1
00:00:40,380 --> 00:00:38,160
from the Kennedy Space Center in Florida

2
00:00:43,049 --> 00:00:40,390
this is space shuttle Columbia launch

3
00:00:45,630 --> 00:00:43,059
control the countdown for launch of

4
00:00:47,310 --> 00:00:45,640
space shuttle Columbia on mission STS 78

5
00:00:49,650 --> 00:00:47,320
is continuing on schedule this morning

6
00:00:52,140 --> 00:00:49,660
the window for launch of Columbia opens

7
00:00:55,640 --> 00:00:52,150
at 10:40 9:00 a.m. Eastern Time and

8
00:00:57,810 --> 00:00:55,650
extends for two and a half hours

9
00:01:01,140 --> 00:00:57,820
situated in Columbia's payload Bay is

10
00:01:03,569 --> 00:01:01,150
the life and microgravity Space Lab LMS

11
00:01:05,490 --> 00:01:03,579
is housing about 43 various experiments

12
00:01:08,249 --> 00:01:05,500
involving life sciences and material

13
00:01:10,080 --> 00:01:08,259

sciences the LMS mission will seek

14
00:01:12,270 --> 00:01:10,090
answers to questions about our ability

15
00:01:14,430 --> 00:01:12,280
to sustain life for prolonged periods of

16
00:01:16,260 --> 00:01:14,440
time and space and about the subtle

17
00:01:18,420 --> 00:01:16,270
mechanisms involved in materials

18
00:01:21,480 --> 00:01:18,430
processing that are obscured by Earth's

19
00:01:23,100 --> 00:01:21,490
gravity LMS will continue to expand the

20
00:01:24,660 --> 00:01:23,110
foundation of scientific research by

21
00:01:27,330 --> 00:01:24,670
studying the effects of microgravity on

22
00:01:31,950 --> 00:01:27,340
the physiology development and behavior

23
00:01:34,940 --> 00:01:31,960
of living systems this is shuttle launch

24
00:01:37,680 --> 00:01:34,950
control at t-minus 3 hours and holding

25
00:01:40,770 --> 00:01:37,690
we are currently standing by to receive

26
00:01:42,499 --> 00:01:40,780
live television of the astronauts and

27
00:01:45,020 --> 00:01:42,509
the operations and check-out building

28
00:01:55,590 --> 00:01:45,030
where their crew quarters are stationed

29
00:02:00,039 --> 00:01:58,060
the crew members are being assisted with

30
00:02:02,440 --> 00:02:00,049
their launch and entry suits by suit

31
00:02:04,840 --> 00:02:02,450
technicians from both KSC and from the

32
00:02:07,480 --> 00:02:04,850
Johnson Space Center this is a good view

33
00:02:10,630 --> 00:02:07,490
of our commander Tom Hendrix who was on

34
00:02:14,380 --> 00:02:10,640
his fourth spaceflight he served as

35
00:02:21,160 --> 00:02:14,390
pilot for both STS 44 in STS 55 and as

36
00:02:29,400 --> 00:02:21,170
commander of sts-7 T our pilot Kevin

37
00:02:36,850 --> 00:02:33,400
jean-jacques 5ea is a member of the

38
00:02:38,979 --> 00:02:36,860

french space agency he is one of our

39
00:02:42,330 --> 00:02:38,989
payload specialists or and will be

40
00:02:45,759 --> 00:02:42,340
making his first trip into space today

41
00:02:48,789 --> 00:02:45,769
Susan Helms is the only female aboard

42
00:02:52,390 --> 00:02:48,799
the vehicle that will be flying today

43
00:02:55,180 --> 00:02:52,400
and she of course is a veteran flier she

44
00:02:57,479 --> 00:02:55,190
has flown in 30 different types of

45
00:03:00,129 --> 00:02:57,489
aircraft being named an astronaut in

46
00:03:07,420 --> 00:03:00,139
1990 she has already flown two missions

47
00:03:12,780 --> 00:03:07,430
STS 54 in STS 64 mission specialist one

48
00:03:19,240 --> 00:03:17,410
and another mission specialists Charles

49
00:03:21,539 --> 00:03:19,250
Brady again on his first flight as well

50
00:03:27,309 --> 00:03:21,549
is giving a thumbs-up that he too is

51
00:03:29,740 --> 00:03:27,319
ready and anxious to go and the final

52
00:03:32,740 --> 00:03:29,750
member of our seven-person crew is

53
00:03:36,640 --> 00:03:32,750
robert brent Thirsk representing the

54
00:03:40,120 --> 00:03:36,650
Canadian Space Agency he is a medical

55
00:03:45,849 --> 00:03:40,130
doctor he was an alternate payload

56
00:03:47,920 --> 00:03:45,859
specialist for STS 41 G and in 1993 and

57
00:03:56,200 --> 00:03:47,930
94 he was the Canadian Space Agency's

58
00:04:00,700 --> 00:03:57,970
this is shuttle launch control at

59
00:04:02,530 --> 00:04:00,710
t-minus three hours and holding and we

60
00:04:05,230 --> 00:04:02,540
are just about 14 seconds or so away

61
00:04:08,050 --> 00:04:05,240
from picking up our hold this has been a

62
00:04:10,210 --> 00:04:08,060
standard two hour hold that follows

63
00:04:14,020 --> 00:04:10,220

tanking operations just to give the

64
00:04:15,670 --> 00:04:14,030
launch team any extra time to make final

65
00:04:18,790 --> 00:04:15,680
preparations before the crew arrives out

66
00:04:21,910 --> 00:04:18,800
at the pad and we are at t-minus 3 hours

67
00:04:23,650 --> 00:04:21,920
and Counting everything continues to go

68
00:04:25,510 --> 00:04:23,660
on schedule for launch of space shuttle

69
00:04:30,930 --> 00:04:25,520
Columbia from pad 39b

70
00:04:35,880 --> 00:04:33,540
and here we have them our commander Tom

71
00:04:38,940 --> 00:04:35,890
Hendricks mission specialist Susan Combs

72
00:04:42,290 --> 00:04:38,950
followed by pilot Kevin regal Richard

73
00:05:01,300 --> 00:04:42,300
Linehan Charles Brady jean-jacques 5ei

74
00:05:06,540 --> 00:05:03,700
you know we have pictures of the Astro

75
00:05:10,420 --> 00:05:06,550
van and the crew departing the van is

76
00:05:12,220 --> 00:05:10,430
there now at the pad surface NASA test

77
00:05:14,260 --> 00:05:12,230
director John Guidi has given an

78
00:05:15,640 --> 00:05:14,270
approval for the crew to begin entry

79
00:05:17,590 --> 00:05:15,650
into the vehicle once they make their

80
00:05:24,070 --> 00:05:17,600
way up the elevator to the 195-foot

81
00:05:25,960 --> 00:05:24,080
level and we have views of the crew as

82
00:05:29,110 --> 00:05:25,970
they are exiting the elevator on the

83
00:05:30,340 --> 00:05:29,120
195-foot level in the background of

84
00:05:32,500 --> 00:05:30,350
course is the swingarm

85
00:05:35,110 --> 00:05:32,510
that the crew will walk across the

86
00:05:59,140 --> 00:05:35,120
orbiter access arm that will gain them

87
00:06:03,850 --> 00:06:01,930
as the crew is preparing to enter the

88
00:06:06,370 --> 00:06:03,860

orbiter astronaut support personnel have

89
00:06:09,130 --> 00:06:06,380
