
NASA

1
00:00:00,506 --> 00:00:25,516
[music]

2
00:00:26,016 --> 00:00:26,083
[background music]

3
00:00:26,083 --> 00:00:29,906
>> Any time we have a checkout on orbit
there's a lot of products that go into that.

4
00:00:30,336 --> 00:00:36,256
We have the training products that we have to
create, we have crew come over and get trained

5
00:00:36,256 --> 00:00:41,216
up on the robot, they dry run the procedures,
we also have a lot of real time ops products

6
00:00:41,216 --> 00:00:44,646
that have to be created, there's an entire
flight ops community that we're interfacing with

7
00:00:45,096 --> 00:00:48,686
and everybody has to be brought up to speed
on what's going to happen, what's expected,

8
00:00:48,686 --> 00:00:52,686
how much time is going to occur, that all
has to be coordinated ahead of time so that

9
00:00:52,686 --> 00:00:58,276
when things are happening real time everything's
expected in terms of what the robot is going

10
00:00:58,386 --> 00:01:02,646
to do, what its next actions are, everybody's on
the same page and so it takes an amazing amount

11
00:01:02,646 --> 00:01:07,106

of time and preparation in
order to achieve that level

12
00:01:07,106 --> 00:01:09,626
of understanding between the ops community.

13
00:01:10,016 --> 00:01:13,026
Then there's the technical side to it, what
we're trying to accomplish on the robot

14
00:01:13,026 --> 00:01:16,236
from the scientific point of view and so
all of that has to be married together

15
00:01:16,236 --> 00:01:21,366
because we our milestones as researchers in
the lab and the ops community has standards

16
00:01:21,366 --> 00:01:24,156
in which they need to achieve those
milestones and so we're trying

17
00:01:24,156 --> 00:01:28,316
to bridge those two worlds together on
this unique payload such as Robonaut.

18
00:01:29,696 --> 00:01:35,186
This milestone for checkout
1.5 was particularly important

19
00:01:35,186 --> 00:01:37,626
because it was the first time the
robot moved under its own power.

20
00:01:38,436 --> 00:01:43,436
The previous checkouts that we had done really
looked at just booting up the robot systems,

21
00:01:43,786 --> 00:01:48,256
making sure that everything from a sensor

point of view, from a computer point

22
00:01:48,256 --> 00:01:54,546
of view had survived ascent to the space
station as we expected it so we powered

23
00:01:54,546 --> 00:02:00,076
up the computer system, we looked at the thermal
signatures cause we want to take things slow

24
00:02:00,776 --> 00:02:04,546
and we've become very satisfied
with the state of the robot

25
00:02:04,546 --> 00:02:08,846
and so checkout 1.5 was ok
let's get that robot to move

26
00:02:08,956 --> 00:02:10,856
and go through the adaptive morning script

27
00:02:10,986 --> 00:02:16,286
to tune the software parameters
to how it moves in 0G.

28
00:02:17,306 --> 00:02:18,986
So that was a huge gantlet that we had to go

29
00:02:19,076 --> 00:02:22,956
through because we're not flying a
fancy computer, we're flying a robot

30
00:02:23,046 --> 00:02:29,196
to assist the crew with their daily
activities and of the activities in particular

31
00:02:29,246 --> 00:02:32,096
that we feel the robot could better serve.

32

00:02:32,276 --> 00:02:38,526
You know cleaning things and assisting the crew
from that point of view so we ultimately have

33
00:02:38,526 --> 00:02:44,406
to get the robot to move so this was a huge
milestone because it means that all the system

34
00:02:44,406 --> 00:02:47,596
and there are hundreds of systems that
are all cross checking each other,

35
00:02:47,826 --> 00:02:51,846
sensors that are cross checking each
other that have to work in order

36
00:02:51,946 --> 00:02:53,736
for the robot to even begin motion.

37
00:02:54,746 --> 00:03:00,626
So our checkout yesterday was looking at the
differences between how the robots going to work

38
00:03:00,626 --> 00:03:04,676
in OG and how we've been
testing it on the earth in 1G.

