1
00:00:26,630 --> 00:00:24,390
from the johns hopkins applied physics

2
00:00:29,269 --> 00:00:26,640
laboratory in laurel maryland welcome to

3
00:00:31,189 --> 00:00:29,279
nasa's new horizons countdown to pluto

4
00:00:33,190 --> 00:00:31,199
i'm mike buckley from apl communications

5
00:00:35,350 --> 00:00:33,200
and public affairs and we're on pluto's

6
00:00:37,110 --> 00:00:35,360
doorstep speeding toward new horizons

7
00:00:39,830 --> 00:00:37,120
historic flyby of the pluto system on

8
00:00:41,990 --> 00:00:39,840
july 14th on july 10th we're about a

9
00:00:44,310 --> 00:00:42,000
long weekend away less than three

10
00:00:46,549 --> 00:00:44,320
million miles from pluto and people are

11
00:00:48,630 --> 00:00:46,559
talking about new horizons

12
00:00:50,709 --> 00:00:48,640
you know it's not easy being pluto it's

13
00:00:53,029 --> 00:00:50,719

cold it's dark out there so far from the

14
00:00:54,630 --> 00:00:53,039
sun it's it's now a dwarf planet and no

15
00:00:56,069 --> 00:00:54,640
one really talks seriously about

16
00:00:58,950 --> 00:00:56,079
colonizing it

17
00:01:01,110 --> 00:00:58,960
but pluto's luck is about to change

18
00:01:03,189 --> 00:01:01,120
nasa's new horizons mission is exploring

19
00:01:05,830 --> 00:01:03,199
the limits of our solar system and pluto

20
00:01:08,310 --> 00:01:05,840
and its moons are the stars of the show

21
00:01:10,789 --> 00:01:08,320
after traveling three billion miles in

22
00:01:13,030 --> 00:01:10,799
more than nine years the new horizons

23
00:01:16,390 --> 00:01:13,040
spacecraft will fly by pluto on july

24
00:01:28,390 --> 00:01:16,400
14th get a front row seat at nasa.gov

25
00:01:32,069 --> 00:01:30,230
for an operations update we're joined by

26
00:01:33,350 --> 00:01:32,079
mark holdridge the new horizons

27
00:01:35,190 --> 00:01:33,360
encounter mission manager from the

28
00:01:36,789 --> 00:01:35,200
applied physics laboratory mark thanks

29
00:01:38,149 --> 00:01:36,799
for joining us my pleasure uh you know

30
00:01:41,990 --> 00:01:38,159
four days to go we're in the home

31
00:01:43,749 --> 00:01:42,000
stretch right now your job is to deliver

32
00:01:44,950 --> 00:01:43,759
new horizons to the right place at the

33
00:01:47,590 --> 00:01:44,960
right time

34
00:01:49,749 --> 00:01:47,600
to get the science tell us again why is

35
00:01:51,670 --> 00:01:49,759
the precision and timing so important on

36
00:01:54,389 --> 00:01:51,680
new horizons well the scientists pick

37
00:01:55,910 --> 00:01:54,399
the optimal place and time to fly by

38
00:01:57,749 --> 00:01:55,920

pluto in order to maximize the

39
00:01:59,590 --> 00:01:57,759
scientific return of the mission and

40
00:02:01,670 --> 00:01:59,600
then we fit a trajectory from the earth

41
00:02:03,830 --> 00:02:01,680
to that aim point and assume that

42
00:02:04,870 --> 00:02:03,840
trajectory would be flown when we design

43
00:02:06,789 --> 00:02:04,880
the hundreds and hundreds of

44
00:02:09,270 --> 00:02:06,799
observations that are now aboard the

45
00:02:10,550 --> 00:02:09,280
spacecraft and executing so we are in

46
00:02:12,229 --> 00:02:10,560
the encounter mode so it's starting to

47
00:02:13,430 --> 00:02:12,239
make those observations now that's right

48
00:02:15,190 --> 00:02:13,440
that's right it's right in the middle of

49
00:02:16,949 --> 00:02:15,200
the onboard sequence that's going to be

50
00:02:18,790 --> 00:02:16,959
running for nine days

51
00:02:20,470 --> 00:02:18,800
so getting there is one thing just tell

52
00:02:21,910 --> 00:02:20,480
how do you make that happen how does the

53
00:02:23,350 --> 00:02:21,920
team get together and make sure that new

54
00:02:24,550 --> 00:02:23,360
