
PAO

1
00:00:04,870 --> 00:00:03,830
since the dragon cargo vehicle was

2
00:00:07,190 --> 00:00:04,880
birthed

3
00:00:09,350 --> 00:00:07,200
uh to the station a week ago this past

4
00:00:11,270 --> 00:00:09,360
sunday the expedition 39 crew members

5
00:00:14,150 --> 00:00:11,280
have been unloading its content setting

6
00:00:15,350 --> 00:00:14,160
up experiments and also stowing away

7
00:00:17,189 --> 00:00:15,360
supplies

8
00:00:19,670 --> 00:00:17,199
this week more cargo is going to be

9
00:00:21,510 --> 00:00:19,680
unloaded but the human crew on orbit is

10
00:00:23,509 --> 00:00:21,520
actually not involved

11
00:00:26,070 --> 00:00:23,519
canadarm2 will be used to remove

12
00:00:28,630 --> 00:00:26,080
payloads from dragon's trunk and install

13
00:00:31,029 --> 00:00:28,640

them on the station and the arm will be

14
00:00:32,549 --> 00:00:31,039
commanded by flight controllers actually

15
00:00:34,389 --> 00:00:32,559
here on the ground

16
00:00:36,630 --> 00:00:34,399
joining us this morning to discuss

17
00:00:39,990 --> 00:00:36,640
operations scheduled to begin

18
00:00:42,069 --> 00:00:40,000
tomorrow actually is troy mccracken troy

19
00:00:44,150 --> 00:00:42,079
thanks for joining us here you're the

20
00:00:45,990 --> 00:00:44,160
lead robotics officer for this operation

21
00:00:47,590 --> 00:00:46,000
that right that's vermif thanks for

22
00:00:50,069 --> 00:00:47,600
having me um yeah i'll be leading all

23
00:00:52,950 --> 00:00:50,079
the cargo operations as we call it for

24
00:00:55,110 --> 00:00:52,960
the spacex trunk yeah

25
00:00:58,549 --> 00:00:55,120
one of the questions how often it do we

26
00:00:59,990 --> 00:00:58,559
actually use the robotic arm for ground

27
00:01:02,150 --> 00:01:00,000
like what you're planning on doing the

28
00:01:03,910 --> 00:01:02,160
ground commanded operation the majority

29
00:01:05,590 --> 00:01:03,920
of our robotic operations now are

30
00:01:06,469 --> 00:01:05,600
actually ground commanded over the years

31
00:01:08,230 --> 00:01:06,479
we've

32
00:01:09,990 --> 00:01:08,240
grown our capability we started out with

33
00:01:12,149 --> 00:01:10,000
simple maneuvers and walk-offs and now

34
00:01:13,910 --> 00:01:12,159
we're doing the majority of the the

35
00:01:16,630 --> 00:01:13,920
cargo operations

36
00:01:20,870 --> 00:01:16,640
the fram transfers we've also done an

37
00:01:23,990 --> 00:01:20,880
rpcmr and r out in the truss

38
00:01:26,149 --> 00:01:24,000

why would that why is ground commanded

39
00:01:28,710 --> 00:01:26,159
preferable there are obviously certain

40
00:01:30,230 --> 00:01:28,720
cases but why is it preferable to having

41
00:01:32,230 --> 00:01:30,240
you guys do it on the ground rather than

42
00:01:34,149 --> 00:01:32,240
the crew on orbit

43
00:01:35,510 --> 00:01:34,159
the cruise time is very valuable on

44
00:01:37,109 --> 00:01:35,520
orbit and so

45
00:01:38,950 --> 00:01:37,119
you know the more we can do from the

46
00:01:40,469 --> 00:01:38,960
ground to support station

47
00:01:41,990 --> 00:01:40,479
the more we're helping the entire

48
00:01:44,789 --> 00:01:42,000
program

49
00:01:46,389 --> 00:01:44,799
the spdm operations are very complex

50
00:01:48,230 --> 00:01:46,399
there's lots of

51
00:01:50,230 --> 00:01:48,240
different things you have to know and do

52
00:01:52,310 --> 00:01:50,240
and the training that we'd have to

53
00:01:54,550 --> 00:01:52,320
provide the crews also

54
00:01:56,709 --> 00:01:54,560
quite high so early on they kind of

55
00:01:58,389 --> 00:01:56,719
decided that they would back the crew

56
00:02:00,630 --> 00:01:58,399
training down on the spdm and have them

57
00:02:01,990 --> 00:02:00,640
focus on the critical crew ops

58
00:02:03,910 --> 00:02:02,000
with the big arm and that's really the

59
00:02:05,350 --> 00:02:03,920
the track and capture events where we're

60
00:02:07,350 --> 00:02:05,360
capturing and releasing the visiting

61
00:02:09,190 --> 00:02:07,360
vehicles where you have to have the crew

62
00:02:10,790 --> 00:02:09,200
