1
00:00:19,590 --> 00:00:17,269
from the johns hopkins applied physics

2
00:00:21,590 --> 00:00:19,600
laboratory in laurel maryland welcome to

3
00:00:24,070 --> 00:00:21,600
the nasa new horizons mission countdown

4
00:00:25,830 --> 00:00:24,080
to pluto i'm mike buckley from apl

5
00:00:27,349 --> 00:00:25,840
communications and public affairs

6
00:00:29,349 --> 00:00:27,359
bringing you the first of these weekly

7
00:00:31,189 --> 00:00:29,359
updates from pluto's doorstep as we

8
00:00:32,790 --> 00:00:31,199
count down to new horizons historic

9
00:00:33,910 --> 00:00:32,800
flight through the pluto system on july

10
00:00:35,910 --> 00:00:33,920
14th

11
00:00:37,910 --> 00:00:35,920
it took more than nine years and a

12
00:00:39,830 --> 00:00:37,920
voyage of three billion miles to get

13
00:00:42,150 --> 00:00:39,840

here the mission team has been looking

14
00:01:13,990 --> 00:00:42,160
forward to this for a long time and we

15
00:01:15,910 --> 00:01:14,950
five

16
00:01:16,950 --> 00:01:15,920
four

17
00:01:19,510 --> 00:01:16,960
three

18
00:01:23,350 --> 00:01:20,870
we have ignition

19
00:01:26,070 --> 00:01:23,360
and liftoff of nasa's new horizons

20
00:01:43,270 --> 00:01:26,080
spacecraft on a decade-long voyage to

21
00:01:49,030 --> 00:01:46,149
we're 34 days from the pluto flyby the

22
00:01:50,389 --> 00:01:49,040
spacecraft is traveling at about 750 000

23
00:01:52,389 --> 00:01:50,399
miles a day

24
00:01:53,749 --> 00:01:52,399
now just about 26 million miles from

25
00:01:55,830 --> 00:01:53,759
pluto

26
00:01:58,149 --> 00:01:55,840
new horizons is a key part of nasa's

27
00:02:00,230 --> 00:01:58,159
exploration of our solar system joining

28
00:02:02,069 --> 00:02:00,240
me to talk about that is jimmy lee

29
00:02:04,709 --> 00:02:02,079
nasa's new frontier is program mission

30
00:02:06,709 --> 00:02:04,719
manager jimmy welcome thanks glad to be

31
00:02:11,029 --> 00:02:06,719
here

32
00:02:13,350 --> 00:02:11,039
horizons fits in to nasa's exploration

33
00:02:16,550 --> 00:02:13,360
of the solar system sure mike

34
00:02:19,110 --> 00:02:16,560
new horizons will provide us

35
00:02:20,949 --> 00:02:19,120
a completion of our preliminary

36
00:02:22,550 --> 00:02:20,959
exploration of our

37
00:02:24,710 --> 00:02:22,560
solar system

38
00:02:26,710 --> 00:02:24,720

the classical planets um

39
00:02:29,270 --> 00:02:26,720
it'll provide us our first up close and

40
00:02:31,190 --> 00:02:29,280
personal look at pluto and its moons

41
00:02:33,190 --> 00:02:31,200
it's very important from a nasa

42
00:02:35,270 --> 00:02:33,200
perspective it's it's one of a number of

43
00:02:37,430 --> 00:02:35,280
missions in our portfolio that will

44
00:02:38,949 --> 00:02:37,440
provide for exploration of our solar

45
00:02:41,110 --> 00:02:38,959
system and beyond

46
00:02:42,790 --> 00:02:41,120
new horizons is actually the first of

47
00:02:44,150 --> 00:02:42,800
this class admissions new frontiers

48
00:02:45,750 --> 00:02:44,160
program

49
00:02:47,670 --> 00:02:45,760
tell us a little bit about new horizons

50
00:02:49,589 --> 00:02:47,680
in that program and where new horizons

51
00:02:52,790 --> 00:02:49,599
fits into new frontiers

52
00:02:55,430 --> 00:02:52,800
well new new horizons was judged to be a

53
00:02:57,430 --> 00:02:55,440
the highest science priority at the time

54
00:03:00,309 --> 00:02:57,440
is the first of the new frontiers class

55
00:03:02,550 --> 00:03:00,319
of missions with the study of pluto and

56
00:03:04,630 --> 00:03:02,560
the kuiper belt will allow us to gain an

57
00:03:06,949 --> 00:03:04,640
understanding of that region of our

58
00:03:09,190 --> 00:03:06,959
solar system and and you know open the

59
00:03:11,030 --> 00:03:09,200
door for future exploration

60
00:03:12,949 --> 00:03:11,040
now with that new frontiers line too

61
00:03:14,949 --> 00:03:12,959
you're you're responsible for a pretty

62
00:03:17,430 --> 00:03:14,959
interesting line of missions you know

63
00:03:18,710 --> 00:03:17,440

that go to some extreme places in here

64
00:03:21,750 --> 00:03:18,720
what are we waiting for to see from new

65
00:03:23,830 --> 00:03:21,760
horizons you know once it gets to pluto

66
00:03:25,589 --> 00:03:23,840
well it's really the the exciting part

67
00:03:27,830 --> 00:03:25,599
about it is what we don't know i mean

68
00:03:29,910 --> 00:03:27,840
with with expiration and discovery you

69
00:03:32,869 --> 00:03:29,920
know you don't know what what awaits us

70
