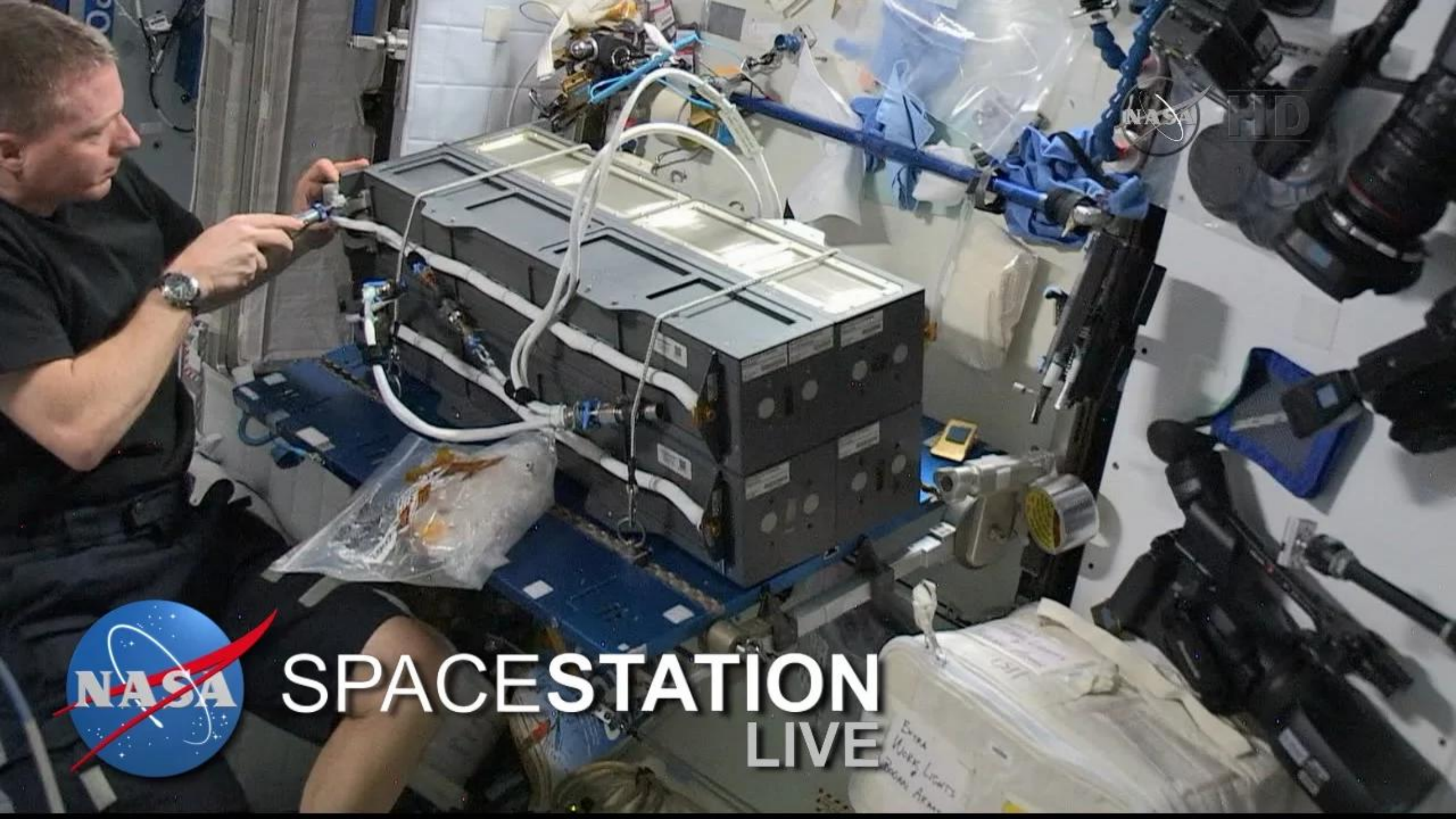
NASA
HD
NASA
SPACESTATION
LIVE

1
00:00:11,190 --> 00:00:09,110
if you're a scientist on earth whose

2
00:00:13,430 --> 00:00:11,200
laboratory is orbiting the planet at

3
00:00:15,190 --> 00:00:13,440
more than 17 000 miles per hour you may

4
00:00:17,189 --> 00:00:15,200
think it's difficult to conduct

5
00:00:19,349 --> 00:00:17,199
experiments if you're not right there

6
00:00:21,750 --> 00:00:19,359
with the equipment

7
00:00:23,750 --> 00:00:21,760
while the space station was in the first

8
00:00:25,189 --> 00:00:23,760
in its planning stage a group of

9
00:00:26,630 --> 00:00:25,199
software developers at the marshall

10
00:00:28,950 --> 00:00:26,640
space flight center in huntsville

11
00:00:31,029 --> 00:00:28,960
alabama came up with a solution my

12
00:00:35,590 --> 00:00:31,039
colleague bill hubsher has more from

13
00:00:38,389 --> 00:00:37,110

that group of software developers here

14
00:00:40,950 --> 00:00:38,399
at the marshall space flight center

15
00:00:42,869 --> 00:00:40,960
created the telescience resource kit or

16
00:00:44,470 --> 00:00:42,879
trek to help scientists around the world

17
00:00:47,029 --> 00:00:44,480
work on their experiments while ever

18
00:00:48,790 --> 00:00:47,039
leaving home that same software could be

19
00:00:51,029 --> 00:00:48,800
used when humans start conducting

20
00:00:52,549 --> 00:00:51,039
science on mars to find out more we're

21
00:00:53,910 --> 00:00:52,559
joined by michelle schneider she is one

22
00:00:55,590 --> 00:00:53,920
of the software developers and the team

23
00:00:57,750 --> 00:00:55,600
lead for trek thanks for taking the time

24
00:00:59,189 --> 00:00:57,760
to join us this morning michelle first

25
00:01:01,430 --> 00:00:59,199
of all tell us a story about how trek

26
00:01:03,189 --> 00:01:01,440
was created sure so i work at the

27
00:01:04,630 --> 00:01:03,199
mission operations laboratory here at

28
00:01:06,950 --> 00:01:04,640
marshall space flight center and we

29
00:01:10,070 --> 00:01:06,960
actually have a very long history

30
00:01:11,590 --> 00:01:10,080
in supporting payload operations

31
00:01:13,830 --> 00:01:11,600
prior to supporting the international

32
00:01:15,590 --> 00:01:13,840
space station program we supported space

33
00:01:17,429 --> 00:01:15,600
lab missions and space lab was a

34
00:01:19,910 --> 00:01:17,439
research facility that fit into the

35
00:01:22,070 --> 00:01:19,920
cargo bay of the space shuttle

36
00:01:24,710 --> 00:01:22,080
and when scientists and engineers flew

37
00:01:26,230 --> 00:01:24,720
payloads or experiments on space lab

38
00:01:27,910 --> 00:01:26,240

they would travel here to huntsville

39
00:01:29,749 --> 00:01:27,920
alabama to

40
00:01:31,749 --> 00:01:29,759
operate their payload in the huntsville

41
00:01:33,270 --> 00:01:31,759
operations support center

42
00:01:34,870 --> 00:01:33,280
and of course baseline missions were a

43
00:01:37,030 --> 00:01:34,880
very short duration though they only

44
00:01:38,230 --> 00:01:37,040