member there focus their training there

63
00:02:12,630 --> 00:02:10,800

and then they also support the evas

64
00:02:14,710 --> 00:02:12,640
whenever there's a

65
00:02:16,150 --> 00:02:14,720
one of the external um

66
00:02:18,150 --> 00:02:16,160
crew members are outside and they're

67
00:02:20,070 --> 00:02:18,160
flying well they can step into the arm

68
00:02:21,190 --> 00:02:20,080
and we can fly them around on the arm

69
00:02:22,550 --> 00:02:21,200
right so when we're doing that we

70
00:02:25,030 --> 00:02:22,560
definitely want to have a crew member on

71
00:02:27,750 --> 00:02:25,040
the sticks inside flying the arm right

72
00:02:29,750 --> 00:02:27,760
so focusing on um dragon itself

73
00:02:31,509 --> 00:02:29,760
obviously um

74
00:02:34,550 --> 00:02:31,519
and your operation that's scheduled this

75
00:02:35,750 --> 00:02:34,560
week um describe to us the

76
00:02:37,509 --> 00:02:35,760
where these

77
00:02:39,589 --> 00:02:37,519
payloads are they're on the external

78
00:02:41,350 --> 00:02:39,599
part obviously

79
00:02:43,190 --> 00:02:41,360
describe where they are now and and

80
00:02:45,910 --> 00:02:43,200
where they're headed okay um we have two

81
00:02:49,110 --> 00:02:45,920
payloads coming up in the trunk um

82
00:02:51,430 --> 00:02:49,120
they have we have hdev which is the

83
00:02:53,270 --> 00:02:51,440
high definition earth viewing payload

84
00:02:55,350 --> 00:02:53,280
that has some cameras so we'll be

85
00:02:56,949 --> 00:02:55,360
reaching into the trunk with the spdm

86
00:02:57,830 --> 00:02:56,959
and the ssrms pulling it out of the

87
00:03:00,070 --> 00:02:57,840
trunk

88
00:03:02,149 --> 00:03:00,080

and then we'll be flying it over to the

89
00:03:04,470 --> 00:03:02,159
the columbus module where we'll be

90
00:03:06,949 --> 00:03:04,480
installing it on the nader

91
00:03:08,949 --> 00:03:06,959
exposed facility so that those cameras

92
00:03:11,270 --> 00:03:08,959
can look down on earth and do some

93
00:03:13,589 --> 00:03:11,280
viewing there

94
00:03:15,830 --> 00:03:13,599
the next payload is opals

95
00:03:17,830 --> 00:03:15,840
you also saw that in the trunk we'll be

96
00:03:19,670 --> 00:03:17,840
pulling it out of the trunk and this

97
00:03:22,229 --> 00:03:19,680
one's much more complicated it has to go

98
00:03:25,030 --> 00:03:22,239
out on one of the elc's on the end of

99
00:03:27,430 --> 00:03:25,040
the truss so to provide power to it

100
00:03:30,309 --> 00:03:27,440
we'll stow it on the spdm itself there's

101
00:03:32,229 --> 00:03:30,319
a eotp platform on the spdm where you

102
00:03:34,309 --> 00:03:32,239
can attach these frames and then we can

103
00:03:36,710 --> 00:03:34,319
provide power to them and keep them warm

104
00:03:39,030 --> 00:03:36,720
so once we install it on the spdm we

105
00:03:41,910 --> 00:03:39,040
actually have to stow this pdm on a lab

106
00:03:44,470 --> 00:03:41,920
pdgf stow it there and then we walk off

107
00:03:46,630 --> 00:03:44,480
with the big arm over to the mt

108
00:03:47,830 --> 00:03:46,640
then we'll reach back and grab the spdm

109
00:03:49,509 --> 00:03:47,840
and pull it off

110
00:03:51,430 --> 00:03:49,519
the the lab

111
00:03:53,830 --> 00:03:51,440
after we do that then we'll translate

112
00:03:56,949 --> 00:03:53,840
the mt out to worksite seven so farther

113
00:03:58,869 --> 00:03:56,959

outboard and once we get out there we'll

114
00:04:00,789 --> 00:03:58,879
install the opals on the final

115
00:04:03,190 --> 00:04:00,799
destination on elc on the nader side of

116
00:04:05,350 --> 00:04:03,200
the payload are there

117
00:04:06,869 --> 00:04:05,360
obviously the transit paths are there

118
00:04:09,110 --> 00:04:06,879
are there any problems with some of

119
00:04:10,869 --> 00:04:09,120
these transit class in terms of training

120
00:04:13,110 --> 00:04:10,879
or or where you're headed with these

121
00:04:15,110 --> 00:04:13,120
payloads um the real issue now is

122
00:04:16,949 --> 00:04:15,120
clearance with all the

123
00:04:18,390 --> 00:04:16,959
modules that we put on station whenever

