Benjamin Reed

Deputy Program Manager
Satellite Servicing Capabilities Office
Goddard Space Flight Center

1
00:00:02,216 --> 00:00:05,266
>> Kyle Herring: Earlier in
the week, the robotics team

2
00:00:05,536 --> 00:00:08,086
in collaboration
with the European --

3
00:00:08,086 --> 00:00:09,806
the Canadian Space Agency,

4
00:00:09,896 --> 00:00:13,476
which obviously supplied
the station's robotics,

5
00:00:13,476 --> 00:00:16,156
the major components
of the robotics system

6
00:00:16,156 --> 00:00:17,586
of the International
Space Station,

7
00:00:18,086 --> 00:00:20,186
along with investigators

8
00:00:20,186 --> 00:00:24,456
at NASA's Goddard Space Flight
Center participated all week

9
00:00:24,506 --> 00:00:27,606
in the robotic refueling
demonstration.

10
00:00:28,116 --> 00:00:32,916
And we have an opportunity
to talk

11
00:00:32,916 --> 00:00:36,016

to Ben Reed who's the
Deputy Project Manager

12
00:00:36,416 --> 00:00:39,376
for the Satellite
Servicing Capabilities Office

13
00:00:39,376 --> 00:00:43,576
at NASA's Goddard Space Flight
Center outside Greenbelt,

14
00:00:43,576 --> 00:00:44,136
Maryland.

15
00:00:44,136 --> 00:00:45,246
Ben, are you there?

16
00:00:45,826 --> 00:00:46,886
>> Ben Reed: I am here, yes.

17
00:00:47,016 --> 00:00:47,326
>> Kyle Herring: Hey.

18
00:00:47,326 --> 00:00:50,156
Well, I really appreciate
you stopping by.

19
00:00:50,886 --> 00:00:55,066
I know you've had probably
one of the busier weeks,

20
00:00:55,066 --> 00:00:59,096
maybe not just weeks -- week,
but couple of weeks in preparing

21
00:00:59,096 --> 00:01:02,096
for this and then leading up
to all this activity this week.

22

00:01:03,346 --> 00:01:05,346
First off, I have to ask,
how's your weather up there?

23
00:01:05,346 --> 00:01:08,066
I heard there was some
storms headed your way.

24
00:01:08,596 --> 00:01:10,926
>> Ben Reed: Right
now it is cold.

25
00:01:10,926 --> 00:01:13,266
We've had below freezing
for three or four days,

26
00:01:13,266 --> 00:01:17,116
but presently no
precip, so not too bad.

27
00:01:18,316 --> 00:01:21,326
>> Kyle Herring: Well, down
here it's probably about 70

28
00:01:21,326 --> 00:01:23,716
and sunny, but that's okay.

29
00:01:23,716 --> 00:01:26,396
Not inside here in Mission
Control and probably not inside

30
00:01:26,396 --> 00:01:28,966
where you are, shirt-sleeve
environment.

31
00:01:29,286 --> 00:01:31,356
Lay the groundwork for us

32
00:01:32,276 --> 00:01:35,016
in what y'all did

each day this week.

33
00:01:35,016 --> 00:01:37,566
I know you had a little bit
of a glitch getting started.

34
00:01:37,566 --> 00:01:40,526
Obviously, you can talk about
that if you want at the outset.

35
00:01:40,526 --> 00:01:44,426
But lay the groundwork for us
of what y'all did this week

36
00:01:44,426 --> 00:01:46,516
and how it ended
this morning earlier.

37
00:01:47,216 --> 00:01:49,796
>> Ben Reed: Well, we've had
an incredibly successful.

