Fleet of Rockets

#NASAatHome

1
00:01:00,740 --> 00:00:22,710
[Music]

2
00:01:05,160 --> 00:01:03,510
hey good afternoon and welcome to NASA

3
00:01:07,290 --> 00:01:05,170
at home spaceport series I wish

4
00:01:09,870 --> 00:01:07,300
desperately I could show you video of

5
00:01:11,250 --> 00:01:09,880
our two guests today jamming out during

6
00:01:13,050 --> 00:01:11,260
that intro video it was pretty hilarious

7
00:01:15,090 --> 00:01:13,060
I don't know how I can get a video of

8
00:01:17,219 --> 00:01:15,100
that but I need a copy of it I'm Joshua

9
00:01:19,710 --> 00:01:17,229
Santora coming to you live that's our

10
00:01:21,240 --> 00:01:19,720
guest for today I'm Joshua Santoro with

11
00:01:23,460 --> 00:01:21,250
NASA communication at the Kennedy Space

12
00:01:25,109 --> 00:01:23,470
Center usually today I'm coming to you

13
00:01:27,750 --> 00:01:25,119

live from my house as most of the

14
00:01:28,950 --> 00:01:27,760
country we're at home still trying to

15
00:01:30,840 --> 00:01:28,960
keep the wheels turning and doing an

16
00:01:32,940 --> 00:01:30,850
excellent job of that a couple guys here

17
00:01:35,790 --> 00:01:32,950
today who are gonna help exemplify that

18
00:01:38,880 --> 00:01:35,800
reality so looking at the spaceport

19
00:01:40,230 --> 00:01:38,890
story what Casey is and what we do today

20
00:01:43,320 --> 00:01:40,240
we are gonna be highlighting the launch

21
00:01:45,859 --> 00:01:43,330
services program and that was that URL I

22
00:01:50,010 --> 00:01:45,869
threw up nasa.gov slash launch services

23
00:01:51,810 --> 00:01:50,020
excited for these guys also in the midst

24
00:01:54,450 --> 00:01:51,820
of everything else going on today to

25
00:01:57,270 --> 00:01:54,460
make sure to send your questions in on

26
00:01:59,999 --> 00:01:57,280
this chat window on YouTube as well as

27
00:02:01,859 --> 00:02:00,009
use the hashtag NASA at home super

28
00:02:03,330 --> 00:02:01,869
excited for these guys they wanted to

29
00:02:05,790 --> 00:02:03,340
play a video to kick off today so we're

30
00:02:07,169 --> 00:02:05,800
gonna do that so enjoy this and then

31
00:02:36,399 --> 00:02:07,179
they're gonna jump right in when we come

32
00:02:41,809 --> 00:02:39,740
whoa that's exciting a dead man Wow

33
00:02:44,660 --> 00:02:41,819
rockets from Kennedy Space Center that's

34
00:02:48,280 --> 00:02:44,670
what we do every day right Tim that is

35
00:02:50,899 --> 00:02:48,290
awesome we get to do that every day here

36
00:02:52,160 --> 00:02:50,909
pump it up baby this is what we love

37
00:02:54,440 --> 00:02:52,170
here at launch services program

38
00:02:56,720 --> 00:02:54,450

launching our rockets every day with our

39
00:02:58,309 --> 00:02:56,730
commercial partners and it is so much

40
00:03:00,319 --> 00:02:58,319
fun we are happy to be here thanks for

41
00:03:02,300 --> 00:03:00,329
joining us at NASA at home I'd like to

42
00:03:05,479 --> 00:03:02,310
take a moment to introduce you to my

43
00:03:07,399 --> 00:03:05,489
great friend NASA launch manager launch

44
00:03:12,259 --> 00:03:07,409
services program Alabama fan

45
00:03:15,020 --> 00:03:12,269
extraordinaire mr. Tim Dunn hello guys

46
00:03:17,089 --> 00:03:15,030
we are thrilled to be with you today and

47
00:03:19,429 --> 00:03:17,099
I would like to take a moment to

48
00:03:22,550 --> 00:03:19,439
introduce my good buddy which way is

49
00:03:22,909 --> 00:03:22,560
Mick he's this way he's this way there

50
00:03:33,229 --> 00:03:22,919
he is

51
00:03:36,530 --> 00:03:33,239
an incredible Tennessee vol fan

52
00:03:37,879 --> 00:03:36,540
whoo go Vols so yeah hey Tim we're here

53
00:03:39,319 --> 00:03:37,889
to talk about rockets today and you know

54
00:03:41,960 --> 00:03:39,329
that's the important thing for our folks

55
00:03:43,339 --> 00:03:41,970
listening at home today and one of the

56
00:03:45,379 --> 00:03:43,349
things we really need to get out of the

57
00:03:47,659 --> 00:03:45,389
way is first why do Rockets work right I

58
00:03:50,210 --> 00:03:47,669
mean Isaac Newton created these laws and

59
00:03:54,170 --> 00:03:50,220
that's really the basis of what Rockets

60
00:03:58,580 --> 00:03:54,180
work yeah let's look at that so as

61
00:04:02,599 --> 00:03:58,590
legend has it roughly 350 years ago ol

62
00:04:05,059 --> 00:04:02,609
Sir Isaac was out in the orchard and he

63
00:04:08,330 --> 00:04:05,069

saw the Apple fall from the tree and

64
00:04:12,289 --> 00:04:08,340
thus started the wheels of motion so in

65
00:04:14,719 --> 00:04:12,299
his brain so that first law is is a

66
00:04:17,120 --> 00:04:14,729
universal law of gravitation and it

67
00:04:19,310 --> 00:04:17,130
basically defines how we're all

68
00:04:21,949 --> 00:04:19,320
connected to each other and most

69
00:04:24,950 --> 00:04:21,959
importantly how rockets and spacecraft

70
00:04:26,450 --> 00:04:24,960
are connected to planet Earth until we

71
00:04:30,110 --> 00:04:26,460
do something to get them off the earth

72
00:04:32,960 --> 00:04:30,120
it also defines that even though me and

73
00:04:35,779 --> 00:04:32,970
my good buddy Mick Wolfman are about 10

74
00:04:38,330 --> 00:04:35,789
miles apart right now absolutely still

75
00:04:41,180 --> 00:04:38,340
absolutely attracted to each other right

76
00:04:43,010 --> 00:04:41,190
Mick absolutely Tim Alabama fan ball fan

77
00:04:44,149 --> 00:04:43,020
attract each other we get it to get us

78
00:04:45,680 --> 00:04:44,159
great but you know what's really

79
00:04:47,719 --> 00:04:45,690
important about rockets and why they

80
00:04:48,519 --> 00:04:47,729
work is Newton's third law and as you

81
00:04:49,779 --> 00:04:48,529
can see in

82
00:04:52,509 --> 00:04:49,789
chart that we showed a little earlier

83
00:04:54,729 --> 00:04:52,519
moons third law is to every action

84
00:04:57,129 --> 00:04:54,739
there's an equal and opposite reaction

85
00:04:59,799 --> 00:04:57,139
and that is the basis for what rockets

86
00:05:01,509 --> 00:04:59,809
do for us right we have a reaction we

87
00:05:03,369 --> 00:05:01,519
get an equal and opposite reaction to

88
00:05:06,399 --> 00:05:03,379

get off Earth and get things traveling

89
00:05:09,279 --> 00:05:06,409
so it's right yeah so why rockets right

90
00:05:11,589 --> 00:05:09,289
we've asked that right well we as humans

91
00:05:13,899 --> 00:05:11,599
work naturally curiosity to study things

