1
00:00:03,300 --> 00:00:09,190
>>> WELCOME, I'M KATHRYN
HAMBLETON.

2
00:00:09,190 --> 00:00:18,760
WE'RE LOADED AND READY TO GO IN
ATLAS 5 WHICH WILL LAUNCH DURING

3
00:00:18,760 --> 00:00:24,230
A 50 MINUTE WINDOW BEGINNING AT
11:05 TOMORROW EVENING.

4
00:00:24,230 --> 00:00:29,730
HERE WITH ME TODAY†-- ACTUALLY
JUST TO LET YOU KNOW FIRST, WE

5
00:00:29,730 --> 00:00:32,610
WILL BE TAKING QUESTIONS FOR
THOSE IN THE ROOM AS WELL AS

6
00:00:32,610 --> 00:00:34,370
FROM THOSE ON THE PHONE.

7
00:00:34,370 --> 00:00:35,370
AND THOSE ONLINE.

8
00:00:35,370 --> 00:00:39,010
IF YOU'RE ON THE PHONE, PLEASE
PRESS STAR ONE TO BE ENTERED

9
00:00:39,010 --> 00:00:47,309
INTO THE QUEUE.

10
00:00:47,309 --> 00:00:51,350
WE HAVE A LOT OF SCIENCE GOING
UP ON THE ROCKET TOMORROW.

11
00:00:51,350 --> 00:00:53,460
HERE WITH ME TO GIVE US AN

OVERVIEW OF THE SCIENCE GOING

12
00:00:53,460 --> 00:01:11,270
UP, WE HAVE PETE HAS BRUK FROM
THE INTERNATIONAL SPACE STATION.

13
00:01:11,270 --> 00:01:14,520
>>> THANK YOU FOR JOINING US
THIS AFTERNOON.

14
00:01:14,520 --> 00:01:16,850
WE ARE REALLY EXCITED ABOUT
TOMORROW NIGHT'S LAUNCH AND

15
00:01:16,850 --> 00:01:19,180
ESPECIALLY ABOUT ALL THE
SCIENTIFIC HARDWARE THAT'S GOING

16
00:01:19,180 --> 00:01:22,280
UP FOR US TO CONTINUE OUR GREAT
WORK ON THE INTERNATIONAL SPACE

17
00:01:22,280 --> 00:01:23,280
STATION.

18
00:01:23,280 --> 00:01:29,170
THIS IS BRING A VARIETY OF ALL
KINDS OF HARDWARE ON THIS LAUNCH

19
00:01:29,170 --> 00:01:34,280
IN THE SCIENTIFIC AREA WE HAVE
860 KILOGRAMS OF CARGO FOR THE

20
00:01:34,280 --> 00:01:38,990
SCIENCE TEAM, WHICH IS OVER
1,700 POUNDS OF CARGO.

21
00:01:38,990 --> 00:01:44,330
WHICH ADDS UP TO ABOUT A QUARTER
OF THE TOTAL CARGO ON THE

22
00:01:44,330 --> 00:01:45,330
CYGNUS.

23
00:01:45,330 --> 00:01:51,070
THE ISS IS VERY VERSATILE AND
CAPABLE LABORATORY IN SPACE.

24
00:01:51,070 --> 00:01:53,000
BUT IT'S NOT LIKE MOST
LABORATORIES THAT YOU'RE

25
00:01:53,000 --> 00:01:54,830
FAMILIAR WITH ON THE GROUND
HERE.

26
00:01:54,830 --> 00:01:57,670
WHICH MAY FOCUS IN ONE
DISCIPLINE OF SCIENCE, AND MAYBE

27
00:01:57,670 --> 00:02:00,070
ONE VERY NARROW FOCUS OF
SCIENCE.

28
00:02:00,070 --> 00:02:03,540
WE'VE GOT A BROAD BREADTH OF
SCIENTIFIC DISCIPLINES.

29
00:02:03,540 --> 00:02:07,360
HUMAN RESEARCH, BIOLOGY AND
BIOTECHNOLOGY.

30
00:02:07,360 --> 00:02:11,230
EARTH AND SPACE SCIENCES,
PHYSICAL SCIENCES, TECHNOLOGY

31
00:02:11,230 --> 00:02:14,210
DEVELOPMENT AS WELL AS
EDUCATION.

32
00:02:14,210 --> 00:02:19,680
TODAY ACROSS THE INTERNATIONAL
PARTNERSHIP WE'VE HAD OVER 1,900

33
00:02:19,680 --> 00:02:22,120
EXPERIMENTS CONDUCTED ON THE
ISS.

34
00:02:22,120 --> 00:02:26,000
WE'VE SERVED MORE THAN 2,700
SCIENTISTS ACROSS THE

35
00:02:26,000 --> 00:02:27,980
PARTNERSHIP AND AROUND THE
WORLD.

36
00:02:27,980 --> 00:02:31,860
AND WE'VE HAD PARTICIPATION ON
THE ISS PROGRAM OF MORE THAN 95

37
00:02:31,860 --> 00:02:35,230
COUNTRIES AROUND THE WORLD.

38
00:02:35,230 --> 00:02:38,690
TOMORROW'S LAUNCH WILL BRING
SUPPLIES TO HELP US CONTINUE OUR

39
00:02:38,690 --> 00:02:41,480
WORK ON THE SPACE STATION, TO
CONTINUE SOME OF THE EXPERIMENTS

40
00:02:41,480 --> 00:02:43,410
THAT ARE ALREADY GOING ON.

41
00:02:43,410 --> 00:02:46,410
WE HAVE SEVERAL NEW EXPERIMENTS
THAT THE CYGNUS IS BRINGING TO

42
00:02:46,410 --> 00:02:47,410

US.

43
00:02:47,410 --> 00:02:50,190
TODAY, THIS AFTERNOON, THE
SPEAKERS THAT FOLLOW US, YOU'LL

44
00:02:50,190 --> 00:02:53,130
HEAR ABOUT SOME OF THESE
EXCITING INVESTIGATIONS.

45
00:02:53,130 --> 00:02:57,010
WE HAVE A PLANNED CONTROLLED
FIRE THAT WILL BE IGNITED ON THE

46
00:02:57,010 --> 00:03:01,500
CYGNUS SPACECRAFT AFTER IT'S
FINISHED ITS MISSION AFTER IT'S

47
00:03:01,500 --> 00:03:02,850
UNBERTHED.

48
00:03:02,850 --> 00:03:06,010
THAT WILL STUDY THE GROWTH OF
FIRES IN SPACE AND HELP US KEEP

49
00:03:06,010 --> 00:03:09,230
FUTURE SPACECRAFT SAFE FROM
FIRES.

50
00:03:09,230 --> 00:03:12,850
YOU'LL SEE AN EXPERIMENT ABOUT
MECHANICAL ADHESION.

51
00:03:12,850 --> 00:03:17,391
THIS IS A TECHNOLOGY THAT ALLOWS
ITS REUSABLE ADHESION, IT

52
00:03:17,391 --> 00:03:18,980
DOESN'T LEAVE ANY ADHESIVE.

53
00:03:18,980 --> 00:03:22,200
IT'S USABLE ON MANY DIFFERENT
SURFACES.

54
00:03:22,200 --> 00:03:25,370
MOST BENEFIT TO US IS IT'S
REUSABLE ON LOTS OF DIFFERENT

55
00:03:25,370 --> 00:03:26,370
SURFACES.

56
00:03:26,370 --> 00:03:29,709
YOU'LL HEAR ABOUT ADDITIVE
MANUFACTURING, WHICH IS THE NEXT

57
00:03:29,709 --> 00:03:33,370
PHASE FOR US IN THE SPACE
PROGRAM FOR MAKING HARDWARE OUT

58
00:03:33,370 --> 00:03:35,459
OF JUST RAW MATERIALS AND SPACE.

59
00:03:35,459 --> 00:03:39,030
IT ALLOWS US TO BUILD NEW TOOLS
ON THE SPACE STATION,

60
00:03:39,030 --> 00:03:42,150
REPLACEMENT PARTS AND EVENT
WE'RE LOOKING FORWARD TO THE

61
00:03:42,150 --> 00:03:46,590
ADDITIVE MANUFACTURING BUILDING
NEW EXPERIMENT HARDWARE FOR US.

62
00:03:46,590 --> 00:03:50,490
YOU'LL HEAR ABOUT AN
INVESTIGATION ABOUT THE IMPACT

63
00:03:50,490 --> 00:03:55,030

SHATTERED SOIL THAT MAKES UP THE
LUNAR SURFACE, COMMENTS AND

64
00:03:55,030 --> 00:03:56,030
ASTEROIDS.

65
00:03:56,030 --> 00:03:58,040
AND FINALLY, YOU'LL HEAR ABOUT
AN INSTRUMENT TO BE MOUNTED

66
00:03:58,040 --> 00:04:01,780
INSIDE THE ISS WHICH WILL LOOK
AT METEORS AS THEY ENTER THE

67
00:04:01,780 --> 00:04:02,849
UPPER ATMOSPHERE.

68
00:04:02,849 --> 00:04:06,660
AND IT WILL LOOK AT THE CHEMICAL
COMPOSITION OF THOSE METEORS,

69
00:04:06,660 --> 00:04:11,260
WHAT MAKES UP THOSE METEORS.

70
00:04:11,260 --> 00:04:14,849
I HOPE YOU'LL AGREE WITH US THE
STATION PROGRAM, SCIENCE PROGRAM

71
00:04:14,849 --> 00:04:17,590
WE HAVE IS ADVANCING THE
KNOWLEDGE OF OUR EARTH AROUND

72
00:04:17,590 --> 00:04:18,590
US.

73
00:04:18,590 --> 00:04:22,370
IT'S ADVANCING HUMAN EXPLORATION
OF SPACE AND IS BENEFITTING ALL

74

00:04:22,370 --> 00:04:24,660
OF US ON THE GROUND.

75
00:04:24,660 --> 00:04:28,400
I'D LIKE TO TURN IT OVER TO MIKE
ROBERTS.

76
00:04:28,400 --> 00:04:31,539
>> I'M HERE FROM THE CASUS.

77
00:04:31,539 --> 00:04:34,919
IT'S THE MANAGER OF THE
INTERNATIONAL SPACE STATION

78
00:04:34,919 --> 00:04:36,490
NATIONAL LAB.

79
00:04:36,490 --> 00:04:39,660
PETE INTRODUCED TO YOU A LOT OF
THE DIFFERENT TOOLS THAT ARE

80
00:04:39,660 --> 00:04:47,360
AVAILABLE ABOARD THE
INTERNATIONAL SPACE STATION.

81
00:04:47,360 --> 00:04:50,809
HE MENTIONED A BROAD BREADTH OF
RESEARCH CENTERS ACROSS THE

82
00:04:50,809 --> 00:04:54,059
UNITED STATES THE INTERNATIONAL
SPACE STATION NATIONAL LAB

83
00:04:54,059 --> 00:04:59,349
SPECIALIZED IN PROVIDING ACCESS
TO THE SPACE ENVIRONMENT FOR

84
00:04:59,349 --> 00:05:05,900
LARGE VARIETY OF USERS, WE ARE
SPONSORING ON THE ISS LAB

85
00:05:05,900 --> 00:05:09,210
PROJECT METEOR, UTILIZING THE
INTERNATIONAL SPACE STATION AS

86
00:05:09,210 --> 00:05:11,039
AN EARTH OBSERVATION PLATFORM.

87
00:05:11,039 --> 00:05:16,319
IN THE SAME WAY THAT WE HAVE
SATELLITES THAT ORBIT THE EARTH,

88
00:05:16,319 --> 00:05:19,069
THE INTERNATIONAL SPACE STATION
AFFORDS UNIQUE OPPORTUNITIES

89
00:05:19,069 --> 00:05:23,789
FROM ITS ORBITING THE U.S. AND
THE WORLD ABOUT EVERY 90 MINUTES

90
00:05:23,789 --> 00:05:24,789
OR SO.

91
00:05:24,789 --> 00:05:26,150
THERE ARE OPPORTUNITIES THERE TO
UTILIZE IT AS AN EARTH

92
00:05:26,150 --> 00:05:27,889
OBSERVATION PLATFORM.

93
00:05:27,889 --> 00:05:32,419
THERE ARE ALSO OPPORTUNITIES ON
BOARD THE INTERNATIONAL SPACE

94
00:05:32,419 --> 00:05:36,360
STATION FOR COMMERCIAL COMPANIES
TO TEST HYPOTHESIS TO DEVELOP

95
00:05:36,360 --> 00:05:40,229

DRUGS AND IN SOME CASES TO
ACTUALLY EXPLORE MANUFACTURING

96
00:05:40,229 --> 00:05:42,139
CAPABILITIES ON ORBIT.

97
00:05:42,139 --> 00:05:44,759
YOU'RE GOING TO HEAR FROM ONE OF
OUR IMPLEMENTATION PARTNERS MADE

98
00:05:44,759 --> 00:05:50,279
IN SPACE A LITTLE BIT LATER WHO
WILL TAKE ABOUT IT WAS A

99
00:05:50,279 --> 00:05:52,610
TECHNOLOGY DEMONSTRATION ON
BOARD THE INTERNATIONAL SPACE

100
00:05:52,610 --> 00:05:58,500
STATION THAT HAS TRANSFERRED
INTO A ADDITIVE MANUFACTURING

101
00:05:58,500 --> 00:05:59,500
FACILITY.

