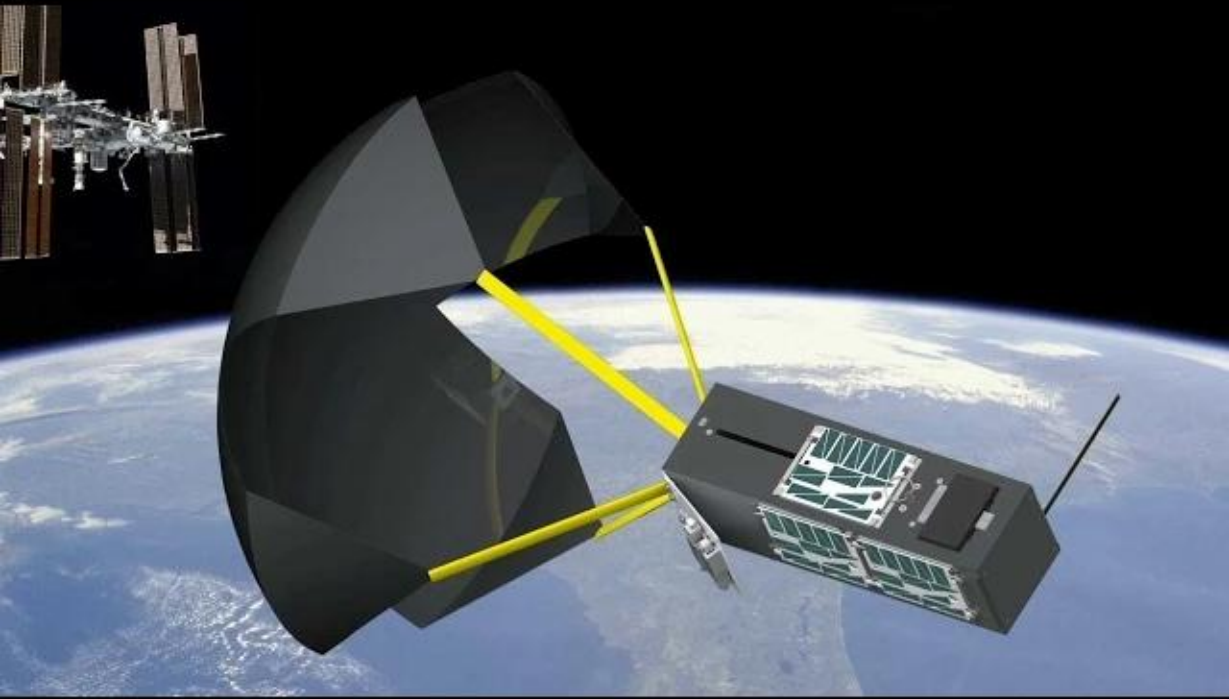

1
00:00:04,950 --> 00:00:02,310
welcome to the space station flight

2
00:00:07,269 --> 00:00:04,960
control room we have joining us remotely

3
00:00:08,790 --> 00:00:07,279
from the ames research center mark

4
00:00:10,230 --> 00:00:08,800
murbach who is the principal

5
00:00:11,749 --> 00:00:10,240
investigator for one of the experiments

6
00:00:14,230 --> 00:00:11,759
that went up to the space station on

7
00:00:16,310 --> 00:00:14,240
board the cygnus it's a satellite

8
00:00:17,510 --> 00:00:16,320
technology demonstration uh project and

9
00:00:19,349 --> 00:00:17,520
he's gonna tell us a little bit more

10
00:00:21,429 --> 00:00:19,359
about that so i think you are the

11
00:00:24,470 --> 00:00:21,439
principal investigator for tech ed sat

12
00:00:26,950 --> 00:00:24,480
four what exactly is the investigation

13
00:00:28,390 --> 00:00:26,960

it's a multi-purpose project really at

14
00:00:29,750 --> 00:00:28,400
the first order is we're trying to

15
00:00:31,910 --> 00:00:29,760
develop some technologies and the

16
00:00:33,510 --> 00:00:31,920
thermal physics of bringing samples back

17
00:00:35,270 --> 00:00:33,520
from the space station

18
00:00:37,510 --> 00:00:35,280
and in particular our one of our end

19
00:00:40,709 --> 00:00:37,520
goals is to bring back something about

20
00:00:42,869 --> 00:00:40,719
this size if you can see it um this

21
00:00:45,430 --> 00:00:42,879
beautiful sculpture actually uh it's a

22
00:00:47,990 --> 00:00:45,440
real protoflight object back from the

23
00:00:50,470 --> 00:00:48,000
iss and it would carry out small samples

24
00:00:53,029 --> 00:00:50,480
that we would thermally control and be

25
00:00:54,389 --> 00:00:53,039
able to bring on a on-demand kind of

26
00:00:56,069 --> 00:00:54,399
process so

27
00:00:59,590 --> 00:00:56,079
part of that larger effort is called

28
00:01:02,069 --> 00:00:59,600
small payload quick return or spqr

29
00:01:02,790 --> 00:01:02,079
which is a historical acronym also

30
00:01:05,270 --> 00:01:02,800
so

31
00:01:07,350 --> 00:01:05,280
the the idea is to be able to send small

32
00:01:09,190 --> 00:01:07,360
samples from the space station back down

33
00:01:13,270 --> 00:01:09,200
to earth

34
00:01:15,990 --> 00:01:13,280
that's correct okay why would we do that

35
00:01:18,230 --> 00:01:16,000
um so uh the space station has become

36
00:01:20,310 --> 00:01:18,240
one of our important field centers at

37
00:01:21,749 --> 00:01:20,320
the field center where nasa has

38
00:01:23,270 --> 00:01:21,759

numerous field centers this one now is

39
00:01:26,630 --> 00:01:23,280
in orbit along with our international

40
00:01:28,710 --> 00:01:26,640
collaborators and um and so we

41
00:01:30,230 --> 00:01:28,720
we've solved the up mass problem we we

42
00:01:31,830 --> 00:01:30,240
take a lot of cargo up but there's a lot

43
00:01:34,149 --> 00:01:31,840
of experiments that we would like to be

44
00:01:36,390 --> 00:01:34,159
able to get down uh from the space

45
00:01:38,149 --> 00:01:36,400
station on a on-demand or a more

46
00:01:40,789 --> 00:01:38,159
frequent uh

47
00:01:42,789 --> 00:01:40,799
opportunity we are very very fond of our

48
00:01:44,710 --> 00:01:42,799
space station and the crew obviously so

49
00:01:45,910 --> 00:01:44,720
we had to come up with a safe means of

50
00:01:46,870 --> 00:01:45,920
doing this

51
00:01:52,469 --> 00:01:46,880
