



1
00:00:06,710 --> 00:00:04,789
good morning and welcome to today's

2
00:00:09,750 --> 00:00:06,720
briefing on the increasing role that

3
00:00:12,070 --> 00:00:09,760
cubesats tiny inexpensive satellites are

4
00:00:13,270 --> 00:00:12,080
playing in exploration technology

5
00:00:15,350 --> 00:00:13,280
demonstration

6
00:00:17,430 --> 00:00:15,360
scientific research and educational

7
00:00:19,189 --> 00:00:17,440
investigations at nasa and throughout

8
00:00:21,750 --> 00:00:19,199
the space community

9
00:00:24,870 --> 00:00:21,760
a united launch alliance atlas v rocket

10
00:00:27,509 --> 00:00:24,880
is poised for liftoff tomorrow at 5 49

11
00:00:29,509 --> 00:00:27,519
a.m pacific time from vanderberg air

12
00:00:32,549 --> 00:00:29,519
force base in california where we are

13
00:00:35,590 --> 00:00:32,559

today and writing along as an auxiliary

14

00:00:37,990 --> 00:00:35,600

payload are 13 cubesats

15

00:00:39,990 --> 00:00:38,000

for the cubesats are nasa sponsored and

16

00:00:43,270 --> 00:00:40,000

nine of them are national reconnaissance

17

00:00:45,670 --> 00:00:43,280

office or nro sponsored and one of those

18

00:00:47,670 --> 00:00:45,680

was developed with nasa funding

19

00:00:50,470 --> 00:00:47,680

all will be flown on the nro's

20

00:00:52,709 --> 00:00:50,480

government rideshare advanced concepts

21

00:00:54,670 --> 00:00:52,719

experiment or grace which is an

22

00:00:56,869 --> 00:00:54,680

auxiliary payload aboard the

23

00:00:58,709 --> 00:00:56,879

nrol55 mission

24

00:01:00,310 --> 00:00:58,719

and to talk about the growing role

25

00:01:02,389 --> 00:01:00,320

cubesats are playing

26

00:01:04,070 --> 00:01:02,399

we're pleased to be joined today by

27

00:01:05,990 --> 00:01:04,080

steve jerzig

28

00:01:07,910 --> 00:01:06,000

associate administrator for the space

29

00:01:12,149 --> 00:01:07,920

technology mission directorate at nasa

30

00:01:16,230 --> 00:01:13,030

hubbell

31

00:01:20,390 --> 00:01:16,240

deputy chief cubesat program office the

32

00:01:25,270 --> 00:01:22,149

sheri zacharias

33

00:01:30,230 --> 00:01:25,280

vice president technology and laboratory

34

00:01:34,550 --> 00:01:31,830

john cerrafini

35

00:01:36,870 --> 00:01:34,560

vice president at allied mines and chief

36

00:01:41,590 --> 00:01:36,880

executive officer for both bridge sat

37

00:01:49,429 --> 00:01:44,310

andrew petro small spacecraft technology

38

00:01:54,630 --> 00:01:51,990

and scott higginbotham nasa launch

39

00:01:58,469 --> 00:01:54,640

services program ilana 12 mission

40

00:02:01,830 --> 00:02:00,469

so for those of you watching on tv or

41

00:02:04,069 --> 00:02:01,840

through the web we will be taking

42

00:02:06,550 --> 00:02:04,079

questions today on social media

43

00:02:10,150 --> 00:02:06,560

during the q a portion using the hashtag

44

00:02:11,910 --> 00:02:10,160

ask nasa kimberly williams from nasa's

45

00:02:13,830 --> 00:02:11,920

ames research center public affairs

46

00:02:15,589 --> 00:02:13,840

office is here and she is

47

00:02:17,110 --> 00:02:15,599

looking for incoming messages and we

48

00:02:19,030 --> 00:02:17,120

will be happy to take those questions a

49

00:02:21,110 --> 00:02:19,040

little bit later on for media who have

50

00:02:23,910 --> 00:02:21,120

dialed in on the phone a reminder to

51
00:02:24,949 --> 00:02:23,920
please press star one to be placed into

52
00:02:26,470 --> 00:02:24,959
the queue

53
00:02:29,110 --> 00:02:26,480
and we'll begin today's briefing with a

54
00:02:31,110 --> 00:02:29,120
few opening remarks steve

55
00:02:33,190 --> 00:02:31,120
thank you mike um it's great to be here

56
00:02:35,270 --> 00:02:33,200
today as we prepare for the first launch

57
00:02:37,110 --> 00:02:35,280
of nasa's and aerospace corporations

58
00:02:40,070 --> 00:02:37,120
optical communications and sensor

59
00:02:42,070 --> 00:02:40,080
demonstration ocsd mission i want to

60
00:02:43,670 --> 00:02:42,080
thank the nra for providing the launch

61
00:02:46,630 --> 00:02:43,680
opportunity and

62
00:02:48,630 --> 00:02:46,640
vandenberg air force base for hosting us

63
00:02:50,309 --> 00:02:48,640

as many of you know nasa has several

64

00:02:51,830 --> 00:02:50,319

small spacecraft or cubesats on

65

00:02:55,509 --> 00:02:51,840

tomorrow's launch

66

00:02:57,270 --> 00:02:55,519

nasa's cubesat launch initiative csli

67

00:03:00,390 --> 00:02:57,280

enables the launch of cubesat projects

68

00:03:02,830 --> 00:03:00,400

designed built and operated by students

69

00:03:05,670 --> 00:03:02,840

teachers faculty and government

70

00:03:08,550 --> 00:03:05,680

researchers also nasa's educational

71

00:03:10,470 --> 00:03:08,560

launch of nano satellites alana missions

72

00:03:12,470 --> 00:03:10,480

managed by the launch services program

73

00:03:14,630 --> 00:03:12,480

at kennedy space center in florida

74

00:03:16,790 --> 00:03:14,640

launched the cubesat selected through

75

00:03:18,390 --> 00:03:16,800

csli into space

76

00:03:20,390 --> 00:03:18,400

you hear from several people on this

77

00:03:23,190 --> 00:03:20,400

panel and the second panel about some of

78

00:03:25,350 --> 00:03:23,200

those very innovative cubesat missions

79

00:03:27,990 --> 00:03:25,360

you may be asking why is nasa investing

80

00:03:29,830 --> 00:03:28,000

in small spacecraft and cubesats we

81

00:03:31,270 --> 00:03:29,840

believe our investments will first

82

00:03:33,430 --> 00:03:31,280

advance the capabilities of small

83

00:03:35,030 --> 00:03:33,440

spacecraft to support nasa missions in

84

00:03:37,110 --> 00:03:35,040

exploration

85

00:03:39,190 --> 00:03:37,120

operations and our four science

86

00:03:42,789 --> 00:03:39,200

disciplines planetary science earth

87

00:03:44,229 --> 00:03:42,799

science heliophysics and astrophysics

88

00:03:46,949 --> 00:03:44,239

the perform missions are examined

89

00:03:48,789 --> 00:03:46,959

phenomena not otherwise possible

90

00:03:50,630 --> 00:03:48,799

accelerate the introduction of new small

91

00:03:53,110 --> 00:03:50,640

spacecraft technologies

92

00:03:55,030 --> 00:03:53,120

and capabilities and unleash nasa's

93

00:03:57,190 --> 00:03:55,040

unique capabilities and assets into the

94

00:03:58,550 --> 00:03:57,200

already vibrant small spacecraft

95

00:04:00,869 --> 00:03:58,560

community

96

00:04:04,470 --> 00:04:00,879

our small spacecraft technology or sst

97

00:04:05,670 --> 00:04:04,480

program of which ocst is an element

98

00:04:07,429 --> 00:04:05,680

as well as our science mission

99

00:04:09,429 --> 00:04:07,439

directorates and human exploration and

100

00:04:11,190 --> 00:04:09,439

operations mission directorates develop

101
00:04:13,750 --> 00:04:11,200
and demonstrate new small spacecraft

102
00:04:16,150 --> 00:04:13,760
technologies and capabilities for nasa's

103
00:04:19,030 --> 00:04:16,160
missions our ultimate goal is to promote

104
00:04:21,509 --> 00:04:19,040
small spacecraft as a paradigm shift for

105
00:04:23,670 --> 00:04:21,519
nasa and the larger space community

106
00:04:25,749 --> 00:04:23,680
the sstp is one of nine programs in the

107
00:04:28,070 --> 00:04:25,759
space technology mission directorate the

108
00:04:30,390 --> 00:04:28,080
program is managed by nasa ames research

109
00:04:32,390 --> 00:04:30,400
center at moffett field california ames

110
00:04:34,469 --> 00:04:32,400
has pioneered most of nasa's small

111
00:04:35,830 --> 00:04:34,479
spacecraft missions

112
00:04:37,590 --> 00:04:35,840
nasa's space technology mission

113
00:04:39,350 --> 00:04:37,600

directorate which is responsible for

114

00:04:40,710 --> 00:04:39,360

this technology demonstration is

115

00:04:42,790 --> 00:04:40,720

committed to developing the critical

116

00:04:44,710 --> 00:04:42,800

technologies and capabilities required

117

00:04:46,550 --> 00:04:44,720

to enable future exploration missions

118

00:04:48,710 --> 00:04:46,560

beyond low earth orbit

119

00:04:51,189 --> 00:04:48,720

in order to explore an asteroid or one

120

00:04:52,950 --> 00:04:51,199

day land humans on the surface of mars

121

00:04:54,310 --> 00:04:52,960

we will need sustained and substantial

122

00:04:56,469 --> 00:04:54,320

investments in advanced space

123

00:04:57,749 --> 00:04:56,479

technologies we will likely need the new

124

00:04:59,909 --> 00:04:57,759

capabilities we are demonstrating with

125

00:05:01,590 --> 00:04:59,919

these cubesats on our future missions

126
00:05:03,029 --> 00:05:01,600
into deep space

127
00:05:04,469 --> 00:05:03,039
without these investments we will not be

128
00:05:06,550 --> 00:05:04,479
able to move humans beyond the

129
00:05:08,710 --> 00:05:06,560