102
00:05:59,500 --> 00:06:03,180
THAT'S AN EXCITING OPPORTUNITIES
FOR VARIETY OF USERS HERE IN THE

103
00:06:03,180 --> 00:06:06,240
UNITED STATES WHO RANGE FROM
COMMERCIAL COMPANIES WHO WANT TO

104
00:06:06,240 --> 00:06:10,990
EXPLORE ADDITIVE MANUFACTURING
CAPABILITIES AS WELL AS TO

105
00:06:10,990 --> 00:06:11,990
STUDENTS.

106
00:06:11,990 --> 00:06:14,099
YOU'LL HEAR FROM ANOTHER
IMPLEMENTATION PARTNER NANO

107
00:06:14,099 --> 00:06:22,469
RACKS WHO PROVIDES RESEARCH
OPPORTUNITIES AND OFFERING

108
00:06:22,469 --> 00:06:24,699
OPPORTUNITIES FOR SATELLITES TO
BE LAUNCHED FROM THE

109
00:06:24,699 --> 00:06:27,580
INTERNATIONAL SPACE STATION.

110
00:06:27,580 --> 00:06:33,349
THEIR CUSTOMER BASE IS STUDENTS
AS WELL.

111
00:06:33,349 --> 00:06:42,129
THEY HAVE AN ACTIVE STEM PROGRAM
TO ENABLE ACCESS TO THE SPACE

112
00:06:42,129 --> 00:06:45,020
ENVIRONMENT TO MIDDLE AND HIGH
SCHOOL STUDENTS.

113
00:06:45,020 --> 00:06:48,569
WE LOOK FORWARD VERY MUCH TO THE
LAUNCH OF THE ROCKET TOMORROW

114
00:06:48,569 --> 00:06:52,159
AND NEW POSSIBILITIES THAT ARE
GOING TO COME FROM THE HUHDITION

115
00:06:52,159 --> 00:06:54,449
OF THESE FACILITIES TO THE
INTERNATIONAL SPACE STATION

116

00:06:54,449 --> 00:06:56,030
NATIONAL LAB.

117
00:06:56,030 --> 00:06:57,610
>> THANK YOU.

118
00:06:57,610 --> 00:07:00,539
WE NOW HAVE SOME TYPE FOR
QUESTIONS BEFORE WE GO TO OUR

119
00:07:00,539 --> 00:07:01,539
NEXT SPEAKER.

120
00:07:01,539 --> 00:07:03,870
FOR THOSE IN THE ROOM IF YOU
WOULD RAISE YOUR HAND AND

121
00:07:03,870 --> 00:07:06,590
SOMEONE WITH A MICROPHONE WILL
COME TO YOU.

122
00:07:06,590 --> 00:07:10,430
STATE YOUR NAME AND TO WHOM YOUR
QUESTION IS DIRECTED AND PLEASE

123
00:07:10,430 --> 00:07:12,050
KEEP IT TO ONE QUESTION FOR NOW.

124
00:07:12,050 --> 00:07:15,340
IF WE HAVE ADDITIONAL TIME WE'LL
GO FOR ADDITIONAL QUESTIONS.

125
00:07:15,340 --> 00:07:20,749
FOR THOSE ON THE PHONE O PRESS
STAR ONE AND THOSE ON LINE USE

126
00:07:20,749 --> 00:07:22,529
THE†#ASKNASA.

127

00:07:22,529 --> 00:07:26,310
>> I'D LIKE TO HEAR MORE ABOUT
THE ADDITIVE MANUFACTURING

128
00:07:26,310 --> 00:07:27,310
CAPABILITIES.

129
00:07:27,310 --> 00:07:30,719
EXACTLY WHAT YOU'RE DOING AND
TRYING TO ACCOMPLISH.

130
00:07:30,719 --> 00:07:33,080
>> THAT WILL BE ONE OF OUR
SPEAKERS THAT WILL COME UP,

131
00:07:33,080 --> 00:07:41,509
WE'LL BE ABLE TO TALK MORE ABOUT
THAT SHORTLY.

132
00:07:41,509 --> 00:07:45,150
>> MY NAME IS MARK GAUCH,
HISTORICAL SPACE IMAGERY.

133
00:07:45,150 --> 00:07:57,210
CAN YOU TELL ME, GENTLEMEN, THE
NANO, RAX, WITH ITS CAPABILITY

134
00:07:57,210 --> 00:08:00,629
LAUNCHED FROM SPACE, FROM THE
SPACE STATION?

135
00:08:00,629 --> 00:08:04,929
WILL THIS BE†-- IF I'M TO BE
LOOKING FORWARD TO THE FUTURE,

136
00:08:04,929 --> 00:08:11,210
LOOKING AT THINGS LIKE DREAM
CHASER, BEING LAUNCHED JETTSING

137
00:08:11,210 --> 00:08:18,990

INTO SPACE, WILL IT BE ABLE TO
DOCK AT THE SPACE STATION AND BE

138
00:08:18,990 --> 00:08:20,590
LAUNCHED FROM THE SPACE STATION?

139
00:08:20,590 --> 00:08:22,709
THAT WILL BE A POSSIBILITY?

140
00:08:22,709 --> 00:08:26,960
>> SHORT ANSWER TO THAT QUESTION
IS YES.

141
00:08:26,960 --> 00:08:30,059
THERE'S OBVIOUSLY A LOT OF
INTEREST WITH THE CAPABILITIES

142
00:08:30,059 --> 00:08:34,310
OF SMALL SATELLITES AND NANO
SATELLITES TO IMPROVE THE SPEED

143
00:08:34,310 --> 00:08:37,051
OF RETURN FOR TAKING
TECHNOLOGIES INTO THE SPACE

144
00:08:37,051 --> 00:08:38,051
ENVIRONMENT.

145
00:08:38,051 --> 00:08:42,029
RATHER THAN HAVING TO RELY UPON
A LARGE SATELLITE BUS WHICH IS

146
00:08:42,029 --> 00:08:45,520
EXTREMELY EXPENSIVE AND REQUIRES
A LOT OF DEVELOPMENT TIME TO

147
00:08:45,520 --> 00:08:48,220
ACTUALLY BUILD YOUR OWN AND DO
IT YOURSELF.

148
00:08:48,220 --> 00:08:50,600
AND THERE ARE COMPANIES THAT ARE
INTERESTED IN TAKING THAT

149
00:08:50,600 --> 00:08:54,240
CAPABILITY FROM BUILDING A
SATELLITE HERE ON EARTH AND

150
00:08:54,240 --> 00:08:57,540
TAKING IT INTO SPACE TO LAUNCH,
TO ACTUALLY DOING ASSEMBLY AND

151
00:08:57,540 --> 00:09:00,280
MODIFICATION OF SATELLITES ON
ORBIT.

152
00:09:00,280 --> 00:09:08,069
THE INTERNATIONAL SPACE STATION
GIVES YOU THE OPPORTUNITY TO

153
00:09:08,069 --> 00:09:12,270
MANUFACTURE PARTS IN ORBIT AND
RECONFIGURE BEFORE LAUNCH OR

154
00:09:12,270 --> 00:09:14,230
RECOVER IT.

155
00:09:14,230 --> 00:09:18,540
IT'S THE BEGINNING OF A WHOLE
NEW MARKET IN LOW EARTH ORBIT.

156
00:09:18,540 --> 00:09:23,709
>> JUST A SECOND PART TO THAT
QUESTION, VERY AWARE OF THE

157
00:09:23,709 --> 00:09:27,569
GREAT WORK CASUS HAS DONE IN
GIVING MANY INDIVIDUALS AND

158

00:09:27,569 --> 00:09:32,880
GROUPS THE OPPORTUNITY TO DO
EXPERIMENTS IN SPACE.

159
00:09:32,880 --> 00:09:39,269
WAS CASUS PART OF THIS GOING
FORWARD INVOLVING THE FUTURE OF

160
00:09:39,269 --> 00:09:40,269
SATELLITES?

161
00:09:40,269 --> 00:09:41,710
BEING LAUNCHED FROM THE SPACE
STATION?

162
00:09:41,710 --> 00:09:47,160
>> YES, SO ONE OF THE MAJOR
REASONS BEHIND THE DESIGNATION

163
00:09:47,160 --> 00:09:50,180
OF THE U.S. OPERATING SEGMENT AS
AN INTERNATIONAL SPACE STATION

164
00:09:50,180 --> 00:09:54,440
NATIONAL LAB WAS TO PROVIDE
OPPORTUNITIES FOR A RANGE OF

165
00:09:54,440 --> 00:09:59,730
INVESTIGATORS AND ENGINEERS TO
EXPLORE LOWER EARTH ORBIT AS AN

166
00:09:59,730 --> 00:10:04,340
ENVIRONMENT FOR INNOVATION, FOR
TRYING NEW TECHNOLOGIES IN THE

167
00:10:04,340 --> 00:10:05,340
SPACE ENVIRONMENT.

168
00:10:05,340 --> 00:10:08,610
SO THOSE OPPORTUNITIES RANGE

FROM COMMERCIAL MANUFACTURING

169
00:10:08,610 --> 00:10:12,950
CAPABILITIES ALL THE WAY TO
SUBCOMPONENT TESTING.

170
00:10:12,950 --> 00:10:14,899
THERE ARE A VARIETY OF
OPPORTUNITIES THAT ARE OUT

171
00:10:14,899 --> 00:10:15,899
THERE.

172
00:10:15,899 --> 00:10:18,310
NOT ONLY FOR THE EARTH
OBSERVATION MARKET, FOR

173
00:10:18,310 --> 00:10:21,830
SATELLITES, BUT ALSO FOR
DEVELOPING NEW CAPABILITIES TO

174
00:10:21,830 --> 00:10:25,209
DEVELOP NEW AREAS OF RESEARCH
AND TECHNOLOGY DEVELOPMENT IN

175
00:10:25,209 --> 00:10:30,120
LOWER EARTH ORBIT AND CASUS IS
GLAD TO BE PART OF THIS.

176
00:10:30,120 --> 00:10:31,629
>> THANK YOU.

177
00:10:31,629 --> 00:10:34,060
THANK YOU VERY MUCH.

178
00:10:34,060 --> 00:10:35,560
NEXT UP I'D LIKE TO WELCOME DR.

179
00:10:35,560 --> 00:10:39,060

GARY RUFF PROJECT MANAGER AND
CO-INVESTIGATOR FOR THE

180
00:10:39,060 --> 00:10:42,220
SPACECRAFT FIRE SAFETY
DEMONSTRATION PROJECT KNOWN AS

181
00:10:42,220 --> 00:10:43,220
SAFFIRE.

182
00:10:43,220 --> 00:10:48,560
I KNOW IT'S A DANGEROUS THING TO
HAVE A FIRE IN A SPACECRAFT.

183
00:10:48,560 --> 00:10:51,220
CAN YOU TELL US WHY YOU'RE GOING
TO INTENTIONALLY START A FIRE

184
00:10:51,220 --> 00:10:53,320
INSIDE A SPACECRAFT?

185
00:10:53,320 --> 00:10:54,320
>> SURE.

186
00:10:54,320 --> 00:10:57,709
THE BIG PICTURE OBJECTIVE IS TO
LEARN SOME THINGS ABOUT FIRE

187
00:10:57,709 --> 00:11:02,009
SAFETY IN SPACECRAFT THAT WILL
HELP US TO PROVIDE THE RIGHT

188
00:11:02,009 --> 00:11:05,550
EQUIPMENT AND THE RIGHT
PROCEDURES AND EVERYTHING FOR

189
00:11:05,550 --> 00:11:09,470
ASTRONAUTS AS THEY GO ON LONG
DURATION MISSIONS.

190
00:11:09,470 --> 00:11:13,070
FOR SAFFIRE ONE THAT WILL BE
LAUNCHING TOMORROW NIGHT THE

191
00:11:13,070 --> 00:11:18,240
OBJECTIVE IS TO LOOK HOW LARGE A
FIRE CAN GET IN SPACE IF IT WERE

192
00:11:18,240 --> 00:11:22,779
TO START ON A MATERIAL, LET'S
SAY A LARGE PIECE OF MATERIAL,

193
00:11:22,779 --> 00:11:26,879
HOW LARGE IT CAN GET IN SPACE,
HOW FAST IT CAN GROW.

194
00:11:26,879 --> 00:11:30,310
AND WHETHER IT REACHES A STEADY
SIZE OR CONTINUES TO GROW IN

195
00:11:30,310 --> 00:11:32,329
SIZE AS IT PROPAGATES.

196
00:11:32,329 --> 00:11:37,110
OF COURSE, WE'VE DONE COMBUSTION
SCIENCE EXPERIMENTS ON THE SPACE

197
00:11:37,110 --> 00:11:38,110
STATION BEFORE.

198
00:11:38,110 --> 00:11:42,490
BUT THEY'VE BEEN THE SIZE OF A
NOTE CARD, IF EVEN THAT.

199
00:11:42,490 --> 00:11:47,959
ON SAFFIRE ONE, WHAT WE'RE GOING
TO BE DOING IS BURNING A SAMPLE

200
00:11:47,959 --> 00:11:49,759

THAT'S ABOUT THAT BIG.

201
00:11:49,759 --> 00:11:54,209
SO IF IT WERE†-- IF THIS WERE TO
BURN ON A SPACECRAFT, IT WOULD

202
00:11:54,209 --> 00:11:55,930
BE A BIG DEAL.

