



1
00:00:35,910 --> 00:00:34,310
good afternoon everyone this is the

2
00:00:37,430 --> 00:00:35,920
pre-launch news conference for

3
00:00:39,510 --> 00:00:37,440
osiris-rex

4
00:00:42,310 --> 00:00:39,520
scheduled to be launched on

5
00:00:45,350 --> 00:00:42,320
thursday at 7 05 p.m aboard a united

6
00:00:48,150 --> 00:00:45,360
launch alliance atlas v rocket

7
00:00:49,750 --> 00:00:48,160
and here to discuss the upcoming mission

8
00:00:51,270 --> 00:00:49,760
the countdown the launch and the

9
00:00:53,910 --> 00:00:51,280
spacecraft

10
00:00:56,389 --> 00:00:53,920
we have joining us jeffrey yoder the

11
00:00:58,389 --> 00:00:56,399
acting associate administrator from the

12
00:01:02,069 --> 00:00:58,399
nasa science mission directorate in

13
00:01:10,230 --> 00:01:04,789

dante loretta the principal investigator

14

00:01:14,469 --> 00:01:12,870

tim dunn the nasa launch director from

15

00:01:18,630 --> 00:01:14,479

the launch services program at the

16

00:01:23,109 --> 00:01:21,109

scott messer the program manager for

17

00:01:27,429 --> 00:01:23,119

nasa missions from the united launch

18

00:01:30,069 --> 00:01:27,439

alliance in centennial colorado

19

00:01:32,310 --> 00:01:30,079

michael donnelly the nasa osiris-rex

20

00:01:36,710 --> 00:01:32,320

project manager for nasa's goddard space

21

00:01:41,109 --> 00:01:39,190

rich coons the osiris-rex program

22

00:01:44,710 --> 00:01:41,119

manager from lockheed martin space

23

00:01:49,190 --> 00:01:46,710

and clay flynn the launch weather

24

00:01:51,830 --> 00:01:49,200

officer from the 45th weather squadron

25

00:01:53,910 --> 00:01:51,840

from cape canaveral air force station

26
00:01:55,350 --> 00:01:53,920
and we'll begin first with jeff yoder

27
00:01:57,590 --> 00:01:55,360
jeff thank you

28
00:01:59,270 --> 00:01:57,600
well good afternoon it's my pleasure to

29
00:02:01,670 --> 00:01:59,280
welcome you to the launch of nasa's

30
00:02:05,270 --> 00:02:01,680
first mission to go out touch a near

31
00:02:06,630 --> 00:02:05,280
earth asteroid venue and bring a sample

32
00:02:08,869 --> 00:02:06,640
back to us

33
00:02:12,550 --> 00:02:08,879
for the nasa science mission directorate

34
00:02:14,949 --> 00:02:12,560
uh its mission is to innovate explore

35
00:02:17,510 --> 00:02:14,959
discover and inspire

36
00:02:19,670 --> 00:02:17,520
with over a hundred missions our diverse

37
00:02:22,550 --> 00:02:19,680
portfolio gives us the opportunity to

38
00:02:24,470 --> 00:02:22,560

accomplish that mission in many ways not

39

00:02:26,390 --> 00:02:24,480

just to the scientific community but to

40

00:02:29,430 --> 00:02:26,400

the world at large

41

00:02:30,470 --> 00:02:29,440

in fact nasa's science is interconnected

42

00:02:32,070 --> 00:02:30,480

with our

43

00:02:34,630 --> 00:02:32,080

astrophysics

44

00:02:36,869 --> 00:02:34,640

earth science heliophysics and of course

45

00:02:38,790 --> 00:02:36,879

planetary science will bring part will

46

00:02:41,270 --> 00:02:38,800

be part of this unique mission that

47

00:02:43,670 --> 00:02:41,280

you'll hear about more today

48

00:02:46,150 --> 00:02:43,680

one year ago the new horizons mission

49

00:02:48,390 --> 00:02:46,160

wowed us as a flew by pluto

50

00:02:51,030 --> 00:02:48,400

last july

51
00:02:53,190 --> 00:02:51,040
our juno mission entered the jupiter's

52
00:02:55,589 --> 00:02:53,200
orbit and is now bringing back amazing

53
00:02:57,589 --> 00:02:55,599
amazing photos and will continue over

54
00:03:00,309 --> 00:02:57,599
the next year and a half to produce uh

55
00:03:02,630 --> 00:03:00,319
amazing a great science

56
00:03:04,309 --> 00:03:02,640
well nasa science is the greatest engine

57
00:03:06,309 --> 00:03:04,319
of scientific discovery in the planet

58
00:03:07,670 --> 00:03:06,319
today and you will hear more about one

59
00:03:09,830 --> 00:03:07,680
of the engine's

60
00:03:11,030 --> 00:03:09,840
vital mechanisms

61
00:03:12,390 --> 00:03:11,040
so george

62
00:03:14,309 --> 00:03:12,400
thank you jeff

63
00:03:16,710 --> 00:03:14,319

now today loretta who's the principal

64

00:03:19,350 --> 00:03:16,720

investigator for osiris-rex from the

65

00:03:20,790 --> 00:03:19,360

university of arizona dante thank you

66

00:03:22,949 --> 00:03:20,800

george and thanks everybody for being

67

00:03:23,990 --> 00:03:22,959

here this is a great milestone for this

68

00:03:25,750 --> 00:03:24,000

team

69

00:03:27,110 --> 00:03:25,760

for many of us including myself it's

70

00:03:28,869 --> 00:03:27,120

something that's been over a decade in

71

00:03:30,789 --> 00:03:28,879

the works i'm going to tell you about

72

00:03:32,309 --> 00:03:30,799

our science objectives today and what

73

00:03:34,630 --> 00:03:32,319

we're going to achieve with this amazing

74

00:03:37,190 --> 00:03:34,640

mission to asteroid bennu and back if i

75

00:03:39,589 --> 00:03:37,200

could have my video please

76
00:03:41,430 --> 00:03:39,599
the mission name is an awesome acronym

77
00:03:43,350 --> 00:03:41,440
that describes our primary science

78
00:03:46,309 --> 00:03:43,360
objectives and as i like to say it's

79
00:03:48,789 --> 00:03:46,319
also my fault so if you let

80
00:03:51,670 --> 00:03:48,799
the first letter in the acronym is the o

81
00:03:53,190 --> 00:03:51,680
this is for our origins investigation

82
00:03:55,509 --> 00:03:53,200
and this really is what drives our

83
00:03:57,589 --> 00:03:55,519
program we're going to asteroid bennu

84
00:03:59,030 --> 00:03:57,599
because it's a time capsule from the

85
00:04:01,670 --> 00:03:59,040
earliest stages of solar system

86
00:04:03,990 --> 00:04:01,680
formation back when our planetary system

87
00:04:06,229 --> 00:04:04,000
was spread across as dust grains in a

88
00:04:08,949 --> 00:04:06,239

swirling cloud around our growing

89

00:04:11,110 --> 00:04:08,959

protostar inside this region of the

90

00:04:13,509 --> 00:04:11,120

protoplanetary disk there were bodies

91

00:04:16,229 --> 00:04:13,519

that were accumulating many of them were

92

00:04:18,229 --> 00:04:16,239

getting water ice and organic material

93

00:04:20,229 --> 00:04:18,239

key compounds that we believe may have

94

00:04:22,390 --> 00:04:20,239

led to the habitability of our planet

95

00:04:24,230 --> 00:04:22,400

and even to the origin of life on earth

96

00:04:26,469 --> 00:04:24,240

these are really critical because our

97

00:04:28,390 --> 00:04:26,479

earth went through a major period of

98

00:04:30,629 --> 00:04:28,400

geologic upheaval during the late heavy

99

00:04:32,150 --> 00:04:30,639

bombardment where millions of asteroids

100

00:04:33,430 --> 00:04:32,160

collided with the surface sterilizing

101
00:04:35,110 --> 00:04:33,440
our planet

102
00:04:37,270 --> 00:04:35,120
we're following on the heels of

103
00:04:39,189 --> 00:04:37,280
successful nasa missions like stardust

104
00:04:40,870 --> 00:04:39,199
and fla in fact as you'll hear our

105
00:04:42,950 --> 00:04:40,880
return capsule is using the same

106
00:04:45,110 --> 00:04:42,960
technology that the stardust mission did

107
00:04:47,030 --> 00:04:45,120
to bring those amazing materials back

108
00:04:49,350 --> 00:04:47,040
and sample return is really at the

109
00:04:50,790 --> 00:04:49,360
forefront of planetary exploration not

110
00:04:53,350 --> 00:04:50,800
only are we going to get this material

111
00:04:54,950 --> 00:04:53,360
into our laboratories for precise

112
00:04:57,670 --> 00:04:54,960
chemical analyses that can't be

113
00:04:59,430 --> 00:04:57,680

duplicated by spacecraft instruments but

114

00:05:01,749 --> 00:04:59,440

this is going to be a treasure trove of

115

00:05:03,670 --> 00:05:01,759

information and material for scientists

116

00:05:05,430 --> 00:05:03,680

yet to come we're talking about

117

00:05:07,270 --> 00:05:05,440

analyzing compounds that are present in

118

00:05:09,670 --> 00:05:07,280

these materials in some cases at the

119

00:05:11,830 --> 00:05:09,680

parts per million level we have to get

120

00:05:13,749 --> 00:05:11,840

these samples into our laboratories to

121

00:05:16,070 --> 00:05:13,759

investigate these driving questions for

122

00:05:18,550 --> 00:05:16,080

osiris-rex and i'm very excited to be

123

00:05:21,270 --> 00:05:18,560

able to lead this mission

124

00:05:23,189 --> 00:05:21,280

the next part of our acronym is the

125

00:05:24,950 --> 00:05:23,199

spectral interpretation

126
00:05:27,029 --> 00:05:24,960
and we've had the benefit of studying

127
00:05:29,110 --> 00:05:27,039
our target asteroid bennu using some of

128
00:05:30,710 --> 00:05:29,120
the best telescopes on earth and in

129
00:05:32,790 --> 00:05:30,720
space including the hubble space

130
00:05:35,270 --> 00:05:32,800
telescope spitzer space telescope

131
00:05:37,270 --> 00:05:35,280
telescopes in tucson hawaii chile canary

132
00:05:39,350 --> 00:05:37,280
islands all over our planet and we have

133
00:05:41,110 --> 00:05:39,360
a pretty good data set and we think we

134
00:05:42,870 --> 00:05:41,120
know a lot about what this asteroid is

135
00:05:45,029 --> 00:05:42,880
made out of but we're also bringing

136
00:05:47,029 --> 00:05:45,039
fantastic science instruments with us

137
00:05:48,629 --> 00:05:47,039
like the ovirs visible and infrared

138
00:05:49,830 --> 00:05:48,639

spectrometer from the goddard space

139

00:05:51,909 --> 00:05:49,840

flight center

140

00:05:53,350 --> 00:05:51,919

and the otes thermal emission

141

00:05:55,350 --> 00:05:53,360

spectrometer from our partners at

142

00:05:56,950 --> 00:05:55,360

arizona state university we're going to

143

00:05:58,790 --> 00:05:56,960

use these instruments along with our

144

00:06:00,550 --> 00:05:58,800

camera systems from arizona university

145

00:06:02,629 --> 00:06:00,560

of arizona and our laser altimeter from

146

00:06:05,350 --> 00:06:02,639

the canadian space agency to ground

147

00:06:07,350 --> 00:06:05,360

truth that information and ultimately

148

00:06:09,270 --> 00:06:07,360

map the surface of the asteroid for the

149

00:06:10,710 --> 00:06:09,280

key organic compounds so that we can

150

00:06:12,550 --> 00:06:10,720

pick the best spot on the surface of the

151

00:06:13,830 --> 00:06:12,560

asteroid to get those samples

152

00:06:15,590 --> 00:06:13,840

and that leads into our next

153

00:06:17,029 --> 00:06:15,600

investigation which we call the resource

154

00:06:18,629 --> 00:06:17,039

identification

155

00:06:20,469 --> 00:06:18,639

when i first came up with that term i

156

00:06:21,909 --> 00:06:20,479

thought i was thinking really futuristic

157

00:06:24,070 --> 00:06:21,919

sci-fi that we're going to go out to

158

00:06:26,150 --> 00:06:24,080

asteroids and use these materials to

159

00:06:27,510 --> 00:06:26,160

further space exploration and now we see

160

00:06:29,749 --> 00:06:27,520

that that may be happening in the near

161

00:06:31,909 --> 00:06:29,759

future we're going to pioneer the

162

00:06:34,070 --> 00:06:31,919

technologies and the capabilities that

163

00:06:36,390 --> 00:06:34,080

to send a spacecraft out to asteroid

164

00:06:38,309 --> 00:06:36,400

bennu and perform detailed global

165

00:06:39,830 --> 00:06:38,319

mapping of the entire surface to

166

00:06:42,469 --> 00:06:39,840

understand its composition and its

167

00:06:44,230 --> 00:06:42,479

mineralogy ultimately focusing in on

168

00:06:46,390 --> 00:06:44,240

regions of interest where we're going to

169

00:06:49,270 --> 00:06:46,400

get super high resolution shots of the

170

00:06:50,790 --> 00:06:49,280

surface to understand that material

171

00:06:53,029 --> 00:06:50,800

the next part of our investigation is

172

00:06:54,550 --> 00:06:53,039

about the security aspect by virtue of

173

00:06:56,390 --> 00:06:54,560

our mission design we're going to an

174

00:06:57,990 --> 00:06:56,400

asteroid with an orbit very similar to

175

00:06:59,670 --> 00:06:58,000

earth we want to know what its

176

00:07:01,909 --> 00:06:59,680

trajectory is going to be in the future

177

00:07:03,430 --> 00:07:01,919

in case it represents a potential hazard

178

00:07:05,350 --> 00:07:03,440

we're going to study a phenomenon known

179

00:07:06,950 --> 00:07:05,360

as the yarkovsky effect which is

180

00:07:09,110 --> 00:07:06,960

essentially the absorption of energy

181

00:07:11,430 --> 00:07:09,120

from sun emission of that energy back

182

00:07:13,430 --> 00:07:11,440

out as heat and that causes a small

183

00:07:15,830 --> 00:07:13,440

thrust on the asteroid changing its

184

00:07:17,909 --> 00:07:15,840

trajectory over time since we've been

185

00:07:19,670 --> 00:07:17,919

monitoring asteroid bennu uh beginning

186

00:07:21,830 --> 00:07:19,680

in 1999 we've seen it's changed its

