OVHD
HATCH
EXIT
DECK

1
00:00:07,670 --> 00:00:02,710
station this is houston are you ready

2
00:00:12,470 --> 00:00:10,870
houston station i'm ready for the event

3
00:00:14,390 --> 00:00:12,480
bert church high school this is mission

4
00:00:18,310 --> 00:00:14,400
control houston please call station for

5
00:00:21,910 --> 00:00:19,910
station this is bonnie schmidt from

6
00:00:24,070 --> 00:00:21,920
let's talk science with students here at

7
00:00:28,950 --> 00:00:24,080
burt church high school how do you hear

8
00:00:32,630 --> 00:00:31,349
well hello uh birch church high school

9
00:00:34,229 --> 00:00:32,640
and uh

10
00:00:36,229 --> 00:00:34,239
and the folks at let's talk science i

11
00:00:37,670 --> 00:00:36,239
read you loud and clear greetings and

12
00:00:47,590 --> 00:00:37,680
welcome aboard the international space

13
00:00:52,790 --> 00:00:49,750

hi chris it's bob thursk here uh there's

14
00:00:55,110 --> 00:00:52,800
a thousand students uh teachers parents

15
00:00:56,869 --> 00:00:55,120
and other officials here i'll turn you

16
00:00:57,990 --> 00:00:56,879
over to our first student who has a

17
00:01:06,469 --> 00:00:58,000
question

18
00:01:11,510 --> 00:01:08,710
you when you first get here it is so

19
00:01:12,469 --> 00:01:11,520
weird your body is so confused without

20
00:01:14,469 --> 00:01:12,479
gravity

21
00:01:17,670 --> 00:01:14,479
all sorts of things change

22
00:01:18,950 --> 00:01:17,680
and you feel sick you feel congested it

23
00:01:21,030 --> 00:01:18,960
feels like you're recovering from an

24
00:01:22,870 --> 00:01:21,040
illness or something so

25
00:01:25,109 --> 00:01:22,880
it takes a while just for your body to

26
00:01:26,870 --> 00:01:25,119
adapt but then once your body adapts

27
00:01:29,429 --> 00:01:26,880
then the other thing that you need to do

28
00:01:31,830 --> 00:01:29,439
to adjust is just start to get

29
00:01:33,990 --> 00:01:31,840
elegant in weightlessness how to move

30
00:01:35,670 --> 00:01:34,000
and fly around without bumping into

31
00:01:37,830 --> 00:01:35,680
things and knocking stuff off the walls

32
00:01:40,630 --> 00:01:37,840
and crashing into things

33
00:01:42,550 --> 00:01:40,640
and i found that my body recovered in uh

34
00:01:45,590 --> 00:01:42,560
three or four days and felt pretty good

35
00:01:48,230 --> 00:01:45,600
but to become elegant and and graceful

36
00:01:50,550 --> 00:01:48,240
in space took about a month but now i

37
00:01:55,990 --> 00:01:50,560
feel completely adapted and adjusted and

38
00:02:00,310 --> 00:01:58,230

i'm gavin and my question is since

39
00:02:02,149 --> 00:02:00,320
you're in space for five months

40
00:02:10,229 --> 00:02:02,159
are you worried about how your body will

41
00:02:16,550 --> 00:02:14,229
yes uh as you well know the our sun and

42
00:02:17,990 --> 00:02:16,560
every star in the universe

43
00:02:21,270 --> 00:02:18,000
is a huge

44
00:02:23,430 --> 00:02:21,280
nuclear furnace pouring out radiation

45
00:02:25,589 --> 00:02:23,440
it's what keeps us alive the heat and

46
00:02:27,830 --> 00:02:25,599
the energy from the from our sun

47
00:02:30,470 --> 00:02:27,840
but without our atmosphere and the

48
00:02:32,949 --> 00:02:30,480
earth's magnetic field to protect us uh

49
00:02:34,630 --> 00:02:32,959
the radiation is much higher and here on

50
00:02:36,710 --> 00:02:34,640
the space station we still have the

51
00:02:38,550 --> 00:02:36,720
magnetic field but we don't have the

52
00:02:39,830 --> 00:02:38,560
atmosphere and so we're interested in it

53
00:02:42,949 --> 00:02:39,840
and my body

54
00:02:45,110 --> 00:02:42,959
of course stops radiation and when the

55
00:02:46,949 --> 00:02:45,120
radiation hits my body it it can do

56
00:02:49,030 --> 00:02:46,959
damage at the cellular level

57
00:02:50,949 --> 00:02:49,040
uh we're doing an experiment here on

58
00:02:53,670 --> 00:02:50,959
board just as you folks are with let's

59
00:02:54,949 --> 00:02:53,680
talk science with a small detector

60
00:02:57,110 --> 00:02:54,959
and uh

61
00:02:59,670 --> 00:02:57,120
and with that we can try and track the

62
00:03:01,430 --> 00:02:59,680
radiation damage or at least

63
00:03:03,670 --> 00:03:01,440

dosage in our bodies

64
00:03:06,470 --> 00:03:03,680
um but i of course was worried about it

65
00:03:09,270 --> 00:03:06,480
before flight i talked to our

66
00:03:12,470 --> 00:03:09,280
radiation experts and our scientists and

