1
00:00:42,830 --> 00:00:39,350
once again we're receiving downlink

2
00:00:48,229 --> 00:00:45,590
the surface tension driven convection

3
00:00:50,150 --> 00:00:48,239
experiment

4
00:00:51,270 --> 00:00:50,160
there are several components to this

5
00:01:04,070 --> 00:00:51,280
chamber

6
00:01:04,080 --> 00:01:15,030
pi team concurs as flat as can be

7
00:01:18,789 --> 00:01:17,910
other features in this facility are

8
00:01:20,469 --> 00:01:18,799
the

9
00:01:22,149 --> 00:01:20,479
submerged heater

10
00:01:24,789 --> 00:01:22,159
which

11
00:01:26,469 --> 00:01:24,799
payload specialist fred leslie has

12
00:01:28,950 --> 00:01:26,479
recently

13
00:01:31,270 --> 00:01:28,960

moved from

14
00:01:33,109 --> 00:01:31,280
a point at which it was

15
00:01:35,030 --> 00:01:33,119
sticking out from

16
00:01:35,910 --> 00:01:35,040
the silicon fluid to a point where it is

17
00:01:38,390 --> 00:01:35,920
now

18
00:01:40,469 --> 00:01:38,400
actually submerged he filled this

19
00:01:42,230 --> 00:01:40,479
container with this silicon oil

20
00:01:44,149 --> 00:01:42,240
the silicone oil contains small

21
00:01:46,950 --> 00:01:44,159
particles which you see

22
00:01:49,510 --> 00:01:46,960
in the aero region are floating

23
00:01:50,550 --> 00:01:49,520
along the surface of the fluid

24
00:01:53,350 --> 00:01:50,560
and

25
00:01:56,310 --> 00:01:53,360
fred leslie has just reported that

26
00:01:58,230 --> 00:01:56,320
he has obtained a flat surface and

27
00:02:01,270 --> 00:01:58,240
experimenters on the ground

28
00:02:04,149 --> 00:02:01,280
have confirmed that they agree that the

29
00:02:12,869 --> 00:02:04,159
surface is flat as is desired at this

30
00:02:17,270 --> 00:02:15,270
we are currently receiving another

31
00:02:19,750 --> 00:02:17,280
video image from inside the surface

32
00:02:21,990 --> 00:02:19,760
tension driven convection experiment

33
00:02:24,869 --> 00:02:22,000
this camera is an infrared imaging

34
00:02:27,030 --> 00:02:24,879
camera that allows the experiment team

35
00:02:29,110 --> 00:02:27,040
to look at the temperature variations

36
00:02:39,670 --> 00:02:29,120
that exist on the surface

37
00:02:39,680 --> 00:02:45,830
okay step one

38
00:02:45,840 --> 00:02:52,390

okay that's complete

39
00:02:52,400 --> 00:02:57,910
do we have any other lights now

40
00:03:01,350 --> 00:02:59,830
well the same indications i'm getting

41
00:03:08,710 --> 00:03:01,360
the light keeps coming on about once

42
00:03:19,270 --> 00:03:10,790
did the messages displayed change or do

43
00:03:56,309 --> 00:03:23,670
uh the left window shows uh 17 on

44
00:04:31,030 --> 00:03:58,229
and that's a two decimal zero in slot

45
00:04:35,830 --> 00:04:32,070
okay

46
00:04:42,469 --> 00:04:35,840
os temp light is on pcg verify light tcg

47
00:04:42,479 --> 00:04:45,830
okay copy that

48
00:04:52,990 --> 00:04:49,390
left to right top to bottom 33.6

49
00:04:55,870 --> 00:04:53,000
43.3 34.3

50
00:04:57,749 --> 00:04:55,880
43.9 second row

51
00:05:00,550 --> 00:04:57,759
5.01

52
00:05:01,990 --> 00:05:00,560
that's five point zero one

53
00:05:04,629 --> 00:05:02,000
zero zero eight

54
00:05:05,430 --> 00:05:04,639
three three point eight four four point

55
00:05:07,749 --> 00:05:05,440
two

56
00:05:09,510 --> 00:05:07,759
third row

57
00:05:11,430 --> 00:05:09,520
one one point six

58
00:07:45,430 --> 00:05:11,440
one two zero

59
00:07:49,510 --> 00:07:47,189
this is mission control houston this

