
EVERYTHING
ABOUT MISSION CONTROL HOUSTON

1
00:00:00,436 --> 00:00:01,246
>> The camera's coming.

2
00:00:09,246 --> 00:00:10,506
>> Hey flight director
Mary Lawrence.

3
00:00:10,796 --> 00:00:11,186
>> Oh hey.

4
00:00:11,636 --> 00:00:13,486
>> Do you think you have a few
minutes to tell us everything

5
00:00:13,486 --> 00:00:14,646
about Mission Control Houston?

6
00:00:14,766 --> 00:00:14,966
>> Sure.

7
00:00:15,456 --> 00:00:17,646
>> So can we follow you
into the control room?

8
00:00:18,596 --> 00:00:19,196
>> Yeah let's go.

9
00:00:19,196 --> 00:00:19,996
I'm about to start my shift.

10
00:00:21,426 --> 00:00:23,446
>> So what's it like
at Mission Control?

11
00:00:23,806 --> 00:00:25,506
>> We fly space ships;
it's awesome.

12

00:00:26,326 --> 00:00:27,536
>> Do you have a
shift every day?

13
00:00:28,136 --> 00:00:28,616
>> Not every day.

14
00:00:28,616 --> 00:00:30,246
I have a string of
shifts every few weeks.

15
00:00:30,896 --> 00:00:32,116
>> How many shifts
are there per day?

16
00:00:32,606 --> 00:00:32,826
>> Three.

17
00:00:34,216 --> 00:00:36,276
>> And how many other
flight directors are there?

18
00:00:36,356 --> 00:00:37,116
>> There's 26.

19
00:00:38,126 --> 00:00:42,366
>> Oh man I hope I'm
allowed back here.

20
00:00:45,836 --> 00:00:48,076
So what exactly does
a flight director do?

21
00:00:49,096 --> 00:00:51,766
>> The flight director is the
lead of the flight control team,

22
00:00:51,766 --> 00:00:53,186
so they're the final
decision maker

23
00:00:53,286 --> 00:00:54,906
in all human space
flight operations.

24
00:00:55,366 --> 00:00:56,376
>> What's a flight controller?

25
00:00:57,056 --> 00:00:57,736
>> They do all the work.

26
00:00:58,456 --> 00:01:01,326
>> What was your first
day on console like?

27
00:01:01,326 --> 00:01:03,456
>> It was pretty quiet;
the crew was sleeping.

28
00:01:04,446 --> 00:01:05,876
>> Is this mission control?

29
00:01:06,136 --> 00:01:07,786
>> This is one of the
back rooms that supports.

30
00:01:08,296 --> 00:01:09,876
>> Oh, how many back
rooms are there?

31
00:01:09,926 --> 00:01:10,556
>> There's several.

32
00:01:11,226 --> 00:01:13,356
>> How many people support
the people in Mission Control?

33
00:01:13,556 --> 00:01:15,876
>> Could be a handful, could

be hundreds during busy times.

34
00:01:16,406 --> 00:01:18,016
>> What is done in the
back rooms that helps

35
00:01:18,016 --> 00:01:19,106
out the flight controllers?

36
00:01:19,776 --> 00:01:21,356
>> They're kind of the
second set of eyes.

37
00:01:21,726 --> 00:01:23,526
They help out the work load
at each of the consoles.

38
00:01:24,086 --> 00:01:25,656
>> Where's the real
mission control?

39
00:01:25,656 --> 00:01:27,866
>> Oh, can we go in?

40
00:01:27,866 --> 00:01:28,046
>> Sure.

41
00:01:37,046 --> 00:01:41,556
>> Whoa. So this
is Mission Control.

42
00:01:41,686 --> 00:01:43,446
>> This is it.

43
00:01:43,446 --> 00:01:44,696
>> What mission is
controlled here?

44
00:01:45,136 --> 00:01:46,316

>> International Space Station.

45
00:01:46,696 --> 00:01:48,346
>> Where do you control
other missions?

