
PAO
NASA

1
00:00:01,280 --> 00:00:01,810
>> Hi everybody.

2
00:00:01,810 --> 00:00:04,180
It's Josh Farley here inside
NASA's Mission Control Center

3
00:00:04,180 --> 00:00:05,190
here at the Johnson
Space Center.

4
00:00:05,190 --> 00:00:07,150
I'm joined by my
friend Melanie Miller

5
00:00:07,150 --> 00:00:08,130
who I think has probably one

6
00:00:08,130 --> 00:00:09,680
of the coolest jobs
here inside the room.

7
00:00:09,680 --> 00:00:12,970
She's a robotics officer so
she's in charge and her team is

8
00:00:12,970 --> 00:00:16,130
in charge of actually operating
the robot arm, the Dexterous,

9
00:00:16,130 --> 00:00:18,270
as we call it, the special
purpose Dexterous manipulator

10
00:00:18,270 --> 00:00:19,550
and all sorts of things.

11
00:00:19,550 --> 00:00:22,640
But you are a key part of

Dragon coming up to the station

12
00:00:22,640 --> 00:00:24,950
so talk a little bit about what
the crew did, what your team did

13
00:00:24,950 --> 00:00:27,940
down here and kind of how
you guys pulled it off.

14
00:00:27,940 --> 00:00:29,030
>> Melanie Miller: Well
we started the day,

15
00:00:29,030 --> 00:00:33,580
we started the day earlier
than the crew got up

16
00:00:33,580 --> 00:00:34,620
and we set everything up so

17
00:00:34,620 --> 00:00:37,210
that we had two workstations
operating in case one went

18
00:00:37,210 --> 00:00:40,590
down the crew could do a
quick switch to the other one.

19
00:00:40,590 --> 00:00:42,710
And then the crew
monitored the vehicle

20
00:00:42,710 --> 00:00:44,190
as it got closer and closer.

21
00:00:44,190 --> 00:00:46,410
We were in the background
working

22
00:00:46,410 --> 00:00:48,840
with the flight control team to
decide if we were ready to go

23
00:00:48,840 --> 00:00:51,550
for the next step to
get a little bit closer.

24
00:00:51,550 --> 00:00:54,900
Finally we got to 30 meters and
there was a lot of discussion

25
00:00:54,900 --> 00:00:57,710
about what the lighting was
going to look like if we went

26
00:00:57,710 --> 00:01:02,040
to what we call into the
capture volume which is 5 meters

27
00:01:02,040 --> 00:01:05,200
from the arm and 10
meters from station.

28
00:01:05,200 --> 00:01:07,880
And we decided to
go ahead and go

29
00:01:07,880 --> 00:01:11,030
and so the crew did
their capture at night

30
00:01:11,030 --> 00:01:13,880
and the lighting
turned out to be okay.

31
00:01:13,880 --> 00:01:16,200
And on the ground
we were setting

32
00:01:16,200 --> 00:01:19,240
up for them all the cameras
and things that they needed

33
00:01:19,240 --> 00:01:24,000
and watching over their shoulder
to make sure that the Dragon was

34
00:01:24,000 --> 00:01:27,040
in the proper volume and
everything looked good.

35
00:01:27,040 --> 00:01:28,380
We gave them a go.

36
00:01:28,380 --> 00:01:31,380
They went in and captured
it pretty quickly.

37
00:01:31,380 --> 00:01:34,210
And once they captured it they
did a small maneuver to get

38
00:01:34,210 --> 00:01:38,160
to an expected position, we
called it the capture position,

39
00:01:38,160 --> 00:01:41,940
and after they were done they
handed it over to my team

40
00:01:41,940 --> 00:01:46,800
and we maneuvered Dragon
through two auto sequences

41
00:01:46,800 --> 00:01:51,010
to about 150 centimeters,
a meter and 1/2

42

00:01:51,010 --> 00:01:52,370
from the install point.