lasted about seven to ten days maybe

45
00:01:40,469 --> 00:01:38,240
towards the end of the program they

46
00:01:43,190 --> 00:01:40,479
would go out to 20 25 days but still

47
00:01:44,950 --> 00:01:43,200
pretty short so people could travel here

48
00:01:47,429 --> 00:01:44,960
but when it came time to support the

49
00:01:48,789 --> 00:01:47,439
international space station program

50
00:01:50,950 --> 00:01:48,799
we realized that wasn't going to be a

51
00:01:52,789 --> 00:01:50,960
feasible approach because of course

52
00:01:54,310 --> 00:01:52,799
space station payloads can operate for

53
00:01:55,910 --> 00:01:54,320
years at a time so people really

54
00:01:58,630 --> 00:01:55,920
couldn't just uproot their lives and

55
00:02:00,149 --> 00:01:58,640
move to huntsville alabama for years so

56
00:02:02,550 --> 00:02:00,159
that's when we started working on the

57
00:02:04,950 --> 00:02:02,560
remote operations concept the idea that

58
00:02:07,030 --> 00:02:04,960
people could stay at home to monitor and

59
00:02:08,949 --> 00:02:07,040
control their payloads so

60
00:02:10,229 --> 00:02:08,959
there's a lot of very important software

61
00:02:11,910 --> 00:02:10,239
that runs here at the huntsville

62
00:02:14,070 --> 00:02:11,920
operations support center that makes

63
00:02:16,070 --> 00:02:14,080

remote operations possible

64
00:02:18,070 --> 00:02:16,080
and the trello science resource kit or

65
00:02:20,229 --> 00:02:18,080
trek software is one part of that

66
00:02:22,390 --> 00:02:20,239
overall solution and it's one of the

67
00:02:25,430 --> 00:02:22,400
products that we deploy out all over the

68
00:02:27,270 --> 00:02:25,440
world so payload teams can stay at home

69
00:02:29,589 --> 00:02:27,280
to operate their payloads so track is

70
00:02:31,509 --> 00:02:29,599
basically just a suite of software

71
00:02:33,350 --> 00:02:31,519
applications and libraries that provide

72
00:02:35,509 --> 00:02:33,360
capabilities

73
00:02:38,070 --> 00:02:35,519
to monitor and control an asset on the

74
00:02:39,509 --> 00:02:38,080
ground or on the spacecraft and this can

75
00:02:41,110 --> 00:02:39,519
be done from either their their

76
00:02:43,110 --> 00:02:41,120
laboratories or for that matter from

77
00:02:44,790 --> 00:02:43,120
their arm chairs absolutely laptops

78
00:02:47,190 --> 00:02:44,800
absolutely and they do it from both

79
00:02:48,470 --> 00:02:47,200
locations it makes it very convenient

80
00:02:50,150 --> 00:02:48,480
because now they don't have to travel

81
00:02:51,830 --> 00:02:50,160
anywhere they can stay in the comfort of

82
00:02:53,750 --> 00:02:51,840
home and and take care of all their

83
00:02:55,030 --> 00:02:53,760
operations work there what were some of

84
00:02:56,390 --> 00:02:55,040
the bigger challenges when it came to

85
00:02:58,470 --> 00:02:56,400
creating trek

86
00:03:00,630 --> 00:02:58,480
well one of them is that we originally

87
00:03:02,710 --> 00:03:00,640
started working on the trek in the 90s

88
00:03:05,110 --> 00:03:02,720

and while the internet is something

89