international space station in essence

130
00:05:10,950 --> 00:05:08,720
technology drives exploration and our

131
00:05:12,790 --> 00:05:10,960
journey to mars i also want to take a

132
00:05:14,870 --> 00:05:12,800
quick moment to talk about our cubequest

133
00:05:16,710 --> 00:05:14,880
challenge and element of our centennial

134
00:05:18,550 --> 00:05:16,720
challenges program

135
00:05:20,790 --> 00:05:18,560
non-government cubesat builders will vie

136
00:05:22,950 --> 00:05:20,800
for a launch opportunity to lunar orbit

137
00:05:25,029 --> 00:05:22,960
aboard a rocket on a future deep space

138
00:05:26,710 --> 00:05:25,039

mission from there they will compete for

139

00:05:29,350 --> 00:05:26,720

achievements in communication and deep

140

00:05:31,270 --> 00:05:29,360

space longevity and prizes totaling five

141

00:05:36,070 --> 00:05:31,280

and a half million dollars and now i'd

142

00:05:39,749 --> 00:05:37,909

thank you very much and i'd like to take

143

00:05:42,070 --> 00:05:39,759

this opportunity to thank nasa for

144

00:05:44,870 --> 00:05:42,080

inviting us here today to join the panel

145

00:05:46,870 --> 00:05:44,880

tomorrow the nro will be launching l55

146

00:05:48,950 --> 00:05:46,880

which is only the third nro launch of

147

00:05:51,670 --> 00:05:48,960

its kind that will provide ride share to

148

00:05:53,350 --> 00:05:51,680

an auxiliary payload of cubesats the

149

00:05:55,749 --> 00:05:53,360

grace mission will be hosting nine

150

00:05:58,150 --> 00:05:55,759

cubesats sponsored by the nro and four

151
00:05:59,909 --> 00:05:58,160
by nasa nro and nasa have a

152
00:06:02,150 --> 00:05:59,919
long-standing partnership with regards

153
00:06:03,749 --> 00:06:02,160
to cubesats where we exchange ride share

154
00:06:04,870 --> 00:06:03,759
opportunities and lessons learned when

155
00:06:07,110 --> 00:06:04,880
available

156
00:06:09,430 --> 00:06:07,120
the nro recognizes the utility of

157
00:06:11,510 --> 00:06:09,440
cubesats as a cost-effective way of

158
00:06:12,870 --> 00:06:11,520
exploring new technology and concepts of

159
00:06:14,950 --> 00:06:12,880
operation

160
00:06:17,510 --> 00:06:14,960
and cubesats are a great way to inspire

161
00:06:19,510 --> 00:06:17,520
innovation and cool science that's why

162
00:06:22,469 --> 00:06:19,520
the nro is committed to supporting

163
00:06:24,629 --> 00:06:22,479

government partners as providing free

164

00:06:26,870 --> 00:06:24,639

free ride to space on select nro

165

00:06:28,550 --> 00:06:26,880

launches and by sponsoring experiments

166

00:06:30,550 --> 00:06:28,560

to demonstrate new technology and

167

00:06:33,510 --> 00:06:30,560

capabilities that benefit not only the

168

00:06:35,189 --> 00:06:33,520

nro but the larger space community so

169

00:06:38,629 --> 00:06:35,199

i'd say we're definitely looking forward

170

00:06:40,070 --> 00:06:38,639

to tomorrow's launch thank you sherry

171

00:06:41,909 --> 00:06:40,080

good morning and i'm very pleased to

172

00:06:43,510 --> 00:06:41,919

have this opportunity i'm

173

00:06:45,909 --> 00:06:43,520

vice president of technology and

174

00:06:47,990 --> 00:06:45,919

laboratory operations at this aerospace

175

00:06:52,309 --> 00:06:48,000

corporation located in el segundo

176
00:06:54,309 --> 00:06:52,319
california aerospace is a non-profit

177
00:06:56,870 --> 00:06:54,319
corporation that operates a federally

178
00:06:57,670 --> 00:06:56,880
funded research and development center

179
00:07:00,830 --> 00:06:57,680
we

180
00:07:03,749 --> 00:07:00,840
act as an advisory role to government

181
00:07:06,390 --> 00:07:03,759
regarding space enterprise aerospace has

182
00:07:09,430 --> 00:07:06,400
been involved with cubesats or picosats

183
00:07:12,070 --> 00:07:09,440
for over 20 years we launched our first

184
00:07:13,510 --> 00:07:12,080
picosat in 1999

185
00:07:16,150 --> 00:07:13,520
and initially

186
00:07:18,309 --> 00:07:16,160
our

187
00:07:20,390 --> 00:07:18,319
activity was funded by darpa and

188
00:07:22,070 --> 00:07:20,400

internally funded we now have paying

189

00:07:29,749 --> 00:07:22,080

customers

190

00:07:32,870 --> 00:07:29,759

and initially the balance between

191

00:07:35,189 --> 00:07:32,880

innovation and risk was about even they

192

00:07:37,029 --> 00:07:35,199

were very highly innovative and also

193

00:07:40,710 --> 00:07:37,039

very highly risky

194

00:07:42,550 --> 00:07:40,720

as we've learned over the last 20 years

195

00:07:44,550 --> 00:07:42,560

by

196

00:07:46,390 --> 00:07:44,560

learning from our previous mistakes and

197

00:07:49,110 --> 00:07:46,400

and increasing our

198

00:07:52,150 --> 00:07:49,120

experience i'm happy to say that the

199

00:07:54,869 --> 00:07:52,160

risk has gone down the reliability has

200

00:07:56,230 --> 00:07:54,879

gone up and our innovation has stayed

201
00:08:00,950 --> 00:07:56,240
very high

202
00:08:03,830 --> 00:08:00,960
we um initially turned our focus on

203
00:08:06,390 --> 00:08:03,840
demonstrating technologies and we now

204
00:08:09,510 --> 00:08:06,400
are looking at enabling technology so

205
00:08:11,270 --> 00:08:09,520
that future missions are possible

206
00:08:12,950 --> 00:08:11,280
small satellites are really just the

207
00:08:15,029 --> 00:08:12,960
same as big satellites they have all the

208
00:08:16,550 --> 00:08:15,039
same subsystems and

209
00:08:19,110 --> 00:08:16,560
many of the same requirements so

210
00:08:22,070 --> 00:08:19,120
aerospace has developed appropriate

211
00:08:23,909 --> 00:08:22,080
power systems communication systems

212
00:08:26,869 --> 00:08:23,919
navigation systems

213
00:08:29,430 --> 00:08:26,879

attitude control and pointing systems as

214

00:08:32,149 --> 00:08:29,440

well as automated ground systems we

215

00:08:35,110 --> 00:08:32,159

currently operate three rf ground

216

00:08:37,430 --> 00:08:35,120

systems and one optical ground system

217

00:08:38,630 --> 00:08:37,440

with one of each

218

00:08:41,509 --> 00:08:38,640

about to

219

00:08:43,589 --> 00:08:41,519

come online shortly

220

00:08:45,430 --> 00:08:43,599

tomorrow's launch

221

00:08:47,269 --> 00:08:45,440

will be of the

222

00:08:49,990 --> 00:08:47,279

optical communication and sensor

223

00:08:52,630 --> 00:08:50,000

demonstration or ocsd

224

00:08:55,110 --> 00:08:52,640

this is a partnership between aerospace

225

00:08:58,790 --> 00:08:55,120

and nasa and it will demonstrate

226

00:09:01,110 --> 00:08:58,800

high-speed optical transmission of data

227

00:09:02,310 --> 00:09:01,120

in a future launch early next year we

228

00:09:04,949 --> 00:09:02,320

will

229

00:09:06,829 --> 00:09:04,959

launch two companion satellites which

230

00:09:09,910 --> 00:09:06,839

will demonstrate small

231

00:09:12,550 --> 00:09:09,920

satellite proximity operations this is a

232

00:09:15,910 --> 00:09:12,560

great example of a partnership between

233

00:09:17,430 --> 00:09:15,920

aerospace and nasa enabling technologies

234

00:09:19,350 --> 00:09:17,440

that will then be available for the

235

00:09:21,829 --> 00:09:19,360

entire community

236

00:09:23,590 --> 00:09:21,839

lastly i i want to talk about something

237

00:09:25,350 --> 00:09:23,600

that i feel pretty strongly about and

238

00:09:28,070 --> 00:09:25,360

that's that the cubesat program at

239

00:09:30,790 --> 00:09:28,080

aerospace has enabled our scientists and

240

00:09:33,910 --> 00:09:30,800

engineers to really get a hands-on feel

241

00:09:35,750 --> 00:09:33,920

for what it's like to begin a project

242

00:09:38,230 --> 00:09:35,760

determine what the requirements are and

243

00:09:40,470 --> 00:09:38,240

then see it all the way through to

244

00:09:42,230 --> 00:09:40,480

launch and operations in the satellite

245

00:09:46,630 --> 00:09:42,240

world that's a pretty rare

246

00:09:48,310 --> 00:09:46,640

thing to happen and it really gives our

247

00:09:50,470 --> 00:09:48,320

our scientists and engineer the

248

00:09:53,110 --> 00:09:50,480

opportunity to be creative

249

00:09:55,509 --> 00:09:53,120

and innovative as well as really get a

250

00:09:57,910 --> 00:09:55,519

feel for what it means to

251
00:10:00,070 --> 00:09:57,920
deal with a whole system and with that

252
00:10:02,389 --> 00:10:00,080
i'd like to turn it over to john

253
00:10:04,069 --> 00:10:02,399
thank you sherry hi i'm john cerafini

254
00:10:05,910 --> 00:10:04,079
i'm a venture capital investor with

255
00:10:07,590 --> 00:10:05,920
allied mines where i lead our two

256
00:10:09,910 --> 00:10:07,600
investments in low-earth orbit

257
00:10:11,910 --> 00:10:09,920
technologies namely bridge sat and

258
00:10:13,910 --> 00:10:11,920
hawkeye 360.