horizons is headed you know in the right

55
00:02:26,470 --> 00:02:24,560
direction at the right place how do you

56
00:02:28,949 --> 00:02:26,480
guys do it well we do it through a

57
00:02:30,550 --> 00:02:28,959
series of measurements observations made

58
00:02:32,790 --> 00:02:30,560
with the long-range camera the lorry

59
00:02:34,630 --> 00:02:32,800
camera and we combine that with tracking

60
00:02:36,150 --> 00:02:34,640
data doppler data from the deep space

61
00:02:38,309 --> 00:02:36,160
network and then from that we can

62
00:02:40,309 --> 00:02:38,319
determine what the trajectory of the

63
00:02:42,070 --> 00:02:40,319

spacecraft is relative to pluto and

64
00:02:44,470 --> 00:02:42,080
decide if you need to do any maneuvers

65
00:02:46,229 --> 00:02:44,480
or course corrections or in some cases

66
00:02:47,670 --> 00:02:46,239
not to do them that's right we've done a

67
00:02:49,190 --> 00:02:47,680
total of nine maneuvers so far

68
00:02:51,270 --> 00:02:49,200
trajectory correction maneuvers as we

69
00:02:53,350 --> 00:02:51,280
call them to get the spacecraft on the

70
00:02:56,150 --> 00:02:53,360
nominal trajectory and we performed the

71
00:02:59,030 --> 00:02:56,160
last one necessary ten days ago so ten

72
00:03:01,110 --> 00:02:59,040
days now it so is is it on target yes

73
00:03:02,470 --> 00:03:01,120
it's it's doing very well um the

74
00:03:04,070 --> 00:03:02,480
maneuver went off very well it was

75
00:03:06,309 --> 00:03:04,080
within a millimeter per second the

76
00:03:07,509 --> 00:03:06,319
accuracy that we were looking for and

77
00:03:09,750 --> 00:03:07,519
we're basically headed right up the

78
00:03:12,309 --> 00:03:09,760
middle of a 60 by 90 mile box that we

79
00:03:13,190 --> 00:03:12,319
need to hit so after three billion miles

80
00:03:15,030 --> 00:03:13,200
to be

81
00:03:16,229 --> 00:03:15,040
in that box at your aim point that too

82
00:03:19,350 --> 00:03:16,239
and i guess another factor there's

83
00:03:20,790 --> 00:03:19,360
timing so after nine and a half years

84
00:03:22,470 --> 00:03:20,800
within seconds of where it was supposed

85
00:03:24,869 --> 00:03:22,480
to be right we're trying to get the the

86
00:03:26,869 --> 00:03:24,879
timing it down to under 100 seconds of

87
00:03:28,869 --> 00:03:26,879
of error we want to get within 100

88
00:03:31,270 --> 00:03:28,879

second accuracy the time of closest

89
00:03:32,869 --> 00:03:31,280
approach um okay let's take a peek into

90
00:03:33,830 --> 00:03:32,879
the mission operation center here at apl

91
00:03:36,070 --> 00:03:33,840
and see what's going on there because

92
00:03:37,430 --> 00:03:36,080
i'll lead that to to ask you what's

93
00:03:39,190 --> 00:03:37,440
what's coming up in the next few days

94
00:03:41,270 --> 00:03:39,200
what's next or what's left for new

95
00:03:43,190 --> 00:03:41,280
horizons to do before the flyby yeah so

96
00:03:44,869 --> 00:03:43,200
the end game of navigation now that we

97
00:03:46,550 --> 00:03:44,879
have the trajectory under control is to

98
00:03:49,110 --> 00:03:46,560
get the knowledge the the timing

99
00:03:51,910 --> 00:03:49,120
information nailed down so we're taking

100
00:03:54,070 --> 00:03:51,920
a series of optical navigation images in

101
00:03:55,350 --> 00:03:54,080
the final these next coming days we're

102
00:03:57,750 --> 00:03:55,360
basically in the middle of that stretch

103
00:03:59,110 --> 00:03:57,760
right now and we're trying to fine tune

104
00:04:00,710 --> 00:03:59,120
our estimate of the time of closest

105
00:04:02,550 --> 00:04:00,720
approach and as i mentioned we want to

106
00:04:03,750 --> 00:04:02,560
get that to within 100 seconds and so

107
00:04:05,509 --> 00:04:03,760
far it's looking really good it looks

