
NASA
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1
00:00:05,110 --> 00:00:02,950
communications with the space station is

2
00:00:06,389 --> 00:00:05,120
a fairly easy there's typically no delay

3
00:00:08,070 --> 00:00:06,399
talking to the crew up there but

4
00:00:10,709 --> 00:00:08,080
whenever nasa starts looking toward

5
00:00:12,230 --> 00:00:10,719
going to an asteroid or to

6
00:00:14,310 --> 00:00:12,240
mars or any of the other far out

7
00:00:16,230 --> 00:00:14,320
destinations communication gets a bit

8
00:00:17,750 --> 00:00:16,240
trickier so there's a team here at the

9
00:00:19,269 --> 00:00:17,760
johnson space center over in one of our

10
00:00:21,670 --> 00:00:19,279
buildings here that's been testing out

11
00:00:23,590 --> 00:00:21,680
different scenarios and creating an

12
00:00:25,269 --> 00:00:23,600
artificial communications delay that is

13
00:00:27,750 --> 00:00:25,279

sometimes several seconds

14
00:00:29,269 --> 00:00:27,760
sometimes several minutes trying to talk

15
00:00:31,109 --> 00:00:29,279
with the crew and figuring out exactly

16
00:00:33,270 --> 00:00:31,119
how all of that is going to work we've

17
00:00:35,350 --> 00:00:33,280
got a live report now from nasa public

18
00:00:37,110 --> 00:00:35,360
affairs officer brandy dean who is there

19
00:00:39,670 --> 00:00:37,120
working with that team brandi how are

20
00:00:41,910 --> 00:00:39,680
things going

21
00:00:43,750 --> 00:00:41,920
hi thanks josh we are as you said here

22
00:00:45,510 --> 00:00:43,760
in a building 220 at johnson space

23
00:00:48,229 --> 00:00:45,520
center where we it's currently the home

24
00:00:51,029 --> 00:00:48,239
of the autonomous mission operations

25
00:00:53,189 --> 00:00:51,039
mission that is uh similar to nemo that

26
00:00:55,110 --> 00:00:53,199
you heard about earlier one of the ways

27
00:00:57,430 --> 00:00:55,120
we simulate in this case a mission to an

28
00:00:59,349 --> 00:00:57,440
asteroid and here with us to tell us

29
00:01:01,349 --> 00:00:59,359
about it today we've got jeff maldon who

30
00:01:03,189 --> 00:01:01,359
is the simulation supervisor he's been

31
00:01:04,310 --> 00:01:03,199
the one putting in all the problems for

32
00:01:05,990 --> 00:01:04,320
the crew

33
00:01:07,350 --> 00:01:06,000
inside the deep space habitat here

34
00:01:09,510 --> 00:01:07,360
behind us to deal with thanks so much

35
00:01:11,350 --> 00:01:09,520
for joining us jeff thank you all right

36
00:01:13,109 --> 00:01:11,360
so tell us a little bit about what

37
00:01:15,830 --> 00:01:13,119
autonomous mission operations is what

38
00:01:17,429 --> 00:01:15,840

that means why we're here sure thing um

39
00:01:19,270 --> 00:01:17,439
autonomous mission operations is all

40
00:01:22,390 --> 00:01:19,280
about a testing environment to try to

41
00:01:24,870 --> 00:01:22,400
test the effect of time delay on a a

42
00:01:26,710 --> 00:01:24,880
mission and it's the interaction between

43
00:01:28,870 --> 00:01:26,720
crew and the flight control team here in

44
00:01:30,550 --> 00:01:28,880
the ground and so what we've set up is a

45
00:01:32,710 --> 00:01:30,560
dish the dish behind us the deep space

46
00:01:34,550 --> 00:01:32,720
habitat serves as our vehicle and the

47
00:01:35,990 --> 00:01:34,560
crew is on board there and we have the

48
00:01:38,469 --> 00:01:36,000
in our mission control center here on

49
00:01:42,069 --> 00:01:38,479
site we have a full flight control team

50
00:01:43,590 --> 00:01:42,079
of certified flight controllers that are

51
00:01:45,670 --> 00:01:43,600
working with the crew to execute a