43
00:01:52,370 --> 00:01:53,490
So it was a big maneuver.

44
00:01:53,490 --> 00:01:55,250
There was a lot of things
going on on the ground

45
00:01:55,250 --> 00:01:57,400
and on board during that time.

46
00:01:57,400 --> 00:02:01,800
My team was focused on moving
Dragon and at certain points

47
00:02:01,800 --> 00:02:03,500
in that maneuver we would call

48
00:02:03,500 --> 00:02:05,820
to the team this is the
position we're at so

49
00:02:05,820 --> 00:02:07,470
that they could kick
off other things

50
00:02:07,470 --> 00:02:09,740
like the space station
maneuvering

51
00:02:09,740 --> 00:02:13,090
to the install position,
the whole vehicle.

52
00:02:13,090 --> 00:02:16,430
And we also made a
call once we finished

53
00:02:16,430 --> 00:02:19,890
so that the Space X guys
could roll the arrays

54
00:02:19,890 --> 00:02:23,790
around to the proper position
for install and we were calling

55
00:02:23,790 --> 00:02:27,300
up to the crew saying hey, take
a look out your window and look

56
00:02:27,300 --> 00:02:30,820
at the birthing site of
Dragon and inspect it

57
00:02:30,820 --> 00:02:34,030
to make sure there's no damage
so that we can seal up good.

58
00:02:34,030 --> 00:02:39,180
So all that was going on,
it was very busy on board

59
00:02:39,180 --> 00:02:43,360
and on the ground and that was
a change from last mission.

60
00:02:43,360 --> 00:02:46,500
Because last mission we
had the crew do everything

61
00:02:46,500 --> 00:02:47,290
so it was all serial.

62
00:02:47,290 --> 00:02:48,110
>> Josh Farley: They
did everything, right?

63

00:02:48,110 --> 00:02:49,680
>> Melanie Miller: Yeah they
did everything last time.

64
00:02:49,680 --> 00:02:54,460
This time we did a lot in
parallel so it was exciting

65
00:02:54,460 --> 00:02:56,040
and it went very smoothly.

66
00:02:56,040 --> 00:02:58,790
>> Josh Farley: So how do you,
you know it's kind of nuts

67
00:02:58,790 --> 00:02:59,410
to think that you guys are

68
00:02:59,410 --> 00:03:01,680
down here you know
basically controlling this arm

69
00:03:01,680 --> 00:03:03,900
with this big spacecraft
on the end of it.

70
00:03:03,900 --> 00:03:05,070
You know you can't see it.

71
00:03:05,070 --> 00:03:06,630
I mean sometimes you can
see it on the video monitors

72
00:03:06,630 --> 00:03:08,200
but you're really just kind
of trusting your training,

73
00:03:08,200 --> 00:03:11,780
trusting you know the systems
are going to work as expected

74
00:03:11,780 --> 00:03:13,510
to so I mean what is
that like as a controller

75
00:03:13,510 --> 00:03:14,740
to be sitting here in
Mission Control and kind

76
00:03:14,740 --> 00:03:16,110
of basically flying
the spacecraft

77
00:03:16,110 --> 00:03:19,330
that you're not anywhere near?

78
00:03:19,330 --> 00:03:22,920
>> Melanie Miller: We
practice a lot doing it offline

79
00:03:22,920 --> 00:03:26,420
and we design the procedures
that the crew use to fly as well

80
00:03:26,420 --> 00:03:28,290
and we've done that
for many years.

81
00:03:28,290 --> 00:03:31,450
And so now we are executing
those procedures from the ground

82
00:03:31,450 --> 00:03:34,900
that we have had crews for
several years do so we have,

83
00:03:34,900 --> 00:03:37,740
a lot of it is a lot
of history background.

84
00:03:37,740 --> 00:03:41,880
Sometimes you're just
doing your job and it seems

85
00:03:41,880 --> 00:03:46,360
like it's just a
normal part of your day.