203
00:11:55,930 --> 00:12:02,889
SO THE APPARATUS, THE SAFFIRE
ONE APPARATUS, HAVE A VERY SMALL

204
00:12:02,889 --> 00:12:05,509
PROTOTYPE MODEL HERE.

205
00:12:05,509 --> 00:12:10,660
THERE'S TWO CHAMBERS, A FLOW
CHAMBER AND AVIONICS CHAMBER.

206
00:12:10,660 --> 00:12:19,360
WE HAVE TWO FANS ON THE AVIONICS
BAY AND THE INLET AT THE BOTTOM.

207
00:12:19,360 --> 00:12:24,769
IF YOU COULD BRING UP THE STILL
IMAGE, IT'S SHOWN HERE ON THE

208
00:12:24,769 --> 00:12:27,990
SCREEN YOU CAN SEE THE SAMPLE
CARD WHICH WAS THIS SAMPLE

209
00:12:27,990 --> 00:12:31,620
SITTING THERE INSIDE THE FLOW
DOCK AND THE OTHER PART OF IT IS

210
00:12:31,620 --> 00:12:33,790
THE AVIONICS BAY.

211

00:12:33,790 --> 00:12:37,700
IF YOU COULD ROLL THE VIDEO.

212
00:12:37,700 --> 00:12:40,879
WHAT YOU'RE GOING TO SEE HERE
IS, YOU KNOW, THE SAFFIRE

213
00:12:40,879 --> 00:12:46,269
EQUIPMENT, EXPERIMENT WAS LOADED
ON TO CYGNUS IN JANUARY, AND

214
00:12:46,269 --> 00:12:47,620
IT'S GOING TO GO UP TO STATION.

215
00:12:47,620 --> 00:12:49,730
AS THEY SAID ONE OF THE
IMPORTANT THINGS ABOUT OUR

216
00:12:49,730 --> 00:12:52,339
EXPERIMENT IS WE'LL STAY ON
CYGNUS.

217
00:12:52,339 --> 00:12:55,470
SO THE CREW IS GOING TO OFF LOAD
THEIR CARGO, ALL THE EXPERIMENTS

218
00:12:55,470 --> 00:13:00,449
WE'LL HEAR ABOUT AND THEN LOAD
IN TRASH AND THEN OUR JOB REALLY

219
00:13:00,449 --> 00:13:02,709
STARTS ONCE THEY DEBERTH.

220
00:13:02,709 --> 00:13:06,740
IT WILL MOVE CYGNUS WILL MOVE
FAR ENOUGH AWAY FROM THE STATION

221
00:13:06,740 --> 00:13:14,290
AND WE'LL HAVE ENGINEERS IN
DULLES AT ORBITAL ATK'S FACILITY

222
00:13:14,290 --> 00:13:16,320
SENDING COMMANDS TO START THE
EXPERIMENT.

223
00:13:16,320 --> 00:13:19,269
AND SO IT WILL RUN THROUGH THAT
WHOLE EXPERIMENT IN ABOUT TWO

224
00:13:19,269 --> 00:13:23,920
AND A HALF HOURS IS WHAT IT WILL
TAKE TO GET ALL OF THE DATA WE

225
00:13:23,920 --> 00:13:26,310
NEED WHICH IS GOING TO BE
PRIMARILY VIDEO.

226
00:13:26,310 --> 00:13:30,350
THERE'S OXYGEN CONCENTRATIONS,
CO 2 CONCENTRATION AND VARIOUS

227
00:13:30,350 --> 00:13:33,130
TEMPERATURES.

228
00:13:33,130 --> 00:13:36,690
WHAT HAPPENS WHEN†-- ALTHOUGH
THE CYGNUS VEHICLE WILL REMAIN

229
00:13:36,690 --> 00:13:40,699
IN ORBIT FOR ABOUT EIGHT DAYS
WHILE THEY'RE GETTING ALL OF OUR

230
00:13:40,699 --> 00:13:41,699
DATA DOWN.

231
00:13:41,699 --> 00:13:45,290
THE EXPERIMENT IS VERY SHORT BUT
IT TAKES A WHILE TO GET ALL THE

232

00:13:45,290 --> 00:13:47,870
DATA WE NEED BACK DOWN TO EARTH.

233
00:13:47,870 --> 00:13:51,860
AND THEN WHAT WILL HAPPEN IS
WHEN WE'RE DONE, THEN CYGNUS

234
00:13:51,860 --> 00:13:56,379
WILL DEORBIT AND DESTRUCTIVELY
DEORBIT INTO THE PACIFIC.

235
00:13:56,379 --> 00:14:00,480
AND SO JUST TO CONCLUDE, I MEAN,
A LOT OF THIS†-- THERE'S A LOT

236
00:14:00,480 --> 00:14:05,490
OF INTERACTION HERE BETWEEN NASA
ENGINEERS, ORBITAL ATK, ISS TO

237
00:14:05,490 --> 00:14:08,019
MAKE THIS HAPPEN BECAUSE THIS
VEHICLE WASN'T INTENDED TO DO

238
00:14:08,019 --> 00:14:09,790
EXPERIMENTS LIKE THIS.

239
00:14:09,790 --> 00:14:14,449
IT'S BEEN GREAT TEAM EFFORT AND
FUN WORKING WITH THEM.

240
00:14:14,449 --> 00:14:15,680
>> ALL RIGHT.

241
00:14:15,680 --> 00:14:17,560
WE'LL TAKE QUESTIONS FOR DR.

242
00:14:17,560 --> 00:14:18,560
RUFF.

243

00:14:18,560 --> 00:14:21,230
AGAIN, PLEASE RAISE YOUR HAND
AND WHEN THE MICROPHONE COMES TO

244
00:14:21,230 --> 00:14:22,230
YOU.

245
00:14:22,230 --> 00:14:23,230
STATE YOUR NAME.

246
00:14:23,230 --> 00:14:28,779
QUESTION UP HERE IN THE FRONT.

247
00:14:28,779 --> 00:14:31,460
JUST A SECOND.

248
00:14:31,460 --> 00:14:32,460
>> HI I HAD A COUPLE OF
QUESTIONS.

249
00:14:32,460 --> 00:14:34,959
IS THAT THE ONLY TYPE OF
MATERIAL THAT YOU'RE TESTING OR

250
00:14:34,959 --> 00:14:38,089
WILL THERE BE OTHER TYPES OF
MATERIAL THAT YOU'LL BE TESTING?

251
00:14:38,089 --> 00:14:40,990
>> THIS IS THE ONLY ONE ON
SAFFIRE ONE.

252
00:14:40,990 --> 00:14:43,990
BECAUSE WE DON'T GET BACK AND
YOU NEED MORE DATA POINTS.

253
00:14:43,990 --> 00:14:45,770
WE CONSTRUCTED THREE OF THESE.

254

00:14:45,770 --> 00:14:52,360
THERE IS THREE OF THESE UNITS
THAT WILL GO ON 0 A 5 AND SEVEN.

255
00:14:52,360 --> 00:15:00,259
WE HAVE NINE DIFFERENT SAMPLES,
THERE'S A COUPLE OF THIS KIND OF

256
00:15:00,259 --> 00:15:04,459
MATERIAL SO WE CAN LOOK AT
HOW†-- VARIATIONS IN SIZE AND

257
00:15:04,459 --> 00:15:06,610
HOW THAT IMPACTS THE FLAME
SPREAD.

258
00:15:06,610 --> 00:15:16,360
THERE'S NO MAX AND SOME OTHER
MATERIALS THEY USE ON STATION.

259
00:15:16,360 --> 00:15:20,230
>> IS THIS THE LAST PART OF THE
MISSION BEFORE IT GOES OUT OF

260
00:15:20,230 --> 00:15:21,230
ORBIT?

261
00:15:21,230 --> 00:15:22,480
I KNOW THEY'RE RELEASING THE
CUBE SET.

262
00:15:22,480 --> 00:15:27,810
SO IS THAT GOING TO BE BEFORE OR
AFTER THE SAFFIRE TEST?

263
00:15:27,810 --> 00:15:29,069
>> IT WOULD BE BEFORE.

264
00:15:29,069 --> 00:15:33,159
I DON'T KNOW WHEN IN THE

TIMELINE, BUT IT'S BEFORE.

265
00:15:33,159 --> 00:15:41,660
>> HI, I'M CURIOUS, ARE YOU
GOING TO BE MONITORING THE

266
00:15:41,660 --> 00:15:44,629
ATMOSPHERE BESIDES THE MATERIAL
ON THE FIRE?

267
00:15:44,629 --> 00:15:47,359
ARE YOU GOING TO BE MONITORING
THE ATMOSPHERE AT ALL?

268
00:15:47,359 --> 00:15:50,910
>> ON THIS EXPERIMENT WE HAVE†--
WE WILL BE MONITORING THE OXYGEN

269
00:15:50,910 --> 00:15:57,209
CONCENTRATION AND CO 2 AT THE
INLET TO OUR DOCK.

270
00:15:57,209 --> 00:16:01,129
ORBITAL ATK HAS A SMOKE DETECTOR
IN THE VEHICLE WE'LL BE

271
00:16:01,129 --> 00:16:02,980
MONITORING THAT.

272
00:16:02,980 --> 00:16:06,459
THAT'S ALL THAT WE'RE REALLY
GETTING ABOUT THE CABIN

273
00:16:06,459 --> 00:16:10,179
ATMOSPHERE IN THIS EXPERIMENT.

274
00:16:10,179 --> 00:16:16,939
>> NOT ANY RESIDUE FROM THE FIRE
ITSELF THEN?

275
00:16:16,939 --> 00:16:18,509
>> NOT IN THIS SERIES OF
EXPERIMENTS.

276
00:16:18,509 --> 00:16:19,769
>> WHAT ABOUT IN THE FUTURE?

277
00:16:19,769 --> 00:16:24,189
>> IN THE FUTURE WE'RE PLANNING
RIGHT NOW THREE ADDITIONAL

278
00:16:24,189 --> 00:16:29,209
SAFFIRE FLIGHTS THAT WILL
ESSENTIALLY†-- WE WILL USE THIS

279
00:16:29,209 --> 00:16:33,569
TYPE OF HARDWARE FOR
FLAMMABILITY EXPERIMENTS THEN

280
00:16:33,569 --> 00:16:37,939
WE'LL USE THE ENTIRE CYGNUS
CABIN AS PART OF OUR TEST BED

281
00:16:37,939 --> 00:16:41,389
WHERE WE WILL MONITOR THE
COMBUSTION GASES AND CLEANUP

282
00:16:41,389 --> 00:16:45,980
PROCESS AND THE PARTICULATE
THAT'S PRODUCED.

283
00:16:45,980 --> 00:16:50,790
>> VERY GOOD, THANK YOU.

284
00:16:50,790 --> 00:16:59,060
>> YES, MARK GAUCH, CAN YOU TELL
ME, SIR, THE ISS AS IT STANDS

285
00:16:59,060 --> 00:17:03,649

NOW, HAS IT BEEN DEVELOPED AND
MADE OF FIRE RETARDANT

286
00:17:03,649 --> 00:17:04,649
MATERIALS?

287
00:17:04,649 --> 00:17:08,510
ALSO, KNOWING THAT EARTH'S
ATMOSPHERE AND HOW FIRE REACTS

288
00:17:08,510 --> 00:17:12,950
TO IT, HAVE THERE EVER BEEN ANY
PREVIOUS TESTS IN TERMS OF THE

289
00:17:12,950 --> 00:17:17,640
CONTENTS IN SPACE'S ATMOSPHERE
AND HOW IT WOULD REACT TO FIRE

290
00:17:17,640 --> 00:17:20,290
INVOLVING YOUR TEST?

291
00:17:20,290 --> 00:17:21,820
>> OKAY.

292
00:17:21,820 --> 00:17:29,420
THE FIRST QUESTION ABOUT
FLAMMABLE MATERIALS ON ISS, ALL

293
00:17:29,420 --> 00:17:34,670
MATERIALS THAT GO UP ARE TESTED
USING TERRESTRIAL FLAMMABILITY

294
00:17:34,670 --> 00:17:38,070
TESTS TO FIND OUT WHICH ONE CAN
PROPAGATE A FIRE AND WHICH

295
00:17:38,070 --> 00:17:40,560
DON'T.

296

00:17:40,560 --> 00:17:46,540
YOU TRY TO USE MATERIALS THAT
DON'T BURN IN THOSE CONDITIONS.

297
00:17:46,540 --> 00:17:49,930
BECAUSE PEOPLE LIVE THERE,
YOU'LL HAVE SOME THINGS THEY

298
00:17:49,930 --> 00:17:51,890
HAVE TO USE THAT WILL BURN.

299
00:17:51,890 --> 00:17:55,540
AND SO FOR ANYTHING LIKE THAT,
THERE'S A CONFIGURATION CONTROL

300
00:17:55,540 --> 00:18:00,000
REQUIREMENT AND ISOLATION FROM
POWER SOURCES.

301
00:18:00,000 --> 00:18:02,760
AND ALL OF THOSE THINGS TO HELP,
YOU KNOW, MAKE SURE THAT IT

302
00:18:02,760 --> 00:18:05,070
REMAINS SAFE.

303
00:18:05,070 --> 00:18:12,010
THE SECOND QUESTION†--
>> HAVE YOU LOOKED AT EARTH'S

304
00:18:12,010 --> 00:18:15,430
ATMOSPHERE IN TERMS OF ITS
OXYGEN CONTENT, HOW A FIRE

305
00:18:15,430 --> 00:18:20,140
CURRENTLY BURNS, HAVE THERE BEEN
PREVIOUS TESTS DONE IN TERMS OF

306
00:18:20,140 --> 00:18:28,220
EARTH'S ATMOSPHERE AND HOW IT

WOULD REACT?