00:03:34,789 --> 00:03:32,879
out there thanks jimmy

71
00:03:37,190 --> 00:03:34,799
alan stern is the new horizons principal

72
00:03:38,949 --> 00:03:37,200
investigator new horizons is the first

73
00:03:40,949 --> 00:03:38,959
outer planets mission led by a principal

74
00:03:42,949 --> 00:03:40,959
investigator who's charged with managing

75
00:03:44,869 --> 00:03:42,959
the entire mission from developing a

76
00:03:46,630 --> 00:03:44,879
concept and assembling a team to

77
00:03:48,630 --> 00:03:46,640
building a spacecraft and delivering new

78
00:03:50,789 --> 00:03:48,640
science data alan thank you for joining

79
00:03:52,949 --> 00:03:50,799
us thank you before we start getting

80
00:03:54,789 --> 00:03:52,959
into mission updates tell us first about

81
00:03:56,710 --> 00:03:54,799
the new horizons mission

82
00:03:59,270 --> 00:03:56,720
well new horizons is the first mission

83
00:04:01,429 --> 00:03:59,280
to explore the pluto system it's a flyby

84
00:04:03,030 --> 00:04:01,439
like all the other first missions to the

85
00:04:05,830 --> 00:04:03,040
closer planets

86
00:04:08,149 --> 00:04:05,840
but it's a 21st century spacecraft the

87
00:04:10,390 --> 00:04:08,159
fastest ever launch going the farthest

88
00:04:11,830 --> 00:04:10,400

any spacecraft ever has to reach its

89
00:04:14,229 --> 00:04:11,840
primary target

90
00:04:16,069 --> 00:04:14,239
and armed with a very sophisticated

91
00:04:18,229 --> 00:04:16,079
payload of seven

92
00:04:19,909 --> 00:04:18,239
very high-tech very powerful scientific

93
00:04:21,749 --> 00:04:19,919
instruments so that we can write the

94
00:04:23,749 --> 00:04:21,759
textbook on what the pluto system is all

95
00:04:25,749 --> 00:04:23,759
about and how it came to be yeah like a

96
00:04:27,590 --> 00:04:25,759
lot to learn in this case new horizons

97
00:04:28,870 --> 00:04:27,600
is a mission of first there are a lot of

98
00:04:30,550 --> 00:04:28,880
firsts on this mission obviously it's

99
00:04:32,550 --> 00:04:30,560
the first mission to the pluto system

100
00:04:34,790 --> 00:04:32,560
it's also the first mission to what we

101
00:04:36,310 --> 00:04:34,800
call the third zone of the solar system

102
00:04:38,230 --> 00:04:36,320
the kuiper belt

103
00:04:41,030 --> 00:04:38,240
it's the first mission in nasa's new

104
00:04:42,710 --> 00:04:41,040
frontiers program of pi led missions and

105
00:04:45,189 --> 00:04:42,720
it just happens to be the first

106
00:04:46,390 --> 00:04:45,199
pi led mission ever to the outer planets

107
00:04:49,270 --> 00:04:46,400
so there are a lot of firsts and new

108
00:04:51,030 --> 00:04:49,280
horizons there's also one last which i

109
00:04:53,749 --> 00:04:51,040
think is very important to the mission

110
00:04:56,390 --> 00:04:53,759
and that is that we at pluto are

111
00:04:58,710 --> 00:04:56,400
completing what was begun in the 1960s

112
00:04:59,830 --> 00:04:58,720
by nasa with the first missions to

113
00:05:02,629 --> 00:04:59,840

planets

114
00:05:05,350 --> 00:05:02,639
venus and mars and across that 50-year

115
00:05:06,950 --> 00:05:05,360
period the united states has explored

116
00:05:08,790 --> 00:05:06,960
all the planets and we're kind of

117
00:05:10,390 --> 00:05:08,800
running the anchor leg with pluto to

118
00:05:11,670 --> 00:05:10,400
finish the relay

119
00:05:13,110 --> 00:05:11,680
you know in fact i could even go back

120
00:05:15,029 --> 00:05:13,120
farther it would seem like this mission

121
00:05:16,469 --> 00:05:15,039
almost started in 1930 and when clyde

122
00:05:18,070 --> 00:05:16,479
tombaugh discovered what we thought was

123
00:05:20,550 --> 00:05:18,080
just this oddball planet on the edge of

124
00:05:22,230 --> 00:05:20,560
the solar system but as it turned out it

125
00:05:24,230 --> 00:05:22,240
was actually the first of a whole new

126
00:05:26,150 --> 00:05:24,240
class of worlds that new horizons is

127
00:05:27,830 --> 00:05:26,160
traveling to in a place that we're just

128
00:05:29,270 --> 00:05:27,840
now beginning to learn about right in

129
00:05:32,150 --> 00:05:29,280
1930 when

130
00:05:35,430 --> 00:05:32,160
tombow at lowell observatory discovered

131
00:05:37,590 --> 00:05:35,440
pluto he had no idea that he actually

132
00:05:39,909 --> 00:05:37,600
uncovered the biggest structure in the

133
00:05:41,990 --> 00:05:39,919
solar system the kuiper belt the third

134
00:05:43,670 --> 00:05:42,000
zone as we call it sometimes we call it

135
00:05:45,350 --> 00:05:43,680
