --> 00:37:24,400
spacecraft aren't as big as the ground

1036
00:37:28,790 --> 00:37:26,320
we're obviously a lot closer and we'll

1037
00:37:30,310 --> 00:37:28,800
be doing scans of this guy to just look

1038
00:37:31,510 --> 00:37:30,320

for that look for hazards look to see

1039
00:37:33,589 --> 00:37:31,520
whether there's anything out there that

1040
00:37:35,430 --> 00:37:33,599
we can't see right now so there's a

1041
00:37:37,430 --> 00:37:35,440
really good chance we'll find more every

1042
00:37:39,190 --> 00:37:37,440
mission i think that's gone to any

1043
00:37:41,190 --> 00:37:39,200
system ever has discovered new things

1044
00:37:42,390 --> 00:37:41,200
and i expect lucy to be the same yeah

1045
00:37:45,589 --> 00:37:42,400
absolutely

1046
00:37:48,950 --> 00:37:45,599
pure spartan 157 on youtube does the

1047
00:37:52,230 --> 00:37:48,960
atlas 5 use a kickstage to get lucy into

1048
00:37:54,390 --> 00:37:52,240
an interplanetary orbit if not what is

1049
00:37:56,470 --> 00:37:54,400
the propulsion system that is being used

1050
00:37:58,630 --> 00:37:56,480
for the lucy mission

1051
00:38:00,790 --> 00:37:58,640
yeah so the the lucy spacecraft has

1052
00:38:03,910 --> 00:38:00,800
quite a bit of fuel onboard a chemical

1053
00:38:06,150 --> 00:38:03,920
system hydrazine and nitrogen hydroxide

1054
00:38:07,990 --> 00:38:06,160
uh the ls5 doesn't have the standard srb

1055
00:38:09,829 --> 00:38:08,000
boosters that that we typically need uh

1056
00:38:11,910 --> 00:38:09,839
it has enough energy to get us you know

1057
00:38:14,230 --> 00:38:11,920
that that high speed uh to get us on our

1058
00:38:16,230 --> 00:38:14,240
way um and that's why we're using the

1059
00:38:18,630 --> 00:38:16,240
gravity assist right uh we need that

1060
00:38:20,390 --> 00:38:18,640
boost from the earth we just don't have

1061
00:38:22,950 --> 00:38:20,400
enough energy on the launch vehicle to

1062
00:38:24,630 --> 00:38:22,960
get us that far um so as carly mentioned

1063
00:38:25,990 --> 00:38:24,640

we'll be doing those two gravity assists

1064
00:38:27,990 --> 00:38:26,000
and that will get us on our way and

1065
00:38:30,230 --> 00:38:28,000
energize the orbit uh all the way to the

1066
00:38:33,349 --> 00:38:30,240
trojans yeah that's fantastic

1067
00:38:35,510 --> 00:38:33,359
wynton ashley on youtube asks is lucy

1068
00:38:37,829 --> 00:38:35,520
going to bring back samples

1069
00:38:39,670 --> 00:38:37,839
no it won't so this is purely remote so

1070
00:38:41,829 --> 00:38:39,680
you could think of it as like flying by

1071
00:38:43,750 --> 00:38:41,839
taking pictures taking images but not

1072
00:38:45,910 --> 00:38:43,760
stopping we're going to be doing eight

1073
00:38:48,390 --> 00:38:45,920
targets as we've already discussed and

1074
00:38:49,910 --> 00:38:48,400
you can't stop start and carry on that's

1075
00:38:51,109 --> 00:38:49,920
very hard to do in space so we'll be

1076
00:38:53,270 --> 00:38:51,119
flying by

1077
00:38:54,870 --> 00:38:53,280
doing as much science as we can during

1078
00:38:57,750 --> 00:38:54,880
that encounter but then on to the next

1079
00:38:59,910 --> 00:38:57,760
target yeah okay andrea on facebook are

1080
00:39:02,230 --> 00:38:59,920
there any specific organic compounds

1081
00:39:04,310 --> 00:39:02,240
that nasa will look for on the asteroids

1082
00:39:06,310 --> 00:39:04,320
specifically anything associated with

1083
00:39:08,470 --> 00:39:06,320
the origins of life maybe

1084
00:39:10,230 --> 00:39:08,480
so we will there's an instrument called

1085
00:39:12,710 --> 00:39:10,240
lisa that enables us to look at the

