
GOOD DESIGN AWARD 2016
GOLD
AWARD
JAXA

1
00:00:08,629 --> 00:00:03,429
station this is houston are you ready

2
00:00:13,669 --> 00:00:10,470
houston this is the international space

3
00:00:15,669 --> 00:00:13,679
station we are ready for the event

4
00:00:23,109 --> 00:00:15,679
cnn this is mission control houston

5
00:00:23,119 --> 00:00:30,790
and good morning station this is

6
00:00:34,630 --> 00:00:32,549
hello this is mike fossum on the space

7
00:00:36,310 --> 00:00:34,640
station i can hear you it's a little bit

8
00:00:39,510 --> 00:00:36,320
uh a little bit garbled but i can make

9
00:00:39,520 --> 00:00:43,430
well hopefully you can hear

10
00:00:48,630 --> 00:00:44,470
this an me

11
00:00:53,590 --> 00:00:51,990
yes it's an okay connection

12
00:00:55,430 --> 00:00:53,600
all right roger that well let's get

13
00:00:57,350 --> 00:00:55,440

rolling i know you have a busy morning

14
00:00:59,029 --> 00:00:57,360
uh here's my question it's so nice to

15
00:01:02,069 --> 00:00:59,039
meet you you've been in space you've

16
00:01:07,590 --> 00:01:02,079
been on the iss since june do you miss

17
00:01:11,590 --> 00:01:09,510
there are certainly times when you miss

18
00:01:13,030 --> 00:01:11,600
gravity particularly when you drop

19
00:01:15,510 --> 00:01:13,040
something when you lose something up

20
00:01:17,429 --> 00:01:15,520
here on earth you get used to

21
00:01:19,190 --> 00:01:17,439
things that that get away from you

22
00:01:21,590 --> 00:01:19,200
falling down by your feet and so you'll

23
00:01:23,749 --> 00:01:21,600
look around the floor in the immediate

24
00:01:25,749 --> 00:01:23,759
area up here they don't fall down they

25
00:01:27,830 --> 00:01:25,759
can fall in any direction and they don't

26
00:01:30,710 --> 00:01:27,840
stop when they hit a surface they're

27
00:01:32,710 --> 00:01:30,720
more likely to bounce than to lodge so

28
00:01:35,190 --> 00:01:32,720
they can sometimes bounce a long ways

29
00:01:38,950 --> 00:01:35,200
and that's a frustrating thing at times

30
00:01:40,390 --> 00:01:38,960
to chase down the stuff you lose

31
00:01:42,389 --> 00:01:40,400
yeah i guess you got to watch watch

32
00:01:44,469 --> 00:01:42,399
where you're looking so mike here's my

33
00:01:45,830 --> 00:01:44,479
question with regard to the iss i know

34
00:01:47,910 --> 00:01:45,840
you're one of three crew members up

35
00:01:50,389 --> 00:01:47,920
there right now so far russia has

36
00:01:51,510 --> 00:01:50,399
grounded the soyuz they're working on a

37
00:01:53,510 --> 00:01:51,520
fix

38
00:02:00,709 --> 00:01:53,520

hoping for a launch in a couple of days

39
00:02:07,030 --> 00:02:03,590
we're fine we have our we arrived on the

40
00:02:09,190 --> 00:02:07,040
soyuz rocket in uh june like you said

41
00:02:11,110 --> 00:02:09,200
and the the problem is with the boosters

42
00:02:13,110 --> 00:02:11,120
for launch and there was a failure of

43
00:02:16,150 --> 00:02:13,120
that booster on one of the last launches

44
00:02:17,910 --> 00:02:16,160
of the cargo progress cargo or the uh

45
00:02:19,670 --> 00:02:17,920
it was a progress cargo vehicle but it

46
00:02:21,589 --> 00:02:19,680
launches on the essentially the same

47
00:02:24,070 --> 00:02:21,599
rocket the soyuz rocket the same one

48
00:02:25,910 --> 00:02:24,080
that we rode to orbit we don't use that

49
00:02:27,430 --> 00:02:25,920
part of the rocket for the ride home

50
00:02:29,270 --> 00:02:27,440
it's a much different

51
00:02:32,869 --> 00:02:29,280
much different game going home so our

52
00:02:34,150 --> 00:02:32,879
ship is fine and there are no no similar

53
00:02:35,910 --> 00:02:34,160
components

54
00:02:37,270 --> 00:02:35,920
related to that failure for our ride

55
00:02:39,350 --> 00:02:37,280
home so we'll be

56
00:02:41,990 --> 00:02:39,360
planning to go home in about a month and

57
00:02:43,990 --> 00:02:42,000
there's no changes with that what could

58
00:02:46,309 --> 00:02:44,000
change potentially is we're scheduled to

59
00:02:48,869 --> 00:02:46,319
have another cargo ship launch

60
00:02:51,030 --> 00:02:48,879
