1
00:00:07,450 --> 00:00:05,349
what would happen if we went to Mars

2
00:00:09,129 --> 00:00:07,460
today well there'd be a little bit of

3
00:00:11,379 --> 00:00:09,139
surprise because we should have left

4
00:00:12,789 --> 00:00:11,389
earth 6 months ago and that's if you're

5
00:00:14,440 --> 00:00:12,799
using nuclear thermal propulsion

6
00:00:17,200 --> 00:00:14,450
capabilities which do not yet exist

7
00:00:19,750 --> 00:00:17,210
today using chemical propulsion like we

8
00:00:21,189 --> 00:00:19,760
have in Rockets today the trip to Mars

9
00:00:23,230 --> 00:00:21,199
would probably be on the order of eight

10
00:00:24,970 --> 00:00:23,240
or nine months during that eight or nine

11
00:00:27,070 --> 00:00:24,980
month time we would be weightless for

12
00:00:28,390 --> 00:00:27,080
that most of the transit time and our

13
00:00:29,609 --> 00:00:28,400

bodies would be accommodating and

14
00:00:31,779 --> 00:00:29,619
adjusting to the weightless environment

15
00:00:34,180 --> 00:00:31,789
there's a possibility we'd be using

16
00:00:35,649 --> 00:00:34,190
artificial gravity on the trip and if we

17
00:00:37,180 --> 00:00:35,659
did that we might be rotating our

18
00:00:38,860 --> 00:00:37,190
spacecraft or at least a large part of

19
00:00:40,570 --> 00:00:38,870
the spacecraft so we would have spent

20
00:00:43,060 --> 00:00:40,580
the last six or eight or nine months

21
00:00:45,369 --> 00:00:43,070
actually rotating head-over-heels in an

22
00:00:47,410 --> 00:00:45,379
artificial gravity centrifuge several

23
00:00:48,850 --> 00:00:47,420
times each minute either way our bodies

24
00:00:51,070 --> 00:00:48,860
will have adjusted to that environment

25
00:00:53,500 --> 00:00:51,080
and when we land on Mars we'll have to

26
00:00:55,450 --> 00:00:53,510
accommodate to the new stationary one

27
00:00:57,910 --> 00:00:55,460
third of a G environment of the surface

28
00:00:59,740 --> 00:00:57,920
of Mars we're going to be on Mars for 18

29
00:01:01,380 --> 00:00:59,750
months according to our design reference

30
00:01:04,630 --> 00:01:01,390
mission nASA has put together a

31
00:01:06,969 --> 00:01:04,640
standardized mission plan for going to

32
00:01:08,830 --> 00:01:06,979
Mars not an official plan but a strawman

33
00:01:09,970 --> 00:01:08,840
plan that allows all the different

34
00:01:11,380 --> 00:01:09,980
organizations all the different

35
00:01:13,420 --> 00:01:11,390
engineers and scientists working on

36
00:01:15,310 --> 00:01:13,430
trips to Mars to work toward the same

37
00:01:17,440 --> 00:01:15,320
mission design so we know how many

38
00:01:20,020 --> 00:01:17,450

months in transit how many months on the

39
00:01:22,240 --> 00:01:20,030
planet how many months coming back those

40
00:01:24,970 --> 00:01:22,250
18 months on Mars will be the busiest

41
00:01:26,980 --> 00:01:24,980
time of our happy little crew of our

42
00:01:29,020 --> 00:01:26,990
lives we will be working as productively

43
00:01:31,450 --> 00:01:29,030
as we possibly can on the surface of

44
00:01:32,980 --> 00:01:31,460
Mars to justify the expense of the

45
00:01:34,840 --> 00:01:32,990
mission and it will be a large expense

46
00:01:37,480 --> 00:01:34,850
spread across several space agencies

47
00:01:39,850 --> 00:01:37,490
around the world so that we are able to

48
00:01:41,830 --> 00:01:39,860
produce results that will allow future

49
00:01:44,830 --> 00:01:41,840
missions to fly results that are so

50
00:01:46,810 --> 00:01:44,840
interesting and so so valuable that

51
00:01:48,940 --> 00:01:46,820
future missions will be will be funded

52
00:01:51,250 --> 00:01:48,950
and sent to do subsequent missions to

53
00:01:52,990 --> 00:01:51,260
Mars and then after the sixth after the

54
00:01:54,820 --> 00:01:53,000
eighteen months on the planet there will

55
00:01:56,860 --> 00:01:54,830
be a six-month transit coming back to

