
SPACE STATION 2014

1
00:00:04,070 --> 00:00:02,570
there are a lot of different kinds of

2
00:00:06,380 --> 00:00:04,080
research that have been done on the

3
00:00:09,080 --> 00:00:06,390
station in 2013 and every other year

4
00:00:10,669 --> 00:00:09,090
going back but there are a couple of

5
00:00:13,009 --> 00:00:10,679
highlights that we want to look ahead to

6
00:00:15,020 --> 00:00:13,019
things that are coming up this year you

7
00:00:17,750 --> 00:00:15,030
mentioned deployables stuff that we're

8
00:00:19,910 --> 00:00:17,760
going to going to put into orbit from

9
00:00:22,099 --> 00:00:19,920
the space station this year that's right

10
00:00:24,250 --> 00:00:22,109
you know there there's a set of

11
00:00:26,810 --> 00:00:24,260
different standards now for small

12
00:00:28,700 --> 00:00:26,820
microsatellites and cube SATs some of

13
00:00:30,259 --> 00:00:28,710

them are as small as coffee cup some of

14
00:00:32,990 --> 00:00:30,269
them are you know more a little bit

15
00:00:35,120 --> 00:00:33,000
bigger but still very small and those

16
00:00:36,950 --> 00:00:35,130
are those there are great technologies

17
00:00:38,270 --> 00:00:36,960
that can be tested that way ways of

18
00:00:39,830 --> 00:00:38,280
looking at whether ways of looking at

19
00:00:41,060 --> 00:00:39,840
the space environment but they're

20
00:00:43,819 --> 00:00:41,070
launched limited they're always looking

21
00:00:45,229 --> 00:00:43,829
for a way to piggyback on some satellite

22
00:00:47,540 --> 00:00:45,239
launch somewhere and there's a whole

23
00:00:49,700 --> 00:00:47,550
queue of cube SATs waiting for launch

24
00:00:52,850 --> 00:00:49,710
opportunities so our Japanese colleagues

25
00:00:54,830 --> 00:00:52,860
developed a larger CubeSat deployer we

26
00:00:56,389 --> 00:00:54,840
call the J sod and that has flown

27
00:00:59,450 --> 00:00:56,399
successfully to the space station this

28
00:01:00,860 --> 00:00:59,460
year then there's another set of

29
00:01:03,020 --> 00:01:00,870
deployers that was developed by the

30
00:01:05,359 --> 00:01:03,030
NanoRacks corporation for these very

31
00:01:08,359 --> 00:01:05,369
small cube SATs it can deploy up to 30

32
00:01:11,359 --> 00:01:08,369
small cube SATs all at once and we have

33
00:01:13,270 --> 00:01:11,369
a full slate of organizations both

34
00:01:15,649 --> 00:01:13,280
technology companies universities

35
00:01:18,380 --> 00:01:15,659
education organizations the National

36
00:01:20,690 --> 00:01:18,390
Science Foundation that are interested

37
00:01:22,039 --> 00:01:20,700
in in flying these deployables so one of

38
00:01:24,230 --> 00:01:22,049

the big changes in the coming years

39
00:01:25,429 --> 00:01:24,240
we're going to see dozens of these being

40
00:01:28,670 --> 00:01:25,439
deployed at different points in time

41
00:01:30,050 --> 00:01:28,680
from the airlock in the gem the the Kibo

42
00:01:31,550 --> 00:01:30,060
exposed facility these will be things

43
00:01:34,730 --> 00:01:31,560
that we put out they don't they're not

44
00:01:36,649 --> 00:01:34,740
retrieved what kind of research is going

45
00:01:38,929 --> 00:01:36,659
on inside these cubes that are flying

46
00:01:41,210 --> 00:01:38,939
away so some of them are technology

47
00:01:43,850 --> 00:01:41,220
demonstrations to do things like look at

48
00:01:45,800 --> 00:01:43,860
how to prove how you might use these

49
00:01:47,810 --> 00:01:45,810
little satellites to inspect spacecraft

50
00:01:50,120 --> 00:01:47,820
