
OSIRIS-REx

1
00:00:01,990 --> 00:00:01,030
five

2
00:00:03,110 --> 00:00:02,000
four

3
00:00:04,070 --> 00:00:03,120
three

4
00:00:07,190 --> 00:00:04,080
two

5
00:00:12,470 --> 00:00:10,470
and lift off of osiris-rex

6
00:00:14,070 --> 00:00:12,480
it's seven-year mission

7
00:00:19,150 --> 00:00:14,080
to boldly go

8
00:00:26,230 --> 00:00:22,070
backs look good

9
00:00:32,310 --> 00:00:27,750
these are big chamber pressures have

10
00:00:32,320 --> 00:00:49,590
the atlas has begun a pitcher

11
00:00:49,600 --> 00:01:03,670
oh

12
00:01:06,310 --> 00:01:05,350
welcome to our

13
00:01:09,670 --> 00:01:06,320

happy

14
00:01:14,469 --> 00:01:11,910
here to discuss how our countdown on our

15
00:01:17,830 --> 00:01:14,479
launch and the status of our mission

16
00:01:19,910 --> 00:01:17,840
we'll begin first with ellen stofan the

17
00:01:23,590 --> 00:01:19,920
nasa chief scientist from nasa

18
00:01:31,910 --> 00:01:26,630
jim green the planetary division

19
00:01:36,230 --> 00:01:34,469
dante loretta the osiris-rex principal

20
00:01:39,190 --> 00:01:36,240
investigator at the university of

21
00:01:46,389 --> 00:01:41,910
scott messer the program manager from

22
00:01:49,109 --> 00:01:46,399
united launch alliance for nasa missions

23
00:01:51,830 --> 00:01:49,119
and rich coons the osiris program

24
00:01:53,830 --> 00:01:51,840
manager for lockheed martin

25
00:01:54,950 --> 00:01:53,840
and we'll begin first with ellen sophan

26
00:01:56,230 --> 00:01:54,960
ellen

27
00:01:59,990 --> 00:01:56,240
you know tonight is the night for

28
00:02:05,590 --> 00:02:00,000
celebration we are on our way to an

29
00:02:10,309 --> 00:02:07,990
you know right after the launch my uh

30
00:02:11,910 --> 00:02:10,319
son was here and his fiancee turned to

31
00:02:15,190 --> 00:02:11,920
me and she said

32
00:02:17,350 --> 00:02:15,200
why am i crying and i was crying and i

33
00:02:19,670 --> 00:02:17,360
said because we've just done

34
00:02:21,190 --> 00:02:19,680
something amazing

35
00:02:23,430 --> 00:02:21,200
as a country

36
00:02:25,190 --> 00:02:23,440
the contributions you've seen from this

37
00:02:26,710 --> 00:02:25,200
team who you're going to hear from some

38
00:02:28,470 --> 00:02:26,720

of tonight

39
00:02:31,430 --> 00:02:28,480
we've built an amazing spacecraft

40
00:02:33,190 --> 00:02:31,440
osiris-rex we've launched it it's now on

41
00:02:35,589 --> 00:02:33,200
its way to bennu we're going to get

42
00:02:37,030 --> 00:02:35,599
amazing science out of it we're going to

43
00:02:39,110 --> 00:02:37,040
be answering some of the most

44
00:02:40,390 --> 00:02:39,120
fundamental questions that nasa really

45
00:02:42,390 --> 00:02:40,400
focuses on

46
00:02:44,150 --> 00:02:42,400
how does this planet work how did this

47
00:02:45,509 --> 00:02:44,160
planet form

48
00:02:47,589 --> 00:02:45,519
and we're even going to be looking at

49
00:02:49,670 --> 00:02:47,599
questions as basic as

50
00:02:52,309 --> 00:02:49,680
where did life and how did life

51
00:02:54,630 --> 00:02:52,319
originate on this planet this mission is

52
00:02:57,670 --> 00:02:54,640
huge contributions to science we're

53
00:03:00,070 --> 00:02:57,680
really excited we're on our way and as

54
00:03:02,630 --> 00:03:00,080
my boss charlie bolden said earlier

55
00:03:05,030 --> 00:03:02,640
every day at nasa we're turning science

56
00:03:11,670 --> 00:03:05,040
fiction into science fact and that's

57
00:03:16,470 --> 00:03:13,990
okay thank you ellen and now to jim

58
00:03:18,630 --> 00:03:16,480
green our planetary division director

59
00:03:19,990 --> 00:03:18,640
from nasa headquarters jim thank you

60
00:03:23,670 --> 00:03:20,000
very much george

61
00:03:26,149 --> 00:03:23,680
indeed nasa did it again

62
00:03:27,509 --> 00:03:26,159
i mean you know from a planetary science

63
00:03:30,149 --> 00:03:27,519

perspective

64
00:03:32,470 --> 00:03:30,159
we're making enormous strides in

65
00:03:33,830 --> 00:03:32,480
understanding our solar system and our

66
00:03:35,830 --> 00:03:33,840
place in it

67
00:03:39,270 --> 00:03:35,840
you know we were everything we knew

68
00:03:41,430 --> 00:03:39,280
about the solar system just 50 years ago

69
00:03:44,949 --> 00:03:41,440
we got primarily from the back end of a

70
00:03:46,710 --> 00:03:44,959
telescope or from meteorites that fell

71
00:03:48,869 --> 00:03:46,720
and when the meteorites fell and we

72
00:03:51,670 --> 00:03:48,879
wanted to know where they came from

73
00:03:54,789 --> 00:03:51,680
and what their composition was and how

74
00:03:57,910 --> 00:03:54,799
did they get to be they where they were

75
00:04:00,550 --> 00:03:57,920
this mission will make enormous strides

76
00:04:03,509 --> 00:04:00,560
answering so many questions that have

77
00:04:06,070 --> 00:04:03,519
come up in those 50 years

78
00:04:07,990 --> 00:04:06,080
it's just truly amazing

79
00:04:09,429 --> 00:04:08,000
and it requires an enormous number of

80
00:04:11,750 --> 00:04:09,439
people to do that

81
00:04:14,149 --> 00:04:11,760
many of the centers work together

82
00:04:15,429 --> 00:04:14,159
you know at nasa headquarters i have my

83
00:04:18,069 --> 00:04:15,439
team here

84
00:04:19,830 --> 00:04:18,079
our program scientists

85
00:04:21,990 --> 00:04:19,840
christina ricci

86
00:04:23,590 --> 00:04:22,000
deputy program scientist

87
00:04:26,790 --> 00:04:23,600
jeff grossman

88
00:04:29,270 --> 00:04:26,800

our program scientist and and gordon

89
00:04:31,590 --> 00:04:29,280
johnston our program executive these are

90
00:04:35,030 --> 00:04:31,600
my eyes and ears as to what's happening

91
00:04:37,270 --> 00:04:35,040
and they stay in touch and help me

92
00:04:39,749 --> 00:04:37,280
work all the issues at nasa headquarters

93
00:04:41,430 --> 00:04:39,759
remove the obstacles that allows the

94
00:04:43,189 --> 00:04:41,440
missions to proceed

95
00:04:45,030 --> 00:04:43,199
and of course there's all the technical

96
00:04:47,350 --> 00:04:45,040
teams that do their work you know

97
00:04:49,670 --> 00:04:47,360
goddard space flight center here we are

98
00:04:53,350 --> 00:04:49,680
at kennedy space flight center

99
00:04:55,670 --> 00:04:53,360
so indeed it's a wide nasa effort that

100
00:04:58,070 --> 00:04:55,680
goes right into the science community

101
00:05:00,070 --> 00:04:58,080
with the university of arizona our lead

102
00:05:01,909 --> 00:05:00,080
investigators and our principal

103
00:05:05,189 --> 00:05:01,919
investigator here

104
00:05:07,029 --> 00:05:05,199
i can't tell you how exciting this is

105
00:05:08,830 --> 00:05:07,039
you're just going to have to take my

106
00:05:11,590 --> 00:05:08,840
word for it and watch it

107
00:05:15,670 --> 00:05:11,600
unfold what will happen when the samples

108
00:05:17,830 --> 00:05:15,680
come back will be decades of study

109
00:05:20,310 --> 00:05:17,840
and that's what's really exciting about

110
00:05:22,469 --> 00:05:20,320
it the ability to hang on to those

111
00:05:25,270 --> 00:05:22,479
pristine materials

112
00:05:27,590 --> 00:05:25,280
pose questions and go to them and have

113
00:05:30,390 --> 00:05:27,600

them answer them for us

114
00:05:32,710 --> 00:05:30,400
through the analysis tools we have

115
00:05:35,270 --> 00:05:32,720
it's really quite a milestone

116
00:05:37,670 --> 00:05:35,280
you know planetary science

117
00:05:40,230 --> 00:05:37,680
is for me where it's at

118
00:05:42,790 --> 00:05:40,240
and we just keep hitting it out of the

119
00:05:49,350 --> 00:05:42,800
ballpark and tonight we hit it off the

120
00:05:53,510 --> 00:05:51,350
all right thanks jim

121
00:05:54,870 --> 00:05:53,520
now dante loretta the osiris-rex

122
00:05:56,870 --> 00:05:54,880
principal investigator from the

123
00:05:57,909 --> 00:05:56,880