56
00:01:59,530 --> 00:01:56,870
earth so what would happen if we landed

57
00:02:01,180 --> 00:01:59,540
on Mars today we would see outside of

58
00:02:04,000 --> 00:02:01,190
our window of you very much like this a

59
00:02:07,000 --> 00:02:04,010
red landscape with a substantial amount

60
00:02:09,249 --> 00:02:07,010
of relief to it and a lot of prospects

61
00:02:11,290 --> 00:02:09,259
for for exploration as we understand the

62
00:02:12,309 --> 00:02:11,300
planet but we would not see is something

63
00:02:14,140 --> 00:02:12,319

that looks like this

64
00:02:16,870 --> 00:02:14,150
this is a scene that astronauts see now

65
00:02:18,310 --> 00:02:16,880
after six months in transit and as

66
00:02:20,380 --> 00:02:18,320
bass craft after they land on a

67
00:02:22,330 --> 00:02:20,390
planetary surface the spacecraft is the

68
00:02:24,430 --> 00:02:22,340
International Space Station and the

69
00:02:25,660 --> 00:02:24,440
planetary surface of course is the earth

70
00:02:27,700 --> 00:02:25,670
you can notice immediately the

71
00:02:29,920 --> 00:02:27,710
differences in color earth is I got a

72
00:02:31,510 --> 00:02:29,930
lot more green to it than Mars does here

73
00:02:35,260 --> 00:02:31,520
even in the steppes of Kazakhstan this

74
00:02:37,210 --> 00:02:35,270
was just a few months ago in June when

75
00:02:39,220 --> 00:02:37,220
this particular astronaut crew was able

76
00:02:41,170 --> 00:02:39,230
to land successfully after the Space

77
00:02:43,540 --> 00:02:41,180
Station mission we have recovery

78
00:02:45,940 --> 00:02:43,550
vehicles on the horizon poised to bring

79
00:02:47,560 --> 00:02:45,950
a lot of rescue personnel to the landing

80
00:02:49,750 --> 00:02:47,570
site to help the astronauts make the

81
00:02:52,120 --> 00:02:49,760
transition from their spacecraft just

82
00:02:54,460 --> 00:02:52,130
off screen left right here into a

83
00:02:56,980 --> 00:02:54,470
medical facility an inflatable tent off

84
00:02:58,480 --> 00:02:56,990
to screen to the left and in fact

85
00:03:00,100 --> 00:02:58,490
there's a lot of people here that you

86
00:03:02,020 --> 00:03:00,110
would not see on Mars what you would see

87
00:03:04,030 --> 00:03:02,030
on Mars is not just a single astronaut

88
00:03:05,770 --> 00:03:04,040

but probably five or six astronauts this

89
00:03:07,960 --> 00:03:05,780
group of people right in the middle each

90
00:03:10,570 --> 00:03:07,970
of them requiring the support of others

91
00:03:12,310 --> 00:03:10,580
just as that single astronaut does in

92
00:03:14,050 --> 00:03:12,320
the scene and imagine the number of

93
00:03:16,360 --> 00:03:14,060
people for three astronauts in this

94
00:03:18,790 --> 00:03:16,370
landing there's lots of people required

95
00:03:20,350 --> 00:03:18,800
for a typical landing on the on the

96
00:03:22,420 --> 00:03:20,360
earth one of the issues that this

97
00:03:25,390 --> 00:03:22,430
astronaut is confronting in this picture

98
00:03:27,280 --> 00:03:25,400
is a ballast disturbance he's his the

99
00:03:29,230 --> 00:03:27,290
organs of balance and his inner ear have

100
00:03:31,120 --> 00:03:29,240
become accustomed to the weightlessness

101
00:03:32,890 --> 00:03:31,130
of space flight and he's not as

102
00:03:36,160 --> 00:03:32,900
confident standing up and moving around

103
00:03:37,990 --> 00:03:36,170
as he was before flight in that medical

104
00:03:40,120 --> 00:03:38,000
tent after a brief checkup we'll be

105
00:03:42,670 --> 00:03:40,130
asking him and his colleagues to do a

106
00:03:45,760 --> 00:03:42,680
very simple stereo lie of stereotyped

107
00:03:47,590 --> 00:03:45,770
kind of set of measurements that mimic

108
00:03:50,050 --> 00:03:47,600
the activities an astronaut might well

109
00:03:51,910 --> 00:03:50,060
be doing immediately after arriving on

110
00:03:54,190 --> 00:03:51,920
the surface of Mars things as simple as

