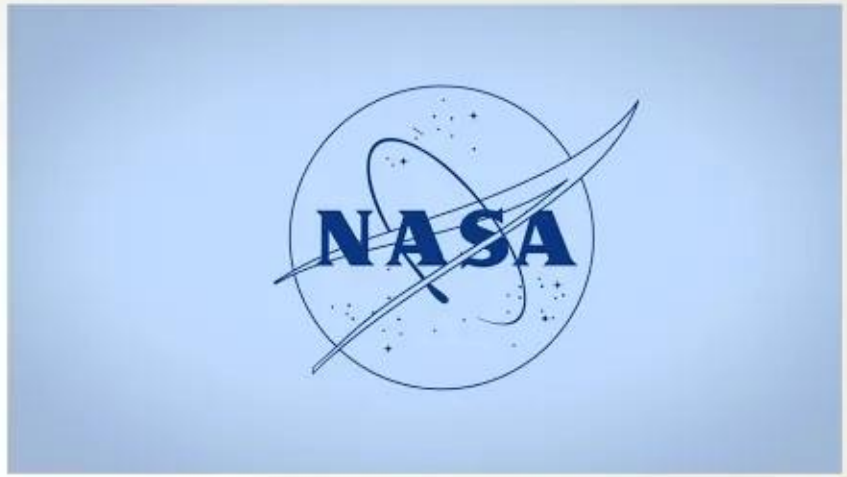
NASA

1
00:00:17,349 --> 00:00:15,749
it's all about the earth and what we can

2
00:00:19,670 --> 00:00:17,359
learn about it from the international

3
00:00:35,830 --> 00:00:19,680
space station hi i'm nasa astronaut

4
00:00:39,510 --> 00:00:38,310
welcome back this month on station life

5
00:00:41,190 --> 00:00:39,520
we're going to highlight the

6
00:00:43,430 --> 00:00:41,200
international space station as a

7
00:00:44,869 --> 00:00:43,440
platform for studying the earth and take

8
00:00:46,790 --> 00:00:44,879
a behind the scenes look at what it's

9
00:00:48,790 --> 00:00:46,800
like to live and work aboard the

10
00:00:50,310 --> 00:00:48,800
international space station

11
00:00:52,709 --> 00:00:50,320
you know they say a picture is worth a

12
00:00:55,189 --> 00:00:52,719
thousand words the first pictures taken

13
00:00:58,229 --> 00:00:55,199

by humans from space forever change the

14
00:00:59,990 --> 00:00:58,239
way we view ourselves and our world if

15
00:01:02,150 --> 00:01:00,000
you've ever flown on an airplane in the

16
00:01:04,310 --> 00:01:02,160
window seat you know the natural desire

17
00:01:06,230 --> 00:01:04,320
to stare out the window well aboard the

18
00:01:08,070 --> 00:01:06,240
international space station one of our

19
00:01:10,149 --> 00:01:08,080
favorite things to do during our off

20
00:04:46,310 --> 00:01:10,159
time is to stare at the beauty of our

21
00:04:49,590 --> 00:04:47,990
take a moment every day to look out the

22
00:04:52,469 --> 00:04:49,600
window and appreciate where you are

23
00:04:53,909 --> 00:04:52,479
literally watch the earth go by

24
00:04:55,270 --> 00:04:53,919
we're going around the earth once every

25
00:04:57,830 --> 00:04:55,280
90 minutes

26
00:05:00,390 --> 00:04:57,840
so you see a sunrise and a sunset every

27
00:05:03,590 --> 00:05:00,400
hour and a half it's just so vast and so

28
00:05:05,749 --> 00:05:03,600
vibrant in color and so and so so much

29
00:05:06,870 --> 00:05:05,759
contrast between the black

30
00:05:08,629 --> 00:05:06,880
that

31
00:05:10,629 --> 00:05:08,639
it kind of overwhelms you at first don't

32
00:05:13,510 --> 00:05:10,639
just look out the window during the day

33
00:05:15,510 --> 00:05:13,520
go for the the times between day and

34
00:05:17,270 --> 00:05:15,520
night and then night and day

35
00:05:19,110 --> 00:05:17,280
and take some time to look out into the

36
00:05:20,950 --> 00:05:19,120
universe at night time because that's

37
00:05:22,469 --> 00:05:20,960
when you can really see all the stars

38
00:05:23,590 --> 00:05:22,479

and you can see that the stars are not

39
00:05:25,430 --> 00:05:23,600
only

40
00:05:28,150 --> 00:05:25,440
like in a planetarium where they're sort

41
00:05:29,990 --> 00:05:28,160
of in a 2d field they're actually 3d and

42
00:05:31,909 --> 00:05:30,000
some are farther than others but you

43
00:05:34,629 --> 00:05:31,919
could see the blues and the oranges and

44
00:05:36,390 --> 00:05:34,639
the reds and the whites and the yellows

45
00:05:38,150 --> 00:05:36,400
and really see

46
00:05:39,670 --> 00:05:38,160
more color about the stars which

47
00:05:41,189 --> 00:05:39,680
indicates more about where they are in

48
00:05:42,870 --> 00:05:41,199
their life cycle what kind of things

49
00:05:43,830 --> 00:05:42,880
they're burning and doing and you would

50
00:05:45,270 --> 00:05:43,840
think that

51
00:05:46,390 --> 00:05:45,280
you'd get tired of looking out the

52
00:06:00,469 --> 00:05:46,400
window

53
00:06:04,950 --> 00:06:02,950
like i said before a picture's worth a

54
00:06:07,110 --> 00:06:04,960
thousand words but in the case of

55
00:06:09,110 --> 00:06:07,120
international space station imagery a

56
00:06:10,150 --> 00:06:09,120
picture could also be worth a thousand

57
00:06:12,150 --> 00:06:10,160
lives

58
00:06:13,990 --> 00:06:12,160
an imaging system aboard the station

59
00:06:16,710 --> 00:06:14,000