92
00:05:16,779 --> 00:05:13,909
that we can see we want to get off the

93
00:05:18,099 --> 00:05:16,789
planet right we want to launch people we

94
00:05:20,079 --> 00:05:18,109
want to launch probes we won't launch

95
00:05:21,729 --> 00:05:20,089
satellites well as Tim said we need

96
00:05:24,429 --> 00:05:21,739
velocity that we need to be traveling

97
00:05:25,689 --> 00:05:24,439
about 17,000 800 miles an hour now that

98
00:05:27,849 --> 00:05:25,699
all about you folks out there at home

99
00:05:34,329 --> 00:05:27,859
but Tim and I don't drive that fast

100
00:05:37,269 --> 00:05:34,339
going to work every day fifty miles per

101
00:05:38,829 --> 00:05:37,279
hour on KSC property exactly we do not

102
00:05:40,809 --> 00:05:38,839
exceed the seventeen thousand eight

103
00:05:43,149 --> 00:05:40,819
hundred mile an hour limit on KSC at all

104
00:05:44,469 --> 00:05:43,159
but we need to visit and study and

105
00:05:46,059 --> 00:05:44,479
observe our universe that's another

106
00:05:48,249 --> 00:05:46,069
reason we have Rockets right to get our

107
00:05:50,289 --> 00:05:48,259
spacecraft traveling fast enough to

108
00:05:53,019 --> 00:05:50,299
reach the edge of the universe and to do

109
00:05:55,269 --> 00:05:53,029
that our Rockets help our spacecraft get

110
00:05:57,759 --> 00:05:55,279
traveling up to about 46,000 miles hour

111
00:05:59,889 --> 00:05:57,769
or beyond and you know we're looking to

112
00:06:01,989 --> 00:05:59,899
him to actually start launching humans

113
00:06:03,909 --> 00:06:01,999

again from Kennedy Space Center I think

114
00:06:05,709 --> 00:06:03,919
that's really cool and we that's one of

115
00:06:08,229 --> 00:06:05,719
the things we'll use rockets for so you

116
00:06:09,759 --> 00:06:08,239
know ironically rockets they're just

117
00:06:12,189 --> 00:06:09,769
plain cool to them that's all it is

118
00:06:15,100 --> 00:06:12,199
rockets are just plain cool but you know

119
00:06:17,589 --> 00:06:15,110
what absolutely love rockets our whole

120
00:06:20,439 --> 00:06:17,599
lives have been about rockets we've done

121
00:06:23,409 --> 00:06:20,449
everything in our power since we were

122
00:06:26,379 --> 00:06:23,419
small little children to make sure that

123
00:06:29,589 --> 00:06:26,389
we could have a part in the space

124
00:06:31,989 --> 00:06:29,599
industry of the United States and we are

125
00:06:34,539 --> 00:06:31,999
so blessed and thrilled to be working

126
00:06:36,789 --> 00:06:34,549
for NASA and to be sharing some rocket

127
00:06:38,109 --> 00:06:36,799
love with you guys today yeah Tim

128
00:06:39,789 --> 00:06:38,119
actually we you and I've talked about

129
00:06:41,559 --> 00:06:39,799
that before we've had some great things

130
00:06:43,209 --> 00:06:41,569
as we've grown up from kids to where we

131
00:06:45,519 --> 00:06:43,219
are today and some influences we've had

132
00:06:47,919 --> 00:06:45,529
Star Trek Wernher von Braun Space

133
00:06:49,299 --> 00:06:47,929
Shuttle Apollo you know what was your

134
00:06:50,229 --> 00:06:49,309
favorite Star Trek what you what do you

135
00:06:53,679 --> 00:06:50,239
want to be when you grew up

136
00:06:56,199 --> 00:06:53,689
Oh Captain Kirk who doesn't want to be

137
00:06:57,879 --> 00:06:56,209
Captain Kirk oh that was me man I wanted

138
00:07:00,069 --> 00:06:57,889

to be mr. Scott he was always fixing

139
00:07:01,700 --> 00:07:00,079
things and moving for right so again

140
00:07:04,310 --> 00:07:01,710
Glade grunt

141
00:07:06,680 --> 00:07:04,320
to be here serving and working but Tim

142
00:07:11,180 --> 00:07:06,690
how do we choose the right rocket

143
00:07:14,810 --> 00:07:11,190
take a little look at that what's the

144
00:07:17,660 --> 00:07:14,820
right rocket to launch a robot rockets

145
00:07:19,310 --> 00:07:17,670
come in lots of shapes and sizes so

146
00:07:22,220 --> 00:07:19,320
what's the right rocket for a space

147
00:07:24,740 --> 00:07:22,230
exploring robot choosing a rocket

148
00:07:28,450 --> 00:07:24,750
depends on three things how much the

149
00:07:33,230 --> 00:07:28,460
robot weighs how far away it's going and

150
00:07:35,690 --> 00:07:33,240
what it's going to do when the robot is

151
00:07:39,530 --> 00:07:35,700
small and light and stays close to study

152
00:07:42,020 --> 00:07:39,540
earth a small rocket is a-ok when the

153
00:07:44,240 --> 00:07:42,030
robot is large and heavy lots and lots

154
00:07:47,000 --> 00:07:44,250
of gear and travels far away in the

155
00:07:49,940 --> 00:07:47,010
solar system a big powerful rocket is

156
00:07:52,100 --> 00:07:49,950
what will do the job it's hard to find

157
00:07:54,470 --> 00:07:52,110
the perfect match but that's the mission

158
00:07:57,320 --> 00:07:54,480
of all the dedicated people in NASA's

159
00:07:59,710 --> 00:07:57,330
launch services program they've launched

160
00:08:02,510 --> 00:07:59,720
more than 200 rocket robot combos

161
00:08:08,150 --> 00:08:02,520
connecting us all to Discovery in the

162
00:08:09,620 --> 00:08:08,160
universe yet Tim we had to put that one

163
00:08:11,600 --> 00:08:09,630

out there just a little shout out for a

164
00:08:13,370 --> 00:08:11,610
launch services program you know make

165
00:08:15,980 --> 00:08:13,380
sure number one and number two Amanda

166
00:08:17,390 --> 00:08:15,990
Miscavige and Chuck Duvall who probably

167
00:08:19,520 --> 00:08:17,400
are watching this know that we're doing

168
00:08:21,470 --> 00:08:19,530
our job and the team at LSP is doing a

169
00:08:23,420 --> 00:08:21,480
great job from analysis to engineering

170
00:08:25,250 --> 00:08:23,430
to everything so great little plug there

171
00:08:26,600 --> 00:08:25,260
on how we pick our rockets but you know

172
00:08:28,610 --> 00:08:26,610
what's really important on what we do in

173
00:08:30,560 --> 00:08:28,620
LSP is we get to work with our

174
00:08:32,060 --> 00:08:30,570
commercial partners that's an important

175
00:08:33,200 --> 00:08:32,070
collaboration that we have Tim I know

176
00:08:35,570 --> 00:08:33,210
you'd like to talk about collaboration

177
00:08:38,090 --> 00:08:35,580
and especially the fleet of Rockets that

178
00:08:41,020 --> 00:08:38,100
we have in LSP yeah let's take a look at

179
00:08:44,810 --> 00:08:41,030
that fleet of rockets so there is a

180
00:08:47,300 --> 00:08:44,820
gorgeous picture it's one that I could

181