124
00:04:20,310 --> 00:04:18,400
we come up on the port side when we're

125
00:04:23,830 --> 00:04:20,320
walking off basically we have to come up

126
00:04:26,150 --> 00:04:23,840
between the gym module and the truss

127
00:04:27,350 --> 00:04:26,160
the gem module has an exposed facility

128
00:04:29,430 --> 00:04:27,360
out there where they've attached

129
00:04:31,830 --> 00:04:29,440
payloads with appendages so whenever

130
00:04:33,990 --> 00:04:31,840
whenever we're coming up that corridor

131
00:04:36,310 --> 00:04:34,000
um we have to watch our clearances when

132
00:04:37,749 --> 00:04:36,320
we're just maneuvering the ssrms that's

133
00:04:39,270 --> 00:04:37,759
not really a big issue because it's

134
00:04:41,430 --> 00:04:39,280
pretty small but when you start putting

135
00:04:42,790 --> 00:04:41,440
modules or the spdm with its arms

136
00:04:44,310 --> 00:04:42,800
hanging off you really have to

137
00:04:47,270 --> 00:04:44,320
coordinate where you go through so when

138
00:04:49,270 --> 00:04:47,280

we're going through this

139
00:04:50,950 --> 00:04:49,280
corridor we'll actually slow down we'll

140
00:04:53,110 --> 00:04:50,960
have to change our payload file and go

141
00:04:54,950 --> 00:04:53,120
to slower rates as we go through that

142
00:04:56,310 --> 00:04:54,960
tightest clearance and then once we get

143
00:04:57,990 --> 00:04:56,320
through it we'll go back to our higher

144
00:05:01,029 --> 00:04:58,000
rates where we can move the arm at a

145
00:05:02,629 --> 00:05:01,039
faster speed um i know that uh i think

146
00:05:04,310 --> 00:05:02,639
it was late last week and maybe early

147
00:05:07,510 --> 00:05:04,320
this week you guys have done obviously

148
00:05:10,790 --> 00:05:07,520
some preparatory work um the the station

149
00:05:12,070 --> 00:05:10,800
has unique capabilities

150
00:05:14,070 --> 00:05:12,080
can you talk about the changes that

151
00:05:17,029 --> 00:05:14,080
you've made in terms of like like its

152
00:05:19,909 --> 00:05:17,039
operating base uh for the preparations

153
00:05:21,749 --> 00:05:19,919
for your activities this week right

154
00:05:23,830 --> 00:05:21,759
in preparation the

155
00:05:25,670 --> 00:05:23,840
first we had to translate the mt out to

156
00:05:27,749 --> 00:05:25,680
work site six so we

157
00:05:29,990 --> 00:05:27,759
does the mt is normally where we store

158
00:05:31,110 --> 00:05:30,000
the spdm so it's kind of up on the truss

159
00:05:32,950 --> 00:05:31,120
out of the way

160
00:05:34,870 --> 00:05:32,960
we have to be on node two with the big

161
00:05:37,430 --> 00:05:34,880
arm to do the capture and install the

162
00:05:39,029 --> 00:05:37,440
vehicle so after that was completed we

163
00:05:41,029 --> 00:05:39,039

needed to translate the mt over to

164
00:05:44,710 --> 00:05:41,039
worksite six and then we went and

165
00:05:46,390 --> 00:05:44,720
unstowed the spdm from that mbs after we

166
00:05:47,749 --> 00:05:46,400
did that since this is the first flight

167
00:05:49,430 --> 00:05:47,759
of

168
00:05:51,749 --> 00:05:49,440
dragon where we're doing these fram

169
00:05:53,510 --> 00:05:51,759
payloads we took the spdm and put it in

170
00:05:55,430 --> 00:05:53,520
a hover position over the top of the

171
00:05:57,590 --> 00:05:55,440
trunk so that we could use the spdm

172
00:05:59,830 --> 00:05:57,600
cameras to do a survey of the trunk make

173
00:06:01,749 --> 00:05:59,840
sure that everything in there survived

174
00:06:04,390 --> 00:06:01,759
launched and was where we were expecting

175
00:06:07,189 --> 00:06:04,400
it to be there was no issues

176
00:06:11,270 --> 00:06:07,199
uh we actually just saw a live view

177
00:06:13,830 --> 00:06:11,280
of of the robotic arms uh spdm and

178
00:06:15,270 --> 00:06:13,840
columbus as we talked about earlier and

179
00:06:17,590 --> 00:06:15,280
as we're talking about now we're talking

180
00:06:20,550 --> 00:06:17,600
with troy mccracken who is a

181
00:06:22,309 --> 00:06:20,560
lead robotics officer the robo console

182
00:06:24,550 --> 00:06:22,319