university of arizona dante thank you

124
00:06:00,070 --> 00:05:57,919
george

125
00:06:04,950 --> 00:06:00,080
well you all be real glad to know we got

126
00:06:08,790 --> 00:06:07,510
it was an amazing evening for me and for

127
00:06:12,309 --> 00:06:08,800
this team

128
00:06:15,110 --> 00:06:12,319
um this represents the hopes and dreams

129
00:06:17,990 --> 00:06:15,120
hard work blood sweat and tears of

130
00:06:19,909 --> 00:06:18,000
thousands and thousands of people

131
00:06:21,270 --> 00:06:19,919
have have worked on this program for

132
00:06:23,430 --> 00:06:21,280
over a decade

133
00:06:25,189 --> 00:06:23,440
to make this a reality

134
00:06:28,390 --> 00:06:25,199
i do want to mention that the mission is

135
00:06:30,230 --> 00:06:28,400
dedicated to to my friend my mentor dr

136
00:06:32,469 --> 00:06:30,240
michael drake

137
00:06:34,309 --> 00:06:32,479
mike passed away just four months after

138
00:06:35,830 --> 00:06:34,319

we were selected by nasa to lead this

139
00:06:39,029 --> 00:06:35,840
mission and

140
00:06:41,749 --> 00:06:39,039
you know he left some parting words

141
00:06:43,110 --> 00:06:41,759
when when i had to say goodbye to him

142
00:06:45,189 --> 00:06:43,120
and he said you know first of all you

143
00:06:46,469 --> 00:06:45,199
can do this you've got the team we're

144
00:06:49,430 --> 00:06:46,479
one team

145
00:06:51,189 --> 00:06:49,440
these are big questions everybody's uh

146
00:06:53,510 --> 00:06:51,199
rooting for you everybody's behind you

147
00:06:54,790 --> 00:06:53,520
and uh and we can take that and and lead

148
00:06:56,070 --> 00:06:54,800
them forward

149
00:06:57,589 --> 00:06:56,080
uh i want to recognize a couple people

150
00:07:00,150 --> 00:06:57,599
in the audience my deputy principal

151
00:07:03,589 --> 00:07:00,160
investigator ed bashar uh came on right

152
00:07:05,510 --> 00:07:03,599
after i stepped into the role as the pi

153
00:07:07,350 --> 00:07:05,520
and has really led the science team

154
00:07:09,670 --> 00:07:07,360
throughout development

155
00:07:11,029 --> 00:07:09,680
ed is retiring after this is a great way

156
00:07:12,950 --> 00:07:11,039
to go out

157
00:07:15,110 --> 00:07:12,960
heather enos is coming in as the deputy

158
00:07:16,950 --> 00:07:15,120
principal investigator to lead us into

159
00:07:18,710 --> 00:07:16,960
operations and

160
00:07:20,629 --> 00:07:18,720
she brings a lot of experience from

161
00:07:21,350 --> 00:07:20,639
phoenix mars lander mars odyssey and

162
00:07:23,909 --> 00:07:21,360
other

163
00:07:26,710 --> 00:07:23,919

major nasa missions it's a really proud

164
00:07:27,909 --> 00:07:26,720
moment for the agency i'm honored and

165
00:07:30,870 --> 00:07:27,919
privileged to be able to lead this

166
00:07:32,950 --> 00:07:30,880
mission for nasa and

167
00:07:35,270 --> 00:07:32,960
glad the university of arizona continues

168
00:07:37,670 --> 00:07:35,280
to be a strong partner for nasa as we go

169
00:07:38,629 --> 00:07:37,680
forward on this journey to benjamin back

170
00:07:40,710 --> 00:07:38,639
so

171
00:07:42,710 --> 00:07:40,720
we've worked hard to get to this point

172
00:07:44,869 --> 00:07:42,720
the best times are ahead of us

173
00:07:46,070 --> 00:07:44,879
we are going to get to asteroid bennu

174
00:07:47,270 --> 00:07:46,080
we're going to map it we're going to

175
00:07:48,950 --> 00:07:47,280
pick that site we're going to get that

176
00:07:50,309 --> 00:07:48,960
sample and we're going to bring it back

177
00:07:54,230 --> 00:07:50,319
to earth

178
00:07:56,070 --> 00:07:54,240
in 2023 and so i can't tell you how

179
00:07:58,629 --> 00:07:56,080
thrilled i was this evening it was a it

180
00:08:00,550 --> 00:07:58,639
was a wild emotional ride

181
00:08:02,070 --> 00:08:00,560
thinking of everybody that's with us

182
00:08:03,589 --> 00:08:02,080
that's not with us

183
00:08:05,270 --> 00:08:03,599
and uh

184
00:08:07,430 --> 00:08:05,280
all of the anomalies that we trouble

185
00:08:09,909 --> 00:08:07,440
shot none of those came up we hit all of

186
00:08:12,710 --> 00:08:09,919
our milestones within a within seconds

187
00:08:14,150 --> 00:08:12,720
of the predicts uh really kicked that

188
00:08:15,670 --> 00:08:14,160

that field goal right down the center of

189
00:08:18,390 --> 00:08:15,680
the goal post so

190
00:08:24,469 --> 00:08:18,400
nasa has done it again absolutely

191
00:08:29,589 --> 00:08:27,430
thank you dante and now to scott messer

192
00:08:32,230 --> 00:08:29,599
from united launch alliance the program

193
00:08:34,070 --> 00:08:32,240
manager for nasa's mission scott

194
00:08:35,909 --> 00:08:34,080
thank you george uh i just wanted to

195
00:08:38,870 --> 00:08:35,919
start out by saying how about that

196
00:08:41,190 --> 00:08:38,880
launch i mean

197
00:08:43,350 --> 00:08:41,200
was that not awesome i mean the uh the

198
00:08:45,430 --> 00:08:43,360
delta or the atlas v rocket performed

199
00:08:48,630 --> 00:08:45,440
impeccably this evening

200
00:08:49,670 --> 00:08:48,640
we looked at the uh countdown was uh

201
00:08:52,070 --> 00:08:49,680
just

202
00:08:54,470 --> 00:08:52,080
crystal clean and hardly anything going

203
00:08:56,790 --> 00:08:54,480
on as dante said we hit all of our

204
00:08:59,750 --> 00:08:56,800
milestones just right on time and in

205
00:09:01,590 --> 00:08:59,760
most cases a little bit ahead of time

206
00:09:03,670 --> 00:09:01,600
i just listened to the

207
00:09:07,030 --> 00:09:03,680
quick look review on the way back and

208
00:09:10,230 --> 00:09:07,040
the vehicle performance was absolutely

209
00:09:11,110 --> 00:09:10,240
perfect almost the engineers were trying

210
00:09:13,110 --> 00:09:11,120
to

211
00:09:15,110 --> 00:09:13,120
fight with one another over who could be

212
00:09:18,070 --> 00:09:15,120
the most nominal on their system

213
00:09:22,710 --> 00:09:18,080

performance so the vehicle was very good

214
00:09:25,910 --> 00:09:22,720
the orbit that we hit was almost perfect

215
00:09:28,310 --> 00:09:25,920
the spacecraft has already made some

216
00:09:31,190 --> 00:09:28,320
little minor corrections and they were

217
00:09:33,670 --> 00:09:31,200
thrilled at uh just how perfect the the

218
00:09:35,590 --> 00:09:33,680
orbit was so that was that was great so

219
00:09:38,550 --> 00:09:35,600
i want to just say congratulations to

220
00:09:40,949 --> 00:09:38,560
nasa and the entire osiris-rex team

221
00:09:42,230 --> 00:09:40,959
as well as all of the families that have

222
00:09:45,590 --> 00:09:42,240
spent

223
00:09:49,190 --> 00:09:45,600
countless hours with their

224
00:09:51,350 --> 00:09:49,200
husbands wives fathers and mothers out

225
00:09:53,750 --> 00:09:51,360
supporting this this launch it's been

226
00:09:54,470 --> 00:09:53,760
wonderful

227
00:09:56,949 --> 00:09:54,480
so

228
00:09:59,590 --> 00:09:56,959
just a little bit more the osiris-rex

229
00:10:01,829 --> 00:09:59,600
mission is the third mission in the new

230
00:10:02,710 --> 00:10:01,839
frontiers program the first two missions

231
00:10:10,470 --> 00:10:02,720
uh

232
00:10:12,710 --> 00:10:10,480
v as well it's been a thrilling for us

233
00:10:14,949 --> 00:10:12,720
to be part of the the mission success

234
00:10:17,430 --> 00:10:14,959
and the discoveries and the images

235
00:10:18,790 --> 00:10:17,440
that uh the new frontiers program has

236
00:10:20,550 --> 00:10:18,800
seen

237
00:10:23,670 --> 00:10:20,560
you know our experience

238
00:10:26,710 --> 00:10:23,680

at ula is that sustained reliability and

239
00:10:28,230 --> 00:10:26,720
mission success only come if we have

240
00:10:31,190 --> 00:10:28,240
great

241
00:10:34,630 --> 00:10:31,200
partners to to team with and to be

242
00:10:36,470 --> 00:10:34,640