00:08:49,910 --> 00:08:47,310
just spend hours looking at who doesn't

182
00:08:51,920 --> 00:08:49,920
love rockets I mean my goodness

183
00:08:55,670 --> 00:08:51,930
here's a nice sampling of rockets that

184
00:08:57,290 --> 00:08:55,680
are some are in active now but as you

185
00:08:59,960 --> 00:08:57,300
move a little bit to the right there you

186
00:09:04,040 --> 00:08:59,970
see some of those incredible performers

187
00:09:06,610 --> 00:09:04,050
of today the Atlas 5 the Falcon 9 the

188
00:09:09,170 --> 00:09:06,620

Falcon Heavy and the delta 4 heavy and

189
00:09:11,270 --> 00:09:09,180
we got a little bit of a shout out to

190
00:09:13,940 --> 00:09:11,280
some of our future rockets on here as

191
00:09:14,780 --> 00:09:13,950
well Omega from Northrop Grumman as well

192
00:09:17,030 --> 00:09:14,790
as Blue Origin

193
00:09:19,760 --> 00:09:17,040
new Glenn what you see across the top

194
00:09:22,250 --> 00:09:19,770
there is the current fleet of LSP

195
00:09:24,710 --> 00:09:22,260
rockets that we have to choose from so

196
00:09:26,870 --> 00:09:24,720
when we're doing our job of matching up

197
00:09:29,540 --> 00:09:26,880
the science requirements for a

198
00:09:32,480 --> 00:09:29,550
spacecraft how big is it where does it

199
00:09:34,490 --> 00:09:32,490
need to go and we match that up with a

200
00:09:36,710 --> 00:09:34,500
launch vehicle and so we use our

201
00:09:38,060 --> 00:09:36,720
commercial partners to do that yeah

202
00:09:40,100 --> 00:09:38,070
that's him we had to show that one there

203
00:09:42,470 --> 00:09:40,110
a little bit and people probably notice

204
00:09:45,050 --> 00:09:42,480
the little symbol of mission complete

205
00:09:46,790 --> 00:09:45,060
for the Delta 2 right there and I had to

206
00:09:48,740 --> 00:09:46,800
put that in just for you my friend I

207
00:09:51,200 --> 00:09:48,750
know Delta 2 has a special place in your

208
00:09:53,060 --> 00:09:51,210
heart and you know we flew that last

209
00:09:55,670 --> 00:09:53,070
mission last year with icesat-2 and it

210
00:09:57,260 --> 00:09:55,680
was an awesome awesome mission I even

211
00:10:00,740 --> 00:09:57,270
got a model here for you too

212
00:10:02,950 --> 00:10:00,750
oh good little model of the Delta 2 just

213
00:10:06,830 --> 00:10:02,960

for you my friend right we can show our

214
00:10:08,720 --> 00:10:06,840
friends you got workhorse did wonderful

215
00:10:12,080 --> 00:10:08,730
things for our nation for so many years

216
00:10:13,940 --> 00:10:12,090
but fortunately we have other rockets to

217
00:10:15,470 --> 00:10:13,950
play with now mix so why don't you start

218
00:10:17,960 --> 00:10:15,480
talking to us about some of the current

219
00:10:19,280 --> 00:10:17,970
rockets we're still yes yeah Tim so you

220
00:10:20,540 --> 00:10:19,290
know what's really cool about the

221
00:10:21,440 --> 00:10:20,550
Rockets we get to work with and what

222
00:10:22,880 --> 00:10:21,450
we're here to talk about

223
00:10:25,520 --> 00:10:22,890
who doesn't love Rockets right we all

224
00:10:27,980 --> 00:10:25,530
love rockets but all Rockets have

225
00:10:30,200 --> 00:10:27,990
something in common even the new what I

226
00:10:32,240 --> 00:10:30,210
call new that everybody loves talk about

227
00:10:34,790 --> 00:10:32,250
the new Falcon Heavy the new SpaceX

228
00:10:36,230 --> 00:10:34,800
Falcon 9 even those Rockets have things

229
00:10:38,390 --> 00:10:36,240
in common with the Rockets we talked

230
00:10:39,680 --> 00:10:38,400
about and so let's look at some launch

231
00:10:41,390 --> 00:10:39,690
vehicle hardware because one of the

232
00:10:44,720 --> 00:10:41,400
things that they have in common right is

233
00:10:46,760 --> 00:10:44,730
they all have a first stage and a second

234
00:10:49,570 --> 00:10:46,770
stage from our smallest rocket the

235
00:10:52,190 --> 00:10:49,580
Pegasus XL which is a solid rocket motor

236
00:10:55,400 --> 00:10:52,200
vehicle that is dropped from a modified

237
00:10:57,740 --> 00:10:55,410
l-1011 and that carries out its mission

238
00:11:00,410 --> 00:10:57,750

from that to our mighty Atlas 5 that

239
00:11:01,610 --> 00:11:00,420
we're launching Mars 2020 on in July and

240
00:11:04,520 --> 00:11:01,620
we'll talk about that a little bit later

241
00:11:06,550 --> 00:11:04,530
to the mighty Delta 4 which is being

242
00:11:09,440 --> 00:11:06,560
used by our United States space force

243
00:11:11,660 --> 00:11:09,450
folks and and NASA had used that to

244
00:11:13,700 --> 00:11:11,670
launch some missions in previous years

245
00:11:15,350 --> 00:11:13,710
Parker Solar Probe comes to mind but

246
00:11:17,630 --> 00:11:15,360
every vehicle has something in common

247
00:11:20,780 --> 00:11:17,640
they need a fuel and they need an

248
00:11:22,670 --> 00:11:20,790
oxidizer right to get their engines

249
00:11:24,440 --> 00:11:22,680
going and you need something to combine

250
00:11:25,820 --> 00:11:24,450
those fuel and oxidizer and then you

251
00:11:27,680 --> 00:11:25,830
need something to ignite those so you

252
00:11:27,950 --> 00:11:27,690
need a little bit of flame so as we like

253
00:11:30,440 --> 00:11:27,960
to

254
00:11:33,050 --> 00:11:30,450
people Tim it's as simple and easy as

255
00:11:35,390 --> 00:11:33,060
the fire triangle right fuel oxidizer

256
00:11:37,010 --> 00:11:35,400
put a little heat with that very similar

257
00:11:39,080 --> 00:11:37,020
to that estie's rocket that you got

258
00:11:42,320 --> 00:11:39,090
behind you that you know starts a lot of

259
00:11:45,500 --> 00:11:42,330
people off right absolutely got a couple

260
00:11:47,360 --> 00:11:45,510
of s DS rockets right here and mick was

261
00:11:50,540 --> 00:11:47,370
telling you guys the simplicity of

262
00:11:52,430 --> 00:11:50,550
rockets is we've got to satisfy Newton's

263
00:11:54,440 --> 00:11:52,440

third law for every action there's an

264
00:11:56,120 --> 00:11:54,450
equal and opposite reaction we need to

265
00:11:58,460 --> 00:11:56,130
blow a whole lot of stuff out the

266
00:12:00,740 --> 00:11:58,470
tailpipe of these rockets to get them

267
00:12:02,690 --> 00:12:00,750
going in the other direction alright so

268
00:12:04,340 --> 00:12:02,700
the way we do that is we load them up

269
00:12:07,520 --> 00:12:04,350
with those propellants that make mention

270
00:12:11,180 --> 00:12:07,530
and fire triangle oxidizers and fuels