make changes even potentially repair

51
00:01:51,649 --> 00:01:50,130
spacecraft someday others of them are

52
00:01:53,929 --> 00:01:51,659
looking at the space environment itself

53
00:01:56,179 --> 00:01:53,939
and as they re-enter they take

54
00:01:58,130 --> 00:01:56,189
information and they use ham radio

55
00:02:00,620 --> 00:01:58,140
frequencies to send data back to earth

56
00:02:03,469 --> 00:02:00,630
as they're re-entering and provide extra

57
00:02:05,600 --> 00:02:03,479
information others are looking at the

58
00:02:07,219 --> 00:02:05,610
plasma environment or looking at other

59
00:02:09,350 --> 00:02:07,229
aspects of the space environment as they

60
00:02:11,900 --> 00:02:09,360
move along and then some are just

61
00:02:14,210 --> 00:02:11,910
testing communications or even formation

62
00:02:16,160 --> 00:02:14,220
flying algorithms so if you can

63
00:02:17,690 --> 00:02:16,170

if you can release a number of cube SATs

64
00:02:19,220 --> 00:02:17,700
and they all disperse out together and

65
00:02:22,220 --> 00:02:19,230
can maintain themselves in a nice

66
00:02:24,830 --> 00:02:22,230
location you get the impact of a larger

67
00:02:26,390 --> 00:02:24,840
satellite but with the mass and so forth

68
00:02:27,940 --> 00:02:26,400
of the small satellites interesting it's

69
00:02:30,170 --> 00:02:27,950
a great area for new technologies a

70
00:02:32,300 --> 00:02:30,180
thing that has been done on space

71
00:02:34,160 --> 00:02:32,310
station for many years are a variety of

72
00:02:35,750 --> 00:02:34,170
protein crystal growth experiments but

73
00:02:38,840 --> 00:02:35,760
there's some new ones that we're looking

74
00:02:40,610 --> 00:02:38,850
forward to in 2014 right right you know

75
00:02:42,380 --> 00:02:40,620
NASA did a lot of protein crystal growth

76
00:02:46,430 --> 00:02:42,390
early in the space station and then we

77
00:02:49,430 --> 00:02:46,440
had a hiatus because we did some

78
00:02:52,250 --> 00:02:49,440
retooling of our portfolio and it wasn't

79
00:02:54,980 --> 00:02:52,260
seeming very relevant to exploration and

80
00:02:56,300 --> 00:02:54,990
now with the National Lab designation of

81
00:02:58,520 --> 00:02:56,310
the International Space Station

82
00:03:01,070 --> 00:02:58,530
commercial users other government

83
00:03:02,810 --> 00:03:01,080
agencies like the NIH that are trying to

84
00:03:04,190 --> 00:03:02,820
get protein structures have the

85
00:03:06,199 --> 00:03:04,200
opportunity to come back to the space

86
00:03:08,480 --> 00:03:06,209
station and use that as an environment

87
00:03:11,030 --> 00:03:08,490
to get structural information about

88
00:03:13,070 --> 00:03:11,040

proteins and other biological molecules

89
00:03:16,130 --> 00:03:13,080
so we'll have a set of experiments

90
00:03:20,630 --> 00:03:16,140
flying on SpaceX 3 coming up very soon

91
00:03:22,580 --> 00:03:20,640
and the those will be the first kind of

92
00:03:26,030 --> 00:03:22,590
comprehensive set of experiments really

93
00:03:28,250 --> 00:03:26,040
designed to show whether or not space

94
00:03:30,350 --> 00:03:28,260
gives you a complete advantage across a

95
00:03:31,940 --> 00:03:30,360
wide variety of types of proteins and so

96
00:03:34,250 --> 00:03:31,950
that's a really exciting scientific

97
00:03:35,360 --> 00:03:34,260
study because all of the other studies

98
00:03:36,979 --> 00:03:35,370
you know sometimes will get a good

99
00:03:38,540 --> 00:03:36,989
protein crystal back sometimes we won't

100