00:03:07,270 --> 00:03:05,120
that's part of our everyday lives today

90
00:03:09,509 --> 00:03:07,280
that was back in the beginning of the

91
00:03:11,910 --> 00:03:09,519
internet and so a lot of the technology

92
00:03:14,630 --> 00:03:11,920
available at that time was still very

93
00:03:17,830 --> 00:03:14,640
new and not anywhere near as powerful as

94
00:03:19,990 --> 00:03:17,840
it is today so one of the challenges was

95
00:03:21,910 --> 00:03:20,000
using software and hardware at that time

96
00:03:24,070 --> 00:03:21,920
to meet the needs of

97
00:03:25,910 --> 00:03:24,080
what we had to do to

98
00:03:28,229 --> 00:03:25,920
work in a space environment

99
00:03:29,509 --> 00:03:28,239
so you guys were kind of pioneers

100
00:03:31,430 --> 00:03:29,519
in and of yourself yeah something we

101
00:03:32,550 --> 00:03:31,440
take for granted how easy it is to make

102
00:03:34,229 --> 00:03:32,560
connections on the internet you were

103
00:03:35,910 --> 00:03:34,239
trying to do that 20 years ago we were

104
00:03:37,990 --> 00:03:35,920
and it's been great we've grown up with

105
00:03:39,910 --> 00:03:38,000
the internet right along with it

106
00:03:41,589 --> 00:03:39,920
so you've been helping scientists around

107
00:03:43,430 --> 00:03:41,599
the world as i said for years now but

108
00:03:45,350 --> 00:03:43,440
now you're going to become one you and

109
00:03:47,110 --> 00:03:45,360
your team actually have a technology

110
00:03:48,949 --> 00:03:47,120
demonstration on station right now tell

111
00:03:50,710 --> 00:03:48,959
us about that that's right we're super

112
00:03:52,149 --> 00:03:50,720
excited we now have our own payload on

113
00:03:54,070 --> 00:03:52,159

the international space station it's

114
00:03:55,990 --> 00:03:54,080
called the trek demonstration payload

115
00:03:57,750 --> 00:03:56,000
and it has a couple of purposes

116
00:04:00,149 --> 00:03:57,760
one thing is even though the trek

117
00:04:02,710 --> 00:04:00,159
software was originally developed to be

118
00:04:04,390 --> 00:04:02,720
used as ground software turns out that

119
00:04:05,350 --> 00:04:04,400
the same function you need to do on the

120
00:04:07,509 --> 00:04:05,360
ground

121
00:04:09,910 --> 00:04:07,519
you also need to do in-flight software

122
00:04:11,830 --> 00:04:09,920
with your payload onboard space station

123
00:04:13,589 --> 00:04:11,840
so now the truck software is a standard

124
00:04:15,990 --> 00:04:13,599
software service onboard the space

125
00:04:18,229 --> 00:04:16,000
station so with the truck demonstration

126
00:04:20,629 --> 00:04:18,239
payload we're able to demonstrate trek

127
00:04:23,350 --> 00:04:20,639
on both sides on the ground and on board

128
00:04:24,870 --> 00:04:23,360
and all the data flow that takes place

129
00:04:26,629 --> 00:04:24,880
in between and show all of its

130
00:04:28,550 --> 00:04:26,639
capabilities

131
00:04:30,870 --> 00:04:28,560
a second purpose so

132
00:04:32,950 --> 00:04:30,880
uh space station is now moved from the

133
00:04:35,830 --> 00:04:32,960
