

N22

N - No payload fairing

2 - 2 solid rocket boosters



Atlas V

Atlas V different configurations



1  
00:00:00,030 --> 00:00:13,940  
liftoff in five four three two one zero

2  
00:00:18,300 --> 00:00:15,840  
that's exactly what our tour today

3  
00:00:19,740 --> 00:00:18,310  
focuses on the launching of rockets and

4  
00:00:22,140 --> 00:00:19,750  
humans as part of the Commercial Crew

5  
00:00:24,870 --> 00:00:22,150  
program Commercial Crew is focused on

6  
00:00:26,790 --> 00:00:24,880  
safely getting humans to and from the

7  
00:00:29,460 --> 00:00:26,800  
International Space Station with our

8  
00:00:31,529 --> 00:00:29,470  
partners Boeing and SpaceX hi I'm Joshua

9  
00:00:33,270 --> 00:00:31,539  
Santora thanks for joining me here today

10  
00:00:35,280 --> 00:00:33,280  
on the sunny coast of Central Florida at

11  
00:00:37,890 --> 00:00:35,290  
the Kennedy Space Center our tour today

12  
00:00:41,580 --> 00:00:37,900  
has two main stops the first is over

13  
00:00:44,280 --> 00:00:41,590

there its launch complex 39a or LC 39a

14

00:00:46,229 --> 00:00:44,290

this has been where SpaceX launched a

15

00:00:49,049 --> 00:00:46,239

number of Falcon 9's its Falcon Heavy

16

00:00:51,240 --> 00:00:49,059

and soon humans onboard the crew Dragon

17

00:00:53,250 --> 00:00:51,250

our second stop is actually a little

18

00:00:55,529 --> 00:00:53,260

further south on Cape Canaveral Air

19

00:00:57,959 --> 00:00:55,539

Force Station property its United Launch

20

00:01:00,630 --> 00:00:57,969

alliances Space Launch Complex 41 or

21

00:01:02,130 --> 00:01:00,640

Slick's 41 it has been the site of such

22

00:01:04,889 --> 00:01:02,140

historic launches as the New Horizons

23

00:01:06,510 --> 00:01:04,899

spacecraft which flew past Pluto the

24

00:01:09,320 --> 00:01:06,520

Mars Science Laboratory Curiosity rover

25

00:01:11,430 --> 00:01:09,330

and soon humans on board the Starliner

26  
00:01:14,070 --> 00:01:11,440  
we've got a lot of ground to cover today

27  
00:01:17,010 --> 00:01:14,080  
let's get going you might recognize this

28  
00:01:19,080 --> 00:01:17,020  
it's a falcon core stage there used for

29  
00:01:22,139 --> 00:01:19,090  
both the Falcon 9's and the Falcon heavy

30  
00:01:23,609 --> 00:01:22,149  
rocket all SpaceX Rockets are designed

31  
00:01:26,130 --> 00:01:23,619  
and built at their headquarters in

32  
00:01:27,870 --> 00:01:26,140  
California before being transported to

33  
00:01:30,089 --> 00:01:27,880  
the rocket development facility in

34  
00:01:32,100 --> 00:01:30,099  
McGregor Texas for engine testing and

35  
00:01:34,520 --> 00:01:32,110  
then finally here to the Kennedy Space

36  
00:01:37,050 --> 00:01:34,530  
Center or to another SpaceX launch site

37  
00:01:39,120 --> 00:01:37,060  
the Falcon 9 which will be used for the

38  
00:01:41,639 --> 00:01:39,130

commercial crew launches has been used

39

00:01:45,540 --> 00:01:41,649

by SpaceX on over 50 successful flights

40

00:01:49,380 --> 00:01:45,550

since 2010 equipped with nine merlin 1d

41

00:01:50,600 --> 00:01:49,390

engines each Falcon 9 packs over 1.7

42

00:01:53,669 --> 00:01:50,610

million pounds of thrust

43

00:01:55,740 --> 00:01:53,679

we love redundancy and that's a huge

44

00:01:57,540 --> 00:01:55,750

plus for this configuration as they're

45

00:01:58,109 --> 00:01:57,550

able to experience up to two engine

46

00:02:01,859 --> 00:01:58,119

shutdowns

47

00:02:04,350 --> 00:02:01,869

and still succeed after launch once the

48

00:02:06,719 --> 00:02:04,360

first stage is depleted of fuel it will

49

00:02:08,669 --> 00:02:06,729

separate and return to Earth releasing

50

00:02:10,979 --> 00:02:08,679

the second stage which has its own

51  
00:02:14,070 --> 00:02:10,989  
Merlin vacuum engine to continue on to

52  
00:02:16,500 --> 00:02:14,080  
orbit for fuel both the first and second

53  
00:02:18,930 --> 00:02:16,510  
stages use rocket grade kerosene and

54  
00:02:21,360 --> 00:02:18,940  
both stages carry supercooled liquid

55  
00:02:22,990 --> 00:02:21,370  
oxygen as their oxidizer since there's