307
00:18:28,220 --> 00:18:34,320
>> THERE HAVE BEEN QUITE A FEW
COMBUSTION EXPERIMENTS IN 21%

308
00:18:34,320 --> 00:18:38,110
OXYGEN AND OTHER OXYGEN
CONCENTRATIONS.

309
00:18:38,110 --> 00:18:39,250
THEY'VE STUDIED IT.

310
00:18:39,250 --> 00:18:42,760
BUT IT GOES TO SMALL SIZES.

311
00:18:42,760 --> 00:18:46,820
WHAT WE WANT TO DO IS START TO
GET TO A MORE, I GUESS,

312
00:18:46,820 --> 00:18:52,710
DANGEROUS FIRE IF IT WERE TO
OCCUR IN A SPACECRAFT.

313
00:18:52,710 --> 00:18:54,290
>> LOOKING FORWARD TO HEARING
THE RESULTS.

314
00:18:54,290 --> 00:18:55,530
>> THANK YOU.

315
00:18:55,530 --> 00:18:58,420
>> HI, BILL HARDWOOD WITH CBS
NEWS.

316
00:18:58,420 --> 00:19:00,560
YOU HAVEN'T EXPLICITLY SAID IT.

317
00:19:00,560 --> 00:19:05,910

YOU DON'T EXPECT THE FIRE TO GET
OUT OF YOUR CONTAINMENT VESSEL.

318
00:19:05,910 --> 00:19:08,200
WHY NOT DO IT ON THE SPACE
STATION WITH THE CREW TO WATCH

319
00:19:13,770 --> 00:19:09,210
IT?

320
00:19:13,770 --> 00:19:15,720
>> YOU'RE RIGHT.

321
00:19:15,720 --> 00:19:22,880
WE MADE IT SO THAT THE FIRE
COMBUSTION GASES WILL COME OUT,

322
00:19:22,880 --> 00:19:25,960
THE FIRE IS CONTROLLED AND STAYS
INSIDE OUR BOX.

323
00:19:25,960 --> 00:19:30,710
BECAUSE ORBITAL ATK LIKES TO
REMAIN IN CONTROL OF THEIR

324
00:19:30,710 --> 00:19:31,710
VEHICLES.

325
00:19:31,710 --> 00:19:34,290
IT NEEDS TO COME DOWN IN THE
PACIFIC.

326
00:19:34,290 --> 00:19:39,210
THE REASON WE DON'T DO THIS ON
ISS IS THE PIECE THAT WE'RE NOT

327
00:19:39,210 --> 00:19:42,690
DOING ON CYGNUS WE WOULD
DEFINITELY HAVE TO DO ON ISS IS

328
00:19:42,690 --> 00:19:44,650
CLEANING UP THE MESS.

329
00:19:44,650 --> 00:19:49,190
THERE IS NO CHAMBER BIG ENOUGH
ON ISS TO BE ABLE TO BURN

330
00:19:49,190 --> 00:19:50,280
SOMETHING THIS LARGE.

331
00:19:50,280 --> 00:19:52,030
YOU CAN BURN SMALL THINGS.

332
00:19:52,030 --> 00:19:55,160
AND A LOT OF THAT COMES TO
PROTECT THE CREW, BECAUSE IF

333
00:19:55,160 --> 00:19:57,520
YOU'RE GOING TO HAVE IT ON ISS
THE CREW HAS TO INTERACT.

334
00:19:57,520 --> 00:20:00,500
THEY'VE GOT TO GO IN THE CHAMBER
AND YOU HAVE TO BE ABLE TO CLEAN

335
00:20:04,840 --> 00:20:01,900
UP THE MESS.

336
00:20:04,840 --> 00:20:08,650
THE MESSIER THE BETTER.

337
00:20:08,650 --> 00:20:13,330
>> WE'LL TAKE ONE MORE QUESTION.

338
00:20:13,330 --> 00:20:18,890
>> IS IGNITIONS FOR THE
EXPERIMENT, ARE THERE ANY SAFETY

339

00:20:18,890 --> 00:20:21,840
CONDITIONS HAVING THAT DOCKED TO
THE STATION FOR A WHILE?

340
00:20:21,840 --> 00:20:28,030
DID YOU HAVE TO THINK OF
ANYTHING THERE?

341
00:20:28,030 --> 00:20:29,290
>> MANY THINGS.

342
00:20:29,290 --> 00:20:31,930
THAT'S THE FIRST QUESTION WE
GET.

343
00:20:31,930 --> 00:20:38,000
IT'S AN ELECTRICAL IGNITER AND
TECHNICALLY, WE'VE GOT THE

344
00:20:38,000 --> 00:20:40,570
EXPERIMENT IS POWERED THROUGH
FOUR RELAYS.

345
00:20:40,570 --> 00:20:44,180
THEY'RE ALL INDIVIDUALLY†-- CAN
BE ALL INDIVIDUALLY CONTROLLED

346
00:20:44,180 --> 00:20:46,790
AND MONITORED BY ORBITAL.

347
00:20:46,790 --> 00:20:51,490
WE CAN'T, SO OUR AVIONICS IS
POWERED ON TWO SETS OF RELAYS,

348
00:20:51,490 --> 00:20:53,410
THE IGNITER IS ON TWO MORE.

349
00:20:53,410 --> 00:20:58,340
THEY'VE ALL GOT TO BE CLOSED
BEFORE WE CAN START THE SOFTWARE

350
00:20:58,340 --> 00:21:01,390
TO INITIATE THE EXPERIMENT.

351
00:21:01,390 --> 00:21:03,360
SO THEY'RE MONITORING THAT
THROUGHOUT THE MISSION.

352
00:21:03,360 --> 00:21:06,690
>> ON THE ISS HAVE ANY
INTERACTION WITH THAT.

353
00:21:06,690 --> 00:21:10,510
A SAFETY SWITCH THEY HAVE TO
THROW AS IT LEAVES TO ENABLE IT?

354
00:21:10,510 --> 00:21:13,830
IS IT ALL SOFTWARE CONTROLLED?

355
00:21:13,830 --> 00:21:14,840
>> IT'S NOT ALL SOFTWARE
CONTROLLED.

356
00:21:14,840 --> 00:21:16,500
THERE'S NO SWITCH THEY HAVE TO
DO.

357
00:21:16,500 --> 00:21:23,050
OF COURSE, ORBITAL ATK HAS TO
COMMAND THOSE RELAYS.

358
00:21:23,050 --> 00:21:26,270
THE ONLY THING THAT THEY HAVE TO
DO IS NOT PACK BAGS AROUND OUR

359
00:21:26,270 --> 00:21:27,880
INLET AND OUTLET.

360
00:21:27,880 --> 00:21:29,690

YOU SAW WE'VE GOT A FLOW THROUGH
US.

361
00:21:29,690 --> 00:21:33,420
WE'RE COORDINATED THAT WORKING
WITH ISS AND THE PACKING

362
00:21:33,420 --> 00:21:34,500
ARRANGEMENT.

363
00:21:34,500 --> 00:21:35,620
WE SHOULD BE GOOD.

364
00:21:35,620 --> 00:21:37,030
>> ALL RIGHT.

365
00:21:37,030 --> 00:21:38,380
WE'RE GOING TO MOVE ON TO OUR
NEXT SPEAKER.

366
00:21:38,380 --> 00:21:40,060
THANK YOU VERY MUCH, DR.

367
00:21:40,060 --> 00:21:41,060
RUFF.

368
00:21:41,060 --> 00:21:42,690
UP NEXT I'D LIKE TO WELCOME DR.

369
00:21:42,690 --> 00:21:49,590
AARON PARNEZ FROM NASA'S JET
PROPULSION LABORATORY.

370
00:21:49,590 --> 00:21:55,370
HIS WORK IS ABOUT CLIMBING
ROBOTS.

371
00:21:55,370 --> 00:22:01,700
CAN YOU TELL HOW THEY ARE GOING

TO STICK WITHOUT BE STICKY IN

372
00:22:01,700 --> 00:22:03,409
THE HARSH ENVIRONMENT OF SPACE?

373
00:22:03,409 --> 00:22:06,140
>> YEAH, MY PLEASURE.

374
00:22:06,140 --> 00:22:09,980
OUR WORK IN MY LAB IS ALL ABOUT
ROBOTIC GRIPPERS.

375
00:22:09,980 --> 00:22:13,360
WE USE THESE GRIPPERS AS THE
FEET ON CLIMBING ROBOTS TO GO UP

376
00:22:13,360 --> 00:22:19,080
CLIFF FACES, ACROSS CAVE
CEILINGS.

377
00:22:19,080 --> 00:22:26,170
WE CAN USE THESE GRIPPERS ON THE
HANDS ON ROBOTIC ARMS.

378
00:22:26,170 --> 00:22:29,780
WE'RE INSPIRED BY ONE OF
NATURE'S BEST GRIPPERS, WHICH IS

379
00:22:29,780 --> 00:22:31,220
THE GECKO FOOT.

380
00:22:31,220 --> 00:22:38,150
THEY STICK WITH LOTS OF TINY
HAIRS ON THEIR FEET THAT ALLOW

381
00:22:38,150 --> 00:22:40,380
THEM TO TAKE ADVANTAGE OF THESE
FORCES.

382

00:22:40,380 --> 00:22:42,670
IF WE COULD BRING UP THE FIRST
PICTURE.

383
00:22:42,670 --> 00:22:47,300
THIS IS A GRAPHIC PUT TOGETHER
BY BOB FULL AND HIS TEAM AT UC

384
00:22:47,300 --> 00:22:48,300
BERKELEY.

385
00:22:48,300 --> 00:22:51,490
YOU CAN SEE ON THE TOE OF THE
GECKO ARE FLAPS.

386
00:22:51,490 --> 00:22:54,750
YOU CAN SEE THESE WITH YOUR EYE.

387
00:22:54,750 --> 00:23:04,590
ON THOSE FLAPS GROW THOUSANDS OF
TINY HAIRS CALLED SITAE.

388
00:23:04,590 --> 00:23:08,300
AND AT THE TIPS OF ALL OF THOSE
HAIRS IS FURTHER BRANCHING, THE

389
00:23:08,300 --> 00:23:09,300
NANO STRUCTURE.

390
00:23:09,300 --> 00:23:13,460
THESE ARE MUCH, MUCH TOO SMALL
TO SEE WITH YOUR EYE.

391
00:23:13,460 --> 00:23:15,880
THAT'S WHAT ACTUALLY MAKES
CONTACT WITH THE SURFACE AND

392
00:23:15,880 --> 00:23:19,590
THAT'S WHAT TAKES ADVANTAGE OF
THESE FORCES.

393
00:23:19,590 --> 00:23:22,500
IF YOU BRING UP THE NEXT SLIDE,
YOU CAN SEE OUR ROBOTIC

394
00:23:22,500 --> 00:23:25,050
IMITATION OF GECKO SKIN.

395
00:23:25,050 --> 00:23:28,760
WE'RE NOT QUITE AS ADVANCED AS
WHAT THE GECKO HAS ON ITS FOOT.

396
00:23:28,760 --> 00:23:32,250
THAT'S LIMITED BY CURRENT
MANUFACTURING CAPABILITIES.

397
00:23:32,250 --> 00:23:33,630
YOU CAN SEE ROUGHLY THE SAME
SHAPE.

398
00:23:33,630 --> 00:23:38,130
IT HAS A DIRECTION ALITY TO IT.

399
00:23:38,130 --> 00:23:43,660
IF THE GECKO PULLS DOWN IT'S
STICKY.

400
00:23:43,660 --> 00:23:48,310
IF IT DOESN'T PULL DOWN OR
PUSHES UP TO THE SIDE, IT'S NOT

401
00:23:48,310 --> 00:23:49,680
STICKY AT ALL.

402
00:23:49,680 --> 00:23:51,300
THIS IS A GOOD THING.

403
00:23:51,300 --> 00:23:53,730
IF YOU'RE CLIMBING UP THE WALL

VERY QUICKLY AND YOU'RE USING

404
00:23:53,730 --> 00:23:54,950
SOMETHING LIKE DUCT TAPE.

405
00:23:54,950 --> 00:23:58,250
IT MIGHT BE JUST FINE TO GET
STUCK ON THE WALL.

406
00:23:58,250 --> 00:24:02,630
BUT YOU'RE GOING TO HAVE TO PULL
WITH A LOT OF FORCE TO GET IT TO

407
00:24:02,630 --> 00:24:03,630
UNSTICK.

408
00:24:03,630 --> 00:24:05,760
AND THIS IS A BIG DEAL IN SPACE.

409
00:24:05,760 --> 00:24:09,290
WHERE THERE'S NO GRAVITY,
NOTHING TO REACT TO THOSE

410
00:24:09,290 --> 00:24:10,290
FORCES.

411
00:24:10,290 --> 00:24:13,600
HAVING THE ABILITY TO TURN YOUR
ADHESION ON AND OFF ON COMMAND

412
00:24:13,600 --> 00:24:14,600
IS POWERFUL.

413
00:24:14,600 --> 00:24:19,340
THE OTHER THING IS, IT'S A VERY
REUSABLE ADHESIVE.

