
NASA
NASA
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NASA

1
00:00:06,590 --> 00:00:03,830
hi everybody welcome to NASA's Kennedy

2
00:00:08,270 --> 00:00:06,600
Space Center and the NASA social for the

3
00:00:10,520 --> 00:00:08,280
launch of the twin radiation belt storm

4
00:00:12,950 --> 00:00:10,530
probes i'm jason townsend from the NASA

5
00:00:14,870 --> 00:00:12,960
social media team today is part two of

6
00:00:16,640 --> 00:00:14,880
the NASA social yesterday we had a great

7
00:00:19,310 --> 00:00:16,650
tour of the facilities here at Kennedy

8
00:00:20,540 --> 00:00:19,320
we also had an exciting video call with

9
00:00:21,830 --> 00:00:20,550
the International Space Station where

10
00:00:24,050 --> 00:00:21,840
five of the folks who are in this room

11
00:00:25,519 --> 00:00:24,060
today along with nine of the folks from

12
00:00:27,259 --> 00:00:25,529
across the Twittersphere had the

13
00:00:28,580 --> 00:00:27,269

opportunity to ask their questions of

14
00:00:30,950 --> 00:00:28,590
the astronauts who are living off this

15
00:00:32,240 --> 00:00:30,960
planet but before we start going to too

16
00:00:34,459 --> 00:00:32,250
much detail for the benefit of the

17
00:00:37,340 --> 00:00:34,469
viewers who are at home on NASA TV just

18
00:00:39,139 --> 00:00:37,350
what is a NASA social well a NASA social

19
00:00:41,750 --> 00:00:39,149
really is all about taking the online

20
00:00:43,639 --> 00:00:41,760
world offline we invite our followers

21
00:00:45,500 --> 00:00:43,649
our fans and the social media community

22
00:00:47,900 --> 00:00:45,510
to have members come out here to the

23
00:00:49,400 --> 00:00:47,910
NASA facilities we hope that they take

24
00:00:51,410 --> 00:00:49,410
part in these special events where we

25
00:00:52,939 --> 00:00:51,420
give them access to facilities and meet

26
00:00:55,189 --> 00:00:52,949
our passionate employees that most folks

27
00:00:57,170 --> 00:00:55,199
don't get the chance to do but we also

28
00:00:59,479 --> 00:00:57,180
hope they take this opportunity to share

29
00:01:02,029 --> 00:00:59,489
all about NASA with all of their

30
00:01:04,160 --> 00:01:02,039
followers online using social media and

31
00:01:06,200 --> 00:01:04,170
it doesn't stop here now in this room

32
00:01:08,210 --> 00:01:06,210
we're continuing on with more social

33
00:01:11,210 --> 00:01:08,220
media events out there just recently

34
00:01:13,070 --> 00:01:11,220
announced is the next NASA social at the

35
00:01:15,260 --> 00:01:13,080
Goldstone deep space communications

36
00:01:18,170 --> 00:01:15,270
complex in California's Mojave Desert on

37
00:01:20,030 --> 00:01:18,180
October 15 2012 you can find out more

38
00:01:25,249 --> 00:01:20,040

about this and the NASA social program

39
00:01:28,070 --> 00:01:25,259
at WWDC gov slash social but back to

40
00:01:30,319 --> 00:01:28,080
today we hope you're following along

41
00:01:33,859 --> 00:01:30,329
online by following @nasa

42
00:01:36,499 --> 00:01:33,869
and at our bee storm probes on Twitter

43
00:01:38,569 --> 00:01:36,509
and that you like NASA and the radiation

44
00:01:41,090 --> 00:01:38,579
belt storm probes pages on Facebook and

45
00:01:43,609 --> 00:01:41,100
that you follow NASA on your circles in

46
00:01:44,929 --> 00:01:43,619
Google+ and if you want to follow or

47
00:01:47,179 --> 00:01:44,939
join the conversation online you're

48
00:01:49,730 --> 00:01:47,189
welcome to do so at any time by using

49
00:01:52,399 --> 00:01:49,740
the pound rbsp hashtag for the mission

50
00:01:55,340 --> 00:01:52,409
and pound NASA social for the today's

51
00:01:56,539 --> 00:01:55,350
event in today's televised event we're

52
00:01:57,770 --> 00:01:56,549
bringing to you some of the behind the

53
00:01:59,539 --> 00:01:57,780
scenes information about the twin

54
00:02:01,819 --> 00:01:59,549
radiation belt storm probes satellites

55
00:02:03,530 --> 00:02:01,829
we hope you'll learn more about the

56
00:02:05,530 --> 00:02:03,540
mission as it seeks to explore the Van

57
00:02:07,730 --> 00:02:05,540
Allen radiation belts around the earth

58
00:02:09,710 --> 00:02:07,740
rbsp is scheduled to launch tomorrow

59
00:02:12,470 --> 00:02:09,720
morning in the early hours of Friday at

60
00:02:13,850 --> 00:02:12,480
4:07 a.m. Eastern Time aboard a ula

61
00:02:15,920 --> 00:02:13,860
Atlas 5 rocket from

62
00:02:17,330 --> 00:02:15,930
right here in Florida today you'll hear

63
00:02:18,860 --> 00:02:17,340

from a variety of different folks who

64
00:02:20,930 --> 00:02:18,870
each have a unique perspective on this

65
00:02:22,910 --> 00:02:20,940
mission from the hands-on science work

66
00:02:24,650 --> 00:02:22,920
to the big picture view of America's

67
00:02:26,660 --> 00:02:24,660
space program and how this mission fits

68
00:02:27,140 --> 00:02:26,670
into it these speakers are part of this

69
00:02:34,640 --> 00:02:27,150
event

70
00:02:36,920 --> 00:02:34,650
social which were formerly called NASA

71
00:02:38,510 --> 00:02:36,930
Tweetup s-- we're building on the recent

72
00:02:40,520 --> 00:02:38,520
success from earlier this month with the

73
00:02:43,580 --> 00:02:40,530
first for NASA it was the first ever

74
00:02:45,650 --> 00:02:43,590
NASA social happening at seven different

75
00:02:47,570 --> 00:02:45,660
facilities at once occurring

76
00:02:49,190 --> 00:02:47,580
simultaneously where we all came

77
00:02:50,449 --> 00:02:49,200
together for an incredible experience

78
00:02:53,510 --> 00:02:50,459
for the landing of the Mars Science

79
00:02:54,830 --> 00:02:53,520
Laboratory Curiosity rover on Mars its

80
00:02:56,690 --> 00:02:54,840
experiences like these that really

81
00:02:58,490 --> 00:02:56,700
helped share NASA with new audiences in

82
00:02:59,810 --> 00:02:58,500
new ways and it gets shared in very

83
00:03:01,310 --> 00:02:59,820
non-traditional ways that show off the

84
00:03:03,380 --> 00:03:01,320
science and engineering work that we do

85
00:03:04,760 --> 00:03:03,390
here at NASA we strive every day to

86
00:03:06,140 --> 00:03:04,770
promote the diversity of amazing work

87
00:03:08,150 --> 00:03:06,150
done here and to share our missions

88
00:03:10,580 --> 00:03:08,160

programs and the talented employees in

89
00:03:12,140 --> 00:03:10,590
ways that connect with everybody the

90
00:03:14,180 --> 00:03:12,150
NASA socials are just one part of this

91
00:03:16,970 --> 00:03:14,190
strategy and that strategy is always

92
00:03:18,590 --> 00:03:16,980
evolving we're always looking for new

93
00:03:20,780 --> 00:03:18,600
opportunities connect with new audiences

94
00:03:22,550 --> 00:03:20,790
and share information in new ways we're

95
00:03:23,960 --> 00:03:22,560
always exploring where the public is and

96
00:03:26,449 --> 00:03:23,970
figuring out where social media is

97
00:03:28,130 --> 00:03:26,459
headed next we are the most on the most

98
00:03:29,810 --> 00:03:28,140
popular platforms now and when new ones

99
00:03:31,520 --> 00:03:29,820
emerge we'll go there too

100
00:03:33,860 --> 00:03:31,530
so thank you for joining us for this

101
00:03:35,750 --> 00:03:33,870
event today and this experience no

102
00:03:38,210 --> 00:03:35,760
matter if it's offline here in person or

103
00:03:39,259 --> 00:03:38,220
watching online today at home we're glad

104
00:03:41,870 --> 00:03:39,269
you could join us to hear more about

105
00:03:43,520 --> 00:03:41,880
this incredible mission and without much

106
00:03:45,680 --> 00:03:43,530
further ado here to talk with us about

107
00:03:47,180 --> 00:03:45,690
Helio physics the study of the Sun and

108
00:03:51,350 --> 00:03:47,190
how it interacts with the solar system

109
00:03:53,090 --> 00:03:51,360
is dr. Barbara Giles the director of the

110
00:03:54,710 --> 00:03:53,100
Helio physics division of the science

111
00:03:58,150 --> 00:03:54,720
Mission Directorate at NASA headquarters

112
00:03:58,160 --> 00:04:02,309
[Applause]

113
00:04:08,740 --> 00:04:05,800

so I'm very very happy to be here today

114
00:04:11,229 --> 00:04:08,750
to tell you about the radiation belt

115
00:04:13,509 --> 00:04:11,239
storm probes and and my particular job

116
00:04:16,509 --> 00:04:13,519
is is to tell you how it fits in the

117
00:04:20,469 --> 00:04:16,519
broader context of what NASA is trying

118
00:04:23,530 --> 00:04:20,479
to do in the area of Helio physics Helio

119
00:04:26,530 --> 00:04:23,540
physics is about solar in space physics

120
00:04:29,310 --> 00:04:26,540
it's about how the Sun affects our

121
00:04:32,080 --> 00:04:29,320
Earth's near space environment and

122
00:04:34,930 --> 00:04:32,090
before we talk more about that I just

123
00:04:37,510 --> 00:04:34,940
want to want to tell you a little bit

124
00:04:39,250 --> 00:04:37,520
about myself and my connection with this

125
00:04:43,200 --> 00:04:39,260
mission

126
00:04:46,690 --> 00:04:43,210
I started at NASA thirty years ago as a

127
00:04:48,490 --> 00:04:46,700
freshman at the University and when I

128
00:04:52,360 --> 00:04:48,500
went to Goddard Space Flight Center

129
00:04:55,750 --> 00:04:52,370
about 15 years later I had the privilege

130
00:04:59,080 --> 00:04:55,760
of with dr. Bob Hoffman starting the

131
00:05:01,510 --> 00:04:59,090
first studies for this mission later

132
00:05:04,420 --> 00:05:01,520
when I went to NASA headquarters I also

133
00:05:07,180 --> 00:05:04,430
had the honor of of procuring the

134
00:05:09,940 --> 00:05:07,190
payload the instruments that would be

135
00:05:13,180 --> 00:05:09,950
onboard and now that I've been named

136
00:05:17,050 --> 00:05:13,190
director I have I have this honor of

137
00:05:19,390 --> 00:05:17,060
being with you today one thing I can

138
00:05:22,450 --> 00:05:19,400

share with you is that every one of

139
00:05:25,690 --> 00:05:22,460
those instrument teams have done

140
00:05:28,240 --> 00:05:25,700
absolutely the best job that anyone

141
00:05:32,140 --> 00:05:28,250
could have expected of them the

142
00:05:36,129 --> 00:05:32,150
instruments on board are the highest

143
00:05:39,029 --> 00:05:36,139
quality the absolute best instruments

144
00:05:42,670 --> 00:05:39,039
that have ever been flown in this region

145
00:05:45,909 --> 00:05:42,680
I can also take a few minutes to brag on

146
00:05:47,800 --> 00:05:45,919
the Applied Physics lab and the job that

147
00:05:50,920 --> 00:05:47,810
they have done building the spacecraft

148
00:05:54,339 --> 00:05:50,930
and getting the spacecraft ready for

149
00:05:58,620 --> 00:05:54,349
launch there were several times over the

150
00:06:02,500 --> 00:05:58,630
past few years where APL has has made

151
00:06:06,650 --> 00:06:02,510
decisions that in hindsight I can now

152
00:06:11,510 --> 00:06:06,660
say absolutely made this mission six

153
00:06:14,390 --> 00:06:11,520
it is being launched on time within its

154
00:06:16,850 --> 00:06:14,400
cost commitments because of some of

155
00:06:21,800 --> 00:06:16,860
those decisions they made that this is

156
00:06:23,990 --> 00:06:21,810
in terms of taxpayer investment one of

157
00:06:26,750 --> 00:06:24,000
the best investments I believe that we

158
00:06:30,320 --> 00:06:26,760
have made in the heliophysics area and

159
00:06:36,530 --> 00:06:30,330
it will pay dividends for for many years

160
00:06:38,990 --> 00:06:36,540
to come so let's see the next thing what

161
00:06:41,350 --> 00:06:39,000
oh I know this is something that we

162
00:06:44,060 --> 00:06:41,360
really want to talk about this is

163
00:06:47,420 --> 00:06:44,070

absolutely the most exciting time for

164
00:06:51,260 --> 00:06:47,430
science at NASA I believe as you know

165
00:06:56,270 --> 00:06:51,270
earlier this month we landed the rover

166
00:06:58,760 --> 00:06:56,280
on Mars and certainly those the

167
00:07:01,460 --> 00:06:58,770
excitement of discoveries on other

168
00:07:05,270 --> 00:07:01,470
planets are something that just really

169
00:07:08,300 --> 00:07:05,280
speaks to our soul NASA is also all

170
00:07:11,240 --> 00:07:08,310
about understanding our own planet and

171
00:07:13,100 --> 00:07:11,250
the radiation belt storm probes is a

172
00:07:15,950 --> 00:07:13,110
mission that will do just that

173
00:07:20,480 --> 00:07:15,960
in particular the questions we're trying

174
00:07:23,600 --> 00:07:20,490
to answer are why does the Sun vary how

175
00:07:27,020 --> 00:07:23,610
does the earth respond and what are the

176
00:07:28,490 --> 00:07:27,030
implications for life in society and so

177
00:07:31,340 --> 00:07:28,500
that's what you're going to hear about

178
00:07:34,970 --> 00:07:31,350
today is how the radiation belt storm

179
00:07:38,360 --> 00:07:34,980
probes fits into those big questions

180
00:07:40,850 --> 00:07:38,370
that we're trying to answer when we're

181
00:07:44,150 --> 00:07:40,860
thinking about why does the Sun vary

182
00:07:47,480 --> 00:07:44,160
about two years ago we launched the

183
00:07:50,570 --> 00:07:47,490
first mission in our program that's

184
00:07:54,260 --> 00:07:50,580
called living with a star because we do

185
00:07:56,900 --> 00:07:54,270
live in the atmosphere of a star our Sun

186
00:08:00,670 --> 00:07:56,910
it's the most important star in my

187
00:08:03,800 --> 00:08:00,680
opinion the Solar Dynamics Observatory

188
00:08:06,590 --> 00:08:03,810

those that that mission gives you all of

189
00:08:08,660 --> 00:08:06,600
those exciting images of the Sun that

190
00:08:12,050 --> 00:08:08,670
you've been seeing in the news and in

191
00:08:13,860 --> 00:08:12,060
print the radiation belt storm probes is

192
00:08:16,409 --> 00:08:13,870
going to join that mission

193
00:08:19,110 --> 00:08:16,419
and will truly be able to make that

194
00:08:21,780 --> 00:08:19,120
connection between what is happening on

195
00:08:25,740 --> 00:08:21,790
the Sun and what is happening in Earth's

196
00:08:28,110 --> 00:08:25,750
near space environment so that's what I

197
00:08:31,170 --> 00:08:28,120
want you to know about the radiation

198
00:08:34,190 --> 00:08:31,180
belt storm probes and I would love to

199
00:08:38,670 --> 00:08:34,200
answer more questions if you have them

200
00:08:41,430 --> 00:08:38,680
about the heliophysics program about the

201
00:08:44,550 --> 00:08:41,440
living with a star program about Solar

202
00:08:49,350 --> 00:08:44,560
Dynamics Observatory or any of the other

203
00:08:52,230 --> 00:08:49,360
missions that we manage for you for your

204
00:08:58,560 --> 00:08:52,240
for your program in solar and space

205
00:09:08,010 --> 00:09:05,580
don't be shy yes my first question among

206
00:09:11,490 --> 00:09:08,020
many would be how does what you're doing

207
00:09:13,680 --> 00:09:11,500
now compared with the historical of an

208
00:09:17,190 --> 00:09:13,690
Allen explorations of the early space

209
00:09:21,000 --> 00:09:17,200
program this is very exciting mission

210
00:09:23,400 --> 00:09:21,010
we've actually had a few missions that

211
00:09:28,050 --> 00:09:23,410
have advanced the science of their

212
00:09:30,090 --> 00:09:28,060
radiation belts over time and the big

213
00:09:33,210 --> 00:09:30,100

difference here is that we're actually

214
00:09:36,510 --> 00:09:33,220
going to have instrumentation that

215
00:09:39,360 --> 00:09:36,520
covers the full range of measurements

216
00:09:41,850 --> 00:09:39,370
that we need to unravel the mysteries

217
00:09:44,460 --> 00:09:41,860
and I think that Dave Sypek you're going

218
00:09:48,330 --> 00:09:44,470
to cover about that instrument range

219
00:09:52,560 --> 00:09:48,340
about the full range of fields particles

220
00:09:56,160 --> 00:09:52,570
waves we've got the two spacecraft that

221
00:10:00,810 --> 00:09:56,170
allow us to separate processes that act

222
00:10:03,090 --> 00:10:00,820
on timescales or spatial scales that's

223
00:10:06,200 --> 00:10:03,100
going to be the big difference in this

224
00:10:10,230 --> 00:10:06,210
case it's it's an incredibly harsh

225
00:10:13,320 --> 00:10:10,240
environment it has taken us this long to

226
00:10:16,100 --> 00:10:13,330
build this mission because of that harsh

227
00:10:18,540 --> 00:10:16,110
environment we had two advanced

228
00:10:22,320 --> 00:10:18,550
technologies to the point where we could

229
00:10:25,530 --> 00:10:22,330
safely fly these missions through the

230
00:10:29,700 --> 00:10:25,540
radiation belts sustain the measurements

231
00:10:32,430 --> 00:10:29,710
through big storms so I think that's one

232
00:10:34,860 --> 00:10:32,440
of the biggest differences from time

233
00:10:37,860 --> 00:10:34,870
we've learned a lot now we're going to

234
00:10:44,900 --> 00:10:37,870
be able I hope to nail down the the

235
00:10:50,750 --> 00:10:48,080
the opportunity

236
00:10:55,160 --> 00:10:50,760
because you are going into such a

237
00:10:56,810 --> 00:10:55,170
hazardous environment how predictable is

238
00:11:01,040 --> 00:10:56,820

that the degradation of the systems

239
00:11:03,920 --> 00:11:01,050
onboard these areas they're really a way

240
00:11:08,000 --> 00:11:03,930
of knowing that well we can we can

241
00:11:10,850 --> 00:11:08,010
always wonder whether we have understood

242
00:11:13,070 --> 00:11:10,860
everything that's coming before us one

243
00:11:15,530 --> 00:11:13,080
thing that we do know is that we have

244
00:11:18,350 --> 00:11:15,540
flown missions through these regions for

245
00:11:22,130 --> 00:11:18,360
many years we have a lot of experience

246
00:11:25,010 --> 00:11:22,140
on what causes upsets to systems we have

247
00:11:28,010 --> 00:11:25,020
a lot of experience about how this

248
00:11:31,010 --> 00:11:28,020
environment might degrade systems and we

249
00:11:33,980 --> 00:11:31,020
have designed against those so I think

250
00:11:36,950 --> 00:11:33,990
we have a lot of good information a lot

251
00:11:39,200 --> 00:11:36,960
of good experience and I have every

252
00:11:41,960 --> 00:11:39,210
confidence that this missions going to

253
00:11:45,620 --> 00:11:41,970
going to survive that environment just

254
00:11:47,450 --> 00:11:45,630
fine we have a good track record

255
00:11:51,050 --> 00:11:47,460
actually I'll just brag on our track

256
00:11:53,840 --> 00:11:51,060
record for a minute is that in

257
00:11:57,140 --> 00:11:53,850
heliophysics many of the missions that

258
00:12:00,680 --> 00:11:57,150
we have flown they have designed

259
00:12:04,600 --> 00:12:00,690
lifetimes they're two years or four

260
00:12:07,670 --> 00:12:04,610
years whatever the design lifetime is

261
00:12:11,780 --> 00:12:07,680
these missions have typically exceeded

262
00:12:14,990 --> 00:12:11,790
those lifetimes by several by several

263
00:12:21,570 --> 00:12:15,000

times and I think this one will as well

264
00:12:27,070 --> 00:12:24,430
are there plans to put in some type of

265
00:12:28,930 --> 00:12:27,080
an early warning system for solar storms

266
00:12:34,180 --> 00:12:28,940
and their effect on the planet our

267
00:12:37,540 --> 00:12:34,190
electrical grid actually we we have as

268
00:12:40,930 --> 00:12:37,550
part of the heliophysics program we are

269
00:12:44,320 --> 00:12:40,940
currently managing 17 missions in orbit

270
00:12:48,970 --> 00:12:44,330
now several of them do have real-time

271
00:12:53,350 --> 00:12:48,980
data capability it brings us data now on

272
00:12:55,990 --> 00:12:53,360
what is happening on the Sun a beacon so

273
00:12:59,230 --> 00:12:56,000
that after a day or two we see more

274
00:13:02,620 --> 00:12:59,240
information and then once the events get

275
00:13:06,760 --> 00:13:02,630
closer to the earth more information all

276
00:13:10,600 --> 00:13:06,770
of that data is fed to the Space Weather

277
00:13:13,720 --> 00:13:10,610
Prediction Center at that is that NOAA

278
00:13:17,530 --> 00:13:13,730
manages in Boulder Colorado and they do

279
00:13:19,840 --> 00:13:17,540
issue warnings on a regular basis if you

280
00:13:23,170 --> 00:13:19,850
haven't signed up for their warnings

281
00:13:25,030 --> 00:13:23,180
there they're really fascinating to come

282
00:13:27,190 --> 00:13:25,040
through your email I recommend you just

283
00:13:30,880 --> 00:13:27,200
sign up for all of the warnings it's

284
00:13:32,770 --> 00:13:30,890
just fun to see them come through and

285
00:13:36,850 --> 00:13:32,780
and think about what's happening in the

286
00:13:38,860 --> 00:13:36,860
space environment real time maybe that's

287
00:13:42,700 --> 00:13:38,870
only me that I enjoy Sam

288
00:13:45,220 --> 00:13:42,710

but okay I love it I wash it this

289
00:13:46,720 --> 00:13:45,230
question kind of builds on the last I

290
00:13:49,630 --> 00:13:46,730
was wondering if you could give some

291
00:13:54,280 --> 00:13:49,640
more everyday real-world examples of

292
00:13:56,110 --> 00:13:54,290
what our PSP is going to apply to folks

293
00:13:58,240 --> 00:13:56,120
in their lives as far as maybe radio

294
00:14:00,100 --> 00:13:58,250
frequencies and and measuring things

295
00:14:02,560 --> 00:14:00,110
that would potentially interfere with

296
00:14:05,980 --> 00:14:02,570
the mobile devices that were becoming

297
00:14:07,480 --> 00:14:05,990
you know so dependent upon we'll be glad

298
00:14:09,100 --> 00:14:07,490
to do that now Dave are you gonna go

299
00:14:11,890 --> 00:14:09,110
into some of that in a little more

300
00:14:14,710 --> 00:14:11,900
detail so I I don't want to steal Dave's

301
00:14:17,620 --> 00:14:14,720
thunder but one of the things that I

302
00:14:21,100 --> 00:14:17,630
think is really important that doesn't

303
00:14:24,700 --> 00:14:21,110
come you know in in in all of our our

304
00:14:26,769 --> 00:14:24,710
literature about rbsp but one of the

305
00:14:30,220 --> 00:14:26,779
things is that the instrumentation is

306
00:14:33,100 --> 00:14:30,230
really going to be able to measure many

307
00:14:35,010 --> 00:14:33,110
of the current systems that happen in

308
00:14:37,870 --> 00:14:35,020
our near-earth space environment

309
00:14:40,870 --> 00:14:37,880
understanding those current systems and

310
00:14:44,050 --> 00:14:40,880
then later using other spacecraft as

311
00:14:46,420 --> 00:14:44,060
well understanding how that connects to

312
00:14:48,490 --> 00:14:46,430
currents on the ground the geomagnetic

313
00:14:50,860 --> 00:14:48,500

induced currents that you hear about

314
00:14:52,620 --> 00:14:50,870
that affect the power grid we're going

315
00:14:55,750 --> 00:14:52,630
to be able to make those connections

316
00:14:59,110 --> 00:14:55,760
over time and hopefully we will have

317
00:15:02,260 --> 00:14:59,120
some models available in in the

318
00:15:05,290 --> 00:15:02,270
not-too-distant future we're working on

319
00:15:08,350 --> 00:15:05,300
that to really predict how that might

320
00:15:12,460 --> 00:15:08,360
affect the power grid so that's that's

321
00:15:15,579 --> 00:15:12,470
my I guess that's one of my dreams to

322
00:15:17,860 --> 00:15:15,589
come come to fruition over the next two

323
00:15:19,420 --> 00:15:17,870
years now Dave you've prep I've seen

324
00:15:22,329 --> 00:15:19,430
your slides you've got other good

325
00:15:27,100 --> 00:15:22,339
examples as well so I won't steal those

326
00:15:31,510 --> 00:15:27,110
from you okay okay we got one more time

327
00:15:33,940 --> 00:15:31,520
anybody anyway

328
00:15:36,040 --> 00:15:33,950
as the information comes back from the

329
00:15:37,690 --> 00:15:36,050
storm probes will there be access to the

330
00:15:40,180 --> 00:15:37,700
data available online for the general

331
00:15:41,710 --> 00:15:40,190
public to catch up on any of what

332
00:15:43,570 --> 00:15:41,720
they're you know what it's picking up oh

333
00:15:46,720 --> 00:15:43,580
absolutely

334
00:15:51,010 --> 00:15:46,730
one thing that NASA has as a principle

335
00:15:54,310 --> 00:15:51,020
is is an open data policy and so as soon

336
00:15:56,580 --> 00:15:54,320
as the data has has gone through its

337
00:15:59,890 --> 00:15:56,590
initial processing it will be available

338
00:16:03,120 --> 00:15:59,900

in a very short period of time

339
00:16:07,480 --> 00:16:03,130
it's openly accessible there will be

340
00:16:10,750 --> 00:16:07,490
plots and graphs and the raw data that

341
00:16:13,900 --> 00:16:10,760
anyone would be able to to pick up and

342
00:16:16,240 --> 00:16:13,910
in use in whatever way they they'd like

343
00:16:19,480 --> 00:16:16,250
to so we're gonna and we're going to try

344
00:16:21,700 --> 00:16:19,490
to to also put some interpretations out

345
00:16:24,970 --> 00:16:21,710
there as well as time goes on when

346
00:16:28,060 --> 00:16:24,980
there's a storm they'll also be some

347
00:16:31,540 --> 00:16:28,070
releases that help explain the data for

348
00:16:35,550 --> 00:16:31,550
the larger events so we hope that that

349
00:16:39,940 --> 00:16:35,560
you'll you'll follow us in the future

350
00:16:49,390 --> 00:16:39,950
okay thank you very much Barbara thank

351
00:16:52,480 --> 00:16:49,400
you so next up we have dr. David Tsai

352
00:16:53,530 --> 00:16:52,490
back he's the rbsp mission scientist

353
00:16:55,240 --> 00:16:53,540
from the NASA Goddard Space Flight

354
00:17:01,170 --> 00:16:55,250
Center so joining us here today

355
00:17:05,620 --> 00:17:03,910
Thank You delighted to be here delighted

356
00:17:08,800 --> 00:17:05,630
to be with your viewers on NASA

357
00:17:10,270 --> 00:17:08,810
television I'm David cyber Kai at NASA's

358
00:17:12,670 --> 00:17:10,280
Goddard Space Flight Center

359
00:17:15,070 --> 00:17:12,680
I'm the mission scientist for the rbsp

360
00:17:17,560 --> 00:17:15,080
mission that means I work closely with

361
00:17:20,890 --> 00:17:17,570
NASA headquarters and the scientists and

362
00:17:23,020 --> 00:17:20,900
engineers at JH APL to get the best

363
00:17:25,480 --> 00:17:23,030

possible science out of this mission and

364
00:17:27,730 --> 00:17:25,490
to communicate it to you the public

365
00:17:30,970 --> 00:17:27,740
that's my job so I'm very happy to be

366
00:17:32,710 --> 00:17:30,980
with you here today okay let's see

367
00:17:37,330 --> 00:17:32,720
should have a slide to go with my

368
00:17:38,980 --> 00:17:37,340
presentation that's good okay we've done

369
00:17:42,340 --> 00:17:38,990
that one check move on

370
00:17:44,650 --> 00:17:42,350
okay so where do we fit in the big

371
00:17:46,630 --> 00:17:44,660
picture well we're talking about space

372
00:17:49,540 --> 00:17:46,640
weather we're talking about things that

373
00:17:53,230 --> 00:17:49,550
happen at the Sun and connect to us here

374
00:17:55,720 --> 00:17:53,240
at Earth the driver for everything we do

375
00:17:58,030 --> 00:17:55,730
and we study is the Sun the turbulent

376
00:18:00,280 --> 00:17:58,040
processes that occur on the Sun flares

377
00:18:02,860 --> 00:18:00,290
explosions on the Sun blasts of plasma

378
00:18:04,780 --> 00:18:02,870
that come out from the Sun carrying the

379
00:18:07,960 --> 00:18:04,790
magnetic field of the Sun outward

380
00:18:10,150 --> 00:18:07,970
towards the earth through interplanetary

381
00:18:12,880 --> 00:18:10,160
space past the other planets to earth

382
00:18:14,620 --> 00:18:12,890
when those explosions and those blasts

383
00:18:16,600 --> 00:18:14,630
of plasma reach earth

384
00:18:19,480 --> 00:18:16,610
that's when interesting things start to

385
00:18:21,340 --> 00:18:19,490
happen the Earth's magnetic field is our

386
00:18:24,700 --> 00:18:21,350
shield against them but it's an

387
00:18:27,070 --> 00:18:24,710
imperfect shield variations in the solar

388
00:18:29,170 --> 00:18:27,080

wind the Sun that are coming out shake

389
00:18:31,600 --> 00:18:29,180
and make the magnetospheric magnetic

390
00:18:34,480 --> 00:18:31,610
field our shield shudder and shake

391
00:18:36,580 --> 00:18:34,490
they interject energy particles plasma

392
00:18:38,980 --> 00:18:36,590
into the Earth's magnetic field they're

393
00:18:41,050 --> 00:18:38,990
the driver of geomagnetic storms which

394
00:18:43,120 --> 00:18:41,060
cause disturbances in the area around

395
00:18:45,160 --> 00:18:43,130
Earth they're the driver of a rural

396
00:18:49,660 --> 00:18:45,170
phenomenon the Aurora that you can see

397
00:18:52,630 --> 00:18:49,670
at high latitudes in the sky at night so

398
00:18:54,790 --> 00:18:52,640
where do we fit in the picture we with

399
00:18:57,040 --> 00:18:54,800
rbsp are measuring that response at

400
00:18:58,840 --> 00:18:57,050
Earth the response to these geomagnetic

401
00:19:01,420 --> 00:18:58,850
storms that are driven by things

402
00:19:03,640 --> 00:19:01,430
happening on the Sun we're a partner in

403
00:19:05,740 --> 00:19:03,650
a sequence of events we're a partner

404
00:19:07,930 --> 00:19:05,750
with the other spacecraft that dr. Giles

405
00:19:09,880 --> 00:19:07,940
just mentioned we're looking forward to

406
00:19:11,080 --> 00:19:09,890
working with them let's go on to the

407
00:19:13,749 --> 00:19:11,090
next slide

408
00:19:16,180 --> 00:19:13,759
we're interested in solving problems of

409
00:19:18,279 --> 00:19:16,190
practical importance that's the living

410
00:19:20,830 --> 00:19:18,289
with a star program it works on things

411
00:19:23,200 --> 00:19:20,840
like that these are some examples of

412
00:19:25,600 --> 00:19:23,210
space weather effects space weather

413
00:19:27,610 --> 00:19:25,610

things that can harm our technology or

414
00:19:29,860 --> 00:19:27,620
our astronauts in space

415
00:19:32,220 --> 00:19:29,870
perhaps they range over much broader

416
00:19:35,409 --> 00:19:32,230
range of topics than you had imagined

417
00:19:37,840 --> 00:19:35,419
Airlines exposure to radiation in

418
00:19:40,840 --> 00:19:37,850
airlines in passenger jets passing over

419
00:19:44,159 --> 00:19:40,850
the polar caps harm to spacecraft and

420
00:19:46,509 --> 00:19:44,169
satellites harm to astronauts

421
00:19:48,789 --> 00:19:46,519
difficulties with communication in the

422
00:19:51,279 --> 00:19:48,799
polar region difficulties talking to

423
00:19:53,409 --> 00:19:51,289
airplanes difficulty with your GPS these

424
00:19:54,580 --> 00:19:53,419
are all space weather effects we're

425
00:19:58,269 --> 00:19:54,590
gonna be looking at one particular

426
00:20:01,419 --> 00:19:58,279
aspect the harm that radiation in space

427
00:20:04,210 --> 00:20:01,429
in the Van Allen belts can cause two

428
00:20:06,519 --> 00:20:04,220
spacecraft circling the earth we want to

429
00:20:08,680 --> 00:20:06,529
be able to predict what goes on to

430
00:20:11,499 --> 00:20:08,690
predict we have to first observe and

431
00:20:15,539 --> 00:20:11,509
understand compared with other cases

432
00:20:18,820 --> 00:20:15,549
other days other spacecraft let's go on

433
00:20:20,889 --> 00:20:18,830
NASA's living with a star program as dr.