called environmental research and

60
00:06:18,870 --> 00:06:16,720
visualization system i serve

61
00:06:21,189 --> 00:06:18,880
captured photographs of earth from space

62
00:06:23,110 --> 00:06:21,199
for use in developing countries affected

63
00:06:24,710 --> 00:06:23,120

by natural disasters

64
00:06:26,870 --> 00:06:24,720
this is yet another way the orbiting

65
00:06:37,909 --> 00:06:26,880
laboratory is serving humanity off the

66
00:06:43,430 --> 00:06:41,990
servir is a joint nasa and usaid program

67
00:06:44,950 --> 00:06:43,440
where we're working with developing

68
00:06:47,189 --> 00:06:44,960
countries around the world and

69
00:06:49,189 --> 00:06:47,199
strengthening their ability to use

70
00:06:51,909 --> 00:06:49,199
satellites to address the many problems

71
00:06:54,150 --> 00:06:51,919
that they have including floods fires

72
00:06:56,230 --> 00:06:54,160
harmful algal blooms and other types of

73
00:06:58,230 --> 00:06:56,240
events that they have where they can use

74
00:07:00,950 --> 00:06:58,240
satellites to really make better

75
00:07:03,029 --> 00:07:00,960
decisions we're using space information

76
00:07:04,950 --> 00:07:03,039
to have decisions that affect people in

77
00:07:07,749 --> 00:07:04,960
the village where they live when there's

78
00:07:09,589 --> 00:07:07,759
a major disaster governments around the

79
00:07:10,950 --> 00:07:09,599
world come together

80
00:07:13,749 --> 00:07:10,960
and they

81
00:07:15,990 --> 00:07:13,759
they provide all the satellite data

82
00:07:18,309 --> 00:07:16,000
basically that the world has to offer

83
00:07:20,309 --> 00:07:18,319
but they're smaller disasters that that

84
00:07:21,909 --> 00:07:20,319
occur in the countries that we work in

85
00:07:24,390 --> 00:07:21,919
that may not make the front page of the

86
00:07:26,870 --> 00:07:24,400
new york times but in that country it's

87
00:07:29,110 --> 00:07:26,880
a really big deal we asked ourselves

88
00:07:31,029 --> 00:07:29,120

could we make a difference if we had a

89
00:07:33,749 --> 00:07:31,039
dedicated imager

90
00:07:35,909 --> 00:07:33,759
for acquiring imagery quickly after

91
00:07:37,670 --> 00:07:35,919
natural disasters and to be able to

92
00:07:39,830 --> 00:07:37,680
provide that imagery back to the

93
00:07:42,309 --> 00:07:39,840
countries that need them that have

94
00:07:44,950 --> 00:07:42,319
real decisions that need to be made with

95
00:07:47,909 --> 00:07:44,960
a very quick turnaround as nasa we

96
00:07:49,670 --> 00:07:47,919
looked in our own backyard and

97
00:07:55,189 --> 00:07:49,680
started thinking could we use the

98
00:07:59,270 --> 00:07:56,790
the international space station was

99
00:08:01,749 --> 00:07:59,280
really fantastic asset to take advantage

100
00:08:04,309 --> 00:08:01,759
of because it it passes over 90 percent

101
00:08:06,629 --> 00:08:04,319
of the earth's populated area every 24

102
00:08:09,110 --> 00:08:06,639
hours we developed an imaging system and

103
00:08:11,270 --> 00:08:09,120
we called it iserv which basically is a

104
00:08:13,670 --> 00:08:11,280
a camera and a telescope system that

105
00:08:16,390 --> 00:08:13,680
sits inside the international space

106
00:08:18,550 --> 00:08:16,400
station and can collect imagery when it

107
00:08:20,230 --> 00:08:18,560
passes over natural disasters or other

108
00:08:22,629 --> 00:08:20,240
events that we need to collect imagery

109
00:08:25,830 --> 00:08:22,639
initially we were planning to take few

110
00:08:28,390 --> 00:08:25,840
pictures per day so we contacted all the

111
00:08:30,950 --> 00:08:28,400
us admissions around the world and in

112
00:08:33,750 --> 00:08:30,960
total we had more than 2 000 requests

113
00:08:35,750 --> 00:08:33,760

coming you know for people who need

114
00:08:38,790 --> 00:08:35,760
images from isil

115
00:08:41,670 --> 00:08:38,800
and we moved to like 1000 images per day

116
00:08:43,829 --> 00:08:41,680
we provided i serve imagery for many