414
00:24:19,340 --> 00:24:21,830
YOU CAN IMAGINE IF A GECKO TOOK

THREE OR FOUR STEPS AND THE FOOT

415
00:24:21,830 --> 00:24:26,930
STOPPED WORKING THAT WOULD BE A
BAD EVOLUTIONARY DESIGN.

416
00:24:26,930 --> 00:24:31,200
WE'VE TESTED OUR ROBOTIC GECKO
SKINS IN THE LABS 30,000 CYCLES

417
00:24:31,200 --> 00:24:34,390
ON AND OFF WITH NO DECREASE IN
PERFORMANCE.

418
00:24:34,390 --> 00:24:37,950
WE'VE TESTED THEM HANGING ON THE
WALL FOR A YEAR.

419
00:24:37,950 --> 00:24:39,540
AND THEN REUSED THEM.

420
00:24:39,540 --> 00:24:45,180
AND WE'VE TESTED THEM IN A
THERMAL VACUUM CHAMBER.

421
00:24:45,180 --> 00:24:49,020
BECAUSE THEY RELY ON FORCES,
THEY'RE NOT SUSCEPTIBLE TO

422
00:24:49,020 --> 00:24:51,820
TEMPERATURE, PRESSURE RADIATION,
SOME OF THE THINGS THAT MAKE

423
00:24:51,820 --> 00:24:56,530
USING CONVENTIONAL ADHESIVES
LIKE DUCT TAPE AND SUPER GLUE

424
00:24:56,530 --> 00:25:00,400
NOT FEASIBLE IN THE SPACE
ENVIRONMENT.

425
00:25:00,400 --> 00:25:02,780
WHAT WE'LL DO FOR THIS
EXPERIMENT IS HAVE THE

426
00:25:02,780 --> 00:25:06,770
ASTRONAUTS TEST FIVE HAND HELD
GRIPPERS.

427
00:25:06,770 --> 00:25:09,510
THIS IS THE LARGEST OF THESE
GRIPPERS AND THEY†-- IT'S A

428
00:25:09,510 --> 00:25:12,440
MEDIUM AND SMALL SIZE.

429
00:25:12,440 --> 00:25:14,510
AND TO OPERATE IT, YOU SQUEEZE
TOGETHER.

430
00:25:14,510 --> 00:25:19,170
TOUCH DOWN TO THE SURFACE AND
NOW IT'S STUCK.

431
00:25:19,170 --> 00:25:22,970
WE'VE GOT SPRINGS THAT ARE
LOADING THAT MATERIAL IN THE

432
00:25:22,970 --> 00:25:24,060
PROPER DIRECTION.

433
00:25:24,060 --> 00:25:27,550
BUT TO TURN THE STICKINESS OFF,
YOU SIMPLY SQUEEZE TOGETHER

434
00:25:30,640 --> 00:25:28,550
AGAIN.

435
00:25:30,640 --> 00:25:34,100

WE'LL MAKE THE ASTRONAUTS DO IT
30 OR 40 TIMES.

436
00:25:34,100 --> 00:25:37,260
THEY'LL BE MEASURING WHAT THE
STICKING POWER IS BY PULLING ON

437
00:25:37,260 --> 00:25:39,870
DIFFERENT PARTS OF THE GRIPPERS.

438
00:25:39,870 --> 00:25:43,920
WE'LL LEAVE ONE GRIPPER IN PLACE
FOR A FULL YEAR TO TEST THE

439
00:25:43,920 --> 00:25:46,890
AFFECTS OF LONG DURATION
MICROGRAVITY.

440
00:25:46,890 --> 00:25:51,250
THIS EXPERIMENT IS A PRECURSOR
TO FUTURE CAPABILITIES THAT WE'D

441
00:25:51,250 --> 00:25:55,330
LIKE TO SEE MOVE UP TO THE
INTERNATIONAL SPACE STATION AND

442
00:25:55,330 --> 00:25:59,380
OTHER ACTIVITIES IN LOW EARTH
ORBIT.

443
00:25:59,380 --> 00:26:05,590
THERE ARE MANY CENSORS WE'D LIKE
TO USE THAT REQUIRE A PRELOAD,

444
00:26:05,590 --> 00:26:10,700
EDDY CURRENT CENSORS, MAGNETIC
FLUX LEAKAGE CENSORS.

445
00:26:10,700 --> 00:26:14,130
IN SPACE, YOU'RE PUSHING INTO

THE SURFACE IS PUSHING YOU AWAY

446
00:26:14,130 --> 00:26:15,730
FROM THE SURFACE.

447
00:26:15,730 --> 00:26:19,050
USING A GECKO GRIPPER TO REACT
TO THE LOAD WILL ALLOW US TO USE

448
00:26:19,050 --> 00:26:22,450
THOSE KIND OF CENSORS,
REPOSITION THEM IN DIFFERENT

449
00:26:22,450 --> 00:26:23,450
PLACES.

450
00:26:23,450 --> 00:26:25,770
A LITTLE BIT BIGGER IN SCOPE,
YOU CAN IMAGINE USING THESE AS

451
00:26:25,770 --> 00:26:31,030
THE ARMS ON THE ROBOTIC ARMS TO
ASSEMBLE THINGS IN SPACE, REPAIR

452
00:26:31,030 --> 00:26:34,510
SATELLITES, GRAB SPACE GARBAGE
AND DEORBIT IT.

453
00:26:34,510 --> 00:26:38,780
MY FAVORITE APPLICATION IS TO
PUT THESE ON THE FEET OF A

454
00:26:38,780 --> 00:26:41,900
CRAWLING ROBOT AND HAVE THE
ROBOT GO AROUND ON THE OUTSIDE

455
00:26:41,900 --> 00:26:47,190
OF THE SPACE STATION, INSPECT
ORBITAL DEBRIS, IMPACTS, INSPECT

456
00:26:47,190 --> 00:26:51,620
MEET ORITE DAMAGES.

457
00:26:51,620 --> 00:26:56,190
DO ALL THE THINGS A ROBOT WOULD
BE ABLE TO DO.

458
00:26:56,190 --> 00:26:59,070
WE'RE INTERESTED IN THESE
APPLICATIONS, SPACE BASED

459
00:26:59,070 --> 00:27:02,240
APPLICATIONS, BUT THERE ARE A
FEW COMMERCIAL COMPANIES THAT

460
00:27:02,240 --> 00:27:07,030
ARE LOOKING AT MAKING GECKO
ADHESIVES VIABLE HERE ON EARTH.

461
00:27:07,030 --> 00:27:10,530
EITHER IN A FACTORY FLOOR
SETTING WHERE YOU MIGHT BE

462
00:27:10,530 --> 00:27:14,010
WORKING WITH SOLAR PANELS OR
CEREAL BOXES.

463
00:27:14,010 --> 00:27:15,630
OR IN YOUR HOME.

464
00:27:15,630 --> 00:27:19,650
THIS WOULD ALLOW YOU TO HANG
YOUR FLAT SCREEN TV ON THE TO

465
00:27:19,650 --> 00:27:21,310
THE WALL.

466
00:27:21,310 --> 00:27:26,210
WHEN YOU'RE READY TO MOVE, YOU

CAN TURN THE STICKINESS OFF AND

467
00:27:26,210 --> 00:27:27,800
PUT IT ON A DIFFERENT WALL.

468
00:27:27,800 --> 00:27:29,420
THAT'S A SUMMARY.

469
00:27:29,420 --> 00:27:31,330
I'M LOOKING FORWARD TO YOUR
QUESTIONS.

470
00:27:31,330 --> 00:27:34,980
THIS IS OUR FIRST EXPERIMENT
GOING UP TO THE SPACE STATION,

471
00:27:34,980 --> 00:27:36,910
WE'RE VERY, VERY EXCITED.

472
00:27:36,910 --> 00:27:39,160
>> THANK YOU.

473
00:27:39,160 --> 00:27:46,310
PLEASE RAISE YOUR HAND IN THE
ROOM, USE†#ASKNASA.

474
00:27:46,310 --> 00:27:50,300
PLEASE STICK TO ONE QUESTION, IF
WE HAVE MORE TIME WE'LL COME

475
00:27:50,300 --> 00:27:53,280
BACK FOR MORE QUESTIONS.

476
00:27:53,280 --> 00:27:56,150
>> YES, SIR.

477
00:27:56,150 --> 00:27:58,520
MARK GAUCH, HISTORICAL SPACE
IMAGERY.

478
00:27:58,520 --> 00:28:02,330
CAN YOU TELL ME, SIR, THE GECKO
GRIP THAT YOU CURRENTLY HAVE

479
00:28:02,330 --> 00:28:05,730
THAT YOU SAY THE ASTRONAUTS ARE
GOING TO TEST IN SPACE, RIGHT

480
00:28:05,730 --> 00:28:10,420
NOW, HERE IN EARTH'S ATMOSPHERE,
HOW MUCH WILL†-- WEIGHT WILL

481
00:28:10,420 --> 00:28:15,400
THAT PARTICULAR GRIP SUPPORT FOR
HOW LONG AND HOW ARE YOU

482
00:28:15,400 --> 00:28:18,690
EXPECTING THAT TO DIFFER IN THE
ENVIRONMENT OF SPACE?

483
00:28:18,690 --> 00:28:19,690
>> YEAH.

484
00:28:19,690 --> 00:28:21,030
GOOD QUESTION.

485
00:28:21,030 --> 00:28:25,920
SO A GRIPPER THIS SIZE CAN
SUPPORT ABOUT 15 POUNDS ON A

486
00:28:25,920 --> 00:28:27,110
SMOOTH SURFACE.

487
00:28:27,110 --> 00:28:31,240
AS THE SURFACE ROUGHNESS GOES
UP, THE HOLDING POWER DROPS

488
00:28:31,240 --> 00:28:32,240

DOWN.

489
00:28:32,240 --> 00:28:35,400
THAT'S BECAUSE WE DON'T HAVE ALL
OF THOSE COMPLEX LAYERS THAT THE

490
00:28:35,400 --> 00:28:37,950
GECKO HAS.

491
00:28:37,950 --> 00:28:41,170
WE EXPECT IT TO BE THE SAME IN
SPACE.

492
00:28:41,170 --> 00:28:44,820
IN 15 POUNDS OF FORCE IN ZERO
GRAVITY IS A LOT.

493
00:28:44,820 --> 00:28:46,420
BECAUSE THINGS DON'T WEIGHT
ANYTHING.

494
00:28:46,420 --> 00:28:47,420
YOU'RE WEIGHTLESS.

495
00:28:47,420 --> 00:28:49,110
YOU CAN MOVE AROUND.

496
00:28:49,110 --> 00:28:53,330
BIG OBJECTS AS LONG AS YOU KEEP
THE INERTIA FORCES LOW.

497
00:28:53,330 --> 00:28:55,440
BUT WE HAVEN'T TESTED IT.

498
00:28:55,440 --> 00:28:59,490
THAT'S WHY WE'RE GOING UP THERE
TO DO THE WORK AND MAKE SURE

499
00:28:59,490 --> 00:29:01,650

THAT THAT'S ACTUALLY WHAT WE
SEE.

500
00:29:01,650 --> 00:29:03,789
>> THANK YOU.

501
00:29:03,789 --> 00:29:09,980
>> HI, KEN KRAMER, TALKING ABOUT
ROBOTICS, ANOTHER APPLICATION I

502
00:29:09,980 --> 00:29:14,070
WANT TO ASK YOU ABOUT IS WHAT
ABOUT SENDING THESE TO PLANETARY

503
00:29:14,070 --> 00:29:18,320
BODIES LIKE THE MOON AND MARS TO
GO UP AND DOWN MOUNTAINS, HILL

504
00:29:18,320 --> 00:29:22,540
SIDES, CRATERS, LARGE ROCKS,
THINGS LIKE THAT?

505
00:29:22,540 --> 00:29:27,470
MAYBE SEND ONE TO THE 2020
ROVER.

506
00:29:27,470 --> 00:29:28,470
>> YEAH.

507
00:29:28,470 --> 00:29:34,730
SO PLANETARY BODIES TYPICALLY
ARE MUCH ROUGHER SURFACES.

508
00:29:34,730 --> 00:29:37,990
WE HAVE DIFFERENT GRIPPING
TECHNOLOGY THAT WE USE FOR THOSE

509
00:29:37,990 --> 00:29:40,120
ROUGHER SURFACES.

510
00:29:40,120 --> 00:29:42,870
THERE'S ANOTHER TECHNOLOGY
CALLED MICROSPINES THAT ARE

511
00:29:42,870 --> 00:29:45,550
BASICALLY LOTS OF SHARP HOOKS.

512
00:29:45,550 --> 00:29:48,090
IT'S ALSO A BIT BIO INSPIRED.

513
00:29:48,090 --> 00:29:50,150
THAT'S WHAT WE USE FOR OUR ROCK
CLIMBING ROBOTS.

514
00:29:50,150 --> 00:29:53,820
IT'S ACTUALLY PART OF THE BASE
LINE FOR THE ASTEROID READER X

515
00:29:53,820 --> 00:29:59,420
MISSION WHICH IS GOING TO GRAB
AN SUV SIZED BOLDER USING THAT

516
00:29:59,420 --> 00:30:01,470
KIND OF A GRIPPER.