in a few days and we're watching that

61
00:02:53,030 --> 00:02:51,040
very closely because it uses the soyuz

62
00:02:55,270 --> 00:02:53,040
rocket and that of course is in

63
00:02:57,589 --> 00:02:55,280

preparation for the next soyuz launch in

64
00:02:59,910 --> 00:02:57,599
about three weeks with the next

65
00:03:01,430 --> 00:02:59,920
three-person crew to come up here and

66
00:03:03,350 --> 00:03:01,440
for us to get some handover time with

67
00:03:05,110 --> 00:03:03,360
them so we're watching it very close

68
00:03:07,910 --> 00:03:05,120
it's a tight schedule but we're working

69
00:03:10,869 --> 00:03:07,920
hard to meet it up here and certainly on

70
00:03:16,070 --> 00:03:13,190
help us understand sort of morning noon

71
00:03:19,270 --> 00:03:16,080
and night what sort of experiments

72
00:03:23,509 --> 00:03:19,280
you all are are undergoing on the iss

73
00:03:26,789 --> 00:03:25,430
oh sure we can we could talk about that

74
00:03:29,350 --> 00:03:26,799
for a long time there's a lot of

75
00:03:31,190 --> 00:03:29,360
different experiments that are going on

76
00:03:32,630 --> 00:03:31,200
all the time and around the clock some

77
00:03:34,630 --> 00:03:32,640
of the experiments

78
00:03:36,390 --> 00:03:34,640
involve us and we're the guinea pigs

79
00:03:38,550 --> 00:03:36,400
here in the microgravity environment and

80
00:03:41,350 --> 00:03:38,560
we're doing different exercise routines

81
00:03:44,390 --> 00:03:41,360
and medications to combat a particularly

82
00:03:46,470 --> 00:03:44,400
bone loss muscle uh muscle atrophy those

83
00:03:49,270 --> 00:03:46,480
kind of things the deterioration of the

84
00:03:51,270 --> 00:03:49,280
cardiovascular system and so we're the

85
00:03:53,589 --> 00:03:51,280
guinea pigs to to look at that some of

86
00:03:56,149 --> 00:03:53,599
these are related to longer duration

87
00:03:58,229 --> 00:03:56,159
human space flight like the trip to mars

88
00:04:00,470 --> 00:03:58,239

we hope to make some day

89
00:04:02,229 --> 00:04:00,480
and it's also related to bone loss of

90
00:04:04,470 --> 00:04:02,239
course and and muscle atrophy and those

91
00:04:06,869 --> 00:04:04,480
things are related to diseases and the

92
00:04:09,030 --> 00:04:06,879
progression of age on earth up here the

93
00:04:11,509 --> 00:04:09,040
aging process for our bones takes place

94
00:04:13,030 --> 00:04:11,519
in in weeks and months instead of years

95
00:04:15,030 --> 00:04:13,040
and so we're looking at the same kind of

96
00:04:16,229 --> 00:04:15,040
things that you know about on earth for

97
00:04:17,670 --> 00:04:16,239
combating that

98
00:04:19,270 --> 00:04:17,680
there are a lot of other experiments

99
00:04:21,189 --> 00:04:19,280
that go on and they range from very

100
00:04:23,909 --> 00:04:21,199
interactive ones where we're

101
00:04:25,030 --> 00:04:23,919
involved with hands-on and eyes on the

102
00:04:26,629 --> 00:04:25,040
experiment

103
00:04:28,230 --> 00:04:26,639
basically the hands

104
00:04:30,629 --> 00:04:28,240
and eyes of the researchers on the

105
00:04:33,189 --> 00:04:30,639
ground there's others where we

106
00:04:34,950 --> 00:04:33,199
essentially change out samples where

107
00:04:37,110 --> 00:04:34,960
there's a furnaces that are going on

108
00:04:39,670 --> 00:04:37,120
that are doing materials processing and

109
00:04:41,990 --> 00:04:39,680
our job is to service those experiments

110
00:04:45,030 --> 00:04:42,000
they're all closed and sealed during the

111
00:04:47,510 --> 00:04:45,040
actual conduct of the science experiment

112
00:04:49,830 --> 00:04:47,520
but they need us up here to to change

113
00:04:52,230 --> 00:04:49,840

out the samples to change out the fuel

114
00:04:54,469 --> 00:04:52,240
canisters you know and things like that

115
00:04:56,150 --> 00:04:54,479
to start the plants growing to

116
00:04:58,629 --> 00:04:56,160
clean out and

117
00:05:02,310 --> 00:04:58,639
reset the centrifuges

118
00:05:06,310 --> 00:05:04,150
okay so given all of that i imagine

119
00:05:08,710 --> 00:05:06,320
