1
00:00:00,030 --> 00:00:13,709
liftoff in five four three two one zero

2
00:00:19,120 --> 00:00:16,450
we're here in Hawthorne California at

3
00:00:20,980 --> 00:00:19,130
SpaceX's headquarters this is a

4
00:00:22,839 --> 00:00:20,990
remarkable facility that includes

5
00:00:25,420 --> 00:00:22,849
everything from their Mission Control

6
00:00:27,849 --> 00:00:25,430
Center to the design and manufacturing

7
00:00:30,429 --> 00:00:27,859
of their rockets and the focus of our

8
00:00:33,340 --> 00:00:30,439
tour today the design and manufacturing

9
00:00:34,960 --> 00:00:33,350
of their Dragon spacecraft we're excited

10
00:00:36,820 --> 00:00:34,970
to have SpaceX's innovative

11
00:00:39,400 --> 00:00:36,830
contributions as a part of the

12
00:00:42,220 --> 00:00:39,410
Commercial Crew program Commercial Crew

13
00:00:43,600 --> 00:00:42,230

is focused on safely launching humans to

14
00:00:46,110 --> 00:00:43,610
and from the international space station

15
00:00:49,720 --> 00:00:46,120
with our two partners SpaceX and Boeing

16
00:00:51,040 --> 00:00:49,730
hi I'm Joshua Santora and today we're

17
00:00:53,560 --> 00:00:51,050
gonna get an inside look at the

18
00:00:56,529 --> 00:00:53,570
development and construction of the crew

19
00:00:59,350 --> 00:00:56,539
dragon also known as dragon 2 which is

20
00:01:01,900 --> 00:00:59,360
SpaceX's crewed spacecraft let's head

21
00:01:03,729 --> 00:01:01,910
inside we've made our way inside to the

22
00:01:06,010 --> 00:01:03,739
factory floor and the first thing I

23
00:01:08,560 --> 00:01:06,020
can't emphasize enough is how massive

24
00:01:10,480 --> 00:01:08,570
and busy this facility is we're here to

25
00:01:13,210 --> 00:01:10,490
talk about the crew dragon but there's

26
00:01:15,550 --> 00:01:13,220
so much going on their area is dedicated

27
00:01:18,130 --> 00:01:15,560
to the Falcon boosters which will launch

28
00:01:19,899 --> 00:01:18,140
the spacecraft the merlin engines which

29
00:01:22,600 --> 00:01:19,909
will propel the first and second stages

30
00:01:25,300 --> 00:01:22,610
the spacecraft itself which will go look

31
00:01:27,880 --> 00:01:25,310
at in a minute and a 3d printing lab

32
00:01:29,999 --> 00:01:27,890
that we're here in front of now through

33
00:01:32,410 --> 00:01:30,009
3d printing or additive manufacturing

34
00:01:34,749 --> 00:01:32,420
robust and high-performing rocket parts

35
00:01:37,289 --> 00:01:34,759
can be created and offer improvements

36
00:01:39,850 --> 00:01:37,299
over traditional manufacturing methods

37
00:01:41,520 --> 00:01:39,860
SpaceX uses 3d printing for a variety of

38
00:01:44,230 --> 00:01:41,530

its rocket and spacecraft parts

39
00:01:47,050 --> 00:01:44,240
including most notably the super Draco

40
00:01:49,510 --> 00:01:47,060
engines the super Draco is functioned as

41
00:01:50,950 --> 00:01:49,520
an emergency abort system and each crew

42
00:01:55,060 --> 00:01:50,960
dragon will be equipped with eight of

43
00:01:57,130 --> 00:01:55,070
them together they can produce 120,000

44
00:01:59,440 --> 00:01:57,140
pounds of axial thrust at under a second

45
00:02:01,780 --> 00:01:59,450
that's enough force to transport the

46
00:02:04,060 --> 00:02:01,790
crew dragon almost a hundred meters in

47
00:02:06,340 --> 00:02:04,070
two seconds and over half a kilometer in

48
00:02:08,430 --> 00:02:06,350
about five seconds if an emergency

49
