Fleet of Rockets

#NASAatHome

1
00:01:04,910 --> 00:00:18,380
[Music]

2
00:01:09,360 --> 00:01:07,320
all right welcome once again coming to

3
00:01:11,670 --> 00:01:09,370
you live from the Kennedy Space Center

4
00:01:14,850 --> 00:01:11,680
sort of I'm your host today Joshua

5
00:01:16,080 --> 00:01:14,860
Santora typically at the for NASA

6
00:01:18,120 --> 00:01:16,090
communication at the Kennedy Space

7
00:01:20,570 --> 00:01:18,130
Center so happy to have you all with me

8
00:01:22,890 --> 00:01:20,580
today obviously wanting to talk about

9
00:01:24,960 --> 00:01:22,900
this spaceport the John F Kennedy

10
00:01:27,090 --> 00:01:24,970
spaceport looking at the features here

11
00:01:29,310 --> 00:01:27,100
today our main feature is the launch

12
00:01:31,080 --> 00:01:29,320
services program do you want to give a

13
00:01:33,660 --> 00:01:31,090

quick kind of note for you all be sure

14
00:01:36,960 --> 00:01:33,670
to ask questions live online in the chat

15
00:01:38,310 --> 00:01:36,970
box there and tell us what things you

16
00:01:40,230 --> 00:01:38,320
like to see on future shows and be sure

17
00:01:43,530 --> 00:01:40,240
to subscribe to the channel and now

18
00:01:46,590 --> 00:01:43,540
without further ado back by popular but

19
00:01:48,930 --> 00:01:46,600
popular demand excuse me two gentlemen

20
00:01:52,800 --> 00:01:48,940
who need no introduction and yet demand

21
00:01:57,090 --> 00:01:52,810
one anyway we have today mr. Tim Dunn

22
00:01:59,969 --> 00:01:57,100
Tim thanks for being here yeah thank you

23
00:02:02,250 --> 00:01:59,979
thank you that was great introduction

24
00:02:04,710 --> 00:02:02,260
yeah we we love joining your show

25
00:02:06,060 --> 00:02:04,720
whenever we can and that is mr. Nick

26
00:02:08,930 --> 00:02:06,070
Waldman they're coming to you live

27
00:02:12,660 --> 00:02:08,940
appreciate you guys as always joining me

28
00:02:14,340 --> 00:02:12,670
so today I want to circle back to you we

29
00:02:16,259 --> 00:02:14,350
had you on a couple weeks ago talking

30
00:02:19,020 --> 00:02:16,269
about rockets and kind of the fleet that

31
00:02:21,330 --> 00:02:19,030
the launch services program uses launch

32
00:02:23,820 --> 00:02:21,340
services obviously a huge part of our

33
00:02:26,940 --> 00:02:23,830
spaceport here managing a ton of

34
00:02:28,320 --> 00:02:26,950
launches for the world and want to just

35
00:02:30,420 --> 00:02:28,330
kind of turn it back over to you guys

36
00:02:32,130 --> 00:02:30,430
and say tell us more I know today we're

37
00:02:35,220 --> 00:02:32,140
talking about orbits which is a really

38
00:02:36,990 --> 00:02:35,230

fun kind of technical thing but very

39
00:02:39,660 --> 00:02:37,000
intriguing there are no roadways in

40
00:02:41,039 --> 00:02:39,670
space so how do we how do we do orbits

41
00:02:42,509 --> 00:02:41,049
how do orbits happen how do we actually

42
00:02:44,810 --> 00:02:42,519
navigate in three-dimensional space

43
00:02:46,890 --> 00:02:44,820
where you're not touching the ground

44
00:02:48,090 --> 00:02:46,900
well hopefully we're gonna get into some

45
00:02:50,789 --> 00:02:48,100
of that we're gonna try to keep it

46
00:02:52,680 --> 00:02:50,799
really basic for everybody but before we

47
00:02:55,410 --> 00:02:52,690
do man we're just excited to be back

48
00:02:57,210 --> 00:02:55,420
here with you Josh and Tim and I are

49
00:03:00,390 --> 00:02:57,220
excited about our jobs as we told you

50
00:03:00,980 --> 00:03:00,400
guys last time and Josh you'll show that

51
00:03:03,350 --> 00:03:00,990
picture

52
00:03:05,410 --> 00:03:03,360
we get to do everyday right I mean it's

53
00:03:07,940 --> 00:03:05,420
excitement here at Kennedy Space Center

54
00:03:10,160 --> 00:03:07,950
launching rockets for as much as we can

55
00:03:12,890 --> 00:03:10,170
working with our commercial partners and

56
00:03:15,260 --> 00:03:12,900
look into the future of men and women in

57
00:03:17,330 --> 00:03:15,270
space coming up here at the end of the

58
00:03:20,360 --> 00:03:17,340
month we just love what we do each and

59
00:03:22,340 --> 00:03:20,370
every day but quick quick recap before I

60
00:03:26,270 --> 00:03:22,350
let Tim get in here on orbital mechanics

61
00:03:27,950 --> 00:03:26,280
is last time we were with you yeah Tim

62
00:03:30,410 --> 00:03:27,960
chomping at the bit for orbital stuff

63
00:03:32,330 --> 00:03:30,420

but last time we were with you guys we

64
00:03:33,560 --> 00:03:32,340
talked launch vehicles and commonality

65
00:03:35,600 --> 00:03:33,570
and launch vehicles right in our

66
00:03:37,880 --> 00:03:35,610
commercial launch vehicles and you can

67
00:03:39,830 --> 00:03:37,890
see they're kind of the commercial set

68
00:03:41,930 --> 00:03:39,840
that's out there today of new and

69
00:03:44,000 --> 00:03:41,940
retired vehicles that we've worked with

70
00:03:45,380 --> 00:03:44,010
in the past some of great our great

71
00:03:48,560 --> 00:03:45,390
partners at United Launch Alliance

72
00:03:50,590 --> 00:03:48,570
Northrop Grumman SpaceX we're starting

73
00:03:54,110 --> 00:03:50,600
to work with our folks at Blue Origin

74
00:03:56,210 --> 00:03:54,120
Virgin Galactic rocket labs our old

75
00:03:57,650 --> 00:03:56,220
partners from Lockheed Martin and Martin

76
00:03:59,330 --> 00:03:57,660
Marietta who have merged into new

77
00:04:01,310 --> 00:03:59,340
companies with all kinds of new

78
00:04:02,870 --> 00:04:01,320
commercial launch people so just to

79
00:04:04,880 --> 00:04:02,880
recap that's our commercial launch

80
00:04:06,680 --> 00:04:04,890
people is there but you know why do we

81
00:04:08,630 --> 00:04:06,690
why do we need Rockets right let's just

82
00:04:11,000 --> 00:04:08,640
talk about that really quick before we

83
00:04:13,040 --> 00:04:11,010
get into orbits why Rockets well we as

84
00:04:14,240 --> 00:04:13,050
humans have a natural curiosity to see

85
00:04:16,640 --> 00:04:14,250
the things be one we got to escape

86
00:04:18,830 --> 00:04:16,650