60
00:07:51,430 --> 00:07:49,520
view is of a

61
00:07:55,029 --> 00:07:51,440
television that was recorded previously

62
00:07:57,110 --> 00:07:55,039
on board columbia over the past uh

63
00:07:58,950 --> 00:07:57,120

two days that it's been in orbit by the

64
00:08:00,550 --> 00:07:58,960
crew they're playing that back now to

65
00:08:03,029 --> 00:08:00,560
the ground dumping

66
00:08:05,830 --> 00:08:03,039
this video down this video showing the

67
00:08:07,510 --> 00:08:05,840
cargo bay of columbia and the left hand

68
00:08:10,629 --> 00:08:07,520
payload bay door

69
00:08:13,749 --> 00:08:10,639
which has been in that

70
00:08:15,909 --> 00:08:13,759
halfway shut position uh since uh

71
00:08:17,909 --> 00:08:15,919
just a few hours after uh columbia set

72
00:08:19,830 --> 00:08:17,919
up shop on orbit to that halfway open

73
00:08:22,390 --> 00:08:19,840
position is designed to

74
00:08:24,390 --> 00:08:22,400
help further protect colombia from

75
00:08:26,710 --> 00:08:24,400
any possible impacts by orbital debris

76
00:08:29,869 --> 00:08:26,720
that it may encounter in its

77
00:08:32,870 --> 00:08:29,879
fairly low altitude orbit of

78
00:08:35,750 --> 00:08:32,880
145 nautical miles and also its extended

79
00:08:39,670 --> 00:08:35,760
time that will be spent in orbit of 16

80
00:08:43,829 --> 00:08:41,990
this is space lab operations huntsville

81
00:08:46,870 --> 00:08:43,839
payload commander kathy thornton working

82
00:08:49,829 --> 00:08:46,880
the controls of the drop physics module

83
00:08:52,070 --> 00:08:49,839
for the first attempt at deploying an

84
00:08:53,670 --> 00:08:52,080
actual liquid drop in that facility here

85
00:08:55,190 --> 00:08:53,680
on the

86
00:08:57,110 --> 00:08:55,200
during the mission

87
00:08:59,430 --> 00:08:57,120
and as we can see she has the drop

88
00:09:00,870 --> 00:08:59,440

suspended now uh still attached to the

89
00:09:04,870 --> 00:09:00,880
two injector

90
00:09:10,310 --> 00:09:07,030
and this first attempt as we heard a few

91
00:09:12,870 --> 00:09:10,320
minutes ago we'll be using a

92
00:09:14,870 --> 00:09:12,880
four cubic centimeter

93
00:09:19,190 --> 00:09:14,880
drop of liquid

94
00:09:24,389 --> 00:09:21,509
yesterday she was working a fair amount

95
00:09:27,110 --> 00:09:24,399
with the system but using

96
00:09:28,230 --> 00:09:27,120
solid test spheres or calibration

97
00:09:30,550 --> 00:09:28,240
spheres

98
00:09:31,910 --> 00:09:30,560
rather than liquids so

99
00:09:35,110 --> 00:09:31,920
she's proceeding

100
00:09:42,870 --> 00:09:35,120
slowly and carefully here to see if

101
00:09:47,829 --> 00:09:45,110
and uh

102
00:09:50,389 --> 00:09:47,839
kent rominger now uh taking a few photos

103
00:09:51,750 --> 00:09:50,399
of uh payload specialist al sacco who

104
00:09:53,430 --> 00:09:51,760
continues to be

105
00:09:56,870 --> 00:09:53,440
working with his

106
00:09:58,790 --> 00:09:56,880
hands inside the space lab glovebox

107
00:10:01,269 --> 00:09:58,800
he's in a fairly lengthy set of

108
00:10:04,630 --> 00:10:01,279
procedures to

109
00:10:07,190 --> 00:10:04,640
initiate protein crystal growth samples

110
00:10:14,150 --> 00:10:07,990
the

111
00:10:15,670 --> 00:10:14,160
using individualized or customized

112
00:10:19,350 --> 00:10:15,680
startup

113
00:10:21,509 --> 00:10:19,360

procedures for the samples

114
00:10:23,910 --> 00:10:21,519
and we can see two of the payload

115
00:10:25,670 --> 00:10:23,920