39
00:03:05,706 --> 00:03:12,026
The robot was going through and moving its
arms one by one, moving each of the joints

40
00:03:12,026 --> 00:03:17,756
in its arms to understand the differences
between operating in 1G and 0G.

41
00:03:17,756 --> 00:03:20,866
The robots actions are controlled
by a set of software parameters

42
00:03:21,046 --> 00:03:24,276

and those software parameters have
to be adjusted between here on earth

43
00:03:24,276 --> 00:03:30,236
and in the space station and so we had the robot
go through and adaptively learn the differences

44
00:03:30,236 --> 00:03:31,576
between those software parameters.

45
00:03:32,406 --> 00:03:35,616
There's a certain choreography
to it of how we interact

46
00:03:35,956 --> 00:03:40,006
with the crew cause we don't talk
directly with the crew and we have

47
00:03:40,116 --> 00:03:45,306
to discuss we have our Robonaut flight
controllers and they discuss the actions

48
00:03:45,306 --> 00:03:48,666
and what's going to take place and
in the off nominal that we might have

49
00:03:48,666 --> 00:03:53,296
with a specific actions and so those have
to get sent up to the crew and then the crew

50
00:03:53,296 --> 00:03:56,456
in their observations are sending
down to the flight controllers

51
00:03:56,456 --> 00:04:01,686
on the ground what they're observing and so
there's this nice little dance that has to occur

52
00:04:01,966 --> 00:04:05,926
and plus we're doing commanding both

from the ground and onboard the station

53
00:04:05,996 --> 00:04:11,776
so with yesterday's events for example Mike
Fossum was actually commanding the robot

54
00:04:11,776 --> 00:04:16,456
on the station and so he was initiating
the scripts and he was loading the scripts

55
00:04:16,796 --> 00:04:19,066
that were having the robot run through

56
00:04:19,736 --> 00:04:25,096
and like I mentioned adaptively learn
it's game parameters for operation

57
00:04:25,466 --> 00:04:30,946
but at the end we had the ground stow the robot
and so there's this nice tradeoff and this dance

58
00:04:30,996 --> 00:04:33,876
that has to occur back and forth and a
lot of real time ops that are happening

59
00:04:33,936 --> 00:04:38,406
and coordination so check out 1.5
is what we accomplished yesterday

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00:04:39,076 --> 00:04:45,776
and it was a very exciting day for our lab
in particular, all the flight controllers

61
00:04:45,776 --> 00:04:47,936
that we had on the ground
watching the robot and the crew.

62
00:04:48,636 --> 00:04:51,706
I don't know if you got a chance to
see Mike Fossum in some of the video

63
00:04:52,116 --> 00:04:55,286
but he was a very excited
individual running that robot

64
00:04:55,286 --> 00:04:58,046
and then we were equally excited
watching him run that robot.

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00:04:58,626 --> 00:05:02,636
We can sort of already get the sense
of the relationship of the crew

66
00:05:02,836 --> 00:05:06,126
and Robonaut could have in the future.

67
00:05:06,236 --> 00:05:11,156
He was you could tell that Mike felt very
like the activities that we were doing

68
00:05:11,276 --> 00:05:14,906
with Robonaut represented this new
age that we're trying to usher in,

69
00:05:15,406 --> 00:05:21,596
which is having the crew and a high dexterous
humanoid work together and we were just

70
00:05:21,956 --> 00:05:26,326
so genuinely excited to see his enthusiasm
and the events couldn't have gone any better.

71
00:05:26,866 --> 00:05:32,216
We having the first humanoid
robot aboard the ISS move

72
00:05:32,216 --> 00:05:34,606
under its own power was really a momentous day.

73

00:05:34,906 --> 00:05:38,966
It was really tough to contain our emotions
because you're supposed to be this stoic,

74
00:05:39,516 --> 00:05:46,586
have this sense of you know seriousness in the
control center but yet we were grinning from ear

75
00:05:46,586 --> 00:05:53,536
to ear like kids in a candy store,
just having the most wonderful time,