52
00:01:48,630 --> 00:01:45,680
timeline and so what we set up is this

53
00:01:50,550 --> 00:01:48,640
uh this timeline to try to

54
00:01:53,030 --> 00:01:50,560
increase the interaction between the

55
00:01:54,870 --> 00:01:53,040
crew and the ground and vice versa

56
00:01:56,550 --> 00:01:54,880
where activities need to check back and

57
00:01:58,149 --> 00:01:56,560
forth there's data being transferred

58
00:01:59,590 --> 00:01:58,159
back and forth much like we do today on

59
00:02:01,190 --> 00:01:59,600
the space station and we did before on

60
00:02:02,950 --> 00:02:01,200
the shuttle as well

61
00:02:05,350 --> 00:02:02,960
we're trying to exercise

62
00:02:07,190 --> 00:02:05,360
how that how that data transfer and how

63
00:02:08,949 --> 00:02:07,200

those communications get affected as you

64
00:02:10,790 --> 00:02:08,959
increase the time delay and what kind of

65
00:02:12,630 --> 00:02:10,800
things can we do to fix it what kind of

66
00:02:14,869 --> 00:02:12,640
tools can we put in place to help us

67
00:02:16,869 --> 00:02:14,879
with maintaining situational awareness

68
00:02:18,710 --> 00:02:16,879
on the ground of where the crew is

69
00:02:20,229 --> 00:02:18,720
it's a key piece of being in flight

70
00:02:22,229 --> 00:02:20,239
controllers knowing exactly what's going

71
00:02:24,150 --> 00:02:22,239
on and being able to get ahead of it so

72
00:02:26,470 --> 00:02:24,160
you can provide information to the crew

73
00:02:28,309 --> 00:02:26,480
in a timely manner or to address issues

74
00:02:30,390 --> 00:02:28,319
that occur on the vehicle

75
00:02:31,350 --> 00:02:30,400
and likewise the crew to know

76
00:02:35,750 --> 00:02:31,360
what the

77
00:02:39,110 --> 00:02:35,760
them in terms of plan changes or actions

78
00:02:41,110 --> 00:02:39,120
in recovery situations

79
00:02:42,309 --> 00:02:41,120
if we increase the time delay it makes

80
00:02:43,910 --> 00:02:42,319
that very difficult to transfer that

81
00:02:44,949 --> 00:02:43,920
information in a timely manner and so

82
00:02:46,550 --> 00:02:44,959
what we're trying to do is we're

83
00:02:48,390 --> 00:02:46,560
increasing our time delay from as little

84
00:02:50,949 --> 00:02:48,400
as five seconds which is similar to kind

85
00:02:53,270 --> 00:02:50,959
of a you know near earth kind of

86
00:02:55,750 --> 00:02:53,280
situation up to maybe the moon and then

87
00:02:59,030 --> 00:02:55,760
as you go to 50 seconds or even as far

88
00:03:00,309 --> 00:02:59,040

as 300 second delay or five minutes

89
00:03:02,470 --> 00:03:00,319
then that's going to be a 10 minute

90
00:03:04,470 --> 00:03:02,480
round trip for a conversation to happen

91
00:03:06,470 --> 00:03:04,480
at least and so it can make things quite

92
00:03:08,149 --> 00:03:06,480
difficult so

93
00:03:10,149 --> 00:03:08,159
nasa wants to go further out into space

94
00:03:11,990 --> 00:03:10,159
but that means the further you go the

95
00:03:13,430 --> 00:03:12,000
longer it takes not only for us to get

96
00:03:14,710 --> 00:03:13,440
there but also for communication from

97
00:03:16,149 --> 00:03:14,720
the ground to get there right

98
00:03:18,070 --> 00:03:16,159
exploration is going to be more than

99
00:03:19,750 --> 00:03:18,080
just designing the vehicle it's going to

100
00:03:21,670 --> 00:03:19,760
be about

101
00:03:24,550 --> 00:03:21,680
designing and helping the flight control

102
00:03:26,149 --> 00:03:24,560
teams and the crews to be able to uh to

103
00:03:27,509 --> 00:03:26,159
handle the situations and environments

104
00:03:29,110 --> 00:03:27,519
they're going to be in so there's the