434
00:20:23,259 --> 00:20:20,899
Giles pointed out it addresses

435
00:20:25,930 --> 00:20:23,269
fundamental questions very basic

436
00:20:28,029 --> 00:20:25,940
questions how and why does the Sun vary

437
00:20:29,889 --> 00:20:28,039
what causes explosions what about the

438
00:20:32,139 --> 00:20:29,899

solar cycle Dow do we know that this is

439
00:20:34,389 --> 00:20:32,149
gonna be a big solar cycle as you all

440
00:20:36,669 --> 00:20:34,399
know we're headed into the peak of the

441
00:20:38,590 --> 00:20:36,679
solar cycle right now it'd be good if we

442
00:20:40,720 --> 00:20:38,600
could predict just how strong that solar

443
00:20:43,480 --> 00:20:40,730
cycle will be how big its effects will

444
00:20:46,119 --> 00:20:43,490
be how did the earth and other planetary

445
00:20:48,549 --> 00:20:46,129
systems respond we want to know because

446
00:20:50,440 --> 00:20:48,559
we want to protect our spacecraft our

447
00:20:51,310 --> 00:20:50,450
assets and predict what's gonna happen

448
00:20:53,739 --> 00:20:51,320
on the ground

449
00:20:56,049 --> 00:20:53,749
for example power line transmissions at

450
00:20:58,419 --> 00:20:56,059
high latitudes as dr. Giles mentioned

451
00:21:00,639 --> 00:20:58,429
what are the impacts on human and

452
00:21:03,909 --> 00:21:00,649
robotic explorers these things can

453
00:21:05,499 --> 00:21:03,919
destroy spacecraft so what are we gonna

454
00:21:07,720 --> 00:21:05,509
have to do we're gonna have to

455
00:21:09,909 --> 00:21:07,730
understand the basic physics there's no

456
00:21:11,919 --> 00:21:09,919
first principle no model for predicting

457
00:21:13,690 --> 00:21:11,929
what happens unless you understand the

458
00:21:16,090 --> 00:21:13,700
science that should go into the model

459
00:21:17,619 --> 00:21:16,100
just like weather forecasts you got to

460
00:21:19,269 --> 00:21:17,629
go out and observe you got to think

461
00:21:21,669 --> 00:21:19,279
about it you got to put things together

462
00:21:23,200 --> 00:21:21,679
and then you develop these complicated

463
00:21:26,080 --> 00:21:23,210

models for weather

464
00:21:28,180 --> 00:21:26,090
we have space weather we'd like to know

465
00:21:29,770 --> 00:21:28,190
how to mitigate or accommodate space

466
00:21:31,420 --> 00:21:29,780
weather and you can't call your

467
00:21:33,670 --> 00:21:31,430
satellites back in if there's trouble

468
00:21:35,770 --> 00:21:33,680
but perhaps you can power them down and

469
00:21:37,810 --> 00:21:35,780
protect them you can ask astronauts not

470
00:21:40,180 --> 00:21:37,820
to be out on spacewalks if something bad

471
00:21:42,340 --> 00:21:40,190
is going to happen when we'd like to

472
00:21:44,740 --> 00:21:42,350
understand how space weather affects

473
00:21:47,500 --> 00:21:44,750
instruments spacecraft electrical

474
00:21:49,840 --> 00:21:47,510
circuits surfaces in space solar cells

475
00:21:52,030 --> 00:21:49,850
in space these can all be harmed by

476
00:21:53,860 --> 00:21:52,040
space weather if you know what's out

477
00:21:57,490 --> 00:21:53,870
there you know how to design them and

478
00:22:00,160 --> 00:21:57,500
build them in future let's go on the

479
00:22:01,750 --> 00:22:00,170
Earth's radiation belts are invisible to

480
00:22:03,820 --> 00:22:01,760
you and me this is an artist's

481
00:22:06,190 --> 00:22:03,830
conception it's a movie go ahead and

482
00:22:09,340 --> 00:22:06,200
start the movie they're out there

483
00:22:12,010 --> 00:22:09,350
pulsating in space they can grow they

484
00:22:14,590 --> 00:22:12,020
can wax they can wane stronger one day

485
00:22:16,870 --> 00:22:14,600
weaker the other varying on timescales

486
00:22:20,170 --> 00:22:16,880
ranging from minutes to hours through

487
00:22:22,300 --> 00:22:20,180
days to months black even up to years

488
00:22:24,640 --> 00:22:22,310

all different time scales all different

489
00:22:26,740 --> 00:22:24,650
kinds of variations some of them are

490
00:22:29,140 --> 00:22:26,750
global the whole thing expanding in and

491
00:22:31,810 --> 00:22:29,150
out some of them are very local ripples

492
00:22:33,790 --> 00:22:31,820
on a doughnut shaped object circling the

493
00:22:37,000 --> 00:22:33,800
earth bouncing back and forth causing

494
00:22:39,670 --> 00:22:37,010
things to happen they're connected to

495
00:22:41,320 --> 00:22:39,680
the earth as dr. Giles said the currents

496
00:22:44,080 --> 00:22:41,330
and variations that happen in the

497
00:22:46,060 --> 00:22:44,090
radiation belts can have effects down on

498
00:22:48,280 --> 00:22:46,070
the surface of the earth primarily at

499
00:22:50,530 --> 00:22:48,290
high latitudes that's where field lines

500
00:22:51,490 --> 00:22:50,540
lead on a bar magnet to the northern and

501
00:22:53,410 --> 00:22:51,500
southern poles

502
00:22:55,300 --> 00:22:53,420
that's where currents would flow that's

503
00:22:58,330 --> 00:22:55,310
where trouble could happen to power line

504
00:23:02,560 --> 00:22:58,340
transmissions or communications let's go

505
00:23:04,420 --> 00:23:02,570
on so what about rbsp well this is what

506
00:23:06,700 --> 00:23:04,430
NASA hopes to get out of the mission and

507
00:23:08,320 --> 00:23:06,710
this is what we're gonna see we're gonna

508
00:23:10,870 --> 00:23:08,330
try to understand the hazardous

509
00:23:13,240 --> 00:23:10,880
environment that we face out there we'd

510
00:23:15,640 --> 00:23:13,250
like to know what produces the radiation

511
00:23:18,400 --> 00:23:15,650
in the Van Allen radiation belts what

512
00:23:20,290 --> 00:23:18,410
processes remove the particles from the

513
00:23:22,930 --> 00:23:20,300

Van Allen radiation belts because they

514
00:23:25,780 --> 00:23:22,940
grow in wax and wane what processes

515
00:23:28,570 --> 00:23:25,790
modify the radiation belts that's what

516
00:23:29,980 --> 00:23:28,580
this mission is intended to address I've

517
00:23:32,080 --> 00:23:29,990
got a statement there about the

518
00:23:33,860 --> 00:23:32,090
instruments on the spacecraft but I

519
00:23:36,320 --> 00:23:33,870
believe Nikki you'll talk more

520
00:23:39,440 --> 00:23:36,330
the instruments is that right Dave

521
00:23:41,299 --> 00:23:39,450
sounds great okay so as Barbara said

522
00:23:42,950 --> 00:23:41,309
we've got the complete set of

523
00:23:45,380 --> 00:23:42,960
instruments we need from the lowest

524
00:23:48,560 --> 00:23:45,390
possible particle energies to the

525
00:23:50,810 --> 00:23:48,570
highest from tens of evey to more than a

526
00:23:52,310 --> 00:23:50,820
Giga electron volt that's from very cold

527
00:23:54,140 --> 00:23:52,320
very energetic

528
00:23:58,010 --> 00:23:54,150
we've got composition we know about

529
00:23:59,690 --> 00:23:58,020
protons electrons helium oxygen we're

530
00:24:02,360 --> 00:23:59,700
gonna measure all the waves out there

531
00:24:05,090 --> 00:24:02,370
the waves at high frequency the waves at

532
00:24:07,820 --> 00:24:05,100
low frequency the DC electric field the

533
00:24:10,010 --> 00:24:07,830
DC magnetic field the AC electric and

534
00:24:12,410 --> 00:24:10,020
magnetic field comprehensive

535
00:24:14,510 --> 00:24:12,420
instrumentation a pair of spacecraft to

536
00:24:16,669 --> 00:24:14,520
determine cause and effect a pair of

537
00:24:19,400 --> 00:24:16,679
spacecraft to determine the extent of

538
00:24:21,290 --> 00:24:19,410

various phenomena out there a pair of

539
00:24:25,310 --> 00:24:21,300
spacecraft to tell us what's going on

540
00:24:26,780 --> 00:24:25,320
next slide I think at that point I stop

541
00:24:31,100 --> 00:24:26,790
and take your questions

542
00:24:34,210 --> 00:24:31,110
and pass on the baton I could be Nicki

543
00:24:38,700 --> 00:24:34,220
farts but but that would be peculiar

544
00:24:42,840 --> 00:24:41,310
so how much heliophysics luck was

545
00:24:44,730 --> 00:24:42,850
involved in sending the apollo

546
00:24:49,530 --> 00:24:44,740
spacecraft through the Van Allen belts

547
00:24:52,320 --> 00:24:49,540
back in the 60s okay so actually the the

548
00:24:53,610 --> 00:24:52,330
Van Allen radiation belts the astronauts

549
00:24:55,560 --> 00:24:53,620
that were going out passed through them

550
00:24:57,570 --> 00:24:55,570
rather quickly and they didn't do space

551
00:24:59,400 --> 00:24:57,580
maneuvers while they were in the Van

552
00:25:00,990 --> 00:24:59,410
Allen radiation belts and as long as you

553
00:25:04,860 --> 00:25:01,000
would stay inside the spacecraft you

554
00:25:07,560 --> 00:25:04,870
would be okay so in in that sense there

555
00:25:09,120 --> 00:25:07,570
wasn't any and the effects of the Van

556
00:25:11,130 --> 00:25:09,130
Allen radiation belts were known about

557
00:25:13,650 --> 00:25:11,140
then so it was known not to do anything

558
00:25:15,900 --> 00:25:13,660
then once you're in interplanetary space

559
00:25:18,420 --> 00:25:15,910
you might have problems with energetic

560
00:25:20,370 --> 00:25:18,430
particles coming from the Sun and there

561
00:25:22,500 --> 00:25:20,380
you would certainly not want them to be

562
00:25:24,480 --> 00:25:22,510
outside during a big solar flare an

563
00:25:26,490 --> 00:25:24,490

energetic particle event the other

564
00:25:28,290 --> 00:25:26,500
astronauts we have to worry about are

565
00:25:31,200 --> 00:25:28,300
the ones in the space station in the

566
00:25:33,000 --> 00:25:31,210
Earth's magnetosphere right now at the

567
00:25:34,860 --> 00:25:33,010
highest latitudes it gets up to the

568
00:25:36,990 --> 00:25:34,870
footprint of these field lines gets up

569
00:25:39,390 --> 00:25:37,000
the open lines open to the Sun and so

570
00:25:42,390 --> 00:25:39,400
there there is a need to take care not

571
00:25:48,370 --> 00:25:42,400
to do extra vehicular activity during

572
00:25:48,380 --> 00:25:56,320
somebody else

573
00:26:02,789 --> 00:25:59,169
in light of the Hicks Boston publicity

574
00:26:04,419 --> 00:26:02,799
at the supercollider are you prepared to

575
00:26:07,180 --> 00:26:04,429
theoretically detect something

576
00:26:07,930 --> 00:26:07,190
extraordinary the genetics that expected

577
00:26:10,959 --> 00:26:07,940
the fine

578
00:26:13,239 --> 00:26:10,969
beep be hopeful not I'm get your noble

579
00:26:15,070 --> 00:26:13,249
to tell the honest truth right here the

580
00:26:16,989 --> 00:26:15,080
most exciting things that come out of

581
00:26:19,479 --> 00:26:16,999
these missions are the ones you didn't

582
00:26:22,779 --> 00:26:19,489
expect to see and so you have to keep

583
00:26:24,519 --> 00:26:22,789
your eyes open all my career yes there's

584
00:26:26,619 --> 00:26:24,529
a certain set of things we're guaranteed

585
00:26:28,479 --> 00:26:26,629
to do we're going to the right place at

586
00:26:30,789 --> 00:26:28,489
the right time the peak of the solar

587
00:26:33,310 --> 00:26:30,799
cycle the heart of the radiation belts

588
00:26:36,069 --> 00:26:33,320

but it's the things you don't expect to

589
00:26:38,739 --> 00:26:36,079
see that are most interesting but if we

590
00:26:40,329 --> 00:26:38,749
get the biggest solar flare ever then

591
00:26:42,579 --> 00:26:40,339
we're gonna learn something really new

592
00:26:44,319 --> 00:26:42,589
and interesting or perhaps there's some

593
00:26:46,449 --> 00:26:44,329
phenomena out there that we just haven't

594
00:26:49,119 --> 00:26:46,459
considered and yeah that's what we keep

595
00:26:53,499 --> 00:26:49,129
our eyes open for and that's the delight

596
00:26:56,469 --> 00:26:53,509
of the mission is there any evidence

597
00:27:00,039 --> 00:26:56,479
that activity on the surface of the

598
00:27:02,139 --> 00:27:00,049
earth affects the belt in any way yes

599
00:27:05,019 --> 00:27:02,149
there is as a matter of fact there is

600
00:27:06,729 --> 00:27:05,029
evidence that phenomena on the surface

601
00:27:09,940 --> 00:27:06,739
of the earth can affect the belts an

602
00:27:13,029 --> 00:27:09,950
example of that is lightning strikes

603
00:27:15,310 --> 00:27:13,039
lightning strikes in one hemisphere

604
00:27:17,949 --> 00:27:15,320
launched waves that travel along

605
00:27:20,829 --> 00:27:17,959
magnetic field lines up to the other

606
00:27:23,229 --> 00:27:20,839
Pole the other Hemisphere and the sort

607
00:27:25,899 --> 00:27:23,239
of waves that they launch are just the

608
00:27:28,329 --> 00:27:25,909
right kind to interact with electrons in

609
00:27:31,209 --> 00:27:28,339
the radiation belts either energizing

610
00:27:33,219 --> 00:27:31,219
them or scattering them there are plenty

611
00:27:35,379 --> 00:27:33,229
of people who believe that processes in

612
00:27:38,589 --> 00:27:35,389
the Earth's ionosphere sudden

613
00:27:41,169 --> 00:27:38,599

disturbances can launch waves up into

614
00:27:43,329 --> 00:27:41,179
the atmosphere up into the magnetosphere

615
00:27:45,009 --> 00:27:43,339
and affect the particles yes we're

616
00:27:47,049 --> 00:27:45,019
looking for that and we want to work

617
00:27:54,060 --> 00:27:47,059
closely with ground-based people to

618
00:27:57,900 --> 00:27:56,040
I know it was stated yesterday that

619
00:28:00,090 --> 00:27:57,910
these two different spacecrafts were

620
00:28:01,560 --> 00:28:00,100
basically built for the cost of one what

621
00:28:02,940 --> 00:28:01,570
is some of the advantages of having the

622
00:28:05,010 --> 00:28:02,950
two different spacecrafts in the two

623
00:28:07,020 --> 00:28:05,020
orbits as opposed to just one not a lot

624
00:28:09,750 --> 00:28:07,030
this the if you were gonna ask about the

625
00:28:11,910 --> 00:28:09,760
spacecraft design I defer to Dave but if

626
00:28:13,830 --> 00:28:11,920
you're gonna ask about why have to

627
00:28:15,480 --> 00:28:13,840
there's some simple reasons we've

628
00:28:17,910 --> 00:28:15,490
thought about at the start of the

629
00:28:19,470 --> 00:28:17,920
mission the answer is two spacecraft

630
00:28:22,260 --> 00:28:19,480
tell you if something is happening first

631
00:28:24,150 --> 00:28:22,270
here and then propagates their two

632
00:28:26,880 --> 00:28:24,160
spacecraft tells you if it's widespread

633
00:28:29,070 --> 00:28:26,890
or very local and the spacing is going

634
00:28:31,440 --> 00:28:29,080
to vary as nikki is going to tell you in

635
00:28:32,910 --> 00:28:31,450
in a few minutes two spacecrafts gives

636
00:28:35,130 --> 00:28:32,920
you a wealth of information that

637
00:28:37,260 --> 00:28:35,140
separates spatial and temporal effects

638
00:28:39,450 --> 00:28:37,270

lets you know more we've had one

639
00:28:41,790 --> 00:28:39,460
spacecraft missions before we've never

640
00:28:43,980 --> 00:28:41,800
had fully equipped two spacecraft

641
00:28:51,039 --> 00:28:43,990
mission to tell us more details on

642
00:28:55,810 --> 00:28:53,440
is there any working theory as to why

643
00:28:57,249 --> 00:28:55,820
there is a clear area between the inner

644
00:28:58,989 --> 00:28:57,259
belt and the outer belt is there some

645
00:29:01,720 --> 00:28:58,999
mechanism that sweeps out there yes

646
00:29:04,090 --> 00:29:01,730
there's yes there are plasma waves in

647
00:29:05,919 --> 00:29:04,100
that region of space that can remove the

648
00:29:07,960 --> 00:29:05,929
particles faster than they can be put

649
00:29:10,840 --> 00:29:07,970
into that region see but sometimes that

650
00:29:13,299 --> 00:29:10,850
space is full of particles and so during

651
00:29:15,100 --> 00:29:13,309
big storms they get in go across it and

652
00:29:16,570 --> 00:29:15,110
get into the inner belt and can hang

653
00:29:19,269 --> 00:29:16,580
around there for a long period of time

654
00:29:21,519 --> 00:29:19,279
and as normal there are more theories

655
00:29:30,779 --> 00:29:21,529
than scientists so we'll be checking out

656
00:29:35,389 --> 00:29:33,060
all right well then hearing none we will

657
00:29:45,810 --> 00:29:35,399
go ahead and move on to our next speaker

658
00:29:47,849 --> 00:29:45,820
we have next up we have Nikki Fox she is

659
00:29:49,859 --> 00:29:47,859
joining us from the rbsp she's the

660
00:29:52,529 --> 00:29:49,869
deputy project scientist

661
00:29:54,029 --> 00:29:52,539
so welcome Nikki Fox she's at the

662
00:29:59,159 --> 00:29:54,039
Applied Physics Laboratory at Johns

663
00:30:01,289 --> 00:29:59,169

Hopkins so hi it is my great pleasure to

664
00:30:03,749 --> 00:30:01,299
be here representing the the science

665
00:30:05,969 --> 00:30:03,759
team today I've been having an amazing

666
00:30:07,709 --> 00:30:05,979
couple of days I've been I think my

667
00:30:10,079 --> 00:30:07,719
fourth trip out to see the rocket today

668
00:30:11,099 --> 00:30:10,089
which that was awesome and you've all

669
00:30:13,499 --> 00:30:11,109
seen it haven't you

670
00:30:16,799 --> 00:30:13,509
isn't it nice does isn't the logo

671
00:30:19,829 --> 00:30:16,809
fabulous yeah do you know that logo is

672
00:30:21,930 --> 00:30:19,839
hand-painted ok because what so so if

673
00:30:23,189 --> 00:30:21,940
you have a smooth fairing then they can

674
00:30:25,139 --> 00:30:23,199
put like a peel on you know you just

675
00:30:26,639 --> 00:30:25,149
produce like a sticker and then you peel

676
00:30:28,289 --> 00:30:26,649
it off and put it on a smooth parry if

677
00:30:30,239 --> 00:30:28,299
you looked closely at ours its ridged

678
00:30:33,239 --> 00:30:30,249
because it's a four meter fairing so it

679
00:30:35,430 --> 00:30:33,249
had to be hand painted so Abby there's

680
00:30:38,669 --> 00:30:35,440
an artist who specializes in this we got

681
00:30:39,989 --> 00:30:38,679
a projector projected the logo onto the

682
00:30:42,089 --> 00:30:39,999
spacecraft and it's actually if you

683
00:30:43,739 --> 00:30:42,099
cannot the spacecraft sorry they'd be

684
00:30:46,259 --> 00:30:43,749
really mad if he painted the spacecraft

685
00:30:47,339 --> 00:30:46,269
own that's where the fairing and he got

686
00:30:50,099 --> 00:30:47,349
it really close and he actually painted

687
00:30:52,469 --> 00:30:50,109
it in 3d so it go the whole thing wraps

688
00:30:54,719 --> 00:30:52,479

around the vanes it is amazing if you

689
00:30:57,659 --> 00:30:54,729
can it's just yeah I'm sorry I'm very up

690
00:31:00,149 --> 00:30:57,669
thank you I'm very excited if you can't

691
00:31:02,249 --> 00:31:00,159
tell I am very excited okay I've been

692
00:31:03,839 --> 00:31:02,259
saying for about two months now it's

693
00:31:06,059 --> 00:31:03,849
impossible for me to be any more excited

694
00:31:08,549 --> 00:31:06,069
than I am today and in fact I'm still

695
00:31:11,369 --> 00:31:08,559
proving that wrong and Liz I did wear my

696
00:31:12,959 --> 00:31:11,379
radiation belt this morning so I'd I

697
00:31:14,789 --> 00:31:12,969
meant to put it on before I came in Liz

698
00:31:16,649 --> 00:31:14,799
made me a radiation belt when I'm sorry

699
00:31:19,319 --> 00:31:16,659
I will leap out to the car and get it so

700
00:31:22,139 --> 00:31:19,329
you can all see her creation so anyway

701
00:31:24,119 --> 00:31:22,149
enough of me blabbing on so onto my onto

702
00:31:26,489 --> 00:31:24,129
my slides so dave did a really nice job

703
00:31:28,680 --> 00:31:26,499
and I'm sure Barbara did also of setting

704
00:31:30,239 --> 00:31:28,690
up you know why it's so important for us

705
00:31:33,239 --> 00:31:30,249
to understand the Sun and the solar

706
00:31:36,119 --> 00:31:33,249
system connections it's not just the Sun

707
00:31:37,979 --> 00:31:36,129
and the effect on our planet but we you

708
00:31:39,839 --> 00:31:37,989
know all of the planets live in the

709
00:31:41,729 --> 00:31:39,849
atmosphere of the Sun so there are many

710
00:31:43,680 --> 00:31:41,739
things that we can study here at Earth

711
00:31:46,769 --> 00:31:43,690
that are directly applicable to other

712
00:31:48,960 --> 00:31:46,779
planets for example all of the strongly

713
00:31:50,850 --> 00:31:48,970

magnetized planets so Jupiter Saturn

714
00:31:53,039 --> 00:31:50,860
Uranus and Neptune

715
00:31:54,869 --> 00:31:53,049
they all have radiation belts very very

716
00:31:57,029 --> 00:31:54,879
similar to ours

717
00:31:58,919 --> 00:31:57,039
not necessarily the two structure that

718
00:32:01,529 --> 00:31:58,929
Dave was talking about but there are

719
00:32:03,149 --> 00:32:01,539
very large radiation belts around these

720
00:32:05,129 --> 00:32:03,159
planets because they have strong

721
00:32:07,350 --> 00:32:05,139
magnetic fields they actually kind of

722
00:32:10,230 --> 00:32:07,360
constrain and trap the particles into

723
00:32:11,909 --> 00:32:10,240
that region so curiosity is finding

724
00:32:13,889 --> 00:32:11,919
wonderful things on Mars but it is not

725
00:32:17,070 --> 00:32:13,899
going to find a radiation belt there so

726
00:32:19,830 --> 00:32:17,080
so you know we we are looking at things

727
00:32:22,200 --> 00:32:19,840
that are applicable not just here but

728
00:32:24,419 --> 00:32:22,210
but throughout the universe the same

729
00:32:26,580 --> 00:32:24,429
processes that accelerate particles in

730
00:32:28,560 --> 00:32:26,590
the radiation belts actually cause the

731
00:32:30,960 --> 00:32:28,570
Crab Nebula 6,000 light years away to

732
00:32:32,940 --> 00:32:30,970
glow in x-rays so it is fundamental

733
00:32:37,200 --> 00:32:32,950
physics that we are studying how the

734
00:32:38,669 --> 00:32:37,210
next slide please Mike okay and this is

735
00:32:40,259 --> 00:32:38,679
a still or is that a movie is that I

736
00:32:42,029 --> 00:32:40,269
think it may be just a still no it's

737
00:32:44,759 --> 00:32:42,039
gonna be a movie excellent

738
00:32:47,249 --> 00:32:44,769

so here we see a big solar event coming

739
00:32:49,470 --> 00:32:47,259
and smacking into the magnetosphere this

740
00:32:52,289 --> 00:32:49,480
is a nice model from the University of

741
00:32:54,960 --> 00:32:52,299
Maryland and showing you know how the

742
00:32:56,759 --> 00:32:54,970
the magnetosphere responds to what's

743
00:32:58,470 --> 00:32:56,769
coming from the Sun so the easy thing to

744
00:32:59,909 --> 00:32:58,480
do is to look up see the aurora and say

745
00:33:02,220 --> 00:32:59,919
you've got a space weather event

746
00:33:04,440 --> 00:33:02,230
obviously for radiation you can't see

747
00:33:09,060 --> 00:33:04,450
radiation so we have to send probes out

748
00:33:10,710 --> 00:33:09,070
into into that region of space thank you

749
00:33:15,019 --> 00:33:10,720
I feel like Vanna White and now the next

750
00:33:17,700 --> 00:33:15,029
slide okay so here we have a picture of

751
00:33:20,090 --> 00:33:17,710
James Van Alen working this is when they

752
00:33:21,960 --> 00:33:20,100
were discovering the radiation belts

753
00:33:24,119 --> 00:33:21,970
basically if there was a thought bubble

754
00:33:25,710 --> 00:33:24,129
above there it would say oh dear what's

755
00:33:27,269 --> 00:33:25,720
this signal I keep saying and why is it

756
00:33:29,970 --> 00:33:27,279
cropping up it wasn't supposed to be

757
00:33:32,039 --> 00:33:29,980
there and after a while of trying to

758
00:33:33,629 --> 00:33:32,049
make it go away they finally said okay

759
00:33:35,159 --> 00:33:33,639
we must have a radiation belt there so

760
00:33:38,759 --> 00:33:35,169
it was the first discovery of the space

761
00:33:42,269 --> 00:33:38,769
age back in 1958 and that was what led

762
00:33:43,680 --> 00:33:42,279
to the also fuel subsequent missions to

763
00:33:46,019 --> 00:33:43,690

go and find the outer radiation belt

764
00:33:47,639 --> 00:33:46,029
because with Explorer one Van Alen found

765
00:33:50,340 --> 00:33:47,649
the inner one and you can see in with

766
00:33:52,109 --> 00:33:50,350
Karl McIlwain who actually was the was

767
00:33:54,180 --> 00:33:52,119
the thesis adviser of a number of the

768
00:33:56,620 --> 00:33:54,190
science team members that Craig kletzing

769
00:33:59,470 --> 00:33:56,630
won from that the University of Iowa

770
00:34:01,450 --> 00:33:59,480
who is the PI of our emphasis instrument

771
00:34:03,730 --> 00:34:01,460
that's the magnetic fields and waves

772
00:34:07,900 --> 00:34:03,740
instrument that was his thesis adviser

773
00:34:09,550 --> 00:34:07,910
Barry mock my boss is also mustn't

774
00:34:11,350 --> 00:34:09,560
forget it so he's that was his thesis

775
00:34:14,320 --> 00:34:11,360
adviser there of course is James Van

776
00:34:17,740 --> 00:34:14,330
Allen George Ludwik and Karl Pickering

777
00:34:19,510 --> 00:34:17,750
on the end all feverishly finding the

778
00:34:21,130 --> 00:34:19,520
radiation belts and on the next slide

779
00:34:23,590 --> 00:34:21,140
you'll see a picture that though I think

780
00:34:26,020 --> 00:34:23,600
they were quite happy there but so

781
00:34:27,880 --> 00:34:26,030
that's the press conference where James

782
00:34:30,370 --> 00:34:27,890
Van Allen said we have radiation belts

783
00:34:32,500 --> 00:34:30,380
the reason they are called radiation

784
00:34:35,080 --> 00:34:32,510
belts is he was actually out lecturing

785
00:34:37,210 --> 00:34:35,090
and he was trying to explain where they

786
00:34:38,800 --> 00:34:37,220
were and he was having some trouble and

787
00:34:41,020 --> 00:34:38,810
one of the students said oh you mean

788
00:34:42,730 --> 00:34:41,030

like a belt goes around like a belt and

789
00:34:45,130 --> 00:34:42,740
he said yep that's it so that's why they

790
00:34:46,000 --> 00:34:45,140
are the Van Allen radiation belts next

791
00:34:48,460 --> 00:34:46,010
slide please

792
00:34:50,200 --> 00:34:48,470
so here he is gracing the cover of Time

793
00:34:51,760 --> 00:34:50,210
magazine in fact not once but twice he

794
00:34:53,620 --> 00:34:51,770
got on the cover of Time magazine and

795
00:34:55,390 --> 00:34:53,630
this was the original picture that we

796
00:34:58,540 --> 00:34:55,400
thought we would see in the radiation

797
00:35:01,420 --> 00:34:58,550
belts this very stable in a belt which

798
00:35:03,220 --> 00:35:01,430
we we know is stable well we're gonna

799
00:35:04,900 --> 00:35:03,230
find out actually how stable it is

800
00:35:06,880 --> 00:35:04,910
but then the outer radiation but we also

801
00:35:09,790 --> 00:35:06,890
thought that was very stable when we

802
00:35:11,590 --> 00:35:09,800
when we first went up so subsequent

803
00:35:14,770 --> 00:35:11,600