mother earth in order to get out there

87
00:04:21,440 --> 00:04:18,840
and study it so it's all about the

88
00:04:23,090 --> 00:04:21,450

velocity it is all about velocity and

89
00:04:25,000 --> 00:04:23,100
rockets are just plain cool that's why

90
00:04:29,240 --> 00:04:25,010
Tim and I love what we do each day

91
00:04:31,100 --> 00:04:29,250
rockets are just cool but Tim none of

92
00:04:32,930 --> 00:04:31,110
this could be done if it wasn't for an

93
00:04:36,380 --> 00:04:32,940
amazing gentleman that you like to talk

94
00:04:39,080 --> 00:04:36,390
about a lot bring him along Joshua let's

95
00:04:42,800 --> 00:04:39,090
see my favorite guy this is the guy that

96
00:04:46,130 --> 00:04:42,810
started it all for us rocket guys Sir

97
00:04:49,130 --> 00:04:46,140
Isaac Newton so you see a beautiful

98
00:04:50,660 --> 00:04:49,140
picture there that's about 350 years ago

99
00:04:53,930 --> 00:04:50,670
and it was right when the Great Plague

100
00:04:55,670 --> 00:04:53,940
was hitting London and so guess what

101
00:04:58,670 --> 00:04:55,680
we're in the middle of a plague

102
00:05:00,920 --> 00:04:58,680
ourselves a pandemic and they what they

103
00:05:02,960 --> 00:05:00,930
did in England in those days was they

104
00:05:04,820 --> 00:05:02,970
closed down the University he was just

105
00:05:06,730 --> 00:05:04,830
about to get his bachelor's degree and

106
00:05:10,250 --> 00:05:06,740
they closed the University for two years

107
00:05:12,950 --> 00:05:10,260
gosh what would most of us mortals do we

108
00:05:13,719 --> 00:05:12,960
would say hey Spring Break let's go

109
00:05:16,839 --> 00:05:13,729
we're out

110
00:05:17,890 --> 00:05:16,849
break time let's get out let's go but

111
00:05:20,320 --> 00:05:17,900
not this guy

112
00:05:22,929 --> 00:05:20,330
you know what Sir Isaac did he went and

113
00:05:26,140 --> 00:05:22,939

he did a bunch of original research he

114
00:05:29,320 --> 00:05:26,150
studied gravity gravity gravitation he

115
00:05:32,529 --> 00:05:29,330
studied optics and he laid in the basics

116
00:05:34,929 --> 00:05:32,539
of calculus as we know it today so what

117
00:05:37,510 --> 00:05:34,939
are you guys doing during a pandemic as

118
00:05:39,040 --> 00:05:37,520
you were telling working from home make

119
00:05:41,589 --> 00:05:39,050
have you have you done anything like

120
00:05:43,839 --> 00:05:41,599
that yet I have done some research Tim

121
00:05:45,909 --> 00:05:43,849
I've been studying up on my clock baking

122
00:05:47,709 --> 00:05:45,919
skills lately and you know that's a lot

123
00:05:49,570 --> 00:05:47,719
tougher than it looks for an engineer

124
00:05:50,980 --> 00:05:49,580
but it's been fun I've taken this

125
00:05:53,499 --> 00:05:50,990
opportunity to learn a few new things

126
00:05:55,510 --> 00:05:53,509
outside of my normal day job it's been

127
00:05:57,939 --> 00:05:55,520
really cool I think that's cool that Sir

128
00:05:59,860 --> 00:05:57,949
Isaac Newton did that work and and move

129
00:06:01,540 --> 00:05:59,870
forward for us and got us those you know

130
00:06:08,739 --> 00:06:01,550
three laws that we like to talk about

131
00:06:11,260 --> 00:06:08,749
right that right equal and opposite

132
00:06:14,350 --> 00:06:11,270
reaction so we got our rockets that we

133
00:06:16,480 --> 00:06:14,360
love so dearly and so we like the fuse

134
00:06:19,119 --> 00:06:16,490
on this for the rocket and we start

135
00:06:21,010 --> 00:06:19,129
blowing up the fire and the smoke we get

136
00:06:23,350 --> 00:06:21,020
that equal and opposite reaction of

137
00:06:25,480 --> 00:06:23,360
going to space so let's go to the next

138
00:06:27,760 --> 00:06:25,490

slide Joshua and let's talk a little bit

139
00:06:30,959 --> 00:06:27,770
about basic orbital mechanics surprise

140
00:06:34,959 --> 00:06:30,969
me what slide are you gonna bring to me

141
00:06:37,629 --> 00:06:34,969
there we go what does it mean to be in

142
00:06:40,239 --> 00:06:37,639
orbit well let's put us a cannon on the

143
00:06:42,909 --> 00:06:40,249
North Pole and let's start firing out

144
00:06:45,549 --> 00:06:42,919
cannonballs you know let's just set we

145
00:06:47,110 --> 00:06:45,559
have a standard velocity muzzle and fire

146
00:06:50,619 --> 00:06:47,120
a few cannonballs what's it gonna do

147
00:06:53,279 --> 00:06:50,629
it's gonna splash down uh-oh and there

148
00:06:56,679 --> 00:06:53,289
we go it's gonna splash into the ocean

149
00:06:58,480 --> 00:06:56,689
right but guess what Nick we got some

150
00:07:01,029 --> 00:06:58,490
great friends in the space business

151
00:07:02,799 --> 00:07:01,039
don't we we do and you know what as I

152
00:07:05,129 --> 00:07:02,809
said earlier Tim it's all about the

153
00:07:08,529 --> 00:07:05,139
velocity man it's all about the velocity

154
00:07:11,559 --> 00:07:08,539
so guess what we are going to dial up

155
00:07:14,679 --> 00:07:11,569
Jeff Bezos on Amazon and we're gonna say

156
00:07:16,749 --> 00:07:14,689
hey Jeff we got you at Amazon we got

157
00:07:20,199 --> 00:07:16,759
Elon Musk on the other line he wants to

158
00:07:23,199 --> 00:07:20,209
fund our cannon 2.0 with immobilizing

159
00:07:25,679 --> 00:07:23,209
and don't forget our friend Tory Bruno

160
00:07:27,929 --> 00:07:25,689
over at ula Corey's where he's at

161
00:07:29,999 --> 00:07:27,939
on that you know it's gonna get the

162
00:07:32,459 --> 00:07:30,009
ballistics just right on that muzzle for

163
00:07:34,319 --> 00:07:32,469

me and these three guys working in

164
00:07:36,509 --> 00:07:34,329
concert with you and I we're gonna get

165
00:07:39,419 --> 00:07:36,519
that muzzle velocity up to let's pick a

166
00:07:41,939 --> 00:07:39,429
number make 17,000 800 miles per hour

167
00:07:44,039 --> 00:07:41,949
that sounds like a good number Tim and

168
00:07:46,859 --> 00:07:44,049
let's start firing that cannon off the

169
00:07:49,559 --> 00:07:46,869
North Pole and we're gonna bring that

170
00:07:51,419 --> 00:07:49,569
cannon up to uh pick a number a hundred