38
00:01:49,796 --> 00:01:53,556
We could not be more
pleased with the cooperation

39
00:01:53,556 --> 00:01:58,546
of the folks the robofliers
down at Mission Control,

40
00:01:58,616 --> 00:02:02,026
the Canadian Space Agency,
our good friends Pro

41
00:02:02,506 --> 00:02:06,536
at Marshals Space Flight
Center, as well as my team here

42
00:02:06,536 --> 00:02:09,736
at Goddard working

together on this robotics

43
00:02:09,736 --> 00:02:12,066
and fueling mission,
which I don't want

44
00:02:12,066 --> 00:02:17,096
to sound overly dramatic, but
it is -- it is or it might be --

45
00:02:17,096 --> 00:02:18,596
only history will tell --

46
00:02:18,726 --> 00:02:22,936
that the start of what could
be a revolution of a new era

47
00:02:22,936 --> 00:02:28,596
in how satellites are
built and flown in space.

48
00:02:28,596 --> 00:02:30,586
And so what do I mean by that?

49
00:02:30,586 --> 00:02:34,696
Well, what we're doing on
space station with the robotics

50
00:02:34,696 --> 00:02:37,206
and fueling mission, what
we did this past week was

51
00:02:37,206 --> 00:02:44,206
to demonstrate that present-day
technology is able to access,

52
00:02:44,846 --> 00:02:49,396
take apart, disassemble the
fittings, the lock wire,

53
00:02:49,396 --> 00:02:53,306
these small caps, this crushable
seal that is, you know,

54
00:02:53,656 --> 00:02:57,896
half the diameter of a penny
with present-day technology,

55
00:02:57,896 --> 00:03:01,776
with the robot Dextre, special
purpose Dextre's manipulator

56
00:03:02,176 --> 00:03:07,916
up on space station, is able to
undo these triple seals that are

57
00:03:07,916 --> 00:03:12,796
on more than 900 satellites
presently operating in space.

58
00:03:12,996 --> 00:03:18,526
What that means is that
fleet owners and operators,

59
00:03:18,526 --> 00:03:20,226
people who run these satellites,

60
00:03:20,566 --> 00:03:22,666
perhaps could have
options in the future.

61
00:03:23,216 --> 00:03:25,816
The present paradigm is
to operate a satellite;

62
00:03:25,956 --> 00:03:28,656
when it has an anomaly or
when it runs out of fuel,

63

00:03:29,186 --> 00:03:32,946
you decommission it, you build
a replacement assuming you have

64
00:03:32,946 --> 00:03:33,866
the funds to do so.

65
00:03:33,866 --> 00:03:38,006
What satellite servicing brings
to the table is the possibility

66
00:03:38,006 --> 00:03:41,706
that one could go up
with a robotic spacecraft

67
00:03:41,706 --> 00:03:46,186
and give it more fuel, fix a
solar array, perform some sort

68
00:03:46,186 --> 00:03:50,006
of a servicing function,
a repair, a refueling

69
00:03:50,006 --> 00:03:52,076
or relocation to
allow that satellite

70
00:03:52,296 --> 00:03:55,626
to continue its operations
longer.

71
00:03:55,956 --> 00:03:59,776
And the unique capability of
the space station with Dextre

72
00:03:59,776 --> 00:04:02,636
up there, with the ELC platform

73
00:04:02,636 --> 00:04:05,386
where you can mount technology

demonstration payloads

74
00:04:05,386 --> 00:04:07,416
like this, it's simply
fantastic.

75
00:04:07,416 --> 00:04:11,156
It allows us to quickly
advance technologies,

76
00:04:11,186 --> 00:04:16,466
prove that the technologies work
in orbit for much, much cheaper

77
00:04:16,466 --> 00:04:19,896
than if I had to do this
on my own, as it were,

78
00:04:19,896 --> 00:04:23,596
without the help of
the great capabilities

79
00:04:23,596 --> 00:04:24,986
of the International
Space Station.

80
00:04:25,416 --> 00:04:26,996
>> Kyle Herring: Well, that's --
you know, I was going to ask you

81
00:04:26,996 --> 00:04:28,886
about that, 'cause, you
know, that's one thing

82
00:04:28,886 --> 00:04:31,586
that people maybe tend
to overlook is, you know,

83
00:04:31,816 --> 00:04:34,956
think about the station

as a science laboratory

84
00:04:34,956 --> 00:04:38,646
because of what we're doing
inside, but the station is

85
00:04:38,646 --> 00:04:40,886
like a -- kind of
like the shuttle was.

