1
00:00:05,870 --> 00:00:02,629
mission that launched from Vandenberg in

2
00:00:09,049 --> 00:00:05,880
November 2021 and intentionally impacted

3
00:00:12,410 --> 00:00:09,059
an asteroid as the world's first test

4
00:00:13,730 --> 00:00:12,420
for planetary defense on September 22nd

5
00:00:15,650 --> 00:00:13,740
of this year

6
00:00:18,310 --> 00:00:15,660
today we will hear from Representatives

7
00:00:21,349 --> 00:00:18,320
on this International Mission including

8
00:00:22,490 --> 00:00:21,359
NASA administrator Bill Nelson who will

9
00:00:24,529 --> 00:00:22,500
share information about what we're

10
00:00:27,230 --> 00:00:24,539
learning from Dart and give us an update

11
00:00:29,630 --> 00:00:27,240
on NASA's planetary defense program

12
00:00:33,370 --> 00:00:29,640
on the line the president of the Italian

13
00:00:36,229 --> 00:00:33,380

space agency Giorgio sakacha on the

14
00:00:39,170 --> 00:00:36,239
Lucia Cube excuse me which hitched a

15
00:00:41,930 --> 00:00:39,180
ride on Dart Lori glaze the director of

16
00:00:44,330 --> 00:00:41,940
NASA's planetary division here at NASA

17
00:00:47,690 --> 00:00:44,340
headquarters in Washington D.C

18
00:00:49,610 --> 00:00:47,700
then we'll have Nancy Nancy Chabot the

19
00:00:52,010 --> 00:00:49,620
dark coordination lead at the Johns

20
00:00:53,450 --> 00:00:52,020
Hopkins Applied Physics laboratory in

21
00:00:56,209 --> 00:00:53,460
Laurel Maryland

22
00:00:58,670 --> 00:00:56,219
finally we'll hear from Tom Statler the

23
00:00:59,810 --> 00:00:58,680
DART program scientist also here at NASA

24
00:01:01,549 --> 00:00:59,820
headquarters

25
00:01:06,710 --> 00:01:01,559
first we'll hear from the last

26
00:01:12,170 --> 00:01:09,350
good afternoon everybody

27
00:01:13,429 --> 00:01:12,180
two weeks ago NASA made history once

28
00:01:17,330 --> 00:01:13,439
again

29
00:01:19,490 --> 00:01:17,340
we conducted Humanities first planetary

30
00:01:22,730 --> 00:01:19,500
defense test

31
00:01:27,649 --> 00:01:22,740
and we showed the world that NASA is

32
00:01:29,749 --> 00:01:27,659
serious as a defender of this planet

33
00:01:31,850 --> 00:01:29,759
and we captured the attention of

34
00:01:34,130 --> 00:01:31,860
millions of people around the world

35
00:01:37,370 --> 00:01:34,140
in this test

36
00:01:39,590 --> 00:01:37,380
and that's because Dart

37
00:01:43,190 --> 00:01:39,600
as we call it

38
00:01:46,550 --> 00:01:43,200

it felt like a movie plot

39
00:01:51,050 --> 00:01:46,560
but this was not Hollywood

40
00:01:54,590 --> 00:01:51,060
last November just before Thanksgiving a

41
00:01:57,889 --> 00:01:54,600
falcon 9 carrying NASA's first planetary

42
00:02:01,429 --> 00:01:57,899
defense test mission launched from the

43
00:02:04,730 --> 00:02:01,439
Vandenberg space Force Base

44
00:02:06,109 --> 00:02:04,740
and after a 10-month journey millions of

45
00:02:10,570 --> 00:02:06,119
miles

46
00:02:13,190 --> 00:02:10,580
NASA successfully crashed a

47
00:02:16,330 --> 00:02:13,200
refrigerator-sized spacecraft into the

48
00:02:20,030 --> 00:02:16,340
asteroid dimorphous

49
00:02:22,729 --> 00:02:20,040
seven million miles from Earth

50
00:02:24,470 --> 00:02:22,739
and it came in at 14

51
00:02:27,470 --> 00:02:24,480
000 miles an hour

52
00:02:30,890 --> 00:02:27,480
and it was a bullseye

53
00:02:32,570 --> 00:02:30,900
but why would NASA do something like

54
00:02:36,170 --> 00:02:32,580
this

55
00:02:38,570 --> 00:02:36,180
well if an earth-threatening asteroid

56
00:02:41,930 --> 00:02:38,580
was discovered

57
00:02:45,350 --> 00:02:41,940
and we could see it far enough away

58
00:02:47,210 --> 00:02:45,360
this technique could be used to deflect

59
00:02:50,530 --> 00:02:47,220
it

60
00:02:55,130 --> 00:02:50,540
and so today NASA

61
00:02:58,790 --> 00:02:55,140
confirms that Dart successfully changed

62
00:03:00,650 --> 00:02:58,800
the targeted asteroids trajectory now

63
00:03:04,309 --> 00:03:00,660

how do we know that

64
00:03:09,050 --> 00:03:04,319
well prior to dart's impact it took

65
00:03:15,190 --> 00:03:09,060
dimorphous 11 hours and 55 minutes to

66
00:03:18,070 --> 00:03:15,200
orbit its larger parent asteroid didimos

67
00:03:20,690 --> 00:03:18,080
since dart's impact

68
00:03:24,649 --> 00:03:20,700
astronomers have been using telescopes

69
00:03:26,750 --> 00:03:24,659
on Earth to measure how much that time

70
00:03:29,449 --> 00:03:26,760
has changed

71
00:03:32,589 --> 00:03:29,459
and now the team has confirmed that the

72
00:03:37,309 --> 00:03:32,599
spacecraft's impact altered

73
00:03:38,630 --> 00:03:37,319
dimorphous orbit around didimos by 32

74
00:03:40,330 --> 00:03:38,640
minutes

75
00:03:44,149 --> 00:03:40,340
and therefore

76
00:03:48,110 --> 00:03:44,159
successfully moved its trajectory

77
00:03:51,289 --> 00:03:48,120
in other words Dart shortened the 11

78
00:03:56,149 --> 00:03:51,299
hour and 55-minute orbit

79
00:04:00,110 --> 00:03:56,159
to 11 hours and 23 minutes

80
00:04:02,750 --> 00:04:00,120
and it moved it in another location

81
00:04:05,330 --> 00:04:02,760
and that has been confirmed by the

82
00:04:08,630 --> 00:04:05,340
telescopes

83
00:04:11,030 --> 00:04:08,640
it was expected to be a huge success if

84
00:04:12,830 --> 00:04:11,040
it only slowed the orbit by about 10

85
00:04:21,530 --> 00:04:12,840
minutes

86
00:04:24,890 --> 00:04:21,540
Dr Lori glaze and the dart team will

87
00:04:27,830 --> 00:04:24,900
explain more about how we confirm that

88
00:04:29,570 --> 00:04:27,840

now this is a watershed moment for

89
00:04:33,170 --> 00:04:29,580
planetary defense

90
00:04:36,230 --> 00:04:33,180
and a watershed moment for Humanity

91
00:04:39,710 --> 00:04:36,240
and that's why it was fitting that Dart

92
00:04:41,290 --> 00:04:39,720
was an international endeavor

93
00:04:43,969 --> 00:04:41,300
science

94
00:04:47,930 --> 00:04:43,979
benefits Humanity

95
00:04:50,810 --> 00:04:47,940
this is a unifying mission

96
00:04:54,710 --> 00:04:50,820
and thanks to Italian space agency

97
00:04:58,370 --> 00:04:54,720
president Giorgio sakosha

98
00:05:01,430 --> 00:04:58,380
I thank him for his partnership

99
00:05:04,249 --> 00:05:01,440
all of us have a responsibility to

100
00:05:08,090 --> 00:05:04,259
protect our home planet

101
00:05:11,030 --> 00:05:08,100
after all it's the only one we have

102
00:05:13,430 --> 00:05:11,040
and this Mission shows that NASA is

103
00:05:18,650 --> 00:05:13,440
trying to be ready

104
00:05:26,390 --> 00:05:21,530
I believe that NASA has proven that we

105
00:05:33,050 --> 00:05:26,400
are serious as a defender of the planet

106
00:05:37,790 --> 00:05:34,310
foreign

107
00:05:40,010 --> 00:05:37,800
thank you administrator Nelson now we're

108
00:05:44,510 --> 00:05:40,020
here from the Italian space agency

109
00:05:44,520 --> 00:05:48,290
here

110
00:05:55,850 --> 00:05:52,610
first of all let me congratulate Senator

111
00:05:58,550 --> 00:05:55,860
Nelson bill you and your team made

112
00:06:01,370 --> 00:05:58,560
really history with with the deviation

113
00:06:04,610 --> 00:06:01,380

of the asteroids I think was something

114
00:06:07,850 --> 00:06:04,620
that we can really be proud of proud of

115
00:06:10,790 --> 00:06:07,860
us as an international Endeavor and I

116
00:06:14,150 --> 00:06:10,800
think our clients can can feel a bit

117
00:06:16,790 --> 00:06:14,160
more safe for the future

118
00:06:18,290 --> 00:06:16,800
from our side from the Italian state

119
00:06:22,490 --> 00:06:18,300
agency point of view and the Italian

120
00:06:26,390 --> 00:06:22,500
team that supported this Mission uh it

121
00:06:29,090 --> 00:06:26,400
was a unique opportunity to be the

122
00:06:31,969 --> 00:06:29,100
reporter or the event we can call our

123
00:06:35,330 --> 00:06:31,979
staff this way because our leecher Tube

124
00:06:38,870 --> 00:06:35,340