271
00:12:14,540 --> 00:12:11,190
and so what we do is we use we have to

272
00:12:16,790 --> 00:12:14,550
have an oxidizer and and a fuel on each

273
00:12:19,850 --> 00:12:16,800
stage and so Mik why don't you show in

274
00:12:22,610 --> 00:12:19,860
moral a more larger model with your

275
00:12:25,130 --> 00:12:22,620
Atlas 5 there the first stage of the

276
00:12:26,960 --> 00:12:25,140
Atlas 5 yes I've got an atlas 5 right

277
00:12:29,780 --> 00:12:26,970
here for folks on out there watching us

278
00:12:31,580 --> 00:12:29,790
NASA at home and that was five is made

279
00:12:34,730 --> 00:12:31,590
up of a first stage and the second stage

280
00:12:37,490 --> 00:12:34,740
this happens to be the Atlas 5 500

281
00:12:38,990 --> 00:12:37,500
series so the 5 metre fairing that you

282
00:12:41,840 --> 00:12:39,000
see up here which protects our payload

283
00:12:43,700 --> 00:12:41,850
also encompasses our second stage or on

284
00:12:45,290 --> 00:12:43,710
an Atlas is called a centaur so the

285
00:12:48,200 --> 00:12:45,300
second stage is actually inside this

286
00:12:50,300 --> 00:12:48,210
bearing but the first stage is this part

287
00:12:53,270 --> 00:12:50,310
right here and that first stage is made

288
00:12:55,910 --> 00:12:53,280

up of two tanks a fuel tank and an

289
00:12:58,370 --> 00:12:55,920
oxidizer tank and what do we use for

290
00:13:00,890 --> 00:12:58,380
fuel Tim it's a it's a it's a major

291
00:13:03,440 --> 00:13:00,900
industry secret across all vehicles

292
00:13:06,110 --> 00:13:03,450
including files and mattresses high-tech

293
00:13:08,990 --> 00:13:06,120
right how about stuff let's call it

294
00:13:10,430 --> 00:13:09,000
rocket propellant one that sounds cool

295
00:13:13,130 --> 00:13:10,440
that sounds pretty cool

296
00:13:16,970 --> 00:13:13,140
what would our grandmother call it high

297
00:13:18,920 --> 00:13:16,980
grade kerosene ah that's right yes it's

298
00:13:21,020 --> 00:13:18,930
kerosene fuel rocket propellant one it's

299
00:13:22,670 --> 00:13:21,030
awesome but then we have an oxidizer so

300
00:13:24,800 --> 00:13:22,680
we need to carry that oxidizer with us

301
00:13:27,020 --> 00:13:24,810
right to provide that and then providing

302
00:13:29,240 --> 00:13:27,030
ignition to get us off the off of Mother

303
00:13:31,550 --> 00:13:29,250
Earth and into space so we carry liquid

304
00:13:33,620 --> 00:13:31,560
oxygen rp1 and liquid oxygen in our

305
00:13:36,620 --> 00:13:33,630
first stage to be able to do that now

306
00:13:39,770 --> 00:13:36,630
some missions require just a little bit

307
00:13:41,290 --> 00:13:39,780
more power to get off of Earth

308
00:13:43,030 --> 00:13:41,300
so we strap-on

309
00:13:45,009 --> 00:13:43,040
solid rocket motors that's what these

310
00:13:47,740 --> 00:13:45,019
are right here solid rocket motors oh

311
00:13:50,050 --> 00:13:47,750
and what's ironic Tim likes to remind me

312
00:13:52,420 --> 00:13:50,060
all the time is my favorite vehicle here

313
00:13:54,850 --> 00:13:52,430

one of my favorite vehicles Atlas 5 the

314
00:13:57,040 --> 00:13:54,860
solid rocket motors are about 60 inches

315
00:13:59,110 --> 00:13:57,050
in diameter one of my other favorite

316
00:14:01,329 --> 00:13:59,120
vehicles is the Pegasus XL which we

317
00:14:03,280 --> 00:14:01,339
talked about which is a solid rocket

318
00:14:04,240 --> 00:14:03,290
motor vehicle in itself but it's only 50

319
00:14:06,400 --> 00:14:04,250
inches in diameter

320
00:14:08,410 --> 00:14:06,410
so Tim always likes to tell me that one

321
00:14:11,139 --> 00:14:08,420
of these solids is like the first stage

322
00:14:12,639 --> 00:14:11,149
of my Pegasus and you know we got to

323
00:14:14,319 --> 00:14:12,649
deal with what we got to deal with to

324
00:14:15,970 --> 00:14:14,329
get our payload customers into orbit

325
00:14:17,380 --> 00:14:15,980
that's our that's our job right this is

326
00:14:19,449 --> 00:14:17,390
our public service announcement right

327
00:14:21,370 --> 00:14:19,459
Tim our job is to get our payload

328
00:14:25,150 --> 00:14:21,380
customers into orbit safely and on time

329
00:14:28,030 --> 00:14:25,160
using the rockets that we love to work

330
00:14:30,639 --> 00:14:28,040
with so that must have been our public

331
00:14:33,550 --> 00:14:30,649
service moment where we do have to pause

332
00:14:35,819 --> 00:14:33,560
Nick and I love Rockets so much but we

333
00:14:39,220 --> 00:14:35,829
do have to catch ourselves and pause and

334
00:14:41,620 --> 00:14:39,230
remember that guess what if it wasn't

335
00:14:44,860 --> 00:14:41,630
for our spacecraft customers we wouldn't

336
00:14:47,410 --> 00:14:44,870
have jobs and so we absolutely are laser

337
00:14:49,840 --> 00:14:47,420
focused on mission success for our

338
00:14:51,550 --> 00:14:49,850

spacecraft and what they need to do in

339
00:14:54,060 --> 00:14:51,560
space what they need to do when they're

340
00:14:57,790 --> 00:14:54,070
on orbit or heading to other planets

341
00:15:00,310 --> 00:14:57,800
absolutely I think that's enough right

342
00:15:01,900 --> 00:15:00,320
now weekly weather yeah we love our

343
00:15:04,210 --> 00:15:01,910
spacecraft customers but we're all about

344
00:15:06,040 --> 00:15:04,220
Rockets so second stage second stage

345
00:15:10,090 --> 00:15:06,050
same thing right we need a fuel and an

346
00:15:11,889 --> 00:15:10,100
oxidizer so what do we use anybody you

347
00:15:14,769 --> 00:15:11,899
want to guess Tim what is what is our

348
00:15:17,710 --> 00:15:14,779
fuel oh gosh oh we go

349
00:15:21,970 --> 00:15:17,720
should we try let's try something super

350
00:15:27,010 --> 00:15:21,980
cold Nick what do you say okay how about

351
00:15:28,540 --> 00:15:27,020
we go with liquid hydrogen oh how cool

352
00:15:31,150 --> 00:15:28,550
do you have to get that liquid hydrogen

353
00:15:33,910 --> 00:15:31,160
make very very cold Tim down into the

354
00:15:35,769 --> 00:15:33,920
minus minus temperatures colder than you

355
00:15:37,840 --> 00:15:35,779
ever want to experience you know for

356
00:15:40,210 --> 00:15:37,850
that but you know we cleanly like

357
00:15:42,370 --> 00:15:40,220
hydrogen go ahead

358
00:15:44,259 --> 00:15:42,380
oxygen on the first stage and liquid

359
00:15:47,199 --> 00:15:44,269
oxygen on the second stage those are

360
00:15:51,280 --> 00:15:47,209