86
00:03:46,360 --> 00:03:53,010
But then you realize I'm moving
this huge spacecraft in space.

87
00:03:53,010 --> 00:03:54,870
>> Josh Farley: And
it's flying really fast.

88
00:03:54,870 --> 00:03:54,940
[laughter]

89
00:03:54,940 --> 00:03:57,970
>> Melanie Miller: Yeah
and you need to be really,

90
00:03:57,970 --> 00:04:01,490
really careful and just be
at the top of your game,

91
00:04:01,490 --> 00:04:02,640
watching all your data.

92
00:04:02,640 --> 00:04:05,380
So even when we don't have video
we do have data while we're

93
00:04:05,380 --> 00:04:09,430
flying so we can see the arm
joint angles and those feed

94
00:04:09,430 --> 00:04:12,180

into a simulator we
have that's really neat

95
00:04:12,180 --> 00:04:14,540
that simulates everything
on space station.

96
00:04:14,540 --> 00:04:17,980
It stimulates the solar
rays moving from the data.

97
00:04:17,980 --> 00:04:22,490
It even simulates Dragon flying
in and all the arm motion

98
00:04:22,490 --> 00:04:25,760
and so, and that's all
fed from real telemetry.

99
00:04:25,760 --> 00:04:28,440
That same simulator is what we
use to plan the trajectories

100
00:04:28,440 --> 00:04:31,620
because we can actually
fly it in a simulator mode

101
00:04:31,620 --> 00:04:35,070
or we can have it run in a
real time mode, we call it,

102
00:04:35,070 --> 00:04:38,230
based on the data on board.

103
00:04:38,230 --> 00:04:40,600
So we use that, sometimes we'll
even put it up on the big board

104
00:04:40,600 --> 00:04:42,710
when we don't have video

in the control centers

105
00:04:42,710 --> 00:04:45,580
so that everybody and the
whole team has good situational

106
00:04:45,580 --> 00:04:48,770
awareness of what's going on.

107
00:04:48,770 --> 00:04:50,610
So and we train.

108
00:04:50,610 --> 00:04:53,850
We have three people and
there's a certain protocol

109
00:04:53,850 --> 00:04:58,530
to everything we do, almost
like we're in the military.

110
00:04:58,530 --> 00:05:00,940
You know we take
it very seriously.

111
00:05:00,940 --> 00:05:02,640
We each check each other.

112
00:05:02,640 --> 00:05:06,460
We check what the arm's doing
and we train certain calls

113
00:05:06,460 --> 00:05:08,580
that we would make if
something didn't look right.

114
00:05:08,580 --> 00:05:10,300
My backroom, for example,

115
00:05:10,300 --> 00:05:15,090

if they see something wrong they
would say stop motion or safe

116
00:05:15,090 --> 00:05:18,890
and I have a command up on my
display and I can click that.

117
00:05:18,890 --> 00:05:20,470
What it does is it
stops everything.

118
00:05:20,470 --> 00:05:21,140
>> Josh Farley: Instantly.

119
00:05:21,140 --> 00:05:22,330
>> Melanie Miller: Instantly,

120
00:05:22,330 --> 00:05:24,620
safes the arm and
everything stops.

121
00:05:24,620 --> 00:05:27,570
>> Josh Farley: Whenever
it comes time for Dragon

122
00:05:27,570 --> 00:05:29,160
to say goodbye it's
basically going

123
00:05:29,160 --> 00:05:30,740
to be the process
in reverse, right?

124
00:05:30,740 --> 00:05:33,210
So the crews going to take care
of basically uninstalling it?

125
00:05:33,210 --> 00:05:34,140
Are you guys going
to steer it around?

126
00:05:34,140 --> 00:05:36,310
Is it going to be the same thing
as last time or is it different?

127
00:05:36,310 --> 00:05:37,020
>> Melanie Miller:
It's different.

128
00:05:37,020 --> 00:05:38,640
Last time the crew
did everything.