the twilight zone because the lighting

136
00:05:48,710 --> 00:05:45,360
levels are so low

137
00:05:51,029 --> 00:05:48,720
and this region of the solar system uh

138
00:05:52,950 --> 00:05:51,039

wasn't really anticipated

139
00:05:55,270 --> 00:05:52,960
in fact across the whole of the middle

140
00:05:56,870 --> 00:05:55,280
of the 20th century out into the late

141
00:05:58,550 --> 00:05:56,880
20th century we just thought pluto was

142
00:06:00,469 --> 00:05:58,560
an oddball didn't fit the pattern of

143
00:06:02,790 --> 00:06:00,479
being one of the inner rocky planets the

144
00:06:04,550 --> 00:06:02,800
terrestrials didn't fit with the giant

145
00:06:06,309 --> 00:06:04,560
planets at all

146
00:06:08,230 --> 00:06:06,319
it was just off there on its own and

147
00:06:09,909 --> 00:06:08,240
then beginning in the 90s

148
00:06:11,110 --> 00:06:09,919
uh planetary scientists began to

149
00:06:14,550 --> 00:06:11,120
discover

150
00:06:16,230 --> 00:06:14,560
small objects comets and and uh the

151
00:06:18,870 --> 00:06:16,240
building blocks of small planets that

152
00:06:21,670 --> 00:06:18,880
orbit in the kuiper belt region it's

153
00:06:23,350 --> 00:06:21,680
teeming with these small objects

154
00:06:26,390 --> 00:06:23,360
pluto is the biggest and brightest by a

155
00:06:28,230 --> 00:06:26,400
long way but eventually as more and more

156
00:06:30,469 --> 00:06:28,240
data was taken on the kuiper belt it was

157
00:06:31,670 --> 00:06:30,479
discovered that the kuiper belt also

158
00:06:34,309 --> 00:06:31,680
contains

159
00:06:36,309 --> 00:06:34,319
a handful of other small planets other

160
00:06:38,309 --> 00:06:36,319
plutos even though they're different

161
00:06:39,670 --> 00:06:38,319
different compositions different numbers

162
00:06:41,830 --> 00:06:39,680
of moons

163
00:06:44,230 --> 00:06:41,840

some have atmospheres some do not but

164
00:06:46,150 --> 00:06:44,240
this is pluto's cohort this is pluto's

165
00:06:48,550 --> 00:06:46,160
family and it's the third class of

166
00:06:49,589 --> 00:06:48,560
planet in the solar system the small ice

167
00:06:51,990 --> 00:06:49,599
dwarfs

168
00:06:54,390 --> 00:06:52,000
and our first look to at one of these

169
00:06:55,909 --> 00:06:54,400
objects is new horizons so tell us about

170
00:06:57,589 --> 00:06:55,919
the spacecraft you know what was put

171
00:07:00,710 --> 00:06:57,599
together to get that data and get that

172
00:07:02,629 --> 00:07:00,720
first look right we built a really high

173
00:07:05,270 --> 00:07:02,639
tech very small spacecraft about the

174
00:07:06,790 --> 00:07:05,280
size of a baby grand piano even with the

175
00:07:08,710 --> 00:07:06,800
fuel on board it weighs less than a

176
00:07:10,870 --> 00:07:08,720
thousand pounds the spacecraft has

177
00:07:13,510 --> 00:07:10,880
tremendous capability for conducting a

178
00:07:15,589 --> 00:07:13,520
reconnaissance flyby fast turns very

179
00:07:17,909 --> 00:07:15,599
large solid-state memories for storing

180
00:07:19,670 --> 00:07:17,919
data fast bus speeds on the spacecraft

181
00:07:21,430 --> 00:07:19,680
so we can take data from up to five

182
00:07:23,589 --> 00:07:21,440
instruments at once

183
00:07:25,990 --> 00:07:23,599
many other capabilities as well and

184
00:07:28,790 --> 00:07:26,000
highly miniaturized so that we could be

185
00:07:31,749 --> 00:07:28,800
very light and get a very fast launch as

186
00:07:33,430 --> 00:07:31,759
a result of that on board the spacecraft

187
00:07:35,510 --> 00:07:33,440
the real business end of the mission is

188
00:07:37,990 --> 00:07:35,520

the scientific payload we have seven

189
00:07:40,790 --> 00:07:38,000
scientific instruments on board

190
00:07:42,790 --> 00:07:40,800
we have nine cameras for mapping we have

191
00:07:44,469 --> 00:07:42,800
two spectrometers for atmospheric and

192
00:07:46,230 --> 00:07:44,479
surface composition we have the

193
00:07:49,430 --> 00:07:46,240
capability to do thermal mapping on

194
00:07:50,869 --> 00:07:49,440
board to measure dust particles uh dust

195
00:07:52,710 --> 00:07:50,879
impact rates

196
00:07:54,550 --> 00:07:52,720
in the solar system and also at pluto to

197
00:07:56,950 --> 00:07:54,560
sample the material coming off pluto's

198
00:07:59,990 --> 00:07:56,960
atmosphere determine its density and its

199
00:08:01,589 --> 00:08:00,000
composition so there's a very powerful

200
00:08:03,749 --> 00:08:01,599
suite of instruments and

201
00:08:05,830 --> 00:08:03,759