missions have then found that the outer

804
00:35:17,170 --> 00:35:14,780
radiation belt is extremely dynamic but

805
00:35:19,180 --> 00:35:17,180
the the puzzling thing to us is that it

806
00:35:22,330 --> 00:35:19,190
doesn't always react the same way so you

807
00:35:24,160 --> 00:35:22,340
can have a nice solar storm coming

808
00:35:26,350 --> 00:35:24,170
towards you and it causes the radiation

809
00:35:29,230 --> 00:35:26,360
belts to pump up get really big both in

810
00:35:30,520 --> 00:35:29,240
size and in strength another one can

811
00:35:31,780 --> 00:35:30,530
come by just a few months later and

812
00:35:34,480 --> 00:35:31,790
actually cause the radiation belt to

813
00:35:35,650 --> 00:35:34,490

shrink and then you know a couple of

814
00:35:37,090 --> 00:35:35,660
months later one comes by and the

815
00:35:39,460 --> 00:35:37,100
radiation belts didn't appear to not

816
00:35:41,530 --> 00:35:39,470
even notice anything had gone by whereas

817
00:35:45,220 --> 00:35:41,540
the solar signatures all look the same

818
00:35:46,870 --> 00:35:45,230
or similar nice Aurora with them all but

819
00:35:49,060 --> 00:35:46,880
the radiation belt responses are very

820
00:35:51,640 --> 00:35:49,070
different so what we know is that while

821
00:35:53,860 --> 00:35:51,650
we've made great strides on saying hey

822
00:35:55,150 --> 00:35:53,870
they respond to the Sun we don't really

823
00:35:57,580 --> 00:35:55,160
understand why they respond in different

824
00:35:59,800 --> 00:35:57,590
ways so it's almost like making a cake

825
00:36:01,390 --> 00:35:59,810
and you have your recipe you're not

826
00:36:02,980 --> 00:36:01,400
quite sure if the right quantities of

827
00:36:04,360 --> 00:36:02,990
what and one day you get a flourless

828
00:36:06,610 --> 00:36:04,370
chocolate cake and another day you get

829
00:36:07,330 --> 00:36:06,620
an angel food cake that anyone who bakes

830
00:36:10,810 --> 00:36:07,340
understands

831
00:36:13,360 --> 00:36:10,820
that analogy so next slide please

832
00:36:17,530 --> 00:36:13,370
okay so we have the two spacecraft as

833
00:36:19,480 --> 00:36:17,540
dave said - are much better than one no

834
00:36:21,010 --> 00:36:19,490
we do not have one as a spare it is

835
00:36:24,370 --> 00:36:21,020
there is a scientific reason that we

836
00:36:26,110 --> 00:36:24,380
have the two if you are I guess I'll do

837
00:36:28,780 --> 00:36:26,120
the ants on the cork because Mike likes

838
00:36:30,430 --> 00:36:28,790

the ants on the cork so if you have two

839
00:36:33,730 --> 00:36:30,440
ants or you have an ant sitting on a

840
00:36:36,280 --> 00:36:33,740
cork in a large bathtub of water and it

841
00:36:38,470 --> 00:36:36,290
suddenly goes down and up and it has no

842
00:36:40,420 --> 00:36:38,480
idea why it's really non down or up it

843
00:36:42,430 --> 00:36:40,430
just knows it went down or up but if it

844
00:36:43,720 --> 00:36:42,440
has a friend another ant and in this

845
00:36:46,330 --> 00:36:43,730
we're assuming that ants can talk

846
00:36:49,210 --> 00:36:46,340
clearly but and it says it says to the

847
00:36:51,400 --> 00:36:49,220
ant on the other side did you just go up

848
00:36:52,990 --> 00:36:51,410
and down and the other answers yes I did

849
00:36:54,670 --> 00:36:53,000
well did you go up and down at the same

850
00:36:57,220 --> 00:36:54,680
time as me in which case it was a really

851
00:36:58,750 --> 00:36:57,230
big feature or did you go up and down a

852
00:37:00,730 --> 00:36:58,760
little bit after me a little bit before

853
00:37:02,140 --> 00:37:00,740
was it a bigger was it a smaller and

854
00:37:04,660 --> 00:37:02,150
suddenly you start building up the

855
00:37:06,100 --> 00:37:04,670
picture of the dynamics you also are

856
00:37:08,110 --> 00:37:06,110
going to have two spacecraft flying

857
00:37:09,910 --> 00:37:08,120
through the same phenomena fairly

858
00:37:11,320 --> 00:37:09,920
quickly so instead of one spacecraft

859
00:37:12,730 --> 00:37:11,330
that would have to go around await nine

860
00:37:14,050 --> 00:37:12,740
hours to come back and give miss only

861
00:37:15,790 --> 00:37:14,060
knows what happens in nine hours and the

862
00:37:18,010 --> 00:37:15,800
magnetosphere you've got another one

863
00:37:20,200 --> 00:37:18,020

coming through very quickly so that's

864
00:37:23,020 --> 00:37:20,210
why we want to have two we continually

865
00:37:24,490 --> 00:37:23,030
vary the space between them the orbits

866
00:37:28,180 --> 00:37:24,500
of the two spacecraft are very slightly

867
00:37:31,170 --> 00:37:28,190
different so tomorrow morning at 78

868
00:37:34,840 --> 00:37:31,180
minutes after launch we will hopefully

869
00:37:37,120 --> 00:37:34,850
separate spacecraft a from from the

870
00:37:39,970 --> 00:37:37,130
rocket then the Centaur will reorient

871
00:37:42,220 --> 00:37:39,980
turn around go up a little bit in Apogee

872
00:37:44,290 --> 00:37:42,230
re spin up these things are amazing by

873
00:37:47,230 --> 00:37:44,300
the way these centers just really kept

874
00:37:48,910 --> 00:37:47,240
up but then then it's gonna spin up and

875
00:37:50,470 --> 00:37:48,920
then it's gonna spit out the second one

876
00:37:52,960 --> 00:37:50,480
so they will be in very slightly

877
00:37:54,550 --> 00:37:52,970
different orbits so the good thing about

878
00:37:56,320 --> 00:37:54,560
that is the orbit periods are a little

879
00:37:58,900 --> 00:37:56,330
bit different and they actually lap one

880
00:38:01,330 --> 00:37:58,910
another so you know we're going to get

881
00:38:04,480 --> 00:38:01,340
continually varying spaces between the

882
00:38:05,800 --> 00:38:04,490
spacecraft as the mission goes on what

883
00:38:07,960 --> 00:38:05,810
else can I tell you about this so that

884
00:38:10,450 --> 00:38:07,970
you see the orbit here cuts through the

885
00:38:12,880 --> 00:38:10,460
inner belt and then swings out so it

886
00:38:14,620 --> 00:38:12,890
goes pretty fast down through perigee

887
00:38:16,630 --> 00:38:14,630
and then cut it does a nice cut through

888
00:38:18,310 --> 00:38:16,640

the inner belt and then swings out and

889
00:38:20,720 --> 00:38:18,320
we'll do a nice sort of longitudinal

890
00:38:23,059 --> 00:38:20,730
sweep through the outer belt

891
00:38:24,589 --> 00:38:23,069
and characterize so we went out we're

892
00:38:26,390 --> 00:38:24,599
getting the inner and the outer and

893
00:38:28,849 --> 00:38:26,400
thanks to an instrument that was

894
00:38:31,220 --> 00:38:28,859
contributed to us from the National

895
00:38:34,520 --> 00:38:31,230
Reconnaissance Office we actually have a

896
00:38:37,760 --> 00:38:34,530
really nice high-energy proton detector

897
00:38:39,319 --> 00:38:37,770
that will go up to 2 GeV which is really

898
00:38:42,770 --> 00:38:39,329
going to do a nice job of seeing what's

899
00:38:44,270 --> 00:38:42,780
in the inner belt and and then when we

900
00:38:45,950 --> 00:38:44,280
come through the outer belt we'll go

901
00:38:47,539 --> 00:38:45,960
through the quieter regions where the

902
00:38:48,799 --> 00:38:47,549
hope instrument will be really important

903
00:38:52,039 --> 00:38:48,809
where we're looking at that low energy

904
00:38:54,109 --> 00:38:52,049
plasma and then coming out the mag ice

905
00:38:56,660 --> 00:38:54,119
will pick up kind of in the middle range

906
00:38:58,910 --> 00:38:56,670
of the of the particles and repped will

907
00:39:01,940 --> 00:38:58,920
pick up the high end of the outer belt

908
00:39:03,349 --> 00:39:01,950
particles so I know you've all you're

909
00:39:05,599 --> 00:39:03,359
probably probably know more about the

910
00:39:07,250 --> 00:39:05,609
instruments than I do but so we have we

911
00:39:09,260 --> 00:39:07,260
have this nice particle suite that

912
00:39:11,839 --> 00:39:09,270
covers from the very very low energies

913
00:39:15,049 --> 00:39:11,849

right up to the very high energies in

914
00:39:17,809 --> 00:39:15,059
the in the inner belt we also have very

915
00:39:19,099 --> 00:39:17,819
nice fields and waves instruments so if

916
00:39:22,549 --> 00:39:19,109
you when you look at the spacecraft you

917
00:39:24,440 --> 00:39:22,559
see we have these long booms that come

918
00:39:26,359 --> 00:39:24,450
out from the solar panels we put the

919
00:39:28,430 --> 00:39:26,369
magnetometers on there there is a search

920
00:39:30,410 --> 00:39:28,440
coil magnetometer on one side that's

921
00:39:33,589 --> 00:39:30,420
looking at the sort of high frequency

922
00:39:36,319 --> 00:39:33,599
magnetic fields and the AC ranges they

923
00:39:38,620 --> 00:39:36,329
fluxgate which is on the other side that

924
00:39:41,270 --> 00:39:38,630
is looking at the DC or the lower

925
00:39:42,950 --> 00:39:41,280
frequency magnetic fields they're add-on

926
00:39:44,720 --> 00:39:42,960
booms because we really want them to

927
00:39:46,099 --> 00:39:44,730
sample the medium they're traveling

928
00:39:47,780 --> 00:39:46,109
through not tell me what's going on on

929
00:39:49,700 --> 00:39:47,790
the spacecraft so we have an

930
00:39:51,890 --> 00:39:49,710
unbelievably magnetically quiet

931
00:39:54,349 --> 00:39:51,900
spacecraft that couch will probably talk

932
00:39:55,039 --> 00:39:54,359
a little bit about just not yes

933
00:39:58,940 --> 00:39:55,049
absolutely

934
00:40:01,280 --> 00:39:58,950
okay so here's now anyway so it's a very

935
00:40:03,799 --> 00:40:01,290
very very quiet spacecraft but we put

936
00:40:05,690 --> 00:40:03,809
them out on these booms so that they are

937
00:40:07,880 --> 00:40:05,700
really telling us what's happening in

938
00:40:10,010 --> 00:40:07,890

the medium so there are also six

939
00:40:12,319 --> 00:40:10,020
electric field booms so the spacecraft

940
00:40:14,539 --> 00:40:12,329
is spinning one of the reasons it's

941
00:40:16,730 --> 00:40:14,549
spinning is we can put much simpler

942
00:40:18,440 --> 00:40:16,740
particle detectors on there and allow

943
00:40:20,329 --> 00:40:18,450
the spacecraft to take the particle

944
00:40:21,680 --> 00:40:20,339
through the entire magnetic field and

945
00:40:23,839 --> 00:40:21,690
pick up every single one of those

946
00:40:25,670 --> 00:40:23,849
particle populations all those different

947
00:40:29,059 --> 00:40:25,680
pitch angles or coding angles that they

948
00:40:31,790 --> 00:40:29,069
they move around with so that's one

949
00:40:34,700 --> 00:40:31,800
reason for spinning the other is we have

950
00:40:36,470 --> 00:40:34,710
electric field booms the ones on the top

951
00:40:38,330 --> 00:40:36,480
and bottom of the spacecraft are 6

952
00:40:40,520 --> 00:40:38,340
meters long they're Stacy booms they're

953
00:40:41,870 --> 00:40:40,530
rigid but ones that come up from the

954
00:40:45,530 --> 00:40:41,880
side which you can't see on this picture

955
00:40:47,510 --> 00:40:45,540
are 50 meters long each so we're a

956
00:40:49,610 --> 00:40:47,520
hundred meters across or the size of a

957
00:40:52,490 --> 00:40:49,620
football field when those antennae go

958
00:40:54,830 --> 00:40:52,500
out and they are thin wires so spinning

959
00:40:56,690 --> 00:40:54,840
that the centrifugal force keeps those

960
00:40:59,030 --> 00:40:56,700
out so that that's why we're spinning

961
00:41:01,250 --> 00:40:59,040
what else can I tell you so we've done

962
00:41:04,250 --> 00:41:01,260
why why do you have to get up so ungodly

963
00:41:06,440 --> 00:41:04,260

early okay

964
00:41:07,880 --> 00:41:06,450
so apart from the fact that we've got

965
00:41:09,320 --> 00:41:07,890
less chance of an afternoon storm at

966
00:41:11,120 --> 00:41:09,330
4:00 in the morning which is really good

967
00:41:12,890 --> 00:41:11,130
the other reason is this point of the

968
00:41:14,720 --> 00:41:12,900
orbit which we call Apogee the the

969
00:41:16,730 --> 00:41:14,730
furthest point away from the earth that

970
00:41:19,310 --> 00:41:16,740
actually walks around all of the local

971
00:41:21,590 --> 00:41:19,320
times as the mission continues it takes

972
00:41:23,930 --> 00:41:21,600
us two years to go all the way around

973
00:41:25,940 --> 00:41:23,940
plus a little bit and the most

974
00:41:29,090 --> 00:41:25,950
interesting region scientifically is

975
00:41:29,990 --> 00:41:29,100
between local dawn so if you look you

976
00:41:32,180 --> 00:41:30,000
know when you when you look straight up

977
00:41:33,860 --> 00:41:32,190
and it's 6 a.m. in the morning then

978
00:41:36,500 --> 00:41:33,870
that's local dawn and that's when the

979
00:41:38,270 --> 00:41:36,510
apogee is is there sweep that round to

980
00:41:41,240 --> 00:41:38,280
midnight that's the most interesting

981
00:41:43,640 --> 00:41:41,250
region if we go for 2 years we can get

982
00:41:47,180 --> 00:41:43,650
that twice as long as we start our

983
00:41:48,620 --> 00:41:47,190
operations at 6 local time so take 60

984
00:41:51,410 --> 00:41:48,630
days to Commission you have to bring

985
00:41:52,700 --> 00:41:51,420
those instruments on very slowly so I'm

986
00:41:55,100 --> 00:41:52,710
afraid you'll have to get ups to watch

987
00:41:56,450 --> 00:41:55,110
it at 407 but but nighttime launches are

988
00:41:58,670 --> 00:41:56,460

way more spectacular so I think you'll

989
00:42:00,950 --> 00:41:58,680
be really happy about that so we've done

990
00:42:04,420 --> 00:42:00,960
y2y still ungodly early and why all

991
00:42:06,950 --> 00:42:04,430
those booms looking up okay next slide

992
00:42:10,850 --> 00:42:06,960
so this is the movie the two dots

993
00:42:13,310 --> 00:42:10,860
represent rbsp and this is done using

994
00:42:14,390 --> 00:42:13,320
Sam pecks data and you see the two of

995
00:42:16,040 --> 00:42:14,400
them you actually see they're sort of

996
00:42:18,170 --> 00:42:16,050
chasing one another and it does vary

997
00:42:20,990 --> 00:42:18,180
here comes a storm so the storm this is

998
00:42:23,090 --> 00:42:21,000
the DST or disturb storm time index in

999
00:42:25,490 --> 00:42:23,100
the top corner here you're about to see

1000
00:42:27,890 --> 00:42:25,500
it hit start with a storm and there's

1001
00:42:30,080 --> 00:42:27,900
radiation and belts are responding very

1002
00:42:31,670 --> 00:42:30,090
dramatically not as dramatically as they

1003
00:42:34,040 --> 00:42:31,680
will to a smaller storm coming up

1004
00:42:35,870 --> 00:42:34,050
actually but so the so the two

1005
00:42:36,730 --> 00:42:35,880
spacecraft as we said a lapping one

1006
00:42:39,099 --> 00:42:36,740
another

1007
00:42:40,720 --> 00:42:39,109
and well they're also sweeping out it's

1008
00:42:42,220 --> 00:42:40,730
almost like petals of the flower they're

1009
00:42:44,290 --> 00:42:42,230
going to keep sweeping that out until we

1010
00:42:46,359 --> 00:42:44,300
have the whole thing covered it's a bit

1011
00:42:50,050 --> 00:42:46,369
like a spirograph or that you play with

1012
00:42:51,280 --> 00:42:50,060
there's a kid and I think we'll go on to

1013
00:42:54,430 --> 00:42:51,290

the next one because this is a long one

1014
00:42:57,190 --> 00:42:54,440
okay so I did mention that we are doing

1015
00:42:59,710 --> 00:42:57,200
fundamental particle acceleration if you

1016
00:43:01,720 --> 00:42:59,720
look take an aerial shot of CERN and

1017
00:43:03,099 --> 00:43:01,730
look down at that particle detector you

1018
00:43:05,230 --> 00:43:03,109
and check particles into it they get

1019
00:43:07,180 --> 00:43:05,240
energized it's just a big radiation belt

1020
00:43:09,160 --> 00:43:07,190
that's exactly what we're doing they're

1021
00:43:10,810 --> 00:43:09,170
particles are in our own magnetosphere a

1022
00:43:12,550 --> 00:43:10,820
common misconception people think

1023
00:43:13,990 --> 00:43:12,560
particles come from the Sun and enter it

1024
00:43:16,540 --> 00:43:14,000
and that's what pumps up the radiation

1025
00:43:18,250 --> 00:43:16,550
belts it's the energy from the Sun we

1026
00:43:20,020 --> 00:43:18,260
are very very full of particles in the

1027
00:43:21,849 --> 00:43:20,030
magnetosphere it is not empty there are

1028
00:43:23,079 --> 00:43:21,859
a lot there that you know the particles

1029
00:43:24,880 --> 00:43:23,089
are injected from within the

1030
00:43:28,720 --> 00:43:24,890
magnetosphere and get very highly

1031
00:43:30,849 --> 00:43:28,730
energized so same processes are causing

1032
00:43:32,800 --> 00:43:30,859
particle acceleration on the Sun giving

1033
00:43:35,260 --> 00:43:32,810
rise to a lot of the solar activity

1034
00:43:37,630 --> 00:43:35,270
that's then driving the radiation belt

1035
00:43:40,030 --> 00:43:37,640
response there's the large radiation

1036
00:43:42,040 --> 00:43:40,040
belts at Jupiter which is the most

1037
00:43:43,900 --> 00:43:42,050
intense radiation and I think it's bad

1038
00:43:46,480 --> 00:43:43,910

where we're going but wow that one would

1039
00:43:49,810 --> 00:43:46,490
be really bad and there's a nice picture

1040
00:43:54,130 --> 00:43:49,820
of the Crab Nebula at the top there next

1041
00:43:55,930 --> 00:43:54,140
slide so nice artist's rendition of the

1042
00:43:59,980 --> 00:43:55,940
two spacecraft is this a movie or is

1043
00:44:02,440 --> 00:43:59,990
this just a still just a still okay so

1044
00:44:07,470 --> 00:44:02,450
we've done the instruments we've done

1045
00:44:10,779 --> 00:44:09,339
okay

1046
00:44:12,309 --> 00:44:10,789
are you largely going to be in an

1047
00:44:13,870 --> 00:44:12,319
equatorial orbit or do you have a high

1048
00:44:15,579 --> 00:44:13,880
inclination so you can look at all parts

1049
00:44:18,489 --> 00:44:15,589
of the belt even the ones near the poles

1050
00:44:21,249 --> 00:44:18,499
nope awesome question we are down at 10

1051
00:44:22,870 --> 00:44:21,259
degrees 10 degrees inclination we want

1052
00:44:25,420 --> 00:44:22,880
to get as close to the equator as

1053
00:44:27,549 --> 00:44:25,430
possible if you think about particle

1054
00:44:29,049 --> 00:44:27,559
just particle motion there are three

1055
00:44:31,089 --> 00:44:29,059
different ways that a particle moves

1056
00:44:33,969 --> 00:44:31,099
around the field line it goes round and

1057
00:44:36,579 --> 00:44:33,979
round it it also bounces almost from

1058
00:44:38,380 --> 00:44:36,589
pole to pole and it also drifts from

1059
00:44:41,019 --> 00:44:38,390
magnetic field line to magnetic field

1060
00:44:44,170 --> 00:44:41,029
line so it's a kind of a complex dance

1061
00:44:46,539 --> 00:44:44,180
it does around the magnetosphere there

1062
00:44:47,949 --> 00:44:46,549
are some particles that are almost field

1063
00:44:50,049 --> 00:44:47,959

aligned and they are the ones that are

1064
00:44:52,209 --> 00:44:50,059
often lost as dave said in the slot

1065
00:44:54,519 --> 00:44:52,219
region or causing the aurora there are

1066
00:44:56,109 --> 00:44:54,529
some that that a bit actually are kind

1067
00:44:57,880 --> 00:44:56,119
of lying down a ton like what we call a

1068
00:44:59,199 --> 00:44:57,890
90 degree pitch angle so they're

1069
00:45:01,329 --> 00:44:59,209
literally just staying in that

1070
00:45:03,430 --> 00:45:01,339
equatorial region so if we don't get

1071
00:45:05,890 --> 00:45:03,440
right down to those particles they are

1072
00:45:12,039 --> 00:45:05,900
not going to get to us so we have to lie

1073
00:45:15,189 --> 00:45:12,049
down in that in that orbit goodness

1074
00:45:17,229 --> 00:45:15,199
forbid if there's an issue during the

1075
00:45:19,059 --> 00:45:17,239
during the mission class like if if

1076
00:45:21,839 --> 00:45:19,069
something were to happen to one of the

1077
00:45:25,439 --> 00:45:21,849
spacecraft how much does that change

1078
00:45:28,449 --> 00:45:25,449
what you're looking at and the kind of

1079
00:45:30,189 --> 00:45:28,459
effects you expect to see well it would

1080
00:45:32,829 --> 00:45:30,199
it would we would still get great

1081
00:45:34,299 --> 00:45:32,839
science results because the instruments

1082
00:45:36,459 --> 00:45:34,309
that are flown on the spacecraft are

1083
00:45:38,079 --> 00:45:36,469
literally the cutting edge you know most

1084
00:45:40,029 --> 00:45:38,089
sophisticated instruments ever flown in

1085
00:45:41,559 --> 00:45:40,039
this region and you know even if you

1086
00:45:44,019 --> 00:45:41,569
talk to some of my pis they'll tell you

1087
00:45:46,509 --> 00:45:44,029
well we were selected in 2006 but new

1088
00:45:47,499 --> 00:45:46,519

technology came along while we were you

1089
00:45:49,959 --> 00:45:47,509
know building and we've even

1090
00:45:51,219 --> 00:45:49,969
incorporated that into so you know we

1091
00:45:52,870 --> 00:45:51,229
really are flying cutting edge

1092
00:45:55,599 --> 00:45:52,880
instruments so we would still get great

1093
00:45:57,339 --> 00:45:55,609
science only if we only had one what we

1094
00:45:59,009 --> 00:45:57,349
would lose would be this ability to

1095
00:46:01,239 --> 00:45:59,019
really characterize the dynamics

1096
00:46:03,130 --> 00:46:01,249
particularly small scale features we

1097
00:46:05,199 --> 00:46:03,140
really want to know is this is this

1098
00:46:06,759 --> 00:46:05,209
something that's changing in time or is

1099
00:46:09,039 --> 00:46:06,769
this something that's changing in space

1100
00:46:11,319 --> 00:46:09,049
and the only way you can really unravel

1101
00:46:13,359 --> 00:46:11,329
temporal versus facial is with two

1102
00:46:16,029 --> 00:46:13,369
spacecraft so that would be a big

1103
00:46:17,439 --> 00:46:16,039
drawback to put it mildly

1104
00:46:19,059 --> 00:46:17,449
it was certainly put a cramp e'en in

1105
00:46:21,100 --> 00:46:19,069
day's plans to get in that Nobel Prize

1106
00:46:23,840 --> 00:46:21,110
anyway but some

1107
00:46:26,800 --> 00:46:23,850
assuming assuming that then we would

1108
00:46:29,060 --> 00:46:26,810
still get great science with one yeah

1109
00:46:30,440 --> 00:46:29,070
okay and then at my last slide cuz I did

1110
00:46:32,150 --> 00:46:30,450
forget one didn't I Mike thank you for

1111
00:46:33,260 --> 00:46:32,160
bringing it up okay so I was going to

1112
00:46:35,900 --> 00:46:33,270
talk about radiation damage to

1113
00:46:37,970 --> 00:46:35,910

satellites so I always like to say our

1114
00:46:39,940 --> 00:46:37,980
mission is a fundamental physics mission

1115
00:46:42,170 --> 00:46:39,950
we are studying particle acceleration

1116
00:46:44,720 --> 00:46:42,180
it's not just rocket science it's just

1117
00:46:46,310 --> 00:46:44,730
particle acceleration and that's it's a

1118
00:46:48,320 --> 00:46:46,320
fundamental process that's taking place

1119
00:46:50,060 --> 00:46:48,330
all over the universe but the really

1120
00:46:53,150 --> 00:46:50,070
cool thing about this is it has

1121
00:46:54,680 --> 00:46:53,160
practical applications and here's just

1122
00:46:55,820 --> 00:46:54,690
one I know Dave talked in length about a

1123
00:46:57,830 --> 00:46:55,830
number of different space weather

1124
00:46:59,330 --> 00:46:57,840
effects but really in the radiation

1125
00:47:01,040 --> 00:46:59,340
bolts these are the things that we worry

1126
00:47:02,660 --> 00:47:01,050
about for our satellites particularly

1127
00:47:04,850 --> 00:47:02,670
the outer radiation belt because the

1128
00:47:06,200 --> 00:47:04,860
inner one occasionally dips down and

1129
00:47:08,050 --> 00:47:06,210
covers the space station but this is

1130
00:47:10,940 --> 00:47:08,060
really what we're worried about Frost

1131
00:47:12,740 --> 00:47:10,950
because your GPS are out in here and

1132
00:47:14,990 --> 00:47:12,750
goodness knows no one uses a map anymore

1133
00:47:16,400 --> 00:47:15,000
you just pull out a phone I mean

1134
00:47:18,170 --> 00:47:16,410
seriously do you turn off at the airport

1135
00:47:19,430 --> 00:47:18,180
and then you look up the address for

1136
00:47:20,780 --> 00:47:19,440
your hotel and your email and then you

1137
00:47:22,940 --> 00:47:20,790
hit the button and it just tells you

1138
00:47:24,710 --> 00:47:22,950

where to go so I'm kind of really keen

1139
00:47:26,810 --> 00:47:24,720
on my GPS actually so I really want to

1140
00:47:29,840 --> 00:47:26,820
protect those but all of your satellite

1141
00:47:32,060 --> 00:47:29,850
communications satellite TV you know we

1142
00:47:34,520 --> 00:47:32,070
just we don't even realize half the time

1143
00:47:36,200 --> 00:47:34,530
what we rely on this space region for so

1144
00:47:39,610 --> 00:47:36,210
you know we can have single event upsets

1145
00:47:43,130 --> 00:47:39,620
that can cause computer errors failures

1146
00:47:45,020 --> 00:47:43,140
it you can have a surface charging just

1147
00:47:46,400 --> 00:47:45,030
because suddenly the the medium you're

1148
00:47:47,630 --> 00:47:46,410
going through is much more dense much

1149
00:47:50,600 --> 00:47:47,640
more particles and it's just like a

1150
00:47:52,100 --> 00:47:50,610
friction that you can get the the

1151
00:47:54,110 --> 00:47:52,110
particularly things the things we all

1152
00:47:56,810 --> 00:47:54,120
really dread deep direct direct

1153
00:47:59,420 --> 00:47:56,820
discharge because that is just that's

1154
00:48:00,680 --> 00:47:59,430
often a killer so that's actually why

1155
00:48:02,570 --> 00:48:00,690
you put lots and lots of shielding

1156
00:48:05,030 --> 00:48:02,580
around all of your electronics and we

1157
00:48:07,040 --> 00:48:05,040
are a sort of armor plated spacecraft we

1158
00:48:09,620 --> 00:48:07,050
have aluminum shielding it's about the

1159
00:48:11,300 --> 00:48:09,630
thickness of a slice of bread all around

1160
00:48:11,690 --> 00:48:11,310
and it's practically anything we can

1161
00:48:15,080 --> 00:48:11,700
shield

1162
00:48:16,280 --> 00:48:15,090
the apertures of the instruments are

1163
00:48:19,010 --> 00:48:16,290

about the only thing that are not

1164
00:48:20,540 --> 00:48:19,020
covered in in like armor plating and

1165
00:48:22,580 --> 00:48:20,550
then solar panel degradation just

1166
00:48:24,740 --> 00:48:22,590
hitting high-energy particles just

1167
00:48:26,780 --> 00:48:24,750
hitting your solar panels and damaging

1168
00:48:27,820 --> 00:48:26,790
them so and we are doing fundamental

1169
00:48:30,490 --> 00:48:27,830
physics and

1170
00:48:35,420 --> 00:48:30,500
practical applications and that really

1171
00:48:39,650 --> 00:48:37,700
[Music]