56  
00:02:25,570 --> 00:02:23,000  
no oxygen in space

57  
00:02:28,000 --> 00:02:25,580  
the Falcon boosters have the ability to

58  
00:02:29,470 --> 00:02:28,010  
land and be reused and to assist with

59  
00:02:31,990 --> 00:02:29,480  
reusability to have a few special

60  
00:02:34,120 --> 00:02:32,000  
features the first is the hypersonic

61  
00:02:36,310 --> 00:02:34,130  
grid fin there are four of them that

62  
00:02:38,740 --> 00:02:36,320  
will mount towards the top of the rocket

63  
00:02:40,930 --> 00:02:38,750

and those help steer as it reenters the

64

00:02:42,550 --> 00:02:40,940

Earth's atmosphere there's also the

65

00:02:44,290 --> 00:02:42,560

carbon-fiber landing links there's two

66

00:02:45,520 --> 00:02:44,300

on the floor behind you those will be

67

00:02:48,420 --> 00:02:45,530

installed near the bottom of the rocket

68

00:02:51,340 --> 00:02:48,430

and they deployed just before landing

69

00:02:52,960 --> 00:02:51,350

reusability goes a really long way to

70

00:02:56,890 --> 00:02:52,970

helping reduce the cost of access to

71

00:02:58,990 --> 00:02:56,900

space but recovering a booster is always

72

00:03:01,500 --> 00:02:59,000

secondary to ensuring the spacecraft

73

00:03:04,810 --> 00:03:01,510

gets to the correct destination in space

74

00:03:06,550 --> 00:03:04,820

now we don't launch indoors and we

75

00:03:08,949 --> 00:03:06,560

certainly don't launch horizontally so

76  
00:03:11,110 --> 00:03:08,959  
when the time is right the main hangar

77  
00:03:13,000 --> 00:03:11,120  
door will open and the transporter

78  
00:03:15,100 --> 00:03:13,010  
erector or teehee will move into the

79  
00:03:17,470 --> 00:03:15,110  
building the rocket will be secured on

80  
00:03:19,060 --> 00:03:17,480  
top and then the rocket with the te will

81  
00:03:21,100 --> 00:03:19,070  
both roll up to the top of the launch

82  
00:03:23,770 --> 00:03:21,110  
pad let's head out there and take a

83  
00:03:25,180 --> 00:03:23,780  
closer look once the Falcon 9 finishes

84  
00:03:27,790 --> 00:03:25,190  
making the trip to the top of the launch

85  
00:03:30,280 --> 00:03:27,800  
pad the te will then lift the entire

86  
00:03:31,900 --> 00:03:30,290  
rocket into a vertical position final

87  
00:03:33,580 --> 00:03:31,910  
checkout takes place and four commercial

88  
00:03:35,170 --> 00:03:33,590

crew launches when the time is right

89

00:03:37,570 --> 00:03:35,180

the astronauts make their way out here

90

00:03:41,020 --> 00:03:37,580

travel up the tower across the crew

91

00:03:42,070 --> 00:03:41,030

access arm and into the crew dragon the

92

00:03:44,320 --> 00:03:42,080

launch will be controlled and monitored

93

00:03:46,360 --> 00:03:44,330

closely by SpaceX personnel here at

94

00:03:48,820 --> 00:03:46,370

their launch and landing control center

95

00:03:51,070 --> 00:03:48,830

and in Hawthorne California at their

96

00:03:52,570 --> 00:03:51,080

Mission Control Center as well as by

97

00:03:54,699 --> 00:03:52,580

NASA personnel at the Kennedy Space

98

00:03:57,190 --> 00:03:54,709

Center and the Johnson Space Center in

99

00:03:59,289 --> 00:03:57,200

Houston Texas all of these teams have to

100

00:04:01,900 --> 00:03:59,299

work together to ensure all systems are

101  
00:04:04,090 --> 00:04:01,910  
working and ready for flight the launch

102  
00:04:06,580 --> 00:04:04,100  
team conducts a go/no-go poll prior to

103  
00:04:08,949 --> 00:04:06,590  
final countdown then after the engines

104  
00:04:10,990 --> 00:04:08,959  
ignite the launch mount briefly holds

105  
00:04:13,120 --> 00:04:11,000  
onto the rocket for the flight computers

106  
00:04:14,979 --> 00:04:13,130  
to do a final check before releasing the

107  
00:04:17,920 --> 00:04:14,989  
rocket for liftoff beginning the

108  
00:04:19,330 --> 00:04:17,930  
astronauts trip into space now let's

109  
00:04:21,280 --> 00:04:19,340  
head over and see how Boeing is doing

110  
00:04:22,719 --> 00:04:21,290  
their launch prep we're out here at

111  
00:04:23,950 --> 00:04:22,729  
slick 41 now where they're in the