mounted into crew module a small camera

90
00:06:11,020 --> 00:06:09,140
that will allow us to see live pictures

91
00:06:13,540 --> 00:06:11,030
of the crew being seated in Columbia

92
00:06:15,910 --> 00:06:13,550
this is the first time NASA TV has shown

93
00:06:17,860 --> 00:06:15,920
live pictures of this event and to

94
00:06:20,620 --> 00:06:17,870
assist with the commentary of these new

95
00:06:22,660 --> 00:06:20,630
views astronaut Marsha Ivins is joining

96
00:06:25,990 --> 00:06:22,670
us to describe the events as they occur

97
00:06:29,590 --> 00:06:26,000
welcome Marcia thanks astronaut support

98
00:06:32,380 --> 00:06:29,600
personnel is assisting as Tom Hendricks

99
00:06:33,430 --> 00:06:32,390
comes in holding his head so it doesn't

100
00:06:35,830 --> 00:06:33,440
bump into anything

101
00:06:38,440 --> 00:06:35,840
Tom's now standing on the ms2 seat he's

102
00:06:40,930 --> 00:06:38,450
holding on to a handhold above the

103
00:06:43,780 --> 00:06:40,940
forward window and now he'll pull

104
00:06:45,610 --> 00:06:43,790
himself up after he gets himself unstuck

105
00:06:48,160 --> 00:06:45,620
here pull himself up into the seat as

106
00:06:50,560 --> 00:06:48,170
they hold the parachute down you see the

107
00:06:53,440 --> 00:06:50,570
big bottles on the back of the of his

108
00:06:55,600 --> 00:06:53,450
harness you need to get those centered

109
00:06:57,220 --> 00:06:55,610
exactly right on the parachute so that

110
00:06:58,870 --> 00:06:57,230
it's comfortable when you're sitting in

111
00:07:02,320 --> 00:06:58,880
their headrests back down on the seat

112
00:07:04,390 --> 00:07:02,330
now now the suit tech al Rochford will

113
00:07:07,420 --> 00:07:04,400

start to adjust the straps on his

114
00:07:10,570 --> 00:07:07,430
harness so that he's pulled down and

115
00:07:12,730 --> 00:07:10,580
comfortable in the seat and then they'll

116
00:07:14,410 --> 00:07:12,740
start connecting the parachute and the

117
00:07:17,200 --> 00:07:14,420
shoulder harnesses to them we ask the

118
00:07:24,310 --> 00:07:17,210
crew to just lie there and and be a

119
00:07:28,290 --> 00:07:24,320
vegetable while we strap them in you can

120
00:07:30,760 --> 00:07:28,300
see al Scott Kevin's helmet kicked the

121
00:07:33,040 --> 00:07:30,770
headrest back and Kevin to lift his head

122
00:07:34,690 --> 00:07:33,050
up you can see the little comm pick tail

123
00:07:44,740 --> 00:07:34,700
hanging out of the back and now we'll

124
00:07:45,880 --> 00:07:44,750
fish his hand in there to get it Marcia

125
00:07:52,140 --> 00:07:45,890
can you tell us what we're looking at at

126
00:07:54,640 --> 00:07:52,150
this point we're in the mid-deck now and

127
00:07:57,790 --> 00:07:54,650
max Candler who's the suit tech and he

128
00:08:02,380 --> 00:07:57,800
is strapping in Chuck Brady who's

129
00:08:05,770 --> 00:08:02,390
sitting in the MS 3 seat sitting in

130
00:08:06,460 --> 00:08:05,780
front of Chuck and the rest of the guys

131
00:08:08,770 --> 00:08:06,470
on the mid-deck

132
00:08:10,420 --> 00:08:08,780
is the whole row of our wall of lockers

133
00:08:12,500 --> 00:08:10,430
that has all the stuff in it that were

134
00:08:16,760 --> 00:08:12,510
taken to space Mack

135
00:08:22,040 --> 00:08:16,770
got his parachute on the harness and

136
00:08:23,630 --> 00:08:22,050
looks like he's got the seatbelt on and

137
00:08:29,660 --> 00:08:23,640
we have another view of the flight deck

138
00:08:31,610 --> 00:08:29,670

with the ground launch sequencer

139
00:08:33,710 --> 00:08:31,620
mainline computer program has been

140
00:08:40,750 --> 00:08:33,720
active and it is now processing all

141
00:08:45,620 --> 00:08:40,760
pertinent data you're cleared to launch

142
00:08:49,580 --> 00:08:45,630
copy that and Columbia you guys have a

143
00:08:57,740 --> 00:08:49,590
good mission and we'll be back here in a

144
00:08:59,330 --> 00:08:57,750
little over two weeks thanks Jeff we got

145
00:09:01,340 --> 00:08:59,340
a crew here that's ready to go and I saw

146
00:09:03,500 --> 00:09:01,350
the professionals here at the Cape we're

147
00:09:05,560 --> 00:09:03,510
ready to work with JSC during launch and

148
00:09:08,180 --> 00:09:05,570
that the rest of the day we're ready to

149
00:09:11,090 --> 00:09:08,190
go clear to work with folks at the

150
00:09:12,230 --> 00:09:11,100
Marshall Space Flight Center and we're

151
00:09:15,740 --> 00:09:12,240
just about ten seconds away from

152
00:09:21,860 --> 00:09:15,750
resuming on the countdown for the launch

153
00:09:24,200 --> 00:09:21,870
a space shuttle Columbia today and we're

154
00:09:25,580 --> 00:09:24,210
at t-minus nine minutes and Counting and

155
00:09:27,830 --> 00:09:25,590
the ground launch sequencer have been

156
00:09:29,060 --> 00:09:27,840
initiated it NASA test director John

157
00:09:30,380 --> 00:09:29,070
Guidi is about to call for the

158
00:09:33,170 --> 00:09:30,390
transmittal of stored pre-launch

159
00:09:34,730 --> 00:09:33,180
commands as Columbia is less than nine

160
00:09:35,930 --> 00:09:34,740
minutes away from beginning a two and a

161
00:09:37,940 --> 00:09:35,940
half week mission of life and

162
00:09:40,010 --> 00:09:37,950
microgravity experiments taking full

163
00:09:43,490 --> 00:09:40,020

scientific advantage of the effects of

164
00:09:45,470 --> 00:09:43,500
microgravity in space coming up next

165
00:09:47,660 --> 00:09:45,480
will be the orbiter access arm being

166
00:09:49,490 --> 00:09:47,670
retracted away from the vehicle this is

167
00:09:51,920 --> 00:09:49,500
the walkway used by the crew to gain

168
00:09:53,180 --> 00:09:51,930
entry into and out of the vehicle and it

169
00:10:00,500 --> 00:09:53,190
can be returned to position within

170
00:10:05,130 --> 00:10:04,140
and we see first motion of the Oh a a

171
00:10:28,590 --> 00:10:05,140
retract

172
00:10:34,680 --> 00:10:32,610
t-minus seven minutes and Counting and

173
00:10:36,300 --> 00:10:34,690
the gaseous oxygen vent hood is slowly

174
00:10:39,480 --> 00:10:36,310
being retracted away from the top of the

175
00:10:41,550 --> 00:10:39,490
external tank inside this tank is about

176
00:10:43,380 --> 00:10:41,560
500,000 gallons and super cold liquid

177