so

52
00:01:54,230 --> 00:01:52,479
from from orbit you you typically use a

53
00:01:55,670 --> 00:01:54,240
small rocket to do that

54
00:01:57,590 --> 00:01:55,680
however we certainly would not put a

55
00:01:59,109 --> 00:01:57,600
small rocket inside the space station

56
00:02:02,870 --> 00:01:59,119
and have a process because of the

57
00:02:04,310 --> 00:02:02,880
obvious safety implications so we had to

58
00:02:06,069 --> 00:02:04,320
rub our chins a little bit and so the

59
00:02:08,150 --> 00:02:06,079
idea was to come up with a drag device

60
00:02:10,630 --> 00:02:08,160
to do that and it's not obvious how we

61
00:02:12,790 --> 00:02:10,640
might do that and it turns out that uh

62
00:02:14,550 --> 00:02:12,800
even at that altitude 350 to 400

63
00:02:16,869 --> 00:02:14,560

kilometers there's a very tenuous

64
00:02:19,110 --> 00:02:16,879
atmosphere and so if you construct a

65
00:02:20,550 --> 00:02:19,120
drag device

66
00:02:22,949 --> 00:02:20,560
such that

67
00:02:25,510 --> 00:02:22,959
for every kilogram you have a square

68
00:02:28,070 --> 00:02:25,520
meter of of drag area you can actually

69
00:02:30,390 --> 00:02:28,080
deorbit something in in a few days so we

70
00:02:31,910 --> 00:02:30,400
started to study that and then ask okay

71
00:02:33,509 --> 00:02:31,920
how do you do this how do you practice

72
00:02:35,270 --> 00:02:33,519
how do you do this so that was part of

73
00:02:36,390 --> 00:02:35,280
the genesis of the the tickets house

74
00:02:38,390 --> 00:02:36,400
building small

75
00:02:40,309 --> 00:02:38,400
cubesat objects that actually eventually

76
00:02:41,910 --> 00:02:40,319
build to a larger capability and at the

77
00:02:43,270 --> 00:02:41,920
same time doing some very interesting

78
00:02:45,430 --> 00:02:43,280
thermal physics

79
00:02:48,070 --> 00:02:45,440
okay so this is a sample this is a

80
00:02:50,949 --> 00:02:48,080
sandwich of of our exo-brick device the

81
00:02:52,710 --> 00:02:50,959
exo brick is the substitute rocket at

82
00:02:56,790 --> 00:02:52,720
the drag device that will bring things

83
00:02:59,350 --> 00:02:56,800
back from orbit eventually on demand

84
00:03:01,110 --> 00:02:59,360
and so this is a a one of numerous

85
00:03:03,430 --> 00:03:01,120
materials but it's a sandwich object you

86
00:03:04,390 --> 00:03:03,440
can see it's quite pliable we can fold

87
00:03:06,149 --> 00:03:04,400
it etc

88
00:03:07,270 --> 00:03:06,159

and it's subject to high temperatures

89
00:03:08,949 --> 00:03:07,280
also

90
00:03:10,869 --> 00:03:08,959
and so this is what we're experimenting

91
00:03:13,589 --> 00:03:10,879
with this is the fabric of the exo break

92
00:03:16,149 --> 00:03:13,599
that we have on teca set three and four

93
00:03:18,149 --> 00:03:16,159
so basically we started with a cubesat

94
00:03:21,350 --> 00:03:18,159
uh that also has wonderful not only

95
00:03:23,110 --> 00:03:21,360
technological but also educational uh

96
00:03:25,190 --> 00:03:23,120
aspects to it uh that i'm very excited

97
00:03:27,670 --> 00:03:25,200
about then eventually we can evolve this

98
00:03:28,789 --> 00:03:27,680
into what we call a three unit or three

99
00:03:30,869 --> 00:03:28,799
liter

100
00:03:33,910 --> 00:03:30,879
satellite which is this size

101
00:03:35,990 --> 00:03:33,920
so our tickets at uh three four and five

102
00:03:38,309 --> 00:03:36,000
for example would be uh made of this