67
00:03:14,070 --> 00:03:12,480
uh we don't want to risk the lives any

68
00:03:15,830 --> 00:03:14,080
more than we have to of of the people

69
00:03:17,190 --> 00:03:15,840
that are exploring space

70
00:03:18,869 --> 00:03:17,200
and um

71
00:03:21,589 --> 00:03:18,879
there's a slightly increased level of

72
00:03:23,910 --> 00:03:21,599
radiation exposure but it's not that far

73
00:03:25,830 --> 00:03:23,920
different than people who work in the uh

74
00:03:27,670 --> 00:03:25,840
in the industry people who work around

75
00:03:29,509 --> 00:03:27,680
x-ray machines pilots who fly at high

76
00:03:31,830 --> 00:03:29,519
altitude or even someone who chooses to

77
00:03:34,149 --> 00:03:31,840
live their whole life at a high altitude

78
00:03:39,589 --> 00:03:34,159
in la paz or even in denver somewhere

79
00:03:43,830 --> 00:03:41,910
hi my name is caitlin and my question is

80
00:03:45,670 --> 00:03:43,840
if humans were to live on mars would

81
00:03:51,509 --> 00:03:45,680
they be more exposed to radiation than

82
00:03:54,309 --> 00:03:53,350
caitlin yes

83
00:03:58,309 --> 00:03:54,319
mars

84
00:04:00,550 --> 00:03:58,319
with rovers on the surface and some of

85
00:04:01,910 --> 00:04:00,560
the spaceships that are orbiting mars uh

86
00:04:03,589 --> 00:04:01,920
coming from countries all around the

87
00:04:06,070 --> 00:04:03,599
world canadian hardware is on the

88
00:04:08,789 --> 00:04:06,080

surface of mars right now

89
00:04:10,470 --> 00:04:08,799
but what we found is mars has some weak

90
00:04:12,470 --> 00:04:10,480
magnetic field but not very much so it

91
00:04:14,390 --> 00:04:12,480
doesn't protect the planet very much

92
00:04:15,990 --> 00:04:14,400
that way and it has an atmosphere but

93
00:04:18,310 --> 00:04:16,000
not a very thick atmosphere and not a

94
00:04:20,310 --> 00:04:18,320
lot of water vapor and so it doesn't

95
00:04:22,629 --> 00:04:20,320
soak up much radiation it protects you

96
00:04:24,710 --> 00:04:22,639
better than empty space than the the gap

97
00:04:26,870 --> 00:04:24,720
in between mars and the earth but it's

98
00:04:29,590 --> 00:04:26,880
not like being home not like mother

99
00:04:30,950 --> 00:04:29,600
earth so when we do go to mars and

100
00:04:33,670 --> 00:04:30,960
hopefully you'll be one of the people

101
00:04:35,510 --> 00:04:33,680
standing on mars

102
00:04:37,749 --> 00:04:35,520
you will need to have brought with you

103
00:04:39,270 --> 00:04:37,759
radiation protection it's not that hard

104
00:04:44,950 --> 00:04:39,280
to do we know how to do it you just have

105
00:04:54,629 --> 00:04:47,670
hi i'm taylor and i would like to know

106
00:05:00,550 --> 00:04:58,310
operating canadarm2 is so much fun in

107
00:05:01,670 --> 00:05:00,560
fact you can operate it from right here

108
00:05:03,749 --> 00:05:01,680
you have two

109
00:05:05,749 --> 00:05:03,759
hand controllers or joysticks and you

110
00:05:07,270 --> 00:05:05,759
turn it with your right hand and you

111
00:05:10,150 --> 00:05:07,280
move it up and down and back and forth

112
00:05:13,110 --> 00:05:10,160
with your left hand so uh moving like a

113
00:05:14,550 --> 00:05:13,120

big elegant version of your arm except

114
00:05:17,189 --> 00:05:14,560
instead of your arm

115
00:05:19,749 --> 00:05:17,199
it's got a hand at both ends so it's got

116
00:05:21,670 --> 00:05:19,759
two wrists and an elbow so you can

117
00:05:23,510 --> 00:05:21,680
really move the cannon arm much more

118
00:05:24,870 --> 00:05:23,520
than you can move your own arm so you

119
00:05:27,110 --> 00:05:24,880
have to pay attention you got to look at

120
00:05:30,310 --> 00:05:27,120
the screens plan ahead but the actual

121
00:05:32,230 --> 00:05:30,320
flying of canadarm2 is a real joy and i

122
00:05:33,830 --> 00:05:32,240
got to fly canadarm the original one on

123
00:05:35,749 --> 00:05:33,840
the shuttle i've

124
00:05:38,550 --> 00:05:35,759
used the one here on the space station

125
00:05:41,270 --> 00:05:38,560
several times and

126
00:05:43,350 --> 00:05:41,280
it's easy because of the training it's

127
00:05:45,670 --> 00:05:43,360
intuitive it's fun but also it just

128
00:05:47,830 --> 00:05:45,680
makes me feel great as a canadian to be

129
00:05:52,629 --> 00:05:47,840
operating canadarm2 on the international

130
00:05:56,870 --> 00:05:55,029
hi i'm justina and i would like to know

131
00:06:03,830 --> 00:05:56,880