517
00:30:01,470 --> 00:30:05,970
IF YOU GO ON YOUTUBE AND SEARCH
ROCK CLIMBING ROBOTS OR YOU

518
00:30:05,970 --> 00:30:10,090
SEARCH CRAZY ENGINEERING GECKO
GRIPPER, YOU'LL FIND A LITTLE

519
00:30:10,090 --> 00:30:14,330
YOUTUBE EPISODE THAT JP ELLIS
PUT TOGETHER ON THE DIFFERENT

520
00:30:14,330 --> 00:30:15,330
TECHNOLOGIES.

521
00:30:15,330 --> 00:30:27,020
YOU'RE FREE TO POST THOSE ON
YOUR SITES AND ALL OF THAT.

522
00:30:27,020 --> 00:30:32,830
>> MY NAME IS SHANNON STUART.

523
00:30:32,830 --> 00:30:36,570
MY QUESTION IS, WHAT'S THE
BIOLOGICAL BASIS FOR THE GECKO'S

524
00:30:36,570 --> 00:30:37,920
HIREARCHICAL SPINE STRUCTURE.

525
00:30:37,920 --> 00:30:45,600
COULD THAT INFORM THE TECHNOLOGY
YOU NEED TO IMPROVE?

526
00:30:45,600 --> 00:30:50,020
>> GECKOES HAVE THE HIERARCHY IN
ORDER TO CONFORM TO THE SURFACES

527
00:30:50,020 --> 00:30:52,100
IT FINDS IN ITS ENVIRONMENT.

528
00:30:52,100 --> 00:30:55,420
WHICH AREN'T SMOOTH COMPOSITE
PANELS LIKE YOU'LL FIND ON THE

529
00:30:55,420 --> 00:30:57,240
SPACE STATION.

530
00:30:57,240 --> 00:31:01,790
THE HIERARCHY IS NECESSARY TO
GET ALL THE TINY NANO STRUCTURES

531
00:31:01,790 --> 00:31:04,230
IN GOOD CONTACT WITH THE

SURFACE.

532
00:31:04,230 --> 00:31:07,330
AND IT'S ABSOLUTELY INFORMED OUR
DESIGN.

533
00:31:07,330 --> 00:31:10,290
THERE HAS BEEN A NICE
COLLABORATION BETWEEN THE

534
00:31:10,290 --> 00:31:16,110
EXPERIMENTAL BIOLOGISTS AT UC
BERKELEY AND SOME OF THE

535
00:31:16,110 --> 00:31:19,020
TECHNOLOGIESTS THAT ARE TRYING
TO MAKE ROBOTIC VERSIONS OF

536
00:31:19,020 --> 00:31:20,020
THESE.

537
00:31:20,020 --> 00:31:21,920
WE HAVEN'T CAUGHT UP TO NATURE
YET.

538
00:31:21,920 --> 00:31:23,659
WE'RE HOPING TO.

539
00:31:23,659 --> 00:31:28,310
>> WE'LL TAKE ONE QUESTION FROM
ASK NASA.

540
00:31:28,310 --> 00:31:30,930
>> DERRICK ASKS ABOUT
APPLICATIONS FOR OTHER MISSIONS

541
00:31:30,930 --> 00:31:34,870
BY SAYING, IS THE GECKO FOOT
TECHNOLOGY TO BE USED ON THE ARM

542
00:31:34,870 --> 00:31:35,870
MISSION?

543
00:31:35,870 --> 00:31:36,870
>> YEAH.

544
00:31:36,870 --> 00:31:41,740
SO THE ANSWER IS IT'S NOT A
GECKO TECHNOLOGY.

545
00:31:41,740 --> 00:31:43,390
BUT IT'S A SIMILAR KIND OF
GRIPPER.

546
00:31:43,390 --> 00:31:46,240
SO IT'S ALSO WORK BEING DONE IN
OUR LAB.

547
00:31:46,240 --> 00:31:47,480
IT USES CLAWS.

548
00:31:47,480 --> 00:31:50,340
SO THE GECKOES USE LOTS OF TINY
LITTLE HAIRS.

549
00:31:50,340 --> 00:31:54,430
BUT IF YOU THINK OF HOW A BEAR
CLIMBS A TREE IT'S USING CLAWS.

550
00:31:54,430 --> 00:31:57,950
WE HAVE A TECHNOLOGY THAT'S
INSPIRED BY THAT KIND OF CLAW

551
00:31:57,950 --> 00:32:00,470
BASED GRIPPING CALLED
MICROSPINES.

552
00:32:00,470 --> 00:32:03,910
THAT'S WHAT CURRENTLY USED FOR

ARM.

553
00:32:03,910 --> 00:32:07,310
>> THANK YOU.

554
00:32:07,310 --> 00:32:08,520
THANK YOU VERY MUCH.

555
00:32:08,520 --> 00:32:11,790
AND NEXT WE HAVE MICHAEL SNYDER
WHO IS THE CHIEF TECHNOLOGY

556
00:32:11,790 --> 00:32:13,690
OFFICER FOR MADE IN SPACE.

557
00:32:13,690 --> 00:32:16,820
AND HE'S GOING TO TELL US ABOUT
THE SECOND GENERATION OF A 3 D

558
00:32:16,820 --> 00:32:17,980
PRINTER HEADING TO SPACE.

559
00:32:17,980 --> 00:32:18,980
MR.

560
00:32:18,980 --> 00:32:22,850
SNYDER, WILL YOU TELL US HOW
THIS IS NEW AND BETTER THAN THE

561
00:32:22,850 --> 00:32:24,110
CURRENT ONE?

562
00:32:24,110 --> 00:32:25,110
>> SURE.

563
00:32:25,110 --> 00:32:29,450
FIRST OFF I'M THE CHIEF
ENGINEER, JASON†-- NO PROBLEM.

564
00:32:29,450 --> 00:32:34,201
SO OUR AMF IS THE RESULT OF A
FOUR YEAR EFFORT THAT START

565
00:32:34,201 --> 00:32:37,330
WOULD NASA SMALL BUSINESS
INNOVATIVE RESEARCH GRANT WE

566
00:32:37,330 --> 00:32:39,430
WERE FORTUNATE TO BE AWARDED.

567
00:32:39,430 --> 00:32:42,920
THIS PRINTER IS LARGER AND A
SUCCESSOR TO THE PRINTER THAT

568
00:32:42,920 --> 00:32:46,720
WAS LAUNCHED IN 2014 AND
OPERATED SUCCESSFULLY ON BOARD.

569
00:32:46,720 --> 00:32:54,560
>> A LOT OF LESSENS WE WERE
LEARNED WERE TO MINIMIZE CREW

570
00:32:54,560 --> 00:33:01,110
TIME AND MAKE IT ACCURATE AND
FUNCTIONAL FOR THE PARTS WE'RE

571
00:33:01,110 --> 00:33:02,110
PRODUCING.

572
00:33:02,110 --> 00:33:05,320
WE CAN PRODUCE A LOT OF
DIFFERENT MATERIALS WITH THIS.

573
00:33:05,320 --> 00:33:09,240
WE'RE LAUNCHING THREE, WHICH ARE
ALL PLASTIC BASED.

574
00:33:09,240 --> 00:33:11,560

FIRST ONE IS ABS WHICH WE'VE
PRINTED WITH.

575
00:33:11,560 --> 00:33:13,720
THAT'S LIKE LEGO BRICKS.

576
00:33:13,720 --> 00:33:20,150
THE SECOND ONE IS A GREEN HIGH
DENSITY POLYETHYLENE.

577
00:33:20,150 --> 00:33:23,600
THAT'S LIKE WHAT YOU FIND IN
FOOD CONTAINERS.

578
00:33:23,600 --> 00:33:34,050
AND AN AEROSPACE GRADE POLYMER
THAT CAN SURVIVE A VACUUM.

579
00:33:34,050 --> 00:33:38,930
FIRST PART WE'LL BE PRINTING IS
AN OPTIMIZED TOOL IN PARTNERSHIP

580
00:33:38,930 --> 00:33:39,930
AND LOWE'S.

581
00:33:39,930 --> 00:33:45,590
WE HAVE A SCANNING TECHNOLOGY
INSIDE WHICH CAN DO GEOMETRIC

582
00:33:45,590 --> 00:33:47,220
VERIFICATION OF THE PARTS.

583
00:33:47,220 --> 00:33:50,920
THERE'S HARDWARE INSIDE,
SOFTWARE FROM AUTODESK CALLED

584
00:33:50,920 --> 00:33:52,500
MOMENTUM IT'S COOL.

585

00:33:52,500 --> 00:33:54,300
WE CAN CHECK THE C.A.D.

586
00:33:54,300 --> 00:33:58,100
WE SEND
UP TO SEE IF THE GEOMETRIES

587
00:33:58,100 --> 00:33:59,100
MATCH.

588
00:33:59,100 --> 00:34:02,910
THE PART OF THIS PRINTER IS WITH
CASUS WE'LL BE OFFERING THE

589
00:34:02,910 --> 00:34:08,280
SERVICE FOR ANYBODY TO MAKE
EXPERIMENTS, PARTS, STEM

590
00:34:08,280 --> 00:34:11,290
ACTIVITIES, IT CAN ALL BE
PRODUCE WOULD THIS PRINTER.

591
00:34:11,290 --> 00:34:13,180
THAT'S OUR HOPE IN THE FUTURE
GOING FORWARD.

592
00:34:13,180 --> 00:34:19,050
IT'S MAKING THE PROCESS BETTER
AND EASIER FOR ANYONE TO USE.

593
00:34:19,050 --> 00:34:25,100
>> WE HAVE TIME FOR A FEW
QUESTIONS ABOUT THE 3 D PRINTER.

594
00:34:25,100 --> 00:34:28,460
HERE IN THE MIDDLE.

595
00:34:28,460 --> 00:34:31,940
RAISE YOUR HAND AGAIN, SIR.

596
00:34:31,940 --> 00:34:36,560
>> CLEARLY THERE'S A LOT OF
TESTING THAT GOES INTO PARTS

597
00:34:36,560 --> 00:34:38,580
THAT ARE USED IN SPACE,
SPACECRAFT.

598
00:34:38,580 --> 00:34:42,399
IS THERE ANYTHING WITH THE
DESIGN THAT HELPS YOU TEST THE

599
00:34:42,399 --> 00:34:45,260
OUTPUT OF THE COMPUTER TO MAKE
SURE IT DOESN'T HAVE INTERNAL

600
00:34:45,260 --> 00:34:49,470
FLAWS?

601
00:34:49,470 --> 00:34:51,500
>> WE CAN BRING A PICTURE UP OF
THE PRINTER.

602
00:34:51,500 --> 00:34:54,300
IT'S A LOT BETTER LOOKING THAN I
AM.

603
00:34:54,300 --> 00:34:56,250
THERE IT IS.

604
00:34:56,250 --> 00:34:59,530
SO PART OF THAT IS THE GEOMETRIC
SCANNING CAPABILITY, AS WELL AS

605
00:34:59,530 --> 00:35:02,630
WE HAVE REALTIME VIEWING OF THE
PART THAT'S BEING PRODUCED.

606
00:35:02,630 --> 00:35:06,480

AND GOES IN AND OUT WITH THE
STATION SIGNAL ACQUISITION.

607
00:35:06,480 --> 00:35:10,870
WE'RE ABLE TO OPTIMIZE THAT
PROCESS, ALSO THROUGH SOFTWARE

608
00:35:10,870 --> 00:35:12,660
IN TERMS OF FINAL INSPECTION.

609
00:35:12,660 --> 00:35:14,350
AND IT'S ACTUALLY MADE MODULAR.

610
00:35:14,350 --> 00:35:17,970
WE CAN SWAP OUT SYSTEMS
INCLUDING THE ELECTRICAL SYSTEMS

611
00:35:17,970 --> 00:35:26,790
AND THE FILAMENT AND THE
EXTRUDER SO WE CAN UPGRADE†--

612
00:35:32,110 --> 00:35:29,450
[†NO AUDIO†]
[†NO AUDIO†]

613
00:35:32,110 --> 00:35:36,110
>> WE'RE SENDING FOUR STIMULATES

614
00:35:36,110 --> 00:35:37,110
UP.

615
00:35:37,110 --> 00:35:41,010
THIS IS A SIMULATED STIMULATES.

616
00:35:41,010 --> 00:35:42,140
THIS ISN'T WHAT WE'RE SENDING
UP.

617
00:35:42,140 --> 00:35:45,200

YOU CAN SEE IN THIS CLEAR TUBE,
WE HAVE THE MATERIAL RIGHT HERE,

618
00:35:45,200 --> 00:35:51,510
AND ON TOP WE HAVE THE DEVICE
WHICH WE CALL THE ENTRAPULATOR.

619
00:35:51,510 --> 00:35:54,590
IT HOLDS THE MATERIAL IN PLACE.

620
00:35:54,590 --> 00:36:00,350
WHEN THIS IS LAUNCHED UP TO
STATION, DURING LAUNCH, LAUNCH

621
00:36:00,350 --> 00:36:03,800
VIBRATIONS, THIS STUFF WON'T
MOVE AROUND.

622
00:36:03,800 --> 00:36:06,820
WE'RE SENDING THE MATERIAL
PRESORTED BY DIFFERENT SIZES.

623
00:36:06,820 --> 00:36:11,090
WE DON'T WANT MIXING OR ANYTHING
TO HAPPEN UNTIL WE ACTIVATE THE

624
00:36:11,090 --> 00:36:12,090
EXPERIMENT.

625
00:36:12,090 --> 00:36:16,000
WHAT WILL HAPPEN THE ASTRONAUTS,
VERY LITTLE THEY HAVE TO DO.