1086
00:39:15,349 --> 00:39:12,720
chemical uh signatures the chemical

1087
00:39:18,069 --> 00:39:15,359
footprints of different species and so

1088
00:39:20,550 --> 00:39:18,079

it's been tuned to be sensitive to the

1089
00:39:22,230 --> 00:39:20,560
carbon band so we will be able to tell

1090
00:39:23,910 --> 00:39:22,240
different types of compounds on the

1091
00:39:26,310 --> 00:39:23,920
surface we think there might be things

1092
00:39:30,950 --> 00:39:26,320
like ammonia so and there might be

1093
00:39:33,109 --> 00:39:30,960
uh other organic ices and um exotic ices

1094
00:39:34,870 --> 00:39:33,119
we don't really know they're very hard

1095
00:39:36,870 --> 00:39:34,880
to look at from the earth because

1096
00:39:38,630 --> 00:39:36,880
they're dark they're a long way away and

1097
00:39:40,150 --> 00:39:38,640
to look through the earth's atmosphere

1098
00:39:41,190 --> 00:39:40,160
you're also you know you've got to take

1099
00:39:42,870 --> 00:39:41,200
all the water out and all the other

1100
00:39:45,190 --> 00:39:42,880
things so we'll finally be able to

1101
00:39:47,270 --> 00:39:45,200
really see at high spatial resolutions

1102
00:39:49,109 --> 00:39:47,280
what the ice is what the minerals and

1103
00:39:51,030 --> 00:39:49,119
what the rocks are made of so we'll

1104
00:39:52,470 --> 00:39:51,040
we'll know a lot more when we get there

1105
00:39:54,390 --> 00:39:52,480
yeah i just think it's fascinating that

1106
00:39:56,150 --> 00:39:54,400
lucy is going to find out a lot of

1107
00:39:57,750 --> 00:39:56,160
information and we're not even landing

1108
00:39:59,589 --> 00:39:57,760
on any of these asteroids we're just

1109
00:40:00,870 --> 00:39:59,599
flying by them but also a very high rate

1110
00:40:02,390 --> 00:40:00,880
of speed right

1111
00:40:04,710 --> 00:40:02,400
yeah it's uh

1112
00:40:05,670 --> 00:40:04,720
15 000 miles per hour

1113
00:40:08,790 --> 00:40:05,680

right

1114
00:40:10,390 --> 00:40:08,800
we're about 620 miles on average from

1115
00:40:11,910 --> 00:40:10,400
these asteroids but everything happens

1116
00:40:14,390 --> 00:40:11,920
so fast you know if you look at that

1117
00:40:16,870 --> 00:40:14,400
12-year mission most of the observations

1118
00:40:19,109 --> 00:40:16,880
and the science happens in that 24 hours

1119
00:40:21,589 --> 00:40:19,119
out of 12 years so it's it's really

1120
00:40:23,030 --> 00:40:21,599
exciting um you know uh we're excited to

1121
00:40:25,030 --> 00:40:23,040
point the instruments and get that

1122
00:40:26,309 --> 00:40:25,040
initial data back great great we have

1123
00:40:27,910 --> 00:40:26,319
some practice so there's a lot of the

1124
00:40:30,550 --> 00:40:27,920
team that are involved in new horizons

1125
00:40:32,550 --> 00:40:30,560
new horizons flew past pluto and arikos

1126
00:40:35,349 --> 00:40:32,560
so we we have some great expertise on

1127
00:40:37,190 --> 00:40:35,359
the team that know on a high speed flyby

1128
00:40:39,030 --> 00:40:37,200
of an asteroid how to take the perfect

1129
00:40:40,710 --> 00:40:39,040
picture yeah and so we'll be we'll be

1130
00:40:42,630 --> 00:40:40,720
utilizing all of that knowledge all of

1131
00:40:44,550 --> 00:40:42,640
that heritage to make sure lucy returns

1132
00:40:46,230 --> 00:40:44,560
the best data it can that's great that's

1133
00:40:48,150 --> 00:40:46,240
great and then david on twitter are

1134
00:40:50,550 --> 00:40:48,160
there clusters of asteroids at other

1135
00:40:51,990 --> 00:40:50,560
lagrange points of jupiter and i think

1136
00:40:55,270 --> 00:40:52,000
maybe explain lagrange points i don't

