
Follow Chris' Mission
@ astro_seal

1
00:00:01,439 --> 00:00:09,070
ignition sequence stars

2
00:00:16,070 --> 00:00:14,150
[Music]

3
00:00:17,590 --> 00:00:16,080
good morning you're looking at the scene

4
00:00:19,349 --> 00:00:17,600
in the international space station

5
00:00:21,029 --> 00:00:19,359
flight control room at nasa's johnson

6
00:00:22,790 --> 00:00:21,039
space center in houston

7
00:00:24,470 --> 00:00:22,800
this is where there is always a team of

8
00:00:26,470 --> 00:00:24,480
specialists on duty to monitor the

9
00:00:27,830 --> 00:00:26,480
station systems and where they work with

10
00:00:30,310 --> 00:00:27,840
the crew members through all of their

11
00:00:32,709 --> 00:00:30,320
tasks on the daily agenda

12
00:00:34,790 --> 00:00:32,719
expedition 63 commander chris cassidy

13
00:00:36,709 --> 00:00:34,800

and flight engineers anatoly ivanishin

14
00:00:38,790 --> 00:00:36,719
and yvonne wagner are looking forward to

15
00:00:40,630 --> 00:00:38,800
spending their upcoming weekend off duty

16
00:00:42,470 --> 00:00:40,640
after having finished up a full week

17
00:00:47,750 --> 00:00:42,480
full of science support and station

18
00:00:51,750 --> 00:00:49,910
houston station on space to ground

19
00:00:54,069 --> 00:00:51,760
welcome to space to ground i'm leah

20
00:00:56,229 --> 00:00:54,079
cheshire this week chris cassidy

21
00:00:59,670 --> 00:00:56,239
continued research into how the body

22
00:01:01,830 --> 00:00:59,680
repairs dna damage in space

23
00:01:04,469 --> 00:01:01,840
due to increased exposure to radiation

24
00:01:06,870 --> 00:01:04,479
in space dna damage can have long-term

25
00:01:09,510 --> 00:01:06,880
effects on astronaut health the genes in

26
00:01:12,230 --> 00:01:09,520
space 6 experiment evaluates the entire

27
00:01:14,469 --> 00:01:12,240
dna repair process by inducing dna

28
00:01:17,030 --> 00:01:14,479
damages and assessing mutation and

29
00:01:19,510 --> 00:01:17,040
repair on tuesday cassidy set up the

30
00:01:22,070 --> 00:01:19,520
biomolecule sequencer a device that can

31
00:01:24,310 --> 00:01:22,080
sequence dna in space with a new flow

32
00:01:26,630 --> 00:01:24,320
cell where the samples are added

33
00:01:28,550 --> 00:01:26,640
understanding how dna damage and repairs

34
00:01:30,630 --> 00:01:28,560
occur in microgravity can contribute to

35
00:01:33,030 --> 00:01:30,640
procedures to protect astronauts not

36
00:01:36,149 --> 00:01:33,040
only on the space station but also on

37
00:01:38,390 --> 00:01:36,159
future missions to the moon or mars

38
00:01:40,789 --> 00:01:38,400

in the japanese aerospace exploration

39
00:01:42,870 --> 00:01:40,799
agency's kibo module chris cassidy

40
00:01:45,109 --> 00:01:42,880
worked on hardware that gives us a much

41
00:01:47,190 --> 00:01:45,119
closer look at things we can't see with

42
00:01:49,190 --> 00:01:47,200
the naked eye

43
00:01:51,510 --> 00:01:49,200
cassidy performed lens collection for

44
00:01:53,429 --> 00:01:51,520
the confocal space microscopy setup and

45
00:01:56,230 --> 00:01:53,439
closeout removing the lenses from the

46
00:01:57,910 --> 00:01:56,240
aquatic habitat in kibo and reinstalling

47
00:01:59,990 --> 00:01:57,920
them to the microscope setup in the

48
00:02:02,230 --> 00:02:00,000
japanese experiment module helping

49
00:02:04,230 --> 00:02:02,240
maintain the microscope itself

50
00:02:06,789 --> 00:02:04,240
as it is confocal this special

51
00:02:08,710 --> 00:02:06,799
microscope blocks out out-of-focus light

52
00:02:10,389 --> 00:02:08,720
providing a greater resolution on the

53
00:02:12,710 --> 00:02:10,399
subject of interest

54
00:02:14,790 --> 00:02:12,720
the confocal microscope allows data to

55
00:02:16,949 --> 00:02:14,800
be obtained real time on the fundamental

56
00:02:18,949 --> 00:02:16,959
nature of cellular and tissue structures

57
00:02:20,790 --> 00:02:18,959
and functions

58
00:02:22,630 --> 00:02:20,800
as we look forward to the weekend on

59
00:02:24,390 --> 00:02:22,640
earth it seems like a good chance to

60
00:02:27,910 --> 00:02:24,400
answer natalie's question about what

61
00:02:30,309 --> 00:02:27,920
weekends are like on the space station

62
00:02:32,470 --> 00:02:30,319
like most full-time employees on earth

63
00:02:34,630 --> 00:02:32,480

astronauts in space usually get weekends

64
00:02:36,309 --> 00:02:34,640
off too and enjoy talking with friends

65
00:02:39,509 --> 00:02:36,319
and family taking photos out of the

66
00:02:41,270 --> 00:02:39,519
window reading watching movies and more

67
00:02:43,589 --> 00:02:41,280
however there are a couple of tasks

68
00:02:45,670 --> 00:02:43,599
still on their schedules astronauts are

69
00:02:47,910 --> 00:02:45,680
still required to work out for about two

70
00:02:50,150 --> 00:02:47,920
hours each day and they also take some

71
00:02:51,830 --> 00:02:50,160
time to tidy up their home in low earth

72
00:02:53,750 --> 00:02:51,840
orbit

73
00:02:59,370 --> 00:02:53,760
keep sending in your questions using the

74
00:02:59,380 --> 00:03:09,990
[Music]