105
00:03:31,750 --> 00:03:29,120
vehicle design itself which is being

106
00:03:33,270 --> 00:03:31,760
worked by a whole group of people now

107
00:03:34,789 --> 00:03:33,280
but there's also the piece of it that

108
00:03:37,030 --> 00:03:34,799
we're working on here is to try to

109
00:03:38,470 --> 00:03:37,040
develop the ideas and the techniques to

110
00:03:39,990 --> 00:03:38,480
be able to fly those kinds of missions

111
00:03:42,070 --> 00:03:40,000
and we need to do our homework now here

112
00:03:44,070 --> 00:03:42,080
on the ground before we get there and so

113
00:03:46,309 --> 00:03:44,080

any mission doesn't matter if it's this

114
00:03:48,949 --> 00:03:46,319
deep space habitat or if it's uh any

115
00:03:51,030 --> 00:03:48,959
other vehicle that would go um beyond

116
00:03:53,110 --> 00:03:51,040
earth orbit beyond the moon to the to an

117
00:03:54,550 --> 00:03:53,120
asteroid to mars wherever it is that we

118
00:03:56,630 --> 00:03:54,560
want to go is going to have to overcome

119
00:03:59,190 --> 00:03:56,640
these kind of challenges and so we're

120
00:04:00,789 --> 00:03:59,200
starting to try to uh to figure that out

121
00:04:02,869 --> 00:04:00,799
with a real flight control team with a

122
00:04:04,470 --> 00:04:02,879
real with real crew members here with

123
00:04:07,910 --> 00:04:04,480
experience in this kind of stuff we've

124
00:04:09,190 --> 00:04:07,920
got um a blended team from um

125
00:04:10,949 --> 00:04:09,200
flight controllers established flight

126
00:04:14,550 --> 00:04:10,959
controllers with experience on shuttle

127
00:04:16,150 --> 00:04:14,560
missions uh iss mission today

128
00:04:17,909 --> 00:04:16,160
they bring all that experience to the

129
00:04:19,349 --> 00:04:17,919
table they've all been trained to be

130
00:04:21,749 --> 00:04:19,359
outstanding flight controllers and they

131
00:04:23,749 --> 00:04:21,759
all contain the skill sets that's

132
00:04:25,350 --> 00:04:23,759
required to do this job

133
00:04:27,670 --> 00:04:25,360
but what we're testing now is not so

134
00:04:29,830 --> 00:04:27,680
much that it's more the ability to apply

135
00:04:31,270 --> 00:04:29,840
those in a case where you don't have the

136
00:04:33,270 --> 00:04:31,280
same level of

137
00:04:35,110 --> 00:04:33,280
instant communication with the crew like

138
00:04:36,230 --> 00:04:35,120

we have today all of our techniques and

139
00:04:38,310 --> 00:04:36,240
all of our

140
00:04:39,909 --> 00:04:38,320
experience base in the past has always

141
00:04:41,350 --> 00:04:39,919
been on near earth or as far out as the

142
00:04:43,830 --> 00:04:41,360
moon we've never gone further than that

143
00:04:45,430 --> 00:04:43,840
and we want to go further the mission

144
00:04:46,950 --> 00:04:45,440
starts here and you come from a space

145
00:04:48,550 --> 00:04:46,960
station background right that's correct

146
00:04:50,469 --> 00:04:48,560
i'm a flight controller for the space

147
00:04:51,830 --> 00:04:50,479
station and attitude control specialist

148
00:04:53,430 --> 00:04:51,840
great um

149
00:04:55,350 --> 00:04:53,440
the the time delay for the space station

150
00:04:57,350 --> 00:04:55,360
is just fractions of a second right not

151
00:04:58,710 --> 00:04:57,360
not much at all right in terms of all

152
00:04:59,909 --> 00:04:58,720
the delays through the network and back

153
00:05:01,270 --> 00:04:59,919
up and down it would be you know

154
00:05:03,189 --> 00:05:01,280
something similar to like a one second

155
00:05:05,029 --> 00:05:03,199
delay and so it's not it's not that big

156