111
00:03:56,380 --> 00:03:54,200
unassisted standing up from a seated

112
00:03:58,210 --> 00:03:56,390
position at a chair standing up from

113
00:04:00,420 --> 00:03:58,220

from flat on the floor as if they had

114
00:04:02,800 --> 00:04:00,430
accidentally stumbled and fallen on Mars

115
00:04:05,199 --> 00:04:02,810
moving weights around moving large

116
00:04:08,050 --> 00:04:05,209
objects around a short distance and even

117
00:04:10,330 --> 00:04:08,060
the heel to toe walk that is a very good

118
00:04:14,380 --> 00:04:10,340
indicator of integrated sensory motor

119
00:04:17,140 --> 00:04:14,390
function those those studies that are

120
00:04:19,300 --> 00:04:17,150
done right now on spacecraft on Soyuz

121
00:04:21,430 --> 00:04:19,310
crews that land back on the earth are

122
00:04:23,380 --> 00:04:21,440
providing information to future

123
00:04:25,750 --> 00:04:23,390
spacecraft designers both for Mars

124
00:04:27,340 --> 00:04:25,760
Landers and for Mars habitats so they

125
00:04:29,350 --> 00:04:27,350
will know how to design their vehicles

126
00:04:30,680 --> 00:04:29,360
to provide the best of support and care

127
00:04:32,720 --> 00:04:30,690
for astronauts in this

128
00:04:35,200 --> 00:04:32,730
awkward phase of transition from

129
00:04:38,270 --> 00:04:35,210
weightlessness to Mars surface gravity

130
00:04:40,970 --> 00:04:38,280
this particular image illustrates visual

131
00:04:42,470 --> 00:04:40,980
testing because we have recently over

132
00:04:45,440 --> 00:04:42,480
the last several years identified

133
00:04:46,850 --> 00:04:45,450
changes in visual acuity as a problem

134
00:04:48,920 --> 00:04:46,860
astronauts have in long-duration

135
00:04:49,700 --> 00:04:48,930
spaceflight it comes on very gradually

136
00:04:51,860 --> 00:04:49,710
very slowly

137
00:04:54,620 --> 00:04:51,870
it was probably there even on shorter

138
00:04:56,170 --> 00:04:54,630

flights back in the shuttle era and the

139
00:04:58,490 --> 00:04:56,180
extended time on the space station

140
00:05:01,760 --> 00:04:58,500
simply allows it to become more fully

141
00:05:03,770 --> 00:05:01,770
expressed that it may be related to a

142
00:05:06,050 --> 00:05:03,780
change in the cardiovascular system I

143
00:05:08,240 --> 00:05:06,060
mentioned earlier the cardiovascular

144
00:05:10,790 --> 00:05:08,250
system is of course full of the body's

145
00:05:12,680 --> 00:05:10,800
fluids especially the blood the blood

146
00:05:14,510 --> 00:05:12,690
does shift in the upper and the body

147
00:05:16,340 --> 00:05:14,520
from the lower body into the upper body

148
00:05:18,410 --> 00:05:16,350
actually what it does is equilibrating

149
00:05:20,000 --> 00:05:18,420
the absence of gravity so it is more

150
00:05:22,070 --> 00:05:20,010
evenly distributed up and down the

151
00:05:24,410 --> 00:05:22,080
body's long axis but that has the net

152
00:05:26,600 --> 00:05:24,420
result of being an increase in in body

153
00:05:28,040 --> 00:05:26,610
fluid in the upper part of the body the

154
00:05:30,200 --> 00:05:28,050
upper part of the body is where the head

155
00:05:32,240 --> 00:05:30,210
is in the brain and there's increased

156
00:05:33,890 --> 00:05:32,250
filling of the head and the brain and

157
00:05:35,840 --> 00:05:33,900
perhaps an increased pressure in the

158
00:05:38,180 --> 00:05:35,850
upper part of the body that pressure has

159
00:05:40,400 --> 00:05:38,190
to go somewhere and it tries to find

160
00:05:43,220 --> 00:05:40,410
places to go including along the optic

161
00:05:44,840 --> 00:05:43,230
nerve tracts those are the tracks the of

162
00:05:47,060 --> 00:05:44,850
the optic nerves from the brain to the

163
00:05:49,040 --> 00:05:47,070

eye and if it does that then perhaps

164
00:05:52,340 --> 00:05:49,050
it's pushing against the eyeball and

165
00:05:54,380 --> 00:05:52,350