626
00:36:16,000 --> 00:36:19,640
EVENTUALLY THEY'LL PULL IT OFF
OF CYGNUS HOPEFULLY BEFORE

627
00:36:19,640 --> 00:36:20,640
SAFFIRE STARTS.

628
00:36:20,640 --> 00:36:25,850
AND THEY'LL PUT IT IN PLACE IN
THE EXPRESS RACK LOCATION AND

629
00:36:25,850 --> 00:36:30,030
BASICALLY PRESS A FEW BUTTONS
AND THE ENTRAPULATOR WILL PULL

630
00:36:30,030 --> 00:36:31,960
UP AND GIVE THE MATERIAL ROOM TO
MOVE AROUND.

631
00:36:31,960 --> 00:36:32,960
THAT'S WHAT WE'RE INTERESTED IN.

632
00:36:32,960 --> 00:36:37,750
WE HAVE A CAMERA THE SIZE OF A
CREDIT CARD LOOKING AT EACH OF

633
00:36:37,750 --> 00:36:38,750
THE TUBES.

634
00:36:38,750 --> 00:36:41,900
WE'LL BE TAKING IMAGES OVER THE
COURSE OF A YEAR.

635
00:36:41,900 --> 00:36:45,280
WE'RE ON STATION FOR A YEAR
BECAUSE WE'RE BASICALLY

636
00:36:45,280 --> 00:36:47,880
INTERESTED IN THE MICROGRAVITY
ENVIRONMENT THAT STATION OFFERS.

637
00:36:47,880 --> 00:36:52,250
IT'S SIMILAR TO THE MICROGRAVITY
ENVIRONMENT YOU'D SEE ON AN

638
00:36:52,250 --> 00:36:53,250

ASTEROID.

639
00:36:53,250 --> 00:36:55,000
IT WORKS OUT NICELY FOR US.

640
00:36:55,000 --> 00:36:56,810
YOU CAN GO TO THE NEXT PICTURE.

641
00:36:56,810 --> 00:36:59,250
THIS IS A PICTURE OF OUR
STIMULATES.

642
00:36:59,250 --> 00:37:01,340
AS I SAID, FOUR DIFFERENT
MATERIALS.

643
00:37:01,340 --> 00:37:06,490
THIS IS THE FIRST ONE, AGAIN
IT'S GOING IN A TUBE LIKE THIS,

644
00:37:06,490 --> 00:37:08,180
NOT A JAR LIKE THIS.

645
00:37:08,180 --> 00:37:10,490
THIS IS THE SIMPLEST MODEL.

646
00:37:10,490 --> 00:37:13,100
THREE DIFFERENT BEADS MADE OF
SILICA GLASS.

647
00:37:13,100 --> 00:37:16,830
FOR MODELS, THIS WILL BE THE
EASIEST TO ANALYZE AFTERWARDS.

648
00:37:16,830 --> 00:37:18,690
EACH TUBE GETS MORE COMPLEX.

649
00:37:18,690 --> 00:37:25,550
IN ONE OF THE TUBES WE HAVE

SIMILAR MATERIAL BUT TAKEN AWAY

650
00:37:25,550 --> 00:37:30,160
THE SPHERICAL SHAPE AND WE HAVE
SHARDS OF GLASS.

651
00:37:30,160 --> 00:37:31,160
WE HAVE ANOTHER MATERIAL, A TYPE
OF METEORITE.

652
00:37:31,160 --> 00:37:32,160
AND WE HAVE AN ACTUAL METEORITE.

653
00:37:32,160 --> 00:37:35,790
THIS IS THE SAME TYPE OF
MATERIAL THAT MAKES UP

654
00:37:35,790 --> 00:37:36,790
ASTEROIDS.

655
00:37:36,790 --> 00:37:41,130
IT'S PARTICLES OF DIFFERENT
SIZES FROM DUST FINE DUST TO

656
00:37:41,130 --> 00:37:42,160
MUCH BIGGER PIECES.

657
00:37:42,160 --> 00:37:46,650
ONE OF OUR TUBES IS FILLED WITH
A METEORITE WE'VE CRUSHED UP AND

658
00:37:46,650 --> 00:37:47,650
PUT INSIDE.

659
00:37:47,650 --> 00:37:50,980
WE'LL GET ON STATION AND
BASICALLY LOOK AT HOW ALL THESE

660
00:37:50,980 --> 00:37:53,660

DIFFERENT SIZED PARTICLES ARE
MOVING AROUND.

661
00:37:53,660 --> 00:37:56,000
WE'LL UNDERSTAND WHAT'S
HAPPENING AND GIVE US A BETTER

662
00:37:56,000 --> 00:37:58,040
UNDERSTANDING OF THE DYNAMICS,
SOMETHING WE HAVEN'T STUDIED

663
00:37:58,040 --> 00:37:59,040
BEFORE TO THIS POINT.

664
00:37:59,040 --> 00:38:00,540
AND LAST BUT NOT LEAST I WANT TO
PULL UP THE LAST PICTURE AND SAY

665
00:38:00,540 --> 00:38:03,490
THAT WE HAVE A GOOD TEAM OF
SCIENTISTS, ALL THE EXPERTS ON

666
00:38:03,490 --> 00:38:04,490
OUR TEAM.

667
00:38:04,490 --> 00:38:05,490
THE EFFORT WAS LED AT JOHNSON
SPACE CENTER BUT WE HAVE PEOPLE

668
00:38:05,490 --> 00:38:06,490
FROM ALL OVER WHO HELPED DECIDE
WHAT TO PUT IN THESE TUBES.

669
00:38:06,490 --> 00:38:07,700
OVER THE NEXT YEAR WE'LL BE
GETTING BACK DATA.

670
00:38:07,700 --> 00:38:09,490
WE'RE INTERESTED TO SEE WHAT WE
LEARNED ABOUT BEHAVIOR IN

671
00:38:09,490 --> 00:38:10,490
MICROGRAVITY, THANK YOU.

672
00:38:10,490 --> 00:38:11,490
>> ALL RIGHT.

673
00:38:11,490 --> 00:38:12,490
WE HAVE TIME FOR A FEW
QUESTIONS.

674
00:38:12,490 --> 00:38:13,490
START OVER HERE.

675
00:38:13,490 --> 00:38:14,490
>> YES, MARK GAUCH, HISTORICAL
SPACE IMAGERY.

676
00:38:14,490 --> 00:38:15,490
CAN YOU TELL ME, WOULD YOU BE
LOOKING AT THIS EXPERIMENT IN

677
00:38:15,490 --> 00:38:16,490
TERMS OF LOOKING AT IT, MAYBE
BONDING IT INTO A BUILDING

678
00:38:16,490 --> 00:38:17,490
BLOCK, IF IT WERE, FOR THE
FUTURE IN SPACE?

679
00:38:17,490 --> 00:38:18,490
MAYBE IN COLONIZATION?

680
00:38:18,490 --> 00:38:19,490
>> SURE, IF YOU'RE TALKING ABOUT
THIS IN PARTICULAR, WE'RE

681
00:38:19,490 --> 00:38:21,080
INTERESTED IN THE ACTUAL

INTERACTIONS, FORCES IN WHAT'S

682
00:38:21,080 --> 00:38:22,080
GOING TO HAPPEN.

683
00:38:22,080 --> 00:38:24,780
IT'S SOMETHING WE REALLY HAVEN'T
STUDIED FOR MORE THAN 30 SECONDS

684
00:38:24,780 --> 00:38:28,790
AT A TIME ON A PARABOLIC FLIGHT.

685
00:38:28,790 --> 00:38:33,870
WE'RE INTERESTED IN THE EFFECTS
OF THEM INTERACTING WITH EACH

686
00:38:33,870 --> 00:38:34,870
OTHER.

687
00:38:34,870 --> 00:38:37,690
WE HAVE INTERACTIONS WITH THE
TUBE WE'RE TAKING INTO ACCOUNT.

688
00:38:37,690 --> 00:38:41,850
WE'LL LEARN FROM STRATA-1 AND
BUILD UPON THAT AND DECIDE WHAT

689
00:38:41,850 --> 00:38:42,880
TO PUT IN EACH OF THE TUBES.

690
00:38:42,880 --> 00:38:43,880
>> INTERESTING, THANK YOU.

691
00:38:43,880 --> 00:38:44,880
>> AND WE HAVE ONE HERE IN THE
MIDDLE.

692
00:38:44,880 --> 00:38:46,680
>> HI, IN TERMS OF ASTEROID

RERACK MISSION, FOR THE

693
00:38:46,680 --> 00:38:48,710
COMPOSITION IN THE TUBES, DID
YOU LOOK AT THE ASTEROIDS AND

694
00:38:48,710 --> 00:38:49,730
MAKE THE COMPOSITIONS BASED ON
THOSE?

695
00:38:49,730 --> 00:38:50,730
>> THAT'S A GREAT QUESTION.

696
00:38:50,730 --> 00:38:54,440
SOME OF THE FOLKS ARE INVOLVED
IN ASTEROID REDIRECT MISSION.

697
00:38:54,440 --> 00:38:57,770
ONE OF THE TUBES IS A CONDRITES
ARE METEORITES BUT THEY'RE

698
00:38:57,770 --> 00:38:58,770
REPRESENTATIVE OF ASTEROIDS.

699
00:38:58,770 --> 00:39:00,240
THIS ONE IN PARTICULAR IS AN
ORDINARY CHONDRITE.

700
00:39:00,240 --> 00:39:01,240
IT'S THE MOST COMMON TYPE OF
METEORITE.

701
00:39:01,240 --> 00:39:02,240
A LESS COMMON TYPE IS A
CARBONACEOUS CHONDRITE.

702
00:39:02,240 --> 00:39:05,090
THIS IS REPRESENTATIVE OF THE
BODY THE MISSION IS BASE LINED

703
00:39:05,090 --> 00:39:06,090
TO GO VISIT.

704
00:39:06,090 --> 00:39:07,130
>> KEN KRAMER, I'M WONDERING
ABOUT THE VOLUME.

705
00:39:07,130 --> 00:39:09,170
HOW DID YOU DECIDE WHAT VOLUME,
I DON'T SEE A LOT OF FREE SPACE

706
00:39:09,170 --> 00:39:10,170
THERE.

707
00:39:10,170 --> 00:39:13,230
THIS IS WHAT I WAS WONDERING
WHEN YOU WERE DESCRIBING THIS

708
00:39:13,230 --> 00:39:14,230
LAST WEEK.

709
00:39:14,230 --> 00:39:15,230
FROM THE†--
>> YEAH.

710
00:39:15,230 --> 00:39:18,710
>> THERE'S NOT A LOT OF SPACE,
I'M WONDERING, DOESN'T IT NEED

711
00:39:18,710 --> 00:39:19,710
MORE?

712
00:39:19,710 --> 00:39:20,710
>> SURE, THAT'S GREAT POINT.

713
00:39:20,710 --> 00:39:25,220
WHEN THIS MOVES BACK IT GIVES IT
ABOUT AN INCH, INCH AND A HALF

714
00:39:25,220 --> 00:39:26,220
ARE SO.

715
00:39:26,220 --> 00:39:29,010
LIKE I SHOWED WE HAVE A PICTURE
OF THE SCIENCE TEAM MEMBERS AND

716
00:39:29,010 --> 00:39:31,360
SO A COUPLE OF THOSE FOLKS ARE
COMPUTATIONAL PEOPLE, AND SO

717
00:39:31,360 --> 00:39:33,060
THEY'VE, YOU KNOW, OPTIMIZED,
YOU KNOW, THERE'S SOMETHING

718
00:39:33,060 --> 00:39:36,090
CALLED A NUMBER THAT YOU TAKE
INTO ACCOUNT THE EFFECT OF THE

719
00:39:36,090 --> 00:39:41,010
COLLISIONS PARTICLES INTERACTING
WITH EACH OTHER AND THE DIAMETER

720
00:39:41,010 --> 00:39:43,140
OF THE TUBE.

721
00:39:43,140 --> 00:39:46,110
THERE'S A WAY TO CALCULATE THAT.

722
00:39:46,110 --> 00:39:47,150
HOPEFULLY THAT HELPS.

723
00:39:47,150 --> 00:39:48,150
>> IT'S PLENTY?

724
00:39:48,150 --> 00:39:49,240
>> JUST RIGHT, IT'S PERFECT.

725

00:39:49,240 --> 00:39:52,430
IF IT'S NOT WE'LL LEARN AND FISH
IT FOR STRATA 2.

726
00:39:52,430 --> 00:39:55,590
WE HAVE PUT A LOT OF THOUGHT
INTO HOW MUCH VOLUME FOR THE

727
00:39:55,590 --> 00:39:58,060
SPACE IT WILL HAVE TO MOVE
AROUND.

728
00:39:58,060 --> 00:39:59,060
YEP.

729
00:39:59,060 --> 00:40:04,380
>> HOW DO YOU ANTICIPATE YOU'LL
ACCOUNT FOR THE MOVEMENT OF THE

730
00:40:04,380 --> 00:40:05,380
SPACE STATION ITSELF?

731
00:40:05,380 --> 00:40:07,980
THE ORBITAL MANEUVERS, BOOSTING,
WILL THAT AFFECT THE EXPERIMENT?

732
00:40:07,980 --> 00:40:09,520
HAVE YOU NORMALIZED FOR THAT?

733
00:40:09,520 --> 00:40:11,600
>> THAT'S A WONDERFUL QUESTION.