75
00:03:13,910 --> 00:03:12,229
chris cassidy is a u.s navy captain with

76
00:03:15,910 --> 00:03:13,920
a bachelor's degree in math from the

77
00:03:18,869 --> 00:03:15,920
naval academy and a masters in ocean

78
00:03:20,949 --> 00:03:18,879
engineering from mit he also served 11

79
00:03:22,949 --> 00:03:20,959
years as a navy seal with four overseas

80
00:03:25,030 --> 00:03:22,959
deployments before becoming a nasa

81
00:03:26,630 --> 00:03:25,040
astronaut but you never really know

82
00:03:28,470 --> 00:03:26,640
someone do you until you know things

83
00:03:30,710 --> 00:03:28,480
like their favorite musical instrument

84
00:03:32,309 --> 00:03:30,720
and what they hope to be remembered for

85
00:03:34,070 --> 00:03:32,319
cassidy shed some light on these things

86
00:03:45,589 --> 00:03:34,080
and more as the clock counted down to

87
00:03:50,070 --> 00:03:47,990
what is your favorite season fall what's

88
00:03:53,110 --> 00:03:50,080

your favorite constellation orion

89
00:03:56,070 --> 00:03:53,120
favorite musical instrument the viola

90
00:03:58,550 --> 00:03:56,080
the viola only because my kids played it

91
00:04:01,030 --> 00:03:58,560
morning or night person morning one

92
00:04:02,869 --> 00:04:01,040
thing you're afraid of screwing up on a

93
00:04:05,589 --> 00:04:02,879
space mission one thing you have in the

94
00:04:07,429 --> 00:04:05,599
refrigerator at all times pesto what's

95
00:04:09,750 --> 00:04:07,439
your favorite book the count of monte

96
00:04:13,429 --> 00:04:09,760
cristo favorite movie saving private

97
00:04:15,750 --> 00:04:13,439
ryan favorite dance move sprinkler

98
00:04:18,069 --> 00:04:15,760
what's your favorite color navy blue

99
00:04:20,150 --> 00:04:18,079
guilty pleasure eating ice cream the

100
00:04:21,509 --> 00:04:20,160
accomplishment you are most proud of

101
00:04:23,749 --> 00:04:21,519
being the honor graduate of seal

102
00:04:25,909 --> 00:04:23,759
training the next item on your space

103
00:04:27,430 --> 00:04:25,919
bucket list welcoming

104
00:04:29,189 --> 00:04:27,440
one of the commercial crews onboard the

105
00:04:32,150 --> 00:04:29,199
space station advice that you would give

106
00:04:35,430 --> 00:04:32,160
to younger you communicate more often

107
00:04:37,990 --> 00:04:35,440
who inspires you anybody that does

108
00:04:40,390 --> 00:04:38,000
unsolicited unselfish acts what would

109
00:04:42,790 --> 00:04:40,400
you like to be remembered for

110
00:05:00,870 --> 00:04:42,800
having the greatest nba three-point

111
00:05:05,189 --> 00:05:02,629
the international space station is a

112
00:05:06,870 --> 00:05:05,199
working laboratory in space and solar

113
00:05:07,830 --> 00:05:06,880

energy is a key element in keeping it

114
00:05:09,749 --> 00:05:07,840
running

115
00:05:11,350 --> 00:05:09,759
astronauts rely on this renewable energy

116
00:05:13,189 --> 00:05:11,360
source to power the machines they need

117
00:05:15,189 --> 00:05:13,199
for their science work as well as the

118
00:05:17,430 --> 00:05:15,199
ones they need for their survival

119
00:05:19,189 --> 00:05:17,440
in this demonstration video astronaut

120
00:05:20,710 --> 00:05:19,199
ricky arnold explains the process of

121
00:05:22,790 --> 00:05:20,720
generating power from the station's

122
00:05:25,749 --> 00:05:22,800
solar arrays to produce the electricity

123
00:05:28,970 --> 00:05:25,759
for astronauts as they orbit 250 miles

124
00:05:42,070 --> 00:05:28,980
above the earth's surface

125
00:05:45,189 --> 00:05:43,590
all right welcome aboard the

126
00:05:47,189 --> 00:05:45,199
international space station i'm

127
00:05:49,189 --> 00:05:47,199
astronaut ricky arnold and i'm currently

128
00:05:52,150 --> 00:05:49,199
at one of our human research facilities

129
00:05:55,270 --> 00:05:52,160
on iss where you can see centrifuges

130
00:05:56,710 --> 00:05:55,280
laptops and other scientific equipment

131
00:05:58,469 --> 00:05:56,720