what was the most challenging part of

132
00:06:07,029 --> 00:06:05,670
the most challenging part of becoming an

133
00:06:09,590 --> 00:06:07,039
astronaut

134
00:06:11,590 --> 00:06:09,600
i swear is getting selected canada has

135
00:06:13,270 --> 00:06:11,600
only chosen a small handful of

136
00:06:14,469 --> 00:06:13,280
astronauts in our whole history as a

137
00:06:15,430 --> 00:06:14,479
nation

138
00:06:18,550 --> 00:06:15,440

and

139
00:06:21,110 --> 00:06:18,560
the the selection process is so rigorous

140
00:06:24,070 --> 00:06:21,120
and so demanding that i was really

141
00:06:25,430 --> 00:06:24,080
nervous and and i know that bob thirst

142
00:06:27,590 --> 00:06:25,440
was there with you probably felt the

143
00:06:29,350 --> 00:06:27,600
same way when he was selected in fact

144
00:06:30,790 --> 00:06:29,360
bob was part of the team that looked

145
00:06:32,710 --> 00:06:30,800
over the applicants to try and see if

146
00:06:34,469 --> 00:06:32,720
i'd be a good astronaut or not so thank

147
00:06:36,629 --> 00:06:34,479
you bob

148
00:06:38,790 --> 00:06:36,639
but that was the hardest part was

149
00:06:40,309 --> 00:06:38,800
getting through that door but then once

150
00:06:42,150 --> 00:06:40,319
you're an astronaut then i think the

151
00:06:44,230 --> 00:06:42,160
hardest part is just remembering

152
00:06:46,390 --> 00:06:44,240
everything you people are trying to

153
00:06:47,830 --> 00:06:46,400
teach you important things for years and

154
00:06:52,070 --> 00:06:47,840
years and years and you need to know

155
00:06:53,589 --> 00:06:52,080
them all to live and work here and so

156
00:06:56,469 --> 00:06:53,599
i think the hardest part of being an

157
00:06:58,309 --> 00:06:56,479
astronaut is is remembering all of the

158
00:07:03,670 --> 00:06:58,319
key information that'll let you be

159
00:07:07,830 --> 00:07:05,510
chris it's uh bob here just wanted to

160
00:07:09,749 --> 00:07:07,840
say we did a fine job selecting you as

161
00:07:11,589 --> 00:07:09,759
an astronaut uh and i was just going to

162
00:07:12,950 --> 00:07:11,599
ask you if you can do some a somersault

163
00:07:21,029 --> 00:07:12,960

for us show us what weightlessness is

164
00:07:25,510 --> 00:07:23,110
well being weightless is just so much

165
00:07:27,909 --> 00:07:25,520
fun there's there's no up or down it's

166
00:07:29,510 --> 00:07:27,919
completely arbitrary you can you can

167
00:07:32,150 --> 00:07:29,520
choose completely which way you want to

168
00:07:34,070 --> 00:07:32,160
go and bob you've been here and you know

169
00:07:35,589 --> 00:07:34,080
exactly what it's like so

170
00:07:37,830 --> 00:07:35,599
you could just uh

171
00:07:40,070 --> 00:07:37,840
float and turn and tumble and do a

172
00:07:42,230 --> 00:07:40,080
thousand somersaults and

173
00:07:47,589 --> 00:07:42,240
you can do an interview with students in

174
00:07:52,230 --> 00:07:49,990
thank you

175
00:07:54,550 --> 00:07:52,240
i'm miranda and i'm just wondering does

176
00:07:59,670 --> 00:07:54,560
the food taste the same in orbit as it

177
00:08:04,390 --> 00:08:02,550
miranda uh at first no and it's not

178
00:08:06,629 --> 00:08:04,400
because of the food it's because when

179
00:08:07,510 --> 00:08:06,639
you first get to space

180
00:08:08,629 --> 00:08:07,520
um

181
00:08:10,309 --> 00:08:08,639
gravity

182
00:08:12,150 --> 00:08:10,319
of course is not pushing the blood to

183
00:08:15,270 --> 00:08:12,160
your feet anymore no because you're

184
00:08:16,950 --> 00:08:15,280
basically weightless so your body has

185
00:08:18,710 --> 00:08:16,960
learned over your whole lifetime to

186
00:08:21,430 --> 00:08:18,720
squeeze the blood up to your head so you

187
00:08:23,350 --> 00:08:21,440
don't faint and that's kind of fighting

188
00:08:25,510 --> 00:08:23,360

because normally your body has to work

189
00:08:26,950 --> 00:08:25,520
against gravity and it doesn't recognize

190
00:08:28,469 --> 00:08:26,960
immediately there's no gravity so your

191
00:08:30,390 --> 00:08:28,479
body keeps squeezing the blood up to

192
00:08:32,790 --> 00:08:30,400
your head but no gravity to push it back

193
00:08:34,310 --> 00:08:32,800
down again so your head sort of inflates

194
00:08:36,389 --> 00:08:34,320
like someone was squeezing the bottom of

195
00:08:38,709 --> 00:08:36,399
a balloon and so your head fills up with

196
00:08:41,110 --> 00:08:38,719