129
00:05:38,640 --> 00:05:41,390
This time the crew
will participate

130
00:05:41,390 --> 00:05:45,720
in unbolting the common
birthing mechanism

131
00:05:45,720 --> 00:05:48,840
that has Dragon attached
at the node

132
00:05:48,840 --> 00:05:50,470
and then we'll actually
do the unbirth.

133
00:05:50,470 --> 00:05:54,710
We're going to fly from that
zero plane to a meter and 1/2

134
00:05:54,710 --> 00:05:57,110
and then we have a big
auto sequence that puts us

135
00:05:57,110 --> 00:06:00,110
into the release position so
we'll do all the arm maneuvering

136
00:06:00,110 --> 00:06:03,490
with Dragon on the
end of the arm.

137
00:06:03,490 --> 00:06:07,310
Then the crew will pick up
with the actual ungrapple

138
00:06:07,310 --> 00:06:10,400
of Dragon we call release
and the back away maneuver

139
00:06:10,400 --> 00:06:14,580
because that is a time
critical safety type thing

140
00:06:14,580 --> 00:06:17,880
and we wouldn't want to start
doing that and then lose video

141
00:06:17,880 --> 00:06:21,390
from the ground for some
reason so that's our plan.

142
00:06:21,390 --> 00:06:22,860
>> Josh Farley: So is it
fun doing this kind of job?

143
00:06:22,860 --> 00:06:24,990
I mean does it ever
become normal,

144
00:06:24,990 --> 00:06:25,610
you know what you're doing?

145
00:06:25,610 --> 00:06:27,270
I can't imagine that it does.

146

00:06:27,270 --> 00:06:28,880
>> Melanie Miller:
No, it's, it is fun.

147
00:06:28,880 --> 00:06:31,070
Actually I think we
have the best job.

148
00:06:31,070 --> 00:06:34,550
And we get to train the
crew before they go up.

149
00:06:34,550 --> 00:06:36,330
We get to train the crew
when they're on board

150
00:06:36,330 --> 00:06:38,810
for doing critical
operations like EBA's

151
00:06:38,810 --> 00:06:41,200
or Dragon captures or releases.

152
00:06:41,200 --> 00:06:42,560
And then we get to participate

153
00:06:42,560 --> 00:06:45,940
in the operations while
it's going on so I think

154
00:06:45,940 --> 00:06:46,960
that covers the gamut.

155
00:06:46,960 --> 00:06:51,520
It is an awesome privilege
to be able to be certified

156
00:06:51,520 --> 00:06:53,570
to do this kind of
job and be selected.

157
00:06:53,570 --> 00:06:54,620
>> Josh Farley: Yeah, last
question for you I know

158
00:06:54,620 --> 00:06:55,850
because you've got to get
up there and actually talk

159
00:06:55,850 --> 00:06:57,770
to the crew about these
procedures here in a little bit

160
00:06:57,770 --> 00:07:00,910
but you know the end of the arm,
I think whenever I had to learn

161
00:07:00,910 --> 00:07:01,590
about it, the thing

162
00:07:01,590 --> 00:07:03,620
that surprises me is I always
thought it basically kind

163
00:07:03,620 --> 00:07:04,800
of you know bolted
into something.

164
00:07:04,800 --> 00:07:06,590
It's not, there's
stairs on the end, right,

165
00:07:06,590 --> 00:07:08,300
they kind of pull tight.

166
00:07:08,300 --> 00:07:09,670
Matter of fact you guys
are going to be pointing it

167

00:07:09,670 --> 00:07:11,850
at the [inaudible] I think
later on today for somebody

168
00:07:11,850 --> 00:07:14,090
to take pictures of it
to examine it so talk

169
00:07:14,090 --> 00:07:15,010
about the mechanics of it.

170
00:07:15,010 --> 00:07:19,510
It's really a very kind
of smartly designed armed

171
00:07:19,510 --> 00:07:20,710
by our Canadian friends.

