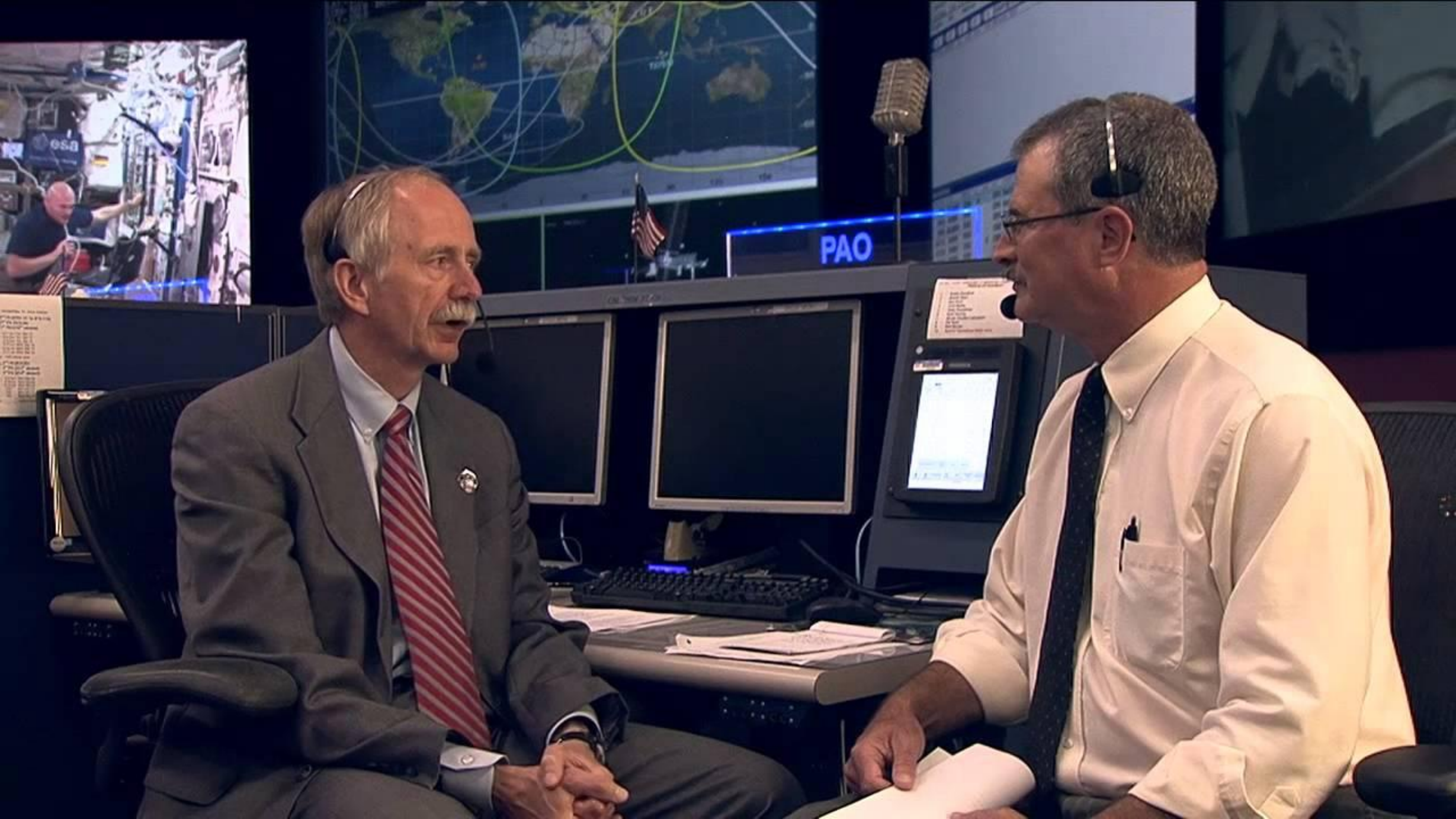
PAO

1
00:00:05,590 --> 00:00:03,510
well the international space station is

2
00:00:07,909 --> 00:00:05,600
helping prepare us to carry out deep

3
00:00:10,230 --> 00:00:07,919
space exploration missions of the future

4
00:00:12,549 --> 00:00:10,240
to destinations like an asteroid and

5
00:00:14,310 --> 00:00:12,559
ultimately to the planet mars

6
00:00:16,230 --> 00:00:14,320
much of that work here at nasa to

7
00:00:17,910 --> 00:00:16,240
prepare for those missions is being done

8
00:00:20,070 --> 00:00:17,920
under the direction and guidance of the

9
00:00:22,390 --> 00:00:20,080
agency's human exploration and

10
00:00:23,750 --> 00:00:22,400
operations directorate which is led by

11
00:00:25,589 --> 00:00:23,760
associate administrator bill

12
00:00:26,790 --> 00:00:25,599
gerstenmaier who joins us here in the

13
00:00:28,390 --> 00:00:26,800

international space station flight

14
00:00:30,310 --> 00:00:28,400
control room this morning

15
00:00:31,669 --> 00:00:30,320
nice to have you here it's great to be

16
00:00:33,190 --> 00:00:31,679
here tell me what you're doing here in

17
00:00:35,030 --> 00:00:33,200
houston park this uh

18
00:00:37,110 --> 00:00:35,040
presentation you're a part of today yeah

19
00:00:39,990 --> 00:00:37,120
i get a chance today to talk to the

20
00:00:42,229 --> 00:00:40,000
teams here in houston about the future

21
00:00:44,310 --> 00:00:42,239
and our plans for exploration um you

22
00:00:45,750 --> 00:00:44,320
know we have many things on it going

23
00:00:47,990 --> 00:00:45,760
right now we have the space station

24
00:00:49,510 --> 00:00:48,000
which is really the first piece of space

25
00:00:51,189 --> 00:00:49,520
station activity or exploration that

26
00:00:54,069 --> 00:00:51,199
we're doing we call that kind of the

27
00:00:56,310 --> 00:00:54,079
earth reliant region as you can see last

28
00:00:58,310 --> 00:00:56,320
week when the crew came up on the soyuz

29
00:01:00,069 --> 00:00:58,320
you know a six-hour jaunt from the earth

30
00:01:02,229 --> 00:01:00,079
to the space station is not too tough

31
00:01:03,670 --> 00:01:02,239
and we get there if we have parts we

32
00:01:05,350 --> 00:01:03,680
need to bring back like the suit that

33
00:01:06,870 --> 00:01:05,360
you described earlier that we were able

34
00:01:09,109 --> 00:01:06,880
to deliver that on the spacex dragon

35
00:01:10,870 --> 00:01:09,119
vehicle but as we think about moving

36
00:01:12,710 --> 00:01:10,880
human presence out into the solar system

37
00:01:14,469 --> 00:01:12,720
we have to start breaking those ties

38
00:01:16,390 --> 00:01:14,479

with the earth so we kind of move from

39
00:01:18,390 --> 00:01:16,400
this earth-reliant region and the space

40
00:01:19,910 --> 00:01:18,400
station and activities that we do there

41
00:01:21,670 --> 00:01:19,920
to a region we're calling the proving

42
00:01:23,429 --> 00:01:21,680
ground of space and that reaches out

43
00:01:25,270 --> 00:01:23,439
somewhere around the moon to kind of the

44
00:01:27,270 --> 00:01:25,280
cis lunar space or the region between

45
00:01:29,510 --> 00:01:27,280
the earth and the moon and the idea