187

00:07:24,790 --> 00:07:21,840

position to the yarkovsky effect alone

188

00:07:26,550 --> 00:07:24,800

by over 160 kilometers so we really want

189

00:07:28,469 --> 00:07:26,560

to understand this phenomena so that we

190

00:07:30,390 --> 00:07:28,479

can better understand asteroid bennu and

191

00:07:32,309 --> 00:07:30,400

apply that understanding to all

192

00:07:34,309 --> 00:07:32,319

asteroids not only in near earth space

193

00:07:35,830 --> 00:07:34,319

but throughout our solar system

194

00:07:37,990 --> 00:07:35,840

and then finally we are a regolith

195

00:07:40,390 --> 00:07:38,000

explorer regolith is what we call the

196

00:07:42,309 --> 00:07:40,400

loose blanket of gravel and dust on the

197

00:07:43,670 --> 00:07:42,319

surface of these airless bodies and the

198

00:07:45,830 --> 00:07:43,680

ultimate objective is to bring those

199

00:07:47,270 --> 00:07:45,840

back into our labs for analysis but we

200

00:07:49,430 --> 00:07:47,280

also want to understand how that

201
00:07:51,510 --> 00:07:49,440
material behaves in a microgravity

202
00:07:53,830 --> 00:07:51,520
environment you got to remember bennu is

203
00:07:55,990 --> 00:07:53,840
only 500 meters across like the size of

204
00:07:57,430 --> 00:07:56,000
a small mountain in outer space and we

205
00:07:59,510 --> 00:07:57,440
don't really understand granular

206
00:08:01,909 --> 00:07:59,520
mechanics in that kind of microgravity

207
00:08:03,670 --> 00:08:01,919
environment so by the act of putting our

208
00:08:05,749 --> 00:08:03,680
tag sam device onto the surface of the

209
00:08:07,749 --> 00:08:05,759
asteroid to collect the sample in and of

210
00:08:09,270 --> 00:08:07,759
itself we're performing a fantastic

211
00:08:11,670 --> 00:08:09,280
science experiment

212
00:08:13,189 --> 00:08:11,680
so we've got great science ahead of us

213
00:08:15,830 --> 00:08:13,199

i'm really excited to get to this

214

00:08:17,990 --> 00:08:15,840

milestone to get osiris-rex launched on

215

00:08:20,230 --> 00:08:18,000

its journey to bennu and back

216

00:08:22,869 --> 00:08:20,240

back to georgia thank you geronte

217

00:08:24,469 --> 00:08:22,879

now to tim dunn the nasa launch director

218

00:08:27,350 --> 00:08:24,479

from the kennedy space center launch

219

00:08:28,710 --> 00:08:27,360

services program tim talk to us about

220

00:08:30,150 --> 00:08:28,720

the countdown

221

00:08:31,990 --> 00:08:30,160

thank you george

222

00:08:34,230 --> 00:08:32,000

i'm proud to be here today representing

223

00:08:36,630 --> 00:08:34,240

the women and men of nasa's launch

224

00:08:39,509 --> 00:08:36,640

services program and i'm thrilled to be

225

00:08:41,670 --> 00:08:39,519

the launch director for osiris-rex

226

00:08:43,430 --> 00:08:41,680

this exotic and highly complex cutting

227

00:08:46,470 --> 00:08:43,440

edge science mission brings added

228

00:08:48,310 --> 00:08:46,480

excitement to our entire launch team

229

00:08:50,150 --> 00:08:48,320

working alongside our united launch

230

00:08:53,030 --> 00:08:50,160

alliance colleagues the engineers and

231

00:08:55,590 --> 00:08:53,040

analysts of nasa lsp take great pride in

232

00:08:57,750 --> 00:08:55,600

launching osiris-rex

233

00:08:59,110 --> 00:08:57,760

nasa has a terrific record flying on the

234

00:09:01,269 --> 00:08:59,120

atlas v

235

00:09:02,710 --> 00:09:01,279

we've successfully launched 12 missions

236

00:09:05,269 --> 00:09:02,720

on this rocket

237

00:09:07,030 --> 00:09:05,279

missions to pluto jupiter

238

00:09:08,710 --> 00:09:07,040

the moon the sun

239

00:09:11,030 --> 00:09:08,720

the radiation belts

240

00:09:13,509 --> 00:09:11,040

three spacecraft to mars

241

00:09:16,150 --> 00:09:13,519

and now the asteroid bennu

242

00:09:19,430 --> 00:09:16,160

osiris-rex will be the 13th nasa mission

243

00:09:22,150 --> 00:09:19,440

on atlas v and the 65th atlas v launch

244

00:09:26,710 --> 00:09:22,160

overall

245

00:09:29,430 --> 00:09:26,720

osiris-rex will launch on an atlas v 411

246

00:09:32,310 --> 00:09:29,440

from space launch complex 41.

247

00:09:34,870 --> 00:09:32,320

slick 41 is proud to have hosted 53

248

00:09:37,030 --> 00:09:34,880

atlas 5 launches to date

249

00:09:39,110 --> 00:09:37,040

now i'd like to show a video of the ula

250

00:09:41,110 --> 00:09:39,120

crew receiving and assembling the atlas

251
00:09:45,590 --> 00:09:41,120
5 launch vehicle and mating the

252
00:09:48,470 --> 00:09:45,600
osiris-rex spacecraft at complex 41.

253
00:09:50,790 --> 00:09:48,480
here you see in july we received the

254
00:09:53,269 --> 00:09:50,800
second stage the centaur

255
00:09:54,630 --> 00:09:53,279
from decatur alabama it came by way of

256
00:09:56,150 --> 00:09:54,640
trailer

257
00:09:58,949 --> 00:09:56,160
the first stage

258
00:09:59,750 --> 00:09:58,959
came next and it was came on the mariner

259
00:10:01,990 --> 00:09:59,760
ship

260
00:10:03,670 --> 00:10:02,000
these atlas five stages are manufactured

261
00:10:05,750 --> 00:10:03,680
in ula's state of the art factory in

262
00:10:07,509 --> 00:10:05,760
decatur alabama

263
00:10:09,910 --> 00:10:07,519

they're transported to cape canaveral

264

00:10:11,910 --> 00:10:09,920

via the ship and sometimes over the road

265

00:10:14,069 --> 00:10:11,920

as required

266

00:10:15,750 --> 00:10:14,079

the offload of the first stage took it

267

00:10:17,509 --> 00:10:15,760

to the asoc where it underwent

268

00:10:19,750 --> 00:10:17,519

processing there

269

00:10:22,150 --> 00:10:19,760

and then out to the pad

270

00:10:23,750 --> 00:10:22,160

earlier in august

271

00:10:26,870 --> 00:10:23,760

here you see the

272

00:10:28,389 --> 00:10:26,880

stacked centaur the second stage in an

273

00:10:30,310 --> 00:10:28,399

off-site vertical integration

274

00:10:32,710 --> 00:10:30,320

configuration with the boat tail and the

275

00:10:35,110 --> 00:10:32,720

interstage assembly and it's being

276

00:10:39,670 --> 00:10:35,120

raised and mated to the top of the first

277

00:10:44,710 --> 00:10:42,790

the 411 configuration of atlas 5 has one

278

00:10:47,910 --> 00:10:44,720

solid rocket motor and here you see a

279

00:10:50,310 --> 00:10:47,920

sequence of that aerojet rocketdyne

280

00:10:51,590 --> 00:10:50,320

solid rocket booster being mated at the

281

00:10:54,790 --> 00:10:51,600

vif

282

00:10:57,030 --> 00:10:54,800

to the north side of the atlas v

283

00:10:58,470 --> 00:10:57,040

and on the early morning hours

284

00:11:00,949 --> 00:10:58,480

of the 29th

285

00:11:03,990 --> 00:11:00,959

of august we rolled out this beauty the

286

00:11:06,389 --> 00:11:04,000

encapsulated assembly with osiris-rex

287

00:11:09,590 --> 00:11:06,399

inside the payload fairing

288

00:11:11,269 --> 00:11:09,600

we found a little moment in time where

289

00:11:13,430 --> 00:11:11,279

the weather cooperated and we were able

290

00:11:15,430 --> 00:11:13,440

to successfully lift

291

00:11:17,350 --> 00:11:15,440

in the midst of a lot of bad weather as

292

00:11:19,430 --> 00:11:17,360

you can see here the storm clouds were

293

00:11:21,269 --> 00:11:19,440

brewing that day but we had a very

294

00:11:23,269 --> 00:11:21,279

smooth day and were able to successfully

295

00:11:26,630 --> 00:11:23,279

mate that encapsulated assembly at the

296

00:11:30,150 --> 00:11:28,870

the osiris-rex launch campaign has gone

297

00:11:32,069 --> 00:11:30,160

very well

298

00:11:35,110 --> 00:11:32,079

over the past eight days since

299

00:11:36,389 --> 00:11:35,120

osiris-rex spacecraft mate the atlas 5

300

00:11:37,829 --> 00:11:36,399

team has been busy with launch

301

00:11:39,910 --> 00:11:37,839

preparations

302

00:11:41,269 --> 00:11:39,920

last wednesday we performed the final

303

00:11:43,269 --> 00:11:41,279

integrated systems test with the

304

00:11:46,230 --> 00:11:43,279

spacecraft and rocket

305

00:11:47,910 --> 00:11:46,240

then last thursday the combined nasa and

306

00:11:50,069 --> 00:11:47,920

ula launch team held the flight

307

00:11:52,150 --> 00:11:50,079

readiness review where we assessed all

308

00:11:53,829 --> 00:11:52,160

processing and pre-launch preparations

309

00:11:56,069 --> 00:11:53,839

for this mission

310

00:11:58,310 --> 00:11:56,079

last friday we performed a successful

311

00:12:00,870 --> 00:11:58,320

mission dress rehearsal to exercise and

312

00:12:01,990 --> 00:12:00,880

prepare the entire ula

313

00:12:04,470 --> 00:12:02,000

nasa

314

00:12:06,230 --> 00:12:04,480

lockheed martin and air force atlas v

315

00:12:07,910 --> 00:12:06,240

launch team

316

00:12:09,190 --> 00:12:07,920

just this morning we conducted the

317

00:12:10,949 --> 00:12:09,200

launch readiness review for the

318

00:12:13,509 --> 00:12:10,959

osiris-rex mission

319

00:12:14,949 --> 00:12:13,519

senior managers from nasa ksc

320

00:12:17,750 --> 00:12:14,959

goddard space flight center and

321

00:12:20,069 --> 00:12:17,760

headquarters as well as ulf and the air

322

00:12:21,910 --> 00:12:20,079

force assess the readiness of the rocket

323

00:12:24,949 --> 00:12:21,920

the spacecraft and range assets to

324

00:12:27,670 --> 00:12:24,959

proceed with launch on thursday evening

325

00:12:30,069 --> 00:12:27,680

tomorrow we will begin our final launch

326

00:12:32,710 --> 00:12:30,079

preparations at approximately nine a.m

327

00:12:35,190 --> 00:12:32,720

eastern time by rolling the atlas v on

328

00:12:37,509 --> 00:12:35,200

its mobile launch platform approximately

329

00:12:39,509 --> 00:12:37,519

one-quarter mile north from the vif the

330

00:12:43,030 --> 00:12:39,519

vertical integration facility to the

331

00:12:45,430 --> 00:12:43,040

launch pad at slick 41.

332

00:12:47,910 --> 00:12:45,440

on thursday the launch crew will begin

333

00:12:49,269 --> 00:12:47,920

arriving on console mid-day

334

00:12:51,350 --> 00:12:49,279

the crew will perform the final

335

00:12:53,430 --> 00:12:51,360

preparations of atlas v power on and

336

00:12:54,790 --> 00:12:53,440

electrical checks beginning at noon

337

00:12:57,990 --> 00:12:54,800

eastern time

338

00:12:59,990 --> 00:12:58,000

this will be followed just before 5 pm

339

00:13:01,910 --> 00:13:00,000

by loading the super cold cryogenic

340

00:13:04,150 --> 00:13:01,920

propellants on board

341

00:13:06,069 --> 00:13:04,160

first liquid oxygen into the tanks of

342

00:13:07,190 --> 00:13:06,079

the first stage booster and second stage

343

00:13:09,190 --> 00:13:07,200

centaur

344

00:13:10,790 --> 00:13:09,200

then liquid hydrogen into the second

345

00:13:12,230 --> 00:13:10,800

stage

346

00:13:14,470 --> 00:13:12,240

final flight control tests will be

347

00:13:16,470 --> 00:13:14,480

performed along with final tests with

348

00:13:18,069 --> 00:13:16,480

eastern range instrumentation

349

00:13:22,150 --> 00:13:18,079

and then we will be ready for launch

350

00:13:26,310 --> 00:13:22,160

thursday evening at 7 05 pm eastern time

351
00:13:29,110 --> 00:13:26,320
with a 115 minute launch window

352
00:13:31,509 --> 00:13:29,120
in summary the atlas v rocket and range

353
00:13:34,150 --> 00:13:31,519
equipment are ready and the combined

354
00:13:36,310 --> 00:13:34,160
government and contractor launch team is

355
00:13:38,470 --> 00:13:36,320
prepared to launch this fantastic

356
00:13:40,710 --> 00:13:38,480
asteroid sample retrieval mission

357
00:13:43,110 --> 00:13:40,720
osiris-rex

358
00:13:45,189 --> 00:13:43,120
back to you george thank you tim

359
00:13:47,110 --> 00:13:45,199
and now to scott messer the program

360
00:13:50,389 --> 00:13:47,120
manager for nasa missions from the

361
00:13:51,990 --> 00:13:50,399
united launch alliance scott

362
00:13:53,750 --> 00:13:52,000
thank you george

363
00:13:55,910 --> 00:13:53,760

on behalf of united launch alliance i

364

00:13:57,829 --> 00:13:55,920

just wanted to note that we are honored

365

00:14:00,310 --> 00:13:57,839

to be here on day one

366

00:14:03,030 --> 00:14:00,320

of the osiris-rex or one day before

367

00:14:05,590 --> 00:14:03,040

launch of the osiris-rex mission

368

00:14:07,670 --> 00:14:05,600

this is a very exciting mission for us

369

00:14:10,150 --> 00:14:07,680

and and for me

370

00:14:12,710 --> 00:14:10,160

personally and i i get really

371

00:14:15,269 --> 00:14:12,720

enthusiastic every time i come down and

372

00:14:17,910 --> 00:14:15,279

learn more about this mission

373

00:14:20,550 --> 00:14:17,920

osiris-rex will be the eighth launch for

374

00:14:24,550 --> 00:14:20,560

ula in 2016

375

00:14:27,829 --> 00:14:24,560

and uh the 111th launch of ula since its

376

00:14:29,350 --> 00:14:27,839
formation in december of 2016.

