1
00:00:08,549 --> 00:00:06,309
we all see astronauts drinking out of

2
00:00:10,790 --> 00:00:08,559
bags with straws that resemble maybe a

3
00:00:12,629 --> 00:00:10,800
child's juice box so in order for crew

4
00:00:14,870 --> 00:00:12,639
members to drink somewhat normally from

5
00:00:17,189 --> 00:00:14,880
a cup space cups were designed and

6
00:00:18,710 --> 00:00:17,199
fabricated by a small company founded by

7
00:00:21,429 --> 00:00:18,720
portland state university's mark

8
00:00:23,990 --> 00:00:21,439
weislogel this cup is a key part of the

9
00:00:26,390 --> 00:00:24,000
capillary beverage investigation today

10
00:00:27,429 --> 00:00:26,400
wise logo shows us the science in the

11
00:00:31,349 --> 00:00:27,439
cup

12
00:00:33,030 --> 00:00:31,359
what is a capillary beverage okay

13
00:00:34,389 --> 00:00:33,040

let me describe something to you okay we

14
00:00:36,630 --> 00:00:34,399
got into this business doing space

15
00:00:38,310 --> 00:00:36,640
experiments on the on the station

16
00:00:39,590 --> 00:00:38,320
and in that process we learned a bunch

17
00:00:41,190 --> 00:00:39,600
of things about how to control things

18
00:00:44,150 --> 00:00:41,200
and how to predict how they how they

19
00:00:46,229 --> 00:00:44,160
perform when we heard about an espresso

20
00:00:48,069 --> 00:00:46,239
machine going up to meet an italian

21
00:00:50,229 --> 00:00:48,079
astronaut in space we thought what a

22
00:00:52,470 --> 00:00:50,239
delight espresso is a complicated fluid

23
00:00:53,670 --> 00:00:52,480
it's gravity dominated there's all kinds

24
00:00:55,029 --> 00:00:53,680
of stuff that's going to be missed if

25
00:00:56,950 --> 00:00:55,039
it's in a bag

26
00:00:58,630 --> 00:00:56,960
not only the flavor and the aromas but

27
00:00:59,910 --> 00:00:58,640
the action of all the bubbles and all

28
00:01:01,910 --> 00:00:59,920
the activities surface tension and

29
00:01:03,750 --> 00:01:01,920
wedding phenomena so we thought hey

30
00:01:06,310 --> 00:01:03,760
let's make a let's make a cup that shows

31
00:01:07,830 --> 00:01:06,320
all that stuff and also also represents

32
00:01:09,990 --> 00:01:07,840
an application of all that we've learned

33
00:01:11,910 --> 00:01:10,000
from our science stuff not just how we

34
00:01:13,429 --> 00:01:11,920
manage fuels and urine and things like

35
00:01:15,030 --> 00:01:13,439
this but how we can manage drinks for

36
00:01:16,630 --> 00:01:15,040
normal everyday living

37
00:01:18,149 --> 00:01:16,640
we since found out that if you make a

38
00:01:19,510 --> 00:01:18,159

reusable cup you could save all kinds of

39
00:01:21,429 --> 00:01:19,520
volume in terms of the bags that they

40
00:01:23,749 --> 00:01:21,439
use in space station okay so it has has

41
00:01:25,350 --> 00:01:23,759
these different applications to it

42
00:01:27,590 --> 00:01:25,360
nasa was interested in the idea as well

43
00:01:30,390 --> 00:01:27,600
and so our company through cases is

44
00:01:31,830 --> 00:01:30,400
putting this on on board for testing so

45
00:01:34,390 --> 00:01:31,840
what's going through my mind now is is

46
00:01:36,950 --> 00:01:34,400
it just a giant red solo cup going up or

47
00:01:39,190 --> 00:01:36,960
whatever okay okay now we're doing this

48
00:01:40,950 --> 00:01:39,200
in part for fun but really below all of

49
00:01:43,030 --> 00:01:40,960
this is engineering and science type of

50
00:01:45,030 --> 00:01:43,040
data so we are data

51
00:01:46,870 --> 00:01:45,040
enthusiasts you know in this regard it's

52
00:01:48,469 --> 00:01:46,880
nerdy in a way but it's it's important

53
00:01:50,950 --> 00:01:48,479
to us for designs of real advanced

54
00:01:52,550 --> 00:01:50,960
systems on spacecraft so we are made

55
00:01:54,310 --> 00:01:52,560
these things transparent we can image

56
00:01:56,550 --> 00:01:54,320
them and 80 of the work here is going to

57
00:01:57,830 --> 00:01:56,560
be science how the fluids behave the

58
00:01:59,190 --> 00:01:57,840
changes in temperature changes in

59
00:02:00,630 --> 00:01:59,200
behavior even how they're used by the

60
00:02:02,550 --> 00:02:00,640
astronauts okay and we're going to

61