00:05:07,029 --> 00:05:05,039
of a deal for us we're able to have uh

157
00:05:09,189 --> 00:05:07,039
communications like we're having now

158
00:05:11,110 --> 00:05:09,199
with the crew and the capcom and um for

159
00:05:12,469 --> 00:05:11,120
the station handles that for us and

160
00:05:13,909 --> 00:05:12,479
we're able to get information up and

161
00:05:15,670 --> 00:05:13,919
down quickly

162
00:05:17,590 --> 00:05:15,680
and then also we have the ability to get

163
00:05:18,550 --> 00:05:17,600

telemetry from the from the station

164
00:05:20,550 --> 00:05:18,560
vehicle

165
00:05:22,550 --> 00:05:20,560
on the ground so we're able to see

166
00:05:24,310 --> 00:05:22,560
how the station is performing how our

167
00:05:25,909 --> 00:05:24,320
specific subsystem for example me with

168
00:05:27,749 --> 00:05:25,919
attitude control i'm able to see what

169
00:05:29,990 --> 00:05:27,759
the current orientation of the vehicle

170
00:05:31,830 --> 00:05:30,000
is um how much propellant we're using

171
00:05:33,830 --> 00:05:31,840
how you know if we're doing maneuvers or

172
00:05:35,430 --> 00:05:33,840
anything like that um

173
00:05:36,469 --> 00:05:35,440
but when we go further out the crew is

174
00:05:37,909 --> 00:05:36,479
gonna have to have a lot of this

175
00:05:39,990 --> 00:05:37,919
responsibility right some of the

176
00:05:42,230 --> 00:05:40,000
investigation here is how to transfer

177
00:05:44,390 --> 00:05:42,240
some of that responsibility back over to

178
00:05:46,710 --> 00:05:44,400
the crew and yet still maintain such a

179
00:05:48,390 --> 00:05:46,720
complex vehicle like the iss is right

180
00:05:50,230 --> 00:05:48,400
now it takes it takes the full flight

181
00:05:51,909 --> 00:05:50,240
control team to really operate the crew

182
00:05:53,510 --> 00:05:51,919
to give them the time to do the other

183
00:05:54,870 --> 00:05:53,520
things that they need to do on onboard

184
00:05:56,309 --> 00:05:54,880
the station like the science and the

185
00:05:58,070 --> 00:05:56,319
maintenance kind of tasks that they do

186
00:05:59,990 --> 00:05:58,080
so a lot of the systems of the iss are

187
00:06:00,950 --> 00:06:00,000
actually controlled from the ground and

188
00:06:02,950 --> 00:06:00,960

so we

189
00:06:05,029 --> 00:06:02,960
we do a a lot of commanding back and

190
00:06:07,350 --> 00:06:05,039
forth to the iss on a daily basis now

191
00:06:09,350 --> 00:06:07,360
when we get into a case like this where

192
00:06:12,070 --> 00:06:09,360
we're at five minutes for our commanding

193
00:06:13,990 --> 00:06:12,080
to even reach the vehicle well it's very

194
00:06:15,270 --> 00:06:14,000
difficult to maintain a tight grip of

195
00:06:16,629 --> 00:06:15,280
what you're doing when you're at that

196
00:06:18,230 --> 00:06:16,639
kind of delay so some of those

197
00:06:20,629 --> 00:06:18,240
activities may need to be transferred

198
00:06:22,950 --> 00:06:20,639
back over to a crew member and

199
00:06:25,270 --> 00:06:22,960
what the tool sets that we deploy in

200
00:06:26,950 --> 00:06:25,280
cases like there are simulations here

201
00:06:28,870 --> 00:06:26,960
we seek to try to make that job a little

202
00:06:30,469 --> 00:06:28,880
bit easier for the crew the crew's got a

203
00:06:33,110 --> 00:06:30,479
ton of things to do and they've got a

204
00:06:34,710 --> 00:06:33,120
busy timeline to execute

205
00:06:36,309 --> 00:06:34,720
it's difficult for them to execute that

206
00:06:37,909 --> 00:06:36,319
at a specialist level like we do at the

207
00:06:39,909 --> 00:06:37,919
iss

208
00:06:41,749 --> 00:06:39,919