46
00:01:49,006 --> 00:01:50,016
>> Down the hall,
around the corner.

47
00:01:50,546 --> 00:01:52,226
>> How many control rooms
are in this building?

48
00:01:52,546 --> 00:01:52,946
>> There's three.

49
00:01:53,546 --> 00:01:55,526
>> How many people are
usually in this room?

50
00:01:55,976 --> 00:01:57,486
>> Could be six,
could be 20 something.

51
00:01:57,816 --> 00:01:59,036
>> Is there assigned seating?

52
00:01:59,406 --> 00:01:59,856
>> There is.

53
00:02:00,336 --> 00:02:01,416
>> What do the patches mean?

54
00:02:02,086 --> 00:02:03,546
>> These patches
represent missions

55
00:02:03,546 --> 00:02:04,796

that have been flown
out of this room.

56
00:02:05,246 --> 00:02:06,236
>> What time does it close?

57
00:02:06,806 --> 00:02:07,296
>> We never close.

58
00:02:08,326 --> 00:02:10,346
>> How many mission controls
support the Space Station

59
00:02:10,466 --> 00:02:11,086
across the world?

60
00:02:11,476 --> 00:02:13,356
>> Primarily there's
five across the world.

61
00:02:14,236 --> 00:02:16,426
>> So this is where the
flight director sits?

62
00:02:16,566 --> 00:02:17,156
>> It is.

63
00:02:18,076 --> 00:02:19,016
>> Oh hi.

64
00:02:19,256 --> 00:02:19,446
>> Hi.

65
00:02:19,626 --> 00:02:22,376
>> What's the hardest part
about being a flight director?

66
00:02:22,776 --> 00:02:25,066
>> Constantly being aware that

there's six people on orbit

67
00:02:25,066 --> 00:02:26,856
who are depending on
you to keep them safe.

68
00:02:27,366 --> 00:02:28,506
>> And the most rewarding?

69
00:02:29,366 --> 00:02:30,536
>> Seeing them return
safely to Earth

70
00:02:30,536 --> 00:02:31,426
when their mission's complete.

71
00:02:32,026 --> 00:02:33,596
>> How many acronyms
do you have to learn?

72
00:02:34,636 --> 00:02:35,466
>> T-M-T-C.

73
00:02:36,026 --> 00:02:37,666
>> What did you study
in school to prepare

74
00:02:37,666 --> 00:02:38,766
for being a flight director?

75
00:02:39,026 --> 00:02:39,816
>> Mechanical engineering.

76
00:02:40,496 --> 00:02:43,216
>> So are there a lot of pilots
that are flight controllers?

77
00:02:43,926 --> 00:02:45,616
>> Some are, but it's not a

requirement to do the job.

78
00:02:46,226 --> 00:02:48,186
>> How long do you have to
train to be a flight controller?

79
00:02:48,186 --> 00:02:49,276
>> It takes about a year.

80
00:02:49,806 --> 00:02:50,636
>> What's that training like?

81
00:02:51,196 --> 00:02:51,886
>> Pretty vigorous.

82
00:02:51,926 --> 00:02:54,706
We simulate ISS onboard
operations,

83
00:02:54,706 --> 00:02:55,946
only we break a lot more stuff.

84
00:02:56,286 --> 00:02:57,496
>> They're called
simulations right?

85
00:02:57,756 --> 00:02:58,246
>> That's correct.

86
00:02:58,516 --> 00:02:59,896
>> How long can they last?

87
00:03:00,136 --> 00:03:02,376
>> About a length of a
shift, so about nine hours.

88
00:03:02,586 --> 00:03:04,966
>> What's the coolest part
about working in this room?

89
00:03:05,066 --> 00:03:06,666
>> Understanding all the
history that's happened here

90
00:03:06,666 --> 00:03:07,276
over the years.

91
00:03:07,616 --> 00:03:10,446
>> So when you switch shifts
how long is that hand over?