satellite was a spacecraft detached from

125
00:06:40,909 --> 00:06:38,880
dark from the mother spacecraft 15 days

126
00:06:45,290 --> 00:06:40,919
before the impact

127
00:06:48,050 --> 00:06:45,300
and the spacecraft learned on its own

128
00:06:52,010 --> 00:06:48,060
how to follow dark

129
00:06:53,390 --> 00:06:52,020
in its course towards the afterwards and

130
00:06:54,010 --> 00:06:53,400
about the

131
00:06:55,689 --> 00:06:54,020
um

132
00:07:00,050 --> 00:06:55,699
about

133
00:07:04,370 --> 00:07:00,060
one hour say before before the the

134
00:07:08,450 --> 00:07:04,380
events uh it it started an autonomous

135
00:07:10,629 --> 00:07:08,460
course to be ready to take

136
00:07:15,189 --> 00:07:10,639
pictures

137
00:07:19,249 --> 00:07:15,199
and be the witness of the event

138
00:07:22,070 --> 00:07:19,259

and on board two Optical cameras that

139
00:07:25,070 --> 00:07:22,080
were supposed to be used to monitor the

140
00:07:27,850 --> 00:07:25,080
events at the same time to guide the

141
00:07:30,950 --> 00:07:27,860
navigation of the special which was done

142
00:07:32,809 --> 00:07:30,960
taking advantage of the algorithm of

143
00:07:36,170 --> 00:07:32,819
artificial intelligence

144
00:07:39,890 --> 00:07:36,180
it was a very small spacecraft the Cubes

145
00:07:45,010 --> 00:07:39,900
but extremely intelligent and smart

146
00:07:52,309 --> 00:07:48,070
just to give an idea we're talking about

147
00:07:56,570 --> 00:07:52,319
uh monitoring and events while traveling

148
00:07:59,330 --> 00:07:56,580
at a relative speed with with respect to

149
00:08:05,350 --> 00:07:59,340
the asteroids of six kilometers per

150
00:08:15,469 --> 00:08:10,129
had to watch the event and then do a

151
00:08:17,330 --> 00:08:15,479
flyby of the two asteroids and turn to

152
00:08:20,110 --> 00:08:17,340
continue monitoring what was happening

153
00:08:24,650 --> 00:08:20,120
it was really really something

154
00:08:28,010 --> 00:08:24,660
challenging but when after the impact

155
00:08:29,170 --> 00:08:28,020
took place you can you can see

156
00:08:32,750 --> 00:08:29,180
um

157
00:08:37,670 --> 00:08:32,760
we have prepared two videos the first

158
00:08:40,610 --> 00:08:37,680
one showed the last second before the

159
00:08:43,550 --> 00:08:40,620
impact and you can see the the change

160
00:08:46,130 --> 00:08:43,560
basically a little change in in the

161
00:08:49,790 --> 00:08:46,140
little dots which is the most showing

162
00:08:54,310 --> 00:08:49,800
the ejection of the of the materials but

163
00:09:01,070 --> 00:08:57,430

shows what actually happened during this

164
00:09:03,410 --> 00:09:01,080
approaching of the more Force the flight

165
00:09:04,370 --> 00:09:03,420
time and the Turning of the the Southern

166
00:09:08,389 --> 00:09:04,380
Lights

167
00:09:11,150 --> 00:09:08,399
and and getting far away so we what you

168
00:09:15,410 --> 00:09:11,160
can see in the second video is actually

169
00:09:17,630 --> 00:09:15,420
the approaching from 700 kilometers of

170
00:09:21,829 --> 00:09:17,640
distance then the flight Heights will

171
00:09:25,490 --> 00:09:21,839
went very close up to 59 kilometers from

172
00:09:26,870 --> 00:09:25,500
the uh from the morphers and then you

173
00:09:29,630 --> 00:09:26,880
can see

174
00:09:32,690 --> 00:09:29,640
um while we're getting more far away of

175
00:09:34,610 --> 00:09:32,700
about 300 kilometers so I believe what

176
00:09:37,730 --> 00:09:34,620
you're seeing here is really really

177
00:09:40,070 --> 00:09:37,740
fantastic I remember the night when from

178
00:09:43,730 --> 00:09:40,080
the control sensor

179
00:09:46,850 --> 00:09:43,740
um at the argotech Paris is the our

180
00:09:49,670 --> 00:09:46,860
prime contractor we started looking at

181
00:09:51,949 --> 00:09:49,680
those images we we couldn't believe our

182
00:09:53,650 --> 00:09:51,959
eyes that actually we made it and we

183
00:09:55,550 --> 00:09:53,660
made it thanks to this fantastic

184
00:09:57,410 --> 00:09:55,560
collaboration with the with the

185
00:10:02,290 --> 00:09:57,420
colleague from NASA and we are really

186
00:10:07,970 --> 00:10:06,410
thank you thank you Mr sakacha we are so

187
00:10:09,410 --> 00:10:07,980
pleased that you were able to join us on

188
00:10:12,889 --> 00:10:09,420

the line and we understand you'll stay

189
00:10:14,990 --> 00:10:12,899
on for questions next we'll have Miss

190
00:10:17,870 --> 00:10:15,000
Laurie glaze

191
00:10:19,790 --> 00:10:17,880
great thank you so much Gina

192
00:10:22,070 --> 00:10:19,800
let's all just kind of take a moment to

193
00:10:24,410 --> 00:10:22,080
soak this in

194
00:10:27,470 --> 00:10:24,420
we're all here this afternoon because

195
00:10:31,910 --> 00:10:27,480
For the First time ever

196
00:10:35,870 --> 00:10:31,920
Humanity has changed the orbit of a

197
00:10:38,630 --> 00:10:35,880
planetary body of a planetary object

198
00:10:40,610 --> 00:10:38,640
first time ever

199
00:10:44,090 --> 00:10:40,620
you've heard that the team is measured

200
00:10:46,730 --> 00:10:44,100
that the orbital period of dimorphous

201
00:10:50,150 --> 00:10:46,740
has changed from a period of 11 hours

202
00:10:53,269 --> 00:10:50,160
and 55 minutes to a period of 11 hours

203
00:10:55,670 --> 00:10:53,279
and 23 minutes that's a change of 32

204
00:10:58,190 --> 00:10:55,680
minutes with a Precision of plus or

205
00:11:00,650 --> 00:10:58,200
minus two minutes and Nancy's going to

206
00:11:02,630 --> 00:11:00,660
talk a lot more about how we know that

207
00:11:04,610 --> 00:11:02,640
and and why we're confident in that

208
00:11:07,069 --> 00:11:04,620
number but I want to take a moment here

209
00:11:10,250 --> 00:11:07,079
just to give my sincere thanks to the

210
00:11:11,930 --> 00:11:10,260
entire team this is a big effort uh the

211
00:11:15,290 --> 00:11:11,940
team at Johns Hopkins Applied Physics

212
00:11:17,389 --> 00:11:15,300
laboratory to the Italian space agency

213
00:11:19,250 --> 00:11:17,399

and in the all of the collaborating

214
00:11:22,430 --> 00:11:19,260
partners that have contributed to

215
00:11:25,550 --> 00:11:22,440
achieving this remarkable or remarkable

216
00:11:28,370 --> 00:11:25,560
uh measurement on this achievement

217
00:11:31,370 --> 00:11:28,380
so we've been watching this Mission and

218
00:11:33,290 --> 00:11:31,380
you know as you heard the the minimum

219
00:11:36,470 --> 00:11:33,300
requirement for changing the orbital

220
00:11:38,750 --> 00:11:36,480
period was really only 73 seconds but

221
00:11:40,610 --> 00:11:38,760
based on models uh the team had been

222
00:11:42,889 --> 00:11:40,620
looking at a broad range of parameters

223
00:11:45,110 --> 00:11:42,899
for the potential physical properties of

224
00:11:47,269 --> 00:11:45,120
dimorphous and from those models had

225
00:11:49,250 --> 00:11:47,279
estimated we would make a change of

226
00:11:51,230 --> 00:11:49,260
between a few minutes and several tens

227
00:11:54,230 --> 00:11:51,240
of minutes and so what you've seen here

228
00:11:57,050 --> 00:11:54,240
is that that result of A 32-minute

229
00:11:59,030 --> 00:11:57,060
change is consistent with the uh the

230
00:12:00,829 --> 00:11:59,040
estimates that were made beforehand but

231
00:12:02,569 --> 00:12:00,839
clearly at the upper end of that range

232
00:12:04,190 --> 00:12:02,579
which is really fascinating you'll hear

233
00:12:07,550 --> 00:12:04,200
more from Tom about what else we can

234
00:12:09,650 --> 00:12:07,560
learn from these data going forward

235
00:12:12,470 --> 00:12:09,660
but it's just been so cool the whole

236
00:12:15,350 --> 00:12:12,480
world has been watching this um since uh

237
00:12:17,870 --> 00:12:15,360
Dart impacted dimorphous uh you know two

238
00:12:19,370 --> 00:12:17,880

weeks ago on September 26th and if I

239