and so what we try to do is provide

209
00:06:43,350 --> 00:06:41,759
additional data insight that helps to

210
00:06:46,230 --> 00:06:43,360
break down the system a little bit and

211
00:06:47,990 --> 00:06:46,240
helps to help them recognize issues

212
00:06:50,230 --> 00:06:48,000
performance problems and then also just

213
00:06:51,909 --> 00:06:50,240

to execute a nominal procedure to make

214
00:06:53,909 --> 00:06:51,919
sure that they don't you know aren't

215
00:06:55,589 --> 00:06:53,919
risk of making any mistakes so that that

216
00:06:57,510 --> 00:06:55,599
way if a mistake occurs it's something

217
00:06:58,550 --> 00:06:57,520
they're easy to fix and things like that

218
00:07:00,150 --> 00:06:58,560
so

219
00:07:01,589 --> 00:07:00,160
it's all to make the job smoother to

220
00:07:02,950 --> 00:07:01,599
make it easier to make it more enjoyable

221
00:07:04,710 --> 00:07:02,960
when you're there

222
00:07:06,230 --> 00:07:04,720
for the crew members on that long flight

223
00:07:07,510 --> 00:07:06,240
i mean you don't want to have to give

224
00:07:08,710 --> 00:07:07,520
them so much overhead so what we're

225
00:07:11,589 --> 00:07:08,720
trying to do is develop the kinds of

226
00:07:13,350 --> 00:07:11,599
tool sets and and test them here to see

227
00:07:14,710 --> 00:07:13,360
how they affect both the flight control

228
00:07:16,150 --> 00:07:14,720
team but also the crew do you think

229
00:07:17,909 --> 00:07:16,160
you're learning a lot so far i think

230
00:07:19,830 --> 00:07:17,919
we're learning a ton we're

231
00:07:20,629 --> 00:07:19,840
we've learned a lot about uh

232
00:07:22,870 --> 00:07:20,639
how

233
00:07:24,710 --> 00:07:22,880
voice communication needs to vary

234
00:07:26,390 --> 00:07:24,720
and and especially at the longer time

235
00:07:27,909 --> 00:07:26,400
delays we've seen a lot of

236
00:07:29,909 --> 00:07:27,919
cases where

237
00:07:31,830 --> 00:07:29,919
a call would go up from one side and

238
00:07:33,110 --> 00:07:31,840

then by the time it gets to the other

239
00:07:35,110 --> 00:07:33,120
side they've already called something

240
00:07:36,710 --> 00:07:35,120
back to us and so the conversation

241
00:07:38,070 --> 00:07:36,720
becomes out of sync it's like you're

242
00:07:39,430 --> 00:07:38,080
going to tell them to do something their

243
00:07:40,790 --> 00:07:39,440
their call is coming back the other way

244
00:07:42,550 --> 00:07:40,800
but you haven't heard it yet telling you

245
00:07:43,510 --> 00:07:42,560
they've already started that and so you

246
00:07:45,670 --> 00:07:43,520
kind of are out of sync and you're

247
00:07:47,749 --> 00:07:45,680
talking past each other um we've

248
00:07:50,390 --> 00:07:47,759
implemented some tool changes and things

249
00:07:52,710 --> 00:07:50,400
as simple as chat rooms with texting

250
00:07:54,309 --> 00:07:52,720
much like what we use here today on the

251
00:07:56,070 --> 00:07:54,319
ground um

252
00:07:57,909 --> 00:07:56,080
over a delay but it allows that that

253
00:07:59,430 --> 00:07:57,919
message to remain there you can go back

254
00:08:00,950 --> 00:07:59,440
and read it again you can even see the

255
00:08:02,309 --> 00:08:00,960
context of the message because the

256
00:08:04,629 --> 00:08:02,319
previous question would have been up

257
00:08:08,230 --> 00:08:04,639
earlier in the chat window as an example

258
00:08:09,589 --> 00:08:08,240
for for for alternatives to voice um

259
00:08:11,430 --> 00:08:09,599
and we're also looking at other data

260
00:08:13,749 --> 00:08:11,440
transfer kind of things as well so it's