fluid and your sinuses fill up so when

197
00:08:43,430 --> 00:08:41,120
you first get to space within a little

198
00:08:45,350 --> 00:08:43,440
while you're all clogged up and sinus

199
00:08:47,350 --> 00:08:45,360
plugged up so you can't even taste your

200
00:08:50,070 --> 00:08:47,360
food and that lasts several days until

201
00:08:52,150 --> 00:08:50,080
your body finally gets to equilibrium

202
00:08:53,990 --> 00:08:52,160
and then the food tastes about the same

203
00:08:56,150 --> 00:08:54,000
and i have

204
00:08:58,710 --> 00:08:56,160
canadian food right here that folks were

205
00:09:00,470 --> 00:08:58,720
nice enough to send up to me which

206
00:09:03,190 --> 00:09:00,480
just came up on the dragon spaceship

207
00:09:06,550 --> 00:09:03,200
recently but i have a lot of nice

208
00:09:09,190 --> 00:09:06,560
food i have canadian maple cookies

209
00:09:11,110 --> 00:09:09,200
i have a smoked salmon pate

210
00:09:14,310 --> 00:09:11,120
some canadian chocolate

211
00:09:15,430 --> 00:09:14,320
uh look at this a tube a tube of maple

212
00:09:17,590 --> 00:09:15,440
syrup

213
00:09:20,150 --> 00:09:17,600

which uh is a real treat up here really

214
00:09:21,910 --> 00:09:20,160
high quality maple syrup and from not to

215
00:09:24,710 --> 00:09:21,920
away far away from you guys from

216
00:09:27,509 --> 00:09:24,720
saskatchewan i have some

217
00:09:30,790 --> 00:09:27,519
buffalo jerky right here

218
00:09:32,389 --> 00:09:30,800
cranberry flavored buffalo jerky and uh

219
00:09:35,750 --> 00:09:32,399
and we even have something from the east

220
00:09:38,630 --> 00:09:35,760
coast here with the blueberry

221
00:09:40,150 --> 00:09:38,640
granola bar so we have lots of food

222
00:09:42,310 --> 00:09:40,160
it keeps us healthy

223
00:09:44,310 --> 00:09:42,320
it tastes good and it also it's a really

224
00:09:45,910 --> 00:09:44,320
important social time of the day when

225
00:09:49,030 --> 00:09:45,920
you can get together talk about what

226
00:09:51,750 --> 00:09:49,040
everybody's doing and uh and relax and

227
00:09:59,110 --> 00:09:51,760
really try and share the human part of

228
00:10:08,470 --> 00:10:04,230
hi

229
00:10:17,509 --> 00:10:08,480
does it take to travel to the

230
00:10:22,630 --> 00:10:20,230
karen uh it took us two days

231
00:10:25,269 --> 00:10:22,640
but it it doesn't have to take that long

232
00:10:27,269 --> 00:10:25,279
uh you launch out of a rocket pad a

233
00:10:28,949 --> 00:10:27,279
launch pad in baikonur kazakhstan bob

234
00:10:30,790 --> 00:10:28,959
and i have both done this a russian

235
00:10:32,470 --> 00:10:30,800
rocket called a soyuz

236
00:10:34,150 --> 00:10:32,480
and the space station is somewhere

237
00:10:36,550 --> 00:10:34,160
around the world and you sort of play

238
00:10:37,829 --> 00:10:36,560

play chase a tail chase and you have to

239
00:10:39,110 --> 00:10:37,839
get just to the right points you can

240
00:10:40,069 --> 00:10:39,120
come up and dock

241
00:10:41,910 --> 00:10:40,079
well

242
00:10:43,350 --> 00:10:41,920
you could do it quickly but it's kind of

243
00:10:44,870 --> 00:10:43,360
nice to have a little time to adapt and

244
00:10:46,389 --> 00:10:44,880
check out all your equipment but then

245
00:10:47,910 --> 00:10:46,399
again

246
00:10:50,230 --> 00:10:47,920
you run a bit of a risk with your little

247
00:10:51,990 --> 00:10:50,240
spaceship of any moment it's not on the

248
00:10:53,430 --> 00:10:52,000
earth or docked to the space station if

249
00:10:56,310 --> 00:10:53,440
something breaks then

250
00:10:57,590 --> 00:10:56,320
you run a risk so this next space launch

251
00:10:59,670 --> 00:10:57,600
that's going to happen in about three

252
00:11:02,550 --> 00:10:59,680
weeks they're actually going to launch

253
00:11:04,790 --> 00:11:02,560
and dock in six hours so they'll be sit

254
00:11:05,990 --> 00:11:04,800
just imagine if uh

255
00:11:08,389 --> 00:11:06,000
today

256
00:11:11,110 --> 00:11:08,399
right now you launched six hours from

257
00:11:13,030 --> 00:11:11,120
now i mean by by supper time you could

258
00:11:18,870 --> 00:11:13,040
be up and dock with the space station so

259
00:11:23,590 --> 00:11:22,069
hi my name is emily and do you see

260
00:11:28,870 --> 00:11:23,600
satellites in the other planet through

261
00:11:31,990 --> 00:11:30,069
emily we're

262
00:11:33,990 --> 00:11:32,000
yes we do um

263
00:11:34,710 --> 00:11:34,000