00:03:40,550 --> 00:03:38,550
and it's kind of controversial maybe

101
00:03:42,380 --> 00:03:40,560
whether or not every protein should go

102
00:03:43,820 --> 00:03:42,390
to space for example so this is really

103
00:03:46,340 --> 00:03:43,830
going to help us put that scientific

104
00:03:48,710 --> 00:03:46,350
question to bed also ten percent of the

105
00:03:50,810 --> 00:03:48,720
samples are flying in that experiment on

106
00:03:53,990 --> 00:03:50,820
behalf of specific partners on the

107
00:03:56,360 --> 00:03:54,000
ground pharmaceutical companies in NIH

108
00:03:58,759 --> 00:03:56,370
in particular they have a biomolecular

109
00:04:00,140 --> 00:03:58,769
structure Institute and there are a

110
00:04:02,030 --> 00:04:00,150
bunch of proteins out there that we know

111
00:04:05,420 --> 00:04:02,040
are important in disease we don't have a

112
00:04:07,039 --> 00:04:05,430
structure for and so that that play back

113
00:04:09,530 --> 00:04:07,049

and forth between advancing the state of

114
00:04:11,600 --> 00:04:09,540
the science and also really providing an

115
00:04:13,310 --> 00:04:11,610
opening for these kinds of users to get

116
00:04:14,810 --> 00:04:13,320
access to space if it turns out to be a

117
00:04:16,640 --> 00:04:14,820
useful way of getting structures is

118
00:04:19,250 --> 00:04:16,650
going to is really important advance for

119
00:04:21,979 --> 00:04:19,260
2014 looking ahead in the year there's

120
00:04:23,870 --> 00:04:21,989
also some new biological research that's

121
00:04:26,540 --> 00:04:23,880
going to involve the use of rodents what

122
00:04:28,050 --> 00:04:26,550
are we looking at there yeah so what we

123
00:04:29,490 --> 00:04:28,060
had a decade-old survey that the

124
00:04:31,320 --> 00:04:29,500
schulich Adam ease of science did in

125
00:04:33,000 --> 00:04:31,330
2011 and they looked at all the things

126
00:04:34,800 --> 00:04:33,010
that we could do in a microgravity

127
00:04:36,510 --> 00:04:34,810
environment made recommendations and one

128
00:04:38,970 --> 00:04:36,520
of their top recommendations was to

129
00:04:42,659 --> 00:04:38,980
really take advantage of that effect of

130
00:04:44,430 --> 00:04:42,669
floating in space on the body we needed

131
00:04:46,680 --> 00:04:44,440
to have a capability to do significant

132
00:04:49,710 --> 00:04:46,690
studies and rodents and so we've we've

133
00:04:51,150 --> 00:04:49,720
turned on that capability there during

134
00:04:52,020 --> 00:04:51,160
assembly we had some rodent flights

135
00:04:53,700 --> 00:04:52,030
those road and flights have been

136
00:04:55,650 --> 00:04:53,710
directly connected to drugs that have

137
00:04:57,600 --> 00:04:55,660
come to market so we know that you

138
00:04:59,640 --> 00:04:57,610

really can learn things using rodents as

139
00:05:01,050 --> 00:04:59,650
a model there are things you can do with

140
00:05:03,150 --> 00:05:01,060
rinses amodel you definitely would not

141
00:05:05,159 --> 00:05:03,160
do with the crew as a subject in a

142
00:05:07,350 --> 00:05:05,169
medical experiment you can really get to

143
00:05:09,420 --> 00:05:07,360
that mechanism understand what gene is

144
00:05:11,580 --> 00:05:09,430
turning on to cause what process and can

145
00:05:13,379 --> 00:05:11,590
this drug stop it and that's the kind of

146
00:05:15,480 --> 00:05:13,389
research that will be going on of course

147
00:05:17,670 --> 00:05:15,490
you know we've only found relatively

148
00:05:19,920 --> 00:05:17,680