1137
00:40:57,430 --> 00:40:55,280
know yeah so the lagrange points are um

1138
00:41:00,069 --> 00:40:57,440

they're regions of space that uh gravity

1139
00:41:02,069 --> 00:41:00,079
neutral so where the sun gravity and the

1140
00:41:03,829 --> 00:41:02,079
jupiter's gravity cancel out and

1141
00:41:06,710 --> 00:41:03,839
actually earth has them too it's not

1142
00:41:08,309 --> 00:41:06,720
specific to jupiter it's just this

1143
00:41:11,430 --> 00:41:08,319
area of space that's very stable and

1144
00:41:12,710 --> 00:41:11,440
that's why actually jwst the james webb

1145
00:41:14,950 --> 00:41:12,720
telescope that's going to be launched

1146
00:41:16,390 --> 00:41:14,960
later this year the sort of the follow

1147
00:41:18,309 --> 00:41:16,400
one from hubble is going to be sitting

1148
00:41:19,910 --> 00:41:18,319
in the earth's lagrange point because

1149
00:41:22,150 --> 00:41:19,920
it's a stable region of space that it

1150
00:41:24,069 --> 00:41:22,160
can observe the solar system from and

1151
00:41:25,670 --> 00:41:24,079
that's why the jupiter trojan asteroids

1152
00:41:27,990 --> 00:41:25,680
are so special because this stable

1153
00:41:31,190 --> 00:41:28,000
region of space has enabled them

1154
00:41:32,870 --> 00:41:31,200
to uh to to remain the whole time the

1155
00:41:34,550 --> 00:41:32,880
solar system has been forming and

1156
00:41:36,790 --> 00:41:34,560
evolving they've been sitting there

1157
00:41:39,589 --> 00:41:36,800
watching it all happen so the earth

1158
00:41:41,430 --> 00:41:39,599
actually has two trojan asteroids um

1159
00:41:43,270 --> 00:41:41,440
recently discovered we don't know if

1160
00:41:45,430 --> 00:41:43,280
they're as stable as the jovian ones so

1161
00:41:47,430 --> 00:41:45,440
maybe they're sort of a transitory thing

1162
00:41:49,270 --> 00:41:47,440
but um it's it's a pretty uncommon thing

1163
00:41:51,190 --> 00:41:49,280

jupiter is pretty special to have so

1164
00:41:52,309 --> 00:41:51,200
many yeah i have an important question

1165
00:41:53,910 --> 00:41:52,319
how are you guys feeling there's a lot

1166
00:41:56,069 --> 00:41:53,920
of questions coming in that's great

1167
00:41:57,910 --> 00:41:56,079
again keep them coming in hashtag ask

1168
00:41:59,990 --> 00:41:57,920
nasa you gotta you gotta test these

1169
00:42:05,829 --> 00:42:00,000
folks no that's great are you doing okay

1170
00:42:10,550 --> 00:42:08,390
yeah very thoughtful so jonathan has one

1171
00:42:13,270 --> 00:42:10,560
as well jonathan on twitter will lucy

1172
00:42:15,270 --> 00:42:13,280
use a gravity boost from earth or one of

1173
00:42:16,870 --> 00:42:15,280
the outer planets to build up the speed

1174
00:42:19,270 --> 00:42:16,880
for the long trip on the asteroid we do

1175
00:42:21,430 --> 00:42:19,280
know about the three from earth are we

1176
00:42:23,430 --> 00:42:21,440
are we doing that with any other um

1177
00:42:24,870 --> 00:42:23,440
asteroid as he said

1178
00:42:26,230 --> 00:42:24,880
nope just the three earth gravity

1179
00:42:27,990 --> 00:42:26,240
assists we're not going to be getting

1180
00:42:29,910 --> 00:42:28,000
close to any of the other big big

1181
00:42:31,829 --> 00:42:29,920
targets in our solar system yeah it's

1182
00:42:33,829 --> 00:42:31,839
interesting because uh we're actually

1183
00:42:35,349 --> 00:42:33,839
you know when we do our flybys that's

1184
00:42:36,630 --> 00:42:35,359
the closest that the spacecraft will be

1185
00:42:38,150 --> 00:42:36,640
to jupiter

1186
00:42:40,550 --> 00:42:38,160
so that's amazing right the children's

1187
00:42:41,910 --> 00:42:40,560