00:12:21,949 --> 00:12:19,380
could pull up my first image please

240
00:12:24,889 --> 00:12:21,959
we've had observations from around the

241
00:12:26,870 --> 00:12:24,899
world ground-based telescopes and even a

242
00:12:28,310 --> 00:12:26,880
couple space-based telescopes I just

243
00:12:31,730 --> 00:12:28,320
want to share a couple of them with you

244
00:12:34,670 --> 00:12:31,740
here this image here was taken by the

245
00:12:36,050 --> 00:12:34,680
soar telescope in southern Chile and let

246
00:12:38,210 --> 00:12:36,060
me just describe a little bit of what

247
00:12:40,430 --> 00:12:38,220
you're seeing you just saw images from

248
00:12:42,710 --> 00:12:40,440
the Lucia Cube going head on looking at

249
00:12:45,170 --> 00:12:42,720
a cone of ejecta coming off of

250
00:12:47,389 --> 00:12:45,180
dimorphous well here now you're looking

251
00:12:49,250 --> 00:12:47,399
at an image that same kind of view but

252
00:12:51,290 --> 00:12:49,260
from a side on so you're seeing that

253
00:12:53,389 --> 00:12:51,300
ejected cone kind of facing out to the

254
00:12:55,670 --> 00:12:53,399
left you can see one arm of that cone

255
00:12:57,769 --> 00:12:55,680
pointing down to about eight o'clock and

256
00:13:01,009 --> 00:12:57,779
then the top arm of that cone pointing

257
00:13:04,610 --> 00:13:01,019
up to about noon and so we can see that

258
00:13:06,889 --> 00:13:04,620
cone um here from the ground you also

259
00:13:09,410 --> 00:13:06,899
see this really bright streak going off

260
00:13:10,970 --> 00:13:09,420
towards about two o'clock it looks kind

261
00:13:13,069 --> 00:13:10,980
of like the tale of a comet that's

262
00:13:15,110 --> 00:13:13,079
because what we're seeing there is this

263
00:13:18,710 --> 00:13:15,120

fine-grained particles that were ejected

264
00:13:21,290 --> 00:13:18,720
from the asteroid being driven away from

265
00:13:25,490 --> 00:13:21,300
the asteroid by solar radiation pressure

266
00:13:27,410 --> 00:13:25,500
very much akin to uh to a comet so very

267
00:13:29,569 --> 00:13:27,420
cool observations here this image was

268
00:13:32,230 --> 00:13:29,579
actually taken two days after the impact

269
00:13:35,509 --> 00:13:32,240
and if we go on to the next image please

270
00:13:37,370 --> 00:13:35,519
we're continuing to take images this is

271
00:13:39,769 --> 00:13:37,380
the latest and greatest hot off the

272
00:13:42,170 --> 00:13:39,779
press Hubble Space Telescope image that

273
00:13:45,290 --> 00:13:42,180
was collected on Saturday

274
00:13:47,449 --> 00:13:45,300
and what you can see here is that that

275
00:13:50,389 --> 00:13:47,459
ejection cone again we're looking side

276
00:13:52,190 --> 00:13:50,399
on that that bottom arm of the cone is

277
00:13:54,110 --> 00:13:52,200
still pointing down to about uh eight

278
00:13:55,970 --> 00:13:54,120
o'clock but the top part of that

279
00:13:57,710 --> 00:13:55,980
ejection cone has kind of gotten pressed

280
00:14:00,410 --> 00:13:57,720
back again with that solar radiation

281
00:14:03,110 --> 00:14:00,420
pressure and you can also see that that

282
00:14:05,389 --> 00:14:03,120
Comet like tail has now kind of split

283
00:14:08,569 --> 00:14:05,399
into two as it gets away from from the

284
00:14:10,730 --> 00:14:08,579
asteroid this is so fresh and such a new

285
00:14:13,009 --> 00:14:10,740
image that the scientists are still

286
00:14:16,009 --> 00:14:13,019
working on interpretation of that kind

287
00:14:18,370 --> 00:14:16,019
of double bifurcated tail it's about 10

288
00:14:20,930 --> 00:14:18,380

000 kilometers across here in this image

289
00:14:23,150 --> 00:14:20,940
really fascinating stuff the learning is

290
00:14:25,550 --> 00:14:23,160
going to continue for uh for a long time

291
00:14:27,350 --> 00:14:25,560
to come and so with that I'm going to

292
00:14:29,449 --> 00:14:27,360
pass it over to Nancy to talk a little

293
00:14:31,370 --> 00:14:29,459
bit more about the results

294
00:14:33,949 --> 00:14:31,380
well thank you so much it's really a

295
00:14:35,810 --> 00:14:33,959
pleasure to be here today and I I really

296
00:14:38,449 --> 00:14:35,820
just need to start by also just

297
00:14:41,210 --> 00:14:38,459
acknowledging what a team effort it has

298
00:14:42,769 --> 00:14:41,220
been in order to get to this moment

299
00:14:45,290 --> 00:14:42,779
um from the team who built the

300
00:14:47,269 --> 00:14:45,300
spacecraft um from the team who so

301
00:14:49,250 --> 00:14:47,279
successfully LED that spacecraft to

302
00:14:50,629 --> 00:14:49,260
guide itself to that spectacular

303
00:14:52,310 --> 00:14:50,639
Collision

304
00:14:55,129 --> 00:14:52,320
to really the team that's been working

305
00:14:57,710 --> 00:14:55,139
ever since that Collision two weeks ago

306
00:14:59,930 --> 00:14:57,720
to understand what happened to dimorphos

307
00:15:02,030 --> 00:14:59,940
I've been collaborative around the world

308
00:15:04,430 --> 00:15:02,040
in order to get to this result today and

309
00:15:05,810 --> 00:15:04,440
I'm just really happy to be here as a

310
00:15:08,210 --> 00:15:05,820
representative of that large

311
00:15:11,090 --> 00:15:08,220
international team to share that result

312
00:15:13,009 --> 00:15:11,100
and to dig into this data a little bit

313
00:15:15,110 --> 00:15:13,019

so digging into the data one thing I

314
00:15:16,730 --> 00:15:15,120
want to stress up here up front is that

315
00:15:19,310 --> 00:15:16,740
there are two different types of

316
00:15:21,470 --> 00:15:19,320
observational data sets both completely

317
00:15:23,030 --> 00:15:21,480
independent that were used from data

318
00:15:25,490 --> 00:15:23,040
collected here on the earth in order to

319
00:15:27,290 --> 00:15:25,500
arrive at this result of 32 minutes for

320
00:15:29,030 --> 00:15:27,300
the orbital period change and they're

321
00:15:30,769 --> 00:15:29,040
both completely consistent and

322
00:15:33,290 --> 00:15:30,779
supporting this result that we've heard

323
00:15:35,090 --> 00:15:33,300
of this 32-minute orbital period change

324
00:15:37,310 --> 00:15:35,100
if I could have the first animation

325
00:15:39,410 --> 00:15:37,320
please

326
00:15:41,629 --> 00:15:39,420
the first data set and method used by

327
00:15:43,790 --> 00:15:41,639
the dart team uses optical telescopes

328
00:15:45,530 --> 00:15:43,800
here on the earth and so these optical

329
00:15:47,030 --> 00:15:45,540
telescopes here on the earth can never

330
00:15:49,550 --> 00:15:47,040
actually tell the difference between

331
00:15:51,949 --> 00:15:49,560
didibose and dimorphose as it looks to

332
00:15:54,530 --> 00:15:51,959
these telescopes this asteroid system is

333
00:15:56,930 --> 00:15:54,540
always just a single point of light

334
00:15:59,210 --> 00:15:56,940
but that single point of light changes

335
00:16:01,069 --> 00:15:59,220
in brightness with time as seen by these

336
00:16:03,110 --> 00:16:01,079
telescopes because sometimes the little

337
00:16:04,670 --> 00:16:03,120
asteroid dimorphose passes in front of

338
00:16:06,650 --> 00:16:04,680

the larger asteroid dynamos and there's

339
00:16:08,449 --> 00:16:06,660
a little bit of a shadow but then other

340
00:16:11,150 --> 00:16:08,459
times it actually passes right into

341
00:16:13,550 --> 00:16:11,160
dinamosa's Shadow this is a dimorphous

342
00:16:16,129 --> 00:16:13,560
eclipse and so you can see from these

343
00:16:18,230 --> 00:16:16,139
Eclipse events that the telescopes see a

344
00:16:20,210 --> 00:16:18,240
decrease in the overall brightness of

345
00:16:21,590 --> 00:16:20,220
this asteroid system every time that

346
00:16:23,329 --> 00:16:21,600
this happens

347
00:16:25,550 --> 00:16:23,339
and then you can also see that these

348
00:16:27,470 --> 00:16:25,560
Eclipse timings are very much related to

349
00:16:29,870 --> 00:16:27,480
