FIRING ROOM 1

KENNEDY SPACE CENTER, FLORIDA

GSDO
GROUND SYSTEMS DEVELOPMENT AND OPERATIONS

1
00:00:17,450 --> 00:00:15,410
spectral system is the next newest

2
00:00:19,220 --> 00:00:17,460
biggest rocket that we're going to build

3
00:00:20,810 --> 00:00:19,230
and it's not just a replacement for the

4
00:00:22,370 --> 00:00:20,820
Space Shuttle this rocket is going to

5
00:00:25,429 --> 00:00:22,380
carry us much further than the shuttle

6
00:00:29,960 --> 00:00:25,439
would go it's NASA's next big rocket for

7
00:00:33,950 --> 00:00:29,970
deep space explore the SLS is a national

8
00:00:37,490 --> 00:00:33,960
capability that provides a unique access

9
00:00:42,459 --> 00:00:37,500
to space that America has not had in 40

10
00:00:45,979 --> 00:00:42,469
years a large launch vehicle like this

11
00:00:48,319 --> 00:00:45,989
really opens the door to destinations

12
00:00:54,819 --> 00:00:48,329
beyond it's not limited by destination

13
00:00:59,389 --> 00:00:57,260

what we're focused on here this Center

14
00:01:01,729 --> 00:00:59,399
is the propulsion system and that

15
00:01:04,100 --> 00:01:01,739
consists of two solid rocket boosters

16
00:01:06,050 --> 00:01:04,110
and a core with some tanks that feed

17
00:01:08,630 --> 00:01:06,060
some liquid rocket engines in the middle

18
00:01:12,469 --> 00:01:08,640
and then the astronauts it on the top in

19
00:01:15,679 --> 00:01:12,479
the Orion spacecraft one of the things

20
00:01:18,350 --> 00:01:15,689
we recognized for SLS is we had to be

21
00:01:21,920 --> 00:01:18,360
affordable so we had to do things

22
00:01:24,020 --> 00:01:21,930
differently more efficiently and smarter

23
00:01:26,570 --> 00:01:24,030
we're all conscious about saving money

24
00:01:28,550 --> 00:01:26,580
doing it a more affordable than we have

25
00:01:30,830 --> 00:01:28,560
in the past but at the same time we

26
00:01:33,710 --> 00:01:30,840
can't sacrifice reliability or safety

27
00:01:35,780 --> 00:01:33,720
the system uses a significant amount of

28
00:01:37,399 --> 00:01:35,790
heritage hardware which is things that

29
00:01:40,789 --> 00:01:37,409
we've evolved from the space shuttle

30
00:01:42,560 --> 00:01:40,799
program the Space Shuttle had to kind of

31
00:01:46,700 --> 00:01:42,570
candle looking things which are the

32
00:01:51,319 --> 00:01:46,710
solid Rockets those are kept and those

33
00:01:53,030 --> 00:01:51,329
are used on sls we've added a segment to

34
00:01:55,010 --> 00:01:53,040
the four segments solid rocket boosters

35
00:01:57,289 --> 00:01:55,020
that we had on shuttle that gives it

36
00:01:59,300 --> 00:01:57,299
more power more thrust and it helps this

37
00:02:01,010 --> 00:01:59,310
larger rocket get off the ground what

38
00:02:02,600 --> 00:02:01,020

those boosters are for is just to get

39
00:02:04,840 --> 00:02:02,610
you going they burn for a couple of

40
00:02:07,219 --> 00:02:04,850
minutes and then they fall to the ground

41
00:02:08,839 --> 00:02:07,229
then your liquid engines you're up high

42
00:02:10,699 --> 00:02:08,849
enough your liquid needed to carry your

43
00:02:11,790 --> 00:02:10,709
vehicle to as high as you want to go and

44
00:02:13,230 --> 00:02:11,800
if you have additional state

45
00:02:15,450 --> 00:02:13,240
like we're going to have one then you

46
00:02:17,790 --> 00:02:15,460
can go further out into space right now

47
00:02:20,640 --> 00:02:17,800
the IMP Tory that we've got consists of

48
00:02:23,550 --> 00:02:20,650
14 engines that flown on shelf we've got