00:02:10,530 --> 00:02:08,440
situation was detected

50
00:02:13,170 --> 00:02:10,540
even during liftoff or on the way to

51
00:02:15,720 --> 00:02:13,180
orbit those super Draco's are programmed

52
00:02:17,550 --> 00:02:15,730
to automatically fire leaving behind the

53
00:02:20,400 --> 00:02:17,560
booster and transporting the crew and

54
00:02:22,860 --> 00:02:20,410
spacecraft to safety at that point

55
00:02:26,370 --> 00:02:22,870
parachutes deploy and it allows the crew

56
00:02:27,330 --> 00:02:26,380
to return gently to earth now let's go

57
00:02:30,720 --> 00:02:27,340
check and see what's happening

58
00:02:32,910 --> 00:02:30,730
underneath the Dragon spacecraft once

59
00:02:35,100 --> 00:02:32,920
the mission in space is complete we need

60
00:02:36,810 --> 00:02:35,110
to get those astronauts home safely the

61
00:02:39,900 --> 00:02:36,820
process of returning to earth we call

62
00:02:41,700 --> 00:02:39,910
re-entry for spacex the final phase of

63
00:02:43,860 --> 00:02:41,710

reentry is actually landing in the ocean

64
00:02:45,900 --> 00:02:43,870
with four main parachutes much like the

65
00:02:48,750 --> 00:02:45,910
astronauts of the Mercury Gemini and

66
00:02:49,710 --> 00:02:48,760
Apollo programs did but before you can

67
00:02:51,360 --> 00:02:49,720
deploy parachutes

68
00:02:52,590 --> 00:02:51,370
you've got to withstand the immense heat

69
00:02:55,080 --> 00:02:52,600
of passing through the Earth's

70
00:02:58,020 --> 00:02:55,090
atmosphere the outside of the spacecraft

71
00:03:00,810 --> 00:02:58,030
will experience temperatures over 3,000

72
00:03:03,060 --> 00:03:00,820
degrees Fahrenheit in order to protect

73
00:03:04,710 --> 00:03:03,070
their crews SpaceX has developed a

74
00:03:07,920 --> 00:03:04,720
thermal protection system that they call

75
00:03:10,110 --> 00:03:07,930
pica-x it's a high-tech carbon material

76
00:03:12,060 --> 00:03:10,120
that covers the bottom of the spacecraft

77
00:03:13,650 --> 00:03:12,070
they've been using it on their cargo

78
00:03:16,320 --> 00:03:13,660
dragons like the one you see overhead

79
00:03:17,610 --> 00:03:16,330
since 2010 and they'll be using that to

80
00:03:20,310 --> 00:03:17,620
bring the crew dragon home safely as

81
00:03:22,740 --> 00:03:20,320
well this thermal protection system is

82
00:03:24,930 --> 00:03:22,750
designed to dissipate heat away from the

83
00:03:26,840 --> 00:03:24,940
spacecraft as it rears the Earth's

84
00:03:29,699 --> 00:03:26,850
atmosphere with very little degradation

85
00:03:32,130 --> 00:03:29,709
the original pica material was first

86
00:03:35,220 --> 00:03:32,140
developed by NASA and has been adapted

87
00:03:36,930 --> 00:03:35,230
by SpaceX in partnership with NASA it's

88
00:03:39,660 --> 00:03:36,940

so effective at protecting the

89
00:03:41,910 --> 00:03:39,670
spacecraft that each crew dragon will be

90
00:03:43,530 --> 00:03:41,920
able to be reused many times this is

91
00:03:47,280 --> 00:03:43,540
going to save on construction time and

92
00:03:48,720 --> 00:03:47,290
cost when it comes time for launch the

93
00:03:50,970 --> 00:03:48,730
folks here at Mission Control in

94
00:03:54,360 --> 00:03:50,980
Hawthorne have a critical role to play

95
00:03:57,150 --> 00:03:54,370
even when launch is 2,500 miles away on

96
00:03:58,740 --> 00:03:57,160
the east coast of Florida when it comes

97
00:04:00,630 --> 00:03:58,750
time for the crew dragon to launch