the orbital period of dynamos around

350
00:16:32,030 --> 00:16:29,880
amorphose so by measuring when these

351
00:16:34,069 --> 00:16:32,040
eclipse happen you can determine what

352
00:16:36,350 --> 00:16:34,079
that orbital period is

353
00:16:38,389 --> 00:16:36,360
I also want to take a moment here to say

354
00:16:41,090 --> 00:16:38,399
the dart team already did this we did

355
00:16:43,610 --> 00:16:41,100
this in order to get the timing for

356
00:16:45,650 --> 00:16:43,620
dart's kinetic impact event so when the

357
00:16:47,810 --> 00:16:45,660
dart spacecraft was speeding in to hit

358
00:16:49,850 --> 00:16:47,820
dimorphos it was really important that

359
00:16:51,889 --> 00:16:49,860
dimorphos wasn't hiding behind didimos

360
00:16:53,810 --> 00:16:51,899
or located in front of didimos at that

361
00:16:56,030 --> 00:16:53,820
time but was actually off to the side

362
00:16:58,310 --> 00:16:56,040
and telescopes on the earth the dart

363
00:17:00,530 --> 00:16:58,320

team had used those data in order to get

364
00:17:02,509 --> 00:17:00,540
that timing to inform when the dart

365
00:17:04,370 --> 00:17:02,519
spacecraft should show up so that the

366
00:17:06,590 --> 00:17:04,380
autonomous navigation system could

367
00:17:08,449 --> 00:17:06,600
separate dynamos from dimorphos and

368
00:17:09,949 --> 00:17:08,459
Target onto dimorphos and squarely hit

369
00:17:11,449 --> 00:17:09,959
it and we see that that positional

370
00:17:13,370 --> 00:17:11,459
information that the team had was

371
00:17:15,710 --> 00:17:13,380
excellent and dimorphos was exactly

372
00:17:17,929 --> 00:17:15,720
where it was expected from the analysis

373
00:17:19,490 --> 00:17:17,939
of this telescopic data so this is just

374
00:17:21,470 --> 00:17:19,500
to say that the team was highly

375
00:17:23,689 --> 00:17:21,480
experienced and practiced at already

376
00:17:26,030 --> 00:17:23,699
using this method of telescopes to

377
00:17:27,650 --> 00:17:26,040
understand where dimorphos is relative

378
00:17:31,190 --> 00:17:27,660
to didimos

379
00:17:34,310 --> 00:17:31,200
I can have the next graphic please

380
00:17:37,010 --> 00:17:34,320
so ever since uh the event on September

381
00:17:39,289 --> 00:17:37,020
26th two weeks ago these telescopes have

382
00:17:40,970 --> 00:17:39,299
been observing this system nightly and

383
00:17:42,890 --> 00:17:40,980
that's what you see going across here on

384
00:17:44,990 --> 00:17:42,900
this graph on the top just this nightly

385
00:17:47,270 --> 00:17:45,000
telescopic data night after night after

386
00:17:49,010 --> 00:17:47,280
night after knife all added up there

387
00:17:50,390 --> 00:17:49,020
there's actually four different

388
00:17:52,250 --> 00:17:50,400

telescopes on the earth that have

389
00:17:53,450 --> 00:17:52,260
contributed to making this graph so far

390
00:17:55,549 --> 00:17:53,460
that you're looking at in this result

391
00:17:58,010 --> 00:17:55,559
that we're presenting today it's the Las

392
00:18:00,110 --> 00:17:58,020
Cabanas observatory in Chile the Los

393
00:18:02,390 --> 00:18:00,120
cumbras Observatory Global telescope

394
00:18:04,909 --> 00:18:02,400
network with facilities both in South

395
00:18:07,250 --> 00:18:04,919
Africa and in Chile and the Danish

396
00:18:09,110 --> 00:18:07,260
telescope in Chile and all four of their

397
00:18:10,789 --> 00:18:09,120
data have excellent agreement and are

398
00:18:12,049 --> 00:18:10,799
all just overlaying on top of each other

399
00:18:14,150 --> 00:18:12,059
right here

400
00:18:16,370 --> 00:18:14,160
Additionally the dart team has two

401
00:18:18,470 --> 00:18:16,380
independent research groups that have

402
00:18:20,510 --> 00:18:18,480
looked at analyzing this data separately

403
00:18:21,890 --> 00:18:20,520
and they have come to exactly the same

404
00:18:23,690 --> 00:18:21,900
conclusion

405
00:18:25,610 --> 00:18:23,700
so this is also then showing two

406
00:18:27,830 --> 00:18:25,620
examples of this much larger data set

407
00:18:30,230 --> 00:18:27,840
blown up to so you can see the actual

408
00:18:32,810 --> 00:18:30,240
data on September 29th and on October

409
00:18:34,490 --> 00:18:32,820
4th and what you see very clearly in

410
00:18:36,049 --> 00:18:34,500
that data is these dips in brightness

411
00:18:38,029 --> 00:18:36,059
that we were just talking about with

412
00:18:39,590 --> 00:18:38,039
that animation and these dips in

413
00:18:41,810 --> 00:18:39,600

brightness were confirmed by these two

414
00:18:44,510 --> 00:18:41,820
independent research groups and they are

415
00:18:46,490 --> 00:18:44,520
consistent and indicate that the orbital

416
00:18:49,430 --> 00:18:46,500
period of dimorphos around dynamos

417
00:18:52,490 --> 00:18:49,440
currently is 11 hours and 23 minutes

418
00:18:55,070 --> 00:18:52,500
what you can also see here is that it is

419
00:18:57,950 --> 00:18:55,080
not consistent with being 11 hours and

420
00:19:01,310 --> 00:18:57,960
55 minutes as it was prior to dart's

421
00:19:03,169 --> 00:19:01,320
impact event and this is a very strong

422
00:19:05,990 --> 00:19:03,179
conclusive evidence the team is very

423
00:19:08,210 --> 00:19:06,000
confident in of this 32-minute orbital

424
00:19:10,310 --> 00:19:08,220
period change

425
00:19:13,490 --> 00:19:10,320
now the second data set that was used

426
00:19:15,950 --> 00:19:13,500
independently is planetary radar and the

427
00:19:18,710 --> 00:19:15,960
planetary radar facilities used were the

428
00:19:20,570 --> 00:19:18,720
Goldstone observatory in California and

429
00:19:21,710 --> 00:19:20,580
the green Bank observatory in West

430
00:19:24,110 --> 00:19:21,720
Virginia

431
00:19:26,029 --> 00:19:24,120
what's nice about planetary radar is

432
00:19:28,430 --> 00:19:26,039
that in contrast to the apital

433
00:19:31,370 --> 00:19:28,440
telescopes you can actually distinctly

434
00:19:33,590 --> 00:19:31,380
get signal from both dimorphos and

435
00:19:35,630 --> 00:19:33,600
dinamos directly and this is an

436
00:19:38,029 --> 00:19:35,640
important distinction so the Goldstone

437
00:19:40,070 --> 00:19:38,039
observatory in particular has been

438
00:19:42,950 --> 00:19:40,080

tracking the position of dimorphos

439
00:19:45,529 --> 00:19:42,960
regularly every night for the last two

440
00:19:47,570 --> 00:19:45,539
weeks roughly and from those they have

441
00:19:51,049 --> 00:19:47,580
also been tracking that this is an 11

442
00:19:53,029 --> 00:19:51,059
hour and 23 minute period currently for

443
00:19:55,909 --> 00:19:53,039
dimorphos around didibos with a

444
00:19:58,630 --> 00:19:55,919
32-minute orbital period change I can

445
00:20:01,610 --> 00:19:58,640
have the last graphic for me please here

446
00:20:03,890 --> 00:20:01,620
additionally on October 4th and October

447
00:20:05,930 --> 00:20:03,900
9th these radar facilities were able to

448
00:20:07,610 --> 00:20:05,940
get some direct images of the dynamos

449
00:20:10,909 --> 00:20:07,620
and dimorphos system here you see

450
00:20:13,610 --> 00:20:10,919
didimos but also directly in the image

451
00:20:15,890 --> 00:20:13,620
you can also get signal from dimorphos

452
00:20:17,630 --> 00:20:15,900
and so we're directly Imaging both of

453
00:20:19,970 --> 00:20:17,640
these asteroids and getting their

454
00:20:22,669 --> 00:20:19,980
positions relative to each other and the

455
00:20:25,370 --> 00:20:22,679
position of dimorphos is consistent with

456
00:20:28,070 --> 00:20:25,380
11 hours and 23 minutes for its orbital

457
00:20:30,289 --> 00:20:28,080
period and it is not consistent with

458
00:20:32,150 --> 00:20:30,299
being what the orbital period was prior

459
00:20:34,669 --> 00:20:32,160
to the dart impact which was 11 hours

460
00:20:36,650 --> 00:20:34,679
and 55 minutes and so this is and just

461
00:20:40,730 --> 00:20:36,660