49
00:02:24,840 --> 00:02:23,560
one engine that was assembled and still

50
00:02:26,700 --> 00:02:24,850
needs green run testing our

51
00:02:29,010 --> 00:02:26,710
certification testing we looked at all

52
00:02:30,720 --> 00:02:29,020
the spares as we collected the spares we

53
00:02:33,090 --> 00:02:30,730
determined that we for this embolus

54
00:02:36,420 --> 00:02:33,100
abstains engines will have 16 engines

55
00:02:38,700 --> 00:02:36,430
that will be able to usually life we are

56
00:02:41,610 --> 00:02:38,710
making tremendous progress we've got all

57
00:02:43,710 --> 00:02:41,620
of our prime contractors on board we're

58
00:02:47,010 --> 00:02:43,720
testing engines we're testing solid

59
00:02:50,300 --> 00:02:47,020
rocket boosters or avionics systems j-2x

60
00:02:53,010 --> 00:02:50,310
has set recently set a record at Stennis

61
00:02:56,550 --> 00:02:53,020
when we were testing it was the first

62
00:03:04,050 --> 00:02:56,560
liquid oxygen engine to get to a full

63
00:03:06,240 --> 00:03:04,060

duration test in for tests we were

64
00:03:09,090 --> 00:03:06,250
developing this booster under the Ares

65
00:03:11,760 --> 00:03:09,100
program and and we're moving that into

66
00:03:13,530 --> 00:03:11,770
the SLS beautiful the motor itself has

67
00:03:16,199 --> 00:03:13,540
been through three development firing

68
00:03:19,170 --> 00:03:16,209
which are full-scale motors tested out

69
00:03:21,229 --> 00:03:19,180
in Utah and we've gotten a lot of good

70
00:03:23,880 --> 00:03:21,239
data engineering data from those tests

71
00:03:25,890 --> 00:03:23,890
this is an adapter that goes between the

72
00:03:27,660 --> 00:03:25,900
bottom of the Ryan capsule and the top

73
00:03:30,870 --> 00:03:27,670
of the Space Launch System rocket that

74
00:03:32,850 --> 00:03:30,880
were developing here Marshall it's been

75
00:03:35,910 --> 00:03:32,860
specifically designed to give strength

76
00:03:39,170 --> 00:03:35,920
to the adapter so that it can take the

77
00:03:41,940 --> 00:03:39,180
loads in flight and still be lightweight

78
00:03:44,850 --> 00:03:41,950
this shape started out as a series of

79
00:03:47,610 --> 00:03:44,860
flat panels the iso grid pattern was

80
00:03:49,440 --> 00:03:47,620
machined into the surfaces then they

81
00:03:51,540 --> 00:03:49,450
were formed that was called bump in a

82
00:03:53,440 --> 00:03:51,550
process called the bump for me to make

83
00:03:55,479 --> 00:03:53,450
them into the shape that we need here

84
00:03:57,280 --> 00:03:55,489
and we weld three of these segments

85
00:04:06,950 --> 00:03:57,290
together to form the cone that you see

86
00:04:17,210 --> 00:04:10,770
we just you know delivered the first

87
00:04:23,460 --> 00:04:20,580
we've started a lot of the parts on to

88
00:04:25,980 --> 00:04:23,470

the outside of the CM and we've actually

89
00:04:27,930 --> 00:04:25,990
put it in what we call the bird cage so

90
00:04:30,360 --> 00:04:27,940
we can locate all those parts you know

91
00:04:32,310 --> 00:04:30,370
within you know thousands of an inch to

92
00:04:36,300 --> 00:04:32,320
make sure that everything is going

93
00:04:38,820 --> 00:04:36,310
together okay putting you know wiring

94
00:04:40,590 --> 00:04:38,830
inside with putting tubes for the you

95
00:04:42,960 --> 00:04:40,600
know for the propulsion system putting

96
00:04:47,370 --> 00:04:42,970
valves and pumps and so all of that

97
00:04:50,750 --> 00:04:47,380
happens in stages right there in the ONC