but not that much differently than on

264
00:11:36,870 --> 00:11:34,720
earth

265
00:11:39,509 --> 00:11:36,880
uh of course the other planets are are

266
00:11:41,590 --> 00:11:39,519
millions of kilometers away and we're

267
00:11:42,949 --> 00:11:41,600
only a few hundred kilometers away so

268
00:11:45,110 --> 00:11:42,959
even the moon

269
00:11:47,190 --> 00:11:45,120
although it's very slightly clearer and

270
00:11:49,350 --> 00:11:47,200
very very slightly bigger

271
00:11:51,269 --> 00:11:49,360
we're much much closer to the earth so

272
00:11:53,350 --> 00:11:51,279
even the moon looks

273
00:11:54,790 --> 00:11:53,360
pretty much the same the other planets

274
00:11:57,190 --> 00:11:54,800
were not far enough away from the earth

275
00:12:00,550 --> 00:11:57,200
to have a significant difference

276
00:12:02,230 --> 00:12:00,560
stars uh look differently just because

277
00:12:03,430 --> 00:12:02,240
there's no air in the way so they don't

278
00:12:05,190 --> 00:12:03,440
twinkle

279
00:12:08,550 --> 00:12:05,200
they're not scintillating because of the

280
00:12:10,629 --> 00:12:08,560
atmosphere so they're nice and clear

281
00:12:12,389 --> 00:12:10,639
and other satellites

282
00:12:13,990 --> 00:12:12,399
most of them are well above us most of

283
00:12:15,910 --> 00:12:14,000
the satellites we're kind of in the

284
00:12:17,750 --> 00:12:15,920
minimum orbit that you would want to be

285
00:12:19,430 --> 00:12:17,760
so you only see them as little points of

286
00:12:21,829 --> 00:12:19,440
light going by and you only see them

287
00:12:24,150 --> 00:12:21,839
rarely but any clear night in alberta if

288
00:12:26,470 --> 00:12:24,160

you go outside just around sunrise or

289
00:12:28,790 --> 00:12:26,480
just after sunset and wait and you'll

290
00:12:31,509 --> 00:12:28,800
see satellites go over sometimes you can

291
00:12:36,470 --> 00:12:31,519
see this satellite go over and that's

292
00:12:40,710 --> 00:12:37,590
okay

293
00:12:47,430 --> 00:12:40,720
i'm alexi and what does a launch feel

294
00:12:50,949 --> 00:12:49,910
alexi for launch you're lying on your

295
00:12:55,509 --> 00:12:50,959
so

296
00:12:58,629 --> 00:12:55,519
it's hard to be stable you're lying like

297
00:12:59,350 --> 00:12:58,639
this and you're accelerating that way

298
00:13:01,350 --> 00:12:59,360
so

299
00:13:04,230 --> 00:13:01,360
all of the force is on your body this

300
00:13:05,750 --> 00:13:04,240
way squishing you down into your seat

301
00:13:07,350 --> 00:13:05,760
and

302
00:13:09,269 --> 00:13:07,360
you know you could build a rocket ship

303
00:13:11,030 --> 00:13:09,279
that could have a lot more acceleration

304
00:13:13,350 --> 00:13:11,040
than the human body could take so it's

305
00:13:15,829 --> 00:13:13,360
kind of a trade-off and we've decided

306
00:13:17,910 --> 00:13:15,839
about four or five times your body's

307
00:13:19,750 --> 00:13:17,920
weight that's enough that's pretty heavy

308
00:13:21,509 --> 00:13:19,760
on your face and your chest it's hard to

309
00:13:23,430 --> 00:13:21,519
breathe you're wearing a lot of safety

310
00:13:25,910 --> 00:13:23,440
equipment and so your rocket ship is

311
00:13:27,750 --> 00:13:25,920
going that way super fast you're getting

312
00:13:29,829 --> 00:13:27,760
squished into your seat there's some

313
00:13:31,829 --> 00:13:29,839

vibration you can feel the rocket sort

314
00:13:33,670 --> 00:13:31,839
of steering like like a boat going

315
00:13:35,590 --> 00:13:33,680
through the waves as it's steering to

316
00:13:38,150 --> 00:13:35,600
get exactly to the right orbit and it

317
00:13:40,069 --> 00:13:38,160
gets quite heavy as you burn the fuel

318
00:13:41,590 --> 00:13:40,079
the rocket of course gets lighter and

319
00:13:43,110 --> 00:13:41,600
lighter so

320
00:13:44,629 --> 00:13:43,120
uh so even though the engines are

321
00:13:45,829 --> 00:13:44,639
putting up the same amount of force

322
00:13:46,790 --> 00:13:45,839
because you're getting lighter and

323
00:13:48,550 --> 00:13:46,800
lighter

324
00:13:50,230 --> 00:13:48,560
then it feels a higher and higher

325
00:13:52,310 --> 00:13:50,240
acceleration so you get squished more

326
00:13:53,750 --> 00:13:52,320
and more f equals ma

327
00:13:55,110 --> 00:13:53,760
um so

328
00:13:57,509 --> 00:13:55,120
by the end of it you're getting pretty

329
00:13:59,829 --> 00:13:57,519
heavily squished into your chair uh but