another example of these two independent

462
00:20:43,610 --> 00:20:40,740
methods all giving you this same answer

463
00:20:45,590 --> 00:20:43,620

so this is a very exciting and promising

464
00:20:47,810 --> 00:20:45,600
result for planetary defense to have

465
00:20:50,510 --> 00:20:47,820
this orbital period change of 32 minutes

466
00:20:52,250 --> 00:20:50,520
it's within the range of the models that

467
00:20:54,470 --> 00:20:52,260
have been uh studied but it's also

468
00:20:56,690 --> 00:20:54,480
definitely indicating that you're

469
00:20:58,789 --> 00:20:56,700
getting an enhanced deflection due to

470
00:21:00,770 --> 00:20:58,799
the amount of ejecta that Rocky material

471
00:21:02,450 --> 00:21:00,780
that's being thrown off when dart's

472
00:21:03,950 --> 00:21:02,460
Collision happened

473
00:21:05,990 --> 00:21:03,960
I think it's also though important to

474
00:21:07,970 --> 00:21:06,000
put this into perspective of a kinetic

475
00:21:09,650 --> 00:21:07,980
impactor technique if you wanted to use

476
00:21:12,230 --> 00:21:09,660
this in the future potentially to

477
00:21:14,690 --> 00:21:12,240
deflect an asteroid this is a four

478
00:21:17,390 --> 00:21:14,700
percent change in the orbital period of

479
00:21:20,090 --> 00:21:17,400
dimorphose around dynamos and it just

480
00:21:22,070 --> 00:21:20,100
gave it a small nudge but if you wanted

481
00:21:23,570 --> 00:21:22,080
to do this in the future potentially it

482
00:21:26,029 --> 00:21:23,580
could potentially work but you'd want to

483
00:21:28,250 --> 00:21:26,039
do it years in advance warning time is

484
00:21:29,690 --> 00:21:28,260
really key here in order to enable this

485
00:21:31,490 --> 00:21:29,700
sort of asteroid deflection to

486
00:21:33,470 --> 00:21:31,500
potentially be used in the future and is

487
00:21:34,909 --> 00:21:33,480
part of a much larger planetary defense

488
00:21:36,770 --> 00:21:34,919

strategy

489
00:21:38,990 --> 00:21:36,780
so I'll just end by saying that it's

490
00:21:42,350 --> 00:21:39,000
exciting that we've taken this first

491
00:21:44,870 --> 00:21:42,360
step to develop and now to successfully

492
00:21:47,690 --> 00:21:44,880
demonstrate asteroid deflection in space

493
00:21:49,250 --> 00:21:47,700
with the dart Mission the dart team is

494
00:21:51,350 --> 00:21:49,260
very happy to be sharing this initial

495
00:21:53,210 --> 00:21:51,360
result even though there's still a lot

496
00:21:54,470 --> 00:21:53,220
of work to do and I'll pass it over to

497
00:21:57,649 --> 00:21:54,480
you Tom

498
00:22:00,289 --> 00:21:57,659
thanks Nancy it's so wonderful to see

499
00:22:02,270 --> 00:22:00,299
this result for the period change of the

500
00:22:04,310 --> 00:22:02,280
binary asteroid we've been imagining

501
00:22:06,710 --> 00:22:04,320
this for years and have it finally be

502
00:22:08,810 --> 00:22:06,720
real is is really quite a thrill but as

503
00:22:11,090 --> 00:22:08,820
Nancy said this is really just the start

504
00:22:13,669 --> 00:22:11,100
it really is just the beginning of the

505
00:22:15,590 --> 00:22:13,679
analysis of this tremendously Rich data

506
00:22:17,750 --> 00:22:15,600
set that we're going to get from the

507
00:22:19,490 --> 00:22:17,760
dart Mission uh in addition to the

508
00:22:22,430 --> 00:22:19,500
observations which are ongoing and will

509
00:22:24,529 --> 00:22:22,440
continue for some months we also have a

510
00:22:26,570 --> 00:22:24,539
lot of work ahead of us in order to to

511
00:22:28,909 --> 00:22:26,580
really understand what happened we're

512
00:22:31,490 --> 00:22:28,919
going to be analyzing the images from

513
00:22:34,789 --> 00:22:31,500

the dart spacecraft and from lychicube

514
00:22:38,210 --> 00:22:34,799
to get shape models we need to get a

515
00:22:39,890 --> 00:22:38,220
never before in hand shape model for

516
00:22:41,450 --> 00:22:39,900
dimorphos we didn't know what it was

517
00:22:43,909 --> 00:22:41,460
going to look like before we got there

518
00:22:46,669 --> 00:22:43,919
and now we do we will also have a

519
00:22:48,710 --> 00:22:46,679
refined new shape model for didimos

520
00:22:51,770 --> 00:22:48,720
there might be some revisions

521
00:22:54,230 --> 00:22:51,780
refinements to the average density of

522
00:22:55,909 --> 00:22:54,240
the system and that plus the shape model

523
00:22:58,070 --> 00:22:55,919
give giving us the volume of the

524
00:23:01,370 --> 00:22:58,080
asteroids will give us the first real

525
00:23:03,110 --> 00:23:01,380
determination of the mass of dimorphos

526
00:23:04,250 --> 00:23:03,120
the asteroid that we actually impacted

527
00:23:06,649 --> 00:23:04,260
that's going to be tremendously

528
00:23:09,049 --> 00:23:06,659
important going forward there's also

529
00:23:11,390 --> 00:23:09,059
going to be intense work done on the

530
00:23:13,909 --> 00:23:11,400
beautiful ejecta plume that was imaged

531
00:23:17,270 --> 00:23:13,919
by lychee Cube and that is seen every

532
00:23:19,250 --> 00:23:17,280
night by by ground-based telescopes what

533
00:23:21,289 --> 00:23:19,260
direction did the material go in what

534
00:23:23,810 --> 00:23:21,299
were the sizes of the particles how much

535
00:23:25,909 --> 00:23:23,820
was there we might be able to get an

536
00:23:27,770 --> 00:23:25,919
estimate of the amount of mass in the

537
00:23:29,450 --> 00:23:27,780
ejecta plume and how fast it was moving

538
00:23:32,029 --> 00:23:29,460

and that also is very important to

539
00:23:34,070 --> 00:23:32,039
understand what happened the team is

540
00:23:36,830 --> 00:23:34,080
going to be working to understand in

541
00:23:40,370 --> 00:23:36,840
detail the new orbit the new 11 hour and

542
00:23:42,529 --> 00:23:40,380
23 minute orbit how out of circular is

543
00:23:44,390 --> 00:23:42,539
it how elliptical is it is there a

544
00:23:47,870 --> 00:23:44,400
little bit of a wobble induced did we

545
00:23:51,169 --> 00:23:47,880
induce a wobble in dimorphos itself as a

546
00:23:53,090 --> 00:23:51,179
result of the impact and the physics

547
00:23:55,610 --> 00:23:53,100
simulators on the team will be

548
00:23:56,930 --> 00:23:55,620
simulating the impact again even though

549
00:23:59,690 --> 00:23:56,940
they've already done it they're going to

550
00:24:02,270 --> 00:23:59,700
do it some more in order to match up the

551
00:24:04,610 --> 00:24:02,280
predictions of the simulations with the

552
00:24:07,310 --> 00:24:04,620
actual observed properties of the ejecta

553
00:24:09,289 --> 00:24:07,320
plume so that we will know what we

554
00:24:11,510 --> 00:24:09,299
actually did the asteroid and we'll be

555
00:24:13,970 --> 00:24:11,520
able to make some predictions for what

556
00:24:16,610 --> 00:24:13,980
European Space Agency spacecraft Hera

557
00:24:19,930 --> 00:24:16,620
will find when it arrives at the Dynamo

558
00:24:22,850 --> 00:24:19,940
system in 2027. all of this information

559
00:24:24,770 --> 00:24:22,860
plays into our understanding of what

560
00:24:27,590 --> 00:24:24,780
really happened in the experiment how

561
00:24:29,990 --> 00:24:27,600
how effectively did the kinetic impact

562
00:24:32,330 --> 00:24:30,000
change the motion of the asteroid how

563
00:24:34,310 --> 00:24:32,340

efficiently was momentum transferred

564
00:24:36,529 --> 00:24:34,320
it's too soon to say there's a lot of

565
00:24:39,710 --> 00:24:36,539
moving Parts in this calculation but as

566
00:24:41,930 --> 00:24:39,720
Nancy intimated it looks like The Recoil

567
00:24:44,810 --> 00:24:41,940
from the ejecta blasted off the surface

568
00:24:46,850 --> 00:24:44,820
was a substantial contributor to the

569
00:24:48,950 --> 00:24:46,860
overall push given to the asteroid in

570
00:24:52,190 --> 00:24:48,960
addition to the push of the spacecraft

571
00:24:54,830 --> 00:24:52,200