00:10:53,400 --> 00:10:43,390
fuels that run the overboost three main

178
00:10:59,340 --> 00:10:57,270
- OH - so semaj divisors and a nifty 802

179
00:11:15,750 --> 00:10:59,350
flow have a great flight and have more

180
00:11:16,950 --> 00:11:15,760
fun than a barrel of when we have a go

181
00:11:18,720 --> 00:11:16,960
for autosequence start

182
00:11:19,980 --> 00:11:18,730
Columbia's onboard computers have

183
00:11:29,100 --> 00:11:19,990
primary control of all the vehicles

184
00:11:31,840 --> 00:11:29,110
critical function 10 - 20 seconds 15 -

185
00:11:45,280 --> 00:11:37,330
12 11 8 we have a go for main engine

186
00:11:47,020 --> 00:11:45,290
start 5 4 3 2 1 and we have liftoff of

187
00:11:48,520 --> 00:11:47,030
the space shuttle Columbia on an

188
00:11:51,150 --> 00:11:48,530

international life science and

189
00:11:53,260 --> 00:11:51,160
microgravity mission

190
00:12:00,760 --> 00:11:53,270
Houston now controlling the flight of

191
00:12:02,380 --> 00:12:00,770
Columbia Columbia completes the roll to

192
00:12:03,760 --> 00:12:02,390
place the shuttle in a heads-down wings

193
00:12:09,220 --> 00:12:03,770
level position for the eight and a half

194
00:12:11,320 --> 00:12:09,230
minute ride to orbit 23 seconds into the

195
00:12:12,910 --> 00:12:11,330
flight 1b is three liquid fuel main

196
00:12:15,010 --> 00:12:12,920
engines will soon begin to throttle back

197
00:12:17,020 --> 00:12:15,020
in a three-step fashion to sixty-seven

198
00:12:18,340 --> 00:12:17,030
percent of rated performance that will

199
00:12:19,960 --> 00:12:18,350
dampen the stress on the shuttles

200
00:12:29,139 --> 00:12:19,970
aerosurfaces as it breaks through the

201
00:12:34,759 --> 00:12:31,970
one minute 45 seconds into the flight

202
00:12:36,710 --> 00:12:34,769
Columbia traveling at 2400 miles per

203
00:12:38,629 --> 00:12:36,720
hour more than 18 miles downrange from

204
00:12:39,949 --> 00:12:38,639
the Kennedy Space Center 22 miles in

205
00:12:44,660 --> 00:12:39,959
altitude all systems functioning

206
00:12:46,670 --> 00:12:44,670
normally booster officer here in Mission

207
00:12:48,379 --> 00:12:46,680
Control standing by for solid rocket

208
00:13:00,540 --> 00:12:48,389
booster shut down in separation about

209
00:13:04,680 --> 00:13:02,910
booster officer confirms a normal solid

210
00:13:12,740 --> 00:13:04,690
rocket booster separation standing by

211
00:13:30,830 --> 00:13:15,240
we're with you join engine start it's a

212
00:13:35,950 --> 00:13:32,900
and obviously this is a silent version

213
00:13:38,240 --> 00:13:35,960

so we'll try to let the gaps

214
00:13:42,590 --> 00:13:38,250
how'd your any narration you can provide

215
00:13:44,720 --> 00:13:42,600
it'd be great okay obviously I looked

216
00:13:48,110 --> 00:13:44,730
out the window just during the roll

217
00:13:50,870 --> 00:13:48,120
program there and our obviously first

218
00:14:13,000 --> 00:13:50,880
stage pretty bumpy ride and he could

219
00:14:16,750 --> 00:14:15,160
and with that for a cloud deck there I

220
00:14:25,000 --> 00:14:16,760
glanced out the window to see the high

221
00:14:30,519 --> 00:14:25,010
cirrus Becca by Tom it sure does show

222
00:14:32,379 --> 00:14:30,529
the rough rides of the solids yeah you

223
00:15:04,930 --> 00:14:32,389
all know it's playing impressive right

224
00:15:04,940 --> 00:15:18,000
there's a tail off of the SRBs

225
00:15:18,010 --> 00:15:50,370
and there's a flashing SRB Sep

226
00:15:54,450 --> 00:15:52,500
and the sky was dark but we could still

227
00:16:03,810 --> 00:15:54,460
sit here and out the side windows after

228
00:16:10,860 --> 00:16:03,820
SRB Sep and opening the visors that's

229
00:16:12,510 --> 00:16:10,870
why we have tethers sure shows where the

230
00:16:34,030 --> 00:16:12,520
blond hair assemblies the only surprise

231
00:16:38,890 --> 00:16:36,040
and you'll see a few reflections of the

232
00:16:41,170 --> 00:16:38,900
forward RCS button RCS Jets firing

233
00:16:49,630 --> 00:16:41,180
during 80 SEP and of course we did the

234
00:16:51,400 --> 00:16:49,640
11 second plus X after the 7 we see you

235
00:16:53,050 --> 00:16:51,410
doing that now Tom and that's a lot of

236
00:16:55,090 --> 00:16:53,060
people real happy to see that video it's

237
00:16:59,590 --> 00:16:55,100
sure to show you coming back off your

238
00:17:18,130 --> 00:16:59,600

chairs after the 3G real nice so we're

239
00:17:23,740 --> 00:17:21,759
hey Chris I think less there Marsha

240
00:17:25,960 --> 00:17:23,750
Ivins some of the other folks that spent

241
00:17:28,449 --> 00:17:25,970
a lot of time making this available to

242
00:17:30,340 --> 00:17:28,459
try and bring another token of the

243
00:17:34,570 --> 00:17:30,350
cockpit with us it's just a fantastic

244
00:17:36,430 --> 00:17:34,580
experience to hear Tom we agree and we

245
00:17:37,990 --> 00:17:36,440
really appreciated the in-cabin video

246
00:17:40,060 --> 00:17:38,000
during the strapping as well and let's

247
00:17:41,470 --> 00:17:40,070
folks see what you what you did to get

248
00:17:43,149 --> 00:17:41,480
to space and what the ride looked like

249
00:17:48,909 --> 00:17:43,159
and I'm sure those people are listening

250
00:17:50,379 --> 00:17:48,919
now and happy to go along with you and

251
00:17:52,090 --> 00:17:50,389
you didn't call me you should see

252
00:17:57,750 --> 00:17:52,100
another one of Lockheed Martin's tanks

253
00:18:05,700 --> 00:18:00,279
like that wash I verify a good

254
00:18:07,590 --> 00:18:05,710
horizontal sit also thank you in minutes

255
00:18:12,909 --> 00:18:07,600
it wasn't it

256
00:18:16,240 --> 00:18:12,919
CC oh no I don't go pop so in C go back

257
00:18:21,070 --> 00:18:16,250
single row he comes go si yo go payload

258
00:18:24,610 --> 00:18:21,080
so EPS we're go in Co so booster no

259
00:18:26,769 --> 00:18:24,620
surgeon go thank you

260
00:18:29,409 --> 00:18:26,779
and weather gave me a go obscene

261
00:18:32,200 --> 00:18:29,419
forecast if all three sides KSC Edwards

262
00:18:34,899 --> 00:18:32,210
and Ben career so fight oh that's all

263
00:18:50,850 --> 00:18:34,909

what's required two days correct right

264
00:18:56,610 --> 00:18:53,490
copy hell are these utilities go anta