98
00:04:56,870 --> 00:04:53,840
we have own contract with us a nice

99
00:04:59,450 --> 00:04:56,880
baseline to build our harnesses they're

100
00:05:05,770 --> 00:04:59,460
set up shop in the ONC and so their

101
00:05:11,630 --> 00:05:08,390
federal protection is very difficult in

102
00:05:13,700 --> 00:05:11,640
re-entry vehicles to to test into model

103
00:05:16,820 --> 00:05:13,710
I really have to have to fly it to

104
00:05:19,320 --> 00:05:16,830
really understand what's going to happen

105
00:05:20,910 --> 00:05:19,330
we're building ceramic thermal

106
00:05:22,680 --> 00:05:20,920
insulation tiles for the back shell of

107
00:05:23,880 --> 00:05:22,690
the capsule we're building thermal

108
00:05:25,770 --> 00:05:23,890
barriers for the capsule and we're

109
00:05:31,170 --> 00:05:25,780
building multi-layer insulation for that

110
00:05:36,060 --> 00:05:34,529
I'm heat shield design we've so we're

111
00:05:38,550 --> 00:05:36,070
designing and building the heat shield

112
00:05:40,890 --> 00:05:38,560
for the future or I measures the heat

113
00:05:43,950 --> 00:05:40,900

shield right now is in our big 20 by 20

114
00:05:47,460 --> 00:05:43,960
router it's a five access router and

115
00:05:49,560 --> 00:05:47,470
right now it's machining the interior

116
00:05:51,480 --> 00:05:49,570
bowl if you will to heat shield to cut

117
00:05:54,210 --> 00:05:51,490
out that heat shield on the on the

118
00:05:57,390 --> 00:05:54,220
router it could take weeks of machine

119
00:06:02,460 --> 00:05:57,400
time running multiple shifts it's the

120
00:06:03,540 --> 00:06:02,470
biggest heat shield ever constructed now

121
00:06:05,790 --> 00:06:03,550
the component is the heat shield

122
00:06:07,860 --> 00:06:05,800
skeleton so the piece of the titanium

123
00:06:10,469 --> 00:06:07,870
substructure the backbone that makes up

124
00:06:13,409 --> 00:06:10,479
the carrier structure itself another

125
00:06:15,120 --> 00:06:13,419
unique thing is all day hand drilling

126
00:06:17,820 --> 00:06:15,130
that we're doing so it's not automated

127
00:06:19,890 --> 00:06:17,830
by a router in this case and l has to be

128
00:06:23,400 --> 00:06:19,900
the hand drew hand drilled by

129
00:06:25,740 --> 00:06:23,410
technicians on the inside 200-plus

130
00:06:28,680 --> 00:06:25,750
titanium parts all match drilled

131
00:06:30,180 --> 00:06:28,690
together so we have a tool that puts all

132
00:06:36,620 --> 00:06:30,190
the pieces in the right spot and then we

133
00:06:43,170 --> 00:06:40,320
mcc is transforming from supporting

134
00:06:45,600 --> 00:06:43,180
space shuttle and Space Station to a

135
00:06:50,010 --> 00:06:45,610
platform that will support space station

136
00:06:51,990 --> 00:06:50,020
and m pc b or orion in order to adapt to

137
00:06:55,320 --> 00:06:52,000
the future we need to go to a more

138
00:06:57,240 --> 00:06:55,330

modern system KSC will still offer the

139
00:06:58,920 --> 00:06:57,250
vehicle all the way up into launch will

140
00:07:00,300 --> 00:06:58,930
operate the vehicle to splashdown the

141
00:07:09,059 --> 00:07:00,310
recovery forces come in and take over

142
00:07:10,230 --> 00:07:09,069
after that firing one is the launch

143
00:07:14,730 --> 00:07:10,240
control room we're going to use for

144
00:07:16,200 --> 00:07:14,740
Orion SLS for em1 missions we've been

145
00:07:18,420 --> 00:07:16,210
working with the Orion program to get

146
00:07:19,920 --> 00:07:18,430
the spacecraft data so we can we can