are so far out from jupiter but yeah

1188
00:42:45,750 --> 00:42:41,920

we're using that energy as carly

1189
00:42:47,829 --> 00:42:45,760
mentioned to to get us there uh sahas on

1190
00:42:49,829 --> 00:42:47,839
youtube asks what will happen to the

1191
00:42:52,069 --> 00:42:49,839
spacecraft after its mission will it

1192
00:42:53,829 --> 00:42:52,079
orbit will its orbit be stable enough we

1193
00:42:55,270 --> 00:42:53,839
do know that for lucy to survive is

1194
00:42:57,190 --> 00:42:55,280
there any other insight you can tell us

1195
00:42:58,550 --> 00:42:57,200
about what maybe could happen after the

1196
00:43:00,069 --> 00:42:58,560
nominal mission

1197
00:43:01,829 --> 00:43:00,079
yeah it's very interesting you know that

1198
00:43:03,750 --> 00:43:01,839
the engineers analyzed the orbit to make

1199
00:43:05,990 --> 00:43:03,760
sure that it wasn't going to impact

1200
00:43:08,069 --> 00:43:06,000
anything in over a hundred thousand

1201
00:43:10,069 --> 00:43:08,079
years oh my gosh but it's going to be in

1202
00:43:11,589 --> 00:43:10,079
this stable orbit for for millions of

1203
00:43:13,589 --> 00:43:11,599
years so that's really the exciting part

1204
00:43:15,670 --> 00:43:13,599
so hopefully you know as carly mentioned

1205
00:43:17,349 --> 00:43:15,680
uh the spacecraft keeps going and we can

1206
00:43:19,109 --> 00:43:17,359
do more science that's the whole point

1207
00:43:20,790 --> 00:43:19,119
of these missions it's about to learn

1208
00:43:22,390 --> 00:43:20,800
more the origin of our solar system

1209
00:43:25,109 --> 00:43:22,400
calibrate our models it's really

1210
00:43:26,550 --> 00:43:25,119
exciting and it's a unique orbit i

1211
00:43:29,190 --> 00:43:26,560
we got lucky i think carly you're

1212
00:43:30,550 --> 00:43:29,200
amazing it's amazing

1213
00:43:31,910 --> 00:43:30,560

and phil on reddit actually kind of

1214
00:43:33,910 --> 00:43:31,920
touches on what you were talking about

1215
00:43:36,630 --> 00:43:33,920
carly how much of the experience of

1216
00:43:38,710 --> 00:43:36,640
missions like osiris-rex uh has helped

1217
00:43:40,710 --> 00:43:38,720
the development of the lucy mission oh

1218
00:43:42,550 --> 00:43:40,720
so much i mean every mission builds on

1219
00:43:44,470 --> 00:43:42,560
what's come before it and

1220
00:43:46,950 --> 00:43:44,480
the we'll be able to put the

1221
00:43:48,870 --> 00:43:46,960
jovian trojan asteroids into a context

1222
00:43:51,109 --> 00:43:48,880
of wider asteroids as well with the

1223
00:43:53,670 --> 00:43:51,119
other missions like psyche and orex that

1224
00:43:55,109 --> 00:43:53,680
have already flown and so every time a

1225
00:43:56,950 --> 00:43:55,119
new mission comes along there's a

1226
00:43:58,470 --> 00:43:56,960
technology development that go with it

1227
00:44:00,710 --> 00:43:58,480
you know the solar panels this isn't the

1228
00:44:01,990 --> 00:44:00,720
first time we've flown solar panels and

1229
00:44:04,630 --> 00:44:02,000
so we've learned a lot from the

1230
00:44:06,870 --> 00:44:04,640
experience of juno and uh we've gone on

1231
00:44:08,230 --> 00:44:06,880
and these are even better so you know

1232
00:44:09,670 --> 00:44:08,240
it's we're standing on the shoulders of

1233
00:44:11,589 --> 00:44:09,680
giants just like every other national

1234
00:44:13,030 --> 00:44:11,599
mission yeah and i think the three of us

1235
00:44:15,510 --> 00:44:13,040
haven't talked about this yet but you

1236
00:44:17,349 --> 00:44:15,520
know lucy yes is named after the lucy

1237
00:44:18,870 --> 00:44:17,359
fossil but the lucy fossil was named

1238