117
00:08:47,190 --> 00:08:43,839
many natural disasters including floods

118
00:08:49,269 --> 00:08:47,200
and fires for deforestation for volcanic

119
00:08:52,150 --> 00:08:49,279
eruptions for earthquakes so it was

120
00:08:54,389 --> 00:08:52,160
really a fantastic example showing

121
00:08:57,190 --> 00:08:54,399
how imagery from the international space

122
00:09:00,389 --> 00:08:57,200
station could be used in these times of

123
00:09:04,070 --> 00:09:00,399
dire need and now we have a huge

124
00:09:05,110 --> 00:09:04,080
archives of images of areas around the

125
00:09:07,269 --> 00:09:05,120
world

126
00:09:11,110 --> 00:09:07,279
so this is something that was not really

127
00:09:12,949 --> 00:09:11,120
there before i serve is an example of in

128
00:09:15,990 --> 00:09:12,959
essence making the international space

129
00:09:17,110 --> 00:09:16,000
station even more international and

130
00:09:18,949 --> 00:09:17,120
connecting

131
00:09:55,030 --> 00:09:18,959
space to village to better understand

132
00:09:55,040 --> 00:10:15,350
so

133
00:10:19,829 --> 00:10:17,990
imagine bread loaf-sized satellites

134
00:10:21,910 --> 00:10:19,839
zipping around the earth each day

135
00:10:23,910 --> 00:10:21,920
imaging the globe and providing updates

136
00:10:25,590 --> 00:10:23,920
on the environment thanks to the

137
00:10:27,430 --> 00:10:25,600
international space station this

138
00:10:29,990 --> 00:10:27,440

constellation of satellite image

139
00:10:31,430 --> 00:10:30,000
gathering has been made a reality with

140
00:10:34,150 --> 00:10:31,440
the mission of photographing the

141
00:10:36,310 --> 00:10:34,160
majority of the earth every day planet

142
00:10:38,790 --> 00:10:36,320
labs created small satellites

143
00:10:40,870 --> 00:10:38,800
individually referred to as doves to

144
00:10:43,110 --> 00:10:40,880
capture ground imagery for use in

145
00:10:45,030 --> 00:10:43,120
humanitarian environmental and

146
00:10:48,230 --> 00:10:45,040
commercial applications

147
00:10:49,829 --> 00:10:48,240
with the 2005 nasa authorization act

148
00:10:52,150 --> 00:10:49,839
designating the us segment of the

149
00:10:54,790 --> 00:10:52,160
station as a national laboratory the

150
00:10:57,190 --> 00:10:54,800
space station drives growth of a robust

151
00:10:59,190 --> 00:10:57,200
commercial marketplace in space through

152
00:11:01,750 --> 00:10:59,200
endeavors like planet labs

153
00:11:03,829 --> 00:11:01,760
the earth imaging mission of planet labs

154
00:11:05,990 --> 00:11:03,839
dove satellites takes another leap

155
00:11:16,230 --> 00:11:06,000
toward creating benefits on earth

156
00:11:18,710 --> 00:11:17,269
what happens if you wake up in the

157
00:11:21,190 --> 00:11:18,720
morning and you understand the state of

158
00:11:23,269 --> 00:11:21,200
the world as it is right now what could

159
00:11:24,790 --> 00:11:23,279
that data enable how can people make

160
00:11:26,630 --> 00:11:24,800
smarter decisions

161
00:11:28,710 --> 00:11:26,640
how could for example a farmer get

162
00:11:31,269 --> 00:11:28,720
better yield on his or her crops how

163
00:11:34,230 --> 00:11:31,279

could somebody help disaster response

164
00:11:36,389 --> 00:11:34,240
how can we use satellites to help

165
00:11:38,630 --> 00:11:36,399
humanity that in many ways was the

166
00:11:40,790 --> 00:11:38,640
underlying thesis of doing planet labs

167
00:11:42,550 --> 00:11:40,800
was to get data into the hands of people

168
00:11:43,829 --> 00:11:42,560
that could enable us to make smarter

169
00:11:46,790 --> 00:11:43,839
responses to that

170
00:11:48,630 --> 00:11:46,800
planet labs set out with the mission to

171
00:11:50,069 --> 00:11:48,640
photograph the entire earth

172
00:11:51,509 --> 00:11:50,079
every day

173
00:11:53,750 --> 00:11:51,519
and they thought how are we going to do

174
00:11:55,030 --> 00:11:53,760
this they said let's build our own

175
00:11:58,710 --> 00:11:55,040