construction phase to the utilization

134
00:04:37,749 --> 00:04:35,840
phase so science is our primary focus so

135
00:04:39,830 --> 00:04:37,759
the program's been working very hard to

136
00:04:42,310 --> 00:04:39,840
roll out lots of new capabilities and

137
00:04:44,070 --> 00:04:42,320
services to make it even easier to fly

138
00:04:46,469 --> 00:04:44,080

and operate a payload

139
00:04:48,550 --> 00:04:46,479
so the truck demonstration payload is

140
00:04:50,790 --> 00:04:48,560
serving as the pathfinder payload for

141
00:04:52,870 --> 00:04:50,800
many of these new services so we're the

142
00:04:54,469 --> 00:04:52,880
very first payload on board to use these

143
00:04:56,469 --> 00:04:54,479
new services

144
00:04:58,550 --> 00:04:56,479
we're doing lots of performance testing

145
00:04:59,430 --> 00:04:58,560
to characterize how well the services

146
00:05:00,950 --> 00:04:59,440
work

147
00:05:03,029 --> 00:05:00,960
and we're sharing that information with

148
00:05:04,390 --> 00:05:03,039
payload teams so that when they're going

149
00:05:05,990 --> 00:05:04,400
through the list of all the services

150
00:05:07,990 --> 00:05:06,000
available trying to decide which ones

151
00:05:09,670 --> 00:05:08,000
they want to use for their operations

152
00:05:11,670 --> 00:05:09,680
they have a lot of information to make

153
00:05:13,590 --> 00:05:11,680
those choices now the beauty of your

154
00:05:15,189 --> 00:05:13,600
particular payload is that it was it was

155
00:05:17,350 --> 00:05:15,199
all electronic you pretty much had to

156
00:05:19,430 --> 00:05:17,360
upload it right right we just upload

157
00:05:21,430 --> 00:05:19,440
uploaded the software there was a laptop

158
00:05:23,510 --> 00:05:21,440
already on board we installed it and

159
00:05:24,870 --> 00:05:23,520
we're ready to go and it's that simple

160
00:05:26,310 --> 00:05:24,880
can you tell me a little bit about the

161
00:05:27,749 --> 00:05:26,320
the new services that you're helping

162
00:05:29,670 --> 00:05:27,759
test with the new the track

163
00:05:32,150 --> 00:05:29,680

demonstration software sure one of them

164
00:05:34,230 --> 00:05:32,160
is called delay tolerant networking and

165
00:05:35,350 --> 00:05:34,240
um that's a really important and new

166
00:05:37,350 --> 00:05:35,360
service

167
00:05:39,830 --> 00:05:37,360
you know even though we're using things

168
00:05:42,150 --> 00:05:39,840
that like standard network protocols

169
00:05:43,749 --> 00:05:42,160
that are used every day on terrestrial

170
00:05:45,189 --> 00:05:43,759
networks when you get into a space to

171
00:05:47,110 --> 00:05:45,199
ground environment it is a little bit

172
00:05:48,950 --> 00:05:47,120
different for example we don't have a

173
00:05:51,189 --> 00:05:48,960
hundred percent coverage that we can

174
00:05:53,749 --> 00:05:51,199
communicate with the space station at

175
00:05:56,070 --> 00:05:53,759
all times sometimes there are data

176
00:05:58,469 --> 00:05:56,080
dropouts where we just can't communicate

177