00:02:04,310 --> 00:02:02,560
compare those with computer models and

62
00:02:06,709 --> 00:02:04,320
analytical expressions mathematics okay

63
00:02:07,990 --> 00:02:06,719

so it's science but 20 of this work is

64
00:02:10,229 --> 00:02:08,000
going to be fun for the astronauts

65
00:02:11,670 --> 00:02:10,239
unscripted fun that they can use at

66
00:02:13,270 --> 00:02:11,680
lunch time whether they're drinking

67
00:02:14,949 --> 00:02:13,280
cocoa or

68
00:02:16,309 --> 00:02:14,959
peach mango smoothies or whatever or

69
00:02:17,750 --> 00:02:16,319
espresso okay that those are the kind of

70
00:02:19,110 --> 00:02:17,760
things that we expect to be fun but

71
00:02:20,630 --> 00:02:19,120
there's really science underneath all of

72
00:02:22,229 --> 00:02:20,640
this stuff too

73
00:02:23,589 --> 00:02:22,239
so we've learned a lot about how fluids

74
00:02:25,510 --> 00:02:23,599
behave in microgravity how has that

75
00:02:27,589 --> 00:02:25,520
helped your design okay that actually

76
00:02:29,030 --> 00:02:27,599
dictates the shape of the container so

77
00:02:30,869 --> 00:02:29,040
if we know some of the properties of

78
00:02:32,470 --> 00:02:30,879
some of the drinks we then go into a

79
00:02:35,030 --> 00:02:32,480
design and drew and i work together on

80
00:02:37,110 --> 00:02:35,040
this to then come up with a shape 3d

81
00:02:38,550 --> 00:02:37,120
print it test it and drop towers confirm

82
00:02:40,949 --> 00:02:38,560
its performance show it with

83
00:02:42,869 --> 00:02:40,959
computations with computer simulations

84
00:02:44,550 --> 00:02:42,879
and then demonstrate in the in space

85
00:02:46,630 --> 00:02:44,560
it's the last step

86
00:02:48,229 --> 00:02:46,640
3d printing that's a big deal so is this

87
00:02:50,309 --> 00:02:48,239
the reason you went with 3d printing is

88
00:02:52,710 --> 00:02:50,319

because there'll be a 3d printer on

89
00:02:55,110 --> 00:02:52,720
that's a very nice connection too so 3d

90
00:02:56,470 --> 00:02:55,120
printing espresso machines coffee cups

91
00:02:57,830 --> 00:02:56,480
sounds right to me

92
00:02:59,509 --> 00:02:57,840
so how does it work is there any

93
00:03:00,630 --> 00:02:59,519
difference in i mean how will they put

94
00:03:02,390 --> 00:03:00,640
fluids in it

95
00:03:04,390 --> 00:03:02,400
they take a drink bag now from the from

96
00:03:06,710 --> 00:03:04,400
the dispenser for any drink that they

97
00:03:08,949 --> 00:03:06,720
they wish to do and then they dispense

98
00:03:10,630 --> 00:03:08,959
it into the cup it wicks inside the cup

99
00:03:12,790 --> 00:03:10,640
and is stable inside so it holds in

100
00:03:14,550 --> 00:03:12,800
there like as if gravity was holding it

101
00:03:16,070 --> 00:03:14,560
but it's surface tension not gravity

102
00:03:17,270 --> 00:03:16,080
when they go to drink they make a

103
00:03:19,030 --> 00:03:17,280
capillary connection and then they

104
00:03:20,470 --> 00:03:19,040
continue to drink normally but it's

105
00:03:22,470 --> 00:03:20,480
surface tension that's bringing liquid

106
00:03:23,750 --> 00:03:22,480
to the face not gravity so it's not

107
00:03:25,990 --> 00:03:23,760
being poured into the mouth it's being

108
00:03:28,149 --> 00:03:26,000
drawn in by surface tension forces now

109
00:03:30,470 --> 00:03:28,159
don pettit demonstrated demonstrated an

110
00:03:32,070 --> 00:03:30,480
early version in in cooperation with us

111
00:03:33,670 --> 00:03:32,080
on how this works it was actually

112
00:03:35,110 --> 00:03:33,680
patented but there are new items in this

113
00:03:36,789 --> 00:03:35,120

design that make it unique so there's a

114
00:03:37,910 --> 00:03:36,799
second patent coming what's it like for

115
00:03:40,229 --> 00:03:37,920
you to be

116
00:03:42,070 --> 00:03:40,239
a university professor and then you have

117
00:03:43,670 --> 00:03:42,080
an experiment on space station it's a

118
00:03:46,149 --> 00:03:43,680
delight it's something we've never

119
00:03:47,589 --> 00:03:46,159
gotten used to very exciting anything

120
00:03:48,550 --> 00:03:47,599
else you want to say about capillary

121
00:03:50,949 --> 00:03:48,560
beverage