1172
00:48:41,120 --> 00:48:39,660
my question actually comes from it one

1173
00:48:42,500 --> 00:48:41,130
of my Twitter followers Garrett is here

1174
00:48:44,090 --> 00:48:42,510
he wanted to know if the probes are

1175
00:48:46,310 --> 00:48:44,100
gonna be named after the launch I know

1176
00:48:49,460 --> 00:48:46,320
right now they're just a and B and when

1177
00:48:51,620 --> 00:48:49,470
we we were the Grail Tweetup together so

1178
00:48:53,420 --> 00:48:51,630
I know afterwards they were named after

1179
00:48:55,490 --> 00:48:53,430
the launch was that will that be the

1180
00:48:57,320 --> 00:48:55,500
case with these there are plans to

1181
00:48:59,420 --> 00:48:57,330
rename the mission after the launch

1182
00:49:00,860 --> 00:48:59,430
I believe the spacecraft will always be

1183
00:49:04,700 --> 00:49:00,870
affectionately known as the radiation

1184
00:49:06,380 --> 00:49:04,710
belt storm probes but there are plans to

1185
00:49:09,380 --> 00:49:06,390
rename the mission it hasn't been

1186
00:49:11,060 --> 00:49:09,390
completely finalized what it will be but

1187
00:49:12,770 --> 00:49:11,070
I have always called them van and Alan

1188
00:49:14,540 --> 00:49:12,780

them they're my two babies one is fat

1189
00:49:15,680 --> 00:49:14,550
and the other is Alan and I've worked I

1190
00:49:19,040 --> 00:49:15,690
mean these guys I've worked with him for

1191
00:49:21,290 --> 00:49:19,050
11 years and I've they're they're older

1192
00:49:25,510 --> 00:49:21,300
than my children so they are they are

1193
00:49:32,870 --> 00:49:31,370
the either of the probes not not planned

1194
00:49:34,490 --> 00:49:32,880
I mean we're certainly looking at that

1195
00:49:36,800 --> 00:49:34,500
you know if you you get these these

1196
00:49:38,120 --> 00:49:36,810
scientists we're awful bunch so we you

1197
00:49:39,590 --> 00:49:38,130
know we build our instruments and then

1198
00:49:40,580 --> 00:49:39,600
we work out what we can really do with

1199
00:49:42,440 --> 00:49:40,590
them you know you have your requirements

1200
00:49:45,050 --> 00:49:42,450
and you build to that but you know for

1201
00:49:47,330 --> 00:49:45,060
example burn Blake is is a cosmic ray

1202
00:49:48,560 --> 00:49:47,340
fiend and I absolutely guarantee that

1203
00:49:51,050 --> 00:49:48,570
the first thing that he looks for is

1204
00:49:54,170 --> 00:49:51,060
cosmic rays so you know I'm not saying

1205
00:49:55,670 --> 00:49:54,180
no it's not a planned result but as Dave

1206
00:49:56,840 --> 00:49:55,680
said the most exciting science is the

1207
00:50:03,560 --> 00:49:56,850
stuff you didn't plan for

1208
00:50:04,640 --> 00:50:03,570
so nothing planned excuse me the picture

1209
00:50:06,080 --> 00:50:04,650
you showed earlier with a three

1210
00:50:08,780 --> 00:50:06,090
gentleman holding the rocket out that's

1211
00:50:11,090 --> 00:50:08,790
the doctor's Pickering funnel and and

1212
00:50:15,800 --> 00:50:11,100
dr. Bowen brought on the great rocket

1213
00:50:18,590 --> 00:50:15,810

scientist obviously that you know what

1214
00:50:20,570 --> 00:50:18,600
we discovered about the Van Allen Van

1215
00:50:23,870 --> 00:50:20,580
Allen radiation belts really helped to

1216
00:50:27,650 --> 00:50:23,880
in the rocket design through through all

1217
00:50:28,730 --> 00:50:27,660
the well ever since then absolutely do

1218
00:50:31,100 --> 00:50:28,740
you think we're gonna get more

1219
00:50:34,430 --> 00:50:31,110
information now absolutely really gonna

1220
00:50:36,770 --> 00:50:34,440
boost yes in the future this is gonna

1221
00:50:40,190 --> 00:50:36,780
make dramatic changes to to satellite

1222
00:50:42,260 --> 00:50:40,200
design and be models that we use to sort

1223
00:50:44,810 --> 00:50:42,270
of estimate the shielding and the

1224
00:50:46,760 --> 00:50:44,820
lifetime of spacecraft are twenty more

1225
00:50:49,910 --> 00:50:46,770
than twenty years old and we know just

1226
00:50:52,160 --> 00:50:49,920
with new data that some of them are over

1227
00:50:55,520 --> 00:50:52,170
predicting there the you know the medium

1228
00:50:57,500 --> 00:50:55,530
and some are under predicting and that's

1229
00:50:59,210 --> 00:50:57,510
both that is bad on both counts because

1230
00:51:00,770 --> 00:50:59,220
if you under predict well I mean

1231
00:51:02,090 --> 00:51:00,780
obviously it doesn't take a rocket

1232
00:51:03,560 --> 00:51:02,100
scientist to tell you what's gonna

1233
00:51:05,360 --> 00:51:03,570
happen if you under predictive what the

1234
00:51:07,250 --> 00:51:05,370
medium was like but if you over predict

1235
00:51:08,750 --> 00:51:07,260
it you've put too much shielding on so

1236
00:51:11,180 --> 00:51:08,760
you see you've spent more on launching

1237
00:51:12,650 --> 00:51:11,190
it than you needed to and you know

1238
00:51:14,960 --> 00:51:12,660

anyone who works in the space industry

1239
00:51:16,280 --> 00:51:14,970
will tell you lighter is better when

1240
00:51:18,770 --> 00:51:16,290
you're you know you don't want to launch

1241
00:51:22,490 --> 00:51:18,780
a tank if you know a mini-cooper would

1242
00:51:24,170 --> 00:51:22,500
have done so you know you really do want

1243
00:51:26,180 --> 00:51:24,180
to do much much better at predicting

1244
00:51:27,560 --> 00:51:26,190
what's going to happen also operational

1245
00:51:29,330 --> 00:51:27,570
spacecraft if you don't want to

1246
00:51:31,370 --> 00:51:29,340
underestimate the life of those and not

1247
00:51:33,320 --> 00:51:31,380
launch one quick enough nor do you want

1248
00:51:35,180 --> 00:51:33,330
to overestimate launch one and then

1249
00:51:36,690 --> 00:51:35,190
leave it in storage and now you've got

1250
00:51:38,190 --> 00:51:36,700
two being damaged you know

1251
00:51:40,920 --> 00:51:38,200
you you really do need to do a much

1252
00:51:42,960 --> 00:51:40,930
better job so this mission is is

1253
00:51:45,750 --> 00:51:42,970
tailored to to really update those

1254
00:51:49,859 --> 00:51:45,760
models so the ones we use now are 88 and

1255
00:51:52,680 --> 00:51:49,869
88 and 89 and 89 there's already beta

1256
00:51:54,180 --> 00:51:52,690
versions of those just waiting it's like

1257
00:51:56,670 --> 00:51:54,190
they've got everything else set up and

1258
00:51:59,430 --> 00:51:56,680
they're waiting for rbsp because this to

1259
00:52:03,990 --> 00:51:59,440
probe information is just going to

1260
00:52:05,460 --> 00:52:04,000
really blow everyone out of the water do

1261
00:52:07,170 --> 00:52:05,470
the two spacecraft talk to one another

1262
00:52:10,380 --> 00:52:07,180
or just to the ground no they're very

1263
00:52:14,270 --> 00:52:10,390

antisocial damn they actually they just

1264
00:52:16,829 --> 00:52:14,280
talk to the ground that was that was a

1265
00:52:19,170 --> 00:52:16,839
decision early on to say it you know to

1266
00:52:22,829 --> 00:52:19,180
save money and they don't really need to

1267
00:52:25,079 --> 00:52:22,839
talk to one another it's a you know they

1268
00:52:28,490 --> 00:52:25,089
they the instruments do talk to one

1269
00:52:31,890 --> 00:52:28,500
another on each spacecraft however so

1270
00:52:33,359 --> 00:52:31,900
you know if one particle instrument in

1271
00:52:36,060 --> 00:52:33,369
particular suddenly sees a large

1272
00:52:37,829 --> 00:52:36,070
increase in particle fluxes it sends out

1273
00:52:39,900 --> 00:52:37,839
a signal saying hey you know large

1274
00:52:41,910 --> 00:52:39,910
increase and then the magnetic field and

1275
00:52:43,800 --> 00:52:41,920
the electric field instruments will go

1276
00:52:47,370 --> 00:52:43,810
into a very high time resolution mode

1277
00:52:49,319 --> 00:52:47,380
and hope will respond by instead of

1278
00:52:51,000 --> 00:52:49,329
taking one proton and one electron it

1279
00:52:52,589 --> 00:52:51,010
will go into a first electron cycle or

1280
00:52:56,670 --> 00:52:52,599
something so that we're getting a lot

1281
00:53:05,540 --> 00:52:56,680
higher time resolution data perfect

1282
00:53:11,910 --> 00:53:08,460
next up we have the chief engineer from

1283
00:53:14,070 --> 00:53:11,920
the applied physics laboratories Space

1284
00:53:24,440 --> 00:53:14,080
Department his name as he told me to

1285
00:53:26,580 --> 00:53:24,450
introduce him is couch thanks Jason

1286
00:53:29,359 --> 00:53:26,590
I'd like to speak to you afterwards

1287
00:53:32,280 --> 00:53:29,369
about scheduling me to speak after Nikki

1288
00:53:33,960 --> 00:53:32,290

she's a she's a tough act to follow I

1289
00:53:35,040 --> 00:53:33,970
think you've all probably got the notion

1290
00:53:38,430 --> 00:53:35,050
that the scientists are pretty

1291
00:53:39,540 --> 00:53:38,440
enthusiastic about this this mission and

1292
00:53:41,940 --> 00:53:39,550
believe it or not engineers get

1293
00:53:44,099 --> 00:53:41,950
enthusiastic about their work also all

1294
00:53:46,640 --> 00:53:44,109
of this is about all the science that

1295
00:53:50,640 --> 00:53:46,650
comes back and the engineers are very

1296
00:53:51,810 --> 00:53:50,650
proud to be able to enable that science

1297
00:53:54,120 --> 00:53:51,820
and the knowledge that that brings back

1298
00:53:56,190 --> 00:53:54,130
to us so with that I'd like to tell you

1299
00:53:58,320 --> 00:53:56,200
a little bit about the role of the

1300
00:54:00,210 --> 00:53:58,330
Applied Physics lab in implementing this

1301
00:54:02,790 --> 00:54:00,220
mission and my role as chief engineer at

1302
00:54:04,740 --> 00:54:02,800
the department before I get into that I

1303
00:54:07,109 --> 00:54:04,750
would like to thank dr. Giles for the

1304
00:54:08,730 --> 00:54:07,119
kind words that she said in her opening

1305
00:54:11,670 --> 00:54:08,740
remarks about the performance the

1306
00:54:13,380 --> 00:54:11,680
Applied Physics lab it again it is all

1307
00:54:14,790 --> 00:54:13,390
about the science but it is also very

1308
00:54:18,120 --> 00:54:14,800
important to us as an institution to

1309
00:54:20,940 --> 00:54:18,130
make our customer NASA happy with our

1310
00:54:22,800 --> 00:54:20,950
performance and to date and we've been

1311
00:54:25,560 --> 00:54:22,810
very successful in getting to launch on

1312
00:54:27,240 --> 00:54:25,570
time and on schedule the really hard

1313
00:54:29,609 --> 00:54:27,250

part starts now

1314
00:54:35,460 --> 00:54:29,619
and the payoff for all of that hard work

1315
00:54:38,760 --> 00:54:37,260
the Applied Physics lab is the

1316
00:54:40,340 --> 00:54:38,770
implementing institution for NASA for

1317
00:54:43,740 --> 00:54:40,350
the radiation belt storm probes mission

1318
00:54:45,990 --> 00:54:43,750
we designed built integrated tested and

1319
00:54:47,070 --> 00:54:46,000
we will operate both spacecraft during

1320
00:54:49,020 --> 00:54:47,080
the course of the mission we also

1321
00:54:51,450 --> 00:54:49,030
developed the ground system in concert

1322
00:54:53,190 --> 00:54:51,460
with that and we also developed one of

1323
00:54:56,030 --> 00:54:53,200
the instruments that's flying onboard

1324
00:54:59,480 --> 00:54:56,040
the spacecraft GRB spice investigation

1325
00:55:04,440 --> 00:55:02,280
this was sort of a repeat performance in

1326
00:55:07,830 --> 00:55:04,450
a way from the stereo mission that we

1327
00:55:10,620 --> 00:55:07,840
also executed for NASA very similar in

1328
00:55:13,020 --> 00:55:10,630
that stereo is an investigation that

1329
00:55:14,609 --> 00:55:13,030
also uses two spacecraft there they're

1330
00:55:17,070 --> 00:55:14,619
in completely different orbit they're in

1331
00:55:19,130 --> 00:55:17,080
a heliocentric orbit around the Sun not

1332
00:55:21,120 --> 00:55:19,140
remain in low-earth orbit nevertheless

1333
00:55:22,859 --> 00:55:21,130
there were a lot of valuable lessons

1334
00:55:25,310 --> 00:55:22,869
that we learned in the course of

1335
00:55:27,420 --> 00:55:25,320
building two spacecraft concurrently

1336
00:55:28,800 --> 00:55:27,430
launching them and operating them that

1337
00:55:31,800 --> 00:55:28,810
we applied to the development of the

1338
00:55:33,750 --> 00:55:31,810

rbsp mission and I think helped make us

1339
00:55:35,940 --> 00:55:33,760
successful programmatically in bringing

1340
00:55:36,770 --> 00:55:35,950
the mission to this point again on cost

1341
00:55:39,090 --> 00:55:36,780
and on schedule

1342
00:55:41,760 --> 00:55:39,100
many of the same team members who worked

1343
00:55:43,640 --> 00:55:41,770
on stereo also helped implement the rbsp

1344
00:55:46,109 --> 00:55:43,650
mission so that was another advantage to

1345
00:55:48,900 --> 00:55:46,119
being able to retain that workforce and

1346
00:55:51,980 --> 00:55:48,910
having good work for them to do next

1347
00:55:57,020 --> 00:55:54,109
just briefly in my role as chief

1348
00:55:58,760 --> 00:55:57,030
engineer I have to say I love my job too

1349
00:56:01,280 --> 00:55:58,770
and one of the great things about it is

1350
00:56:03,710 --> 00:56:01,290
is that primarily I give advice to

1351
00:56:06,770 --> 00:56:03,720
people I've been at the lab for thirty

1352
00:56:08,180 --> 00:56:06,780
years I've had my share of building a

1353
00:56:10,280 --> 00:56:08,190
lot of hardware and delivering hardware

1354
00:56:12,260 --> 00:56:10,290
and delivering systems to launch it it's

1355
00:56:14,240 --> 00:56:12,270
very gratifying work it's also very hard

1356
00:56:15,530 --> 00:56:14,250
work and I'm more than happy at this

1357
00:56:16,880 --> 00:56:15,540
point to sort of step aside and let

1358
00:56:18,980 --> 00:56:16,890
other people do all that really hard

1359
00:56:21,530 --> 00:56:18,990
work and to just give advice the the

1360
00:56:23,750 --> 00:56:21,540
hard part of that though is that people

1361
00:56:24,890 --> 00:56:23,760
generally only want good advice which is

1362
00:56:28,160 --> 00:56:24,900
a little bit harder than just giving

1363
00:56:31,760 --> 00:56:28,170

advice so I perform that function on

1364
00:56:34,040 --> 00:56:31,770
rbsp as you're probably aware there are

1365
00:56:36,020 --> 00:56:34,050
literally thousands of details that go

1366
00:56:38,839 --> 00:56:36,030
into implementing a mission like this

1367
00:56:41,000 --> 00:56:38,849
and executing it and when problems arise

1368
00:56:44,390 --> 00:56:41,010
as they inevitably do during the course

1369
00:56:46,160 --> 00:56:44,400
of the development it sometimes is hard

1370
00:56:49,549 --> 00:56:46,170
for the people who are in the midst of

1371
00:56:51,620 --> 00:56:49,559
dealing with all those details to have

1372
00:56:53,210 --> 00:56:51,630
an overall big picture view of what's

1373
00:56:54,950 --> 00:56:53,220
going on and so that's one of the

1374
00:56:57,230 --> 00:56:54,960
functions that I serve is in that

1375
00:57:00,109 --> 00:56:57,240
engineering oversight role is to provide

1376
00:57:01,970 --> 00:57:00,119
an independent assessment of the

1377
00:57:05,770 --> 00:57:01,980
problems and the proposed resolution

1378
00:57:08,720 --> 00:57:05,780
that the project would like to implement

1379
00:57:10,970 --> 00:57:08,730
I'm also responsible for defining and

1380
00:57:13,099 --> 00:57:10,980
ensuring that the engineering teams

1381
00:57:15,380 --> 00:57:13,109
execute these missions according to the

1382
00:57:17,539 --> 00:57:15,390
proper processes and going through the

1383
00:57:20,089 --> 00:57:17,549
proper reviews and doing all the things

1384
00:57:21,980 --> 00:57:20,099
that we know are the right things to do

1385
00:57:26,630 --> 00:57:21,990
in order to ensure successful missions

1386
00:57:28,700 --> 00:57:26,640
after we launch next please oh I should

1387
00:57:31,280 --> 00:57:28,710
say that another thing that I get to do

1388
00:57:33,140 --> 00:57:31,290

is briefings like this the day before

1389
00:57:35,599 --> 00:57:33,150
launch so that the members of the

1390
00:57:37,099 --> 00:57:35,609
project team can actually remain focused

1391
00:57:39,650 --> 00:57:37,109
on the job that they have ahead of them

1392
00:57:41,510 --> 00:57:39,660
and make sure that they're well rested

1393
00:57:45,859 --> 00:57:41,520
and ready for launch tomorrow morning at

1394
00:57:47,720 --> 00:57:45,869
bright and early at 4:07 so what's easy

1395
00:57:48,770 --> 00:57:47,730
about the two spacecraft mission there

1396
00:57:50,599 --> 00:57:48,780
are some things that are easy about it

1397
00:57:53,150 --> 00:57:50,609
there's some things that are not so easy

1398
00:57:55,069 --> 00:57:53,160
about it one thing is is that both of

1399
00:57:57,319 --> 00:57:55,079
the spacecraft are nearly identical so

1400
00:58:00,920 --> 00:57:57,329
we just kind of build two copies of most

1401
00:58:02,630 --> 00:58:00,930
everything that we make we take an

1402
00:58:04,069 --> 00:58:02,640
approach with with this mission we have

1403
00:58:04,859 --> 00:58:04,079
taken approach with this mission as we

1404
00:58:08,670 --> 00:58:04,869
did on stereo

1405
00:58:10,620 --> 00:58:08,680
to keep the design fairly simple and I

1406
00:58:13,799 --> 00:58:10,630
should have put the word relatively

1407
00:58:16,200 --> 00:58:13,809
simple in there because I learned in the

1408
00:58:18,930 --> 00:58:16,210
course of my career that there really is

1409
00:58:22,049 --> 00:58:18,940
nothing simple or easy about any of this

1410
00:58:24,059 --> 00:58:22,059
work it the complexity even when you

1411
00:58:26,130 --> 00:58:24,069
take a simple approach it to me still

1412
00:58:27,539 --> 00:58:26,140
boggles my mind and I regard it very

1413
00:58:30,299 --> 00:58:27,549

often as nothing less than a minor

1414
00:58:31,829 --> 00:58:30,309
miracle that we're able to do these

1415
00:58:35,160 --> 00:58:31,839
things and get the science that we get

1416
00:58:36,749 --> 00:58:35,170
back from them keeping them simple also

1417
00:58:38,970 --> 00:58:36,759
makes them easier to test and operate

1418
00:58:40,529 --> 00:58:38,980
which is an advantage it gives you some

1419
00:58:42,599 --> 00:58:40,539
flexibility during the integration and

1420
00:58:44,549 --> 00:58:42,609
test process sometimes if a problem

1421
00:58:46,589 --> 00:58:44,559
crops up on one spacecraft where you can

1422
00:58:49,349 --> 00:58:46,599
sort of put that one aside get a team to

1423
00:58:51,089 --> 00:58:49,359
focus on solving that problem while the

1424
00:58:52,759 --> 00:58:51,099
integration and testing proceeds with

1425
00:58:55,519 --> 00:58:52,769
the processing of the second spacecraft

1426
00:58:57,809 --> 00:58:55,529
and some of the tests you run

1427
00:59:00,269 --> 00:58:57,819
concurrently on both spacecraft there's

1428
00:59:02,279 --> 00:59:00,279
a discipline that we all follow in this

1429
00:59:04,739 --> 00:59:02,289
community that we call test as you fly

1430
00:59:08,670 --> 00:59:04,749
which is part of the methodology again

1431
00:59:10,289 --> 00:59:08,680
to ensure a successful mission so we do

1432
00:59:12,120 --> 00:59:10,299
things like when we vibrate the

1433
00:59:14,039 --> 00:59:12,130
spacecraft we've we've I break them the

1434
00:59:15,450 --> 00:59:14,049
way that they will be stacked in the

1435
00:59:18,029 --> 00:59:15,460
launch vehicle one on top of the other

1436
00:59:20,489 --> 00:59:18,039
we also want to our acoustic tests like

1437
00:59:22,049 --> 00:59:20,499
that one spacecraft at a time other

1438
00:59:23,579 --> 00:59:22,059

tests like thermal vacuum we have to

1439
00:59:25,229 --> 00:59:23,589
separate the spacecraft and test those

1440
00:59:28,049 --> 00:59:25,239
separately because they don't fly

1441
00:59:29,279 --> 00:59:28,059
together at least they better not fly

1442
00:59:33,539 --> 00:59:29,289
together after they've been released

1443
00:59:35,789 --> 00:59:33,549
from the launch vehicle so those are

1444
00:59:38,359 --> 00:59:35,799
some of the advantages to do in to

1445
00:59:41,309 --> 00:59:38,369
spacecraft mission next slide please

1446
00:59:43,470 --> 00:59:41,319
some of the things that are not quite so

1447
00:59:45,539 --> 00:59:43,480
easy about a two spacecraft mission well

1448
00:59:46,950 --> 00:59:45,549
I said earlier that one of the easy

1449
00:59:49,229 --> 00:59:46,960
things is that both spacecraft are

1450
00:59:51,569 --> 00:59:49,239
nearly identical one of the not so easy

1451
00:59:54,720 --> 00:59:51,579
things is that they are not exactly

1452
00:59:56,640 --> 00:59:54,730
identical now this is not necessarily a

1453
00:59:57,930 --> 00:59:56,650
hard thing to do but there are some

1454
00:59:59,549 --> 00:59:57,940
differences between the two spacecraft

1455
01:00:01,440 --> 00:59:59,559
and you just have to keep track of them

1456
01:00:02,640 --> 01:00:01,450
as you go through the development for

1457
01:00:04,140 --> 01:00:02,650
instance you know that the two

1458
01:00:05,940 --> 01:00:04,150
spacecraft made to each other so the

1459
01:00:07,289 --> 01:00:05,950
mating Hardware on one spacecraft is a

1460
01:00:10,079 --> 01:00:07,299
little bit different than the the mating

1461
01:00:11,819 --> 01:00:10,089
hardware on another the spacecraft talk

1462
01:00:13,259 --> 01:00:11,829
on different frequencies so you have to

1463
01:00:14,670 --> 01:00:13,269

make sure that the right radios go on

1464
01:00:17,029 --> 01:00:14,680
the right spacecraft you don't mix those

1465
01:00:19,249 --> 01:00:17,039
up and some of the

1466
01:00:21,079 --> 01:00:19,259
signals from the launch vehicle while

1467
01:00:22,880 --> 01:00:21,089
you're doing ground processing them it's

1468
01:00:24,289 --> 01:00:22,890
called the umbilical harness from the

1469
01:00:25,729 --> 01:00:24,299
launch vehicle those signals are carried

1470
01:00:26,779 --> 01:00:25,739
up from one spacecraft to another so

1471
01:00:29,689 --> 01:00:26,789
it's a little bit different seeing them

1472
01:00:31,519 --> 01:00:29,699
in the harness again not a hard problem

1473
01:00:32,569 --> 01:00:31,529
just something that you you have to pay

1474
01:00:35,479 --> 01:00:32,579
attention to while you're doing the

1475
01:00:37,640 --> 01:00:35,489
integration and test process operating

1476
01:00:40,339 --> 01:00:37,650
two spacecraft requires generally a

1477
01:00:42,890 --> 01:00:40,349
larger operations team in the Mission

1478
01:00:45,259 --> 01:00:42,900
Operations Center a lot of the

1479
01:00:46,909 --> 01:00:45,269
procedures that you use are identical

1480
01:00:49,489 --> 01:00:46,919
between the two of them but you still

1481
01:00:51,439 --> 01:00:49,499
have to have enough people to be able to

1482
01:00:54,829 --> 01:00:51,449
handle the operations for both and

1483
01:00:56,509 --> 01:00:54,839
particularly if again god forbid there's

1484
01:00:58,849 --> 01:00:56,519
an anomaly on one spacecraft that needs

1485
01:01:01,159 --> 01:00:58,859
resolution that you've got the manpower

1486
01:01:02,209 --> 01:01:01,169
that you need to address that one while

1487
01:01:05,029 --> 01:01:02,219
you continue to operate the other

1488
01:01:07,939 --> 01:01:05,039

spacecraft also if you run into a

1489
01:01:11,209 --> 01:01:07,949
problem late in the game that happens to

1490
01:01:12,559 --> 01:01:11,219
be a design problem that you for

1491
01:01:14,209 --> 01:01:12,569
whatever reason didn't uncover earlier

1492
01:01:16,219 --> 01:01:14,219
on the one spacecraft well that can mean

1493
01:01:19,059 --> 01:01:16,229
that both spacecraft are affected and

1494
01:01:22,579 --> 01:01:19,069
you've got to take units off perhaps and

1495
01:01:24,859 --> 01:01:22,589
effect modifications to both of them and

1496
01:01:26,479 --> 01:01:24,869
then get them both on the spacecraft and

1497
01:01:28,339 --> 01:01:26,489
I've already talked about the testing

1498
01:01:30,140 --> 01:01:28,349
then the tests that you can't run

1499
01:01:32,809 --> 01:01:30,150
simultaneously that you have to break

1500
01:01:34,819 --> 01:01:32,819
apart and then have to back to thermal

1501
01:01:37,249 --> 01:01:34,829
vacuum chambers say to run through run

1502
01:01:39,649 --> 01:01:37,259
those tests so there are some some

1503
01:01:42,159 --> 01:01:39,659
pluses and minuses in doing this next

1504
01:01:49,039 --> 01:01:45,469
this depicts the rbsp spacecraft and its

1505
01:01:51,949 --> 01:01:49,049
flight configuration both spacecraft

1506
01:01:56,449 --> 01:01:51,959
combined are just short of 2,900 pounds

1507
01:01:58,130 --> 01:01:56,459
and mate and wait wait the average power

1508
01:01:59,299 --> 01:01:58,140
generation on each spacecraft is about

1509
01:02:02,449 --> 01:01:59,309
350 watts

1510
01:02:03,829 --> 01:02:02,459
they are spin stabilized all the time

1511
01:02:06,499 --> 01:02:03,839
they're in orbit they're spinning at a

1512
01:02:08,479 --> 01:02:06,509
rate of about five rpm and they

1513
01:02:10,189 --> 01:02:08,489

basically point the spin axis of the

1514
01:02:13,009 --> 01:02:10,199
spacecraft towards the Sun which keeps

1515
01:02:16,059 --> 01:02:13,019
the Sun on the solar panels and keeps us

1516
01:02:18,979 --> 01:02:16,069
at adequate power generation the

1517
01:02:21,109 --> 01:02:18,989
requirement for the mission life was two

1518
01:02:22,459 --> 01:02:21,119
years but we expect to get be able to

1519
01:02:26,599 --> 01:02:22,469
get four years of operation out of the

1520
01:02:29,149 --> 01:02:26,609
spacecraft at a minimum most of the

1521
01:02:30,289 --> 01:02:29,159
instruments are pointed out in this

1522
01:02:32,449 --> 01:02:30,299
diagram

1523
01:02:33,799 --> 01:02:32,459
I apologize for all the acronyms if we

1524
01:02:35,029 --> 01:02:33,809
spelled out the name of each one of

1525
01:02:37,539 --> 01:02:35,039
these investigations that wouldn't fit

1526
01:02:40,849 --> 01:02:37,549
on the slide but essentially there are

1527
01:02:43,279 --> 01:02:40,859
experiments that are wave experiment

1528
01:02:45,229 --> 01:02:43,289
oriented electromagnetic wave electric

1529
01:02:47,150 --> 01:02:45,239
fields and magnetic fields and that's

1530
01:02:49,910 --> 01:02:47,160
what all the booms and antennas and

1531
01:02:52,009 --> 01:02:49,920
sensors like that or for on the bottom

1532
01:02:55,069 --> 01:02:52,019
of the spacecraft are most of the

1533
01:02:56,809 --> 01:02:55,079
particle detecting instruments and you

1534
01:02:59,390 --> 01:02:56,819
can see those colored cones at the

1535
01:03:01,339 --> 01:02:59,400
bottom of the spacecraft those really

1536
01:03:03,199 --> 01:03:01,349
aren't physical parts of the instruments

1537
01:03:05,779 --> 01:03:03,209
themselves but rather they depict that

1538
01:03:08,299 --> 01:03:05,789

depicts the field of view of each one of

1539
01:03:11,299 --> 01:03:08,309
the instruments and so we that's always

1540
01:03:12,890 --> 01:03:11,309
a very useful thing for us to put the

1541
01:03:14,479 --> 01:03:12,900
visualization in there because we have

1542
01:03:15,949 --> 01:03:14,489
to ensure that there isn't aren't any

1543
01:03:17,989 --> 01:03:15,959
obstructions or interferences between

1544
01:03:21,519 --> 01:03:17,999
the instruments on the spacecraft in the

1545
01:03:24,529 --> 01:03:21,529
fields of view next please

1546
01:03:26,929 --> 01:03:24,539
okay I've just got a few pictures of the

1547
01:03:28,429 --> 01:03:26,939
the development of the spacecraft the

1548
01:03:32,299 --> 01:03:28,439
environmental testing again this is the

1549
01:03:35,989 --> 01:03:32,309
test as you fly approach that we take to

1550
01:03:37,699 --> 01:03:35,999
qualifying spacecraft we did something a

1551
01:03:40,069 --> 01:03:37,709
little bit different for us with the

1552
01:03:41,749 --> 01:03:40,079
rbsp spacecraft in testing the

1553
01:03:43,219 --> 01:03:41,759
spacecraft of the acoustics environment

1554
01:03:45,499 --> 01:03:43,229
that's generated by the launch vehicle

1555
01:03:47,689 --> 01:03:45,509
and that we don't have an acoustics