satellite

176
00:12:00,629 --> 00:11:58,720
they're very large they are very

177
00:12:01,910 --> 00:12:00,639
expensive we took a different approach

178
00:12:03,590 --> 00:12:01,920
by making them really small we can

179
00:12:05,910 --> 00:12:03,600
launch lots of them and by launching

180
00:12:07,430 --> 00:12:05,920
lots of them we can cover this to get to

181
00:12:09,430 --> 00:12:07,440
this mission of imaging the whole earth

182
00:12:11,110 --> 00:12:09,440
every day if we can do that then we can

183
00:12:12,949 --> 00:12:11,120
literally change the way that we see the

184
00:12:15,670 --> 00:12:12,959
world and they called it the dove it's

185
00:12:19,110 --> 00:12:15,680
about the size of a loaf of bread our

186
00:12:21,750 --> 00:12:19,120
doves are basically mainly a big camera

187
00:12:23,350 --> 00:12:21,760
with a telescope looking down

188
00:12:25,190 --> 00:12:23,360

to take pictures of the earth we

189
00:12:27,430 --> 00:12:25,200
initially developed the first dove

190
00:12:29,190 --> 00:12:27,440
satellite in our garage so we kept on

191
00:12:31,350 --> 00:12:29,200
iterating the dove design we made it

192
00:12:34,310 --> 00:12:31,360
better and better and eventually we put

193
00:12:36,389 --> 00:12:34,320
our first one into space

194
00:12:37,910 --> 00:12:36,399
we had no idea what the quality would be

195
00:12:39,590 --> 00:12:37,920
like i mean we didn't know if it was

196
00:12:41,430 --> 00:12:39,600
going to work but we got an image down

197
00:12:43,910 --> 00:12:41,440
and it was so beautiful

198
00:12:46,150 --> 00:12:43,920
and that we we knew at that point we

199
00:12:47,910 --> 00:12:46,160
could make this technology work

200
00:12:49,269 --> 00:12:47,920
wow we can really do this and we can

201
00:12:50,629 --> 00:12:49,279
achieve this mission which is something

202
00:12:52,790 --> 00:12:50,639
that is really needed for us to

203
00:12:54,790 --> 00:12:52,800
understand global change so we had done

204
00:12:56,790 --> 00:12:54,800
a couple of demonstration satellites but

205
00:12:58,550 --> 00:12:56,800
the next steps we wanted to do was to

206
00:13:01,030 --> 00:12:58,560
scale it up to test

207
00:13:03,110 --> 00:13:01,040
the first fleets of satellites but what

208
00:13:04,710 --> 00:13:03,120
made that possible was actually access

209
00:13:05,990 --> 00:13:04,720
to space so here's the problem that in

210
00:13:08,069 --> 00:13:06,000
order to take pictures of the entire

211
00:13:09,190 --> 00:13:08,079
earth every day you're gonna need more

212
00:13:11,110 --> 00:13:09,200
than one or two satellites you're gonna

213
00:13:12,310 --> 00:13:11,120

need a whole lot of satellites and you

214
00:13:14,949 --> 00:13:12,320
need to be able to deploy them really

215
00:13:16,710 --> 00:13:14,959
fast and really there's only one obvious

216
00:13:20,710 --> 00:13:16,720
choice on how to deploy that and that's

217
00:13:25,269 --> 00:13:23,110
there was no other platform in the world

218
00:13:27,269 --> 00:13:25,279
in order to get access to space of of

219
00:13:29,190 --> 00:13:27,279
that fashion in that time period than

220
00:13:31,430 --> 00:13:29,200
the international space station nanomax

221
00:13:33,190 --> 00:13:31,440
is our key partner with nasa at

222
00:13:35,910 --> 00:13:33,200
nanoracks we understood plant lab's

223
00:13:37,509 --> 00:13:35,920
vision and we knew that we could help

224
00:13:39,030 --> 00:13:37,519
we worked together to figure out what

225
00:13:41,430 --> 00:13:39,040
was going to be the best way to get as

226
00:13:43,670 --> 00:13:41,440
many satellites as possible and we

227
00:13:46,150 --> 00:13:43,680
basically developed a new platform it

228
00:13:48,230 --> 00:13:46,160
goes out of the gym airlock

229
00:13:50,949 --> 00:13:48,240
it's picked up by a robotic arm pointed

230
00:13:58,629 --> 00:13:50,959
out in a space and it fires these little

231
00:14:02,310 --> 00:14:00,550
they were able to secure 28 of our