across from me is another one of these

132
00:06:01,749 --> 00:05:58,479
experiment racks where you can see

133
00:06:03,909 --> 00:06:01,759
ultrasound imaging more laptops cameras

134
00:06:06,550 --> 00:06:03,919
other equipment all stuff that requires

135
00:06:08,230 --> 00:06:06,560
electrical power in fact we have so much

136
00:06:10,469 --> 00:06:08,240
equipment for science and life support

137
00:06:13,350 --> 00:06:10,479
that our electrical system has about 8

138
00:06:15,350 --> 00:06:13,360

miles or 13 kilometers of wiring to make

139
00:06:16,629 --> 00:06:15,360
it all work so where does this energy

140
00:06:19,270 --> 00:06:16,639
come from

141
00:06:20,550 --> 00:06:19,280
let's have a look

142
00:06:22,150 --> 00:06:20,560
from here in the cupola and through

143
00:06:24,550 --> 00:06:22,160
other windows you can easily see the

144
00:06:25,909 --> 00:06:24,560
solar arrays soaking in the sunlight

145
00:06:27,670 --> 00:06:25,919
they are massive

146
00:06:30,070 --> 00:06:27,680
these four solar arrays are made of

147
00:06:32,309 --> 00:06:30,080
solar cells which are purified chunks of

148
00:06:35,670 --> 00:06:32,319
the element silicon together the solar

149
00:06:38,469 --> 00:06:35,680
rays contain a total of 262 400 solar

150
00:06:40,550 --> 00:06:38,479
cells and cover an area of about 27 000

151
00:06:43,830 --> 00:06:40,560
square feet more than half the area of a

152
00:06:45,350 --> 00:06:43,840
football field that's huge

153
00:06:47,270 --> 00:06:45,360
when the station is in sunlight the

154
00:06:49,589 --> 00:06:47,280
solar arrays produce about 60 percent

155
00:06:50,950 --> 00:06:49,599
more power than we actually need during

156
00:06:52,790 --> 00:06:50,960
the daytime

157
00:06:55,430 --> 00:06:52,800
that extra power goes directly to

158
00:06:56,870 --> 00:06:55,440
charging our lithium-ion batteries

159
00:06:59,029 --> 00:06:56,880
those batteries are essential because

160
00:07:01,749 --> 00:06:59,039
they provide the power we need during

161
00:07:03,749 --> 00:07:01,759
the 16 night times we have per day here

162
00:07:05,510 --> 00:07:03,759
on the space station

163
00:07:07,909 --> 00:07:05,520

the energy our solar arrays can produce

164
00:07:09,830 --> 00:07:07,919
is enough to power 40 homes and we can

165
00:07:12,390 --> 00:07:09,840
maximize the power we generate by

166
00:07:13,990 --> 00:07:12,400
rotating the arrays in two axes one like

167
00:07:16,070 --> 00:07:14,000
a windmill to track the sun through the

168
00:07:18,230 --> 00:07:16,080
course of the day the other the track

169
00:07:19,990 --> 00:07:18,240
the sun's inclination or its angle in

170
00:07:21,670 --> 00:07:20,000
the sky

171
00:07:24,070 --> 00:07:21,680
the space station's electrical power

172
00:07:26,070 --> 00:07:24,080
system uses direct current to provide

173
00:07:30,070 --> 00:07:26,080
energy for our laptop's lights water

174
00:07:31,909 --> 00:07:30,080
recovery system and science experiments

175
00:07:36,620 --> 00:07:31,919
thanks for coming aboard today now back

176
00:07:58,150 --> 00:07:43,270
[Music]

177
00:08:01,830 --> 00:07:59,830
many nasa astronauts who have been to

178
00:08:03,990 --> 00:08:01,840
space for an extended period of time

179
00:08:05,749 --> 00:08:04,000
such as ricky arnold has returned to

180
00:08:07,670 --> 00:08:05,759
earth with a new appreciation for the

181
00:08:09,270 --> 00:08:07,680
planet they left behind it's also been

182
00:08:10,869 --> 00:08:09,280
true for those who took a trip to space

183
00:08:12,629 --> 00:08:10,879
on a space shuttle mission that only

184
00:08:14,070 --> 00:08:12,639
lasted a week or so

185
00:08:15,990 --> 00:08:14,080
take it from former astronaut bill

186
00:08:18,469 --> 00:08:16,000
mcarthur who has made both kinds of

187
00:08:20,629 --> 00:08:18,479
trips he tells us he has definitely

188
00:08:25,160 --> 00:08:20,639

experienced a shift in his world view

189
00:08:43,670 --> 00:08:37,180
[Music]