92
00:03:10,806 --> 00:03:12,106
>> About 30 to 45 minutes.

93
00:03:12,276 --> 00:03:13,856
>> Are all the systems
run from desktops?

94
00:03:14,116 --> 00:03:14,506
>> That's correct.

95
00:03:14,936 --> 00:03:17,186
>> Do you deal with the
same software updates we do?

96
00:03:17,186 --> 00:03:19,936
>> Yes, we have to keep our
computers free from viruses too.

97
00:03:20,096 --> 00:03:20,966
>> So what does this button do?

98
00:03:20,966 --> 00:03:21,186
>> Hey.

99
00:03:21,256 --> 00:03:21,446
>> Oh.

100
00:03:21,446 --> 00:03:21,606
>> No.

101
00:03:22,056 --> 00:03:22,926
>> Sorry about that.

102
00:03:22,926 --> 00:03:24,136
So what are you listening to?

103
00:03:24,136 --> 00:03:25,536
>> They're called voice loops.

104
00:03:25,766 --> 00:03:27,676
>> And how many people do
you listen to at one time?

105
00:03:27,986 --> 00:03:29,806
>> Hopefully only one if
I'm doing my job correctly.

106
00:03:30,066 --> 00:03:32,356
>> Does the flight director
fly the Space Station?

107
00:03:32,596 --> 00:03:33,176
>> Not exactly.

108
00:03:33,426 --> 00:03:34,256
>> So who does?

109
00:03:34,686 --> 00:03:36,536
>> Sir Isaac Newton does.

110
00:03:36,536 --> 00:03:37,636
>> So is that true Mary?

111
00:03:37,856 --> 00:03:38,366
>> ADCO helps.

112
00:03:39,206 --> 00:03:40,876
>> Oh, hey ADCO.

113
00:03:41,196 --> 00:03:43,666
So what exactly does
ADCO stand for?

114
00:03:43,886 --> 00:03:45,996
>> Attitude, Determination,
and Control Officer.

115
00:03:46,556 --> 00:03:47,446
>> That explains
the [inaudible].

116
00:03:47,446 --> 00:03:50,166
So how do you deal
with orbital debris?

117
00:03:50,296 --> 00:03:52,056
>> We use thrusters
on the Russian segment

118
00:03:52,056 --> 00:03:52,936
and get out of the way.

119
00:03:53,446 --> 00:03:55,626
>> Can astronauts fly the
station from the inside?

120
00:03:55,696 --> 00:03:56,336
>> They sure can.

121
00:03:56,716 --> 00:03:57,956
>> Is there a cruise control?

122
00:03:58,516 --> 00:04:00,266
>> It's a little more

complicated than that.

123
00:04:00,586 --> 00:04:02,136
>> Can you make the
station do a barrel roll?

124
00:04:02,606 --> 00:04:05,126
>> I could; I probably
wouldn't be here much longer.

125
00:04:05,126 --> 00:04:07,476
>> Do you need a space
ship driver's license?

126
00:04:07,686 --> 00:04:08,686
>> That's my certification.

127
00:04:09,376 --> 00:04:11,716
>> So Mary, each
flight controller looks

128
00:04:11,716 --> 00:04:12,646
at a specific part?

129
00:04:13,046 --> 00:04:15,696
>> That's right, everyone has
a very specific responsibility

130
00:04:15,696 --> 00:04:16,406
as part of the team.

131
00:04:16,866 --> 00:04:18,506
>> Does everyone talk
to the astronauts?

132
00:04:18,766 --> 00:04:20,416
>> Not everyone;
that's CAPCOM's job.

133

00:04:20,686 --> 00:04:23,136
>> I heard that you have to be
an astronaut to be a CAPCOM.

134
00:04:23,256 --> 00:04:25,196
>> Not all the CAPCOMs
are astronauts;

135
00:04:25,336 --> 00:04:27,236
some are former flight
controllers or instructors.

136
00:04:27,726 --> 00:04:28,916
>> So is there a phone number

137
00:04:28,956 --> 00:04:30,516
for the International
Space Station?