about minus 300 degrees Fahrenheit and

361
00:15:52,960 --> 00:15:51,290
then to liquefy hydrogen you got to go

362
00:15:53,920 --> 00:15:52,970
about another hundred degrees so it's

363
00:15:56,940 --> 00:15:53,930

about minus

364
00:15:59,860 --> 00:15:56,950
or 15 minus 420 degrees Fahrenheit

365
00:16:01,960 --> 00:15:59,870
cryogenics they're wonderful very

366
00:16:03,880 --> 00:16:01,970
wonderful very wonderful so but hey guys

367
00:16:05,410 --> 00:16:03,890
sneaked him he talked about this I

368
00:16:06,690 --> 00:16:05,420
wanted to be the first thing he only had

369
00:16:09,820 --> 00:16:06,700
a question lemon I wanted to ask

370
00:16:11,740 --> 00:16:09,830
somebody asked why is it that we reuse

371
00:16:14,199 --> 00:16:11,750
some Rockets some Rockets actually fly

372
00:16:15,040 --> 00:16:14,209
back to be reused and others just fall

373
00:16:21,180 --> 00:16:15,050
into the ocean

374
00:16:25,840 --> 00:16:24,610
so yeah actually it's it's cool we Tim

375
00:16:28,449 --> 00:16:25,850
and I've been around long enough we have

376
00:16:30,940 --> 00:16:28,459
actually seen the industry changed when

377
00:16:32,800 --> 00:16:30,950
we first started out launch vehicles

378
00:16:34,329 --> 00:16:32,810
were called expendable matter-of-fact

379
00:16:36,850 --> 00:16:34,339
launch services program was called the

380
00:16:39,430 --> 00:16:36,860
expendable launch vehicle program in our

381
00:16:42,220 --> 00:16:39,440
early days when we first started in 1998

382
00:16:44,590 --> 00:16:42,230
here at Kennedy Space Center so a lot of

383
00:16:47,260 --> 00:16:44,600
vehicles we're launching satellites and

384
00:16:49,960 --> 00:16:47,270
Kham Kham probes things like that and

385
00:16:51,850 --> 00:16:49,970
they were just thrown away now we had

386
00:16:55,590 --> 00:16:51,860
some people come on board people were

387
00:16:58,360 --> 00:16:55,600
studying reuse for many many years and

388
00:17:00,610 --> 00:16:58,370

SpaceX is what most people refer to or

389
00:17:03,070 --> 00:17:00,620
look at they started looking at how they

390
00:17:05,049 --> 00:17:03,080
could reuse their first stages and it

391
00:17:06,790 --> 00:17:05,059
came down to if you could reuse your

392
00:17:08,439 --> 00:17:06,800
first stage you could turn your rocket

393
00:17:10,990 --> 00:17:08,449
around faster and get your customers

394
00:17:12,760 --> 00:17:11,000
back on orbit quicker and so you could

395
00:17:14,770 --> 00:17:12,770
launch more in a year which we've seen

396
00:17:17,890 --> 00:17:14,780
SpaceX do in the last couple years so

397
00:17:20,049 --> 00:17:17,900
it's a real change in the industry to be

398
00:17:21,669 --> 00:17:20,059
able to start seeing us reuse hardware

399
00:17:24,040 --> 00:17:21,679
there's a lot that goes along with

400
00:17:26,130 --> 00:17:24,050
reusing hardware and NASA launch

401
00:17:28,510 --> 00:17:26,140
services program and our contractor

402
00:17:30,010 --> 00:17:28,520
SpaceX in this case we are working very

403
00:17:33,370 --> 00:17:30,020
closely together and make sure we can

404
00:17:34,330 --> 00:17:33,380
have best benefit with reuse so last one

405
00:17:37,090 --> 00:17:34,340
for now and I'll let you guys get back

406
00:17:38,919 --> 00:17:37,100
to it somebody asked why do you have

407
00:17:40,960 --> 00:17:38,929
stages to a rocket doesn't that add

408
00:17:44,380 --> 00:17:40,970
extra complexity a chance for something

409
00:17:48,840 --> 00:17:44,390
to go wrong I'll let our launch manager

410
00:17:52,690 --> 00:17:48,850
answer that one so that was just basic

411
00:17:57,580 --> 00:17:52,700
rocket theory on being able to get the

412
00:18:00,250 --> 00:17:57,590
most mass into orbit most eloquently and

413
00:18:01,930 --> 00:18:00,260

easily so what you want to do josh is

414
00:18:03,490 --> 00:18:01,940
you've got it you've got to be keep

415
00:18:07,180 --> 00:18:03,500
throwing stuff out of the tailpipe of

416
00:18:07,700 --> 00:18:07,190
these Rockets continually right so what

417
00:18:09,590 --> 00:18:07,710
happens

418
00:18:12,860 --> 00:18:09,600
when you've loaded up did an incredible

419
00:18:15,019 --> 00:18:12,870
huge tank but now it's only a third full

420
00:18:17,419 --> 00:18:15,029
well you're still having to carry the

421
00:18:20,210 --> 00:18:17,429
mass of the rest of that empty tank with

422
00:18:23,990 --> 00:18:20,220
you onto orbit so the early rocketeers

423
00:18:27,110 --> 00:18:24,000
dr. Goddard and in the early 20th

424
00:18:29,630 --> 00:18:27,120
century said what if once you burned out

425
00:18:31,130 --> 00:18:29,640
that portion of propellant in the rocket

426
00:18:33,730 --> 00:18:31,140
what if you threw that part of the

427
00:18:37,310 --> 00:18:33,740
rocket away and then you focused on

428
00:18:39,139 --> 00:18:37,320
continuing on into flight and so when

429
00:18:41,090 --> 00:18:39,149
you look at the rocket equation one of

430
00:18:43,310 --> 00:18:41,100
the basic equations on how you manage

431
00:18:45,500 --> 00:18:43,320
the mass of the rocket versus the mass

432
00:18:48,710 --> 00:18:45,510
of the propellant versus the tiny little

433
00:18:50,539 --> 00:18:48,720
mass of the spacecraft it made much more

434
00:18:53,330 --> 00:18:50,549
sense in it was the perfect solution

435
00:18:55,460 --> 00:18:53,340
what to throw that expended mass away as

436
00:18:57,919 --> 00:18:55,470
soon as you could and focus on the

437
00:18:59,960 --> 00:18:57,929
performance of your engine once it's now

438
00:19:02,389 --> 00:18:59,970

either in the space environment or much

439
00:19:04,519 --> 00:19:02,399
closer so it's much more matched for

440
00:19:06,590 --> 00:19:04,529
that cool that's awesome guys thinks

441
00:19:08,870 --> 00:19:06,600
I'll let you get back to it all right

442
00:19:10,549 --> 00:19:08,880
really quick we're gonna wrap up real

443
00:19:12,049 --> 00:19:10,559
launch beautiful hard real quick because

444
00:19:13,970 --> 00:19:12,059
we've talked first stage we've talked

445
00:19:16,190 --> 00:19:13,980
second stage but and we also talked to

446
00:19:17,870 --> 00:19:16,200
our spacecraft spacecraft customer Tim

447
00:19:19,430 --> 00:19:17,880
but one of the important things to

448
00:19:21,409 --> 00:19:19,440
protect our spacecraft customer on

449
00:19:23,600 --> 00:19:21,419
ascent into space is we have to have

450
00:19:25,010 --> 00:19:23,610