86
00:04:40,886 --> 00:04:44,626
It's like a tested and this a --
isn't this a perfect opportunity

87
00:04:44,626 --> 00:04:47,476
to demonstrate that, that
this station can be used

88
00:04:47,836 --> 00:04:51,216
for this type of work that,
you know, ten years from now,

89
00:04:51,216 --> 00:04:54,196
maybe sooner, we're
doing the kinds of thing

90
00:04:54,256 --> 00:04:55,806
that you guys are studying?

91
00:04:55,806 --> 00:04:56,276
>> Ben Reed: Absolutely.

92
00:04:56,276 --> 00:04:57,706
I couldn't agree more.

93
00:04:57,706 --> 00:04:59,836
I am space station's
biggest fan;

94

00:05:00,076 --> 00:05:04,866
working with the payloads office
there in Houston to get a ride

95
00:05:04,866 --> 00:05:11,296
to orbit and then a nice safe
installation onto the outside

96
00:05:11,296 --> 00:05:13,626
of the station, be able to
conduct your experiment,

97
00:05:13,626 --> 00:05:18,276
and then when the experiment
is done, you would --

98
00:05:18,436 --> 00:05:21,526
we get to use that technology
and go to the next step.

99
00:05:21,716 --> 00:05:24,446
Space station simply turns
its attention, as you said,

100
00:05:24,446 --> 00:05:26,626
that alpha magnetic
spectrometer, right.

101
00:05:27,076 --> 00:05:28,536
Yesterday you're
working on my thing,

102
00:05:28,536 --> 00:05:29,946
today you're working
on the next one.

103
00:05:29,946 --> 00:05:32,296
I mean it's -- and I
realize lots and lots

104

00:05:32,296 --> 00:05:33,556
of things are happening
concurrently,

105
00:05:34,006 --> 00:05:40,106
but it really is an incredible
in-orbit infrastructure

106
00:05:40,106 --> 00:05:44,166
that allows rapid technology
development and demonstration,

107
00:05:44,166 --> 00:05:48,526
and I couldn't be more pleased
to take advantage of it,

108
00:05:48,526 --> 00:05:52,846
and I know my potential future
clients are also pleased

109
00:05:52,846 --> 00:05:55,666
that they can point to
this and say, hey, look.

110
00:05:55,866 --> 00:05:58,546
This is -- it's been
demonstrated in space,

111
00:05:58,546 --> 00:06:00,786
my anxiety can be
eased that much more

112
00:06:00,786 --> 00:06:03,736
because I've seen it
actually happen in Zero-G.

113
00:06:04,096 --> 00:06:06,016
I don't have to take
somebody's word for it

114

00:06:06,286 --> 00:06:09,416
that a ground demonstration
will work the same in orbit.

115
00:06:10,466 --> 00:06:14,836
>> Kyle Herring: So lay out
how the week kind of progressed

116
00:06:14,906 --> 00:06:18,466
for you guys and where you
started and where you ended.

117
00:06:18,466 --> 00:06:20,006
Because I think, didn't you end

118
00:06:20,006 --> 00:06:23,686
with an actual simulated
refueling of the satellite?

119
00:06:23,936 --> 00:06:24,276
>> Ben Reed: Yes.

120
00:06:24,276 --> 00:06:28,256
Yes. So we started
middle of last week.

121
00:06:28,256 --> 00:06:33,936
We had a couple of days of
operations where we used Dextre

122
00:06:33,936 --> 00:06:38,786
to pick up our wire cutter
tool, we cut lock wire.

123
00:06:38,786 --> 00:06:42,156
And this is small wire, this
wire is twenty-thousandths

124
00:06:42,556 --> 00:06:46,156
of an inch, so not large

wire by any stretch.

125
00:06:46,156 --> 00:06:50,076
But we were able to
precisely snag that wire,

126
00:06:50,526 --> 00:06:54,436
use our custom-built wire
cutter tool to snip the wire.