46
00:01:31,270 --> 00:01:29,520
there is to to gain experience in

47
00:01:33,350 --> 00:01:31,280
operating kind of away from the home

48
00:01:34,789 --> 00:01:33,360
planet where it now takes five days

49
00:01:36,469 --> 00:01:34,799
potentially to get back if something

50
00:01:38,149 --> 00:01:36,479
doesn't work right you have to do

51
00:01:39,429 --> 00:01:38,159
rendezvous potentially on the other side

52
00:01:41,270 --> 00:01:39,439
of the moon where you have to do

53
00:01:43,109 --> 00:01:41,280
autonomous rendezvous without the ground

54
00:01:45,429 --> 00:01:43,119
teams being able to watch and monitor

55
00:01:47,030 --> 00:01:45,439
things we also get a chance to look at

56
00:01:49,670 --> 00:01:47,040
news and things like lunar gravity

57
00:01:51,590 --> 00:01:49,680
assist to maneuver spacecraft around

58
00:01:52,950 --> 00:01:51,600
we get a chance to kind of practice

59
00:01:54,550 --> 00:01:52,960
things that you're going to want to go

60
00:01:55,990 --> 00:01:54,560
do when they really become more serious

61
00:01:58,789 --> 00:01:56,000
as you move into kind of this third

62
00:02:00,310 --> 00:01:58,799
region so further even further away

63
00:02:01,749 --> 00:02:00,320

and so if you think about the apollo

64
00:02:03,830 --> 00:02:01,759
program what we did in

65
00:02:05,429 --> 00:02:03,840
mercury and gemini is we did a series of

66
00:02:07,749 --> 00:02:05,439
flights that really prepared us for

67
00:02:10,309 --> 00:02:07,759
apollo we did eva activities to prepare

68
00:02:13,430 --> 00:02:10,319
for those we did rendezvous proximity

69
00:02:15,910 --> 00:02:13,440
operations in both the lunar

70
00:02:17,510 --> 00:02:15,920
vicinity and also on the earth or in the

71
00:02:18,869 --> 00:02:17,520
vicinity of the earth so we need to do

72
00:02:20,550 --> 00:02:18,879
the same things in this proving ground

73
00:02:22,630 --> 00:02:20,560
region of space so that's kind of our

74
00:02:24,390 --> 00:02:22,640
next location we will do that with the

75
00:02:26,150 --> 00:02:24,400
asteroid redirect mission so instead of

76
00:02:28,309 --> 00:02:26,160
going out to an asteroid the intent is

77
00:02:29,990 --> 00:02:28,319
to bring an asteroid back in around the

78
00:02:31,910 --> 00:02:30,000
moon and then allows us to go practice

79
00:02:33,750 --> 00:02:31,920
in this proving ground region of space

80
00:02:35,270 --> 00:02:33,760
then eventually we get to this further

81
00:02:36,949 --> 00:02:35,280
out region which we call essentially

82
00:02:39,350 --> 00:02:36,959
earth independent so by the time we're

83
00:02:41,670 --> 00:02:39,360
there ready to do mars class missions we

84
00:02:43,430 --> 00:02:41,680
need to be really independent of earth

85
00:02:45,270 --> 00:02:43,440
where our crews can really operate we've

86
00:02:47,270 --> 00:02:45,280
got the risk level up we understand the

87
00:02:48,710 --> 00:02:47,280
operations and techniques but the cool

88
00:02:50,869 --> 00:02:48,720

thing is really all this stuff really

89
00:02:53,030 --> 00:02:50,879
starts back at the space station so the

90
00:02:54,949 --> 00:02:53,040
things you talked about today where the