general support computers there in the

116
00:10:27,110 --> 00:10:25,680
lower left-hand corner of our current

117
00:10:28,949 --> 00:10:27,120
view

118
00:10:29,829 --> 00:10:28,959
thornton now making an entry on one of

119
00:10:33,190 --> 00:10:29,839
them

120
00:10:36,230 --> 00:10:33,200
and we also see that one of those pgse

121
00:10:43,030 --> 00:10:36,240
laptop computers shows the

122
00:10:43,040 --> 00:11:03,269
a tpr session in about five minutes

123
00:11:08,470 --> 00:11:06,150
this is space lab operations huntsville

124
00:11:10,069 --> 00:11:08,480
and as uh kathy thornton continues to

125
00:11:13,269 --> 00:11:10,079
work with the

126
00:11:16,790 --> 00:11:13,279
drop physics module uh

127
00:11:20,389 --> 00:11:16,800
kent romenger the sts-73 pilot now is in

128
00:11:22,389 --> 00:11:20,399
the module to take a few still photos to

129
00:11:26,069 --> 00:11:22,399
document the operations

130
00:11:30,710 --> 00:11:26,079
uh that's uh typically done uh to

131
00:11:34,949 --> 00:11:32,630
information about

132
00:11:40,069 --> 00:11:34,959
experiment operations during the course

133
00:11:47,990 --> 00:11:43,829
romans are on duty uh has

134
00:11:50,069 --> 00:11:48,000
on the redshift he serves as uh

135
00:11:50,949 --> 00:11:50,079
for the orbiter support functions that

136
00:11:53,110 --> 00:11:50,959
uh

137
00:11:55,750 --> 00:11:53,120
are necessary to provide

138
00:11:57,350 --> 00:11:55,760

the smooth platform that

139
00:12:53,910 --> 00:11:57,360
columbia has been

140
00:12:58,150 --> 00:12:57,030
and we obviously see the change of

141
00:13:00,790 --> 00:12:58,160
parameters

142
00:13:03,910 --> 00:13:00,800
causing uh

143
00:13:07,990 --> 00:13:03,920
some rather wide gyrations of the drop

144
00:13:14,389 --> 00:13:10,310
which thorn will be trying to bring back

145
00:13:14,399 --> 00:13:18,629
further modifying some of the

146
00:13:18,639 --> 00:13:25,990
some of the inputs

147
00:13:26,000 --> 00:13:29,030
when we hear the

148
00:13:29,040 --> 00:13:39,829
instructions about

149
00:13:39,839 --> 00:14:01,430
up

150
00:14:05,750 --> 00:14:03,829
obviously uh there's uh

151
00:14:08,470 --> 00:14:05,760
rather large effects from some of these

152
00:14:10,949 --> 00:14:08,480
changes and uh in understanding

153
00:14:13,670 --> 00:14:10,959
uh what the result is going to be from

154
00:14:14,710 --> 00:14:13,680
particular changes it's a certain amount

155
00:14:18,069 --> 00:14:14,720
of

156
00:14:20,870 --> 00:14:18,079
learning process or trial and error

157
00:14:24,550 --> 00:14:20,880
thornton continuing to try to see if

158
00:14:26,470 --> 00:14:24,560
some adjustments to the

159
00:14:30,550 --> 00:14:26,480
acoustic energy will

160
00:14:32,949 --> 00:14:30,560
get the drop centered up again and

161
00:14:35,269 --> 00:14:32,959
and reduce the

162
00:14:36,949 --> 00:14:35,279
motion

163
00:14:38,710 --> 00:14:36,959

and now she's actually looking inside

164
00:14:40,629 --> 00:14:38,720
the window of the test chamber rather

165
00:14:44,230 --> 00:14:40,639
than seeing the video

166
00:14:57,030 --> 00:14:46,629
since the drop is no longer visible on

167
00:15:02,949 --> 00:14:59,670
this was a drop of water

168
00:15:05,910 --> 00:15:02,959
just distilled water with the only

169
00:15:07,110 --> 00:15:05,920
additive to it being some small plastic

170
00:15:09,189 --> 00:15:07,120
particles

171
00:15:12,230 --> 00:15:09,199
that are suspended in the water