108
00:04:06,789 --> 00:04:05,519
like we're converging and when we're

109
00:04:09,190 --> 00:04:06,799
happy with that result we'll have a

110
00:04:10,949 --> 00:04:09,200
couple of opportunities to uplink those

111
00:04:11,670 --> 00:04:10,959
updated timing information as well as

112
00:04:13,509 --> 00:04:11,680
the

113
00:04:15,350 --> 00:04:13,519

most precise estimate that we have for

114
00:04:17,430 --> 00:04:15,360
pluto's orbit and its satellites to the

115
00:04:19,670 --> 00:04:17,440
spacecraft right before the closest

116
00:04:21,509 --> 00:04:19,680
approach so how is the spacecraft new

117
00:04:23,189 --> 00:04:21,519
horizons healthy how's it looking it's

118
00:04:25,110 --> 00:04:23,199
very very healthy it's just happily

119
00:04:26,830 --> 00:04:25,120
ticking away all the commands necessary

120
00:04:28,629 --> 00:04:26,840
to to carry out the

121
00:04:29,830 --> 00:04:28,639
observations all right good news mark

122
00:04:31,670 --> 00:04:29,840
thank you for joining us it's my

123
00:04:33,270 --> 00:04:31,680
pleasure thank you

124
00:04:35,110 --> 00:04:33,280
now mark mentioned what it takes to get

125
00:04:37,030 --> 00:04:35,120
new horizons in the right place to meet

126
00:04:39,030 --> 00:04:37,040
pluto now high-flying mission team

127
00:04:42,550 --> 00:04:39,040
member joe peterson has a similar take

128
00:04:44,230 --> 00:04:42,560
on these precise operations

129
00:04:45,990 --> 00:04:44,240
hi i'm joe peterson i'm the science

130
00:04:48,390 --> 00:04:46,000
operations downlink lead for the new

131
00:04:49,749 --> 00:04:48,400
horizons nation of pluto and i'm here to

132
00:04:52,710 --> 00:04:49,759
take part in one of my favorite hobbies

133
00:04:53,990 --> 00:04:52,720
that's jumping out of airplanes

134
00:04:55,749 --> 00:04:54,000
you might think that after the thrill of

135
00:04:56,550 --> 00:04:55,759
jumping out of airplanes but getting

136
00:04:58,950 --> 00:04:56,560
back

137
00:05:01,830 --> 00:04:58,960
to behind a computer and doing basically

138
00:05:04,469 --> 00:05:01,840

geeky stuff for a space mission might be

139
00:05:06,629 --> 00:05:04,479
not as exciting but it's not true at all

140
00:05:08,070 --> 00:05:06,639
working on this project has an immense

141
00:05:10,390 --> 00:05:08,080
amount of excitement we're exploring

142
00:05:11,990 --> 00:05:10,400
space it's pretty amazing so one of the

143
00:05:14,550 --> 00:05:12,000
great things about skydiving is all the

144
00:05:16,710 --> 00:05:14,560
teamwork involved with new horizons

145
00:05:18,310 --> 00:05:16,720
teamwork is so important we have

146
00:05:19,430 --> 00:05:18,320
many many people in this project and

147
00:05:21,189 --> 00:05:19,440
unless they

148
00:05:22,950 --> 00:05:21,199
all work together as a team it just this

149
00:05:24,230 --> 00:05:22,960
mission just can't come together one of

150
00:05:26,310 --> 00:05:24,240
the things we do just for fun in

151
00:05:28,310 --> 00:05:26,320
skydiving are jumps that are a little

152
00:05:31,029 --> 00:05:28,320
out of the ordinary we take a hula hoop

153
00:05:32,790 --> 00:05:31,039
and we actually take turns diving

154
00:05:34,629 --> 00:05:32,800
through the hoop on new horizons there's

155
00:05:36,790 --> 00:05:34,639
a similar thing going on that we need to

156
00:05:38,390 --> 00:05:36,800
thread the needle as we go by pluto we

157
00:05:39,909 --> 00:05:38,400
want to go by just where we want to be

158
00:05:41,670 --> 00:05:39,919
and we want to be the right place to

159
00:05:43,909 --> 00:05:41,680
take the best observations

160
00:05:46,150 --> 00:05:43,919
and we have a navigation team that is

161
00:05:47,029 --> 00:05:46,160
