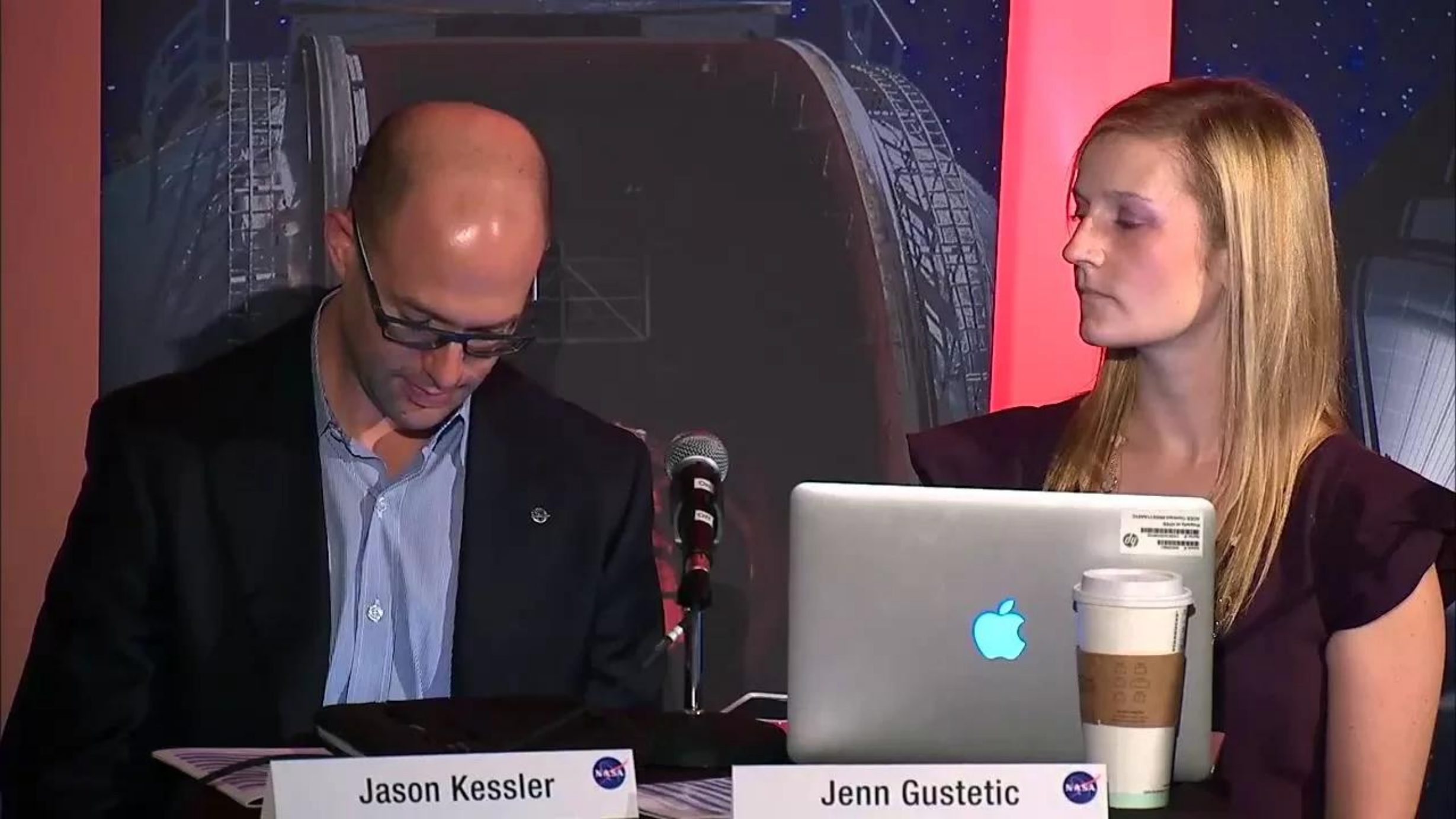
Jason Kessler
Jenn Gustetic

1
00:00:04,150 --> 00:00:02,149
here we are again at the partnership and

2
00:00:06,230 --> 00:00:04,160
participatory engagement session of the

3
00:00:08,950 --> 00:00:06,240
idea synthesis

4
00:00:10,870 --> 00:00:08,960
uh remind you to check out

5
00:00:13,830 --> 00:00:10,880
asteroid partners and

6
00:00:15,749 --> 00:00:13,840
join and follow the conversation online

7
00:00:17,830 --> 00:00:15,759
we've had some good really good

8
00:00:20,470 --> 00:00:17,840
conversations started already we're

9
00:00:23,189 --> 00:00:20,480
about to to move into our

10
00:00:25,349 --> 00:00:23,199
third and final section of

11
00:00:26,470 --> 00:00:25,359
this conversation before we then open it

12
00:00:27,509 --> 00:00:26,480
up into

13
00:00:33,990 --> 00:00:27,519

a

14
00:00:35,430 --> 00:00:34,000
who's going to be representing

15
00:00:37,510 --> 00:00:35,440
ecast

16
00:00:39,590 --> 00:00:37,520
and the expert in citizen assessment of

17
00:00:41,110 --> 00:00:39,600
science and technology

18
00:00:43,030 --> 00:00:41,120
david

19
00:00:44,950 --> 00:00:43,040
good morning

20
00:00:47,670 --> 00:00:44,960
my name is dave gustin and i'm here in

21
00:00:49,510 --> 00:00:47,680
tempe at arizona state university where

22
00:00:51,270 --> 00:00:49,520
i co-direct a research center called the

23
00:00:53,830 --> 00:00:51,280
consortium for science policy and

24
00:00:55,990 --> 00:00:53,840
outcomes or cspo

25
00:00:58,150 --> 00:00:56,000
in my remarks uh as was mentioned i'm

26
00:00:59,990 --> 00:00:58,160
representing a group called ecast the

27
00:01:03,590 --> 00:01:00,000
expert in citizen assessment of science

28
00:01:07,750 --> 00:01:05,750
ecast is a distributed network that

29
00:01:10,550 --> 00:01:07,760
brings together university-based

30
00:01:12,630 --> 00:01:10,560
research centers like cspo

31
00:01:15,109 --> 00:01:12,640
informal science education centers like

32
00:01:17,030 --> 00:01:15,119
the museum of science boston

33
00:01:19,190 --> 00:01:17,040
citizen science programs like science

34
00:01:20,950 --> 00:01:19,200
cheerleader and sci starter and

35
00:01:23,510 --> 00:01:20,960
nonpartisan policy think tanks like the

36
00:01:25,590 --> 00:01:23,520
woodrow wilson international center

37
00:01:27,510 --> 00:01:25,600
together we engage citizens on decision

38
00:01:28,789 --> 00:01:27,520

making related to science and technology

39
00:01:30,870 --> 00:01:28,799
policy

40
00:01:34,310 --> 00:01:30,880
ecast organizes deliberations among

41
00:01:37,190 --> 00:01:34,320
citizens to inform them about s p policy

42
00:01:39,350 --> 00:01:37,200
elicit their input reciprocally inform s

43
00:01:41,910 --> 00:01:39,360
and z policy makers

44
00:01:44,469 --> 00:01:41,920
ecast's methods are designed to enable

45
00:01:45,990 --> 00:01:44,479
participants to formulate and articulate

46
00:01:47,510 --> 00:01:46,000
their own questions

47
00:01:49,749 --> 00:01:47,520
so the policy makers may better

48
00:01:54,069 --> 00:01:49,759
understand and take into account public

49
00:01:57,270 --> 00:01:55,590
the grand challenge of the asteroid

50
00:02:00,069 --> 00:01:57,280
initiative the asteroid initiative

51
00:02:02,389 --> 00:02:00,079
addresses is find all asteroid threats

52
00:02:04,149 --> 00:02:02,399
to human populations and know what to do

53
00:02:05,510 --> 00:02:04,159
about them

54
00:02:07,910 --> 00:02:05,520
part of that challenge is also

55
00:02:10,070 --> 00:02:07,920
communication to engage in broader

56
00:02:11,990 --> 00:02:10,080
conversation with those who are not

57
00:02:14,550 --> 00:02:12,000
thinking of or not working on or not

58
00:02:16,309 --> 00:02:14,560
caring about such an initiative

59
00:02:17,910 --> 00:02:16,319
despite the clear articulation of the

60
00:02:19,350 --> 00:02:17,920
grand challenge

61
00:02:21,350 --> 00:02:19,360
there are values inherent in the

62
00:02:22,869 --> 00:02:21,360
question that are not completely owned

63
00:02:25,030 --> 00:02:22,879

by the current community of interest

64
00:02:28,710 --> 00:02:25,040
including advancing human space

65
00:02:30,470 --> 00:02:28,720
exploration expanding planetary defense

66
00:02:31,750 --> 00:02:30,480
anticipating spillover effects of

67
00:02:33,990 --> 00:02:31,760
technologies

68
00:02:37,589 --> 00:02:34,000
and charting the nation's future

69
00:02:40,390 --> 00:02:37,599
role in space thus statements like that

70
00:02:42,550 --> 00:02:40,400
in the august 17th washington post

71
00:02:44,869 --> 00:02:42,560
rarely has the agency proposed an idea

72
00:02:46,869 --> 00:02:44,879
so controversial among lawmakers

73
00:02:49,509 --> 00:02:46,879
so fraught with technical and scientific

74
00:02:51,270 --> 00:02:49,519
uncertainties and so hard to explain to

75
00:02:53,589 --> 00:02:51,280
ordinary people

76
00:02:56,390 --> 00:02:53,599
that suggests that a wide frame and a

77
00:03:01,430 --> 00:02:56,400
long duration public engagement process

78
00:03:05,030 --> 00:03:02,949
we think of this

79
00:03:07,190 --> 00:03:05,040
as taking into account what we call the

80
00:03:09,589 --> 00:03:07,200
life cycle of decision makers

81
00:03:11,990 --> 00:03:09,599
in which we consider a variety of roles

82
00:03:14,390 --> 00:03:12,000
that citizens perform in as well as a

83
00:03:16,390 --> 00:03:14,400
variety of decision makers and points of

84
00:03:18,710 --> 00:03:16,400
decision within society

85
00:03:20,390 --> 00:03:18,720
not just the official high-ranking and

86
00:03:22,869 --> 00:03:20,400
technical ones

87
00:03:25,750 --> 00:03:22,879
the grandest challenge is therefore to

88
00:03:27,670 --> 00:03:25,760

draw otherwise unengaged citizens into

89
00:03:29,910 --> 00:03:27,680
respectful multi-directional

90
00:03:31,030 --> 00:03:29,920
conversations about the asteroid

91
00:03:32,789 --> 00:03:31,040
initiative

92
00:03:34,869 --> 00:03:32,799
and enable them to learn about and make

93
00:03:39,670 --> 00:03:34,879
recommendations based on their own

94
00:03:43,509 --> 00:03:41,910
aspiring to this more active engaged

95
00:03:45,589 --> 00:03:43,519
role for citizens

96
00:03:47,910 --> 00:03:45,599
rather than just have them be passive

97
00:03:49,589 --> 00:03:47,920
understanders of science

98
00:03:52,070 --> 00:03:49,599
is part of a broader approach that we

99
00:03:53,910 --> 00:03:52,080
call anticipatory governance

100
00:03:55,030 --> 00:03:53,920
which involves in addition to public

101
00:03:57,509 --> 00:03:55,040
engagement

102
00:03:59,589 --> 00:03:57,519
open-ended approaches to foresight

103
00:04:01,110 --> 00:03:59,599
for example using scenarios rather than

104
00:04:03,429 --> 00:04:01,120
predictive modeling

105
00:04:05,270 --> 00:04:03,439
and thinking about plausibility

106
00:04:07,190 --> 00:04:05,280
other than just risk

107
00:04:09,350 --> 00:04:07,200
and integrating knowledge and approaches

108
00:04:10,949 --> 00:04:09,360
across disciplines for example by

109
00:04:13,110 --> 00:04:10,959
encouraging collaborations between

110
00:04:14,949 --> 00:04:13,120
natural scientists and engineers on one

111
00:04:17,030 --> 00:04:14,959
hand with social scientists and

112
00:04:19,509 --> 00:04:17,040
humanists on the other

113
00:04:21,430 --> 00:04:19,519

taking these aspects ensemble

114
00:04:23,430 --> 00:04:21,440
allow for the reflexive governance or

115
00:04:24,790 --> 00:04:23,440
management of a new science and

116
00:04:27,110 --> 00:04:24,800
technology

117
00:04:29,430 --> 00:04:27,120
in an informed and socially robust

118
00:04:31,350 --> 00:04:29,440
fashion

119
00:04:34,950 --> 00:04:31,360
a plan of action for increased public

120
00:04:37,270 --> 00:04:34,960
understanding of and engagement with

121
00:04:39,510 --> 00:04:37,280
the asteroid initiative could include

122
00:04:41,830 --> 00:04:39,520
soliciting informed structured feedback

123
00:04:44,390 --> 00:04:41,840
from citizens in multiple geographic

124
00:04:46,070 --> 00:04:44,400
regions creating long-term feedback

125
00:04:47,510 --> 00:04:46,080
opportunities for the long-duration

126
00:04:50,070 --> 00:04:47,520
asteroid initiative

127
00:04:52,150 --> 00:04:50,080
and providing an on-ramp for citizens to

128
00:04:57,110 --> 00:04:52,160
learn by doing through other related and

129
00:05:00,950 --> 00:04:58,950
this shift from public understanding to

130
00:05:02,469 --> 00:05:00,960
public engagement has already been

131
00:05:04,390 --> 00:05:02,479
happening in the science museum and

132
00:05:06,629 --> 00:05:04,400
science center community

133
00:05:08,230 --> 00:05:06,639
and it has involved contaminant shifts

134
00:05:09,510 --> 00:05:08,240
from public comment to citizen

135
00:05:11,350 --> 00:05:09,520
deliberation

136
00:05:13,510 --> 00:05:11,360
facilitated not only by a change in

137
00:05:15,270 --> 00:05:13,520
attitude and a change in understanding

138
00:05:22,550 --> 00:05:15,280

but of course also by a change in

139
00:05:27,189 --> 00:05:24,629
ecast's experience

140
00:05:29,350 --> 00:05:27,199
in this matter includes coordinating the

141
00:05:31,749 --> 00:05:29,360
us component of the recent worldwide

142
00:05:34,390 --> 00:05:31,759
views on biodiversity

143
00:05:36,790 --> 00:05:34,400
we organized in four cities in the u.s

144
00:05:39,510 --> 00:05:36,800
and coordinated through the danish board

145
00:05:41,749 --> 00:05:39,520
on technology with 25 countries and 4

146
00:05:43,830 --> 00:05:41,759
000 individuals around the world

147
00:05:44,790 --> 00:05:43,840
to provide input to the 11th council of

148
00:05:46,629 --> 00:05:44,800
parties

149
00:05:48,790 --> 00:05:46,639
of the united nations united nations

150
00:05:50,790 --> 00:05:48,800
convention on biological diversity that

151
00:05:53,110 --> 00:05:50,800
took place in october 12th

152
00:05:55,029 --> 00:05:53,120
in october 2012.