91
00:02:57,589 --> 00:02:54,959
the crews are looking at the

92
00:02:59,589 --> 00:02:57,599
the uh how the biology system of the

93
00:03:01,350 --> 00:02:59,599
human changes in the microgravity

94
00:03:03,910 --> 00:03:01,360
environment that's going to be obviously

95
00:03:06,149 --> 00:03:03,920
important to see how the microbiome of

96
00:03:07,830 --> 00:03:06,159
the of the human changes as you're there

97
00:03:09,350 --> 00:03:07,840
for a year so you want to learn that

98
00:03:11,270 --> 00:03:09,360
here if there's something unique that's

99
00:03:12,869 --> 00:03:11,280
not quite right with the way things work

100
00:03:14,470 --> 00:03:12,879
you want to know now yeah

101
00:03:15,990 --> 00:03:14,480
the crew is working with the veggie

102
00:03:17,750 --> 00:03:16,000
which is interesting you know before

103
00:03:20,149 --> 00:03:17,760
we've we just did

104
00:03:22,390 --> 00:03:20,159
plant research to to grow unique plants

105
00:03:23,990 --> 00:03:22,400
do we understand the genomics of the

106
00:03:25,589 --> 00:03:24,000
plants and we were trying to understand

107
00:03:26,949 --> 00:03:25,599
how to feed ourselves not trying to feed

108
00:03:28,470 --> 00:03:26,959
ourselves so this is the first time

109
00:03:30,550 --> 00:03:28,480
we're actually growing plants with the

110
00:03:32,630 --> 00:03:30,560
intent that we can we can actually eat

111
00:03:34,229 --> 00:03:32,640
these and this will augment the crew's

112
00:03:36,149 --> 00:03:34,239
food supply which will be which will be

113
00:03:37,830 --> 00:03:36,159

intriguing and interesting so it'll be

114
00:03:39,670 --> 00:03:37,840
neat to see the images from station see

115
00:03:41,270 --> 00:03:39,680
how big the plants are growing this time

116
00:03:42,710 --> 00:03:41,280
we'll freeze these these plants will

117
00:03:44,470 --> 00:03:42,720
bring them back to the earth to just

118
00:03:46,390 --> 00:03:44,480
make sure that there's nothing from a

119
00:03:47,910 --> 00:03:46,400
biological standpoint that's occurred at

120
00:03:49,990 --> 00:03:47,920
a plant that would be problems if you

121
00:03:51,830 --> 00:03:50,000
went ahead and ate it so it's it's kind

122
00:03:53,350 --> 00:03:51,840
of one quick check before we do that but

123
00:03:56,550 --> 00:03:53,360
then the crews will essentially now have

124
00:03:57,830 --> 00:03:56,560
potentially a source of fresh vegetables

125
00:04:00,229 --> 00:03:57,840
and lettuce

126
00:04:01,670 --> 00:04:00,239
for there to augment their daily uh diet

127
00:04:03,509 --> 00:04:01,680
which i think will be interesting to the

128
00:04:05,750 --> 00:04:03,519
crews here but absolutely mandatory as

129
00:04:07,670 --> 00:04:05,760
we go on exploration class missions we

130
00:04:09,190 --> 00:04:07,680
try to talk about that a lot and how the

131
00:04:10,789 --> 00:04:09,200
work that's being done on the station is

132
00:04:13,030 --> 00:04:10,799
building towards these other things and

133
00:04:15,509 --> 00:04:13,040
and and it's the other things it's the

134
00:04:17,749 --> 00:04:15,519
going to mars that tends to get people

135
00:04:18,710 --> 00:04:17,759