very well integrated with and this team

243
00:10:37,670 --> 00:10:36,480
the goddard team the lockheed martin

244
00:10:40,389 --> 00:10:37,680
team the

245
00:10:42,550 --> 00:10:40,399
uh the entire team has just been a

246
00:10:43,910 --> 00:10:42,560
great team for us to work with

247
00:10:45,590 --> 00:10:43,920
we're thrilled to be part of these

248
00:10:49,030 --> 00:10:45,600
critical missions and we'll continue to

249
00:10:50,949 --> 00:10:49,040
maintain our focus on mission success

250
00:10:52,710 --> 00:10:50,959
for all of our customers and once again

251
00:10:55,350 --> 00:10:52,720
i just wanted to say thanks to all of

252
00:10:57,110 --> 00:10:55,360
our industry part or all of our partners

253
00:10:59,670 --> 00:10:57,120
who have worked on this this great

254
00:11:01,030 --> 00:10:59,680
mission and we are excited to be

255
00:11:07,030 --> 00:11:01,040
part and to get

256
00:11:10,790 --> 00:11:08,230
thank you scott

257
00:11:12,310 --> 00:11:10,800
now to rich coons from lockheed martin

258
00:11:13,829 --> 00:11:12,320
he's been with us here at kennedy for a

259
00:11:16,949 --> 00:11:13,839
number of months helping to get

260
00:11:18,870 --> 00:11:16,959
osiris-rex ready for launch tonight

261
00:11:21,030 --> 00:11:18,880
rich coons is the osiris-rex program

262
00:11:22,470 --> 00:11:21,040
manager for lockheed martin rich thank

263
00:11:23,910 --> 00:11:22,480

you george

264
00:11:26,230 --> 00:11:23,920
so let me start by saying that the

265
00:11:28,150 --> 00:11:26,240
osiris-rex spacecraft is happy and

266
00:11:30,710 --> 00:11:28,160
healthy

267
00:11:32,550 --> 00:11:30,720
and i can't tell you how proud i am of

268
00:11:34,230 --> 00:11:32,560
everybody that was involved

269
00:11:35,350 --> 00:11:34,240
in getting us to the point that i could

270
00:11:37,269 --> 00:11:35,360
say that

271
00:11:38,710 --> 00:11:37,279
we started the journey with a phenomenal

272
00:11:41,350 --> 00:11:38,720
launch

273
00:11:43,030 --> 00:11:41,360
on the atlas v it delivered us right

274
00:11:45,829 --> 00:11:43,040
where we needed to be

275
00:11:48,790 --> 00:11:45,839
and we separated on plan within a minute

276
00:11:50,470 --> 00:11:48,800
of when we when we said we would

277
00:11:53,190 --> 00:11:50,480
um and

278
00:11:55,590 --> 00:11:53,200
since then it's just been knocking

279
00:11:58,069 --> 00:11:55,600
milestone after milestone so

280
00:12:00,310 --> 00:11:58,079
once once you saw stop being able to see

281
00:12:02,310 --> 00:12:00,320
the rocket there was still actually

282
00:12:05,269 --> 00:12:02,320
about an hour's worth of work that went

283
00:12:06,870 --> 00:12:05,279
in on the ulta team side to make sure

284
00:12:09,110 --> 00:12:06,880
that we were

285
00:12:12,310 --> 00:12:09,120
delivered to where we needed to be

286
00:12:15,190 --> 00:12:12,320
so at about 805

287
00:12:16,710 --> 00:12:15,200
we separated from the upper stage

288
00:12:18,629 --> 00:12:16,720

we immediately were able to start

289
00:12:20,949 --> 00:12:18,639
receiving some telemetry back from the

290
00:12:22,870 --> 00:12:20,959
vehicle

291
00:12:24,230 --> 00:12:22,880
since then we've done a number of

292
00:12:26,150 --> 00:12:24,240
different things we've initialized the

293
00:12:27,829 --> 00:12:26,160
propulsion system

294
00:12:30,389 --> 00:12:27,839
we have

295
00:12:32,470 --> 00:12:30,399
gotten the solar arrays out and deployed

296
00:12:34,069 --> 00:12:32,480
we're able to balance the power on both

297
00:12:35,590 --> 00:12:34,079
arrays they're both moving we've been

298
00:12:37,670 --> 00:12:35,600
able to articulate them in both

299
00:12:40,230 --> 00:12:37,680
directions

300
00:12:42,470 --> 00:12:40,240
we have slewed the vehicle on its

301
00:12:45,350 --> 00:12:42,480
thrusters so the prop system is working

302
00:12:47,350 --> 00:12:45,360
as expected we were able to slew to the

303
00:12:49,430 --> 00:12:47,360
communications attitude

304
00:12:50,870 --> 00:12:49,440
and within 40 minutes of being separated

305
00:12:52,550 --> 00:12:50,880
we had established two-way

306
00:12:54,389 --> 00:12:52,560
communications with the ground station

307
00:12:55,829 --> 00:12:54,399
in canberra

308
00:13:00,310 --> 00:12:55,839
so that whole

309
00:13:02,710 --> 00:13:00,320
experience was incredibly nerve-racking

310
00:13:04,949 --> 00:13:02,720
but it is working absolutely as we

311
00:13:07,350 --> 00:13:04,959
designed it absolutely as we tested it

312
00:13:09,350 --> 00:13:07,360
on the ground so now all that i can say

313
00:13:11,110 --> 00:13:09,360

is let's go get the science

314
00:13:13,430 --> 00:13:11,120
and uh let's get into that outbound

315
00:13:15,110 --> 00:13:13,440
crude phase

316
00:13:16,470 --> 00:13:15,120
and couldn't be happier with the work of

317
00:13:23,269 --> 00:13:16,480
everybody

318
00:13:27,190 --> 00:13:24,949
all right we're ready to take questions

319
00:13:28,870 --> 00:13:27,200
now please give your name an affiliation

320
00:13:33,030 --> 00:13:28,880
when the microphone comes to you and

321
00:13:37,990 --> 00:13:35,430
uh jim siegel i'm with uh celebration

322
00:13:39,670 --> 00:13:38,000
news and space flight insider i have a

323
00:13:42,150 --> 00:13:39,680
question about the

324
00:13:44,389 --> 00:13:42,160
i'm excited for you for all of the

325
00:13:46,150 --> 00:13:44,399
science that you anticipate receiving

326
00:13:47,670 --> 00:13:46,160
and i understand that the mother lode is

327
00:13:50,629 --> 00:13:47,680
going to be the

328
00:13:52,069 --> 00:13:50,639
material that is returned in seven years

329
00:13:54,550 --> 00:13:52,079
but expect that

330
00:13:57,110 --> 00:13:54,560
prior to that you are going to be

331
00:13:58,710 --> 00:13:57,120
making a number of other

332
00:13:59,910 --> 00:13:58,720
discoveries that are going to be

333
00:14:01,269 --> 00:13:59,920
important and i wonder if you could

334
00:14:03,750 --> 00:14:01,279
describe

335
00:14:07,189 --> 00:14:03,760
when and what some of those things might

336
00:14:10,470 --> 00:14:07,199
be prior to seven years from now

337
00:14:12,710 --> 00:14:10,480
yeah so osiris-rex has really benefited

338
00:14:13,829 --> 00:14:12,720

from three major science campaigns and i

339
00:14:16,069 --> 00:14:13,839
think the science team is really

340
00:14:18,470 --> 00:14:16,079
fortunate the first one was getting

341
00:14:20,310 --> 00:14:18,480
ready for uh the operations using

342
00:14:22,629 --> 00:14:20,320
astronomy techniques we had ground-based

343
00:14:24,470 --> 00:14:22,639
telescopes space-based telescopes and we

344
00:14:26,310 --> 00:14:24,480
did a very thorough job characterizing

345
00:14:28,069 --> 00:14:26,320
bennu to the greatest extent possible

346
00:14:29,269 --> 00:14:28,079
with all of those assets the second

347
00:14:31,509 --> 00:14:29,279
phase is going to come during the

348
00:14:33,269 --> 00:14:31,519
asteroid encounter we have an amazing

349
00:14:34,790 --> 00:14:33,279
set of scientific instruments we got the

350
00:14:37,030 --> 00:14:34,800
ocam suite from the university of

351
00:14:38,389 --> 00:14:37,040
arizona the osiris-rex thermal emission

352
00:14:40,310 --> 00:14:38,399
spectrometer from arizona state

353
00:14:41,829 --> 00:14:40,320
university our visible and infrared

354
00:14:44,470 --> 00:14:41,839
spectrometer for goddard space flight

355
00:14:45,829 --> 00:14:44,480
center and the laser altimeter from the

356
00:14:47,590 --> 00:14:45,839
canadian space agency as an

357
00:14:49,110 --> 00:14:47,600
international contribution and we also

358
00:14:50,949 --> 00:14:49,120
have a student collaboration called the

359
00:14:52,870 --> 00:14:50,959
rexus regolith x-ray imaging

360
00:14:54,389 --> 00:14:52,880