doing this needle threading that is so

162
00:05:48,710 --> 00:05:47,039
hard

163
00:05:50,710 --> 00:05:48,720

it requires precision flying and we're

164
00:05:52,469 --> 00:05:50,720
coming up on the culmination of all this

165
00:05:54,710 --> 00:05:52,479
effort all this planning

166
00:05:57,430 --> 00:05:54,720
very soon we're going to go by pluto and

167
00:05:58,790 --> 00:05:57,440
get get the actual goods of what this

168
00:06:00,150 --> 00:05:58,800
whole mission has wanted to do is

169
00:06:01,590 --> 00:06:00,160
discover

170
00:06:03,909 --> 00:06:01,600
this amazing place that we haven't

171
00:06:05,270 --> 00:06:03,919
explored yet quite naturally

172
00:06:07,189 --> 00:06:05,280
the public believes skydiving is

173
00:06:08,309 --> 00:06:07,199
incredibly risky but those risks can be

174
00:06:11,590 --> 00:06:08,319
mitigated

175
00:06:13,350 --> 00:06:11,600
space exploration is a risky business

176
00:06:15,270 --> 00:06:13,360
and there's a lot of

177
00:06:17,990 --> 00:06:15,280
time and a lot of heart and soul

178
00:06:19,749 --> 00:06:18,000
involved new horizons we've got seven

179
00:06:21,590 --> 00:06:19,759
different instruments all taking data of

180
00:06:23,430 --> 00:06:21,600
different parts of pluto the atmosphere

181
00:06:25,590 --> 00:06:23,440
of the surface all the timing is so

182
00:06:28,390 --> 00:06:25,600
critical and has to be choreographed

183
00:06:30,629 --> 00:06:28,400
so well and that's one thing that

184
00:06:33,029 --> 00:06:30,639
our science team has been working on for

185
00:06:34,950 --> 00:06:33,039
years so after a great skydive you throw

186
00:06:36,710 --> 00:06:34,960
out your pilot chute your canopy opens

187
00:06:38,230 --> 00:06:36,720
over your head and everything gets quiet

188
00:06:39,350 --> 00:06:38,240

you normally no longer have that wind

189
00:06:40,790 --> 00:06:39,360
noise and now you're just floating

190
00:06:42,150 --> 00:06:40,800
looking at the mountains and flying your

191
00:06:43,830 --> 00:06:42,160
parachute down

192
00:06:45,909 --> 00:06:43,840
thinking wow what a great job we just

193
00:06:47,029 --> 00:06:45,919
did in new horizons that's the same kind

194
00:06:49,990 --> 00:06:47,039
of feeling that i think we're all going

195
00:06:52,070 --> 00:06:50,000
to feel after we've passed by pluto

196
00:06:53,589 --> 00:06:52,080
taken our observations seen them come

197
00:06:55,510 --> 00:06:53,599
down at least seen a good number of them

198
00:07:12,950 --> 00:06:55,520
come down and say wow we really got some

199
00:07:16,790 --> 00:07:14,870
joining us for a science update is kathy

200
00:07:18,790 --> 00:07:16,800
oaken deputy project scientist from

201
00:07:20,629 --> 00:07:18,800
southwest research institute kathy

202
00:07:21,909 --> 00:07:20,639
welcome back thanks

203
00:07:23,189 --> 00:07:21,919
um i want to start talking about some of

204
00:07:25,909 --> 00:07:23,199
the pictures you know back when the

205
00:07:27,029 --> 00:07:25,919
encounter started in january and even a

206
00:07:28,950 --> 00:07:27,039
few months after that we're seeing

207
00:07:30,469 --> 00:07:28,960
mostly the black and white pictures

208
00:07:31,430 --> 00:07:30,479
from the lorry camera and now we're

209
00:07:33,270 --> 00:07:31,440
seeing

210
00:07:35,110 --> 00:07:33,280
more and more color but they're they're

211
00:07:36,790 --> 00:07:35,120
combinations right it's it's color

212
00:07:38,070 --> 00:07:36,800
combined with the lore images if you can

213
00:07:39,270 --> 00:07:38,080

kind of tell us how did those pictures

214
00:07:41,990 --> 00:07:39,280
come together

215
00:07:44,309 --> 00:07:42,000
yeah sure i'm happy to so the

216
00:07:46,230 --> 00:07:44,319
instruments on new horizons were all