377

00:14:31,430 --> 00:14:29,360
he'll also be

378

00:14:34,150 --> 00:14:31,440
the fourth launch of this particular

379

00:14:36,710 --> 00:14:34,160
configuration the 411.

380

00:14:37,829 --> 00:14:36,720
the 411 configuration includes a four

381

00:14:39,430 --> 00:14:37,839
meter

382

00:14:40,870 --> 00:14:39,440
payload fairing which houses the

383

00:14:44,150 --> 00:14:40,880
spacecraft

384

00:14:47,030 --> 00:14:44,160
it's got a single solid rocket booster

385

00:14:49,829 --> 00:14:47,040
and the first stage is powered by the

386

00:14:51,750 --> 00:14:49,839
rd-180 built by rd amros

387

00:14:54,550 --> 00:14:51,760
and this the centaur

388

00:14:57,509 --> 00:14:54,560

upper stage is powered by the rocketdyne

389

00:15:00,230 --> 00:14:57,519

aerojet rocketdyne rl10a engine

390

00:15:02,870 --> 00:15:00,240

and i've got a short animated video that

391

00:15:04,069 --> 00:15:02,880

will show the events that we expect to

392

00:15:09,910 --> 00:15:04,079

occur

393

00:15:13,910 --> 00:15:11,829

the following profile details the

394

00:15:15,990 --> 00:15:13,920

important events of this mission using

395

00:15:17,030 --> 00:15:16,000

approximate times

396

00:15:18,069 --> 00:15:17,040

six

397

00:15:19,110 --> 00:15:18,079

five

398

00:15:20,310 --> 00:15:19,120

four

399

00:15:22,629 --> 00:15:20,320

three

400

00:15:23,430 --> 00:15:22,639

two atlas engine ignition

401

00:15:28,629 --> 00:15:23,440

one

402

00:15:31,670 --> 00:15:28,639

zero and liftoff of the atlas 5 rocket

403

00:15:33,910 --> 00:15:31,680

the atlas 5 rd-180 main engine and a

404

00:15:37,910 --> 00:15:33,920

single solid rocket booster ignite to

405

00:15:42,550 --> 00:15:40,069

shortly after liftoff atlas begins its

406

00:15:44,870 --> 00:15:42,560

initial pitch yaw and roll maneuvers to

407

00:15:47,910 --> 00:15:44,880

attain the proper ascent profile and

408

00:15:50,550 --> 00:15:47,920

minimize aerodynamic loads

409

00:15:53,110 --> 00:15:50,560

the atlas 5 reaches mach 1 the speed of

410

00:15:55,829 --> 00:15:53,120

sound at 57 seconds

411

00:15:58,150 --> 00:15:55,839

at 69 seconds the vehicle experiences

412

00:16:00,150 --> 00:15:58,160

maximum dynamic pressure

413

00:16:02,949 --> 00:16:00,160

the solid rocket booster is jettisoned

414

00:16:05,110 --> 00:16:02,959

in less than two and a half minutes

415

00:16:07,110 --> 00:16:05,120

as it approaches booster engine cut off

416

00:16:08,590 --> 00:16:07,120

the atlas v is burning propellant at the

417

00:16:11,990 --> 00:16:08,600

rate of 1

418

00:16:15,430 --> 00:16:12,000

672 pounds per second traveling at over

419

00:16:18,949 --> 00:16:15,440

12 000 miles per hour and located 62

420

00:16:22,790 --> 00:16:18,959

miles in altitude and 188 miles

421

00:16:28,550 --> 00:16:24,949

booster engine cutoff occurs about four

422

00:16:33,269 --> 00:16:30,550

the booster stage is jettisoned six

423

00:16:35,189 --> 00:16:33,279

seconds later

424

00:16:37,350 --> 00:16:35,199

the first centaur main engine start

425

00:16:40,870 --> 00:16:37,360

takes place 10 seconds after booster

426
00:16:44,949 --> 00:16:43,110
the payload fairing is jettisoned about

427
00:16:47,350 --> 00:16:44,959
eight seconds later

428
00:16:49,189 --> 00:16:47,360
the vehicle now weighs just six percent

429
00:16:53,269 --> 00:16:49,199
of what it did at liftoff four and a

430
00:16:57,990 --> 00:16:55,110
cut off of the centaur main engine

431
00:17:00,790 --> 00:16:58,000
occurs just over 12 minutes after launch

432
00:17:02,790 --> 00:17:00,800
the mission now enters a 21 minute coast

433
00:17:05,590 --> 00:17:02,800
phase

434
00:17:08,150 --> 00:17:05,600
at 33 minutes 48 seconds the centaur

435
00:17:13,189 --> 00:17:08,160
main engine is restarted

436
00:17:18,069 --> 00:17:15,429
following the second centaur main engine

437
00:17:20,949 --> 00:17:18,079
cutoff at 40 minutes 38 seconds the

438
00:17:23,750 --> 00:17:20,959

mission enters a final 15-minute coast

439

00:17:29,909 --> 00:17:26,870

at 55 minutes 37 seconds centaur

440

00:17:32,390 --> 00:17:29,919

releases nasa's osiris-rex on its way to

441

00:17:40,150 --> 00:17:32,400

its rendezvous with the asteroid

442

00:17:45,590 --> 00:17:43,270

so as as noted in the video the the

443

00:17:47,590 --> 00:17:45,600

timelines

444

00:17:50,070 --> 00:17:47,600

discussed there are

445

00:17:51,990 --> 00:17:50,080

approximate each day we do have a two

446

00:17:55,750 --> 00:17:52,000

hour launch window or

447

00:17:58,549 --> 00:17:55,760

as tim mentioned 115 minutes each day

448

00:18:00,870 --> 00:17:58,559

and with inside that we've got a launch

449

00:18:02,549 --> 00:18:00,880

attempt every five minutes

450

00:18:04,789 --> 00:18:02,559

so

451
00:18:07,110 --> 00:18:04,799
times can vary depending upon where we

452
00:18:08,789 --> 00:18:07,120
launched the timelines that were

453
00:18:11,110 --> 00:18:08,799
presented in the video

454
00:18:13,430 --> 00:18:11,120
are for a launch at the middle of the

455
00:18:15,750 --> 00:18:13,440
window so if we launch

456
00:18:17,830 --> 00:18:15,760
on thursday night when i hope we do

457
00:18:19,430 --> 00:18:17,840
which will be at the start of the window

458
00:18:22,150 --> 00:18:19,440
some of those timelines will be a little

459
00:18:23,430 --> 00:18:22,160
bit longer so for example spacecraft

460
00:18:25,510 --> 00:18:23,440
separation

461
00:18:27,750 --> 00:18:25,520
would occur about three and a half

462
00:18:30,150 --> 00:18:27,760
minutes after what was noted in that

463
00:18:34,710 --> 00:18:30,160

video it's just if anybody was writing

464

00:18:40,630 --> 00:18:37,750

as i noted we are proud to uh to deliver

465

00:18:43,029 --> 00:18:40,640

the osiris-rex spacecraft to its orbit

466

00:18:45,990 --> 00:18:43,039

we recognize that this is a risky and

467

00:18:49,110 --> 00:18:46,000

technically challenging business and

468

00:18:52,390 --> 00:18:49,120

so we are can we'll continue to deliver

469

00:18:53,990 --> 00:18:52,400

with uh our reliable processes

470

00:18:56,070 --> 00:18:54,000

deliver the nation's most important

471

00:18:58,950 --> 00:18:56,080

payloads and critical capabilities to

472

00:19:01,029 --> 00:18:58,960

orbit and just once again thank you to

473

00:19:03,909 --> 00:19:01,039

all of our mission partners the entire

474

00:19:05,190 --> 00:19:03,919

ula team looks forward to a successful

475

00:19:08,230 --> 00:19:05,200

launch of

476

00:19:10,789 --> 00:19:08,240

osiris-rex on thursday night and

477

00:19:13,190 --> 00:19:10,799

so with that i'll do a go atlas go

478

00:19:16,230 --> 00:19:13,200

centaur and go osiris-rex

479

00:19:18,070 --> 00:19:16,240

back to you george thank you scott

480

00:19:20,710 --> 00:19:18,080

we'll go now to michael donnelly who's

481

00:19:23,029 --> 00:19:20,720

the nasa osiris-rex project manager from

482

00:19:25,510 --> 00:19:23,039

nasa's goddard space flight center

483

00:19:27,430 --> 00:19:25,520

michael okay so like everybody else i'm

484

00:19:28,390 --> 00:19:27,440

happy to be here i'm happy to be

485

00:19:30,230 --> 00:19:28,400

launching

486

00:19:32,150 --> 00:19:30,240

on thursday so

487

00:19:35,190 --> 00:19:32,160

picking up where the

488

00:19:38,150 --> 00:19:35,200

ula video ended if you could start the

489

00:19:40,549 --> 00:19:38,160

first video for me

490

00:19:42,070 --> 00:19:40,559

59 minutes and this is with the opening

491

00:19:44,390 --> 00:19:42,080

of the launch window on the very first

492

00:19:45,909 --> 00:19:44,400

day the spacecraft separates from the

493

00:19:47,270 --> 00:19:45,919

launch vehicle

494

00:19:49,350 --> 00:19:47,280

about

495

00:19:51,909 --> 00:19:49,360

four minutes in the solar rays will

496

00:19:53,190 --> 00:19:51,919

deploy after the rates have been damped

497

00:19:54,310 --> 00:19:53,200

there's another

498

00:19:57,029 --> 00:19:54,320

i don't know

499

00:19:59,590 --> 00:19:57,039

13 minutes or so while we slew the

500

00:20:01,590 --> 00:19:59,600

spacecraft to a favorable communications

501
00:20:03,909 --> 00:20:01,600
attitude for canberra and we will

502
00:20:06,549 --> 00:20:03,919
establish two-way communication so 17

503
00:20:08,230 --> 00:20:06,559
minutes after separation we should have

504
00:20:10,470 --> 00:20:08,240
stable communications between the

505
00:20:13,110 --> 00:20:10,480
spacecraft and canberra and be able to

506
00:20:15,430 --> 00:20:13,120
determine that the spacecraft is safe

507
00:20:17,270 --> 00:20:15,440
14 days after launch we will turn on the

508
00:20:19,669 --> 00:20:17,280
instruments and check them out and then

509
00:20:21,430 --> 00:20:19,679
we'll turn them back off about one year

510
00:20:23,270 --> 00:20:21,440
after launch after going around the sun

511
00:20:24,870 --> 00:20:23,280
once we'll do an earth gravity assist

512
00:20:27,510 --> 00:20:24,880
and change the orbit plane of the

513
00:20:31,190 --> 00:20:27,520

spacecraft put it in the same plane as

514

00:20:33,430 --> 00:20:31,200

the asteroid bennu and then just shy of

515

00:20:36,390 --> 00:20:33,440

two years after launch we'll actually

516

00:20:37,830 --> 00:20:36,400

get to bennu in august of 2018. start

517

00:20:40,310 --> 00:20:37,840

all of our measurements all of our

518

00:20:43,669 --> 00:20:40,320

observations and pick a site so that we

519

00:20:46,230 --> 00:20:43,679

can safely tag in july of 2020.