spectrometer it's going to be the

361
00:14:56,790 --> 00:14:54,399
greatest remote sensing mission of an

362
00:14:58,790 --> 00:14:56,800
asteroid ever performed we are going to

363
00:15:00,710 --> 00:14:58,800

map this thing globally

364
00:15:02,150 --> 00:15:00,720
we have to do that for our sample return

365
00:15:03,829 --> 00:15:02,160
science and that's what's driven this

366
00:15:04,790 --> 00:15:03,839
the flight system design and the mission

367
00:15:06,550 --> 00:15:04,800
design

368
00:15:07,670 --> 00:15:06,560
but we've got a lot of other plans for

369
00:15:09,030 --> 00:15:07,680
what we're going to do with that data

370
00:15:12,150 --> 00:15:09,040
we're going to understand asteroid

371
00:15:14,550 --> 00:15:12,160
geology dynamical evolution orbit

372
00:15:16,230 --> 00:15:14,560
trajectory the yarkovsky effect we're

373
00:15:18,470 --> 00:15:16,240
going to ground truth that telescopic

374
00:15:21,030 --> 00:15:18,480
data and we're going to study regolith

375
00:15:22,550 --> 00:15:21,040
or the blanket of gravel and dust on the

376
00:15:24,550 --> 00:15:22,560
surface of the asteroid in a

377
00:15:26,629 --> 00:15:24,560
microgravity environment which is really

378
00:15:29,030 --> 00:15:26,639
a whole new realm of astrophysical

379
00:15:30,710 --> 00:15:29,040
investigation so the mission will have

380
00:15:33,110 --> 00:15:30,720
phenomenal science from the asteroid

381
00:15:35,110 --> 00:15:33,120
encounter leading up to the sample

382
00:15:37,829 --> 00:15:35,120
acquisition event and then of course the

383
00:15:39,990 --> 00:15:37,839
final stage to cap off the trilogy that

384
00:15:41,990 --> 00:15:40,000
of science that osiris-rex will bring is

385
00:15:43,829 --> 00:15:42,000
the sample return investigation starting

386
00:15:45,590 --> 00:15:43,839
seven years from now

387
00:15:47,590 --> 00:15:45,600
you know i can imagine as we get closer

388
00:15:49,670 --> 00:15:47,600

and closer the images are going to be

389
00:15:51,509 --> 00:15:49,680
absolutely riveting

390
00:15:54,230 --> 00:15:51,519
now one of the things that we also did

391
00:15:57,350 --> 00:15:54,240
as dante mentioned is using our

392
00:16:00,150 --> 00:15:57,360
ground-based assets such as radars we've

393
00:16:02,949 --> 00:16:00,160
hit this object before with radars and

394
00:16:04,629 --> 00:16:02,959
we've gotten return echoes this is how

395
00:16:07,269 --> 00:16:04,639
we know some of its basic

396
00:16:10,230 --> 00:16:07,279
characteristics but when we get there

397
00:16:12,550 --> 00:16:10,240
and get up close and personal really

398
00:16:14,790 --> 00:16:12,560
review it we can then go back and look

399
00:16:16,949 --> 00:16:14,800
at the radar data and get a better

400
00:16:19,509 --> 00:16:16,959
interpretation of what that means this

401
00:16:22,870 --> 00:16:19,519
will be the first major asteroid we've

402
00:16:25,110 --> 00:16:22,880
seen and visited in a way that helps us

403
00:16:25,990 --> 00:16:25,120
understand the observations

404
00:16:27,509 --> 00:16:26,000
from

405
00:16:30,150 --> 00:16:27,519
ground-based measurements that we've

406
00:16:32,550 --> 00:16:30,160
made we call that ground truthing you

407
00:16:34,710 --> 00:16:32,560
know be able to be there and see that

408
00:16:37,189 --> 00:16:34,720
that's going to help us in so many other

409
00:16:39,910 --> 00:16:37,199
ways as we take more observations of

410
00:16:41,670 --> 00:16:39,920
other objects as we do continue to do

411
00:16:44,870 --> 00:16:41,680
radar we hit maybe

412
00:16:46,230 --> 00:16:44,880
70 80 asteroids a year using radar

413
00:16:47,030 --> 00:16:46,240

techniques

414
00:16:48,550 --> 00:16:47,040
so

415
00:16:50,470 --> 00:16:48,560
you know it's going to help the program

416
00:16:51,509 --> 00:16:50,480
all over the place

417
00:16:55,350 --> 00:16:51,519
thank you

418
00:16:55,360 --> 00:17:02,310
all right we'll take one right here

419
00:17:07,270 --> 00:17:04,309
sawyer rosenstein with talking space i

420
00:17:09,429 --> 00:17:07,280
know that um obviously this mission

421
00:17:12,710 --> 00:17:09,439
is dedicated to the original pi and you

422
00:17:13,990 --> 00:17:12,720
had the uh the plaque for mike drake and

423
00:17:15,909 --> 00:17:14,000
everything and i was wondering your

424
00:17:18,470 --> 00:17:15,919
thoughts now that this is in space and

425
00:17:20,309 --> 00:17:18,480
on its way about him basically getting

426
00:17:21,990 --> 00:17:20,319
on his way to the asteroid

427
00:17:24,549 --> 00:17:22,000
today's been a bittersweet moment for me

428
00:17:25,990 --> 00:17:24,559
and i'll admit to as i was driving

429
00:17:28,470 --> 00:17:26,000
through the air force station on my way

430
00:17:30,630 --> 00:17:28,480
to the asoc you know i was alone i had

431
00:17:31,990 --> 00:17:30,640
some time to think and i really missed

432
00:17:34,470 --> 00:17:32,000
him i mean he would he would have been

433
00:17:36,549 --> 00:17:34,480
thrilled right now and uh this would

434
00:17:40,150 --> 00:17:36,559
have been a great achievement for him

435
00:17:41,750 --> 00:17:40,160
and uh i i wish he was there with me so

436
00:17:43,110 --> 00:17:41,760
that was the deal when he brought me on

437
00:17:44,950 --> 00:17:43,120
as a deputy i was supposed to just

438
00:17:46,710 --> 00:17:44,960

handle the science side of the business

439
00:17:48,870 --> 00:17:46,720
and he was going to handle all the

440
00:17:49,990 --> 00:17:48,880
administrative stuff the management and

441
00:17:52,150 --> 00:17:50,000
uh

442
00:17:53,830 --> 00:17:52,160
you know he had parting words for me

443
00:17:56,390 --> 00:17:53,840
about being able to take this team

444
00:17:57,990 --> 00:17:56,400
forward and carrying uh you know the

445
00:17:59,190 --> 00:17:58,000
torch for the next generation and he

446
00:18:01,270 --> 00:17:59,200
really believed in that he really

447
00:18:03,430 --> 00:18:01,280
believed the reason that we fly these

448
00:18:05,190 --> 00:18:03,440
missions as a nation why we invest in

449
00:18:07,029 --> 00:18:05,200
these kinds of endeavors is for the

450
00:18:08,390 --> 00:18:07,039
great science but really for the

451
00:18:10,310 --> 00:18:08,400
educational opportunities the

452
00:18:12,789 --> 00:18:10,320
inspirational opportunities we want

453
00:18:14,390 --> 00:18:12,799
people to realize the impossible

454
00:18:16,150 --> 00:18:14,400
to see what you can do

455
00:18:18,630 --> 00:18:16,160
creatively constructively when people

456
00:18:20,390 --> 00:18:18,640
come together dedicated to a program

457
00:18:22,710 --> 00:18:20,400
like this dedicated to to mission

458
00:18:24,710 --> 00:18:22,720
success and i mentioned the thousands of

459
00:18:26,070 --> 00:18:24,720
people who have worked on this and it's

460
00:18:28,789 --> 00:18:26,080
it's the human spirit you know

461
00:18:30,870 --> 00:18:28,799
osiris-rex is us you know we're taking

462
00:18:33,029 --> 00:18:30,880
those sensors out deep into the solar

463
00:18:34,470 --> 00:18:33,039

system those are our eyes those are our

464
00:18:36,310 --> 00:18:34,480
information that we're bringing back so

465
00:18:38,630 --> 00:18:36,320
we can better understand the big

466
00:18:40,950 --> 00:18:38,640
questions where did we come from you

467
00:18:42,870 --> 00:18:40,960
know and uh where are we going what is

468
00:18:46,630 --> 00:18:42,880
what is our future and really are we

469
00:18:51,750 --> 00:18:49,270
all right over here

470
00:18:53,029 --> 00:18:51,760
sarah hammond arizona public media dante

471
00:18:54,870 --> 00:18:53,039
can you talk a little bit about the

472
00:18:56,549 --> 00:18:54,880
university of arizona's legacy of

473
00:18:58,950 --> 00:18:56,559
planetary science that has brought us to