147
00:07:21,210 --> 00:07:19,930
process it with our software in the

148
00:07:24,980 --> 00:07:21,220
firing room and we will be flight

149
00:07:28,529 --> 00:07:24,990
following that mission how to fire one

150
00:07:30,360 --> 00:07:28,539
we refitted the room we redid it putting

151
00:07:31,950 --> 00:07:30,370
the sound suppression carpeting on the

152
00:07:33,809 --> 00:07:31,960
walls making it kind of a more

153
00:07:36,240 --> 00:07:33,819
comfortable place to work so we're

154
00:07:38,159 --> 00:07:36,250
aiming for about 50 people in firing one

155
00:07:40,980 --> 00:07:38,169
for an e/m one mission we are actually

156
00:07:45,490 --> 00:07:40,990
using firing one right now to test pad

157
00:07:50,350 --> 00:07:48,040
this party is going to be almost like a

158
00:07:53,890 --> 00:07:50,360
complete new back because we will have

159
00:07:56,260 --> 00:07:53,900
refurbished each and every system that

160
00:07:59,650 --> 00:07:56,270
it's inside of that we're going to have

161
00:08:01,960 --> 00:07:59,660
the vehicle launched from the mobile

162
00:08:04,780 --> 00:08:01,970
launcher and not only launched from the

163
00:08:07,870 --> 00:08:04,790

mobile launcher behalf at our doubt that

164
00:08:11,350 --> 00:08:07,880
we'll have all the services attached to

165
00:08:14,020 --> 00:08:11,360
the vehicle the tower is going to be on

166
00:08:20,500 --> 00:08:14,030
the mobile launcher the vehicle will be

167
00:08:22,600 --> 00:08:20,510
a symbol at the VA be it's a return to a

168
00:08:25,180 --> 00:08:22,610
concept that we knew that worked very

169
00:08:27,610 --> 00:08:25,190
well during the Apollo years when the

170
00:08:31,150 --> 00:08:27,620
mobile launch platform had a tower on it

171
00:08:34,180 --> 00:08:31,160
we knew that the báb was designed to

172
00:08:37,330 --> 00:08:34,190
accommodate a launch tower on a mobile

173
00:08:40,120 --> 00:08:37,340
launch platform we have to make sure

174
00:08:42,820 --> 00:08:40,130
that the beep the VA be can remain

175
00:08:46,420 --> 00:08:42,830
adaptable and accommodate different

176
00:08:49,930 --> 00:08:46,430
vehicle architectures and now we have a

177
00:08:51,910 --> 00:08:49,940
clean VA be shell / say that the

178
00:08:56,070 --> 00:08:51,920
infrastructure so that we can

179
00:08:59,710 --> 00:08:56,080
accommodate the the new hardware the new

180
00:09:02,020 --> 00:08:59,720
vehicle access with that new platforms

181
00:09:05,500 --> 00:09:02,030
and that is the first phase of we're

182
00:09:07,660 --> 00:09:05,510
doing now and once the vehicle is ready

183
00:09:09,460 --> 00:09:07,670
with all the connections the only thing

184
00:09:11,590 --> 00:09:09,470
we got to do is move the vehicle to the

185
00:09:13,840 --> 00:09:11,600
bat do the connections to the mobile

186
00:09:17,140 --> 00:09:13,850
launcher and once we do those connection

187
00:09:18,280 --> 00:09:17,150
we're ready to launch there was a time

188
00:09:20,079 --> 00:09:18,290

where I had to explain what a call it

189
00:09:21,760 --> 00:09:20,089
was if you didn't work out here at the

190
00:09:22,990 --> 00:09:21,770
Space Center or if you weren't in the

191
00:09:25,090 --> 00:09:23,000
central florida area a lot of people

192
00:09:28,329 --> 00:09:25,100
just you know somehow the vehicle got

193
00:09:30,070 --> 00:09:28,339
out to the pad we know what to expect

194
00:09:31,630 --> 00:09:30,080
from a load perspective with the new

195
00:09:33,940 --> 00:09:31,640