138
00:04:30,616 --> 00:04:30,736
>> Yes.

139
00:04:31,466 --> 00:04:34,476
>> Could you just type it
in my phone really quick?

140
00:04:34,476 --> 00:04:34,976
>> We'll call you.

141
00:04:35,216 --> 00:04:35,976
>> Oh okay.

142
00:04:36,266 --> 00:04:38,706
Well what is the time
zone of the Space Station?

143
00:04:38,996 --> 00:04:40,426
>> Greenwich Mean Time, GMT.

144

00:04:40,746 --> 00:04:41,306
>> Why is that?

145
00:04:42,066 --> 00:04:43,686
>> There's control
centers all over the world

146
00:04:43,796 --> 00:04:44,946
so we just picked
somewhere in the middle.

147
00:04:45,986 --> 00:04:47,686
>> What is a shift like
when the crew is sleeping?

148
00:04:47,686 --> 00:04:48,816
>> It's pretty quiet.

149
00:04:48,816 --> 00:04:50,476
We're mostly just
planning for the next day.

150
00:04:50,906 --> 00:04:52,546
>> Are you allowed
food and drink in here?

151
00:04:53,376 --> 00:04:53,606
>> Yes.

152
00:04:54,336 --> 00:04:56,036
>> What happens if a
flight controller gets sick?

153
00:04:56,346 --> 00:04:57,096
>> We call someone else.

154
00:04:57,506 --> 00:04:58,986
>> What happens if an
astronaut gets sick?

155
00:04:59,596 --> 00:05:01,126
>> They call the doctor
here on the ground

156
00:05:01,126 --> 00:05:02,456
and take a sick day
if they need to.

157
00:05:02,916 --> 00:05:04,216
>> Oh. Who's sitting here?

158
00:05:04,726 --> 00:05:05,666
>> This is ground control.

159
00:05:05,886 --> 00:05:06,926
>> What does ground control do?

160
00:05:07,286 --> 00:05:08,546
>> Ground control's responsible

161
00:05:08,546 --> 00:05:10,596
for everything here
on the ground.

162
00:05:10,596 --> 00:05:11,556
>> Oh, hey ground control.

163
00:05:11,726 --> 00:05:14,246
Is there any communication
delay from the ground to orbit?

164
00:05:14,886 --> 00:05:15,366
>> Not really.

165
00:05:15,986 --> 00:05:17,936
>> And how often do you lose
signal from the Station?

166

00:05:18,006 --> 00:05:19,356
>> A couple times per shift.

167
00:05:19,706 --> 00:05:20,496
>> How long do those last?

168
00:05:21,246 --> 00:05:23,186
>> Could be anywhere from
one minute to 30 minutes.

169
00:05:23,526 --> 00:05:25,436
>> What happens if Mission
Control loses power?

170
00:05:25,516 --> 00:05:26,446
>> We have backup power.

171
00:05:26,746 --> 00:05:27,766
>> How high are the satellites

172
00:05:27,806 --> 00:05:28,976
that communicate
with the station?

173
00:05:29,266 --> 00:05:30,436
>> Twenty three thousand miles.

174
00:05:30,656 --> 00:05:31,746
>> And how high is the station?

175
00:05:32,186 --> 00:05:33,316
>> Two hundred and fifty miles.

176
00:05:34,136 --> 00:05:35,986
>> What's the official
language on the station?

177
00:05:36,306 --> 00:05:38,726
>> Actually the remote interface

officer would know that one.

178
00:05:40,006 --> 00:05:40,706
>> Oh it's English.

179
00:05:41,786 --> 00:05:43,826
>> Do flight controllers
know multiple languages?

180
00:05:44,066 --> 00:05:46,066
[Foreign Language Spoken]

181
00:05:46,116 --> 00:05:48,556
So Mary, how fast does the
station orbit the Earth?

182
00:05:49,066 --> 00:05:51,136
>> Seventeen thousand five
hundred miles per hour.