520

00:20:47,830 --> 00:20:46,240

if we can go to the next video please

521

00:20:50,230 --> 00:20:47,840

this is the instrument suite that will

522

00:20:51,830 --> 00:20:50,240

support all those observations from the

523

00:20:54,470 --> 00:20:51,840

pis facility

524

00:20:56,390 --> 00:20:54,480

we have the osiris-rex camera suite

525

00:20:59,029 --> 00:20:56,400

that's a suite of three

526

00:21:01,430 --> 00:20:59,039

visible cameras the polycam

527

00:21:03,750 --> 00:21:01,440

map cam and sam cam

528

00:21:05,909 --> 00:21:03,760

from arizona state university we get one

529

00:21:07,590 --> 00:21:05,919

of our two spectrometers that would be

530

00:21:08,950 --> 00:21:07,600

the osiris-rex thermal emission

531

00:21:11,430 --> 00:21:08,960

spectrometer

532

00:21:13,270 --> 00:21:11,440

and from our well from goddard space

533

00:21:14,830 --> 00:21:13,280

flight center we get the second

534

00:21:16,789 --> 00:21:14,840

spectrometer the

535

00:21:19,510 --> 00:21:16,799

osiris-rex visible and infrared

536

00:21:21,590 --> 00:21:19,520

spectrometer ovirs between those two

537

00:21:25,270 --> 00:21:21,600

spectrometers we cover the wavelengths

538

00:21:27,590 --> 00:21:25,280

of 0.4 microns out to 50 microns

539

00:21:29,350 --> 00:21:27,600

from our canadian partners csa and their

540

00:21:32,070 --> 00:21:29,360

contractor mcdonald detwiler and

541

00:21:34,149 --> 00:21:32,080

associates we get the osiris-rex laser

542

00:21:36,950 --> 00:21:34,159

altimeter which will be used for mapping

543

00:21:39,909 --> 00:21:36,960

the asteroid and lastly from a team of

544

00:21:42,149 --> 00:21:39,919

students from mit and harvard we get our

545

00:21:43,990 --> 00:21:42,159

student collaboration instrument which

546

00:21:45,350 --> 00:21:44,000

is the regolith x-ray imaging

547

00:21:47,590 --> 00:21:45,360

spectrometer

548

00:21:49,750 --> 00:21:47,600

and so these five instruments make up

549

00:21:50,950 --> 00:21:49,760

that suite of instruments that will be

550

00:21:53,110 --> 00:21:50,960

used to

551

00:21:54,870 --> 00:21:53,120

pick out the sample site do all those

552

00:21:57,029 --> 00:21:54,880

that exciting science that dante

553

00:21:59,909 --> 00:21:57,039

mentioned that made up his acronym

554

00:22:03,270 --> 00:21:59,919

and you know help us bring a sample back

555

00:22:06,230 --> 00:22:03,280

in september of 2023 right yeah

556

00:22:08,870 --> 00:22:06,240

september 24th 2023. there's way too

557

00:22:11,669 --> 00:22:08,880

many septembers in this mission so all

558

00:22:14,390 --> 00:22:11,679

right george all right thank you michael

559

00:22:16,310 --> 00:22:14,400

now to rich coons he's the osiris-rex

560

00:22:18,789 --> 00:22:16,320

program manager from lockheed martin

561

00:22:20,390 --> 00:22:18,799

space systems rich

562

00:22:22,789 --> 00:22:20,400

hi if we could actually start the first

563

00:22:24,390 --> 00:22:22,799

video so there's one additional payload

564

00:22:26,149 --> 00:22:24,400

on the

565

00:22:28,470 --> 00:22:26,159

osiris-rex spacecraft and that's

566

00:22:30,789 --> 00:22:28,480

actually the tag sam arm

567

00:22:32,310 --> 00:22:30,799

so the tag sam arm starts with the

568

00:22:35,190 --> 00:22:32,320

sample head and that's what will

569

00:22:36,789 --> 00:22:35,200

actually go and collect the sample from

570

00:22:39,029 --> 00:22:36,799

bennu

571

00:22:40,789 --> 00:22:39,039

it's about 12 inches in diameter and

572

00:22:42,310 --> 00:22:40,799

we've been testing it now for for

573

00:22:44,230 --> 00:22:42,320

several years

574

00:22:46,710 --> 00:22:44,240

that's connected to an arm that's about

575

00:22:48,870 --> 00:22:46,720

10 feet long that contains a pogo

576
00:22:50,710 --> 00:22:48,880
assembly so that we can stay in contact

577
00:22:52,830 --> 00:22:50,720
with the asteroid for the three seconds

578
00:22:56,390 --> 00:22:52,840
that will take for us to collect our

579
00:22:58,870 --> 00:22:56,400
sample when we sense that contact the

580
00:23:00,470 --> 00:22:58,880
compressed gas will be released

581
00:23:02,070 --> 00:23:00,480
and then we'll actually collect that

582
00:23:04,549 --> 00:23:02,080
sample in the head

583
00:23:07,590 --> 00:23:04,559
as a function of releasing that gas

584
00:23:08,470 --> 00:23:07,600
we've tested this arm extensively over

585
00:23:11,270 --> 00:23:08,480
the last

586
00:23:13,110 --> 00:23:11,280
decade to make sure that we can collect

587
00:23:15,110 --> 00:23:13,120
more than enough sample

588
00:23:17,590 --> 00:23:15,120

in the environment that we expect to see

589

00:23:19,350 --> 00:23:17,600

in space so we've exposed it to vacuum

590

00:23:22,549 --> 00:23:19,360

we've exposed it to temperature we've

591

00:23:24,549 --> 00:23:22,559

tested it both pre and post vibration

592

00:23:28,470 --> 00:23:24,559

and we've tested it over a very wide

593

00:23:35,029 --> 00:23:32,789

if we can start the next video

594

00:23:37,270 --> 00:23:35,039

now how are we actually going to use

595

00:23:38,549 --> 00:23:37,280

that head so

596

00:23:41,190 --> 00:23:38,559

the first thing we have to do is we

597

00:23:43,110 --> 00:23:41,200

launch with the arm stowed in in its

598

00:23:45,190 --> 00:23:43,120

configuration so release the head and

599

00:23:46,630 --> 00:23:45,200

then deploy the arm getting it all the

600

00:23:48,470 --> 00:23:46,640

way out

601
00:23:49,590 --> 00:23:48,480
we get to practice doing the tag

602
00:23:50,630 --> 00:23:49,600
maneuver

603
00:23:52,870 --> 00:23:50,640
as we

604
00:23:54,549 --> 00:23:52,880
get closer to collecting the sample

605
00:23:56,149 --> 00:23:54,559
which is shown here

606
00:23:58,549 --> 00:23:56,159
once we detect

607
00:24:00,549 --> 00:23:58,559
the contact we'll release the gas

608
00:24:03,029 --> 00:24:00,559
when we release that gas it actually

609
00:24:05,029 --> 00:24:03,039
will mobilize the material and collect

610
00:24:06,549 --> 00:24:05,039
it in the head

611
00:24:09,909 --> 00:24:06,559
once we've done the collection we

612
00:24:11,909 --> 00:24:09,919
actually go up and do a spin maneuver

613
00:24:14,230 --> 00:24:11,919

where we're able to tell how much

614

00:24:17,990 --> 00:24:14,240

material we have to within

615

00:24:20,149 --> 00:24:18,000

20 to 40 grams of material

616

00:24:21,750 --> 00:24:20,159

once we know we have enough material we

617

00:24:24,630 --> 00:24:21,760

stow the head

618

00:24:26,870 --> 00:24:24,640

and close it into the src

619

00:24:29,269 --> 00:24:26,880

it is the same src that successfully

620

00:24:32,310 --> 00:24:29,279

returned the stardust samples

621

00:24:33,590 --> 00:24:32,320

so it'll return back to

622

00:24:35,909 --> 00:24:33,600

utah

623

00:24:37,830 --> 00:24:35,919

in 2023

624

00:24:40,549 --> 00:24:37,840

when it reenters the environment it's

625

00:24:42,390 --> 00:24:40,559

traveling 27 000 miles an hour and by

626
00:24:44,470 --> 00:24:42,400
the time it gently touches down it's

627
00:24:47,990 --> 00:24:44,480
moving less than 10

628
00:24:49,510 --> 00:24:48,000
and we'll move it from

629
00:24:51,669 --> 00:24:49,520
uttr

630
00:24:53,990 --> 00:24:51,679
to johnson space center where it's a

631
00:24:55,750 --> 00:24:54,000
world-class curation facility

632
00:24:59,029 --> 00:24:55,760
and those samples will be

633
00:25:00,789 --> 00:24:59,039
evaluated for many years to come

634
00:25:04,230 --> 00:25:00,799
so in order to get to that point we had

635
00:25:05,909 --> 00:25:04,240
to do a lot once we arrived here at

636
00:25:07,590 --> 00:25:05,919
kennedy space center so if we can play

637
00:25:11,190 --> 00:25:07,600
the third video

638
00:25:12,549 --> 00:25:11,200

um we we traveled on a c-17 aircraft we

639

00:25:14,789 --> 00:25:12,559

arrived here

640

00:25:16,470 --> 00:25:14,799

on may 20th

641

00:25:17,830 --> 00:25:16,480

turns out that there was a thunderstorm

642

00:25:19,190 --> 00:25:17,840

all day they were worried about

643

00:25:20,870 --> 00:25:19,200

diverting us

644

00:25:22,710 --> 00:25:20,880

it cleared up and it was sunny as we

645

00:25:23,750 --> 00:25:22,720

landed we were able to move it into the

646

00:25:25,750 --> 00:25:23,760

high bay

647

00:25:27,190 --> 00:25:25,760

the next day where we took it out of its

648

00:25:29,590 --> 00:25:27,200

shipping container

649

00:25:31,590 --> 00:25:29,600

and lifted it onto its spin balance

650

00:25:33,350 --> 00:25:31,600

table and the first thing we did is made

651
00:25:34,789 --> 00:25:33,360
sure that when we spin the spacecraft

652
00:25:36,470 --> 00:25:34,799
that was balanced the way that we

653
00:25:38,390 --> 00:25:36,480
expected it to be

654
00:25:40,070 --> 00:25:38,400
so that we understood how we would

655
00:25:43,750 --> 00:25:40,080
control it

656
00:25:45,669 --> 00:25:43,760
when it was here after that we had to

657
00:25:48,470 --> 00:25:45,679
remove the solar arrays in order to

658
00:25:50,549 --> 00:25:48,480
finish the processing so this is our pop

659
00:25:52,470 --> 00:25:50,559
and catch is what we call it for the

660
00:25:54,230 --> 00:25:52,480
solar arrays where we actually release

661
00:25:55,669 --> 00:25:54,240
the mechanisms that hold the spacecraft

662
00:25:58,230 --> 00:25:55,679
in make sure they're going to work

663
00:26:01,190 --> 00:25:58,240

flawlessly when we get up on orbit

664

00:26:03,269 --> 00:26:01,200

then move to a rotation fixture to

665

00:26:05,190 --> 00:26:03,279

continue processing a lot of the

666

00:26:07,190 --> 00:26:05,200

processing that we really did here at

667

00:26:09,750 --> 00:26:07,200

the cape was centered around making sure

668

00:26:12,549 --> 00:26:09,760

that we got the blankets on that the

669

00:26:14,390 --> 00:26:12,559

spacecraft was cleaned appropriately and

670

00:26:18,310 --> 00:26:14,400

that everything was still functioning

671

00:26:19,990 --> 00:26:18,320

after we moved it on the 20th of may

672

00:26:22,149 --> 00:26:20,000

the blankets

673

00:26:25,510 --> 00:26:22,159

closeouts went extremely well

674

00:26:27,590 --> 00:26:25,520

the team is at this point in time has

675

00:26:29,830 --> 00:26:27,600

them all closed out because we're on top

676
00:26:31,430 --> 00:26:29,840
of the rocket

677
00:26:32,630 --> 00:26:31,440
and then we had to put the arrays back

678
00:26:36,070 --> 00:26:32,640
on

679
00:26:37,669 --> 00:26:36,080
final time

680
00:26:39,750 --> 00:26:37,679
that was the last time that we were able

681
00:26:42,070 --> 00:26:39,760
to see several of those bays so a lot of

682
00:26:43,830 --> 00:26:42,080
that time is goes into us being very

683
00:26:45,990 --> 00:26:43,840
careful about making sure that those

684
00:26:47,269 --> 00:26:46,000
things that need to stay here with us

685
00:26:48,390 --> 00:26:47,279
are staying here with us and that

686
00:26:51,110 --> 00:26:48,400
everything that has to go with the

687
00:26:54,070 --> 00:26:51,120
spacecraft is going with the spacecraft

688
00:26:56,310 --> 00:26:54,080

um once we were able to confirm that all

689

00:26:58,310 --> 00:26:56,320

of that had happened we were closed up

690

00:27:01,269 --> 00:26:58,320

inside of the fairing

691

00:27:03,750 --> 00:27:01,279

and as tim showed we moved out to be

692

00:27:05,430 --> 00:27:03,760

stacked on top of the rocket

693

00:27:07,190 --> 00:27:05,440

it's certainly been an extremely

694

00:27:09,029 --> 00:27:07,200

exciting time

695

00:27:11,269 --> 00:27:09,039

for everybody here things have gone

696

00:27:12,870 --> 00:27:11,279

exceptionally well our partners have

697

00:27:14,950 --> 00:27:12,880

been very supportive and couldn't be

698

00:27:17,110 --> 00:27:14,960

happier with how well things have gone

699

00:27:19,430 --> 00:27:17,120

to this point

700

00:27:24,310 --> 00:27:19,440

back to you george thank you rich

701
00:27:28,149 --> 00:27:26,389
clay flynn is the launch weather officer

702
00:27:29,190 --> 00:27:28,159
during the countdown who you'll be

703
00:27:31,110 --> 00:27:29,200
hearing

704
00:27:34,070 --> 00:27:31,120
from the 45th weather squadron at cape

705
00:27:35,909 --> 00:27:34,080
canaveral air force station clay thank

706
00:27:37,830 --> 00:27:35,919
you very much george if i could have the

707
00:27:39,190 --> 00:27:37,840
satellite picture up i'd appreciate it

708
00:27:40,310 --> 00:27:39,200
if you look down in south florida you'll

709
00:27:42,230 --> 00:27:40,320
know we have quite a bit of cloudy

710
00:27:44,149 --> 00:27:42,240
conditions some showers and isolated

711
00:27:45,669 --> 00:27:44,159
thunderstorms down south that's

712
00:27:46,870 --> 00:27:45,679
associated with the surface trough that

713
00:27:48,070 --> 00:27:46,880

pushed through our area yesterday you

714

00:27:50,230 --> 00:27:48,080

may recall yesterday we had a few

715

00:27:51,990 --> 00:27:50,240

showers over the area it did push south

716

00:27:53,510 --> 00:27:52,000

it should remain south through through

717

00:27:54,950 --> 00:27:53,520

the next several days it does become a

718

00:27:56,950 --> 00:27:54,960

little more broad

719

00:27:58,870 --> 00:27:56,960

and diffuse as it starts to lose its

720

00:28:00,710 --> 00:27:58,880

characteristics into this weekend but

