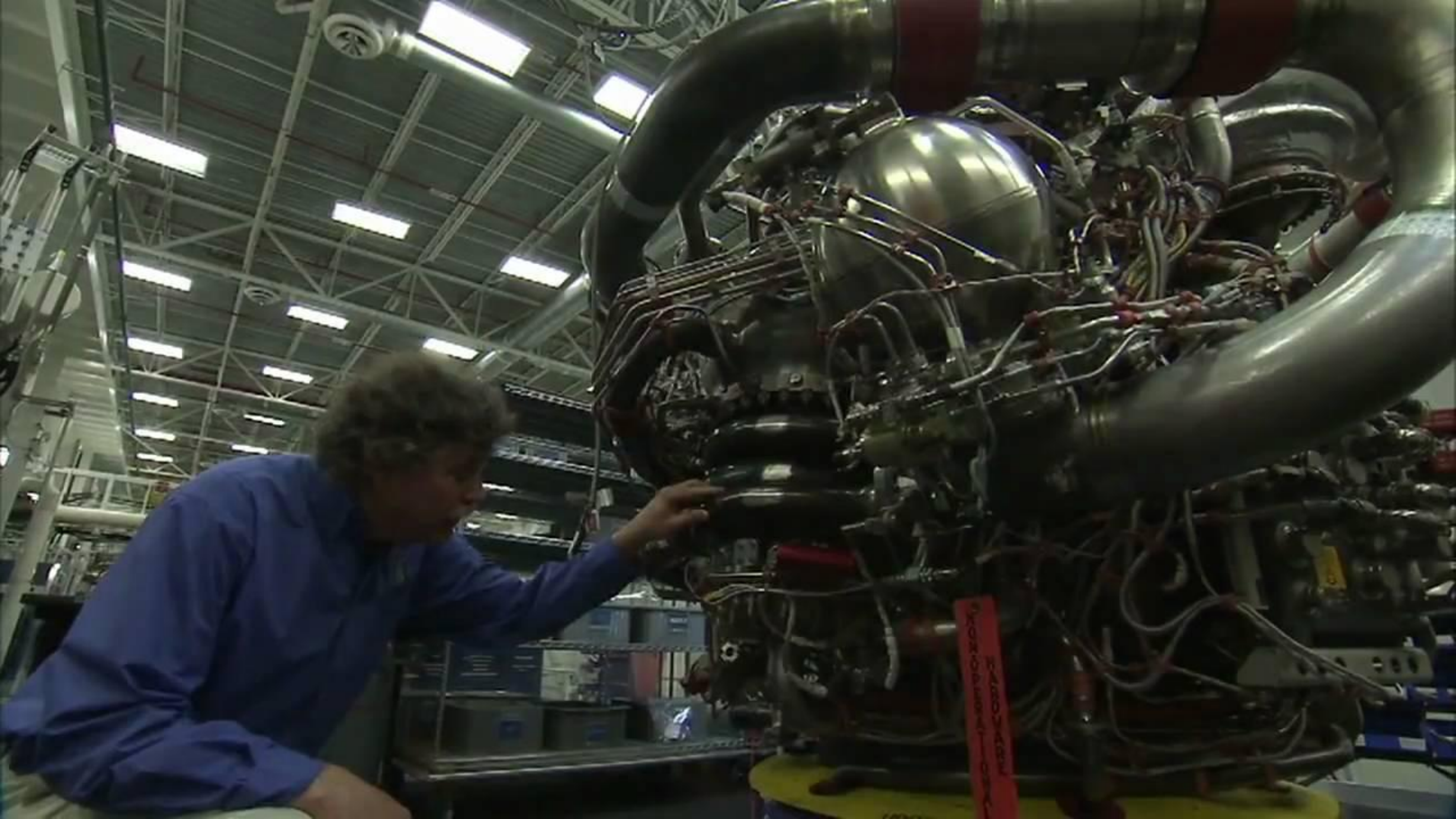

1
00:00:04,160 --> 00:00:17,910
so

2
00:00:21,269 --> 00:00:19,670
i'm lori meggs and welcome to a special

3
00:00:22,950 --> 00:00:21,279
edition of focus on marshall we're here

4
00:00:24,310 --> 00:00:22,960
at the kennedy space center florida

5
00:00:25,910 --> 00:00:24,320
where we're focusing on the space

6
00:00:27,349 --> 00:00:25,920
shuttle main engines and joining me now

7
00:00:29,349 --> 00:00:27,359
is space shuttle main engine project

8
00:00:30,790 --> 00:00:29,359
manager jerry cook and jerry we have a

9
00:00:32,630 --> 00:00:30,800
shuttle on the launch pad ready to go

10
00:00:34,630 --> 00:00:32,640
but let's remind folks what it takes to

11
00:00:36,470 --> 00:00:34,640
get those main engines ready for launch

12
00:00:38,310 --> 00:00:36,480
okay lori uh you're right this is a

13
00:00:39,990 --> 00:00:38,320

culmination of weeks and months of

14
00:00:41,990 --> 00:00:40,000
effort that to turn the shuttle around

15
00:00:44,069 --> 00:00:42,000
the ssmes are part of the shuttle

16
00:00:45,990 --> 00:00:44,079
propulsion elements managed by marshall

17
00:00:47,590 --> 00:00:46,000
once the solid rocket boosters separate

18
00:00:49,190 --> 00:00:47,600
the three main engines provide the

19
00:00:51,750 --> 00:00:49,200
ascent thrust to get the vehicle up on

20
00:00:54,310 --> 00:00:51,760
orbit and jerry a lot of power and a lot

21
00:00:55,910 --> 00:00:54,320
of hard work that goes into this for 520

22
00:00:57,510 --> 00:00:55,920
seconds let's talk about the workforce

23
00:00:59,189 --> 00:00:57,520
here that gets these things ready the

24
00:01:00,790 --> 00:00:59,199
workforce is outstanding and it's made

25
00:01:02,470 --> 00:01:00,800
up of the people both here at the

26
00:01:04,630 --> 00:01:02,480
kennedy space center the people back at

27
00:01:06,469 --> 00:01:04,640
marshall uh the engines themselves are

28
00:01:07,990 --> 00:01:06,479
manufactured by pratt whitney rocketdyne

29
00:01:10,310 --> 00:01:08,000
they're located in canoga park in

30
00:01:12,070 --> 00:01:10,320
california and the high pressure pumps

31
00:01:13,910 --> 00:01:12,080
are manufactured down in west palm beach

32
00:01:15,910 --> 00:01:13,920
just a couple hours south of here so

33
00:01:17,830 --> 00:01:15,920
it's an amount an enormous amount of

34
00:01:19,510 --> 00:01:17,840
effort goes into every mission not only

35
00:01:21,830 --> 00:01:19,520
pre-launch but also during the launch to

36
00:01:23,510 --> 00:01:21,840
maintain uh the telemetry data that we

37
00:01:25,350 --> 00:01:23,520
need as well as the post-launch

38
00:01:26,710 --> 00:01:25,360

operations all right i think we're going

39
00:01:29,590 --> 00:01:26,720
to see some of the operations here at

40
00:01:31,350 --> 00:01:29,600
ksc thanks jerry thank you

41
00:01:33,190 --> 00:01:31,360
i'm here in the engine shop at ksc and

42
00:01:34,870 --> 00:01:33,200
joining me now is paul breske he is a

43
00:01:36,630 --> 00:01:34,880
launch support engineer with pratt and

44
00:01:38,630 --> 00:01:36,640
whitney rocketdyne and paul we are