153
00:05:57,590 --> 00:05:55,039
beyond this procedural role

154
00:05:59,670 --> 00:05:57,600
best partners extended the conversation

155
00:06:01,830 --> 00:05:59,680
through creating an online poll that was

156
00:06:04,070 --> 00:06:01,840
hosted by the koshlands museum in

157
00:06:06,390 --> 00:06:04,080
washington dc and mirrored on the

158
00:06:08,629 --> 00:06:06,400
discovery magazine's website

159
00:06:10,309 --> 00:06:08,639
we created multi-sited

160
00:06:12,469 --> 00:06:10,319
and zoo projects

161
00:06:14,230 --> 00:06:12,479
and museum programs including

162
00:06:16,550 --> 00:06:14,240
biodiversity galleries and a

163
00:06:18,550 --> 00:06:16,560

downloadable biodiversity quest

164
00:06:20,550 --> 00:06:18,560
adaptable for use by informal science

165
00:06:24,710 --> 00:06:20,560
education institutions around the

166
00:06:29,110 --> 00:06:27,350
ecast wants to encourage nasa to include

167
00:06:31,510 --> 00:06:29,120
intensive and extensive public

168
00:06:34,309 --> 00:06:31,520
engagement as part of the core planning

169
00:06:35,990 --> 00:06:34,319
process the asteroid initiative in order

170
00:06:38,710 --> 00:06:36,000
for the agency to best be able to

171
00:06:40,870 --> 00:06:38,720
proactively design a program that will

172
00:06:42,950 --> 00:06:40,880
deliver on public values

173
00:06:45,590 --> 00:06:42,960
in ecast experience multi-sited

174
00:06:48,070 --> 00:06:45,600
engagement could be done at a relatively

175
00:06:49,990 --> 00:06:48,080
reasonable cost and it could be executed

176
00:06:51,830 --> 00:06:50,000
rapidly enough so as to inform the

177
00:06:53,749 --> 00:06:51,840
immediate mission planning that will

178
00:06:56,710 --> 00:06:53,759
follow the initial

179
00:06:58,230 --> 00:06:56,720
asteroid mission formulation review

180
00:07:00,230 --> 00:06:58,240
such work would also complement and

181
00:07:03,029 --> 00:07:00,240
extend the initial principles of the

182
00:07:04,550 --> 00:07:03,039
1958 national aeronautics and space act

183
00:07:05,909 --> 00:07:04,560
which directed nasa to share its

184
00:07:09,670 --> 00:07:05,919
knowledge to the widest possible

185
00:07:11,110 --> 00:07:09,680
practical uh widest extent practical

186
00:07:13,830 --> 00:07:11,120
in work

187
00:07:15,830 --> 00:07:13,840
such work can be pursued irrespective of

188
00:07:17,909 --> 00:07:15,840

the omb restrictions on public outreach

189
00:07:19,749 --> 00:07:17,919
activities because it is actually

190
00:07:23,270 --> 00:07:19,759
research intended to gather new and

191
00:07:28,309 --> 00:07:25,909
such citizen engagement studies build

192
00:07:30,550 --> 00:07:28,319
the capacity of citizens to interact in

193
00:07:32,550 --> 00:07:30,560
a more nuanced way that may also have

194
00:07:33,830 --> 00:07:32,560
significant value for nasa designers and

195
00:07:35,430 --> 00:07:33,840
engineers

196
00:07:37,670 --> 00:07:35,440
nasa may very well perform a more

197
00:07:39,749 --> 00:07:37,680
technically capable mission after such

198
00:07:41,589 --> 00:07:39,759
public interactions

199
00:07:43,589 --> 00:07:41,599
in the end the agency will also be

200
00:07:45,670 --> 00:07:43,599
better oriented to share resulting

201
00:07:47,749 --> 00:07:45,680
knowledge with the public because it is

202
00:07:50,710 --> 00:07:47,759
pursuing knowledge that the public has

203
00:07:53,189 --> 00:07:50,720
already found to be worthwhile

204
00:07:54,629 --> 00:07:53,199
and in the closing seconds just let me

205
00:07:57,110 --> 00:07:54,639
say

206
00:07:59,510 --> 00:07:57,120
someone more personally

207
00:08:02,469 --> 00:07:59,520
just the other day i was on the occasion

208
00:08:04,550 --> 00:08:02,479
of the 150th anniversary reading the

209
00:08:06,070 --> 00:08:04,560
gettysburg address to my seven-year-old

210
00:08:08,710 --> 00:08:06,080
son sam

211
00:08:11,430 --> 00:08:08,720
uh and sam in addition to being a

212
00:08:13,909 --> 00:08:11,440
budding historian as a budding scientist

213
00:08:15,749 --> 00:08:13,919

and very much loves

214
00:08:16,710 --> 00:08:15,759
space and space science

215
00:08:18,230 --> 00:08:16,720
and

216
00:08:19,350 --> 00:08:18,240
it seems to me that

217
00:08:22,710 --> 00:08:19,360
over its

218
00:08:23,990 --> 00:08:22,720
lifetime nasa has done a remarkable job

219
00:08:29,589 --> 00:08:24,000
of

220
00:08:31,029 --> 00:08:29,599
and ecast would like to see it be

221
00:08:34,709 --> 00:08:31,039
as best it can

222
00:08:36,310 --> 00:08:34,719
be by the people as well so thank you

223
00:08:38,709 --> 00:08:36,320
thank you david

224
00:08:40,790 --> 00:08:38,719
i i'll ask you if you wouldn't mind

225
00:08:42,230 --> 00:08:40,800
sticking on the line

226
00:08:44,149 --> 00:08:42,240
we're going to have a question period

227
00:08:45,910 --> 00:08:44,159
and discussion afterwards

228
00:08:49,590 --> 00:08:45,920
and i'm sure there'll be

229
00:08:51,110 --> 00:08:49,600
questions for you later on

230
00:08:52,070 --> 00:08:51,120
okay i'll try to do that thank you thank

231
00:08:54,230 --> 00:08:52,080
you

232
00:08:56,070 --> 00:08:54,240
we'll now move to margaret race from the

233
00:08:58,790 --> 00:08:56,080
seti institute who will also be joining

234
00:09:01,110 --> 00:08:58,800
us virtually

235
00:09:02,550 --> 00:09:01,120
hi there um can you hear me

236
00:09:03,509 --> 00:09:02,560
yes we can

237
00:09:06,550 --> 00:09:03,519
okay

238
00:09:08,389 --> 00:09:06,560

um i am also continuing the discussion

239
00:09:11,910 --> 00:09:08,399
of the uh

240
00:09:14,470 --> 00:09:11,920
private part of um

241
00:09:16,710 --> 00:09:14,480
the private income

242
00:09:18,550 --> 00:09:16,720
part that we're focused on so while the

243
00:09:23,910 --> 00:09:18,560
grand challenge

244
00:09:33,670 --> 00:09:24,790
okay

245
00:09:35,509 --> 00:09:33,680
so we're in the grand challenge and

246
00:09:38,550 --> 00:09:35,519
thinking about asteroids as both

247
00:09:40,150 --> 00:09:38,560
opportunities and threats and we are

248
00:09:41,990 --> 00:09:40,160
thinking about the elements that are

249
00:09:44,310 --> 00:09:42,000
related to success

250
00:09:45,430 --> 00:09:44,320
um just as we heard from the previous

251
00:09:47,110 --> 00:09:45,440
speaker

252
00:09:48,710 --> 00:09:47,120
there's a lot more than just science

253
00:09:51,190 --> 00:09:48,720
tech and technology that would

254
00:09:53,990 --> 00:09:51,200
contribute to this success

255
00:09:56,150 --> 00:09:54,000
and my talk is focusing on the parts

256
00:09:57,670 --> 00:09:56,160
that it also involves the public

257
00:10:00,070 --> 00:09:57,680
and thinking about these missions

258
00:10:02,470 --> 00:10:00,080
whether they are the resource missions

259
00:10:04,550 --> 00:10:02,480
getting passwords and redirecting them

260
00:10:06,630 --> 00:10:04,560
or the deflection ones

261
00:10:07,829 --> 00:10:06,640
i'm thinking about the risks to mission

262
00:10:09,750 --> 00:10:07,839
success

263
00:10:11,110 --> 00:10:09,760

and it's important to identify and

264
00:10:12,949 --> 00:10:11,120
acknowledge that there are other

265
00:10:15,829 --> 00:10:12,959
impediments than just the technical

266
00:10:17,030 --> 00:10:15,839
implants ones especially since we're

267
00:10:19,110 --> 00:10:17,040
starting to

268
00:10:21,430 --> 00:10:19,120
go down the

269
00:10:24,389 --> 00:10:21,440
road towards new activities beyond earth

270
00:10:26,470 --> 00:10:24,399
orbits that have really unique features

271
00:10:28,630 --> 00:10:26,480
and what i'm

272
00:10:30,630 --> 00:10:28,640
suggesting is a stepwise approach to

273
00:10:33,750 --> 00:10:30,640
research and technology development that

274
00:10:35,910 --> 00:10:33,760
also includes a systematic approach to

275
00:10:38,710 --> 00:10:35,920
looking at these other areas

276
00:10:40,710 --> 00:10:38,720
so next slide

277
00:10:43,269 --> 00:10:40,720
so when we think about what's involved

278
00:10:45,590 --> 00:10:43,279
in the challenge everyone is quite aware

279
00:10:47,910 --> 00:10:45,600
of the need to think about science

280
00:10:48,949 --> 00:10:47,920
whether it's observing and detecting

281
00:10:51,030 --> 00:10:48,959
or

282
00:10:53,430 --> 00:10:51,040
characterizing and modeling predicting

283
00:10:55,030 --> 00:10:53,440
where these past stories may be

284
00:10:57,350 --> 00:10:55,040
the technology whether it's a

285
00:10:59,670 --> 00:10:57,360
redirection technology a deflection

286
00:11:01,670 --> 00:10:59,680
technology or perhaps even exploitation

287
00:11:02,710 --> 00:11:01,680
capturing and using

288
00:11:04,470 --> 00:11:02,720

and

289
00:11:06,949 --> 00:11:04,480
we have to think about mission planning

290
00:11:08,949 --> 00:11:06,959
how do we design these missions when we

291
00:11:11,030 --> 00:11:08,959
think about the new technologies proof

292
00:11:13,910 --> 00:11:11,040
of concept whether we're talking about

293
00:11:16,949 --> 00:11:13,920
deflecting with gravity tractor or

294
00:11:19,190 --> 00:11:16,959
kinetic impactors or nuclear

295
00:11:21,110 --> 00:11:19,200
we also have to think about reducing the

296
00:11:22,550 --> 00:11:21,120
risks to the mission and then the final

297
00:11:24,790 --> 00:11:22,560
thing is these partnerships that we're

298
00:11:26,310 --> 00:11:24,800
talking about the collaboration

299
00:11:28,550 --> 00:11:26,320
and the other

300
00:11:31,190 --> 00:11:28,560
so on the right hand on my screen if you

301
00:11:33,910 --> 00:11:31,200
will look at where it says the

302
00:11:36,630 --> 00:11:33,920
science and technical experts

303
00:11:38,870 --> 00:11:36,640
the um generally what we know is that

304
00:11:41,030 --> 00:11:38,880
science and technical experts look at

305
00:11:42,870 --> 00:11:41,040
what to do and how to do it we take an

306
00:11:45,430 --> 00:11:42,880
incremental approach to things we do the

307
00:11:47,509 --> 00:11:45,440
research and technology development and

308
00:11:49,030 --> 00:11:47,519
in this case our success means either on

309
00:11:52,069 --> 00:11:49,040
the one hand we're going to save the

310
00:11:53,910 --> 00:11:52,079
world or develop new markets and develop

311
00:11:58,790 --> 00:11:53,920
new space

312
00:12:02,629 --> 00:12:00,310
that's how the scientists see it but

313
00:12:05,110 --> 00:12:02,639

here's how others see the risks the

314
00:12:07,509 --> 00:12:05,120
general public is the thing you want to

315
00:12:09,829 --> 00:12:07,519
do what not what are you going to do but

316
00:12:11,829 --> 00:12:09,839
you want to do what and they're asking

317
00:12:13,269 --> 00:12:11,839
questions about should we do it and what

318
00:12:16,230 --> 00:12:13,279
could go wrong

319
00:12:18,949 --> 00:12:16,240
and when we think about a natural threat

320
00:12:21,110 --> 00:12:18,959
or a phenomenon like asteroids there's a

321
00:12:23,750 --> 00:12:21,120
lot of partial or misinformation out

322
00:12:26,230 --> 00:12:23,760
there in some cases even disbelief

323
00:12:27,190 --> 00:12:26,240
belief or conspiracy theories

324
00:12:29,110 --> 00:12:27,200
and

325
00:12:31,910 --> 00:12:29,120
when we're talking about moving around

326
00:12:34,790 --> 00:12:31,920
asteroids there's the potential that we

327
00:12:36,870 --> 00:12:34,800
take a natural hazard of some sort and

328
00:12:39,430 --> 00:12:36,880
if we do something wrong it's seen as

329
00:12:41,750 --> 00:12:39,440
turning it into a man-made problem

330
00:12:43,750 --> 00:12:41,760
so what we're talking about is looking

331
00:12:46,550 --> 00:12:43,760
at the risk to the missions that are

332
00:12:48,389 --> 00:12:46,560
caused by responses and views

333
00:12:49,750 --> 00:12:48,399
and actions by the public and

334
00:12:52,150 --> 00:12:49,760
individuals

335
00:12:53,910 --> 00:12:52,160
because this is different than an

336
00:12:55,590 --> 00:12:53,920
individual making a decision to do

337
00:12:57,990 --> 00:12:55,600
something this is the government or

338
00:13:01,509 --> 00:12:58,000

commercial groups making a decision and

339
00:13:05,190 --> 00:13:01,519
the individual or the country or the

340
00:13:06,790 --> 00:13:05,200
societal group has little say in it

341
00:13:09,030 --> 00:13:06,800
they're asking questions about who's

342
00:13:10,790 --> 00:13:09,040
responsible for making these decisions

343
00:13:13,030 --> 00:13:10,800
do you have the authority to do it what

344
00:13:15,030 --> 00:13:13,040
are the geopolitics of it

345
00:13:17,590 --> 00:13:15,040
asking questions as we heard earlier is

346
00:13:19,750 --> 00:13:17,600
it legal is it in compliance with u.s

347
00:13:21,590 --> 00:13:19,760
law in this case

348
00:13:23,350 --> 00:13:21,600
have you done an environmental impact

349
00:13:25,269 --> 00:13:23,360
statement are you being transparent

350
00:13:27,190 --> 00:13:25,279
about the information what about

351
00:13:28,550 --> 00:13:27,200
lawsuits that might happen

352
00:13:31,190 --> 00:13:28,560
that would result in temporary

353
00:13:32,870 --> 00:13:31,200
restraining orders and

354
00:13:34,870 --> 00:13:32,880
holds on launches

355
00:13:37,910 --> 00:13:34,880
they're asking questions about is it

356
00:13:40,150 --> 00:13:37,920
right is it ethical are you playing god

357
00:13:42,949 --> 00:13:40,160
and there's a in some cases a distrust

358
00:13:45,430 --> 00:13:42,959
of technology what if things go wrong

359
00:13:48,310 --> 00:13:45,440
and so on and on you can come to these

360
00:13:50,790 --> 00:13:48,320
kind of questions that the public has

361
00:13:52,949 --> 00:13:50,800
what we do know from research on risk

362
00:13:54,949 --> 00:13:52,959
there's a repeated pattern and a process

363
00:13:55,990 --> 00:13:54,959

that we see of experts versus public

364
00:13:58,870 --> 00:13:56,000
views

365
00:14:00,389 --> 00:13:58,880
this isn't the same as ignorance or fear

366
00:14:01,910 --> 00:14:00,399
people

367
00:14:03,829 --> 00:14:01,920
we have to recognize the multiple

368
00:14:05,990 --> 00:14:03,839
publics that are involved and think

369
00:14:07,030 --> 00:14:06,000
about a stepwise approach to addressing

370
00:14:09,910 --> 00:14:07,040
these

371
00:14:11,750 --> 00:14:09,920
um i'm coming at it from my experiences

372
00:14:13,750 --> 00:14:11,760
on the mars sample return mission where

373
00:14:15,590 --> 00:14:13,760
the risks have to do with bringing back

374
00:14:17,910 --> 00:14:15,600
potential life from outer space that

375
00:14:19,590 --> 00:14:17,920
might be biohazardous and so we

376
00:14:22,310 --> 00:14:19,600
identified and addressed all of the

377
00:14:23,750 --> 00:14:22,320
potential mission impediments legal

378
00:14:24,949 --> 00:14:23,760
psychological

379
00:14:27,990 --> 00:14:24,959
psyc

380
00:14:30,310 --> 00:14:28,000
risk perception that people may have

381
00:14:33,030 --> 00:14:30,320
education and outreach that may help it

382
00:14:35,750 --> 00:14:33,040
and we took a systematic approach to

383
00:14:37,829 --> 00:14:35,760
exploring these new areas and in the

384
00:14:40,710 --> 00:14:37,839
case of the features of asteroids as

385
00:14:43,590 --> 00:14:40,720
threats and resources the public really

386
00:14:45,750 --> 00:14:43,600
is um generally uninformed about it they

387
00:14:47,430 --> 00:14:45,760
just don't know about it and they do

388
00:14:49,750 --> 00:14:47,440

have unique concerns

389
00:14:51,829 --> 00:14:49,760
and we're entering into new areas that

390
00:14:54,389 --> 00:14:51,839
have legal and policy questions that are

391
00:14:55,990 --> 00:14:54,399
beyond earth orbit

392
00:14:58,310 --> 00:14:56,000
if you look at the scientist and

393
00:15:00,150 --> 00:14:58,320
technology view of hazardous asteroids

394
00:15:03,110 --> 00:15:00,160
for instance and putting it in the

395
00:15:04,710 --> 00:15:03,120
context of the disaster and natural

396
00:15:06,470 --> 00:15:04,720
hazard literature

397
00:15:09,910 --> 00:15:06,480
what we're talking about is a general

398
00:15:12,230 --> 00:15:09,920
threat this general threat is looking at

399
00:15:13,910 --> 00:15:12,240
how do we detect them how do we deflect

400
00:15:16,629 --> 00:15:13,920
them and how do we make decisions about

401
00:15:18,150 --> 00:15:16,639
them the notion is once you can detect

402
00:15:21,110 --> 00:15:18,160
it and then you can decide if it's a

403
00:15:23,430 --> 00:15:21,120
threatening one you can go ahead and

404
00:15:25,269 --> 00:15:23,440
deflect it somehow and then make

405
00:15:27,670 --> 00:15:25,279
decisions at the world level that

406
00:15:30,550 --> 00:15:27,680
everybody is happy about and launch a

407
00:15:33,030 --> 00:15:30,560
mission and have an impact and success

408
00:15:35,269 --> 00:15:33,040
and if you're not successful um then you

409
00:15:37,670 --> 00:15:35,279
can address questions of evacuation or

410
00:15:39,509 --> 00:15:37,680
other actions that might be appropriate

411
00:15:41,910 --> 00:15:39,519
but another way to view it is a much

412
00:15:43,990 --> 00:15:41,920
more accurate one which is that we're

413
00:15:46,150 --> 00:15:44,000

really talking about more than just a

414
00:15:48,069 --> 00:15:46,160
general threat if you think about

415
00:15:49,910 --> 00:15:48,079
natural hazards there's a general threat

416
00:15:52,069 --> 00:15:49,920
of a flood or a hurricane but then a

417
00:15:55,110 --> 00:15:52,079
more specific one once that hurricane

418
00:15:57,509 --> 00:15:55,120
gets named as hurricane charles and then

419
00:16:00,150 --> 00:15:57,519
an imminent threat to the people when

420
00:16:02,949 --> 00:16:00,160
it's coming tomorrow and so we have to

421
00:16:05,430 --> 00:16:02,959
think about those levels of information

422
00:16:07,910 --> 00:16:05,440
as we go along because it's far far more

423
00:16:09,749 --> 00:16:07,920
complicated and in the public context

424
00:16:10,710 --> 00:16:09,759
what we see is that

425
00:16:11,430 --> 00:16:10,720
um

426
00:16:19,430 --> 00:16:11,440
the

427
00:16:21,749 --> 00:16:19,440
know things like orbital dynamics direct

428
00:16:24,470 --> 00:16:21,759
impacts keyhole deflection risk

429
00:16:26,550 --> 00:16:24,480
corridors deflection choices the time

430
00:16:29,269 --> 00:16:26,560
delays that we have between warnings

431
00:16:31,670 --> 00:16:29,279
false alarms having pseudo experts get

432
00:16:33,350 --> 00:16:31,680
involved is really something that we

433
00:16:35,910 --> 00:16:33,360
need to think about and there's of

434
00:16:39,430 --> 00:16:35,920
course geopolitics and decisions about

435
00:16:41,590 --> 00:16:39,440
what sizes of asteroids to reflect and

436
00:16:43,749 --> 00:16:41,600
whether nuclear might be involved so all

437
00:16:45,910 --> 00:16:43,759
of these questions are amenable to the

438
00:16:48,710 --> 00:16:45,920

kind of work that has been done in the

439
00:16:50,150 --> 00:16:48,720
risk literature all along

440
00:16:52,069 --> 00:16:50,160
for those involved in afterward

441
00:16:54,069 --> 00:16:52,079
redeflection and resources you're not

442
00:16:55,590 --> 00:16:54,079
out of the picture of some of these risk

443
00:16:58,230 --> 00:16:55,600
problems as well

444
00:17:00,230 --> 00:16:58,240
people are um asking questions about

445
00:17:02,150 --> 00:17:00,240
who's making decisions and why should

446
00:17:04,309 --> 00:17:02,160
you be able to use those things as we

447
00:17:06,870 --> 00:17:04,319
heard earlier there's questions about

448
00:17:08,949 --> 00:17:06,880
legal challenges and nepa

449
00:17:11,669 --> 00:17:08,959
ownership and claims to them private

450
00:17:12,789 --> 00:17:11,679
property outer space treaty issues and

451
00:17:14,230 --> 00:17:12,799
so on

452
00:17:15,750 --> 00:17:14,240
and if you look at the outer space

453
00:17:18,390 --> 00:17:15,760
treaty for instance

454
00:17:21,270 --> 00:17:18,400
all these years we've been in geospatial

455
00:17:23,029 --> 00:17:21,280
geostationary or a low earth orbit and

456
00:17:25,270 --> 00:17:23,039
those are where we've played out all the

457
00:17:27,189 --> 00:17:25,280
legal issues when you look at the moon

458
00:17:29,270 --> 00:17:27,199
and other celestial bodies on the right

459
00:17:31,270 --> 00:17:29,280
hand of this chart the only thing that

460
00:17:33,430 --> 00:17:31,280
has been involved has been

461
00:17:36,470 --> 00:17:33,440
issues of planetary protection and

462
00:17:38,789 --> 00:17:36,480
science missions so all of those issues

463
00:17:40,470 --> 00:17:38,799

that we're talking about come up brand

464
00:17:42,230 --> 00:17:40,480
new whether it's asteroid mining and

465
00:17:44,549 --> 00:17:42,240
redirecting

466
00:17:45,669 --> 00:17:44,559
questions of ownership claims retrieval

467
00:17:48,549 --> 00:17:45,679
and

468
00:17:50,710 --> 00:17:48,559
u.s law or whoever the agency is

469
00:17:52,789 --> 00:17:50,720
so whether we're looking at

470
00:17:54,470 --> 00:17:52,799
asteroid

471
00:17:57,350 --> 00:17:54,480
challenges as

472
00:18:00,470 --> 00:17:57,360
the opportunities of using the resources

473
00:18:02,070 --> 00:18:00,480
or the threats from deflection there are

474
00:18:04,630 --> 00:18:02,080
a lot of other elements beyond the

475
00:18:07,190 --> 00:18:04,640
science and technology so for the path

476
00:18:09,990 --> 00:18:07,200
forward it's important to also think

477
00:18:12,549 --> 00:18:10,000
about those and include them in the

478
00:18:14,549 --> 00:18:12,559
stepwise approach include research

479
00:18:16,950 --> 00:18:14,559
drawing from the experience of the

480
00:18:19,110 --> 00:18:16,960
natural hazard literature how do we link

481
00:18:21,510 --> 00:18:19,120
this in with the fema people and others

482
00:18:23,669 --> 00:18:21,520
who will be acting upon it this isn't a

483
00:18:25,750 --> 00:18:23,679
matter of just turning over saying i

484
00:18:29,110 --> 00:18:25,760
found it and now it's your turn

485
00:18:31,830 --> 00:18:29,120
we have to think about how to

486
00:18:35,830 --> 00:18:31,840
address these potential michelin mission

487
00:18:38,710 --> 00:18:35,840
impediments especially for the asteroid

488
00:18:40,470 --> 00:18:38,720

impact hazardous uh hazardous asteroid

489
00:18:42,710 --> 00:18:40,480
impact and deflection

490
00:18:45,669 --> 00:18:42,720
areas and there's a long lead time in

491
00:18:48,070 --> 00:18:45,679
this just as in any other research

492
00:18:49,909 --> 00:18:48,080
so it's important to look ahead we want

493
00:18:52,070 --> 00:18:49,919
to make sure that as we get to that

494
00:18:54,230 --> 00:18:52,080
point where we're ready to launch

495
00:18:56,070 --> 00:18:54,240
that we have provided more than just

496
00:18:58,390 --> 00:18:56,080
one-way information to the public that

497
00:19:00,710 --> 00:18:58,400
we really are addressing what they need

498
00:19:02,789 --> 00:19:00,720
to know in order to make that our

499
00:19:09,029 --> 00:19:02,799
success

500
00:19:13,430 --> 00:19:11,270
thank you margaret

501
00:19:16,549 --> 00:19:13,440
and i'd also like to invite you to stay

502
00:19:18,549 --> 00:19:16,559
on the line as uh we'll be moving into

503
00:19:21,350 --> 00:19:18,559
questions and discussion after

504
00:19:22,549 --> 00:19:21,360
uh we finish with our presentations if

505
00:19:25,990 --> 00:19:22,559
possible

506
00:19:39,430 --> 00:19:26,000
okay thank you next up is jill lapore

507
00:19:43,990 --> 00:19:41,750
all right um my name is joe lapore and

508
00:19:47,270 --> 00:19:44,000
uh i'll be giving a talk on space

509
00:19:48,310 --> 00:19:47,280
design's asteroid in this in initiative

510
00:19:51,190 --> 00:19:48,320
paper