721

00:28:03,750 --> 00:28:00,720

for the most part the boundary should

722

00:28:05,430 --> 00:28:03,760

remain to our south over central florida

723

00:28:07,029 --> 00:28:05,440

we have high pressure building in

724

00:28:08,310 --> 00:28:07,039

clockwise flow around high pressure

725

00:28:10,710 --> 00:28:08,320

systems so we would expect to have

726
00:28:12,630 --> 00:28:10,720
easterly winds winds blowing from east

727
00:28:14,310 --> 00:28:12,640
to the west not only at the low levels

728
00:28:16,870 --> 00:28:14,320
but also in the mid levels of the

729
00:28:18,310 --> 00:28:16,880
atmosphere when those conditions exist

730
00:28:20,549 --> 00:28:18,320
afternoon and evening thunderstorms

731
00:28:21,750 --> 00:28:20,559
favor the interior of the state so

732
00:28:23,830 --> 00:28:21,760
really

733
00:28:25,830 --> 00:28:23,840
what we'd expect to see for for the

734
00:28:27,830 --> 00:28:25,840
pre-launch operations tomorrow

735
00:28:29,830 --> 00:28:27,840
for the most part during the day and for

736
00:28:31,430 --> 00:28:29,840
the launch account on thursday would

737
00:28:33,510 --> 00:28:31,440
expect the sea breeze to set up mid to

738
00:28:35,590 --> 00:28:33,520

late morning by early afternoon we

739

00:28:37,029 --> 00:28:35,600

should see it over the over the mainland

740

00:28:39,029 --> 00:28:37,039

or nearing the mainland

741

00:28:40,549 --> 00:28:39,039

as the sea breeze sets up we see a small

742

00:28:42,389 --> 00:28:40,559

threat of an isolated shower i don't

743

00:28:44,310 --> 00:28:42,399

think we'll see thunderstorms at that

744

00:28:45,830 --> 00:28:44,320

time of day but should see showers

745

00:28:47,750 --> 00:28:45,840

starting to develop along the sea breeze

746

00:28:49,750 --> 00:28:47,760

and migrating to the west so once we

747

00:28:52,389 --> 00:28:49,760

pick up the count we'd expect to see a

748

00:28:54,310 --> 00:28:52,399

band of clouds to our west with showers

749

00:28:55,909 --> 00:28:54,320

with additional late afternoon heating

750

00:28:57,669 --> 00:28:55,919

showers and thunderstorms developing on

751
00:28:59,110 --> 00:28:57,679
that sea breeze but again the sea breeze

752
00:29:00,149 --> 00:28:59,120
should be to the west and migrating to

753
00:29:02,870 --> 00:29:00,159
the west

754
00:29:04,950 --> 00:29:02,880
as we near sunset uh oftentimes we'll

755
00:29:07,510 --> 00:29:04,960
start to favor clouds coming in off the

756
00:29:09,350 --> 00:29:07,520
water so we'd expect to see

757
00:29:11,110 --> 00:29:09,360
some cumulus clouds coming off the

758
00:29:12,789 --> 00:29:11,120
atlantic and that again is our principal

759
00:29:15,190 --> 00:29:12,799
concern for the attempt on thursday

760
00:29:16,630 --> 00:29:15,200
night so if i could have the forecast

761
00:29:18,070 --> 00:29:16,640
brought up please

762
00:29:20,310 --> 00:29:18,080
what we'd really be looking at is a

763
00:29:22,149 --> 00:29:20,320

scattered deck of clouds at about 3000

764

00:29:24,870 --> 00:29:22,159

feet another scattered deck of high

765

00:29:26,389 --> 00:29:24,880

clouds at about 26 000 feet

766

00:29:28,470 --> 00:29:26,399

good visibility should be about seven

767

00:29:30,230 --> 00:29:28,480

statute miles or greater

768

00:29:32,070 --> 00:29:30,240

our winds out of the east northeast

769

00:29:34,630 --> 00:29:32,080

about zero seven zero gusting to 15

770

00:29:36,950 --> 00:29:34,640

knots well below the liftoff constraints

771

00:29:38,549 --> 00:29:36,960

with a 30 excuse me a 20 chance of

772

00:29:40,230 --> 00:29:38,559

violation for the first attempt on

773

00:29:41,750 --> 00:29:40,240

thursday evening and the principal

774

00:29:43,029 --> 00:29:41,760

concern there would be cumulus clouds

775

00:29:45,029 --> 00:29:43,039

and again that would be with the deep

776

00:29:47,110 --> 00:29:45,039

easterly flow clouds coming in off the

777

00:29:48,950 --> 00:29:47,120

water moving from the east to the west

778

00:29:50,470 --> 00:29:48,960

that's the principal concern so it looks

779

00:29:52,389 --> 00:29:50,480

pretty favorable for the first attempt

780

00:29:54,230 --> 00:29:52,399

thursday evening if i could move on to

781

00:29:55,190 --> 00:29:54,240

the 24 hour delay should we be on the

782

00:29:57,190 --> 00:29:55,200

pad

783

00:29:59,190 --> 00:29:57,200

similar conditions for friday evening

784

00:30:00,389 --> 00:29:59,200

should we should we have a 24-hour delay

785

00:30:01,990 --> 00:30:00,399

with the exception that we do have a few

786

00:30:03,269 --> 00:30:02,000

little perturbations in the flow that

787

00:30:05,350 --> 00:30:03,279

should enhance

788

00:30:07,190 --> 00:30:05,360

the cumulus clouds over the atlantic and

789

00:30:09,350 --> 00:30:07,200

possibly an additional shower or two

790

00:30:11,430 --> 00:30:09,360

coming in off the atlantic and we do

791

00:30:13,590 --> 00:30:11,440

start to moisten up a bit on friday and

792

00:30:15,350 --> 00:30:13,600

saturday so a little greater threat of a

793

00:30:17,669 --> 00:30:15,360

cumulus cloud rule violation a lesser

794

00:30:19,029 --> 00:30:17,679

concern for any type of anvil cloud but

795

00:30:20,470 --> 00:30:19,039

nevertheless there was some anvil cloud

796

00:30:22,470 --> 00:30:20,480

that could possibly form from

797

00:30:24,710 --> 00:30:22,480

thunderstorms up to the north with a

798

00:30:26,149 --> 00:30:24,720

little upper level disturbance so what

799

00:30:27,750 --> 00:30:26,159

we look for on

800

00:30:30,230 --> 00:30:27,760

friday then would just be scattered low

801
00:30:32,630 --> 00:30:30,240
clouds another broken deck now at about

802
00:30:34,230 --> 00:30:32,640
24 000 feet good visibility our winds a

803
00:30:36,710 --> 00:30:34,240
little more easterly still gusting in

804
00:30:38,549 --> 00:30:36,720
the mid teens well below the constraints

805
00:30:41,029 --> 00:30:38,559
and as i mentioned a 30 percent chance

806
00:30:43,110 --> 00:30:41,039
of violation if i could have the 48-hour

807
00:30:45,110 --> 00:30:43,120
delay she would be on the pad and pretty

808
00:30:47,190 --> 00:30:45,120
much a carbon copy on saturday if we're

809
00:30:49,590 --> 00:30:47,200
on the pad similar conditions cumulus

810
00:30:51,750 --> 00:30:49,600
cloud and a small a lesser threat of an

811
00:30:53,430 --> 00:30:51,760
anvil cloud with a 30 chance of

812
00:30:55,430 --> 00:30:53,440
violation winds still well below the

813
00:30:58,310 --> 00:30:55,440

constraints coming off the water with

814

00:30:59,990 --> 00:30:58,320

gusts about 15 knots as we near sunset

815

00:31:01,590 --> 00:31:00,000

that's all i have george thank you all

816

00:31:04,149 --> 00:31:01,600

right thank you clay

817

00:31:06,070 --> 00:31:04,159

and we're ready now to take questions

818

00:31:08,549 --> 00:31:06,080

we'll start first here in the room with

819

00:31:11,509 --> 00:31:08,559

questions then we'll take some questions

820

00:31:14,310 --> 00:31:11,519

from the phone and then we'll go to our

821

00:31:17,110 --> 00:31:14,320

social media which you can ask questions

822

00:31:20,310 --> 00:31:17,120

on social media by hashtag ask nasa

823

00:31:21,830 --> 00:31:20,320

would be before you go to ask a question

824

00:31:23,350 --> 00:31:21,840

so let's start

825

00:31:24,789 --> 00:31:23,360

here in the

826

00:31:32,389 --> 00:31:24,799

in the room first

827

00:31:36,710 --> 00:31:34,389

hi thank you and good luck first of all

828

00:31:38,789 --> 00:31:36,720

uh ken kramer universe today in

829

00:31:41,269 --> 00:31:38,799

northeast astronomy forum my question is

830

00:31:43,350 --> 00:31:41,279

for dante so we we know that comets and

831

00:31:45,430 --> 00:31:43,360

asteroids brought a lot of water your

832

00:31:47,029 --> 00:31:45,440

mission is about organic molecules can

833

00:31:47,830 --> 00:31:47,039

you tell us what we know or don't know

834

00:31:49,669 --> 00:31:47,840

about

835

00:31:50,630 --> 00:31:49,679

the organic molecules that were brought

836

00:31:55,350 --> 00:31:50,640

early

837

00:31:57,350 --> 00:31:55,360

asteroids whether they survived were

838

00:31:59,430 --> 00:31:57,360

they pulverized could they possibly have

839

00:32:01,190 --> 00:31:59,440

contributed at all to the to the

840

00:32:02,870 --> 00:32:01,200

original life here thanks

841

00:32:04,950 --> 00:32:02,880

absolutely one of the leading theories

842

00:32:06,389 --> 00:32:04,960

for the delivery of organic molecules to

843

00:32:08,070 --> 00:32:06,399

the surface of the earth after that late

844

00:32:09,909 --> 00:32:08,080

heavy bombardment period is the

845

00:32:12,870 --> 00:32:09,919

exogenous delivery or the delivery from

846

00:32:14,389 --> 00:32:12,880

asteroids and comets and we do have rare

847

00:32:16,389 --> 00:32:14,399

classes of meteorites that we call

848

00:32:17,830 --> 00:32:16,399

carbonaceous chondrites where we see

849

00:32:19,269 --> 00:32:17,840

some of these organic molecules and

850

00:32:21,509 --> 00:32:19,279

that's really what has

851
00:32:24,070 --> 00:32:21,519
made that hypothesis viable

852
00:32:26,230 --> 00:32:24,080
but a lot of our analyses are

853
00:32:27,830 --> 00:32:26,240
confused by the fact that meteorites

854
00:32:29,990 --> 00:32:27,840
once around the surface of the earth are

855
00:32:32,389 --> 00:32:30,000
very quickly contaminated organically

856
00:32:34,149 --> 00:32:32,399
especially because microbes love these

857
00:32:36,070 --> 00:32:34,159
materials they get in there they

858
00:32:37,509 --> 00:32:36,080
colonize them and the things we're

859
00:32:39,590 --> 00:32:37,519
looking for are the things that these

860
00:32:41,750 --> 00:32:39,600
bacteria are made out of the amino acids

861
00:32:43,669 --> 00:32:41,760
that make up their proteins particularly

862
00:32:45,350 --> 00:32:43,679
interested in the handedness you know

863
00:32:47,350 --> 00:32:45,360

some organic molecules have a right hand

864

00:32:48,870 --> 00:32:47,360

version and a left hand version and life

865

00:32:51,190 --> 00:32:48,880

preferentially chooses one over the

866

00:32:53,669 --> 00:32:51,200

other so we're really interested in what

867

00:32:55,669 --> 00:32:53,679

were those original inventory of

868

00:32:57,669 --> 00:32:55,679

materials the seeds of life that these

869

00:33:04,389 --> 00:32:57,679

carbon rich asteroids and comets may

870

00:33:09,269 --> 00:33:05,990

jim siegel i'm with the celebration

871

00:33:10,710 --> 00:33:09,279

independent and space flight insider i'm

872

00:33:12,789 --> 00:33:10,720

i'm interested

873

00:33:15,990 --> 00:33:12,799

to learn a little bit more about the uh

874

00:33:19,190 --> 00:33:16,000

asteroid itself because uh for example why

875

00:33:21,590 --> 00:33:19,200

was that particular asteroid chosen uh

876

00:33:24,950 --> 00:33:21,600

how far is it from earth how far will it

877

00:33:27,110 --> 00:33:24,960

be at the time that this landing occurs

878

00:33:29,269 --> 00:33:27,120

uh it from the

879

00:33:31,110 --> 00:33:29,279

video it seemed to be in a roughly same

880

00:33:32,630 --> 00:33:31,120

orbit as the earth and i wondered

881

00:33:34,789 --> 00:33:32,640

whether that was true or whether it's

882

00:33:37,190 --> 00:33:34,799

just kind of passing through a little

883

00:33:39,590 --> 00:33:37,200

bit more about its history thank you

884

00:33:41,110 --> 00:33:39,600

well i'll take that one so when we first

885

00:33:43,190 --> 00:33:41,120

started selecting the target for

886

00:33:44,950 --> 00:33:43,200

osiris-rex we levied some engineering

887

00:33:46,389 --> 00:33:44,960

constraints on the system

888

00:33:48,389 --> 00:33:46,399

we were working with lockheed martin we

889

00:33:49,830 --> 00:33:48,399

were going to use their heritage design

890

00:33:52,149 --> 00:33:49,840

to the greatest extent possible to

891

00:33:53,830 --> 00:33:52,159

minimize development risk and we made a

892

00:33:54,630 --> 00:33:53,840

couple key decisions one of the big one

893

00:33:56,549 --> 00:33:54,640

was

894

00:33:58,710 --> 00:33:56,559

no radioisotope power source we were

895

00:34:00,310 --> 00:33:58,720

going to go with a solar array for our

896

00:34:02,149 --> 00:34:00,320

power source and we didn't want to have

897

00:34:03,750 --> 00:34:02,159

to go too far out into the solar system

898

00:34:05,669 --> 00:34:03,760

so that we could maneuver around the

899

00:34:07,590 --> 00:34:05,679

asteroid and still have plenty of power

900

00:34:09,990 --> 00:34:07,600

for our instruments that limited us to

901
00:34:12,069 --> 00:34:10,000
objects that didn't go out 1.6

902
00:34:13,510 --> 00:34:12,079
astronomical units remembering that one

903
00:34:15,510 --> 00:34:13,520
astronomical unit is the average

904
00:34:17,430 --> 00:34:15,520
distance between the earth and the sun

905
00:34:19,589 --> 00:34:17,440
we also didn't want to have to deal with

906
00:34:21,909 --> 00:34:19,599
major thermal control systems so we

907
00:34:24,230 --> 00:34:21,919
wanted to stay away from the sun as much

908
00:34:26,389 --> 00:34:24,240
as possible and we set that limit to 0.8

909
00:34:28,950 --> 00:34:26,399
astronomical units we also made the

910
00:34:31,349 --> 00:34:28,960