you're pretty busy up there but i'm sure

120
00:05:10,390 --> 00:05:08,720
you can keep up what's happening back

121
00:05:12,150 --> 00:05:10,400
here on earth with regard to the news

122
00:05:14,629 --> 00:05:12,160
and we keep talking here at cnn about

123
00:05:16,469 --> 00:05:14,639
you know weak economy budget cuts uh you

124
00:05:17,990 --> 00:05:16,479
know i covered the final space shuttle

125
00:05:20,230 --> 00:05:18,000
launch of the atlantis uh a couple

126
00:05:22,469 --> 00:05:20,240
months ago at kennedy so with no no

127
00:05:25,270 --> 00:05:22,479
longer a space shuttle program how do we

128
00:05:27,590 --> 00:05:25,280
still instill a sense of you know space

129
00:05:32,310 --> 00:05:27,600
and exploration uh in the hearts and

130
00:05:35,749 --> 00:05:33,830
well not just in the hearts and minds of

131
00:05:37,590 --> 00:05:35,759
the youngsters but in in all of the the

132
00:05:40,390 --> 00:05:37,600
people of america and really around the

133
00:05:42,310 --> 00:05:40,400
world you know go outside and and look

134
00:05:44,469 --> 00:05:42,320
up and watch us come over some evening

135
00:05:47,189 --> 00:05:44,479
and it's it's marvelous to look at this

136
00:05:48,950 --> 00:05:47,199
facility that humans have built and it's

137
00:05:50,870 --> 00:05:48,960
15 countries from around the world

138
00:05:53,830 --> 00:05:50,880

working together very hard for many

139
00:05:55,990 --> 00:05:53,840
years decades really to to design this

140
00:05:57,590 --> 00:05:56,000
space station and then to build it and

141
00:05:59,510 --> 00:05:57,600
now we're up here we're living here

142
00:06:00,870 --> 00:05:59,520
we've been up here for 11 years around

143
00:06:03,430 --> 00:06:00,880
the clock

144
00:06:04,309 --> 00:06:03,440
and with crew after crew we're the 29th

145
00:06:08,150 --> 00:06:04,319
crew

146
00:06:10,070 --> 00:06:08,160
to uh run the space station and it's an

147
00:06:12,070 --> 00:06:10,080
exciting thing we've gone from

148
00:06:14,309 --> 00:06:12,080
assembling the world's largest and most

149
00:06:17,670 --> 00:06:14,319
complicated certainly most complicated

150
00:06:19,990 --> 00:06:17,680
engineering project is now operational

151
00:06:21,990 --> 00:06:20,000
uh in orbit around the earth and it's an

152
00:06:24,710 --> 00:06:22,000
amazing thing there's a lot of great

153
00:06:26,629 --> 00:06:24,720
stuff and it's it's really today this is

154
00:06:29,189 --> 00:06:26,639
the where the exploration is taking

155
00:06:32,070 --> 00:06:29,199
place you know in space where humans are

156
00:06:35,029 --> 00:06:32,080
involved we certainly have rovers rovers

157
00:06:37,029 --> 00:06:35,039
on mars that are still still you know

158
00:06:38,870 --> 00:06:37,039
giving us some results we have probes

159
00:06:40,469 --> 00:06:38,880
that are ex you know out beyond our

160
00:06:42,230 --> 00:06:40,479
solar system now and there's a lot of

161
00:06:44,629 --> 00:06:42,240
exciting work there in the

162
00:06:47,510 --> 00:06:44,639
uh you know in the unmanned work or

163
00:06:49,110 --> 00:06:47,520

the remote uh uh sensing kind of work

164
00:06:51,189 --> 00:06:49,120
but here's where the humans are involved

165
00:06:53,029 --> 00:06:51,199
and this is where the pioneering space

166
00:06:55,990 --> 00:06:53,039
you know takes place where we learn how

167
00:06:58,870 --> 00:06:56,000
to live and work in space for long

168
00:07:00,710 --> 00:06:58,880
periods of time and and it's an exciting

169
00:07:02,950 --> 00:07:00,720
time i think we need to continue to tell

170
00:07:05,270 --> 00:07:02,960
that story and i look forward to the

171
00:07:07,589 --> 00:07:05,280
years ahead it's a it is a sad thing to

172
00:07:10,070 --> 00:07:07,599
me and to most of us i think to see the

173
00:07:12,469 --> 00:07:10,080
space shuttle program come to an end but

174
00:07:14,790 --> 00:07:12,479
it was time and we have to come to grips

175
00:07:16,230 --> 00:07:14,800
with that at the same time we look

176
00:07:19,270 --> 00:07:16,240
forward to there's a lot of different

177