511
00:19:53,110 --> 00:19:51,200
um although i'm giving the talk

512
00:19:55,669 --> 00:19:53,120
this presentation was uh developed and

513
00:19:59,350 --> 00:19:55,679

written by joseph m clay i just want to

514
00:20:03,909 --> 00:20:01,830
so i just start off uh and begin with

515
00:20:06,630 --> 00:20:03,919
the background on how we started

516
00:20:08,149 --> 00:20:06,640
preparing a paper for this in in

517
00:20:09,510 --> 00:20:08,159
initiative

518
00:20:11,669 --> 00:20:09,520
we um

519
00:20:14,149 --> 00:20:11,679
we looked at the forces on

520
00:20:16,070 --> 00:20:14,159
asteroids and

521
00:20:18,310 --> 00:20:16,080
in summary we're looking at

522
00:20:19,430 --> 00:20:18,320
we looked at gravity

523
00:20:21,190 --> 00:20:19,440
collisions

524
00:20:23,430 --> 00:20:21,200
radiation pressure

525
00:20:25,990 --> 00:20:23,440
solar wind and then there's there's some

526
00:20:28,390 --> 00:20:26,000
others possible magnetic mass

527
00:20:29,909 --> 00:20:28,400
mass loss and mass flow

528
00:20:31,510 --> 00:20:29,919
we're going to be focusing on the

529
00:20:34,630 --> 00:20:31,520
radiation pressure

530
00:20:35,590 --> 00:20:34,640
and the solar wind pressure

531
00:20:37,990 --> 00:20:35,600
and

532
00:20:39,590 --> 00:20:38,000
radiation pressure is comprised of

533
00:20:41,430 --> 00:20:39,600
two

534
00:20:44,549 --> 00:20:41,440
components

535
00:20:48,549 --> 00:20:44,559
first is the direct incident

536
00:20:51,750 --> 00:20:48,559
and the second is a yarkovsky of effect

537
00:20:54,630 --> 00:20:51,760
and the yorkovsky effect is a uh

538
00:20:56,470 --> 00:20:54,640

a directional radiation pressure

539
00:20:58,630 --> 00:20:56,480
it's caused by temperature variation

540
00:21:00,230 --> 00:20:58,640
from road rotation

541
00:21:03,350 --> 00:21:00,240
and it's a force that's acting on a

542
00:21:05,350 --> 00:21:03,360
rotating rotating body and it's uh it's

543
00:21:07,350 --> 00:21:05,360
caused by a difference in the direction

544
00:21:09,350 --> 00:21:07,360
of the absorption and the re

545
00:21:10,789 --> 00:21:09,360
emission of

546
00:21:13,029 --> 00:21:10,799
radiation

547
00:21:15,270 --> 00:21:13,039
so essentially there's a lag between the

548
00:21:18,230 --> 00:21:15,280
incoming radiation and the temperature

549
00:21:20,630 --> 00:21:18,240
change of the body and that causes it

550
00:21:24,470 --> 00:21:20,640
causes that force this is a very small

551
00:21:29,029 --> 00:21:26,870
so if we were to look at some simple re

552
00:21:30,870 --> 00:21:29,039
relations for the radiation pressure and

553
00:21:33,270 --> 00:21:30,880
the solar wind pressure

554
00:21:34,230 --> 00:21:33,280
the radiation pressure is a function of

555
00:21:35,590 --> 00:21:34,240
the

556
00:21:37,830 --> 00:21:35,600
solar flux

557
00:21:39,510 --> 00:21:37,840
and the speed of light

558
00:21:41,190 --> 00:21:39,520
and if you were to

559
00:21:43,510 --> 00:21:41,200
reduce that down

560
00:21:45,909 --> 00:21:43,520
you would find that the solar intensity

561
00:21:48,149 --> 00:21:45,919
will decrease with the inverse square of

562
00:21:51,669 --> 00:21:48,159
the distance from the sun's that's r1

563
00:21:55,430 --> 00:21:53,990

and similarly if you look at the solar

564
00:21:59,270 --> 00:21:55,440
wind pressure

565
00:22:01,350 --> 00:21:59,280
if you were to assume constant velocity

566
00:22:03,590 --> 00:22:01,360
uh you it's going to be a function of

567
00:22:05,909 --> 00:22:03,600
the uh solar wind

568
00:22:07,669 --> 00:22:05,919
density which is n and the speed

569
00:22:09,270 --> 00:22:07,679
and when you reduce that down you also

570
00:22:10,789 --> 00:22:09,280
find that that it's going to be a

571
00:22:11,590 --> 00:22:10,799
function of the

572
00:22:18,789 --> 00:22:11,600
the

573
00:22:22,630 --> 00:22:21,350
so if we were to use those two uh

574
00:22:24,789 --> 00:22:22,640
relations

575
00:22:26,950 --> 00:22:24,799
and plot out what the

576
00:22:29,190 --> 00:22:26,960
pressure would be at various distances

577
00:22:31,990 --> 00:22:29,200
from the sun this is what it would look

578
00:22:33,830 --> 00:22:32,000
like we have two curves one for the

579
00:22:37,350 --> 00:22:33,840
average radiation pressure

580
00:22:39,430 --> 00:22:37,360
one for the average solar wind pressure

581
00:22:41,110 --> 00:22:39,440
and you can see that the

582
00:22:43,510 --> 00:22:41,120
average radiation pressure starts out at

583
00:22:45,990 --> 00:22:43,520
about 80 newtons per square kilo

584
00:22:48,470 --> 00:22:46,000
kilometer so that's uh

585
00:22:52,070 --> 00:22:48,480
kilometers squared uh so it's acting

586
00:22:54,149 --> 00:22:52,080
over a very large large surface area

587
00:22:55,830 --> 00:22:54,159
and uh you we have listed you know

588
00:22:59,190 --> 00:22:55,840

several planet

589
00:23:01,669 --> 00:22:59,200
locations and also we have listed uh uh

590
00:23:03,750 --> 00:23:01,679
uh arrows and that's the asteroid that

591
00:23:06,149 --> 00:23:03,760
we're going to be focusing on and it's

592
00:23:09,430 --> 00:23:06,159
at a distance uh it varies from a

593
00:23:11,190 --> 00:23:09,440
distance of about 1.1 au to

594
00:23:14,710 --> 00:23:11,200
1.43

595
00:23:19,750 --> 00:23:17,110
and we're we're looking at uh eros

596
00:23:21,990 --> 00:23:19,760
because of its differences in exposed

597
00:23:23,830 --> 00:23:22,000
area so as you

598
00:23:25,430 --> 00:23:23,840
rotate it you can change what what its

599
00:23:27,029 --> 00:23:25,440
exposed area is

600
00:23:29,270 --> 00:23:27,039
and and therefore you can change the

601
00:23:36,950 --> 00:23:29,280
amount of force that's being applied to

602
00:23:40,310 --> 00:23:38,630
so looking at the control of the

603
00:23:41,510 --> 00:23:40,320
radiation pressure and the solar wind

604
00:23:44,870 --> 00:23:41,520
pressure

605
00:23:47,669 --> 00:23:44,880
changing the the area exposed towards

606
00:23:48,710 --> 00:23:47,679
the sun if you could theoretically

607
00:23:50,789 --> 00:23:48,720
rotate it

608
00:23:53,269 --> 00:23:50,799
and there's our test case arrows

609
00:23:54,950 --> 00:23:53,279
and we're looking at a a conservative

610
00:23:58,070 --> 00:23:54,960
minimum

611
00:23:59,750 --> 00:23:58,080
area exposed area of 98.5 square

612
00:24:02,390 --> 00:23:59,760
kilometers

613
00:24:03,269 --> 00:24:02,400

and a maximum area or a

614
00:24:08,950 --> 00:24:03,279
a

615
00:24:15,750 --> 00:24:08,960
374

616
00:24:19,510 --> 00:24:17,029
so

617
00:24:21,190 --> 00:24:19,520
pressure

618
00:24:22,789 --> 00:24:21,200
it has an added advantage that it can be

619
00:24:24,230 --> 00:24:22,799
controlled by changing the

620
00:24:26,950 --> 00:24:24,240
optical properties

621
00:24:28,950 --> 00:24:26,960
so if you had a a optical property on

622
00:24:32,789 --> 00:24:28,960
the surface that was black that would be

623
00:24:34,870 --> 00:24:32,799
having a solar absorptance of 1.0

624
00:24:36,710 --> 00:24:34,880
and if you were to able to change that

625
00:24:38,789 --> 00:24:36,720
and move off to the right on this on

626
00:24:40,630 --> 00:24:38,799
this chart you could go all the way to

627
00:24:42,870 --> 00:24:40,640
absorptivity of zero

628
00:24:44,149 --> 00:24:42,880
which would be a specular mirrored

629
00:24:46,549 --> 00:24:44,159
surface

630
00:24:48,470 --> 00:24:46,559
and and by doing that you would would be

631
00:24:50,789 --> 00:24:48,480
able to effectively change the magnitude

632
00:24:51,669 --> 00:24:50,799
of the radiation pressure by a factor of

633
00:24:54,950 --> 00:24:51,679
two

634
00:25:01,029 --> 00:24:54,960
so that's a a second way that we can con

635
00:25:05,510 --> 00:25:03,029
so if it now if we look at what the

636
00:25:08,710 --> 00:25:05,520
maximum forces are

637
00:25:10,390 --> 00:25:08,720
um at the apogee and the perigee of uh

638
00:25:12,870 --> 00:25:10,400

arrows

639
00:25:15,190 --> 00:25:12,880
what we look at here is the the the

640
00:25:18,789 --> 00:25:15,200
delta since we're able to uh or we can

641
00:25:20,470 --> 00:25:18,799
theoretically rotate the uh uh

642
00:25:21,510 --> 00:25:20,480
arrows we can change what its exposed

643
00:25:26,230 --> 00:25:21,520
area is

644
00:25:27,350 --> 00:25:26,240
we could see maximum differences of 1361

645
00:25:34,070 --> 00:25:27,360
newtons

646
00:25:37,269 --> 00:25:34,080
perigee

647
00:25:38,950 --> 00:25:37,279
and uh and and newton is about a quarter

648
00:25:41,350 --> 00:25:38,960
of a pounds just to give you what what

649
00:25:47,110 --> 00:25:41,360
kind of ballpark values we are look

650
00:25:49,990 --> 00:25:48,390
so now if we

651
00:25:53,750 --> 00:25:50,000
if we theoretically

652
00:25:55,430 --> 00:25:53,760
move the earth into the path of uh of

653
00:25:58,230 --> 00:25:55,440
arrows so this is not the actual

654
00:26:00,870 --> 00:25:58,240
location obviously but just

655
00:26:02,310 --> 00:26:00,880
theoretically if if we did that

656
00:26:04,630 --> 00:26:02,320
we're looking at what what would the

657
00:26:06,230 --> 00:26:04,640
delta v on the far left there the delta

658
00:26:08,710 --> 00:26:06,240
v b have to be

659
00:26:10,870 --> 00:26:08,720
in order to change the path of uh arrows

660
00:26:13,110 --> 00:26:10,880
so that it would would then then miss

661
00:26:14,950 --> 00:26:13,120
the earth so you need to change it by at

662
00:26:20,630 --> 00:26:14,960
least the the radius of the earth which

663
00:26:25,190 --> 00:26:21,430

so

664
00:26:28,070 --> 00:26:25,200
orbital mechanics we calculated that the

665
00:26:33,750 --> 00:26:28,080
delta v would have to be about 0.24

666
00:26:37,350 --> 00:26:36,070
so if you were used at 0.24 meters per

667
00:26:40,390 --> 00:26:37,360
second

668
00:26:43,590 --> 00:26:40,400
and then use the the uh the max force

669
00:26:45,350 --> 00:26:43,600
that we showed on uh or i showed on um

670
00:26:48,710 --> 00:26:45,360
slide seven

671
00:26:51,190 --> 00:26:48,720
and the the mass of uh arrows we can

672
00:26:54,710 --> 00:26:51,200
calculate how how long it would would

673
00:26:57,269 --> 00:26:54,720
take in order to a achieve this

674
00:26:58,390 --> 00:26:57,279
and it comes out to be about 37 400

675
00:27:00,710 --> 00:26:58,400
earth years

676
00:27:02,549 --> 00:27:00,720
so um obviously that doesn't look like a

677
00:27:04,070 --> 00:27:02,559
practical

678
00:27:06,149 --> 00:27:04,080
solution

679
00:27:08,230 --> 00:27:06,159
and even if you were to substitute in

680
00:27:11,669 --> 00:27:08,240
instead of the 1361 even if you were to

681
00:27:14,070 --> 00:27:11,679
use the uh the the maximum force

682
00:27:21,430 --> 00:27:14,080
um at the uh perigee we're still looking

683
00:27:25,269 --> 00:27:22,789
so now changing it up just a little bit

684
00:27:29,029 --> 00:27:25,279
we're talking about the partnerships uh

685
00:27:30,070 --> 00:27:29,039
or markets for uh part part partnerships

686
00:27:32,389 --> 00:27:30,080
and

687
00:27:34,389 --> 00:27:32,399
can markets be defined to support nasa's

688
00:27:37,269 --> 00:27:34,399

asteroid initiative

689
00:27:40,310 --> 00:27:37,279
so in a very very general sense uh

690
00:27:42,389 --> 00:27:40,320
technology drivers are uh needed

691
00:27:45,669 --> 00:27:42,399
to create technologies which would feed

692
00:27:48,389 --> 00:27:45,679
these these uh hypothetical mark markets

693
00:27:50,070 --> 00:27:48,399
and what we want to do is to

694
00:27:54,870 --> 00:27:50,080
determine what these

695
00:27:57,909 --> 00:27:55,669
so

696
00:27:59,669 --> 00:27:57,919
looking at kind of a simple view of

697
00:28:01,029 --> 00:27:59,679
nasa's current

698
00:28:02,470 --> 00:28:01,039
architecture

699
00:28:05,269 --> 00:28:02,480
you have the

700
00:28:06,230 --> 00:28:05,279
sls which is used to bring or orion out

701
00:28:10,789 --> 00:28:06,240
to a

702
00:28:13,750 --> 00:28:10,799
lunar dro distant retrograde orbit

703
00:28:17,669 --> 00:28:13,760
and you have a sep sepio which can be

704
00:28:19,269 --> 00:28:17,679
used to uh capture a small asteroid

705
00:28:20,710 --> 00:28:19,279
maybe 10 to 12

706
00:28:23,830 --> 00:28:20,720
meters in size

707
00:28:25,669 --> 00:28:23,840
and then use a solar electric propulsion

708
00:28:27,510 --> 00:28:25,679
to uh push it back

709
00:28:29,190 --> 00:28:27,520
where you could rendezvous with

710
00:28:33,029 --> 00:28:29,200
or orion

711
00:28:34,870 --> 00:28:33,039
and then you can do a um eva to uh

712
00:28:37,750 --> 00:28:34,880
to go off and uh

713
00:28:39,830 --> 00:28:37,760

examine and study it

714
00:28:41,510 --> 00:28:39,840
so what we're looking for are markets to

715
00:28:43,190 --> 00:28:41,520
fill this type of

716
00:28:45,990 --> 00:28:43,200
architecture

717
00:28:47,909 --> 00:28:46,000
okay almost done um and what one one of

718
00:28:50,310 --> 00:28:47,919
these would be that after this type of

719
00:28:52,549 --> 00:28:50,320
of a mission is complete then the

720
00:28:56,630 --> 00:28:52,559
asteroid is is left there at the lunar

721
00:29:00,950 --> 00:28:59,029
so in conclusion the radius of forces

722
00:29:03,190 --> 00:29:00,960
and solar wind forces are significant

723
00:29:04,310 --> 00:29:03,200
but not capable of full-scale asteroid

724
00:29:05,029 --> 00:29:04,320
deflection

725
00:29:06,389 --> 00:29:05,039
so

726
00:29:09,510 --> 00:29:06,399
other forces must be found to

727
00:29:11,350 --> 00:29:09,520
successfully deflect the asteroids

728
00:29:13,669 --> 00:29:11,360
and market forces could be used to guide

729
00:29:18,870 --> 00:29:13,679
the nasa architecture and perhaps a

730
00:29:18,880 --> 00:29:26,789
thank you joe all right thank you

731
00:29:31,990 --> 00:29:29,669
next up we have uh tony freeman joining

732
00:29:35,909 --> 00:29:32,000
us from the jet propulsion lab he will

733
00:29:38,710 --> 00:29:37,669
good morning i'm sorry i can't be there

734
00:29:41,669 --> 00:29:38,720
in person

735
00:29:43,510 --> 00:29:41,679
um it just wasn't able to fit that in

736
00:29:44,630 --> 00:29:43,520
the schedule this time

737
00:29:46,789 --> 00:29:44,640
but uh

738
00:29:48,870 --> 00:29:46,799

thank you for letting me uh

739
00:29:50,789 --> 00:29:48,880
talk about this topic

740
00:29:52,950 --> 00:29:50,799
so what i'm here to do this morning is

741
00:29:54,470 --> 00:29:52,960
actually solve all the problems of the

742
00:29:57,350 --> 00:29:54,480
asteroid initiative

743
00:29:59,830 --> 00:29:57,360
by bundling together all of the ideas

744
00:30:02,710 --> 00:29:59,840
into a coherent program

745
00:30:05,269 --> 00:30:02,720
that then nasa can defend

746
00:30:07,669 --> 00:30:05,279
and move forward with

747
00:30:10,310 --> 00:30:07,679
and i had helped put this together from

748
00:30:13,990 --> 00:30:10,320
bob cesserone and joel ceselle

749
00:30:18,070 --> 00:30:15,990
the programs are how

750
00:30:19,990 --> 00:30:18,080
nasa does business

751
00:30:22,470 --> 00:30:20,000
we have

752
00:30:24,389 --> 00:30:22,480
many programs within nasa within the

753
00:30:25,669 --> 00:30:24,399
human programs the

754
00:30:27,830 --> 00:30:25,679
the

755
00:30:29,830 --> 00:30:27,840
science programs and

756
00:30:31,590 --> 00:30:29,840
earth sciences in particular living with

757
00:30:33,750 --> 00:30:31,600
the star for example

758
00:30:40,149 --> 00:30:33,760
and the astro asteroid initiative is

759
00:30:44,950 --> 00:30:42,549
so here's the list of programs that we

760
00:30:47,510 --> 00:30:44,960
pulled together that showed some of the

761
00:30:49,669 --> 00:30:47,520
amazing programs that nasa does

762
00:30:52,470 --> 00:30:49,679
some of them like the mars program

763
00:30:54,710 --> 00:30:52,480

were voted the most successful program

764
00:30:57,750 --> 00:30:54,720
in the u.s government

765
00:30:59,509 --> 00:30:57,760
that's hard to imagine but uh

766
00:31:00,950 --> 00:30:59,519
that a nasa program would be judged that

767
00:31:02,630 --> 00:31:00,960
way but you know

768
00:31:04,789 --> 00:31:02,640
we do a pretty good job at this

769
00:31:08,149 --> 00:31:04,799
particular

770
00:31:12,789 --> 00:31:10,310
but there is no current overarching nasa

771
00:31:14,149 --> 00:31:12,799
program that's targeted specifically at

772
00:31:16,149 --> 00:31:14,159
small bodies

773
00:31:19,110 --> 00:31:16,159
whether that's asteroids or other bodies

774
00:31:21,669 --> 00:31:19,120
like comets the closest we get is the

775
00:31:24,549 --> 00:31:21,679
near-earth object observation program

776
00:31:28,149 --> 00:31:24,559
which is great but you know it's more or

777
00:31:29,750 --> 00:31:28,159
less a stand-alone activity

778
00:31:30,789 --> 00:31:29,760
so who would be the stakeholders for a

779
00:31:32,950 --> 00:31:30,799
program

780
00:31:35,830 --> 00:31:32,960
well the science community

781
00:31:38,149 --> 00:31:35,840
uh human space flight who are targeting

782
00:31:39,669 --> 00:31:38,159
asteroids as a destination

783
00:31:42,230 --> 00:31:39,679
uh the commercial

784
00:31:43,990 --> 00:31:42,240
world with space resources and then as

785
00:31:47,190 --> 00:31:44,000
we've seen in some of the other talks

786
00:31:49,029 --> 00:31:47,200
planetary protection

787
00:31:51,110 --> 00:31:49,039
it's pretty easy to map

788
00:31:52,950 --> 00:31:51,120

the initiative

789
00:31:55,750 --> 00:31:52,960
activities into

790
00:31:57,350 --> 00:31:55,760
a traditional program structure with

791
00:32:00,710 --> 00:31:57,360
advanced studies

792
00:32:02,710 --> 00:32:00,720
technology development robotic missions

793
00:32:05,029 --> 00:32:02,720
ground-based observations

794
00:32:06,630 --> 00:32:05,039
crude operations on the manned side

795
00:32:12,310 --> 00:32:06,640
commercialization

796
00:32:16,630 --> 00:32:14,389
so what would the objectives be well you

797
00:32:19,509 --> 00:32:16,640
could argue about this for days and i'm

798
00:32:21,269 --> 00:32:19,519
sure as nasa set up a program structure

799
00:32:22,950 --> 00:32:21,279
there would be arguments for days about

800
00:32:24,630 --> 00:32:22,960
exactly what the wording was exactly

801
00:32:26,389 --> 00:32:24,640
what the objectives were

802
00:32:28,549 --> 00:32:26,399
but it would be something like

803
00:32:31,350 --> 00:32:28,559
increasing the opportunities for human

804
00:32:33,110 --> 00:32:31,360
space exploration beyond earth orbit

805
00:32:34,470 --> 00:32:33,120
along the way to mars

806
00:32:37,029 --> 00:32:34,480
protecting the earth from future

807
00:32:39,269 --> 00:32:37,039
asteroid impacts and fostering a new

808
00:32:41,669 --> 00:32:39,279
commercial space business that uses the

809
00:32:43,750 --> 00:32:41,679
resources that these asteroids represent

810
00:32:46,149 --> 00:32:43,760
with the u.s industry leading the way

811
00:32:47,990 --> 00:32:46,159
and advancing key space technologies

812
00:32:50,310 --> 00:32:48,000
essential for the future and if

813
00:32:52,070 --> 00:32:50,320

something like that could be agreed on a

814
00:32:54,549 --> 00:32:52,080
lot of decisions become very easy

815
00:32:57,750 --> 00:32:54,559
afterwards

816
00:33:00,389 --> 00:32:57,760
to look at the priorities you could take

817
00:33:01,990 --> 00:33:00,399
a sieve like this one which represents

818
00:33:05,269 --> 00:33:02,000
on the left-hand side

819
00:33:07,750 --> 00:33:05,279
all of the rfi inputs that

820
00:33:09,909 --> 00:33:07,760
bounded into ground-based observations

821
00:33:12,630 --> 00:33:09,919
and technologies and science and

822
00:33:13,830 --> 00:33:12,640
partnerships and different widgets and

823
00:33:15,909 --> 00:33:13,840
payloads

824
00:33:18,310 --> 00:33:15,919
different ideas for missions and you

825
00:33:20,389 --> 00:33:18,320
could bundle all of that together in a

826
00:33:23,990 --> 00:33:20,399
road mapping activity that used

827
00:33:27,110 --> 00:33:24,000
something like the jpl18 to brainstorm

828
00:33:29,909 --> 00:33:27,120
analyze prioritize and then synthesize

829
00:33:32,230 --> 00:33:29,919
options that were highest payoff

830
00:33:33,269 --> 00:33:32,240
for the stakeholder community and then

831
00:33:35,430 --> 00:33:33,279
examine

832
00:33:37,990 --> 00:33:35,440
the space components of those in more

833
00:33:40,630 --> 00:33:38,000
detail using something like our tmx

834
00:33:43,750 --> 00:33:40,640
which does a very good job of point

835
00:33:48,070 --> 00:33:45,830
so lots of technologies i'm not going to

836
00:33:50,230 --> 00:33:48,080
list all of them off but obviously solar

837
00:33:53,110 --> 00:33:50,240
electric propulsion is on a lot of

838
00:33:55,909 --> 00:33:53,120

people's minds robotics and autonomous

839
00:33:58,310 --> 00:33:55,919
systems the kind of sensors we need

840
00:34:01,190 --> 00:33:58,320
there's an underlying base of technology

841
00:34:03,509 --> 00:34:01,200
required and most programs have that

842
00:34:05,509 --> 00:34:03,519
or they go to the office of the chief

843
00:34:07,590 --> 00:34:05,519
technologist and say here are our

844
00:34:09,669 --> 00:34:07,600
requirements defined to meet these

845
00:34:11,909 --> 00:34:09,679
program needs and

846
00:34:14,950 --> 00:34:11,919
please implement a technology program

847
00:34:17,430 --> 00:34:14,960
that that addresses that

848
00:34:19,430 --> 00:34:17,440
another advantage to to

849
00:34:21,589 --> 00:34:19,440
having a program structure is you get

850
00:34:23,430 --> 00:34:21,599
out of the the lottery game

851
00:34:25,190 --> 00:34:23,440
if you look at the missions listed here

852
00:34:28,550 --> 00:34:25,200
that are nasa

853
00:34:29,750 --> 00:34:28,560
either apl or guarded or jpl

854
00:34:31,669 --> 00:34:29,760
they're either

855
00:34:34,230 --> 00:34:31,679
when they addressed an asteroid or a

856
00:34:37,430 --> 00:34:34,240
comet objective it was done as a very

857
00:34:39,190 --> 00:34:37,440
secondary or tertiary science

858
00:34:41,990 --> 00:34:39,200
objective along the way to the main

859
00:34:44,950 --> 00:34:42,000
target or it was done through the the

860
00:34:47,109 --> 00:34:44,960
competition of the discovery and new

861
00:34:50,069 --> 00:34:47,119
horizons programs

862
00:34:51,829 --> 00:34:50,079
and that's great and that asteroid

863
00:34:54,230 --> 00:34:51,839

science has done pretty well over the

864
00:34:56,790 --> 00:34:54,240
years but if you talk to the folks who

865
00:34:59,190 --> 00:34:56,800
work in venus science in the planetary

866
00:35:01,750 --> 00:34:59,200
world they haven't won the lottery ever

867
00:35:03,589 --> 00:35:01,760
on discovery and new frontiers we

868
00:35:04,870 --> 00:35:03,599
haven't had a venus mission since

869
00:35:07,349 --> 00:35:04,880
magellan

870
00:35:09,829 --> 00:35:07,359
and past success is no indicator of

871
00:35:12,310 --> 00:35:09,839
future performance as i'm sure most of

872
00:35:14,550 --> 00:35:12,320
you are aware so there's no guarantee

873
00:35:15,750 --> 00:35:14,560
that you'll win a discovery or new

874
00:35:18,069 --> 00:35:15,760
frontiers

875
00:35:20,550 --> 00:35:18,079
competition with an asteroid mission in

876
00:35:22,790 --> 00:35:20,560
the next 20 years so it could be a long

877
00:35:24,630 --> 00:35:22,800
time before we see another asteroid

878
00:35:27,270 --> 00:35:24,640
mission in the competed world

879
00:35:29,430 --> 00:35:27,280
in a program structure you get to define

880
00:35:32,470 --> 00:35:29,440
your requirements have some work that's

881
00:35:35,750 --> 00:35:32,480
assigned some work that's competed and

882
00:35:37,510 --> 00:35:35,760
it's much easier to get that addressed

883