171
00:07:52,919 --> 00:07:51,429
and fifteen hundred and twenty miles

172
00:07:56,100 --> 00:07:52,929
above the surface of the earth and guess

173
00:07:57,839 --> 00:07:56,110
what that cannonball it wants to fall

174
00:08:00,629 --> 00:07:57,849
into the ocean but it's got too much

175
00:08:06,179 --> 00:08:00,639
what Nick velocity to him too much

176
00:08:08,819 --> 00:08:06,189
velocity so it continues to fall all

177
00:08:10,769 --> 00:08:08,829
around the earth and that's how we have

178
00:08:12,509 --> 00:08:10,779
satellites in orbit so let's talk a

179
00:08:16,409 --> 00:08:12,519
little bit about where we launch these

180
00:08:18,059 --> 00:08:16,419
guys from yeah it's an all start yeah

181
00:08:19,649 --> 00:08:18,069
that's exciting for us is you know we

182
00:08:21,809 --> 00:08:19,659
talked launch vehicles we love our

183
00:08:24,149 --> 00:08:21,819
launch vehicles we also love our launch

184
00:08:26,639 --> 00:08:24,159
site so you know we launched from many

185
00:08:28,619 --> 00:08:26,649
different places around the globe but

186
00:08:30,269 --> 00:08:28,629
two particular right here to him and

187
00:08:33,299 --> 00:08:30,279
once you start off and tell us a little

188
00:08:35,129 --> 00:08:33,309

bit about the eastern range yeah there

189
00:08:38,009 --> 00:08:35,139
you see a beautiful shot of our country

190
00:08:39,329 --> 00:08:38,019
both what we call watch range is one on

191
00:08:41,219 --> 00:08:39,339
the East Coast one on the west coast I

192
00:08:44,400 --> 00:08:41,229
want to talk a little bit about why do

193
00:08:46,740 --> 00:08:44,410
we launch from Florida well back in the

194
00:08:48,629 --> 00:08:46,750
early days of rocketry Rockets weren't

195
00:08:51,600 --> 00:08:48,639
quite as safe as they are now we needed

196
00:08:55,860 --> 00:08:51,610
lots of big blue ocean to launch out

197
00:08:58,889 --> 00:08:55,870
into right so was undeveloped country

198
00:09:01,850 --> 00:08:58,899
here in Brevard County all along the

199
00:09:05,100 --> 00:09:01,860
East Coast here so we started launching

200
00:09:08,129 --> 00:09:05,110
those test rockets way back in the late

201
00:09:11,129 --> 00:09:08,139
40s early 50s and so that's how we

202
00:09:13,530 --> 00:09:11,139
establish the eastern range and from the

203
00:09:16,439 --> 00:09:13,540
eastern range we can generally launch a

204
00:09:17,670 --> 00:09:16,449
little bit north through a little bit

205
00:09:20,340 --> 00:09:17,680
south of Dewey

206
00:09:23,009 --> 00:09:20,350
kind of has the fan charts shows here so

207
00:09:27,329 --> 00:09:23,019
guess what I got my handy dandy globe

208
00:09:28,170 --> 00:09:27,339
here and guess what make every day since

209
00:09:31,350 --> 00:09:28,180
you've been born

210
00:09:36,530 --> 00:09:31,360
what has the Sun done it has risen in

211
00:09:38,940 --> 00:09:36,540
the east and it has set in the West

212
00:09:42,750 --> 00:09:38,950
thus the

213
00:09:44,819 --> 00:09:42,760

is rotating right so if we're right here

214
00:09:48,120 --> 00:09:44,829
on the coast of Florida and we will

215
00:09:50,730 --> 00:09:48,130
launch due east we get to take advantage

216
00:09:52,800 --> 00:09:50,740
of that natural velocity that the earth

217
00:09:55,530 --> 00:09:52,810
is already providing about a thousand

218
00:09:57,870 --> 00:09:55,540
miles per hour of rotational velocity of

219
00:10:01,949 --> 00:09:57,880
the earth that is free energy that we

220
00:10:03,600 --> 00:10:01,959
get right there to help our rocket so

221
00:10:05,189 --> 00:10:03,610
from the east coast we're going to go

222
00:10:07,310 --> 00:10:05,199
into some low-earth orbits

223
00:10:09,269 --> 00:10:07,320
some equatorial low-earth orbits and

224
00:10:10,650 --> 00:10:09,279
special orbit I'm going to tell you guys

225
00:10:12,750 --> 00:10:10,660
about in just a little bit called a

226
00:10:14,250 --> 00:10:12,760
geosynchronous orbit so MIT why don't

227
00:10:15,990 --> 00:10:14,260
you tell us about the other side of our

228
00:10:17,939 --> 00:10:16,000
country yeah so one of our other

229
00:10:20,040 --> 00:10:17,949
favorite ranges is the western range out

230
00:10:22,170 --> 00:10:20,050
in California or Vandenberg Air Force

231
00:10:23,639 --> 00:10:22,180
Base you know you talked about Kennedy

232
00:10:25,829 --> 00:10:23,649
Space Center at Cape Canaveral Air Force

233
00:10:28,379 --> 00:10:25,839
Station here on Florida but Vandenberg

234
00:10:30,300 --> 00:10:28,389
Air Force Base out in California is one

235
00:10:32,160 --> 00:10:30,310
of our favorite launch sites also and

236
00:10:33,750 --> 00:10:32,170
what's unique about that Tim same as you

237
00:10:35,970 --> 00:10:33,760
said is we need that big blue ocean

238
00:10:37,170 --> 00:10:35,980

right we want a personnel safety is

239
00:10:39,090 --> 00:10:37,180
number one we want to make sure

240
00:10:40,949 --> 00:10:39,100
everybody's safe we launch these things

241
00:10:43,880 --> 00:10:40,959
so as you can see from the fan of

242
00:10:46,319 --> 00:10:43,890
Vandenberg we head due south from there

243
00:10:49,019 --> 00:10:46,329
and there's there's some degrees in that

244
00:10:50,790 --> 00:10:49,029
due south area from where we launch but

245
00:10:53,579 --> 00:10:50,800
what's cool about that is we get into a

246
00:10:56,610 --> 00:10:53,589
really cool orbit that is called a polar

247
00:10:59,340 --> 00:10:56,620
orbit and if you show your globe there

248
00:11:01,560 --> 00:10:59,350
Tim yep what that means is we leave

249
00:11:03,840 --> 00:11:01,570
California we head down towards the

250
00:11:06,000 --> 00:11:03,850
South Pole we come back around on the

251
00:11:08,370 --> 00:11:06,010
North Pole and we keep going around and

252
00:11:10,470 --> 00:11:08,380
then to take advantage of what you were

253
00:11:14,189 --> 00:11:10,480
saying the earth is spinning so what

254
00:11:16,860 --> 00:11:14,199
happens is every 14 days we can see the

255
00:11:18,780 --> 00:11:16,870