really excited yeah i think you know

136
00:04:20,390 --> 00:04:18,720
when you

137
00:04:22,870 --> 00:04:20,400
you know some people kind of go well why

138
00:04:25,270 --> 00:04:22,880

mars well part of the reason for mars is

139
00:04:26,870 --> 00:04:25,280
it's it has some basic capabilities of

140
00:04:28,469 --> 00:04:26,880
things that we can use so we don't have

141
00:04:30,870 --> 00:04:28,479
to carry everything with this you know

142
00:04:33,430 --> 00:04:30,880
we it has a carbon dioxide environment

143
00:04:35,270 --> 00:04:33,440
or atmosphere um so we we can

144
00:04:37,350 --> 00:04:35,280
potentially pull oxygen out of the

145
00:04:39,110 --> 00:04:37,360
atmosphere with a like a sabati a

146
00:04:40,390 --> 00:04:39,120
reactor very similar to what we do on

147
00:04:42,790 --> 00:04:40,400
space station

148
00:04:44,550 --> 00:04:42,800
and so we can pull that oxygen out to

149
00:04:46,310 --> 00:04:44,560
compress it and then we have a source of

150
00:04:47,990 --> 00:04:46,320
oxygen to breathe and then also

151
00:04:49,830 --> 00:04:48,000
potentially oxygen was an important

152
00:04:51,350 --> 00:04:49,840
component of rocket fuel to potentially

153
00:04:53,909 --> 00:04:51,360
get you off of mars when it's time to

154
00:04:55,670 --> 00:04:53,919
come home we also know mars has a lot of

155
00:04:58,150 --> 00:04:55,680
moisture if you look at the physic

156
00:05:00,070 --> 00:04:58,160
phoenix lander in the northern poles of

157
00:05:02,390 --> 00:05:00,080
mars there's moisture there water so

158
00:05:04,310 --> 00:05:02,400
we've got water which we can use we also

159
00:05:05,909 --> 00:05:04,320
know there's nitrogen present in the

160
00:05:08,150 --> 00:05:05,919
martian environment that's an important

161
00:05:10,390 --> 00:05:08,160
component of growing food we believe the

162
00:05:12,469 --> 00:05:10,400
martian soil could potentially support

163
00:05:13,749 --> 00:05:12,479

growth of plants we'll maybe get a

164
00:05:15,909 --> 00:05:13,759
chance to look at that in some other

165
00:05:17,590 --> 00:05:15,919
investigations and we have a radiation

166
00:05:19,830 --> 00:05:17,600
monitor now actually on the rover

167
00:05:22,230 --> 00:05:19,840
curiosity rover that runs around and

168
00:05:24,629 --> 00:05:22,240
monitors the daily radiation environment

169
00:05:27,909 --> 00:05:24,639
on the surface of mars so so the point

170
00:05:29,990 --> 00:05:27,919
is mars has many things that we can use

171
00:05:31,510 --> 00:05:30,000
to make our journey tolerable to go

172
00:05:33,029 --> 00:05:31,520
those distances so we don't have to

173
00:05:34,629 --> 00:05:33,039
carry everything with this so we'll

174
00:05:36,390 --> 00:05:34,639
spend the next couple years

175
00:05:38,550 --> 00:05:36,400
investigating things about what we can

176
00:05:40,469 --> 00:05:38,560
use in the martian environment

177
00:05:41,749 --> 00:05:40,479
to to prepare us for eventually going

178
00:05:43,830 --> 00:05:41,759
there so when you when you think about

179
00:05:45,029 --> 00:05:43,840
it we're really kind of moving human

180
00:05:46,950 --> 00:05:45,039
presence from

181