00:35:39,190 --> 00:35:37,520
the items in red are all the

884
00:35:41,910 --> 00:35:39,200
international missions that we could

885
00:35:44,550 --> 00:35:41,920
identify that addressed

886
00:35:46,069 --> 00:35:44,560
some of the objectives of asteroids and

887
00:35:48,470 --> 00:35:46,079
other small bodies

888
00:35:49,990 --> 00:35:48,480

and i have to say that nasa involvement

889
00:35:52,069 --> 00:35:50,000
in these is

890
00:35:54,069 --> 00:35:52,079
at best minimal

891
00:35:56,069 --> 00:35:54,079
it's usually one scientist or two

892
00:35:57,750 --> 00:35:56,079
scientists on the science team

893
00:35:59,990 --> 00:35:57,760
who are you know communicating with the

894
00:36:02,230 --> 00:36:00,000
rest of the community but

895
00:36:03,349 --> 00:36:02,240
the the the missions don't get to

896
00:36:06,390 --> 00:36:03,359
address

897
00:36:09,750 --> 00:36:06,400
major objectives for a program which

898
00:36:11,589 --> 00:36:09,760
would would be beneficial

899
00:36:13,030 --> 00:36:11,599
i have to say the ground-based community

900
00:36:15,829 --> 00:36:13,040
does a lot better job of this they

901
00:36:17,990 --> 00:36:15,839
communicate quite well across the

902
00:36:20,069 --> 00:36:18,000
international community and their

903
00:36:21,990 --> 00:36:20,079
commercial involvement as we we've

904
00:36:23,750 --> 00:36:22,000
learned in this workshop

905
00:36:25,670 --> 00:36:23,760
that seems to be working pretty well but

906
00:36:29,030 --> 00:36:25,680
i think it would still be better bound

907
00:36:32,790 --> 00:36:31,349
one objective that you might identify

908
00:36:35,910 --> 00:36:32,800
for a program

909
00:36:38,790 --> 00:36:35,920
is an outpost for a translunar asteroid

910
00:36:40,950 --> 00:36:38,800
where you take the asteroid and

911
00:36:43,510 --> 00:36:40,960
if people go to it and provide

912
00:36:46,390 --> 00:36:43,520
capability and leave it there in place

913
00:36:47,270 --> 00:36:46,400

for others to use they are then entitled

914
00:36:49,750 --> 00:36:47,280
to

915
00:36:51,430 --> 00:36:49,760
a use of some of the resources that are

916
00:36:53,910 --> 00:36:51,440
available there which include the

917
00:36:56,870 --> 00:36:53,920
material on the asteroid for either

918
00:36:59,910 --> 00:36:56,880
science use or for commercial use or to

919
00:37:00,950 --> 00:36:59,920
demonstrate a new technology that could

920
00:37:05,109 --> 00:37:00,960
advance

921
00:37:08,950 --> 00:37:06,829
most programs have

922
00:37:09,990 --> 00:37:08,960
commercialization arms and that's

923
00:37:11,670 --> 00:37:10,000
usually done through the

924
00:37:13,990 --> 00:37:11,680
commercialization

925
00:37:18,790 --> 00:37:14,000
commercial technology offices at the

926
00:37:20,470 --> 00:37:18,800
field centers or within nasa itself

927
00:37:23,109 --> 00:37:20,480
and then programs have education and

928
00:37:24,470 --> 00:37:23,119
public outreach where it's a coherent

929
00:37:26,790 --> 00:37:24,480
strategy again

930
00:37:28,310 --> 00:37:26,800
i hate to bring it back to mars but the

931
00:37:31,030 --> 00:37:28,320
mars rover

932
00:37:33,510 --> 00:37:31,040
outreach has been widely praised

933
00:37:35,030 --> 00:37:33,520
it's part of the mars program

934
00:37:36,550 --> 00:37:35,040
and it's

935
00:37:39,910 --> 00:37:36,560
it's basically

936
00:37:41,510 --> 00:37:39,920
a planned activity that supports the

937
00:37:43,190 --> 00:37:41,520
missions and the science and the

938
00:37:46,950 --> 00:37:43,200

technology development

939
00:37:48,710 --> 00:37:46,960
all as one coherent package

940
00:37:51,349 --> 00:37:48,720
and then finally the missing piece in

941
00:37:53,430 --> 00:37:51,359
the initiative was science

942
00:37:55,510 --> 00:37:53,440
nothing wrong with that nasa programs do

943
00:37:57,990 --> 00:37:55,520
have

944
00:38:00,630 --> 00:37:58,000
elements that are independent of science

945
00:38:03,589 --> 00:38:00,640
but there's enough science going on in

946
00:38:05,589 --> 00:38:03,599
small bodies and asteroids in particular

947
00:38:07,990 --> 00:38:05,599
that you could bundle that in

948
00:38:10,390 --> 00:38:08,000
under the auspices of a program

949
00:38:12,470 --> 00:38:10,400
and steer some of those science

950
00:38:15,270 --> 00:38:12,480
opportunities towards

951
00:38:19,750 --> 00:38:15,280
advancing the overall objectives of an

952
00:38:23,589 --> 00:38:22,230
so i think that's the

953
00:38:25,430 --> 00:38:23,599
the conclusion

954
00:38:27,750 --> 00:38:25,440
of my talk is basically this would all

955
00:38:30,390 --> 00:38:27,760
be very nicely wrapped up in a bow and a

956
00:38:33,349 --> 00:38:30,400
program it's what nasa knows how to do

957
00:38:35,430 --> 00:38:33,359
and it also gives you a line item in the

958
00:38:38,150 --> 00:38:35,440
budget that you can defend

959
00:38:39,990 --> 00:38:38,160
to omb and to congress and to the

960
00:38:43,349 --> 00:38:40,000
national academy and

961
00:38:44,870 --> 00:38:43,359
whoever else has an interest in that

962
00:38:51,109 --> 00:38:44,880
thank you

963
00:38:54,950 --> 00:38:52,710

and if you two wouldn't mind stink

964
00:38:57,349 --> 00:38:54,960
sticking on the line if possible to uh

965
00:38:58,550 --> 00:38:57,359
be able to join in uh answering

966
00:39:01,270 --> 00:38:58,560
questions as they come up in the

967
00:39:02,710 --> 00:39:01,280
discussion sure i'd be happy to do so

968
00:39:05,670 --> 00:39:02,720
very good thank you

969
00:39:07,910 --> 00:39:05,680
uh and our last presenter um jean-claude

970
00:39:08,950 --> 00:39:07,920
piude representing the canadian space

971
00:39:15,030 --> 00:39:08,960
agency

972
00:39:20,870 --> 00:39:16,470
okay

973
00:39:24,790 --> 00:39:22,790
and just to say i'm replacing a

974
00:39:25,829 --> 00:39:24,800
christian language that prepared the

975
00:39:27,670 --> 00:39:25,839
slide and

976
00:39:29,430 --> 00:39:27,680
he was participating to the last version

977
00:39:31,990 --> 00:39:29,440
of the workshop but was not able to come

978
00:39:34,470 --> 00:39:32,000
this time

979
00:39:36,710 --> 00:39:34,480
so we the first i said 30 years of

980
00:39:38,310 --> 00:39:36,720
suspiration i will say

981
00:39:40,150 --> 00:39:38,320
more like this 50 years of this

982
00:39:43,030 --> 00:39:40,160
exploration in canada we started our

983
00:39:44,630 --> 00:39:43,040
space program 50 years ago and and it

984
00:39:46,550 --> 00:39:44,640
was interesting the discussion on

985
00:39:48,230 --> 00:39:46,560
commercial activities

986
00:39:50,470 --> 00:39:48,240
i think space exploration is happening

987
00:39:53,349 --> 00:39:50,480
the the way it's a new frontier and in

988
00:39:55,829 --> 00:39:53,359

canada when we started 50 years ago

989
00:39:58,390 --> 00:39:55,839
to send something in space it creates

990
00:40:00,470 --> 00:39:58,400
now a space economy in canada like

991
00:40:03,349 --> 00:40:00,480
mainland satcom

992
00:40:04,870 --> 00:40:03,359
navigation and uh earth observation but

993
00:40:06,710 --> 00:40:04,880
this is really because the government

994
00:40:08,150 --> 00:40:06,720
started and said okay we want to explore

995
00:40:10,630 --> 00:40:08,160
space that

996
00:40:13,270 --> 00:40:10,640
this industry exists today and so when

997
00:40:15,829 --> 00:40:13,280
we talk about space exploration today we

998
00:40:18,390 --> 00:40:15,839
are now building the economy of tomorrow

999
00:40:21,670 --> 00:40:18,400
uh by doing the exploration and going uh

1000
00:40:23,750 --> 00:40:21,680
we are in leo uh we go and we go uh

1001
00:40:26,710 --> 00:40:23,760
beyond earth orbit so this is an

1002
00:40:28,790 --> 00:40:26,720
important aspect but more recently our

1003
00:40:30,470 --> 00:40:28,800
exploration has been focusing on on a

1004
00:40:33,430 --> 00:40:30,480
space robotic

1005
00:40:35,750 --> 00:40:33,440
vision system and also contribution to a

1006
00:40:38,230 --> 00:40:35,760
science mission especially for mars and

1007
00:40:40,390 --> 00:40:38,240
uh and semester with mission and space

1008
00:40:42,550 --> 00:40:40,400
astronomy is also a strong focus for us

1009
00:40:44,710 --> 00:40:42,560
so

1010
00:40:46,470 --> 00:40:44,720
the international context is important

1011
00:40:48,550 --> 00:40:46,480
also uh

1012
00:40:50,069 --> 00:40:48,560
the from a human exploration point of

1013
00:40:52,309 --> 00:40:50,079

view uh

1014
00:40:53,910 --> 00:40:52,319
since a few years there is a discussion

1015
00:40:56,390 --> 00:40:53,920
and

1016
00:40:57,910 --> 00:40:56,400
some of you

1017
00:41:00,069 --> 00:40:57,920
have been participating and know about

1018
00:41:00,950 --> 00:41:00,079
the global expression strategy that

1019
00:41:03,829 --> 00:41:00,960
was

1020
00:41:05,430 --> 00:41:03,839
created or written and it's interesting

1021
00:41:07,430 --> 00:41:05,440
it was started

1022
00:41:09,990 --> 00:41:07,440
after the the nasa's announcement of the

1023
00:41:12,150 --> 00:41:10,000
moon uh return and uh our u.s

1024
00:41:14,950 --> 00:41:12,160
announcement of the moon return and the

1025
00:41:18,309 --> 00:41:14,960
international uh community was uh

1026
00:41:19,750 --> 00:41:18,319
asked to to participate and uh so we

1027
00:41:21,829 --> 00:41:19,760
at that point was the international

1028
00:41:23,589 --> 00:41:21,839
community so key moon is good but mars

1029
00:41:25,990 --> 00:41:23,599
and asteroids and lagrange planet are

1030
00:41:27,990 --> 00:41:26,000
are so good and so now that's okay we

1031
00:41:30,390 --> 00:41:28,000
will include everything in the in this

1032
00:41:32,069 --> 00:41:30,400
global expression strategy and one of

1033
00:41:34,150 --> 00:41:32,079
the result was also the creation of the

1034
00:41:37,030 --> 00:41:34,160
isic the international specification

1035
00:41:38,150 --> 00:41:37,040
coordination grew that again is focusing

1036
00:41:39,990 --> 00:41:38,160
uh

1037
00:41:42,150 --> 00:41:40,000
a lot on human exploration but also

1038
00:41:43,829 --> 00:41:42,160

including science and and more and more

1039
00:41:45,670 --> 00:41:43,839
are looking how can we

1040
00:41:48,390 --> 00:41:45,680
manage robotic and human exploration

1041
00:41:51,030 --> 00:41:48,400
together so each benefit

1042
00:41:52,790 --> 00:41:51,040
from each other and uh there was the the

1043
00:41:56,630 --> 00:41:52,800
glove exploration roadmap published in

1044
00:41:59,030 --> 00:41:56,640
2011 and a new one published

1045
00:42:01,510 --> 00:41:59,040
this year revised version

1046
00:42:03,270 --> 00:42:01,520
so these are documents that are a kind

1047
00:42:06,150 --> 00:42:03,280
of uh

1048
00:42:08,790 --> 00:42:06,160
agreement between uh

1049
00:42:10,309 --> 00:42:08,800
at least 10 space agency

1050
00:42:13,030 --> 00:42:10,319
mainly from

1051
00:42:13,990 --> 00:42:13,040
north america us north america europe

1052
00:42:15,030 --> 00:42:14,000
and

1053
00:42:17,349 --> 00:42:15,040
asia

1054
00:42:20,150 --> 00:42:17,359
uh but so it is

1055
00:42:22,870 --> 00:42:20,160
significant it's really showing uh a

1056
00:42:24,710 --> 00:42:22,880
direction where we we can go in time of

1057
00:42:26,790 --> 00:42:24,720
exploration and recently also the

1058
00:42:27,829 --> 00:42:26,800
benefit from space exploration has been

1059
00:42:29,750 --> 00:42:27,839
published

1060
00:42:31,430 --> 00:42:29,760
it's clear from

1061
00:42:33,589 --> 00:42:31,440
from a canadian point of view and i

1062
00:42:34,790 --> 00:42:33,599
think it's clear for other also that

1063
00:42:36,630 --> 00:42:34,800

uh

1064
00:42:39,109 --> 00:42:36,640
space exploration need to respond to the

1065
00:42:40,710 --> 00:42:39,119
priority of the government and if it's

1066
00:42:43,430 --> 00:42:40,720
not doing that

1067
00:42:45,430 --> 00:42:43,440
asteroid moon or mars or anything

1068
00:42:47,510 --> 00:42:45,440
will not go forward

1069
00:42:50,309 --> 00:42:47,520
so the global expression roadmap is

1070
00:42:53,270 --> 00:42:50,319
interesting in the sense that

1071
00:42:55,270 --> 00:42:53,280
we say the long term uh vision is that

1072
00:42:58,069 --> 00:42:55,280
12 human on mars

1073
00:43:00,550 --> 00:42:58,079
we know we already have robot on mars uh

1074
00:43:02,069 --> 00:43:00,560
since a few years now and and a

1075
00:43:03,670 --> 00:43:02,079
recurrent series of missions so from a

1076
00:43:05,349 --> 00:43:03,680
robotic point of view

1077
00:43:08,230 --> 00:43:05,359
mars is uh

1078
00:43:10,390 --> 00:43:08,240
well the program is underway already but

1079
00:43:12,950 --> 00:43:10,400
from a human point of view this is the

1080
00:43:15,670 --> 00:43:12,960
the long-term view from money space

1081
00:43:16,950 --> 00:43:15,680
agency and in the meantime we need to

1082
00:43:20,470 --> 00:43:16,960
develop some

1083
00:43:22,710 --> 00:43:20,480
capabilities to to go there and

1084
00:43:24,550 --> 00:43:22,720
the system in our space is a good place

1085
00:43:27,670 --> 00:43:24,560
and asteroid also

1086
00:43:29,109 --> 00:43:27,680
it's a good way to learn to do that

1087
00:43:31,430 --> 00:43:29,119
so from a canadian point of view we have

1088
00:43:32,950 --> 00:43:31,440

been focusing on on few technology in

1089
00:43:34,710 --> 00:43:32,960
terms of space exploration and in terms

1090
00:43:37,349 --> 00:43:34,720
of the space program in general and i

1091
00:43:39,190 --> 00:43:37,359
will mention a few here but

1092
00:43:41,109 --> 00:43:39,200
i i will cover that

1093
00:43:42,870 --> 00:43:41,119
by saying we are focusing on optics and

1094
00:43:46,710 --> 00:43:42,880
robotics that's basically the vision

1095
00:43:48,230 --> 00:43:46,720
system and robotics and starting a few

1096
00:43:50,069 --> 00:43:48,240
new things

1097
00:43:53,990 --> 00:43:50,079
we recently uh

1098
00:43:56,069 --> 00:43:54,000
as part of the 2009 economic action plan

1099
00:43:58,470 --> 00:43:56,079
government gave money to uh additional

1100
00:43:59,750 --> 00:43:58,480
funds to the kenyan space agency and we

1101
00:44:01,910 --> 00:43:59,760
developed the next generation of the

1102
00:44:04,630 --> 00:44:01,920
space arm

1103
00:44:06,550 --> 00:44:04,640
which is an advanced generation and this

1104
00:44:07,430 --> 00:44:06,560
one could be used uh

1105
00:44:09,750 --> 00:44:07,440
for

1106
00:44:11,109 --> 00:44:09,760
space servicing and and an asteroid

1107
00:44:13,510 --> 00:44:11,119
mission uh

1108
00:44:16,790 --> 00:44:13,520
to retrieve a sample or to basically

1109
00:44:19,829 --> 00:44:16,800
capture uh things so this technology is

1110
00:44:22,150 --> 00:44:19,839
uh especially the small arm uh

1111
00:44:23,829 --> 00:44:22,160
that you can see here which is like the

1112
00:44:24,790 --> 00:44:23,839
dexter which is on the space station

1113
00:44:25,589 --> 00:44:24,800

right now

1114
00:44:30,550 --> 00:44:25,599
it's

1115
00:44:33,510 --> 00:44:30,560
have a new long arm that is a

1116
00:44:35,030 --> 00:44:33,520
telescopic boom so that can't fit on a

1117
00:44:37,510 --> 00:44:35,040
smaller

1118
00:44:39,910 --> 00:44:37,520
launcher vehicle as compared to the the

1119
00:44:42,069 --> 00:44:39,920
space shuttle where the the canadarm2

1120
00:44:43,510 --> 00:44:42,079
was launched

1121
00:44:44,950 --> 00:44:43,520
we have been working also an active

1122
00:44:47,109 --> 00:44:44,960
vision system for

1123
00:44:49,910 --> 00:44:47,119
quite uh some time

1124
00:44:52,870 --> 00:44:49,920
canada started with a kind of optic

1125
00:44:54,950 --> 00:44:52,880
vision system uh in the led of the the

1126
00:44:58,550 --> 00:44:54,960
specialty and the space station

1127
00:45:00,550 --> 00:44:58,560
and uh realized that uh optic it's not

1128
00:45:03,030 --> 00:45:00,560
easy in space because of the lighting

1129
00:45:05,349 --> 00:45:03,040
condition and so switch really to the

1130
00:45:07,589 --> 00:45:05,359
kind of laser-based camera and since

1131
00:45:10,710 --> 00:45:07,599
then we have been using that for many uh

1132
00:45:13,589 --> 00:45:10,720
activity and one of them is the when the

1133
00:45:14,550 --> 00:45:13,599
the shuttle needed an inspection system

1134
00:45:16,950 --> 00:45:14,560
uh

1135
00:45:18,550 --> 00:45:16,960
nasa went to a company in canada to

1136
00:45:20,470 --> 00:45:18,560
procure that

1137
00:45:23,670 --> 00:45:20,480
system because we have been developing

1138
00:45:25,990 --> 00:45:23,680

uh a in any was already demonstrated for

1139
00:45:28,309 --> 00:45:26,000
space transition on the phoenix mission

1140
00:45:31,589 --> 00:45:28,319
a mars mission we provided again another

1141
00:45:34,710 --> 00:45:31,599
lidar system to measure the atmosphere

1142
00:45:36,069 --> 00:45:34,720
there was some commercials like xss-11

1143
00:45:38,710 --> 00:45:36,079
it was done

1144
00:45:42,550 --> 00:45:38,720
a pure commercial sell-off so to use a

1145
00:45:44,870 --> 00:45:42,560
lidar system to track a satellite and we

1146
00:45:47,510 --> 00:45:44,880
more recently we did we demonstrated a

1147
00:45:48,470 --> 00:45:47,520
trider which is a kind of laser system

1148
00:45:51,990 --> 00:45:48,480
again

1149
00:45:53,990 --> 00:45:52,000
to estimate the pose of a vehicle and

1150
00:45:57,510 --> 00:45:54,000
we are providing uh

1151
00:46:00,630 --> 00:45:57,520
and it's really pertinent here is the

1152
00:46:03,750 --> 00:46:00,640
laser system again for a the mapping of

1153
00:46:06,470 --> 00:46:03,760
an asteroid uh for the aussie rex

1154
00:46:09,430 --> 00:46:06,480
mission uh which is designed

1155
00:46:11,750 --> 00:46:09,440
based on the xsf-11 and the phoenix uh

1156
00:46:14,470 --> 00:46:11,760
so you can see there's some continuity

1157
00:46:16,630 --> 00:46:14,480
and there's a strong expertise in canada

1158
00:46:18,630 --> 00:46:16,640
to provide that type of system

1159
00:46:21,750 --> 00:46:18,640
and this is a bit of detail on the

1160
00:46:23,030 --> 00:46:21,760
azureus rex uh laser activator so

1161
00:46:24,950 --> 00:46:23,040
uh

1162
00:46:27,190 --> 00:46:24,960
obviously this is a

1163
00:46:29,109 --> 00:46:27,200

system to do a rendezvous with an

1164
00:46:30,870 --> 00:46:29,119
asteroid so

1165
00:46:33,510 --> 00:46:30,880
it's pretty easy to make the lane with

1166
00:46:35,910 --> 00:46:33,520
an asteroid mission the system could be

1167
00:46:38,069 --> 00:46:35,920
improved and make better

1168
00:46:40,829 --> 00:46:38,079
and could be a almost a direct

1169
00:46:44,390 --> 00:46:40,839
contribution uh to such a

1170
00:46:46,710 --> 00:46:44,400
mission uh i heard that there was uh

1171
00:46:50,470 --> 00:46:46,720
there is not much observation of uh near

1172
00:46:54,069 --> 00:46:50,480
earth object uh recently we launched a

1173
00:46:57,829 --> 00:46:54,079
a a small satellite a micro satellite

1174
00:46:59,750 --> 00:46:57,839
this size uh to and one of the the goal

1175
00:47:01,589 --> 00:46:59,760
of this satellite is to observe

1176
00:47:03,829 --> 00:47:01,599
near-earth objects so

1177
00:47:06,390 --> 00:47:03,839
and i think if i am right with the first

1178
00:47:07,510 --> 00:47:06,400
one to to be dedicated to do

1179
00:47:11,190 --> 00:47:07,520
such

1180
00:47:13,430 --> 00:47:11,200
an activity it's based on the we are the

1181
00:47:16,470 --> 00:47:13,440
most which is a micro satellite for

1182
00:47:18,950 --> 00:47:16,480
space astronomy which is very successful

1183
00:47:21,109 --> 00:47:18,960
was designed for one year and as now has

1184
00:47:22,230 --> 00:47:21,119
been for ten years in space so

1185
00:47:24,230 --> 00:47:22,240
and uh

1186
00:47:26,230 --> 00:47:24,240
so this uh this this new satellite neo

1187
00:47:27,670 --> 00:47:26,240
set is still in uh

1188
00:47:31,589 --> 00:47:27,680

in uh

1189
00:47:33,510 --> 00:47:31,599
not confirmation but we are uh trying to

1190
00:47:35,750 --> 00:47:33,520
find the term but uh

1191
00:47:38,150 --> 00:47:35,760
basically uploading the software and we

1192
00:47:40,870 --> 00:47:38,160
have not yet done the first uh capture

1193
00:47:43,109 --> 00:47:40,880
the first image but it should be done

1194
00:47:44,870 --> 00:47:43,119
soon so this one is uh it could be also

1195
00:47:47,589 --> 00:47:44,880
not a contribution

1196
00:47:49,430 --> 00:47:47,599
to uh to know at least where you want to

1197
00:47:50,630 --> 00:47:49,440
go if you want to capture an asterisk

1198
00:47:53,349 --> 00:47:50,640
you still need to

1199
00:47:56,470 --> 00:47:53,359
to find where and uh lastly we have been

1200
00:47:57,589 --> 00:47:56,480
working with uh i was immediate nasa uh

1201
00:48:00,150 --> 00:47:57,599
for uh

1202
00:48:02,470 --> 00:48:00,160
for the moon mission uh

1203
00:48:04,630 --> 00:48:02,480
which is the oscar resort and now called

1204
00:48:07,349 --> 00:48:04,640
the resource prospector mission and

1205
00:48:09,109 --> 00:48:07,359
developing the rover and the drill

1206
00:48:12,390 --> 00:48:09,119
and the drill with some adaptation

1207
00:48:14,630 --> 00:48:12,400
obviously uh could be used for uh

1208
00:48:18,150 --> 00:48:14,640
for an asteroid mission if you want to

1209
00:48:20,870 --> 00:48:18,160
to capture uh a core uh this is a uh

1210
00:48:23,430 --> 00:48:20,880
during the dual core sample

1211
00:48:25,589 --> 00:48:23,440
and we have also a mini color uh which

1212
00:48:28,630 --> 00:48:25,599
is can be used uh

1213
00:48:30,630 --> 00:48:28,640

just to do a very small core so the the

1214
00:48:32,950 --> 00:48:30,640
drill can do i think one or two meter

1215
00:48:35,030 --> 00:48:32,960
core now and uh so that type of

1216
00:48:37,030 --> 00:48:35,040
technology with us some adaptation

1217
00:48:39,910 --> 00:48:37,040
because it's based on here on gravity

1218
00:48:42,549 --> 00:48:39,920
and moon even if the gravity is slower

1219
00:48:44,549 --> 00:48:42,559
there is still some gravity

1220
00:48:46,829 --> 00:48:44,559
so in conclusion the

1221
00:48:50,390 --> 00:48:46,839
this asteroid initiative is it's

1222
00:48:52,470 --> 00:48:50,400
interesting uh we

1223
00:48:55,510 --> 00:48:52,480
will follow that closely and see if it's

1224
00:48:57,430 --> 00:48:55,520
materialized in a in some

1225
00:48:59,030 --> 00:48:57,440
in some real mission

1226
00:49:03,990 --> 00:48:59,040
uh

1227
00:49:05,910 --> 00:49:04,000
has the the capacity to provide

1228
00:49:08,390 --> 00:49:05,920
something and there is some interest

1229
00:49:10,390 --> 00:49:08,400
from a canadian point of view to do so

1230
00:49:12,150 --> 00:49:10,400
uh so we we are

1231
00:49:14,549 --> 00:49:12,160
looking to that we are studying that and

1232
00:49:17,030 --> 00:49:14,559
and we think it's a it's a good

1233
00:49:19,670 --> 00:49:17,040
opportunity for uh for canada to

1234
00:49:21,030 --> 00:49:19,680
position the the the canadian industry

1235
00:49:21,910 --> 00:49:21,040
and obviously

1236
00:49:23,829 --> 00:49:21,920
it's

1237
00:49:25,829 --> 00:49:23,839
we need the government

1238
00:49:27,829 --> 00:49:25,839

he has to

1239
00:49:30,230 --> 00:49:27,839
be based on government priorities and in

1240
00:49:31,910 --> 00:49:30,240
canada we we are revising our space

1241
00:49:34,470 --> 00:49:31,920
program so we

1242
00:49:37,990 --> 00:49:34,480
we will follow that uh very closely to

1243
00:49:45,910 --> 00:49:38,000
see if something can be contributed

1244
00:49:51,430 --> 00:49:48,470
okay that concludes our presentations

1245
00:49:53,270 --> 00:49:51,440
for today i'd i'd like to possible focus

1246
00:49:56,470 --> 00:49:53,280
the questions for the next couple of

1247
00:49:59,190 --> 00:49:56,480