that payload fairing that we see on top

451
00:19:26,899 --> 00:19:25,020
of the rocket right to make sure that

452
00:19:29,389 --> 00:19:26,909
everything is protected

453
00:19:31,100 --> 00:19:29,399
before we enter outer space there and so

454
00:19:32,659 --> 00:19:31,110
that's another thing we do on the

455
00:19:35,750 --> 00:19:32,669
vehicle to make it aerodynamic and

456
00:19:38,090 --> 00:19:35,760
protect our payload customer so that's

457
00:19:39,680 --> 00:19:38,100
basics that's the basics of launch

458
00:19:42,409 --> 00:19:39,690
vehicle hardware right there first stage

459
00:19:44,510 --> 00:19:42,419
second stage fuel oxidizer basic fire

460
00:19:48,070 --> 00:19:44,520
triangle just like a lot of you at home

461
00:19:49,940 --> 00:19:48,080
who play with sd's rockets you guys

462
00:19:52,460 --> 00:19:49,950
experience that every time you light one

463
00:19:54,409 --> 00:19:52,470

off it's a solid rocket motor and it's

464
00:19:56,419 --> 00:19:54,419
built it's got a fuel and oxidizer built

465
00:19:58,039 --> 00:19:56,429
in and you can launch that rocket and

466
00:19:59,690 --> 00:19:58,049
get your payload into where you need to

467
00:20:01,940 --> 00:19:59,700
be but you know 10 having all these

468
00:20:05,389 --> 00:20:01,950
rockets one of the things we love to do

469
00:20:07,070 --> 00:20:05,399
in LSP with our customers is we like to

470
00:20:07,970 --> 00:20:07,080
explore like we talked earlier why

471
00:20:10,100 --> 00:20:07,980
Rockets right

472
00:20:11,930 --> 00:20:10,110
we like to explore the universe and as

473
00:20:15,049 --> 00:20:11,940
you can see on the screen right now we

474
00:20:17,960 --> 00:20:15,059
in LSP have launched quite a few

475
00:20:19,590 --> 00:20:17,970
satellites to explore our universe and

476
00:20:21,900 --> 00:20:19,600
to get to learn and know

477
00:20:24,120 --> 00:20:21,910
about what's going on with the planets

478
00:20:26,460 --> 00:20:24,130
and the Sun and things are doing but

479
00:20:28,350 --> 00:20:26,470
most importantly I think you can see Tim

480
00:20:30,630 --> 00:20:28,360
what's our favorite place to study right

481
00:20:32,550 --> 00:20:30,640
there oh if you guys look at all of

482
00:20:36,030 --> 00:20:32,560
those missions in that box

483
00:20:39,120 --> 00:20:36,040
those are all dedicated to who doesn't

484
00:20:42,630 --> 00:20:39,130
love their mother planet Earth and so

485
00:20:46,200 --> 00:20:42,640
you see in the 21 year history of LSP

486
00:20:49,170 --> 00:20:46,210
we've launched 92 missions near and far

487
00:20:51,780 --> 00:20:49,180
from the Sun out to Pluto but we dearly

488
00:20:54,390 --> 00:20:51,790

love this planet that we all live on and

489
00:20:56,880 --> 00:20:54,400
absolutely love the earth science

490
00:20:58,500 --> 00:20:56,890
missions that we work absolutely Tim and

491
00:20:59,550 --> 00:20:58,510
you know one of one of the things we've

492
00:21:01,890 --> 00:20:59,560
done over the years we've had some

493
00:21:04,530 --> 00:21:01,900
notable missions as launch services

494
00:21:06,000 --> 00:21:04,540
program and some of those have been you

495
00:21:08,880 --> 00:21:06,010
and I've been part of those notable

496
00:21:10,980 --> 00:21:08,890
missions and they include Pluto New

497
00:21:12,690 --> 00:21:10,990
Horizons Parker Solar Probe that I

498
00:21:14,610 --> 00:21:12,700
talked about but some of our favorite

499
00:21:17,580 --> 00:21:14,620
ones are theirs are those little Mars

500
00:21:20,820 --> 00:21:17,590
rovers right Mars Pathfinder Sojourner

501
00:21:23,910 --> 00:21:20,830
oh yes Spirit and Opportunity that we

502
00:21:25,890 --> 00:21:23,920
launched in back in 2003 and about nine

503
00:21:28,320 --> 00:21:25,900
years ago we launched the Curiosity

504
00:21:30,450 --> 00:21:28,330
rover and it's still crawling around on

505
00:21:33,240 --> 00:21:30,460
the surface of Mars returning incredible

506
00:21:34,740 --> 00:21:33,250
science and images to us and guess what

507
00:21:36,270 --> 00:21:34,750
we're doing this summer Mik why don't

508
00:21:36,780 --> 00:21:36,280
you tell the folks so you know what

509
00:21:39,360 --> 00:21:36,790
we're doing

510
00:21:40,590 --> 00:21:39,370
July of this year we are so excited to

511
00:21:43,560 --> 00:21:40,600
be getting ready to launch the next

512
00:21:45,360 --> 00:21:43,570
probe to Mars to start things on for man

513
00:21:47,670 --> 00:21:45,370

to moon and man to Mars and that is Mars

514
00:21:50,850 --> 00:21:47,680
2020 right there you see a picture of

515
00:21:53,490 --> 00:21:50,860
Mars 2020 Rover that is being prepped

516
00:21:57,120 --> 00:21:53,500
and ready to go for launch this summer

517
00:21:58,800 --> 00:21:57,130
and we're just so excited about that Tim

518
00:22:00,450 --> 00:21:58,810
but you know what's cool about Mars

519
00:22:02,790 --> 00:22:00,460
slight sway and I know you love this

520
00:22:04,560 --> 00:22:02,800
because we talk about it every day in

521
00:22:07,380 --> 00:22:04,570
the office when we're in the office and

522
00:22:10,650 --> 00:22:07,390
when you call me on the Skype also and

523
00:22:12,810 --> 00:22:10,660
the team's but this Rover has a special

524
00:22:14,340 --> 00:22:12,820
little buddy that's going along with it

525
00:22:17,550 --> 00:22:14,350
and what is that Tim what is it you love

526
00:22:18,900 --> 00:22:17,560
so back on the rover for just a second

527
00:22:22,260 --> 00:22:18,910
Josh if you could throw the picture of

528
00:22:23,730 --> 00:22:22,270
that we are really pleased up to now we

529
00:22:27,120 --> 00:22:23,740
have only been able to call this

530
00:22:29,340 --> 00:22:27,130
gorgeous piece of equipment Mars 2020

531
00:22:31,110 --> 00:22:29,350
but about a month ago we released the

532
00:22:33,149 --> 00:22:31,120
name for this Rover and its first

533
00:22:36,029 --> 00:22:33,159
appearance so Kure

534
00:22:38,729 --> 00:22:36,039
city will be joined by perseverance once

535
00:22:41,580 --> 00:22:38,739
we launched in July and transit to Mars

536
00:22:44,249 --> 00:22:41,590
and that one additional thing that we're

537
00:22:47,009 --> 00:22:44,259
taking on the Mars 2020 perseverance

538
00:22:49,710 --> 00:22:47,019

mission is this it's going to be

539
00:22:52,399 --> 00:22:49,720
strapped to the belly of the Mars rover

540
00:22:55,409 --> 00:22:52,409