259
00:10:15,829 --> 00:10:13,920
allied mines is a differentiated venture

260
00:10:18,069 --> 00:10:15,839
capital investment firm as a publicly

261
00:10:19,910 --> 00:10:18,079
traded holding company we specialize in

262
00:10:21,670 --> 00:10:19,920
creating new companies from scratch

263
00:10:23,670 --> 00:10:21,680

around disruptive transformational

264

00:10:25,430 --> 00:10:23,680

intellectual property that we find in

265

00:10:26,870 --> 00:10:25,440

u.s universities and federal research

266

00:10:28,870 --> 00:10:26,880

labs

267

00:10:30,790 --> 00:10:28,880

given the amazing cost efficiencies to

268

00:10:32,710 --> 00:10:30,800

be gained through leo based

269

00:10:34,230 --> 00:10:32,720

investments and the new revenue models

270

00:10:36,150 --> 00:10:34,240

available through the commercialization

271

00:10:38,550 --> 00:10:36,160

of those capabilities we have been

272

00:10:40,630 --> 00:10:38,560

active investors in what many call new

273

00:10:42,550 --> 00:10:40,640

space

274

00:10:44,630 --> 00:10:42,560

for the past nearly two years allied

275

00:10:46,389 --> 00:10:44,640

minds has been working closely with dr

276

00:10:48,389 --> 00:10:46,399

rich welley and the rest of the smallsat

277

00:10:50,310 --> 00:10:48,399

team aerospace corporation

278

00:10:52,470 --> 00:10:50,320

to leverage the capabilities developed

279

00:10:55,110 --> 00:10:52,480

under the ocsd program to achieve

280

00:10:57,190 --> 00:10:55,120

commercial optical downlink as a service

281

00:10:59,030 --> 00:10:57,200

via a proprietary mesh network of small

282

00:11:01,030 --> 00:10:59,040

satellites that will interface with

283

00:11:03,829 --> 00:11:01,040

clients spacecraft and downlink their

284

00:11:05,829 --> 00:11:03,839

data at speeds orders of magnitude

285

00:11:07,910 --> 00:11:05,839

faster and with much lower latency than

286

00:11:09,350 --> 00:11:07,920

what is offered today by rf capabilities

287

00:11:11,030 --> 00:11:09,360

alone

288

00:11:12,069 --> 00:11:11,040

tomorrow's launch is an extremely

289

00:11:14,389 --> 00:11:12,079

important milestone in the

290

00:11:16,550 --> 00:11:14,399

commercialization of this great ocspd

291

00:11:18,710 --> 00:11:16,560

optical transmission capability in

292

00:11:20,550 --> 00:11:18,720

providing strong evidence that rapid

293

00:11:22,230 --> 00:11:20,560

throughput can be achieved to the use of

294

00:11:24,389 --> 00:11:22,240

optical transmission

295

00:11:27,190 --> 00:11:24,399

on small satellites platforms

296

00:11:29,990 --> 00:11:27,200

tomorrow is 200 megabits per second

297

00:11:31,829 --> 00:11:30,000

by q1 we seek to demonstrate up to 622

298

00:11:34,949 --> 00:11:31,839

megabits per second and by the end of

299

00:11:37,269 --> 00:11:34,959

2016 we're seeking to achieve 2.5

300

00:11:39,269 --> 00:11:37,279

gigabits per second in throughput

301
00:11:40,949 --> 00:11:39,279
so why is this compelling

302
00:11:42,470 --> 00:11:40,959
first and i think we're all very

303
00:11:44,470 --> 00:11:42,480
familiar with this problem

304
00:11:46,150 --> 00:11:44,480
in that the amount of small sats today

305
00:11:47,430 --> 00:11:46,160
already in leo particularly earth

306
00:11:49,590 --> 00:11:47,440
observation

307
00:11:50,710 --> 00:11:49,600
are today generating an enormous amount

308
00:11:53,350 --> 00:11:50,720
of data

309
00:11:57,269 --> 00:11:53,360
so much so that the paucity of expensive

310
00:12:00,550 --> 00:11:57,279
rf resources available today means that

311
00:12:03,990 --> 00:12:00,560
a material amount of this data 15 to be

312
00:12:06,069 --> 00:12:04,000
precise is actually lost lost in space

313
00:12:08,069 --> 00:12:06,079

as the number of small satellites in leo

314

00:12:10,310 --> 00:12:08,079

increases exponentially over the next 10

315

00:12:12,470 --> 00:12:10,320

years to upwards of nearly 3 000 small

316

00:12:13,910 --> 00:12:12,480

sats and the payloads of these small

317

00:12:16,629 --> 00:12:13,920

satellites get increasingly more

318

00:12:18,470 --> 00:12:16,639

sophisticated and generate new data with

319

00:12:20,389 --> 00:12:18,480

synthetic aperture radar systems and

320

00:12:23,269 --> 00:12:20,399

live video platforms and hyper and

321

00:12:25,269 --> 00:12:23,279

multi-spectral imaging capabilities

322

00:12:27,590 --> 00:12:25,279

the amount of data to be generated over

323

00:12:29,509 --> 00:12:27,600

the next 10 years is estimated at up to

324

00:12:31,990 --> 00:12:29,519

32 exabytes

325

00:12:34,629 --> 00:12:32,000

of total data simply put without a new

326

00:12:36,870 --> 00:12:34,639

alternative for data transmission that

327

00:12:39,350 --> 00:12:36,880

is faster with lower latency and greater

328

00:12:41,110 --> 00:12:39,360

security it's clear that with just rf

329

00:12:43,190 --> 00:12:41,120

capabilities alone

330

00:12:45,670 --> 00:12:43,200

the amount of future data to be quote

331

00:12:47,670 --> 00:12:45,680

unquote lost in space will also increase

332

00:12:49,350 --> 00:12:47,680

exponentially

333

00:12:51,030 --> 00:12:49,360

the second reason driving the need for

334

00:12:53,190 --> 00:12:51,040

optical transmission

335

00:12:55,829 --> 00:12:53,200

is its promise for low latency

336

00:12:57,750 --> 00:12:55,839

imagine a scenario where data generated

337

00:13:00,310 --> 00:12:57,760

in leo could be available to terrestrial

338

00:13:02,069 --> 00:13:00,320

users not within days or hours but

339

00:13:03,750 --> 00:13:02,079

within seconds

340

00:13:05,509 --> 00:13:03,760

that promise can only be achieved with a

341

00:13:06,949 --> 00:13:05,519

mesh network of optical transmission

342

00:13:09,190 --> 00:13:06,959

capabilities

343

00:13:11,110 --> 00:13:09,200

we demand immediate access to our data

344

00:13:13,350 --> 00:13:11,120

here on earth so much so that we get

345

00:13:15,590 --> 00:13:13,360

angry if our web browsers don't load

346

00:13:17,670 --> 00:13:15,600

within two seconds why don't we demand

347

00:13:19,430 --> 00:13:17,680

the same of data that has originated

348

00:13:22,069 --> 00:13:19,440

from low earth orbit well bridge that

349

00:13:23,670 --> 00:13:22,079

will make that possibility

350

00:13:24,949 --> 00:13:23,680

finally we have recently established a

351
00:13:27,030 --> 00:13:24,959
second company

352
00:13:28,790 --> 00:13:27,040
named hawkeye 360 for the

353
00:13:31,190 --> 00:13:28,800
commercialization of intellectual

354
00:13:33,269 --> 00:13:31,200
property developed at virginia tech

355
00:13:34,550 --> 00:13:33,279
specifically for the geolocation and

356
00:13:37,030 --> 00:13:34,560
characterization

357
00:13:38,550 --> 00:13:37,040
of rf signals intelligence much more to

358
00:13:39,509 --> 00:13:38,560
follow about this new company in the

359
00:13:41,189 --> 00:13:39,519
future

360
00:13:42,230 --> 00:13:41,199
with that i'll pause and turn it over to

361
00:13:48,310 --> 00:13:42,240
andy

362
00:13:49,829 --> 00:13:48,320
nasa's small spacecraft technology

363
00:13:51,269 --> 00:13:49,839

program

364

00:13:54,069 --> 00:13:51,279

in which we are developing and

365

00:13:55,030 --> 00:13:54,079

demonstrating new technologies to

366

00:13:57,189 --> 00:13:55,040

enable

367

00:13:59,189 --> 00:13:57,199

greater capabilities for nasa's missions

368

00:14:00,710 --> 00:13:59,199

and science exploration and space

369

00:14:02,470 --> 00:14:00,720

operations

370

00:14:04,550 --> 00:14:02,480

i'd like to begin by thanking the nro

371

00:14:06,550 --> 00:14:04,560

for providing a ride to space for the

372

00:14:07,949 --> 00:14:06,560

optical communications and sensor

373

00:14:12,470 --> 00:14:07,959

demonstration

374

00:14:15,189 --> 00:14:12,480

ocsd was selected by nasa back in 2012

375

00:14:17,430 --> 00:14:15,199

it was one of only three

376

00:14:19,750 --> 00:14:17,440

projects selected from over 100

377

00:14:21,030 --> 00:14:19,760

proposals so it was a very competitive

378

00:14:23,750 --> 00:14:21,040

field

379

00:14:26,230 --> 00:14:23,760

the aerospace corporation that's leading

380

00:14:27,269 --> 00:14:26,240

this project also one of the other of

381

00:14:29,350 --> 00:14:27,279

the three

382

00:14:31,509 --> 00:14:29,360

from that set of projects

383

00:14:33,110 --> 00:14:31,519

led by rich welley who you'll be hearing

384

00:14:35,269 --> 00:14:33,120

from later

385

00:14:38,230 --> 00:14:35,279

the aerospace team

386

00:14:41,030 --> 00:14:38,240

are pioneers in the field of small very

387

00:14:43,269 --> 00:14:41,040

small spacecraft and

388

00:14:46,230 --> 00:14:43,279

as they've proven they're exceptionally

389

00:14:47,590 --> 00:14:46,240

creative and skilled engineers

390

00:14:49,750 --> 00:14:47,600

and it's really been a pleasure to work

391

00:14:51,829 --> 00:14:49,760

with them over the last couple of years

392

00:14:53,350 --> 00:14:51,839

we're also very excited about

393

00:14:55,829 --> 00:14:53,360

the commercial involvement that john

394

00:14:58,230 --> 00:14:55,839

talked about with with bridgeset

395

00:14:59,829 --> 00:14:58,240

we're not only developing these

396

00:15:02,710 --> 00:14:59,839