minutes 15 or so uh from the last group

1248
00:50:00,710 --> 00:49:59,200
of speakers uh and then we can

1249
00:50:02,950 --> 00:50:00,720
transition in

1250
00:50:05,430 --> 00:50:02,960
uh and more of the wide-ranging

1251
00:50:07,510 --> 00:50:05,440
discussion of uh covering all the ideas

1252
00:50:08,390 --> 00:50:07,520
that that have been brought forth

1253
00:50:12,630 --> 00:50:08,400
so

1254
00:50:15,109 --> 00:50:12,640
joe do we have anything coming in

1255
00:50:18,150 --> 00:50:15,119
yeah um actually more of a comment than

1256
00:50:19,910 --> 00:50:18,160
a question for uh dave at david at

1257
00:50:22,549 --> 00:50:19,920
arizona state this is from linda

1258
00:50:24,549 --> 00:50:22,559
billingsley she uh um indicates that

1259
00:50:26,230 --> 00:50:24,559
there's a need to engage all

1260
00:50:29,349 --> 00:50:26,240
everyone to participate in the in the

1261
00:50:30,710 --> 00:50:29,359
deliberations and invite disrupters uh

1262
00:50:33,030 --> 00:50:30,720
into like-minded groups and i don't know

1263
00:50:34,790 --> 00:50:33,040

if he wanted to uh expand on that any at

1264
00:50:38,069 --> 00:50:34,800
all

1265
00:50:40,710 --> 00:50:38,079
uh thank you to to linda for that

1266
00:50:43,270 --> 00:50:40,720
uh commenter question

1267
00:50:45,910 --> 00:50:43,280
and the invitation of disrupters into

1268
00:50:47,349 --> 00:50:45,920
groups of uh engaged in public

1269
00:50:48,470 --> 00:50:47,359
deliberation

1270
00:50:51,349 --> 00:50:48,480
is

1271
00:50:55,829 --> 00:50:51,359
a great idea for certain purposes

1272
00:50:57,910 --> 00:50:55,839
and there are times when uh you want uh

1273
00:51:00,630 --> 00:50:57,920
those disruptions when you want to have

1274
00:51:01,750 --> 00:51:00,640
some divergent thinking when you want to

1275
00:51:02,790 --> 00:51:01,760
shake things up and there are other

1276
00:51:06,309 --> 00:51:02,800
purposes

1277
00:51:09,349 --> 00:51:06,319
uh for which you need uh more convergent

1278
00:51:12,069 --> 00:51:09,359
thinking and you know i think that

1279
00:51:14,069 --> 00:51:12,079
should nasa or any other uh agency

1280
00:51:16,309 --> 00:51:14,079
decide that it wants to engage

1281
00:51:18,870 --> 00:51:16,319
uh in a broad-based public deliberation

1282
00:51:20,870 --> 00:51:18,880
activity it has to be very clear about

1283
00:51:23,349 --> 00:51:20,880
the kind of uh public engagement it

1284
00:51:25,030 --> 00:51:23,359
wants and whether that role will be to

1285
00:51:27,349 --> 00:51:25,040
open things up a bit

1286
00:51:29,910 --> 00:51:27,359
um broaden and disrupt some current

1287
00:51:32,470 --> 00:51:29,920
thought or whether it wants some more

1288
00:51:34,710 --> 00:51:32,480

convergent kinds of recommendations and

1289
00:51:37,030 --> 00:51:34,720
you have the same kinds of

1290
00:51:39,510 --> 00:51:37,040
issues that crop up with technical

1291
00:51:41,430 --> 00:51:39,520
advisory committees as well that operate

1292
00:51:43,589 --> 00:51:41,440
under consensus or that

1293
00:51:45,670 --> 00:51:43,599
uh operate under different kinds of

1294
00:51:47,190 --> 00:51:45,680
rules and that get different direction

1295
00:51:50,470 --> 00:51:47,200
from the agencies to which they're

1296
00:51:52,150 --> 00:51:50,480
giving advice

1297
00:51:53,990 --> 00:51:52,160
thank you

1298
00:51:56,150 --> 00:51:54,000
may i add in a comment here this is

1299
00:51:58,470 --> 00:51:56,160
margaret race please

1300
00:52:01,270 --> 00:51:58,480
okay the disrupters idea is a very good

1301
00:52:02,470 --> 00:52:01,280
one because um there's what we need to

1302
00:52:04,630 --> 00:52:02,480
do is

1303
00:52:06,950 --> 00:52:04,640
be mindful of the fact that this is not

1304
00:52:08,630 --> 00:52:06,960
single discussion single decisions that

1305
00:52:11,349 --> 00:52:08,640
are being made

1306
00:52:15,430 --> 00:52:11,359
at the recent planetary defense

1307
00:52:18,230 --> 00:52:15,440
conference in arizona it was last april

1308
00:52:20,710 --> 00:52:18,240
there was a conference-wide simulation

1309
00:52:22,790 --> 00:52:20,720
that involved everyone that participated

1310
00:52:25,190 --> 00:52:22,800
and they took on different roles

1311
00:52:27,109 --> 00:52:25,200
whether it was looking at the science

1312
00:52:29,670 --> 00:52:27,119
the technology

1313
00:52:31,589 --> 00:52:29,680

and some of the issues that came about

1314
00:52:34,230 --> 00:52:31,599
with asteroid deflection were quite

1315
00:52:35,990 --> 00:52:34,240
surprising so some groups of people took

1316
00:52:38,790 --> 00:52:36,000
on the role of being individual

1317
00:52:41,589 --> 00:52:38,800
countries for instance making decisions

1318
00:52:43,910 --> 00:52:41,599
within the context of the u.n and they

1319
00:52:45,030 --> 00:52:43,920
actually voted against the asteroid

1320
00:52:47,030 --> 00:52:45,040
deflection

1321
00:52:49,109 --> 00:52:47,040
there are questions of having a nuclear

1322
00:52:51,430 --> 00:52:49,119
launch for instance who would that outer

1323
00:52:53,589 --> 00:52:51,440
space treaty would have to be waived in

1324
00:52:56,390 --> 00:52:53,599
some way and we don't have a proof of

1325
00:52:59,190 --> 00:52:56,400
concept so there are risks at many many

1326
00:53:01,190 --> 00:52:59,200
levels and the idea of bringing in

1327
00:53:03,990 --> 00:53:01,200
disruptors or at least acknowledging

1328
00:53:06,470 --> 00:53:04,000
that these risks are real is something

1329
00:53:10,069 --> 00:53:06,480
important and that's what

1330
00:53:12,069 --> 00:53:10,079
i think both david and my focus is on

1331
00:53:14,470 --> 00:53:12,079
thinking ahead to the kinds of risks

1332
00:53:16,230 --> 00:53:14,480
that can come up to the mission

1333
00:53:19,190 --> 00:53:16,240
and the kind of success that we want to

1334
00:53:20,950 --> 00:53:19,200
see but those risks are coming in areas

1335
00:53:22,710 --> 00:53:20,960
that we can't necessarily address with

1336
00:53:24,150 --> 00:53:22,720
science and technology

1337
00:53:26,549 --> 00:53:24,160
so we have to think about how to go

1338
00:53:28,790 --> 00:53:26,559

through the actual process of

1339
00:53:31,990 --> 00:53:28,800
communicating not one way

1340
00:53:33,829 --> 00:53:32,000
but um looking at

1341
00:53:35,990 --> 00:53:33,839
what information we're going to give to

1342
00:53:37,750 --> 00:53:36,000
experts in a fema situation what

1343
00:53:41,349 --> 00:53:37,760
information we give to the public the

1344
00:53:43,030 --> 00:53:41,359
mass media there's just so many places

1345
00:53:44,309 --> 00:53:43,040
this is dave again i would i would

1346
00:53:47,190 --> 00:53:44,319
endorse that

1347
00:53:51,589 --> 00:53:47,200
uh very much

1348
00:53:51,599 --> 00:53:56,150
any questions in here in the room

1349
00:54:01,430 --> 00:53:58,150
uh this is a question for the um

1350
00:54:04,630 --> 00:54:01,440
yarkovsky effect on the eros uh analysis

1351
00:54:06,309 --> 00:54:04,640
um so uh that's a a dozen kilometer

1352
00:54:08,390 --> 00:54:06,319
sized asteroid how do the numbers play

1353
00:54:13,990 --> 00:54:08,400
out with an irregularly shaped like 100

1354
00:54:18,630 --> 00:54:16,950
i really don't have any uh data on on

1355
00:54:20,870 --> 00:54:18,640
that right now i would have to uh

1356
00:54:29,109 --> 00:54:20,880
consult with uh joe clay on that

1357
00:54:31,910 --> 00:54:31,109
any other questions for

1358
00:54:39,109 --> 00:54:31,920
this

1359
00:54:39,119 --> 00:54:43,990
let me throw one out um

1360
00:54:49,190 --> 00:54:45,829
and this may get our discussion started

1361
00:54:51,990 --> 00:54:49,200
as we uh seem ready to transition into

1362
00:54:54,150 --> 00:54:52,000
the discussion that i'm hoping will

1363
00:54:56,870 --> 00:54:54,160

facilitate

1364
00:54:58,470 --> 00:54:56,880
some sense of of what the findings

1365
00:55:00,309 --> 00:54:58,480
out of this session ought to be because

1366
00:55:02,069 --> 00:55:00,319
ultimately this is

1367
00:55:04,470 --> 00:55:02,079
our session

1368
00:55:06,470 --> 00:55:04,480
to be shared together we had a number of

1369
00:55:07,589 --> 00:55:06,480
presenters that were selected

1370
00:55:10,150 --> 00:55:07,599
um

1371
00:55:12,230 --> 00:55:10,160
based on their rfi response has been and

1372
00:55:15,910 --> 00:55:12,240
now's an opportunity for us based on

1373
00:55:17,589 --> 00:55:15,920
that uh to engage in conversation that

1374
00:55:21,270 --> 00:55:17,599
that will lead into

1375
00:55:23,589 --> 00:55:21,280
uh the planning process and so uh

1376
00:55:24,390 --> 00:55:23,599
i'll i'll focus it on this last panel

1377
00:55:26,870 --> 00:55:24,400
but

1378
00:55:28,150 --> 00:55:26,880
we can expand it beyond as well and and

1379
00:55:29,109 --> 00:55:28,160
that is

1380
00:55:31,190 --> 00:55:29,119
uh

1381
00:55:33,430 --> 00:55:31,200
how would you measure successful public

1382
00:55:34,390 --> 00:55:33,440
engagement it's easy for us to talk

1383
00:55:36,150 --> 00:55:34,400
about

1384
00:55:37,750 --> 00:55:36,160
um

1385
00:55:38,549 --> 00:55:37,760
that this is something that we want to

1386
00:55:41,190 --> 00:55:38,559
do

1387
00:55:44,069 --> 00:55:41,200
um but and maybe particularly for david

1388
00:55:46,870 --> 00:55:44,079

and and margaret to kick us off on that

1389
00:55:48,470 --> 00:55:46,880
and then a follow-up to that

1390
00:55:50,950 --> 00:55:48,480
um

1391
00:55:53,349 --> 00:55:50,960
can you give us some examples of success

1392
00:55:55,589 --> 00:55:53,359
from your perspective so that we have an

1393
00:55:57,349 --> 00:55:55,599
idea of something that we might be

1394
00:55:59,349 --> 00:55:57,359
working towards i know there was a

1395
00:56:02,309 --> 00:55:59,359
little bit of that uh david in your

1396
00:56:05,750 --> 00:56:02,319
presentation uh but i'd like to expand

1397
00:56:09,430 --> 00:56:07,430
okay thank you that's

1398
00:56:11,829 --> 00:56:09,440
an incredibly critical

1399
00:56:15,510 --> 00:56:11,839
uh an important question about measuring

1400
00:56:18,150 --> 00:56:15,520
the success of of public engagement and

1401
00:56:19,349 --> 00:56:18,160
i think the trick is

1402
00:56:22,150 --> 00:56:19,359
to

1403
00:56:24,870 --> 00:56:22,160
realize that just like with other

1404
00:56:26,950 --> 00:56:24,880
forms of advice

1405
00:56:27,910 --> 00:56:26,960
or technology assessment

1406
00:56:28,630 --> 00:56:27,920
that

1407
00:56:31,510 --> 00:56:28,640
the

1408
00:56:33,349 --> 00:56:31,520
critical measure is not necessarily that

1409
00:56:35,910 --> 00:56:33,359
there's some silver bullet that comes

1410
00:56:39,109 --> 00:56:35,920
from the public and

1411
00:56:40,470 --> 00:56:39,119
has a discernible impact on exactly

1412
00:56:42,470 --> 00:56:40,480
what's going on

1413
00:56:43,829 --> 00:56:42,480

if we use that criterion then a whole

1414
00:56:46,789 --> 00:56:43,839
lot of for example what the national

1415
00:56:47,829 --> 00:56:46,799
academies does would not be worthwhile

1416
00:56:50,549 --> 00:56:47,839
doing

1417
00:56:53,349 --> 00:56:50,559
but i think our criteria success

1418
00:56:55,670 --> 00:56:53,359
need to rest in the area of capacity

1419
00:56:58,150 --> 00:56:55,680
building and learning among

1420
00:57:00,309 --> 00:56:58,160
both the specific and the broad array of

1421
00:57:02,390 --> 00:57:00,319
individuals who are involved in the

1422
00:57:03,349 --> 00:57:02,400
activities so

1423
00:57:08,390 --> 00:57:03,359
have

1424
00:57:10,789 --> 00:57:08,400
not just substantively

1425
00:57:12,630 --> 00:57:10,799
but procedurally and if you will

1426
00:57:13,750 --> 00:57:12,640
reflexively about their own role in the

1427
00:57:14,710 --> 00:57:13,760
process

1428
00:57:16,470 --> 00:57:14,720
have

1429
00:57:19,829 --> 00:57:16,480
the uh

1430
00:57:21,750 --> 00:57:19,839
elite actors the folks say at nasa who

1431
00:57:23,030 --> 00:57:21,760
are designing programs and projects have

1432
00:57:24,230 --> 00:57:23,040
they learned

1433
00:57:26,150 --> 00:57:24,240
maybe they have learned something

1434
00:57:28,069 --> 00:57:26,160
substantively through the interaction

1435
00:57:29,670 --> 00:57:28,079
but more importantly have they learned

1436
00:57:31,910 --> 00:57:29,680
about process and have they learned

1437
00:57:35,030 --> 00:57:31,920
about how to re how to approach

1438
00:57:37,349 --> 00:57:35,040

their activities more reflexively

1439
00:57:39,990 --> 00:57:37,359
with a greater degree of of

1440
00:57:42,950 --> 00:57:40,000
self-awareness and awareness of the

1441
00:57:43,910 --> 00:57:42,960
public role that they're pursuing and

1442
00:57:47,270 --> 00:57:43,920
that

1443
00:57:49,510 --> 00:57:47,280
build

1444
00:57:50,630 --> 00:57:49,520
a capacity as i think i tried to suggest

1445
00:57:58,150 --> 00:57:50,640
in the

1446
00:58:01,030 --> 00:57:58,160
the public is engaged more sophisticated

1447
00:58:02,870 --> 00:58:01,040
and more nuanced about that conversation

1448
00:58:06,069 --> 00:58:02,880
now there could be real

1449
00:58:08,150 --> 00:58:06,079
and concrete influence on the project

1450
00:58:10,470 --> 00:58:08,160
itself

1451
00:58:11,990 --> 00:58:10,480
and that would be a goal as well but i

1452
00:58:13,030 --> 00:58:12,000
think the success really has to be

1453
00:58:14,069 --> 00:58:13,040
measured

1454
00:58:16,069 --> 00:58:14,079
by

1455
00:58:19,750 --> 00:58:16,079
the increased capacity in the learning

1456
00:58:21,829 --> 00:58:19,760
that goes on among the participants

1457
00:58:24,309 --> 00:58:21,839
thank you

1458
00:58:26,870 --> 00:58:24,319
this is margaret race again um

1459
00:58:29,349 --> 00:58:26,880
when i look at it in terms of the

1460
00:58:31,109 --> 00:58:29,359
natural hazards community there's a lot

1461
00:58:33,589 --> 00:58:31,119
of research that's been done over the

1462
00:58:37,030 --> 00:58:33,599
decades on how do we respond to natural

1463
00:58:39,190 --> 00:58:37,040

disasters and threats of different sorts

1464
00:58:41,589 --> 00:58:39,200
and if you look at the history of

1465
00:58:43,190 --> 00:58:41,599
something like fire we know what fire is

1466
00:58:45,750 --> 00:58:43,200
the public knows what fire is they

1467
00:58:48,150 --> 00:58:45,760
respond to it and there are examples of

1468
00:58:50,630 --> 00:58:48,160
it all the time so we're kind of

1469
00:58:53,349 --> 00:58:50,640
we have a collective memory of these

1470
00:58:55,750 --> 00:58:53,359
things asteroids are very different than

1471
00:58:57,910 --> 00:58:55,760
that especially when we're talking about

1472
00:58:59,510 --> 00:58:57,920
asteroid deflections for planetary

1473
00:59:01,589 --> 00:58:59,520
defense

1474
00:59:03,109 --> 00:59:01,599
there is no collective memory the public

1475
00:59:04,549 --> 00:59:03,119
doesn't understand a lot of the

1476
00:59:07,430 --> 00:59:04,559
terminology

1477
00:59:08,710 --> 00:59:07,440
and it's unclear even what we would do

1478
00:59:11,510 --> 00:59:08,720
to tell

1479
00:59:14,549 --> 00:59:11,520
fema type agencies or regional emergency

1480
00:59:16,710 --> 00:59:14,559
response folks what to do so there's a

1481
00:59:20,069 --> 00:59:16,720
lot of behind the scenes information

1482
00:59:23,430 --> 00:59:20,079
that has to go along with this

1483
00:59:26,150 --> 00:59:23,440
and we want to again think about

1484
00:59:27,990 --> 00:59:26,160
not just one-way delivery of information

1485
00:59:29,270 --> 00:59:28,000
to the public but information that they

1486
00:59:31,430 --> 00:59:29,280
can use

1487
00:59:33,670 --> 00:59:31,440
thinking in terms of just the typhoon

1488
00:59:35,190 --> 00:59:33,680

for instance that just happened uh in

1489
00:59:37,670 --> 00:59:35,200
the philippines

1490
00:59:39,990 --> 00:59:37,680
that's what we're up against

1491
00:59:41,670 --> 00:59:40,000
we're up against the potential threat of

1492
00:59:43,910 --> 00:59:41,680
something like that

1493
00:59:46,870 --> 00:59:43,920
and what would we tell an individual

1494
00:59:49,670 --> 00:59:46,880
especially if we have a multiple year

1495
00:59:51,589 --> 00:59:49,680
warning of something like that

1496
00:59:54,390 --> 00:59:51,599
what is an evacuation in those

1497
00:59:58,549 --> 00:59:56,390
so these are things that are important

1498
01:00:00,710 --> 00:59:58,559
to consider ahead of time they don't

1499
01:00:02,870 --> 01:00:00,720
change the fact that the science and

1500
01:00:05,430 --> 01:00:02,880
technology is looking to deflect

1501
01:00:08,069 --> 01:00:05,440
um the asteroids but on the ground

1502
01:00:09,030 --> 01:00:08,079
dealing with the risks and and talking

1503
01:00:12,390 --> 01:00:09,040
about the

1504
01:00:14,470 --> 01:00:12,400
education it's way more than just

1505
01:00:18,150 --> 01:00:14,480
asteroid deflection it's really risky

1506
01:00:20,309 --> 01:00:18,160
government governance at the local area

1507
01:00:23,270 --> 01:00:20,319
this is tony freeman i think you raise a

1508
01:00:26,309 --> 01:00:23,280
very good point there's a good analogy

1509
01:00:28,230 --> 01:00:26,319
to the 2004 tsunami

1510
01:00:30,470 --> 01:00:28,240
it had been a long time since we had a

1511
01:00:31,430 --> 01:00:30,480
tsunami that was that deadly

1512
01:00:33,589 --> 01:00:31,440
and

1513
01:00:35,750 --> 01:00:33,599

you know technologies science a lot have

1514
01:00:37,030 --> 01:00:35,760
changed since the last time we had one

1515
01:00:39,670 --> 01:00:37,040
of those things

1516
01:00:40,710 --> 01:00:39,680
and afterwards a lot of really good work

1517
01:00:42,630 --> 01:00:40,720
was done

1518
01:00:44,870 --> 01:00:42,640
looking at the concept of operations how

1519
01:00:47,190 --> 01:00:44,880
do you get people alerted how do you get

1520
01:00:49,750 --> 01:00:47,200
people warned what technologies do you

1521
01:00:52,390 --> 01:00:49,760
use but also how do you educate them and

1522
01:00:54,829 --> 01:00:52,400
i think that's a very instructive area

1523
01:00:56,549 --> 01:00:54,839
for us to look at for the asteroid

1524
01:00:58,470 --> 01:00:56,559
program um

1525
01:01:00,390 --> 01:00:58,480
speaking from california i could tell

1526
01:01:02,309 --> 01:01:00,400
you that we have sort of a 10-year

1527
01:01:04,150 --> 01:01:02,319
window when it comes to earthquakes if

1528
01:01:06,549 --> 01:01:04,160
you don't have them every so often

1529
01:01:09,190 --> 01:01:06,559
people sort of get complacent and that

1530
01:01:11,910 --> 01:01:09,200
is the issue also about the decisions in

1531
01:01:14,309 --> 01:01:11,920
italy right now there has been a legal

1532
01:01:16,069 --> 01:01:14,319
case where some scientists who suggested

1533
01:01:18,150 --> 01:01:16,079
that we wouldn't have another

1534
01:01:20,710 --> 01:01:18,160
earthquake are actually

1535
01:01:22,150 --> 01:01:20,720
found guilty and are facing um prison

1536
01:01:24,309 --> 01:01:22,160
time for

1537
01:01:25,910 --> 01:01:24,319
liability and making a wrong decision

1538
01:01:27,750 --> 01:01:25,920

because people went back to their homes

1539
01:01:29,349 --> 01:01:27,760
and then the earthquake hit and people

1540
01:01:31,589 --> 01:01:29,359
died so

1541
01:01:32,950 --> 01:01:31,599
this this will play out and certainly in

1542
01:01:35,829 --> 01:01:32,960
terms of uh

1543
01:01:37,190 --> 01:01:35,839
i'll say a minsk situation um it could

1544
01:01:38,950 --> 01:01:37,200
have been worse

1545
01:01:40,069 --> 01:01:38,960
but there's one where it came in from

1546
01:01:42,549 --> 01:01:40,079
the blind

1547
01:01:44,309 --> 01:01:42,559
nobody could even have predicted it in

1548
01:01:45,829 --> 01:01:44,319
time so we have to recognize that these

1549
01:01:47,990 --> 01:01:45,839
things will happen and that's part of

1550
01:01:49,589 --> 01:01:48,000
the education that gets given to the

1551
01:01:52,710 --> 01:01:49,599
public as well

1552
01:01:55,750 --> 01:01:52,720
the uncertainties

1553
01:01:57,270 --> 01:01:55,760
thank you jean-claude yeah

1554
01:02:00,230 --> 01:01:57,280
i will see public engagement from

1555
01:02:02,309 --> 01:02:00,240
another point of view we we just had a

1556
01:02:04,549 --> 01:02:02,319
quite successful

1557
01:02:07,270 --> 01:02:04,559
astronaut in space with chris artfield

1558
01:02:09,990 --> 01:02:07,280
and which basically was able to attract

1559
01:02:11,670 --> 01:02:10,000
public attention and it seemed

1560
01:02:13,270 --> 01:02:11,680
spontaneous but it was really a

1561
01:02:15,990 --> 01:02:13,280
preparation

1562
01:02:19,109 --> 01:02:16,000
that

1563
01:02:20,789 --> 01:02:19,119

so public engagement should not be done

1564
01:02:23,910 --> 01:02:20,799
only on on

1565
01:02:26,710 --> 01:02:23,920
fear of something but try really and not

1566
01:02:28,870 --> 01:02:26,720
just to learn or to educate the public

1567
01:02:31,029 --> 01:02:28,880
it's really the public is basically it's

1568
01:02:33,670 --> 01:02:31,039
public money so if the public is not

1569
01:02:37,750 --> 01:02:33,680
supporting that it's not engaged it's

1570
01:02:39,750 --> 01:02:37,760
very difficult to sustain an activity so

1571
01:02:42,069 --> 01:02:39,760
and we have been thinking about that uh

1572
01:02:45,270 --> 01:02:42,079
giving the success of the the chris

1573
01:02:48,309 --> 01:02:45,280
flight and how much the public like it

1574
01:02:50,230 --> 01:02:48,319
uh could we repeat that from for robotic

1575
01:02:52,390 --> 01:02:50,240
mission and uh

1576
01:02:53,510 --> 01:02:52,400
and and probably yes but we have to

1577
01:02:54,549 --> 01:02:53,520
really

1578
01:02:56,950 --> 01:02:54,559
uh

1579
01:02:58,870 --> 01:02:56,960
think about the public engagement as a

1580
01:03:03,029 --> 01:02:58,880
requirement

1581
01:03:05,670 --> 01:03:03,039
sensor to do this thing we need a

1582
01:03:07,990 --> 01:03:05,680
to capture this we need some requirement

1583
01:03:10,789 --> 01:03:08,000
that will be linked purely to the the

1584
01:03:13,750 --> 01:03:10,799
public engagement and this has to be i

1585
01:03:15,670 --> 01:03:13,760
think uh very early in the when you

1586
01:03:17,750 --> 01:03:15,680
design the mission and not after the

1587
01:03:21,029 --> 01:03:17,760
fact and say okay we we do that for

1588
01:03:23,510 --> 01:03:21,039

science or for protection and then oh by

1589
01:03:25,829 --> 01:03:23,520
the way we need now to engage the public

1590
01:03:27,829 --> 01:03:25,839
because this is part of our mandate and

1591
01:03:29,430 --> 01:03:27,839
so it's really something you have to be

1592
01:03:32,630 --> 01:03:29,440
ready to spend money

1593
01:03:36,390 --> 01:03:32,640
on engaging the public and maybe adding

1594
01:03:38,309 --> 01:03:36,400
an hd camera on your system which has no

1595
01:03:40,470 --> 01:03:38,319
scientific goal with just no technical

1596
01:03:42,549 --> 01:03:40,480
goal but you will provide

1597
01:03:44,630 --> 01:03:42,559
nice image and and you have also to

1598
01:03:47,109 --> 01:03:44,640
engage the public in all the difficulty

1599
01:03:48,870 --> 01:03:47,119
of your missions okay now we have this

1600
01:03:51,430 --> 01:03:48,880
and we are designing this this is

1601
01:03:53,109 --> 01:03:51,440
difficult if you don't

1602
01:03:55,109 --> 01:03:53,119
give the information and you are not

1603
01:03:56,309 --> 01:03:55,119
using the social media the way has been

1604
01:03:58,630 --> 01:03:56,319
used with

1605
01:04:01,510 --> 01:03:58,640
chris then it's very difficult to engage

1606
01:04:01,520 --> 01:04:04,870
thank you

1607
01:04:10,390 --> 01:04:07,029
the difference again with the um on