00:07:20,469 --> 00:07:19,280
things on the table it's a little bit

178
00:07:21,990 --> 00:07:20,479
confusing

179
00:07:24,070 --> 00:07:22,000
certainly from here where i can't keep

180
00:07:25,990 --> 00:07:24,080
track of it on a daily basis but i'm

181
00:07:27,029 --> 00:07:26,000
sure to everybody and to you who reports

182
00:07:29,670 --> 00:07:27,039
in our in

183
00:07:31,430 --> 00:07:29,680
in the business a little confusing on

184
00:07:33,510 --> 00:07:31,440
exactly where we're going and i think

185
00:07:35,589 --> 00:07:33,520
we're trying different ideas right now

186
00:07:37,670 --> 00:07:35,599
some of them are led by the government

187
00:07:40,070 --> 00:07:37,680
some many of them are led by private

188
00:07:42,390 --> 00:07:40,080

enterprise certainly within months

189
00:07:44,150 --> 00:07:42,400
private enterprise will start delivering

190
00:07:45,909 --> 00:07:44,160
cargo to the space station we look

191
00:07:48,230 --> 00:07:45,919
forward to that uh with great

192
00:07:50,550 --> 00:07:48,240
anticipation and there's a number of

193
00:07:54,150 --> 00:07:50,560
teams working on the next way of getting

194
00:07:55,990 --> 00:07:54,160
uh you know humans into space to deliver

195
00:07:57,830 --> 00:07:56,000
you know to the space station and serve

196
00:07:59,990 --> 00:07:57,840
as a lifeboat and a ride home to

197
00:08:03,430 --> 00:08:00,000
supplement our soyuz capability that we

198
00:08:07,670 --> 00:08:05,830
mike i read that as a young boy you

199
00:08:10,070 --> 00:08:07,680
actually started a notebook writing

200
00:08:15,670 --> 00:08:10,080
about mars do you think in your lifetime

201
00:08:19,589 --> 00:08:18,150
yes i do i've always believed that i had

202
00:08:21,990 --> 00:08:19,599
hoped that i could be one of the people

203
00:08:23,430 --> 00:08:22,000
to help put those footprints there and

204
00:08:25,430 --> 00:08:23,440
and i still may it won't be my

205
00:08:27,589 --> 00:08:25,440
footprints more than likely but i think

206
00:08:29,510 --> 00:08:27,599
we will because it's very compelling

207
00:08:32,310 --> 00:08:29,520
it's hard it's a real challenge the moon

208
00:08:34,870 --> 00:08:32,320
is three days away uh mars is six to

209
00:08:36,389 --> 00:08:34,880
eight months depending on exactly how

210
00:08:38,870 --> 00:08:36,399
how you get there

211
00:08:40,709 --> 00:08:38,880
that's one way and then you have to you

212
00:08:42,709 --> 00:08:40,719
know do your work and turn around and

213
00:08:45,269 --> 00:08:42,719

come home so mars trip is a two-year

214
00:08:46,710 --> 00:08:45,279
mission and the systems have to work

215
00:08:48,790 --> 00:08:46,720
they have to work

216
00:08:51,430 --> 00:08:48,800
very reliably and so part of what we're

217
00:08:53,829 --> 00:08:51,440
doing up here with closed loop recycling

218
00:08:55,910 --> 00:08:53,839
our water to a very high percentage

219
00:08:57,990 --> 00:08:55,920
that's the highest ever on a spacecraft

220
00:09:02,150 --> 00:08:58,000
that's a big deal but that system is has

221
00:09:04,150 --> 00:09:02,160
to operate flawlessly to and from mars

222
00:09:06,389 --> 00:09:04,160
for a long trip like that and so we're

223
00:09:08,389 --> 00:09:06,399
we're making ground we're learning

224
00:09:10,949 --> 00:09:08,399
things from the international space

225
00:09:12,630 --> 00:09:10,959
station as a test bed for these kind of

226
00:09:15,030 --> 00:09:12,640
systems that are going to be crucial for

227
00:09:17,350 --> 00:09:15,040
a long trip to mars as well as the human

228
00:09:20,150 --> 00:09:17,360
aspect of it keeping us healthy healthy

229
00:09:21,910 --> 00:09:20,160
enough to to endure the trip there

230
00:09:27,430 --> 00:09:21,920
be healthy enough to get the work done

231
00:09:31,110 --> 00:09:29,509
mike that's all the time i get with you

232
00:09:33,190 --> 00:09:31,120
i look forward to covering the day when

233
00:09:37,829 --> 00:09:33,200
we get to mars pleasure to meet you

234
00:09:43,350 --> 00:09:40,070
thank you very much i really appreciate

235
00:09:47,590 --> 00:09:45,350