45
00:01:40,630 --> 00:01:38,640
standing in front of the main engines

46
00:01:43,190 --> 00:01:40,640
that will be installed on atlantis and

47
00:01:44,710 --> 00:01:43,200
launching sts-132 shortly tell us about

48
00:01:47,109 --> 00:01:44,720
what happens here in the engine shop

49
00:01:48,630 --> 00:01:47,119
once an engine all three engines return

50
00:01:50,310 --> 00:01:48,640
from their previous mission they go

51
00:01:52,870 --> 00:01:50,320
through a horizontal and vertical

52
00:01:55,830 --> 00:01:52,880
processing that takes about eight to ten

53
00:01:58,310 --> 00:01:55,840
weeks we have this processing area here

54
00:01:59,910 --> 00:01:58,320
and we also have over to our right the

55
00:02:02,389 --> 00:01:59,920
high bay where they get hardware

56
00:02:04,550 --> 00:02:02,399
replacements if required and special

57
00:02:06,870 --> 00:02:04,560
inspections what's interesting about

58
00:02:08,790 --> 00:02:06,880
these engines especially is this is the

59
00:02:10,869 --> 00:02:08,800
nozzle thrust chamber and there's a

60
00:02:12,550 --> 00:02:10,879
thousand eighty individual tubes that

61
00:02:14,309 --> 00:02:12,560
the hydrogen flows down through and

62
00:02:16,150 --> 00:02:14,319
cools the engine to protect it from the

63
00:02:18,470 --> 00:02:16,160

combustion byproducts

64
00:02:20,550 --> 00:02:18,480
and most people don't realize that we

65
00:02:23,270 --> 00:02:20,560
use the hydrogen not only as fuel but as

66
00:02:24,630 --> 00:02:23,280
a coolant for the whole engine paul the

67
00:02:26,070 --> 00:02:24,640
main engines have been one of the most

68
00:02:28,070 --> 00:02:26,080
stable components of the shuttle

69
00:02:29,830 --> 00:02:28,080
propulsion system how many engines have

70
00:02:32,550 --> 00:02:29,840
we flown and are we still flying the

71
00:02:35,509 --> 00:02:32,560
same engines today since sts-1 we have

72
00:02:37,630 --> 00:02:35,519
flown 46 different engines however we've

73
00:02:40,150 --> 00:02:37,640
constantly upgraded them and since

74
00:02:42,229 --> 00:02:40,160
sts-105 we're now flying the block 2

75
00:02:44,630 --> 00:02:42,239
engine with an upgraded power head

76
00:02:46,790 --> 00:02:44,640
advanced turbo machinery manufactured in

77
00:02:48,869 --> 00:02:46,800
west palm beach and a new advanced

78
00:02:50,869 --> 00:02:48,879
health monitoring controller the main

79
00:02:52,790 --> 00:02:50,879
computer for the engine and why do we

80
00:02:55,910 --> 00:02:52,800
need these upgrades well primarily for

81
00:02:58,150 --> 00:02:55,920
safety and reliability especially the

82
00:02:59,990 --> 00:02:58,160
new engines have a larger throat in the

83
00:03:01,830 --> 00:03:00,000
main combustion chamber which lowers the

84
00:03:04,790 --> 00:03:01,840
temperature and pressures of the engines

85
00:03:06,550 --> 00:03:04,800
during operations while not changing the

86
00:03:07,990 --> 00:03:06,560
performance at all

87
00:03:09,670 --> 00:03:08,000
and i know you guys are proud of this

88
00:03:12,070 --> 00:03:09,680

little statistic i see on the wall there

89