directly impacting and so there's a lot

572
00:24:57,289 --> 00:24:54,840
yet to come I want to finish off with

573
00:25:00,669 --> 00:24:57,299
one more image this is a spectacular

574
00:25:03,890 --> 00:25:00,679
image taken from lychee Cube and

575
00:25:06,049 --> 00:25:03,900
enhanced by the dart team to bring out

576
00:25:08,149 --> 00:25:06,059
fine structures the rectangles that

577
00:25:10,430 --> 00:25:08,159
you're seeing are not real it's just

578
00:25:12,649 --> 00:25:10,440
that in each successive rectangle the

579
00:25:15,289 --> 00:25:12,659
contrast has been boosted by another

580
00:25:17,990 --> 00:25:15,299
factor of two in order to bring out that

581
00:25:21,350 --> 00:25:18,000
that faint structure and this is just a

582
00:25:23,450 --> 00:25:21,360
visually stunning image and every little

583
00:25:26,090 --> 00:25:23,460
wiggle in those streamers every little

584
00:25:29,330 --> 00:25:26,100
blob every little particle that you see

585
00:25:31,490 --> 00:25:29,340
is a clue to something it's a clue to

586
00:25:33,710 --> 00:25:31,500
something that happens on the surface of

587
00:25:35,990 --> 00:25:33,720
an asteroid when an object impacts it

588
00:25:38,090 --> 00:25:36,000

and if you're looking at this image and

589
00:25:39,649 --> 00:25:38,100
a dozen new questions are popping into

590
00:25:42,350 --> 00:25:39,659
your head that you would have never

591
00:25:44,390 --> 00:25:42,360
thought to ask before seeing this well

592
00:25:46,789 --> 00:25:44,400
that's just one of the Hallmarks of

593
00:25:49,490 --> 00:25:46,799
great science it opens up new questions

594
00:25:51,529 --> 00:25:49,500
that we would have never thought to ask

595
00:25:54,350 --> 00:25:51,539
but in addition to the science value of

596
00:25:57,110 --> 00:25:54,360
this image I I really love it because it

597
00:25:58,909 --> 00:25:57,120
is Artistic it is poetic and and even

598
00:26:02,510 --> 00:25:58,919
though those rectangles aren't real

599
00:26:04,010 --> 00:26:02,520
they're suggestive of Windows of Windows

600
00:26:06,350 --> 00:26:04,020
of understanding we're opening new

601
00:26:08,690 --> 00:26:06,360
windows of understanding looking deeper

602
00:26:11,090 --> 00:26:08,700
and deeper and deeper to gain a better

603
00:26:13,549 --> 00:26:11,100
understanding of not just how to defend

604
00:26:15,950 --> 00:26:13,559
our planet against this natural Hazard

605
00:26:18,350 --> 00:26:15,960
of asteroid impact but also to

606
00:26:21,830 --> 00:26:18,360
understand how our solar system works

607
00:26:24,110 --> 00:26:21,840
and how we got to be where we are now so

608
00:26:27,049 --> 00:26:24,120
with that I'll give it back to you Gina

609
00:26:28,970 --> 00:26:27,059
thank you so much for that update uh we

610
00:26:30,649 --> 00:26:28,980
are now ready for our questions and

611
00:26:32,990 --> 00:26:30,659
answer time

612
00:26:34,669 --> 00:26:33,000
um if there we do have some reporters on

613
00:26:36,710 --> 00:26:34,679

the line but if there are any questions

614
00:26:38,750 --> 00:26:36,720
for from reporters in the audience

615
00:26:40,370 --> 00:26:38,760
please grab a microphone

616
00:26:47,690 --> 00:26:40,380
and

617
00:26:51,769 --> 00:26:49,490
um thank you we would now begin the

618
00:26:54,230 --> 00:26:51,779
question and answer session if you would

619
00:26:56,810 --> 00:26:54,240
like to ask a question please press star

620
00:26:59,149 --> 00:26:56,820
one and meet to your phone and record

621
00:27:01,010 --> 00:26:59,159
your name your name is required to

622
00:27:03,649 --> 00:27:01,020
introduce your question as well as your

623
00:27:06,890 --> 00:27:03,659
affiliation if you need to withdraw your

624
00:27:09,289 --> 00:27:06,900
question press star two again to ask a

625
00:27:11,090 --> 00:27:09,299
question please press star one it will

626
00:27:13,070 --> 00:27:11,100
take a few moments for the question is

627
00:27:15,409 --> 00:27:13,080
to come through thank you thanks

628
00:27:17,510 --> 00:27:15,419
operator and I will call on you when I'm

629
00:27:20,690 --> 00:27:17,520
ready to answer for ask for questions in

630
00:27:22,669 --> 00:27:20,700
the room or on the line thank you

631
00:27:24,769 --> 00:27:22,679
uh your highest Joel ochenbach with the

632
00:27:27,110 --> 00:27:24,779
Washington Post um this is all

633
00:27:31,029 --> 00:27:27,120
fascinating congratulations basic

634
00:27:34,610 --> 00:27:31,039
question is this a plausible Deployable

635
00:27:38,090 --> 00:27:34,620
type of technology for deflecting an

636
00:27:40,310 --> 00:27:38,100
asteroid based on uh the the results of

637
00:27:43,070 --> 00:27:40,320
of this test and also can you just

638
00:27:45,769 --> 00:27:43,080

explain a little bit about why was the

639
00:27:48,890 --> 00:27:45,779
change in the in the orbital

640
00:27:50,930 --> 00:27:48,900
um period at the high end of estimates

641
00:27:54,070 --> 00:27:50,940
just what mechanically was happening

642
00:27:58,190 --> 00:27:54,080
there I know you you referenced the

643
00:28:00,649 --> 00:27:58,200
ejecta in The Recoil but I mean can you

644
00:28:03,010 --> 00:28:00,659
explain the new Tony and mechanics of

645
00:28:07,070 --> 00:28:05,269
I think you should take the first part

646
00:28:08,510 --> 00:28:07,080
and then I'm happy to chime in after

647
00:28:10,610 --> 00:28:08,520
yeah

648
00:28:13,010 --> 00:28:10,620
um so on the first question about is

649
00:28:16,190 --> 00:28:13,020
this a viable technique for the future I

650
00:28:19,570 --> 00:28:16,200
think that the uh the dart Mission uh

651
00:28:23,510 --> 00:28:19,580
has demonstrated uh that we are capable

652
00:28:25,669 --> 00:28:23,520
of deflecting deflecting an asteroid

653
00:28:28,549 --> 00:28:25,679
um even a potentially hazardous asteroid

654
00:28:29,750 --> 00:28:28,559
of this size using a kinetic impactor

655
00:28:31,909 --> 00:28:29,760
technique

656
00:28:33,769 --> 00:28:31,919
um as Nancy said earlier one of the key

657
00:28:35,870 --> 00:28:33,779
pieces to being successful with

658
00:28:38,990 --> 00:28:35,880
implementing a technique like this is

659
00:28:41,870 --> 00:28:39,000
early detection the more time we have

660
00:28:44,090 --> 00:28:41,880
for that little nudge in the in the

661
00:28:46,490 --> 00:28:44,100
change in that orbital period to really

662
00:28:48,890 --> 00:28:46,500
make a change uh the better off we are

663
00:28:52,190 --> 00:28:48,900

the key point of this type of technique

664
00:28:54,769 --> 00:28:52,200
of course is to uh just give that little

665
00:28:56,870 --> 00:28:54,779
nudge such that the uh the asteroid

666
00:28:58,370 --> 00:28:56,880
crosses over earth's path

667
00:29:00,529 --> 00:28:58,380
um either just before we get there or

668
00:29:01,909 --> 00:29:00,539
just after we've gone by so that we

669
00:29:03,590 --> 00:29:01,919
don't actually end up in the same place

670
00:29:05,570 --> 00:29:03,600
at the same time so this has been

671
00:29:08,690 --> 00:29:05,580
incredibly successful demonstration of

672
00:29:10,190 --> 00:29:08,700
the kinetic impactor and so we're you

673
00:29:12,049 --> 00:29:10,200
know hopefully we've got that tool in

674
00:29:14,390 --> 00:29:12,059
our in our toolkit now I'll pass it over

675
00:29:17,330 --> 00:29:14,400
to Nancy for the other half yeah thanks

676
00:29:20,210 --> 00:29:17,340
so period change of 32 minutes is

677
00:29:22,010 --> 00:29:20,220
spectacular and exciting and what the

678
00:29:23,750 --> 00:29:22,020
dart team is working on right now to

679
00:29:27,409 --> 00:29:23,760
understand so the dart investigation

680
00:29:28,850 --> 00:29:27,419
team has over 200 members that are on 28

681
00:29:31,250 --> 00:29:28,860
different countries we've been meeting

682
00:29:33,409 --> 00:29:31,260
daily and having really intriguing

683