capabilities for nasa and for the

397

00:15:04,710 --> 00:15:02,720

government but you know we want to

398

00:15:06,629 --> 00:15:04,720

build the private industry in this field

399

00:15:08,310 --> 00:15:06,639

as well and that's that's very helpful

400

00:15:11,509 --> 00:15:08,320

in that

401
00:15:14,230 --> 00:15:11,519
ocsd is one of six flight projects we

402
00:15:16,629 --> 00:15:14,240
have underway right now and we have 15

403
00:15:18,550 --> 00:15:16,639
other projects in development

404
00:15:21,189 --> 00:15:18,560
we are working with nine different

405
00:15:23,189 --> 00:15:21,199
private companies 12 universities eight

406
00:15:25,189 --> 00:15:23,199
nasa centers and several other

407
00:15:26,790 --> 00:15:25,199
government agencies on these

408
00:15:28,710 --> 00:15:26,800
various projects

409
00:15:30,550 --> 00:15:28,720
i'd like to go to the illustration just

410
00:15:32,949 --> 00:15:30,560
to give a little context

411
00:15:35,829 --> 00:15:32,959
of how ocsd

412
00:15:39,189 --> 00:15:35,839
this mission fits into our overall

413
00:15:42,710 --> 00:15:39,199

portfolio of missions going back to 2013

414

00:15:44,150 --> 00:15:42,720
and 2014 we flew five phone sat

415

00:15:46,310 --> 00:15:44,160
satellites

416

00:15:47,670 --> 00:15:46,320
which were very simple low-cost

417

00:15:51,030 --> 00:15:47,680
satellites

418

00:15:53,030 --> 00:15:51,040
one u-cube sets that used a

419

00:15:55,590 --> 00:15:53,040
mobile phone as the

420

00:15:58,150 --> 00:15:55,600
basis of the control system that

421

00:16:01,189 --> 00:15:58,160
architecture has uh been continued in

422

00:16:03,910 --> 00:16:01,199
the next um series of satellites uh

423

00:16:06,870 --> 00:16:03,920
starting um next month at the end of

424

00:16:10,069 --> 00:16:06,880
this month we'll be launching the edison

425

00:16:12,230 --> 00:16:10,079
swarm which is eight cubesats um

426

00:16:13,430 --> 00:16:12,240

this is an example i

427

00:16:16,069 --> 00:16:13,440

have here

428

00:16:17,910 --> 00:16:16,079

is a one and a half u cubesat uh you can

429

00:16:19,269 --> 00:16:17,920

see it's similar in size and shape to

430

00:16:22,389 --> 00:16:19,279

the ocsd

431

00:16:24,470 --> 00:16:22,399

and it shows you the the flexibility and

432

00:16:26,389 --> 00:16:24,480

the power of this platform

433

00:16:28,150 --> 00:16:26,399

for doing a whole wide variety of

434

00:16:32,069 --> 00:16:28,160

different types of missions in in

435

00:16:33,430 --> 00:16:32,079

technology science and exploration

436

00:16:35,430 --> 00:16:33,440

so um

437

00:16:37,590 --> 00:16:35,440

in addition to to the missions i

438

00:16:39,430 --> 00:16:37,600

described uh the edison and nodes

439

00:16:41,910 --> 00:16:39,440

missions going um

440

00:16:43,430 --> 00:16:41,920

in the next two months um

441

00:16:45,430 --> 00:16:43,440

we have a

442

00:16:48,150 --> 00:16:45,440

flight a suborbital flight of a very

443

00:16:50,069 --> 00:16:48,160

small capsule uh which is another area

444

00:16:52,710 --> 00:16:50,079

of technology we're

445

00:16:55,110 --> 00:16:52,720

making making advancements in and then

446

00:16:57,829 --> 00:16:55,120

we come to the second flight of ocsd

447

00:16:59,430 --> 00:16:57,839

that was described uh taking this uh

448

00:17:00,710 --> 00:16:59,440

technology further in laser

449

00:17:02,870 --> 00:17:00,720

communications

450

00:17:06,230 --> 00:17:02,880

and proximity operations for small

451
00:17:08,470 --> 00:17:06,240
spacecraft and then we have a project

452
00:17:10,150 --> 00:17:08,480
led by jpl also

453
00:17:12,710 --> 00:17:10,160
with aerospace

454
00:17:15,510 --> 00:17:12,720
in which they will demonstrate a

455
00:17:18,870 --> 00:17:15,520
reflecting antenna which is a way to

456
00:17:20,309 --> 00:17:18,880
increase the capability of radio

457
00:17:21,990 --> 00:17:20,319
communication

458
00:17:24,549 --> 00:17:22,000
and then we have

459
00:17:26,789 --> 00:17:24,559
the cubesat proximity operations

460
00:17:28,710 --> 00:17:26,799
demonstration called cpod

461
00:17:31,029 --> 00:17:28,720
led by tyvac

462
00:17:33,990 --> 00:17:31,039
another small private company

463
00:17:36,549 --> 00:17:34,000

and uh that will demonstrate autonomous

464

00:17:38,789 --> 00:17:36,559

rendezvous and docking with two cubesats

465

00:17:40,789 --> 00:17:38,799

which is will be another um

466

00:17:42,630 --> 00:17:40,799

first for this type of activity with

467

00:17:45,190 --> 00:17:42,640

such small spacecraft

468

00:17:49,029 --> 00:17:45,200

and then we have several um the series

469

00:17:51,430 --> 00:17:49,039

of additional projects uh in development

470

00:17:54,470 --> 00:17:51,440

to do demonstrations of propulsion

471

00:17:57,830 --> 00:17:54,480

including electric propulsion uh with uh

472

00:18:01,110 --> 00:17:57,840

6u and in one case a 12u cubesat coming

473

00:18:04,549 --> 00:18:03,190

so

474

00:18:07,029 --> 00:18:04,559

to conclude

475

00:18:09,669 --> 00:18:07,039

we're hoping for a good launch tomorrow

476
00:18:12,549 --> 00:18:09,679
and lots of good things to come thanks

477
00:18:14,390 --> 00:18:12,559
and i'll turn it over to scott

478
00:18:16,870 --> 00:18:14,400
thanks andy good morning everyone

479
00:18:18,630 --> 00:18:16,880
i'm scott higginbotham i'm a mission

480
00:18:20,390 --> 00:18:18,640
manager in the launch services program

481
00:18:21,430 --> 00:18:20,400
and i'm the mission manager for alana

482
00:18:23,750 --> 00:18:21,440
12.

483
00:18:25,029 --> 00:18:23,760
four cubesats that are flying on this

484
00:18:26,950 --> 00:18:25,039
mission that are sponsored by the

485
00:18:28,390 --> 00:18:26,960
cubesat launch initiative

486
00:18:31,270 --> 00:18:28,400
it occurred to me driving in this

487
00:18:32,870 --> 00:18:31,280
morning that our uh mission is something

488
00:18:34,789 --> 00:18:32,880

something like a matrushka doll a

489

00:18:36,789 --> 00:18:34,799

nesting doll we have a mission within a

490

00:18:38,710 --> 00:18:36,799

mission within a mission we have a lana

491

00:18:40,230 --> 00:18:38,720

12 that's part of grace that's part of

492

00:18:42,549 --> 00:18:40,240

l55

493

00:18:45,750 --> 00:18:42,559

the four cubesats that make up ilana 12

494

00:18:47,510 --> 00:18:45,760

come from the full spectrum of providers

495

00:18:49,990 --> 00:18:47,520

that we work with in the cubesat launch

496

00:18:51,750 --> 00:18:50,000

initiative we have one coming from the

497

00:18:54,070 --> 00:18:51,760

jet propulsion laboratory representing

498

00:18:55,750 --> 00:18:54,080

government we have one coming from amsat

499

00:18:57,990 --> 00:18:55,760

that represents a non-profit

500

00:19:00,390 --> 00:18:58,000

organization and we have two coming from

501
00:19:02,070 --> 00:19:00,400
universities representing academia

502
00:19:03,750 --> 00:19:02,080
and all four of these spacecraft are

503
00:19:05,590 --> 00:19:03,760
looking into various aspects of

504
00:19:08,830 --> 00:19:05,600
technology development scientific

505
00:19:11,909 --> 00:19:08,840
research and educational uh

506
00:19:13,830 --> 00:19:11,919
outreach um all three four of these

507
00:19:15,350 --> 00:19:13,840
teams have worked extremely hard to get

508
00:19:17,430 --> 00:19:15,360
their hardware ready to go fly and we're

509
00:19:20,710 --> 00:19:17,440
very very proud of them not only did

510
00:19:22,710 --> 00:19:20,720
they have to build and test a spacecraft

511
00:19:25,909 --> 00:19:22,720
they had to produce a lot of objective

512
00:19:27,750 --> 00:19:25,919
evidence to prove to us to the nro and

513
00:19:29,590 --> 00:19:27,760

to united launch alliance and the air

514

00:19:31,350 --> 00:19:29,600

force that their hardware was safe to

515

00:19:33,909 --> 00:19:31,360

fly and would not harm the primary

516

00:19:35,830 --> 00:19:33,919

mission or hurt the public

517

00:19:36,950 --> 00:19:35,840

and they've done an excellent job and

518

00:19:39,190 --> 00:19:36,960

they're going to speak to you here at

519

00:19:40,789 --> 00:19:39,200

the next press conference about what it

520

00:19:42,549 --> 00:19:40,799

took to build their satellites and what

521

00:19:44,789 --> 00:19:42,559

these satellites are going to do so i

522

00:19:47,909 --> 00:19:44,799

won't steal any of their thunder

523

00:19:50,150 --> 00:19:47,919

in conclusion i want to thank the nro in

524

00:19:52,470 --> 00:19:50,160

particular the office of space launch

525

00:19:54,390 --> 00:19:52,480

for their outstanding leadership and

526

00:19:56,230 --> 00:19:54,400

pulling this mission together

527

00:19:59,029 --> 00:19:56,240

i should also recognize their

528

00:20:02,070 --> 00:19:59,039

integration contractor sri who did a

529

00:20:04,230 --> 00:20:02,080

magnificent job all these people and ula

530

00:20:07,669 --> 00:20:04,240

all these people did a wonderful job of

531

00:20:09,510 --> 00:20:07,679

making a very hard task look easy and

532

00:20:11,909 --> 00:20:09,520

because of their efforts we're ready to

533

00:20:15,990 --> 00:20:11,919

go fly tomorrow so with that

534

00:20:16,789 --> 00:20:16,000

go l55 go grace go ilana 12.