flattening the eyeball somewhat changing

166
00:05:55,670 --> 00:05:54,390
the focal length of the eye and causing

167
00:05:59,870 --> 00:05:55,680
the astronauts to have visual

168
00:06:01,850 --> 00:05:59,880
disturbances such as a decreasing near

169
00:06:04,280 --> 00:06:01,860
vision capability it's more or less like

170
00:06:06,500 --> 00:06:04,290
they've lost a lot of their nerve visual

171
00:06:08,240 --> 00:06:06,510
a near field of visual accomodation

172
00:06:10,820 --> 00:06:08,250
ability and they're they're more

173
00:06:12,800 --> 00:06:10,830
farsighted than they were before this is

174
00:06:14,060 --> 00:06:12,810
of only a little bit of a nuisance on

175
00:06:15,500 --> 00:06:14,070
the space station except when you're

176
00:06:17,150 --> 00:06:15,510
trying to do some close-up work like

177
00:06:19,460 --> 00:06:17,160
reading your checklist like say for a

178
00:06:21,680 --> 00:06:19,470
Soyuz landing but we don't know if it's

179
00:06:23,360 --> 00:06:21,690
going to continue to get worse on longer

180
00:06:24,590 --> 00:06:23,370
missions beyond low-earth orbit and

181
00:06:26,900 --> 00:06:24,600
especially longer missions and

182
00:06:28,190 --> 00:06:26,910
weightlessness so we're studying the

183
00:06:30,590 --> 00:06:28,200
phenomenon today on the space station

184
00:06:32,990 --> 00:06:30,600
and we're also evaluating some of the

185
00:06:34,700 --> 00:06:33,000
mechanisms behind it it may be that this

186
00:06:36,260 --> 00:06:34,710
fluid shift is actually the cause of

187
00:06:38,330 --> 00:06:36,270
this and if that's the case then it

188
00:06:40,490 --> 00:06:38,340

makes sense that reversing the fluid

189
00:06:43,370 --> 00:06:40,500
shift might alleviate the symptoms and

190
00:06:43,950 --> 00:06:43,380
and cause the eye to resume resume it's

191
00:06:46,439 --> 00:06:43,960
more

192
00:06:49,560 --> 00:06:46,449
spiracle shape so we're using a Russian

193
00:06:51,270 --> 00:06:49,570
device to redistribute the body's fluids

194
00:06:53,100 --> 00:06:51,280
as if the individual is standing up

195
00:06:55,140 --> 00:06:53,110
under Earth's normal gravity the Russian

196
00:06:57,180 --> 00:06:55,150
device is called Jebus it's a lower body

197
00:06:59,129 --> 00:06:57,190
negative pressure device and it's just

198
00:07:00,510 --> 00:06:59,139
what it sounds like it applies a slight

199
00:07:02,879 --> 00:07:00,520
negative pressure to the lower body

200
00:07:05,730 --> 00:07:02,889
allowing the fluids to redistribute in a

201
00:07:07,980 --> 00:07:05,740
normal manner typical for life on earth

202
00:07:10,080 --> 00:07:07,990
under a gravity field if measurements

203
00:07:12,240 --> 00:07:10,090
like this one and others indicate a

204
00:07:14,279 --> 00:07:12,250
return to normal visual function and

205
00:07:15,779 --> 00:07:14,289
other measurements indicate a change in

206
00:07:18,300 --> 00:07:15,789
the fluid distribution that might be a

207
00:07:20,790 --> 00:07:18,310
hint as to the right path to proceed for

208
00:07:24,110 --> 00:07:20,800
changes for the visual acuity changes in

209
00:07:26,010 --> 00:07:24,120
a current long-duration space flight

210
00:07:28,230 --> 00:07:26,020
another issue of long-duration

211
00:07:31,260 --> 00:07:28,240
spaceflight may well be bouts of

212
00:07:33,540 --> 00:07:31,270
loneliness and isolation the six

213
00:07:35,999 --> 00:07:33,550

astronauts if there are six on the Mars

214
00:07:37,560 --> 00:07:36,009
mission will be the only people on that

215
00:07:38,879 --> 00:07:37,570
mission and when they land on Mars

216
00:07:41,640 --> 00:07:38,889
they're going to be the only people on

217
00:07:44,850 --> 00:07:41,650
the entire planet of Mars they will be

218
00:07:46,589 --> 00:07:44,860
they will be isolated as no humans have

219
00:07:49,500 --> 00:07:46,599
ever been isolated before and they will

220
