SPACE TO GROUND

1
00:00:06,869 --> 00:00:03,590
houston station on space to ground

2
00:00:08,470 --> 00:00:06,879
3d printing in zero gravity

3
00:00:10,709 --> 00:00:08,480
welcome to space to ground i'm gary

4
00:00:12,310 --> 00:00:10,719
jordan it can be quite a hassle to ship

5
00:00:14,470 --> 00:00:12,320
tools to space and could take months or

6
00:00:16,390 --> 00:00:14,480
even years of planning and execution so

7
00:00:18,550 --> 00:00:16,400
why not just make the tools in orbit

8
00:00:20,310 --> 00:00:18,560
jeff williams used a 3d printer on the

9
00:00:21,990 --> 00:00:20,320
international space station this week

10
00:00:24,470 --> 00:00:22,000
and popped out a few samples called

11
00:00:26,070 --> 00:00:24,480
coupons these coupons help demonstrate

12
00:00:28,470 --> 00:00:26,080
the composition of the print material

13
00:00:30,230 --> 00:00:28,480

when used in space researchers print a

14
00:00:31,990 --> 00:00:30,240
duplicate copy of the coupon on the

15
00:00:33,670 --> 00:00:32,000
ground to compare dimensions layer

16
00:00:36,069 --> 00:00:33,680
thickness adhesion strength and

17
00:00:38,150 --> 00:00:36,079
flexibility to the ones in space

18
00:00:40,069 --> 00:00:38,160
having 3d printing in space provides

19
00:00:42,069 --> 00:00:40,079
on-site and on-demand manufacturing

20
00:00:44,310 --> 00:00:42,079
capabilities and reduces the need for

21
00:00:46,709 --> 00:00:44,320
shipping spares on cargo vehicles saving

22
00:00:47,990 --> 00:00:46,719
a lot on time and cost

23
00:00:49,670 --> 00:00:48,000
williams continued work on

24
00:00:52,549 --> 00:00:49,680
three-dimensional objects on the station

25
00:00:54,549 --> 00:00:52,559
this week with satellites called spheres

26
00:00:56,310 --> 00:00:54,559
these bowling ball-sized robots fly

27
00:00:58,389 --> 00:00:56,320
within the cabin of the space station

28
00:01:00,630 --> 00:00:58,399
and contain their own power propulsion

29
00:01:02,389 --> 00:01:00,640
computers and navigation equipment

30
00:01:04,469 --> 00:01:02,399
they test out space flight maneuvers and

31
00:01:06,710 --> 00:01:04,479
tasks on a small scale inside the space

32
00:01:08,230 --> 00:01:06,720
station researchers upload algorithms

33
00:01:09,670 --> 00:01:08,240
and programs for the astronauts to

34
00:01:11,670 --> 00:01:09,680
execute on the spheres and run

35
00:01:13,830 --> 00:01:11,680
autonomously to see how the satellites

36
00:01:15,830 --> 00:01:13,840
behave in the microgravity environment

37
00:01:17,350 --> 00:01:15,840
sphere simulates space operations like

38
00:01:19,590 --> 00:01:17,360

automatic rendezvous and docking of

39
00:01:21,910 --> 00:01:19,600
space vehicles formation flight patterns

40
00:01:23,190 --> 00:01:21,920
and remote operations and can be adapted

41
00:01:25,030 --> 00:01:23,200
with more equipment to conduct

42
00:01:27,510 --> 00:01:25,040
experiments like studying the behavior

43
00:01:29,350 --> 00:01:27,520
of liquids or creating 3d models of

44
00:01:31,350 --> 00:01:29,360
objects to interact with

45
00:01:33,190 --> 00:01:31,360
this week's question comes from jim who

46
00:01:34,710 --> 00:01:33,200
wants to know the speed of a spacecraft

47
00:01:36,310 --> 00:01:34,720
entering the earth's atmosphere and the

48
00:01:37,910 --> 00:01:36,320
temperature inside

49
00:01:40,390 --> 00:01:37,920
for this question let's use the recent

50
00:01:41,350 --> 00:01:40,400
re-entry of the expedition 47 crew as an

51
00:01:43,510 --> 00:01:41,360
example

52
00:01:44,950 --> 00:01:43,520
tim copra tim peake and yuri malenchenko

53
00:01:46,870 --> 00:01:44,960
recently returned to earth from the

54
00:01:49,429 --> 00:01:46,880
international space station on the soyuz

55
00:01:52,310 --> 00:01:49,439
spacecraft upon descent the soyuz starts

56
00:01:54,389 --> 00:01:52,320
slowing down from 17 500 miles per hour

57
00:01:56,310 --> 00:01:54,399
with a de-orbit burn to enter the

58
00:01:58,149 --> 00:01:56,320
earth's atmosphere once the descent

59
00:01:59,830 --> 00:01:58,159
module reaches entry interface or the

60
00:02:01,109 --> 00:01:59,840
edge of the atmosphere friction from the

61
00:02:02,870 --> 00:02:01,119
thick atmosphere heats the outer

62
00:02:04,870 --> 00:02:02,880
surfaces of the vehicle and slows the

63
00:02:07,990 --> 00:02:04,880

vehicle for eight minutes all the way

64
00:02:09,510 --> 00:02:08,000
down to about 515 miles per hour then

65
00:02:11,270 --> 00:02:09,520
the parachutes and the landing engines

66
00:02:13,270 --> 00:02:11,280
do the rest while the heat on the

67
00:02:15,190 --> 00:02:13,280
outside can get up to 3000 degrees

68
00:02:17,750 --> 00:02:15,200
fahrenheit the temperature on the inside

69
00:02:19,589 --> 00:02:17,760
is maintained between 78 and 80 degrees

70
00:02:21,510 --> 00:02:19,599
through the cooling systems hooked up to

71
00:02:23,910 --> 00:02:21,520
the socal launch and entry suits that

72
00:02:25,190 --> 00:02:23,920
the crew wears during descent

73
00:02:27,589 --> 00:02:25,200
keep sending us your questions and