265
00:18:58,860 --> 00:18:56,620
thorough range clear to launch

266
00:19:00,210 --> 00:18:58,870
copy SRO launch director entity your

267
00:19:02,700 --> 00:19:00,220
launch team is ready proceed

268
00:19:31,890 --> 00:19:02,710
copy that I've run a poll in the past

269
00:19:31,900 --> 00:19:45,239
Houston companies in a roll program

270
00:20:03,030 --> 00:19:52,950
not elaborate 104 lotty calm good fast

271
00:20:07,080 --> 00:20:05,400
team status as we press onto a checklist

272
00:20:08,370 --> 00:20:07,090
slide you come go ahead

273
00:20:10,380 --> 00:20:08,380
yes sir he has done fess and he to

274
00:20:11,120 --> 00:20:10,390
reconfig and a sin checklist thank you

275
00:20:15,870 --> 00:20:11,130
sir

276
00:20:18,420 --> 00:20:15,880
handy let's see prop line discipline I

277
00:20:22,020 --> 00:20:18,430
just want to make sure that the injector

278
00:20:51,020 --> 00:20:22,030
temps on your left jets that are on FA

279
00:20:55,580 --> 00:20:53,270
okay you can see a Rick and Chuck with

280
00:20:57,110 --> 00:20:55,590
the cameras is hard work and Susan

281
00:21:00,800 --> 00:20:57,120
sorting out some of the others things

282
00:21:03,350 --> 00:21:00,810
are on the mid-deck we've got most of

283
00:21:05,630 --> 00:21:03,360
the crew out of their helmets folks on

284
00:21:25,310 --> 00:21:05,640
the mid-deck are really busy getting

285
00:21:33,060 --> 00:21:27,990
Houston should see Athena's with Kevin

286
00:21:40,680 --> 00:21:33,070
in the left Roger we're looking at it

287
00:21:44,970 --> 00:21:40,690
now it's a good picture and here you can

288
00:21:47,820 --> 00:21:44,980

see Rick adapted to zero-g but Kevin had

289
00:21:49,710 --> 00:21:47,830
failed to real add to the floor so give

290
00:22:05,450 --> 00:21:49,720
Rick a task during his adaptation in the

291
00:22:11,150 --> 00:22:07,790
and they're coming to the tunnel now is

292
00:22:34,340 --> 00:22:11,160
Bob Thirsk and he's already wired up

293
00:22:38,000 --> 00:22:36,380
on the left side of the picture and the

294
00:22:41,870 --> 00:22:38,010
red and white striped shirt is payload

295
00:22:43,940 --> 00:22:41,880
commander Susan Helms and near the the

296
00:22:45,950 --> 00:22:43,950
tunnel at the rear of the picture

297
00:22:47,480 --> 00:22:45,960
connecting the space lab to the rest of

298
00:22:50,210 --> 00:22:47,490
the orbiters crew cabin area

299
00:22:53,750 --> 00:22:50,220
mission specialist Rick Linehan a white

300
00:22:55,490 --> 00:22:53,760
shirt adorns jean-jacques 5e a the

301
00:22:57,799 --> 00:22:55,500
French payload specialist with Canadian

302
00:23:03,850 --> 00:22:57,809
payload specialist Bob Thirsk in the

303
00:23:10,100 --> 00:23:07,940
it's a microgravity transmission I'm

304
00:23:12,169 --> 00:23:10,110
back in the Space Lab module at the

305
00:23:14,270 --> 00:23:12,179
moment in behind me you can see some of

306
00:23:16,789 --> 00:23:14,280
the crew members working on the

307
00:23:18,350 --> 00:23:16,799
experiments that we will be conducting

308
00:23:20,419 --> 00:23:18,360
today and over the next several days

309
00:23:23,690 --> 00:23:20,429
before we return July 7th

310
00:23:27,460 --> 00:23:23,700
these are microgravity experiments can

311
00:23:30,740 --> 00:23:27,470
you explain what that means to all of us

312
00:23:32,690 --> 00:23:30,750
well there is pretty much 50/50 when we

313
00:23:34,640 --> 00:23:32,700

call life science and microgravity

314
00:23:36,950 --> 00:23:34,650
Sciences the other half the life science

315
00:23:38,870 --> 00:23:36,960
is a study on the effects of the human

316
00:23:41,750 --> 00:23:38,880
body being exposed to this environment

317
00:23:45,680 --> 00:23:41,760
and behind me you can see dr. Bob Thirsk

318
00:23:48,680 --> 00:23:45,690
is one of the experiments which is what

319
00:23:50,899 --> 00:23:48,690
we termed the like wrestling machine he

320
00:23:53,830 --> 00:23:50,909
is testing his muscle strength and

321
00:23:56,950 --> 00:23:53,840
helping him as dr. Rick went ahead and

322
00:24:00,289 --> 00:23:56,960
we also a conducting simultaneously

323
00:24:02,990 --> 00:24:00,299
furnace operations and bubble drop

324
00:24:06,260 --> 00:24:03,000
operations to see how materials operate

325
00:24:10,640 --> 00:24:06,270
at microgravity so it's both material

326
00:24:12,740 --> 00:24:10,650
and what we call human spaceman what is

327
00:24:15,860 --> 00:24:12,750
interesting to dr. what is that

328
00:24:18,350 --> 00:24:15,870
astronauts tend to inadvertently develop

329
00:24:19,850 --> 00:24:18,360
a torso rotation motor strategy as well

330
00:24:22,610 --> 00:24:19,860
during the first couple of days of

331
00:24:24,649 --> 00:24:22,620
spaceflight and we probably do this to

332
00:24:26,590 --> 00:24:24,659
try to minimize our symptoms of motion

333
00:24:30,320 --> 00:24:26,600
sickness but in fact we might be

334
00:24:32,899 --> 00:24:30,330
exacerbating the symptoms the doctor

335
00:24:34,760 --> 00:24:32,909
what torso rotation experiment study on

336
00:24:37,460 --> 00:24:34,770
the life and microgravity Spacelab

337
00:24:39,950 --> 00:24:37,470
mission we're going to be measuring our

338
00:24:43,210 --> 00:24:39,960

eye movements with special electrodes

339
00:24:47,140 --> 00:24:43,220
that we apply to our face

340
00:24:52,660 --> 00:24:47,150
the special velocity rate center that we

341
00:24:55,140 --> 00:24:52,670
rigidly fixed to the top of our head it

342
00:24:57,700 --> 00:24:55,150
also will be measuring our torso

343
00:24:59,890 --> 00:24:57,710
movements as well with the special

344
00:25:05,440 --> 00:24:59,900
backpack accelerometer which is fixed to

345
00:25:06,940 --> 00:25:05,450
our back after the flight is over doctor

346
00:25:09,160 --> 00:25:06,950
what is going to compare our eye

347
00:25:11,020 --> 00:25:09,170
movements to our head movements and our

348
00:25:12,730 --> 00:25:11,030
head movements to our chest movements

349
00:25:15,220 --> 00:25:12,740
and he'll be looking for any evidence

350
00:25:17,050 --> 00:25:15,230
that we might have adopted some torso

351
00:25:19,270 --> 00:25:17,060
rotation motor strategy during this

352
00:25:21,040 --> 00:25:19,280
flight we'll be doing this experiment