330
00:14:01,509 --> 00:13:59,839
it's a heck of a ride it only takes

331
00:14:03,430 --> 00:14:01,519
we've been talking for a little over 10

332
00:14:05,509 --> 00:14:03,440
minutes it takes less time than that to

333
00:14:07,670 --> 00:14:05,519
get to space from the time the engine's

334
00:14:09,990 --> 00:14:07,680
light until you get to space

335
00:14:12,470 --> 00:14:10,000
it is only about nine minutes and it's a

336
00:14:14,629 --> 00:14:12,480
rough ride but boy it is a ride i'd be

337
00:14:16,069 --> 00:14:14,639
happy to do again and it's a ride that

338
00:14:17,030 --> 00:14:16,079

takes you someplace you can't get any

339
00:14:22,710 --> 00:14:17,040
other way

340
00:14:27,430 --> 00:14:25,350
hi i'm ashley do you have a form 45

341
00:14:33,269 --> 00:14:27,440
minute day and then a 45 minute night

342
00:14:39,189 --> 00:14:34,949
ashley uh

343
00:14:43,350 --> 00:14:41,829
so let's say that this is the world okay

344
00:14:44,389 --> 00:14:43,360
this roll i'll get a little closer you

345
00:14:45,990 --> 00:14:44,399
can see

346
00:14:47,110 --> 00:14:46,000
let's say that this great tape is the

347
00:14:47,990 --> 00:14:47,120
world

348
00:14:50,389 --> 00:14:48,000
so

349
00:14:51,910 --> 00:14:50,399
we're going around the world but if you

350
00:14:53,750 --> 00:14:51,920
guys are the sun

351
00:14:55,430 --> 00:14:53,760
then sometimes we go around the world

352
00:14:57,030 --> 00:14:55,440
this way and if that's the case then

353
00:14:58,870 --> 00:14:57,040
you're right you'd be in the sun for

354
00:15:00,389 --> 00:14:58,880
about 45 minutes and then you'd be

355
00:15:03,590 --> 00:15:00,399
behind the world in the shade for about

356
00:15:05,990 --> 00:15:03,600
45 minutes but our orbit precesses and

357
00:15:07,990 --> 00:15:06,000
sometimes we go around the world

358
00:15:09,430 --> 00:15:08,000
sort of this way and if you're going

359
00:15:11,269 --> 00:15:09,440
around the world this way then if you

360
00:15:13,189 --> 00:15:11,279
think about it if you guys are the sun

361
00:15:15,430 --> 00:15:13,199
then you might come into the sun right

362
00:15:17,750 --> 00:15:15,440
here and you'd be in the sun almost your

363
00:15:20,310 --> 00:15:17,760

whole orbit until you came around to the

364
00:15:22,310 --> 00:15:20,320
shadow again sort of following

365
00:15:23,990 --> 00:15:22,320
almost the sunset line on the world all

366
00:15:26,230 --> 00:15:24,000
the way around and sometimes that

367
00:15:28,230 --> 00:15:26,240
happens where you're sort of at an

368
00:15:31,590 --> 00:15:28,240
oblique angle to the sun and so you get

369
00:15:32,629 --> 00:15:31,600
a lot of sort of dim sunshine until you

370
00:15:34,310 --> 00:15:32,639
come around and then you get a little

371
00:15:36,790 --> 00:15:34,320
bit of night on the other side so the

372
00:15:38,710 --> 00:15:36,800
maximum you can ever get is your 45 of

373
00:15:47,749 --> 00:15:38,720
night and then it gets less and less

374
00:15:52,629 --> 00:15:50,310
hi i'm haley and i was wondering can you

375
00:15:58,150 --> 00:15:52,639
feel the speed of the iss as it orbits

376
00:16:03,749 --> 00:16:00,790
you can't feel the speed haley it's sort

377
00:16:05,829 --> 00:16:03,759
of like you know that in alberta you're

378
00:16:07,509 --> 00:16:05,839
going pretty fast you know you see the

379
00:16:09,350 --> 00:16:07,519
sun rise on one side in the morning and

380
00:16:10,949 --> 00:16:09,360
it goes across and sets on the other

381
00:16:12,949 --> 00:16:10,959
side in the evening and that's because

382
00:16:15,829 --> 00:16:12,959
the world is turning so you've got a lot

383
00:16:17,030 --> 00:16:15,839
of speed you're moving fast

384
00:16:18,710 --> 00:16:17,040
but you don't feel it because

385
00:16:21,430 --> 00:16:18,720
everything's moving along with you and

386
00:16:23,829 --> 00:16:21,440
it's the same up here the only time you

387
00:16:24,949 --> 00:16:23,839
really get a sense of the fact that

388
00:16:26,550 --> 00:16:24,959

you're moving

389
00:16:28,870 --> 00:16:26,560
is sort of like where you are when you

390
00:16:31,110 --> 00:16:28,880
look at something else when you look at

391
00:16:32,470 --> 00:16:31,120
the sun you can tell as the sun rises

392
00:16:34,790 --> 00:16:32,480
and goes to the sky that you know the

393
00:16:36,870 --> 00:16:34,800
world is turning well for us when we

394