decision to fly the stardust sample

911
00:34:33,669 --> 00:34:31,359
return capsule design and that was rated

912
00:34:35,190 --> 00:34:33,679
to a re-entry velocity of 12.4

913
00:34:37,270 --> 00:34:35,200

kilometers per second

914

00:34:39,349 --> 00:34:37,280

and that criteria set a constraint on

915

00:34:41,349 --> 00:34:39,359

the inclination of the asteroid's orbit

916

00:34:43,030 --> 00:34:41,359

relative to the earth which is the angle

917

00:34:44,790 --> 00:34:43,040

of the asteroid's orbit relative to the

918

00:34:47,430 --> 00:34:44,800

earth's orbit that had to be less than

919

00:34:49,349 --> 00:34:47,440

10 degrees so but just those three

920

00:34:52,629 --> 00:34:49,359

constraints got us down to near-earth

921

00:34:54,470 --> 00:34:52,639

asteroids in very earth-like orbits

922

00:34:56,230 --> 00:34:54,480

and then we wanted to pick an asteroid

923

00:34:58,390 --> 00:34:56,240

that we felt would have a significant

924

00:34:59,829 --> 00:34:58,400

probability of the loose regolith on the

925

00:35:02,710 --> 00:34:59,839

surface because we're going to go with

926
00:35:04,950 --> 00:35:02,720
this tag sam sample acquisition concept

927
00:35:07,030 --> 00:35:04,960
of gas stimulation and so we needed

928
00:35:08,950 --> 00:35:07,040
something that was relatively large

929
00:35:11,829 --> 00:35:08,960
because when asteroids get to be about

930
00:35:13,670 --> 00:35:11,839
200 meters or in diameter or smaller

931
00:35:15,750 --> 00:35:13,680
they tend to rotate very rapidly

932
00:35:17,510 --> 00:35:15,760
sometimes as often as once every minute

933
00:35:19,750 --> 00:35:17,520
and that would likely fling any of that

934
00:35:21,670 --> 00:35:19,760
gravel off the surface so we went to

935
00:35:23,910 --> 00:35:21,680
something about 500 meters when we chose

936
00:35:25,510 --> 00:35:23,920
asteroid bennu after we went through all

937
00:35:28,230 --> 00:35:25,520
of those constraints

938
00:35:30,230 --> 00:35:28,240

we were down to about two dozen objects

939

00:35:32,069 --> 00:35:30,240

and finally science got to come in and

940

00:35:35,109 --> 00:35:32,079

have a vote and we wanted that

941

00:35:37,990 --> 00:35:35,119

carbon-rich composition to help with our

942

00:35:40,470 --> 00:35:38,000

investigation of the origins of life in

943

00:35:42,950 --> 00:35:40,480

the solar system and uh there was five

944

00:35:44,870 --> 00:35:42,960

asteroids that met all of those criteria

945

00:35:47,270 --> 00:35:44,880

we selected asteroid bennu as the final

946

00:35:49,510 --> 00:35:47,280

target of osiris-rex because it was so

947

00:35:51,589 --> 00:35:49,520

well characterized with radar data

948

00:35:57,030 --> 00:35:51,599

telescopic data that we felt that really

949

00:36:01,109 --> 00:35:59,109

so it's orbit it varies uh it does a

950

00:36:03,190 --> 00:36:01,119

close approach to the earth once every

951
00:36:05,589 --> 00:36:03,200
six years it's in an orbital period of

952
00:36:07,670 --> 00:36:05,599
1.2 years earth goes around every one

953
00:36:09,190 --> 00:36:07,680
year so every six years they line up and

954
00:36:11,510 --> 00:36:09,200
when it was discovered it was about

955
00:36:13,670 --> 00:36:11,520
three times the distance that the moon

956
00:36:15,670 --> 00:36:13,680
is from from the earth but on occasion

957
00:36:17,670 --> 00:36:15,680
it gets on the other side of the sun so

958
00:36:20,150 --> 00:36:17,680
it can be over two astronomical units

959
00:36:21,670 --> 00:36:20,160
away and it's that phasing that changes

960
00:36:22,790 --> 00:36:21,680
every six years there's a close

961
00:36:24,790 --> 00:36:22,800
encounter between the earth and the

962
00:36:27,589 --> 00:36:24,800
asteroid and then they they go apart and

963
00:36:41,990 --> 00:36:27,599

they come back together

964

00:36:45,109 --> 00:36:43,589

thanks uh stephen clark from space

965

00:36:47,750 --> 00:36:45,119

flight now um i have a couple of

966

00:36:50,069 --> 00:36:47,760

questions uh first maybe for dante and

967

00:36:53,270 --> 00:36:50,079

if anyone else wants to chime in um i'm

968

00:36:54,950 --> 00:36:53,280

curious um interested in how

969

00:36:56,710 --> 00:36:54,960

in your nervousness and anxiety going

970

00:36:58,150 --> 00:36:56,720

into the launch uh would you consider

971

00:36:59,910 --> 00:36:58,160

this the riskiest part of the mission

972

00:37:01,670 --> 00:36:59,920

you have a lot of things that seem

973

00:37:04,069 --> 00:37:01,680

pretty untried to come

974

00:37:05,829 --> 00:37:04,079

i'm interested in how you're feeling now

975

00:37:07,430 --> 00:37:05,839

compares to some of the risks that come

976
00:37:08,630 --> 00:37:07,440
on once you get to the asteroid and have

977
00:37:10,390 --> 00:37:08,640
a follow-up

978
00:37:12,630 --> 00:37:10,400
i'm absolutely not nervous because we

979
00:37:14,310 --> 00:37:12,640
have a phenomenal team and they know

980
00:37:15,750 --> 00:37:14,320
what they're doing and i have my full

981
00:37:17,589 --> 00:37:15,760
trust and faith in that they're going to

982
00:37:19,510 --> 00:37:17,599
get this job done i am anxious because

983
00:37:21,270 --> 00:37:19,520
i've been working on this program for 12

984
00:37:23,109 --> 00:37:21,280
years now and i really want to fly this

985
00:37:24,310 --> 00:37:23,119
spacecraft that lockheed martin has

986
00:37:25,829 --> 00:37:24,320
built for us

987
00:37:27,349 --> 00:37:25,839
but those are two very different states

988
00:37:28,790 --> 00:37:27,359

of mine i want to make sure you

989

00:37:30,950 --> 00:37:28,800

understand how much faith i have in this

990

00:37:32,950 --> 00:37:30,960

crew it's an awesome experience of a

991

00:37:34,870 --> 00:37:32,960

lifetime for me to be here and work side

992

00:37:36,790 --> 00:37:34,880

by side with this team and see how

993

00:37:39,750 --> 00:37:36,800

professional and thorough and dedicated

994

00:37:41,670 --> 00:37:39,760

they are as we go and a hallmark of

995

00:37:42,950 --> 00:37:41,680

osiris-rex has been effective risk

996

00:37:44,470 --> 00:37:42,960

management

997

00:37:45,430 --> 00:37:44,480

there's risk in this business we all

998

00:37:48,069 --> 00:37:45,440

know that

999

00:37:49,349 --> 00:37:48,079

but we really set out to actively

1000

00:37:51,670 --> 00:37:49,359

identify

1001
00:37:53,349 --> 00:37:51,680
and manage and mitigate our risks so

1002
00:37:54,710 --> 00:37:53,359
absolutely we're going to fly a

1003
00:37:56,230 --> 00:37:54,720
spacecraft into the surface of an

1004
00:37:58,550 --> 00:37:56,240
asteroid and get a sample and we're

1005
00:38:00,470 --> 00:37:58,560
going to drop a return capsule at 27 000

1006
00:38:01,829 --> 00:38:00,480
miles in the top of the per hour into

1007
00:38:03,109 --> 00:38:01,839
the top of our atmosphere and recover

1008
00:38:05,190 --> 00:38:03,119
that material

1009
00:38:06,550 --> 00:38:05,200
but we understand the risks and as we've

1010
00:38:08,390 --> 00:38:06,560
gone through the development program

1011
00:38:09,510 --> 00:38:08,400
we've had the resources and it's really

1012
00:38:11,670 --> 00:38:09,520
a testament to being in the new

1013
00:38:14,069 --> 00:38:11,680

frontiers program at nasa that we have

1014

00:38:15,990 --> 00:38:14,079

the resources to to manage this program

1015

00:38:17,430 --> 00:38:16,000

properly and i am very confident that

1016

00:38:18,870 --> 00:38:17,440

we've we've managed the risks and we

1017

00:38:21,829 --> 00:38:18,880

understand them and that this mission is

1018

00:38:23,829 --> 00:38:21,839

going to succeed and probably

1019

00:38:34,630 --> 00:38:23,839

mike and rich want to follow in on some

1020

00:38:39,270 --> 00:38:36,790

i i know this mission is coming in a

1021

00:38:41,910 --> 00:38:39,280

little bit under budget uh so maybe uh

1022

00:38:42,710 --> 00:38:41,920

jeff and dante contacting this one um

1023

00:38:43,750 --> 00:38:42,720

is

1024

00:38:46,150 --> 00:38:43,760

uh

1025

00:38:48,630 --> 00:38:46,160

what happens to that money that was

1026
00:38:50,710 --> 00:38:48,640
saved during the development and is it

1027
00:38:52,470 --> 00:38:50,720
to stay within the project and

1028
00:38:53,750 --> 00:38:52,480
what sort of augmentations might you be

1029
00:38:57,589 --> 00:38:53,760
studying to

1030
00:39:02,390 --> 00:38:59,750
so within the science mission director

1031
00:39:05,349 --> 00:39:02,400
we manage our missions as a portfolio as

1032
00:39:07,750 --> 00:39:05,359
i mentioned earlier we have over 114 uh

1033
00:39:08,950 --> 00:39:07,760
active active missions going on so there

1034
00:39:10,550 --> 00:39:08,960
are some missions that may come in a

1035
00:39:13,109 --> 00:39:10,560
little bit above some missions that come

1036
00:39:15,510 --> 00:39:13,119
in come in underneath so we manage again

1037
00:39:16,950 --> 00:39:15,520
at the portfolio level not just at a

1038
00:39:18,630 --> 00:39:16,960

single mission

1039

00:39:20,150 --> 00:39:18,640

and so

1040

00:39:21,109 --> 00:39:20,160

as we go through and look to make sure

1041

00:39:23,270 --> 00:39:21,119

our

1042

00:39:24,310 --> 00:39:23,280

the science of what we call phase e is

1043

00:39:27,829 --> 00:39:24,320

is well

1044

00:39:29,589 --> 00:39:27,839

the great science we also look at what

1045

00:39:30,950 --> 00:39:29,599

funds are needed for other missions that

1046

00:39:34,150 --> 00:39:30,960

may

1047

00:39:35,829 --> 00:39:34,160

again we do a portfolio management not

1048

00:39:37,349 --> 00:39:35,839

just not just a single project

1049

00:39:38,790 --> 00:39:37,359

management

1050

00:39:42,069 --> 00:39:38,800

okay darrell do you have a question

1051
00:39:45,349 --> 00:39:43,829
nail fox 35

1052
00:39:47,430 --> 00:39:45,359
um

1053
00:39:49,270 --> 00:39:47,440
what type of was there any debris this

1054
00:39:52,150 --> 00:39:49,280
for nasa and ula was there any debris

1055
00:39:54,390 --> 00:39:52,160
found from the anomaly over at 40 and if

1056
00:39:57,990 --> 00:39:54,400
so what was found how much was found

1057
00:40:01,430 --> 00:40:00,069
i'll let you take that okay

1058
00:40:03,589 --> 00:40:01,440
yeah so

1059
00:40:05,910 --> 00:40:03,599
what i can tell you is that

1060
00:40:07,270 --> 00:40:05,920
our teams did an extensive

1061
00:40:09,030 --> 00:40:07,280
walk down

1062
00:40:14,150 --> 00:40:09,040
of the

1063
00:40:17,109 --> 00:40:14,160

and uh our atlas 5 vehicle as well as

1064

00:40:19,990 --> 00:40:17,119

osiris-rex are safely buttoned up

1065

00:40:22,309 --> 00:40:20,000

and secure in inside the vif

1066

00:40:24,950 --> 00:40:22,319

we haven't identified any damage or any

1067

00:40:26,309 --> 00:40:24,960

concerns as a result of the incident uh

1068

00:40:29,190 --> 00:40:26,319

last week

1069

00:40:30,790 --> 00:40:29,200

and we do continue to evaluate our our

1070

00:40:33,829 --> 00:40:30,800

progress

1071

00:40:35,589 --> 00:40:33,839

as we get as we move towards launch but

1072

00:40:37,349 --> 00:40:35,599

at this point we haven't identified any

1073

00:40:40,630 --> 00:40:37,359

risks and we're on track for launch on

1074

00:40:45,030 --> 00:40:43,990

uh not that i'm aware of

1075

00:40:47,109 --> 00:40:45,040

all right we're going to go to the

1076

00:40:49,030 --> 00:40:47,119

phones now bill harwood i think you're

1077

00:40:50,710 --> 00:40:49,040

online

1078

00:40:52,150 --> 00:40:50,720

yeah thanks a lot george just a quick

1079

00:40:54,069 --> 00:40:52,160

question for dante actually three quick

1080

00:40:55,030 --> 00:40:54,079

questions but i promise they're quick uh

1081

00:40:56,710 --> 00:40:55,040

looking at the flight but i was

1082

00:40:58,390 --> 00:40:56,720

wondering uh what the distance is a

1083

00:41:00,390 --> 00:40:58,400

close approach did you plan any earth

1084

00:41:01,990 --> 00:41:00,400

obs during the the flyby either for

1085

00:41:04,550 --> 00:41:02,000

science or to test your instruments and

1086

00:41:06,710 --> 00:41:04,560

finally uh is this strictly plane change

1087

00:41:08,230 --> 00:41:06,720

or is there some velocity component plus

1088

00:41:11,030 --> 00:41:08,240

or minus thanks

1089

00:41:12,790 --> 00:41:11,040

sure so uh one year after osiris-rex

1090

00:41:13,589 --> 00:41:12,800

launches from the earth we'll come back

1091

00:41:15,430 --> 00:41:13,599

to

1092

00:41:16,870 --> 00:41:15,440

the earth and do an earth gravity assist

1093

00:41:18,710 --> 00:41:16,880

and that is primarily for the

1094

00:41:21,349 --> 00:41:18,720

inclination plane change to get us on to

1095

00:41:22,950 --> 00:41:21,359

the sixth degree inc inclined plane that

1096

00:41:25,270 --> 00:41:22,960

bennu orbits on

1097

00:41:26,950 --> 00:41:25,280

the distance of close approach uh will

1098

00:41:28,390 --> 00:41:26,960

vary depending on exactly when in the

1099

00:41:30,950 --> 00:41:28,400

launch window we go

1100

00:41:32,630 --> 00:41:30,960

uh roughly about 20 000 kilometers will

1101

00:41:34,870 --> 00:41:32,640

be the range but again that's variable

1102

00:41:36,630 --> 00:41:34,880

depending on the specifics of our launch

1103

00:41:38,950 --> 00:41:36,640

injection trajectory

1104

00:41:41,030 --> 00:41:38,960