127
00:06:54,966 --> 00:06:58,896
We then put that tool
on the back burner,

128
00:06:58,896 --> 00:07:03,656
picked up our multifunction tool

129
00:07:03,656 --> 00:07:06,326
with its special adapter
that's been designed

130
00:07:06,326 --> 00:07:10,876
to handle a tertiary cap,
which is about the size --

131
00:07:10,876 --> 00:07:12,976
a little bit smaller
than a coffee mug.

132
00:07:13,496 --> 00:07:17,146
We securely fastened ourselves
over that tertiary cap,

133
00:07:17,516 --> 00:07:21,306
unscrewed it, and safely stowed
it to the top of our module.

134
00:07:21,606 --> 00:07:26,126
Still holding the wire
cutter tool, we then moved in

135
00:07:26,126 --> 00:07:31,716
and cut two more wires, equally
small, put those two tools away,

136
00:07:31,716 --> 00:07:34,176
the wire cutter tool and the
multi function tool away.

137
00:07:34,176 --> 00:07:38,416
We then used our safety cap
tool to remove the next cap

138
00:07:38,416 --> 00:07:40,836
that was nested under
the tertiary cap,

139
00:07:41,396 --> 00:07:44,436
and this is completely different
form factor from the first cap,

140
00:07:44,496 --> 00:07:46,756
so we had to have a
different tool to do it.

141
00:07:47,346 --> 00:07:49,936
We removed that cap,
safely stowed it,

142
00:07:50,326 --> 00:07:54,026
and then last night
was the final act.

143
00:07:54,026 --> 00:07:55,696
That's where we picked
up our nozzle tool,

144
00:07:55,906 --> 00:08:01,646
we threaded onto the exposed
fill-in drain valve threads,

145
00:08:01,756 --> 00:08:05,166
which any roboticist will
tell you, is not easy to do.

146
00:08:05,166 --> 00:08:06,736
Threading on is tricky business.

147
00:08:07,106 --> 00:08:12,336
But we expertly -- we, the joint
team, expertly threaded on.

148
00:08:12,816 --> 00:08:16,876
We then opened up a series
of valves, reservoirs, pumps,

149
00:08:16,936 --> 00:08:20,386
turned them on through our
friends down at Marshall,

150
00:08:20,836 --> 00:08:24,476
and we pumped 1.3
liters of liquid ethanol

151
00:08:24,896 --> 00:08:28,226
across this robotically-mated
interface with no leakage.

152
00:08:28,646 --> 00:08:29,536
Very successful.

153
00:08:29,536 --> 00:08:30,486
We were very happy.

154
00:08:30,956 --> 00:08:33,746
We then separated
and left behind a --

155
00:08:33,886 --> 00:08:37,576

we withdrew the tool, leaving
behind a quick disconnect

156
00:08:37,576 --> 00:08:42,606
fitting, and in the process
of doing so, we expected it,

157
00:08:42,606 --> 00:08:45,096
we predicted it, there was a
very small amount of ethanol

158
00:08:45,096 --> 00:08:47,716
that was trapped
between the two seals,

159
00:08:47,716 --> 00:08:51,616
and we have a very cool video
of that ethanol spraying

160
00:08:51,616 --> 00:08:54,386
out in the vacuum of space
and then rapidly evaporating.

161
00:08:54,766 --> 00:08:56,716
And that will be
posted on our website

162
00:08:56,716 --> 00:09:00,256
and I'm sure YouTube
before the day is out.

163
00:09:00,536 --> 00:09:03,246
So I encourage people to
go -- to go look for that.

164
00:09:03,246 --> 00:09:07,116
And then we put that tool
away and we concluded roughly

165
00:09:07,116 --> 00:09:10,476

around midnight eastern
yesterday.