217
00:07:48,469 --> 00:07:46,240
designed to work together to give us a

218
00:07:50,950 --> 00:07:48,479
comprehensive picture of the pluto

219
00:07:52,550 --> 00:07:50,960
system and it was designed for the lori

220
00:07:54,790 --> 00:07:52,560
camera which gives us our highest

221
00:07:56,710 --> 00:07:54,800
resolution black and white images to

222
00:07:59,189 --> 00:07:56,720
work together with the ralph instrument

223
00:08:02,390 --> 00:07:59,199
which gives us our color images

224
00:08:04,950 --> 00:08:02,400
and so we can take the lori images

225
00:08:06,950 --> 00:08:04,960
and overlay the color on top of it to

226
00:08:08,390 --> 00:08:06,960
make our best picture of what we think

227
00:08:11,350 --> 00:08:08,400
pluto looks like

228
00:08:12,790 --> 00:08:11,360
you can see that here with the lori

229
00:08:14,869 --> 00:08:12,800
in the black and white and then the

230
00:08:15,909 --> 00:08:14,879
color and the combined product in the

231
00:08:18,390 --> 00:08:15,919
middle

232
00:08:20,390 --> 00:08:18,400
um speaking of color pluto and sharon

233
00:08:21,909 --> 00:08:20,400
have been revealing themselves slowly

234
00:08:23,029 --> 00:08:21,919
over the past couple of months uh just

235
00:08:24,950 --> 00:08:23,039
wondering

236
00:08:26,230 --> 00:08:24,960
since april what are they showing you

237
00:08:28,390 --> 00:08:26,240
what are you seeing in these pictures as

238
00:08:30,070 --> 00:08:28,400

the color gets better and better yeah

239
00:08:32,149 --> 00:08:30,080
we were so excited when the ralph

240
00:08:35,190 --> 00:08:32,159
instrument took its first color images

241
00:08:37,909 --> 00:08:35,200
of pluto and sharon in april and so we

242
00:08:39,589 --> 00:08:37,919
had the very first color image and it

243
00:08:41,909 --> 00:08:39,599
you could see that pluto is a little

244
00:08:43,829 --> 00:08:41,919
redder than sharon and but they're just

245
00:08:46,949 --> 00:08:43,839
points of light in the distance because

246
00:08:48,070 --> 00:08:46,959
we were still very far away at this time

247
00:08:51,350 --> 00:08:48,080
and then

248
00:08:53,030 --> 00:08:51,360
later we had another

249
00:08:55,190 --> 00:08:53,040
image of pluto we had a number of them

250
00:08:59,190 --> 00:08:55,200
we put them together into a map that you

251
00:09:01,350 --> 00:08:59,200
see here these are ralph images in color

252
00:09:04,230 --> 00:09:01,360
with pluto and sharon

253
00:09:06,550 --> 00:09:04,240
spanning over a whole orbit or six days

254
00:09:08,949 --> 00:09:06,560
and you can see as pluto rotates and

255
00:09:10,870 --> 00:09:08,959
sharon rotates pluto is consistently

256
00:09:12,470 --> 00:09:10,880
more red than charon which is more

257
00:09:14,550 --> 00:09:12,480
gray-like and that's telling you

258
00:09:16,470 --> 00:09:14,560
something about the surface and what's

259
00:09:17,590 --> 00:09:16,480
on the surface of pluto and sharon and

260
00:09:18,949 --> 00:09:17,600
then we really started to get a clearer

261
00:09:20,870 --> 00:09:18,959
picture just a little bit later on

262
00:09:22,470 --> 00:09:20,880
that's right a little bit later on we

263
00:09:25,269 --> 00:09:22,480

had these images

264
00:09:27,829 --> 00:09:25,279
and these are that combined product

265
00:09:30,230 --> 00:09:27,839
again where we have the lori base black

266
00:09:33,030 --> 00:09:30,240
and white with the color overlaid on top

267
00:09:35,750 --> 00:09:33,040
of them and so you can see the vantage

268
00:09:38,310 --> 00:09:35,760
part point is remarkably different and

269
00:09:39,670 --> 00:09:38,320
even over this span of time which is

270
00:09:41,590 --> 00:09:39,680
less than a week

271
00:09:44,630 --> 00:09:41,600