474
00:19:00,789 --> 00:18:58,960
the osiris-rex mission

475
00:19:02,230 --> 00:19:00,799
i'm a professor in the lunar and

476
00:19:05,510 --> 00:19:02,240
planetary laboratory at the university

477
00:19:08,070 --> 00:19:05,520
of arizona and lpl has over 50-year

478
00:19:10,470 --> 00:19:08,080
history of supporting nasa space flight

479
00:19:12,470 --> 00:19:10,480
programs in planetary science our

480
00:19:16,230 --> 00:19:12,480
founding goes back to the very beginning

481
00:19:18,470 --> 00:19:16,240
of the space age with dr kuiper who

482
00:19:20,150 --> 00:19:18,480
provided the original lunar atlases for

483
00:19:21,750 --> 00:19:20,160
selecting the apollo landing sites and

484
00:19:23,510 --> 00:19:21,760
the surveyor landing sites in support of

485
00:19:25,510 --> 00:19:23,520
the very first nasa planetary

486
00:19:27,669 --> 00:19:25,520
exploration missions and really is

487
00:19:29,990 --> 00:19:27,679
standing on the shoulders of giants uh

488
00:19:31,750 --> 00:19:30,000

it's awe-inspiring for me to go back and

489
00:19:34,870 --> 00:19:31,760
and look at the history of lpl because

490
00:19:37,270 --> 00:19:34,880
we've been involved in voyager pioneer

491
00:19:38,950 --> 00:19:37,280
uh you know mars phoenix lander mars

492
00:19:40,070 --> 00:19:38,960
reconnaissance orbiter mars global

493
00:19:42,470 --> 00:19:40,080
surveyor

494
00:19:44,549 --> 00:19:42,480
and cassini messenger

495
00:19:47,270 --> 00:19:44,559
deep impact all of these missions have

496
00:19:49,029 --> 00:19:47,280
had a major lpl presence on them and so

497
00:19:49,990 --> 00:19:49,039
we wouldn't be able to do the osiris-rex

498
00:19:51,590 --> 00:19:50,000
mission

499
00:19:53,350 --> 00:19:51,600
at university of arizona if it wasn't

500
00:19:55,669 --> 00:19:53,360
for that long history a lot of the

501
00:19:57,510 --> 00:19:55,679
people on the team uh cut their teeth on

502
00:19:59,909 --> 00:19:57,520
those programs and you know i was able

503
00:20:01,750 --> 00:19:59,919
to harness all of that talent and and

504
00:20:04,149 --> 00:20:01,760
focus them on osiris-rex to make it the

505
00:20:06,870 --> 00:20:04,159
success that it has been to date

506
00:20:08,149 --> 00:20:06,880
well we've got a question um a calling

507
00:20:18,230 --> 00:20:08,159
question we'll take that and then we'll

508
00:20:18,240 --> 00:20:30,789
question on the phone

509
00:20:34,310 --> 00:20:32,710
all right we were not able to get our

510
00:20:35,990 --> 00:20:34,320
questions and we'll come back here

511
00:20:37,830 --> 00:20:36,000
question right back here

512
00:20:39,830 --> 00:20:37,840
i'm julian almenas i'm from nicholson

513
00:20:41,750 --> 00:20:39,840

student media at ucf

514
00:20:44,470 --> 00:20:41,760
um i was just wondering obviously this

515
00:20:47,110 --> 00:20:44,480
has a big presence nationwide but how

516
00:20:53,029 --> 00:20:47,120
will the success of this launch affect

517
00:20:57,350 --> 00:20:55,029
you know i think any time the nasa

518
00:20:59,510 --> 00:20:57,360
family accomplishes anything it's a big

519
00:21:01,510 --> 00:20:59,520
boost and certainly our presence here in

520
00:21:03,350 --> 00:21:01,520
the orlando area at kennedy space center

521
00:21:06,630 --> 00:21:03,360
the launch operations that we do here at

522
00:21:08,390 --> 00:21:06,640
kennedy is so critical to nasa's success

523
00:21:10,549 --> 00:21:08,400
it's critical to every spacecraft i

524
00:21:12,390 --> 00:21:10,559
think sometimes you know i'm on the

525
00:21:13,909 --> 00:21:12,400
science side and a lot of the times when

526
00:21:16,149 --> 00:21:13,919
people think about what we do they think

527
00:21:18,710 --> 00:21:16,159
about the great scientific discoveries

528
00:21:20,789 --> 00:21:18,720
our rovers on mars and what it's really

529
00:21:22,390 --> 00:21:20,799
important to remember is we'd never have

530
00:21:25,270 --> 00:21:22,400
those rovers on mars we wouldn't have

531
00:21:27,110 --> 00:21:25,280
osiris-rex on its way to an asteroid if

532
00:21:29,350 --> 00:21:27,120
it weren't for the people who worked so

533
00:21:31,750 --> 00:21:29,360
hard here at kennedy space center who

534
00:21:33,510 --> 00:21:31,760
made this launch successful our partners

535
00:21:35,190 --> 00:21:33,520
at united launch alliance our partners

536
00:21:37,990 --> 00:21:35,200
at lockheed martin there's people all

537
00:21:41,190 --> 00:21:38,000
around the country who've had a hand in

538
00:21:43,430 --> 00:21:41,200

this in making this mission a success

539
00:21:44,950 --> 00:21:43,440
and they're all critical

540
00:21:47,590 --> 00:21:44,960
to really pushing the boundaries of

541
00:21:49,190 --> 00:21:47,600
exploration that we do every day at nasa

542
00:21:50,710 --> 00:21:49,200
and i'll just add to that we do have

543
00:21:52,789 --> 00:21:50,720
science team members based at the

544
00:21:54,549 --> 00:21:52,799
university of central florida umberto

545
00:21:56,789 --> 00:21:54,559
campings is a co-investigator on the

546
00:21:59,270 --> 00:21:56,799
program bringing expertise in asteroid

547
00:22:01,430 --> 00:21:59,280
astronomy asteroid spectroscopy

548
00:22:03,029 --> 00:22:01,440
and and characterizing bennu using those

549
00:22:05,430 --> 00:22:03,039
ground-based telescopes that i mentioned

550
00:22:07,190 --> 00:22:05,440
as well so we're really proud of ucf's

551
00:22:10,870 --> 00:22:07,200
contribution to osiris-rex and we look

552
00:22:12,310 --> 00:22:10,880
forward to continued collaboration

553
00:22:24,149 --> 00:22:12,320
additional questions here in the room

554
00:22:28,789 --> 00:22:26,390
amanda barnett with cnn digital

555
00:22:30,310 --> 00:22:28,799
uh congratulations to the team

556
00:22:32,230 --> 00:22:30,320
sounds like everything went well tonight

557
00:22:33,669 --> 00:22:32,240
it was a drama-free launch but what's

558
00:22:35,350 --> 00:22:33,679
the next moment where you might be

559
00:22:37,029 --> 00:22:35,360
holding your breath a little bit and

560
00:22:38,630 --> 00:22:37,039
then if someone could talk about this

561
00:22:40,710 --> 00:22:38,640
gravity assist

562
00:22:45,029 --> 00:22:40,720
which is coming up in about a year and

563
00:22:49,510 --> 00:22:47,990

i can do it so uh we launched today on a

564
00:22:51,350 --> 00:22:49,520
trajectory that's going to bring us back

565
00:22:54,950 --> 00:22:51,360
to the earth about one year from now in

566
00:22:56,870 --> 00:22:54,960
september of 2017 and we will be using

567
00:22:59,029 --> 00:22:56,880
an earth gravity assist primarily to

568
00:23:01,590 --> 00:22:59,039
change the inclination of the orbital

569
00:23:03,830 --> 00:23:01,600
plane because bennu our target asteroid

570
00:23:06,070 --> 00:23:03,840
orbits about six degrees off from the

571
00:23:07,830 --> 00:23:06,080
orbit plane of the earth so we'll use

572
00:23:09,909 --> 00:23:07,840
basically flying underneath antarctica

573
00:23:11,909 --> 00:23:09,919
to bend the spacecraft trajectory up

574
00:23:12,950 --> 00:23:11,919
onto that rendezvous trajectory with the

575
00:23:15,510 --> 00:23:12,960
asteroid

576
00:23:17,830 --> 00:23:15,520
for me uh the next real moment of truth

577
00:23:20,070 --> 00:23:17,840
is when we get the first resolved images

578
00:23:22,390 --> 00:23:20,080
of the target asteroid because

579
00:23:24,470 --> 00:23:22,400
everyone on the team has some image in

580
00:23:27,110 --> 00:23:24,480
their mind of what bennu is going to

581
00:23:28,789 --> 00:23:27,120
look like and uh it's going to be

582
00:23:31,190 --> 00:23:28,799
phenomenal to see what it really looks

583
00:23:33,190 --> 00:23:31,200
like we had a great reminder of this

584
00:23:35,270 --> 00:23:33,200
with the the european rosetta mission