1556
01:03:50,179 --> 01:03:47,699
facility facility a dedicated acoustics

1557
01:03:52,759 --> 01:03:50,189
facility at the laboratory and we didn't

1558
01:03:54,259 --> 01:03:52,769
want to take the expense to go and use

1559
01:03:56,269 --> 01:03:54,269
Goddard's facility which we've done in

1560
01:03:58,339 --> 01:03:56,279
the past because we didn't need any

1561
01:04:01,160 --> 01:03:58,349
other of Goddard's facilities to test

1562
01:04:05,089 --> 01:04:01,170
the spacecraft so instead we brought in

1563
01:04:07,549 --> 01:04:05,099

a company whose main business is doing

1564
01:04:10,089 --> 01:04:07,559
the sound engineering for rock concerts

1565
01:04:12,529 --> 01:04:10,099
and things like that and you can see the

1566
01:04:15,199 --> 01:04:12,539
stack of speakers that they set up with

1567
01:04:17,179 --> 01:04:15,209
a spacecraft in the middle they were

1568
01:04:19,130 --> 01:04:17,189
actually very excited to have this type

1569
01:04:21,890 --> 01:04:19,140
of work - it's a little bit different

1570
01:04:23,449 --> 01:04:21,900
for them and they enjoyed coming in and

1571
01:04:24,799 --> 01:04:23,459
setting this this up for us so that we

1572
01:04:27,319 --> 01:04:24,809
could run our acoustics tests right

1573
01:04:29,419 --> 01:04:27,329
there at the laboratory the middle

1574
01:04:32,359 --> 01:04:29,429
picture shows you that the spacecraft

1575
01:04:34,959 --> 01:04:32,369
stack on the vibration table testing it

1576
01:04:37,130 --> 01:04:34,969
for the launch vibration environment and

1577
01:04:40,189 --> 01:04:37,140
that smaller picture on the right

1578
01:04:42,229 --> 01:04:40,199
depicts both spacecraft getting ready to

1579
01:04:43,460 --> 01:04:42,239
go to be sealed up into the thermal

1580
01:04:47,420 --> 01:04:43,470
vacuum chambers at the lab

1581
01:04:49,730 --> 01:04:47,430
to do the thermal vacuum testing quickly

1582
01:04:51,349 --> 01:04:49,740
a week colloquially we call this shake

1583
01:04:54,890 --> 01:04:51,359
and bake and of the vibration followed

1584
01:04:57,470 --> 01:04:54,900
by the film of vacuum testing and next

1585
01:05:00,589 --> 01:04:57,480
slide please some some more testing of

1586
01:05:02,900 --> 01:05:00,599
the spacecraft the the spin balance test

1587
01:05:05,000 --> 01:05:02,910
for the spacecraft we actually balance

1588
01:05:07,160 --> 01:05:05,010

the spacecraft the same way the tires on

1589
01:05:09,609 --> 01:05:07,170
your car are balanced and even though

1590
01:05:13,910 --> 01:05:09,619
the spacecraft only spin at five rpm in

1591
01:05:16,220 --> 01:05:13,920
flight we we spin them up at about 85

1592
01:05:17,839 --> 01:05:16,230
rpm in order to determine where we need

1593
01:05:20,420 --> 01:05:17,849
to place balanced masses in order to

1594
01:05:22,730 --> 01:05:20,430
perfectly balance the spacecraft for

1595
01:05:24,740 --> 01:05:22,740
flight and that other picture there

1596
01:05:26,540 --> 01:05:24,750
should gives you sort of a hard view to

1597
01:05:29,270 --> 01:05:26,550
see but it's the solar array deployment

1598
01:05:31,400 --> 01:05:29,280
testing which we have to take special

1599
01:05:32,990 --> 01:05:31,410
measures in order to test adequately on

1600
01:05:34,820 --> 01:05:33,000
the ground because on the ground of

1601
01:05:36,920 --> 01:05:34,830
course we have to deal with gravity that

1602
01:05:38,870 --> 01:05:36,930
we don't deal with in space but we do

1603
01:05:40,640 --> 01:05:38,880
this you know as a matter of course to

1604
01:05:43,160 --> 01:05:40,650
ensure the volume the mechanisms and

1605
01:05:44,140 --> 01:05:43,170
deployables on the spacecraft work next

1606
01:05:47,200 --> 01:05:44,150
please

1607
01:05:51,230 --> 01:05:47,210
as I said we operate the spacecraft from

1608
01:05:52,760 --> 01:05:51,240
our campus in Laurel Maryland we have a

1609
01:05:55,310 --> 01:05:52,770
Mission Operations Center that's

1610
01:05:58,700 --> 01:05:55,320
configured to handle the operations of

1611
01:06:00,320 --> 01:05:58,710
two spacecraft at once it's kind of hard

1612
01:06:02,540 --> 01:06:00,330
to see in that picture you can see some

1613
01:06:05,060 --> 01:06:02,550

large flat paneled screens on one side

1614
01:06:07,579 --> 01:06:05,070
of the room and if you look very closely

1615
01:06:09,440 --> 01:06:07,589
you can see the same display the same

1616
01:06:11,900 --> 01:06:09,450
flat panel just displays on the other

1617
01:06:14,240 --> 01:06:11,910
side of the room the room is is

1618
01:06:17,420 --> 01:06:14,250
configured for two teams of operators

1619
01:06:20,000 --> 01:06:17,430
two teams of engineers to support all

1620
01:06:21,680 --> 01:06:20,010
the the operations being able to view

1621
01:06:27,890 --> 01:06:21,690
all the telemetry from their subsystems

1622
01:06:31,250 --> 01:06:27,900
next please and this is the 18 meter or

1623
01:06:33,260 --> 01:06:31,260
60-foot dish antenna on our facility at

1624
01:06:35,020 --> 01:06:33,270
APL which is the prime ground station

1625
01:06:37,670 --> 01:06:35,030
for communications with the spacecraft

1626
01:06:40,490 --> 01:06:37,680
we also make use of some commercial

1627
01:06:42,140 --> 01:06:40,500
backup stations around the world in the

1628
01:06:45,020 --> 01:06:42,150
event that we need to bring any other

1629
01:06:48,280 --> 01:06:45,030
assets online but this is the main

1630
01:06:51,800 --> 01:06:48,290
ground station for the probe mission

1631
01:06:52,960 --> 01:06:51,810
next picture this is a picture from this

1632
01:06:56,620 --> 01:06:52,970
morning

1633
01:06:58,730 --> 01:06:56,630
it's it's really gratifying and exciting

1634
01:07:00,380 --> 01:06:58,740
after you know having worked on

1635
01:07:02,690 --> 01:07:00,390
something like this for five years to

1636
01:07:04,460 --> 01:07:02,700
see it sitting on top of the rocket

1637
01:07:06,020 --> 01:07:04,470
getting ready for launch it's a

1638
01:07:06,590 --> 01:07:06,030

beautiful picture we never get tired of

1639
01:07:12,220 --> 01:07:06,600
looking at it

1640
01:07:17,170 --> 01:07:12,230
and finally just a few more pictures of

1641
01:07:19,850 --> 01:07:17,180
the spacecraft at various stages of

1642
01:07:22,280 --> 01:07:19,860
processing down here at the Cape being

1643
01:07:23,840 --> 01:07:22,290
encapsulated in the fairing and we're

1644
01:07:26,480 --> 01:07:23,850
looking forward to a successful launch

1645
01:07:33,280 --> 01:07:26,490
tomorrow morning if there are any

1646
01:07:37,340 --> 01:07:35,300
yeah

1647
01:07:39,200 --> 01:07:37,350
so when you do the spin test do you have

1648
01:07:42,230 --> 01:07:39,210
to put LED lights in to balance the

1649
01:07:45,230 --> 01:07:42,240
satellites they're not necessarily led

1650
01:07:47,810 --> 01:07:45,240
but but that is the idea just as I said

1651
01:07:50,510 --> 01:07:47,820
just like your tires on your car are

1652
01:07:53,630 --> 01:07:50,520
balanced and we do a lot of analysis

1653
01:07:55,250 --> 01:07:53,640
beforehand to understand how unbalanced

1654
01:07:56,810 --> 01:07:55,260
we think the spacecraft will be before

1655
01:07:58,970 --> 01:07:56,820
we have to put the balanced mass on

1656
01:08:01,550 --> 01:07:58,980
there and we calculate how much mass we

1657
01:08:03,740 --> 01:08:01,560
think we'll need and make provisions for

1658
01:08:05,000 --> 01:08:03,750
where that mass will be attached to the

1659
01:08:12,359 --> 01:08:05,010
spacecraft in order to achieve the

1660
01:08:16,410 --> 01:08:14,730
are there any new significant design

1661
01:08:18,990 --> 01:08:16,420
changes as far as the structure of the

1662
01:08:20,309 --> 01:08:19,000
spacecraft or any other improvements as

1663
01:08:21,840 --> 01:08:20,319

opposed to the some of the previous

1664
01:08:24,629 --> 01:08:21,850
missions like stereo that you're

1665
01:08:27,059 --> 01:08:24,639
implementing well the answer is yes and

1666
01:08:29,149 --> 01:08:27,069
that was those modifications and changes

1667
01:08:31,890 --> 01:08:29,159
were largely driven by the environment

1668
01:08:34,439 --> 01:08:31,900
into which we were flying so as Nicky

1669
01:08:36,539 --> 01:08:34,449
said the electronics boxes have walls

1670
01:08:37,860 --> 01:08:36,549
they're about 3/8 of an inch thick or

1671
01:08:40,439 --> 01:08:37,870
about the thickness of a slice of bread

1672
01:08:43,410 --> 01:08:40,449
in order to reduce the radiation

1673
01:08:45,780 --> 01:08:43,420
environment at the electronic piece part

1674
01:08:48,240 --> 01:08:45,790
level we also went to great lengths to

1675
01:08:51,570 --> 01:08:48,250
shield the harness so that it wouldn't

1676
01:08:53,550 --> 01:08:51,580
be damaged by the deposition of charges

1677
01:08:55,800 --> 01:08:53,560
into the insulators of the harness the

1678
01:08:57,510 --> 01:08:55,810
installation of the wire that can cause

1679
01:09:00,840 --> 01:08:57,520
charge to build up and can cause

1680
01:09:02,789 --> 01:09:00,850
discharges that are both damaging to the

1681
01:09:04,740 --> 01:09:02,799
to the spacecraft but they also create

1682
01:09:05,789 --> 01:09:04,750
noise and interference it interferes

1683
01:09:08,700 --> 01:09:05,799
with the measurements that we're trying

1684
01:09:11,789 --> 01:09:08,710
to make the solar panels themselves had

1685
01:09:13,890 --> 01:09:11,799
some special techniques applied to

1686
01:09:16,860 --> 01:09:13,900
minimize any build-up of charge and

1687
01:09:19,110 --> 01:09:16,870
resulting discharge in the panel's

1688
01:09:22,140 --> 01:09:19,120

themselves through the use of conductive

1689
01:09:23,910 --> 01:09:22,150
grouting material in the build up of the

1690
01:09:25,349 --> 01:09:23,920
solar panels so yeah there were a number

1691
01:09:26,550 --> 01:09:25,359
of things that we had to do that were

1692
01:09:30,059 --> 01:09:26,560
basically driven by the environment

1693
01:09:31,919 --> 01:09:30,069
individual flying for this mission it

1694
01:09:33,840 --> 01:09:31,929
was it fees or could have been feasible

1695
01:09:36,660 --> 01:09:33,850
to put a camera on there to watch what's

1696
01:09:39,149 --> 01:09:36,670
going on radiation belts

1697
01:09:40,979 --> 01:09:39,159
it would have been feasible perhaps but

1698
01:09:42,300 --> 01:09:40,989
I don't know that that was would be very

1699
01:09:44,249 --> 01:09:42,310
interesting to the scientists

1700
01:09:45,510 --> 01:09:44,259
particularly because of where we're

1701
01:09:48,269 --> 01:09:45,520
flying in the type of science we're

1702
01:09:50,039 --> 01:09:48,279
doing you you you have seen images of

1703
01:09:52,439 --> 01:09:50,049
Aurora that are taken by certain

1704
01:09:54,479 --> 01:09:52,449
spacecraft Aurora or feature that

1705
01:09:55,950 --> 01:09:54,489
features that occur mostly over the

1706
01:09:58,080 --> 01:09:55,960
poles and we're not a polar orbiting

1707
01:10:00,870 --> 01:09:58,090
spacecraft for one thing so it really

1708
01:10:02,129 --> 01:10:00,880
wasn't any value added in trying to put

1709
01:10:06,390 --> 01:10:02,139
any type of imager whether it was

1710
01:10:13,679 --> 01:10:06,400
visible or UV or whatever um did I get

1711
01:10:17,129 --> 01:10:15,870
so most cameras would actually switch

1712
01:10:18,899 --> 01:10:17,139
off when they go through the belts

1713
01:10:20,370 --> 01:10:18,909

you've got so much radiation so if you

1714
01:10:23,129 --> 01:10:20,380
if you remember when you see us big

1715
01:10:25,500 --> 01:10:23,139
flare that hits sto or Soho and you just

1716
01:10:27,239 --> 01:10:25,510
see that camera go if you actually look

1717
01:10:29,399 --> 01:10:27,249
at some of the rural cameras less than

1718
01:10:31,439 --> 01:10:29,409
an hour after that they are completely

1719
01:10:33,540 --> 01:10:31,449
snowed out also so you know you're

1720
01:10:34,919 --> 01:10:33,550
traveling and living in that the one

1721
01:10:36,899 --> 01:10:34,929
thing that would would have been a nice

1722
01:10:38,850 --> 01:10:36,909
addition would have been an ene imager

1723
01:10:41,100 --> 01:10:38,860
so if you're familiar with the image

1724
01:10:43,859 --> 01:10:41,110
spacecraft that flew and it did this

1725
01:10:46,199 --> 01:10:43,869
energetic neutral atom imaging it's a

1726
01:10:47,640 --> 01:10:46,209
completely different kind of imager and

1727
01:10:49,739 --> 01:10:47,650
that would have been really looking at

1728
01:10:51,779 --> 01:10:49,749
the ring current that might have been a

1729
01:10:53,459 --> 01:10:51,789
nice addition it wouldn't be great on

1730
01:10:55,049 --> 01:10:53,469
the platform the particular orbit we

1731
01:10:56,429 --> 01:10:55,059
have you'd be better at a geosynchronous

1732
01:10:59,399 --> 01:10:56,439
or something where you really you know

1733
01:11:00,719 --> 01:10:59,409
or a or a polar orbit that image had to

1734
01:11:02,640 --> 01:11:00,729
do a better job at that but that that

1735
01:11:05,189 --> 01:11:02,650
would have been a nice addition but we

1736
01:11:07,949 --> 01:11:05,199
do have balloons so we have a really

1737
01:11:09,449 --> 01:11:07,959
nice barrel is the name of it it's a

1738
01:11:10,919 --> 01:11:09,459

collaborating balloon mission and I

1739
01:11:14,969 --> 01:11:10,929
think it's about 20 balloons that are

1740
01:11:16,469 --> 01:11:14,979
launched from Antarctic and they they go

1741
01:11:18,719 --> 01:11:16,479
up and they've got that nice yes thank

1742
01:11:21,839 --> 01:11:18,729
you yes January of 13 which is why we're

1743
01:11:24,000 --> 01:11:21,849
so dying to get up there and and they

1744
01:11:25,709 --> 01:11:24,010
have a nice sort of fairly stable wind

1745
01:11:27,239 --> 01:11:25,719
pattern so they will go up and they're

1746
01:11:29,459 --> 01:11:27,249
basically looking at the other end of

1747
01:11:31,469 --> 01:11:29,469
the radiation belt so we're looking at

1748
01:11:33,089 --> 01:11:31,479
everything why it's really enhancing and

1749
01:11:35,879 --> 01:11:33,099
how the particle populations are

1750
01:11:37,560 --> 01:11:35,889
changing and barrel is sitting there

1751
01:11:39,029 --> 01:11:37,570
looking at the particles precipitating

1752
01:11:40,979 --> 01:11:39,039
down so they're really looking at the

1753
01:11:44,240 --> 01:11:40,989
losses for us so it's a really nice

1754
01:11:52,130 --> 01:11:49,370
I mean some how or or would the design

1755
01:11:54,650 --> 01:11:52,140
of the spacecraft have changed if if the

1756
01:11:58,940 --> 01:11:54,660
the rotation of it were to have been say

1757
01:12:02,050 --> 01:11:58,950
you know 15 rpm or 20 during a normal

1758
01:12:06,010 --> 01:12:02,060
operational state or even non rotational

1759
01:12:08,360 --> 01:12:06,020
a faster spin rate would have had

1760
01:12:11,240 --> 01:12:08,370
implications for the instruments and how

1761
01:12:12,800 --> 01:12:11,250
they had collect their data it also

1762
01:12:14,510 --> 01:12:12,810
makes a difference the amount of fuel

1763
01:12:16,190 --> 01:12:14,520

that we would need on board in order to

1764
01:12:17,870 --> 01:12:16,200
maintain a spin rate of that size and

1765
01:12:20,540 --> 01:12:17,880
then how much fuel that would take when

1766
01:12:22,160 --> 01:12:20,550
we have to maneuver the spacecraft to

1767
01:12:25,610 --> 01:12:22,170
keep the spin axis pointed more or less

1768
01:12:29,900 --> 01:12:25,620
at the Sun as far as the engineering

1769
01:12:33,200 --> 01:12:29,910
subsystems not not a lot of impact there

1770
01:12:36,290 --> 01:12:33,210
necessarily but this the spin stabilized

1771
01:12:38,090 --> 01:12:36,300
mode of course is a much easier mode

1772
01:12:39,860 --> 01:12:38,100
from a stability point of view and the

1773
01:12:42,620 --> 01:12:39,870
guidance and control aspects of it and

1774
01:12:44,870 --> 01:12:42,630
whether you're spinning at 5 rpm or 10

1775
01:12:46,130 --> 01:12:44,880
or 15 rpm is is there's not a lot of

1776
01:12:47,810 --> 01:12:46,140
difference there the main impact would

1777
01:12:53,450 --> 01:12:47,820
have been on the on the the instrument

1778
01:12:55,820 --> 01:12:53,460
designs so you're the chief engineer

1779
01:12:57,800 --> 01:12:55,830
which means you get pulled in on all the

1780
01:13:00,170 --> 01:12:57,810
really tough problems during the

1781
01:13:07,310 --> 01:13:00,180
spacecraft development what has you the

1782
01:13:08,900 --> 01:13:07,320
most worried I have to pause because

1783
01:13:11,979 --> 01:13:08,910
that's my boss who asked who asked the

1784
01:13:18,559 --> 01:13:15,919
you know I'll be quite honest with you I

1785
01:13:21,199 --> 01:13:18,569
am NOT a huge fan of single string

1786
01:13:25,040 --> 01:13:21,209
spacecraft and that in these spacecraft

1787
01:13:28,699 --> 01:13:25,050
arm as an engineer I like to guarantee

1788
01:13:31,369 --> 01:13:28,709

mission success by by having something

1789
01:13:33,619 --> 01:13:31,379
to fall back on on the spacecraft now it

1790
01:13:35,509 --> 01:13:33,629
is a fact of this business that we build

1791
01:13:36,469 --> 01:13:35,519
a lot of single string spacecraft and

1792
01:13:39,799 --> 01:13:36,479
over the years we have developed

1793
01:13:43,489 --> 01:13:39,809
methodologies for how we test these

1794
01:13:46,669 --> 01:13:43,499
things how we design them to ensure that

1795
01:13:48,369 --> 01:13:46,679
they work even in the face or even

1796
01:13:50,929 --> 01:13:48,379
recognizing that we are always

1797
01:13:53,719 --> 01:13:50,939
susceptible to stochastic failure to

1798
01:13:55,729 --> 01:13:53,729
random failures that somehow escape us

1799
01:13:58,939 --> 01:13:55,739
from all the testing that we've done on

1800
01:14:02,209 --> 01:13:58,949
the ground that's that's the thing that

1801
01:14:04,399 --> 01:14:02,219
I would probably worry about the most

1802
01:14:08,089 --> 01:14:04,409
but it's not something that I'm going to

1803
01:14:10,849 --> 01:14:08,099
lose a lot of sleep over because of our

1804
01:14:14,290 --> 01:14:10,859
history and experience in building

1805
01:14:16,279 --> 01:14:14,300
spacecraft like this Thank You Jonathan

1806
01:14:23,409 --> 01:14:16,289
thank you very much for your time today

1807
01:14:27,500 --> 01:14:26,329
next up here we have ali mendoza hill

1808
01:14:29,299 --> 01:14:27,510
she's with NASA's launch services

1809
01:14:36,079 --> 01:14:29,309
program and she's the mission manager

1810
01:14:36,609 --> 01:14:36,089
for this launch so thank you good

1811
01:14:39,379 --> 01:14:36,619
afternoon

1812
01:14:41,929 --> 01:14:39,389
speaking of acts to follow you just get

1813
01:14:44,089 --> 01:14:41,939

me know pretty pictures no presentations

1814
01:14:46,040 --> 01:14:44,099
actually just a correction I am a

1815
01:14:48,049 --> 01:14:46,050
mission manager in our launch services

1816
01:14:52,359 --> 01:14:48,059
program but I'm not the mission manager

1817
01:14:56,239 --> 01:14:52,369
for our BSP I wish this is a really neat

1818
01:14:58,909 --> 01:14:56,249
satellite both of them both and the

1819
01:15:00,739 --> 01:14:58,919
mission manager for our BSP is Rex

1820
01:15:02,689 --> 01:15:00,749
engelhardt and you were supposed to meet

1821
01:15:04,549 --> 01:15:02,699
him at the tour yesterday but he got

1822
01:15:06,709 --> 01:15:04,559
pulled away and wasn't able to meet you

1823
01:15:10,790 --> 01:15:06,719
but if not he was a very interesting

1824
01:15:11,629 --> 01:15:10,800
character but I am work for launch

1825
01:15:14,270 --> 01:15:11,639
services program

1826
01:15:16,639 --> 01:15:14,280
LSP for short so when I say LSP you'll

1827
01:15:19,579 --> 01:15:16,649
know what I'm talking about and LSP is

1828
01:15:21,649 --> 01:15:19,589
the program here at Kennedy and we are

1829
01:15:23,839 --> 01:15:21,659
responsible for getting the launch the

1830
01:15:24,050 --> 01:15:23,849
vehicles the launch vehicles for you for

1831
01:15:28,310 --> 01:15:24,060
this

1832
01:15:31,910 --> 01:15:28,320
crafts make it on-orbit so here at LSB

1833
01:15:34,520 --> 01:15:31,920
we've got engineers technicians and a

1834
01:15:36,230 --> 01:15:34,530
lot of support personnel what we call

1835
01:15:39,500 --> 01:15:36,240
the rocket scientists on the launch

1836
01:15:43,280 --> 01:15:39,510
vehicle side not on the brilliant

1837
01:15:44,930 --> 01:15:43,290
scientists like so we do where we are

1838
01:15:46,940 --> 01:15:44,940

responsible for selecting a launch

1839
01:15:50,180 --> 01:15:46,950
vehicle and that process can start years

1840
01:15:52,130 --> 01:15:50,190
before the launch is ready to go what we

1841
01:15:54,740 --> 01:15:52,140
do is we go out and procure we take all

1842
01:15:57,020 --> 01:15:54,750
the spacecraft requirements and we send

1843
01:15:58,550 --> 01:15:57,030
it out to industry and said you know

1844
01:16:00,620 --> 01:15:58,560
we'll ask them who wants to bid on this

1845
01:16:05,270 --> 01:16:00,630
launch vehicle you know to launch this

1846
01:16:07,790 --> 01:16:05,280
up the satellite it'll come back and

1847
01:16:09,890 --> 01:16:07,800
we'll it's a rigorous process and we'll

1848
01:16:11,270 --> 01:16:09,900
analyze all the different proposals that

1849
01:16:12,830 --> 01:16:11,280
come in and make sure what is the best

1850
01:16:16,430 --> 01:16:12,840
and most effective right for the

1851
01:16:18,890 --> 01:16:16,440
satellite at times it's very close and

1852
01:16:21,080 --> 01:16:18,900
it's just those little nuances that that

1853
01:16:24,100 --> 01:16:21,090
will have a select one vehicle over

1854
01:16:26,150 --> 01:16:24,110
another and in reality that the one that

1855
01:16:28,040 --> 01:16:26,160
that wins is the one that can best

1856
01:16:29,930 --> 01:16:28,050
protect the spacecraft and get it into

1857
01:16:31,790 --> 01:16:29,940
the right orbit and / mission success in

1858
01:16:37,250 --> 01:16:31,800
the end so we can get the science that

1859
01:16:39,620 --> 01:16:37,260
would help benefit us on earth rocket

1860
01:16:41,960 --> 01:16:39,630
this one it's an Atlas 5 it's a vehicle

1861
01:16:44,600 --> 01:16:41,970
if you've seen the configuration it's a

1862
01:16:47,210 --> 01:16:44,610
401 that all that means it's a four

1863
01:16:49,280 --> 01:16:47,220

meter fairing it has no strap-ons around

1864
01:16:51,410 --> 01:16:49,290
it that's what the zero is and the one

1865
01:16:53,600 --> 01:16:51,420
is that the Centaur the upper stage has

1866
01:16:54,860 --> 01:16:53,610
only one engine I'm so that kind of

1867
01:16:58,940 --> 01:16:54,870
tells you the nomenclature when you see

1868
01:17:01,430 --> 01:16:58,950
that out there we appear at LSP and it

1869
01:17:03,530 --> 01:17:01,440
depending on the satellite we can select

1870
01:17:05,060 --> 01:17:03,540
anything from small vehicles such as a

1871
01:17:09,320 --> 01:17:05,070
Pegasus that's air launched from an

1872
01:17:12,980 --> 01:17:09,330
l-1011 a delta ii from United Launch

1873
01:17:18,740 --> 01:17:12,990
Alliance or the big you know big ones

1874
01:17:22,550 --> 01:17:18,750
like Atlas five so I believe Nikki was

1875
01:17:25,310 --> 01:17:22,560
talking about the orbit that it's that

1876
01:17:27,050 --> 01:17:25,320
rbsp is going to be in a pudgy and

1877
01:17:29,540 --> 01:17:27,060
perigee you're talking about a

1878
01:17:31,820 --> 01:17:29,550
difference of three hundred miles on one

1879
01:17:34,250 --> 01:17:31,830
end and nineteen thousand miles on the

1880
01:17:35,720 --> 01:17:34,260
other if you put that into reference if

1881
01:17:37,020 --> 01:17:35,730
you would drive from the North Pole to

1882
01:17:38,700 --> 01:17:37,030
the South Pole

1883
01:17:41,250 --> 01:17:38,710
around and go halfway back that's

1884
01:17:43,440 --> 01:17:41,260
nineteen thousand miles more or less so

1885
01:17:44,970 --> 01:17:43,450
you can kind of understand the orbit

1886
01:17:46,890 --> 01:17:44,980
that the lightness five is going to in

1887
01:17:50,820 --> 01:17:46,900
the Centaur will place the satellites

1888
01:17:54,840 --> 01:17:50,830

and the probes let's see what else can I

1889
01:17:56,550 --> 01:17:54,850
tell you about we do launch out of not

1890
01:17:58,080 --> 01:17:56,560
just from here Kennedy Space Center will

1891
01:18:00,540 --> 01:17:58,090
have launch vehicles that launch at

1892
01:18:02,790 --> 01:18:00,550
different places around the around the

1893
01:18:05,160 --> 01:18:02,800
earth we have launched from Kodiak will

1894
01:18:07,590 --> 01:18:05,170
launch from Vandenberg which is out in

1895
01:18:11,070 --> 01:18:07,600
California we have Kwajalein which is

1896
01:18:12,900 --> 01:18:11,080
out in the Marshall Islands and a couple

1897
01:18:15,360 --> 01:18:12,910
other places and pretty much the

1898
01:18:17,640 --> 01:18:15,370
inclination will determine where we

1899
01:18:19,650 --> 01:18:17,650
launch from I'm so like you're someone

1900
01:18:20,760 --> 01:18:19,660
was asking about polar orbits you know

1901
01:18:23,310 --> 01:18:20,770
those we would launch out of the

1902
01:18:25,500 --> 01:18:23,320
Vandenburg facility so it all depends on

1903
01:18:27,900 --> 01:18:25,510
the launch vehicle where they can go and

1904
01:18:32,430 --> 01:18:27,910
where the spacecraft needs to go where

1905
01:18:34,350 --> 01:18:32,440
the launch site will be well once we

1906
01:18:36,120 --> 01:18:34,360
select the launch vehicle and even

1907
01:18:37,770 --> 01:18:36,130
before that we do work closely with the

1908
01:18:40,530 --> 01:18:37,780
spacecraft to understand what their

1909
01:18:42,660 --> 01:18:40,540
requirements are as he was mentioning

1910
01:18:45,210 --> 01:18:42,670
the shake and bake process all that data

1911
01:18:46,620 --> 01:18:45,220
is fed to the launch vehicles so they

1912
01:18:49,530 --> 01:18:46,630
ensure that the launch vehicle doesn't

1913
01:18:51,420 --> 01:18:49,540

damage the spacecraft and in turn the

1914
01:18:53,940 --> 01:18:51,430
spacecraft doesn't do anything to damage

1915
01:18:57,330 --> 01:18:53,950
the launch vehicle or impact you know

1916
01:18:59,040 --> 01:18:57,340
it's its trajectory and its release of

1917
01:19:01,560 --> 01:18:59,050
the spacecraft so it's an iterative

1918
01:19:04,470 --> 01:19:01,570
process and it's very integrated so LSP

1919
01:19:06,090 --> 01:19:04,480
also manages that that aspect in between

1920
01:19:08,100 --> 01:19:06,100
the spacecraft and the launch vehicle

1921
01:19:10,230 --> 01:19:08,110
providers all the way from before

1922
01:19:13,530 --> 01:19:10,240
selection will go to different offers

1923
01:19:16,920 --> 01:19:13,540
and get different analyses done through

1924
01:19:20,720 --> 01:19:16,930
through launch and then once it's off

1925
01:19:20,730 --> 01:19:25,490
let's see

1926
01:19:31,310 --> 01:19:29,810
this is heard for us here it's pretty

1927
01:19:34,220 --> 01:19:31,320
much all Espino nutshell I wouldn't want

1928
01:19:35,450 --> 01:19:34,230
to bore you with all the details as far

1929
01:19:38,630 --> 01:19:35,460
as they asked me to tell you a little

1930
01:19:40,970 --> 01:19:38,640
bit about myself and how I got here

1931
01:19:43,430 --> 01:19:40,980
let's say I started in Ellis and here at

1932
01:19:46,130 --> 01:19:43,440
Kennedy Space Center in 2000 so I am an

1933
01:19:51,470 --> 01:19:46,140
engineer I went to various schools in

1934
01:19:54,310 --> 01:19:51,480
Florida not FSU so the U and FIU and

1935
01:19:58,010 --> 01:19:54,320
Florida Tech sorry three but not FSU

1936
01:19:59,870 --> 01:19:58,020
anyway so I have a bachelors in

1937
01:20:02,270 --> 01:19:59,880
industrial engineering and I've got a

1938
01:20:04,280 --> 01:20:02,280

master's in Space Systems and I have a

1939
01:20:06,950 --> 01:20:04,290
partial master's that hasn't been

1940
01:20:08,930 --> 01:20:06,960
finished in mechanical but I stayed

1941
01:20:10,640 --> 01:20:08,940