because we miniaturize them it's amazing

202
00:08:08,950 --> 00:08:05,840
all seven combined way less than just

203
00:08:11,350 --> 00:08:08,960
the camera on the cassini saturn orbiter

204
00:08:13,990 --> 00:08:11,360
and combined when we turn them all on

205
00:08:15,990 --> 00:08:14,000
we're talking 28 watts that's like a

206
00:08:17,909 --> 00:08:16,000
night light to run all these high-tech

207
00:08:19,029 --> 00:08:17,919
instruments in their computers

208
00:08:20,309 --> 00:08:19,039
so

209
00:08:21,110 --> 00:08:20,319
what are these instruments and what are

210
00:08:22,469 --> 00:08:21,120
they going to learn what are they going

211
00:08:24,230 --> 00:08:22,479
to gather in the pluto system what are

212
00:08:26,550 --> 00:08:24,240
the goals we're going to bring back from

213
00:08:28,790 --> 00:08:26,560

pluto when we fly through that system

214
00:08:30,309 --> 00:08:28,800
mike we're going to write the textbook

215
00:08:32,389 --> 00:08:30,319
we know very little about the pluto

216
00:08:35,029 --> 00:08:32,399
system now it's really a mission of raw

217
00:08:36,870 --> 00:08:35,039
exploration flying into the unknown to

218
00:08:39,750 --> 00:08:36,880
see what's there so we're going to

219
00:08:41,430 --> 00:08:39,760
produce maps of pluto's surface in black

220
00:08:43,750 --> 00:08:41,440
and white and in color

221
00:08:45,990 --> 00:08:43,760
in medium resolution and high resolution

222
00:08:47,829 --> 00:08:46,000
the same for pluto's big moon sharon

223
00:08:49,750 --> 00:08:47,839
we're also going to image all of the

224
00:08:51,430 --> 00:08:49,760
small moons we're going to search for

225
00:08:53,350 --> 00:08:51,440
new moons we're going to search for

226
00:08:55,910 --> 00:08:53,360
rings we're going to determine the

227
00:08:57,590 --> 00:08:55,920
atmospheric composition it's structure

228
00:08:59,750 --> 00:08:57,600
with altitude we're going to determine

229
00:09:01,750 --> 00:08:59,760
the atmospheric escape rate whether the

230
00:09:03,350 --> 00:09:01,760
atmosphere has an ionosphere

231
00:09:05,590 --> 00:09:03,360
and then we're going to measure make

232
00:09:08,550 --> 00:09:05,600
composition maps so that every pixel

233
00:09:10,550 --> 00:09:08,560
will have a spectrum on pluto 64 000

234
00:09:13,269 --> 00:09:10,560
locations and we're going to do similar

235
00:09:15,670 --> 00:09:13,279
mapping of the big moon sharon and lower

236
00:09:17,190 --> 00:09:15,680
resolution mapping of the smaller moons

237
00:09:18,710 --> 00:09:17,200
and that's not the full list but it

238
00:09:21,190 --> 00:09:18,720

gives you an idea

239
00:09:22,389 --> 00:09:21,200
for the range and variety of data sets

240
00:09:24,150 --> 00:09:22,399
for example i didn't tell you anything

241
00:09:25,430 --> 00:09:24,160
about stereo mapping but that's

242
00:09:26,949 --> 00:09:25,440
something else we're going to do that's

243
00:09:28,870 --> 00:09:26,959
going to give us the ability to

244
00:09:30,230 --> 00:09:28,880
reconstruct the topography on pluto's

245
00:09:31,670 --> 00:09:30,240
surface in 3d

246
00:09:33,590 --> 00:09:31,680
i mean it's already getting the idea

247
00:09:35,509 --> 00:09:33,600
that this is this isn't just a weekend

248
00:09:38,070 --> 00:09:35,519
of pluto this idea right the fly by

249
00:09:39,829 --> 00:09:38,080
itself is july 14th but it's a long it's

250
00:09:42,070 --> 00:09:39,839
a six-month encounter you know beginning

251
00:09:43,350 --> 00:09:42,080
back in january

252
00:09:44,870 --> 00:09:43,360
what have we learned so far are we

253
00:09:46,870 --> 00:09:44,880
learning things about pluto now that we

254
00:09:48,710 --> 00:09:46,880
didn't know before new horizons started

255
00:09:50,470 --> 00:09:48,720
speeding closer to the pluto system well

256
00:09:52,310 --> 00:09:50,480
that's another great question we

257
00:09:54,710 --> 00:09:52,320
started in january with environmental

258
00:09:57,430 --> 00:09:54,720
monitoring the the region of space where

259
00:09:58,710 --> 00:09:57,440
pluto orbits and we're using the plasma

260
00:10:01,110 --> 00:09:58,720
instruments on board to study the

261
00:10:03,030 --> 00:10:01,120
heliospheric environment we're now using

262
00:10:05,350 --> 00:10:03,040
the alice ultraviolet spectrometer to

263
00:10:07,509 --> 00:10:05,360

also study the charged particle

264
00:10:09,030 --> 00:10:07,519
populations out there the dust

265
00:10:11,269 --> 00:10:09,040
instrument is on and it's measuring the

266