small numbers of animals in space before

149
00:05:21,570 --> 00:05:19,930
and so there are some great

150
00:05:23,280 --> 00:05:21,580
opportunities for fundamental discovery

151
00:05:25,650 --> 00:05:23,290
as well these are just a couple of

152
00:05:27,420 --> 00:05:25,660
examples of new things but another thing

153
00:05:29,760 --> 00:05:27,430
that's going to be happening in 2014 is

154
00:05:31,680 --> 00:05:29,770
that you and your staff are going to be

155
00:05:33,330 --> 00:05:31,690
working on the science program for the

156
00:05:36,180 --> 00:05:33,340
career that is going up there for a full

157
00:05:38,460 --> 00:05:36,190
year the the year-long crew what kind of

158
00:05:40,440 --> 00:05:38,470
things are you going to try to use that

159
00:05:43,529 --> 00:05:40,450
cruise experience to take advantage of

160
00:05:44,700 --> 00:05:43,539
yeah the the one-year expedition is has

161
00:05:47,400 --> 00:05:44,710
been a really amazing collaboration

162
00:05:49,770 --> 00:05:47,410
between us scientists and our Russian

163
00:05:51,719 --> 00:05:49,780

colleagues because we've been looking at

164
00:05:53,850 --> 00:05:51,729
all of the different risks to the human

165
00:05:55,500 --> 00:05:53,860
body from being in space coming up with

166
00:05:57,180 --> 00:05:55,510
what list of that is the most important

167
00:05:58,920 --> 00:05:57,190
that everyone knows we really need to

168
00:06:00,930 --> 00:05:58,930
solve before we leave low-earth orbit

169
00:06:02,610 --> 00:06:00,940
and go on to a future destination and

170
00:06:04,440 --> 00:06:02,620
then we're going to be targeting

171
00:06:06,150 --> 00:06:04,450
experiments that are focused on those to

172
00:06:07,620 --> 00:06:06,160
make sure that the things we've learned

173
00:06:09,480 --> 00:06:07,630
from studying crews that are up for

174
00:06:11,730 --> 00:06:09,490
about six months that there's no

175
00:06:13,770 --> 00:06:11,740
surprise as no gotchas if you extend

176
00:06:16,020 --> 00:06:13,780
that out to one year we'll be looking at

177
00:06:18,540 --> 00:06:16,030
bone loss will be looking at neuro

178
00:06:20,279 --> 00:06:18,550
vestibular balance disorders will be

179
00:06:21,810 --> 00:06:20,289
definitely looking at the vision impacts

180
00:06:23,820 --> 00:06:21,820
and the loss of vision that some

181
00:06:25,590 --> 00:06:23,830
astronauts are experiencing and it will

182
00:06:27,510 --> 00:06:25,600
be done in a joint medical program

183
00:06:28,980 --> 00:06:27,520
between the US and Russia for the

184
00:06:31,080 --> 00:06:28,990
astronaut and the cosmonaut to

185
00:06:32,760 --> 00:06:31,090
participate in the exciting stuff to

186
00:06:34,590 --> 00:06:32,770
look forward to in the coming year yeah

187
00:06:35,730 --> 00:06:34,600
it will probably be early in the year

188
00:06:37,980 --> 00:06:35,740

that will finally get the final

189
00:06:39,210 --> 00:06:37,990
selection of all the experiments and the

190
00:06:40,560 --> 00:06:39,220
crew members will have had their

191
00:06:41,830 --> 00:06:40,570
informed consent and agreed to

192
00:06:43,120 --> 00:06:41,840
participate and then we'll

193
00:06:45,010 --> 00:06:43,130
have a big announcement of what those

194
00:06:46,180 --> 00:06:45,020
experiments are going to be things that

195
00:06:47,740 --> 00:06:46,190
we're looking forward to on the

196
00:06:50,680 --> 00:06:47,750
International Space Station science

197
00:06:52,390 --> 00:06:50,690
looking ahead to 2014 a space station