190
00:08:45,990 --> 00:08:43,680
when you first get to get to get to

191
00:08:47,990 --> 00:08:46,000
orbit of course main engine cuts off and

192
00:08:49,829 --> 00:08:48,000
it's it's really it's really funny it's

193
00:08:52,470 --> 00:08:49,839
really not funny but it's fun to watch

194
00:08:54,550 --> 00:08:52,480
everyone i think everyone takes whatever

195
00:08:57,190 --> 00:08:54,560
writing utensil he or she has and

196
00:08:59,350 --> 00:08:57,200
releases it because it's it's i want to

197
00:09:01,030 --> 00:08:59,360
see something float yeah i know i feel

198
00:09:02,150 --> 00:09:01,040
floaty but now i want to see something

199
00:09:04,470 --> 00:09:02,160
float

200
00:09:06,790 --> 00:09:04,480
and then as quickly as you can

201
00:09:14,630 --> 00:09:06,800
particularly a first-time flyer it's

202
00:09:20,310 --> 00:09:16,070
the first thing you're overwhelmed with

203
00:09:25,269 --> 00:09:22,790
it's darn exciting and so immediately

204
00:09:29,269 --> 00:09:25,279
you're trying to identify geographical

205
00:09:32,230 --> 00:09:29,279
feed identify places

206
00:09:34,630 --> 00:09:32,240
you look and you see things like a

207
00:09:36,949 --> 00:09:34,640
massive thunderstorm you know a super

208
00:09:39,590 --> 00:09:36,959
cumulonimbus cloud coming up and it

209
00:09:42,070 --> 00:09:39,600
really does come up at you it is that

210
00:09:44,310 --> 00:09:42,080
tangible nature of what what you're

211
00:09:49,110 --> 00:09:44,320
seeing that really does take your breath

212
00:09:53,590 --> 00:09:51,590
i worried my family when i was sending

213
00:09:56,630 --> 00:09:53,600

them notes because i started talking

214
00:09:58,630 --> 00:09:56,640
about the black velvet of deep space you

215
00:10:00,550 --> 00:09:58,640
look in the sky here on the earth and

216
00:10:02,550 --> 00:10:00,560
you know it's like milky way or those

217
00:10:05,750 --> 00:10:02,560
thin clouds up there what am i looking

218
00:10:08,150 --> 00:10:05,760
at but but everything is really really

219
00:10:09,910 --> 00:10:08,160
vivid and and i think that's

220
00:10:11,350 --> 00:10:09,920
another part of the visual aspect

221
00:10:15,829 --> 00:10:11,360
whether you're looking out or looking

222
00:10:18,710 --> 00:10:15,839
down it's part of the same thing of

223
00:10:20,949 --> 00:10:18,720
taking a picture of someone nothing

224
00:10:22,470 --> 00:10:20,959
captures

225
00:10:25,030 --> 00:10:22,480
vivid colors

226
00:10:26,870 --> 00:10:25,040
and and texture and subtlety like the

227
00:10:28,470 --> 00:10:26,880
human eye does and and when you're in

228
00:10:29,750 --> 00:10:28,480
space it's the same thing and i think

229
00:10:30,710 --> 00:10:29,760
that's in part

230
00:10:33,670 --> 00:10:30,720
why

231
00:10:36,069 --> 00:10:33,680
it's such a such a powerful

232
00:10:39,430 --> 00:10:36,079
personal experience and as much as we

233
00:10:41,670 --> 00:10:39,440
love the pictures that we bring back

234
00:10:43,060 --> 00:10:41,680
it's not the same as

235
00:10:45,350 --> 00:10:43,070
seeing it yourself

236
00:10:47,590 --> 00:10:45,360
[Music]

237
00:10:49,110 --> 00:10:47,600
there's a certain serenity

238
00:10:51,670 --> 00:10:49,120

that comes it's not just from what

239
00:10:55,829 --> 00:10:51,680
you've seen it's from

240
00:11:00,310 --> 00:10:58,630
goal that you had and that's something i

241
00:11:02,710 --> 00:11:00,320
felt right after i got on orbit the

242
00:11:05,030 --> 00:11:02,720
first time is

243
00:11:07,750 --> 00:11:05,040
you know heaven forbid

244
00:11:11,110 --> 00:11:07,760
i could perish now

245
00:11:13,509 --> 00:11:11,120
and or or i can never fly again but

246
00:11:17,190 --> 00:11:13,519
nothing can take this experience away i

247
00:11:20,390 --> 00:11:17,200
i now i own this experience it is it is

248
00:11:21,270 --> 00:11:20,400
mine forever

249
00:11:22,150 --> 00:11:21,280
[Music]

250
00:11:31,030 --> 00:11:22,160
[Laughter]

251
00:11:34,310 --> 00:11:32,790
can you imagine what it must be like for

252
00:11:35,990 --> 00:11:34,320
scientists who spend years of their

253
00:11:38,310 --> 00:11:36,000
lives developing and designing an

254
00:11:40,790 --> 00:11:38,320
experiment to finally watch it blast off

255
00:11:42,710 --> 00:11:40,800
a planet on the top of a rocket

256
00:11:44,790 --> 00:11:42,720
well in this episode of the new series

257
00:11:46,310 --> 00:11:44,800
nasa explorers you can watch a pair of

258
00:11:48,150 --> 00:11:46,320
researchers go through their first

259
00:11:54,270 --> 00:11:48,160
experience of launching all their hard

260
00:11:54,280 --> 00:11:59,110
[Music]