00:10:13,269 --> 00:10:11,279
dust impact rates in the kuiper belt and

267
00:10:15,030 --> 00:10:13,279
as we started to draw closer in april we

268
00:10:16,710 --> 00:10:15,040
started to image the system with lori

269
00:10:19,110 --> 00:10:16,720
which is our long-range reconnaissance

270
00:10:21,829 --> 00:10:19,120
imager lori's already detected what we

271
00:10:23,670 --> 00:10:21,839
think is a polar cap on pluto

272
00:10:25,590 --> 00:10:23,680
other very large

273
00:10:28,310 --> 00:10:25,600
surface markings some are bright some

274
00:10:30,790 --> 00:10:28,320
are very dark we don't really understand

275
00:10:32,389 --> 00:10:30,800
why pluto should be so contrasty but

276
00:10:34,630 --> 00:10:32,399
i've never seen an object

277
00:10:36,710 --> 00:10:34,640
in my career in planetary science that

278
00:10:38,949 --> 00:10:36,720
looks this interesting at low resolution

279
00:10:41,110 --> 00:10:38,959
and i think it really it really promises

280
00:10:43,350 --> 00:10:41,120
over the next few weeks to get to be a

281
00:10:45,110 --> 00:10:43,360
better and better ride as we start to

282
00:10:46,470 --> 00:10:45,120
uncover what's really there

283
00:10:47,750 --> 00:10:46,480
i want to talk about that right we

284
00:10:49,430 --> 00:10:47,760
mentioned earlier just in your

285
00:10:50,949 --> 00:10:49,440
introduction the role the principal

286
00:10:52,470 --> 00:10:50,959
investigator but you know as we're

287
00:10:53,910 --> 00:10:52,480
getting close to pluto i mean we're on

288
00:10:55,990 --> 00:10:53,920

pluto's doorstep

289
00:10:57,590 --> 00:10:56,000
to tell us a little bit about what it's

290
00:10:59,829 --> 00:10:57,600
like to be leading this team this is a

291
00:11:01,990 --> 00:10:59,839
mission you've worked on for a long time

292
00:11:03,430 --> 00:11:02,000
to be this close just take us through

293
00:11:05,190 --> 00:11:03,440
what you're thinking guiding this team

294
00:11:07,110 --> 00:11:05,200
to that ultimate

295
00:11:09,030 --> 00:11:07,120
well you know new horizons is a small

296
00:11:11,030 --> 00:11:09,040
team compared to

297
00:11:12,790 --> 00:11:11,040
some missions uh when we were building

298
00:11:14,790 --> 00:11:12,800
it there were 2 500 americans that were

299
00:11:16,949 --> 00:11:14,800
involved in building the spacecraft the

300
00:11:18,310 --> 00:11:16,959
payload the ground system

301
00:11:19,590 --> 00:11:18,320
and the rocket of course the launch

302
00:11:21,509 --> 00:11:19,600
vehicle

303
00:11:23,430 --> 00:11:21,519
but in flight

304
00:11:25,590 --> 00:11:23,440
it's been a very small team about 50

305
00:11:28,150 --> 00:11:25,600
people until recently we've staffed up

306
00:11:30,310 --> 00:11:28,160
for the encounter but we've got experts

307
00:11:32,790 --> 00:11:30,320
in guidance in spacecraft systems and

308
00:11:34,310 --> 00:11:32,800
the science mission operations mission

309
00:11:35,910 --> 00:11:34,320
planning

310
00:11:38,310 --> 00:11:35,920
all the disciplines that you need and

311
00:11:39,430 --> 00:11:38,320
this is one charged up team they know

312
00:11:41,910 --> 00:11:39,440
that they're getting to do something

313
00:11:43,430 --> 00:11:41,920

very special because nothing like this

314
00:11:46,310 --> 00:11:43,440
has happened before

315
00:11:48,790 --> 00:11:46,320
since the 1980s that's the last time you

316
00:11:50,150 --> 00:11:48,800
know voyager had a flyby at neptune and

317
00:11:51,110 --> 00:11:50,160
nothing like this is planned to happen

318
00:11:53,269 --> 00:11:51,120
again

319
00:11:54,870 --> 00:11:53,279
ever by any space agency and so the team

320
00:11:56,710 --> 00:11:54,880
is not only psyched up they know that

321
00:11:59,190 --> 00:11:56,720
they're doing something very very

322
00:12:01,829 --> 00:11:59,200
important that we only get one shot at

323
00:12:04,069 --> 00:12:01,839
and leading an effort like that is just

324
00:12:06,310 --> 00:12:04,079
it's humbling it's a privilege

325
00:12:07,750 --> 00:12:06,320
and it's exhilarating at the same time

326
00:12:10,310 --> 00:12:07,760
because we're going to turn a point of

327
00:12:13,190 --> 00:12:10,320
light into a planet and its moons

328
00:12:14,069 --> 00:12:13,200
overnight in the next month thanks alan

329
00:12:15,990 --> 00:12:14,079
we've heard from the principal

330
00:12:25,110 --> 00:12:16,000
investigator now it's time for a mission

331
00:12:28,069 --> 00:12:26,550
each week we'll provide updates on

332
00:12:29,990 --> 00:12:28,079