172
00:15:14,550 --> 00:15:12,240
in the case of this particular operation

173
00:15:16,870 --> 00:15:14,560
the the water has those particles in

174
00:15:20,150 --> 00:15:16,880
there for purposes of

175
00:15:22,550 --> 00:15:20,160
watching to see how the water droplet is

176
00:15:25,110 --> 00:15:22,560
rotating

177
00:15:27,430 --> 00:15:25,120
and now we can see she opens the

178
00:15:29,910 --> 00:15:27,440
access door to the

179
00:15:32,069 --> 00:15:29,920
experiment bay

180
00:15:33,910 --> 00:15:32,079
for the drop physics module

181
00:15:36,870 --> 00:15:33,920
and then we'll be

182
00:15:56,629 --> 00:15:36,880
accessing the actual test chamber

183
00:15:56,639 --> 00:16:03,189
two previous drops

184
00:16:09,030 --> 00:16:06,629
were manipulated and

185
00:16:12,310 --> 00:16:09,040
maintained in levitation for quite some

186
00:16:12,320 --> 00:16:15,749
she has now uh

187
00:16:20,069 --> 00:16:18,069
after um

188
00:16:23,509 --> 00:16:20,079

maintaining levitation on this drop for

189
00:16:29,030 --> 00:16:25,030
she is

190
00:16:32,629 --> 00:16:31,670
contact the drop with the injector

191
00:16:34,550 --> 00:16:32,639
needles

192
00:16:36,790 --> 00:16:34,560
and

193
00:16:39,910 --> 00:16:36,800
suck it back into the

194
00:16:39,920 --> 00:17:03,670
system of the drop physics module

195
00:17:07,029 --> 00:17:05,669
and uh we now see

196
00:17:09,429 --> 00:17:07,039
that

197
00:17:14,630 --> 00:17:09,439
kathy no need to reply but dpm says

198
00:17:14,640 --> 00:17:19,189
i'm having a lot of fun doing this

199
00:18:00,710 --> 00:17:20,789
we're having a lot of fun watching it

200
00:18:05,669 --> 00:18:03,590
and it is the flow along this top

201
00:18:07,830 --> 00:18:05,679
surface that scientists are interested

202
00:18:09,350 --> 00:18:07,840
in

203
00:18:11,510 --> 00:18:09,360
there are

204
00:18:14,950 --> 00:18:11,520
what are referred to as thermo capillary

205
00:18:16,870 --> 00:18:14,960
flows that result from the surface

206
00:18:19,750 --> 00:18:16,880
tension driven the surface tension

207
00:18:21,029 --> 00:18:19,760
variation along the surface of this

208
00:18:22,789 --> 00:18:21,039
liquid

209
00:18:25,270 --> 00:18:22,799
and the

210
00:18:28,470 --> 00:18:25,280
motion of these flows

211
00:18:31,510 --> 00:18:28,480
can be manipulated so that

212
00:18:32,630 --> 00:18:31,520
it become it goes from a two-dimensional

213
00:18:37,029 --> 00:18:32,640

flow

214
00:18:38,070 --> 00:18:37,039
this is accomplished by heating the

215
00:18:42,230 --> 00:18:38,080
surface

216
00:18:45,029 --> 00:18:43,669
uh

217
00:18:46,630 --> 00:18:45,039
laser

218
00:18:47,669 --> 00:18:46,640
flux

219
00:18:51,270 --> 00:18:47,679
or

220
00:18:53,669 --> 00:18:51,280
a by heating the internal

221
00:18:54,630 --> 00:18:53,679
center of this fluid by a submerged

222
00:18:57,590 --> 00:18:54,640
heater

223
00:18:59,270 --> 00:18:57,600
this in turn causes

224
00:19:01,909 --> 00:18:59,280
temperature variations across the

225
00:19:04,710 --> 00:19:01,919
surface of the oil and changes

226
00:19:06,870 --> 00:19:04,720
the direction of the flows

227
00:19:08,630 --> 00:19:06,880
changing from a two-dimensional to a

228
00:19:10,789 --> 00:19:08,640
three-dimensional mode

229
00:19:12,950 --> 00:19:10,799
it is this

230
00:19:14,950 --> 00:19:12,960
transition from two-dimensional to

231
00:19:17,110 --> 00:19:14,960
three-dimensional flow that the