261
00:12:03,910 --> 00:12:01,590
it's the launch day it's a little windy

262
00:12:04,949 --> 00:12:03,920
out here today it's a beautiful day uh

263
00:12:07,430 --> 00:12:04,959

it's a little windy it's got me

264
00:12:08,949 --> 00:12:07,440
concerned my my launch intuition is uh

265
00:12:11,990 --> 00:12:08,959
tingling a bit

266
00:12:13,430 --> 00:12:12,000
i grew up here in florida i came to this

267
00:12:15,030 --> 00:12:13,440
very spot out here in the causeway as a

268
00:12:15,910 --> 00:12:15,040
kid my dad would take us to lunches all

269
00:12:18,389 --> 00:12:15,920
the time

270
00:12:21,030 --> 00:12:18,399
so personally oh it's like

271
00:12:22,230 --> 00:12:21,040
the kid in me comes out when i come here

272
00:12:23,750 --> 00:12:22,240
it's really cool

273
00:12:25,829 --> 00:12:23,760
i've been on both sides of it i've been

274
00:12:28,150 --> 00:12:25,839
a researcher and then i've been now

275
00:12:30,470 --> 00:12:28,160
helping researchers and i gotta say it's

276
00:12:32,710 --> 00:12:30,480
it's nervous on both sides you have a

277
00:12:34,790 --> 00:12:32,720
lot of worry i guess as a scientist you

278
00:12:35,910 --> 00:12:34,800
have a lot of work involved as a payload

279
00:12:37,590 --> 00:12:35,920
provider

280
00:12:38,870 --> 00:12:37,600
you hope you've checked all the boxes

281
00:12:40,389 --> 00:12:38,880
and you've done all that you can do to

282
00:12:41,990 --> 00:12:40,399
make everything work for the researchers

283
00:12:43,670 --> 00:12:42,000
so that they get good data

284
00:12:45,190 --> 00:12:43,680
it's not easy to put even the most

285
00:12:47,750 --> 00:12:45,200
simplest payloads

286
00:12:49,430 --> 00:12:47,760
on the space station but it's worth it

287
00:12:51,190 --> 00:12:49,440
it's worth all the work i think some of

288
00:12:53,350 --> 00:12:51,200

the biggest discoveries we have

289
00:12:54,949 --> 00:12:53,360
we've made and are going to find her up

290
00:12:57,190 --> 00:12:54,959
on the space station it's incredibly

291
00:12:58,470 --> 00:12:57,200
important

292
00:13:01,030 --> 00:12:58,480
well we've been really nervous all the

293
00:13:01,750 --> 00:13:01,040
way up until right this moment nervous

294
00:13:03,670 --> 00:13:01,760
that

295
00:13:04,949 --> 00:13:03,680
our our dreams aren't actually going to

296
00:13:06,710 --> 00:13:04,959
happen

297
00:13:08,470 --> 00:13:06,720
but now that the

298
00:13:10,790 --> 00:13:08,480
um you know larger countdown is

299
00:13:12,150 --> 00:13:10,800
happening and the

300
00:13:13,750 --> 00:13:12,160
rockets all fueled up and everything

301
00:13:15,430 --> 00:13:13,760
looks like it's going to happen on time

302
00:13:17,269 --> 00:13:15,440
it's it's getting really exciting the

303
00:13:18,710 --> 00:13:17,279
last you know 15 minute window before it

304
00:13:20,629 --> 00:13:18,720
takes off

305
00:13:22,230 --> 00:13:20,639
you know thanks to cases for funding

306
00:13:24,230 --> 00:13:22,240
this thanks to nanoracks for helping us

307
00:13:26,470 --> 00:13:24,240
coordinate and making the hardware and

308
00:13:27,750 --> 00:13:26,480
coordinating all the data collection too

309
00:13:29,269 --> 00:13:27,760
thank you for the astronauts who are

310
00:13:31,110 --> 00:13:29,279
going to be working on this project on

311
00:13:33,829 --> 00:13:31,120
station so

312
00:13:35,670 --> 00:13:33,839
a lot of a lot of people worked on this

313
00:13:37,430 --> 00:13:35,680

it's not just the two of us it's it's

314
00:13:45,330 --> 00:13:37,440
been a lot of people so

315
00:13:51,110 --> 00:13:48,310
[Music]

316
00:13:52,470 --> 00:13:51,120
as falcon 9 and cargo dragon take flight

317
00:13:54,870 --> 00:13:52,480
bound for the international space

318
00:13:56,470 --> 00:13:54,880
station with fresh supplies and research

319
00:13:58,790 --> 00:13:56,480
helping to maintain our human presence

320
00:14:01,880 --> 00:13:58,800
in space as the station celebrates its

321
00:14:13,910 --> 00:14:01,890
20th anniversary

322
00:14:18,949 --> 00:14:15,670
it'd be incredible just to watch it no

323
00:14:20,629 --> 00:14:18,959
matter what but knowing that

324
00:14:22,389 --> 00:14:20,639
we have a personal investment in it it

325
00:14:25,189 --> 00:14:22,399
makes it a it makes a big difference

326
00:14:27,110 --> 00:14:25,199
yeah so just knowing that

327
00:14:29,829 --> 00:14:27,120
something that we've been working on is

328
00:14:31,670 --> 00:14:29,839
on it and and then watching the whole

329
00:14:33,509 --> 00:14:31,680
like the whole experience makes it just

330
00:14:34,470 --> 00:14:33,519
different it's

331
00:14:43,509 --> 00:14:34,480
it

332
00:14:45,110 --> 00:14:43,519
worthwhile yeah absolutely and watching

333
00:14:47,030 --> 00:14:45,120
it with your best friend

334
00:14:48,550 --> 00:14:47,040
yeah and like someone that you've been

335
00:14:52,230 --> 00:14:48,560
working with

336
00:14:55,509 --> 00:14:52,240
for such a long time and it's just

337
00:14:58,629 --> 00:14:55,519
oh it's yeah i think it couldn't get

338
00:15:00,790 --> 00:14:58,639

better that's what i can say yeah um

339
00:15:02,150 --> 00:15:00,800
yeah i didn't want to do it with anyone

340
00:15:04,150 --> 00:15:02,160
else yeah

341
00:15:05,509 --> 00:15:04,160
that is the exact same sentiment that i

342
00:15:07,509 --> 00:15:05,519
have too

343
00:15:09,750 --> 00:15:07,519
so it was really it was really special

344
00:15:12,350 --> 00:15:09,760
that we could be here yeah and watch it

345
00:15:26,820 --> 00:15:12,360
together

346
00:15:30,230 --> 00:15:28,230
[Music]