00:05:49,110 --> 00:05:46,960
from the earth essentially into the

182
00:05:50,950 --> 00:05:49,120
solar system in one destination and one

183
00:05:52,230 --> 00:05:50,960
of the first destinations will be mars

184
00:05:53,749 --> 00:05:52,240
after we get through this kind of

185
00:05:55,270 --> 00:05:53,759
proving ground region to make sure we're

186
00:05:57,749 --> 00:05:55,280
really ready to go to commit to those

187
00:05:59,830 --> 00:05:57,759
mars class missions and we need a ship

188
00:06:01,430 --> 00:05:59,840

to get there uh where are we where are

189
00:06:03,270 --> 00:06:01,440
we staying right now in developing the

190
00:06:05,749 --> 00:06:03,280
the spaceship that will take us to mars

191
00:06:07,909 --> 00:06:05,759
yeah this last week was a tremendous

192
00:06:09,670 --> 00:06:07,919
event for the orion capsule they just

193
00:06:11,110 --> 00:06:09,680
attached the heat shield to the bottom

194
00:06:12,710 --> 00:06:11,120
of the capsule and that's the largest

195
00:06:14,390 --> 00:06:12,720
heat shield we've ever flown that

196
00:06:16,950 --> 00:06:14,400
that'll be flown on this

197
00:06:19,270 --> 00:06:16,960
expiration flight test in december of

198
00:06:21,270 --> 00:06:19,280
this year and and progress is moving

199
00:06:23,110 --> 00:06:21,280
really well you go down to the cape and

200
00:06:25,670 --> 00:06:23,120
it's exciting to see a real space

201
00:06:27,270 --> 00:06:25,680
vehicle there it won't have crew on

202
00:06:29,430 --> 00:06:27,280
board and doesn't have life support but

203
00:06:30,950 --> 00:06:29,440
it is it is a really a work of art the

204
00:06:33,189 --> 00:06:30,960
computer systems have all been checked

205
00:06:35,029 --> 00:06:33,199
out it will now the service module is on

206
00:06:36,790 --> 00:06:35,039
it'll get mated excuse me now that this

207
00:06:38,390 --> 00:06:36,800
heat shield is on it'll get mated to the

208
00:06:40,070 --> 00:06:38,400
service module they'll do some

209
00:06:42,469 --> 00:06:40,080
structural testings they'll do some more

210
00:06:44,309 --> 00:06:42,479
final electrical check and then towards

211
00:06:45,909 --> 00:06:44,319
the middle to end of july it's ready to

212
00:06:48,629 --> 00:06:45,919
be turned over to the launch vehicle the

213
00:06:51,029 --> 00:06:48,639

delta iv that'll launch on this fall or

214
00:06:52,950 --> 00:06:51,039
this december so it's a pretty exciting

215
00:06:54,710 --> 00:06:52,960
time for the orion team when i do the

216
00:06:56,710 --> 00:06:54,720
event today mark guyer will be there

217
00:06:59,589 --> 00:06:56,720
representing the orion team and and

218
00:07:00,550 --> 00:06:59,599
they're really excited i think i can see

219
00:07:03,510 --> 00:07:00,560
that

220
00:07:06,469 --> 00:07:03,520
we prepare for a launch and you see

221
00:07:08,550 --> 00:07:06,479
those many years of of work coming to

222
00:07:10,950 --> 00:07:08,560
culmination in in one of these really

223
00:07:13,110 --> 00:07:10,960
major events so this this is this heat

224
00:07:15,189 --> 00:07:13,120
shield performance test and returning at

225
00:07:17,110 --> 00:07:15,199