same spot on the earth as the satellite

256
00:11:20,400 --> 00:11:18,790
travels around there so what's really

257
00:11:23,280 --> 00:11:20,410
cool about that is if people are out

258
00:11:25,470 --> 00:11:23,290
there with Google Earth or Landsat the

259
00:11:27,750 --> 00:11:25,480
Landsat satellite or digital globe that

260
00:11:29,519 --> 00:11:27,760
get these cool pictures that we see over

261
00:11:32,040 --> 00:11:29,529
that's how we get them isn't that

262
00:11:34,380 --> 00:11:32,050
special polar orbit that we get out of

263
00:11:36,360 --> 00:11:34,390

California Java might have a question

264
00:11:39,090 --> 00:11:36,370
yeah I wanted to ask so I heard

265
00:11:42,509 --> 00:11:39,100
something mentioned recently about polar

266
00:11:44,040 --> 00:11:42,519
orbits and the eastern range and I heard

267
00:11:46,110 --> 00:11:44,050
a rumor that there's discussion of that

268
00:11:47,490 --> 00:11:46,120
and this is something I've obviously

269
00:11:49,949 --> 00:11:47,500
been working at the agency for a while

270
00:11:52,319 --> 00:11:49,959
I've seen a lot of launches and I've

271
00:11:52,740 --> 00:11:52,329
I've always been told you can't fly

272
00:11:54,030 --> 00:11:52,750
polar

273
00:11:56,460 --> 00:11:54,040
the eastern range so do you guys have

274
00:12:00,270 --> 00:11:56,470
some more information on that I'll take

275
00:12:02,400 --> 00:12:00,280
that one Joshua so in the very early

276
00:12:08,070 --> 00:12:02,410
days of rocketry in the late 50s and

277
00:12:10,890 --> 00:12:08,080
early 60s as in 1960 we did launch polar

278
00:12:14,160 --> 00:12:10,900
from the eastern range but guess what

279
00:12:16,500 --> 00:12:14,170
when we do that we have to overfly our

280
00:12:18,090 --> 00:12:16,510
friends to the South Cuba and then we

281
00:12:21,540 --> 00:12:18,100
have to fly down through the Panama

282
00:12:24,180 --> 00:12:21,550
Canal area and over fly Central America

283
00:12:26,810 --> 00:12:24,190
so there was a little incident maybe

284
00:12:29,640 --> 00:12:26,820
back in 1960 where we might have dropped

285
00:12:31,560 --> 00:12:29,650
parts of a rocket on our friends to the

286
00:12:33,210 --> 00:12:31,570
south there in Cuba so the State

287
00:12:35,130 --> 00:12:33,220
Department said probably not a smart

288
00:12:37,020 --> 00:12:35,140

thing to do anymore let's not do that

289
00:12:41,010 --> 00:12:37,030
let's go out to California and launch

290
00:12:45,330 --> 00:12:41,020
polar but our good friends at SpaceX

291
00:12:47,970 --> 00:12:45,340
have reattached that situation with our

292
00:12:50,370 --> 00:12:47,980
new capabilities in their incredible

293
00:12:52,320 --> 00:12:50,380
Falcon 9 rocket that has autonomous

294
00:12:54,780 --> 00:12:52,330
flight termination system on it and

295
00:12:57,930 --> 00:12:54,790
they're able to land first stages

296
00:13:00,500 --> 00:12:57,940
downrange or fly then back to the launch

297
00:13:03,510 --> 00:13:00,510
site and because of that they have

298
00:13:07,050 --> 00:13:03,520
represented that option to fly polar out

299
00:13:10,260 --> 00:13:07,060
of the eastern range and if all goes

300
00:13:12,450 --> 00:13:10,270
well we may see that actually

301
00:13:15,329 --> 00:13:12,460
demonstrated on a commercial mission

302
00:13:17,100 --> 00:13:15,339
coming up this summer from the Cape yeah

303
00:13:18,630 --> 00:13:17,110
and again Tim as you said autonomous

304
00:13:21,120 --> 00:13:18,640
flight contamination that's all about

305
00:13:22,680 --> 00:13:21,130
safety and as you said going over the

306
00:13:24,570 --> 00:13:22,690
land and stuff so we just want to make

307
00:13:26,730 --> 00:13:24,580
sure that's so yeah SpaceX has presented

308
00:13:27,750 --> 00:13:26,740
that case again and Josh and we'll see

309
00:13:29,550 --> 00:13:27,760
how that plays out

310
00:13:32,610 --> 00:13:29,560
do you guys anticipate that that's

311
00:13:34,920 --> 00:13:32,620
something that will become common beyond

312
00:13:36,810 --> 00:13:34,930
just like polar from Florida because

313
00:13:39,540 --> 00:13:36,820

that kind of raises the question does

314
00:13:45,840 --> 00:13:39,550
the technology evolution allow us to fly

315
00:13:47,880 --> 00:13:45,850
more places safely I think yeah go ahead

316
00:13:50,400 --> 00:13:47,890
Tim head of the autonomous flight

317
00:13:53,280 --> 00:13:50,410
termination system you get much quicker

318
00:13:55,380 --> 00:13:53,290
response and much more safe flight of

319
00:13:57,060 --> 00:13:55,390
the vehicle and that is the direction

320
00:13:59,760 --> 00:13:57,070
that all of the rockets and the

321
00:14:02,910 --> 00:13:59,770
technology is going is to bring those

322
00:14:04,440 --> 00:14:02,920
smart systems onto the rocket so the

323
00:14:05,860 --> 00:14:04,450
more smart systems you get on the

324
00:14:09,370 --> 00:14:05,870
smarter the Rockets

325
00:14:11,590 --> 00:14:09,380
the easier they are to fly and from more

326
00:14:13,660 --> 00:14:11,600
locations so we look forward to that

327
00:14:15,310 --> 00:14:13,670
added capability on the East Coast and

328
00:14:17,200 --> 00:14:15,320
but we're certainly going to be

329
00:14:20,380 --> 00:14:17,210
utilizing the West Coast for its

330
00:14:23,260 --> 00:14:20,390
tremendous advantage that offers for the

331
00:14:25,390 --> 00:14:23,270
rest of the fleet's yeah besides and it

332
00:14:26,860 --> 00:14:25,400
get Josh it gets back to safety the

333
00:14:28,930 --> 00:14:26,870
companies are making these leaps and

334
00:14:30,970 --> 00:14:28,940
bounds and technology but they're always

335
00:14:33,579 --> 00:14:30,980
continuing to look at safety as their

336
00:14:36,190 --> 00:14:33,589
number one thing you know to not only

337
00:14:41,079 --> 00:14:36,200
protect the society and where we are but

338
00:14:43,390 --> 00:14:41,089

also as we mentioned in our last video

339
00:14:45,190 --> 00:14:43,400
with you or last conference with you our

340
00:14:46,540 --> 00:14:45,200
payload customer right we want to make