so after we we land on the planet

541
00:22:57,479 --> 00:22:55,419
checkout the rover we're gonna drop that

542
00:23:00,119 --> 00:22:57,489
helicopter onto the surface of Mars

543
00:23:03,629 --> 00:23:00,129
drive the rover perseverance away and

544
00:23:05,700 --> 00:23:03,639
then fly and get some beautiful aerial

545
00:23:08,879 --> 00:23:05,710
shots first time ever we're gonna have

546
00:23:11,639 --> 00:23:08,889
aerial video of another planet just

547
00:23:14,399 --> 00:23:11,649
amazing amazing it's so excited for that

548
00:23:16,769 --> 00:23:14,409
mission and the folks at JPL and you

549
00:23:19,320 --> 00:23:16,779
know Josh before we turn it back over to

550
00:23:21,029 --> 00:23:19,330
you Tim and I just want to give a shout

551
00:23:23,729 --> 00:23:21,039
out to our NASA family our launch

552
00:23:25,830 --> 00:23:23,739
services program family NASA at home you

553
00:23:28,469 --> 00:23:25,840
know perseverance is an appropriate name

554
00:23:30,539 --> 00:23:28,479
for that Rover as we are all persevering

555
00:23:32,279 --> 00:23:30,549
through this time working from home and

556
00:23:34,680 --> 00:23:32,289
being where we're at and separated

557
00:23:37,440 --> 00:23:34,690
launch services program our NASA family

558
00:23:39,899 --> 00:23:37,450
at KSC we are truly an integrated family

559
00:23:42,149 --> 00:23:39,909
and we kind of miss seeing everybody so

560
00:23:43,619 --> 00:23:42,159
we thank you and the PIO team for

561
00:23:46,320 --> 00:23:43,629
putting these series together and

562
00:23:50,190 --> 00:23:46,330
allowing us to join you today thanks so

563
00:23:52,080 --> 00:23:50,200

much for having us yeah yeah thanks guys

564
00:23:53,609 --> 00:23:52,090
a couple more questions before you go

565
00:23:55,169 --> 00:23:53,619
before I let you go

566
00:23:56,909 --> 00:23:55,179
the first one was do you have any

567
00:23:59,399 --> 00:23:56,919
personal favorite missions and I'll

568
00:24:02,009 --> 00:23:59,409
leave that pretty broad could be past or

569
00:24:03,539 --> 00:24:02,019
future or maybe present ones that come

570
00:24:05,249 --> 00:24:03,549
to mind is main like that was fun to

571
00:24:10,979 --> 00:24:05,259
work or what a cool thing to be a part

572
00:24:14,430 --> 00:24:10,989
of make I'll let you take well I'll

573
00:24:16,739 --> 00:24:14,440
start off with all the missions I've

574
00:24:19,409 --> 00:24:16,749
worked as a vehicle systems engineer

575
00:24:21,839 --> 00:24:19,419
prior to becoming chief of fleet systems

576
00:24:24,690 --> 00:24:21,849
and that we continue to work in launch

577
00:24:27,629 --> 00:24:24,700
services program with my team of vehicle

578
00:24:28,830 --> 00:24:27,639
folks are exciting but a couple of my

579
00:24:30,779 --> 00:24:28,840
personal favorites

580
00:24:32,149 --> 00:24:30,789
that I was actually on console for and

581
00:24:35,129 --> 00:24:32,159
spent a lot of time working is

582
00:24:37,799 --> 00:24:35,139
absolutely Pluto New Horizons which was

583
00:24:40,289 --> 00:24:37,809
our first Atlas 5 500 series for launch

584
00:24:41,579 --> 00:24:40,299
services program I thought that was

585
00:24:44,759 --> 00:24:41,589
really cool to be able to work that

586
00:24:46,409 --> 00:24:44,769
mission and see what happened and what

587
00:24:48,629 --> 00:24:46,419
we could do to study Pluto and

588
00:24:51,239 --> 00:24:48,639

and ironically we launched that mission

589
00:24:53,460 --> 00:24:51,249
to go study Pluto and a couple weeks

590
00:24:55,109 --> 00:24:53,470
after we launched it was noted we were

591
00:24:58,470 --> 00:24:55,119
notified that Pluto was no longer a

592
00:25:00,419 --> 00:24:58,480
planet but it was a lot of fun a lot of

593
00:25:02,369 --> 00:25:00,429
time a lot of good times working with

594
00:25:04,560 --> 00:25:02,379
the LSP family on that mission that was

595
00:25:06,389 --> 00:25:04,570
one of my favorites the second one that

596
00:25:11,009 --> 00:25:06,399
I have up there that ranks right up

597
00:25:14,249 --> 00:25:11,019
there is the I set chipset mission on

598
00:25:16,080 --> 00:25:14,259
our Delta 2 it was my first Delta 2 that

599
00:25:18,210 --> 00:25:16,090
I got to join the Delta 2 family and

600
00:25:19,739 --> 00:25:18,220
work alongside Tim and and some of the

601
00:25:22,049 --> 00:25:19,749
folks that had done that at United

602
00:25:24,629 --> 00:25:22,059
Launch Alliance it was great to work

603
00:25:26,249 --> 00:25:24,639
that mission Delta 2 as Tim said was a

604
00:25:28,769 --> 00:25:26,259
workhorse for NASA through all those

605
00:25:31,859 --> 00:25:28,779
years and just be able to get to know

606
00:25:33,599 --> 00:25:31,869
our contractors at SpaceX ula Northrop

607
00:25:35,759 --> 00:25:33,609
Grumman and working with them on the

608
00:25:37,830 --> 00:25:35,769
vehicles has always been fun and of

609
00:25:39,720 --> 00:25:37,840
course I spent my last several years

610
00:25:41,759 --> 00:25:39,730
working with the folks at Northrop

611
00:25:44,399 --> 00:25:41,769
Grumman on the Pegasus XL mission and

612
00:25:47,310 --> 00:25:44,409
all of the missions and all of those

613
00:25:50,669 --> 00:25:47,320

have been very a lot of fun for me as a

614
00:25:53,099 --> 00:25:50,679
vehicle guy and achieve work in that

615
00:25:55,979 --> 00:25:53,109
that small vehicle so across the board

616
00:25:57,149 --> 00:25:55,989
Joshua I really like them all as we

617
00:25:59,879 --> 00:25:57,159
started this whole thing out

618
00:26:01,769 --> 00:25:59,889
I just love rockets and being able to go

619
00:26:04,109 --> 00:26:01,779
to work and work with rockets everything

620
00:26:07,619 --> 00:26:04,119
is what it's all about so Tim your

621
00:26:10,019 --> 00:26:07,629
favorite yeah I mean I uh I totally

622
00:26:11,609 --> 00:26:10,029
agree with Nick they all are unique and

623
00:26:15,389 --> 00:26:11,619
we love them all it's kind of like your

624
00:26:20,299 --> 00:26:15,399
kids you love them all and the one thing

625
00:26:24,960 --> 00:26:20,309
is working with all of the team each

626
00:26:27,180 --> 00:26:24,970
their own individual team and flavor we

627
00:26:28,830 --> 00:26:27,190
couple that with our LSP team and then

628
00:26:32,249 --> 00:26:28,840
our range support that we get from the

629
00:26:34,169 --> 00:26:32,259
United States space force and all of our

630
