1
00:00:22,889 --> 00:00:20,519
echo man this thing is huge you could

2
00:00:26,130 --> 00:00:22,899
park a bus in here bill come on we got a

3
00:00:28,079 --> 00:00:26,140
show to do oh sorry hi I'm bill hubscher

4
00:00:29,880 --> 00:00:28,089
and I'm Lori Meggs and welcome to focus

5
00:00:32,190 --> 00:00:29,890
on Marshall on today's episode we are

6
00:00:33,330 --> 00:00:32,200
standing outside a gigantic oven here at

7
00:00:35,460 --> 00:00:33,340
the marshall center and we're going to

8
00:00:36,720 --> 00:00:35,470
show you what's baked in here but first

9
00:00:38,340 --> 00:00:36,730
we're going to take you to two brand new

10
00:00:39,750 --> 00:00:38,350
facilities here at Marshall that are

11
00:00:42,180 --> 00:00:39,760
going to help in the development of

12
00:00:43,740 --> 00:00:42,190
future spacecraft what are the greatest

13
00:00:45,180 --> 00:00:43,750

things about this job is how you can

14
00:00:46,740 --> 00:00:45,190
learn something new every day for

15
00:00:48,540 --> 00:00:46,750
example I always thought the external

16
00:00:50,280 --> 00:00:48,550
tank was built entirely down to the

17
00:00:52,590 --> 00:00:50,290
Michoud assembly facility in New Orleans

18
00:00:54,360 --> 00:00:52,600
not true the nose cones are built right

19
00:00:55,650 --> 00:00:54,370
here at Marshall Richard launches a

20
00:00:58,110 --> 00:00:55,660
supervisor in the non-metallic

21
00:00:59,790 --> 00:00:58,120
processing area and Richard first of all

22
00:01:01,860 --> 00:00:59,800
what is this material we're seeing here

23
00:01:06,389 --> 00:01:01,870
that is part of the nose cone right the

24
00:01:10,109 --> 00:01:06,399
material is at its a graphite fiber whoa

25
00:01:12,719 --> 00:01:10,119
it into a fabric with a phenolic resin

26
00:01:15,179 --> 00:01:12,729
impregnated into that fabric in fact I

27
00:01:18,450 --> 00:01:15,189
have a small piece here of the material

28
00:01:20,700 --> 00:01:18,460
it's very high strength very flexible

29
00:01:23,160 --> 00:01:20,710
and it needs to be flexible so that we

30
00:01:26,520 --> 00:01:23,170
can put it into the nose cone form it

31
00:01:29,550 --> 00:01:26,530
around some of the corners and cavities

32
00:01:32,760 --> 00:01:29,560
that are in the nose cone the material

33
00:01:37,349 --> 00:01:32,770
is actually the fiber is actually made

34
00:01:40,529 --> 00:01:37,359
in Tennessee though it's taken to South

35
00:01:42,300 --> 00:01:40,539
Carolina and woven into a fabric then

36
00:01:44,279 --> 00:01:42,310
shipped to california and there's a

37
00:01:47,160 --> 00:01:44,289
resin is made New York and that's

38
00:01:49,349 --> 00:01:47,170

shipped to california and then pre

39
00:01:52,050 --> 00:01:49,359
impregnate this material and then that

40
00:01:53,910 --> 00:01:52,060
material is shipped here to Marshall for

41
00:01:56,099 --> 00:01:53,920
us to lay up in the nose cone it's

42
00:01:57,209 --> 00:01:56,109
really a nationwide effort so walk us

43
00:01:59,699 --> 00:01:57,219
through the steps what are these guys

44
00:02:02,819 --> 00:01:59,709
doing right here these guys are actually

45
00:02:04,949 --> 00:02:02,829
doing the cut out of each ply we do

46
00:02:09,359 --> 00:02:04,959
little pie shape so that it fits into

47
00:02:11,520 --> 00:02:09,369
the cone itself and we have done many

48
00:02:13,530 --> 00:02:11,530
years of development for this to make

49
00:02:16,649 --> 00:02:13,540
sure we got the ply orientation

50
00:02:19,140 --> 00:02:16,659
and ply cuts right they they have to be

51
00:02:23,009 --> 00:02:19,150
careful of the pie orientation there

52
00:02:27,059 --> 00:02:23,019
there's to make a better strength of the

53
00:02:30,839 --> 00:02:27,069
cone itself we lay some up at 0 degrees

54
00:02:33,599 --> 00:02:30,849
summit 45 degrees summit minus 45

55
00:02:36,270 --> 00:02:33,609
degrees in summit 90 degrees and we have

56
00:02:38,849 --> 00:02:36,280
a plan that the technicians and

57
00:02:40,619 --> 00:02:38,859
engineers follow through step-by-step to

58
00:02:42,330 --> 00:02:40,629
make that happen so it's all in the

59
00:02:44,009 --> 00:02:42,340
layering yeah well how much of this

60