103
00:03:40,470 --> 00:03:38,319
blank and so we also experimented with

104
00:03:43,830 --> 00:03:40,480
ways of making these cheaper this is an

105
00:03:45,270 --> 00:03:43,840
extrusion so we waterjet it and um we

106
00:03:48,229 --> 00:03:45,280
build it up in the cartridge we put the

107
00:03:49,190 --> 00:03:48,239
exo brick on one side and uh it's it's a

108
00:03:51,910 --> 00:03:49,200
lot of fun

109
00:03:53,910 --> 00:03:51,920
and yeah so i work with a group of

110
00:03:56,229 --> 00:03:53,920
semi-grade beers as i call myself and

111
00:03:58,789 --> 00:03:56,239
then my team and also a lot of graduate

112
00:04:00,630 --> 00:03:58,799
interns from local and distant

113
00:04:02,949 --> 00:04:00,640

universities so it's also the

114
00:04:04,550 --> 00:04:02,959
educational aspect is uh also what makes

115
00:04:07,350 --> 00:04:04,560
it a lot of fun so this is really a

116
00:04:09,589 --> 00:04:07,360
skunk works we do rapid proto flight

117
00:04:11,350 --> 00:04:09,599
now in a very safe manner and we test

118
00:04:13,509 --> 00:04:11,360
the heck out of these things but it's

119
00:04:15,509 --> 00:04:13,519
the whole process is very interesting it

120
00:04:16,949 --> 00:04:15,519
sounds like it so how exactly now that

121
00:04:18,229 --> 00:04:16,959
is at the space station what happens how

122
00:04:20,390 --> 00:04:18,239
do you test it

123
00:04:22,310 --> 00:04:20,400
so the uh sequence or as we call the

124
00:04:25,670 --> 00:04:22,320
conops the concept of operations is as

125
00:04:27,430 --> 00:04:25,680
follows so um once our device jettisons

126
00:04:29,030 --> 00:04:27,440
from the space station and i should have

127
00:04:31,189 --> 00:04:29,040
mentioned this is also very exciting

128
00:04:34,150 --> 00:04:31,199
working with our uh

129
00:04:35,430 --> 00:04:34,160
our colleagues at nanoracks a local

130
00:04:37,670 --> 00:04:35,440
texas firm

131
00:04:39,909 --> 00:04:37,680
we're now able to uh actually

132
00:04:42,150 --> 00:04:39,919
eject 48 of these things or it's

133
00:04:44,550 --> 00:04:42,160
equivalent per airlock cycle which is

134
00:04:46,390 --> 00:04:44,560
great okay and it turns out that we are

135
00:04:48,870 --> 00:04:46,400
launching a bunch of these also so when

136
00:04:51,270 --> 00:04:48,880
when it comes to uh our turn we we get

137
00:04:53,270 --> 00:04:51,280
launched from the uh the the iss it gets

138
00:04:54,310 --> 00:04:53,280

processed through the jim airlock of our

139
00:04:55,670 --> 00:04:54,320
colleagues

140
00:04:57,749 --> 00:04:55,680
from um from

141
00:04:59,270 --> 00:04:57,759
jaxa and then um

142
00:05:00,629 --> 00:04:59,280
what happens is that this uh gets very

143
00:05:02,390 --> 00:05:00,639
carefully launched in a particular

144
00:05:04,469 --> 00:05:02,400
orientation and direction because we

145
00:05:07,029 --> 00:05:04,479
don't want to hit the solar panels on

146
00:05:08,710 --> 00:05:07,039
our highly esteemed uh deer space

147
00:05:11,110 --> 00:05:08,720
station right so this has to be pointed

148
00:05:13,110 --> 00:05:11,120
properly and then basically the onboard

149
00:05:15,430 --> 00:05:13,120
timer kicks on it counts on its fingers

150
00:05:17,990 --> 00:05:15,440
to 30 minutes and then the the

151
00:05:20,469 --> 00:05:18,000
communication systems turn on okay then

152
00:05:22,790 --> 00:05:20,479
we begin to listen for that and then