00:07:52,080 --> 00:07:49,510
also be as autonomous as reliant on

221
00:07:53,700 --> 00:07:52,090
themselves as anybody has ever been yes

222
00:07:57,029 --> 00:07:53,710
they will have infrastructure provided

223
00:07:58,830 --> 00:07:57,039
by the by the national space agencies

224
00:08:01,140 --> 00:07:58,840
that funded their travel there there

225
00:08:04,140 --> 00:08:01,150
will be vehicles waiting for them on

226
00:08:06,629 --> 00:08:04,150
Mars with habitats and life support

227
00:08:08,279 --> 00:08:06,639
systems and and there will be everybody

228
00:08:10,080 --> 00:08:08,289
in Mission Control and multiple mission

229
00:08:12,360 --> 00:08:10,090
controls around the world plus all of us

230
00:08:14,700 --> 00:08:12,370
back on earth rooting for them but when

231
00:08:17,879 --> 00:08:14,710
it comes to the final analysis we're all

232
00:08:19,020 --> 00:08:17,889
tens of minutes away by radio because of

233
00:08:20,520 --> 00:08:19,030
the distance between the Earth and Mars

234
00:08:22,820 --> 00:08:20,530
and so the astronauts will really be

235
00:08:25,339 --> 00:08:22,830
working by themselves on their own

236
00:08:29,070 --> 00:08:25,349
supporting each other and this very

237
00:08:30,839 --> 00:08:29,080
stressful highly autonomous setting they

238
00:08:32,279 --> 00:08:30,849

will be trained to work with each other

239
00:08:34,589 --> 00:08:32,289
to understand the problems and

240
00:08:35,819 --> 00:08:34,599
psychological problems of of isolation

241
00:08:38,219 --> 00:08:35,829
and confinement and long-distance

242
00:08:40,050 --> 00:08:38,229
spaceflight and I'm sure they'll be well

243
00:08:42,089 --> 00:08:40,060
selected and very well prepared to do

244
00:08:44,460 --> 00:08:42,099
this but there will be support from from

245
00:08:46,560 --> 00:08:44,470
back on earth to make sure that they are

246
00:08:49,760 --> 00:08:46,570
able to overcome whatever challenges are

247
00:08:51,560 --> 00:08:49,770
presented to them when when time permits

248
00:08:52,639 --> 00:08:51,570
I've mentioned a few of the problems

249
00:08:54,230 --> 00:08:52,649
that have occurred in long-duration

250
00:08:56,360 --> 00:08:54,240
spaceflight the problems that we're

251
00:08:58,880 --> 00:08:56,370
studying on on the one-year ISS mission

252
00:09:01,100 --> 00:08:58,890
we also have the effect of isolation and

253
00:09:03,230 --> 00:09:01,110
increased radiation and low Earth orbit

254
00:09:06,440 --> 00:09:03,240
on the immune system we have changes in

255
00:09:09,500 --> 00:09:06,450
the and the flora and the bacteria that

256
00:09:11,720 --> 00:09:09,510
inhabit our gut so that allows us to

257
00:09:14,269 --> 00:09:11,730
metabolize nutrients in a healthy manner

258
00:09:15,740 --> 00:09:14,279
we have the loss of muscles and bone

259
00:09:17,780 --> 00:09:15,750
capacity and long duration

260
00:09:19,460 --> 00:09:17,790
weightlessness we think we have a good

261
00:09:21,110 --> 00:09:19,470
solution to that that involves exercise

262
00:09:23,660 --> 00:09:21,120
especially resistive exercise

263
00:09:25,519 --> 00:09:23,670

zero-gravity weightlifting but the

264
00:09:27,949 --> 00:09:25,529
problem now seems to be or the problem

265
00:09:29,810 --> 00:09:27,959
now is one of repackaging the systems

266
00:09:32,420 --> 00:09:29,820
that are that seem to be working well on

267
00:09:35,389 --> 00:09:32,430
the space station for use in a much more

268
00:09:38,150 --> 00:09:35,399
compact form on the on a Mars vehicle

269
00:09:40,220 --> 00:09:38,160
and we also have the issue of human

270
00:09:42,949 --> 00:09:40,230
factors aspects of the spaceflight such

271
00:09:45,079 --> 00:09:42,959
as diminished fine motor skills that is

272
00:09:46,820 --> 00:09:45,089
how does one manipulate delicate

273
00:09:48,230 --> 00:09:46,830
instruments and controls and switches

274