00:02:47,369 --> 00:02:44,019
material do you use just to make one

61
00:02:50,839 --> 00:02:47,379
most go we actually use almost 300 feet

62
00:02:54,149 --> 00:02:50,849
almost the length of a football field to

63
00:02:56,819 --> 00:02:54,159

manufacture we have 18 plies in the main

64
00:03:00,149 --> 00:02:56,829
body of the cone and then there's six

65
00:03:03,030 --> 00:03:00,159
act replies in the very tip of the cone

66
00:03:05,909 --> 00:03:03,040
to make sure that there's X strength

67
00:03:08,610 --> 00:03:05,919
there when they mount the spike on in

68
00:03:10,530 --> 00:03:08,620
production alright Richards what happens

69
00:03:12,809 --> 00:03:10,540
after we've cut the pieces out here when

70
00:03:14,970 --> 00:03:12,819
we get done doing the cut out to the

71
00:03:16,559 --> 00:03:14,980
plies here of the pie-shaped we actually

72
00:03:22,319 --> 00:03:16,569
take it over to the cone we'll go over

73
00:03:25,140 --> 00:03:22,329
here and look and lay it lay the each

74
00:03:27,629 --> 00:03:25,150
fly up into the cone this is actually

75
00:03:30,149 --> 00:03:27,639
under vacuum right now and between each

76
00:03:31,920 --> 00:03:30,159
ply we have to put it under vacuum when

77
00:03:34,349 --> 00:03:31,930
we take it out of vacuum will lay this

78
00:03:37,349 --> 00:03:34,359
over and the operators come in here and

79
00:03:40,199 --> 00:03:37,359
do the layup from there it goes into the

80
00:03:45,240 --> 00:03:40,209
next room behind these doors here and it

81
00:03:47,759 --> 00:03:45,250
autoplay where it's pressure and held

82
00:03:50,670 --> 00:03:47,769
under vacuum and heated to 300 degrees

83
00:03:53,189 --> 00:03:50,680
to actually cure out the resonance in

84
00:03:54,869 --> 00:03:53,199
the pre impregnated material I know

85
00:03:57,360 --> 00:03:54,879
there's a few more steps after this and

86
00:03:58,890 --> 00:03:57,370
that's where Lori comes in I'm here with

87
00:04:00,449 --> 00:03:58,900
John sharp and he's the senior manager

88
00:04:01,979 --> 00:04:00,459

for Lockheed Martin for the external

89
00:04:05,280 --> 00:04:01,989
tank nose cone project here at Marshall

90
00:04:07,830 --> 00:04:05,290
and John we've seen it cut and cured now

91
00:04:10,140 --> 00:04:07,840
what happens after cure was taken into

92
00:04:11,699 --> 00:04:10,150
large oven mitts also here in the

93
00:04:14,369 --> 00:04:11,709
national center for advanced

94
00:04:16,680 --> 00:04:14,379
manufacturing and there is post cured

95
00:04:18,810 --> 00:04:16,690
that basically takes it up to a higher

96
00:04:20,999 --> 00:04:18,820
glass transition which makes it more

97
00:04:23,760 --> 00:04:21,009
thermally stable and this brought into

98
00:04:26,100 --> 00:04:23,770
this room where it's machine to be able

99
00:04:28,230 --> 00:04:26,110
to interface with the external tank

100
00:04:30,330 --> 00:04:28,240
that machine assembly facility in New

101
00:04:33,659 --> 00:04:30,340
Orleans so what you see in this room is

102
00:04:36,719 --> 00:04:33,669
a series of drilling and machining tools

103
00:04:39,719 --> 00:04:36,729
that the technicians and engineers used

104
00:04:41,790 --> 00:04:39,729
to put it into final form and to mount

105
00:04:44,339 --> 00:04:41,800
the brackets onto the base of the unit

106
00:04:47,790 --> 00:04:44,349
so that it interfaces with the external

107
00:04:49,200 --> 00:04:47,800
tank in final assembly in New Orleans so

108
00:04:52,170 --> 00:04:49,210
John I understand that each one has a

109
00:04:54,330 --> 00:04:52,180
name to the other do the production crew

110
00:04:56,749 --> 00:04:54,340
actually gives a nickname to each of the

111
00:04:59,700 --> 00:04:56,759
units and through the life the program

112
00:05:01,860 --> 00:04:59,710
will have built 54 of these units so

113
00:05:05,129 --> 00:05:01,870

each one has a name this particular one

114
00:05:07,379 --> 00:05:05,139
unit 52 is named Betsy any room for

115
00:05:09,029 --> 00:05:07,389
Laurie anywhere hey we'll see what we

116
00:05:14,219 --> 00:05:09,039
can do all right thanks for showing us

117
00:05:15,510 --> 00:05:14,229
around John we're in building 4705 at

118
00:05:17,369 --> 00:05:15,520