734
00:40:11,600 --> 00:40:14,200
IN FACT, WE ENCOURAGE THAT.

735
00:40:14,200 --> 00:40:18,000
ANY SORT OF MOVEMENTS OF THE
SPACE STATION, ANY SORT OF

736

00:40:18,000 --> 00:40:22,600
ACCELERATIONS, THE DOCKING OF
THE VEHICLES IS GOOD FOR US.

737
00:40:22,600 --> 00:40:26,740
IT'S ONE OF THE REASONS WE'RE
THERE FOR A YEAR.

738
00:40:26,740 --> 00:40:31,200
WHEN YOU'RE ON THE SURFACE OF AN
ASTEROID YOU'LL GET IMPACTED ALL

739
00:40:31,200 --> 00:40:32,200
THE TIME.

740
00:40:32,200 --> 00:40:33,200
WE'RE INTERESTED IN THOSE TYPE
OF THINGS.

741
00:40:33,200 --> 00:40:35,690
ON OUR EXPERIMENT, WE ACTUALLY
HAVE SOMETHING CALLED SAMS, AN

742
00:40:35,690 --> 00:40:36,740
ACCELERATION MEASUREMENT DEVICE.

743
00:40:36,740 --> 00:40:41,180
WE DESIGNED IT SO THEY CAN TAKE
THE DEVICE AND MOUNT IT ON FRONT

744
00:40:41,180 --> 00:40:42,180
OF OUR PAY LOAD.

745
00:40:42,180 --> 00:40:44,480
WE'LL GET MEASUREMENTS DAILY OF
WHAT KIND OF ACCELERATIONS

746
00:40:44,480 --> 00:40:45,480
STRATA IS EXPERIENCING.

747
00:40:45,480 --> 00:40:47,650
WE HOPE FOR THOSE VIBRATIONS,
THANK YOU.

748
00:40:47,650 --> 00:40:49,550
>> DO WE HAVE ANY OTHER
QUESTIONS?

749
00:40:49,550 --> 00:40:51,740
OKAY THANK YOU VERY MUCH.

750
00:40:51,740 --> 00:40:55,690
AND NEXT WE HAVE MICHAEL LEWIS
WHO IS THE CHIEF TECHNOLOGY

751
00:40:55,690 --> 00:40:56,950
OFFICER AT NANO RACK.

752
00:40:56,950 --> 00:41:00,390
STARTING WITH THIS MISSION, NANO
RACK WILL BE ABLE TO PROVIDE

753
00:41:00,390 --> 00:41:03,220
OPPORTUNITIES TO DEPLOY CUBE
SETS FROM CYGNUS DIRECTLY AFTER

754
00:41:03,220 --> 00:41:05,720
THE VEHICLE DEPARTS FROM THE
INTERNATIONAL SPACE STATION.

755
00:41:05,720 --> 00:41:09,680
SO HOW DOES THIS EXPAND THE KIND
OF SCIENCE THAT'S AVAILABLE TO

756
00:41:09,680 --> 00:41:11,740
THESE SORT OF CUBE SETS?

757
00:41:11,740 --> 00:41:12,740
>> GREAT QUESTION.

758
00:41:12,740 --> 00:41:13,740
THANK YOU.

759
00:41:13,740 --> 00:41:15,250
THANK YOU EVERYBODY HERE.

760
00:41:15,250 --> 00:41:19,480
FIRST I'D LIKE TO TALK A LITTLE
BIT ABOUT OUR CURRENT SATELLITE

761
00:41:19,480 --> 00:41:26,730
DEPLOYERS AND I'LL GET TO THE
EXPANDED CAPABILITY.

762
00:41:26,730 --> 00:41:30,120
MANY OF YOU KNOW WE'RE ABLE TO
DEPLOY SATELLITES OFF OF THE THE

763
00:41:30,120 --> 00:41:31,120
SPACE STATION.

764
00:41:31,120 --> 00:41:34,910
MY COMPANY HAS DEPLOYED NEARLY
100 SATELLITES THIS WAY.

765
00:41:34,910 --> 00:41:35,910
VARIETY OF SATELLITES.

766
00:41:35,910 --> 00:41:38,170
SHOWN HERE THERE'S TWO PLANET
LABS DUBS.

767
00:41:38,170 --> 00:41:40,890
THESE ARE EARTH OBSERVATION
SATELLITES THAT TAKE PICTURES.

768
00:41:40,890 --> 00:41:44,140
SO LOOK AT THE NEXT SLIDE, THIS

IS A ORBITAL VEHICLE, AN OLDER

769
00:41:44,140 --> 00:41:45,140
CYGNUS.

770
00:41:45,140 --> 00:41:46,790
IN THIS MISSION, IN THAT SILVER
AREA, CALLED THE SERVICE MODULE,

771
00:41:46,790 --> 00:41:51,510
WE ARE BOLTING A SATELLITE
DEPLOYER THERE AND WE'RE GOING

772
00:41:51,510 --> 00:41:55,680
TO DEPLOY SATELLITES AFTER
CYGNUS LEAVES THE SPACE STATION.

773
00:41:55,680 --> 00:42:02,530
TO ANSWER YOUR QUESTION, THIS
EXPANDS OUR CAPABILITY IN THAT

774
00:42:02,530 --> 00:42:05,070
WE DON'T HAVE TO BRING
SATELLITES INSIDE AND OUT

775
00:42:05,070 --> 00:42:08,880
THROUGH THE AIR LOCK, BUT ALSO
OPENS THE WORLD UP TO POSSIBLY

776
00:42:08,880 --> 00:42:10,369
MORE HARMFUL MATERIALS, SUCH AS
PROPELLANTS.

777
00:42:10,369 --> 00:42:12,360
WE COULD HAVE SATELLITES THAT
COULD PROPEL THEMSELVES.

778
00:42:12,360 --> 00:42:17,840
ALSO, THIS GIVES US THE
OPPORTUNITY TO POTENTIALLY HAVE

779
00:42:17,840 --> 00:42:25,119
HIGHER ALTITUDE WHICH IS GOOD
ARE FOR OUR SATELLITES.

780
00:42:25,119 --> 00:42:31,520
IT INCREASES THE LAB TIME.

781
00:42:31,520 --> 00:42:34,060
SHOWING ANOTHER SLIDE HERE.

782
00:42:34,060 --> 00:42:38,630
WE HAVE†-- I'M SORRY.

783
00:42:38,630 --> 00:42:43,609
SO HERE'S THE CYGNUS YOU GUYS
ARE FAMILIAR WITH.

784
00:42:43,609 --> 00:42:52,390
WE HAVE A LOT OF STUFF GOING ON
INSIDE OF THIS, IF I MAY TAKE

785
00:42:52,390 --> 00:42:58,530
THIS OPPORTUNITY TO TALK ABOUT
SOME OF THAT.

786
00:42:58,530 --> 00:43:58,130
WE HAVE A TOTAL OF 29 SATELLITES
ON THIS MISSION.

787
00:43:58,130 --> 00:44:48,820
MANY OF THEM ARE

788
00:44:48,820 --> 00:46:38,600
GOING INSIDE
AND THEN LATER WILL BE

789
00:46:38,600 --> 00:47:19,630
DEPLOYED

790
00:47:19,630 --> 00:47:46,500
OUT OF

791
00:47:46,500 --> 00:47:56,020
THE AIR LOCK SYSTEM.

792
00:47:56,020 --> 00:48:07,420
WE

793
00:48:07,420 --> 00:48:11,030
ALSO HAVE A TOTAL OF EIGHT
EXPERIMENTS THAT ARE GOING

794
00:48:11,030 --> 00:48:15,590
INSIDE THEIR VERY SMALL SCIENCE
MODULES.

795
00:48:15,590 --> 00:48:19,670
ACTUALLY, NEXT SLIDE, PLEASE.

796
00:48:19,670 --> 00:48:22,310
THESE ARE OUR NANO LABS.

797
00:48:22,310 --> 00:48:26,740
WE HAVE FIVE, WITH A TOTAL OF
EIGHT EXPERIMENTS.

798
00:48:26,740 --> 00:48:30,730
ONE IS A JAPANESE STUDENT
PROJECT, TWO THAT ARE FROM AN

799
00:48:30,730 --> 00:48:33,100
INDONESIAN HIGH SCHOOL.

800
00:48:33,100 --> 00:48:37,410
AND A NUMBER OF EXPERIMENTS FROM
VALLEY CHRISTIAN HIGH SCHOOL AND

801
00:48:37,410 --> 00:48:38,960
CARAMEL HIGH SCHOOL IN
CALIFORNIA.

802
00:48:38,960 --> 00:48:45,400
THEY'RE DOING A VARIETY OF
SCIENCE, IT'S FASCINATING THE

803
00:48:45,400 --> 00:48:49,060
CAPABILITY THEY'RE ABLE TO DO IN
THESE SMALL CUBES.

804
00:48:49,060 --> 00:48:54,120
EVERYTHING FROM WATER FILTRATION
EXPERIMENTS.

805
00:48:54,120 --> 00:48:59,690
THERE'S A FERMENTATION
EXPERIMENT.

806
00:48:59,690 --> 00:49:09,450
THIS HAS ENABLED†-- IF YOU'RE
LOOKING TO PUT SPACE IN YOUR

807
00:49:09,450 --> 00:49:17,530
CLASSROOM OR YOUR CLASSROOM IN
SPACE, I RECOMMEND YOU GO TO

808
00:49:17,530 --> 00:49:18,530
DREAMUP.ORG.

809
00:49:18,530 --> 00:49:22,160
>> WE HAVE TIME FOR A FEW
QUESTIONS, RAISE YOUR HAND AND

810
00:49:22,160 --> 00:49:25,369
WAIT FOR THE MICROPHONE TO COME
TO YOU.

811

00:49:25,369 --> 00:49:28,130
PLEASE STATE YOUR NAME BEFORE
ASKING YOUR QUESTION.

812
00:49:28,130 --> 00:49:34,320
>> GOOD AFTERNOON, RAY OSBORN.

813
00:49:34,320 --> 00:49:36,990
CURIOUS WITH THE
MICROSATELLITES, WHAT ARE THE

814
00:49:36,990 --> 00:49:40,530
LIMITATIONS IN REGARDS TO†--
BECAUSE THEY'RE SO MUCH SMALLER

815
00:49:40,530 --> 00:49:43,070
THAN THE NORMAL SATELLITES WE
COULD TYPICALLY SEE.

816
00:49:43,070 --> 00:49:48,190
WHAT ARE THE LIMITATIONS WITH
THE MICROSATELLITES WE SEND UP?

817
00:49:48,190 --> 00:49:52,220
>> WE'VE BEEN BLOWN AWAY BY THE
AMOUNT OF TECHNOLOGY THAT YOU

818
00:49:52,220 --> 00:49:54,090
CAN PUT IN THIS FORM FACTOR.

819
00:49:54,090 --> 00:49:57,500
THESE ARE ABOUT THE SIZE OF A
LOAF OF BREAD.

820
00:49:57,500 --> 00:50:00,460
THOSE ONES I SHOWS THERE WERE
IMAGERS AND THEY'RE ABLE TO GET

821
00:50:00,460 --> 00:50:01,460
AMAZING RESOLUTION.

822
00:50:01,460 --> 00:50:05,580
YOU KNOW, THEY WON'T DISCLOSE
HOW MUCH.

823
00:50:05,580 --> 00:50:07,369
IF YOU GO TO PLANET LAB'S
WEBSITE YOU CAN SEE THIS

824
00:50:07,369 --> 00:50:09,800
INCREDIBLE RESOLUTION.

825
00:50:09,800 --> 00:50:15,100
WITH ELECTRONICS GETTING SO
SMALL YOU'RE ABLE TO DO VALUABLE

826
00:50:15,100 --> 00:50:17,480
SCIENCE IN THIS.

827
00:50:17,480 --> 00:50:19,990
WE'VE SEEN A VARIETY OF IT.

828
00:50:19,990 --> 00:50:24,020
I'D SAY THE LIMITATION MORE
IS†-- YEAH.

829
00:50:24,020 --> 00:50:28,421
THE CREATIVITY OF THE
DEVELOPERS.

830
00:50:28,421 --> 00:50:30,490
>> ADDITIONAL QUESTIONS?

831
00:50:30,490 --> 00:50:33,130
ALL RIGHT.

832
00:50:33,130 --> 00:50:34,960
THANK YOU VERY MUCH.

833
00:50:34,960 --> 00:50:36,520
THANK YOU EVERYONE FOR JOINING
US.

834
00:50:36,520 --> 00:50:39,710
WE WILL BE BROADCASTING THE
PRELAUNCH NEWS CONFERENCE TODAY

835
00:50:39,710 --> 00:50:41,240
AT 2:30.

836
00:50:41,240 --> 00:50:44,530
AND THEN TUNE IN TOMORROW NIGHT
FOR A LIVE LAUNCH COVERAGE AT

837
00:50:44,530 --> 00:50:45,530
10:00†P.M.

838
00:50:45,530 --> 00:50:47,220
ON NASA TV.

839
00:50:47,220 --> 00:50:53,090
YOU CAN NASA.GOV FOR MORE
INFORMATION AND FOLLOW ALONG

840
00:50:53,090 --> 00:50:55,640
WITH THE RESEARCHERS ON
INVESTIGATIONS AT

841
00:50:55,640 --> 00:50:58,130
NASA.GOV/STATION.