it is a great opportunity for us to

1105

00:41:42,710 --> 00:41:41,040

check out our whole instrument suite

1106

00:41:44,150 --> 00:41:42,720

nasa missions in the past have learned

1107

00:41:46,069 --> 00:41:44,160

an enormous amount about their

1108

00:41:48,150 --> 00:41:46,079

spacecraft and more importantly the

1109

00:41:49,910 --> 00:41:48,160

ground system and the team on the ground

1110

00:41:51,430 --> 00:41:49,920

and how they deal with all the payloads

1111

00:41:53,190 --> 00:41:51,440

all the requests from the science teams

1112

00:41:55,109 --> 00:41:53,200

and then downlinking and processing of

1113

00:41:57,030 --> 00:41:55,119

the data so we have a fantastic

1114

00:41:59,349 --> 00:41:57,040

calibration and observation campaign

1115

00:42:00,870 --> 00:41:59,359

both of the earth and the moon we'll be

1116

00:42:02,309 --> 00:42:00,880

doing some things like checking out

1117

00:42:04,230 --> 00:42:02,319

instrument alignments you know we've

1118

00:42:05,430 --> 00:42:04,240

aligned these things very precisely

1119

00:42:07,109 --> 00:42:05,440

relative to each other but you might

1120

00:42:09,109 --> 00:42:07,119

expect some small shifts from the launch

1121

00:42:10,950 --> 00:42:09,119

environment and the earth and moon

1122

00:42:12,790 --> 00:42:10,960

observations will allow us to test that

1123

00:42:15,670 --> 00:42:12,800

we'll also go through some of the the

1124

00:42:17,270 --> 00:42:15,680

con ops for the bennu encounter like

1125

00:42:18,870 --> 00:42:17,280

one of our stations called detailed

1126
00:42:20,550 --> 00:42:18,880
survey where we have to slew the

1127
00:42:22,790 --> 00:42:20,560
spacecraft north and south in order to

1128
00:42:24,710 --> 00:42:22,800
cover the entire surface of bennu we'll

1129
00:42:26,550 --> 00:42:24,720
rehearse that and we'll also get some

1130
00:42:28,630 --> 00:42:26,560
really great data on our homeworld and

1131
00:42:30,550 --> 00:42:28,640
on the moon using our spectrometers and

1132
00:42:32,390 --> 00:42:30,560
our cameras so it's a great opportunity

1133
00:42:34,230 --> 00:42:32,400
for us to check out the team check out

1134
00:42:36,550 --> 00:42:34,240
the spacecraft and also

1135
00:42:41,750 --> 00:42:36,560
look at our home

1136
00:42:47,990 --> 00:42:44,790
thanks george um i have a question for

1137
00:42:50,309 --> 00:42:48,000
tim and or scott

1138
00:42:52,550 --> 00:42:50,319

have you received any information from

1139

00:42:55,270 --> 00:42:52,560

spacex that gives you

1140

00:42:57,270 --> 00:42:55,280

the confidence that there's not a

1141

00:43:00,069 --> 00:42:57,280

generic

1142

00:43:02,150 --> 00:43:00,079

rocket equipment issue that could also

1143

00:43:04,069 --> 00:43:02,160

affect the atlas 5

1144

00:43:07,030 --> 00:43:04,079

and or a

1145

00:43:08,870 --> 00:43:07,040

ground support equipment issue

1146

00:43:17,430 --> 00:43:08,880

and if you have gotten any information

1147

00:43:21,349 --> 00:43:19,349

first of all

1148

00:43:23,430 --> 00:43:21,359

our hearts do go out to our colleagues

1149

00:43:25,510 --> 00:43:23,440

over at spacex if you've been in this

1150

00:43:27,750 --> 00:43:25,520

business long enough you've experienced

1151

00:43:29,670 --> 00:43:27,760

today like last thursday

1152

00:43:33,589 --> 00:43:29,680

it's nothing that any of us ever want to

1153

00:43:35,670 --> 00:43:33,599

uh to see however it is part of our our

1154

00:43:38,069 --> 00:43:35,680

business our business it has very harsh

1155

00:43:40,950 --> 00:43:38,079

consequences

1156

00:43:42,390 --> 00:43:40,960

so spacex very resilient company we were

1157

00:43:45,430 --> 00:43:42,400

fortunate to launch with them earlier

1158

00:43:47,109 --> 00:43:45,440

this year the jason 3 mission out at

1159

00:43:48,550 --> 00:43:47,119

vandenberg so have a little bit of

1160

00:43:50,309 --> 00:43:48,560

experience

1161

00:43:53,589 --> 00:43:50,319

knowing their culture

1162

00:43:55,750 --> 00:43:53,599

and look forward to their return soon

1163

00:43:59,829 --> 00:43:55,760

so with that said uh

1164

00:44:01,750 --> 00:43:59,839

given lsp's position uh having

1165

00:44:04,950 --> 00:44:01,760

spacecraft on both

1166

00:44:08,150 --> 00:44:04,960

ula's line of products atlas 5 delta 2

1167

00:44:11,510 --> 00:44:08,160

and delta 4 and also on spacex's falcon

1168

00:44:14,790 --> 00:44:11,520

9 we are in a a special position where

1169

00:44:17,270 --> 00:44:14,800

we're able to look at uh very uh closely

1170

00:44:18,630 --> 00:44:17,280

held launch vehicle data the proprietary

1171

00:44:21,109 --> 00:44:18,640

data for both

1172

00:44:24,150 --> 00:44:21,119

so our team led by our chief engineer

1173

00:44:27,270 --> 00:44:24,160

for lsp led a crossover assessment of

1174

00:44:29,670 --> 00:44:27,280

launch vehicle hardware from what we

1175

00:44:32,470 --> 00:44:29,680

what we were able to observe and know

1176
00:44:34,950 --> 00:44:32,480
from the data from the event on thursday

1177
00:44:37,349 --> 00:44:34,960
for falcon 9 and compare that against

1178
00:44:39,670 --> 00:44:37,359
the systems of atlas v

1179
00:44:40,950 --> 00:44:39,680
and that assessment did complete over

1180
00:44:42,630 --> 00:44:40,960
the weekend

1181
00:44:44,390 --> 00:44:42,640
and our chief engineer was able to

1182
00:44:46,790 --> 00:44:44,400
report in that

1183
00:44:49,990 --> 00:44:46,800
the review was complete and that there

1184
00:44:52,710 --> 00:44:50,000
is no elevated risk to osiris-rex

1185
00:44:53,910 --> 00:44:52,720
launching on an atlas v

1186
00:44:56,630 --> 00:44:53,920
okay we're going to take a couple of

1187
00:45:00,069 --> 00:44:56,640
social media questions here okay this

1188
00:45:02,550 --> 00:45:00,079

first one is from at crote robot

1189

00:45:04,950 --> 00:45:02,560

and it's for ula it's will the centaur

1190

00:45:07,190 --> 00:45:04,960

stage be deorbited after release of

1191

00:45:09,349 --> 00:45:07,200

osiris-rex or does it go into a quote

1192

00:45:12,230 --> 00:45:09,359

disposal orbit

1193

00:45:14,309 --> 00:45:12,240

no since this is a

1194

00:45:17,190 --> 00:45:14,319

trajectory that takes us out into the

1195

00:45:19,910 --> 00:45:17,200

atmosphere it it just continues on out

1196

00:45:23,190 --> 00:45:20,870

and then

1197

00:45:25,670 --> 00:45:23,200

we have a question for uh

1198

00:45:27,990 --> 00:45:25,680

mostly for dante loretta uh he wants to

1199

00:45:29,430 --> 00:45:28,000

know this is at bill graham

1200

00:45:31,670 --> 00:45:29,440

what do you think mike drake would have

1201
00:45:33,349 --> 00:45:31,680
to say today

1202
00:45:34,950 --> 00:45:33,359
well uh at the end of our launch

1203
00:45:36,870 --> 00:45:34,960
readiness review we had the opportunity

1204
00:45:38,550 --> 00:45:36,880
to remember uh some individuals that

1205
00:45:41,750 --> 00:45:38,560
we've lost along the way

1206
00:45:44,309 --> 00:45:41,760
and uh mike drake was my friend my

1207
00:45:47,190 --> 00:45:44,319
mentor and the visionary who brought me

1208
00:45:48,870 --> 00:45:47,200
onto the program in 2004 as his deputy

1209
00:45:51,030 --> 00:45:48,880
principal investigator

1210
00:45:52,790 --> 00:45:51,040
and together he and i worked for seven

1211
00:45:54,230 --> 00:45:52,800
years along with our partners at goddard

1212
00:45:56,550 --> 00:45:54,240
space flight center and lockheed martin

1213
00:45:58,790 --> 00:45:56,560

to bid this proposal to nasa multiple

1214

00:46:00,790 --> 00:45:58,800

times until we were ready for selection

1215

00:46:03,190 --> 00:46:00,800

as the third new frontier's mission

1216

00:46:06,069 --> 00:46:03,200

uh so we miss him dearly he he passed

1217

00:46:08,470 --> 00:46:06,079

away in september of 2011 uh four months

1218

00:46:11,750 --> 00:46:08,480

after we were awarded the contract to

1219

00:46:13,910 --> 00:46:11,760

begin uh the mission osiris-rex i know

1220

00:46:16,069 --> 00:46:13,920

he's still with us he's in our hearts

1221

00:46:18,150 --> 00:46:16,079

in our souls and he's looking down on us

1222

00:46:19,510 --> 00:46:18,160

and he'd be really proud today

1223

00:46:21,750 --> 00:46:19,520

and he'd be having the time of his life

1224

00:46:23,349 --> 00:46:21,760

as well

1225

00:46:24,550 --> 00:46:23,359

we have a question from at fossil

1226
00:46:26,710 --> 00:46:24,560
locator

1227
00:46:28,790 --> 00:46:26,720
this is probably mostly for dante

1228
00:46:32,550 --> 00:46:28,800
specifically what type of carbonaceous

1229
00:46:34,069 --> 00:46:32,560
asteroid is bennu in meteorite terms

1230
00:46:35,190 --> 00:46:34,079
we'd also like a few people have asked

1231
00:46:38,230 --> 00:46:35,200
about how does this compare to

1232
00:46:40,790 --> 00:46:38,240
meteorites that they find here on earth

1233
00:46:42,710 --> 00:46:40,800
well we're going out into the unknown

1234
00:46:44,470 --> 00:46:42,720
and bennu is an unexplored world we've

1235
00:46:45,990 --> 00:46:44,480
done the best job we can with our

1236
00:46:47,829 --> 00:46:46,000
ground-based telescopes and our

1237
00:46:50,069 --> 00:46:47,839
space-based telescopes to try to infer

1238
00:46:52,550 --> 00:46:50,079

its composition we do know it's very

1239

00:46:54,630 --> 00:46:52,560

dark it has an albedo which is its

1240

00:46:55,829 --> 00:46:54,640

reflectivity of only four percent which

1241

00:46:56,950 --> 00:46:55,839

means

1242

00:47:00,390 --> 00:46:56,960

four percent of the sunlight is

1243

00:47:02,550 --> 00:47:00,400

reflected back into space and 96 is

1244

00:47:04,710 --> 00:47:02,560

absorbed uh the problem with these

1245

00:47:06,950 --> 00:47:04,720

carbonaceous asteroids is their spectra

1246

00:47:09,829 --> 00:47:06,960

are pretty featureless and so it's hard

1247

00:47:11,990 --> 00:47:09,839

to identify them exactly and we can't

1248

00:47:13,589 --> 00:47:12,000

link bennu to a specific meteorite class

1249

00:47:15,990 --> 00:47:13,599

and in fact that's one of our science

1250

00:47:18,550 --> 00:47:16,000

objectives is to do that and understand

1251
00:47:21,030 --> 00:47:18,560
what meteorite it may be linked to our

1252
00:47:23,670 --> 00:47:21,040
best estimates are that it's related

1253
00:47:25,750 --> 00:47:23,680
possibly to the ci or cm carbonaceous

1254
00:47:27,030 --> 00:47:25,760
chondrites for the uber meteorite geeks

1255
00:47:28,549 --> 00:47:27,040
out there

1256
00:47:29,829 --> 00:47:28,559
but we don't know and we're going to

1257
00:47:31,589 --> 00:47:29,839
explore this world and we're going to

1258
00:47:34,069 --> 00:47:31,599
bring back a sample and then i'll be

1259
00:47:35,829 --> 00:47:34,079
able to answer the question definitively

1260
00:47:38,069 --> 00:47:35,839
and one final social media question

1261
00:47:40,710 --> 00:47:38,079
before we come back here and this is um

1262
00:47:42,950 --> 00:47:40,720
pretty much for the whole panel um

1263
00:47:44,950 --> 00:47:42,960

at mike sienda wants to know what aspect

1264

00:47:46,549 --> 00:47:44,960

of the osiris-rex mission are you most

1265

00:47:48,470 --> 00:47:46,559

looking forward to

1266

00:47:52,470 --> 00:47:48,480

i'll take one answer on that who would

1267

00:47:52,480 --> 00:47:55,829

let rich answer that one

1268

00:48:00,470 --> 00:47:58,230

i think that the thing that

1269

00:48:02,950 --> 00:48:00,480

one i'm most appreciative of and then

1270

00:48:05,030 --> 00:48:02,960

two that i'm looking forward to the most

1271

00:48:06,470 --> 00:48:05,040

i'm most appreciative of all the people

1272

00:48:09,030 --> 00:48:06,480

that have had a chance to work on the

1273

00:48:10,790 --> 00:48:09,040

mission and get us to today

1274

00:48:12,710 --> 00:48:10,800

so

1275

00:48:15,109 --> 00:48:12,720

it's been an amazing journey i know that

1276

00:48:17,349 --> 00:48:15,119

at our peak just just us alone we had

1277

00:48:19,349 --> 00:48:17,359

900 different people touching the

1278

00:48:20,870 --> 00:48:19,359

satellite in a given month

1279

00:48:22,390 --> 00:48:20,880

and that's pretty impressive so it took

1280

00:48:24,069 --> 00:48:22,400

a lot to get here

1281

00:48:27,109 --> 00:48:24,079

and in terms of what i'm looking forward

1282

00:48:30,710 --> 00:48:27,119

to the most i think it's developing that

1283

00:48:33,270 --> 00:48:30,720

understanding of what we don't know

1284

00:48:35,270 --> 00:48:33,280

bringing back a sample

1285

00:48:36,950 --> 00:48:35,280

dante actually probably

1286

00:48:38,309 --> 00:48:36,960

brought it up and it's something that

1287

00:48:42,230 --> 00:48:38,319

stuck with me

1288

00:48:44,470 --> 00:48:42,240

the fact that we're going to have sample

1289

00:48:47,109 --> 00:48:44,480

material here on earth

1290

00:48:48,630 --> 00:48:47,119

that we can experiment on with

1291

00:48:51,109 --> 00:48:48,640

techniques

1292

00:48:53,270 --> 00:48:51,119

with people with instrumentation that

1293

00:48:55,030 --> 00:48:53,280

nobody's even thought of yet

1294

00:48:56,390 --> 00:48:55,040

in the future is something that's

1295

00:48:59,109 --> 00:48:56,400

phenomenal and it's something that's

1296

00:49:00,630 --> 00:48:59,119

unique to sample return missions

1297

00:49:02,470 --> 00:49:00,640