station this is houston acr that

236
00:09:49,350 --> 00:09:47,600
concludes the cnn portion of the event

237
00:09:55,430 --> 00:09:49,360
please stand by for a voice check from

238
00:09:55,440 --> 00:09:59,509

highly reliable closed loop system

239
00:09:59,519 --> 00:10:04,230
commander fossum

240
00:10:04,240 --> 00:10:08,470
hey greetings mike with you

241
00:10:12,630 --> 00:10:10,550
mike dylan radigan thank you so much for

242
00:10:17,990 --> 00:10:12,640
some of your time whatever time it is

243
00:10:21,750 --> 00:10:19,509
dylan we're over the south atlantic

244
00:10:24,710 --> 00:10:21,760
heading toward africa right now great to

245
00:10:28,150 --> 00:10:26,470
what what time is you're over the south

246
00:10:29,990 --> 00:10:28,160
atlantic heading towards africa so what

247
00:10:34,870 --> 00:10:30,000
time is it was that how do you keep time

248
00:10:39,670 --> 00:10:37,030
we work off of basically a universal

249
00:10:41,430 --> 00:10:39,680
time or gmt and so right now it's about

250
00:10:43,030 --> 00:10:41,440
two o'clock in the afternoon it's just

251
00:10:44,550 --> 00:10:43,040
after our lunch time

252
00:10:46,150 --> 00:10:44,560
keeping track by the sun doesn't make

253
00:10:47,990 --> 00:10:46,160
any sense when you go around the earth

254
00:10:50,470 --> 00:10:48,000
in 90 minutes and you have a sunrise and

255
00:10:53,110 --> 00:10:50,480
a sunset during that time so we work

256
00:10:57,030 --> 00:10:53,120
we work off a a you know a universal

257
00:10:59,910 --> 00:10:58,470
all right all right let's begin the

258
00:11:02,710 --> 00:10:59,920
interview and and if you don't mind

259
00:11:04,550 --> 00:11:02,720
let's start right there uh

260
00:11:06,550 --> 00:11:04,560
you were just educating me the way you

261
00:11:09,110 --> 00:11:06,560
keep time on an international space

262
00:11:12,949 --> 00:11:11,190
educate us a little further how do you

263
00:11:18,069 --> 00:11:12,959

do it and how often does the sun rise

264
00:11:21,750 --> 00:11:20,069
well in order to we're working with

265
00:11:23,829 --> 00:11:21,760
countries around the world and we're

266
00:11:27,030 --> 00:11:23,839
going around the globe in 90 minutes so

267
00:11:29,269 --> 00:11:27,040
we see a sunrise and a sunset uh within

268
00:11:31,590 --> 00:11:29,279
an hour and a half so we can't keep

269
00:11:33,750 --> 00:11:31,600
track by the sun and we had to set a

270
00:11:35,190 --> 00:11:33,760
time standard someplace because we all

271
00:11:38,230 --> 00:11:35,200
have to have a way of talking about it

272
00:11:41,030 --> 00:11:38,240
and so we use gmt greenwich mean time

273
00:11:43,590 --> 00:11:41,040
and and that becomes our clock so right

274
00:11:46,069 --> 00:11:43,600
now it's two o'clock in the afternoon

275
00:11:47,190 --> 00:11:46,079
for us up here we get up at six o'clock

276
00:11:48,949 --> 00:11:47,200
in the morning

277
00:11:50,629 --> 00:11:48,959
we really begin our work day about eight

278
00:11:53,269 --> 00:11:50,639
o'clock in the morning

279
00:11:56,310 --> 00:11:53,279
in earnest and we work until about seven

280
00:11:58,710 --> 00:11:56,320
at night and go to bed around 9 30 10

281
00:12:02,069 --> 00:11:58,720
o'clock so that's that's our clock again

282
00:12:03,990 --> 00:12:02,079
all based on on gmt and the the control

283
00:12:09,190 --> 00:12:04,000
centers around the globe

284
00:12:11,990 --> 00:12:09,200
uh houston moscow munich uh scuba japan

285
00:12:13,829 --> 00:12:12,000
uh all are working to that same clock

286
00:12:15,670 --> 00:12:13,839
and so they're they're displaced in

287
00:12:17,670 --> 00:12:15,680
their in their local times they may be

288
00:12:19,750 --> 00:12:17,680

coming into work at midnight to start

289
00:12:21,110 --> 00:12:19,760
the day and things like that that's just

290
00:12:24,069 --> 00:12:21,120
one of the interesting aspects of

291
00:12:25,590 --> 00:12:24,079
working up here

292
00:12:27,030 --> 00:12:25,600
yeah so that's so it's interesting

293
00:12:28,629 --> 00:12:27,040
though because if you work on the earth