00:03:14,470 --> 00:03:12,080
over a million seconds of power and

90
00:03:16,149 --> 00:03:14,480
counting yes in our entire test and

91
00:03:18,470 --> 00:03:16,159
flight programs we've have over a

92
00:03:21,030 --> 00:03:18,480
million seconds and counting and if you

93
00:03:23,750 --> 00:03:21,040
took that as three engines per flight

94
00:03:26,229 --> 00:03:23,760
that's over 700 space shuttle missions

95
00:03:28,630 --> 00:03:26,239
of operation so a lot of work has gone

96
00:03:30,789 --> 00:03:28,640
into this engine shop oh definitely and

97
00:03:31,990 --> 00:03:30,799
this this engine shop is new relatively

98
00:03:33,750 --> 00:03:32,000
speaking they used to have an engine

99
00:03:36,149 --> 00:03:33,760
shop in the vehicle assembly building

100
00:03:37,830 --> 00:03:36,159
and this is a major upgrade to those

101
00:03:40,149 --> 00:03:37,840
facilities all right well thanks for

102
00:03:41,830 --> 00:03:40,159
showing us around paul oh thank you

103
00:03:43,190 --> 00:03:41,840
i'm here with sharon fagan and she is in

104
00:03:44,710 --> 00:03:43,200
launch operations with the marshall

105
00:03:46,309 --> 00:03:44,720
resident office here at kennedy space

106
00:03:47,750 --> 00:03:46,319
center and sharon it's very exciting to

107
00:03:49,350 --> 00:03:47,760
be standing outside an orbiter

108
00:03:51,190 --> 00:03:49,360
processing facility tell us what happens

109
00:03:53,270 --> 00:03:51,200
here well currently they're working on

110
00:03:55,990 --> 00:03:53,280
the atlantis orbiter getting it ready to

111
00:03:57,830 --> 00:03:56,000
be launched for the sts-132 mission so

112
00:03:59,509 --> 00:03:57,840
all the different ksc folks are doing

113
00:04:02,229 --> 00:03:59,519

the different jobs that they have to do

114
00:04:03,670 --> 00:04:02,239
to get the orbiter ready prior to launch

115
00:04:05,270 --> 00:04:03,680
and we're talking specifically about

116
00:04:06,869 --> 00:04:05,280
main engines for us tell us what happens

117
00:04:08,470 --> 00:04:06,879
to the main engines in this facility

118
00:04:10,309 --> 00:04:08,480
it's in this facility that they both

119
00:04:12,470 --> 00:04:10,319
install the main engines and remove them

120
00:04:14,309 --> 00:04:12,480
after it lands it after the orbiter

121
00:04:16,390 --> 00:04:14,319
lands at kennedy space center and they

122
00:04:18,229 --> 00:04:16,400
do that in a specific order they always

123
00:04:20,229 --> 00:04:18,239
start with engine one which is at the

124
00:04:22,310 --> 00:04:20,239
top and then they move on to engine

125
00:04:24,070 --> 00:04:22,320
three and then engine two for each of

126
00:04:25,670 --> 00:04:24,080
the missions they remove them in the

127
00:04:27,590 --> 00:04:25,680
opposite order they remove them again

128
00:04:29,430 --> 00:04:27,600
back in the opposite order it's very

129
00:04:31,189 --> 00:04:29,440
confusing i'm always thinking of 3-2-1

130
00:04:32,790 --> 00:04:31,199
but it doesn't go that way here tell us

131
00:04:34,390 --> 00:04:32,800
why it's done in that order well they

132
00:04:35,510 --> 00:04:34,400