00:26:37,970 --> 00:26:34,179
contractors that help us do what we do

631
00:26:41,009 --> 00:26:37,980
just a few that I would mention would be

632
00:26:44,729 --> 00:26:41,019
going back about four years we launched

633
00:26:47,009 --> 00:26:44,739
osiris-rex which is circling an asteroid

634
00:26:49,590 --> 00:26:47,019
asteroid Bennu right now and later this

635
00:26:52,560 --> 00:26:49,600
year it's going to touchdown grab some

636
00:26:55,859 --> 00:26:52,570
asteroid dust and actually bring it back

637
00:26:58,739 --> 00:26:55,869
to earth in a few years so we launched

638
00:26:59,270 --> 00:26:58,749

that on an Atlas 5 I can think of the

639
00:27:00,620 --> 00:26:59,280
gray

640
00:27:04,700 --> 00:27:00,630
mission that we launched to the moon

641
00:27:06,980 --> 00:27:04,710
back in 2011 the two sent two probes to

642
00:27:09,740 --> 00:27:06,990
study the gravity of the moon that was a

643
00:27:12,440 --> 00:27:09,750
lot of fun and then make mention his

644
00:27:15,410 --> 00:27:12,450
first mission on Delta 2 that ice that

645
00:27:17,090 --> 00:27:15,420
chips at mission and I'll mention what

646
00:27:19,790 --> 00:27:17,100
we launched just just under two years

647
00:27:23,030 --> 00:27:19,800
ago the icesat-2 mission which was the

648
00:27:25,880 --> 00:27:23,040
very final mission on delta ii that was

649
00:27:28,340 --> 00:27:25,890
a lot of fun mainly because it brought

650
00:27:32,510 --> 00:27:28,350
so many people back together for one

651
00:27:34,670 --> 00:27:32,520
last farewell and great performance from

652
00:27:37,280 --> 00:27:34,680
the work course before we close the book

653
00:27:39,710 --> 00:27:37,290
on that great launch vehicle yeah and

654
00:27:42,470 --> 00:27:39,720
Josh I just go back real quick to the

655
00:27:44,960 --> 00:27:42,480
reuse thing one of my other favourite

656
00:27:47,660 --> 00:27:44,970
missions recent that was in recent years

657
00:27:50,240 --> 00:27:47,670
was our test mission heading out to

658
00:27:52,400 --> 00:27:50,250
study exoplanets and we've seen some

659
00:27:54,710 --> 00:27:52,410
great photos from that and you know

660
00:27:57,890 --> 00:27:54,720
that's been a lot of fun working with

661
00:28:00,530 --> 00:27:57,900
our space spacex contractor they're from

662
00:28:02,000 --> 00:28:00,540
a commercial side learning how they do

663
00:28:03,530 --> 00:28:02,010

business like I said earlier they've

664
00:28:06,530 --> 00:28:03,540
turned the industry on its ear a little

665
00:28:08,990 --> 00:28:06,540
bit on how we do rocket stuff and so

666
00:28:11,300 --> 00:28:09,000
it's been looked fun as NASA LSP to

667
00:28:13,400 --> 00:28:11,310
learn what they do and and how we can

668
00:28:15,860 --> 00:28:13,410
become more agile and more efficient and

669
00:28:17,660 --> 00:28:15,870
doing our job so again overall they're

670
00:28:19,550 --> 00:28:17,670
they're all great missions and I know

671
00:28:22,670 --> 00:28:19,560
the LSP family looks forward to every

672
00:28:25,880 --> 00:28:22,680
mission including Mars 2020 this year we

673
00:28:27,860 --> 00:28:25,890
have Sentinel 6 we have Landsat 9 where

674
00:28:30,740 --> 00:28:27,870
we're still very busy and we're looking

675
00:28:32,630 --> 00:28:30,750
forward to it awesome thanks guys such a

676
00:28:35,030 --> 00:28:32,640
thorough job as usual appreciate you and

677
00:28:36,200 --> 00:28:35,040
your energy I know that even in the

678
00:28:37,940 --> 00:28:36,210
current situation you guys are still

679
00:28:39,910 --> 00:28:37,950
taking care of business so appreciate

680
00:28:42,020 --> 00:28:39,920
the hard work and making us proud now

681
00:28:42,640 --> 00:28:42,030
appreciate it Josh thanks for having us

682
00:28:45,890 --> 00:28:42,650
today

683
00:28:48,050 --> 00:28:45,900
Thank You Josh alright so transitioning

684
00:28:51,470 --> 00:28:48,060
a little bit I'm gonna bring you guys

685
00:28:53,420 --> 00:28:51,480
back to one of the things we're here to

686
00:28:57,200 --> 00:28:53,430
talk about kind of a part of the NASA at

687
00:28:59,600 --> 00:28:57,210
home effort nasa.gov slash NASA at home

688
00:29:00,860 --> 00:28:59,610

want to highlight a couple things for

689
00:29:04,190 --> 00:29:00,870
you really quickly so this is that main

690
00:29:04,670 --> 00:29:04,200
page if you do go to nasa.gov slash NASA

691
00:29:06,860 --> 00:29:04,680
at home

692
00:29:08,240 --> 00:29:06,870
that's that page you see and trying to

693
00:29:09,650 --> 00:29:08,250
highlight something every episode the

694
00:29:12,289 --> 00:29:09,660
specific thing I wanted to highlight

695
00:29:13,909 --> 00:29:12,299
this time is in the virtual tour section

696
00:29:15,739 --> 00:29:13,919
the Commercial Crew program which I

697
00:29:18,829 --> 00:29:15,749
think Nick mentioned this that we have

698
00:29:20,389 --> 00:29:18,839
crews flying into Earth orbit low-earth

699
00:29:22,089 --> 00:29:20,399
orbit for the first time in nine years

700
00:29:24,619 --> 00:29:22,099
this summer coming up very very soon

701
00:29:26,299 --> 00:29:24,629
incredibly excited we have actually put

702
00:29:28,459 --> 00:29:26,309
together some virtual tours related to

703
00:29:31,339 --> 00:29:28,469
Commercial Crew this is one of them that

704
00:29:33,919 --> 00:29:31,349
actually ties specifically to astronaut

705
00:29:35,629 --> 00:29:33,929
training so this is here this is a good

706
00:29:36,799 --> 00:29:35,639
colleague of mine Rachel Power who's

707
00:29:38,749 --> 00:29:36,809
working on some of the stem at home

708
00:29:40,369 --> 00:29:38,759
stuff and this is actually a chance to

709
00:29:43,129 --> 00:29:40,379
kind of go inside the neutral buoyancy

710
00:29:45,560 --> 00:29:43,139
lab one of the largest swimming pools in

711
00:29:46,789 --> 00:29:45,570
the world to get to experience a little

712
00:29:50,690 --> 00:29:46,799
bit of what the astronauts go through

713
00:29:53,659 --> 00:29:50,700

for training all right so that is gonna

714
00:29:55,759 --> 00:29:53,669
do it for us for today please continue

715
00:29:57,440 --> 00:29:55,769
to send your questions to hashtag NASA

716
00:29:57,949 --> 00:29:57,450
at home but from the Kennedy Space

717
00:30:00,919 --> 00:29:57,959
Center

718
00:30:03,680 --> 00:30:00,929
sort of I'm Joshua with Santora this is

719
00:30:05,629 --> 00:30:03,690
a my my son off reminding you to stay