183
00:05:51,476 --> 00:05:52,806
>> Okay give me some context.

184
00:05:52,966 --> 00:05:55,196
>> So that's five
miles a second.

185
00:05:55,196 --> 00:05:57,656
That's from here to New York
City in four and a half minutes.

186
00:05:58,366 --> 00:05:59,076
>> Is there a speed limit?

187
00:06:00,166 --> 00:06:00,576
>> Sort of.

188
00:06:00,846 --> 00:06:01,986
We don't have enough

time for the details.

189
00:06:01,986 --> 00:06:04,476
>> So how many times
does the station pass

190
00:06:04,666 --> 00:06:06,086
over Mission Control every day?

191
00:06:06,666 --> 00:06:09,126
>> Sometimes not at all,
sometimes a couple times a day.

192
00:06:09,566 --> 00:06:12,366
We like to go out and wave hello
to the crew as they pass over.

193
00:06:12,876 --> 00:06:15,426
>> How many times has the
station orbited the Earth?

194
00:06:15,426 --> 00:06:16,316
>> Over 100,000.

195
00:06:17,276 --> 00:06:19,106
>> Have you flown any other
missions in this room?

196
00:06:19,316 --> 00:06:21,566
>> This is the former
shuttle flight control room.

197
00:06:22,006 --> 00:06:24,466
>> So what's going on right now?

198
00:06:24,626 --> 00:06:27,246
>> This is called LOS; it's
a temporary loss of signal.

199

00:06:27,696 --> 00:06:28,726
This is when we take our breaks.

200
00:06:29,976 --> 00:06:31,636
>> And what do you get
to do on those breaks?

201
00:06:32,056 --> 00:06:32,856
>> We play Yahtzee.

202
00:06:34,106 --> 00:06:34,536
Just kidding.

203
00:06:34,826 --> 00:06:38,206
We get food, we go to the
bathroom, we get coffee.

204
00:06:38,766 --> 00:06:41,346
>> Do you think any future
missions will be controlled

205
00:06:41,346 --> 00:06:42,036
from this building?

206
00:06:42,336 --> 00:06:42,786
>> Possibly.

207
00:06:42,786 --> 00:06:46,226
It could be the O'Ryan missions;
EM1 and EM2 are flown from here.

208
00:06:47,136 --> 00:06:49,506
>> What is the farthest any
human has ever traveled?

209
00:06:49,996 --> 00:06:50,926
>> We've been to the moon,

210
00:06:51,046 --> 00:06:55,966

so the Apollo 13 crew has
been 250,000 miles from Earth.

211
00:06:56,696 --> 00:06:59,996
>> Wow. What is the longest time
a NASA astronaut has ever been

212
00:06:59,996 --> 00:07:00,276
in space?

213
00:07:00,766 --> 00:07:02,456
>> Commander Scott
Kelley was on orbit

214
00:07:02,456 --> 00:07:04,646
for 340 days; that's
almost a year.

215
00:07:05,136 --> 00:07:06,536
>> Wow that's a long time.

216
00:07:06,636 --> 00:07:09,206
But how long will
those Mars missions be?

217
00:07:09,666 --> 00:07:10,836
>> Could be a year, maybe two.

218
00:07:12,016 --> 00:07:16,176
>> Wow. Okay so one last
question, is failure an option?

219
00:07:16,476 --> 00:07:16,656
>> No.

220
00:07:17,126 --> 00:07:19,186
>> Well thank you Mary
for taking your time

221

00:07:19,246 --> 00:07:21,086
to answer everything
about Mission Control.

222
00:07:21,366 --> 00:07:22,616
I'm sure there are
more questions

223
00:07:22,736 --> 00:07:23,936
but we'll save those
for another time.

224
00:07:24,256 --> 00:07:24,456
>> Sure.

225
00:07:25,426 --> 00:07:25,866
>> Take care.

226
00:07:26,126 --> 00:07:26,356
>> Bye.