want the reason the top one's put in

133
00:04:36,950 --> 00:04:35,520
first is of course you don't want to

134
00:04:38,710 --> 00:04:36,960
disturb the ones that are below it as

135
00:04:40,790 --> 00:04:38,720
you're putting in the first engine and

136
00:04:42,790 --> 00:04:40,800
then they do three next because they

137
00:04:44,710 --> 00:04:42,800
don't have to rearrange their equipment

138
00:04:46,550 --> 00:04:44,720

to put in three when they get to two

139
00:04:48,070 --> 00:04:46,560
it's clocked 90 degrees so they have to

140
00:04:50,310 --> 00:04:48,080
move their equipment around before they

141
00:04:51,670 --> 00:04:50,320
can install that last engine so sharon

142
00:04:54,469 --> 00:04:51,680
how long does this operation take in the

143
00:04:56,550 --> 00:04:54,479
opf it takes one shift per engine and it

144
00:04:58,950 --> 00:04:56,560
takes around 10 to 12 people to do that

145
00:05:00,710 --> 00:04:58,960
work um the the person that's actually

146
00:05:02,310 --> 00:05:00,720
at the top doing the work is called the

147
00:05:03,990 --> 00:05:02,320
mood director and that's actually one of

148
00:05:05,749 --> 00:05:04,000
the highest certifications that you have

149
00:05:07,510 --> 00:05:05,759
to hold at kennedy space center because

150
00:05:09,670 --> 00:05:07,520
it's such a precise operation and it

151
00:05:12,469 --> 00:05:09,680
takes a lot of skills and experience to

152
00:05:14,150 --> 00:05:12,479
do that thanks sharon

153
00:05:15,909 --> 00:05:14,160
i'm here now with mike cosgrove and he

154
00:05:17,189 --> 00:05:15,919
is the flow manager for the main engines

155
00:05:18,629 --> 00:05:17,199
and mike we've seen what happens in the

156
00:05:20,390 --> 00:05:18,639
opf we've seen what happens in the

157
00:05:21,670 --> 00:05:20,400
engine shop but there's a lot more work

158
00:05:24,469 --> 00:05:21,680
to do right tell us what happens from

159
00:05:26,070 --> 00:05:24,479
there yes there is once the uh vehicle

160
00:05:28,390 --> 00:05:26,080
rolls out of the opf with the engines

161
00:05:31,270 --> 00:05:28,400
installed we're on our way to the vab

162
00:05:32,710 --> 00:05:31,280
and then we're in the vab the vehicle is

163
00:05:34,550 --> 00:05:32,720

rotated vertical

164
00:05:38,070 --> 00:05:34,560
and lifted into position and mated with

165
00:05:40,870 --> 00:05:38,080
the the booster stack and then

166
00:05:42,790 --> 00:05:40,880
we do a few walk downs and a couple of

167
00:05:44,870 --> 00:05:42,800
leaked checks to finish off our our

168
00:05:46,150 --> 00:05:44,880
integrated portion in the vab

169
00:05:49,270 --> 00:05:46,160
the vehicle is then rolled out to the

170
00:05:50,950 --> 00:05:49,280
launch pad and we're getting set for a

171
00:05:52,150 --> 00:05:50,960
real launch mission there

172
00:05:53,590 --> 00:05:52,160
and there's a lot of testing that goes

173
00:05:55,510 --> 00:05:53,600
on even out of the pad too right with

174
00:05:57,350 --> 00:05:55,520
the engines absolutely once we get to

175
00:05:59,670 --> 00:05:57,360
the pad the first thing we do after the