347
00:15:31,910 --> 00:15:30,240
our scientist experiment is officially

348
00:15:34,550 --> 00:15:31,920
on its way to the international space

349
00:15:36,470 --> 00:15:34,560
station the spacex dragon capsule that

350
00:15:38,790 --> 00:15:36,480
gives the research its ride to low earth

351
00:15:40,629 --> 00:15:38,800
orbit now must make the last leg of its

352
00:15:42,310 --> 00:15:40,639
journey to the hands of the astronauts

353
00:15:44,150 --> 00:15:42,320
in microgravity

354
00:15:46,550 --> 00:15:44,160
what's neat for us is we've got cargo

355
00:15:48,949 --> 00:15:46,560
vehicles coming and going to the iss all

356
00:15:51,189 --> 00:15:48,959
the time it is really like a busy

357
00:15:52,629 --> 00:15:51,199
parking lot vehicles come in they stay

358
00:15:53,829 --> 00:15:52,639
for a few months we do a whole bunch of

359
00:15:55,269 --> 00:15:53,839
science and then they leave again and

360
00:15:55,990 --> 00:15:55,279
before you know it the next one's coming

361
00:15:57,749 --> 00:15:56,000
up

362
00:16:00,069 --> 00:15:57,759
now what's important to remember is that

363
00:16:01,749 --> 00:16:00,079

these vehicles cannot dock themselves to

364
00:16:03,509 --> 00:16:01,759
the space station we have to bring them

365
00:16:05,910 --> 00:16:03,519
into the space station utilizing

366
00:16:08,310 --> 00:16:05,920
robotics and what i like to tell people

367
00:16:10,230 --> 00:16:08,320
is performing robotics going out and

368
00:16:12,150 --> 00:16:10,240
capturing that vehicle is like a really

369
00:16:14,150 --> 00:16:12,160
difficult video game

370
00:16:16,550 --> 00:16:14,160
and so we practice over and over and

371
00:16:18,710 --> 00:16:16,560
over again using computer simulations on

372
00:16:20,629 --> 00:16:18,720
how to actually capture that cargo

373
00:16:23,189 --> 00:16:20,639
vehicle to bring it into station

374
00:16:24,949 --> 00:16:23,199
once that cargo vehicle docks to station

375
00:16:26,470 --> 00:16:24,959
we do a series of pressure checks and

376
00:16:28,310 --> 00:16:26,480
equalize that pressure with the

377
00:16:30,150 --> 00:16:28,320
international space station and finally

378
00:16:32,310 --> 00:16:30,160
we get to open the hatch

379
00:16:34,389 --> 00:16:32,320
very quickly the crew starts to move

380
00:16:35,590 --> 00:16:34,399
because we've got some experiments that

381
00:16:37,269 --> 00:16:35,600
are actually kept at certain

382
00:16:38,949 --> 00:16:37,279
temperatures and we have to transfer

383
00:16:40,550 --> 00:16:38,959
them quickly out and keep them at the

384
00:16:42,550 --> 00:16:40,560
same temperature there on board the

385
00:16:44,470 --> 00:16:42,560
space station

386
00:16:46,150 --> 00:16:44,480
elaine and paris du's research is one of

387
00:16:47,269 --> 00:16:46,160
the experiments that requires quick

388
00:16:48,870 --> 00:16:47,279

unloading

389
00:16:51,110 --> 00:16:48,880
stored at a constant temperature to

390
00:16:52,949 --> 00:16:51,120
ensure the hydrogels stay intact it's

391
00:16:54,870 --> 00:16:52,959
one of the first items that astronauts

392
00:16:56,870 --> 00:16:54,880
must remove from dragon

393
00:16:58,949 --> 00:16:56,880
then with the experiment finally aboard

394
00:17:02,829 --> 00:16:58,959
the space station it's time to conduct

395
00:17:07,510 --> 00:17:05,189
microgravity this was fantastic for me

396
00:17:08,870 --> 00:17:07,520
this is what i do this means a lot to me

397
00:17:10,949 --> 00:17:08,880
as a clinician

398
00:17:13,429 --> 00:17:10,959
and so it was really neat to be able to

399
00:17:16,630 --> 00:17:13,439
perform that sort of science on station

400
00:17:24,069 --> 00:17:16,640
acceleration 1002 is loaded

401
00:17:27,669 --> 00:17:25,829
we know that scientists play a huge role

402
00:17:29,190 --> 00:17:27,679
in human space flight missions but there

403
00:17:31,190 --> 00:17:29,200
are ways students from all over the

404
00:17:32,950 --> 00:17:31,200
country can get involved too

405
00:17:34,950 --> 00:17:32,960
nasa relies on them to take part in

406
00:17:36,789 --> 00:17:34,960
micro g next a challenge that allows

407
00:18:08,990 --> 00:17:36,799
them to put their engineering skills to

408
00:18:38,710 --> 00:18:17,100
[Music]

409
00:18:43,029 --> 00:18:40,870
there is one thing that explorers all

410
00:18:45,029 --> 00:18:43,039
throughout time have had in common they

411
00:18:46,549 --> 00:18:45,039
are all at the mercy of weather and

412
00:18:48,630 --> 00:18:46,559
while things like rain and wind and

413
00:18:50,870 --> 00:18:48,640

lightning all factor in you can't forget

414
00:18:52,950 --> 00:18:50,880
about radiation the astronauts and the

415
00:18:54,310 --> 00:18:52,960
systems on their future space vehicles

416
00:18:56,950 --> 00:18:54,320
will have to be protected from deep

417
00:18:58,789 --> 00:18:56,960
space radiation and that's why today's

418
00:19:01,029 --> 00:18:58,799
scientists are working hard to improve

419
00:19:02,720 --> 00:19:01,039
our ability to accurately forecast

420
00:19:05,830 --> 00:19:02,730
dangerous space weather

421
00:19:12,230 --> 00:19:05,840
[Music]