341
00:14:48,160 --> 00:14:46,550
sure mission success and make sure

342
00:14:50,050 --> 00:14:48,170
everything is safe and we get our our

343
00:14:52,470 --> 00:14:50,060
spacecraft customer to where they need

344
00:14:54,970 --> 00:14:52,480
to be so the other cool thing about

345
00:14:56,860 --> 00:14:54,980
working in the western range as we said

346
00:14:59,860 --> 00:14:56,870
polar orbit there one of the other

347
00:15:01,900 --> 00:14:59,870
ranges that we have on the west or a

348
00:15:04,120 --> 00:15:01,910
little farther west I guess Tim right

349
00:15:06,460 --> 00:15:04,130
depending on which way you're going is

350
00:15:08,380 --> 00:15:06,470
button that I have personally been able

351
00:15:11,680 --> 00:15:08,390
to go to and that's the Kwajalein Island

352
00:15:14,650 --> 00:15:11,690
in the martially Kwajalein atoll in the

353
00:15:16,180 --> 00:15:14,660
marshall east islands down there it's a

354
00:15:17,920 --> 00:15:16,190
it's out there in the middle of the

355
00:15:21,720 --> 00:15:17,930
South Pacific and what's really cool

356
00:15:24,910 --> 00:15:21,730
about quad island is we can take a small

357
00:15:26,410 --> 00:15:24,920
launch vehicle like our Pegasus launch

358
00:15:27,730 --> 00:15:26,420
vehicle that's mounted on the bottom in

359
00:15:30,280 --> 00:15:27,740
l-1011 that we talked about last time

360
00:15:33,100 --> 00:15:30,290
and we can get it out to quad island and

361
00:15:35,650 --> 00:15:33,110
we can use it to launch a payload into

362
00:15:38,230 --> 00:15:35,660
an equatorial orbit and the cool thing

363
00:15:40,690 --> 00:15:38,240

about that is quad is only a few degrees

364
00:15:43,060 --> 00:15:40,700
above the equator as you see the red

365
00:15:45,760 --> 00:15:43,070
line they're heading off towards the

366
00:15:47,590 --> 00:15:45,770
equator what that allows us to do is use

367
00:15:50,860 --> 00:15:47,600
that smaller launch vehicle to lift

368
00:15:52,780 --> 00:15:50,870
heavier massive payload and getting it

369
00:15:55,329 --> 00:15:52,790
into that equatorial orbit for science

370
00:15:57,850 --> 00:15:55,339
so really cool opportunity there to

371
00:15:59,949 --> 00:15:57,860
visit the island and get out there for

372
00:16:01,750 --> 00:15:59,959
some space craft stuff it's definitely a

373
00:16:04,810 --> 00:16:01,760
unique launch site that we've been able

374
00:16:08,320 --> 00:16:04,820
to participate in in our career here

375
00:16:10,440 --> 00:16:08,330
with launch services program yeah we've

376
00:16:12,650 --> 00:16:10,450
talked a little bit about these orbits

377
00:16:14,840 --> 00:16:12,660
low-earth orbit

378
00:16:16,280 --> 00:16:14,850
orbit geosynchronous let's show a chart

379
00:16:19,819 --> 00:16:16,290
there Joshua and let's talk a little

380
00:16:22,759 --> 00:16:19,829
more alright so coming out that Eastern

381
00:16:25,069 --> 00:16:22,769
range here in Florida you see that pink

382
00:16:27,829 --> 00:16:25,079
ribbon on the chart here that shows a

383
00:16:29,990 --> 00:16:27,839
rocket leaving the Cape in low-earth

384
00:16:31,910 --> 00:16:30,000
orbit by low Earth orbit we generally

385
00:16:33,949 --> 00:16:31,920
mean about a hundred and fifty to three

386
00:16:36,559 --> 00:16:33,959
hundred miles above the surface of the

387
00:16:38,210 --> 00:16:36,569
earth and so that's where our space

388
00:16:40,519 --> 00:16:38,220

station operates there's that's where a

389
00:16:43,519 --> 00:16:40,529
lot of our earth science satellites

390
00:16:47,749 --> 00:16:43,529
operate and so if we want to also

391
00:16:50,480 --> 00:16:47,759
utilize that the eastern range we can go

392
00:16:52,850 --> 00:16:50,490
into an incredibly special orbit and if

393
00:16:54,650 --> 00:16:52,860
you follow that pink ribbon around twice

394
00:16:56,540 --> 00:16:54,660
around the earth and then it turns into

395
00:17:00,259 --> 00:16:56,550
a blue ribbon it takes you all the way

396
00:17:03,290 --> 00:17:00,269
out to geostationary orbit geo meaning

397
00:17:05,990 --> 00:17:03,300
Earth stationary meaning still wait what

398
00:17:09,260 --> 00:17:06,000
does still mean in space well if you

399
00:17:13,250 --> 00:17:09,270
take my handy dandy tiny little pink

400
00:17:16,130 --> 00:17:13,260
satellite here and my earth we know that

401
00:17:19,819 --> 00:17:16,140
the earth is up roughly about eight

402
00:17:24,860 --> 00:17:19,829
thousand miles in diameter if I take my

403
00:17:26,779 --> 00:17:24,870
satellite about Oh 22,000 miles above

404
00:17:30,460 --> 00:17:26,789
the surface of the earth about three

405
00:17:34,000 --> 00:17:30,470
earth diameters I get into a

406
00:17:37,430 --> 00:17:34,010
geostationary orbit where the satellite

407
00:17:39,740 --> 00:17:37,440
orbital velocity in its period around

408
00:17:42,110 --> 00:17:39,750
the earth matches the earth period of

409
00:17:44,960 --> 00:17:42,120
rotation and it's orbital velocity so

410
00:17:47,600 --> 00:17:44,970
relative to a position on earth it never

411
00:17:49,610 --> 00:17:47,610
changes and that's to view all of our

412
00:17:54,140 --> 00:17:49,620
communication satellites I'm gonna ask

413
00:17:56,180 --> 00:17:54,150

you is that good for Dish Network Direct

414
00:17:58,940 --> 00:17:56,190
TV all of these wonderful communication

415
00:18:00,860 --> 00:17:58,950
things or our weather satellites that

416
00:18:03,940 --> 00:18:00,870
are out of geostationary that need to

417
00:18:06,590 --> 00:18:03,950
keep the same view of weather over

418
00:18:08,600 --> 00:18:06,600
Florida so Mick and I know when to

419
00:18:11,090 --> 00:18:08,610
prepare for hurricanes and that's right

420
00:18:13,520 --> 00:18:11,100
yeah that's pretty clear Mick tell us

421
00:18:15,169 --> 00:18:13,530
about some orbits that we point to from

422
00:18:17,090 --> 00:18:15,179
the west coast and what they're yes so

423
00:18:19,399 --> 00:18:17,100
we we we talked about the polar orbit if

424
00:18:21,860 --> 00:18:19,409