294
00:12:31,590 --> 00:12:28,639
but you're associated with the space

295
00:12:33,990 --> 00:12:31,600
station you work on space station time

296
00:12:35,910 --> 00:12:34,000
uh not on not on earth time

297
00:12:37,829 --> 00:12:35,920
you talk about the work

298
00:12:40,230 --> 00:12:37,839
what specifically is it that you are

299
00:12:41,910 --> 00:12:40,240
working on and why is developing a

300
00:12:49,590 --> 00:12:41,920
closed-loop

301
00:12:53,190 --> 00:12:51,110
we're working on a number of different

302
00:12:54,870 --> 00:12:53,200
things you know of course there's a lot

303
00:12:56,710 --> 00:12:54,880
of the the main reason we're here the

304
00:12:58,470 --> 00:12:56,720
main reason the space station was built

305
00:13:00,470 --> 00:12:58,480
was to conduct the different science

306
00:13:02,230 --> 00:13:00,480
experiments that are ongoing right now

307
00:13:04,470 --> 00:13:02,240
we have many of them that are that are

308
00:13:06,389 --> 00:13:04,480
ongoing some of them were interacting

309
00:13:08,470 --> 00:13:06,399
with some were tending we're changing

310
00:13:10,550 --> 00:13:08,480
out the samples while the scientists on

311
00:13:12,629 --> 00:13:10,560
the ground are running the furnaces

312
00:13:14,629 --> 00:13:12,639
running the combustion chambers things

313
00:13:16,389 --> 00:13:14,639

like that

314
00:13:18,150 --> 00:13:16,399
the other another thing that we're doing

315
00:13:20,710 --> 00:13:18,160
with the space station it's really huge

316
00:13:23,350 --> 00:13:20,720
it's very interesting is developing

317
00:13:25,910 --> 00:13:23,360
we're developing the systems for long

318
00:13:28,550 --> 00:13:25,920
duration operation in space so the space

319
00:13:31,030 --> 00:13:28,560
station itself and its functioning

320
00:13:32,949 --> 00:13:31,040
systems our test beds we're learning

321
00:13:35,269 --> 00:13:32,959
from these different systems

322
00:13:36,629 --> 00:13:35,279
right now in earth orbit you know we're

323
00:13:39,030 --> 00:13:36,639
you know somebody could theoretically

324
00:13:40,550 --> 00:13:39,040
get to us and you know after about a

325
00:13:42,710 --> 00:13:40,560
nine you know nine minutes worth of

326
00:13:45,509 --> 00:13:42,720
launch some rendezvous time usually it

327
00:13:47,269 --> 00:13:45,519
takes a couple of days and we could have

328
00:13:49,350 --> 00:13:47,279
we could have another ship here if we're

329
00:13:51,829 --> 00:13:49,360
on the way to mars we don't have any way

330
00:13:53,990 --> 00:13:51,839
of getting parts up here quickly

331
00:13:55,670 --> 00:13:54,000
and uh and you have to go

332
00:13:57,670 --> 00:13:55,680
self-sufficient because nobody's going

333
00:13:59,990 --> 00:13:57,680
to be coming to help you out

334
00:14:01,829 --> 00:14:00,000
in any way so we have to have systems

335
00:14:04,790 --> 00:14:01,839
that operate for a long period of time

336
00:14:06,870 --> 00:14:04,800
one of the real limiting factors is of

337
00:14:07,910 --> 00:14:06,880
course everything's about the weight or

338
00:14:09,030 --> 00:14:07,920

the mass

339
00:14:10,310 --> 00:14:09,040
in space

340
00:14:15,189 --> 00:14:10,320
water

341
00:14:18,230 --> 00:14:15,199
and you need and you can only launch so

342
00:14:20,069 --> 00:14:18,240
much water it's a kilogram per liter and

343
00:14:21,750 --> 00:14:20,079
it's a lot you can't dehydrate your

344
00:14:25,350 --> 00:14:21,760
water and you can't put it in a foil

345
00:14:27,829 --> 00:14:25,360
pack it and so there's a great advantage

346
00:14:29,670 --> 00:14:27,839
to recycling

347
00:14:31,590 --> 00:14:29,680
you don't have powdered water you need

348
00:14:33,590 --> 00:14:31,600
to recycle as much of that water as

349
00:14:35,910 --> 00:14:33,600
possible that's a fairly new system for

350
00:14:38,230 --> 00:14:35,920
us here on the u.s part of the space

351
00:14:40,710 --> 00:14:38,240
station where we actually recycle we

352
00:14:44,710 --> 00:14:40,720
take a lot of the most of the water out

353
00:14:46,710 --> 00:14:44,720