00:44:20,710 --> 00:44:18,880

after the beatles song lucy in the sky

1239
00:44:22,710 --> 00:44:20,720
with diamonds so tim on facebook wants

1240
00:44:24,870 --> 00:44:22,720
to know are there diamonds on lucy when

1241
00:44:26,950 --> 00:44:24,880
she goes into the sky great question um

1242
00:44:28,470 --> 00:44:26,960
yes there are so

1243
00:44:29,990 --> 00:44:28,480
the test instrument which is that

1244
00:44:31,670 --> 00:44:30,000
infrared instrument that's kind of like

1245
00:44:33,910 --> 00:44:31,680
that thermometer a distance to to get

1246
00:44:35,670 --> 00:44:33,920
the uh temperature of the asteroids

1247
00:44:37,270 --> 00:44:35,680
actually has a beam splitter that that

1248
00:44:39,190 --> 00:44:37,280
gets that light and it's actually made

1249
00:44:41,349 --> 00:44:39,200
out of diamonds so there will be

1250
00:44:42,630 --> 00:44:41,359
diamonds in space isn't that great i

1251
00:44:44,230 --> 00:44:42,640
think that's great i think it just all

1252
00:44:46,069 --> 00:44:44,240
fits in right like the fact that the

1253
00:44:47,829 --> 00:44:46,079
name is after the lucy fossil there's a

1254
00:44:49,430 --> 00:44:47,839
song and there's a diamond actually on

1255
00:44:51,270 --> 00:44:49,440
it it's great i love it it i love when

1256
00:44:53,750 --> 00:44:51,280
things like work out like that

1257
00:44:55,589 --> 00:44:53,760
all right rohan on facebook how far are

1258
00:44:57,990 --> 00:44:55,599
the asteroids

1259
00:44:59,990 --> 00:44:58,000
wow they're far carly right so they're

1260
00:45:02,790 --> 00:45:00,000
very far they're at the same distance as

1261
00:45:04,870 --> 00:45:02,800
jupiter so jupiter is about 5 a.u where

1262
00:45:06,790 --> 00:45:04,880
1au is the distance from the sun to the

1263
00:45:09,349 --> 00:45:06,800

earth so if you think about how far away

1264
00:45:11,109 --> 00:45:09,359
the sun is the the asteroids are

1265
00:45:12,710 --> 00:45:11,119
five times further from the earth than

1266
00:45:15,109 --> 00:45:12,720
we are so we're a factor of four

1267
00:45:17,349 --> 00:45:15,119
different right so a really long way

1268
00:45:18,950 --> 00:45:17,359
away from us um that's why it takes a

1269
00:45:20,950 --> 00:45:18,960
long time to get there and why it's hard

1270
00:45:23,510 --> 00:45:20,960
to do this science from the earth yeah

1271
00:45:26,309 --> 00:45:23,520
yeah bruce on twitter are there any

1272
00:45:28,309 --> 00:45:26,319
currently classified meteorites that you

1273
00:45:30,309 --> 00:45:28,319
suspect may have come from the asteroids

1274
00:45:33,390 --> 00:45:30,319
lucy will be visiting similar to the

1275
00:45:37,109 --> 00:45:33,400
howard heights um link and the

1276
00:45:39,430 --> 00:45:37,119
diogenites i butchered that dan and i

1277
00:45:40,150 --> 00:45:39,440
you know what i'm saying

1278
00:45:46,150 --> 00:45:40,160
so

1279
00:45:47,910 --> 00:45:46,160
of comments and what that means we think

1280
00:45:50,069 --> 00:45:47,920
is there was a parent comet that got

1281
00:45:52,230 --> 00:45:50,079
disrupted and it it forms smaller

1282
00:45:54,550 --> 00:45:52,240
fragments and and those can definitely

1283
00:45:56,309 --> 00:45:54,560
come out and hit the earth um i think

1284
00:45:58,630 --> 00:45:56,319
urabates is the best bet but i'm not

1285
00:46:00,550 --> 00:45:58,640
sure actually if there are on the ground

1286
00:46:02,309 --> 00:46:00,560
um examples of those meteorite

1287
00:46:04,390 --> 00:46:02,319
collection that was that would be good

1288
00:46:05,990 --> 00:46:04,400

to know i should know that yeah that was

1289
00:46:08,470 --> 00:46:06,000