start here at KSC in the industrial

1942
01:20:12,080 --> 01:20:10,650
engineering group with shuttle and so I

1943
01:20:14,450 --> 01:20:12,090
worked shuttle until about a year ago

1944
01:20:16,730 --> 01:20:14,460
and I just transferred over to the

1945
01:20:19,550 --> 01:20:16,740
launch services program kind of a

1946
01:20:21,530 --> 01:20:19,560
different world but but not so much

1947
01:20:23,750 --> 01:20:21,540
we're still launching into space we're

1948
01:20:26,510 --> 01:20:23,760
just not launching humans but the

1949
01:20:28,400 --> 01:20:26,520
science is incredible on on this side of

1950
01:20:29,930 --> 01:20:28,410
the house as well and one of the things

1951
01:20:30,830 --> 01:20:29,940
you go out and talk to the public and

1952
01:20:32,120 --> 01:20:30,840
they say Oh what are you doing at

1953
01:20:34,400 --> 01:20:32,130
Kennedy now that the shuttles gone

1954
01:20:36,620 --> 01:20:34,410
there's no that's it we are launching we

1955
01:20:39,380 --> 01:20:36,630
are making science we are improving life

1956
01:20:41,270 --> 01:20:39,390
here on earth there's so much more to do

1957
01:20:44,210 --> 01:20:41,280
than just launching humans and it's kind

1958
01:20:45,800 --> 01:20:44,220
of the science was kind of put under the

1959
01:20:47,660 --> 01:20:45,810
under the belt of shuttles so I think

1960
01:20:48,970 --> 01:20:47,670
you know we need to take the opportunity

1961
01:20:51,560 --> 01:20:48,980
to get the word out that there is

1962
01:20:53,210 --> 01:20:51,570
science going on it here at Kennedy and

1963
01:20:55,670 --> 01:20:53,220

all across NASA and all across the

1964
01:20:57,740 --> 01:20:55,680
center's APL JPL all the different

1965
01:21:03,650 --> 01:20:57,750
science centers that help universities

1966
01:21:05,810 --> 01:21:03,660
as well so that's pretty much all I have

1967
01:21:11,090 --> 01:21:05,820
I don't have any questions questions

1968
01:21:12,770 --> 01:21:11,100
anybody yeah my question I've been

1969
01:21:14,930 --> 01:21:12,780
asking everybody here is what do you

1970
01:21:16,880 --> 01:21:14,940
want us is NASA social participants to

1971
01:21:19,520 --> 01:21:16,890
communicate to the greater community in

1972
01:21:22,160 --> 01:21:19,530
our society about how important NASA is

1973
01:21:24,350 --> 01:21:22,170
and the science that's being done here

1974
01:21:26,210 --> 01:21:24,360
that you've just elaborated on and maybe

1975
01:21:29,090 --> 01:21:26,220
you can also talk about your experiences

1976
01:21:32,570 --> 01:21:29,100
as a woman in a man's world in this and

1977
01:21:34,460 --> 01:21:32,580
how and how people like yourself and you

1978
01:21:37,860 --> 01:21:34,470
know might Sally Ride and how that's an

1979
01:21:41,340 --> 01:21:37,870
inspiring young girls and in education

1980
01:21:43,740 --> 01:21:41,350
okay I guess part of touching of what I

1981
01:21:46,530 --> 01:21:43,750
was just mentioning on a lot of people

1982
01:21:48,030 --> 01:21:46,540
in the public will say NASA is all about

1983
01:21:49,500 --> 01:21:48,040
just launching a shuttle and getting

1984
01:21:51,660 --> 01:21:49,510
nice pretty pictures when we come back

1985
01:21:53,190 --> 01:21:51,670
we're launching rockets like Hubble

1986
01:21:57,570 --> 01:21:53,200
Space Telescope's and just getting

1987
01:22:00,540 --> 01:21:57,580
pretty pictures in in us in NASA and the

1988
01:22:02,280 --> 01:22:00,550

science community trying to get launch

1989
01:22:03,780 --> 01:22:02,290
these items and just get into space

1990
01:22:04,830 --> 01:22:03,790
we've developed a lot of science out

1991
01:22:08,130 --> 01:22:04,840
there

1992
01:22:11,100 --> 01:22:08,140
we've helped just just then like she was

1993
01:22:13,380 --> 01:22:11,110
a radiation technology I mean that helps

1994
01:22:14,940 --> 01:22:13,390
you know all that science gets fed back

1995
01:22:17,640 --> 01:22:14,950
to the community

1996
01:22:20,040 --> 01:22:17,650
it's MRI imaging it's cancer detection

1997
01:22:23,100 --> 01:22:20,050
research that's going on and a lot of

1998
01:22:25,470 --> 01:22:23,110
the basis is used off of all the science

1999
01:22:27,990 --> 01:22:25,480
that's developed at NASA trying to go

2000
01:22:29,370 --> 01:22:28,000
out to radiation belt trying to go to

2001
01:22:32,010 --> 01:22:29,380
different areas this science is all

2002
01:22:34,170 --> 01:22:32,020
given out to the public again and what

2003
01:22:35,730 --> 01:22:34,180
we call as NASA spin-offs so there's a

2004
01:22:38,460 --> 01:22:35,740
website with NASA spin-offs that you can

2005
01:22:39,840 --> 01:22:38,470
go out there and look at thousands of

2006
01:22:42,180 --> 01:22:39,850
items the middle I don't how many but

2007
01:22:44,910 --> 01:22:42,190
just everyday things like we mentioned

2008
01:22:47,490 --> 01:22:44,920
GPS is you know it's it's the things we

2009
01:22:50,130 --> 01:22:47,500
work on laptops you know there is some

2010
01:22:52,200 --> 01:22:50,140
technology behind that was developed as

2011
01:22:54,180 --> 01:22:52,210
early as the Apollo program and it just

2012
01:22:56,910 --> 01:22:54,190
continues to develop but no one ever

2013
01:22:58,770 --> 01:22:56,920

sees that um so it's it's what's behind

2014
01:23:01,200 --> 01:22:58,780
the scenes it's not just that we launch

2015
01:23:02,640 --> 01:23:01,210
a rocket and we just like to see the

2016
01:23:05,850 --> 01:23:02,650
fireball at the end of the rocket and

2017
01:23:06,840 --> 01:23:05,860
see it go you know hi there is there is

2018
01:23:09,510 --> 01:23:06,850
a lot of science and technology

2019
01:23:12,990 --> 01:23:09,520
development that happens in the process

2020
01:23:13,740 --> 01:23:13,000
of getting to space as far as a woman in

2021
01:23:16,650 --> 01:23:13,750
NASA

2022
01:23:20,400 --> 01:23:16,660
I guess being an engineer at that whole

2023
01:23:22,410 --> 01:23:20,410
I grew up with two brothers two older

2024
01:23:23,760 --> 01:23:22,420
brothers and they were always fixing

2025
01:23:25,350 --> 01:23:23,770
their cars and here was the annoying

2026
01:23:27,840 --> 01:23:25,360
little sister asking what are you doing

2027
01:23:29,040 --> 01:23:27,850
why are you doing that so as a little

2028
01:23:30,690 --> 01:23:29,050
girl I was always interested in how

2029
01:23:32,940 --> 01:23:30,700
things worked and we didn't have you

2030
01:23:36,870 --> 01:23:32,950
know how stuff works online and we

2031
01:23:39,630 --> 01:23:36,880
didn't have you know dirty jobs on the

2032
01:23:40,890 --> 01:23:39,640
internet and cable you know so it you

2033
01:23:43,470 --> 01:23:40,900
just I found out but I asked some

2034
01:23:45,150 --> 01:23:43,480
questions and then moving on it so I was

2035
01:23:48,190 --> 01:23:45,160
always that annoying little girl growing

2036
01:23:50,840 --> 01:23:48,200
up through school and just I had

2037
01:23:53,000 --> 01:23:50,850
professors and teachers that just you

2038
01:23:55,160 --> 01:23:53,010

know helped along the way a lot of math

2039
01:23:57,500 --> 01:23:55,170
person math you know usually they said

2040
01:23:59,000 --> 01:23:57,510
girls don't worry about math you know go

2041
01:24:01,160 --> 01:23:59,010
go do something else and I really

2042
01:24:03,350 --> 01:24:01,170
enjoyed math and I had some wonderful

2043
01:24:05,600 --> 01:24:03,360
math teachers that just you know helped

2044
01:24:08,870 --> 01:24:05,610
me along the way women teachers as well

2045
01:24:12,650 --> 01:24:08,880
as male teachers and I think I played

2046
01:24:15,860 --> 01:24:12,660
sports a lot as well so I was a scholar

2047
01:24:17,420 --> 01:24:15,870
athlete in high school and I think being

2048
01:24:20,540 --> 01:24:17,430
in that environment also just gave you a

2049
01:24:26,920 --> 01:24:20,550
little bit more of a I get exposure and

2050
01:24:30,830 --> 01:24:29,360
assertiveness to just go out there and

2051
01:24:32,540 --> 01:24:30,840
ask and do whatever you want to do

2052
01:24:34,460 --> 01:24:32,550
regardless of whether you're supposed to

2053
01:24:35,570 --> 01:24:34,470
do something or not if you'd like math

2054
01:24:38,030 --> 01:24:35,580
go for it

2055
01:24:39,530 --> 01:24:38,040
it doesn't matter for a male female so

2056
01:24:42,740 --> 01:24:39,540
in Jinja nearing you are part of the

2057
01:24:44,090 --> 01:24:42,750
minority is women and engineering but we

2058
01:24:46,730 --> 01:24:44,100
were all there to do the same thing we

2059
01:24:48,170 --> 01:24:46,740
all studied we took the same tests so

2060
01:24:51,080 --> 01:24:48,180
you you earn the respect of your peers

2061
01:24:53,510 --> 01:24:51,090
by just doing the right thing we're all

2062
01:24:55,220 --> 01:24:53,520
accountable you know and that's how you

2063
01:24:58,400 --> 01:24:55,230

I just deal with it I didn't I've never

2064
01:25:00,050 --> 01:24:58,410
run across any issues especially here at

2065
01:25:02,860 --> 01:25:00,060
that Kennedy Space Center at NASA

2066
01:25:05,090 --> 01:25:02,870
there's to me there doesn't seem to be a

2067
01:25:12,220 --> 01:25:05,100
there's all you're a woman you can't do

2068
01:25:18,140 --> 01:25:14,630
over the weekend there was the issue

2069
01:25:20,870 --> 01:25:18,150
with the Atlas five rocket and you had

2070
01:25:22,610 --> 01:25:20,880
an extra round of testing on Monday how

2071
01:25:26,000 --> 01:25:22,620
does this affect your launch team and

2072
01:25:28,610 --> 01:25:26,010
what role did you all have in that I

2073
01:25:30,650 --> 01:25:28,620
wasn't actually involved in the

2074
01:25:32,210 --> 01:25:30,660
discussions obviously Rex is my cube

2075
01:25:35,090 --> 01:25:32,220
mate he's or on the side an office mate

2076
01:25:37,040 --> 01:25:35,100
so I heard a lot of the discussions but

2077
01:25:39,410 --> 01:25:37,050
yes they worked all through the weekend

2078
01:25:42,200 --> 01:25:39,420
and today is their rest day so they're

2079
01:25:43,970 --> 01:25:42,210
all frosting and so they're all just as

2080
01:25:48,200 --> 01:25:43,980
excited to see you know light this up

2081
01:25:49,700 --> 01:25:48,210
and and go launch so it affects them

2082
01:25:52,860 --> 01:25:49,710
when the issues going on it's the

2083
01:25:55,120 --> 01:25:52,870
unknowns there was a lot of

2084
01:25:56,830 --> 01:25:55,130
between this issue with the rocket

2085
01:25:58,630 --> 01:25:56,840
engine you know with the Russians and

2086
01:26:00,580 --> 01:25:58,640
what we had what we knew what we didn't

2087
01:26:02,650 --> 01:26:00,590
know about it but once it was all

2088
01:26:03,940 --> 01:26:02,660

resolved I mean that's kind of like that

2089
01:26:05,680 --> 01:26:03,950
was yesterday and everybody's just

2090
01:26:08,190 --> 01:26:05,690
moving forward once we know there is no

2091
01:26:09,970 --> 01:26:08,200
issue and the risk is by reminder if any

2092
01:26:11,590 --> 01:26:09,980
everybody just puts it behind the

2093
01:26:19,209 --> 01:26:11,600
minutes the next day and the next the

2094
01:26:22,989 --> 01:26:21,640
is launch services program are you gonna

2095
01:26:26,080 --> 01:26:22,999
be working with any of the Commercial

2096
01:26:28,419 --> 01:26:26,090
Crew folk either Sierra Nevada or Boeing

2097
01:26:31,180 --> 01:26:28,429
we do have a few of our mission managers

2098
01:26:33,370 --> 01:26:31,190
that are helping out so as you know as

2099
01:26:35,439 --> 01:26:33,380
far as lessons learned through NASA we

2100
01:26:37,779 --> 01:26:35,449
do have lessons learned between programs

2101
01:26:40,870 --> 01:26:37,789
so we do have a mission manager on their

2102
01:26:42,910 --> 01:26:40,880
team helping them out as far as just

2103
01:26:44,830 --> 01:26:42,920
even helping on the rocket side and just

2104
01:26:48,310 --> 01:26:44,840
you know environments and and all the

2105
01:26:50,560 --> 01:26:48,320
analysis and just lessons learned that

2106
01:26:54,339 --> 01:26:50,570
over you know we've been doing this here

2107
01:26:56,169 --> 01:26:54,349
at Kennedy since 1998 probably LSP is

2108
01:26:57,910 --> 01:26:56,179
involved in at least 70 launches through

2109
01:27:00,810 --> 01:26:57,920
now with a probably high successful rate

2110
01:27:02,290 --> 01:27:00,820
so we know pretty much that integration

2111
01:27:04,270 --> 01:27:02,300
side of things

2112
01:27:06,640 --> 01:27:04,280
so you've got the best of the shuttle

2113
01:27:09,040 --> 01:27:06,650

guys that launched humans and then you

2114
01:27:11,259 --> 01:27:09,050
got best of the rocket guys that launch

2115
01:27:15,359 --> 01:27:11,269
satellites and you're smelting together

2116
01:27:20,109 --> 01:27:17,890
know you said that choosing which

2117
01:27:22,060 --> 01:27:20,119
vehicle is best for the particular

2118
01:27:24,489 --> 01:27:22,070
mission is is what's involved as part of

2119
01:27:26,169 --> 01:27:24,499
your job how do you and I know that you

2120
01:27:27,580 --> 01:27:26,179
also mentioned that mission success is

2121
01:27:30,250 --> 01:27:27,590
one of the biggest things that you put

2122
01:27:32,529 --> 01:27:30,260
that you factor into that choosing which

2123
01:27:34,000 --> 01:27:32,539
vehicle especially with a lot of the new

2124
01:27:36,520 --> 01:27:34,010
vehicles or that are up-and-coming how

2125
01:27:38,229 --> 01:27:36,530
do you classify mission success when

2126
01:27:41,109 --> 01:27:38,239
choosing the next vehicle for a mission

2127
01:27:46,089 --> 01:27:41,119
such as like rbsp one of the things we

2128
01:27:47,890 --> 01:27:46,099
look at is besides the the require

2129
01:27:49,930 --> 01:27:47,900
current requirements of the spacecraft

2130
01:27:53,350 --> 01:27:49,940
there the mission we also look at past

2131
01:27:56,229 --> 01:27:53,360
performance so via vehicles that I've

2132
01:27:57,430 --> 01:27:56,239
launched you know numerous missions have

2133
01:27:59,649 --> 01:27:57,440
a little bit we have a little bit more

2134
01:28:01,839 --> 01:27:59,659
history on but we also have groups in

2135
01:28:04,600 --> 01:28:01,849
our office that are rocket specialists

2136
01:28:06,969 --> 01:28:04,610
and we're involved in uncoming vehicles

2137
01:28:09,910 --> 01:28:06,979
so in our arsenal of vehicles to choose

2138
01:28:12,160 --> 01:28:09,920

from we also have up and coming our some

2139
01:28:14,169 --> 01:28:12,170
vehicles that we're looking at they're

2140
01:28:16,569 --> 01:28:14,179
not they have to reach a certain

2141
01:28:18,790 --> 01:28:16,579
certification point national to bid for

2142
01:28:20,549 --> 01:28:18,800
a rocket but we're involved through

2143
01:28:23,319 --> 01:28:20,559
their development for instance SpaceX

2144
01:28:25,450 --> 01:28:23,329
SpaceX we have Falcon one and now just

2145
01:28:28,180 --> 01:28:25,460
recently we have the Falcon 9 available

2146
01:28:29,140 --> 01:28:28,190
to bid on contracts for us we have the

2147
01:28:31,530 --> 01:28:29,150
version

2148
01:28:33,670 --> 01:28:31,540
the Falcon 9 heavy is soon to be

2149
01:28:36,400 --> 01:28:33,680
eventually will be on the contract as

2150
01:28:39,790 --> 01:28:36,410
well and we have in-house folks helping

2151
01:28:42,090 --> 01:28:39,800
them develop so our team is is very

2152
01:28:44,230 --> 01:28:42,100
integrated into the launch vehicles

2153
01:28:47,140 --> 01:28:44,240
processes as well as some of the

2154
01:28:48,910 --> 01:28:47,150
spacecraft builders and so you have

2155
01:28:50,410 --> 01:28:48,920
insight and we have a we have a whole

2156
01:28:52,270 --> 01:28:50,420
group of folks that are like the quality

2157
01:28:54,400 --> 01:28:52,280
engineering folks we also have

2158
01:28:56,590 --> 01:28:54,410
independent engineering folks that

2159
01:28:58,840 --> 01:28:56,600
aren't specifically LSP but they do

2160
01:29:00,370 --> 01:28:58,850
support us as well which bring

2161
01:29:02,380 --> 01:29:00,380
experience from different missions as

2162
01:29:04,960 --> 01:29:02,390
well so it's not just because you've

2163
01:29:06,400 --> 01:29:04,970

launched before you're gonna get the

2164
01:29:08,560 --> 01:29:06,410
mission over someone that's never

2165
01:29:11,230 --> 01:29:08,570
launched before there is a give-and-take

2166
01:29:12,760 --> 01:29:11,240
on on how it's an its analyzed so saying

2167
01:29:14,740 --> 01:29:12,770
it's a rigorous process and we will make

2168
01:29:16,390 --> 01:29:14,750
sure that everybody has a fair shake at

2169
01:29:19,660 --> 01:29:16,400
getting Munchie and we want to promote

2170
01:29:22,240 --> 01:29:19,670
the newer vehicles to come onboard so

2171
01:29:24,970 --> 01:29:22,250
our baton just we just owned ramped

2172
01:29:27,730 --> 01:29:24,980
orbital there on Terry's vehicle also

2173
01:29:29,350 --> 01:29:27,740
onto the contract so our or the number

2174
01:29:31,150 --> 01:29:29,360
of vehicles we can select from ur are

2175
01:29:34,990 --> 01:29:31,160
growing which is a great thing because

2176
01:29:36,860 --> 01:29:35,000
there's a little more options last

2177
01:29:40,370 --> 01:29:36,870
question

2178
01:29:43,580 --> 01:29:40,380
um in in selecting which vehicles to use

2179
01:29:47,110 --> 01:29:43,590
for for various missions how much does

2180
01:29:51,050 --> 01:29:47,120
the environment of the launching site

2181
01:29:54,050 --> 01:29:51,060
factor into which vehicle use the

2182
01:29:55,850 --> 01:29:54,060
environment of the launch site that's

2183
01:29:57,620 --> 01:29:55,860
more specific like basically the

2184
01:29:59,150 --> 01:29:57,630
inclination of where you're going that's

2185
01:30:00,770 --> 01:29:59,160
that's where the determine and different

2186
01:30:04,730 --> 01:30:00,780
launch vehicle providers only have

2187
01:30:06,770 --> 01:30:04,740
launch pads at certain locations so for

2188
01:30:08,630 --> 01:30:06,780

instance a delta ii would have in the

2189
01:30:10,370 --> 01:30:08,640
past been able to launch from only from

2190
01:30:12,830 --> 01:30:10,380
kennedy now they're launching from

2191
01:30:14,690 --> 01:30:12,840
Vandenberg if you have a Falcon you

2192
01:30:16,760 --> 01:30:14,700
would be launching from Vandenberg so

2193
01:30:18,920 --> 01:30:16,770
that kind of limits also sometimes which

2194
01:30:20,990 --> 01:30:18,930
vehicles can actually bid for different

2195
01:30:23,200 --> 01:30:21,000
missions because they can't reach

2196
01:30:25,400 --> 01:30:23,210
certain inclinations in certain orbits

2197
01:30:28,310 --> 01:30:25,410
then you have the Pegasus that can

2198
01:30:29,720 --> 01:30:28,320
launch off of a plane so they pretty

2199
01:30:31,880 --> 01:30:29,730
much have an open field and so they have

2200
01:30:34,820 --> 01:30:31,890
various sites but it all really depends

2201
01:30:36,860 --> 01:30:34,830
on that inclination as if you're asking

2202
01:30:39,410 --> 01:30:36,870
as far as like whether if like the

2203
01:30:40,760 --> 01:30:39,420
environment at the launch site you deal

2204
01:30:42,290 --> 01:30:40,770
with it you have storms on the East

2205
01:30:45,380 --> 01:30:42,300
Coast and on the west coast depending

2206
01:30:47,660 --> 01:30:45,390
what time of the year you have winds but

2207
01:30:50,330 --> 01:30:47,670
yeah we manage it and we have the

2208
01:30:51,620 --> 01:30:50,340
weather state though the weather for

2209
01:30:54,230 --> 01:30:51,630
weather folks on this side we have the

2210
01:30:56,810 --> 01:30:54,240
eastern range air force that manages all

2211
01:30:58,130 --> 01:30:56,820
the environments for us and predicts you

2212
01:30:59,810 --> 01:30:58,140
know makes all the predictions and make

2213
01:31:02,020 --> 01:30:59,820

sure we don't launch in the middle of a

2214
01:31:05,560 --> 01:31:02,030
lightning storm

2215
01:31:11,009 --> 01:31:05,570
thank you very much Allie all right

2216
01:31:13,660 --> 01:31:11,019
[Applause]

2217
01:31:15,189 --> 01:31:13,670
next up we have astronaut Leland Melvin

2218
01:31:16,899 --> 01:31:15,199
he's currently the associate

2219
01:31:29,379 --> 01:31:16,909
administrator for education at NASA

2220
01:31:32,770 --> 01:31:29,389
headquarters so welcome good afternoon

2221
01:31:36,160 --> 01:31:32,780
everyone how you doing come on that was

2222
01:31:37,930 --> 01:31:36,170
pretty weak how you doing I mean you're

2223
01:31:39,819 --> 01:31:37,940
here on the eve of a shot of a lot not

2224
01:31:41,259 --> 01:31:39,829
shuttle launch and here feel the launch

2225
01:31:43,359 --> 01:31:41,269
I wish it were shuttle launch so now we

2226
01:31:45,040 --> 01:31:43,369
want it but I that's not the case

2227
01:31:47,199 --> 01:31:45,050
Allie that was great some great

2228
01:31:48,750 --> 01:31:47,209
information and thanks for that great

2229
01:31:50,680 --> 01:31:48,760
information on rbsp

2230
01:31:54,100 --> 01:31:50,690
you're gonna have a very interesting

2231
01:31:55,419 --> 01:31:54,110
tweet up opportunity today we have some

2232
01:31:58,600 --> 01:31:55,429
really cool people that you're gonna

2233
01:32:00,040 --> 01:31:58,610
have a chance to hear and what we're

2234
01:32:01,270 --> 01:32:00,050
trying to do with NASA education is

2235
01:32:04,629 --> 01:32:01,280
inspire the next generation of explorers

2236
01:32:06,899 --> 01:32:04,639
and you guys are our our field generals

2237
01:32:09,509 --> 01:32:06,909
to help get that message out to get that

2238
01:32:11,439 --> 01:32:09,519

message spread around the cosmos and

2239
01:32:13,779 --> 01:32:11,449
we've been doing something called a

2240
01:32:15,819 --> 01:32:13,789
summer of innovation for the last last

2241
01:32:17,830 --> 01:32:15,829
three years we're trying to give

2242
01:32:19,810 --> 01:32:17,840
hands-on experiential activities to kids

2243
01:32:21,250 --> 01:32:19,820
in the summertime to help combat this

2244
01:32:23,379 --> 01:32:21,260
Summer Slide that we've been having with

2245
01:32:25,660 --> 01:32:23,389
kids in school so if you can show the

2246
01:32:28,299 --> 01:32:25,670
first slide we've got a picture of a

2247
01:32:29,739 --> 01:32:28,309
little boy at Dyer Observatory in

2248
01:32:31,479 --> 01:32:29,749
Nashville Tennessee Vanderbilt

2249
01:32:33,459 --> 01:32:31,489
University we've done a lot of work

2250
01:32:35,799 --> 01:32:33,469
within with some organization and we

2251
01:32:37,629 --> 01:32:35,809
have a very special guest from Nashville

2252
01:32:39,790 --> 01:32:37,639
is gonna do some really cool stuff next

2253
01:32:41,379 --> 01:32:39,800
slide this is a picture of a little boy

2254
01:32:43,569 --> 01:32:41,389
getting his pressure suit on

2255
01:32:45,549 --> 01:32:43,579
but these are the types of experiences

2256
01:32:47,350 --> 01:32:45,559
that kids never forget and we find that

2257
01:32:49,629 --> 01:32:47,360
if you get a brain activated if you get

2258
01:32:51,609 --> 01:32:49,639
them thinking about themselves being the

2259
01:32:54,370 --> 01:32:51,619
astronauts being scientist rocket

2260
01:32:56,259 --> 01:32:54,380
scientist all these people then that

2261
01:32:57,879 --> 01:32:56,269
gets them turned on and they take those

2262
01:33:00,790 --> 01:32:57,889
harder classes and they do the things

2263
01:33:03,219 --> 01:33:00,800

required to become a stemis so next

2264
01:33:05,020 --> 01:33:03,229
slide here's a little girl making her

2265
01:33:09,100 --> 01:33:05,030
Rover she was making a rover for

2266
01:33:11,350 --> 01:33:09,110
curiosity week in the next slide these

2267
01:33:14,279 --> 01:33:11,360
are young boys that were looking up at

2268
01:33:16,989 --> 01:33:14,289
the Venus transit and when I think about

2269
01:33:18,580 --> 01:33:16,999
explorers we all look up into the sky we

2270
01:33:21,819 --> 01:33:18,590
look up into the heavens to see what's

2271
01:33:22,060 --> 01:33:21,829
out there and as we tweet and as we send

2272
01:33:23,770 --> 01:33:22,070
our

2273
01:33:26,200 --> 01:33:23,780
messages around the cosmos that goes

2274
01:33:28,780 --> 01:33:26,210
through the sky comes down but we have

2275
01:33:30,970 --> 01:33:28,790
to use sometimes alternative ways to get

2276
01:33:33,160 --> 01:33:30,980
kids inspired whether it's sports

2277
01:33:35,260 --> 01:33:33,170
whether it's music not no matter what it

2278
01:33:37,109 --> 01:33:35,270
is and so the next person you're going

2279
01:33:39,879 --> 01:33:37,119
to hear is a good friend

2280
01:33:41,919 --> 01:33:39,889
singer-songwriter Beth Nilsson Chapman

2281
01:33:44,470 --> 01:33:41,929
who's going to entertain you a little

2282
01:33:48,180 --> 01:33:44,480
bit with some of these songs that relate

2283
01:33:54,300 --> 01:33:48,190
to the mighty sky so come on down Beth

2284
01:33:58,689 --> 01:33:54,310
[Applause]

2285
01:34:01,839 --> 01:33:58,699
rock stars in the house yeah alright

2286
01:34:03,550 --> 01:34:01,849
it's great to be here and I'm from

2287
01:34:05,050 --> 01:34:03,560
Nashville Tennessee which is the vortex

2288
01:34:07,839 --> 01:34:05,060

of songwriting just like this is the

2289
01:34:09,879 --> 01:34:07,849
vortex of space exploration and myself

2290
01:34:11,859 --> 01:34:09,889
and rocky Alvey created this little

2291
01:34:14,410 --> 01:34:11,869
project and and actually tried these

2292
01:34:17,229 --> 01:34:14,420
songs out on the children from summer of

2293
01:34:19,419 --> 01:34:17,239
innovation and we think of songs as a

2294
01:34:21,339 --> 01:34:19,429
great can of can opener into getting all

2295
01:34:26,770 --> 01:34:21,349
that information this song is called the

2296
01:34:29,649 --> 01:34:26,780
big bang boom that's right y'all have to

2297
01:34:33,010 --> 01:34:29,659
sing on the boom it sounds like this

2298
01:34:35,020 --> 01:34:33,020
boom only really loud okay since I love

2299
01:34:41,830 --> 01:34:35,030
you oh yeah and he's gonna be the

2300
01:34:41,840 --> 01:34:53,220
[Music]

2301
01:35:01,900 --> 01:34:57,120
the universe is the strangest place

2302
01:35:06,480 --> 01:35:01,910
started with the Big Bang created time

2303
01:35:11,740 --> 01:35:06,490
also space way back in the Big Bang boom

2304
01:35:16,110 --> 01:35:11,750
no galaxies or stars to see way back in

2305
01:35:19,150 --> 01:35:16,120
the Big Bang boom an expanded

2306
01:35:23,350 --> 01:35:19,160
singularity way back in the Big Bang

2307
01:35:28,890 --> 01:35:23,360
boom the Big Bang balloon the Big Bang

2308
01:35:28,900 --> 01:35:33,300
[Music]

2309
01:35:41,050 --> 01:35:38,460
created from the Big Bang boom excellent

2310
01:35:45,670 --> 01:35:41,060
I'd like y'all come out on the road with

2311
01:35:49,660 --> 01:35:45,680
me at first no Adams could be found way

2312
01:35:52,840 --> 01:35:49,670
back in the Big Bang bill they all were

2313
01:35:56,980 --> 01:35:52,850

formed when it all cooled down way back

2314
01:36:00,550 --> 01:35:56,990
in the Big Bang boom oh and galaxy

2315
01:36:06,400 --> 01:36:00,560
that's our fun way back in the Big Bang

2316
01:36:10,750 --> 01:36:06,410
boom it expanding singularity way back

2317
01:36:15,880 --> 01:36:10,760
in the Big Bang boom the Big Bang the

2318
01:36:22,900 --> 01:36:15,890
Big Bang started with the Big Bang all

2319
01:36:30,550 --> 01:36:22,910
the universe is created from the Big

2320
01:36:35,290 --> 01:36:30,560
Bang galaxies they fly apart close

2321
01:36:39,689 --> 01:36:35,300
throughout the very start you can say oh

2322
01:36:47,829 --> 01:36:43,799
you can see the first light shine

2323
01:36:50,460 --> 01:36:47,839
telescopes look back in time and in your

2324
01:37:02,280 --> 01:36:50,470
head you could

2325
01:37:02,290 --> 01:37:11,420
[Music]

2326
01:37:19,680 --> 01:37:15,960
created from the Big Bang all came from

2327
01:37:20,220 --> 01:37:19,690
the Big Bang who started with the Big

2328
01:37:42,970 --> 01:37:20,230
Bang

2329
01:37:48,490 --> 01:37:42,980
[Music]

2330
01:37:51,350 --> 01:37:48,500
[Applause]