the Marshall Space Flight Center to talk

119
00:05:18,929 --> 00:05:17,379
to nature hatchet she is a mechanical

120
00:05:20,309 --> 00:05:18,939
engineer out here Marshall a nature

121
00:05:22,619 --> 00:05:20,319
first of all tell us what it is you do

122
00:05:25,559 --> 00:05:22,629
here okay I work for the mechanical

123
00:05:28,559 --> 00:05:25,569
fabrication branch asset ask lead for

124
00:05:31,320 --> 00:05:28,569
the machining development task all right

125
00:05:32,999 --> 00:05:31,330
and today we are here because of a huge

126
00:05:34,499 --> 00:05:33,009
project that you've been a part of the

127
00:05:36,600 --> 00:05:34,509
paint's not even dry in this brand new

128
00:05:38,369 --> 00:05:36,610
facility to look at this a brand-new

129
00:05:40,170 --> 00:05:38,379
machining tool this thing is immense

130
00:05:42,890 --> 00:05:40,180
what can you tell us about this what

131
00:05:46,469 --> 00:05:42,900
you're looking at is a high tolerance

132
00:05:49,589 --> 00:05:46,479
high-speed machining tool with seven

133
00:05:51,600 --> 00:05:49,599
axes and it's just awesome can you tell

134
00:05:53,070 --> 00:05:51,610
me what exactly machining means well

135
00:05:54,510 --> 00:05:53,080
what do you want to what will something

136
00:05:56,550 --> 00:05:54,520
happen when we put something in there to

137
00:05:58,589 --> 00:05:56,560
be machined it's a milling machine seven

138
00:06:01,230 --> 00:05:58,599

axis milling machine so what is going to

139
00:06:05,610 --> 00:06:01,240
do is pretty much take off small amounts

140
00:06:08,339 --> 00:06:05,620
of metallic or nonmetallic material and

141
00:06:10,439 --> 00:06:08,349
but it will do it at a high speed that's

142
00:06:12,390 --> 00:06:10,449
what makes it so special so something is

143
00:06:13,829 --> 00:06:12,400
being sculpted there right exactly what

144
00:06:17,249 --> 00:06:13,839
do you mean when you say seven access

145
00:06:19,350 --> 00:06:17,259
though o 7 x's this machine has seven

146
00:06:21,749 --> 00:06:19,360
axis which means that it just can move

147
00:06:24,629 --> 00:06:21,759
in seven different directions there's

148
00:06:26,219 --> 00:06:24,639
the motion so you have if you look at

149
00:06:29,390 --> 00:06:26,229
the red component there that's the

150
00:06:33,019 --> 00:06:29,400
spindle there's five axis on the spindle

151
00:06:37,690 --> 00:06:33,029
you have the rotary table right here the

152
00:06:40,190 --> 00:06:37,700
turntable there is one axis

153
00:06:43,780 --> 00:06:40,200
then you have the headstock in the tail

154
00:06:46,700 --> 00:06:43,790
sockets it has the indexers there is one

155
00:06:49,100 --> 00:06:46,710
axis there so if you count them all up

156
00:06:50,750 --> 00:06:49,110
you have seven axes that's impressive

157
00:06:52,640 --> 00:06:50,760
what kind of things will we expect to be

158
00:06:56,810 --> 00:06:52,650
seeing on here oh yeah we're going to

159
00:06:58,400 --> 00:06:56,820
fabricate dome shape components starting

160
00:07:01,670 --> 00:06:58,410
with the common Boca demonstration

161
00:07:05,150 --> 00:07:01,680
articles we we're capable of putting

162
00:07:10,130 --> 00:07:05,160
cylindrical components between the

163
00:07:11,300 --> 00:07:10,140

trunnions for cylindrical machining so I

164
00:07:14,630 --> 00:07:11,310
can be turned in many different ways

165
00:07:16,970 --> 00:07:14,640
right it's basically like a rotisserie i

166
00:07:18,380 --> 00:07:16,980
guess if if you think about it yet giant

167
00:07:20,600 --> 00:07:18,390
rotisserie that could make it end up in

168
00:07:21,710 --> 00:07:20,610
space ok well thanks very much we look

169
00:07:24,409 --> 00:07:21,720
forward to seeing the first element you

170
00:07:26,810 --> 00:07:24,419
put on there thank you Bill it would be

171
00:07:28,909 --> 00:07:26,820
so cool to have my name on a nose cone I

172
00:07:30,890 --> 00:07:28,919
agree but you know to be even cooler the

173
00:07:33,200 --> 00:07:30,900
size of the cupcake you could bake in

174
00:07:35,150 --> 00:07:33,210
this thing always thinking with his

175
00:07:47,660 --> 00:07:35,160
stomach find out where we turn up next