a good question that i didn't know i

1290
00:46:11,109 --> 00:46:08,480
don't read to you i'm very sorry

1291
00:46:14,870 --> 00:46:11,119
navdeet on twitter asks will humans

1292
00:46:16,710 --> 00:46:14,880
visit trojan asteroids in the future wow

1293
00:46:18,950 --> 00:46:16,720
that that's a that's a challenge right

1294
00:46:20,630 --> 00:46:18,960
um you know it's really far out there uh

1295
00:46:22,870 --> 00:46:20,640
for for humans to get there you have to

1296
00:46:25,190 --> 00:46:22,880
carry a lot of water uh nasa's working

1297
00:46:27,190 --> 00:46:25,200
on missions right now to to to go to the

1298
00:46:29,109 --> 00:46:27,200
moon and go to this space like orion the

1299
00:46:31,270 --> 00:46:29,119
whole artemis program right he's gonna

1300
00:46:33,270 --> 00:46:31,280
send the first woman uh to the surface

1301
00:46:35,349 --> 00:46:33,280
of the moon and the next man um so

1302
00:46:37,109 --> 00:46:35,359
there's plants out there you know uh

1303
00:46:39,510 --> 00:46:37,119
stations that that we can send people

1304
00:46:41,430 --> 00:46:39,520
out there uh we're gonna try at the moon

1305
00:46:43,270 --> 00:46:41,440
and then use that as a stepping stone to

1306
00:46:45,030 --> 00:46:43,280
keep going further mars and hopefully

1307
00:46:46,390 --> 00:46:45,040
beyond yeah one step at a time but we'll

1308
00:46:48,950 --> 00:46:46,400
get there i think

1309
00:46:51,109 --> 00:46:48,960
lucy on facebook what science and

1310
00:46:52,069 --> 00:46:51,119
instruments are on lucy and what do they

1311
00:46:54,710 --> 00:46:52,079
do

1312
00:46:55,910 --> 00:46:54,720
so we have three main instruments but

1313
00:46:58,870 --> 00:46:55,920

one of them is actually a bit of a

1314
00:47:00,950 --> 00:46:58,880
two-for-one deal so we have uh la ralph

1315
00:47:02,230 --> 00:47:00,960
which is made up of m-vic which is the

1316
00:47:04,390 --> 00:47:02,240
instrument i've been working with the

1317
00:47:05,349 --> 00:47:04,400
most and lisa and vic is the color

1318
00:47:08,710 --> 00:47:05,359
camera

1319
00:47:10,710 --> 00:47:08,720
and lisa enables us to get our um

1320
00:47:13,030 --> 00:47:10,720
our fingerprints our chemical

1321
00:47:14,710 --> 00:47:13,040
compositions so that's a really

1322
00:47:16,710 --> 00:47:14,720
important instrument and i've been

1323
00:47:18,390 --> 00:47:16,720
involved in that then there's also uh la

1324
00:47:19,510 --> 00:47:18,400
tess so that's the thermal instrument

1325
00:47:21,589 --> 00:47:19,520
that we've already touched on a little

1326
00:47:22,710 --> 00:47:21,599
bit looking at the heat the temperature

1327
00:47:25,109 --> 00:47:22,720
of the comets

1328
00:47:27,109 --> 00:47:25,119
of the asteroids and then finally uh

1329
00:47:29,670 --> 00:47:27,119
laurie and laurie is our black and white

1330
00:47:31,430 --> 00:47:29,680
imager it's our deep space imager so it

1331
00:47:33,270 --> 00:47:31,440
allows it's kind of like a camera with

1332
00:47:34,390 --> 00:47:33,280
binoculars behind it right we can see

1333
00:47:35,349 --> 00:47:34,400
very well

1334
00:47:37,750 --> 00:47:35,359
um

1335
00:47:40,230 --> 00:47:37,760
at very high spatial resolutions during

1336
00:47:42,630 --> 00:47:40,240
these flybys and so we'll be using all

1337
00:47:44,950 --> 00:47:42,640
of those instruments to understand the

1338
00:47:46,710 --> 00:47:44,960

the targets as we fly by yeah a great

1339
00:47:48,950 --> 00:47:46,720
payload this one's a good one pip on

1340
00:47:50,870 --> 00:47:48,960
twitter asks why are they named the

1341
00:47:52,710 --> 00:47:50,880
trojan asteroids