585
00:23:37,430 --> 00:23:35,280
when they got to their target comet and

586
00:23:39,190 --> 00:23:37,440
they saw that phenomenal geology that

587
00:23:41,110 --> 00:23:39,200
was going on on that comet nucleus it

588
00:23:41,990 --> 00:23:41,120

really just blew us away

589
00:23:44,549 --> 00:23:42,000
and i

590
00:23:45,909 --> 00:23:44,559
them this is what they thought the

591
00:23:47,510 --> 00:23:45,919
comment was going to look like before

592
00:23:49,750 --> 00:23:47,520
they got the camera images back and this

593
00:23:52,470 --> 00:23:49,760
is what it looks like in reality and for

594
00:23:53,990 --> 00:23:52,480
us it's really going to set the pace of

595
00:23:56,070 --> 00:23:54,000
the entire encounter because we're going

596
00:23:57,590 --> 00:23:56,080
to understand right away what kind of

597
00:23:59,029 --> 00:23:57,600
challenge are we up against right is

598
00:24:00,310 --> 00:23:59,039
this going to be literally a walk on the

599
00:24:02,390 --> 00:24:00,320
beach or are we going to have a lot of

600
00:24:04,230 --> 00:24:02,400
work to do to get to that sampling site

601
00:24:05,669 --> 00:24:04,240
so we can get that precious sample back

602
00:24:07,909 --> 00:24:05,679
to earth

603
00:24:09,350 --> 00:24:07,919
okay right here this lady right in back

604
00:24:14,390 --> 00:24:09,360
of

605
00:24:17,669 --> 00:24:16,149
i'm jackie goddard working for the times

606
00:24:20,149 --> 00:24:17,679
of london

607
00:24:22,710 --> 00:24:20,159
if we waited 160 years as a chance the

608
00:24:24,470 --> 00:24:22,720
asteroid could come and visit us instead

609
00:24:26,230 --> 00:24:24,480
um could one of you talk a little bit

610
00:24:30,070 --> 00:24:26,240
about the value of this mission to

611
00:24:31,590 --> 00:24:30,080
future deflection technology thank you

612
00:24:33,510 --> 00:24:31,600
well you know um

613
00:24:36,630 --> 00:24:33,520

we've been looking for

614
00:24:37,830 --> 00:24:36,640
near-earth objects their size uh where

615
00:24:39,190 --> 00:24:37,840
they go

616
00:24:41,669 --> 00:24:39,200
in terms of

617
00:24:43,190 --> 00:24:41,679
how potentially hazardous they might be

618
00:24:45,909 --> 00:24:43,200
and indeed

619
00:24:49,269 --> 00:24:45,919
this asteroid orbits between venus and

620
00:24:53,350 --> 00:24:49,279
mars and crosses our orbit so it can

621
00:24:55,590 --> 00:24:53,360
be a potentially hazardous asteroid

622
00:24:57,350 --> 00:24:55,600
you know kepler's helped us tell us how

623
00:25:01,590 --> 00:24:57,360
these things move

624
00:25:04,870 --> 00:25:01,600
but objects like this are really pushed

625
00:25:07,350 --> 00:25:04,880
with photon pressure you know they obser

626
00:25:10,230 --> 00:25:07,360
they absorb photons and as they spin

627
00:25:12,149 --> 00:25:10,240
they radiate them again and that changes

628
00:25:14,630 --> 00:25:12,159
their trajectory

629
00:25:17,029 --> 00:25:14,640
so that's called the yarkovsky effect

630
00:25:18,470 --> 00:25:17,039
and that violates what kepler would tell

631
00:25:20,789 --> 00:25:18,480
us it would do because there's

632
00:25:22,950 --> 00:25:20,799
additional physics there that's really

633
00:25:25,750 --> 00:25:22,960
critical for us to understand

634
00:25:27,430 --> 00:25:25,760
a whole class of asteroids that behave

635
00:25:30,070 --> 00:25:27,440
in this manner

636
00:25:31,990 --> 00:25:30,080
and so understanding uh the surface

637
00:25:34,950 --> 00:25:32,000
properties their characteristics what

638
00:25:37,190 --> 00:25:34,960

they're made of uh will tell us how that

639
00:25:38,549 --> 00:25:37,200
absorbs the light holds it and then

640
00:25:41,590 --> 00:25:38,559
re-emits it

641
00:25:43,110 --> 00:25:41,600
uh pushing the asteroid in in these kind

642
00:25:46,870 --> 00:25:43,120
of directions

643
00:25:49,510 --> 00:25:46,880
so this aids us in in a whole series of

644
00:25:53,110 --> 00:25:49,520
ways one it helps us do a better job in

645
00:25:56,950 --> 00:25:53,120
determining the exact orbit over

646
00:25:59,190 --> 00:25:56,960
several centuries okay two it enables us

647
00:26:01,430 --> 00:25:59,200
to use what we've learned on a whole

648
00:26:04,230 --> 00:26:01,440
class of asteroids to predict their

649
00:26:06,470 --> 00:26:04,240
orbits to determine if they're even more

650
00:26:08,230 --> 00:26:06,480
hazardous than we thought they were

651
00:26:10,149 --> 00:26:08,240
so it's a huge step for us all the way

652
00:26:12,149 --> 00:26:10,159
around

653
00:26:18,710 --> 00:26:12,159
okay let's go back to ken cramer here in

654
00:26:22,230 --> 00:26:20,630
hi thanks for taking my question ken

655
00:26:25,350 --> 00:26:22,240
kramer universe today in the northeast

656
00:26:27,590 --> 00:26:25,360
astronomy forum um congratulations i'm

657
00:26:29,269 --> 00:26:27,600
just back from the pad seeing that great

658
00:26:30,070 --> 00:26:29,279
launch so i'm a little out of breath and

659
00:26:32,390 --> 00:26:30,080
uh

660
00:26:34,630 --> 00:26:32,400
missed the earlier question period sorry

661
00:26:36,230 --> 00:26:34,640
if this is a repeat but my interest as

662
00:26:38,390 --> 00:26:36,240
you know is in the carburality in the

663
00:26:39,909 --> 00:26:38,400

amino acids so what i want to know is

664
00:26:41,510 --> 00:26:39,919
talk about uh

665
00:26:42,950 --> 00:26:41,520
talk about when you get that sample back

666
00:26:43,909 --> 00:26:42,960
how quick is it going to come back how

667
00:26:46,070 --> 00:26:43,919
quick it's going to get to the

668
00:26:47,830 --> 00:26:46,080
scientists and how quick do you think

669
00:26:48,950 --> 00:26:47,840
you'll be able to determine if if

670
00:26:50,710 --> 00:26:48,960
there's

671
00:26:54,230 --> 00:26:50,720
amino acids there if they're chiral or

672
00:26:56,310 --> 00:26:54,240
not thanks so osiris-rex has always had

673
00:26:58,789 --> 00:26:56,320
the uh strategy and everything we've

674
00:27:00,710 --> 00:26:58,799
done is is go slow and careful and

675
00:27:02,310 --> 00:27:00,720
methodical and that is absolutely going

676
00:27:04,230 --> 00:27:02,320
to be the plan when we get that return

677
00:27:06,149 --> 00:27:04,240
sample back so

678
00:27:08,230 --> 00:27:06,159
we have we are actually still writing

679
00:27:09,669 --> 00:27:08,240
the sample analysis plan and i don't

680
00:27:11,750 --> 00:27:09,679
want the team to finish writing that

681
00:27:13,350 --> 00:27:11,760
until after the tag event after we've

682
00:27:15,190 --> 00:27:13,360
seen the regolith on the surface of the

683
00:27:17,110 --> 00:27:15,200
asteroid after we've done the sample

684
00:27:18,470 --> 00:27:17,120
mass measurement we have some sense of

685
00:27:20,630 --> 00:27:18,480
what we're getting back then they can

686
00:27:22,950 --> 00:27:20,640
really get to the details we have lots

687
00:27:24,870 --> 00:27:22,960
of great concepts and ideas and you know

688
00:27:27,190 --> 00:27:24,880

outlines of what we want to do

689
00:27:28,870 --> 00:27:27,200
based on what what we would use using

690
00:27:31,110 --> 00:27:28,880
instruments that exist in laboratories

691
00:27:32,549 --> 00:27:31,120
today but i know nasa is going to be

692
00:27:34,470 --> 00:27:32,559
investing in

693
00:27:36,470 --> 00:27:34,480
cutting-edge laboratories for sample

694
00:27:38,630 --> 00:27:36,480
analysis as we move forward over the

695
00:27:40,710 --> 00:27:38,640
next seven years so that'll also shape

696
00:27:42,710 --> 00:27:40,720
our analysis plan we will get that

697
00:27:45,110 --> 00:27:42,720
material from the utah test and training

698
00:27:46,950 --> 00:27:45,120
range into the astro materials curation

699
00:27:48,870 --> 00:27:46,960
facility at johnson space center as

700