the new horizons spacecraft went from

272
00:09:46,310 --> 00:09:44,640
being 15 million miles away to 11

273
00:09:48,150 --> 00:09:46,320
million miles away and you could see

274
00:09:49,910 --> 00:09:48,160
pluto getting larger in the field of

275
00:09:51,509 --> 00:09:49,920
view so that was when we get to things

276
00:09:53,269 --> 00:09:51,519
like the beginning of july you start to

277
00:09:54,389 --> 00:09:53,279
see even the more details even probably

278
00:09:55,990 --> 00:09:54,399
some features now that we know you're

279
00:09:58,470 --> 00:09:56,000
able to start naming some of them that's

280
00:10:01,269 --> 00:09:58,480
right that's right so we had that an

281
00:10:03,910 --> 00:10:01,279
image from july 3rd where we have even

282
00:10:05,350 --> 00:10:03,920
more detail it's very exciting so um we

283
00:10:07,509 --> 00:10:05,360
can even start to look at what's some of

284
00:10:10,710 --> 00:10:07,519
the latest ones too we have the heart on

285
00:10:12,230 --> 00:10:10,720
pluto yeah i love this one

286
00:10:14,550 --> 00:10:12,240
what are the what do the colors show in

287
00:10:16,630 --> 00:10:14,560
this well we have a darker area and a

288
00:10:18,870 --> 00:10:16,640

lighter area we know that there's ices

289
00:10:21,509 --> 00:10:18,880
on pluto and we expect those ices to be

290
00:10:23,829 --> 00:10:21,519
brighter and once again as the payload

291
00:10:25,350 --> 00:10:23,839
takes its data and we work all together

292
00:10:27,430 --> 00:10:25,360
we're going to get infrared spectra

293
00:10:29,269 --> 00:10:27,440
telling us the composition of the bright

294
00:10:31,750 --> 00:10:29,279
areas and the composition of the dark

295
00:10:33,430 --> 00:10:31,760
areas so we can really fully understand

296
00:10:35,190 --> 00:10:33,440
the pluto system and of course i think

297
00:10:37,430 --> 00:10:35,200
the colors also reveal some other things

298
00:10:39,750 --> 00:10:37,440
that we see on the surface that's right

299
00:10:41,590 --> 00:10:39,760
we all love pluto

300
00:10:42,630 --> 00:10:41,600
well i guess some exciting times ahead

301
00:10:44,870 --> 00:10:42,640
right just going to be more and more

302
00:10:46,630 --> 00:10:44,880
what observations are coming next uh we

303
00:10:48,870 --> 00:10:46,640
have so many observations going on right

304
00:10:51,509 --> 00:10:48,880
now every day right now we're taking a a

305
00:10:53,990 --> 00:10:51,519
couple of color images and infrared

306
00:10:57,190 --> 00:10:54,000
spectra many lori images we're taking

307
00:10:59,990 --> 00:10:57,200
images of pluto sharon the small moons

308
00:11:02,150 --> 00:11:00,000
of pluto we're using our the rest of our

309
00:11:04,470 --> 00:11:02,160
instrument suite as well we've got the

310
00:11:07,030 --> 00:11:04,480
student dust counter turned on we've got

311
00:11:10,150 --> 00:11:07,040
the plasma sweep swap and pepsi taking

312
00:11:12,949 --> 00:11:10,160
data um rex will be coming up and taking

313
00:11:13,750 --> 00:11:12,959

data soon it's it's very exciting busy

314
00:11:15,910 --> 00:11:13,760
times

315
00:11:17,509 --> 00:11:15,920
very busy kathy thanks for joining us

316
00:11:19,269 --> 00:11:17,519
thanks for having me

317
00:11:21,750 --> 00:11:19,279
you know a frequent question we get is

318
00:11:23,829 --> 00:11:21,760
why after such a long voyage is new

319
00:11:25,350 --> 00:11:23,839
horizons flying past pluto instead of

320
00:11:28,310 --> 00:11:25,360
going into orbit well if you have a

321
00:11:30,150 --> 00:11:28,320
minute here's the answer why are we

322
00:11:31,750 --> 00:11:30,160
going all the way to pluto only to fly

323
00:11:39,590 --> 00:11:31,760
by it and not go into orbit this is