80 percent of lunar velocity will be a

226
00:07:19,029 --> 00:07:17,120
really dynamic test kind of interesting

227
00:07:21,430 --> 00:07:19,039
to see yeah we're also working on

228
00:07:24,230 --> 00:07:21,440
developing other crew vehicles not to go

229
00:07:26,230 --> 00:07:24,240
to mars but to to closer locations um

230
00:07:27,830 --> 00:07:26,240
where are we right now on those yeah

231
00:07:29,510 --> 00:07:27,840
where we are right now is we're looking

232
00:07:31,189 --> 00:07:29,520
at the next generation of crew

233
00:07:34,150 --> 00:07:31,199
transportation vehicles we have a

234
00:07:35,830 --> 00:07:34,160
procurement out then we have companies

235
00:07:37,510 --> 00:07:35,840
that have given us proposals for that

236
00:07:40,070 --> 00:07:37,520
and teams are off evaluating those

237
00:07:42,629 --> 00:07:40,080
proposals and our intent is to choose a

238
00:07:44,469 --> 00:07:42,639

commercial crew provider sometime in the

239
00:07:47,110 --> 00:07:44,479
august september time frame

240
00:07:48,950 --> 00:07:47,120
that one or one or more

241
00:07:50,790 --> 00:07:48,960
commercial crew providers in the august

242
00:07:52,710 --> 00:07:50,800
september time frame that will

243
00:07:55,510 --> 00:07:52,720
essentially be that next generation of

244
00:07:57,110 --> 00:07:55,520
low earth orbit transport to and from

245
00:08:00,550 --> 00:07:57,120
low earth orbit so

246
00:08:02,390 --> 00:08:00,560
again station is a very unique facility

247
00:08:03,749 --> 00:08:02,400
in the fact that it allowed us to do the

248
00:08:05,670 --> 00:08:03,759
cargo flights that we're seeing now

249
00:08:07,110 --> 00:08:05,680
commercially we acquired those in a very

250
00:08:08,710 --> 00:08:07,120
different way than we have before where

251
00:08:10,230 --> 00:08:08,720
typically nasa owned the vehicle now

252
00:08:12,950 --> 00:08:10,240
we're essentially just buying a service

253
00:08:14,869 --> 00:08:12,960
to transport cargo and then now we'll be

254
00:08:17,189 --> 00:08:14,879
getting ready to go essentially by a

255
00:08:19,270 --> 00:08:17,199
service to transport crew and and it's

256
00:08:21,670 --> 00:08:19,280
an exciting time to see these new

257
00:08:23,029 --> 00:08:21,680
providers come online so bring some new

258
00:08:24,790 --> 00:08:23,039
ideas

259
00:08:26,390 --> 00:08:24,800
take advantage of much of the research

260
00:08:27,909 --> 00:08:26,400
that nasa's done in the past and put it

261
00:08:29,589 --> 00:08:27,919
together in a vehicle that they can use

262
00:08:31,430 --> 00:08:29,599
to service nasa's needs but then they

263
00:08:34,389 --> 00:08:31,440

can also use it for their own needs and

264
00:08:37,190 --> 00:08:34,399
so it's a pretty exciting time and and

265
00:08:39,750 --> 00:08:37,200
station also potentially can be

266
00:08:41,829 --> 00:08:39,760
an innovation engine it can let

267
00:08:43,750 --> 00:08:41,839
commercial companies experiment with

268
00:08:46,150 --> 00:08:43,760
microgravity and see how it can affect

269
00:08:48,470 --> 00:08:46,160
the research that they're doing today so

270
00:08:51,110 --> 00:08:48,480
you know we we know

271