and so that's what i'm looking forward

1298

00:49:03,829 --> 00:49:02,480

to the most

1299

00:49:06,710 --> 00:49:03,839

right we'll take two more questions

1300

00:49:09,109 --> 00:49:06,720

right here marcia dunn

1301
00:49:12,069 --> 00:49:09,119
um marcia done associated press both for

1302
00:49:13,990 --> 00:49:12,079
dr loretta um realizing you're calm

1303
00:49:16,470 --> 00:49:14,000
today i'm just wondering when you saw

1304
00:49:19,030 --> 00:49:16,480
that spacex explosion last week did your

1305
00:49:21,589 --> 00:49:19,040
nerves juggle jingle just a little

1306
00:49:23,349 --> 00:49:21,599
and um secondly was there any thought

1307
00:49:25,349 --> 00:49:23,359
ever given to actually landing on the

1308
00:49:27,670 --> 00:49:25,359
asteroid as opposed to just scooping up

1309
00:49:29,670 --> 00:49:27,680
and get going pretty quick

1310
00:49:31,990 --> 00:49:29,680
well i think as tim said you know we

1311
00:49:33,349 --> 00:49:32,000
nobody likes to see your colleagues go

1312
00:49:35,510 --> 00:49:33,359
through a day like they went on thursday

1313
00:49:37,270 --> 00:49:35,520

so sure i mean it was it was a stark

1314

00:49:38,790 --> 00:49:37,280

reminder to me and to this whole team

1315

00:49:39,990 --> 00:49:38,800

about the risks that we face in this

1316

00:49:41,829 --> 00:49:40,000

business

1317

00:49:43,670 --> 00:49:41,839

and in many ways you know it made us

1318

00:49:45,190 --> 00:49:43,680

take a look again at everything we had

1319

00:49:47,349 --> 00:49:45,200

done all of our processes all of our

1320

00:49:50,150 --> 00:49:47,359

procedures all of our equipment and as

1321

00:49:51,670 --> 00:49:50,160

i've said this team is awesome and it's

1322

00:49:53,349 --> 00:49:51,680

it's an honor to be able to watch them

1323

00:49:55,430 --> 00:49:53,359

work you know as the as the principal

1324

00:49:56,950 --> 00:49:55,440

investigator i don't have a role in

1325

00:49:58,710 --> 00:49:56,960

building or launching the rocket i get

1326
00:50:00,390 --> 00:49:58,720
to kind of enjoy the ride and observe

1327
00:50:01,990 --> 00:50:00,400
the team and it's something i've dreamed

1328
00:50:03,990 --> 00:50:02,000
about since i was a little kid to be

1329
00:50:05,670 --> 00:50:04,000
able to to climb around on the vertical

1330
00:50:07,670 --> 00:50:05,680
integration facility and see a rocket

1331
00:50:09,190 --> 00:50:07,680
getting stacked that's got my spacecraft

1332
00:50:10,950 --> 00:50:09,200
on top of it that we're about to send

1333
00:50:12,790 --> 00:50:10,960
off to an asteroid

1334
00:50:14,390 --> 00:50:12,800
sometimes i have to just pinch myself to

1335
00:50:15,750 --> 00:50:14,400
to convince myself that i'm not dreaming

1336
00:50:17,589 --> 00:50:15,760
all of this that it's actually happening

1337
00:50:19,589 --> 00:50:17,599
and that that i have the honor and the

1338
00:50:20,950 --> 00:50:19,599

privilege of leading this for nasa and

1339

00:50:22,630 --> 00:50:20,960

for the nation

1340

00:50:24,390 --> 00:50:22,640

um what was the second part of your

1341

00:50:26,470 --> 00:50:24,400

question

1342

00:50:28,630 --> 00:50:26,480

what was would be the pros and cons even

1343

00:50:31,030 --> 00:50:28,640

if that were possible early on in the

1344

00:50:32,950 --> 00:50:31,040

mission design the osiris-rex team

1345

00:50:34,710 --> 00:50:32,960

looked at the options of landing on the

1346

00:50:36,309 --> 00:50:34,720

asteroid and doing extended surface

1347

00:50:37,349 --> 00:50:36,319

operations versus the touch and go

1348

00:50:38,950 --> 00:50:37,359

maneuver

1349

00:50:41,030 --> 00:50:38,960

and uh we quickly came to the

1350

00:50:42,790 --> 00:50:41,040

realization that there's just so much

1351

00:50:45,030 --> 00:50:42,800

unknown about the surface of the

1352

00:50:47,270 --> 00:50:45,040

asteroid that the idea that you could

1353

00:50:49,750 --> 00:50:47,280

develop a harpoon or an anchoring system

1354

00:50:51,829 --> 00:50:49,760

or use hold down thrusters to keep you

1355

00:50:54,390 --> 00:50:51,839

on the surface was deemed to be too high

1356

00:50:56,790 --> 00:50:54,400

of risk for the program and in fact the

1357

00:50:59,270 --> 00:50:56,800

way to go was the the short duration

1358

00:51:01,829 --> 00:50:59,280

touch and go contact using the pogo

1359

00:51:03,910 --> 00:51:01,839

mechanism to reverse the momentum of the

1360

00:51:05,990 --> 00:51:03,920

spacecraft and send it on on journey

1361

00:51:08,150 --> 00:51:06,000

away and i say as we watched our

1362

00:51:11,109 --> 00:51:08,160

european colleagues dropped the file

1363

00:51:13,109 --> 00:51:11,119

lander onto the surface of comet 67p

1364

00:51:14,710 --> 00:51:13,119

they intended to land but they bounced

1365

00:51:15,990 --> 00:51:14,720

and i looked at that and i said all

1366

00:51:17,510 --> 00:51:16,000

right that's what we're planning on

1367

00:51:19,990 --> 00:51:17,520

doing it just shows me that that was the

1368

00:51:24,790 --> 00:51:20,000

right design solution

1369

00:51:27,829 --> 00:51:26,549

james dean florida today a question of

1370

00:51:29,190 --> 00:51:27,839

follow-up um

1371

00:51:30,630 --> 00:51:29,200

dante maybe a good segue i just want to

1372

00:51:32,870 --> 00:51:30,640

wonder if you could talk a little bit

1373

00:51:34,549 --> 00:51:32,880

more about the moment of contact uh

1374

00:51:36,870 --> 00:51:34,559

obviously our anticipation of that event

1375

00:51:40,549 --> 00:51:36,880

some years away but um

1376
00:51:43,270 --> 00:51:40,559
what will you see and what will we see

1377
00:51:45,589 --> 00:51:43,280
yeah the osiris-rex team has uh

1378
00:51:47,109 --> 00:51:45,599
identified the tag event not only as the

1379
00:51:48,630 --> 00:51:47,119
culmination of the mission right that's

1380
00:51:50,549 --> 00:51:48,640
what we're going to spend the year and a

1381
00:51:52,230 --> 00:51:50,559
half mapping the asteroid to select the

1382
00:51:53,670 --> 00:51:52,240
right location to get that device down

1383
00:51:55,030 --> 00:51:53,680
to the surface and collect that sample

1384
00:51:57,349 --> 00:51:55,040
but we're going to learn a lot about

1385
00:51:59,510 --> 00:51:57,359
asteroid surfaces just from that event

1386
00:52:02,150 --> 00:51:59,520
and so we've already laid out our whole

1387
00:52:04,230 --> 00:52:02,160
tag reconstruction process so after the

1388
00:52:06,470 --> 00:52:04,240

event takes place and we've got that key

1389

00:52:08,069 --> 00:52:06,480

decision to make do we have sample are

1390

00:52:10,069 --> 00:52:08,079

we ready to stow in the return capsule

1391

00:52:11,190 --> 00:52:10,079

or are we going to use some of our

1392

00:52:12,950 --> 00:52:11,200

reserve

1393

00:52:14,549 --> 00:52:12,960

gas bottles and go back for a second

1394

00:52:16,549 --> 00:52:14,559

sampling attempt so we're going to be

1395

00:52:19,510 --> 00:52:16,559

getting photo documentation of the event

1396

00:52:21,349 --> 00:52:19,520

our sam cam primary job is to watch the

1397

00:52:23,670 --> 00:52:21,359

tag sam interact with the surface of the

1398

00:52:25,430 --> 00:52:23,680

asteroid we've also got the nav cams

1399

00:52:26,790 --> 00:52:25,440

which are wider angle cameras and

1400

00:52:28,230 --> 00:52:26,800

they're going to be able to see

1401
00:52:29,990 --> 00:52:28,240
some of what's happening as we interact

1402
00:52:31,430 --> 00:52:30,000
with the asteroid surface and we're

1403
00:52:32,790 --> 00:52:31,440
going to be looking at spacecraft

1404
00:52:34,230 --> 00:52:32,800
telemetry we've got the inertial

1405
00:52:36,309 --> 00:52:34,240
measurement units which will be telling

1406
00:52:37,829 --> 00:52:36,319
us about all the forces that are acting

1407
00:52:39,750 --> 00:52:37,839
on the spacecraft and through our

1408
00:52:41,589 --> 00:52:39,760
knowledge of the spacecraft subsystems

1409
00:52:42,950 --> 00:52:41,599
isolating those forces that are the

1410
00:52:45,349 --> 00:52:42,960
result of the

1411
00:52:46,710 --> 00:52:45,359
the tag sam the asteroid regolith

1412
00:52:49,190 --> 00:52:46,720
interacting with the tag sam device

1413
00:52:50,790 --> 00:52:49,200

itself so one of my

1414

00:52:53,270 --> 00:52:50,800

co-investigators on the science team

1415

00:52:55,190 --> 00:52:53,280

it's his job to go through that data

1416

00:52:57,670 --> 00:52:55,200

within seven days and prepare a tag

1417

00:52:59,510 --> 00:52:57,680

reconstruction report to describe how

1418

00:53:01,829 --> 00:52:59,520

did the asteroid surface respond to the

1419

00:53:03,190 --> 00:53:01,839

tag event that's going to complement the

1420

00:53:05,349 --> 00:53:03,200

tag reconstruction report that the

1421

00:53:06,630 --> 00:53:05,359

spacecraft team at lockheed martin and

1422

00:53:07,990 --> 00:53:06,640

goddard space flight center are going to

1423

00:53:09,990 --> 00:53:08,000

put together and say this is how the

1424

00:53:11,990 --> 00:53:10,000

spacecraft responded to the event and

1425

00:53:13,589 --> 00:53:12,000

we're going to take that into our sample

1426

00:53:15,430 --> 00:53:13,599

success review to decide if we've got

1427

00:53:17,430 --> 00:53:15,440

enough material to come home but we're

1428

00:53:19,589 --> 00:53:17,440

also going to do a long-term analysis of

1429

00:53:21,030 --> 00:53:19,599

that to constrain the properties and of

1430

00:53:21,990 --> 00:53:21,040

the asteroid surface and the regolith

1431

00:53:23,829 --> 00:53:22,000

grains

1432

00:53:27,190 --> 00:53:23,839

okay we've got time for one question

1433

00:53:31,430 --> 00:53:29,910

hi don hiladiak cbc i think for rich

1434

00:53:33,589 --> 00:53:31,440

coons can you explain a little more

1435

00:53:34,950 --> 00:53:33,599

detail how the tag sam the touch and go

1436

00:53:36,870 --> 00:53:34,960

sampler works

1437

00:53:38,710 --> 00:53:36,880

i understand nitrogen gas going to kick

1438

00:53:40,069 --> 00:53:38,720

up a plume but how does it get directed

1439

00:53:41,910 --> 00:53:40,079

into the sampler

1440

00:53:43,670 --> 00:53:41,920

so it's really a reverse vacuum so if

1441

00:53:46,309 --> 00:53:43,680

you think about the video that we showed

1442

00:53:48,390 --> 00:53:46,319

right we've got the compressed gas and

1443

00:53:50,309 --> 00:53:48,400

as we come down we'll actually detect

1444

00:53:51,510 --> 00:53:50,319

that contact and that pogo will start

1445

00:53:53,349 --> 00:53:51,520

compressing

1446

00:53:54,630 --> 00:53:53,359

when we detect that we'll release the

1447

00:53:57,030 --> 00:53:54,640

gas

1448

00:53:59,349 --> 00:53:57,040

and what that'll do is that actually

1449

00:54:01,190 --> 00:53:59,359

gets all the material moving

1450

00:54:03,589 --> 00:54:01,200

right and then since space is a vacuum

1451
00:54:05,750 --> 00:54:03,599
and we've now released gas into it that

1452
00:54:07,190 --> 00:54:05,760
material is going to want to go on the

1453
00:54:09,510 --> 00:54:07,200
path that we've set for it and will

1454
00:54:12,390 --> 00:54:09,520
ultimately be collected inside the tag

1455
00:54:13,910 --> 00:54:12,400
sam head because that gas will move up

1456
00:54:18,710 --> 00:54:13,920
and then go through

1457
00:54:23,430 --> 00:54:21,109
all right with that we're going to wrap

1458
00:54:25,910 --> 00:54:23,440
up we have a science briefing following

1459
00:54:27,990 --> 00:54:25,920
this one but we're going to divide our

1460
00:54:29,510 --> 00:54:28,000
programming because we have an on-orbit

1461
00:54:31,589 --> 00:54:29,520
event on the space station we'll be

1462
00:54:33,510 --> 00:54:31,599
covering on the nasa public channel on

1463
00:54:35,990 --> 00:54:33,520

the main channel that will be

1464

00:54:38,630 --> 00:54:36,000

at two o'clock and then in parallel on

1465

00:54:40,230 --> 00:54:38,640

the nasa media channel will be our

1466

00:54:44,950 --> 00:54:40,240

science briefing

1467

00:54:46,230 --> 00:54:44,960

at 3 30 on the main channel on the

1468

00:54:48,950 --> 00:54:46,240

public channel

1469

00:54:51,349 --> 00:54:48,960

and then looking ahead to tomorrow we

1470

00:54:53,510 --> 00:54:51,359

have two briefings our customary social

1471

00:54:55,670 --> 00:54:53,520

media briefing will be on nasa

1472

00:54:58,230 --> 00:54:55,680

television starting at noon

1473

00:54:59,829 --> 00:54:58,240

and then at one o'clock also on nasa tv

1474

00:55:02,630 --> 00:54:59,839

will be a joint

1475

00:55:06,150 --> 00:55:02,640

social media news media briefing on

1476

00:55:08,789 --> 00:55:06,160

uncovering the secrets of asteroids

1477

00:55:13,589 --> 00:55:08,799

our programming on launch day

1478

00:55:16,390 --> 00:55:13,599

will start at 4 30 with status and live

1479

00:55:18,150 --> 00:55:16,400

audio from the launch conductor as they

1480

00:55:21,510 --> 00:55:18,160

get into the countdown to prepare the

1481

00:55:24,630 --> 00:55:21,520

atlas 5 for fueling and then the launch

1482

00:55:25,829 --> 00:55:24,640

commentary with our interviews

1483

00:55:28,069 --> 00:55:25,839

and

1484

00:55:30,870 --> 00:55:28,079

discussions of all the events to come

1485

00:55:32,150 --> 00:55:30,880

will start at 5 30.

1486

00:55:33,750 --> 00:55:32,160

so with that