00:16:38,790 --> 00:16:36,880
look down at the earth especially if you

395
00:16:40,949 --> 00:16:38,800
look straight down we're going eight

396
00:16:42,790 --> 00:16:40,959
kilometers a second

397
00:16:44,389 --> 00:16:42,800
you know you could be in calgary in in

398
00:16:46,710 --> 00:16:44,399
just a few seconds

399
00:16:49,110 --> 00:16:46,720
and we right across canada in 10 minutes

400
00:16:51,030 --> 00:16:49,120
from the pacific to the atlantic so when

401
00:16:53,030 --> 00:16:51,040
you look straight down it's amazing how

402
00:16:54,710 --> 00:16:53,040
fast the world goes by and you actually

403
00:16:56,790 --> 00:16:54,720
even though we're a long ways up you get

404
00:17:00,710 --> 00:16:56,800
a ground rush just from the incredible

405
00:17:03,430 --> 00:17:00,720
speed we go uh 28 000 kilometers an hour

406
00:17:09,029 --> 00:17:03,440
almost 500 kilometers every minute it's

407
00:17:12,470 --> 00:17:10,870
hi i'm rachel and i'd like to know

408
00:17:19,829 --> 00:17:12,480
during the launch how do you know when

409
00:17:22,390 --> 00:17:21,029
that's that's an interesting question

410
00:17:24,470 --> 00:17:22,400
the um

411
00:17:26,150 --> 00:17:24,480
the purpose of the launch

412
00:17:28,230 --> 00:17:26,160
is of course number one to get you above

413
00:17:29,750 --> 00:17:28,240

the air because you can't go fast enough

414
00:17:31,909 --> 00:17:29,760
in the air there's too much friction

415
00:17:33,830 --> 00:17:31,919
with the air so first the rocket has to

416
00:17:35,750 --> 00:17:33,840
get you above the air and then it has to

417
00:17:37,270 --> 00:17:35,760
tip you over and get you going fast

418
00:17:38,549 --> 00:17:37,280
enough to stay in orbit because if

419
00:17:40,630 --> 00:17:38,559
you're not going fast enough you'll just

420
00:17:42,789 --> 00:17:40,640
fall back down into the air again but

421
00:17:45,430 --> 00:17:42,799
there's a certain speed that is just

422
00:17:47,510 --> 00:17:45,440
fast enough that will fall at the same

423
00:17:49,270 --> 00:17:47,520
rate that the earth curves away from you

424
00:17:51,110 --> 00:17:49,280
and so then you'll be weightless because

425
00:17:53,029 --> 00:17:51,120
you just keep falling just like i'm

426
00:17:55,110 --> 00:17:53,039
falling right now but because we're

427
00:17:56,710 --> 00:17:55,120
going fast enough we never fall down

428
00:18:00,150 --> 00:17:56,720
into the atmosphere the earth's

429
00:18:01,750 --> 00:18:00,160
curvature matches our fall rate so uh

430
00:18:03,590 --> 00:18:01,760
that speed is eight kilometers a second

431
00:18:05,430 --> 00:18:03,600
so when you're in your rocket ship

432
00:18:08,070 --> 00:18:05,440
it's getting you above the air and then

433
00:18:10,470 --> 00:18:08,080
it's accelerating like crazy squishing

434
00:18:12,310 --> 00:18:10,480
in your chair until it has calculated

435
00:18:14,470 --> 00:18:12,320
the computers and the rocket ship have

436
00:18:16,710 --> 00:18:14,480
calculated that you are at exactly the

437
00:18:19,270 --> 00:18:16,720
right height the right angle and the

438
00:18:22,630 --> 00:18:19,280

right speed and the engine shut off and

439
00:18:25,110 --> 00:18:22,640
at that moment at that moment you are in

440
00:18:27,029 --> 00:18:25,120
space and you are weightless because you

441
00:18:28,710 --> 00:18:27,039
go from being squished in your chair by

442
00:18:31,830 --> 00:18:28,720
the acceleration of the rocket to

443
00:18:33,830 --> 00:18:31,840
suddenly weightless and floating inside

444
00:18:35,350 --> 00:18:33,840
your rocket ship and it just happens

445
00:18:37,110 --> 00:18:35,360
just it's like

446
00:18:39,830 --> 00:18:37,120
it's like you were getting pummeled and

447
00:18:41,590 --> 00:18:39,840
beaten up and squished by you know some

448
00:18:44,390 --> 00:18:41,600
big fat gorilla sitting on you and then

449
00:18:51,750 --> 00:18:44,400
they picked up and threw you off a cliff

450
00:18:57,750 --> 00:18:55,510
hi mr hatfield i'm ashton and i was just

451
00:18:59,669 --> 00:18:57,760
wondering how does it feel to sleep

452
00:19:00,870 --> 00:18:59,679
while you're floating in there

453
00:19:06,230 --> 00:19:00,880
i mean and

454
00:19:10,789 --> 00:19:08,150
ash how does it feel to sleep

455
00:19:12,390 --> 00:19:10,799
here's how you do it okay so you uh you

456
00:19:14,710 --> 00:19:12,400
go i have a little sleeping room just

457