1608
01:04:12,549 --> 01:04:10,400
engaging the public with the um positive

1609
01:04:15,109 --> 01:04:12,559
parts of space and even the idea of

1610
01:04:17,349 --> 01:04:15,119
putting a camera on is very good and

1611
01:04:19,029 --> 01:04:17,359
those things are very positive even the

1612
01:04:21,029 --> 01:04:19,039
mars missions and

1613
01:04:24,950 --> 01:04:21,039

engaging the public in basic research

1614
01:04:27,510 --> 01:04:24,960
and exploration and so the asteroid

1615
01:04:29,990 --> 01:04:27,520
deflection and resource use missions may

1616
01:04:33,109 --> 01:04:30,000
be perceived differently there than the

1617
01:04:34,870 --> 01:04:33,119
risk of a hazardous one so there are two

1618
01:04:36,870 --> 01:04:34,880
different kinds of communication that

1619
01:04:38,950 --> 01:04:36,880
has to happen and i agree that the

1620
01:04:41,349 --> 01:04:38,960
public engagement of a positive sort is

1621
01:04:43,029 --> 01:04:41,359
very important but we also have to

1622
01:04:45,430 --> 01:04:43,039
address the risks

1623
01:04:47,430 --> 01:04:45,440
on the other side

1624
01:04:49,029 --> 01:04:47,440
when i hear the term engagement i

1625
01:04:50,950 --> 01:04:49,039
actually think a little bit more

1626
01:04:52,470 --> 01:04:50,960
strongly than in the context that's

1627
01:04:54,230 --> 01:04:52,480
being used here

1628
01:04:56,870 --> 01:04:54,240
i think engagement is something that's

1629
01:04:58,789 --> 01:04:56,880
deeper than simply being uh you know a

1630
01:05:00,789 --> 01:04:58,799
click-through on a web link to a mission

1631
01:05:02,710 --> 01:05:00,799
page i think if you want to engage the

1632
01:05:04,390 --> 01:05:02,720
public it's going to involve things that

1633
01:05:06,230 --> 01:05:04,400
actually actively get them to

1634
01:05:07,670 --> 01:05:06,240
participate in and i'm not sure what

1635
01:05:10,150 --> 01:05:07,680
those things are but i know that

1636
01:05:12,710 --> 01:05:10,160
certainly in the world today people

1637
01:05:14,789 --> 01:05:12,720
engage by spending money they speak with

1638
01:05:16,789 --> 01:05:14,799

their pocketbooks they speak in career

1639
01:05:18,470 --> 01:05:16,799
choices they do other things and i'm

1640
01:05:21,349 --> 01:05:18,480
just not sure that these passive

1641
01:05:23,109 --> 01:05:21,359
observations of missions are

1642
01:05:24,870 --> 01:05:23,119
sufficient engagement to really make

1643
01:05:27,910 --> 01:05:24,880
this work out in the long term

1644
01:05:30,870 --> 01:05:27,920
uh before we jump into um further

1645
01:05:32,069 --> 01:05:30,880
thoughts uh jen reminded me

1646
01:05:34,230 --> 01:05:32,079
we're going to be

1647
01:05:36,309 --> 01:05:34,240
focusing on that very thing this

1648
01:05:37,829 --> 01:05:36,319
afternoon in the crowd sourcing citizen

1649
01:05:40,150 --> 01:05:37,839
science as well as the next gen

1650
01:05:41,670 --> 01:05:40,160
engagement tomorrow morning uh so we

1651
01:05:43,510 --> 01:05:41,680
will have an opportunity to kind of dig

1652
01:05:45,029 --> 01:05:43,520
in there a little bit but i saw a bunch

1653
01:05:45,990 --> 01:05:45,039
of hands go up and there's a mic up in

1654
01:05:47,910 --> 01:05:46,000
the

1655
01:05:50,470 --> 01:05:47,920
uh audience already you mean it wait

1656
01:05:52,710 --> 01:05:50,480
then please well i was just going to say

1657
01:05:54,549 --> 01:05:52,720
along those lines uh

1658
01:05:55,910 --> 01:05:54,559
there are in fact several ways you can

1659
01:05:58,470 --> 01:05:55,920
engage the public

1660
01:06:00,549 --> 01:05:58,480
that are not just the follow along read

1661
01:06:02,230 --> 01:06:00,559
up on the stuff and in fact we're we're

1662
01:06:04,470 --> 01:06:02,240
engaging several

1663
01:06:06,230 --> 01:06:04,480

different uh platform different

1664
01:06:08,470 --> 01:06:06,240
companies where

1665
01:06:11,270 --> 01:06:08,480
the crowd is used to develop parts of

1666
01:06:13,990 --> 01:06:11,280
your system whether that's simple videos

1667
01:06:17,349 --> 01:06:14,000
or software or

1668
01:06:19,990 --> 01:06:17,359
pr infographics and so there's actual

1669
01:06:21,910 --> 01:06:20,000
public ways that you can get

1670
01:06:23,750 --> 01:06:21,920
people involved in the development and

1671
01:06:25,430 --> 01:06:23,760
operations of your missions

1672
01:06:26,630 --> 01:06:25,440
and there's lots of those platforms out

1673
01:06:27,430 --> 01:06:26,640
there now so

1674
01:06:28,710 --> 01:06:27,440
uh

1675
01:06:30,069 --> 01:06:28,720
we work with them and that's a little

1676
01:06:31,430 --> 01:06:30,079
plug but we can talk more about that

1677
01:06:35,430 --> 01:06:31,440
this afternoon

1678
01:06:40,470 --> 01:06:37,750
this is dave again if i may

1679
01:06:43,349 --> 01:06:40,480
please on the strengths of

1680
01:06:45,510 --> 01:06:43,359
of public engagement and

1681
01:06:47,750 --> 01:06:45,520
the way that the

1682
01:06:49,829 --> 01:06:47,760
say ecast and the the science museum and

1683
01:06:51,990 --> 01:06:49,839
science center community has come to

1684
01:06:53,829 --> 01:06:52,000
understand it is that the difference

1685
01:06:56,069 --> 01:06:53,839
between the sort of public understanding

1686
01:06:57,349 --> 01:06:56,079
which would be the click-through uh

1687
01:06:59,270 --> 01:06:57,359
activity

1688
01:07:01,910 --> 01:06:59,280

and public engagement is really about a

1689
01:07:03,270 --> 01:07:01,920
two-way conversation and one that goes

1690
01:07:05,510 --> 01:07:03,280
deeper than simply technical

1691
01:07:07,190 --> 01:07:05,520
understanding but has to do with

1692
01:07:09,270 --> 01:07:07,200
understanding the kinds of values that

1693
01:07:12,309 --> 01:07:09,280
are brought to bear on

1694
01:07:15,589 --> 01:07:12,319
the agenda and the framing of any

1695
01:07:17,910 --> 01:07:15,599
particular initiative and

1696
01:07:21,670 --> 01:07:17,920
i think that yes a lot of those

1697
01:07:23,589 --> 01:07:21,680
crowdsourcing techniques are able to

1698
01:07:26,069 --> 01:07:23,599
engage people in the sense that they

1699
01:07:28,309 --> 01:07:26,079
become active participants in the

1700
01:07:30,950 --> 01:07:28,319
research in the exploration which is

1701
01:07:32,950 --> 01:07:30,960
wonderful but that tends only to happen

1702
01:07:34,069 --> 01:07:32,960
for people who are otherwise paying

1703
01:07:35,750 --> 01:07:34,079
attention

1704
01:07:37,190 --> 01:07:35,760
and that doesn't quite create

1705
01:07:39,029 --> 01:07:37,200
opportunities for people who may not

1706
01:07:41,510 --> 01:07:39,039
have attention may not have the skills

1707
01:07:43,670 --> 01:07:41,520
to participate in that way

1708
01:07:44,630 --> 01:07:43,680
and yet those other kinds of people

1709
01:07:46,309 --> 01:07:44,640
still

1710
01:07:48,789 --> 01:07:46,319
deserve and in many

1711
01:07:50,950 --> 01:07:48,799
instances require the opportunity to

1712
01:07:52,390 --> 01:07:50,960
help frame through their own values the

1713
01:07:54,309 --> 01:07:52,400

kinds of things that are being done in

1714
01:07:56,230 --> 01:07:54,319
their name

1715
01:07:58,390 --> 01:07:56,240
um

1716
01:08:00,069 --> 01:07:58,400
i'll let charlie address the public

1717
01:08:01,750 --> 01:08:00,079
outreach crowd stuff because i know he's

1718
01:08:04,390 --> 01:08:01,760
an expert at that but

1719
01:08:06,309 --> 01:08:04,400
coming from the uh the the defense side

1720
01:08:07,430 --> 01:08:06,319
which is i think where the speakers were

1721
01:08:08,390 --> 01:08:07,440
addressing

1722
01:08:10,150 --> 01:08:08,400
um

1723
01:08:11,349 --> 01:08:10,160
there's a very interesting and subtle

1724
01:08:14,150 --> 01:08:11,359
game

1725
01:08:15,910 --> 01:08:14,160
that gets played off and for example

1726
01:08:19,510 --> 01:08:15,920
the u.s military

1727
01:08:21,910 --> 01:08:19,520
cannot advertise or lobby publicly as

1728
01:08:23,749 --> 01:08:21,920
far as recruiting people but they can

1729
01:08:26,070 --> 01:08:23,759
run recruiting ads

1730
01:08:28,870 --> 01:08:26,080
which are super cool and make them look

1731
01:08:30,229 --> 01:08:28,880
like superheroes and enroll the public

1732
01:08:31,829 --> 01:08:30,239
and keep the public support for the

1733
01:08:33,669 --> 01:08:31,839
military high

1734
01:08:36,870 --> 01:08:33,679
they can legally do that but they can't

1735
01:08:37,669 --> 01:08:36,880
advertise support your military

1736
01:08:38,470 --> 01:08:37,679
now

1737
01:08:40,390 --> 01:08:38,480
in

1738
01:08:41,189 --> 01:08:40,400

the quest

1739
01:08:45,669 --> 01:08:41,199
to

1740
01:08:47,910 --> 01:08:45,679
deal with the defensive aspects the uh

1741
01:08:50,470 --> 01:08:47,920
civil defense aspects of things and and

1742
01:08:53,189 --> 01:08:50,480
in that activity by engaging in that

1743
01:08:55,510 --> 01:08:53,199
activity the education that goes with it

1744
01:08:57,749 --> 01:08:55,520
hey we may have a tsunami here's what

1745
01:09:00,390 --> 01:08:57,759
you do in terms of that tsunami and

1746
01:09:03,030 --> 01:09:00,400
getting people in that preparatory mode

1747
01:09:05,269 --> 01:09:03,040
and educating them as a part of that

1748
01:09:06,789 --> 01:09:05,279
what you can actually do

1749
01:09:07,910 --> 01:09:06,799
and this is probably appropriate for a

1750
01:09:09,590 --> 01:09:07,920
private sector guy more than a

1751
01:09:12,390 --> 01:09:09,600
government sector person to talk about

1752
01:09:15,110 --> 01:09:12,400
overtly is what you're doing is

1753
01:09:17,189 --> 01:09:15,120
very slowly and in a very careful way

1754
01:09:19,990 --> 01:09:17,199
building constituency

1755
01:09:23,030 --> 01:09:20,000
for support of larger activities in that

1756
01:09:24,789 --> 01:09:23,040
realm on the planetary defense side

1757
01:09:27,749 --> 01:09:24,799
so by getting out there and talking to

1758
01:09:29,590 --> 01:09:27,759
people about i i have seen people walk

1759
01:09:31,189 --> 01:09:29,600
into congressional offices

1760
01:09:33,990 --> 01:09:31,199
of

1761
01:09:35,829 --> 01:09:34,000
legislators who had coastal districts

1762
01:09:38,309 --> 01:09:35,839
and literally walk right up to the map

1763
01:09:39,269 --> 01:09:38,319

and go if a tsunami of this size hits

1764
01:09:41,349 --> 01:09:39,279
here

1765
01:09:43,269 --> 01:09:41,359
this part of your state's gone

1766
01:09:45,990 --> 01:09:43,279
and that gets their attention in in a

1767
01:09:48,470 --> 01:09:46,000
very interesting way and and then you go

1768
01:09:51,910 --> 01:09:48,480
in and talk to local officials we're

1769
01:09:54,229 --> 01:09:51,920
i handed the new mayor of houston a copy

1770
01:09:55,910 --> 01:09:54,239
of rain and iron and ice and said

1771
01:09:58,630 --> 01:09:55,920
you might want to look at those gates

1772
01:10:00,870 --> 01:09:58,640
you're putting in the houston harbor

1773
01:10:02,470 --> 01:10:00,880
idea things like that so you can get

1774
01:10:04,390 --> 01:10:02,480
them going in that way and then that can

1775
01:10:06,870 --> 01:10:04,400
translate into broader support and i'll

1776
01:10:09,990 --> 01:10:06,880
give that to you

1777
01:10:11,990 --> 01:10:10,000
thanks um to try and address jason's

1778
01:10:13,910 --> 01:10:12,000
question

1779
01:10:15,669 --> 01:10:13,920
as i often say i think the answer is all

1780
01:10:17,910 --> 01:10:15,679
of the above

1781
01:10:20,870 --> 01:10:17,920
clearly we need engagement and

1782
01:10:22,229 --> 01:10:20,880
participation pre-launch clearly we need

1783
01:10:25,430 --> 01:10:22,239
engagement

1784
01:10:27,590 --> 01:10:25,440
and analysis on threats

1785
01:10:29,590 --> 01:10:27,600
clearly we need to measure quick

1786
01:10:33,030 --> 01:10:29,600
click-throughs and how many people sit

1787
01:10:36,070 --> 01:10:33,040
in times square to watch the event

1788
01:10:39,669 --> 01:10:36,080

engagement as correctly was pointed out

1789
01:10:43,110 --> 01:10:39,679
is a spectrum of opportunities whether

1790
01:10:47,830 --> 01:10:43,120
it's in our case upload your song

1791
01:10:50,470 --> 01:10:47,840
or we have a spanish poet from the 1700s

1792
01:10:52,310 --> 01:10:50,480
whose family are contributing poetry to

1793
01:10:54,390 --> 01:10:52,320
the cosmic archive

1794
01:10:55,510 --> 01:10:54,400
what my experience has been in now

1795
01:10:58,630 --> 01:10:55,520
almost

1796
01:11:01,990 --> 01:10:58,640
20 years of providing public

1797
01:11:04,630 --> 01:11:02,000
participation missions is i knew

1798
01:11:07,510 --> 01:11:04,640
back in 1982 when i was

1799
01:11:09,990 --> 01:11:07,520
a young man and we had a rocket on the

1800
01:11:12,470 --> 01:11:10,000
launch pad at matagorda island that when

1801
01:11:14,630 --> 01:11:12,480
that rocket took off that was a feeling

1802
01:11:16,790 --> 01:11:14,640
that that i'd never had before because

1803
01:11:19,270 --> 01:11:16,800
it was my rocket i was involved in the

1804
01:11:21,669 --> 01:11:19,280
mission the same is true for our

1805
01:11:23,350 --> 01:11:21,679
celestis missions when they know their

1806
01:11:25,189 --> 01:11:23,360
when the families come and they know

1807
01:11:28,229 --> 01:11:25,199
their loved one is fulfilling their

1808
01:11:30,870 --> 01:11:28,239
dreams that's a connectivity to what

1809
01:11:33,669 --> 01:11:30,880
might otherwise be a very boring mission

1810
01:11:36,149 --> 01:11:33,679
of a korean satellite into space that

1811
01:11:37,669 --> 01:11:36,159
carries on and interconnects over

1812
01:11:39,590 --> 01:11:37,679
generations

1813
01:11:43,030 --> 01:11:39,600

for sun jammer we've created what we

1814
01:11:45,430 --> 01:11:43,040
call mind files and bio files where you

1815
01:11:46,229 --> 01:11:45,440
can send yourself

1816
01:11:49,189 --> 01:11:46,239
uh

1817
01:11:51,030 --> 01:11:49,199
into deep space as part of the archive

1818
01:11:52,790 --> 01:11:51,040
we'll have an interactive mission

1819
01:11:54,709 --> 01:11:52,800
control we'll have the first private

1820
01:11:55,669 --> 01:11:54,719
mission control

1821
01:11:57,910 --> 01:11:55,679
that

1822
01:11:59,270 --> 01:11:57,920
will permit people to come in

1823
01:12:00,709 --> 01:11:59,280
and

1824
01:12:03,830 --> 01:12:00,719
after certain

1825
01:12:06,550 --> 01:12:03,840
qualifications actually steer the the

1826
01:12:08,790 --> 01:12:06,560
spacecraft so there's

1827
01:12:11,510 --> 01:12:08,800
innumerable the public's hungry to be

1828
01:12:14,790 --> 01:12:11,520
involved in space and to be directly

1829
01:12:15,990 --> 01:12:14,800
involved in space as opposed to

1830
01:12:17,750 --> 01:12:16,000
watching

1831
01:12:20,070 --> 01:12:17,760
what's the phrase i heard a few highly

1832
01:12:22,550 --> 01:12:20,080
paid civil servants or with the earth

1833
01:12:24,790 --> 01:12:22,560
that's great work but the public doesn't

1834
01:12:26,950 --> 01:12:24,800
necessarily connect to that when they're

1835
01:12:29,590 --> 01:12:26,960
really involved personally involved in

1836
01:12:31,990 --> 01:12:29,600
some way in that mission

1837
01:12:34,709 --> 01:12:32,000
as i mentioned to the owner of the

1838
01:12:36,790 --> 01:12:34,719

rocket that we flew on last year you may

1839
01:12:39,669 --> 01:12:36,800
think that's your rocket but i've got

1840
01:12:41,990 --> 01:12:39,679
500 people here with families on board

1841
01:12:43,590 --> 01:12:42,000
who know it's theirs and that that kind

1842
01:12:46,550 --> 01:12:43,600
of connectivity

1843
01:12:47,990 --> 01:12:46,560
does come from more than just a link

1844
01:12:50,390 --> 01:12:48,000
following and reading about the

1845
01:12:52,470 --> 01:12:50,400
information it's active engagement

1846
01:12:54,709 --> 01:12:52,480
throughout the mission and people want

1847
01:12:57,030 --> 01:12:54,719
it and not only do they want it they

1848
01:13:00,310 --> 01:12:57,040
will pay for it just as they pay for

1849
01:13:03,270 --> 01:13:00,320
experiences today and those funds can be

1850
01:13:05,350 --> 01:13:03,280
used to do future missions or to enhance

1851
01:13:08,229 --> 01:13:05,360
current missions and the fact that we're

1852
01:13:10,870 --> 01:13:08,239
beginning an era where that's okay where

1853
01:13:12,630 --> 01:13:10,880
it's no longer uh oh this mission is

1854
01:13:15,830 --> 01:13:12,640
mine i'm the government you can't do

1855
01:13:17,910 --> 01:13:15,840
anything about it with it or touch it

1856
01:13:19,430 --> 01:13:17,920
we're we're past that i think now and i

1857
01:13:22,149 --> 01:13:19,440
think you'll see

1858
01:13:24,229 --> 01:13:22,159
broad elements of engagement such as the

1859
01:13:28,630 --> 01:13:24,239
kinds of things that that we're looking

1860
01:13:31,350 --> 01:13:29,750
all right and i just want to try to make

1861
01:13:33,590 --> 01:13:31,360
a clarifying comment because i think

1862
01:13:35,110 --> 01:13:33,600
there's there's three games at play here

1863
01:13:36,229 --> 01:13:35,120

uh so there's engagement about the risks

1864
01:13:37,669 --> 01:13:36,239
which i think margaret had a lot of

1865
01:13:38,790 --> 01:13:37,679
interesting things to talk about uh

1866
01:13:40,790 --> 01:13:38,800
there's engagement of how do you have

1867
01:13:41,750 --> 01:13:40,800
like a hit sensation when you're you're

1868
01:13:42,709 --> 01:13:41,760
in the middle that the public is

1869
01:13:44,550 --> 01:13:42,719
following along and they're really

1870
01:13:46,870 --> 01:13:44,560
enjoying it and there's this idea from

1871
01:13:48,070 --> 01:13:46,880
david z cast presentation about sort of

1872
01:13:49,910 --> 01:13:48,080
citizen policy how do you figure out

1873
01:13:51,189 --> 01:13:49,920
what the broadest goals should be how do

1874
01:13:52,630 --> 01:13:51,199
you figure out what the next crits

1875
01:13:54,470 --> 01:13:52,640
hatfield robotic mission should be or

1876
01:13:55,590 --> 01:13:54,480
how do you figure out um exactly what

1877
01:13:57,669 --> 01:13:55,600
the public thinks should be the right

1878
01:13:58,870 --> 01:13:57,679
balance on on risk and future asteroid

1879
01:14:01,030 --> 01:13:58,880
missions are exactly what they think the

1880
01:14:02,310 --> 01:14:01,040
goal should be there and i think what's

1881
01:14:03,510 --> 01:14:02,320
so interesting is an intellectual

1882
01:14:05,430 --> 01:14:03,520
framework from this anticipatory

1883
01:14:06,870 --> 01:14:05,440
governance that was proposed by ecas is

1884
01:14:08,470 --> 01:14:06,880
that they've also got

1885
01:14:10,390 --> 01:14:08,480
a specific experience in proposing

1886
01:14:12,630 --> 01:14:10,400
different activities on how to actually

1887
01:14:15,430 --> 01:14:12,640
pulse the public and to try to have its

1888
01:14:16,470 --> 01:14:15,440

is this nuanced inter interaction where

1889
01:14:17,990 --> 01:14:16,480
you can't really get it through

1890
01:14:19,350 --> 01:14:18,000
crowdsourcing it's having experts who

1891
01:14:21,189 --> 01:14:19,360
help present the information in the

1892
01:14:23,910 --> 01:14:21,199
material in a way that's successful to

1893
01:14:26,070 --> 01:14:23,920
like non-standard actors and um i think

1894
01:14:32,149 --> 01:14:26,080
it's it's a different frameworks that

1895
01:14:40,950 --> 01:14:34,550
can

1896
01:14:42,550 --> 01:14:40,960
uh slides i'd like to

1897
01:14:45,110 --> 01:14:42,560
sparked some i've got some more

1898
01:14:48,310 --> 01:14:45,120
questions that i've put on a slide

1899
01:14:48,320 --> 01:14:51,110
to help us

1900
01:14:51,120 --> 01:14:59,110
kind of zero in a little bit

1901
01:15:03,669 --> 01:15:00,709
as you pull up the slides this is

1902
01:15:05,590 --> 01:15:03,679
margaret race again um i think the last

1903
01:15:07,350 --> 01:15:05,600
speaker speaking about the different

1904
01:15:10,229 --> 01:15:07,360
ways of looking at communication and

1905
01:15:13,189 --> 01:15:10,239
engagement is the real key what the

1906
01:15:15,110 --> 01:15:13,199
problem is or the the um

1907
01:15:17,189 --> 01:15:15,120
the challenge is is that we have to make

1908
01:15:18,709 --> 01:15:17,199
sure we in engage the public in

1909
01:15:20,630 --> 01:15:18,719
appropriate ways across all the

1910
01:15:23,270 --> 01:15:20,640
different things it's not just this is

1911
01:15:25,510 --> 01:15:23,280
not pr this is not just giving people

1912
01:15:26,390 --> 01:15:25,520
science information we really have to be

1913
01:15:29,590 --> 01:15:26,400

very

1914
01:15:32,149 --> 01:15:29,600
attentive to what it is that um and what

1915
01:15:34,870 --> 01:15:32,159
part of the mission or the objective

1916
01:15:36,950 --> 01:15:34,880
we're informing people about

1917
01:15:38,229 --> 01:15:36,960
and zach i would add a fourth category

1918
01:15:40,070 --> 01:15:38,239
actually is we're talking about kind of

1919
01:15:42,149 --> 01:15:40,080
a higher level schema that you started

1920
01:15:43,669 --> 01:15:42,159
to lay out the fourth category being the

1921
01:15:45,910 --> 01:15:43,679
public or individuals meaningfully

1922
01:15:47,510 --> 01:15:45,920
contributing to components of either the

1923
01:15:48,870 --> 01:15:47,520
mission or the grand challenge so the

1924
01:15:50,790 --> 01:15:48,880
amateur astronomer that goes out and

1925
01:15:52,229 --> 01:15:50,800
takes the observation or the folks that

1926
01:15:53,590 --> 01:15:52,239
are subscribed to slu which we'll hear

1927
01:15:56,149 --> 01:15:53,600
about later this afternoon that are

1928
01:15:59,110 --> 01:15:56,159
actually using um telescopes that are

1929
01:16:00,870 --> 01:15:59,120
owned by a broader community and and and

1930
01:16:02,070 --> 01:16:00,880
finding time on that telescope to do

1931
01:16:03,510 --> 01:16:02,080
observations of their own or

1932
01:16:05,189 --> 01:16:03,520
crowdsourcing through existing data on

1933
01:16:06,950 --> 01:16:05,199
things like zuniverse like planetary

1934
01:16:08,390 --> 01:16:06,960
resources is going to be doing so

1935
01:16:11,030 --> 01:16:08,400
actually contributing to the meaningful

1936
01:16:20,310 --> 01:16:11,040
work as well not just participating in

1937
01:16:24,070 --> 01:16:21,350
um

1938
01:16:25,910 --> 01:16:24,080

very serious consideration that

1939
01:16:28,630 --> 01:16:25,920
needs to be taken

1940
01:16:30,149 --> 01:16:28,640
seriously is that

1941
01:16:33,030 --> 01:16:30,159
you guys are here

1942
01:16:34,630 --> 01:16:33,040
representing the front end of a cons a

1943
01:16:36,870 --> 01:16:34,640
conceptual shift

1944
01:16:39,830 --> 01:16:36,880
of getting the public involved

1945
01:16:42,550 --> 01:16:39,840
when you go back to your offices

1946
01:16:45,350 --> 01:16:42,560
and it hits a wall of lawyers and it

1947
01:16:47,669 --> 01:16:45,360
hits a wall of policy people it begins

1948
01:16:50,310 --> 01:16:47,679
to evaporate one example

1949
01:16:52,470 --> 01:16:50,320
is here at johnson space center they've

1950
01:16:55,750 --> 01:16:52,480
built this great little building that is

1951
01:16:57,830 --> 01:16:55,760
all about uh hackers and makers and it's

1952
01:17:00,070 --> 01:16:57,840
really cool and it's got great

1953
01:17:02,149 --> 01:17:00,080
furniture and dry erase boards and

1954
01:17:05,830 --> 01:17:02,159
there's a 3d printing machine and it's

1955
01:17:07,990 --> 01:17:05,840
like beanbag chairs it's like ready for

1956
01:17:09,990 --> 01:17:08,000
that you know well under 30 crowd to

1957
01:17:12,070 --> 01:17:10,000
roll in there and get creative

1958
01:17:13,430 --> 01:17:12,080
the problem is um

1959
01:17:15,350 --> 01:17:13,440
it's inside the gates and you have to