535

00:20:19,430 --> 00:20:16,799

mike

536

00:20:21,669 --> 00:20:19,440

thank you scott and thank you everybody

537

00:20:23,830 --> 00:20:21,679

we're ready now to take questions and

538

00:20:26,070 --> 00:20:23,840

we'll be taking questions from those on

539

00:20:28,870 --> 00:20:26,080

the phone and online

540

00:20:30,070 --> 00:20:28,880

and as a reminder if you're watching um

541

00:20:31,669 --> 00:20:30,080

from afar

542

00:20:33,750 --> 00:20:31,679

please make sure to send your questions

543

00:20:36,070 --> 00:20:33,760

on social media using the hashtag

544

00:20:38,950 --> 00:20:36,080

asknasa and for reporters on the

545

00:20:40,470 --> 00:20:38,960

telephone don't forget to hit star one

546

00:20:41,510 --> 00:20:40,480

to be placed into the queue for

547

00:20:43,590 --> 00:20:41,520

questions

548

00:20:45,750 --> 00:20:43,600

and uh when you are called on please

549

00:20:47,990 --> 00:20:45,760

state your name your affiliation and to

550

00:20:49,669 --> 00:20:48,000

whom you're addressing your question

551
00:20:51,750 --> 00:20:49,679
we'll take one question and that if time

552
00:20:54,149 --> 00:20:51,760
allows we'll be happy to go back for uh

553
00:20:55,909 --> 00:20:54,159
follow-up questions and also because we

554
00:20:57,909 --> 00:20:55,919
have such a large panel please be

555
00:20:59,909 --> 00:20:57,919
mindful that we have limited time and

556
00:21:01,909 --> 00:20:59,919
we'd like to ask that you uh

557
00:21:04,390 --> 00:21:01,919
keep your questions focused on the

558
00:21:06,950 --> 00:21:04,400
panel's topic today which is the use of

559
00:21:08,789 --> 00:21:06,960
cubesats in space exploration we will

560
00:21:11,430 --> 00:21:08,799
not be discussing any details about

561
00:21:14,070 --> 00:21:11,440
tomorrow's launch

562
00:21:16,230 --> 00:21:14,080
so we'll begin uh with questions here

563
00:21:18,310 --> 00:21:16,240

with kimberly williams from ames

564

00:21:20,470 --> 00:21:18,320

research center nasa's ames research

565

00:21:22,470 --> 00:21:20,480

center she has been following incoming

566

00:21:23,590 --> 00:21:22,480

questions on the hashtag ask nasa

567

00:21:25,669 --> 00:21:23,600

kimberly

568

00:21:27,270 --> 00:21:25,679

our first question for today would be

569

00:21:29,110 --> 00:21:27,280

directed to scott

570

00:21:30,950 --> 00:21:29,120

students are watching this launch and

571

00:21:33,830 --> 00:21:30,960

the press briefing during their lunch

572

00:21:35,990 --> 00:21:33,840

time how can more of them get involved

573

00:21:40,230 --> 00:21:36,000

and can this be related to humanities

574

00:21:46,549 --> 00:21:44,230

okay well um how you can get involved um

575

00:21:47,990 --> 00:21:46,559

put together a proposal for building a

576
00:21:49,990 --> 00:21:48,000
spacecraft

577
00:21:51,909 --> 00:21:50,000
and submit it to nasa

578
00:21:54,549 --> 00:21:51,919
we put out a call for cubesat launch

579
00:21:57,430 --> 00:21:54,559
initiative projects every year

580
00:21:59,669 --> 00:21:57,440
i think call 7 is underway right now

581
00:22:03,029 --> 00:21:59,679
propose a satellite that meets some nasa

582
00:22:05,350 --> 00:22:03,039
objectives in an educational

583
00:22:07,909 --> 00:22:05,360
outreach technology development or

584
00:22:09,909 --> 00:22:07,919
science and exploration

585
00:22:12,710 --> 00:22:09,919
get it get it funded and we'll provide

586
00:22:14,070 --> 00:22:12,720
the launch to you if you're selected

587
00:22:15,990 --> 00:22:14,080
but that's not the only way to get

588
00:22:18,070 --> 00:22:16,000

involved there's there's all sorts of

589

00:22:19,909 --> 00:22:18,080

things you can look at our nasa website

590

00:22:21,990 --> 00:22:19,919

we have a tremendous educational

591

00:22:24,549 --> 00:22:22,000

outreach organization that works with

592

00:22:26,310 --> 00:22:24,559

schools both primary schools all the way

593

00:22:27,990 --> 00:22:26,320

up through colleges around the country

594

00:22:30,390 --> 00:22:28,000

providing a variety of different ways

595

00:22:32,230 --> 00:22:30,400

that you can get involved but building

596

00:22:33,830 --> 00:22:32,240

spacecraft are cool you know that's a

597

00:22:35,669 --> 00:22:33,840

neat thing to go do if you can if you

598

00:22:37,430 --> 00:22:35,679

can pull it off and i highly encourage

599

00:22:39,190 --> 00:22:37,440

you to do it in fact we have our first

600

00:22:41,350 --> 00:22:39,200

elementary school

601
00:22:42,789 --> 00:22:41,360
has built a cubesat and it's already

602
00:22:45,190 --> 00:22:42,799
been turned over and packaged for launch

603
00:22:46,710 --> 00:22:45,200
it's going up in december on the ilana 9

604
00:22:48,549 --> 00:22:46,720
mission up to the space station to be

605
00:22:50,789 --> 00:22:48,559
deployed so if an elementary school can

606
00:22:52,630 --> 00:22:50,799
do it so can you

607
00:22:54,549 --> 00:22:52,640
as far as humanities are concerned wow

608
00:22:55,430 --> 00:22:54,559
that's tough because i'm an engineer and

609
00:22:57,350 --> 00:22:55,440
um

610
00:22:59,909 --> 00:22:57,360
but i i think that

611
00:23:02,470 --> 00:22:59,919
for me imagery from space

612
00:23:04,710 --> 00:23:02,480
has an artistic quality to it and

613
00:23:06,789 --> 00:23:04,720

perhaps that's a that's a way that you

614

00:23:11,430 --> 00:23:06,799

can express yourself by gathering images

615

00:23:11,440 --> 00:23:13,990

okay

616

00:23:18,070 --> 00:23:16,230

all right kimberly has uh do you have

617

00:23:19,590 --> 00:23:18,080

any other questions that you can pass on

618

00:23:22,789 --> 00:23:19,600

to us

619

00:23:25,029 --> 00:23:22,799

this would be directed to nasa

620

00:23:26,870 --> 00:23:25,039

what does nasa expect to learn from

621

00:23:30,390 --> 00:23:26,880

technology demonstrations with small

622

00:23:34,549 --> 00:23:32,310

so we learn a tremendous amount about

623

00:23:36,870 --> 00:23:34,559

developing technology and testing it on

624

00:23:39,830 --> 00:23:36,880

earth and including in simulated space

625

00:23:41,750 --> 00:23:39,840

environment we put hardware on vibration

626
00:23:43,990 --> 00:23:41,760
tables to submit the launch environment

627
00:23:47,110 --> 00:23:44,000
we put them in vacuum changers and cycle

628
00:23:49,590 --> 00:23:47,120
the hardware hot and cold um but it it

629
00:23:51,350 --> 00:23:49,600
does not fully simulate uh the space

630
00:23:53,029 --> 00:23:51,360
environment and going into space

631
00:23:55,430 --> 00:23:53,039
so the first thing is testing the

632
00:23:56,710 --> 00:23:55,440
technologies as they're intended to use

633
00:23:58,470 --> 00:23:56,720
in the system

634
00:24:00,630 --> 00:23:58,480
in low earth orbit that is that is

635
00:24:02,230 --> 00:24:00,640
critical to eventually

636
00:24:04,149 --> 00:24:02,240
being able to use technologies in

637
00:24:05,110 --> 00:24:04,159
exploration missions and science

638
00:24:07,750 --> 00:24:05,120

missions

639

00:24:09,909 --> 00:24:07,760

and so on ocsd we're trying to mature

640

00:24:11,590 --> 00:24:09,919

laser communications technology and like

641

00:24:14,230 --> 00:24:11,600

scott said increase

642

00:24:16,870 --> 00:24:14,240

the ability to get larger amounts of

643

00:24:19,350 --> 00:24:16,880

data from low earth orbit to the ground

644

00:24:21,029 --> 00:24:19,360

but we're also advancing uh like andy

645

00:24:22,950 --> 00:24:21,039

andrew mentioned uh propulsion

646

00:24:25,110 --> 00:24:22,960

technologies uh attitude termination

647

00:24:27,190 --> 00:24:25,120

control system families um power system

648

00:24:29,669 --> 00:24:27,200

technologies and our goal is to make

649

00:24:31,430 --> 00:24:29,679

these platforms more capable

650

00:24:33,510 --> 00:24:31,440

along with the instrumentation that goes

651
00:24:37,190 --> 00:24:33,520
on them to do real meaningful

652
00:24:40,390 --> 00:24:39,029
uh just a reminder for uh the reporters

653
00:24:42,310 --> 00:24:40,400
are on the phone we have a number of

654
00:24:44,470 --> 00:24:42,320
reporters on the phone but nobody is uh

655
00:24:46,230 --> 00:24:44,480
into the question queue so a reminder if

656
00:24:47,190 --> 00:24:46,240
you have a question don't forget you

657
00:24:49,990 --> 00:24:47,200
need to

658
00:24:52,310 --> 00:24:50,000
push star one to get into the question

659
00:24:54,710 --> 00:24:52,320
queue and also again for social media

660
00:24:56,149 --> 00:24:54,720
it's hashtag ask nasa

661
00:24:57,990 --> 00:24:56,159
kimberly

662
00:24:59,430 --> 00:24:58,000
and our last question at the moment is

663
00:25:01,269 --> 00:24:59,440

for sherry

664

00:25:05,590 --> 00:25:01,279

why are laser communications so

665

00:25:08,950 --> 00:25:07,590

this is development and

666

00:25:10,630 --> 00:25:08,960

my colleague

667

00:25:13,190 --> 00:25:10,640

dr rich welley will discuss it a little

668

00:25:15,669 --> 00:25:13,200

bit more in the next panel but this is a

669

00:25:16,470 --> 00:25:15,679

demonstration of how small we can make

670

00:25:18,950 --> 00:25:16,480

the

671

00:25:20,950 --> 00:25:18,960

optical lasers and

672

00:25:23,909 --> 00:25:20,960

whether or not we can have sufficient

673

00:25:25,990 --> 00:25:23,919

pointing accuracy of the cubesats so

674

00:25:28,549 --> 00:25:26,000

that we can actually fulfill the mission

675

00:25:30,630 --> 00:25:28,559

so a lot of this is what we would call a

676
00:25:32,470 --> 00:25:30,640
technology demonstration

677
00:25:33,750 --> 00:25:32,480
and um

678
00:25:35,750 --> 00:25:33,760
we will

679
00:25:37,990 --> 00:25:35,760
fly this laser and

680
00:25:42,630 --> 00:25:38,000
learn how to make it better and and have

681
00:25:45,669 --> 00:25:43,830
okay why don't we see if we have any

682
00:25:46,950 --> 00:25:45,679
questions in the room from uh

683
00:25:48,789 --> 00:25:46,960
from anyone in the audience who would

684
00:25:54,230 --> 00:25:48,799
like to ask the panel do we have any

685
00:25:57,750 --> 00:25:55,430
okay

686
00:25:58,549 --> 00:25:57,760
if i could expand upon sherry's answer

687
00:26:00,710 --> 00:25:58,559
yeah

688
00:26:03,190 --> 00:26:00,720

i think one of the things that makes new

689

00:26:06,149 --> 00:26:03,200

space interesting is given the very low

690

00:26:08,230 --> 00:26:06,159

cost of producing each iteration of

691

00:26:10,390 --> 00:26:08,240

small satellites means that it's almost

692

00:26:12,149 --> 00:26:10,400

like software development scrum based

693

00:26:14,789 --> 00:26:12,159

software development where you can come

694

00:26:16,149 --> 00:26:14,799

up with the next iteration to build and

695

00:26:18,470 --> 00:26:16,159

launch for a couple hundred thousand

696

00:26:19,510 --> 00:26:18,480

dollars and that's exciting because to

697

00:26:21,110 --> 00:26:19,520

create

698

00:26:23,669 --> 00:26:21,120

where we are with 200 megabits per

699

00:26:25,830 --> 00:26:23,679

second and then get to 622 megabits per

700

00:26:27,510 --> 00:26:25,840

second within only a few months

701
00:26:28,950 --> 00:26:27,520
that's a capability that that could

702
00:26:31,190 --> 00:26:28,960
never be achieved when you're talking

703
00:26:33,190 --> 00:26:31,200
about much larger satellites

704
00:26:34,630 --> 00:26:33,200
that require years upon years of

705
00:26:35,909 --> 00:26:34,640
development efforts and billions of

706
00:26:38,149 --> 00:26:35,919
dollars and so that's one of the

707