00:27:50,950 --> 00:27:48,880
quickly as possible

701
00:27:52,230 --> 00:27:50,960
and then we will we have a great team

702
00:27:53,909 --> 00:27:52,240
there they know exactly what they're

703
00:27:55,430 --> 00:27:53,919
doing and handling astro materials the

704
00:27:57,830 --> 00:27:55,440
same facility that's responsible for the

705
00:27:59,669 --> 00:27:57,840
apollo samples the stardust comet dust

706
00:28:02,070 --> 00:27:59,679
samples antarctic meteorites and many

707
00:28:04,070 --> 00:28:02,080
other astral materials collections we

708
00:28:06,230 --> 00:28:04,080
have an obligation to the agency and to

709
00:28:08,710 --> 00:28:06,240
the community to get a sample catalog

710
00:28:10,789 --> 00:28:08,720
out within six months of earth return so

711
00:28:12,470 --> 00:28:10,799
a lot of our initial focus will be on

712
00:28:14,630 --> 00:28:12,480
just understanding the nature of the

713
00:28:16,630 --> 00:28:14,640

collection what do we have what is the

714
00:28:18,470 --> 00:28:16,640
grain size distribution we'll do some

715
00:28:20,389 --> 00:28:18,480
quick look science to get a sense of

716
00:28:21,669 --> 00:28:20,399
where we are and then we have two years

717
00:28:23,909 --> 00:28:21,679
of funding

718
00:28:25,590 --> 00:28:23,919
after earth return to do the full sample

719
00:28:27,269 --> 00:28:25,600
analysis science so we're gonna

720
00:28:29,909 --> 00:28:27,279
carefully and methodically go through

721
00:28:32,070 --> 00:28:29,919
and something like the chiral nature of

722
00:28:34,149 --> 00:28:32,080
specific amino acid compounds that's a

723
00:28:36,149 --> 00:28:34,159
very careful measurement very dedicated

724
00:28:38,230 --> 00:28:36,159
measurement and we'll work through the

725
00:28:40,549 --> 00:28:38,240
technique perfect it before we apply it

726
00:28:43,029 --> 00:28:40,559
to the osiris-rex samples

727
00:28:44,470 --> 00:28:43,039
okay we take a couple of social media

728
00:28:48,149 --> 00:28:44,480
questions now and then we'll come back

729
00:28:51,669 --> 00:28:50,310
hi yes we have um a lot of great

730
00:28:53,909 --> 00:28:51,679
engagement on social media for this

731
00:28:55,430 --> 00:28:53,919
mission so uh kevin on twitter is asking

732
00:28:59,669 --> 00:28:55,440
was was the two hour launch window

733
00:29:04,710 --> 00:28:59,679
purely a function of orbital mechanics

734
00:29:09,350 --> 00:29:08,070
tell kevin it's done with math right

735
00:29:11,269 --> 00:29:09,360
i would say it's a combination of the

736
00:29:13,669 --> 00:29:11,279
orbital mechanics and the capability of

737
00:29:16,149 --> 00:29:13,679
the atlas v launch vehicle right so you

738
00:29:17,830 --> 00:29:16,159

get an energy window and the beginning

739
00:29:19,269 --> 00:29:17,840
of it and the end of it are set by what

740
00:29:21,430 --> 00:29:19,279
your launch vehicle is capable of

741
00:29:23,350 --> 00:29:21,440
delivering to you so

742
00:29:25,510 --> 00:29:23,360
we started out with a 30 minute window

743
00:29:27,350 --> 00:29:25,520
and as the atlas v team finished their

744
00:29:29,590 --> 00:29:27,360
analyses and refined the capabilities of

745
00:29:31,350 --> 00:29:29,600
the 411 the spacecraft mass got

746
00:29:33,190 --> 00:29:31,360
determined they were able to open that

747
00:29:36,470 --> 00:29:33,200
window up to give us the full two hours

748
00:29:38,310 --> 00:29:36,480
a day and also the 34 days starting from

749
00:29:39,669 --> 00:29:38,320
now

750
00:29:41,590 --> 00:29:39,679
all right this next question also comes

751
00:29:43,430 --> 00:29:41,600
from twitter um is there any chance that

752
00:29:46,549 --> 00:29:43,440
the sample could be altered at all when

753
00:29:49,430 --> 00:29:46,559
it when it comes back to earth

754
00:29:51,669 --> 00:29:49,440
we are very cognizant of contamination

755
00:29:53,909 --> 00:29:51,679
control on this program and so we have

756
00:29:55,430 --> 00:29:53,919
done a great job cataloging all of the

757
00:29:56,950 --> 00:29:55,440
materials that that sample return

758
00:29:58,389 --> 00:29:56,960
capsule is made out of all of the

759
00:30:00,310 --> 00:29:58,399
materials that have been used to handle

760
00:30:02,310 --> 00:30:00,320
it to clean it you know adhesives and

761
00:30:04,230 --> 00:30:02,320
solvents all of that we've sampled and

762
00:30:06,310 --> 00:30:04,240
we've documented so

763
00:30:08,070 --> 00:30:06,320

we have done a great job i mean lockheed

764
00:30:10,389 --> 00:30:08,080
martin really took on the challenge of

765
00:30:12,549 --> 00:30:10,399
delivering us a clean sampling mechanism

766
00:30:14,310 --> 00:30:12,559
and a clean sample return capsule

767
00:30:15,990 --> 00:30:14,320
but we recognize that there's always

768
00:30:17,750 --> 00:30:16,000
going to be some level of contamination

769
00:30:19,590 --> 00:30:17,760
absolutely because you reach a certain

770
00:30:21,350 --> 00:30:19,600
cleanliness level dictated by your

771
00:30:23,430 --> 00:30:21,360
requirements and your capability to

772
00:30:24,870 --> 00:30:23,440
verify those requirements and so in

773
00:30:26,950 --> 00:30:24,880
addition to flying the sampling

774
00:30:28,789 --> 00:30:26,960
mechanism and the return capsule we've

775
00:30:31,909 --> 00:30:28,799
got a phenomenal collection of witness

776
00:30:34,149 --> 00:30:31,919
plates on the tag sam head itself inside

777
00:30:35,669 --> 00:30:34,159
the sample return capsule and their time

778
00:30:36,950 --> 00:30:35,679
phase they'll open and they'll close at

779
00:30:38,789 --> 00:30:36,960
different stages of the mission to

780
00:30:41,110 --> 00:30:38,799
document any contamination that was

781
00:30:42,549 --> 00:30:41,120
acquired before the sampling event

782
00:30:44,070 --> 00:30:42,559
during the sampling event and then

783
00:30:46,310 --> 00:30:44,080
during the return cruise phase home and

784
00:30:48,830 --> 00:30:46,320
so we'll be able to remove that signal

785
00:30:51,029 --> 00:30:48,840
from any chemical analysis that we

786
00:30:53,510 --> 00:30:51,039
perform awesome all right this last

787
00:30:55,350 --> 00:30:53,520
question um also comes from twitter um

788
00:30:56,710 --> 00:30:55,360

and this person's asking

789
00:30:58,230 --> 00:30:56,720
i know the mission is a seven year

790
00:31:01,110 --> 00:30:58,240
mission they want to know how long will

791
00:31:02,870 --> 00:31:01,120
osiris rex actually be at venue

792
00:31:05,110 --> 00:31:02,880
so osiris-rex will arrive at the

793
00:31:07,669 --> 00:31:05,120
asteroid in august of 2018 that's when

794
00:31:09,669 --> 00:31:07,679
we begin our approach phase a nominal

795
00:31:12,549 --> 00:31:09,679
timeline has us acquiring the sample in

796
00:31:14,789 --> 00:31:12,559
july of 2020 so we'll spend almost two

797
00:31:17,350 --> 00:31:14,799
years mapping selecting the site

798
00:31:19,509 --> 00:31:17,360
verifying the spacecraft capability and

799
00:31:21,430 --> 00:31:19,519
the procedures for collecting the sample

800
00:31:23,509 --> 00:31:21,440
we actually can't leave bennu until

801
00:31:25,430 --> 00:31:23,519
march of 2021

802
00:31:26,870 --> 00:31:25,440
similar to the previous question based

803
00:31:28,950 --> 00:31:26,880
on the capabilities of the spacecraft

804
00:31:31,190 --> 00:31:28,960
propulsion system and the orbital

805
00:31:32,630 --> 00:31:31,200
phasing between bennu and target earth

806
00:31:35,190 --> 00:31:32,640
we have to wait till our departure

807
00:31:37,669 --> 00:31:35,200
window opens up and so we will won't be

808
00:31:39,350 --> 00:31:37,679
able to leave until march of 2021 all

809
00:31:42,789 --> 00:31:39,360
return trajectories get us back on

810
00:31:44,310 --> 00:31:42,799
september 24th 2023.