166
00:09:11,416 --> 00:09:13,066
>> Kyle Herring: You
know, you mentioned

167
00:09:13,066 --> 00:09:17,776
about the residual ethanol and,
you know, that's one of the --

168
00:09:17,776 --> 00:09:19,396
one of the things that we
talked about, you know,

169
00:09:19,396 --> 00:09:22,656
when we do space walks and
how critical it is to try

170
00:09:22,656 --> 00:09:23,706
to make sure that we --

171
00:09:24,356 --> 00:09:28,566
you know, connections like
you mentioned are very precise

172
00:09:29,096 --> 00:09:32,166
with cabling and
things like that.

173
00:09:32,166 --> 00:09:36,036
And I guess this is just another
way of showing, you know --

174
00:09:36,036 --> 00:09:38,316
'cause space walks are
very valuable obviously,

175
00:09:38,316 --> 00:09:40,196
and they're as risky as just

176
00:09:40,196 --> 00:09:42,426
about any other activity
we do in space.

177
00:09:42,476 --> 00:09:48,006
So the robotic marriage of crew
members outside doing tasks

178
00:09:48,006 --> 00:09:50,496
and the robotics of
doing tasks are --

179
00:09:50,526 --> 00:09:52,696
this is just another
demonstration of that.

180
00:09:53,116 --> 00:09:56,176
But what you're talking
about doing, and I wanted

181
00:09:56,176 --> 00:09:58,456
to ask you about, you know,
what are the next steps now,

182
00:09:58,456 --> 00:10:02,426
but what you're doing is talking
about servicing satellites that,

183
00:10:02,656 --> 00:10:04,776
you know, astronauts
right now cannot get to.

184
00:10:05,406 --> 00:10:08,856
And that's a much more expensive
process anyway probably

185
00:10:08,856 --> 00:10:09,806
in the long run, right?

186
00:10:09,936 --> 00:10:10,976
>> Ben Reed: That's
exactly right.

187
00:10:10,976 --> 00:10:11,646
That's exactly right.

188
00:10:11,646 --> 00:10:15,286
I think a good analogy
that many of our listeners

189
00:10:15,286 --> 00:10:18,416
and viewers will be
able to associate

190
00:10:18,416 --> 00:10:23,716
with is deep water oil drilling.

191
00:10:24,126 --> 00:10:27,516
So we send divers down
quite deep to help assemble

192
00:10:27,516 --> 00:10:31,626
and maintain these rigs, but
when we need to go really deep,

193
00:10:32,086 --> 00:10:34,526
that's when we send the
remote operated vehicles,

194
00:10:34,526 --> 00:10:37,086
and only the ROVs go really,

195
00:10:37,086 --> 00:10:39,486
really deep where
it's more dangerous,

196
00:10:39,486 --> 00:10:41,896
where humans cannot get to yet.

197
00:10:42,296 --> 00:10:47,446
Well, robotics in orbit I
think is very, very similar.

198
00:10:48,676 --> 00:10:52,926
We have done countless
amazing feats with humans

199
00:10:52,926 --> 00:10:54,746
and robots working
in lower earth orbit;

200
00:10:54,746 --> 00:10:58,456
Hubble Space Telescope, the
Solar Maximum Repair Mission,

201
00:10:58,456 --> 00:10:59,906
all the assembly and maintenance

202
00:10:59,906 --> 00:11:02,166
of the space station
are fantastic examples

203
00:11:02,166 --> 00:11:04,946
of what we can do as an agency.

204
00:11:05,256 --> 00:11:10,116
But to go further out,
presently, today, in 2013,

205
00:11:11,016 --> 00:11:15,886
say to geosynchronous orbit,
is prohibitive right now

206
00:11:15,886 --> 00:11:20,576
with present day technologies
for our astronaut corps,

207

00:11:20,866 --> 00:11:24,446
and that is the area where
robotics can step in.

208
00:11:24,446 --> 00:11:27,046
So we still have human in
the loop, it's still humans

209
00:11:27,046 --> 00:11:29,146
and robots working
together, only the humans are

210
00:11:29,146 --> 00:11:32,476
on the ground with the
joysticks, with the procedures,

211
00:11:32,696 --> 00:11:34,486
making those intelligent
decisions

212
00:11:34,486 --> 00:11:37,736
that only humans can
do, and we use robots

213
00:11:37,736 --> 00:11:40,646
where it presently is
inaccessible by astronauts.