172
00:07:20,710 --> 00:07:24,310
You know talk a bit about
kind of the design of it.

173
00:07:24,310 --> 00:07:27,960
>> Melanie Miller: Okay so we
call it, the LED is like a can.

174
00:07:27,960 --> 00:07:29,680
>> Josh Farley: It's a
latching end defector.

175
00:07:29,680 --> 00:07:30,950
>> Melanie Miller: Yeah
it's a latching end defector

176
00:07:30,950 --> 00:07:35,020
and it looks a lot like a can
except that it has three wires,

177
00:07:35,020 --> 00:07:39,710
or we call them snares, and

the can, the wires get twisted

178
00:07:39,710 --> 00:07:42,940
around until they wrap around a
peg called the grapple fixture

179
00:07:42,940 --> 00:07:44,210
that's on Dragon.

180
00:07:44,210 --> 00:07:47,380
And that peg has a
head to it like a nail.

181
00:07:47,380 --> 00:07:50,710
So the snares actually
wrap around the pen.

182
00:07:50,710 --> 00:07:51,370
>> Josh Farley: Kind
of choke it.

183
00:07:51,370 --> 00:07:52,810
>> Melanie Miller: And
then they pull it in,

184
00:07:52,810 --> 00:07:54,310
we call that the carriage.

185
00:07:54,310 --> 00:07:56,930
The carriage retracts
and it pulls

186
00:07:56,930 --> 00:08:00,380
in until the snares are tight
on that head of the nail

187
00:08:00,380 --> 00:08:03,380
of the grapple fixture and
pull it in tight until the face

188
00:08:03,380 --> 00:08:07,520
of the can is flush up against
the grapple fixture plate.

189
00:08:07,520 --> 00:08:09,100
And there's a lot
of tension there

190
00:08:09,100 --> 00:08:12,750
and the tension is what
holds it onto the arm.

191
00:08:12,750 --> 00:08:14,200
>> Josh Farley: It's
an incredible design.

192
00:08:14,200 --> 00:08:16,770
You know it's, I think
that's one of the benefits

193
00:08:16,770 --> 00:08:17,890
of having something up in space.

194
00:08:17,890 --> 00:08:19,480
You know I'm not sure if
that would work here on earth

195
00:08:19,480 --> 00:08:20,740
or whatever but it's funny

196
00:08:20,740 --> 00:08:22,150
to see how big the
thing actually is

197
00:08:22,150 --> 00:08:25,060
at the training facilities
we have here in building 9,

198
00:08:25,060 --> 00:08:26,140

the space vehicle
mockup facility.

199
00:08:26,140 --> 00:08:27,250
I mean it's 58 feet long.

200
00:08:27,250 --> 00:08:29,140
It's just huge whenever you
take a look at it and the end

201
00:08:29,140 --> 00:08:31,380
of it is just enormous
so it's always fun

202
00:08:31,380 --> 00:08:32,240
to watch the two guys do.

203
00:08:32,240 --> 00:08:33,810
I wish I could go over
there and do it myself.

204
00:08:33,810 --> 00:08:36,250
I don't think I have the
training to do it [laughter].

205
00:08:36,250 --> 00:08:38,750
We should swap jobs sometime
you know so, alright,

206
00:08:38,750 --> 00:08:39,440
that's Melanie Miller.

207
00:08:39,440 --> 00:08:41,480
I want to thank her, thank
you very much for stopping by.

208
00:08:41,480 --> 00:08:43,290
It's always fun to talk
about this kind of stuff

209
00:08:43,290 --> 00:08:44,780
and we'll be watching at the end

210
00:08:44,780 --> 00:08:48,630
of the month whenever you guys
get ready to release Dragon back

211
00:08:48,630 --> 00:08:52,010
for its reentry back
to the Pacific Ocean.

212
00:08:52,010 --> 00:08:53,270
>> Melanie Miller: Yep,
that will be great.