811
00:31:46,070 --> 00:31:44,320
all right let's come back and take some

812
00:31:54,389 --> 00:31:46,080
other questions here in the room right

813
00:31:58,710 --> 00:31:56,470

i'm from nhk japan broadcasting

814
00:32:01,029 --> 00:31:58,720
corporation first congratulations on a

815
00:32:03,590 --> 00:32:01,039
beautiful gorgeous launch today it was

816
00:32:06,070 --> 00:32:03,600
worth on watching all the flu all the

817
00:32:08,789 --> 00:32:06,080
way from japan herrera crew

818
00:32:11,990 --> 00:32:08,799
and my question is on the principles

819
00:32:13,750 --> 00:32:12,000
investigator mr dante loretta

820
00:32:15,269 --> 00:32:13,760
you just mentioned a little bit about

821
00:32:17,269 --> 00:32:15,279
the

822
00:32:18,549 --> 00:32:17,279
rosetta missions a little bit uh two

823
00:32:21,990 --> 00:32:18,559
questions ago

824
00:32:24,710 --> 00:32:22,000
um and i wonder in terms of what they

825
00:32:26,549 --> 00:32:24,720
have discovered and then showed us how

826
00:32:29,669 --> 00:32:26,559
what do you see that

827
00:32:32,149 --> 00:32:29,679
rosetta mission and how do you want for

828
00:32:33,830 --> 00:32:32,159
the osiris-rex mission to make their

829
00:32:35,269 --> 00:32:33,840
journey

830
00:32:36,630 --> 00:32:35,279
the rosetta team

831
00:32:38,149 --> 00:32:36,640
are phenomenal colleagues of ours

832
00:32:39,269 --> 00:32:38,159
they're our friends they're our comrades

833
00:32:40,710 --> 00:32:39,279
you know we're all in this business

834
00:32:43,350 --> 00:32:40,720
together we're all exploring the

835
00:32:45,430 --> 00:32:43,360
universe and we're happy to share our

836
00:32:47,029 --> 00:32:45,440
scientific information the rosetta team

837
00:32:48,870 --> 00:32:47,039
has been particularly generous and also

838
00:32:51,029 --> 00:32:48,880

sharing a lot of their operational

839
00:32:52,470 --> 00:32:51,039
lessons learned in fact our team has

840
00:32:54,630 --> 00:32:52,480
gone out to visit them in their

841
00:32:55,830 --> 00:32:54,640
operations center on multiple occasions

842
00:32:58,149 --> 00:32:55,840
and we've brought a lot of important

843
00:32:59,990 --> 00:32:58,159
lessons back with us about how you orbit

844
00:33:02,310 --> 00:33:00,000
around a small body like this how you

845
00:33:04,070 --> 00:33:02,320
operate how you use your optical

846
00:33:05,750 --> 00:33:04,080
navigation systems to determine your

847
00:33:07,430 --> 00:33:05,760
spacecraft state and then how you go

848
00:33:08,789 --> 00:33:07,440
through the process of sample site

849
00:33:10,149 --> 00:33:08,799
selection

850
00:33:12,310 --> 00:33:10,159
i thought you would also ask about the

851
00:33:13,750 --> 00:33:12,320
hayabusa mission and i do want to give a

852
00:33:16,630 --> 00:33:13,760
lot of credit to the japanese space

853
00:33:18,070 --> 00:33:16,640
agency we learned a lot about asteroid

854
00:33:20,070 --> 00:33:18,080
proximity operations from the first

855
00:33:22,470 --> 00:33:20,080
hayabusa mission and we have a nice

856
00:33:24,950 --> 00:33:22,480
strong collaboration that the agency has

857
00:33:26,710 --> 00:33:24,960
established with jaxa for working with

858
00:33:28,789 --> 00:33:26,720
the hayabusa 2 team maybe jim wants to

859
00:33:33,029 --> 00:33:28,799
elaborate on yeah i'll be happy to you

860
00:33:36,389 --> 00:33:33,039
know um jax is going uh with hayabusa 2

861
00:33:39,430 --> 00:33:36,399
to another asteroid much like bennu it

862
00:33:41,269 --> 00:33:39,440
has many of the similar characteristics

863
00:33:43,750 --> 00:33:41,279

and it's going to be able to get some

864
00:33:46,710 --> 00:33:43,760
samples for which what we'd like to do

865
00:33:50,549 --> 00:33:46,720
is be able to exchange those samples and

866
00:33:52,870 --> 00:33:50,559
examine them as part of a larger group

867
00:33:57,029 --> 00:33:52,880
of asteroids you know not just the

868
00:33:58,470 --> 00:33:57,039
single one but a family of asteroids so

869
00:34:01,110 --> 00:33:58,480
internationally

870
00:34:03,669 --> 00:34:01,120
we have strong ties with our japanese

871
00:34:05,669 --> 00:34:03,679
colleagues so we also have many european

872
00:34:07,909 --> 00:34:05,679
colleagues that that are in this

873
00:34:09,990 --> 00:34:07,919
business a sample analysis

874
00:34:12,310 --> 00:34:10,000
uh they request samples out of our

875
00:34:14,149 --> 00:34:12,320
archive and and go through a process of

876
00:34:16,310 --> 00:34:14,159
review and and then distribution of

877
00:34:19,270 --> 00:34:16,320
those samples and write scientific

878
00:34:22,389 --> 00:34:19,280
papers and and i think over time as we

879
00:34:24,470 --> 00:34:22,399
see each of these international groups

880
00:34:26,310 --> 00:34:24,480
improve their ability to do sample

881
00:34:28,790 --> 00:34:26,320
analysis

882
00:34:30,230 --> 00:34:28,800
we'll be able to share a lot more of the

883
00:34:32,710 --> 00:34:30,240
science

884
00:34:34,470 --> 00:34:32,720
with them as we all work together

885
00:34:36,629 --> 00:34:34,480
internationally it's really

886
00:34:38,950 --> 00:34:36,639
an international effort

887
00:34:41,750 --> 00:34:38,960
you know planetary science is all about

888
00:34:45,109 --> 00:34:41,760

our solar system it's humanity's solar

889
00:34:47,430 --> 00:34:45,119
system you know let's take it and that's

890
00:34:51,990 --> 00:34:47,440
what we're doing with uh with going to

891
00:34:57,109 --> 00:34:54,710
yes right here in the front

892
00:34:59,190 --> 00:34:57,119
hi congratulations first of all um i had

893
00:35:01,190 --> 00:34:59,200
a question as osiris-rex reaches

894
00:35:02,470 --> 00:35:01,200
approaches bennu um

895
00:35:04,470 --> 00:35:02,480
the team's going to rely on two

896
00:35:06,150 --> 00:35:04,480
different forms of navigation star based

897
00:35:07,670 --> 00:35:06,160
and landmark based i was wondering if

898
00:35:09,430 --> 00:35:07,680
you can tell me any problems that might

899
00:35:13,430 --> 00:35:09,440
arise with either and then how long the

900
00:35:15,430 --> 00:35:13,440
team will spend on each method

901
00:35:17,190 --> 00:35:15,440
right so when we first

902
00:35:19,030 --> 00:35:17,200
even starting now the navigation team

903
00:35:20,870 --> 00:35:19,040
will be using starfield-based optical

904
00:35:23,510 --> 00:35:20,880
navigation and it's inherent in the

905
00:35:25,030 --> 00:35:23,520
spacecraft system but also as we start

906
00:35:27,270 --> 00:35:25,040
to refine our orbit trajectory

907
00:35:28,790 --> 00:35:27,280
especially during the approach phase to

908
00:35:30,550 --> 00:35:28,800
the asteroid because the asteroid will

909
00:35:32,710 --> 00:35:30,560
start out just as a single point of

910
00:35:34,630 --> 00:35:32,720
light and we'll image it against the

911
00:35:36,310 --> 00:35:34,640
background starfield images to refine

912
00:35:38,390 --> 00:35:36,320
our approach maneuvers and the

913
00:35:39,910 --> 00:35:38,400

trajectory we've designed the early

914
00:35:42,310 --> 00:35:39,920
phase of the mission to make that

915
00:35:45,190 --> 00:35:42,320
transition and that transition will take

916
00:35:47,109 --> 00:35:45,200
place during what we call orbit phase a

917
00:35:48,870 --> 00:35:47,119
and so the spacecraft team the

918
00:35:51,670 --> 00:35:48,880
navigation team will continue to use

919
00:35:53,750 --> 00:35:51,680
starfield based optical navigation

920
00:35:55,270 --> 00:35:53,760
while we build up a series of landmarks

921
00:35:56,870 --> 00:35:55,280
on the surface of the asteroid using our

922
00:35:59,430 --> 00:35:56,880
camera systems and our shape modeling

923
00:36:01,430 --> 00:35:59,440
software to identify and register to a

924
00:36:03,109 --> 00:36:01,440
coordinate system where those landmarks

925
00:36:04,390 --> 00:36:03,119
are on the surface of the asteroid so

926
00:36:06,550 --> 00:36:04,400
for a while they'll be running both

927
00:36:08,790 --> 00:36:06,560
systems in parallel star field based

928
00:36:10,069 --> 00:36:08,800
optical navigation and we're pioneering

929
00:36:12,390 --> 00:36:10,079
a lot of techniques there because we've

930
00:36:14,630 --> 00:36:12,400
got a very wide angle camera we call our

931
00:36:16,470 --> 00:36:14,640
nav cam that's capable of getting the

932
00:36:18,230 --> 00:36:16,480
asteroid in the center field of view and

933
00:36:19,910 --> 00:36:18,240
the stars in the background so you can

934
00:36:21,910 --> 00:36:19,920
kind of start to do body centered

935
00:36:23,670 --> 00:36:21,920
navigation and then ultimately they'll

936
00:36:25,990 --> 00:36:23,680
have to make that transition over to

937
00:36:27,910 --> 00:36:26,000
optical navigation landmark tracking i

938
00:36:29,910 --> 00:36:27,920

don't anticipate any problems with those

939
00:36:31,910 --> 00:36:29,920
because we've simulated the mission

940
00:36:33,750 --> 00:36:31,920
literally generated every image

941
00:36:35,349 --> 00:36:33,760
synthetically that we expect to get from

942
00:36:37,349 --> 00:36:35,359
the camera systems and run it through

943
00:36:38,950 --> 00:36:37,359
the navigation filters done all the

944
00:36:41,270 --> 00:36:38,960
thread testing and the team is ready to

945
00:36:43,109 --> 00:36:41,280
do it so unless bennu is a perfect cue

946
00:36:44,630 --> 00:36:43,119
ball with no features on it landmark

947
00:36:48,950 --> 00:36:44,640
tracking optical navigation is going to

948
00:36:53,430 --> 00:36:50,470
all right we'll take one more question

949
00:36:57,589 --> 00:36:56,069
okay thanks mike well from

950
00:36:59,670 --> 00:36:57,599
space.com i just wanted to say congrats

951
00:37:01,589 --> 00:36:59,680
to everybody um on a great launch and

952
00:37:04,550 --> 00:37:01,599
best of luck in the future this may be a

953
00:37:06,550 --> 00:37:04,560
silly question and i am sorry if it is

954
00:37:07,670 --> 00:37:06,560
but like is it possible

955
00:37:09,750 --> 00:37:07,680
like actually using some of our

956
00:37:12,310 --> 00:37:09,760
ground-based assets to get a radar image

957
00:37:14,150 --> 00:37:12,320
of osiris-rex around bennu

958
00:37:15,750 --> 00:37:14,160
like is that a possibility that where we

959
00:37:18,069 --> 00:37:15,760
could actually see the asteroid and the

960
00:37:19,750 --> 00:37:18,079
spacecraft together

961
00:37:22,069 --> 00:37:19,760
well you know we have some really great

962
00:37:25,829 --> 00:37:22,079
facilities not only that nasa has but we

963
00:37:27,030 --> 00:37:25,839

even use um arecibo which is managed by

964
00:37:29,670 --> 00:37:27,040
the national

965
00:37:31,430 --> 00:37:29,680
science foundation and it's a tremendous

966
00:37:33,510 --> 00:37:31,440
asset for us

967
00:37:36,630 --> 00:37:33,520
unfortunately during the times that

968
00:37:39,030 --> 00:37:36,640
osiris-rex is at bennu

969
00:37:41,349 --> 00:37:39,040
it's so far away we wouldn't be able to

970
00:37:44,550 --> 00:37:41,359
uh to use radar we have to we have to

971
00:37:46,630 --> 00:37:44,560
let them come really close to us

972
00:37:49,589 --> 00:37:46,640
before we're able to do that within 20

973
00:37:51,750 --> 00:37:49,599
million miles or so is just right at the

974
00:37:55,829 --> 00:37:51,760
limit of what we can do

975
00:37:59,750 --> 00:37:57,910
all right that is going to conclude our

976
00:38:02,630 --> 00:37:59,760
news conference and the coverage of the