00:19:16,150 --> 00:19:14,720
over there uh when it's time on my watch

458
00:19:17,990 --> 00:19:16,160
to sleep because of course the only way

459
00:19:20,789 --> 00:19:18,000
to tell is by time because the sun's not

460
00:19:22,310 --> 00:19:20,799
right so you you go in you float down

461
00:19:24,070 --> 00:19:22,320
into your sleeping bag you put your feet

462
00:19:25,750 --> 00:19:24,080
into it you float your whole body into

463
00:19:27,750 --> 00:19:25,760

your sleeping bag and then the sleeping

464
00:19:29,590 --> 00:19:27,760
bag has arm holes so you put your arms

465
00:19:31,990 --> 00:19:29,600
through the armholes you do up the great

466
00:19:33,990 --> 00:19:32,000
big zipper and the sleeping bag is just

467
00:19:36,630 --> 00:19:34,000
has a couple little shoe laces tying it

468
00:19:39,110 --> 00:19:36,640
to the wall and that's all and then you

469
00:19:40,710 --> 00:19:39,120
just relax inside your sleeping bag and

470
00:19:41,430 --> 00:19:40,720
when you relax

471
00:19:43,029 --> 00:19:41,440
your

472
00:19:45,750 --> 00:19:43,039
knees it's sort of like

473
00:19:47,909 --> 00:19:45,760
if you ever seen a picture of a uh

474
00:19:50,470 --> 00:19:47,919
of a neonate you know inside their

475
00:19:52,390 --> 00:19:50,480
mother's womb where the body's floating

476
00:19:54,390 --> 00:19:52,400
um it's sort of like that your your

477
00:19:57,669 --> 00:19:54,400
knees come up your arms float up your

478
00:19:59,350 --> 00:19:57,679
head comes forward and you relax and

479
00:20:02,149 --> 00:19:59,360
every single muscle in your body is

480
00:20:04,789 --> 00:20:02,159
relaxed everyone you don't have to roll

481
00:20:06,630 --> 00:20:04,799
over you you don't need a pillow your

482
00:20:08,470 --> 00:20:06,640
shoulder doesn't get sore you don't get

483
00:20:10,149 --> 00:20:08,480
hot in one side and cold on the other

484
00:20:11,350 --> 00:20:10,159
you are completely

485
00:20:13,669 --> 00:20:11,360
relaxed

486
00:20:15,669 --> 00:20:13,679
so it's a wonderful way to sleep you

487
00:20:18,149 --> 00:20:15,679
just every joint is is completely

488
00:20:23,190 --> 00:20:18,159

relaxed in your body i love sleeping and

489
00:20:26,470 --> 00:20:24,789
commander hatfield is bonnie schmidt

490
00:20:28,230 --> 00:20:26,480
from let's talk science again we've just

491
00:20:30,149 --> 00:20:28,240
been notified that our downlink is

492
00:20:31,750 --> 00:20:30,159
ending but i want to thank you so much

493
00:20:33,830 --> 00:20:31,760
for joining us with everybody here at

494
00:20:36,870 --> 00:20:33,840
burt church high school you've made us

495
00:20:38,710 --> 00:20:36,880
so very proud and your your capacity to

496
00:20:40,789 --> 00:20:38,720
take millions of us on this incredible

497
00:20:42,470 --> 00:20:40,799
voyage with you will be remembered by by

498
00:20:46,630 --> 00:20:42,480
all of us so thank you and good luck

499
00:20:54,870 --> 00:20:50,789
thank you very much

500
00:20:57,430 --> 00:20:54,880
thanks to all the students for the great

501
00:20:58,630 --> 00:20:57,440
questions um for the students that uh i

502
00:21:00,230 --> 00:20:58,640
didn't get chance to answer your

503
00:21:02,070 --> 00:21:00,240
questions i'll answer them in writing

504
00:21:04,070 --> 00:21:02,080
for you and

505
00:21:06,230 --> 00:21:04,080
thank you to let's talk science that's a

506
00:21:07,909 --> 00:21:06,240
really good organization in canada doing

507
00:21:10,470 --> 00:21:07,919
a lot of good work right across the

508
00:21:12,870 --> 00:21:10,480
country and we need to understand how

509
00:21:15,909 --> 00:21:12,880
things work to make canada a viable

510
00:21:18,470 --> 00:21:15,919
healthy economy and lex talk science

511
00:21:21,190 --> 00:21:18,480
really helps young canadians learn and

512
00:21:23,029 --> 00:21:21,200
figure out and invent how things work

513
00:21:24,630 --> 00:21:23,039

and and so thanks for doing that thanks

514
00:21:26,470 --> 00:21:24,640
for having me into your school today i

515
00:21:27,990 --> 00:21:26,480
wish everybody all the best and uh

516
00:21:36,390 --> 00:21:28,000
signing off from the international space

517
00:21:41,510 --> 00:21:38,149
station this is houston acr that

518
00:21:42,710 --> 00:21:41,520
concludes the event thank you

519
00:21:44,230 --> 00:21:42,720
thank you let's talk science

520
00:21:45,669 --> 00:21:44,240
participants stationed we are now