214
00:11:40,646 --> 00:11:44,556
So in my world, it is
never, never either/or.

215
00:11:45,076 --> 00:11:48,776
It's just a matter of how
do we adjust the paradigm

216
00:11:48,776 --> 00:11:50,856
for that particular
environment with humans

217

00:11:50,856 --> 00:11:53,056
and robots working
cooperatively together.

218
00:11:54,156 --> 00:11:57,206
>> Kyle Herring: I wanted
to take a brief moment just

219
00:11:57,206 --> 00:11:58,756
to remind everybody,
we're talking

220
00:11:58,756 --> 00:12:01,526
with Ben Reed who's the
Deputy Project Manager

221
00:12:01,526 --> 00:12:03,876
for the Satellite
Servicing Capabilities Office

222
00:12:03,876 --> 00:12:05,636
up at Goddard Space
Flight Center,

223
00:12:05,636 --> 00:12:09,636
NASA's facility outside
Washington, D.C., in Greenbelt.

224
00:12:10,086 --> 00:12:12,856
And Ben, you're setting me up
perfectly for my questions,

225
00:12:12,856 --> 00:12:16,946
because you mentioned Hubble,
and Hubble Space Telescope

226
00:12:17,526 --> 00:12:19,636
from the very beginning
was designed

227

00:12:19,866 --> 00:12:21,696
to be serviced in space.

228
00:12:21,696 --> 00:12:25,356
We knew that it was going to
be launched, and over periods

229
00:12:25,356 --> 00:12:28,116
of time we were going to change
out the science experiments

230
00:12:28,116 --> 00:12:31,226
as technology advanced
and cameras were advanced,

231
00:12:31,226 --> 00:12:34,656
and that's what we did on five
different servicing missions

232
00:12:34,656 --> 00:12:35,926
and it was designed that way.

233
00:12:36,226 --> 00:12:39,196
We still, even then, when
astronauts were working

234
00:12:39,196 --> 00:12:41,616
on Hubble, we ran into
some issues here and there

235
00:12:41,756 --> 00:12:43,106
and learned from them.

236
00:12:43,106 --> 00:12:46,276
We designed tools specifically
for Hubble servicing.

237
00:12:46,276 --> 00:12:50,436
But these -- these communication
satellites and other satellites

238
00:12:50,436 --> 00:12:52,186
that are out as far
as geo, you know,

239
00:12:52,916 --> 00:12:56,976
obviously they weren't designed
to ever be touched again,

240
00:12:57,296 --> 00:13:01,056
and what you're doing is
demonstrating this capability

241
00:13:01,566 --> 00:13:03,016
on those types of satellites.

242
00:13:03,016 --> 00:13:06,326
So do we learn from this in the
future design of satellites?

243
00:13:06,326 --> 00:13:10,116
Say, okay, well, we're learning
how to refuel these robotically,

244
00:13:10,626 --> 00:13:11,996
so you might want to
change your design.

245
00:13:11,996 --> 00:13:15,476
So you mentioned the satellite
builders are taking great

246
00:13:15,476 --> 00:13:16,706
interest in what you're doing.

247
00:13:17,046 --> 00:13:19,596
Can you describe a little bit
about what the future holds

248

00:13:19,596 --> 00:13:22,066
for maybe satellite
design, that type of thing?

249
00:13:22,276 --> 00:13:23,846
>> Ben Reed: Well, I got
to say, you're setting me

250
00:13:23,846 --> 00:13:25,016
up perfectly for my answers.

251
00:13:25,016 --> 00:13:30,766
So we have been approached
by various stakeholders

252
00:13:30,766 --> 00:13:33,966
in the geosatellite
community with exactly

253
00:13:33,966 --> 00:13:35,276
that type of question.