353
00:25:23,320 --> 00:25:21,050
was early in the mission we've already

354
00:25:25,420 --> 00:25:23,330
done it exactly towards the middle of

355
00:25:28,000 --> 00:25:25,430
the flight in a couple of days and again

356
00:25:31,150 --> 00:25:28,010
towards the last day or two of the space

357
00:25:33,400 --> 00:25:31,160
mission if it turns out in fact that

358
00:25:35,740 --> 00:25:33,410
we'd have a doctor torso rotation motor

359
00:25:37,690 --> 00:25:35,750
strategy during the flight which might

360
00:25:39,640 --> 00:25:37,700
cause symptoms of motion sickness it'll

361
00:25:41,950 --> 00:25:39,650
be relatively easy to train future

362
00:25:46,210 --> 00:25:41,960
astronauts to avoid this type of motor

363
00:25:48,340 --> 00:25:46,220

strategy or to pre adapt them to the a

364
00:26:27,290 --> 00:25:48,350
typical movement environment on in a

365
00:26:33,530 --> 00:26:30,920
welcome aboard Columbia in SPS 78b life

366
00:26:36,380 --> 00:26:33,540
sciences a microgravity Space Lab LMS

367
00:26:39,290 --> 00:26:36,390
for short my name is Rick went ahead and

368
00:26:41,960 --> 00:26:39,300
I am the MS for the flight and this is a

369
00:26:44,300 --> 00:26:41,970
ski for astronaut lung function

370
00:26:47,240 --> 00:26:44,310
experiment now Alfie is the brainchild

371
00:26:50,000 --> 00:26:47,250
of dr. John West and Elliott and Kym

372
00:26:52,820 --> 00:26:50,010
frisk from UCSD University of California

373
00:26:54,830 --> 00:26:52,830
San Diego and it is designed to measure

374
00:26:57,500 --> 00:26:54,840
the physiological processes of gas

375
00:27:00,710 --> 00:26:57,510
exchange in the universe on earth and

376
00:27:03,200 --> 00:27:00,720
it's pace or freefall now there are

377
00:27:06,260 --> 00:27:03,210
discreet differences which will occur in

378
00:27:08,150 --> 00:27:06,270
space and there are four payload crew

379
00:27:10,250 --> 00:27:08,160
members who are participating as well as

380
00:27:13,040 --> 00:27:10,260
your crew members in out the experiments

381
00:27:15,290 --> 00:27:13,050
throughout the 17 day LMS flight and

382
00:27:17,960 --> 00:27:15,300
what we hope to ascertain from these

383
00:27:20,990 --> 00:27:17,970
experiments is how the gas flow rate in

384
00:27:23,510 --> 00:27:21,000
the law changes due to microgravity or

385
00:27:28,010 --> 00:27:23,520
freefall in terms of how gas dissipates

386
00:27:29,720 --> 00:27:28,020
or aligns itself in the long now when we

387
00:27:30,550 --> 00:27:29,730
learn things like this we able to

388
00:27:33,110 --> 00:27:30,560

predict

389
00:27:36,020 --> 00:27:33,120
horrible one will function obviously in

390
00:27:38,660 --> 00:27:36,030
space and we can use that knowledge to

391
00:27:40,970 --> 00:27:38,670
determine how things should function on

392
00:27:43,040 --> 00:27:40,980
the ground and with this information we

393
00:27:46,130 --> 00:27:43,050
can also hope to understand various

394
00:27:48,350 --> 00:27:46,140
biological processes which occur in the

395
00:27:50,300 --> 00:27:48,360
human lungs so different diseases that

396
00:27:52,730 --> 00:27:50,310
we might be able to study when we have

397
00:27:54,710 --> 00:27:52,740
better controls it additionally we'll

398
00:27:56,470 --> 00:27:54,720
use this information for long term stays

399
00:27:58,850 --> 00:27:56,480
in space on the space station and

400
00:28:00,710 --> 00:27:58,860
hopefully a long-duration spaceflight

401
00:28:03,500 --> 00:28:00,720
maybe one day to colonize the planets

402
00:28:05,900 --> 00:28:03,510
all this information will be put to use

403
00:28:09,250 --> 00:28:05,910
in one way or the other for long term

404
00:28:12,200 --> 00:28:09,260
space flight and stays on space now this

405
00:28:15,200 --> 00:28:12,210
rather debonair suit that I'm wearing is

406
00:28:18,140 --> 00:28:15,210
now called the Clarke 1 mod of the RIP

407
00:28:20,120 --> 00:28:18,150
suit and rip basically it's a

408
00:28:22,610 --> 00:28:20,130
respiratory plasmid the gravity suit

409
00:28:24,650 --> 00:28:22,620
which will measure our ribcage and

410
00:28:27,710 --> 00:28:24,660
abdomen contractions and expansions

411
00:28:29,660 --> 00:28:27,720
while we breathe and this is measured

412
00:28:32,450 --> 00:28:29,670
over on our alpha ket here

413
00:28:35,360 --> 00:28:32,460

and with that signal that is rotted to

414
00:28:37,430 --> 00:28:35,370
the ground the P is dr. Elliott dr. West

415
00:28:40,850 --> 00:28:37,440
and dr. pris we're able to determine

416
00:28:44,269 --> 00:28:40,860
differences in how we expand our chest

417
00:28:46,789 --> 00:28:44,279
function in space when we breathe it's a

418
00:28:50,240 --> 00:28:46,799
very very important experiment and were

419
00:28:52,880 --> 00:28:50,250
the best experiments I believe to fly on

420
00:28:55,250 --> 00:28:52,890
the SLS series flights we're going to

421
00:28:57,830 --> 00:28:55,260
get along good there from it and I'm

422
00:29:43,830 --> 00:28:57,840
really excited to be able to participate

423
00:29:47,790 --> 00:29:46,320
hey good morning I'm Charles Brady from

424
00:29:50,070 --> 00:29:47,800
the space shuttle Columbia mission

425
00:29:52,110 --> 00:29:50,080
specialist number three them standing in

426
00:29:52,830 --> 00:29:52,120
front of today an experiment developed

427
00:29:56,100 --> 00:29:52,840
by dr. Richie

428
00:29:58,500 --> 00:29:56,110
Edgerton at UCLA laboratories it

429
00:30:01,350 --> 00:29:58,510
involves measuring arm wrist and hand

430
00:30:03,480 --> 00:30:01,360
strength it is well known that in space

431
00:30:06,210 --> 00:30:03,490
over launched at the time our muscles

432
00:30:08,070 --> 00:30:06,220
and our bodies go weaker it's filling

433
00:30:11,880 --> 00:30:08,080
Everett at the hand and wrist and arm

434
00:30:14,160 --> 00:30:11,890
muscles stay essentially the same you're

435
00:30:17,070 --> 00:30:14,170
aboard Columbia myself and my crewmates

436
00:30:19,830 --> 00:30:17,080
are gonna accurately measure exactly

437
00:30:22,320 --> 00:30:19,840
whether or not this is true this device

438
00:30:24,510 --> 00:30:22,330

I have in my hand right here accurately

439
00:30:26,670 --> 00:30:24,520
measures our hands wrist and arm

440