00:08:53,269 --> 00:08:51,120
bacteria mutate differently in space for

272
00:08:55,910 --> 00:08:53,279
some reason so could pharmaceutical

273
00:08:57,030 --> 00:08:55,920
companies use that to be potentially

274
00:08:58,949 --> 00:08:57,040
find new

275
00:09:01,190 --> 00:08:58,959
drugs or new vaccines

276
00:09:02,550 --> 00:09:01,200
so we're trying to expose terrestrial

277
00:09:05,350 --> 00:09:02,560
pharmaceutical companies to the

278
00:09:06,949 --> 00:09:05,360
environment of of space to see if they

279
00:09:09,190 --> 00:09:06,959
can use those unique properties in the

280
00:09:11,030 --> 00:09:09,200
microgravity environment to have them

281
00:09:12,310 --> 00:09:11,040
gain a research advantage over companies

282
00:09:14,550 --> 00:09:12,320
that are not doing research in

283
00:09:16,230 --> 00:09:14,560
microgravity so maybe they will come

284
00:09:18,150 --> 00:09:16,240
online and say we really need to do this

285
00:09:20,150 --> 00:09:18,160
research so then it's not just kind of

286
00:09:21,910 --> 00:09:20,160
the government's pushing research in

287
00:09:23,509 --> 00:09:21,920
space now terrestrial companies have a

288
00:09:25,190 --> 00:09:23,519

real need and they really want to go to

289
00:09:27,670 --> 00:09:25,200
space so we see that in in the

290
00:09:29,509 --> 00:09:27,680
pharmaceutical area we see it in new

291
00:09:31,829 --> 00:09:29,519
drug testing we'll fly some rodents on

292
00:09:33,030 --> 00:09:31,839
spacex the next spacex flight this

293
00:09:34,710 --> 00:09:33,040
summer

294
00:09:36,790 --> 00:09:34,720
and those rodents can be used kind of as

295
00:09:38,389 --> 00:09:36,800
a pass fail test to see if bone loss

296
00:09:40,470 --> 00:09:38,399
medication is effective because we know

297
00:09:41,190 --> 00:09:40,480
our crews lose bone

298
00:09:42,630 --> 00:09:41,200
so

299
00:09:44,470 --> 00:09:42,640
you'll get a very quick answer whether

300
00:09:45,750 --> 00:09:44,480
this drug is effective in controlling

301
00:09:48,470 --> 00:09:45,760
those things so

302
00:09:50,310 --> 00:09:48,480
our job is to expose essentially what we

303
00:09:52,070 --> 00:09:50,320
see every day in space and unique

304
00:09:53,430 --> 00:09:52,080
properties to a much broader community

305
00:09:55,269 --> 00:09:53,440
here on the earth and we use space

306
00:09:57,030 --> 00:09:55,279
station to do that and then they've got

307
00:09:58,870 --> 00:09:57,040
cargo established to their providers and

308
00:10:00,389 --> 00:09:58,880
they'll have crew provided also so then

309
00:10:02,710 --> 00:10:00,399
eventually someday they could have their

310
00:10:04,389 --> 00:10:02,720
own space station as nasa continues to

311
00:10:06,150 --> 00:10:04,399
push that edge and continues to keep

312
00:10:07,910 --> 00:10:06,160
moving humans further and further into

313
00:10:09,910 --> 00:10:07,920

the solar system very exciting to be

314
00:10:11,430 --> 00:10:09,920
part of it too thanks for

315
00:10:12,630 --> 00:10:11,440
giving us a couple of minutes

316
00:10:15,030 --> 00:10:12,640
thank you very much today bill

317
00:10:16,550 --> 00:10:15,040
gerstenmaier is our nasa associate