422
00:19:12,240 --> 00:19:17,270
presented by science at nasa

423
00:19:21,830 --> 00:19:19,669
when seafaring nations began to explore

424
00:19:23,909 --> 00:19:21,840
new regions of the world one of their

425
00:19:26,950 --> 00:19:23,919
biggest concerns in making the journey

426
00:19:29,190 --> 00:19:26,960
safely was how to cope with weather

427
00:19:31,190 --> 00:19:29,200
they could harness the wind for power

428
00:19:32,710 --> 00:19:31,200
they could rely on the sun and the stars

429
00:19:34,950 --> 00:19:32,720
for navigation

430
00:19:37,909 --> 00:19:34,960
they could build sturdy ships

431
00:19:39,909 --> 00:19:37,919
but if a storm rose suddenly they were

432
00:19:42,070 --> 00:19:39,919
at nature's mercy

433
00:19:44,230 --> 00:19:42,080
more than five centuries later our

434
00:19:46,230 --> 00:19:44,240
nation is once again on the cusp of

435
00:19:47,750 --> 00:19:46,240
exploring new worlds

436
00:19:49,909 --> 00:19:47,760
and once again

437
00:19:53,669 --> 00:19:49,919
one of our concerns about traveling long

438
00:19:56,630 --> 00:19:53,679

distances is the weather space weather

439
00:19:58,230 --> 00:19:56,640
while space is a vacuum it's not 100

440
00:20:01,190 --> 00:19:58,240
percent empty

441
00:20:02,870 --> 00:20:01,200
particles energy and magnetic fields

442
00:20:04,630 --> 00:20:02,880
travel through the void

443
00:20:07,430 --> 00:20:04,640
much of these emanate from the sun's

444
00:20:10,230 --> 00:20:07,440
corona as part of a constant outward

445
00:20:12,149 --> 00:20:10,240
flow known as the solar wind which

446
00:20:13,510 --> 00:20:12,159
stretches well beyond the orbit of

447
00:20:15,750 --> 00:20:13,520
neptune

448
00:20:18,630 --> 00:20:15,760
there are also high energy particles or

449
00:20:22,390 --> 00:20:18,640
cosmic rays in the mix which travel vast

450
00:20:24,549 --> 00:20:22,400
distances from dying stars or supernovae

451
00:20:26,950 --> 00:20:24,559
earth's magnetic field and relatively

452
00:20:29,669 --> 00:20:26,960
thick atmosphere act as a shield against

453
00:20:33,270 --> 00:20:29,679
the most harmful forms of this radiation

454
00:20:35,669 --> 00:20:33,280
but in space there is no such deterrent

455
00:20:38,950 --> 00:20:35,679
if we want to travel through this space

456
00:20:40,470 --> 00:20:38,960
we need ways to protect our astronauts

457
00:20:43,909 --> 00:20:40,480
these particles can affect our

458
00:20:46,390 --> 00:20:43,919
technology tripping onboard electronics

459
00:20:48,710 --> 00:20:46,400
dr yari colada vega space weather

460
00:20:51,190 --> 00:20:48,720
scientist at nasa's goddard space flight

461
00:20:53,510 --> 00:20:51,200
center notes we are working hard to

462
00:20:56,310 --> 00:20:53,520
forecast when these particles will be at

463
00:20:59,110 --> 00:20:56,320

their peak such as during solar flares

464
00:21:01,669 --> 00:20:59,120
or coronal mass ejections

465
00:21:04,070 --> 00:21:01,679
acute exposure to these solar energetic

466
00:21:06,310 --> 00:21:04,080
particles is a serious concern for

467
00:21:08,789 --> 00:21:06,320
astronauts and instruments

468
00:21:11,669 --> 00:21:08,799
therefore having a better understanding

469
00:21:13,669 --> 00:21:11,679
of when to expect solar activity is

470
00:21:16,789 --> 00:21:13,679
important for safely sending our

471
00:21:19,350 --> 00:21:16,799
astronauts and spacecraft through space

472
00:21:21,350 --> 00:21:19,360
ironically such space weather activity

473
00:21:24,230 --> 00:21:21,360
can actually protect against another

474
00:21:26,870 --> 00:21:24,240
threat to astronauts the sun's activity

475
00:21:29,430 --> 00:21:26,880
can block dangerous cosmic rays coming

476
00:21:32,230 --> 00:21:29,440
from other stars which are constantly

477
00:21:34,710 --> 00:21:32,240
present illustrating the complexity of

478
00:21:37,590 --> 00:21:34,720
the system nasa tries to understand and

479
00:21:40,390 --> 00:21:37,600
mitigate for our space travelers

480
00:21:42,630 --> 00:21:40,400
over time sea captains learned when to

481
00:21:44,710 --> 00:21:42,640
sell their ships and when to stay in

482
00:21:46,230 --> 00:21:44,720
harbor based on their accumulated

483
00:21:48,230 --> 00:21:46,240
knowledge of the weather

484
00:21:50,470 --> 00:21:48,240
it's more risky to be on the water in

485
00:21:52,549 --> 00:21:50,480
the caribbean during hurricane season

486
00:21:54,710 --> 00:21:52,559
and you'd want to consider avoiding the

487
00:21:56,390 --> 00:21:54,720
northeast coast of america during the

488
00:21:59,430 --> 00:21:56,400

height of winter

489
00:22:01,909 --> 00:21:59,440
dr colada vega says it's very similar to

490
00:22:03,990 --> 00:22:01,919
what we're doing today we're constantly

491