00:30:30,510 --> 00:30:26,680
strength it's pointed out on the graph

441
00:30:33,780 --> 00:30:30,520
here and given a a curve which we can

442
00:30:37,020 --> 00:30:33,790
exactly duplicate over time we measure

443
00:30:39,900 --> 00:30:37,030
this pre-flight and four times in flight

444
00:30:42,180 --> 00:30:39,910
and post-flight basically involves

445
00:30:44,640 --> 00:30:42,190
grabbing the hand grip dynamometer

446
00:30:46,500 --> 00:30:44,650
and squeezing in various levels of

447
00:30:49,740 --> 00:30:46,510
contraction ranging from 10 to 100

448
00:30:51,750 --> 00:30:49,750
percent visual later plotted out on

449
00:30:54,330 --> 00:30:51,760
curves that were asked to follow in

450
00:30:56,940 --> 00:30:54,340
graphs as spike and were asked to trace

451
00:30:59,310 --> 00:30:56,950
these this will give dr. Edgerton and

452
00:31:01,770 --> 00:30:59,320
his assistants all the data that they

453
00:31:03,890 --> 00:31:01,780
need to actually measure whether or not

454
00:31:06,890 --> 00:31:03,900
the muscles and our wrists and arms

455
00:31:09,000 --> 00:31:06,900
continue to stay the same or grow weaker

456
00:31:11,100 --> 00:31:09,010
thanks for joining us aboard space

457
00:31:13,770 --> 00:31:11,110
shuttle Columbia today and we'll be

458
00:31:15,360 --> 00:31:13,780
continuing with some examples of muscle

459
00:32:35,660 --> 00:31:15,370
and ball experiments in the succeeding

460
00:32:40,400 --> 00:32:38,630
that's off lab while we're here can we

461
00:32:48,110 --> 00:32:40,410
get an early start on putting in the

462
00:32:55,990 --> 00:32:48,120
next cartridge stand by one Susan will

463
00:33:02,000 --> 00:32:56,000

check for you we'll stay smart Ralphie

464
00:33:04,040 --> 00:33:02,010
ignore each Luca out that Kate coverage

465
00:33:05,930 --> 00:33:04,050
looking awesome would you like me to try

466
00:33:09,980 --> 00:33:05,940
and start that verification on the rip

467
00:33:12,980 --> 00:33:09,990
and I'm sure my team Eric you can

468
00:33:15,320 --> 00:33:12,990
proceed the support the muscle

469
00:33:17,420 --> 00:33:15,330
physiology experiments we're making use

470
00:33:20,270 --> 00:33:17,430
of a very sophisticated device called a

471
00:33:22,280 --> 00:33:20,280
torque velocity dynamometer or a TBD

472
00:33:25,430 --> 00:33:22,290
it's contributed to the mission by the

473
00:33:27,950 --> 00:33:25,440
European Space Agency I sort of think of

474
00:33:29,930 --> 00:33:27,960
the tort philosophy dynamometer as an

475
00:33:32,540 --> 00:33:29,940
arm-wrestling or a leg wrestling machine

476
00:33:35,060 --> 00:33:32,550
this morning as jean-jacques foggy my

477
00:33:38,180 --> 00:33:35,070
colleague is working out here he's using

478
00:33:40,280 --> 00:33:38,190
within the like wrestling mode sometimes

479
00:33:42,650 --> 00:33:40,290
the machine wins the wrestling match

480
00:33:44,750 --> 00:33:42,660
against us and sometimes it lets us win

481
00:33:47,420 --> 00:33:44,760
but who wins the wrestling match is not

482
00:33:50,360 --> 00:33:47,430
important what is important is that the

483
00:33:53,420 --> 00:33:50,370
TBD can measure the torque or the force

484
00:33:55,400 --> 00:33:53,430
applied by the limb and also the speed

485
00:33:58,190 --> 00:33:55,410
at which we contract our muscles and the

486
00:34:00,290 --> 00:33:58,200
position of the foot or the arm at any

487
00:34:02,180 --> 00:34:00,300
instant in time and with this

488
00:34:05,210 --> 00:34:02,190

information the scientists on the ground

489
00:35:52,050 --> 00:34:05,220
can understand how muscle performance is

490
00:35:57,210 --> 00:35:54,540
now our primary goal in LMS is to

491
00:36:00,390 --> 00:35:57,220
quantify the effects of microgravity on

492
00:36:02,490 --> 00:36:00,400
the adult human body but what happens to

493
00:36:04,560 --> 00:36:02,500
a developing organism in microgravity

494
00:36:08,070 --> 00:36:04,570
well we're flying the experiment called

495
00:36:10,350 --> 00:36:08,080
s TLB which studies just that now s TLB

496
00:36:13,350 --> 00:36:10,360
is a module filled with medaka fish

497
00:36:15,300 --> 00:36:13,360
embryos which are being allowed to

498
00:36:17,730 --> 00:36:15,310
develop on orbit with us during the

499
00:36:19,620 --> 00:36:17,740
mission and during that time they're

500
00:36:22,470 --> 00:36:19,630
being closed-circuit monitored by a

501
00:36:23,790 --> 00:36:22,480
microscope television system in relay to

502
00:36:26,490 --> 00:36:23,800
the ground so that the principal

503
00:36:28,890 --> 00:36:26,500
investigator dr. Kerry Phillips from

504
00:36:31,320 --> 00:36:28,900
Bowdoin College and NASA Ames Research

505
00:36:33,420 --> 00:36:31,330
Center will be able to quantify the

506
00:36:35,430 --> 00:36:33,430
differences between our space embryos

507
00:36:37,650 --> 00:36:35,440
and those in the grounds you'll actually

508
00:36:39,600 --> 00:36:37,660
look at the differences later on at the

509
00:36:41,490 --> 00:36:39,610
end of the mission - between fixed

510
00:36:43,110 --> 00:36:41,500
embryos that we have here and the

511
00:36:45,720 --> 00:36:43,120
controls in the ground to quantify how

512
00:36:48,270 --> 00:36:45,730
much change has occurred or has not

513
00:36:50,370 --> 00:36:48,280

occurred between the two now initial

514
00:36:52,500 --> 00:36:50,380
results seem to indicate that our space

515
00:36:55,440 --> 00:36:52,510
embryos develop somewhat slower than

516
00:36:58,290 --> 00:36:55,450
those in the ground now and NASA someday

517
00:37:00,180 --> 00:36:58,300
hopes to use this information to better

518
00:37:02,850 --> 00:37:00,190
understand the normal embryo logical

519
00:37:05,220 --> 00:37:02,860
process of development and also

520
00:37:07,590 --> 00:37:05,230
hopefully to apply this knowledge later

521
00:38:24,470 --> 00:37:07,600
on to long-duration space travel and

522
00:38:29,030 --> 00:38:26,990
throughout the night experiments have

523
00:38:31,520 --> 00:38:29,040
continued to work in a Space Lab module

524
00:38:36,589 --> 00:38:31,530
while the crew slept included among

525
00:38:38,270 --> 00:38:36,599
those experiments is the bubble drop and

526
00:38:41,120 --> 00:38:38,280
particle unit which we're seeing some