00:29:35,149 --> 00:29:33,419
discussions that uh that are fascinating

684
00:29:36,889 --> 00:29:35,159
and we have to cut off time just so

685
00:29:38,210 --> 00:29:36,899
everybody can get some sleep or get back

686
00:29:40,669 --> 00:29:38,220
to the telescopes and do everything

687
00:29:42,350 --> 00:29:40,679
that's been going so this is this is

688
00:29:43,549 --> 00:29:42,360

active what the team is actively doing

689
00:29:45,769 --> 00:29:43,559
right now we're really happy to be

690
00:29:47,510 --> 00:29:45,779
sharing this first initial result it is

691
00:29:49,490 --> 00:29:47,520
on the high side of you know some of the

692
00:29:51,889 --> 00:29:49,500
models that were run initially so we

693
00:29:54,470 --> 00:29:51,899
feel confident saying that the ejecta is

694
00:29:56,810 --> 00:29:54,480
contributing in a substantial way but

695
00:29:58,130 --> 00:29:56,820
yeah come back in a little bit and we'll

696
00:29:59,990 --> 00:29:58,140
be happy to share the results of those

697
00:30:02,149 --> 00:30:00,000
models that the team is working on about

698
00:30:03,830 --> 00:30:02,159
what specifically is causing that and

699
00:30:05,690 --> 00:30:03,840
what that means not just for what

700
00:30:07,490 --> 00:30:05,700
happened to dimorphos of course but what

701
00:30:09,169 --> 00:30:07,500
this means for potentially applying this

702
00:30:12,769 --> 00:30:09,179
technique to other asteroids in the

703
00:30:14,810 --> 00:30:12,779
future if the need should arise

704
00:30:19,250 --> 00:30:14,820
thank you do we have any other questions

705
00:30:22,750 --> 00:30:21,230
hi Jenna bider coffee or die Magazine

706
00:30:24,830 --> 00:30:22,760
first of all congratulations

707
00:30:26,389 --> 00:30:24,840
amazing Milestone

708
00:30:27,769 --> 00:30:26,399
um so the administrator mentioned that

709
00:30:30,590 --> 00:30:27,779
in addition to the orbital period

710
00:30:32,330 --> 00:30:30,600
changing that um dimorphos was moved a

711
00:30:34,850 --> 00:30:32,340
little bit can you go into that and how

712
00:30:39,430 --> 00:30:34,860
it uh affect how the dark impact

713
00:30:42,710 --> 00:30:39,440

affected the binary system overall

714
00:30:44,090 --> 00:30:42,720
so along with uh changing it because it

715
00:30:46,909 --> 00:30:44,100
still is a double asteroid system

716
00:30:49,549 --> 00:30:46,919
dimorphos just now orbits ever so

717
00:30:52,130 --> 00:30:49,559
slightly closer to didimos than it used

718
00:30:55,070 --> 00:30:52,140
to previously again this is a few

719
00:30:57,110 --> 00:30:55,080
percent change in that actual distance

720
00:30:59,690 --> 00:30:57,120
and it's just slightly closer it's sort

721
00:31:01,549 --> 00:30:59,700
of tens of meters closer but this again

722
00:31:04,070 --> 00:31:01,559
is one of the specifics that's being

723
00:31:05,510 --> 00:31:04,080
worked out as Tom alluded to with all of

724
00:31:07,909 --> 00:31:05,520
this ongoing work to really understand

725
00:31:10,370 --> 00:31:07,919
that but because we came in and the dart

726
00:31:12,289 --> 00:31:10,380
spacecraft hit it sort of head on it

727
00:31:14,630 --> 00:31:12,299
just makes it be bound even more tightly

728
00:31:16,730 --> 00:31:14,640
to didimos than it was before which is

729
00:31:18,649 --> 00:31:16,740
why this double asteroid system was such

730
00:31:20,930 --> 00:31:18,659
an ideal Target to do this first test

731
00:31:22,730 --> 00:31:20,940
for planetary defense um Tom if you

732
00:31:23,870 --> 00:31:22,740
wanted to add to that please nope that

733
00:31:26,330 --> 00:31:23,880
was exactly what I was going to say

734
00:31:28,130 --> 00:31:26,340
perfect thank you we have one more in

735
00:31:33,049 --> 00:31:28,140
the room and then we'll take questions

736
00:31:39,289 --> 00:31:36,590
uh hi this is Assam Ahmed here from AFP

737
00:31:41,450 --> 00:31:39,299
um yeah just in terms of uh the better

738
00:31:43,430 --> 00:31:41,460

than expected result in terms of there

739
00:31:46,029 --> 00:31:43,440
being a greater plume of ejector

740
00:31:48,470 --> 00:31:46,039
imparting more momentum is that result

741
00:31:50,690 --> 00:31:48,480
generalizable now do you think

742
00:31:52,010 --> 00:31:50,700
um does that mean that you know that

743
00:31:53,330 --> 00:31:52,020
you'll factor that into your models

744
00:31:55,430 --> 00:31:53,340
moving forward and you think more

745
00:31:58,730 --> 00:31:55,440
asteroids are generally like this that

746
00:32:01,370 --> 00:31:58,740
are of concern and uh secondly what

747
00:32:02,990 --> 00:32:01,380
would be your next uh what would you

748
00:32:04,610 --> 00:32:03,000
like to see as the next move

749
00:32:07,909 --> 00:32:04,620
um in terms of uh planetary defense

750
00:32:09,169 --> 00:32:07,919
testing thank you I can start on some of

751
00:32:11,630 --> 00:32:09,179
that

752
00:32:14,149 --> 00:32:11,640
um of course this is one test and it's

753
00:32:16,370 --> 00:32:14,159
one test done on one asteroid and of

754
00:32:19,370 --> 00:32:16,380
course what we're learning every time we

755
00:32:21,529 --> 00:32:19,380
send a mission to another asteroid is we

756
00:32:23,870 --> 00:32:21,539
learn that each asteroid has a different

757
00:32:26,870 --> 00:32:23,880
part of the story of our Solar System's

758
00:32:28,909 --> 00:32:26,880
past to tell asteroids are not all the

759
00:32:30,649 --> 00:32:28,919
same the asteroids in the main belt and

760
00:32:32,570 --> 00:32:30,659
in near Earth space have very different

761
00:32:34,610 --> 00:32:32,580
histories most of them have been

762
00:32:37,310 --> 00:32:34,620
shattered in reaccumulated many times

763
00:32:38,810 --> 00:32:37,320

but we know that there are objects of

764
00:32:41,450 --> 00:32:38,820
different types we know that there are

765
00:32:43,250 --> 00:32:41,460
objects that are Rubble piles like bennu

766
00:32:47,690 --> 00:32:43,260
for example we know that there are

767
00:32:52,070 --> 00:32:47,700
objects with diverse surfaces so we

768
00:32:54,350 --> 00:32:52,080
should not be too eager to say one test

769
00:32:56,570 --> 00:32:54,360
on one asteroid tells us exactly how

770
00:32:59,330 --> 00:32:56,580
every other asteroid would behave in a

771
00:33:02,570 --> 00:32:59,340
similar situation but what we can do is

772
00:33:04,510 --> 00:33:02,580
use this test as an anchor point for our

773
00:33:08,029 --> 00:33:04,520
physics calculations and our simulations

774
00:33:09,649 --> 00:33:08,039
that tell us how different kinds of

775
00:33:12,470 --> 00:33:09,659
impacts in different situations should

776
00:33:14,690 --> 00:33:12,480
behave we anchor it with this bit of

777
00:33:16,669 --> 00:33:14,700
ground truth and then that tells us how

778
00:33:17,870 --> 00:33:16,679
better to extrapolate to to other

779
00:33:19,850 --> 00:33:17,880
situations

780
00:33:21,590 --> 00:33:19,860
and if I just add one thing before I'll

781
00:33:23,029 --> 00:33:21,600
pass over to you for the the next steps

782
00:33:25,130 --> 00:33:23,039
I think one of the things that's really

783
00:33:27,830 --> 00:33:25,140
interesting here too is that dimorphos

784
00:33:30,649 --> 00:33:27,840
is a size asteroid that is a priority

785
00:33:32,450 --> 00:33:30,659
for planetary defense this sort of 160

786
00:33:33,950 --> 00:33:32,460
meter sort of object

787
00:33:36,409 --> 00:33:33,960
um and it's uh the first time we've been

788
00:33:38,389 --> 00:33:36,419

to an object of that size and seen how

789
00:33:40,549 --> 00:33:38,399
it reacts too so I think that's another

790
00:33:42,889 --> 00:33:40,559
important point to you know that Tom was

791
00:33:44,930 --> 00:33:42,899
talking about to Anchor our knowledge in

792
00:33:47,149 --> 00:33:44,940
and that this is a size that's directly

793
00:33:49,970 --> 00:33:47,159
relevant to planetary defense that had