232
00:14:03,910 --> 00:14:02,320
satellites to be launched from the

233
00:14:05,269 --> 00:14:03,920
international space station and that was

234
00:14:06,949 --> 00:14:05,279
known as flock one our first

235
00:14:07,829 --> 00:14:06,959
constellation this opened up the whole

236
00:14:10,069 --> 00:14:07,839
world

237
00:14:12,629 --> 00:14:10,079
to uh satellite developers people that

238
00:14:15,350 --> 00:14:12,639

could put things into orbit fast

239
00:14:17,189 --> 00:14:15,360
we now deploy these on a regular basis

240
00:14:19,750 --> 00:14:17,199
from the international space station and

241
00:14:21,590 --> 00:14:19,760
now today we're able to operate the

242
00:14:23,509 --> 00:14:21,600
largest fleet of earth imaging

243
00:14:24,629 --> 00:14:23,519
satellites in human history and none of

244
00:14:27,030 --> 00:14:24,639
that would have been possible without

245
00:14:31,350 --> 00:14:27,040
the international space station

246
00:14:33,910 --> 00:14:31,360
enable young small companies like

247
00:14:36,230 --> 00:14:33,920
ourselves to get going in space

248
00:14:38,389 --> 00:14:36,240
the iss provides a lot of opportunities

249
00:14:40,069 --> 00:14:38,399
for commercial companies to test and

250
00:14:41,110 --> 00:14:40,079
find where the market in space is going

251
00:14:42,949 --> 00:14:41,120
to be

252
00:14:45,269 --> 00:14:42,959
and so what we're seeing today is a

253
00:14:47,269 --> 00:14:45,279
proliferation of new ideas and new

254
00:14:49,430 --> 00:14:47,279
concepts it's almost like it's a

255
00:14:51,590 --> 00:14:49,440
renaissance of what's happening in space

256
00:14:53,590 --> 00:14:51,600
buckle up and strap down because this is

257
00:15:32,389 --> 00:14:53,600
going to be a rocket for all of us in

258
00:15:36,790 --> 00:15:35,430
i used to think when i was

259
00:15:38,870 --> 00:15:36,800
growing up in florida lots of

260
00:15:41,110 --> 00:15:38,880
thunderstorms in florida you know that

261
00:15:42,790 --> 00:15:41,120
here's this this storm over top of me

262
00:15:45,269 --> 00:15:42,800
and it's just this individual little

263
00:15:46,470 --> 00:15:45,279

thing that just is about a storm over

264
00:15:48,710 --> 00:15:46,480
florida

265
00:15:50,550 --> 00:15:48,720
and in fact now after looking at the

266
00:15:53,509 --> 00:15:50,560
earth from space i see that that little

267
00:15:56,949 --> 00:15:53,519
storm in florida is connected to africa

268
00:15:58,870 --> 00:15:56,959
and europe and all across the planet and

269
00:16:00,949 --> 00:15:58,880
one of the most impressive things to see

270
00:16:02,790 --> 00:16:00,959
is how the earth presents itself as

271
00:16:04,230 --> 00:16:02,800
alive when you're watching these storms

272
00:16:06,150 --> 00:16:04,240
at night just

273
00:16:08,310 --> 00:16:06,160
trickle across

274
00:16:10,069 --> 00:16:08,320
the whole surface of the planet like its

275
00:16:10,949 --> 00:16:10,079
own nervous system

276
00:16:13,110 --> 00:16:10,959
and

277
00:16:14,069 --> 00:16:13,120
the emotions of the earth you know

278
00:16:17,350 --> 00:16:14,079
seeing

279
00:16:19,350 --> 00:16:17,360
storms that are developing and the way

280
00:16:20,870 --> 00:16:19,360
you know from having that experience on

281
00:16:23,030 --> 00:16:20,880
earth how it's probably impacting the

282
00:16:25,030 --> 00:16:23,040
people and the places down there it's

283
00:16:27,350 --> 00:16:25,040
like always you know is it upset and mad

284
00:16:29,350 --> 00:16:27,360
today versus the sunshine over some

285
00:16:31,430 --> 00:16:29,360
other part of the planet

286
00:16:33,189 --> 00:16:31,440
and really really really gets you

287
00:16:35,189 --> 00:16:33,199
looking at it in

288
00:16:36,870 --> 00:16:35,199

a different way an appreciative and

289
00:16:39,030 --> 00:16:36,880
respectful way

290
00:16:41,910 --> 00:16:39,040
when you're crossing the deserts in

291
00:16:43,350 --> 00:16:41,920