1960
01:17:18,470 --> 01:17:15,360
get batched

1961
01:17:20,229 --> 01:17:18,480
and that's a lawyer problem where the

1962
01:17:22,630 --> 01:17:20,239
intention was right

1963
01:17:24,790 --> 01:17:22,640

but there is not an understanding that

1964
01:17:28,390 --> 01:17:24,800
that whole process of government badging

1965
01:17:31,030 --> 01:17:28,400
for example is antithetical to the very

1966
01:17:33,430 --> 01:17:31,040
blue gene culture that they are trying

1967
01:17:35,189 --> 01:17:33,440
to get in there and innovate with so

1968
01:17:36,390 --> 01:17:35,199
when you carry back all these great

1969
01:17:39,590 --> 01:17:36,400
ideas

1970
01:17:42,390 --> 01:17:39,600
there needs to be a depth of penetration

1971
01:17:45,350 --> 01:17:42,400
back into the agency so that it doesn't

1972
01:17:46,310 --> 01:17:45,360
end at the official front end of of this

1973
01:17:48,630 --> 01:17:46,320
event

1974
01:17:50,630 --> 01:17:48,640
so that the lawyers get a memo from

1975
01:17:52,870 --> 01:17:50,640
their bosses saying

1976
01:17:54,310 --> 01:17:52,880
we need you to review because they're

1977
01:17:55,510 --> 01:17:54,320
not in this room with you guys getting

1978
01:17:57,110 --> 01:17:55,520
this input

1979
01:17:59,990 --> 01:17:57,120
you're going to carry out some great

1980
01:18:01,590 --> 01:18:00,000
ideas and they're going to die

1981
01:18:05,030 --> 01:18:01,600
on a lawyer's desk

1982
01:18:07,910 --> 01:18:05,040
i'm i'm i'll take exception with that in

1983
01:18:10,229 --> 01:18:07,920
the sense that i was late to this event

1984
01:18:11,590 --> 01:18:10,239
yesterday because i was speaking to the

1985
01:18:13,030 --> 01:18:11,600
ogc

1986
01:18:15,350 --> 01:18:13,040
staff

1987
01:18:16,470 --> 01:18:15,360
about this very mission

1988
01:18:18,709 --> 01:18:16,480

and

1989
01:18:20,550 --> 01:18:18,719
jen can probably speak much better than

1990
01:18:22,390 --> 01:18:20,560
i because she's been

1991
01:18:24,550 --> 01:18:22,400
partnered with the

1992
01:18:26,870 --> 01:18:24,560
general counsel's office for

1993
01:18:28,950 --> 01:18:26,880
quite some time and

1994
01:18:31,270 --> 01:18:28,960
i would say that we've got a really

1995
01:18:33,910 --> 01:18:31,280
great partnership with the attorneys

1996
01:18:36,790 --> 01:18:33,920
that we're working with at our level

1997
01:18:39,590 --> 01:18:36,800
and um

1998
01:18:40,870 --> 01:18:39,600
i've i've done time in nasa i left and

1999
01:18:42,229 --> 01:18:40,880
came back

2000
01:18:44,070 --> 01:18:42,239
and

2001
01:18:45,750 --> 01:18:44,080
i would say it's better

2002
01:18:48,229 --> 01:18:45,760
than

2003
01:18:51,830 --> 01:18:48,239
i've ever seen it i hear examples that

2004
01:18:55,430 --> 01:18:54,070
a creative method that's that's working

2005
01:18:58,950 --> 01:18:55,440
really well and charlie chaffer's

2006
01:18:59,910 --> 01:18:58,960
talking about the the sun jammer and so

2007
01:19:02,550 --> 01:18:59,920
um

2008
01:19:04,709 --> 01:19:02,560
i i think

2009
01:19:07,910 --> 01:19:04,719
we might be perceived as kind of a front

2010
01:19:09,910 --> 01:19:07,920
edge but i i don't feel that if that is

2011
01:19:11,910 --> 01:19:09,920
actually what the perception is that

2012
01:19:14,550 --> 01:19:11,920
it's just a couple of people up here

2013
01:19:16,550 --> 01:19:14,560

alone there there are a lot of people

2014
01:19:17,750 --> 01:19:16,560
behind

2015
01:19:19,669 --> 01:19:17,760
that i'm just saying that that's a

2016
01:19:21,189 --> 01:19:19,679
constant thing as the gentleman i

2017
01:19:23,110 --> 01:19:21,199
mentioned earlier about the nyack

2018
01:19:25,350 --> 01:19:23,120
proposal yeah okay that's got a good

2019
01:19:27,189 --> 01:19:25,360
example that's a great example to

2020
01:19:29,270 --> 01:19:27,199
and see that's why this is helpful

2021
01:19:31,270 --> 01:19:29,280
that's why it's so fantastic to be here

2022
01:19:32,390 --> 01:19:31,280
in conversation and say i wouldn't have

2023
01:19:33,750 --> 01:19:32,400
known that

2024
01:19:35,750 --> 01:19:33,760
but we can go back and have that

2025
01:19:37,350 --> 01:19:35,760
conversation say hey guys because the

2026
01:19:40,310 --> 01:19:37,360
intention is good

2027
01:19:42,550 --> 01:19:40,320
we just don't always uh execute

2028
01:19:44,470 --> 01:19:42,560
and so this is where it's helpful to to

2029
01:19:48,390 --> 01:19:44,480
bring this stuff up well in that case

2030
01:19:52,550 --> 01:19:50,550
and so this is where i wanted to pivot

2031
01:19:55,430 --> 01:19:52,560
into uh some discussion points because

2032
01:19:58,550 --> 01:19:55,440
we focused in on engagement um

2033
01:20:00,870 --> 01:19:58,560
but really throwing it out we've got

2034
01:20:02,830 --> 01:20:00,880
not quite a half hour left

2035
01:20:06,229 --> 01:20:02,840
um

2036
01:20:08,629 --> 01:20:06,239
and we got an opportunity to to put some

2037
01:20:10,790 --> 01:20:08,639
findings in uh that will be factored

2038
01:20:12,390 --> 01:20:10,800

into to some planning and so

2039
01:20:14,950 --> 01:20:12,400
um

2040
01:20:15,910 --> 01:20:14,960
it was great to hear about the niacc uh

2041
01:20:19,270 --> 01:20:15,920
uh

2042
01:20:22,070 --> 01:20:19,280
difficulties are there other areas that

2043
01:20:24,070 --> 01:20:22,080
you're struggling with that when we look

2044
01:20:26,870 --> 01:20:24,080
at trying to build partnership

2045
01:20:29,350 --> 01:20:26,880
opportunities going forward

2046
01:20:33,030 --> 01:20:29,360
what can we do to to to be better and

2047
01:20:37,189 --> 01:20:34,870
are there walls that you've you've come

2048
01:20:39,750 --> 01:20:37,199
up against

2049
01:20:41,830 --> 01:20:39,760
beyond just nyack

2050
01:20:43,189 --> 01:20:41,840
if you could design the system on your

2051
01:20:44,830 --> 01:20:43,199
own

2052
01:20:53,110 --> 01:20:44,840
blank blank piece of

2053
01:20:57,430 --> 01:20:54,870
so i'm gonna go maybe go back to scott's

2054
01:20:58,790 --> 01:20:57,440
presentation as as as a launch point so

2055
01:21:01,189 --> 01:20:58,800
one of the things he mentioned was a

2056
01:21:03,430 --> 01:21:01,199
demo day yeah so if you're trying to

2057
01:21:05,030 --> 01:21:03,440
build something new and different

2058
01:21:06,870 --> 01:21:05,040
one of the things you face when you run

2059
01:21:09,510 --> 01:21:06,880
into the government is they've been

2060
01:21:10,629 --> 01:21:09,520
doing it their way for quite some time

2061
01:21:12,790 --> 01:21:10,639
and

2062
01:21:15,350 --> 01:21:12,800
unless you have an opportunity to show

2063
01:21:16,709 --> 01:21:15,360

them what you're doing in a kind of a

2064
01:21:17,910 --> 01:21:16,719
free and open environment you don't

2065
01:21:19,990 --> 01:21:17,920
often get that audience and i think

2066
01:21:21,910 --> 01:21:20,000
something like a demo day

2067
01:21:23,110 --> 01:21:21,920
is a good way for you to see that

2068
01:21:24,709 --> 01:21:23,120
there's something else out there that's

2069
01:21:27,430 --> 01:21:24,719
a better

2070
01:21:29,750 --> 01:21:27,440
way to do some things you know some of

2071
01:21:31,669 --> 01:21:29,760
the traditional processes like sbirs or

2072
01:21:33,350 --> 01:21:31,679
sttrs

2073
01:21:34,629 --> 01:21:33,360
they just get buried in a corner

2074
01:21:36,070 --> 01:21:34,639
somewhere maybe that's a way where you

2075
01:21:37,669 --> 01:21:36,080
can get more

2076
01:21:39,669 --> 01:21:37,679
of those ideas out in front and then

2077
01:21:43,430 --> 01:21:39,679
allow them to to show you what can be

2078
01:21:46,550 --> 01:21:43,440
done kind of against the old guard

2079
01:21:49,430 --> 01:21:46,560
this is tony freeman at jpl

2080
01:21:51,750 --> 01:21:49,440
nasa also have a tool a vehicle they can

2081
01:21:54,310 --> 01:21:51,760
use to partner with industry called the

2082
01:21:56,070 --> 01:21:54,320
cooperative agreement notice

2083
01:21:57,510 --> 01:21:56,080
it's actually pretty powerful you get a

2084
01:21:59,590 --> 01:21:57,520
lot of latitude

2085
01:22:01,510 --> 01:21:59,600
uh usually industry has to bring some

2086
01:22:04,629 --> 01:22:01,520
matching funds to the table

2087
01:22:07,270 --> 01:22:04,639
but it it actually has been used in a

2088
01:22:12,390 --> 01:22:07,280

wide variety of areas to get direct

2089
01:22:17,189 --> 01:22:15,830
david a simple thing that would help

2090
01:22:20,390 --> 01:22:17,199
outsiders

2091
01:22:24,070 --> 01:22:20,400
feel the shape of the elephant would be

2092
01:22:27,270 --> 01:22:24,080
easily accessible org charts for offices

2093
01:22:29,669 --> 01:22:27,280
some parts of nasa do publish org charts

2094
01:22:32,390 --> 01:22:29,679
others you just have to deduce who

2095
01:22:33,189 --> 01:22:32,400
reports to who and

2096
01:22:37,350 --> 01:22:33,199
how

2097
01:22:45,430 --> 01:22:37,360
okay

2098
01:22:50,070 --> 01:22:47,270
and i'd suggest going beyond the org

2099
01:22:52,149 --> 01:22:50,080
charts back to what are the actual

2100
01:22:54,229 --> 01:22:52,159
technical challenges that are out there

2101
01:22:57,830 --> 01:22:54,239
a lot of times um

2102
01:22:59,350 --> 01:22:57,840
you need that seed i think back 15 years

2103
01:23:02,149 --> 01:22:59,360
to being in college and trying to figure

2104
01:23:03,430 --> 01:23:02,159
out what to do as a master's project and

2105
01:23:05,430 --> 01:23:03,440
not knowing

2106
01:23:07,590 --> 01:23:05,440
what the real challenges were and where

2107
01:23:09,430 --> 01:23:07,600
there would be value if you can lay out

2108
01:23:12,070 --> 01:23:09,440
that underlying framework not just the

2109
01:23:13,750 --> 01:23:12,080
high level strategic goals

2110
01:23:15,430 --> 01:23:13,760
but examples of some of the pieces to

2111
01:23:16,950 --> 01:23:15,440
start getting people thinking about

2112
01:23:18,709 --> 01:23:16,960
where they could contribute and where

2113
01:23:23,110 --> 01:23:18,719

their capabilities and resources best

2114
01:23:28,149 --> 01:23:26,070
so as as a member of the robotics

2115
01:23:31,110 --> 01:23:28,159
concept integration team you know i was

2116
01:23:32,070 --> 01:23:31,120
talking with david and rick just a while

2117
01:23:34,470 --> 01:23:32,080
ago but

2118
01:23:36,550 --> 01:23:34,480
what would really help us is if you

2119
01:23:38,870 --> 01:23:36,560
could really identify that

2120
01:23:41,030 --> 01:23:38,880
just the top three areas that we can

2121
01:23:42,470 --> 01:23:41,040
take back to headquarters or cursed or

2122
01:23:45,189 --> 01:23:42,480
whatever and say

2123
01:23:47,510 --> 01:23:45,199
this is this suggestion these top three

2124
01:23:49,910 --> 01:23:47,520
suggestions would help better enable our

2125
01:23:51,430 --> 01:23:49,920
mutual relationships so if you can give

2126
01:23:53,590 --> 01:23:51,440
me some food there

2127
01:24:01,590 --> 01:23:53,600
that can be taken back and then and

2128
01:24:12,950 --> 01:24:02,790
do we have

2129
01:24:17,189 --> 01:24:14,149
i can add some of the things that i

2130
01:24:18,950 --> 01:24:17,199
heard during the conversation to try to

2131
01:24:21,350 --> 01:24:18,960
add some more fodder

2132
01:24:24,790 --> 01:24:21,360
one was of course the visibility

2133
01:24:26,550 --> 01:24:24,800
aspects that you that you brought up so

2134
01:24:29,110 --> 01:24:26,560
trying to make sure that nasa can also

2135
01:24:30,709 --> 01:24:29,120
play the role of helping potential

2136
01:24:32,629 --> 01:24:30,719
partners that are seeking mutual

2137
01:24:34,709 --> 01:24:32,639
interest get some visibility from their

2138
01:24:37,510 --> 01:24:34,719

partnership as well um

2139
01:24:39,510 --> 01:24:37,520
in in doing so with nasa um i think some

2140
01:24:41,590 --> 01:24:39,520
of the others that we heard were nasa

2141
01:24:43,750 --> 01:24:41,600
can just simply state things david one

2142
01:24:45,990 --> 01:24:43,760
of the things that you mentioned was

2143
01:24:47,510 --> 01:24:46,000
nasa stating on the importance of in

2144
01:24:49,830 --> 01:24:47,520
space resources

2145
01:24:52,550 --> 01:24:49,840
just stating the importance and that can

2146
01:24:54,310 --> 01:24:52,560
serve as a kind of advanced market

2147
01:24:56,470 --> 01:24:54,320
commitment of sorts of the future of

2148
01:24:57,750 --> 01:24:56,480
space exploration that could help drive

2149
01:24:59,430 --> 01:24:57,760
some of the companies that are seeking

2150
01:25:01,350 --> 01:24:59,440
to get

2151
01:25:02,950 --> 01:25:01,360
seeking to drive that activity in space

2152
01:25:05,350 --> 01:25:02,960
and so there's some things that are

2153
01:25:07,510 --> 01:25:05,360
communication activities right

2154
01:25:09,990 --> 01:25:07,520
making statements taking positions

2155
01:25:11,910 --> 01:25:10,000
helping promote um was one kind of set

2156
01:25:14,149 --> 01:25:11,920
of activities that we saw but then also

2157
01:25:16,470 --> 01:25:14,159
i heard many comments on the vehicles

2158
01:25:17,910 --> 01:25:16,480
that we use right to partner i think it

2159
01:25:19,910 --> 01:25:17,920
was also

2160
01:25:21,590 --> 01:25:19,920
you maybe that brought up the

2161
01:25:23,669 --> 01:25:21,600
300 pages of requirements that you had

2162
01:25:26,149 --> 01:25:23,679
to read through to submit a three-page

2163
01:25:27,910 --> 01:25:26,159

document back right so the rfi in many

2164
01:25:29,350 --> 01:25:27,920
ways was the first step to engagement

2165
01:25:30,550 --> 01:25:29,360
how do we continue that but the

2166
01:25:32,310 --> 01:25:30,560
structural kind of elements of how you

2167
01:25:34,149 --> 01:25:32,320
partner credo or cooperative agreement

2168
01:25:37,030 --> 01:25:34,159
as tony said or

2169
01:25:38,790 --> 01:25:37,040
far or cots or prize or there's many

2170
01:25:40,629 --> 01:25:38,800
mechanisms that could be used

2171
01:25:42,149 --> 01:25:40,639
differently but making sure to

2172
01:25:43,590 --> 01:25:42,159
look at which mechanism might further

2173
01:25:45,189 --> 01:25:43,600
the mutual benefit that everybody wants

2174
01:25:50,870 --> 01:25:45,199
the most

2175
01:25:54,870 --> 01:25:52,470
so dovetail off years a little bit i

2176
01:25:56,709 --> 01:25:54,880
think some clarity around nasa's own

2177
01:26:00,070 --> 01:25:56,719
business model where do you want to be

2178
01:26:01,750 --> 01:26:00,080
the builder doer versus the buyer

2179
01:26:03,510 --> 01:26:01,760
versus the

2180
01:26:06,149 --> 01:26:03,520
collaborator

2181
01:26:07,590 --> 01:26:06,159
at different points of the mission

2182
01:26:09,990 --> 01:26:07,600
and then

2183
01:26:11,510 --> 01:26:10,000
allowing industry to push back and say

2184
01:26:12,950 --> 01:26:11,520
yeah you said you wanted to be the doer

2185
01:26:14,790 --> 01:26:12,960
of that but that

2186
01:26:16,229 --> 01:26:14,800
is so simple

2187
01:26:17,990 --> 01:26:16,239
why would you spend big government

2188
01:26:19,350 --> 01:26:18,000

dollars to do that or that's the most

2189
01:26:20,709 --> 01:26:19,360
lucrative why would you spend big

2190
01:26:22,790 --> 01:26:20,719
government dollars that's where we can

2191
01:26:24,229 --> 01:26:22,800
be motivated to go do that so some

2192
01:26:26,070 --> 01:26:24,239
clarity around that i think that gets

2193
01:26:27,590 --> 01:26:26,080
back to david's point as well we

2194
01:26:28,709 --> 01:26:27,600
if i if you make that statement that

2195
01:26:30,550 --> 01:26:28,719
we're going to be a buyer of this

2196
01:26:32,629 --> 01:26:30,560
service we're going to be 20 companies

2197
01:26:33,830 --> 01:26:32,639
pop up and figure out how to deliver it

2198
01:26:35,189 --> 01:26:33,840
if you say i'm going to be a doer of

2199
01:26:36,149 --> 01:26:35,199
this service well i'm not going to go

2200
01:26:38,229 --> 01:26:36,159
build that because i don't have the

2201
01:26:44,709 --> 01:26:38,239
pockets to necessarily compete unless

2202
01:26:47,669 --> 01:26:46,310
i just want to pound home on that

2203
01:26:49,350 --> 01:26:47,679
because i've been pounding on that one

2204
01:26:51,990 --> 01:26:49,360
for about 20 years and that's the idea

2205
01:26:54,629 --> 01:26:52,000
that at that top level

2206
01:26:55,669 --> 01:26:54,639
if the government can sit down and go

2207
01:26:58,790 --> 01:26:55,679
okay

2208
01:27:00,310 --> 01:26:58,800
settlement science and safety

2209
01:27:02,070 --> 01:27:00,320
those are the three main areas we're

2210
01:27:03,350 --> 01:27:02,080
looking at when we're dealing with with

2211
01:27:05,990 --> 01:27:03,360
with

2212
01:27:08,310 --> 01:27:06,000
neos or you know safety in terms of

2213
01:27:09,910 --> 01:27:08,320

planetary defense science in terms of

2214
01:27:11,910 --> 01:27:09,920
expanding the scientific base of

2215
01:27:14,310 --> 01:27:11,920
humanity or the us

2216
01:27:15,910 --> 01:27:14,320
um and settlement is uh

2217
01:27:18,709 --> 01:27:15,920
we're going to be we're blazing a path

2218
01:27:19,990 --> 01:27:18,719
for you so you lock those in at the very

2219
01:27:22,310 --> 01:27:20,000
top level

2220
01:27:24,629 --> 01:27:22,320
and then bring together some people from

2221
01:27:26,629 --> 01:27:24,639
the different communities

2222
01:27:28,790 --> 01:27:26,639
and this is a part of it this is a part

2223
01:27:31,030 --> 01:27:28,800
of it and maybe some more expert people

2224
01:27:32,870 --> 01:27:31,040
in a different setting

2225
01:27:35,750 --> 01:27:32,880
the ones who are really hands on

2226
01:27:38,070 --> 01:27:35,760
directly involved and then maybe on the

2227
01:27:39,750 --> 01:27:38,080
more crowd grassroots thing you know

2228
01:27:42,229 --> 01:27:39,760
more people involved and sit down and go

2229
01:27:44,470 --> 01:27:42,239
okay in each of these areas once you

2230
01:27:46,790 --> 01:27:44,480
have that top level decision your other

2231
01:27:49,270 --> 01:27:46,800
decisions under that cascade out of it

2232
01:27:51,030 --> 01:27:49,280
it becomes clear if the goal is

2233
01:27:52,390 --> 01:27:51,040
settlement then you have to have an

2234
01:27:54,550 --> 01:27:52,400
economy if you're going to have an

2235
01:27:56,950 --> 01:27:54,560
economy then the government needs to

2236
01:27:58,629 --> 01:27:56,960
look at every activity it's doing as to

2237
01:28:00,390 --> 01:27:58,639
does this enable the development of

2238
01:28:02,390 --> 01:28:00,400

economy and economy which is what he was

2239
01:28:04,470 --> 01:28:02,400
saying what does it inhibit

2240
01:28:07,990 --> 01:28:04,480
you know are these operational tasks can

2241
01:28:10,229 --> 01:28:08,000
these be handed off or are these ones

2242
01:28:12,470 --> 01:28:10,239
that uh catalyze

2243
01:28:13,590 --> 01:28:12,480
uh are should we be an anchor tenant or

2244
01:28:14,709 --> 01:28:13,600
should we announce we're going to build

2245
01:28:16,149 --> 01:28:14,719
the building

2246
01:28:18,070 --> 01:28:16,159
even though we know somebody else can

2247
01:28:19,830 --> 01:28:18,080
build that building and we could just be

2248
01:28:21,510 --> 01:28:19,840
an anchor tenant and enable them getting

2249
01:28:23,030 --> 01:28:21,520
financing to build that building there

2250
01:28:24,310 --> 01:28:23,040
are a lot of models actually outside of

2251
01:28:26,790 --> 01:28:24,320
space where government does that very

2252
01:28:28,470 --> 01:28:26,800
effectively you know the fbi or irs

2253
01:28:29,990 --> 01:28:28,480
rolls into a city and says we're going

2254
01:28:31,750 --> 01:28:30,000
to have this floor of the new building

2255
01:28:34,070 --> 01:28:31,760
we are now an anchor tenant they can get

2256
01:28:36,709 --> 01:28:34,080
financing and build the whole building

2257
01:28:39,510 --> 01:28:36,719
those kinds of relationships and then by

2258
01:28:42,790 --> 01:28:39,520
putting it in terms of this is

2259
01:28:44,629 --> 01:28:42,800
we're not doing it for you you are doing

2260
01:28:46,229 --> 01:28:44,639
it with us

2261
01:28:48,470 --> 01:28:46,239
and then that trickles all the way down

2262
01:28:51,350 --> 01:28:48,480
to the crowd sourcing and getting the

2263
01:28:54,310 --> 01:28:51,360

kids involvement because it's not nasa

2264
01:28:55,910 --> 01:28:54,320
astronauts performing

2265
01:28:58,470 --> 01:28:55,920
climbing around the popcorn package

2266
01:29:00,709 --> 01:28:58,480
pulling out gravel on on an asteroid or

2267
01:29:02,790 --> 01:29:00,719
something it is an entire series of

2268
01:29:04,629 --> 01:29:02,800
activities that involve the entire broad

2269
01:29:06,790 --> 01:29:04,639
u.s public

2270
01:29:07,830 --> 01:29:06,800
pushing forward on these different areas

2271
01:29:08,950 --> 01:29:07,840
that are going to lead to these three

2272
01:29:10,790 --> 01:29:08,960
things

2273
01:29:13,669 --> 01:29:10,800
that they are a part of and they will

2274
01:29:14,709 --> 01:29:13,679
reap the rewards from and it's their

2275
01:29:16,870 --> 01:29:14,719
face

2276
01:29:18,790 --> 01:29:16,880
at the end it's their kid that's going

2277
01:29:23,590 --> 01:29:18,800
to be going out there that kind of thing

2278
01:29:27,270 --> 01:29:25,430
um this is um

2279
01:29:29,830 --> 01:29:27,280
rick said something earlier about giving

2280
01:29:32,149 --> 01:29:29,840
the book a reign of fire and ice to the

2281
01:29:34,149 --> 01:29:32,159
new houston mayor and this is a comment

2282
01:29:36,950 --> 01:29:34,159
about the messaging that's contained

2283
01:29:38,550 --> 01:29:36,960
within the idea that nasa states

2284
01:29:41,350 --> 01:29:38,560
something you know

2285
01:29:43,750 --> 01:29:41,360
after the last workshop meeting that

2286
01:29:45,110 --> 01:29:43,760
sunday 60 minutes had a great spot on

2287
01:29:47,669 --> 01:29:45,120
the chelly bens

2288
01:29:49,830 --> 01:29:47,679

explosion and stuff and i was thinking

2289
01:29:52,070 --> 01:29:49,840
oh this is fantastic what a great way to

2290
01:29:53,910 --> 01:29:52,080
represent the risk the public but at the

2291
01:29:56,310 --> 01:29:53,920
end of it the nasa scientists who were

2292
01:29:57,750 --> 01:29:56,320
there really kind of i'm not saying they

2293
01:30:00,950 --> 01:29:57,760
understated it i think they were very

2294
01:30:02,870 --> 01:30:00,960
accurate but i think there was the

2295
01:30:05,669 --> 01:30:02,880
the amount of drama that could have been

2296
01:30:07,350 --> 01:30:05,679
contained in their statement missing you

2297
01:30:08,470 --> 01:30:07,360
know they really said oh you know i left

2298
01:30:10,310 --> 01:30:08,480
the program saying oh well they said

2299
01:30:12,629 --> 01:30:10,320
it's really nothing to worry about

2300
01:30:15,270 --> 01:30:12,639
and i think that's not exactly the

2301
01:30:23,830 --> 01:30:15,280
messaging that is most

2302
01:30:23,840 --> 01:30:28,709
this this gathering in the rfi has been

2303
01:30:32,629 --> 01:30:30,229
pointed to as

2304
01:30:35,750 --> 01:30:32,639
as a step

2305
01:30:37,350 --> 01:30:35,760
how how has this felt is this

2306
01:30:38,390 --> 01:30:37,360
uh

2307
01:30:41,270 --> 01:30:38,400
valuable

2308
01:30:42,550 --> 01:30:41,280
has this opportunity to gather and and

2309
01:30:43,750 --> 01:30:42,560
discuss

2310
01:30:45,990 --> 01:30:43,760
um

2311
01:30:47,669 --> 01:30:46,000
been a valuable process how would you

2312
01:30:49,189 --> 01:30:47,679
change it

2313
01:30:52,310 --> 01:30:49,199

if we're recognizing that we're trying

2314
01:30:54,390 --> 01:30:52,320
to get ideas to plan and move forward

2315
01:31:04,470 --> 01:30:54,400
how would you design

2316
01:31:07,510 --> 01:31:06,149
sorry

2317