254
00:13:35,676 --> 00:13:40,326
Ben, if servicing in geo is
going to happen by somebody

255
00:13:40,326 --> 00:13:43,786
in the near future -- and by
near I mean, you know, five,

256
00:13:43,786 --> 00:13:48,066
six, seven years -- what
can I do as an owner

257
00:13:48,066 --> 00:13:51,536
or as an insurance provider
or as a satellite manufacturer

258
00:13:51,866 --> 00:13:55,656
to make my asset -- my

very expensive asset

259
00:13:55,656 --> 00:13:58,426
in that orbit more
amenable to servicing?

260
00:13:59,026 --> 00:14:01,976
And so because of the work
we've been doing with RRM

261
00:14:01,976 --> 00:14:06,136
and other aspects of our
ground technology campaign,

262
00:14:06,536 --> 00:14:12,076
we put together a list
of specific actions,

263
00:14:12,076 --> 00:14:16,386
not generalities like, make
your connections standard.

264
00:14:16,386 --> 00:14:18,466
You know, they need specifics.

265
00:14:18,466 --> 00:14:21,836
So we put together a
list of specific actions

266
00:14:21,836 --> 00:14:23,526
that stakeholders

267
00:14:23,526 --> 00:14:26,856
in the geosatellite community
could do now with satellites

268
00:14:26,856 --> 00:14:29,966
that are on the shop floor
being built presently

269
00:14:30,356 --> 00:14:33,806
to make themselves more
amenable to servicing.

270
00:14:34,206 --> 00:14:37,486
And being NASA, I am required
by law to have an acronym

271
00:14:37,856 --> 00:14:42,046
for that list, and that list
is called COSA, c-o-s-a,

272
00:14:42,046 --> 00:14:44,716
or Cooperative Servicing Aids.

273
00:14:45,096 --> 00:14:48,556
And we issued this
letter, this COSA letter,

274
00:14:48,556 --> 00:14:50,246
to the geo stakeholder
community,

275
00:14:50,246 --> 00:14:53,886
it's out on the Internet,
and it's not to mandate

276
00:14:53,886 --> 00:14:57,856
to anyone what they need to do,
but rather to open a discussion

277
00:14:58,326 --> 00:15:01,576
with the various
members of that community

278
00:15:01,576 --> 00:15:03,036
as to what makes sense.

279
00:15:03,516 --> 00:15:05,556

I don't think anybody's going

280
00:15:05,786 --> 00:15:09,356
to attach a kilogram
grapple fixture

281
00:15:09,356 --> 00:15:12,356
to a geo communications
bird next week.

282
00:15:12,356 --> 00:15:15,476
By no stretch of the imagination
is that what is being suggested.

283
00:15:15,476 --> 00:15:19,206
But rather, you know, maybe
a decal, put a bumper sticker

284
00:15:19,436 --> 00:15:25,826
or two on the aft end that would
aid the cameras and the lasers

285
00:15:25,826 --> 00:15:29,126
that are going to help with
guiding two vehicles together.

286
00:15:29,126 --> 00:15:31,756
You know, something
that is low mass,

287
00:15:31,756 --> 00:15:33,956
low impact that could be
done in the near term.

288
00:15:35,256 --> 00:15:39,666
That's a discussion that is
being begun now, and I'm sure --

289
00:15:39,666 --> 00:15:41,956
well, I certainly hope

will continue for,

290
00:15:42,266 --> 00:15:43,256
you know, for years to come.

291
00:15:43,576 --> 00:15:44,436
>> Kyle Herring: Yeah, exactly.

292
00:15:44,866 --> 00:15:48,256
One last thing before
I let you go.

293
00:15:48,956 --> 00:15:50,646
What's next for you guys?

294
00:15:50,646 --> 00:15:52,676
What do you see coming up?

295
00:15:52,746 --> 00:15:56,916
You know, further work
obviously with RRM on orbit.

296
00:15:56,916 --> 00:16:00,836
And what do you see
coming up next?

297
00:16:00,836 --> 00:16:02,086
>> Ben Reed: So in
our near feature,

298
00:16:02,466 --> 00:16:04,036
later this year we are going

299
00:16:04,036 --> 00:16:06,826
to launch two additional
task boards.