176
00:06:02,870 --> 00:05:59,680
vehicle powers up is we power up the

177
00:06:04,309 --> 00:06:02,880
controllers and we go through a uh

178
00:06:05,990 --> 00:06:04,319
flight readiness test with the

179
00:06:07,590 --> 00:06:06,000
hydraulics and pneumatics on the engine

180
00:06:08,870 --> 00:06:07,600
to make sure we're still ready to go

181
00:06:10,070 --> 00:06:08,880
after we're integrated with the vehicle

182
00:06:11,670 --> 00:06:10,080
and the pad

183
00:06:14,710 --> 00:06:11,680
and it's not just i know you're in the

184
00:06:16,070 --> 00:06:14,720
lcc here the launch control center but

185
00:06:17,909 --> 00:06:16,080
you guys are monitoring it all over the

186
00:06:19,909 --> 00:06:17,919
country right even in huntsville

187
00:06:21,510 --> 00:06:19,919
absolutely huntsville have the haask and

188
00:06:23,749 --> 00:06:21,520

at canoe park we have the rosk and we're

189
00:06:26,790 --> 00:06:23,759
in constant communication and then after

190
00:06:29,350 --> 00:06:26,800
of course we get closer to launch day uh

191
00:06:31,029 --> 00:06:29,360
we get we do a uh f compartment complete

192
00:06:33,350 --> 00:06:31,039
walk down remove the gsc and the

193
00:06:35,189 --> 00:06:33,360
protective closures close the aft up for

194
00:06:36,790 --> 00:06:35,199
flight and then about a day and a half

195
00:06:38,309 --> 00:06:36,800
before launch we power up the

196
00:06:39,830 --> 00:06:38,319
controllers and do a

197
00:06:42,309 --> 00:06:39,840
sensor and a

198
00:06:44,230 --> 00:06:42,319
igniter checkout on the engines and then

199
00:06:46,150 --> 00:06:44,240
we're ready to support tanking and then

200
00:06:47,909 --> 00:06:46,160
of course on launch day

201
00:06:50,870 --> 00:06:47,919
uh when tanking comes around about eight

202
00:06:52,070 --> 00:06:50,880
hours or so before the launch uh we're

203
00:06:53,909 --> 00:06:52,080
in the data room we're also in the

204
00:06:55,909 --> 00:06:53,919
firing room monitoring and we're

205
00:06:58,150 --> 00:06:55,919
actively talking to the hospital nerask

206
00:06:59,510 --> 00:06:58,160
and monitoring for any uh real time

207
00:07:00,309 --> 00:06:59,520
issues that come up that we can talk

208
00:07:02,230 --> 00:07:00,319
about

209
00:07:04,950 --> 00:07:02,240
and then of course uh as we count down

210
00:07:07,029 --> 00:07:04,960
we're uh always thankful that we can

211
00:07:09,990 --> 00:07:07,039
watch a very uh what we call a boring

212
00:07:12,390 --> 00:07:10,000
countdown uh no events and just standing

213
00:07:14,309 --> 00:07:12,400

by and waiting and then uh

214
00:07:16,390 --> 00:07:14,319
everything goes well for us we light up

215
00:07:17,830 --> 00:07:16,400
and we have a nice day all right well we

216
00:07:22,469 --> 00:07:17,840
can't wait to see it i hope it's very

217
00:07:26,469 --> 00:07:24,469
so all of the hard work and preparations

218
00:07:28,629 --> 00:07:26,479
culminate right here on a launch pad at

219
00:07:30,390 --> 00:07:28,639
kennedy space center the shuttle and the

220
00:07:32,309 --> 00:07:30,400
engines are ready to go