00:09:51,199 --> 00:09:48,240
and things like that

275
00:09:53,090 --> 00:09:51,209
if the sensory motor system and the body

276
00:09:54,530 --> 00:09:53,100
have adapted to the altered gravity

277
00:09:58,579 --> 00:09:54,540
environment of Mars and the altered

278
00:10:00,019 --> 00:09:58,589
gravity environment of spaceflight so

279
00:10:02,930 --> 00:10:00,029
we're one half of the way through our

280
00:10:06,199 --> 00:10:02,940
one-year expedition above Earth in the

281
00:10:08,810 --> 00:10:06,209
ISS and this is a chance for us to test

282
00:10:10,579 --> 00:10:08,820
our test ourselves have we done our

283
00:10:12,199 --> 00:10:10,589
homework well have we learned the

284
00:10:13,940 --> 00:10:12,209
lessons from previous missions on the

285
00:10:15,680 --> 00:10:13,950
International Space Station from

286
00:10:17,329 --> 00:10:15,690
previous missions on the Russian space

287
00:10:19,880 --> 00:10:17,339
station Mir and from a string of

288
00:10:21,860 --> 00:10:19,890

successful Salyut missions the Russians

289
00:10:23,840 --> 00:10:21,870
flew have we learned our lessons from

290
00:10:26,540 --> 00:10:23,850
the American Skylab space station back

291
00:10:29,900 --> 00:10:26,550
in the 1970s and from all other human

292
00:10:31,910 --> 00:10:29,910
space flights the chance to test

293
00:10:33,980 --> 00:10:31,920
ourselves by doing a one-year mission is

294
00:10:36,350 --> 00:10:33,990
the chance to see whether the lessons

295
00:10:38,030 --> 00:10:36,360
we've learned so far and the predictions

296
00:10:40,819 --> 00:10:38,040
we've made based on missions up until

297
00:10:43,280 --> 00:10:40,829
now are met by the by the results from

298
00:10:46,250 --> 00:10:43,290
upcoming of days and months in the

299
00:10:48,199 --> 00:10:46,260
one-year ISS mission astronaut scott

300
00:10:50,930 --> 00:10:48,209
kelly and his russian one-year mission

301
00:10:52,550 --> 00:10:50,940
counterpart mikhail kornienko and their

302
00:10:53,360 --> 00:10:52,560
crewmates on the international space

303
00:10:55,880 --> 00:10:53,370
station right now

304
00:10:58,579 --> 00:10:55,890
and other astronauts past and future and

305
00:11:01,120 --> 00:10:58,589
in fact all of us that are working on

306
00:11:03,500 --> 00:11:01,130
their programs here on the earth are

307
00:11:05,810 --> 00:11:03,510
trying to solve the problems of law

308
00:11:07,460 --> 00:11:05,820
long-duration spaceflight and the

309
00:11:12,170 --> 00:11:07,470
one-year mission is a chance for us to

310
00:11:13,730 --> 00:11:12,180
do exactly that if we are successful in

311
00:11:16,370 --> 00:11:13,740
solving these problems of long-duration

312
00:11:18,800 --> 00:11:16,380
spaceflight future missions will be able

313
00:11:21,050 --> 00:11:18,810

to proceed with confidence and the

314
00:11:22,790 --> 00:11:21,060
because secure the knowledge that they

315
00:11:24,290 --> 00:11:22,800
know what to expect at least based on

316
00:11:26,750 --> 00:11:24,300
our experience on the space station so

317
00:11:28,910 --> 00:11:26,760
far and of course there'll be a better

318
00:11:30,430 --> 00:11:28,920
position to respond to new challenges

319
00:11:32,870 --> 00:11:30,440
that we have not yet been able to

320
00:11:34,460 --> 00:11:32,880
predict and respond to those

321
00:11:37,850 --> 00:11:34,470
successfully so that their missions are

322
00:11:41,120 --> 00:11:37,860
successful and effective and productive

323
00:11:43,010 --> 00:11:41,130
our goal is to provide the astronauts

324
00:11:47,180 --> 00:11:43,020
that land on Mars to make them as as

325
00:11:49,790 --> 00:11:47,190
safe and healthy and as productive and

326
00:11:50,990 --> 00:11:49,800
efficient and as happy as possible that

327
00:11:55,370 --> 00:11:51,000
is the work that we're doing on the

328
00:11:56,630 --> 00:11:55,380
International Space Station today for