324
00:11:42,790 --> 00:11:41,509
it takes a lot of energy to get a rocket

325
00:11:44,550 --> 00:11:42,800
off the ground and that's even with the

326
00:11:46,069 --> 00:11:44,560
spacecraft as small as new horizons

327
00:11:47,750 --> 00:11:46,079
which is roughly the size of a baby

328
00:11:49,430 --> 00:11:47,760
grand piano the rocket isn't just

329
00:11:51,269 --> 00:11:49,440
launching the spacecraft it's launching

330
00:11:53,110 --> 00:11:51,279
all of the fuel that it needs to get

331
00:11:55,509 --> 00:11:53,120
going on its way to pluto as well and

332
00:11:57,190 --> 00:11:55,519
that is a really heavy load the velocity

333
00:11:59,030 --> 00:11:57,200
of that launching rocket was transferred

334
00:12:00,710 --> 00:11:59,040
into the new horizon spacecraft and fast

335
00:12:02,629 --> 00:12:00,720
forward nine years to today the

336
00:12:05,829 --> 00:12:02,639
spacecraft is currently whizzing along

337
00:12:07,110 --> 00:12:05,839
towards pluto at 31 000 miles per hour

338
00:12:09,190 --> 00:12:07,120

the other thing to consider is that

339
00:12:11,190 --> 00:12:09,200
pluto is quite small the force of

340
00:12:12,750 --> 00:12:11,200
gravity on earth is 1g the force of

341
00:12:15,590 --> 00:12:12,760
gravity on pluto is

342
00:12:16,949 --> 00:12:15,600
0.067 g's to get new horizons into orbit

343
00:12:18,949 --> 00:12:16,959
around pluto we would almost need to

344
00:12:20,870 --> 00:12:18,959
completely stop its current velocity

345
00:12:22,629 --> 00:12:20,880
which means we would need another atlas

346
00:12:24,870 --> 00:12:22,639
v burning against its direction of

347
00:12:27,030 --> 00:12:24,880
travel to let it be captured by pluto

348
00:12:29,670 --> 00:12:27,040
and unfortunately it's impossible to

349
00:12:31,110 --> 00:12:29,680
launch an atlas v with an atlas v if new

350
00:12:32,949 --> 00:12:31,120
horizons had that much fuel on board the

351
00:12:34,310 --> 00:12:32,959
spacecraft would be almost impossible to

352
00:12:35,750 --> 00:12:34,320
launch from the earth but let's pretend

353
00:12:37,670 --> 00:12:35,760
for a second that new horizons has some

354
00:12:39,110 --> 00:12:37,680
magic weightless fuel on board if we

355
00:12:40,949 --> 00:12:39,120
were to use the spacecraft's existing

356
00:12:43,030 --> 00:12:40,959
propulsion system to slow it into orbit

357
00:12:46,150 --> 00:12:43,040
around pluto the burn would last more

358
00:12:47,269 --> 00:12:46,160
than 17 days for more news from pluto be

359
00:12:48,790 --> 00:12:47,279
sure to check out the new horizons

360
00:12:51,269 --> 00:12:48,800
websites tweet your questions using the

361
00:12:53,030 --> 00:12:51,279
hashtag plutoflybye and be sure to come

362
00:13:00,150 --> 00:12:53,040
right back tomorrow for more pluto in a

363
00:13:03,190 --> 00:13:01,190

that's right you can join the

364
00:13:05,030 --> 00:13:03,200
conversation via twitter facebook and

365
00:13:07,190 --> 00:13:05,040
other social media platforms talking

366
00:13:09,829 --> 00:13:07,200
about the july 14 flyby

367
00:13:11,590 --> 00:13:09,839
send questions at hashtag pluto flyby

368
00:13:13,509 --> 00:13:11,600
admission information along with new

369
00:13:16,310 --> 00:13:13,519
images are available online at

370
00:13:17,829 --> 00:13:16,320
www.nasa.gov

371
00:13:19,269 --> 00:13:17,839
new horizons

372
00:13:21,430 --> 00:13:19,279
so that's the latest from nasa's new

373
00:13:23,910 --> 00:13:21,440
horizons mission on pluto's doorstep we

374
00:13:25,750 --> 00:13:23,920
are four days away from the flyby less

375
00:13:27,990 --> 00:13:25,760
than three million miles to go the

376
00:13:29,990 --> 00:13:28,000
countdown to pluto continues i'm mike