00:06:00,070 --> 00:05:58,479
well delay tolerant networking provides

178
00:06:02,309 --> 00:06:00,080
ways to basically

179
00:06:04,070 --> 00:06:02,319
store and hold data until it gets

180
00:06:05,749 --> 00:06:04,080
communication again and then it can go

181
00:06:08,710 --> 00:06:05,759
ahead and forward it and all of that

182
00:06:10,550 --> 00:06:08,720
happens automatically so what's cool is

183
00:06:12,950 --> 00:06:10,560
it gives payload teams the ability to

184
00:06:14,950 --> 00:06:12,960
automate their operations so

185
00:06:17,110 --> 00:06:14,960
they don't have to be there all the time

186
00:06:19,189 --> 00:06:17,120
monitoring they can have software

187
00:06:21,189 --> 00:06:19,199
automatically doing that for them oh

188
00:06:23,830 --> 00:06:21,199

fantastic what about storage up there on

189
00:06:26,230 --> 00:06:23,840
the station yes there's a new capability

190
00:06:27,270 --> 00:06:26,240
called network address storage or nas as

191
00:06:28,629 --> 00:06:27,280
we call it

192
00:06:30,790 --> 00:06:28,639
you can kind of think of it as like a

193
00:06:32,390 --> 00:06:30,800
giant hard drive in a way

194
00:06:34,550 --> 00:06:32,400
it's providing lots and lots of

195
00:06:36,629 --> 00:06:34,560
additional storage for payload teams so

196
00:06:39,110 --> 00:06:36,639
that as they generate data as part of

197
00:06:41,270 --> 00:06:39,120
their experiments that's an extra place

198
00:06:43,590 --> 00:06:41,280
where they can store it

199
00:06:45,110 --> 00:06:43,600
it comes with something called a dropbox

200
00:06:46,870 --> 00:06:45,120
where you can have a folder on your

201
00:06:48,550 --> 00:06:46,880
local computer on the ground and you

202
00:06:50,309 --> 00:06:48,560
just drop files in it and they just

203
00:06:52,390 --> 00:06:50,319
automatically get uplinked and it works

204
00:06:54,150 --> 00:06:52,400
the same way going down so that's a

205
00:06:56,629 --> 00:06:54,160
really cool feature that also helps

206
00:06:58,710 --> 00:06:56,639
support automation oh fantastic what do

207
00:07:00,790 --> 00:06:58,720
you see is the future for trek

208
00:07:02,550 --> 00:07:00,800
well every day there's tons of new

209
00:07:04,390 --> 00:07:02,560
technology coming out and we're really

210
00:07:06,150 --> 00:07:04,400
looking forward to continue to enhance

211
00:07:07,830 --> 00:07:06,160
the product and to infuse as much of

212
00:07:10,629 --> 00:07:07,840
that new technology to make it easier

213
00:07:12,390 --> 00:07:10,639

and easier to fly payloads on station

214
00:07:13,589 --> 00:07:12,400
michelle schneider one of the pioneers

215
00:07:14,870 --> 00:07:13,599
for software development here at the

216
00:07:16,230 --> 00:07:14,880
marshall space flight center and the

217
00:07:18,309 --> 00:07:16,240
team lead for trek thanks so much for

218
00:07:19,589 --> 00:07:18,319
taking the time to talk to us today oh

219
00:07:20,950 --> 00:07:19,599
thank you for having me if you'd like to

220
00:07:24,510 --> 00:07:20,960
learn more about trek they actually have