vehicle the larger rocket and things

196
00:09:35,980 --> 00:09:33,950
along those lines and that goes from the

197
00:09:37,630 --> 00:09:35,990
crawler lifted load the hydraulics also

198
00:09:39,490 --> 00:09:37,640
to the crawler way we're gonna have to

199
00:09:42,760 --> 00:09:39,500
increase the load capability for the

200
00:09:44,260 --> 00:09:42,770
crawler Way itself with a rock what we

201
00:09:46,150 --> 00:09:44,270
essentially done is keep all the same

202
00:09:47,560 --> 00:09:46,160
hydraulic components but just increase

203
00:09:48,340 --> 00:09:47,570
the size the diameter of the hydraulic

204
00:09:50,560 --> 00:09:48,350
cylinders

205
00:09:52,060 --> 00:09:50,570
last November we actually took a took a

206
00:09:53,830 --> 00:09:52,070
ride out with the completed crawler to

207
00:09:55,990 --> 00:09:53,840
out to the pad and tested out the

208
00:09:59,050 --> 00:09:56,000
systems and a couple punchless items but

209
00:10:00,970 --> 00:09:59,060
everything worked great the control

210
00:10:02,620 --> 00:10:00,980
system had been upgraded via the cab

211
00:10:04,240 --> 00:10:02,630
cotton the driver's cab consoles and all

212
00:10:07,210 --> 00:10:04,250
been replaced the brakes had all been

213
00:10:09,370 --> 00:10:07,220

replaced nearly every subsystem had some

214
00:10:11,290 --> 00:10:09,380
kind of work done to it the traction

215
00:10:14,080 --> 00:10:11,300
support elements each of the four

216
00:10:15,700 --> 00:10:14,090
corners has 22 rollers that are about

217
00:10:17,470 --> 00:10:15,710
the size of a car be honest with you and

218
00:10:21,900 --> 00:10:17,480
we're changing all of those in large

219
00:10:24,880 --> 00:10:21,910
nose as well what I love doing is

220
00:10:26,800 --> 00:10:24,890
reminding the outside world whether it's

221
00:10:29,590 --> 00:10:26,810
within our government or especially the

222
00:10:32,560 --> 00:10:29,600
media that has a perception that were in

223
00:10:34,570 --> 00:10:32,570
a law there's nothing going on that you

224
00:10:36,130 --> 00:10:34,580
know the space program shutting down to

225
00:10:38,230 --> 00:10:36,140
kind of dispel that rumor and say know

226
00:10:41,470 --> 00:10:38,240
what this is the the far opposite for us

227
00:10:45,310 --> 00:10:41,480
we are utilizing this inter program time

228
00:10:47,980 --> 00:10:45,320
frame to make all the modifications and

229
00:10:50,500 --> 00:10:47,990
all the infrastructure changes that it

230
00:10:53,910 --> 00:10:50,510
will help and bring that agency vision

231
00:10:57,070 --> 00:10:53,920
into reality many of us feel the country

232
00:10:58,510 --> 00:10:57,080
wants to go forward and NASA has a big

233
00:11:01,360 --> 00:10:58,520
following and every time I talk to

234
00:11:03,640 --> 00:11:01,370
people we're excited about NASA enabling

235
00:11:06,130 --> 00:11:03,650
people to go beyond where they have ever

236
00:11:09,190 --> 00:11:06,140
gone before and look and discover things

237
00:11:12,430 --> 00:11:09,200
that they didn't even know existed is

238
00:11:13,510 --> 00:11:12,440

just it's just a real honor it's been a

239
00:11:15,400 --> 00:11:13,520
pleasure to be involved with this

240
00:11:17,620 --> 00:11:15,410
project and I can't say enough for the

241
00:11:19,690 --> 00:11:17,630
team to put this together I'm privileged

242
00:11:21,430 --> 00:11:19,700
to work this program I think most people

243
00:11:22,930 --> 00:11:21,440
are working at today feel the same way I