1
00:00:02,810 --> 00:00:01,790
the next images that are on the next

2
00:00:08,179 --> 00:00:02,820
shuttle flight thanks for being with us

3
00:00:10,009 --> 00:00:08,189
today thank you we're building 4707 in

4
00:00:11,629 --> 00:00:10,019
the rapid prototyping lab and we're

5
00:00:13,580 --> 00:00:11,639
joined by one of the engineers here

6
00:00:15,829 --> 00:00:13,590
Curtis Manning Curtis thanks for being

7
00:00:17,450 --> 00:00:15,839
here with us today first of all tell us

8
00:00:19,580 --> 00:00:17,460
a little bit more about what rapid

9
00:00:21,830 --> 00:00:19,590
prototyping is but rapid prototyping is

10
00:00:24,019 --> 00:00:21,840
a term used to describe the layer upon

11
00:00:25,880 --> 00:00:24,029
layer deposition of material to produce

12
00:00:27,380 --> 00:00:25,890
three-dimensional parts they're

13
00:00:30,109 --> 00:00:27,390

essentially growing three-dimensional

14
00:00:31,730 --> 00:00:30,119
parts rolling parts how do you how does

15
00:00:34,580 --> 00:00:31,740
this fit into the Marshall mission well

16
00:00:37,790 --> 00:00:34,590
the most important aspect is is that we

17
00:00:40,400 --> 00:00:37,800
support in space manufacturing if we're

18
00:00:43,010 --> 00:00:40,410
traveling to the moon or to Mars we need

19
00:00:45,619 --> 00:00:43,020
ways of actually producing parts on the

20
00:00:48,020 --> 00:00:45,629
go and once we get there we need ways to

21
00:00:50,420 --> 00:00:48,030
actually build habitats if you would so

22
00:00:52,549 --> 00:00:50,430
this process enables us to look at those

23
00:00:54,410 --> 00:00:52,559
long-term goals so you're trying to

24
00:00:56,810 --> 00:00:54,420
research a way to have one machine able

25
00:00:59,840 --> 00:00:56,820
to build multiple parts yes one machine

26
00:01:02,450 --> 00:00:59,850
using multiple different materials to

27
00:01:03,920 --> 00:01:02,460
get that end result well you've got a

28
00:01:05,780 --> 00:01:03,930
computer over here with a model on it to

29
00:01:07,550 --> 00:01:05,790
show how you how you build these parts

30
00:01:11,390 --> 00:01:07,560
can you explain it to us a little bit

31
00:01:13,910 --> 00:01:11,400
yes this actually shows what the machine

32
00:01:17,300 --> 00:01:13,920
sees in the layer upon layer deposition

33
00:01:20,510 --> 00:01:17,310
and we're actually putting layer on

34
00:01:22,969 --> 00:01:20,520
layer and growing that part so that is

35
00:01:24,499 --> 00:01:22,979
the process that we use in doing rapid

36
00:01:26,510 --> 00:01:24,509
colors making a three-dimensional part

37
00:01:27,950 --> 00:01:26,520
yes let's start with this really large

38
00:01:29,660 --> 00:01:27,960

machine you've got over here what's

39
00:01:31,640 --> 00:01:29,670
what's this one doing this is the

40
00:01:35,330 --> 00:01:31,650
selective laser sintering machine and

41
00:01:37,910 --> 00:01:35,340
it's actually centering powder to the

42
00:01:40,069 --> 00:01:37,920
layer beneath it it has a binder in it

43
00:01:42,230 --> 00:01:40,079
so once that laser hits it it actually

44
00:01:44,480 --> 00:01:42,240
binds that powder whatever geometry the

45
00:01:45,910 --> 00:01:44,490
cat software it's telling it to you can

46
00:01:48,319 --> 00:01:45,920
make three-dimensional objects like this

47
00:01:50,480 --> 00:01:48,329
exactly like this matter of fact this is

48
00:01:52,219 --> 00:01:50,490
the part that we're growing in the

49
00:01:53,780 --> 00:01:52,229
chamber right now you're just putting

50
00:01:56,149 --> 00:01:53,790
the layer of powder over into the laser

51