153
00:05:24,950 --> 00:05:22,800
for this particular experiment um

154
00:05:28,230 --> 00:05:24,960
we will we'll wait for several orbis and

155
00:05:30,790 --> 00:05:28,240
we'll send an uplink command via email

156
00:05:32,390 --> 00:05:30,800
uh and the the command will be received

157
00:05:34,310 --> 00:05:32,400
and at that point the exo break will be

158
00:05:36,390 --> 00:05:34,320
deployed and it will stop tumbling it

159
00:05:39,029 --> 00:05:36,400
will settle in orientation and it will

160
00:05:41,110 --> 00:05:39,039
begin as deorbit in the next uh

161
00:05:42,550 --> 00:05:41,120
several weeks in this case

162
00:05:44,469 --> 00:05:42,560
and then are you able to retrieve it on

163
00:05:46,790 --> 00:05:44,479

the ground

164
00:05:48,310 --> 00:05:46,800
not yet um so we would like to do that

165
00:05:49,749 --> 00:05:48,320
eventually we're taking small

166
00:05:52,870 --> 00:05:49,759
incremental steps to do that to make

167
00:05:55,510 --> 00:05:52,880
sure that uh our techniques are evolving

168
00:05:56,950 --> 00:05:55,520
so uh tickets at five the number five

169
00:05:59,670 --> 00:05:56,960
that's coming up for example will be the

170
00:06:02,150 --> 00:05:59,680
same size um but this will again have

171
00:06:03,909 --> 00:06:02,160
more advanced communication and control

172
00:06:06,150 --> 00:06:03,919
and we'll have a device that actually we

173
00:06:07,909 --> 00:06:06,160
can expand and contract a little bit so

174
00:06:09,830 --> 00:06:07,919
that actually we can steer this through

175
00:06:12,150 --> 00:06:09,840
the atmosphere targeting a particular

176
00:06:13,590 --> 00:06:12,160
location at the von carmen altitude or

177
00:06:15,029 --> 00:06:13,600
about 100 kilometers right at the very

178
00:06:16,230 --> 00:06:15,039
top of the atmosphere

179
00:06:18,309 --> 00:06:16,240
it sounds like a really interesting

180
00:06:21,430 --> 00:06:18,319
project to be working on we will be

181
00:06:22,710 --> 00:06:21,440
watching out for it um to to get started

182
00:06:24,629 --> 00:06:22,720
here on the space station for the next

183
00:06:26,469 --> 00:06:24,639
round when about i think did you say a

184
00:06:27,990 --> 00:06:26,479
couple weeks from now or

185
00:06:29,909 --> 00:06:28,000
um we were listening in our

186
00:06:31,270 --> 00:06:29,919
teleconference today and it probably it

187
00:06:32,309 --> 00:06:31,280
depends on the all this uh the

188
00:06:34,390 --> 00:06:32,319

scheduling so there's a lot of

189
00:06:35,830 --> 00:06:34,400
scheduling that goes on with the the

190
00:06:38,070 --> 00:06:35,840
space station of course

191
00:06:39,670 --> 00:06:38,080
um and so it probably looks like uh

192
00:06:41,029 --> 00:06:39,680
maybe the end of august when the first

193
00:06:43,350 --> 00:06:41,039
batch of these things will first come

194
00:06:44,629 --> 00:06:43,360
out okay we'll definitely watch for that

195
00:06:45,749 --> 00:06:44,639
thanks so much for joining us and we

196
00:06:47,110 --> 00:06:45,759
will too

197
00:06:49,350 --> 00:06:47,120
thank you brandi i sure appreciate the

198
00:06:51,430 --> 00:06:49,360
invitation we appreciate you talking to

199
00:06:53,110 --> 00:06:51,440
us again this was mark murbach who is

200
00:06:55,350 --> 00:06:53,120
the principal investigator for the tech

201
00:06:57,270 --> 00:06:55,360
ed sat four on board the space station