spacecraft operations and mission

333
00:12:31,509 --> 00:12:30,000
science and to give us the operations

334
00:12:33,750 --> 00:12:31,519
update is mark holdridge the new

335
00:12:37,110 --> 00:12:33,760
horizons encounter mission manager

336
00:12:38,470 --> 00:12:37,120
mark you've had roles on many missions

337
00:12:40,389 --> 00:12:38,480
tell us a little bit about your role on

338
00:12:42,230 --> 00:12:40,399

new horizons well as an encounter

339
00:12:44,310 --> 00:12:42,240
mission manager my responsibilities

340
00:12:47,030 --> 00:12:44,320
primarily for planning and execution of

341
00:12:48,550 --> 00:12:47,040
the flyby as you know there's a tightly

342
00:12:51,110 --> 00:12:48,560
choreographed sequence of events that

343
00:12:53,750 --> 00:12:51,120
take place around the time of the flyby

344
00:12:55,910 --> 00:12:53,760
and a very diverse team of navigators

345
00:12:58,150 --> 00:12:55,920
scientists engineers and operations

346
00:12:59,990 --> 00:12:58,160
personnel and so we have to all work

347
00:13:02,710 --> 00:13:00,000
together to optimize the timeline and

348
00:13:04,790 --> 00:13:02,720
reduce risk and come up with the plan if

349
00:13:06,790 --> 00:13:04,800
you will that we then execute so i've

350
00:13:08,310 --> 00:13:06,800
been spending the past several years

351
00:13:10,389 --> 00:13:08,320
running a number of different meetings

352
00:13:12,389 --> 00:13:10,399
and having uh technical discussions with

353
00:13:14,389 --> 00:13:12,399
the team members to try to you know

354
00:13:15,910 --> 00:13:14,399
refine the timeline and come up with a

355
00:13:17,670 --> 00:13:15,920
good plan for how to do all the

356
00:13:19,030 --> 00:13:17,680
operations

357
00:13:20,310 --> 00:13:19,040
so you mentioned that team take us

358
00:13:22,310 --> 00:13:20,320
through what the team has been going

359
00:13:23,990 --> 00:13:22,320
through the last couple of weeks yeah so

360
00:13:25,910 --> 00:13:24,000
we we've really turned the corner on the

361
00:13:28,629 --> 00:13:25,920
operation in the past week where what i

362
00:13:30,310 --> 00:13:28,639
would say on final approach we've

363
00:13:32,150 --> 00:13:30,320

transitioned from spin mode where we

364
00:13:33,430 --> 00:13:32,160
were playing back the recorder data to

365
00:13:36,629 --> 00:13:33,440
make room for the data that we're going

366
00:13:39,829 --> 00:13:36,639
to be recording in the weeks ahead

367
00:13:41,829 --> 00:13:39,839
we've begun the final op nav imaging

368
00:13:44,069 --> 00:13:41,839
campaign and also resume science

369
00:13:46,470 --> 00:13:44,079
operations and those will continue now

370
00:13:48,710 --> 00:13:46,480
seamlessly through the flyby so we don't

371
00:13:50,629 --> 00:13:48,720
have any more periods uh downtime where

372
00:13:52,550 --> 00:13:50,639
we're spending the spacecraft everything

373
00:13:54,550 --> 00:13:52,560
is up and running now as it will be

374
00:13:57,910 --> 00:13:54,560
throughout the whole flyby you mentioned

375
00:13:59,829 --> 00:13:57,920
opnav navigation right so uh tell us how

376
00:14:01,990 --> 00:13:59,839
you're guiding new horizons toward the

377
00:14:05,030 --> 00:14:02,000
pluto system well we start off with what

378
00:14:07,269 --> 00:14:05,040
we call an a priori estimate for where

379
00:14:09,110 --> 00:14:07,279
pluto is and we

380
00:14:11,110 --> 00:14:09,120
revise that estimate with earth-based

381
00:14:12,949 --> 00:14:11,120
observations as well as the spacecraft's

382
00:14:14,389 --> 00:14:12,959
trajectory and then we difference those

383
00:14:16,230 --> 00:14:14,399
two to

384
00:14:18,069 --> 00:14:16,240
determine you know what maneuvers to do

385
00:14:19,350 --> 00:14:18,079
to get to pluto

386
00:14:21,350 --> 00:14:19,360
starting the beginning of this year

387
00:14:23,590 --> 00:14:21,360
though we really transition to a

388
00:14:25,670 --> 00:14:23,600

relative body type navigation using

389
00:14:27,910 --> 00:14:25,680
optical navigation using the

390
00:14:30,310 --> 00:14:27,920
spacecraft's onboard camera and imaging

391
00:14:32,389 --> 00:14:30,320
pluto directly and figuring out from the

392
00:14:34,629 --> 00:14:32,399
spacecraft's perspective where it's

393
00:14:36,310 --> 00:14:34,639
headed you know relative to pluto and as

394
00:14:38,150 --> 00:14:36,320
we get closer and closer to pluto and it

395
00:14:40,230 --> 00:14:38,160
gets bigger and bigger in the frame we

396
00:14:42,550 --> 00:14:40,240