300
00:16:06,916 --> 00:16:09,176
So I haven't mentioned that

phrase yet, task board,

301
00:16:09,176 --> 00:16:11,616
but we designed the RRM module

302
00:16:11,616 --> 00:16:14,666
to be modular, to
be serviceable.

303
00:16:15,636 --> 00:16:22,196
So many of our legacy satellite
interfaces that are on RRM are

304
00:16:22,196 --> 00:16:25,236
on task boards that
are easily removable

305
00:16:25,326 --> 00:16:27,936
by the special purpose
dexterous manipulator.

306
00:16:28,406 --> 00:16:33,136
So later this year we will
launch two additional task

307
00:16:33,136 --> 00:16:37,806
boards, and they will be taken
out through the JEM airlock,

308
00:16:37,806 --> 00:16:42,316
to the Japanese Experiment
Module external airlock,

309
00:16:42,936 --> 00:16:48,766
and then robotically swap out
the ones that are on RRM now

310
00:16:48,766 --> 00:16:52,666
with the new ones, and that will
give us a fresh set of tasks

311
00:16:53,146 --> 00:16:57,456
that we would like to
demonstrate, to practice on,

312
00:16:57,456 --> 00:17:00,436
to learn from on orbit.

313
00:17:00,436 --> 00:17:02,936
So RRM is not over.

314
00:17:03,116 --> 00:17:07,096
We have additional tasks yet
still on it to be done this year

315
00:17:07,096 --> 00:17:08,866
that are presently up there,

316
00:17:09,116 --> 00:17:12,996
and then these new tasks
boards will follow immediately

317
00:17:12,996 --> 00:17:15,476
in the summer or the early fall.

318
00:17:15,476 --> 00:17:18,936
So we've got a busy
agenda yet ahead of us.

319
00:17:19,756 --> 00:17:20,596
>> Kyle Herring:
Well, that's great,

320
00:17:20,596 --> 00:17:25,506
and I know it's very
slow process but you have

321
00:17:25,506 --> 00:17:28,316
to start somewhere,

and this is has been --

322
00:17:28,316 --> 00:17:30,056
as you said, it's
been an amazing week.

323
00:17:30,056 --> 00:17:31,846
It's been fun to
watch, you know,

324
00:17:31,846 --> 00:17:33,956
from here in the
flight control room.

325
00:17:35,076 --> 00:17:37,716
And good luck with
all the future stuff

326
00:17:37,926 --> 00:17:39,656
with everything you
guys are planning.

327
00:17:40,496 --> 00:17:44,176
And thanks again for joining us
here in mission control, Ben.

328
00:17:44,416 --> 00:17:45,236
>> Ben Reed: It's
been my pleasure.

329
00:17:45,236 --> 00:17:45,726
Thank you.

330
00:17:46,196 --> 00:17:47,796
>> Kyle Herring:
Okay, that's Ben Reed.

331
00:17:47,796 --> 00:17:49,336
He's the Deputy Project Manager

332
00:17:49,336 --> 00:17:52,056
for the Satellite
Servicing Capabilities Office

333
00:17:52,746 --> 00:17:55,696
at NASA's Goddard Space Flight
Center, one of the field centers

334
00:17:55,696 --> 00:17:57,146
that support the agency.

335
00:17:57,146 --> 00:18:01,246
It's in Greenbelt, Maryland,
just north of Washington, D.C.,

336
00:18:01,646 --> 00:18:02,986
just outside the beltway.

337
00:18:02,986 --> 00:18:08,356
The -- and as you heard
Ben say, the plans are

338
00:18:08,356 --> 00:18:10,976
for future task boards
to be launched

339
00:18:10,976 --> 00:18:12,296
to the International
Space Station.

340
00:18:12,296 --> 00:18:14,546
So I'm sure we're going
to hear a lot more

341
00:18:14,546 --> 00:18:19,236
about robotic refueling in the
future using the space station