527
00:38:43,540 --> 00:38:41,130
downlink video from right now this is a

528
00:38:46,370 --> 00:38:43,550
fundamental science research into

529
00:38:48,339 --> 00:38:46,380
theories of nucleation and boiling as a

530
00:38:53,770 --> 00:38:48,349
function of temperature and pressure and

531
00:38:58,550 --> 00:38:53,780
the long term possibility of developing

532
00:39:00,500 --> 00:38:58,560
cooling mechanisms for electronic

533
00:39:03,800 --> 00:39:00,510
applications possibly even for

534
00:39:05,750 --> 00:39:03,810
spacecraft applications is the end

535
00:40:07,880 --> 00:39:05,760
result that's hopeful from these

536
00:40:13,100 --> 00:40:10,550
we can see here in the foreground one of

537
00:40:15,110 --> 00:40:13,110
the plant growth chambers and floating

538
00:40:17,920 --> 00:40:15,120

above it from our perspective is payload

539
00:40:22,760 --> 00:40:17,930
commander Susan Helms documenting the

540
00:40:26,990 --> 00:40:22,770
plants via still photos this particular

541
00:40:29,060 --> 00:40:27,000
container holds four of twenty seedlings

542
00:40:32,420 --> 00:40:29,070
some of fir and some of the loblolly

543
00:40:35,660 --> 00:40:32,430
pine two of each four in each of these

544
00:40:37,070 --> 00:40:35,670
containers are bent the other two are

545
00:40:39,530 --> 00:40:37,080
the controls and the experiment aren't

546
00:40:43,430 --> 00:40:39,540
left unbent samples have both the bent

547
00:40:46,670 --> 00:40:43,440
and the unbent Pines will be cut on this

548
00:40:50,230 --> 00:40:46,680
flight day and another flight day after

549
00:40:59,900 --> 00:40:54,190
those samples will be preserved and

550
00:41:01,400 --> 00:40:59,910
returned to Earth for further study we

551
00:41:03,200 --> 00:41:01,410
can now see payload specialist

552
00:41:05,900 --> 00:41:03,210
jean-jacques 5e a floating near the

553
00:41:08,180 --> 00:41:05,910
front of the Space Lab module in front

554
00:41:10,760 --> 00:41:08,190
of the workbench where he is stowing

555
00:41:13,520 --> 00:41:10,770
equipment used to take cuttings from fir

556
00:41:15,980 --> 00:41:13,530
seedlings as part of the plant growth

557
00:41:17,810 --> 00:41:15,990
facility experiment we can now see

558
00:41:20,330 --> 00:41:17,820
payload specialist regional geography a

559
00:41:21,310 --> 00:41:20,340
working within the plant growth facility

560
00:41:25,190 --> 00:41:21,320
glove bag

561
00:41:30,170 --> 00:41:25,200
he has isolated a fixation bag and is

562
00:41:40,029 --> 00:41:30,180
now removing one of the first seedling

563
00:41:46,640 --> 00:41:43,880

Columbia Houston your mission and we

564
00:41:48,349 --> 00:41:46,650
know you'll be glad to accept it is to

565
00:42:25,650 --> 00:41:48,359
extend to 17 days on orbit

566
00:42:30,180 --> 00:42:28,030
near the center of our screen we can see

567
00:42:32,320 --> 00:42:30,190
mission specialist Chuck Brady

568
00:42:35,340 --> 00:42:32,330
participating in the canal and otolith

569
00:42:38,920 --> 00:42:35,350
integration study or Co eyes

570
00:42:40,600 --> 00:42:38,930
Chuck Brady is wearing some electronic

571
00:42:42,280 --> 00:42:40,610
light occlusion goggles part of the

572
00:42:45,400 --> 00:42:42,290
hardware for the co eyes investigation

573
00:42:48,220 --> 00:42:45,410
and he's involved in voluntary head

574
00:42:50,910 --> 00:42:48,230
movement protocols in which he follows a

575
00:42:53,080 --> 00:42:50,920
target on the luminous target display

576
00:42:55,870 --> 00:42:53,090
which we're viewing from the back near

577
00:42:57,340 --> 00:42:55,880
the foreground and this picture on the

578
00:43:00,820 --> 00:42:57,350
other side a series of light emitting

579
00:43:03,400 --> 00:43:00,830
diodes or LEDs lighting up at various

580
00:43:05,830 --> 00:43:03,410
times and Jeff Brady must follow the

581
00:45:53,900 --> 00:43:05,840
movement of these LEDs to complete these

582
00:45:58,760 --> 00:45:56,440
much commander and to all of your

583
00:46:00,880 --> 00:45:58,770
international crew aboard Columbia and

584
00:46:04,190 --> 00:46:00,890
to our friends aboard mir

585
00:46:08,120 --> 00:46:04,200
congratulations to come on you great

586
00:46:11,600 --> 00:46:08,130
success of your mission as again as well

587
00:46:13,550 --> 00:46:11,610
to spread your cooperation you within

588
00:46:15,770 --> 00:46:13,560

the Olympic Games to bring the world

589
00:46:18,740 --> 00:46:15,780
closer together and we're very proud

590
00:46:22,490 --> 00:46:18,750
very proud that you have taken our

591
00:46:24,650 --> 00:46:22,500
Olympic torch into space with you now

592
00:46:26,630 --> 00:46:24,660
traveling some five and a half million

593
00:46:28,970 --> 00:46:26,640
miles we're very very proud to be

594
00:46:31,850 --> 00:46:28,980
included the roster commandeered

595
00:46:33,350 --> 00:46:31,860
Rajasthan India Persia we watching

596
00:46:35,240 --> 00:46:33,360
Guardium stone hospitals the covers

597
00:46:37,430 --> 00:46:35,250
motion spoke of arrays survived a year

598
00:46:38,990 --> 00:46:37,440
period that's national MP Steve Arkell

599
00:46:41,120 --> 00:46:39,000
was rated of cosmos get a password

600
00:46:43,970 --> 00:46:41,130
numbers D let's not disturb when you

601
00:46:46,850 --> 00:46:43,980
bash real issue she's near here mushiya

602
00:46:56,330 --> 00:46:46,860
shooting speech no it was unavoidable

603
00:46:59,540 --> 00:46:56,340
okay perch which represents all the

604
00:47:01,460 --> 00:46:59,550
efforts from the athletes worldwide to

605
00:47:04,520 --> 00:47:01,470
participate in compete in these

606
00:47:07,910 --> 00:47:04,530
international peaceful competitions and

607
00:47:10,130 --> 00:47:07,920
now that you can see just as we do in

608
00:47:12,530 --> 00:47:10,140
space we compete in a peaceful

609
00:47:15,410 --> 00:47:12,540
environment for the benefit of all

610
00:47:18,800 --> 00:47:15,420
mankind and that competition is to gain

611
00:47:20,750 --> 00:47:18,810
as much from each of our efforts just as

612
00:47:23,350 --> 00:47:20,760
these athletes that will participate in

613
00:47:28,220 --> 00:47:23,360

the game's world beginning July 19th

614
00:47:30,440 --> 00:47:28,230
this was taken this morning when dr.