00:26:40,470 --> 00:26:38,159
benefits that we really appreciate about

708
00:26:42,630 --> 00:26:40,480
being investors in in low earth orbit is

709
00:26:46,149 --> 00:26:42,640
is the speed to market with each new

710
00:26:51,430 --> 00:26:48,470
okay thank you um we do have a caller on

711
00:26:53,350 --> 00:26:51,440
the phone bridge dan from fox news

712
00:26:56,549 --> 00:26:53,360
dan go ahead please

713
00:26:57,350 --> 00:26:56,559

hey guys um quick question regarding um

714

00:26:59,269 --> 00:26:57,360

the

715

00:27:01,909 --> 00:26:59,279

cubesats and

716

00:27:03,430 --> 00:27:01,919

the single-use nature of them the ease

717

00:27:04,870 --> 00:27:03,440

of making them

718

00:27:06,549 --> 00:27:04,880

uh i know that's one of the things

719

00:27:09,269 --> 00:27:06,559

that's synthesized you know it's a

720

00:27:11,430 --> 00:27:09,279

school group

721

00:27:13,110 --> 00:27:11,440

this technology involves

722

00:27:15,110 --> 00:27:13,120

how much more complicated and

723

00:27:17,909 --> 00:27:15,120

sophisticated do you expect that this

724

00:27:20,549 --> 00:27:17,919

technology will be able to get you know

725

00:27:22,789 --> 00:27:20,559

kind of using the analogy of of our

726

00:27:24,789 --> 00:27:22,799

phones being able to do what a giant

727

00:27:27,430 --> 00:27:24,799

super computer used to do

728

00:27:29,669 --> 00:27:27,440

you know 30 40 years ago do we see

729

00:27:32,710 --> 00:27:29,679

cubesats really taking over some of the

730

00:27:37,750 --> 00:27:32,720

uses of what you know larger traditional

731

00:27:42,870 --> 00:27:41,669

i i might address that one

732

00:27:44,630 --> 00:27:42,880

it's

733

00:27:47,269 --> 00:27:44,640

not that we see

734

00:27:49,430 --> 00:27:47,279

cubesats or small spacecraft replacing

735

00:27:52,389 --> 00:27:49,440

larger satellites completely but we

736

00:27:54,070 --> 00:27:52,399

think there are some unique applications

737

00:27:56,389 --> 00:27:54,080

that for which small satellites might

738

00:27:58,470 --> 00:27:56,399

even be better than larger ones if you

739

00:28:00,470 --> 00:27:58,480

want to do distributed measurements over

740

00:28:02,389 --> 00:28:00,480

a large area and collect that data

741

00:28:04,630 --> 00:28:02,399

that's what we're demonstrating with the

742

00:28:06,149 --> 00:28:04,640

edison um mission

743

00:28:07,590 --> 00:28:06,159

and uh

744

00:28:09,190 --> 00:28:07,600

the uh

745

00:28:10,149 --> 00:28:09,200

you know

746

00:28:11,990 --> 00:28:10,159

the the

747

00:28:14,630 --> 00:28:12,000

the time frame that we talked about the

748

00:28:16,549 --> 00:28:14,640

ability to fly a mission quickly learn

749

00:28:18,389 --> 00:28:16,559

from it and turn around and fly another

750

00:28:20,470 --> 00:28:18,399

one very quickly is something you don't

751

00:28:22,389 --> 00:28:20,480

get with large

752

00:28:24,470 --> 00:28:22,399

multi-billion dollar projects that take

753

00:28:27,669 --> 00:28:24,480

five or ten years or more

754

00:28:30,950 --> 00:28:27,679

to begin so we see it driving innovation

755

00:28:33,350 --> 00:28:30,960

and we see it providing very unique

756

00:28:35,510 --> 00:28:33,360

new capabilities

757

00:28:37,830 --> 00:28:35,520

that will supplement and complement what

758

00:28:39,590 --> 00:28:37,840

we do with larger satellites and if i

759

00:28:41,950 --> 00:28:39,600

could just augment that

760

00:28:45,909 --> 00:28:41,960

aerospace has been looking at different

761

00:28:49,110 --> 00:28:45,919

constellations and it may be possible

762

00:28:51,590 --> 00:28:49,120

with constellations of small sats to do

763

00:28:53,830 --> 00:28:51,600

different types of work as well as doing

764

00:28:55,430 --> 00:28:53,840

a mixed constellation

765

00:28:57,110 --> 00:28:55,440

using large satellites and small

766

00:28:59,590 --> 00:28:57,120

satellites to

767

00:29:03,269 --> 00:28:59,600

to accomplish different tasks you might

768

00:29:05,909 --> 00:29:03,279

imagine a small satellite

769

00:29:07,909 --> 00:29:05,919

looking uh being deployed from something

770

00:29:09,830 --> 00:29:07,919

larger and looking to see if there's an

771

00:29:12,310 --> 00:29:09,840

anomaly if we could understand why

772

00:29:14,470 --> 00:29:12,320

because it would have an upfront view of

773

00:29:16,630 --> 00:29:14,480

what's going on so there are lots of

774

00:29:19,269 --> 00:29:16,640

different kinds of missions that

775

00:29:21,909 --> 00:29:19,279

cubesats may be possible of doing or

776

00:29:24,950 --> 00:29:21,919

swarms of small sets

777

00:29:28,310 --> 00:29:24,960

that large satellites just can't thank

778

00:29:30,470 --> 00:29:28,320

you i think the the miniaturization of

779

00:29:33,590 --> 00:29:30,480

satellite componentry the advances in

780

00:29:35,909 --> 00:29:33,600

dignitas the digital signal processing

781

00:29:37,669 --> 00:29:35,919

it's it's also a great story monetarily

782

00:29:39,909 --> 00:29:37,679

you know what once took billions of

783

00:29:42,630 --> 00:29:39,919

dollars and years for us to build and

784

00:29:45,909 --> 00:29:42,640

launch a very sophisticated exquisite

785

00:29:47,830 --> 00:29:45,919

asset up into geo now can be done maybe

786

00:29:50,230 --> 00:29:47,840

not the entire full package of

787

00:29:53,029 --> 00:29:50,240

capabilities but for hundreds of

788

00:29:55,190 --> 00:29:53,039

thousands or small millions of dollars

789

00:29:56,870 --> 00:29:55,200

in months and that's that's a very

790

00:29:59,190 --> 00:29:56,880

interesting proposition particularly to

791

00:30:01,830 --> 00:29:59,200

the american taxpayer who now can see

792

00:30:03,909 --> 00:30:01,840

many of those capabilities replicated um

793

00:30:06,789 --> 00:30:03,919

with a much higher return on invested

794

00:30:09,990 --> 00:30:08,470

before we go back to kimberly for uh

795

00:30:12,630 --> 00:30:10,000

some questions online we do have a

796

00:30:15,590 --> 00:30:12,640

question in the back of the room

797

00:30:18,070 --> 00:30:15,600

hi i'm jerry buxton with amsat and

798

00:30:20,950 --> 00:30:18,080

regarding the access to space through

799

00:30:24,549 --> 00:30:20,960

the csli and the alana program we have

800

00:30:27,190 --> 00:30:24,559

our nrol 55 tomorrow and scott mentioned

801
00:30:30,070 --> 00:30:27,200
alana 9 going to the iss what are the

802
00:30:31,909 --> 00:30:30,080
types of launches opportunities what's

803
00:30:33,750 --> 00:30:31,919
the scope of that that nasa looks at in

804
00:30:36,710 --> 00:30:33,760
order to be able to provide these

805
00:30:38,630 --> 00:30:36,720
opportunities to the small sets

806
00:30:40,630 --> 00:30:38,640
i'll take that um

807
00:30:42,389 --> 00:30:40,640
basically we look for the right vehicle

808
00:30:45,110 --> 00:30:42,399
going to the right place at the right

809
00:30:47,750 --> 00:30:45,120
time at the right price

810
00:30:49,510 --> 00:30:47,760
you know not every cubesat is for

811
00:30:51,350 --> 00:30:49,520
timewise not every cubesat is ready to

812
00:30:53,669 --> 00:30:51,360
go when the rocket's ready to go and

813
00:30:55,269 --> 00:30:53,679

since we're flying is along in the

814

00:30:57,750 --> 00:30:55,279

excess capacity of the rocket for the

815

00:30:59,990 --> 00:30:57,760

most part we got to go when they go

816

00:31:01,430 --> 00:31:00,000

so we have to align the cubesat projects

817

00:31:03,269 --> 00:31:01,440

with with the rocket that's going in

818

00:31:05,430 --> 00:31:03,279

that direction then we got to worry

819

00:31:06,789 --> 00:31:05,440

about where they're going uh the place

820

00:31:08,549 --> 00:31:06,799

are they going to the right inclination

821

00:31:10,710 --> 00:31:08,559

for you to do your science or in some

822

00:31:12,230 --> 00:31:10,720

cases for you to be able to talk to your

823

00:31:14,070 --> 00:31:12,240

satellite a lot of the teams we work

824

00:31:15,590 --> 00:31:14,080

with have a single ground station

825

00:31:17,509 --> 00:31:15,600

they're in a place on the planet and not

826

00:31:19,669 --> 00:31:17,519

all orbits go over that ground station

827

00:31:21,110 --> 00:31:19,679

and so they need us to be able to put

828

00:31:23,830 --> 00:31:21,120

them in the right place so that flight

829

00:31:25,669 --> 00:31:23,840

may not be the right flight for them

830

00:31:27,269 --> 00:31:25,679

same thing with altitude

831

00:31:28,310 --> 00:31:27,279

not every altitude is good for every

832

00:31:31,269 --> 00:31:28,320

satellite

833

00:31:32,950 --> 00:31:31,279

as as you probably all know we we try to

834

00:31:34,630 --> 00:31:32,960

minimize the amount of time a spacecraft

835

00:31:36,470 --> 00:31:34,640

is in orbit after its lifetime is

836

00:31:38,870 --> 00:31:36,480

complete so that it doesn't become a

837

00:31:40,549 --> 00:31:38,880

piece of floating space junk and so we

838

00:31:42,549 --> 00:31:40,559

have rules in place about how long they

839

00:31:44,389 --> 00:31:42,559

can stay in orbit and we have to adhere

840

00:31:46,470 --> 00:31:44,399

to those and those limit us to certain

841

00:31:48,630 --> 00:31:46,480

altitudes and then there's price you

842

00:31:50,389 --> 00:31:48,640

know we we are servants of the taxpayers

843

00:31:52,149 --> 00:31:50,399

and we are trying to find the best value

844

00:31:54,710 --> 00:31:52,159

for the buck to get as many satellites

845

00:31:57,110 --> 00:31:54,720

in space as cheaply as possible and so

846

00:31:58,070 --> 00:31:57,120

we beg borrow rides wherever we can get

847

00:31:59,509 --> 00:31:58,080

them

848

00:32:01,509 --> 00:31:59,519

working with our other governmental

849

00:32:04,310 --> 00:32:01,519

partners the air force

850

00:32:07,350 --> 00:32:04,320

space test program the nro

851
00:32:10,389 --> 00:32:07,360
we also are starting to venture out into

852
00:32:11,830 --> 00:32:10,399
commercial operations and getting rides

853
00:32:14,470 --> 00:32:11,840
into space on

854
00:32:15,590 --> 00:32:14,480
on commercial rockets and also utilizing

855
00:32:17,590 --> 00:32:15,600
the commercial venue through the

856
00:32:20,310 --> 00:32:17,600
international space station to fly our

857
00:32:22,710 --> 00:32:20,320
satellites and in the future we we hope

858
00:32:24,389 --> 00:32:22,720
to ultimately see very small dedicated

859
00:32:27,430 --> 00:32:24,399
launch vehicles that can be used for

860
00:32:29,590 --> 00:32:27,440
small satellites those are emerging and

861
00:32:33,269 --> 00:32:29,600
i think are going to start to become

862
00:32:36,870 --> 00:32:35,190
thank you scott remember for reporters

863
00:32:38,549 --> 00:32:36,880

online it's star one to get into the

864

00:32:39,269 --> 00:32:38,559

question queue and

865

00:32:42,310 --> 00:32:39,279

for

866

00:32:43,350 --> 00:32:42,320

online it's hashtag ask nasa and

867

00:32:45,750 --> 00:32:43,360

kimberly have you got some more

868

00:32:47,909 --> 00:32:45,760

questions for us yes this one is for

869

00:32:50,230 --> 00:32:47,919

steve are there any joint ventures

870

00:32:51,750 --> 00:32:50,240

between esa and nasa regarding small

871

00:32:54,310 --> 00:32:51,760

satellites

872

00:32:56,789 --> 00:32:54,320

you know they're currently we do not

873

00:32:59,350 --> 00:32:56,799

have any joint ventures between esa and

874

00:33:01,909 --> 00:32:59,360

nasa on small satellites but i think

875