we go back to the chart back one chart

425
00:18:23,270 --> 00:18:21,870
there Josh we see the where Tim talked

426
00:18:25,039 --> 00:18:23,280
about the pink ribbon coming out of the

427
00:18:25,990 --> 00:18:25,049
Cape well if you look at the blue ribbon

428
00:18:28,000 --> 00:18:26,000
that goes over the No

429
00:18:29,440 --> 00:18:28,010
in south pole that is the pole orbit

430
00:18:31,960 --> 00:18:29,450
that we talked about then we launched

431
00:18:34,420 --> 00:18:31,970
out a Vandenberg and you basically get

432
00:18:36,970 --> 00:18:34,430
to cover the poles top and bottom of the

433
00:18:38,950 --> 00:18:36,980
earth and as Earth spins around we can

434
00:18:42,460 --> 00:18:38,960
then take pictures of every square mile

435
00:18:45,340 --> 00:18:42,470
of the earth every 14 days we get the

436
00:18:46,840 --> 00:18:45,350
same picture now that can be useful in a

437
00:18:49,480 --> 00:18:46,850
lot of things and we won't go into that

438
00:18:51,550 --> 00:18:49,490

today but the biggest thing is Google

439
00:18:53,560 --> 00:18:51,560
Earth or pictures you want to take if

440
00:18:56,320 --> 00:18:53,570
you've looked up your house right you

441
00:18:58,270 --> 00:18:56,330
can see how the picture changes every 14

442
00:18:59,860 --> 00:18:58,280
days if it's put up that way that's a

443
00:19:03,130 --> 00:18:59,870
really cool orbit to leave out

444
00:19:06,250 --> 00:19:03,140
Vandenberg but you know Tim we talked

445
00:19:08,080 --> 00:19:06,260
about some special things that have

446
00:19:10,030 --> 00:19:08,090
happened to us over a career and and I

447
00:19:11,650 --> 00:19:10,040
think you and I both agree that one of

448
00:19:15,550 --> 00:19:11,660
the coolest things that's happened out

449
00:19:18,280 --> 00:19:15,560
of the west coast is getting into a Mars

450
00:19:21,460 --> 00:19:18,290
trajectory orbit with a certain mission

451
00:19:23,500 --> 00:19:21,470
and you know let's let's see the next

452
00:19:25,510 --> 00:19:23,510
chart on an interplanetary orbit what

453
00:19:26,440 --> 00:19:25,520
that looks like talk us through that and

454
00:19:29,640 --> 00:19:26,450
I'm going to come back to the mission

455
00:19:32,800 --> 00:19:29,650
I'm referring to yeah so here's a Mars

456
00:19:34,030 --> 00:19:32,810
interplanetary orbit so a lot of times

457
00:19:35,440 --> 00:19:34,040
we don't just want to stay in the

458
00:19:37,330 --> 00:19:35,450
vicinity of the earth we want to go

459
00:19:40,120 --> 00:19:37,340
exploring into our solar system and

460
00:19:43,900 --> 00:19:40,130
beyond and so this is a representative

461
00:19:46,090 --> 00:19:43,910
picture showing the Earth and Mars and

462
00:19:48,820 --> 00:19:46,100
how we would leave the earth staying

463
00:19:51,730 --> 00:19:48,830

roughly in the ecliptic plane of our

464
00:19:53,920 --> 00:19:51,740
solar system and then intercept Mars

465
00:19:57,580 --> 00:19:53,930
takes us about six months of strands of

466
00:19:59,590 --> 00:19:57,590
time to get to Mars and so generally for

467
00:20:01,870 --> 00:19:59,600
interplanetary flight our nation has

468
00:20:05,080 --> 00:20:01,880
always launched out of the eastern range

469
00:20:06,550 --> 00:20:05,090
and we were going to take advantage of

470
00:20:08,230 --> 00:20:06,560
that performance that I mentioned

471
00:20:09,910 --> 00:20:08,240
hitting the Earth's velocity getting a

472
00:20:13,120 --> 00:20:09,920
little bit of added boost heading out

473
00:20:16,270 --> 00:20:13,130
and on a an equatorial departure from

474
00:20:18,790 --> 00:20:16,280
the earth on our way to Mars but we have

475
00:20:20,530 --> 00:20:18,800
had occasion in the past one time in

476
00:20:21,880 --> 00:20:20,540
particular a couple of years ago mint

477
00:20:23,890 --> 00:20:21,890
tell us about what happened that was

478
00:20:25,870 --> 00:20:23,900
special out of Vandenberg yeah that was

479
00:20:27,940 --> 00:20:25,880
cool right the insight mission Mars

480
00:20:30,160 --> 00:20:27,950
mission first time in my career that

481
00:20:31,450 --> 00:20:30,170
we've launched a Mars mission I think

482
00:20:33,430 --> 00:20:31,460
first time in your career to that we've

483
00:20:34,960 --> 00:20:33,440
launched a Mars mission out of

484
00:20:36,550 --> 00:20:34,970
Vandenberg and what was really cool

485
00:20:39,100 --> 00:20:36,560
about that as you said Tim leaving out

486
00:20:39,760 --> 00:20:39,110
East Coast we get that extra thousand

487
00:20:41,890 --> 00:20:39,770
mile an hour

488
00:20:43,510 --> 00:20:41,900

energy boost with the earth right well

489
00:20:46,450 --> 00:20:43,520
if you're at vandenberg and you launch

490
00:20:48,910 --> 00:20:46,460
to the west you're fighting that hunt

491
00:20:51,760 --> 00:20:48,920
thousand-mile right so how can you

492
00:20:54,010 --> 00:20:51,770
launch a Mars mission to Mars from

493
00:20:56,080 --> 00:20:54,020
Vandenberg well nice thing about that is

494
00:20:58,180 --> 00:20:56,090
our friends at United Launch Alliance

495
00:21:01,180 --> 00:20:58,190
that launched that mission for us we had

496
00:21:03,280 --> 00:21:01,190
so much extra performance in the Atlas 5

497
00:21:06,540 --> 00:21:03,290
rocket that launched insight that we

498
00:21:09,220 --> 00:21:06,550
were able to launch insight from

499
00:21:11,080 --> 00:21:09,230
Vandenberg and compensate for that

500
00:21:12,700 --> 00:21:11,090
thousand miles an hour with the extra

501
00:21:15,340 --> 00:21:12,710
performance that we had in the vehicle

502
00:21:17,080 --> 00:21:15,350
so that was an exciting time not only

503
00:21:18,970 --> 00:21:17,090
for us at NASA but everybody in the

504
00:21:20,320 --> 00:21:18,980
aerospace industry to be able to see

505
00:21:22,630 --> 00:21:20,330
that happen with the extra performance

506
00:21:24,820 --> 00:21:22,640
and and getting a Mars mission out of

507
00:21:26,290 --> 00:21:24,830
Vandenberg it was a sight to see hey

508
00:21:27,580 --> 00:21:26,300
guys we had a couple of social questions

509