00:01:58,069 --> 00:01:56,159
will attach it to the solid layer below

52
00:01:59,810 --> 00:01:58,079
it okay let's take a look at what you've

53
00:02:01,100 --> 00:01:59,820
got over on this side now now this is

54
00:02:04,429 --> 00:02:01,110
the one that I found interesting you're

55
00:02:06,530 --> 00:02:04,439
actually got I guess a spool of plastic

56
00:02:09,020 --> 00:02:06,540
material looks like fishing line almost

57
00:02:11,690 --> 00:02:09,030
yes this is ABS plastic material that's

58
00:02:12,490 --> 00:02:11,700
in a spool form but once it's fed into

59
00:02:14,920 --> 00:02:12,500
the head

60
00:02:17,140 --> 00:02:14,930
of this machine is heated at extreme

61
00:02:18,670 --> 00:02:17,150
temperatures and extrude it sort of like

62
00:02:21,190 --> 00:02:18,680
a hot glue gun and you can end up

63
00:02:23,380 --> 00:02:21,200

building complex things like this yes a

64
00:02:25,240 --> 00:02:23,390
complex just like a bone and this is

65
00:02:28,420 --> 00:02:25,250
another application that we can use this

66
00:02:31,120 --> 00:02:28,430
process if we are in space to help us

67
00:02:33,160 --> 00:02:31,130
look at how we can remanufacture a human

68
00:02:34,600 --> 00:02:33,170
bone if necessary now you've got another

69
00:02:35,980 --> 00:02:34,610
machine over here building layer upon

70
00:02:37,780 --> 00:02:35,990
layer as you said but this one uses a

71
00:02:40,180 --> 00:02:37,790
liquid what is this a resin this is a

72
00:02:42,850 --> 00:02:40,190
photocurable let resin that's here with

73
00:02:45,250 --> 00:02:42,860
ultraviolet light this is an example of

74
00:02:47,890 --> 00:02:45,260
the park that you can build in this

75
00:02:50,560 --> 00:02:47,900
resident and again it's liquid so it's

76
00:02:52,840 --> 00:02:50,570
citizen of that but as the light hits it

77
00:02:54,699 --> 00:02:52,850
it here is a layer upon layer and here's

78
00:02:56,860 --> 00:02:54,709
one layer to the other and when we're

79
00:02:59,020 --> 00:02:56,870
done we actually grow this part down in

80
00:03:00,670 --> 00:02:59,030
the liquid so the light can hit one side

81
00:03:02,830 --> 00:03:00,680
of it skip over and then cure the other

82
00:03:05,770 --> 00:03:02,840
side solidify that only the inside

83
00:03:07,420 --> 00:03:05,780
liquid exactly interesting Curtis we've

84
00:03:09,699 --> 00:03:07,430
stepped across the lab now to a machine

85
00:03:12,280 --> 00:03:09,709
it looks like it has a giant spool of

86
00:03:14,650 --> 00:03:12,290
aluminum tape and what is this this is

87
00:03:17,259 --> 00:03:14,660
the ultrasonic consolidation process and

88
00:03:19,780 --> 00:03:17,269

he uses ultrasonic solid a Shinto energy

89
00:03:22,509 --> 00:03:19,790
to bind two pieces of aluminum together

90
00:03:24,370 --> 00:03:22,519
so it makes a nice thick stack of

91
00:03:25,539 --> 00:03:24,380
aluminum yes it does and then it uses a

92
00:03:28,030 --> 00:03:25,549
traditional message they cut it out

93
00:03:29,680 --> 00:03:28,040
right it goes and grabs the tool that's

94
00:03:32,650 --> 00:03:29,690
needed and actually cuts out the

95
00:03:33,940 --> 00:03:32,660
geometry and in this case it's a gear so

96
00:03:35,590 --> 00:03:33,950
you're building a gear right now with us

97
00:03:38,289 --> 00:03:35,600
right now alright let's take a look at

98
00:03:40,060 --> 00:03:38,299
this machine which uses that that same

99
00:03:42,280 --> 00:03:40,070
school of plastic like we saw across

100
00:03:45,039 --> 00:03:42,290
across the way so this one's black what

101
00:03:47,199 --> 00:03:45,049