come up with more refined estimates and

397
00:14:45,269 --> 00:14:42,560
we continue to tweak those estimates on

398
00:14:46,949 --> 00:14:45,279
approach and determine uh when and or if

399
00:14:48,150 --> 00:14:46,959
we need to correct a spacecraft

400
00:14:49,670 --> 00:14:48,160
trajectory

401
00:14:51,269 --> 00:14:49,680
now we haven't done many of those

402
00:14:52,710 --> 00:14:51,279
maneuvers right i get an indication that

403
00:14:53,590 --> 00:14:52,720
the spacecraft has generally been on

404
00:14:56,389 --> 00:14:53,600
track

405
00:14:58,550 --> 00:14:56,399
yeah we had one maneuver in march and we

406
00:15:00,629 --> 00:14:58,560
have a number of placeholders

407
00:15:02,470 --> 00:15:00,639
in the weeks ahead in case we need to do

408
00:15:04,949 --> 00:15:02,480
it to tweak the trajectory or as a

409
00:15:07,030 --> 00:15:04,959
hazard avoidance type maneuver

410
00:15:09,750 --> 00:15:07,040
but we expect we're really hopeful that

411
00:15:11,590 --> 00:15:09,760
we'll have one maybe two more maneuvers

412
00:15:13,590 --> 00:15:11,600
so we want to be very careful about when

413
00:15:15,670 --> 00:15:13,600

we do the maneuver so that

414
00:15:17,030 --> 00:15:15,680
we don't have to do another one after it

415
00:15:19,269 --> 00:15:17,040
you know so we're trying to

416
00:15:20,790 --> 00:15:19,279
economize on the number of maneuvers

417
00:15:23,110 --> 00:15:20,800
and either way just to get to this point

418
00:15:25,269 --> 00:15:23,120
it's a pretty precise operation

419
00:15:26,790 --> 00:15:25,279
during the flyby pluto yes i mean we're

420
00:15:28,629 --> 00:15:26,800
trying to hit a very small box

421
00:15:31,030 --> 00:15:28,639
relatively speaking it's

422
00:15:33,110 --> 00:15:31,040
60 by 90 miles and we're going 30 000

423
00:15:35,110 --> 00:15:33,120
miles per hour and we're trying to hit

424
00:15:37,670 --> 00:15:35,120
that box within a plus or minus 100

425
00:15:39,590 --> 00:15:37,680
seconds and that's really necessary we

426
00:15:41,030 --> 00:15:39,600
want to do that to

427
00:15:42,790 --> 00:15:41,040
ensure that we achieve the science

428
00:15:44,150 --> 00:15:42,800
objectives of the mission

429
00:15:45,749 --> 00:15:44,160
so what's next for the team over the

430
00:15:48,389 --> 00:15:45,759
next couple of weeks well we're going to

431
00:15:50,870 --> 00:15:48,399
continue to monitor the trajectory again

432
00:15:52,710 --> 00:15:50,880
using the optical navigation as well as

433
00:15:55,509 --> 00:15:52,720
radiometric tracking from the deep space

434
00:15:57,829 --> 00:15:55,519
network and it can continue to tweak you

435
00:15:59,990 --> 00:15:57,839
know the trajectory if we if we deem it

436
00:16:02,150 --> 00:16:00,000
necessary and of course science is

437
00:16:03,829 --> 00:16:02,160
ongoing we're continuing to image pluto

438
00:16:05,910 --> 00:16:03,839

as it's getting bigger and bigger and

439
00:16:07,110 --> 00:16:05,920
starting to show some of its features

440
00:16:09,430 --> 00:16:07,120
and

441
00:16:11,749 --> 00:16:09,440
all this is happening in parallel

442
00:16:13,269 --> 00:16:11,759
all right well thanks mark now speaking

443
00:16:21,189 --> 00:16:13,279
of science now let's get a science

444
00:16:24,550 --> 00:16:22,790
providing our science update this week

445
00:16:26,629 --> 00:16:24,560
is hal weaver the new horizons project

446
00:16:28,310 --> 00:16:26,639
scientist the one thing i always found

447
00:16:29,749 --> 00:16:28,320
interesting about your job as project

448
00:16:31,509 --> 00:16:29,759
scientists is you're sort of the go

449
00:16:33,430 --> 00:16:31,519
between a dual role between the

450
00:16:35,030 --> 00:16:33,440
spacecraft team and the science team

451
00:16:36,470 --> 00:16:35,040
yeah that's right mike i mean we have

452
00:16:38,069 --> 00:16:36,480
come from two very different cultures

453
00:16:40,470 --> 00:16:38,079
you know this the

454
00:16:42,870 --> 00:16:40,480
engineers they really are in charge of

455
00:16:44,790 --> 00:16:42,880
uh getting what we need uh but we have

456
00:16:47,269 --> 00:16:44,800
to let them know what we need uh the

457
00:16:49,749 --> 00:16:47,279
scientific objectives of the mission uh

458
00:16:50,949 --> 00:16:49,759
is specified by the the science team but

459
00:16:52,710 --> 00:16:50,959
there are a lot of details that have to

460
00:16:54,949 --> 00:16:52,720
be worked out nice i'm that interface

461
00:16:57,670 --> 00:16:54,959
that liaison between the two groups