1342
00:47:53,990 --> 00:47:52,720
so i had to look this up because i

1343
00:47:55,510 --> 00:47:54,000
thought

1344
00:47:57,270 --> 00:47:55,520
i'm glad i did so thank you for that

1345
00:47:59,589 --> 00:47:57,280
question thank you um

1346
00:48:02,630 --> 00:47:59,599
so everything in space has a mythology

1347
00:48:04,710 --> 00:48:02,640
behind it and it happens that these

1348
00:48:07,430 --> 00:48:04,720
regions of these asteroids were all

1349
00:48:09,270 --> 00:48:07,440
named after uh characters in the trojan

1350
00:48:11,109 --> 00:48:09,280
wars so um

1351
00:48:12,549 --> 00:48:11,119
from that greek mythology so we call

1352
00:48:14,790 --> 00:48:12,559
them the trojans because they're named

1353
00:48:18,069 --> 00:48:14,800
after characters from the trojan wars i

1354
00:48:21,829 --> 00:48:18,079
also look that up you are right

1355
00:48:24,309 --> 00:48:21,839
i also looked up how um how did lucy the

1356
00:48:26,309 --> 00:48:24,319
the hominid die did do you guys know

1357
00:48:27,670 --> 00:48:26,319
that oh no i want to hear this answer

1358
00:48:29,190 --> 00:48:27,680
apparently researchers think that she

1359
00:48:30,710 --> 00:48:29,200
might have fallen from a tree again this

1360
00:48:32,150 --> 00:48:30,720
is the namesake of the lucy mission i'm

1361
00:48:34,230 --> 00:48:32,160
not just like randomly talking about

1362
00:48:36,150 --> 00:48:34,240
things but yeah the lucy fossil

1363
00:48:38,150 --> 00:48:36,160

supposedly that's how she passed yeah

1364
00:48:39,589 --> 00:48:38,160
isn't that interesting i mean just the

1365
00:48:41,109 --> 00:48:39,599
fact that this mission makes you think

1366
00:48:42,309 --> 00:48:41,119
and makes you want to learn more i think

1367
00:48:44,470 --> 00:48:42,319
is amazing

1368
00:48:46,390 --> 00:48:44,480
and then don on twitter are there any

1369
00:48:48,309 --> 00:48:46,400
potential available resources in the

1370
00:48:51,030 --> 00:48:48,319
asteroids

1371
00:48:52,870 --> 00:48:51,040
uh potentially right uh we we're work uh

1372
00:48:55,750 --> 00:48:52,880
we're actually bringing the first nasa

1373
00:48:57,829 --> 00:48:55,760
sample back uh as we speak uh 2023 on

1374
00:48:59,589 --> 00:48:57,839
the osiris-rex mission uh that was the

1375
00:49:01,750 --> 00:48:59,599
prime goal of osiris-rex collect that

1376
00:49:04,150 --> 00:49:01,760
sample bring it back potentially

1377
00:49:06,150 --> 00:49:04,160
resources uh we'll we'll have to see i

1378
00:49:08,549 --> 00:49:06,160
mean uh you heard carly right we're so

1379
00:49:10,390 --> 00:49:08,559
excited about the unknown what are we

1380
00:49:11,829 --> 00:49:10,400
actually gonna see in these asteroids uh

1381
00:49:14,230 --> 00:49:11,839
what are the ingredients the organic

1382
00:49:15,829 --> 00:49:14,240
compounds uh potentially you know for

1383
00:49:17,430 --> 00:49:15,839
example uh carly talked a little bit

1384
00:49:20,390 --> 00:49:17,440
earlier about the psyche mission the

1385
00:49:21,750 --> 00:49:20,400
psychiatrist is more metallic right so

1386
00:49:23,589 --> 00:49:21,760
potentially there's an industry out

1387
00:49:26,710 --> 00:49:23,599
there for mining and resources right for

1388
00:49:28,710 --> 00:49:26,720

for special metals and rare metals um so

1389
00:49:30,470 --> 00:49:28,720
you know we're going to learn so much on

1390
00:49:32,230 --> 00:49:30,480
this mission over the 12 years yeah

1391
00:49:34,260 --> 00:49:32,240
absolutely now this is actually the

1392
00:49:35,670 --> 00:49:34,270
final question it's from me sorry

1393
00:49:37,349 --> 00:49:35,680
[Laughter]