africa and the way the dunes form and

292
00:16:46,389 --> 00:16:43,360
they almost look like little you know

293
00:16:49,030 --> 00:16:46,399
birds have run across the sand and then

294
00:16:52,230 --> 00:16:49,040
this contrast you'll get from kind of

295
00:16:55,110 --> 00:16:52,240
the pinks and oranges and whites to

296
00:16:57,590 --> 00:16:55,120
these dark grays and almost deep blues

297
00:16:59,350 --> 00:16:57,600
and of rocks and everything that are are

298
00:17:01,670 --> 00:16:59,360
intersecting with it

299
00:17:04,309 --> 00:17:01,680
and the bahamas and the northern coast

300
00:17:06,549 --> 00:17:04,319
of venezuela which quite honestly is i

301
00:17:08,789 --> 00:17:06,559
think the most beautiful place

302
00:17:18,549 --> 00:17:08,799
on our planet it is

303
00:17:23,189 --> 00:17:20,309
well so far we've learned about using

304
00:17:25,029 --> 00:17:23,199
the iss as a platform for iserv which

305
00:17:27,669 --> 00:17:25,039
captures imagery of the earth to provide

306
00:17:30,230 --> 00:17:27,679
disaster assistance and deploying small

307
00:17:31,669 --> 00:17:30,240
satellites called doves we expect good

308
00:17:33,430 --> 00:17:31,679
things to come from both of these

309
00:17:35,270 --> 00:17:33,440
experiments and look forward to their

310
00:17:37,669 --> 00:17:35,280
robust potential

311
00:17:41,270 --> 00:17:37,679
nasa has selected proposals for two new

312
00:17:43,029 --> 00:17:41,280
future instruments getty and ecostress

313
00:17:45,190 --> 00:17:43,039

these sensors on the iss will give

314
00:17:47,669 --> 00:17:45,200
scientists new ways to observe how

315
00:17:49,350 --> 00:17:47,679
forests and ecosystems are affected by

316
00:17:51,190 --> 00:17:49,360
climate change

317
00:17:53,190 --> 00:17:51,200
our next piece is about a recently

318
00:17:56,150 --> 00:17:53,200
completed mission of an earth observing

319
00:17:58,549 --> 00:17:56,160
instrument on the iss called heiko its

320
00:18:03,430 --> 00:17:58,559
name stands for hyperspectral imager for

321
00:18:08,310 --> 00:18:05,750
carroll township's a very rural area in

322
00:18:10,150 --> 00:18:08,320
northern ohio right on lake erie lake

323
00:18:12,310 --> 00:18:10,160
erie has always been very important to

324
00:18:14,789 --> 00:18:12,320
carroll township and its residents we

325
00:18:16,390 --> 00:18:14,799
use it for drinking water we treat it

326
00:18:27,029 --> 00:18:16,400
and it and it's it's really our

327
00:18:30,470 --> 00:18:28,549
in lake erie

328
00:18:33,029 --> 00:18:30,480
for what for what unknown reason

329
00:18:34,310 --> 00:18:33,039
suddenly the toxin level spiked and that

330
00:18:35,830 --> 00:18:34,320
got through

331
00:18:37,830 --> 00:18:35,840
the treatment system

332
00:18:39,190 --> 00:18:37,840
it was indicated to me that it is pretty

333
00:18:42,630 --> 00:18:39,200
dangerous

334
00:18:45,669 --> 00:18:42,640
cyanotoxins can cause skin rashes

335
00:18:47,990 --> 00:18:45,679
headaches nausea vomiting stomach

336
00:18:49,110 --> 00:18:48,000
problems nervous system problems liver

337
00:18:50,950 --> 00:18:49,120
damage

338
00:18:52,870 --> 00:18:50,960

to death

339
00:18:54,549 --> 00:18:52,880
we sampled and we had about two and a

340
00:18:57,029 --> 00:18:54,559
half times the limit from the world

341
00:18:59,909 --> 00:18:57,039
health organization the second sample

342
00:19:02,310 --> 00:18:59,919
was approximately 3.5 times

343
00:19:04,470 --> 00:19:02,320
our plant wasn't set up to handle what

344
00:19:06,230 --> 00:19:04,480
was coming in from lake erie one of my

345
00:19:07,990 --> 00:19:06,240
biggest worries was actually hurting

346
00:19:09,110 --> 00:19:08,000
someone or

347
00:19:10,870 --> 00:19:09,120
even worse

348
00:19:12,789 --> 00:19:10,880
so we shut it off right away shut

349
00:19:14,070 --> 00:19:12,799
everything off we had a very close call

350
00:19:17,190 --> 00:19:14,080
that day

351