is right here in mission control in fact

183
00:06:27,350 --> 00:06:24,560
troy's been on console for quite a bit

184
00:06:28,950 --> 00:06:27,360
in preparation for these activities

185
00:06:31,430 --> 00:06:28,960
troy

186
00:06:33,590 --> 00:06:31,440
can you talk a little bit about

187
00:06:35,350 --> 00:06:33,600
the manual flying versus program

188
00:06:37,430 --> 00:06:35,360

maneuvers are you guys going to be

189
00:06:39,189 --> 00:06:37,440
mostly doing manual or or are there

190
00:06:40,950 --> 00:06:39,199
program commands how does that work all

191
00:06:43,590 --> 00:06:40,960
the ground control commanding is uh

192
00:06:45,590 --> 00:06:43,600
pre-programmed we use um o-cass so you

193
00:06:47,909 --> 00:06:45,600
give it a destination and it the arm

194
00:06:49,110 --> 00:06:47,919
automatically flies to that point unlike

195
00:06:51,029 --> 00:06:49,120
the crew that they actually have the

196
00:06:52,550 --> 00:06:51,039
hand controllers where they can just

197
00:06:54,710 --> 00:06:52,560
put in manual inputs and the arm

198
00:06:58,070 --> 00:06:54,720
responds to that everything we do on the

199
00:06:59,830 --> 00:06:58,080
ground is a destination and a

200
00:07:01,830 --> 00:06:59,840
automatic maneuver

201
00:07:03,589 --> 00:07:01,840
with that said we have developed a new

202
00:07:05,350 --> 00:07:03,599
tool

203
00:07:07,189 --> 00:07:05,360
in the recent past where when we get in

204
00:07:08,950 --> 00:07:07,199
close and we have to do these alignments

205
00:07:11,110 --> 00:07:08,960
when we bring a payload down we're never

206
00:07:12,390 --> 00:07:11,120
perfectly aligned so we'll have to do

207
00:07:14,550 --> 00:07:12,400
these minor corrections and we've

208
00:07:16,870 --> 00:07:14,560
developed a new tool where we basically

209
00:07:18,070 --> 00:07:16,880
just dial in we want to go a centimeter

210
00:07:21,029 --> 00:07:18,080
to the left or

211
00:07:23,909 --> 00:07:21,039
do a degree in pitch we'll dial that in

212
00:07:25,670 --> 00:07:23,919
and you hit do it and the tool basically

213
00:07:26,870 --> 00:07:25,680

sends the couple commands you need to do

214
00:07:29,350 --> 00:07:26,880
to set up the system and then there's

215
00:07:30,870 --> 00:07:29,360
one final command we send that says

216
00:07:31,990 --> 00:07:30,880
proceed which

217
00:07:33,830 --> 00:07:32,000
makes the maneuver and so it's

218
00:07:35,189 --> 00:07:33,840
simplified those little minor

219
00:07:37,350 --> 00:07:35,199
corrections that we have to do and

220
00:07:39,029 --> 00:07:37,360
that's all based in real time when we

221
00:07:40,790 --> 00:07:39,039
get an actual downlink video and

222
00:07:42,309 --> 00:07:40,800
comparing to what we're seeing to make

223
00:07:45,430 --> 00:07:42,319
sure that everything's lined up before

224
00:07:47,029 --> 00:07:45,440
we actually do the mate of the payload

225
00:07:49,589 --> 00:07:47,039
well i know you know

226
00:07:51,350 --> 00:07:49,599
you're you're well trained in doing this

227
00:07:53,510 --> 00:07:51,360
but there has to be sort of a cool

228
00:07:56,230 --> 00:07:53,520
factor to being able to to operate this

229
00:07:58,950 --> 00:07:56,240
robotic arm from the from the ground for

230
00:08:00,710 --> 00:07:58,960
that station 260 miles up it is always

231
00:08:02,309 --> 00:08:00,720
definitely you know you step back and

232
00:08:04,390 --> 00:08:02,319
when you see the arm moving you know in

233
00:08:05,749 --> 00:08:04,400
the video you'll step back and see that

234
00:08:07,909 --> 00:08:05,759
in the middle of your operations and you

235
00:08:09,670 --> 00:08:07,919
always realize it's it's a great job

236
00:08:11,990 --> 00:08:09,680
here to be able to do this and you know

237
00:08:12,869 --> 00:08:12,000
it's amazing that we've gone this far

238
00:08:14,550 --> 00:08:12,879

well

239
00:08:16,390 --> 00:08:14,560
i know we really appreciate you stopping

240
00:08:19,270 --> 00:08:16,400
by the console over here in the front

241
00:08:21,189 --> 00:08:19,280
corner of the room troy and