of urine waste and the condensation from

354
00:14:48,470 --> 00:14:46,720
just our breathing and our sweating gets

355
00:14:51,509 --> 00:14:48,480
collected in the air conditioning system

356
00:14:53,750 --> 00:14:51,519
here as as condensate and these these

357
00:14:56,550 --> 00:14:53,760
this water this recovered water then is

358
00:14:59,670 --> 00:14:56,560
recycled purified certified double

359
00:15:01,269 --> 00:14:59,680
checked and and then we drink it again

360
00:15:03,670 --> 00:15:01,279
and that's really important and this

361
00:15:05,269 --> 00:15:03,680
kind of a system it has to work

362
00:15:06,949 --> 00:15:05,279
flawlessly

363
00:15:08,870 --> 00:15:06,959

up here of course we check it a lot and

364
00:15:10,949 --> 00:15:08,880
we have some options we can go without

365
00:15:13,350 --> 00:15:10,959
purifying water for months if we needed

366
00:15:15,110 --> 00:15:13,360
to we have supplies on board but if

367
00:15:17,509 --> 00:15:15,120
we're on the way to mars that kind of a

368
00:15:19,829 --> 00:15:17,519
system needs to work without getting you

369
00:15:22,230 --> 00:15:19,839
know some kind of bugs in it or or you

370
00:15:24,470 --> 00:15:22,240
know bike microbial growth in it that

371
00:15:26,310 --> 00:15:24,480
really knocks the system out of whack so

372
00:15:29,189 --> 00:15:26,320
this we're a test bed for systems like

373
00:15:34,389 --> 00:15:32,230
uh are you anticipating with the your

374
00:15:36,629 --> 00:15:34,399
awareness of the current science and the

375
00:15:39,990 --> 00:15:36,639
current uh

376
00:15:46,870 --> 00:15:40,000
ability uh that in our lifetime we will

377
00:15:51,189 --> 00:15:48,949
i'm convinced that i will see you know

378
00:15:52,949 --> 00:15:51,199
human footprints on mars i dreamed about

379
00:15:55,269 --> 00:15:52,959
helping put those footprints there one

380
00:15:57,350 --> 00:15:55,279
day i don't think that's likely to line

381
00:15:58,550 --> 00:15:57,360
up right now but i still think we're

382
00:16:01,350 --> 00:15:58,560
going to see it

383
00:16:03,509 --> 00:16:01,360
it's it's very compelling the mar mars

384
00:16:04,790 --> 00:16:03,519
is just fascinating for so many reasons

385
00:16:06,870 --> 00:16:04,800
we know

386
00:16:08,629 --> 00:16:06,880
fairly certainly mars used to have

387
00:16:10,949 --> 00:16:08,639
liquid water if it used to have liquid

388
00:16:12,389 --> 00:16:10,959

water it used to have an atmosphere it's

389
00:16:14,310 --> 00:16:12,399
got to in order for the water to be

390
00:16:16,389 --> 00:16:14,320
liquid or it just boils off

391
00:16:18,550 --> 00:16:16,399
it no longer has liquid water on the

392
00:16:20,949 --> 00:16:18,560
surface it no longer has a significant

393
00:16:23,829 --> 00:16:20,959
amount of atmosphere what happened what

394
00:16:25,990 --> 00:16:23,839
changed that's important for us to know

395
00:16:27,670 --> 00:16:26,000
i mean there's a scientific curiosity of

396
00:16:29,590 --> 00:16:27,680
understanding these things better but

397
00:16:31,829 --> 00:16:29,600
it's also i think important because talk

398
00:16:34,069 --> 00:16:31,839
about you know global climate change on

399
00:16:35,990 --> 00:16:34,079
mars wow there used to be enough

400
00:16:39,749 --> 00:16:36,000
atmosphere to support water and there no

401
00:16:42,150 --> 00:16:39,759
longer is that was a very big change be

402
00:16:44,230 --> 00:16:42,160
very interesting very useful to know

403
00:16:47,430 --> 00:16:44,240
what caused that kind of a change to a

404
00:16:51,749 --> 00:16:49,829
stunning it's just stunning to have uh

405
00:16:54,870 --> 00:16:51,759
that as a as an opportunity and as a

406
00:16:57,990 --> 00:16:54,880
mission uh you carry obviously uh so

407
00:16:59,749 --> 00:16:58,000
many people's i think curiosity and uh

408
00:17:02,710 --> 00:16:59,759
desire to answer those questions with

409
00:17:05,429 --> 00:17:02,720
you we're privileged to have you uh

410
00:17:07,829 --> 00:17:05,439
doing what you're doing in the practical

411
00:17:09,590 --> 00:17:07,839