00:33:03,430 --> 00:33:01,919

there's opportunity in the future

876

00:33:04,549 --> 00:33:03,440

to not only have

877

00:33:06,149 --> 00:33:04,559

collaboration international

878

00:33:07,110 --> 00:33:06,159

collaboration on small satellites but

879

00:33:10,149 --> 00:33:07,120

also

880

00:33:12,630 --> 00:33:10,159

further international calculation on

881

00:33:15,029 --> 00:33:12,640

developing technologies for human and

882

00:33:16,549 --> 00:33:15,039

robotic exploration of the solar system

883

00:33:20,630 --> 00:33:16,559

i think i

884

00:33:22,870 --> 00:33:20,640

i absolutely believe that in order to

885

00:33:24,549 --> 00:33:22,880

eventually get humans on the surface of

886

00:33:26,149 --> 00:33:24,559

mars it will absolutely need to be an

887

00:33:27,990 --> 00:33:26,159

international collaboration the united

888

00:33:29,350 --> 00:33:28,000

states is not going to do it on its own

889

00:33:31,190 --> 00:33:29,360

um just like the international space

890

00:33:32,630 --> 00:33:31,200

station was you know an international

891

00:33:34,549 --> 00:33:32,640

collaboration that resulted in one of

892

00:33:36,149 --> 00:33:34,559

the greatest engineering achievements

893

00:33:38,470 --> 00:33:36,159

that you know mankind has ever

894

00:33:41,269 --> 00:33:38,480

accomplished

895

00:33:43,669 --> 00:33:41,279

not only from a technical and

896

00:33:45,029 --> 00:33:43,679

a cost standpoint should um

897

00:33:47,590 --> 00:33:45,039

human exploration solar system be

898

00:33:49,909 --> 00:33:47,600

international collaboration but just for

899

00:33:51,909 --> 00:33:49,919

uh just for humanity it ought to be

900

00:33:52,789 --> 00:33:51,919

international collaboration and so we're

901
00:33:54,870 --> 00:33:52,799
going to continue to look for

902
00:33:56,389 --> 00:33:54,880
opportunities not only to collaborate

903
00:33:58,950 --> 00:33:56,399
with the europeans

904
00:34:00,549 --> 00:33:58,960
esa and the government

905
00:34:01,909 --> 00:34:00,559
individual country space agencies but

906
00:34:05,750 --> 00:34:01,919
also

907
00:34:09,909 --> 00:34:08,230
this question is for andy

908
00:34:13,589 --> 00:34:09,919
how is the cube quest challenge

909
00:34:14,790 --> 00:34:13,599
different from the cubesat initiative

910
00:34:16,230 --> 00:34:14,800
um

911
00:34:18,829 --> 00:34:16,240
i think well they're talking about the

912
00:34:21,190 --> 00:34:18,839
cubequest challenge as a prize

913
00:34:23,589 --> 00:34:21,200

competition that the space technology

914

00:34:26,149 --> 00:34:23,599

mission directorate is offering

915

00:34:27,190 --> 00:34:26,159

under the centennial challenges program

916

00:34:29,030 --> 00:34:27,200

in which

917

00:34:31,909 --> 00:34:29,040

there is no funding for the development

918

00:34:33,030 --> 00:34:31,919

of a new capability

919

00:34:36,149 --> 00:34:33,040

in this case

920

00:34:37,750 --> 00:34:36,159

the capability of sending um a cubesat

921

00:34:39,109 --> 00:34:37,760

out into deep space and communicating

922

00:34:42,310 --> 00:34:39,119

back to earth

923

00:34:44,790 --> 00:34:42,320

and and a second challenge of putting uh

924

00:34:46,069 --> 00:34:44,800

cubesat into orbit around the moon

925

00:34:53,030 --> 00:34:46,079

uh

926
00:34:55,589 --> 00:34:53,040
receive um significant prize money um to

927
00:34:57,750 --> 00:34:55,599
um reward them for for making that

928
00:34:59,270 --> 00:34:57,760
accomplishment uh

929
00:35:01,829 --> 00:34:59,280
it's unlike the other things that nasa

930
00:35:04,069 --> 00:35:01,839
does in which we normally

931
00:35:06,150 --> 00:35:04,079
fund the development of a project

932
00:35:07,670 --> 00:35:06,160
along with the

933
00:35:11,750 --> 00:35:07,680
the research team that we're working

934
00:35:17,030 --> 00:35:14,390
and one for nasa

935
00:35:18,870 --> 00:35:17,040
steve has data rate testing for laser

936
00:35:20,710 --> 00:35:18,880
communications been tested and what

937
00:35:24,790 --> 00:35:20,720
types of communication would benefit the

938
00:35:26,790 --> 00:35:24,800

most traffic hydrology etc okay

939

00:35:29,190 --> 00:35:26,800

so we've actually been developing laser

940

00:35:31,430 --> 00:35:29,200

communications technology for quite some

941

00:35:33,829 --> 00:35:31,440

time now we did a very brief

942

00:35:35,030 --> 00:35:33,839

demonstration of laser communications

943

00:35:38,310 --> 00:35:35,040

from

944

00:35:42,069 --> 00:35:38,320

earth

945

00:35:42,950 --> 00:35:42,079

as part of a a nasa mission

946

00:35:45,510 --> 00:35:42,960

and

947

00:35:47,829 --> 00:35:45,520

we are developing a couple of other uh

948

00:35:49,670 --> 00:35:47,839

technologies to allow very high

949

00:35:52,230 --> 00:35:49,680

bandwidth communications you know one

950

00:35:53,670 --> 00:35:52,240

gigabit plus from geostationary orbit

951
00:35:55,190 --> 00:35:53,680
that's the laser communications relay

952
00:35:56,790 --> 00:35:55,200
demonstration mission

953
00:35:58,150 --> 00:35:56,800
um and that could definitely

954
00:35:59,910 --> 00:35:58,160
revolutionize the commercial

955
00:36:02,069 --> 00:35:59,920
communications industry there's a couple

956
00:36:03,190 --> 00:36:02,079
of things a laser com is higher

957
00:36:04,870 --> 00:36:03,200
bandwidth

958
00:36:05,750 --> 00:36:04,880
um and then the second thing is we're

959
00:36:07,990 --> 00:36:05,760
going to a different part of the

960
00:36:09,430 --> 00:36:08,000
electromagnetic spectrum the rf part of

961
00:36:11,190 --> 00:36:09,440
the spectrum is getting pretty crowded

962
00:36:13,349 --> 00:36:11,200
and we keep chopping up that spectrum in

963
00:36:15,109 --> 00:36:13,359

the smaller pieces the cram more

964

00:36:16,390 --> 00:36:15,119

satellites and more transponders in

965

00:36:18,470 --> 00:36:16,400

there and so by going to a different

966

00:36:20,630 --> 00:36:18,480

part of electromagnetic expression light

967

00:36:21,589 --> 00:36:20,640

you know we could open up a whole new

968

00:36:24,950 --> 00:36:21,599

whole new

969

00:36:26,470 --> 00:36:24,960

bandwidth regime sort of to to kind of

970

00:36:28,069 --> 00:36:26,480

sort of revolutionize commercial

971

00:36:30,790 --> 00:36:28,079

communications

972

00:36:33,589 --> 00:36:30,800

um and and also we're developing deep

973

00:36:36,230 --> 00:36:33,599

space optical communications which has

974

00:36:38,710 --> 00:36:36,240

challenges not only in laser transmitter

975

00:36:41,750 --> 00:36:38,720

power and receiver sensitivity because

976

00:36:43,109 --> 00:36:41,760

you're definitely uh a photon starved in

977

00:36:44,470 --> 00:36:43,119

deep space optical communications you

978

00:36:46,390 --> 00:36:44,480

only have a few photons you're getting

979

00:36:49,910 --> 00:36:46,400

back to actually get the data back but

980

00:36:50,710 --> 00:36:49,920

also um as was mentioned pointing

981

00:36:52,710 --> 00:36:50,720

um

982

00:36:54,230 --> 00:36:52,720

is a huge challenge for laser common

983

00:36:57,349 --> 00:36:54,240

when you're talking about com

984

00:36:59,990 --> 00:36:57,359

communications from the moon or mars

985

00:37:02,790 --> 00:37:00,000

back to earth pointing and

986

00:37:05,430 --> 00:37:02,800

stability control is super critical um

987

00:37:06,790 --> 00:37:05,440

so we're hoping as part of the next

988

00:37:08,630 --> 00:37:06,800

discovery

989

00:37:10,870 --> 00:37:08,640

class mission in out of the science

990

00:37:13,829 --> 00:37:10,880

mission directorate to demonstrate deep

991

00:37:15,109 --> 00:37:13,839

space optical communications um on one

992

00:37:16,870 --> 00:37:15,119

of those missions which will be really

993

00:37:18,630 --> 00:37:16,880

exciting and is going to be required

994

00:37:20,630 --> 00:37:18,640

both for um

995

00:37:22,230 --> 00:37:20,640

you know we mentioned how much data is

996

00:37:24,310 --> 00:37:22,240

lost in space for earth orbiting

997

00:37:26,310 --> 00:37:24,320

spacecraft well there's even more data

998

00:37:28,150 --> 00:37:26,320

lost in space from our mars orbiting

999

00:37:30,870 --> 00:37:28,160

spacecraft i think it's going to take

1000

00:37:33,190 --> 00:37:30,880

many months to get the data back from um

1001
00:37:35,510 --> 00:37:33,200
from the pluto mission

1002
00:37:38,470 --> 00:37:35,520
and so deep space optical communications

1003
00:37:40,310 --> 00:37:38,480
offers you know our ability to get a lot

1004
00:37:41,990 --> 00:37:40,320
more data and a lot more

1005
00:37:44,310 --> 00:37:42,000
science return for the deep space

1006
00:37:46,310 --> 00:37:44,320
missions that we do

1007
00:37:47,510 --> 00:37:46,320
rich welly who is on our next panel has

1008
00:37:49,349 --> 00:37:47,520
a question

1009
00:37:51,589 --> 00:37:49,359
yes good morning i wanted to follow up

1010
00:37:53,510 --> 00:37:51,599
on the earlier question about launch uh

1011
00:37:55,829 --> 00:37:53,520
as a as a cubesat builder we're always

1012
00:37:57,750 --> 00:37:55,839
worried about access to space and in the

1013
00:37:59,510 --> 00:37:57,760

early days of the cubesat world it was

1014

00:38:00,870 --> 00:37:59,520

the the regular rights of space were not

1015

00:38:02,470 --> 00:38:00,880

as available as they are now and we

1016

00:38:04,950 --> 00:38:02,480

understand that we're along for the ride

1017

00:38:07,990 --> 00:38:04,960

we're we're there at the at the uh

1018

00:38:09,990 --> 00:38:08,000

uh you know uh at the grace of the of

1019

00:38:11,190 --> 00:38:10,000

the launch provider but i think part of

1020

00:38:12,790 --> 00:38:11,200

it is just getting the launch provider

1021

00:38:14,870 --> 00:38:12,800

comfortable with the idea that cubesats

1022

00:38:16,470 --> 00:38:14,880

can fly and do no harm and my question

1023

00:38:18,550 --> 00:38:16,480

is addressed to megan and scott who are

1024

00:38:20,470 --> 00:38:18,560

dealing with the launch do you see the

1025

00:38:21,990 --> 00:38:20,480

launch providers now as becoming fully

1026

00:38:24,470 --> 00:38:22,000

comfortable with this that that

1027

00:38:26,230 --> 00:38:24,480

rideshare will become very standardized

1028

00:38:30,390 --> 00:38:26,240

as we go forward that they're that this

1029

00:38:33,430 --> 00:38:31,349

well

1030

00:38:35,030 --> 00:38:33,440

i think right now you know there's

1031

00:38:36,710 --> 00:38:35,040

there's a lot of things that do concern

1032

00:38:38,230 --> 00:38:36,720

the primary payload so we are definitely

1033

00:38:40,310 --> 00:38:38,240

in a do no harm state when it comes to

1034

00:38:42,150 --> 00:38:40,320

cubesats and i think we'll continue to

1035

00:38:44,310 --> 00:38:42,160

do that as we move forward with ride

1036

00:38:46,390 --> 00:38:44,320

shares now as ride shares become more

1037

00:38:48,230 --> 00:38:46,400

predominant i think we'll get into a

1038

00:38:50,790 --> 00:38:48,240

pretty steady rhythm for what the

1039

00:38:52,950 --> 00:38:50,800

requirements are for launching and as

1040

00:38:55,109 --> 00:38:52,960

the commercial dedicated launch segment

1041

00:38:57,109 --> 00:38:55,119

opens up in the near term i think we're

1042

00:38:59,829 --> 00:38:57,119

going to see a little bit of a change in

1043

00:39:01,270 --> 00:38:59,839

how we approach our launch to space did

1044

00:39:02,870 --> 00:39:01,280

you see that just there yeah to add on

1045

00:39:04,870 --> 00:39:02,880