00:21:30,430 --> 00:21:27,590
I'm coming through the chat one I wanted

510
00:21:32,980 --> 00:21:30,440
to ask you the first was tell us more

511
00:21:35,080 --> 00:21:32,990
about kind of the nature of being at the

512
00:21:36,790 --> 00:21:35,090
equator and getting that energy boost do

513
00:21:39,010 --> 00:21:36,800

you have to be dead on the equator to

514
00:21:40,570 --> 00:21:39,020
maximize that boost is it like a sliding

515
00:21:44,110 --> 00:21:40,580
scale is it anywhere gets the same kind

516
00:21:46,960 --> 00:21:44,120
of boost so yeah so if you're on the

517
00:21:48,550 --> 00:21:46,970
equator at 0 degrees north latitude 0

518
00:21:50,740 --> 00:21:48,560
degrees south latitude you get the

519
00:21:52,990 --> 00:21:50,750
maximum boost and it's a little bit

520
00:21:56,410 --> 00:21:53,000
greater than a thousand miles per hour

521
00:21:58,570 --> 00:21:56,420
of rotational velocity that you get as

522
00:21:59,530 --> 00:21:58,580
you go north if you went all the way to

523
00:22:02,920 --> 00:21:59,540
the North Pole

524
00:22:05,050 --> 00:22:02,930
you get zero boost so where we're at in

525
00:22:09,340 --> 00:22:05,060
Florida at 28 degrees north latitude

526
00:22:12,910 --> 00:22:09,350
we're getting roughly about 7.9 excuse

527
00:22:15,280 --> 00:22:12,920
me about 900 and some odd miles per hour

528
00:22:18,550 --> 00:22:15,290
of boost and the farther you go north

529
00:22:20,590 --> 00:22:18,560
you it decreases that boost so from 28

530
00:22:23,800 --> 00:22:20,600
degrees north latitude where we're at in

531
00:22:28,480 --> 00:22:23,810
Florida here at the Cape we do see about

532
00:22:30,430 --> 00:22:28,490
900 miles per hour of free velocity so

533
00:22:32,470 --> 00:22:30,440
as I stated earlier Joshua's launching

534
00:22:34,810 --> 00:22:32,480
from Kwajalein we're only a couple of

535
00:22:37,420 --> 00:22:34,820
degrees above the equator so we can use

536
00:22:40,210 --> 00:22:37,430
that smaller launch vehicle to get more

537
00:22:43,060 --> 00:22:40,220
mass into orbit because we get that

538
00:22:44,950 --> 00:22:43,070

extra boost heading to the 0 degree on

539
00:22:46,810 --> 00:22:44,960
the equator right so that's smart we

540
00:22:48,820 --> 00:22:46,820
don't have to have a really big rocket

541
00:22:50,680 --> 00:22:48,830
to lift the same amount of weight to get

542
00:22:52,510 --> 00:22:50,690
us where we need to be going so that

543
00:22:53,020 --> 00:22:52,520
works out to our advantage being able to

544
00:22:54,730 --> 00:22:53,030
do that

545
00:22:57,040 --> 00:22:54,740
cool one more question that came through

546
00:22:59,050 --> 00:22:57,050
was I know we mentioned with the polar

547
00:23:02,110 --> 00:22:59,060
orbit so we specified southern flights

548
00:23:03,850 --> 00:23:02,120
with polar orbits can we fly north for

549
00:23:05,160 --> 00:23:03,860
polar orbits and does it work the same

550
00:23:12,430 --> 00:23:05,170
way

551
00:23:15,270 --> 00:23:12,440
go ahead - oh so we can't fly north from

552
00:23:19,420 --> 00:23:15,280
the from the Cape we can go up to about

553
00:23:22,120 --> 00:23:19,430
52 degrees north of the Equator on

554
00:23:24,040 --> 00:23:22,130
asmath so not quite due north

555
00:23:27,160 --> 00:23:24,050
like we can at Vandenberg we can go due

556
00:23:29,290 --> 00:23:27,170
south so but what you really need to

557
00:23:32,470 --> 00:23:29,300
know is you don't have to go due north

558
00:23:35,440 --> 00:23:32,480
because once you get into orbit you're

559
00:23:37,840 --> 00:23:35,450
going north south south north and just

560
00:23:40,000 --> 00:23:37,850
as the earth is moving under you so even

561
00:23:41,110 --> 00:23:40,010
if you were to start flying north out of

562
00:23:42,850 --> 00:23:41,120
Vandenberg which you wouldn't

563
00:23:44,650 --> 00:23:42,860

necessarily want to do because you kind

564
00:23:46,900 --> 00:23:44,660
of tend to fly right along the coast of

565
00:23:48,550 --> 00:23:46,910
California and I don't think the folks

566
00:23:51,310 --> 00:23:48,560
in San Francisco and Seattle would

567
00:23:53,200 --> 00:23:51,320
appreciate that as much but you get the

568
00:23:56,110 --> 00:23:53,210
same effect so we really don't have to

569
00:23:57,550 --> 00:23:56,120
launch to the north yeah so actually the

570
00:23:59,170 --> 00:23:57,560
reason I threw that over to Tim is I had

571
00:24:02,590 --> 00:23:59,180
a question for Tim because he hit on it

572
00:24:04,060 --> 00:24:02,600
the fifty-two degrees you know that is

573
00:24:07,000 --> 00:24:04,070
pretty close right coming out of Florida

574
00:24:08,740 --> 00:24:07,010
here but today what do we what do we use

575
00:24:10,440 --> 00:24:08,750
that for right another launch like we

576
00:24:13,120 --> 00:24:10,450
forgot to mention is Wallops Island

577
00:24:16,270 --> 00:24:13,130
where we launched some cargo supply out

578
00:24:18,880 --> 00:24:16,280
of but between Wallops and Florida why

579
00:24:21,460 --> 00:24:18,890
do Tim why do we launch that 52 degrees

580
00:24:25,020 --> 00:24:21,470
where we headed what are we doing so

581
00:24:27,880 --> 00:24:25,030
anytime we're going out of the Cape on a

582
00:24:29,260 --> 00:24:27,890
resupply mission to our favorite space

583
00:24:33,730 --> 00:24:29,270
station the international space station

584
00:24:36,190 --> 00:24:33,740
we're heading out at about 51 51 and a

585
00:24:39,420 --> 00:24:36,200
half degrees inclination to the equator

586
00:24:43,090 --> 00:24:39,430
so that we can match up with the ISS is

587
00:24:44,950 --> 00:24:43,100
orbital plane and it's because the

588
00:24:47,440 --> 00:24:44,960

reason it's at that higher plane than

589
00:24:49,810 --> 00:24:47,450
where Florida is at 28 degrees was a

590
00:24:52,240 --> 00:24:49,820
compromise we had with our international

591
00:24:55,870 --> 00:24:52,250
partners the Russians who launched out

592
00:24:58,350 --> 00:24:55,880
of Baikonur in Kazakhstan and they're at

593
00:25:01,630 --> 00:24:58,360