00:19:20,070 --> 00:19:17,200
the last thing you want to do is produce

352
00:19:21,990 --> 00:19:20,080
an unsafe water and allow your people to

353
00:19:24,230 --> 00:19:22,000
drink it

354
00:19:27,430 --> 00:19:24,240
what we need is a better way to track

355
00:19:29,909 --> 00:19:27,440
and predict these cyanobacteria entries

356
00:19:37,350 --> 00:19:29,919
from our source water so that we can

357
00:19:41,590 --> 00:19:39,990
a lot of times we'll find out after the

358
00:19:43,270 --> 00:19:41,600
fact that there's a problem with

359
00:19:44,870 --> 00:19:43,280
cyanobacteria in the water because the

360
00:19:47,350 --> 00:19:44,880
blooms already occurred

361
00:19:50,070 --> 00:19:47,360
we either get results of sick animals or

362
00:19:52,310 --> 00:19:50,080
sick people we need a paradigm shift we

363
00:19:54,789 --> 00:19:52,320

need to go from being constantly

364
00:19:56,789 --> 00:19:54,799
reactive to these blooms to having a

365
00:19:58,070 --> 00:19:56,799
capability that allows us to become

366
00:19:59,909 --> 00:19:58,080
proactive

367
00:20:02,070 --> 00:19:59,919
and the u.s environmental protection

368
00:20:04,149 --> 00:20:02,080
agency has been very encouraging of

369
00:20:05,270 --> 00:20:04,159
allowing for some high risk high reward

370
00:20:07,190 --> 00:20:05,280
projects

371
00:20:12,470 --> 00:20:07,200
and that allowed us to think outside the

372
00:20:15,909 --> 00:20:14,310
we've been fortunate enough to make use

373
00:20:17,750 --> 00:20:15,919
of a sensor on an international space

374
00:20:19,590 --> 00:20:17,760
station called heico which stands for

375
00:20:20,710 --> 00:20:19,600
the hyperspectral imager for the coastal

376
00:20:23,510 --> 00:20:20,720
ocean

377
00:20:24,950 --> 00:20:23,520
ico consists of two instruments

378
00:20:26,630 --> 00:20:24,960
one is a camera

379
00:20:29,430 --> 00:20:26,640
and the second instrument is a

380
00:20:31,750 --> 00:20:29,440
spectrophotometer which actually gives

381
00:20:33,669 --> 00:20:31,760
us the spectrum of light leaving that

382
00:20:35,669 --> 00:20:33,679
water the camera on a cell phone for

383
00:20:37,510 --> 00:20:35,679
example contains about three bands of

384
00:20:40,230 --> 00:20:37,520
data and a red channel a green channel

385
00:20:42,789 --> 00:20:40,240
and a blue channel

386
00:20:45,750 --> 00:20:42,799
hico gathers light from the red orange

387
00:20:48,149 --> 00:20:45,760
yellow green blue indigo and violent

388
00:20:49,510 --> 00:20:48,159

parts of the spectrum so using this

389
00:20:52,149 --> 00:20:49,520
technology

390
00:20:55,350 --> 00:20:52,159
we're able to now detect those water

391
00:20:57,190 --> 00:20:55,360
quality parameters such as water clarity

392
00:20:58,789 --> 00:20:57,200
what the phytoplankton concentration is

393
00:21:01,750 --> 00:20:58,799
in your water how much light is being

394
00:21:04,470 --> 00:21:01,760
absorbed in your water as well as what's

395
00:21:06,630 --> 00:21:04,480
the distribution of cyanobacteria in

396
00:21:09,190 --> 00:21:06,640
those waters and does that concentration

397
00:21:11,029 --> 00:21:09,200
pose a health hazard so what this means

398
00:21:12,470 --> 00:21:11,039
is instead of waiting for someone to

399
00:21:15,110 --> 00:21:12,480
report that there's a problem with

400
00:21:17,190 --> 00:21:15,120
cyanide bacteria bloom we can monitor

401
00:21:19,430 --> 00:21:17,200
these water bodies from space

402
00:21:21,990 --> 00:21:19,440
and get information that we can rapidly

403
00:21:25,350 --> 00:21:22,000
get out to the water quality managers

404
00:21:27,430 --> 00:21:25,360
through a small a smartphone application

405
00:21:29,669 --> 00:21:27,440
that we've developed

406
00:21:31,590 --> 00:21:29,679
so the app allows you to drop a pin

407
00:21:33,110 --> 00:21:31,600
point and that pin can be placed in an

408
00:21:35,270 --> 00:21:33,120
area where a drinking water treatment

409
00:21:36,710 --> 00:21:35,280