00:22:06,149 --> 00:22:04,000
developing and testing new models to

492
00:22:08,470 --> 00:22:06,159
predict space weather and we're

493
00:22:09,909 --> 00:22:08,480
constantly seeking new data to refine

494
00:22:12,470 --> 00:22:09,919
those models

495
00:22:15,430 --> 00:22:12,480
a host of heliophysics missions observe

496
00:22:17,909 --> 00:22:15,440
space from a variety of vantage points

497
00:22:20,310 --> 00:22:17,919
not unlike terrestrial weather sensors

498
00:22:22,789 --> 00:22:20,320
which work in tandem to paint a bigger

499
00:22:26,149 --> 00:22:22,799
picture of our space environment

500
00:22:28,710 --> 00:22:26,159
in august 2018 nasa launched the parker

501
00:22:31,190 --> 00:22:28,720
solar probe to help us better understand

502
00:22:33,990 --> 00:22:31,200
the sun's activity especially what

503
00:22:36,390 --> 00:22:34,000
drives the solar wind and how energetic

504
00:22:38,549 --> 00:22:36,400
particles get accelerated

505
00:22:40,950 --> 00:22:38,559
this data could be used to improve

506
00:22:43,029 --> 00:22:40,960
models of space weather forecasting

507
00:22:45,990 --> 00:22:43,039
ultimately helping us find new and

508
00:22:48,470 --> 00:22:46,000
better ways to shield our spacecraft and

509
00:22:50,710 --> 00:22:48,480
protect our astronauts

510
00:22:53,430 --> 00:22:50,720
whether it was the oceans ancient ships

511
00:22:56,310 --> 00:22:53,440
travel through or the space we will one

512
00:22:58,070 --> 00:22:56,320
day travel through we know this

513
00:23:01,190 --> 00:22:58,080

keeping a watchful eye on the

514
00:23:03,110 --> 00:23:01,200
environment around us is key to ensuring

515
00:23:05,430 --> 00:23:03,120
safe passage

516
00:23:06,710 --> 00:23:05,440
for more information about what matters

517
00:23:12,549 --> 00:23:06,720
in space

518
00:23:15,830 --> 00:23:14,310
the future missions just mentioned like

519
00:23:17,430 --> 00:23:15,840
the ones that will return american

520
00:23:19,110 --> 00:23:17,440
astronauts to the moon in a few short

521
00:23:21,590 --> 00:23:19,120
years and then take them out into the

522
00:23:22,710 --> 00:23:21,600
solar system are part of nasa's artemis

523
00:23:24,549 --> 00:23:22,720
program

524
00:23:26,710 --> 00:23:24,559
artemis will bring together the orion

525
00:23:28,950 --> 00:23:26,720
space vehicle the space launch system

526
00:23:31,270 --> 00:23:28,960
rocket and the ground systems needed to

527
00:23:32,950 --> 00:23:31,280
launch them both and as you'll see the

528
00:23:35,190 --> 00:23:32,960
people building these things are working

529
00:23:36,789 --> 00:23:35,200
hard to get everything ready to go

530
00:23:39,190 --> 00:23:36,799
take a look at the progress being made

531
00:23:48,840 --> 00:23:39,200
at nasa centers and contractor locations

532
00:27:04,630 --> 00:23:54,210
[Music]

533
00:27:04,640 --> 00:27:17,110
um

534
00:27:20,789 --> 00:27:18,710
if you'd like another look at any of the

535
00:27:22,630 --> 00:27:20,799
stories we featured today head on over

536
00:27:24,230 --> 00:27:22,640
to youtube and facebook at those

537
00:27:25,909 --> 00:27:24,240
addresses right there in that blue box

538
00:27:27,350 --> 00:27:25,919

on your nasa tv screen

539
00:27:28,630 --> 00:27:27,360
and while you're there feel free to

540
00:27:30,789 --> 00:27:28,640
check out all the other cool stuff

541
00:27:32,710 --> 00:27:30,799
available about nasa and america's human

542
00:27:33,990 --> 00:27:32,720
space flight program

543
00:27:36,470 --> 00:27:34,000
and if you'd rather take your space

544
00:27:38,310 --> 00:27:36,480
content to go the place to go is houston

545
00:27:39,990 --> 00:27:38,320
we have a podcast where we hear

546
00:27:41,510 --> 00:27:40,000
firsthand from those working in the

547
00:27:43,110 --> 00:27:41,520
thick of all aspects of space

548
00:27:45,430 --> 00:27:43,120
exploration

549
00:27:47,830 --> 00:27:45,440
we post new episodes every friday so

550
00:27:49,430 --> 00:27:47,840
today gary jordan gets the inside scoop

551
00:27:50,950 --> 00:27:49,440
on what it takes to keep the johnson

552
00:27:52,389 --> 00:27:50,960
space center running

553
00:27:54,549 --> 00:27:52,399
you'll hear from the people in charge of

554
00:27:57,269 --> 00:27:54,559
center operations and because it's that

555
00:28:00,310 --> 00:27:57,279
special time of year hurricane response

556
00:28:02,470 --> 00:28:00,320
go to nasa.gov podcasts for this episode

557
00:28:05,029 --> 00:28:02,480
all of our previous episodes and the

558
00:28:07,029 --> 00:28:05,039
full library of nasa podcasts you can

559
00:28:27,510 --> 00:28:07,039
listen to any of the above on apple

560
00:28:27,520 --> 00:28:31,830
let's go

561
00:28:31,840 --> 00:28:46,789
it's