98
00:04:02,430 --> 00:04:00,640
they'll be working together with teams

99
00:04:05,880 --> 00:04:02,440
from the Kennedy Space Center to ensure

100
00:04:07,710 --> 00:04:05,890
a safe and successful flight now let's

101
00:04:10,740 --> 00:04:07,720
go check on the progress of constructing

102
00:04:12,990 --> 00:04:10,750
those crew dragons from top to bottom

103
00:04:15,390 --> 00:04:13,000
this spacecraft is being meticulously

104
00:04:18,479 --> 00:04:15,400
engineered and constructed everything

105
00:04:20,520 --> 00:04:18,489
from fuel to electronics life support

106
00:04:21,340 --> 00:04:20,530
and communication systems are laid out

107
00:04:23,440 --> 00:04:21,350
and can

108
00:04:26,320 --> 00:04:23,450
figure to maximize safety and mission

109
00:04:28,390 --> 00:04:26,330
success it's also really technologically

110
00:04:30,610 --> 00:04:28,400
advanced including the ability to

111
00:04:33,820 --> 00:04:30,620
autonomously fly and dock to the space

112
00:04:35,620 --> 00:04:33,830
station between the Dragon spacecraft

113
00:04:38,230 --> 00:04:35,630

and the Falcon booster you'll find the

114
00:04:40,330 --> 00:04:38,240
trunks the trunk is the location of the

115
00:04:43,360 --> 00:04:40,340
solar panels that are used to power the

116
00:04:45,250 --> 00:04:43,370
spacecraft while on orbit the trunk

117
00:04:47,260 --> 00:04:45,260
would also stabilized the vehicle in the

118
00:04:51,220 --> 00:04:47,270
event an emergency abort is ever

119
00:04:53,170 --> 00:04:51,230
required the dragon development truly

120
00:04:55,360 --> 00:04:53,180
represents an intentional focus on

121
00:04:58,330 --> 00:04:55,370
iterative design and learning from past

122
00:05:00,520 --> 00:04:58,340
experiences from conception phases

123
00:05:02,530 --> 00:05:00,530
SpaceX has had human spaceflight in mind

124
00:05:05,110 --> 00:05:02,540
even while they were just flying cargo

125
00:05:07,390 --> 00:05:05,120
their rockets and spacecraft have been

126
00:05:09,280 --> 00:05:07,400
designed to be human rated and they

127
00:05:12,670 --> 00:05:09,290
continue to benefit from proven success

128
00:05:14,800 --> 00:05:12,680
as they look to the future to end our

129
00:05:17,830 --> 00:05:14,810
tour today I want to give you a taste of

130
00:05:19,780 --> 00:05:17,840
what it's like to be onboard you're

131
00:05:22,390 --> 00:05:19,790
getting a chance to feel what the

132
00:05:25,620 --> 00:05:22,400
astronauts will experience as they strap

133
00:05:28,840 --> 00:05:25,630
in and prepare to blast off into space

134
00:05:30,730 --> 00:05:28,850
Alan Shepard unlocked a new frontier by

135
00:05:33,790 --> 00:05:30,740
being the first American to fly into

136
00:05:37,060 --> 00:05:33,800
space Bob Crippen and John Young

137
00:05:39,400 --> 00:05:37,070
unlocked a 30-year legacy of living and

138
00:05:43,350 --> 00:05:39,410

working in space by being the first to

139
00:05:46,120 --> 00:05:43,360
fly aboard the space shuttle and this

140
00:05:49,360 --> 00:05:46,130
this is where we unlock the future of

141
00:05:51,730 --> 00:05:49,370
commercial spaceflight we'll see you

142
00:05:55,000 --> 00:05:51,740
next time as we prepare to launch

143
00:05:55,960 --> 00:05:55,010
America hi my name is Steve stitch I'm a

144
00:05:57,850 --> 00:05:55,970
deputy program manager for the

145
00:05:59,350 --> 00:05:57,860
Commercial Crew program thank you for