plant may have an intake and see what

410
00:21:38,950 --> 00:21:36,720
the current water quality conditions

411
00:21:40,870 --> 00:21:38,960
were each user gets that information

412
00:21:44,310 --> 00:21:40,880
near real time so they can make judgment

413
00:21:46,950 --> 00:21:44,320

calls on whether they have to respond or

414
00:21:49,350 --> 00:21:46,960
may take action having the hico on the

415
00:21:51,830 --> 00:21:49,360
international space station has been the

416
00:21:53,350 --> 00:21:51,840
ideal test bed for

417
00:21:55,510 --> 00:21:53,360
our research

418
00:21:58,470 --> 00:21:55,520
this is an amazing partnership

419
00:22:01,510 --> 00:21:58,480
the naval research laboratory had hico

420
00:22:03,510 --> 00:22:01,520
on nasa's international space station as

421
00:22:05,430 --> 00:22:03,520
hico acquired a scene it was transferred

422
00:22:07,430 --> 00:22:05,440
to the naval research laboratory and

423
00:22:09,270 --> 00:22:07,440
then the environmental protection agency

424
00:22:10,390 --> 00:22:09,280
was able to do the analysis and the

425
00:22:12,630 --> 00:22:10,400
validation

426
00:22:16,149 --> 00:22:12,640
to send this information out through a

427
00:22:18,710 --> 00:22:16,159
prototype mobile application

428
00:22:21,190 --> 00:22:18,720
yes this technology will reduce cost and

429
00:22:23,430 --> 00:22:21,200
provide near real-time information

430
00:22:26,310 --> 00:22:23,440
but the big goal here is protecting

431
00:22:28,870 --> 00:22:26,320
humans and if we can reduce exposures

432
00:23:38,789 --> 00:22:28,880
both to humans and even animals then

433
00:23:43,510 --> 00:23:40,789
our international space station is an

434
00:23:45,350 --> 00:23:43,520
unprecedented research platform in space

435
00:23:47,510 --> 00:23:45,360
allowing researchers and scientists to

436
00:23:48,870 --> 00:23:47,520
conduct experiments that can't be done

437
00:23:51,110 --> 00:23:48,880
anywhere else

438
00:23:53,190 --> 00:23:51,120

utilizing the iss as a ready-built

439
00:23:55,350 --> 00:23:53,200
platform for studying the earth is well

440
00:23:58,310 --> 00:23:55,360
underway so far we've learned about

441
00:23:59,430 --> 00:23:58,320
iserv planet labs dubs satellites and

442
00:24:01,510 --> 00:23:59,440
hico

443
00:24:03,669 --> 00:24:01,520
two more experiments or payloads in

444
00:24:05,830 --> 00:24:03,679
nasa's speak are on schedule to get to

445
00:24:08,070 --> 00:24:05,840
the iss later this year

446
00:24:09,110 --> 00:24:08,080
their sage iii and lightning imaging

447
00:24:11,110 --> 00:24:09,120
sensor

448
00:24:13,350 --> 00:24:11,120
sage iii will measure ozone and other

449
00:24:15,269 --> 00:24:13,360
gases in the upper atmosphere to help

450
00:24:16,870 --> 00:24:15,279
scientists assess the ozone layer and

451
00:24:18,549 --> 00:24:16,880
how it's recovering

452
00:24:20,470 --> 00:24:18,559
and that lightning imaging sensor will

453
00:24:22,470 --> 00:24:20,480
monitor global lightning for earth

454
00:24:24,870 --> 00:24:22,480
science studies and support operational

455
00:24:26,789 --> 00:24:24,880
weather forecasting and warning

456
00:24:29,190 --> 00:24:26,799
looks like utilizing the iss to further

457
00:24:30,070 --> 00:24:29,200
benefit all of humankind it's right on

458
00:24:31,990 --> 00:24:30,080
track

459
00:24:33,750 --> 00:24:32,000
thanks for joining us on station live at

460
00:24:35,350 --> 00:24:33,760
our behind the scenes look at using the

461
00:24:37,269 --> 00:24:35,360
international space station as a

462
00:24:38,950 --> 00:24:37,279
platform for studying the earth

463
00:24:41,190 --> 00:24:38,960

and be sure to follow us on facebook and

464
00:24:42,950 --> 00:24:41,200
twitter for the latest research news and

465
00:24:45,190 --> 00:24:42,960
don't forget to download our straight up

466
00:24:46,390 --> 00:24:45,200
gangsta app on your mobile device it's

467
00:24:48,230 --> 00:24:46,400
totally legit