112  
00:04:25,570 --> 00:04:23,960  
process right now of making

113  
00:04:27,850 --> 00:04:25,580

modifications to be ready for commercial

114

00:04:29,200 --> 00:04:27,860

crew launches one of the things we had

115

00:04:31,450 --> 00:04:29,210

in mind when we selected two partners

116

00:04:33,880 --> 00:04:31,460

was diversity diversity of thought

117

00:04:36,040 --> 00:04:33,890

opinion approach perspective execution

118

00:04:36,640 --> 00:04:36,050

and innovation Boeing and SpaceX are

119

00:04:38,650 --> 00:04:36,650

doing things

120

00:04:40,090 --> 00:04:38,660

differently and we love that for Boeing

121

00:04:42,400 --> 00:04:40,100

they wanted to focus on creating an

122

00:04:44,469 --> 00:04:42,410

amazing space capsule and so they're

123

00:04:46,090 --> 00:04:44,479

working to fly on top of a proven rocket

124

00:04:48,400 --> 00:04:46,100

they're working with United Launch

125

00:04:50,590 --> 00:04:48,410

Alliance or ula to fly on top of the

126

00:04:52,390 --> 00:04:50,600

Atlas 5 the Atlas 5 is an

127

00:04:54,189 --> 00:04:52,400

industry-leading workhorse that's been

128

00:04:56,560 --> 00:04:54,199

flying for more than 15 years and has

129

00:04:59,260 --> 00:04:56,570

over 80 flights to its name every single

130

00:05:01,450 --> 00:04:59,270

one successful the Atlas 5 also has a

131

00:05:03,189 --> 00:05:01,460

variety of configurations to meet the

132

00:05:04,629 --> 00:05:03,199

needs of its many customers and they've

133

00:05:07,450 --> 00:05:04,639

got one ready just for the Starliner

134

00:05:08,800 --> 00:05:07,460

they're calling it the n2 to the end

135

00:05:10,570 --> 00:05:08,810

means that there's no payload fairing

136

00:05:12,340 --> 00:05:10,580

because there's a capsule the first two

137

00:05:14,170 --> 00:05:12,350

represents the two solid rocket boosters

138

00:05:16,029 --> 00:05:14,180

on the first stage the second two

139

00:05:18,550 --> 00:05:16,039

represents the two engines on the upper

140

00:05:21,010 --> 00:05:18,560

stage or Centaur the two solid rocket

141

00:05:23,200 --> 00:05:21,020

boosters plus the rd-180 engine on the

142

00:05:25,080 --> 00:05:23,210

first stage will produce more than 1.4

143

00:05:27,430 --> 00:05:25,090

million pounds of thrust and lift off

144

00:05:29,710 --> 00:05:27,440

that Atlas 5 will actually arrived here

145

00:05:31,120 --> 00:05:29,720

horizontally down that road and will

146

00:05:32,920 --> 00:05:31,130

travel to that facility the vertical

147

00:05:34,540 --> 00:05:32,930

integration facility and they'll tip it

148

00:05:36,189 --> 00:05:34,550

from horizontal to vertical and then

149

00:05:37,270 --> 00:05:36,199

they'll hoist the Starliner on top and

150

00:05:39,490 --> 00:05:37,280

secure it in place

151  
00:05:41,170 --> 00:05:39,500  
once final checkout has happened and

152  
00:05:44,110 --> 00:05:41,180  
preparation is complete they'll actually

153  
00:05:45,909 --> 00:05:44,120  
roll that entire stack down rails to

154  
00:05:47,650 --> 00:05:45,919  
here on top of this mobile launcher

155  
00:05:49,540 --> 00:05:47,660  
platform to be ready for launch

156  
00:05:51,159 --> 00:05:49,550  
let's head up and take a look at the

157  
00:05:53,409 --> 00:05:51,169  
view the astronauts will have as they

158  
00:05:54,969 --> 00:05:53,419  
prepare to board Starliner the progress

159  
00:05:56,560 --> 00:05:54,979  
and preparation for these Commercial

160  
00:05:59,230 --> 00:05:56,570  
Crew launches will be monitored closely

161  
00:06:01,360 --> 00:05:59,240  
by ul a Boeing and NASA from across the

162  
00:06:03,339 --> 00:06:01,370  
country some will be here in Florida at

163  
00:06:05,500 --> 00:06:03,349

the Atlas spaceflight Operations Center

164

00:06:08,560 --> 00:06:05,510

or Boeing Mission Control Center down

165

00:06:10,659 --> 00:06:08,570

that way others will be in Houston Texas

166

00:06:13,570 --> 00:06:10,669

at the Johnson Space Center in Mission

167

00:06:14,830 --> 00:06:13,580

Control several hours prior launch the

168