2331
01:37:52,610 --> 01:37:51,360
dude do we have any questions we only do

2332
01:37:55,520 --> 01:37:52,620
a couple more songs but do we have any

2333
01:37:58,640 --> 01:37:55,530
questions for from the audience so far

2334
01:38:05,060 --> 01:37:58,650
yes sir when is will.i.am going to drop

2335
01:38:06,740 --> 01:38:05,070
the Mars song when is will I am gonna

2336
01:38:08,570 --> 01:38:06,750
drop something

2337
01:38:11,740 --> 01:38:08,580
there's the song he was gonna do for

2338
01:38:21,860 --> 01:38:11,750

Mars patience my friend okay patience

2339
01:38:24,770 --> 01:38:21,870
any other questions as a fellow

2340
01:38:27,380 --> 01:38:24,780
singer-songwriter myself what got you

2341
01:38:29,660 --> 01:38:27,390
inspired to do the the science lyrics

2342
01:38:31,130 --> 01:38:29,670
and a creativity in your music well

2343
01:38:33,230 --> 01:38:31,140
that's a great question well my my

2344
01:38:35,480 --> 01:38:33,240
co-writer rocky Alvey who is the

2345
01:38:38,720 --> 01:38:35,490
director of the Dyer Observatory in

2346
01:38:40,940 --> 01:38:38,730
Vanderbilt in Nashville had these lyrics

2347
01:38:42,200 --> 01:38:40,950
and some of the songs started and he had

2348
01:38:43,910 --> 01:38:42,210
we'd been working together over the

2349
01:38:46,550 --> 01:38:43,920
years and you know I said you really

2350
01:38:47,990 --> 01:38:46,560
need to do a an album and so I got kind

2351
01:38:50,510 --> 01:38:48,000
of pulled into it because the words were

2352
01:38:52,340 --> 01:38:50,520
so interesting and I'd never really

2353
01:38:54,410 --> 01:38:52,350
known a lot of the stuff about astronomy

2354
01:38:57,320 --> 01:38:54,420
and you know that's the great thing

2355
01:38:59,660 --> 01:38:57,330
about the way songs can kind of give you

2356
01:39:01,880 --> 01:38:59,670
this entree into remembering all the

2357
01:39:03,230 --> 01:39:01,890
information so we've we just had so much

2358
01:39:04,850 --> 01:39:03,240
fun working on it it's the most fun I've

2359
01:39:07,850 --> 01:39:04,860
ever had making a record not been making

2360
01:39:09,590 --> 01:39:07,860
records for 30 years so you know it's

2361
01:39:13,280 --> 01:39:09,600
been really a blast and especially fun

2362
01:39:15,050 --> 01:39:13,290
to watch kids get excited and and see

2363
01:39:15,650 --> 01:39:15,060

the light bulbs light bulbs go off in

2364
01:39:17,390 --> 01:39:15,660
their heads

2365
01:39:23,090 --> 01:39:17,400
here's rocky back here from you observed

2366
01:39:29,880 --> 01:39:26,190
and say one thing that's I can say about

2367
01:39:32,280 --> 01:39:29,890
this album and the songs is NASA has

2368
01:39:34,410 --> 01:39:32,290
been a huge part of an inspiration in my

2369
01:39:36,930 --> 01:39:34,420
life from the time I was a kid one of

2370
01:39:39,000 --> 01:39:36,940
the first memories I have of the sky is

2371
01:39:41,010 --> 01:39:39,010
watching a satellite go across the sky

2372
01:39:42,450 --> 01:39:41,020
when I was about 8 years old as a result

2373
01:39:44,970 --> 01:39:42,460
of those experiences you know I wrote

2374
01:39:46,380 --> 01:39:44,980
these lyrics and songs and Beth and I

2375
01:39:49,350 --> 01:39:46,390
put it together our whole deal is

2376
01:39:50,820 --> 01:39:49,360
turning kids on to science and summer of

2377
01:39:53,310 --> 01:39:50,830
innovation has been such a wonderful

2378
01:39:54,750 --> 01:39:53,320
thing for us at Dyer Observatory because

2379
01:39:57,300 --> 01:39:54,760
we've been able to through summer of

2380
01:39:59,640 --> 01:39:57,310
innovation interface astronauts and

2381
01:40:00,870 --> 01:39:59,650
physicist scientists of all sort with

2382
01:40:02,850 --> 01:40:00,880
these kids who never have that

2383
01:40:04,350 --> 01:40:02,860
experience and so our whole thing is

2384
01:40:05,520 --> 01:40:04,360
getting kids they may not end up being

2385
01:40:08,580 --> 01:40:05,530
scientists they'll be more

2386
01:40:09,810 --> 01:40:08,590
scientifically literate but and some of

2387
01:40:13,190 --> 01:40:09,820
them will be scientists we've had

2388
01:40:16,320 --> 01:40:13,200

several multiple years of epo

2389
01:40:17,520 --> 01:40:16,330
grants from NASA and that has allowed us

2390
01:40:20,460 --> 01:40:17,530
to connect kids who'd never get

2391
01:40:23,640 --> 01:40:20,470
connected with with these great great

2392
01:40:24,120 --> 01:40:23,650
astronauts and scientists so like Leland

2393
01:40:26,450 --> 01:40:24,130
yeah

2394
01:40:28,680 --> 01:40:26,460
who's there this summer inspiring kids

2395
01:40:30,630 --> 01:40:28,690
and I think one of the other things that

2396
01:40:33,570 --> 01:40:30,640
you know we have we think about I think

2397
01:40:35,880 --> 01:40:33,580
about Stone Soup making this education

2398
01:40:38,250 --> 01:40:35,890
piece a partnership you know NASA has a

2399
01:40:40,350 --> 01:40:38,260
piece singer-songwriters have a piece

2400
01:40:43,020 --> 01:40:40,360
you know astrophysicists have a piece

2401
01:40:44,970 --> 01:40:43,030
private sector has a piece and we all

2402
01:40:47,280 --> 01:40:44,980
play in this together I mean you guys

2403
01:40:48,750 --> 01:40:47,290
sending tweets out right now probably

2404
01:40:51,000 --> 01:40:48,760
know of many school teachers that you

2405
01:40:52,560 --> 01:40:51,010
can go and talk to about the programs we

2406
01:40:54,120 --> 01:40:52,570
have at NASA that can help inspire some

2407
01:40:55,500 --> 01:40:54,130
of those kids or even the programs that

2408
01:40:57,090 --> 01:40:55,510
we have for teachers to get them more

2409
01:40:59,370 --> 01:40:57,100
prepared to be better science teachers

2410
01:41:01,290 --> 01:40:59,380
and so I think that's that's really the

2411
01:41:03,540 --> 01:41:01,300
the special sauce about all of this is

2412
01:41:05,520 --> 01:41:03,550
that one organization cannot do it alone

2413
01:41:08,010 --> 01:41:05,530

it takes parents who takes parents to be

2414
01:41:09,930 --> 01:41:08,020
involved with their kids education also

2415
01:41:11,970 --> 01:41:09,940
which a lot of parents really don't

2416
01:41:14,130 --> 01:41:11,980
understand the science but you know we

2417
01:41:15,810 --> 01:41:14,140
have programs that say you don't have to

2418
01:41:17,400 --> 01:41:15,820
be a scientist to raise a scientist so

2419
01:41:18,840 --> 01:41:17,410
we teach parents of things that they

2420
01:41:20,550 --> 01:41:18,850
need to do to get their kids to become

2421
01:41:23,040 --> 01:41:20,560
scientists and engineers so that's

2422
01:41:25,260 --> 01:41:23,050
another another piece of this pie and we

2423
01:41:28,230 --> 01:41:25,270
just had a really cool person walk in

2424
01:41:33,310 --> 01:41:28,240
our administrator charlie bolden come on

2425
01:41:38,930 --> 01:41:36,440
for time flown Shuttle astronaut and

2426
01:41:48,830 --> 01:41:38,940
he's also got a call signed by the name

2427
01:41:50,870 --> 01:41:48,840
of Panther I just I came by as I usually

2428
01:41:53,150 --> 01:41:50,880
like to do to welcome you all and thank

2429
01:41:55,810 --> 01:41:53,160
you for coming you know I was sitting in

2430
01:41:58,670 --> 01:41:55,820
the back and I've had the experience of

2431
01:42:01,250 --> 01:41:58,680
watching Beth do her thing for a while

2432
01:42:03,620 --> 01:42:01,260
and I will add something to what Leland

2433
01:42:06,170 --> 01:42:03,630
said that I think it's really important

2434
01:42:07,790 --> 01:42:06,180
and I shortly after I became the NASA

2435
01:42:09,950 --> 01:42:07,800
Administrator and we sat around we had

2436
01:42:12,520 --> 01:42:09,960
an educational I guess we call it an

2437
01:42:15,440 --> 01:42:12,530
education summit where we brought

2438
01:42:18,070 --> 01:42:15,450

representatives in from colleges and

2439
01:42:21,530 --> 01:42:18,080
universities museums and the like about

2440
01:42:23,450 --> 01:42:21,540
25-30 people and we were looking for

2441
01:42:26,690 --> 01:42:23,460
help in in trying to make our

2442
01:42:28,700 --> 01:42:26,700
educational program more effective and

2443
01:42:31,520 --> 01:42:28,710
enabling us to reach more kids about

2444
01:42:33,530 --> 01:42:31,530
STEM education because the president

2445
01:42:35,990 --> 01:42:33,540
went when I talked to him about taking

2446
01:42:39,890 --> 01:42:36,000
this job the first thing he talked to me

2447
01:42:41,900 --> 01:42:39,900
about was was inspiring kids to want to

2448
01:42:45,350 --> 01:42:41,910
get into STEM education and STEM fields

2449
01:42:47,360 --> 01:42:45,360
and and so that was the deal we made if

2450
01:42:52,300 --> 01:42:47,370
if after the first year I didn't have

2451
01:42:55,220 --> 01:42:52,310
lien MAHS and Malia and Sasha Malia

2452
01:42:58,730 --> 01:42:55,230
Sasha and Malia interested in math and

2453
01:43:00,620 --> 01:42:58,740
science then he could fire me I think

2454
01:43:03,410 --> 01:43:00,630
they're interested in math and science

2455
01:43:05,720 --> 01:43:03,420
at least I hope so with a mom and dad

2456
01:43:08,240 --> 01:43:05,730
who really push it the way they do but

2457
01:43:10,700 --> 01:43:08,250
in that on that day of the summit

2458
01:43:14,450 --> 01:43:10,710
you know we what we wanted to name the

2459
01:43:15,680 --> 01:43:14,460
summer was summer of science and and it

2460
01:43:17,120 --> 01:43:15,690
was interesting because there was a

2461
01:43:19,040 --> 01:43:17,130
representative from I think was the

2462
01:43:21,980 --> 01:43:19,050
Boston Museum of Natural History or the

2463
01:43:23,450 --> 01:43:21,990

Boston Art Museum and and he raised his

2464
01:43:25,640 --> 01:43:23,460
hand he said let me make one

2465
01:43:28,430 --> 01:43:25,650
recommendation he said whatever you do

2466
01:43:32,480 --> 01:43:28,440
don't put science in the name and we

2467
01:43:33,770 --> 01:43:32,490
went Wow help me understand this he said

2468
01:43:36,080 --> 01:43:33,780
what you're gonna do is you're gonna

2469
01:43:37,280 --> 01:43:36,090
turn kids off who don't know that

2470
01:43:37,850 --> 01:43:37,290
they're interested in science and

2471
01:43:39,860 --> 01:43:37,860
engineering

2472
01:43:41,120 --> 01:43:39,870
he said because they're afraid of it he

2473
01:43:43,640 --> 01:43:41,130
said what you're trying to do is

2474
01:43:45,770 --> 01:43:43,650
overcome their fear of science

2475
01:43:48,350 --> 01:43:45,780
they have teachers who are afraid to

2476
01:43:51,229 --> 01:43:48,360
teach it and it and it really stuck with

2477
01:43:52,669 --> 01:43:51,239
us and so we started thinking about

2478
01:43:58,280 --> 01:43:52,679
things you could do and that's where the

2479
01:44:02,330 --> 01:43:58,290
innovation came from you know and it's

2480
01:44:05,750 --> 01:44:02,340
just one young man who represents the

2481
01:44:08,120 --> 01:44:05,760
Society of black engineers he had heard

2482
01:44:10,880 --> 01:44:08,130
me talk about inspiring kids all day

2483
01:44:12,050 --> 01:44:10,890
long he said I just I have had it he

2484
01:44:14,330 --> 01:44:12,060
said you know you keep talking about

2485
01:44:17,209 --> 01:44:14,340
inspiring kids we are not going to be

2486
01:44:18,680 --> 01:44:17,219
able to inspire anybody unless we can

2487
01:44:20,810 --> 01:44:18,690
bring them out where they see what's

2488
01:44:23,240 --> 01:44:20,820

available so you've got to make things

2489
01:44:25,340 --> 01:44:23,250
available to them first so that they

2490
01:44:26,510 --> 01:44:25,350
know some they have something about

2491
01:44:29,870 --> 01:44:26,520
which to be inspired

2492
01:44:35,450 --> 01:44:29,880
that's what Beth does you know I sat on

2493
01:44:38,870 --> 01:44:35,460
a in a pub in many pubs in in in Dublin

2494
01:44:41,450 --> 01:44:38,880
Ireland with Beth and watched her work

2495
01:44:44,300 --> 01:44:41,460
her magic with people she had never seen

2496
01:44:48,470 --> 01:44:44,310
before but people who have a love of

2497
01:44:51,620 --> 01:44:48,480
music and then as she played through the

2498
01:44:54,020 --> 01:44:51,630
night to get engaged in conversations

2499
01:44:56,090 --> 01:44:54,030
with people about space and about

2500
01:44:58,040 --> 01:44:56,100
science and about those kinds of things

2501
01:45:00,200 --> 01:44:58,050
that conversation would have never

2502
01:45:03,350 --> 01:45:00,210
happened had it not been for somebody

2503
01:45:05,209 --> 01:45:03,360
bringing bringing it to them to let them

2504
01:45:07,010 --> 01:45:05,219
know that was available and so that's

2505
01:45:08,660 --> 01:45:07,020
what Leland and his folk are trying to

2506
01:45:10,850 --> 01:45:08,670
do they're just trying to make sure that

2507
01:45:14,060 --> 01:45:10,860
that kids know what's available so that

2508
01:45:16,250 --> 01:45:14,070
they can be inspired so so the summer of

2509
01:45:18,770 --> 01:45:16,260
innovation is about trying to reach two

2510
01:45:20,390 --> 01:45:18,780
groups of people and in my in my mind

2511
01:45:24,380 --> 01:45:20,400
the most important group we're trying to

2512
01:45:26,419 --> 01:45:24,390
reach is the teachers because we can we

2513
01:45:28,970 --> 01:45:26,429

can touch a million kids and we've

2514
01:45:32,410 --> 01:45:28,980
touched a million kids if we touch a

2515
01:45:37,399 --> 01:45:32,420
thousand teachers let me tell you it is

2516
01:45:39,620 --> 01:45:37,409
countless how many kids you reach so by

2517
01:45:42,470 --> 01:45:39,630
reaching you all I mean how many of you

2518
01:45:44,570 --> 01:45:42,480
sitting in this room we never did this

2519
01:45:46,040 --> 01:45:44,580
stuff before and I heard me tell you

2520
01:45:49,939 --> 01:45:46,050
this how much I appreciate your being

2521
01:45:52,850 --> 01:45:49,949
here we will reach more people today by

2522
01:45:55,550 --> 01:45:52,860
your being in this session the NASA has

2523
01:45:57,170 --> 01:45:55,560
ever been able to reach and doing things

2524
01:45:59,770 --> 01:45:57,180
the way we used to do them

2525
01:46:03,080 --> 01:45:59,780
we depended on people trying to find a

2526
01:46:06,560 --> 01:46:03,090
place in the country that had nasa-tv

2527
01:46:09,260 --> 01:46:06,570
or trying to find any media outlet that

2528
01:46:10,790 --> 01:46:09,270
would even mention NASA you know other

2529
01:46:13,400 --> 01:46:10,800
than the first few years of the space

2530
01:46:16,250 --> 01:46:13,410
shuttle program people talk about NASA

2531
01:46:17,780 --> 01:46:16,260
and us and you every single day because

2532
01:46:20,180 --> 01:46:17,790
you're communicating with them and

2533
01:46:22,070 --> 01:46:20,190
you're telling the story and so I can't

2534
01:46:25,760 --> 01:46:22,080
thank you enough for what you do because

2535
01:46:28,640 --> 01:46:25,770
you just you bring a different medium to

2536
01:46:30,740 --> 01:46:28,650
our ability to reach people not just

2537
01:46:32,060 --> 01:46:30,750
kids but people but but the kids are

2538
01:46:33,470 --> 01:46:32,070

really important and the teachers are

2539
01:46:35,720 --> 01:46:33,480
important so I'll thank you for that I

2540
01:46:37,850 --> 01:46:35,730
don't I don't think they want me to stay

2541
01:46:39,350 --> 01:46:37,860
very long but I we can keep trying to

2542
01:46:42,350 --> 01:46:39,360
see if you have some more questions that

2543
01:46:44,210 --> 01:46:42,360
I can that I can answer for you and if I

2544
01:46:47,930 --> 01:46:44,220
can't answer them I've got I've got the

2545
01:46:50,870 --> 01:46:47,940
my driver in the back I'm just kidding

2546
01:46:52,940 --> 01:46:50,880
no well eat up well he'd raise your hand

2547
01:46:54,260 --> 01:46:52,950
well eat up delighted a guy in the white

2548
01:46:58,430 --> 01:46:54,270
shirt back there is the NASA chief

2549
01:47:00,590 --> 01:46:58,440
scientist he is fascinating he he is a

2550
01:47:02,600 --> 01:47:00,600
former NASA employee who is a college

2551
01:47:04,040 --> 01:47:02,610
professor he's a professor at the

2552
01:47:07,700 --> 01:47:04,050
University of Colorado but he's been

2553
01:47:10,070 --> 01:47:07,710
with us for almost two years now working

2554
01:47:11,780 --> 01:47:10,080
as the chief scientist his passion is

2555
01:47:15,110 --> 01:47:11,790
ice he's a Glaciology

2556
01:47:16,970 --> 01:47:15,120
he's a glacier guy and and he's really

2557
01:47:19,250 --> 01:47:16,980
upset right now because he's he's

2558
01:47:21,950 --> 01:47:19,260
running out of glaciers and and and all

2559
01:47:25,010 --> 01:47:21,960
as he's concerned as are we all

2560
01:47:27,140 --> 01:47:25,020
the other fella back there with the much

2561
01:47:29,330 --> 01:47:27,150
more formally dressed David rez now ski

2562
01:47:31,790 --> 01:47:29,340
with the glasses on is the NASA chief of

2563
01:47:33,260 --> 01:47:31,800

staff and he loves getting out and

2564
01:47:35,090 --> 01:47:33,270
having an opportunity to talk to people

2565
01:47:37,280 --> 01:47:35,100
something the chief of staff did not

2566
01:47:39,650 --> 01:47:37,290
ordinarily do but he's incredibly good

2567
01:47:41,420 --> 01:47:39,660
at it and and so I try to get him out

2568
01:47:43,370 --> 01:47:41,430
and then the star of the of the whole

2569
01:47:44,210 --> 01:47:43,380
team is the guy with the yellow tie on

2570
01:47:45,710 --> 01:47:44,220
and the blue shirt

2571
01:47:47,990 --> 01:47:45,720
David Weaver who heads the

2572
01:47:49,910 --> 01:47:48,000
communications effort out of NASA

2573
01:47:52,340 --> 01:47:49,920
headquarters and he and I go back and

2574
01:47:54,710 --> 01:47:52,350
forth a lot and I and I have to remind

2575
01:47:59,540 --> 01:47:54,720
him he's passionate I'm passionate we

2576
01:48:01,400 --> 01:47:59,550
both cry and and and and it's because we

2577
01:48:03,500 --> 01:48:01,410
are so passionate about what we do that

2578
01:48:05,990 --> 01:48:03,510
we don't always agree on things but I

2579
01:48:08,210 --> 01:48:06,000
can always count on David telling me how

2580
01:48:10,130 --> 01:48:08,220
to get the message out and if I'm smart

2581
01:48:11,029 --> 01:48:10,140
enough I do it and on days that I think

2582
01:48:12,469 --> 01:48:11,039
I'm smarter

2583
01:48:16,309 --> 01:48:12,479
I don't and it turns out to be a really

2584
01:48:17,899 --> 01:48:16,319
bad day so I'm learning anyway so that's

2585
01:48:20,869 --> 01:48:17,909
there are other other members of the

2586
01:48:23,799 --> 01:48:20,879
team but yeah who else is back there

2587
01:48:25,789 --> 01:48:23,809
Oh Debra's back there the chief she

2588
01:48:28,129 --> 01:48:25,799

never step out for a minute because

2589
01:48:30,579 --> 01:48:28,139
we're getting ready to lose Debra Debra

2590
01:48:33,109 --> 01:48:30,589
is Debra is a White House Fellow and

2591
01:48:35,389 --> 01:48:33,119
we've been privileged to have her on the

2592
01:48:38,539 --> 01:48:35,399
team for almost a year now she will

2593
01:48:41,569 --> 01:48:38,549
leave next week and and wants to go back

2594
01:48:43,609 --> 01:48:41,579
and do some things in education and so I

2595
01:48:46,789 --> 01:48:43,619
promised her I was gonna help her in

2596
01:48:50,000 --> 01:48:46,799
every way I can because she she really

2597
01:48:52,579 --> 01:48:50,010
knows how to do things and so she's been

2598
01:48:54,020 --> 01:48:52,589
in the office with me for a year we've

2599
01:48:56,539 --> 01:48:54,030
been privileged to have three

2600
01:48:58,039 --> 01:48:56,549
consecutive White House fellows and and

2601
01:49:00,529 --> 01:48:58,049
to tell you if you've never met one they

2602
01:49:03,919 --> 01:49:00,539
are really really really really really

2603
01:49:06,049 --> 01:49:03,929
sharp so Debra that didn't get a chance

2604
01:49:07,459 --> 01:49:06,059
to thank you before now but but thanks

2605
01:49:09,679 --> 01:49:07,469
very much for the year with us and

2606
01:49:11,209 --> 01:49:09,689
talked to some of these people sometime

2607
01:49:14,029 --> 01:49:11,219
anybody have a question that I can

2608
01:49:16,459 --> 01:49:14,039
answer for you yes hi I'm this is less a

2609
01:49:18,559 --> 01:49:16,469
question than a thank you for my son

2610
01:49:20,839 --> 01:49:18,569
who's also named Charlie he was able to

2611
01:49:23,239 --> 01:49:20,849
go through the shuttle experience

2612
01:49:25,069 --> 01:49:23,249
yesterday at the Visitor Center and he

2613
01:49:27,079 --> 01:49:25,079

really enjoyed it so you're inspiring

2614
01:49:29,989 --> 01:49:27,089
thank you thanks very much that was fun

2615
01:49:31,189 --> 01:49:29,999
doing that and I'd you know um for

2616
01:49:32,149 --> 01:49:31,199
anybody who doesn't know they should

2617
01:49:33,849 --> 01:49:32,159
tell me that the shuttle launch

2618
01:49:36,619 --> 01:49:33,859
experience over in the visitors center

2619
01:49:39,979 --> 01:49:36,629
it was really a lot of fun putting that

2620
01:49:41,989 --> 01:49:39,989
together with with Bob Rogers and a

2621
01:49:43,909 --> 01:49:41,999
whole bunch of other folk from who came

2622
01:49:45,529 --> 01:49:43,919
in to help us with it and it's great if

2623
01:49:47,750 --> 01:49:45,539
you haven't had an opportunity to do it

2624
01:49:49,729 --> 01:49:47,760
it's closest thing to go into space to

2625
01:49:52,549 --> 01:49:49,739
be quite honest so without going there

2626
01:49:55,069 --> 01:49:52,559
anybody else yes yes I have a question

2627
01:49:58,789 --> 01:49:55,079
I'm a reach recent participant in the

2628
01:50:00,859 --> 01:49:58,799
NASA EPDM program and that was

2629
01:50:03,829 --> 01:50:00,869
affiliated with Georgia Tech and as a

2630
01:50:06,889 --> 01:50:03,839
teacher I found it interesting is even

2631
01:50:10,039 --> 01:50:06,899
though this was a very much a free

2632
01:50:12,559 --> 01:50:10,049
program for teacher stem teachers I only

2633
01:50:15,259 --> 01:50:12,569
found 50 or 60 teachers within each of

2634
01:50:16,729 --> 01:50:15,269
my classes I would expect something to

2635
01:50:19,189 --> 01:50:16,739
be more like thousands of teachers

2636
01:50:21,500 --> 01:50:19,199
throughout the world what can we do

2637
01:50:23,689 --> 01:50:21,510
within the NASA social community that we

2638
01:50:24,560 --> 01:50:23,699

have here right now to help promote the

2639
01:50:26,569 --> 01:50:24,570
stem

2640
01:50:30,169 --> 01:50:26,579
teaching cause that you guys are so well

2641
01:50:33,169 --> 01:50:30,179
promoting tweet nasa.gov slash education

2642
01:50:35,089 --> 01:50:33,179
and point to the EPD n work that we have

2643
01:50:37,819 --> 01:50:35,099
there I mean you went through it you did

2644
01:50:39,379 --> 01:50:37,829
the robotics I actually did the the

2645
01:50:42,080 --> 01:50:39,389
continuing network with all the online

2646
01:50:43,669 --> 01:50:42,090
teaching tools okay okay but again it's

2647
01:50:46,370 --> 01:50:43,679
a it's a messaging thing if we can get

2648
01:50:49,069 --> 01:50:46,380
it out you know multiply this room by

2649
01:50:51,589 --> 01:50:49,079
thousands that have access to NASA

2650
01:50:53,629 --> 01:50:51,599
education Twitter and social media you

2651
01:50:56,479 --> 01:50:53,639
know avenues and it's just it's just a

2652
01:50:58,760 --> 01:50:56,489
continuous process you know and Charlie

2653
01:51:00,979 --> 01:50:58,770
said it we have to do use you guys as

2654
01:51:02,450 --> 01:51:00,989
better tools to get that message out so

2655
01:51:04,490 --> 01:51:02,460
it's a lot of things like that we have a

2656
01:51:05,660 --> 01:51:04,500
lot of content out there that teachers

2657
01:51:07,959 --> 01:51:05,670
don't know about that they could be

2658
01:51:10,220 --> 01:51:07,969
using we have instruction materials

2659
01:51:11,899 --> 01:51:10,230
rocket guide so many different things

2660
01:51:15,200 --> 01:51:11,909
but it's again it's a it's a messaging

2661
01:51:18,620 --> 01:51:15,210
piece yeah and I just wanted to thank

2662
01:51:20,930 --> 01:51:18,630
you for the free xbox msl game my 14

2663
01:51:22,609 --> 01:51:20,940

year old actually got engaged if in

2664
01:51:28,970 --> 01:51:22,619
version 2 you can add the Master Chief

2665
01:51:30,740 --> 01:51:28,980
you will hook him I'm a recent graduate

2666
01:51:32,089 --> 01:51:30,750
at the University of Florida and I was

2667
01:51:34,030 --> 01:51:32,099
part of a Nia double a group there that

2668
01:51:36,319 --> 01:51:34,040
would always put on like a yearly

2669
01:51:37,669 --> 01:51:36,329
outreach to middle school students try

2670
01:51:39,649 --> 01:51:37,679
and get them involved in space we call

2671
01:51:41,270 --> 01:51:39,659
it aerospace day and I know that NASA

2672
01:51:43,040 --> 01:51:41,280
offers a lot of opportunities to have

2673
01:51:44,120 --> 01:51:43,050
speakers come I know if you have a big

2674
01:51:46,339 --> 01:51:44,130
event you can have an astronaut come

2675
01:51:47,839 --> 01:51:46,349
what are some some ways that we can help

2676
01:51:50,060 --> 01:51:47,849
get NASA involved in an event like that

2677
01:51:51,470 --> 01:51:50,070
to maybe bring even more than just one

2678
01:51:52,970 --> 01:51:51,480
middle school maybe involved like the

2679
01:51:55,609 --> 01:51:52,980
whole town or something like that in an

2680
01:51:58,580 --> 01:51:55,619
event like that one other thing oh yeah

2681
01:52:02,689 --> 01:51:58,590
I was gonna say you know the more the

2682
01:52:05,209 --> 01:52:02,699
merrier for us to be quite honest a fine

2683
01:52:06,560 --> 01:52:05,219
day for you it would be KSC probably

2684
01:52:08,479 --> 01:52:06,570
unless you're going to go to another

2685
01:52:11,000 --> 01:52:08,489
part of the country but every NASA

2686
01:52:14,300 --> 01:52:11,010
Center has responsibility for a segment

2687
01:52:16,879 --> 01:52:14,310
of the of the US and every state has a

2688
01:52:18,680 --> 01:52:16,889

Space Grant consortium which operates

2689
01:52:21,890 --> 01:52:18,690
out of usually out of the land-grant

2690
01:52:23,149 --> 01:52:21,900
University for that state so I would say

2691
01:52:25,220 --> 01:52:23,159
you know if you're from somewhere that

2692
01:52:27,680 --> 01:52:25,230
doesn't have a NASA Center in it do you

2693
01:52:30,140 --> 01:52:27,690
from Minnesota or Montana or something

2694
01:52:32,569 --> 01:52:30,150
like that just go online and find out

2695
01:52:33,819 --> 01:52:32,579
where the Space Grant consortium is and

2696
01:52:37,729 --> 01:52:33,829
it's probably out of the land-grant

2697
01:52:38,450 --> 01:52:37,739
collagen in in your state and then see

2698
01:52:40,729 --> 01:52:38,460
if they can

2699
01:52:42,260 --> 01:52:40,739
you put together a venue where you're

2700
01:52:44,270 --> 01:52:42,270
gonna have a lot of teachers or a lot of

2701
01:52:46,220 --> 01:52:44,280
students or a lot of both and then

2702
01:52:49,760 --> 01:52:46,230
either go through Leland and education

2703
01:52:51,410 --> 01:52:49,770
or through our communications office if

2704
01:52:52,459 --> 01:52:51,420
you're down here a lot you can you could

2705
01:52:56,360 --> 01:52:52,469
you know you can go through the

2706
01:52:58,310 --> 01:52:56,370
communications office here at at KSC but

2707
01:52:59,600 --> 01:52:58,320
but I would say that's one thing these

2708
01:53:01,150 --> 01:52:59,610
based grants probably the best way to go

2709
01:53:02,930 --> 01:53:01,160
because every network of other

2710
01:53:04,940 --> 01:53:02,940
organizations that are part of them they

2711
01:53:07,820 --> 01:53:04,950
could bring in even other people that

2712
01:53:09,590 --> 01:53:07,830
are NASA centric NASA based so that's a

2713
01:53:12,170 --> 01:53:09,600

good way to do it and the other thing I

2714
01:53:14,720 --> 01:53:12,180
would tell you I wouldn't I would not

2715
01:53:18,650 --> 01:53:14,730
limit it to you know just let your

2716
01:53:21,350 --> 01:53:18,660
imagination run Wow we went to a oh

2717
01:53:23,450 --> 01:53:21,360
shucks David we were at the the new the

2718
01:53:28,430 --> 01:53:23,460
National Museum what's the Museum in New

2719
01:53:32,390 --> 01:53:28,440
York American History Museum and and

2720
01:53:35,479 --> 01:53:32,400
they had a night that was incredible and

2721
01:53:37,400 --> 01:53:35,489
it and it turned out to be a space and

2722
01:53:39,860 --> 01:53:37,410
you know NASA night and everything Neil

2723
01:53:42,140 --> 01:53:39,870
deGrasse Tyson was there for kind of a

2724
01:53:46,280 --> 01:53:42,150
talk and then we all went downstairs and

2725
01:53:49,660 --> 01:53:46,290
stuff and but it was the it wasn't your

2726
01:53:52,040 --> 01:53:49,670
typical NASA crowd it was young

2727
01:53:55,010 --> 01:53:52,050
entrepreneurs who were interested in in

2728
01:53:57,920 --> 01:53:55,020
tech stuff you know high tech and by the

2729
01:54:00,740 --> 01:53:57,930
end of the evening they had a really

2730
01:54:02,750 --> 01:54:00,750
good idea about NASA and the kind of

2731
01:54:04,520 --> 01:54:02,760
stuff we did and they were all looking

2732
01:54:06,470 --> 01:54:04,530
for ways that that they could get

2733
01:54:08,810 --> 01:54:06,480
involved whether it was their business

2734
01:54:10,400 --> 01:54:08,820
or or just because they had a particular

2735
01:54:12,740 --> 01:54:10,410
interest so the only thing I would tell

2736
01:54:14,510 --> 01:54:12,750
you is you know don't don't limit it

2737
01:54:16,580 --> 01:54:14,520
again going back to this don't do the

2738
01:54:18,650 --> 01:54:16,590

science thing don't limit it to a

2739
01:54:21,920 --> 01:54:18,660
particular group of kids because you

2740
01:54:24,500 --> 01:54:21,930
think the others are not interested get

2741
01:54:25,610 --> 01:54:24,510
a get a bunch of athletes Leland can

2742
01:54:27,860 --> 01:54:25,620
tell you about this he's been with

2743
01:54:29,660 --> 01:54:27,870
Donovan McNabb and T at the Donovan

2744
01:54:32,209 --> 01:54:29,670
McNabb football camp teaching the

2745
01:54:33,680 --> 01:54:32,219
physics of football to kids who they

2746
01:54:35,870 --> 01:54:33,690
didn't know they were gonna even hear

2747
01:54:38,120 --> 01:54:35,880
NASA they came out to the Donovan McNabb

2748
01:54:40,550 --> 01:54:38,130
football camp and Donovan talked about

2749
01:54:43,160 --> 01:54:40,560
how why he throws a tight spiral and why

2750
01:54:44,900 --> 01:54:43,170
it gets to where he wants it to go on TV

2751
01:54:48,110 --> 01:54:44,910
every once in a while you'll see Kurt

2752
01:54:51,860 --> 01:54:48,120
Warner if you're a football fan Kurt

2753
01:54:54,370 --> 01:54:51,870
Warner multiple time MVP and the NFL

2754
01:54:57,500 --> 01:54:54,380
the st. the not yeah the st. Louis Rams

2755
01:55:00,620 --> 01:54:57,510
Curt does a public service announcement

2756
01:55:02,930 --> 01:55:00,630
now a real quick spot and he talks about

2757
01:55:05,540 --> 01:55:02,940
the physics of football and and and he

2758
01:55:09,200 --> 01:55:05,550
talks about math trigonometry and

2759
01:55:12,020 --> 01:55:09,210
geometry and how he mentally calculates

2760
01:55:14,720 --> 01:55:12,030
how he gets the ball how he got the ball

2761
01:55:16,820 --> 01:55:14,730
to the receiver and and why he was as

2762
01:55:18,470 --> 01:55:16,830
good as he was you know everybody

2763
01:55:21,020 --> 01:55:18,480

thought he's a bartender and he said you

2764
01:55:23,240 --> 01:55:21,030
know I know a little math and just

2765
01:55:24,860 --> 01:55:23,250
gauging the speed the velocity of

2766
01:55:26,660 --> 01:55:24,870
somebody going from that point to that

2767
01:55:28,130 --> 01:55:26,670
point and trying to figure out what

2768
01:55:32,300 --> 01:55:28,140
angle you have to lead it back that's

2769
01:55:33,890 --> 01:55:32,310
math and and so I would say try to try

2770
01:55:37,210 --> 01:55:33,900
to get kids whether they're in music

2771
01:55:39,650 --> 01:55:37,220
athletics anything bring them out and

2772
01:55:41,870 --> 01:55:39,660
let them talk about sports let them talk

2773
01:55:44,510 --> 01:55:41,880
about music but then throw a little

2774
01:55:46,730 --> 01:55:44,520
stuff in and if we can get an astronaut

2775
01:55:48,170 --> 01:55:46,740
there or a space technologist I can

2776
01:55:51,350 --> 01:55:48,180
guarantee you they'll figure out a way

2777
01:55:54,800 --> 01:55:51,360
to tie what we do into it so I would I

2778
01:55:57,410 --> 01:55:54,810
would definitely not don't focus just on

2779
01:55:59,270 --> 01:55:57,420
kids that people tell you you know are

2780
01:56:01,130 --> 01:55:59,280
interested in science and math and are

2781
01:56:03,170 --> 01:56:01,140
those are the kids that are that are

2782
01:56:06,980 --> 01:56:03,180
really serious because I don't think we

2783
01:56:09,020 --> 01:56:06,990
know to be quite honest okay we'll have

2784
01:56:19,610 --> 01:56:09,030
another song from Beth real quick David

2785
01:56:21,200 --> 01:56:19,620
you have something again it's great I

2786
01:56:22,940 --> 01:56:21,210
can't believe I'm standing between these

2787
01:56:26,360 --> 01:56:22,950
two amazing people in the in the world

2788
01:56:28,970 --> 01:56:26,370

at this moment but speaking of stem

2789
01:56:30,590 --> 01:56:28,980
we've been designing stem lesson plans

2790
01:56:31,970 --> 01:56:30,600
for each song on the on this little

2791
01:56:34,040 --> 01:56:31,980
collection of songs called the mighty

2792
01:56:36,370 --> 01:56:34,050
sky and this is the title song it's

2793
01:56:39,890 --> 01:56:36,380
called the mighty sky

2794
01:56:44,270 --> 01:56:39,900
[Music]

2795
01:56:49,910 --> 01:56:44,280
feathered clouds of golden hues are

2796
01:56:56,660 --> 01:56:49,920
fashioned by the gentle winds a silent

2797
01:57:01,549 --> 01:56:56,670
DOMA stars appears the canopy of night

2798
01:57:08,120 --> 01:57:01,559
descends hidden treasures then are found

2799
01:57:13,529 --> 01:57:08,130
they're subtle glories greet thee and

2800
01:57:20,620 --> 01:57:13,539
the gifts of peace are handed down to

2801
01:57:32,649 --> 01:57:26,600
flying through a ryan you would have to

2802
01:57:37,890 --> 01:57:32,659
go so far through Pro prefers to

2803
01:57:48,319 --> 01:57:44,569
[Music]