1394
00:49:38,950 --> 00:49:37,359
but i want to know i mean obviously both

1395
00:49:41,109 --> 00:49:38,960
of you are very personally invested in

1396
00:49:43,030 --> 00:49:41,119
this you spent so much of your careers

1397
00:49:45,109 --> 00:49:43,040
you know leading up to this point what

1398
00:49:46,549 --> 00:49:45,119
are you personally most excited about

1399
00:49:48,630 --> 00:49:46,559
with lucy

1400
00:49:50,790 --> 00:49:48,640
i think the unknown being able to

1401
00:49:52,630 --> 00:49:50,800
explore is such a privilege and the

1402
00:49:54,710 --> 00:49:52,640
unknown unknowns are always the things

1403
00:49:55,829 --> 00:49:54,720
that get you you know you you've planned

1404
00:49:57,190 --> 00:49:55,839
and you've thought about it and you

1405
00:49:58,870 --> 00:49:57,200
think you've got an idea of how

1406
00:50:01,190 --> 00:49:58,880
everything's going to look and be and

1407
00:50:03,030 --> 00:50:01,200
then and and nature just doesn't do that

1408
00:50:04,950 --> 00:50:03,040
you know it surprises us and so i'm

1409
00:50:07,510 --> 00:50:04,960
looking forward to being surprised yeah

1410
00:50:09,430 --> 00:50:07,520
yeah what about you ah jeez um you know

1411
00:50:11,109 --> 00:50:09,440
what i i worked on the juno mission

1412
00:50:12,630 --> 00:50:11,119
right that that used solar power and

1413
00:50:14,710 --> 00:50:12,640

we're going to break that record so it's

1414
00:50:16,710 --> 00:50:14,720
really exciting to be part of this and

1415
00:50:19,030 --> 00:50:16,720
as carly said you know we're going to

1416
00:50:21,349 --> 00:50:19,040
brand new worlds that no other

1417
00:50:23,190 --> 00:50:21,359
spacecraft has ever been so it's going

1418
00:50:25,190 --> 00:50:23,200
to be full of surprises uh but but we're

1419
00:50:26,630 --> 00:50:25,200
ready for the challenge and and very

1420
00:50:28,470 --> 00:50:26,640
prepared as carly mentioned we're going

1421
00:50:30,630 --> 00:50:28,480
to practice on the donald johansson

1422
00:50:32,790 --> 00:50:30,640
asteroid um so we're planning this

1423
00:50:34,950 --> 00:50:32,800
mission uh for for that 12 years and

1424
00:50:36,390 --> 00:50:34,960
hopefully we get a little bit more yeah

1425
00:50:37,589 --> 00:50:36,400
i'm very excited for you guys i can't

1426
00:50:39,109 --> 00:50:37,599
wait to

1427
00:50:40,630 --> 00:50:39,119
hear yeah to hear all the things that

1428
00:50:42,230 --> 00:50:40,640
you discover after the launch tomorrow

1429
00:50:44,150 --> 00:50:42,240
so wonderful thank you both for being

1430
00:50:45,589 --> 00:50:44,160
here today thank you so much all right

1431
00:50:47,030 --> 00:50:45,599
great great great great great and you

1432
00:50:48,710 --> 00:50:47,040
know just thank you to all our viewers

1433
00:50:50,950 --> 00:50:48,720
at home who tuned in to watch this and

1434
00:50:53,109 --> 00:50:50,960
for sending in such thoughtful again

1435
00:50:55,190 --> 00:50:53,119
questions for for will and carly to

1436
00:50:57,270 --> 00:50:55,200
learn more about the lucy mission go to

1437
00:50:59,030 --> 00:50:57,280
nasa.gov

1438
00:51:01,990 --> 00:50:59,040

lucy for more information again it's

1439
00:51:04,630 --> 00:51:02,000
right there on your screen nasa.gov

1440
00:51:06,630 --> 00:51:04,640
lucy and you can also follow lucy's

1441
00:51:09,829 --> 00:51:06,640
12-year mission on social media so you

1442
00:51:13,109 --> 00:51:09,839
can follow nasa solar system on facebook

1443
00:51:16,309 --> 00:51:13,119
twitter and instagram again nasa solar

1444
00:51:18,069 --> 00:51:16,319
system another option is also hashtag

1445
00:51:20,309 --> 00:51:18,079
lucy mission that's an easy one right

1446
00:51:21,910 --> 00:51:20,319
hashtag lucy mission again right there

1447
00:51:23,190 --> 00:51:21,920
on your screen and then i want you to

1448
00:51:25,109 --> 00:51:23,200
take out your phones you got to set your

1449
00:51:26,950 --> 00:51:25,119
alarm clocks for the launch tomorrow

1450
00:51:29,510 --> 00:51:26,960
lucy is set to lift off from cape

1451
00:51:33,430 --> 00:51:29,520
canaveral space for station no earlier

1452
00:51:36,069 --> 00:51:33,440
than 5 34 a.m eastern time tomorrow

1453
00:51:38,150 --> 00:51:36,079
october 16th and be sure to join in with

1454
00:51:41,030 --> 00:51:38,160
the excitement with others from around

1455
00:51:43,589 --> 00:51:41,040
the world by registering for virtual

1456
00:51:45,190 --> 00:51:43,599
nasa social there you can connect with

1457
00:51:47,589 --> 00:51:45,200
us you can learn more about the

1458
00:51:50,150 --> 00:51:47,599
spacecraft and you can even learn how to

1459
00:51:52,309 --> 00:51:50,160
create your own lucy time capsule that's

1460
00:51:53,990 --> 00:51:52,319
really cool as always thank you so much

1461
00:51:57,150 --> 00:51:54,000
for tuning in and we will see you next