00:06:17,260 --> 00:06:14,840

entire area will be cleared of all

169

00:06:19,390 --> 00:06:17,270

personnel for fueling to take place the

170

00:06:21,730 --> 00:06:19,400

Atlas 5 uses liquid oxygen and rocket

171

00:06:23,110 --> 00:06:21,740

great kerosene as its fuel once that

172

00:06:25,240 --> 00:06:23,120

fuelling is complete and it's safe to

173

00:06:26,860 --> 00:06:25,250

return here the astronauts will arrive

174

00:06:29,230 --> 00:06:26,870

and travel up an elevator in that tower

175

00:06:31,390 --> 00:06:29,240

to this level they'll walk across this

176

00:06:32,740 --> 00:06:31,400

the crew access arm the last place

177

00:06:33,189 --> 00:06:32,750

they'll set foot before blasting off

178

00:06:35,620 --> 00:06:33,199

into space

179

00:06:38,080 --> 00:06:35,630

a similar process was followed for the

180

00:06:40,149 --> 00:06:38,090

space shuttle program every launch pad

181

00:06:42,730 --> 00:06:40,159

on earth that launches humans has what's

182

00:06:43,779 --> 00:06:42,740

called a white room the white room here

183

00:06:45,940 --> 00:06:43,789

is actually through those double doors

184

00:06:47,529 --> 00:06:45,950

it's the part of the crew access arm

185

00:06:49,420 --> 00:06:47,539

that connects directly to the spacecraft

186

00:06:50,410 --> 00:06:49,430

and allows for easy access by the

187

00:06:52,390 --> 00:06:50,420

astronauts and there

188

00:06:53,740 --> 00:06:52,400

support personnel it also is extremely

189

00:06:56,290 --> 00:06:53,750

clean to make sure we don't contaminate

190

00:06:58,180 --> 00:06:56,300

the vehicle once the astronauts are

191

00:06:59,740 --> 00:06:58,190

strapped in place and safe the entire

192

00:07:01,720 --> 00:06:59,750

area will again be cleared of all

193

00:07:03,880 --> 00:07:01,730

personnel except those onboard of course

194

00:07:06,040 --> 00:07:03,890

this crew access arm will be swung out

195

00:07:08,800 --> 00:07:06,050

of the way of the rocket and a t-minus

196

00:07:11,470 --> 00:07:08,810

zero the engines ignite and we're off if

197

00:07:13,360 --> 00:07:11,480

all goes according to plan when those

198

00:07:14,530 --> 00:07:13,370

rockets leave Earth it will only take

199

00:07:17,020 --> 00:07:14,540

about eight minutes for them to reach

200

00:07:17,920 --> 00:07:17,030

orbit and a day or so later they'll be

201

00:07:20,590 --> 00:07:17,930

able to rendezvous with the

202

00:07:21,790 --> 00:07:20,600

International Space Station both of our

203

00:07:23,560 --> 00:07:21,800

Commercial Crew partners have spent a

204

00:07:25,240 --> 00:07:23,570

lot of time planning individualized

205

00:07:27,580 --> 00:07:25,250

approaches that have resulted in really

206

00:07:29,500 --> 00:07:27,590

unique hardware on the most fundamental

207

00:07:32,470 --> 00:07:29,510

level force equals mass times

208

00:07:34,180 --> 00:07:32,480

acceleration gravity isn't changing and

209

00:07:36,520 --> 00:07:34,190

each partner knows exactly how much

210

00:07:37,750 --> 00:07:36,530

their spacecraft weighs the difference

211

00:07:39,160 --> 00:07:37,760

in weight means that they'll need a

212

00:07:41,230 --> 00:07:39,170

different amount of force at liftoff

213

00:07:43,780 --> 00:07:41,240

they'll have to get the math just right

214

00:07:45,370 --> 00:07:43,790

in order to reach their destination if

215

00:07:47,080 --> 00:07:45,380

you haven't ever had a chance to see a

216

00:07:49,060 --> 00:07:47,090

launch in person I hope you'll find a

217

00:07:50,830 --> 00:07:49,070

way to do that soon and if you can't

218

00:07:53,440 --> 00:07:50,840

make it out here I hope you'll tune in

219

00:07:54,990 --> 00:07:53,450

online and keep your eyes open for

220

00:07:57,400 --> 00:07:55,000

opportunities to view in virtual reality

221

00:08:00,520 --> 00:07:57,410

we'll see you next time as we prepare to

222

00:08:02,800 --> 00:08:00,530

launch America hello I'm Cathy leaders

223

00:08:04,870 --> 00:08:02,810

Commercial Crew program manager thank

224

00:08:06,500 --> 00:08:04,880

you for taking a tour today with