roughly about 46 degrees north latitude

594
00:25:05,560 --> 00:25:01,640
but to avoid China they have to launch

595
00:25:06,370 --> 00:25:05,570
low higher than about 52 degrees so good

596
00:25:08,110 --> 00:25:06,380
question

597
00:25:09,789 --> 00:25:08,120
yeah that's that's what I was one to hit

598
00:25:12,400 --> 00:25:09,799
on is our favorite station where we

599
00:25:13,870 --> 00:25:12,410
study a lot and we get to see ISS so

600
00:25:17,799 --> 00:25:13,880
those are those are important for us to

601
00:25:19,539 --> 00:25:17,809
get out of Florida so yeah so hey so on

602
00:25:20,770 --> 00:25:19,549
that we're talking lunch we talked

603
00:25:22,570 --> 00:25:20,780
launch vehicles last time we talked

604
00:25:24,400 --> 00:25:22,580
orbits last time things are always

605
00:25:26,440 --> 00:25:24,410
important to what we need to do and you

606
00:25:28,390 --> 00:25:26,450
know what's really important for us is

607
00:25:30,580 --> 00:25:28,400
to put all that together for some of the

608
00:25:32,710 --> 00:25:30,590
few upcoming missions we've gotten LSP

609
00:25:34,870 --> 00:25:32,720
Tim and that we are so excited about

610
00:25:36,610 --> 00:25:34,880
these missions I'm telling you Mars 2020

611
00:25:38,260 --> 00:25:36,620
we talked about that interplanetary

612
00:25:40,510 --> 00:25:38,270
mission right we're going to launch that

613
00:25:42,070 --> 00:25:40,520

in July of 2020 here we're gonna be

614
00:25:44,649 --> 00:25:42,080
launching from Cape Canaveral Air Force

615
00:25:47,980 --> 00:25:44,659
Station our eastern range heading to an

616
00:25:50,039 --> 00:25:47,990
interplanetary trajectory for Mars we

617
00:25:53,380 --> 00:25:50,049
are so excited that we got to see the

618
00:25:55,390 --> 00:25:53,390
helicopter ingenuity made it to

619
00:25:56,980 --> 00:25:55,400
perseverance recently and they are

620
00:25:59,140 --> 00:25:56,990
mating all that together and getting

621
00:26:01,120 --> 00:25:59,150
ready to put on the Atlas 5 for launch

622
00:26:03,340 --> 00:26:01,130
but then we've got an ocean science

623
00:26:06,100 --> 00:26:03,350
spacecraft Sentinel 6 then we're gonna

624
00:26:07,870 --> 00:26:06,110
be studying the ocean with and that

625
00:26:09,039 --> 00:26:07,880
we're looking at November 2020 but we're

626
00:26:11,440 --> 00:26:09,049
gonna launch that one out of Vandenberg

627
00:26:13,810 --> 00:26:11,450
Air Force Base right so we can get into

628
00:26:16,419 --> 00:26:13,820
a polar orbit and we can see the same

629
00:26:18,399 --> 00:26:16,429
spots in the ocean every 14 days and ooh

630
00:26:19,830 --> 00:26:18,409
that's exciting and then 10 you talked a

631
00:26:22,810 --> 00:26:19,840
little bit about geosynchronous

632
00:26:25,210 --> 00:26:22,820
satellites or geostationary sorry about

633
00:26:27,520 --> 00:26:25,220
that it goes to you talked about our

634
00:26:29,500 --> 00:26:27,530
weather satellite the next powerful

635
00:26:31,930 --> 00:26:29,510
weather satellite we've got to meet up

636
00:26:33,549 --> 00:26:31,940
with it's a brother and sister or goes r

637
00:26:36,039 --> 00:26:33,559
and s that we've launched a couple years

638
00:26:38,470 --> 00:26:36,049

ago for weather launching in December of

639
00:26:40,029 --> 00:26:38,480
2021 again launching here from Cape

640
00:26:42,070 --> 00:26:40,039
Canaveral Air Force Station eastern

641
00:26:43,930 --> 00:26:42,080
range so that we can get that continuous

642
00:26:45,580 --> 00:26:43,940
weather monitoring and you and I like to

643
00:26:47,770 --> 00:26:45,590
know when our hurricanes and tropical

644
00:26:49,390 --> 00:26:47,780
storms are coming so those are three

645
00:26:52,029 --> 00:26:49,400
really important missions we've got

646
00:26:54,100 --> 00:26:52,039
coming up in the near future using these

647
00:26:55,840 --> 00:26:54,110
different launch sites and orbits that

648
00:26:57,220 --> 00:26:55,850
we just talked about so you put the

649
00:26:58,840 --> 00:26:57,230
launch vehicle together in orbits

650
00:27:00,700 --> 00:26:58,850
together and that's what it comes down

651
00:27:04,630 --> 00:27:00,710
to is launching our spacecraft customer

652
00:27:07,180 --> 00:27:04,640
and getting science into space so

653
00:27:09,130 --> 00:27:07,190
exciting stuff coming forward there yeah

654
00:27:10,690 --> 00:27:09,140
awesome gentlemen as always I know that

655
00:27:13,090 --> 00:27:10,700
you're super busy getting ready for that

656
00:27:14,830 --> 00:27:13,100
Mars 2020 flight here in July super

657
00:27:15,549 --> 00:27:14,840
excited for that appreciate you being

658
00:27:20,060 --> 00:27:15,559
with us today

659
00:27:22,519 --> 00:27:20,070
Tim Mick always a pleasure hey Josh

660
00:27:24,469 --> 00:27:22,529
with you guys thank you yeah well I'll

661
00:27:26,119 --> 00:27:24,479
see y'all later being you Josh and the

662
00:27:27,889 --> 00:27:26,129
team so thanks for all you're doing

663
00:27:29,450 --> 00:27:27,899

during this to keep everybody informed

664
00:27:31,129 --> 00:27:29,460
of what's going on here at Kennedy

665
00:27:32,180 --> 00:27:31,139
yeah listen we're having fun and trying

666
00:27:33,739 --> 00:27:32,190
to make sure people know that we're

667
00:27:36,109 --> 00:27:33,749
still we're still making progress moving

668
00:27:37,489 --> 00:27:36,119
forward I'll always hey we're still

669
00:27:39,529 --> 00:27:37,499
launching rockets that's what it's all

670
00:27:41,930 --> 00:27:39,539
about rockets are cool rockets are cool

671
00:27:42,799 --> 00:27:41,940
tune in next week to our series all week

672
00:27:44,269 --> 00:27:42,809
long we're going to be talking about the

673
00:27:45,950 --> 00:27:44,279
Artemis program we're calling it our

674
00:27:47,810 --> 00:27:45,960
Artemis week for the launch services

675
00:27:50,119 --> 00:27:47,820
program and Tim and make and all the fun

676
00:27:52,639 --> 00:27:50,129
that they have we will see you next time

677
00:27:54,589 --> 00:27:52,649
that's gonna do it from us here and I