2804
01:57:54,260 --> 01:57:48,329
Oh squint your eyes out stretch your

2805
01:57:58,970 --> 01:57:54,270
hand and hold the billion galaxies more

2806
01:58:04,580 --> 01:57:58,980
stars than our grains of sand and each

2807
01:58:10,339 --> 01:58:04,590
with countless mysteries though our feet

2808
01:58:12,939 --> 01:58:10,349
are bound by earth in our hearts we all

2809
01:58:19,350 --> 01:58:12,949
can fly

2810
01:58:27,490 --> 01:58:19,360
and imaginations are since birth as

2811
01:58:32,530 --> 01:58:27,500
children of the mighty sky so little

2812
01:58:38,070 --> 01:58:32,540
sale bastards blue veil along so less

2813
01:58:43,860 --> 01:58:38,080

two streams for all of this our

2814
01:58:55,300 --> 01:58:50,400
[Music]

2815
01:59:00,130 --> 01:58:55,310
hidden treasures that are found they're

2816
01:59:05,430 --> 01:59:00,140
subtle glories greet the eye and gifts

2817
01:59:13,190 --> 01:59:05,440
of feasts are handed down to Watchers of

2818
01:59:21,370 --> 01:59:15,069
[Music]

2819
01:59:21,380 --> 01:59:25,630
the mighty sky

2820
01:59:25,640 --> 01:59:33,980
[Music]

2821
01:59:38,910 --> 01:59:35,700
great job Beth

2822
01:59:47,370 --> 01:59:38,920
any other questions questions don't be

2823
01:59:52,110 --> 01:59:47,380
shy now hedge against involved with NASA

2824
01:59:58,380 --> 01:59:52,120
in your young childhood young childhood

2825
02:00:02,940 --> 01:59:58,390
I I had a experience with a non

2826
02:00:04,200 --> 02:00:02,950
age-appropriate chemistry set that I mix

2827
02:00:06,270 --> 02:00:04,210
these two two similar chemicals together

2828
02:00:07,380 --> 02:00:06,280
and created the most fantastic explosion

2829
02:00:10,770 --> 02:00:07,390
ever known to humankind

2830
02:00:12,060 --> 02:00:10,780
and that flipped the bit in my head and

2831
02:00:14,460 --> 02:00:12,070
I became a chemistry major in college

2832
02:00:16,230 --> 02:00:14,470
and played sports played football I did

2833
02:00:17,790 --> 02:00:16,240
a lot of different things but it wasn't

2834
02:00:19,680 --> 02:00:17,800
until I started working at NASA Langley

2835
02:00:21,270 --> 02:00:19,690
that a friend of mine said Leland you'd

2836
02:00:23,010 --> 02:00:21,280
be a great astronaut I'm like what are

2837
02:00:24,560 --> 02:00:23,020
you talking about astronaut I don't know

2838
02:00:27,420 --> 02:00:24,570

anything about the astronaut thing and

2839
02:00:29,550 --> 02:00:27,430
he handed me an application I looked at

2840
02:00:32,640 --> 02:00:29,560
it put it down and then another friend

2841
02:00:33,780 --> 02:00:32,650
of mine Charlie Kamara who was a good

2842
02:00:36,630 --> 02:00:33,790
friend we worked in a project together

2843
02:00:38,310 --> 02:00:36,640
he got into the Corps that year and so I

2844
02:00:39,210 --> 02:00:38,320
said to myself well if NASA is letting

2845
02:00:42,030 --> 02:00:39,220
knuckleheads like that into the

2846
02:00:43,770 --> 02:00:42,040
astronaut corps I can get in so I

2847
02:00:45,150 --> 02:00:43,780
applied the next year and I got in but

2848
02:00:47,340 --> 02:00:45,160
it was one of the most fantastic things

2849
02:00:49,650 --> 02:00:47,350
and you know Charlie's flown four times

2850
02:00:52,230 --> 02:00:49,660
deployed the Hubble I mean done all this

2851
02:00:55,710 --> 02:00:52,240
stuff but it paled those things pale in

2852
02:00:57,180 --> 02:00:55,720
comparison to when you inspire a kid to

2853
02:00:59,370 --> 02:00:57,190
do whatever they want to believe

2854
02:01:01,440 --> 02:00:59,380
whatever they believe in and I think the

2855
02:01:02,520 --> 02:01:01,450
part of education coming from being an

2856
02:01:04,170 --> 02:01:02,530
astronaut to being in charge of

2857
02:01:05,550 --> 02:01:04,180
Education now is one of the most

2858
02:01:08,580 --> 02:01:05,560
rewarding things that I've ever done

2859
02:01:10,380 --> 02:01:08,590
because I see kids that have never in

2860
02:01:12,030 --> 02:01:10,390
their wildest dreams would have thought

2861
02:01:14,430 --> 02:01:12,040
about being a good scientist or good

2862
02:01:16,950 --> 02:01:14,440
engineer and I'll tell you one story I

2863
02:01:19,200 --> 02:01:16,960

was giving a presentation at NASA

2864
02:01:21,690 --> 02:01:19,210
Goddard brand new astronaut first time

2865
02:01:24,480 --> 02:01:21,700
had never flown or anything these kids

2866
02:01:26,220 --> 02:01:24,490
walked in they fell asleep I was showing

2867
02:01:27,750 --> 02:01:26,230
a picture of dr. Bernard Harris who was

2868
02:01:29,790 --> 02:01:27,760
the first african-american astronaut to

2869
02:01:32,640 --> 02:01:29,800
do a spacewalk medical doctor to this

2870
02:01:34,950 --> 02:01:32,650
young girl woke up looked up saw him

2871
02:01:37,110 --> 02:01:34,960
heard me talk about him she fell back

2872
02:01:38,610 --> 02:01:37,120
asleep and I said I really must be a

2873
02:01:40,710 --> 02:01:38,620
horrible public speaker

2874
02:01:42,540 --> 02:01:40,720
but five years later I was at a

2875
02:01:45,180 --> 02:01:42,550
conference and this young girl walked up

2876
02:01:46,710 --> 02:01:45,190
to me and she says mr. Melvin I remember

2877
02:01:48,870 --> 02:01:46,720
hearing you talk about Bernard Harris

2878
02:01:50,280 --> 02:01:48,880
five years ago and now I'm going to

2879
02:01:52,410 --> 02:01:50,290
medical school and then I'm gonna be a

2880
02:01:53,760 --> 02:01:52,420
doctor so you never know who you're

2881
02:01:55,560 --> 02:01:53,770
gonna impact you never know when they're

2882
02:01:57,000 --> 02:01:55,570
listening and it's just so important

2883
02:01:58,380 --> 02:01:57,010
that you have a good message and

2884
02:02:01,170 --> 02:01:58,390
something to share with them so I think

2885
02:02:03,120 --> 02:02:01,180
I think we all can do that with this

2886
02:02:05,220 --> 02:02:03,130
technology that we have in our hands and

2887
02:02:06,990 --> 02:02:05,230
there are pockets especially you know I

2888
02:02:10,020 --> 02:02:07,000

think about Angry Birds you know ten

2889
02:02:13,520 --> 02:02:10,030
million copies of Angry Birds was sold

2890
02:02:15,330 --> 02:02:13,530
in three days that's a multi

2891
02:02:16,970 --> 02:02:15,340
multi-millionaire and if we can get

2892
02:02:19,350 --> 02:02:16,980
these kids to start thinking about being

2893
02:02:20,910 --> 02:02:19,360
developers of the technology instead of

2894
02:02:22,800 --> 02:02:20,920
just users of the technology

2895
02:02:24,900 --> 02:02:22,810
let them program the iPhone and the

2896
02:02:26,730 --> 02:02:24,910
droids and create something as a middle

2897
02:02:29,130 --> 02:02:26,740
school student they'll be the next few

2898
02:02:30,840 --> 02:02:29,140
jobs so we have to get them thinking

2899
02:02:33,870 --> 02:02:30,850
about the development piece versus just

2900
02:02:35,130 --> 02:02:33,880
the user piece I think that's what I did

2901
02:02:36,990 --> 02:02:35,140
is a kid blowing things up and getting

2902
02:02:39,740 --> 02:02:37,000
in trouble for burning holes and my

2903
02:02:44,870 --> 02:02:39,750
mother's carpet you know Thanks

2904
02:02:48,830 --> 02:02:47,030
so you mentioned Angry Birds and there's

2905
02:02:50,960 --> 02:02:48,840
a space version of Angry Birds can we

2906
02:02:52,450 --> 02:02:50,970
put a radiation belt level in that space

2907
02:02:57,890 --> 02:02:52,460
version of Angry Birds

2908
02:03:01,610 --> 02:02:57,900
David Weaver call Rubio to promote my

2909
02:03:03,920 --> 02:03:01,620
mission we can do anything we're now an

2910
02:03:07,660 --> 02:03:03,930
asset okay so we'll talk okay we'll talk

2911
02:03:11,650 --> 02:03:07,670
we'll talk okay any other questions

2912
02:03:16,820 --> 02:03:11,660
questions any comments

2913
02:03:19,730 --> 02:03:16,830

isn't specifically about rbsp or

2914
02:03:22,190 --> 02:03:19,740
education but does NASA have plans for

2915
02:03:24,140 --> 02:03:22,200
another leadership I think they're

2916
02:03:27,530 --> 02:03:24,150
called leadership class mission like

2917
02:03:31,640 --> 02:03:27,540
curiosity in the like couple billion

2918
02:03:37,280 --> 02:03:31,650
dollar range I'll let my boss handle

2919
02:03:39,140 --> 02:03:37,290
that so one point I read about there's

2920
02:03:40,490 --> 02:03:39,150
these different classes based on the

2921
02:03:42,380 --> 02:03:40,500
kind of the price of the mission and

2922
02:03:45,500 --> 02:03:42,390
that curiosity was the highest the

2923
02:03:47,840 --> 02:03:45,510
leadership class flagship class does

2924
02:03:52,430 --> 02:03:47,850
NASA have plans for another one of those

2925
02:03:55,220 --> 02:03:52,440
in the next few years let me talk very

2926
02:03:58,340 --> 02:03:55,230
quickly about about flagships and other

2927
02:03:59,930 --> 02:03:58,350
kinds of things we are always thinking

2928
02:04:02,380 --> 02:03:59,940
about flagship missions and always

2929
02:04:05,150 --> 02:04:02,390
working with the scientific communities

2930
02:04:06,770 --> 02:04:05,160
waleed will tell you we we're lucky and

2931
02:04:09,530 --> 02:04:06,780
that we get input from the scientific

2932
02:04:11,770 --> 02:04:09,540
community every 10 years and in almost

2933
02:04:14,290 --> 02:04:11,780
every time and it's in specific

2934
02:04:17,120 --> 02:04:14,300
classifications like Earth Science

2935
02:04:19,910 --> 02:04:17,130
planetary science and the like and they

2936
02:04:22,480 --> 02:04:19,920
they they frequently like to present to

2937
02:04:25,100 --> 02:04:22,490
us a proposal for a flagship mission

2938
02:04:26,780 --> 02:04:25,110

what we're trying to do right now and

2939
02:04:29,450 --> 02:04:26,790
what one of the things we asked the folk

2940
02:04:31,670 --> 02:04:29,460
in the Mars program planning group is to

2941
02:04:33,470 --> 02:04:31,680
look at at where NASA's budget sits

2942
02:04:35,600 --> 02:04:33,480
today and look at where it looks like

2943
02:04:37,010 --> 02:04:35,610
we're going in the future and come up

2944
02:04:39,620 --> 02:04:37,020
with something that accomplishes the

2945
02:04:43,640 --> 02:04:39,630
objectives of a flagship mission with a

2946
02:04:47,510 --> 02:04:43,650
less-than flagship price tag you know if

2947
02:04:49,610 --> 02:04:47,520
you look at well we just announced a

2948
02:04:52,580 --> 02:04:49,620
mission called insight to the other day

2949
02:04:54,740 --> 02:04:52,590
which is a discover mission and that's

2950
02:04:58,210 --> 02:04:54,750
the I think I got to get this right the

2951
02:05:01,090 --> 02:04:58,220
lowest price mission we can

2952
02:05:03,850 --> 02:05:01,100
but it's the closest we're gonna get to

2953
02:05:07,110 --> 02:05:03,860
date to a sample return mission because

2954
02:05:09,670 --> 02:05:07,120
you know it's gonna it's gonna study the

2955
02:05:10,990 --> 02:05:09,680
what do I call it the crustal differ if

2956
02:05:13,780 --> 02:05:11,000
we were here on earth I would call it

2957
02:05:14,980 --> 02:05:13,790
crustal deformation earthquakes and

2958
02:05:16,920 --> 02:05:14,990
stuff like that we're looking at we're

2959
02:05:19,960 --> 02:05:16,930
looking for seismic activity on Mars

2960
02:05:22,390 --> 02:05:19,970
we're looking for ways to get samples of

2961
02:05:24,280 --> 02:05:22,400
soil and other kinds of stuff it's not

2962
02:05:26,470 --> 02:05:24,290
going to scoop but it's gonna look deep

2963
02:05:29,170 --> 02:05:26,480

into the Martian surface we have to

2964
02:05:32,970 --> 02:05:29,180
figure out a way in an affordable way to

2965
02:05:34,750 --> 02:05:32,980
get a sample back from Mars so and

2966
02:05:37,810 --> 02:05:34,760
answering your question we're always

2967
02:05:39,400 --> 02:05:37,820
looking at flagship missions but I look

2968
02:05:41,410 --> 02:05:39,410
at them from the perspective of what are

2969
02:05:43,000 --> 02:05:41,420
the scientific objectives that the

2970
02:05:44,830 --> 02:05:43,010
community wants us to accomplish and

2971
02:05:46,870 --> 02:05:44,840
then I challenge the team to say okay

2972
02:05:47,920 --> 02:05:46,880
this is what they want we can't give

2973
02:05:49,900 --> 02:05:47,930
them a sign we can't give them a

2974
02:05:51,460 --> 02:05:49,910
billion-dollar mission but we can give

2975
02:05:54,190 --> 02:05:51,470
them a billion dollars worth of science

2976
02:05:56,890 --> 02:05:54,200
you know for 450 million or whatever it

2977
02:05:59,290 --> 02:05:56,900
is and sometimes we can and when that

2978
02:06:00,430 --> 02:05:59,300
happens then we can we can go forward

2979
02:06:02,140 --> 02:06:00,440
then to the Congress and the

2980
02:06:04,540 --> 02:06:02,150
administration and say this is a

2981
02:06:06,310 --> 02:06:04,550
critical science objective if we're

2982
02:06:08,980 --> 02:06:06,320
going to do this if we're going to put

2983
02:06:11,500 --> 02:06:08,990
humans on Mars we have to do this

2984
02:06:13,810 --> 02:06:11,510
we have looked we have combed everything

2985
02:06:15,850 --> 02:06:13,820
we can think of we cannot come up with a

2986
02:06:17,410 --> 02:06:15,860
way to do it other than this type of

2987
02:06:19,660 --> 02:06:17,420
mission so I think what you're going to

2988
02:06:22,600 --> 02:06:19,670

see us do in the next few years is talk

2989
02:06:24,550 --> 02:06:22,610
more and more about downsize missions

2990
02:06:26,830 --> 02:06:24,560
you know that accomplish big objectives

2991
02:06:27,880 --> 02:06:26,840
but don't have the price tag on them for

2992
02:06:28,870 --> 02:06:27,890
a little while anyway

2993
02:06:32,320 --> 02:06:28,880
I don't know whether I answered your

2994
02:06:34,180 --> 02:06:32,330
question yeah it's always a people don't

2995
02:06:35,920 --> 02:06:34,190
like to hear that to be quite honest and

2996
02:06:38,710 --> 02:06:35,930
and I'll and I'll share with you

2997
02:06:40,300 --> 02:06:38,720
something we actually have people in the

2998
02:06:42,490 --> 02:06:40,310
community who I think have been

2999
02:06:48,940 --> 02:06:42,500
disappointed that that my enthusiasm

3000
02:06:50,020 --> 02:06:48,950
over curiosity is is while robust I'm

3001
02:06:52,120 --> 02:06:50,030
not saying that

3002
02:06:54,010 --> 02:06:52,130
ok curiosity was so successful that

3003
02:06:55,360 --> 02:06:54,020
we're gonna go out and NASA's budget is

3004
02:06:57,760 --> 02:06:55,370
going to be doubled that's not going to

3005
02:07:00,220 --> 02:06:57,770
happen you know that's not realistic and

3006
02:07:02,980 --> 02:07:00,230
and and hopefully you all understand

3007
02:07:04,750 --> 02:07:02,990
that you know it's just look at the

3008
02:07:06,640 --> 02:07:04,760
fiscal time look at look at the

3009
02:07:08,860 --> 02:07:06,650
situation the country is in right now

3010
02:07:11,350 --> 02:07:08,870
and it would be irresponsible for the

3011
02:07:11,770 --> 02:07:11,360
NASA Administrator to go in and say look

3012
02:07:13,600 --> 02:07:11,780
what we

3013
02:07:16,990 --> 02:07:13,610

did we want to double our budget I would

3014
02:07:19,330 --> 02:07:17,000
love to do that but but the but the the

3015
02:07:21,729 --> 02:07:19,340
probability of that occurring is not

3016
02:07:24,279 --> 02:07:21,739
very good and so I want to go in with a

3017
02:07:26,979 --> 02:07:24,289
credible proposal and this is what I've

3018
02:07:29,439 --> 02:07:26,989
said from the day I testified at my

3019
02:07:31,270 --> 02:07:29,449
hearing to be confirmed as the NASA

3020
02:07:32,799 --> 02:07:31,280
Administrator I want to bring you things

3021
02:07:34,629 --> 02:07:32,809
that are realistic that are affordable

3022
02:07:35,680 --> 02:07:34,639
and that are sustainable that are going

3023
02:07:37,419 --> 02:07:35,690
to last through multiple

3024
02:07:39,430 --> 02:07:37,429
administration's and so that's what

3025
02:07:40,660 --> 02:07:39,440
we're trying to do and and if I if I

3026
02:07:42,430 --> 02:07:40,670
went off and told people we're gonna do

3027
02:07:44,649 --> 02:07:42,440
flagship mission in every every field

3028
02:07:47,229 --> 02:07:44,659
right now I'd get left off the planet

3029
02:07:49,689 --> 02:07:47,239
because that's not realistic you know

3030
02:07:50,350 --> 02:07:49,699
and also not sustainable and not

3031
02:07:52,149 --> 02:07:50,360
affordable

3032
02:07:53,979 --> 02:07:52,159
so wouldn't meet it wouldn't meet any of

3033
02:07:56,200 --> 02:07:53,989
my criteria question over there comment

3034
02:07:58,720 --> 02:07:56,210
so so if somebody were to have NASA

3035
02:08:02,080 --> 02:07:58,730
blank check and say go do one of

3036
02:08:04,510 --> 02:08:02,090
whatever you want to do right now what

3037
02:08:06,819 --> 02:08:04,520
what would your wish lists I I don't

3038
02:08:09,520 --> 02:08:06,829

have a wish list for that I you know I

3039
02:08:12,069 --> 02:08:09,530
really try to focus I depend a lot on

3040
02:08:14,529 --> 02:08:12,079
I'm not I'm not the smartest guy in the

3041
02:08:16,149 --> 02:08:14,539
room I don't go to I don't go to any

3042
02:08:18,459 --> 02:08:16,159
meetings where I'm the smartest guy in

3043
02:08:20,709 --> 02:08:18,469
the room and I know that and I really

3044
02:08:22,359 --> 02:08:20,719
depend on the leaders in the agency to

3045
02:08:25,000 --> 02:08:22,369
advise me on where we ought to be going

3046
02:08:27,580 --> 02:08:25,010
I I love education my mom and dad we're

3047
02:08:29,680 --> 02:08:27,590
educators I don't I don't tangle with

3048
02:08:31,750 --> 02:08:29,690
Leland when it comes to education you

3049
02:08:33,790 --> 02:08:31,760
know because Leland has a professional

3050
02:08:35,529 --> 02:08:33,800
team people who spent their life in

3051
02:08:37,270 --> 02:08:35,539
education and they may not always have

3052
02:08:40,689 --> 02:08:37,280
it right but they got a lot better idea

3053
02:08:42,370 --> 02:08:40,699
than I do and so it would be it would be

3054
02:08:45,279 --> 02:08:42,380
foolhardy for me to try to tell you this

3055
02:08:47,740 --> 02:08:45,289
is my dream I don't have one single

3056
02:08:50,080 --> 02:08:47,750
thing I want to do everything that's why

3057
02:08:52,149 --> 02:08:50,090
I'm the NASA Administrator but I have

3058
02:08:54,850 --> 02:08:52,159
incredibly professional people competent

3059
02:08:56,770 --> 02:08:54,860
and capable people who say this is what

3060
02:09:00,279 --> 02:08:56,780
we should try to do now because that's

3061
02:09:02,620 --> 02:09:00,289
the next logical step you know to to

3062
02:09:03,700 --> 02:09:02,630
putting humans father-in in the universe

3063
02:09:05,740 --> 02:09:03,710

than we've ever been before

3064
02:09:07,359 --> 02:09:05,750
my granddaughter's tell me they think

3065
02:09:09,819 --> 02:09:07,369
I'm short-sighted because I always talk

3066
02:09:13,240 --> 02:09:09,829
about Mars well for me you know that's

3067
02:09:15,490 --> 02:09:13,250
the that's the best conceivable

3068
02:09:17,979 --> 02:09:15,500
destinations for destination for humans

3069
02:09:19,359 --> 02:09:17,989
right now I'm not five years six years

3070
02:09:21,279 --> 02:09:19,369
old like my like my youngest

3071
02:09:23,589 --> 02:09:21,289
granddaughter my youngest granddaughter

3072
02:09:24,950 --> 02:09:23,599
thinks about going you know beyond the

3073
02:09:26,960 --> 02:09:24,960
solar system I

3074
02:09:29,000 --> 02:09:26,970
when I was her age and I thought about

3075
02:09:31,520 --> 02:09:29,010
going to Mars back then you know in the

3076
02:09:33,740 --> 02:09:31,530
50s I was just like them thinking about

3077
02:09:35,660 --> 02:09:33,750
you know going warp speed and all that

3078
02:09:38,690 --> 02:09:35,670
kind of stuff today to them that's gonna

3079
02:09:40,370 --> 02:09:38,700
happen to me Mars was gonna happen and I

3080
02:09:44,150 --> 02:09:40,380
still think Mars is gonna happen and I'm

3081
02:09:45,890 --> 02:09:44,160
I'm I am dedicated to that so you know

3082
02:09:48,500 --> 02:09:45,900
we don't work fast enough for a lot of

3083
02:09:50,060 --> 02:09:48,510
people and I wish I could tell you some

3084
02:09:51,890 --> 02:09:50,070
one thing that I would like to do I

3085
02:09:53,720 --> 02:09:51,900
don't ever get to talk about Aeronautics

3086
02:09:56,420 --> 02:09:53,730
very much in this group you know my

3087
02:09:59,300 --> 02:09:56,430
passion my heart my gut is in

3088
02:10:01,370 --> 02:09:59,310

aeronautics because we do incredible

3089
02:10:04,250 --> 02:10:01,380
things for the nation with our aDNA

3090
02:10:06,260 --> 02:10:04,260
Aeronautics research you know you can

3091
02:10:07,640 --> 02:10:06,270
fly from point A to point B faster than

3092
02:10:09,530 --> 02:10:07,650
you've ever done before safer than

3093
02:10:11,480 --> 02:10:09,540
you've ever done before in cleaner

3094
02:10:13,820 --> 02:10:11,490
airplanes than ever before quieter

3095
02:10:15,410 --> 02:10:13,830
airplanes and and I will brag about it

3096
02:10:17,330 --> 02:10:15,420
that's because of NASA Aeronautics and

3097
02:10:19,250 --> 02:10:17,340
they did and they do it on a shoestring

3098
02:10:20,870 --> 02:10:19,260
that's where I would like to get more

3099
02:10:22,280 --> 02:10:20,880
money if you want to yeah is there

3100
02:10:24,500 --> 02:10:22,290
something that that really is

3101
02:10:25,280 --> 02:10:24,510
undergrowth li underfunded it's it's

3102
02:10:27,170 --> 02:10:25,290
aeronautics

3103
02:10:30,380 --> 02:10:27,180
to be quite honest and that's the big a

3104
02:10:32,480 --> 02:10:30,390
in NASA but but just through through the

3105
02:10:35,420 --> 02:10:32,490
years it you know we've kind of dwindled

3106
02:10:37,640 --> 02:10:35,430
but but the people did not give up on

3107
02:10:39,290 --> 02:10:37,650
their dedication to the field and so

3108
02:10:41,720 --> 02:10:39,300
that's why we still do great stuff I

3109
02:10:43,790 --> 02:10:41,730
have talked too long and I've got to go

3110
02:10:46,040 --> 02:10:43,800
but I again I want to thank you all very

3111
02:10:48,110 --> 02:10:46,050
much you said one more question oh one

3112
02:10:50,180 --> 02:10:48,120
more question I'm sorry I just wanted to

3113
02:10:53,060 --> 02:10:50,190

take this opportunity to thank you for

3114
02:10:55,580 --> 02:10:53,070
NASA's commitment to education I went to

3115
02:10:57,980 --> 02:10:55,590
college on a space grant scholarship and

3116
02:11:00,710 --> 02:10:57,990
I'm now part of the RBS PU science team

3117
02:11:02,990 --> 02:11:00,720
and I'm really thrilled with with the

3118
02:11:16,940 --> 02:11:03,000
launch coming up so thank you I'm not

3119
02:11:22,170 --> 02:11:20,070
well I like to say that this has been a

3120
02:11:25,230 --> 02:11:22,180
very moving experience for me because

3121
02:11:26,850 --> 02:11:25,240
Beth Neilsen and Charlie here have they

3122
02:11:28,650 --> 02:11:26,860
always inspired me when they talk and

3123
02:11:31,770 --> 02:11:28,660
when they play and I'm just very very

3124
02:11:33,270 --> 02:11:31,780
humbled and blessed to have them here do

3125
02:11:35,460 --> 02:11:33,280
we have time for one more any more

3126
02:11:40,410 --> 02:11:35,470
questions or a few more questions or we

3127
02:11:43,320 --> 02:11:40,420
want to wrap it up when I hear yeah I I

3128
02:11:45,210 --> 02:11:43,330
work I do something on it I do a little

3129
02:11:47,400 --> 02:11:45,220
bit of outreach within an observatory or

3130
02:11:49,890 --> 02:11:47,410
I live and my question is kind of along

3131
02:11:51,690 --> 02:11:49,900
the lines of Neil deGrasse Tyson you

3132
02:11:53,730 --> 02:11:51,700
know children are great but they're kind

3133
02:11:55,740 --> 02:11:53,740
of naturally curious my thing is always

3134
02:11:58,290 --> 02:11:55,750
with adults the parents that are gonna

3135
02:11:59,790 --> 02:11:58,300
be influencing these child's life for

3136
02:12:01,740 --> 02:11:59,800
the rest of their lives how do you get

3137
02:12:03,660 --> 02:12:01,750
the adults to kind of get out of there

3138
02:12:05,670 --> 02:12:03,670

they're you know stuck in ways because

3139
02:12:07,470 --> 02:12:05,680
they're quite honestly sometimes harder

3140
02:12:10,440 --> 02:12:07,480
than children to influence in that

3141
02:12:12,990 --> 02:12:10,450
manner children you know can be kind of

3142
02:12:14,640 --> 02:12:13,000
more easily influenced what what kind of

3143
02:12:16,500 --> 02:12:14,650
programs do you guys do you do any work

3144
02:12:18,420 --> 02:12:16,510
with adults or you have any insights on

3145
02:12:21,660 --> 02:12:18,430
that we have a program called SEMA and

3146
02:12:24,540 --> 02:12:21,670
it's where we actually have kids to come

3147
02:12:27,000 --> 02:12:24,550
in on the weekend to do we have these

3148
02:12:29,850 --> 02:12:27,010
SEMA sites where the kids do hands-on

3149
02:12:31,380 --> 02:12:29,860
stuff they build robots they have they

3150
02:12:33,330 --> 02:12:31,390
have little weather stations they do

3151
02:12:35,700 --> 02:12:33,340
programming and different things but we

3152
02:12:37,680 --> 02:12:35,710
also bring their parents in and they're

3153
02:12:39,360 --> 02:12:37,690
taking classes and understanding about

3154
02:12:40,560 --> 02:12:39,370
the things that their kids need to be

3155
02:12:42,540 --> 02:12:40,570
scientists and engineers and their

3156
02:12:44,640 --> 02:12:42,550
understanding about what it's like to

3157
02:12:47,220 --> 02:12:44,650
see their kids building a robot and then

3158
02:12:48,810 --> 02:12:47,230
we tell them you can go home and do

3159
02:12:50,370 --> 02:12:48,820
these other types of things you can go

3160
02:12:52,800 --> 02:12:50,380
to our website and acidophilus our

3161
02:12:55,050 --> 02:12:52,810
education and do projects with your kids

3162
02:12:56,940 --> 02:12:55,060
at home and so that's a way that get

3163
02:12:59,100 --> 02:12:56,950

them engaged but also we have other

3164
02:13:02,220 --> 02:12:59,110
outreach programs David we every shop is

3165
02:13:04,800 --> 02:13:02,230
trying to get more community-based type

3166
02:13:07,830 --> 02:13:04,810
things where we have an astronomy night

3167
02:13:10,380 --> 02:13:07,840
and parents and neil degrasse tyson's

3168
02:13:12,270 --> 02:13:10,390
come and you know the whole community

3169
02:13:14,520 --> 02:13:12,280
comes out to see and witness this type

3170
02:13:15,900 --> 02:13:14,530
of activity and so the kids are inspired

3171
02:13:17,940 --> 02:13:15,910
the parents are now starting to

3172
02:13:19,920 --> 02:13:17,950
understand what it means to grow a

3173
02:13:21,330 --> 02:13:19,930
scientist or an engineer and those are

3174
02:13:23,009 --> 02:13:21,340
the types of things I think that will

3175
02:13:24,389 --> 02:13:23,019
help the community and the parent

3176
02:13:26,519 --> 02:13:24,399
to get a better understanding of what

3177
02:13:28,199 --> 02:13:26,529
they need to do for their kids but and

3178
02:13:30,479 --> 02:13:28,209
it takes you guys to spread that message

3179
02:13:33,179 --> 02:13:30,489
to you have parents you have

3180
02:13:35,819 --> 02:13:33,189
grandparents share that message with

3181
02:13:38,879 --> 02:13:35,829
them go talk to a teacher you know those

3182
02:13:50,449 --> 02:13:38,889
are all ways to spread that message all

3183
02:13:55,289 --> 02:13:53,009
well everybody that concludes our NASA

3184
02:13:57,000 --> 02:13:55,299
social for today for the launch of the

3185
02:13:58,829 --> 02:13:57,010
radiation belt storm probes which is

3186
02:14:01,229 --> 02:13:58,839
scheduled to happen tomorrow morning in

3187
02:14:03,449 --> 02:14:01,239
the wee hours on Friday morning at 4:07

3188
02:14:05,129 --> 02:14:03,459

a.m. Eastern Time we hope that you'll

3189
02:14:08,789 --> 02:14:05,139
follow along online by following the

3190
02:14:11,459 --> 02:14:08,799
@nasa or at our bee storm probes twitter

3191
02:14:13,500 --> 02:14:11,469
accounts or you can like us on facebook

3192
02:14:16,500 --> 02:14:13,510
on the nasa or the radiation belt storm

3193
02:14:17,989 --> 02:14:16,510
probes pages or you can follow a nasa by

3194
02:14:20,189 --> 02:14:17,999
putting us in your circle on google +

3195
02:14:21,959 --> 02:14:20,199
make sure to join the conversation or

3196
02:14:24,359 --> 02:14:21,969
follow along using the pound rbsp

3197
02:14:26,609 --> 02:14:24,369
hashtag and for the NASA social event

3198
02:14:28,049 --> 02:14:26,619
the pound NASA social hashtag thank you

3199
02:14:29,519 --> 02:14:28,059
all very much for joining us here today

3200
02:14:30,689 --> 02:14:29,529
and we hope that you've had a great

3201
02:14:32,459 --> 02:14:30,699
experience and learned a little bit more

3202
02:14:34,930 --> 02:14:32,469
about this incredibly interesting