01:31:09,669 --> 01:31:07,520
um

2318
01:31:11,350 --> 01:31:09,679
yeah you guys have been awesome i mean i

2319
01:31:12,790 --> 01:31:11,360
think it's great that you're doing this

2320
01:31:13,830 --> 01:31:12,800
and again if you can get the depths and

2321
01:31:15,590 --> 01:31:13,840
carry it

2322
01:31:17,510 --> 01:31:15,600
penetrate deep into that headquarters

2323
01:31:19,189 --> 01:31:17,520
building in dc that's great

2324
01:31:21,510 --> 01:31:19,199
or more importantly maybe the center

2325
01:31:22,950 --> 01:31:21,520
director's offices that would be even

2326
01:31:26,390 --> 01:31:22,960
better but

2327
01:31:30,310 --> 01:31:27,830
find an auditorium that doesn't have

2328
01:31:32,070 --> 01:31:30,320
theater style seating

2329
01:31:34,229 --> 01:31:32,080
okay because it implies that you're

2330
01:31:36,390 --> 01:31:34,239
talking to us

2331
01:31:38,229 --> 01:31:36,400
might be part of it or have breakouts

2332
01:31:40,149 --> 01:31:38,239
that go off and work on focused areas

2333
01:31:41,750 --> 01:31:40,159
and bring it back and that kind of thing

2334
01:31:44,229 --> 01:31:41,760
but but you i definitely want to say

2335
01:31:45,910 --> 01:31:44,239
i've spoken to a lot of people

2336
01:31:47,990 --> 01:31:45,920
people that weren't here the day after

2337
01:31:49,189 --> 01:31:48,000
the original one got canceled and

2338
01:31:51,030 --> 01:31:49,199

weren't blah blah blah you know

2339
01:31:53,350 --> 01:31:51,040
officially anyway or whatever but people

2340
01:31:54,790 --> 01:31:53,360
who interacted and um they feel really

2341
01:31:55,590 --> 01:31:54,800
good about what's happening and i think

2342
01:31:57,590 --> 01:31:55,600
you're

2343
01:31:59,270 --> 01:31:57,600
you know this is a good approach the

2344
01:32:07,030 --> 01:31:59,280
rest of nasa could learn from you guys

2345
01:32:10,229 --> 01:32:08,870
any of the questions that are thrown up

2346
01:32:11,990 --> 01:32:10,239
on the board

2347
01:32:15,030 --> 01:32:12,000
how would you like to participate with

2348
01:32:16,950 --> 01:32:15,040
nasa are there technologies that that we

2349
01:32:18,629 --> 01:32:16,960
can focus on

2350
01:32:21,030 --> 01:32:18,639
uh we've got

2351
01:32:24,390 --> 01:32:21,040
15 minutes i don't want to belabor it if

2352
01:32:26,390 --> 01:32:24,400
we feel like we played this out to

2353
01:32:29,189 --> 01:32:26,400
however far we're going to get we can

2354
01:32:31,669 --> 01:32:29,199
break early and people can grab lunch

2355
01:32:33,189 --> 01:32:31,679
but we do have 15 minutes left if if

2356
01:32:36,470 --> 01:32:33,199
there is

2357
01:32:38,149 --> 01:32:36,480
a discussion that needs to be continued

2358
01:32:40,950 --> 01:32:38,159
yeah i might frame one of these

2359
01:32:42,149 --> 01:32:40,960
questions in uh getting

2360
01:32:43,430 --> 01:32:42,159
towards the statement that you made

2361
01:32:44,070 --> 01:32:43,440
about the top three things to go back

2362
01:32:45,750 --> 01:32:44,080
and

2363
01:32:47,350 --> 01:32:45,760

take to gerst from your perspective

2364
01:32:49,590 --> 01:32:47,360
would be what would what would you say

2365
01:32:51,430 --> 01:32:49,600
would be the top opportunities

2366
01:32:52,629 --> 01:32:51,440
in the near term window

2367
01:33:00,790 --> 01:32:52,639
to

2368
01:33:02,390 --> 01:33:00,800
position it for success in both areas so

2369
01:33:03,910 --> 01:33:02,400
what are the opportunities thinking

2370
01:33:04,950 --> 01:33:03,920
maybe about the near term stuff because

2371
01:33:07,110 --> 01:33:04,960
that's the stuff that we need to get

2372
01:33:09,830 --> 01:33:07,120
moving on right but what might be those

2373
01:33:23,030 --> 01:33:09,840
nearer term opportunities

2374
01:33:26,709 --> 01:33:24,870
this will be more self-serving than an

2375
01:33:29,189 --> 01:33:26,719
intended to be but i think it's around

2376
01:33:31,590 --> 01:33:29,199
identify

2377
01:33:32,950 --> 01:33:31,600
because it's the most tangible

2378
01:33:33,990 --> 01:33:32,960
set of technologies we have today

2379
01:33:36,950 --> 01:33:34,000
whether they're ground-based or

2380
01:33:39,110 --> 01:33:36,960
space-based visible or ir

2381
01:33:41,590 --> 01:33:39,120
those are things that

2382
01:33:44,950 --> 01:33:41,600
a broad community of people understand

2383
01:33:47,590 --> 01:33:44,960
very well how to make sense of

2384
01:33:49,990 --> 01:33:47,600
that data and do something with it and

2385
01:33:51,430 --> 01:33:50,000
it goes beyond just the professionals i

2386
01:33:53,990 --> 01:33:51,440
think this is where

2387
01:33:57,990 --> 01:33:54,000
you can get into crowdsourcing

2388
01:34:00,229 --> 01:33:58,000

you can mobilize semi-pros and true

2389
01:34:02,470 --> 01:34:00,239
amateurs to do some portions of the

2390
01:34:05,669 --> 01:34:02,480
mission right there's a lot that we

2391
01:34:08,310 --> 01:34:05,679
don't know about asteroids in general

2392
01:34:09,750 --> 01:34:08,320
not just where they are but even ones we

2393
01:34:11,830 --> 01:34:09,760
know where they are we don't know a lot

2394
01:34:13,430 --> 01:34:11,840
about them uh so there's a lot of work

2395
01:34:14,470 --> 01:34:13,440
that could be done there

2396
01:34:16,470 --> 01:34:14,480
um

2397
01:34:17,830 --> 01:34:16,480
in a very in a very quick turnaround

2398
01:34:19,990 --> 01:34:17,840
where you could reach out and start

2399
01:34:21,910 --> 01:34:20,000
mobilizing a lot of excess capacity to

2400
01:34:23,189 --> 01:34:21,920
get back to engagement i think you want

2401
01:34:24,950 --> 01:34:23,199
to know if you engage somebody it's how

2402
01:34:27,110 --> 01:34:24,960
do they use their excess capital whether

2403
01:34:29,110 --> 01:34:27,120
it's their time their resources

2404
01:34:35,590 --> 01:34:29,120
their mind

2405
01:34:40,709 --> 01:34:37,830
and i completely agree with clinton that

2406
01:34:41,669 --> 01:34:40,719
identify is a good early opportunity but

2407
01:34:43,189 --> 01:34:41,679
i think

2408
01:34:45,030 --> 01:34:43,199
so that we don't lose sight of the next

2409
01:34:47,430 --> 01:34:45,040
step in parallel we really need to start

2410
01:34:49,590 --> 01:34:47,440
focusing on the technologies that do

2411
01:34:51,030 --> 01:34:49,600
need to be developed so that there's an

2412
01:34:52,149 --> 01:34:51,040
understanding out there of what we

2413
01:34:54,390 --> 01:34:52,159

should be working on and we can

2414
01:34:56,229 --> 01:34:54,400
articulate what it is that we need to be

2415
01:34:59,350 --> 01:34:56,239
part of partnering on what steps we need

2416
01:35:00,629 --> 01:34:59,360
to take so that once we are even in a

2417
01:35:02,950 --> 01:35:00,639
better position than we've already

2418
01:35:04,550 --> 01:35:02,960
gotten to from the identify standpoint

2419
01:35:11,669 --> 01:35:04,560
we know how we can actually

2420
01:35:14,790 --> 01:35:13,109
um i

2421
01:35:18,070 --> 01:35:14,800
got the impression that sunjammer and i

2422
01:35:20,070 --> 01:35:18,080
know that b612 these are two um

2423
01:35:22,709 --> 01:35:20,080
semi-commercial or

2424
01:35:24,950 --> 01:35:22,719
certainly fund-raising endeavors that

2425
01:35:26,950 --> 01:35:24,960
enlist the public by offering some

2426
01:35:29,030 --> 01:35:26,960
participation i know you can give money

2427
01:35:31,189 --> 01:35:29,040
to these projects and in some way have

2428
01:35:32,470 --> 01:35:31,199
your name associated with the project

2429
01:35:36,229 --> 01:35:32,480
i

2430
01:35:37,990 --> 01:35:36,239
to somehow attach the nasa meatball to

2431
01:35:40,310 --> 01:35:38,000
that notion of public

2432
01:35:41,430 --> 01:35:40,320
participation

2433
01:35:53,109 --> 01:35:41,440
seems

2434
01:35:57,430 --> 01:35:54,709
i'll go one more i'm looking at the

2435
01:36:00,229 --> 01:35:57,440
pictures behind your head thinking

2436
01:36:02,550 --> 01:36:00,239
somebody at nasa probably cook those up

2437
01:36:03,990 --> 01:36:02,560
maybe you have an image contest

2438
01:36:05,430 --> 01:36:04,000

and ask

2439
01:36:06,790 --> 01:36:05,440
someone else what they think identify

2440
01:36:08,550 --> 01:36:06,800
looks like does it look like a 30

2441
01:36:09,750 --> 01:36:08,560
million dollar facility with a three

2442
01:36:13,030 --> 01:36:09,760
meter optic

2443
01:36:16,229 --> 01:36:13,040
does it look like you know

2444
01:36:18,390 --> 01:36:16,239
an iss eva suit

2445
01:36:20,070 --> 01:36:18,400
for explore

2446
01:36:21,990 --> 01:36:20,080
even conceptually right that sort of

2447
01:36:24,790 --> 01:36:22,000
sets a tone do you go in somewhere else

2448
01:36:26,870 --> 01:36:24,800
and get someone to set the tone of the

2449
01:36:28,629 --> 01:36:26,880
idea behind all of these things and see

2450
01:36:31,910 --> 01:36:28,639
if that sparks a different direction in

2451
01:36:37,590 --> 01:36:31,920
terms of doing some of the work

2452
01:36:37,600 --> 01:36:41,510
the um

2453
01:36:44,790 --> 01:36:43,109
basically it's a bottom the bottom line

2454
01:36:45,750 --> 01:36:44,800
is get on with it

2455
01:36:49,350 --> 01:36:45,760
um

2456
01:36:52,470 --> 01:36:49,360
operating at uh government salary

2457
01:36:53,910 --> 01:36:52,480
pace and aerospace salary pace

2458
01:36:54,950 --> 01:36:53,920
especially for entrepreneurial companies

2459
01:36:57,109 --> 01:36:54,960
like ours you guys are going to have

2460
01:37:00,149 --> 01:36:57,119
some sort of industry day next spring

2461
01:37:03,510 --> 01:37:00,159
that's a million years away for us

2462
01:37:07,430 --> 01:37:03,520
okay we're burning investor money now

2463
01:37:09,030 --> 01:37:07,440

and as is the other company so do it do

2464
01:37:11,990 --> 01:37:09,040
things now they don't have to be the

2465
01:37:14,310 --> 01:37:12,000
major things but things that begin to

2466
01:37:16,470 --> 01:37:14,320
break the catch-22 of can we work with

2467
01:37:19,350 --> 01:37:16,480
these people are they real how do we

2468
01:37:21,990 --> 01:37:19,360
prove it and start doing those things on

2469
01:37:24,709 --> 01:37:22,000
the crowd sourcing side of things go and

2470
01:37:26,390 --> 01:37:24,719
the the broader public involvement get

2471
01:37:28,310 --> 01:37:26,400
started now

2472
01:37:29,910 --> 01:37:28,320
with something don't wait for the

2473
01:37:32,390 --> 01:37:29,920
perfect plan

2474
01:37:34,310 --> 01:37:32,400
the mega giga plan that somehow fits

2475
01:37:36,390 --> 01:37:34,320
into your 2015

2476
01:37:39,990 --> 01:37:36,400
road map activities or something like

2477
01:37:41,350 --> 01:37:40,000
that start now with something that is as

2478
01:37:44,470 --> 01:37:41,360
they say on the internet a minimum

2479
01:37:47,590 --> 01:37:44,480
viable product and gets you rolling and

2480
01:37:49,990 --> 01:37:47,600
indicates that this is real and not a

2481
01:37:52,470 --> 01:37:50,000
kabuki dance or a road show which i

2482
01:37:55,189 --> 01:37:52,480
don't think you guys are engaged in but

2483
01:37:57,910 --> 01:37:55,199
the proof is always going to be in the

2484
01:38:01,590 --> 01:37:57,920
action starting both on the public side

2485
01:38:01,600 --> 01:38:07,270
great

2486
01:38:07,280 --> 01:38:14,950
anything else burning

2487
01:38:18,470 --> 01:38:16,790
please i'm actually carrying the

2488
01:38:20,550 --> 01:38:18,480

microphone but i wanted it just to make

2489
01:38:22,070 --> 01:38:20,560
a comment about some of the discussions

2490
01:38:23,910 --> 01:38:22,080
that's been

2491
01:38:25,590 --> 01:38:23,920
made on crowdsourcing

2492
01:38:27,910 --> 01:38:25,600
there's been some discussion about maybe

2493
01:38:30,470 --> 01:38:27,920
the informed public that can contribute

2494
01:38:31,910 --> 01:38:30,480
because they've got the resources or in

2495
01:38:33,990 --> 01:38:31,920
groups where they're being able to

2496
01:38:35,669 --> 01:38:34,000
contribute and maybe

2497
01:38:37,510 --> 01:38:35,679
the other spectrum of the general public

2498
01:38:39,830 --> 01:38:37,520
that might just be informed and this

2499
01:38:41,109 --> 01:38:39,840
area of crowdsourcing or being able to

2500
01:38:42,790 --> 01:38:41,119
actually provide

2501
01:38:44,390 --> 01:38:42,800
some sort of funding towards a project

2502
01:38:46,550 --> 01:38:44,400
or towards an idea even if it's not

2503
01:38:47,910 --> 01:38:46,560
fully developed yet allows people to

2504
01:38:49,430 --> 01:38:47,920
really feel like

2505
01:38:51,350 --> 01:38:49,440
from a public standpoint that they have

2506
01:38:53,669 --> 01:38:51,360
ownership i really like the idea of the

2507
01:38:59,510 --> 01:38:53,679
mind files that go up because people

2508
01:39:05,109 --> 01:39:02,870
be prepared for expect and grow from

2509
01:39:07,510 --> 01:39:05,119
failures along the road

2510
01:39:09,990 --> 01:39:07,520
not all partnerships are going to work

2511
01:39:12,629 --> 01:39:10,000
not all crowdsourcing is going to get

2512
01:39:14,470 --> 01:39:12,639
there i i looked at one

2513
01:39:16,870 --> 01:39:14,480

a few weeks back that was a lunar

2514
01:39:18,390 --> 01:39:16,880
mission that raised seventeen thousand

2515
01:39:19,189 --> 01:39:18,400
dollars

2516
01:39:20,790 --> 01:39:19,199
well

2517
01:39:23,510 --> 01:39:20,800
and if they can do it

2518
01:39:24,390 --> 01:39:23,520
i need i need several of those things

2519
01:39:27,910 --> 01:39:24,400
but

2520
01:39:31,109 --> 01:39:29,669
when a

2521
01:39:35,669 --> 01:39:31,119
private guy

2522
01:39:38,149 --> 01:39:35,679
puts their a gal puts her money at risk

2523
01:39:39,109 --> 01:39:38,159
and succeeds she gets

2524
01:39:41,270 --> 01:39:39,119
wealthy

2525
01:39:43,430 --> 01:39:41,280
when she fails

2526
01:39:44,550 --> 01:39:43,440
it's tough times

2527
01:39:45,990 --> 01:39:44,560
when

2528
01:39:47,189 --> 01:39:46,000
a government

2529
01:39:51,030 --> 01:39:47,199
gal

2530
01:39:52,870 --> 01:39:51,040
puts the agency at risk which is how any

2531
01:39:55,750 --> 01:39:52,880
of these partnerships are viewed they're

2532
01:39:58,709 --> 01:39:55,760
viewed oh my god what can go wrong what

2533
01:40:03,430 --> 01:39:58,719
will congress say when this thing fails

2534
01:40:05,430 --> 01:40:03,440
and and when the agency succeeds

2535
01:40:06,870 --> 01:40:05,440
often does not people go well you didn't

2536
01:40:08,950 --> 01:40:06,880
need that much money we're going to cut

2537
01:40:11,109 --> 01:40:08,960
your budget

2538
01:40:12,709 --> 01:40:11,119

but the person

2539
01:40:14,870 --> 01:40:12,719
gets a plaque on the wall or something

2540
01:40:17,830 --> 01:40:14,880
that doesn't get personally rich

2541
01:40:18,870 --> 01:40:17,840
but when the agency fails

2542
01:40:21,910 --> 01:40:18,880
there's

2543
01:40:24,950 --> 01:40:21,920
a whole city called washington that i

2544
01:40:27,350 --> 01:40:24,960
lived in for 20 years that just jumps

2545
01:40:29,590 --> 01:40:27,360
all over it and look at you know look at

2546
01:40:32,790 --> 01:40:29,600
this uh

2547
01:40:33,750 --> 01:40:32,800
solyndra example in space kind of thing

2548
01:40:37,109 --> 01:40:33,760
so

2549
01:40:39,669 --> 01:40:37,119
i think that going in to partnerships

2550
01:40:40,390 --> 01:40:39,679
where you invite goofballs like rick and

2551
01:40:43,030 --> 01:40:40,400
me

2552
01:40:45,189 --> 01:40:43,040
to participate

2553
01:40:46,950 --> 01:40:45,199
you've got to qualify us there's no

2554
01:40:48,709 --> 01:40:46,960
question about that you can't just enter

2555
01:40:51,910 --> 01:40:48,719
into a partnership with everybody but

2556
01:40:53,750 --> 01:40:51,920
you have to not expect to bat a thousand

2557
01:40:55,109 --> 01:40:53,760
along the way and you have to structure

2558
01:40:57,030 --> 01:40:55,119
them so that

2559
01:40:59,830 --> 01:40:57,040
people don't get harmed when that

2560
01:41:01,669 --> 01:40:59,840
happens but it can't send the agency

2561
01:41:03,350 --> 01:41:01,679
back to okay now we're back to apollo

2562
01:41:06,550 --> 01:41:03,360
the way it should be because that ain't

2563
01:41:08,629 --> 01:41:06,560

going to happen anymore so be aware that

2564
01:41:10,550 --> 01:41:08,639
not all of these great crowd-sourced

2565
01:41:12,950 --> 01:41:10,560
missions will ever fly

2566
01:41:15,910 --> 01:41:12,960
not every partnership that nasa enters

2567
01:41:17,910 --> 01:41:15,920
into will succeed but you don't need it

2568
01:41:21,590 --> 01:41:17,920
you know part of it when it's much lower

2569
01:41:24,709 --> 01:41:21,600
cost and much more diverse uh diversity

2570
01:41:27,030 --> 01:41:24,719
of organizations trying to get there

2571
01:41:29,030 --> 01:41:27,040
they don't all have to succeed you have

2572
01:41:29,990 --> 01:41:29,040
to have a good batting average and you

2573
01:41:33,030 --> 01:41:30,000
can't

2574
01:41:35,669 --> 01:41:33,040
waste money but at the same time some of

2575
01:41:38,070 --> 01:41:35,679
the best things i've ever built and done

2576
01:41:40,790 --> 01:41:38,080
have come because i really goofed up

2577
01:41:43,109 --> 01:41:40,800
previously and oh i can't do that

2578
01:41:47,109 --> 01:41:43,119
anymore i have to change so that's

2579
01:41:48,390 --> 01:41:47,119
that's a difficult culture at nasa to

2580
01:41:51,350 --> 01:41:48,400
embrace

2581
01:41:54,629 --> 01:41:51,360
i applaud i i've seen night and day

2582
01:41:56,629 --> 01:41:54,639
strides and and i've been doing you know

2583
01:41:59,590 --> 01:41:56,639
jason knows i bought a minuteman missile

2584
01:42:02,070 --> 01:41:59,600
from nasa in 1982. you know i'm still

2585
01:42:04,229 --> 01:42:02,080
the first and only u.s citizen ever to

2586
01:42:06,950 --> 01:42:04,239
buy a minuteman missile that was a

2587
01:42:08,709 --> 01:42:06,960
really unique partnership that that neil

2588
01:42:10,870 --> 01:42:08,719

hosenball who was the general counsel

2589
01:42:13,189 --> 01:42:10,880
figured out well i can't really sell you

2590
01:42:15,590 --> 01:42:13,199
a minute man charlie but i can sell you

2591
01:42:17,750 --> 01:42:15,600
the rights to use it and if you don't

2592
01:42:19,430 --> 01:42:17,760
bring it back in the same condition that

2593
01:42:22,629 --> 01:42:19,440
you borrowed it from you have to pay

2594
01:42:24,229 --> 01:42:22,639
full acquisition value so that there are

2595
01:42:26,390 --> 01:42:24,239
innovative they've always been

2596
01:42:28,629 --> 01:42:26,400
innovative people what i see now is more

2597
01:42:30,149 --> 01:42:28,639
of an innovative culture and that's

2598
01:42:33,109 --> 01:42:30,159
that's because

2599
01:42:35,189 --> 01:42:33,119
the the the i the fingers out of the

2600
01:42:37,510 --> 01:42:35,199
dike the dam the gene you know

2601
01:42:39,189 --> 01:42:37,520
pick whatever silly analogy you want

2602
01:42:41,910 --> 01:42:39,199
there's just too much commercial stuff

2603
01:42:44,390 --> 01:42:41,920
going on to ever bottle it back up and

2604
01:42:48,229 --> 01:42:44,400
go back to the days of apollo that's not

2605
01:42:49,830 --> 01:42:48,239
a viable model but the new model is not

2606
01:42:51,669 --> 01:42:49,840
going to be pure

2607
01:42:53,030 --> 01:42:51,679
you know light at the end of the tunnel

2608
01:42:54,790 --> 01:42:53,040
they're going to be some hiccups along

2609
01:42:56,470 --> 01:42:54,800
the way and you should use those as

2610
01:42:57,510 --> 01:42:56,480
learning events

2611
01:43:01,510 --> 01:42:57,520
and

2612
01:43:04,390 --> 01:43:01,520
not not seek out to fail but not

2613
01:43:05,590 --> 01:43:04,400

punish failure by saying well that model

2614
01:43:07,030 --> 01:43:05,600
doesn't work we're never going to do

2615
01:43:11,830 --> 01:43:07,040
that again

2616
01:43:11,840 --> 01:43:16,550
any other thoughts

2617
01:43:16,560 --> 01:43:19,189
good thought

2618
01:43:23,669 --> 01:43:22,070
all right folks

2619
01:43:26,390 --> 01:43:23,679
i think this is

2620
01:43:27,910 --> 01:43:26,400
proven to be a really really successful

2621
01:43:32,070 --> 01:43:27,920
session this morning

2622
01:43:35,030 --> 01:43:32,080
uh we had 55 respondents

2623
01:43:37,830 --> 01:43:35,040
provide ideas that got down selected to

2624
01:43:39,430 --> 01:43:37,840
those that were presented here today

2625
01:43:41,830 --> 01:43:39,440
huge thanks to

2626
01:43:44,470 --> 01:43:41,840
those that uh all of all of you that

2627
01:43:48,070 --> 01:43:44,480
took time to put in a proposal

2628
01:43:49,510 --> 01:43:48,080
um and for those that were selected to

2629
01:43:52,310 --> 01:43:49,520
take the time to then prepare a

2630
01:43:54,790 --> 01:43:52,320
presentation and come share with us uh

2631
01:43:56,390 --> 01:43:54,800
and then all of all of you that

2632
01:43:58,790 --> 01:43:56,400
joined us to participate in this

2633
01:44:00,709 --> 01:43:58,800
conversation i i really do believe that

2634
01:44:03,270 --> 01:44:00,719
it is the

2635
01:44:06,229 --> 01:44:03,280
the first of many steps forward and i

2636
01:44:09,350 --> 01:44:06,239
feel like we have a lot of good material

2637
01:44:10,950 --> 01:44:09,360
to pull in to the findings that will

2638
01:44:11,830 --> 01:44:10,960

share the plenary

2639
01:44:12,709 --> 01:44:11,840
uh

2640
01:44:13,750 --> 01:44:12,719
and

2641
01:44:15,270 --> 01:44:13,760
uh

2642
01:44:17,270 --> 01:44:15,280
really appreciate

2643
01:44:19,109 --> 01:44:17,280
all your time and energy to get us to

2644
01:44:21,510 --> 01:44:19,119
where we are at this point so

2645
01:44:23,990 --> 01:44:21,520
with that let us close maybe three

2646
01:44:25,830 --> 01:44:24,000
minutes early and um

2647
01:44:26,870 --> 01:44:25,840
this does not end the conversation

2648
01:44:30,629 --> 01:44:26,880
there's

2649
01:44:33,270 --> 01:44:30,639
uh hallways and internet

2650
01:44:35,990 --> 01:44:33,280
and uh relationships that i hope we've

2651
01:44:37,830 --> 01:44:36,000
we've started that will continue this as

2652
01:44:39,030 --> 01:44:37,840
we move forward so with that i thank

2653
01:44:42,310 --> 01:44:39,040
everybody

2654
01:44:43,750 --> 01:44:42,320
uh and we will adjourn our session and

2655
01:44:45,270 --> 01:44:43,760
please remember to attend the

2656
01:44:46,950 --> 01:44:45,280
crowdsourcing and citizen science

2657
01:44:50,790 --> 01:44:46,960
session this afternoon you can see us

2658
01:44:52,470 --> 01:44:50,800
again but in flip rolls um and on friday

2659
01:44:54,629 --> 01:44:52,480
morning you can see us again again

2660
01:44:56,070 --> 01:44:54,639
flipped um for next generation

2661
01:44:57,510 --> 01:44:56,080
engagement and in those two panels we'll

2662
01:45:00,870 --> 01:44:57,520
really be talking about meaningfully

2663
01:45:03,109 --> 01:45:00,880

engaging individuals in the work of

2664
01:45:05,350 --> 01:45:03,119
the grand challenge element of of the

2665
01:45:07,350 --> 01:45:05,360
initiative so we please encourage you to

2666
01:45:09,750 --> 01:45:07,360
come to those and be part of those

2667
01:45:11,270 --> 01:45:09,760
discussions especially since it's been

2668
01:45:12,310 --> 01:45:11,280
stated by some of the folks in the

2669
01:45:14,790 --> 01:45:12,320
audience that that's where we're going

2670
01:45:16,709 --> 01:45:14,800
to be likely doing a lot of the initial

2671
01:45:18,390 --> 01:45:16,719
work right out the gate to get started

2672
01:45:20,229 --> 01:45:18,400
on this activity so we

2673
01:45:21,430 --> 01:45:20,239
would really love your feedback since

2674
01:45:23,189 --> 01:45:21,440
those things are

2675
01:45:24,310 --> 01:45:23,199
quicker in the hopper so thank you very