sense uh you have been getting back and

412
00:17:12,150 --> 00:17:09,600
forth or not just you but

413
00:17:13,909 --> 00:17:12,160

other uh astronauts like yourself have

414
00:17:16,470 --> 00:17:13,919
been getting back and forth using the

415
00:17:19,189 --> 00:17:16,480
russian soyuz rockets which i know

416
00:17:21,029 --> 00:17:19,199
one of those had a failure a cargo

417
00:17:23,189 --> 00:17:21,039
rocket an unmanned cargo rocket had a

418
00:17:24,870 --> 00:17:23,199
failure in august

419
00:17:27,270 --> 00:17:24,880
what is your degree of confidence in

420
00:17:28,870 --> 00:17:27,280
that system and what is your view on the

421
00:17:35,190 --> 00:17:28,880
alternatives

422
00:17:40,710 --> 00:17:38,150
the soyuz launch system has hundreds of

423
00:17:41,830 --> 00:17:40,720
of launches successful launches

424
00:17:43,510 --> 00:17:41,840
and i don't

425
00:17:45,190 --> 00:17:43,520
this is mike's personal opinion i'm not

426
00:17:47,190 --> 00:17:45,200
tied in with the technical details of

427
00:17:49,430 --> 00:17:47,200
what's going on with the investigations

428
00:17:50,950 --> 00:17:49,440
and the and the forward work here but

429
00:17:52,710 --> 00:17:50,960
you know i i have to believe from my

430
00:17:54,470 --> 00:17:52,720
experience as an engineer that we don't

431
00:17:57,110 --> 00:17:54,480
we're not talking about a fundamental

432
00:17:59,750 --> 00:17:57,120
design flaw here we're probably talking

433
00:18:02,710 --> 00:17:59,760
about you know a mistake that was made

434
00:18:05,669 --> 00:18:02,720
in the processing uh you know you've got

435
00:18:06,950 --> 00:18:05,679
equipment equipment can fail you have

436
00:18:09,029 --> 00:18:06,960
you know but more importantly you have

437
00:18:11,110 --> 00:18:09,039
people and anytime you have people in

438
00:18:13,190 --> 00:18:11,120

the loop you know humans do make

439
00:18:15,270 --> 00:18:13,200
failures we double check we check each

440
00:18:16,950 --> 00:18:15,280
other and those kind of things but stuff

441
00:18:18,549 --> 00:18:16,960
something still eventually happens when

442
00:18:21,110 --> 00:18:18,559
you have hundreds of launches and my

443
00:18:23,270 --> 00:18:21,120
guess is it was it's a guess

444
00:18:24,630 --> 00:18:23,280
that there was probably something along

445
00:18:26,310 --> 00:18:24,640
those lines

446
00:18:29,590 --> 00:18:26,320
i think this these next launches are

447
00:18:32,310 --> 00:18:29,600
going to be some of the the the safest

448
00:18:34,789 --> 00:18:32,320
most you know highly successful launches

449
00:18:36,630 --> 00:18:34,799
of of the program because

450
00:18:39,270 --> 00:18:36,640
the extra scrutinies on some of those

451
00:18:42,470 --> 00:18:39,280
details that may have escaped during the

452
00:18:44,789 --> 00:18:42,480
last last launch flow processing so i

453
00:18:47,270 --> 00:18:44,799
think we're in in good shape it's a it

454
00:18:49,909 --> 00:18:47,280
is a strange thing uh for me

455
00:18:52,070 --> 00:18:49,919
and for all of us now to be you know

456
00:18:54,470 --> 00:18:52,080
riding on our on a russian rocket to

457
00:18:56,310 --> 00:18:54,480
space i mean what a what an amazing

458
00:18:58,390 --> 00:18:56,320
thing i that wasn't even comprehensible

459
00:19:00,150 --> 00:18:58,400
i dreamed about walking on mars someday

460
00:19:01,750 --> 00:19:00,160
as a kid i sure never dreamed about

461
00:19:05,909 --> 00:19:01,760
launching in a russian rocket that's

462
00:19:09,110 --> 00:19:07,510
that's i guess why we don't we only

463
00:19:10,630 --> 00:19:09,120

control our intentions we never know

464
00:19:12,230 --> 00:19:10,640
what the outcomes will be commander

465
00:19:14,150 --> 00:19:12,240
thank you so much

466
00:19:17,110 --> 00:19:14,160
for your time

467
00:19:21,909 --> 00:19:17,120
this afternoon enjoy the next sunrise

468
00:19:25,270 --> 00:19:23,830
i will dylan thank you very much a lot

469
00:19:28,710 --> 00:19:25,280
of great questions i really enjoyed

470
00:19:37,190 --> 00:19:31,350
station this is houston acr thank you