462
00:16:58,870 --> 00:16:57,680
right so the flyby is july 14th we heard

463
00:17:00,710 --> 00:16:58,880

earlier about some of the overall

464
00:17:02,629 --> 00:17:00,720
science goals of the mission but this is

465
00:17:05,110 --> 00:17:02,639
a six month encounter and we're already

466
00:17:06,870 --> 00:17:05,120
getting some results oh absolutely we've

467
00:17:08,549 --> 00:17:06,880
in fact already taken images with higher

468
00:17:11,189 --> 00:17:08,559
resolution than what's ever been done

469
00:17:13,110 --> 00:17:11,199
before and it just gets better every day

470
00:17:14,870 --> 00:17:13,120
every week we come in and we're

471
00:17:16,630 --> 00:17:14,880
squeezing as much information as we

472
00:17:18,390 --> 00:17:16,640
possibly can out of these images and

473
00:17:19,750 --> 00:17:18,400
seeing details

474
00:17:21,029 --> 00:17:19,760
like we've never seen before and it's

475
00:17:22,470 --> 00:17:21,039
just getting better and better all right

476
00:17:25,189 --> 00:17:22,480
so what are we learning about pluto so

477
00:17:27,029 --> 00:17:25,199
far yeah so so far actually the uh what

478
00:17:29,029 --> 00:17:27,039
we've learned from the hubble previous

479
00:17:31,510 --> 00:17:29,039
hubble observations about dark spots and

480
00:17:33,669 --> 00:17:31,520
bright spots on pluto seems to be pretty

481
00:17:36,630 --> 00:17:33,679
much borne out by the new

482
00:17:38,150 --> 00:17:36,640
new horizons images but now what we're

483
00:17:41,270 --> 00:17:38,160
really going to be trying to do as we

484
00:17:42,789 --> 00:17:41,280
fly by pluto is learn why you know why

485
00:17:44,549 --> 00:17:42,799
are we having you know what's causing

486
00:17:46,950 --> 00:17:44,559
these bright and dark spots on pluto

487
00:17:48,230 --> 00:17:46,960
exactly what is it now you're taking

488
00:17:49,430 --> 00:17:48,240

different types of images too there's

489
00:17:50,789 --> 00:17:49,440
some for the surface but there are also

490
00:17:52,230 --> 00:17:50,799
some that are looking deeper into the

491
00:17:54,150 --> 00:17:52,240
pluto system yeah that's right we

492
00:17:56,150 --> 00:17:54,160
basically have two big objectives in

493
00:17:58,310 --> 00:17:56,160
mind one is to to just get better

494
00:18:00,710 --> 00:17:58,320
resolution on pluto and sharon but in

495
00:18:03,270 --> 00:18:00,720
addition we're also taking very deep

496
00:18:05,029 --> 00:18:03,280
long exposure photographs of the system

497
00:18:06,789 --> 00:18:05,039
images of the system in order to look

498
00:18:09,270 --> 00:18:06,799
for new satellites and

499
00:18:11,110 --> 00:18:09,280
dust particles that may pose a hazard to

500
00:18:12,950 --> 00:18:11,120
the new horizon spacecraft as it flies

501
00:18:14,630 --> 00:18:12,960
by now we haven't seen anything yet but

502
00:18:16,630 --> 00:18:14,640
we're like you know up in the in the

503
00:18:18,789 --> 00:18:16,640
crow's nest on this on the spacecraft

504
00:18:20,310 --> 00:18:18,799
coming in and looking for anything that

505
00:18:22,070 --> 00:18:20,320
might harm us okay so that's what we

506
00:18:24,390 --> 00:18:22,080
have so far what's next on the science

507
00:18:26,549 --> 00:18:24,400
plan so you know just better and better

508
00:18:29,510 --> 00:18:26,559
basically as we come closer and closer

509
00:18:31,990 --> 00:18:29,520
to pluto getting more resolution on the

510
00:18:34,070 --> 00:18:32,000
on the uh on pluto and sharon going

511
00:18:36,150 --> 00:18:34,080
deeper and deeper uh you know we're

512
00:18:38,150 --> 00:18:36,160
already well below what has been done

513
00:18:40,310 --> 00:18:38,160

from earth-based observations in terms

514
00:18:42,310 --> 00:18:40,320
of looking for new satellites and and

515
00:18:43,430 --> 00:18:42,320
dust in the system so anything you see

516
00:18:45,270 --> 00:18:43,440
from this point on would be something

517
00:18:46,630 --> 00:18:45,280
new all of this is new from now on it's

518
00:18:47,590 --> 00:18:46,640
new and it's just getting better and

519
00:18:49,110 --> 00:18:47,600
better

520
00:18:50,710 --> 00:18:49,120
thanks hal

521
00:18:53,430 --> 00:18:50,720
so that's the latest from nasa's new

522
00:18:56,310 --> 00:18:53,440
horizons mission on pluto's doorstep

523
00:18:59,350 --> 00:18:56,320
34 days and 26 million miles to go until

524
00:19:00,950 --> 00:18:59,360
the pluto flyby the countdown continues

525
00:19:02,789 --> 00:19:00,960
i'm mike buckley from the johns hopkins