615
00:47:33,770 --> 00:47:30,450
Brady was exercising and we thought this

616
00:47:36,550 --> 00:47:33,780
was setting a new standard for ham radio

617
00:47:38,690 --> 00:47:36,560
operators he's operating this rx

618
00:47:41,720 --> 00:47:38,700
simultaneously with getting his daily

619
00:47:51,870 --> 00:47:41,730
exercise and we thought this was above

620
00:48:04,200 --> 00:47:54,670
happy birthday Canada from the space

621
00:48:26,990 --> 00:48:07,200
bonne anniversaire Canada tip wheel and

622
00:49:57,850 --> 00:48:31,770
from STS 78 crew aboard Columbia happy

623
00:50:14,800 --> 00:50:11,350
where to go we go home there's a moon

624
00:50:18,940 --> 00:50:14,810
that's pretty nifty the electricity you

625
00:50:46,680 --> 00:50:18,950
got the camera there go cific just give

626
00:51:02,880 --> 00:50:49,680
okay it's kind of hot out here now

627
00:51:22,230 --> 00:51:02,890
almost why did you do that

628
00:51:35,010 --> 00:51:22,240
hello Verde calculations okay go for

629
00:51:37,190 --> 00:51:35,020
probes 5000 radar Beckham both channels

630
00:51:48,420 --> 00:51:37,200
look good

631
00:51:51,950 --> 00:51:48,430
four thousand three thousand see breaks

632
00:51:58,430 --> 00:51:51,960
coming few thousand pre-flare next gear

633
00:52:06,840 --> 00:51:58,440
player ball bar one thousand ballpark

634
00:52:12,110 --> 00:52:06,850
800 600 500 400 get here here's one way

635
00:52:14,250 --> 00:52:12,120
looking good looking good

636
00:52:17,690 --> 00:52:14,260
right keep it coming

637
00:52:20,820 --> 00:52:17,700
60 feet two fifty forty two forty thirty

638
00:52:21,650 --> 00:52:20,830

slightly low to thirty fifteen hold it

639
00:52:28,370 --> 00:52:21,660
right there

640
00:52:35,910 --> 00:52:28,380
227 216 touchdown at 270 knots

641
00:52:41,130 --> 00:52:35,920
dude you rotate rotate a little bit of

642
00:52:46,440 --> 00:52:41,140
rudder okay ground speed set 159 at

643
00:53:00,260 --> 00:52:46,450
7,000 ago come around the brakes fix

644
00:53:00,270 --> 00:53:08,200
dude's away

645
00:53:08,210 --> 00:53:21,070
backing off the brakes

646
00:53:28,730 --> 00:53:25,820
Houston Columbia will stop Roger Khanna

647
00:53:30,260 --> 00:53:28,740
will stop in congratulations on a great

648
00:53:35,390 --> 00:53:30,270
life science mission and a new shuttle

649
00:53:36,349 --> 00:53:35,400
record and want immediate Delta cap too

650
00:53:37,010 --> 00:53:36,359
high and stand by for further

651
00:53:40,640 --> 00:53:37,020
development

652
00:53:47,780 --> 00:53:40,650
you said go be a runway today Roger time

653
00:53:50,180 --> 00:53:47,790
runway in sight and the runway is now

654
00:53:52,849 --> 00:53:50,190
visible in the picture right time to

655
00:53:55,070 --> 00:53:52,859
touch down now 34 seconds Columbia

656
00:53:58,760 --> 00:53:55,080
descending at the rate of 165 feet per

657
00:54:01,670 --> 00:53:58,770
second and we can see the nose coming up

658
00:54:15,340 --> 00:54:01,680
as the pre-flare is happening getting

659
00:54:15,350 --> 00:54:31,030
landing gear down and locked

660
00:54:31,040 --> 00:54:37,990
main gear touchdown

661
00:54:41,800 --> 00:54:40,150
pilot Kevin Kregel has deployed the drag

662
00:54:53,880 --> 00:54:41,810
chute Columbia now rolling out on runway

663
00:54:57,960 --> 00:54:56,250

Columbia now on the ground at runway 33

664
00:55:00,840 --> 00:54:57,970
at the Kennedy Space Center bringing to

665
00:55:19,039 --> 00:55:00,850
an end a record-setting mission 17 days

666
00:55:25,200 --> 00:55:22,710
Poppaea will stop Roger time welcome

667
00:55:26,640 --> 00:55:25,210
back we'll stop and congratulations on a

668
00:55:30,120 --> 00:55:26,650
great life science mission in a new

669
00:55:32,489 --> 00:55:30,130
shuttle record in one immediate Delta on

670
00:55:35,789 --> 00:55:32,499
l1 we like right out temp too high and

671
00:55:38,220 --> 00:55:35,799
stand by for further deltas right out

672
00:55:39,809 --> 00:55:38,230
temp - hi fellow crew that's given so

673
00:55:55,850 --> 00:55:39,819
much during the fight is ready to go to

674
00:56:02,090 --> 00:56:00,380
yes sir okay yeah we're there now yeah

675
00:56:03,950 --> 00:56:02,100
just go ahead precipice okay thank you

676
00:56:07,340 --> 00:56:03,960
we'll start with taking the secondary

677
00:56:08,870 --> 00:56:07,350
off and high-low to enable these go for

678
00:56:25,920 --> 00:56:08,880
those now that's a good read nice go

679
00:56:31,760 --> 00:56:29,700
TMC did we get a gimbal check I want to

680
00:56:34,800 --> 00:56:31,770
mention that SCS channel 3 on the rudder

681
00:56:36,240 --> 00:56:34,810
may fail and we may deselect him later

682
00:56:43,680 --> 00:56:36,250
but all other channels are good and

683
00:56:45,090 --> 00:56:43,690
we're go for this burn okay Houston go

684
00:56:46,800 --> 00:56:45,100
ahead okay oh you've been waiting for

685
00:56:49,860 --> 00:56:46,810
these words time will give you a go for

686
00:56:52,080 --> 00:56:49,870
the deorbit burn be advised we're seeing

687
00:56:54,660 --> 00:56:52,090
some intermittent problems on rudder

688
00:57:04,450 --> 00:56:54,670

channel 3 and we made you select that

689
00:57:10,390 --> 00:57:07,990
do that first yeah then I'll get you the

690
00:57:14,079 --> 00:57:10,400
ammonia steps okay you can do that max

691
00:57:15,430 --> 00:57:14,089
any changes no changes flaps no dope

692
00:57:26,319 --> 00:57:15,440
okay

693
00:57:27,640 --> 00:57:26,329
we'll stop and congratulations on a

694
00:57:31,240 --> 00:57:27,650
great life science mission and a new

695
00:57:33,609 --> 00:57:31,250
shuttle record in one immediate Delta on