1
00:00:04,710 --> 00:00:02,790
the space station provides a place to

2
00:00:06,389 --> 00:00:04,720
test many technologies in this space

3
00:00:08,629 --> 00:00:06,399
environment where they will be used

4
00:00:10,310 --> 00:00:08,639
laurie meigs with the station's payload

5
00:00:11,589 --> 00:00:10,320
operations integration center at the

6
00:00:13,910 --> 00:00:11,599
marshall space flight center in

7
00:00:15,669 --> 00:00:13,920
huntsville spoke with chris provencher a

8
00:00:17,590 --> 00:00:15,679
project manager with ames research

9
00:00:19,830 --> 00:00:17,600
center he described how his team on the

10
00:00:21,349 --> 00:00:19,840
ground controls the flight of robotic

11
00:00:23,429 --> 00:00:21,359
satellites on the station using a

12
00:00:25,509 --> 00:00:23,439
smartphone similar to the ones many of

13
00:00:27,349 --> 00:00:25,519

us use every day

14
00:00:30,310 --> 00:00:27,359
so i'm researching smart spheres which

15
00:00:32,630 --> 00:00:30,320
is a robotic free flyer on iss so the

16
00:00:36,470 --> 00:00:32,640
spheres are free-flying satellites on

17
00:00:38,549 --> 00:00:36,480
iss and they use co2 propulsion to to

18
00:00:39,990 --> 00:00:38,559
move around and they can navigate but

19
00:00:41,830 --> 00:00:40,000
there are satellites what kind of

20
00:00:43,910 --> 00:00:41,840
control are we talking about so the

21
00:00:45,190 --> 00:00:43,920
controller is actually a google nexus s

22
00:00:49,270 --> 00:00:45,200
smartphone

23
00:00:51,350 --> 00:00:49,280
the satellite we can use the wi-fi on

24
00:00:53,990 --> 00:00:51,360
the phone to communicate with the

25
00:00:55,750 --> 00:00:54,000
satellite via the lan that's onboard iss

26
00:00:57,830 --> 00:00:55,760
we can use the processors that are on

27
00:00:59,590 --> 00:00:57,840
the phone to control where the satellite

28
00:01:01,910 --> 00:00:59,600
goes and what it does

29
00:01:03,590 --> 00:01:01,920
we can use the camera on the phone for

30
00:01:05,509 --> 00:01:03,600
vision and there are other sensors on

31
00:01:07,510 --> 00:01:05,519
the phone that we can use as well so you

32
00:01:09,350 --> 00:01:07,520
send communication from the ground you

33
00:01:12,230 --> 00:01:09,360
call the phone how does that work right

34
00:01:13,910 --> 00:01:12,240
so the ground controller can communicate

35
00:01:16,390 --> 00:01:13,920
to the smartphone and tell the

36
00:01:18,070 --> 00:01:16,400
smartphone where to send the sphere so

37
00:01:20,870 --> 00:01:18,080
that's how we control where this where

38
00:01:23,190 --> 00:01:20,880

this free flyer goes and what it does

39
00:01:25,830 --> 00:01:23,200
have you had any results thus far

40
00:01:27,910 --> 00:01:25,840
yes so in december of 2012 we did do a

41
00:01:29,990 --> 00:01:27,920
demonstration where a ground controller

42
00:01:31,910 --> 00:01:30,000
in the mission control center in houston

43
00:01:35,190 --> 00:01:31,920
controlled the smart spheres to perform

44
00:01:36,310 --> 00:01:35,200
a mobile camera task so he was able to

45
00:01:38,789 --> 00:01:36,320
uplink

46
00:01:41,350 --> 00:01:38,799
commands to the smart spheres to tell it

47
00:01:42,389 --> 00:01:41,360
where to go and where to uh to take

48
00:01:45,270 --> 00:01:42,399
imagery

49
00:01:47,590 --> 00:01:45,280
and he was able to not only run some

50
00:01:49,590 --> 00:01:47,600
autonomous uh plans that the smart

51
00:01:51,350 --> 00:01:49,600
spheres ran but he was also able to

52
00:01:52,789 --> 00:01:51,360
interrupt the plans and take over manual

53
00:01:54,950 --> 00:01:52,799
control of the smart spheres so it's

54
00:01:55,990 --> 00:01:54,960
very successful what did we learn from

55
00:01:58,709 --> 00:01:56,000
that

56
00:02:00,069 --> 00:01:58,719
can control a robotic free flyer from

57
00:02:01,270 --> 00:02:00,079
the ground under the supervision of a

58
00:02:03,350 --> 00:02:01,280
ground controller

59
00:02:05,429 --> 00:02:03,360
the crew only has a limited amount of

60
00:02:07,350 --> 00:02:05,439
time on station and a lot of that time

61
00:02:09,350 --> 00:02:07,360
is spent doing maintenance and

62
00:02:11,510 --> 00:02:09,360
housekeeping types of activities to

63
00:02:13,030 --> 00:02:11,520

include moving cameras around and also

64
00:02:15,510 --> 00:02:13,040
doing other types of environmental

65
00:02:18,070 --> 00:02:15,520
surveys such as taking noise level

66
00:02:19,510 --> 00:02:18,080
readings radiation level readings other

67
00:02:21,589 --> 00:02:19,520
things to make sure that the station is

68
00:02:23,270 --> 00:02:21,599
safe but if we can offload those tasks

69
00:02:25,190 --> 00:02:23,280
to a robot that will free up time for

70
00:02:26,390 --> 00:02:25,200
the crew to spend more time working on

71
00:02:27,670 --> 00:02:26,400
science

72
00:02:28,949 --> 00:02:27,680
and that's what's important to us that's

73
00:02:30,869 --> 00:02:28,959
what's important

74
00:02:32,470 --> 00:02:30,879
why is the space station an ideal place

75
00:02:33,589 --> 00:02:32,480
to conduct this kind of research well

76
00:02:35,190 --> 00:02:33,599
there are a couple of reasons we want to

77
00:02:37,910 --> 00:02:35,200
do this on iss

78
00:02:40,070 --> 00:02:37,920
first the iss is the ideal

79
00:02:41,589 --> 00:02:40,080
test bed for working in microgravity

80
00:02:44,470 --> 00:02:41,599
with free flyers

81
00:02:46,790 --> 00:02:44,480
and secondly since we want these

82
00:02:48,309 --> 00:02:46,800
robotic free flyers to be deployed on

83
00:02:50,309 --> 00:02:48,319
space station we're actually doing our

84
00:02:52,390 --> 00:02:50,319
testing in the operational environment

85
00:02:55,589 --> 00:02:52,400
the smart spheres is a prototype for a

86
00:02:57,589 --> 00:02:55,599
future free-flying robotic system

87
00:02:59,350 --> 00:02:57,599
by by using the smartphone it allows us

88
00:03:01,190 --> 00:02:59,360

to control the spheres and to

89
00:03:03,430 --> 00:03:01,200
demonstrate the activities of a

90
00:03:05,110 --> 00:03:03,440
free-flying camera or a free-flying

91
00:03:06,470 --> 00:03:05,120
sensor

92
00:03:08,790 --> 00:03:06,480
and so

93
00:03:10,630 --> 00:03:08,800
the lessons that we get from these tests