does this one do it this machine is the

102
00:03:49,840 --> 00:03:47,209
latest and greatest version of the fdm

103
00:03:52,390 --> 00:03:49,850
process that we looked at earlier it

104
00:03:55,120 --> 00:03:52,400
uses the same technology but it has it

105
00:03:56,710 --> 00:03:55,130
uses a lot more materials and it's a lot

106
00:03:57,940 --> 00:03:56,720
faster and in fact you're building

107
00:04:00,310 --> 00:03:57,950
something from return to flight with

108
00:04:03,520 --> 00:04:00,320
this one right yes this is an actual

109
00:04:05,259 --> 00:04:03,530
part that we built that allows us to

110
00:04:08,170 --> 00:04:05,269
look at the foam on the ice frost ramp

111
00:04:10,180 --> 00:04:08,180
and it's a functional tool that's the

112
00:04:11,590 --> 00:04:10,190
most important important part we're able

113
00:04:13,030 --> 00:04:11,600

to build functional tools with these

114
00:04:13,630 --> 00:04:13,040
processes and this is in use right now

115
00:04:16,930 --> 00:04:13,640
right

116
00:04:18,520 --> 00:04:16,940
now now this machine here I guess in a

117
00:04:21,220 --> 00:04:18,530
way could replace your traditional

118
00:04:24,760 --> 00:04:21,230
welders is that right well it's a way of

119
00:04:27,670 --> 00:04:24,770
looking at putting a welding in a

120
00:04:29,800 --> 00:04:27,680
different life as a the powders are

121
00:04:32,800 --> 00:04:29,810
actually sprayed into a focal point and

122
00:04:35,740 --> 00:04:32,810
the laser meets that at that focal point

123
00:04:37,360 --> 00:04:35,750
and actually Wells on the spot so it's a

124
00:04:40,420 --> 00:04:37,370
way of doing I guess you would call it

125
00:04:43,030 --> 00:04:40,430
spot welding and it enables us to repair

126
00:04:45,010 --> 00:04:43,040
parts as well as add-on features so be

127
00:04:47,050 --> 00:04:45,020
very fine weld again it doesn't harm the

128
00:04:49,030 --> 00:04:47,060
original part that's actly now let's

129
00:04:51,580 --> 00:04:49,040
take a look at your latest and greatest

130
00:04:53,710 --> 00:04:51,590
machines in fact these just arrived here

131
00:04:55,330 --> 00:04:53,720
at rapid prototyping last week what are

132
00:04:58,030 --> 00:04:55,340
these try they're still on the pallets

133
00:05:01,510 --> 00:04:58,040
matter of fact this is the electron beam

134
00:05:04,300 --> 00:05:01,520
process it's very very unique in that it

135
00:05:06,909 --> 00:05:04,310
uses electron beam instead of a laser to

136
00:05:10,360 --> 00:05:06,919
melt the powder but the one thing that

137
00:05:13,120 --> 00:05:10,370
that is unique is that we can use exotic

138
00:05:15,490 --> 00:05:13,130

materials exotic metals this is titanium

139
00:05:18,070 --> 00:05:15,500
alright so we're able now to build

140
00:05:21,010 --> 00:05:18,080
titanium parts and pull them right off

141
00:05:22,450 --> 00:05:21,020
of a machine use the future and

142
00:05:23,650 --> 00:05:22,460
prototyping we're here Marshall that's

143
00:05:26,350 --> 00:05:23,660
it thanks a lot for having a steady

144
00:05:27,610 --> 00:05:26,360
Curtis thanks for visiting bill it's

145
00:05:29,650 --> 00:05:27,620
amazing the way they can make those

146
00:05:31,719 --> 00:05:29,660
intricate parts which is plastic wire

147
00:05:33,790 --> 00:05:31,729
and does it was fascinating to watch bus

148
00:05:35,080 --> 00:05:33,800
we got to see some great new technology

149
00:05:37,210 --> 00:05:35,090
as well as some impressive shuttle

150
00:05:39,190 --> 00:05:37,220
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