to that um

1046

00:39:07,430 --> 00:39:04,880

we've been slowly

1047

00:39:09,670 --> 00:39:07,440

improving the processes for evaluating

1048

00:39:11,430 --> 00:39:09,680

the uniqueness of each spacecraft and

1049

00:39:14,630 --> 00:39:11,440

that is starting to allow and the more

1050

00:39:16,630 --> 00:39:14,640

experience that these providers get the

1051

00:39:18,069 --> 00:39:16,640

easier it is for us to get comfortable

1052

00:39:20,230 --> 00:39:18,079

once they understand the data they're

1053

00:39:23,109 --> 00:39:20,240

looking at and so slowly we've been

1054

00:39:25,109 --> 00:39:23,119

chipping away at allowing cubesats to be

1055

00:39:26,870 --> 00:39:25,119

more and more intriguing with some

1056

00:39:28,630 --> 00:39:26,880

different capabilities

1057

00:39:30,470 --> 00:39:28,640

but it's still in the end there's a risk

1058

00:39:32,390 --> 00:39:30,480

calculus that has to be done

1059

00:39:34,550 --> 00:39:32,400

where you decide whether it's worth

1060

00:39:36,630 --> 00:39:34,560

taking the chance or not so do i think

1061

00:39:38,870 --> 00:39:36,640

we're going to see any rtgs on cubesats

1062

00:39:40,790 --> 00:39:38,880

anytime soon probably not but are we

1063

00:39:43,030 --> 00:39:40,800

going to be able to see things that

1064

00:39:45,430 --> 00:39:43,040

maybe have propulsion systems that are a

1065

00:39:47,030 --> 00:39:45,440

little more energetic absolutely i think

1066

00:39:49,030 --> 00:39:47,040

there's a variety of reasons why we all

1067

00:39:50,870 --> 00:39:49,040

want to do that for uh

1068

00:39:53,829 --> 00:39:50,880

for end of life mission per end of

1069

00:39:56,069 --> 00:39:53,839

mission purposes and also for uh for

1070

00:39:58,230 --> 00:39:56,079

avoidance of conjunctions but you know

1071

00:39:59,829 --> 00:39:58,240

slowly we have to we have to provide

1072

00:40:01,589 --> 00:39:59,839

enough compelling evidence to show that

1073

00:40:04,870 --> 00:40:01,599

this hardware doesn't represent an undue

1074

00:40:06,710 --> 00:40:04,880

risk and and we'll get there

1075

00:40:09,190 --> 00:40:06,720

once again if you're on the telephone uh

1076

00:40:12,230 --> 00:40:09,200

press star one to get into the question

1077

00:40:14,150 --> 00:40:12,240

queue and if you're online hashtag ask

1078

00:40:16,710 --> 00:40:14,160

nasa to get your question in and

1079

00:40:18,710 --> 00:40:16,720

kimberly do you have some more questions

1080

00:40:21,270 --> 00:40:18,720

i have a question for megan

1081

00:40:23,109 --> 00:40:21,280

when will cube the cubestats be released

1082

00:40:25,190 --> 00:40:23,119

will they be deployed all at once or

1083

00:40:27,510 --> 00:40:25,200

separately and how long will they remain

1084

00:40:28,710 --> 00:40:27,520

operational

1085

00:40:31,030 --> 00:40:28,720

so uh

1086

00:40:32,710 --> 00:40:31,040

so the process in which that your launch

1087

00:40:34,950 --> 00:40:32,720

standardly that the cubesats are

1088

00:40:37,270 --> 00:40:34,960

released after the primary payload so

1089

00:40:39,109 --> 00:40:37,280

again not to interfere

1090

00:40:40,550 --> 00:40:39,119

they're usually staged from their

1091

00:40:42,630 --> 00:40:40,560

deployment so they have a deployment

1092

00:40:45,829 --> 00:40:42,640

sequence so they're not launched all at

1093

00:40:47,270 --> 00:40:45,839

once in a large cloud

1094

00:40:49,190 --> 00:40:47,280

i'm sorry what was the last part of that

1095

00:40:51,589 --> 00:40:49,200

question

1096

00:40:53,589 --> 00:40:51,599

you completed two let's see how long

1097

00:40:56,390 --> 00:40:53,599

will they remain operational

1098

00:40:58,630 --> 00:40:56,400

so cubes their operational life varies

1099

00:41:00,470 --> 00:40:58,640

depending upon the internal components

1100

00:41:02,069 --> 00:41:00,480

the size of the spacecraft and what

1101

00:41:04,550 --> 00:41:02,079

their mission is

1102

00:41:08,230 --> 00:41:04,560

so on average we see cubesats last

1103

00:41:10,309 --> 00:41:08,240

anywhere from one to two years

1104

00:41:14,870 --> 00:41:10,319

just depending upon what their their

1105

00:41:17,990 --> 00:41:16,390

my next question

1106

00:41:19,750 --> 00:41:18,000

for scott

1107

00:41:21,910 --> 00:41:19,760

what resources are available to help a

1108

00:41:24,150 --> 00:41:21,920

new student team select and develop

1109

00:41:25,750 --> 00:41:24,160

their very first cubesat

1110

00:41:27,670 --> 00:41:25,760

hmm okay

1111

00:41:30,069 --> 00:41:27,680

um i i would i would think in the

1112

00:41:32,309 --> 00:41:30,079

academic community talking to your

1113

00:41:33,829 --> 00:41:32,319

to your colleagues from other schools

1114

00:41:35,270 --> 00:41:33,839

that's probably the first and foremost

1115

00:41:37,349 --> 00:41:35,280

thing that i would recommend there are a

1116

00:41:39,430 --> 00:41:37,359

lot of academic institutions that have

1117

00:41:42,069 --> 00:41:39,440

now gotten their feet wet and built

1118

00:41:44,309 --> 00:41:42,079

their first spacecraft and the cubesat

1119

00:41:47,190 --> 00:41:44,319

community academic community especially

1120

00:41:49,990 --> 00:41:47,200

is still a very tight-knit community and

1121

00:41:51,990 --> 00:41:50,000

folks are are more than willing to share

1122

00:41:54,630 --> 00:41:52,000

their experiences so that would be my my

1123

00:41:57,430 --> 00:41:54,640

first suggestion the other one is uh is

1124

00:41:59,990 --> 00:41:57,440

reach out to uh to industry

1125

00:42:01,910 --> 00:42:00,000

industry there there are a wide variety

1126
00:42:03,589 --> 00:42:01,920
of standard cubesat parts that are now

1127
00:42:06,150 --> 00:42:03,599
available that you can buy on the

1128
00:42:08,470 --> 00:42:06,160
internet um we have actually a new

1129
00:42:10,230 --> 00:42:08,480
industry has been created uh with the

1130
00:42:11,670 --> 00:42:10,240
small set movement and um there are

1131
00:42:13,589 --> 00:42:11,680
variety of companies around the country

1132
00:42:15,349 --> 00:42:13,599
around the world that sell these parts

1133
00:42:17,190 --> 00:42:15,359
and they are they're willing to provide

1134
00:42:20,390 --> 00:42:17,200
advice as well

1135
00:42:22,710 --> 00:42:20,400
i'd like that add to that

1136
00:42:25,829 --> 00:42:22,720
our program offers an opportunity for

1137
00:42:27,589 --> 00:42:25,839
universities to propose projects to nasa

1138
00:42:29,109 --> 00:42:27,599

it's called small sat technology

1139

00:42:30,309 --> 00:42:29,119

partnerships

1140

00:42:32,790 --> 00:42:30,319

and we're going to be doing this every

1141

00:42:34,550 --> 00:42:32,800

year university can propose a project

1142

00:42:37,270 --> 00:42:34,560

that they want to do in relation to

1143

00:42:38,069 --> 00:42:37,280

small spacecraft including cubesats

1144

00:42:40,630 --> 00:42:38,079

and

1145

00:42:43,030 --> 00:42:40,640

in addition to the award we make to them

1146

00:42:46,790 --> 00:42:43,040

we provide

1147

00:42:48,230 --> 00:42:46,800

up to one one person uh of nasa labor to

1148

00:42:50,790 --> 00:42:48,240

work with them so that they can

1149

00:42:52,870 --> 00:42:50,800

collaborate with nasa

1150

00:42:54,470 --> 00:42:52,880

and nasa gets the benefit of the fresh

1151

00:42:57,990 --> 00:42:54,480

ideas coming from the universities as

1152

00:43:03,270 --> 00:42:59,910

my last question

1153

00:43:05,030 --> 00:43:03,280

is general so i guess uh nasa or nro or

1154

00:43:06,870 --> 00:43:05,040

any of you guys could answer this how

1155

00:43:09,190 --> 00:43:06,880

long would it take a spacecraft this

1156

00:43:11,270 --> 00:43:09,200

size to go to the moon

1157

00:43:13,270 --> 00:43:11,280

that's a good question

1158

00:43:17,510 --> 00:43:13,280

i'll start yeah

1159

00:43:21,990 --> 00:43:18,630

how much

1160

00:43:23,589 --> 00:43:22,000

um

1161

00:43:25,270 --> 00:43:23,599

so yeah i can't really answer that

1162

00:43:26,630 --> 00:43:25,280

question without knowing how it's

1163

00:43:27,829 --> 00:43:26,640

getting there

1164

00:43:29,190 --> 00:43:27,839

different rockets have different

1165

00:43:31,589 --> 00:43:29,200

capabilities

1166

00:43:35,030 --> 00:43:31,599

and so depending upon how hard they push

1167

00:43:36,870 --> 00:43:35,040

it how much velocity they give to it

1168

00:43:38,390 --> 00:43:36,880

and how much it provides itself does it

1169

00:43:40,710 --> 00:43:38,400

have its own onboard propulsion system

1170

00:43:44,630 --> 00:43:40,720

can it propel itself and how robust is

1171

00:43:47,109 --> 00:43:44,640

that capability so it depends

1172

00:43:48,710 --> 00:43:47,119

just to add a little to that

1173

00:43:51,030 --> 00:43:48,720

because we've looked at really doing it

1174

00:43:53,190 --> 00:43:51,040

two different ways one is as

1175

00:43:54,390 --> 00:43:53,200

scott was saying it can ride along on

1176

00:43:56,150 --> 00:43:54,400

something already

1177

00:43:57,670 --> 00:43:56,160

on its way to the moon which makes it a

1178

00:43:59,910 --> 00:43:57,680

lot easier for for such a small

1179

00:44:02,150 --> 00:43:59,920

spacecraft then to get there we've also

1180

00:44:03,910 --> 00:44:02,160

looked uh at least in a preliminary way

1181

00:44:05,510 --> 00:44:03,920

at what it would take to

1182

00:44:07,750 --> 00:44:05,520

have a very small spacecraft with its

1183

00:44:09,589 --> 00:44:07,760

own propulsion system

1184

00:44:11,750 --> 00:44:09,599

orbiting out away from the earth out out

1185

00:44:14,230 --> 00:44:11,760

toward the moon uh in that kind of case

1186

00:44:15,430 --> 00:44:14,240

it might take maybe a year two years or

1187

00:44:17,510 --> 00:44:15,440

even longer

1188

00:44:19,030 --> 00:44:17,520

but there are cases where that might be

1189

00:44:20,309 --> 00:44:19,040

a very interesting type of mission that

1190

00:44:22,470 --> 00:44:20,319

could be done with an electric

1191

00:44:24,630 --> 00:44:22,480

propulsion system

1192

00:44:27,829 --> 00:44:24,640

a very low cost way of getting a small

1193

00:44:29,510 --> 00:44:27,839

payload to the moon so we're looking at

1194

00:44:32,069 --> 00:44:29,520

some more novel concepts like that as

1195

00:44:34,470 --> 00:44:33,109

okay

1196

00:44:35,910 --> 00:44:34,480

that's all the time we have for today

1197

00:44:37,910 --> 00:44:35,920

and i would like to thank our panel and

1198

00:44:41,109 --> 00:44:37,920

everyone who joined us today

1199

00:44:44,150 --> 00:44:41,119

our next briefing we'll discuss the five

1200

00:44:46,470 --> 00:44:44,160

nasa cubesat missions launching tomorrow

1201

00:44:49,349 --> 00:44:46,480

uh the united launch alliance atlas v

1202

00:44:52,069 --> 00:44:49,359

rocket is set to launch at 5 49 a.m

1203

00:44:54,550 --> 00:44:52,079

pacific time from vandenberg air force

1204

00:44:57,829 --> 00:44:54,560

base and our coverage on nasa television

1205

00:45:00,470 --> 00:44:57,839

will begin at 5 19 a.m pacific

1206

00:45:02,309 --> 00:45:00,480

8 19 a.m eastern time

1207

00:45:04,390 --> 00:45:02,319

this press conference will be available

1208

00:45:07,190 --> 00:45:04,400

in about an hour from now and for the

1209

00:45:11,829 --> 00:45:07,200

next 30 days for replay by calling

1210

00:45:15,670 --> 00:45:13,670

and you can find out more about nasa's

1211

00:45:16,710 --> 00:45:15,680

various cubesat programs and missions by