794
00:33:52,250 --> 00:33:49,980
not been visit visited before

795
00:33:54,529 --> 00:33:52,260
yeah so I'll take the the question about

796
00:33:56,090 --> 00:33:54,539
you know what what would be next

797
00:33:57,409 --> 00:33:56,100
um and I think there's two things that

798
00:33:59,630 --> 00:33:57,419
are really important here and you heard

799
00:34:01,549 --> 00:33:59,640
Tom say that you know this is one test

800
00:34:03,590 --> 00:34:01,559
on one asteroid

801
00:34:05,269 --> 00:34:03,600
um and that in this case it appears that

802
00:34:07,250 --> 00:34:05,279
that particular asteroid may be this

803
00:34:10,129 --> 00:34:07,260
kind of loose collection of of debris

804
00:34:11,930 --> 00:34:10,139
out of of uh material but not all

805
00:34:13,970 --> 00:34:11,940
asteroids are like that some may be a

806
00:34:16,430 --> 00:34:13,980
solid rock um as opposed to a collection

807
00:34:18,530 --> 00:34:16,440
of smaller rocks held together and the

808
00:34:19,849 --> 00:34:18,540
way they react is going to depend on

809
00:34:22,669 --> 00:34:19,859
whether they are solid or whether

810
00:34:24,169 --> 00:34:22,679
they're these um collection of rubble

811
00:34:25,490 --> 00:34:24,179
um so one of the key things that will be

812
00:34:27,770 --> 00:34:25,500
important that we should be thinking

813
00:34:30,950 --> 00:34:27,780

about going into the future is how can

814
00:34:32,869 --> 00:34:30,960
we respond quickly if we identify uh a

815
00:34:35,329 --> 00:34:32,879
potentially hazardous asteroid that's

816
00:34:37,129 --> 00:34:35,339
out there maybe decades away but be able

817
00:34:39,530 --> 00:34:37,139
to send a mission out to look at it and

818
00:34:41,750 --> 00:34:39,540
get more information on how big is it

819
00:34:44,089 --> 00:34:41,760
and is it a collection of rocks or is it

820
00:34:46,070 --> 00:34:44,099
a solid body so that's one thing that's

821
00:34:47,270 --> 00:34:46,080
really important but actually what I

822
00:34:49,070 --> 00:34:47,280
just said there is you gotta know

823
00:34:51,050 --> 00:34:49,080
they're coming and so the very next

824
00:34:55,129 --> 00:34:51,060
thing that we really need to do of

825
00:34:57,710 --> 00:34:55,139
course is to complete our inventory of

826
00:35:00,170 --> 00:34:57,720
these objects in the solar system that

827
00:35:02,570 --> 00:35:00,180
are potentially dangerous to Earth again

828
00:35:05,690 --> 00:35:02,580
from this size category of about 140

829
00:35:07,130 --> 00:35:05,700
meters and larger ours is our next goal

830
00:35:09,290 --> 00:35:07,140
is to try and make sure we can identify

831
00:35:11,030 --> 00:35:09,300
those and characterize those and we

832
00:35:13,190 --> 00:35:11,040
actually have a mission in the pipeline

833
00:35:15,410 --> 00:35:13,200
the near-earth object surveyor that's

834
00:35:17,870 --> 00:35:15,420
intended to do that

835
00:35:20,329 --> 00:35:17,880
thanks so much now we'll go to questions

836
00:35:23,810 --> 00:35:20,339
from the media on the line I just want

837
00:35:25,670 --> 00:35:23,820
to confirm that Mr Giorgio sakacha is

838
00:35:29,450 --> 00:35:25,680

still on the line

839
00:35:32,329 --> 00:35:29,460
as well yes I'm here awesome thank you

840
00:35:34,190 --> 00:35:32,339
all right uh operator can we please have

841
00:35:36,109 --> 00:35:34,200
our first question from media on the

842
00:35:38,329 --> 00:35:36,119
line

843
00:35:40,370 --> 00:35:38,339
yes Miss Masha done

844
00:35:41,690 --> 00:35:40,380
your line is open and please State your

845
00:35:43,910 --> 00:35:41,700
affiliation

846
00:35:46,130 --> 00:35:43,920
yes hi Marsha Dunn Associated Press

847
00:35:49,670 --> 00:35:46,140
thank you for this

848
00:35:53,030 --> 00:35:49,680
um when did you find out what day

849
00:35:54,710 --> 00:35:53,040
um that you had achieved this 32 minute

850
00:35:57,470 --> 00:35:54,720
orbital

851
00:35:59,510 --> 00:35:57,480
um slim down I'm just wondering how many

852
00:36:00,829 --> 00:35:59,520
days of observations it took and I

853
00:36:05,510 --> 00:36:00,839
didn't know if it came over the weekend

854
00:36:09,230 --> 00:36:05,520
or late last week and what if if Nancy

855
00:36:12,170 --> 00:36:09,240
and Tom could both say what their

856
00:36:15,290 --> 00:36:12,180
reactions were upon First Learning of

857
00:36:18,050 --> 00:36:15,300
this 32-minute Miss

858
00:36:19,790 --> 00:36:18,060
so I'll go first uh we had been uh

859
00:36:21,710 --> 00:36:19,800
saying the telescopes would need time in

860
00:36:23,690 --> 00:36:21,720
order to do this measurement and indeed

861
00:36:26,210 --> 00:36:23,700
they did but I think this is really

862
00:36:28,910 --> 00:36:26,220
credit to the enthusiastic international

863
00:36:29,810 --> 00:36:28,920

team that we have that got on this so

864
00:36:31,730 --> 00:36:29,820
quickly

865
00:36:33,829 --> 00:36:31,740
um both from the optical telescopes and

866
00:36:35,750 --> 00:36:33,839
from the radar observations multiple

867
00:36:37,849 --> 00:36:35,760
groups around the world that these data

868
00:36:39,950 --> 00:36:37,859
started pouring in like I said as a team

869
00:36:41,990 --> 00:36:39,960
we were holding these daily meetings and

870
00:36:43,910 --> 00:36:42,000
also sort of communicating uh throughout

871
00:36:45,770 --> 00:36:43,920
outside of those

872
00:36:47,210 --> 00:36:45,780
um and I think it's that enthusiasm and

873
00:36:49,250 --> 00:36:47,220
that teamwork

874
00:36:51,410 --> 00:36:49,260
um that you know we share ideas on there

875
00:36:53,870 --> 00:36:51,420
and so it's hard to pinpoint exactly

876
00:36:56,210 --> 00:36:53,880
when maybe the team you know had

877
00:36:57,950 --> 00:36:56,220
complete confidence in this result but

878
00:36:59,690 --> 00:36:57,960
we have been tracking it for these last

879
00:37:02,510 --> 00:36:59,700
two weeks and are completely confident

880
00:37:05,690 --> 00:37:04,430
um yeah maybe I'll speak to you the

881
00:37:06,530 --> 00:37:05,700
other half of the question

882
00:37:09,349 --> 00:37:06,540
um

883
00:37:12,530 --> 00:37:09,359
so the as Laurie said earlier the the

884
00:37:14,270 --> 00:37:12,540
team before impact has been spent years

885
00:37:16,550 --> 00:37:14,280
trying to understand the range of

886
00:37:19,010 --> 00:37:16,560
possible outcomes of this experiment not

887
00:37:21,950 --> 00:37:19,020
knowing what the target was going to be

888
00:37:23,870 --> 00:37:21,960

and so they did simulations on solid

889
00:37:26,089 --> 00:37:23,880
rocks and broken rocks and fractured

890
00:37:28,190 --> 00:37:26,099
rocks and piles of rocks and Robo piles

891
00:37:29,930 --> 00:37:28,200
and piles of gravel and and there was

892
00:37:32,089 --> 00:37:29,940
this immense range and one of the things

893
00:37:34,730 --> 00:37:32,099
we did understand from from those

894
00:37:37,730 --> 00:37:34,740
simulations is that we expected a solid

895
00:37:39,470 --> 00:37:37,740
rock to be less responsive than a pile

896
00:37:43,069 --> 00:37:39,480
of gravel a Loosely bound Rubble pile

897
00:37:43,730 --> 00:37:43,079
would have a big response so

898
00:37:45,770 --> 00:37:43,740
um

899
00:37:48,650 --> 00:37:45,780
I won't speak for anybody on the team

900
00:37:50,750 --> 00:37:48,660
other than myself but the last few

901
00:37:53,870 --> 00:37:50,760
minutes before impact on the 26th were

902
00:37:55,609 --> 00:37:53,880
quite dramatic and when I saw dimorphos

903
00:37:57,470 --> 00:37:55,619
come into view and when I saw there was

904
00:37:59,089 --> 00:37:57,480
not a single crater on it and there were

905
00:38:01,490 --> 00:37:59,099
a lot of what appeared to be loose rocks

906
00:38:03,470 --> 00:38:01,500
and I this was a totally non-scientific

907
00:38:07,970 --> 00:38:03,480
by eye measurement I looked at it and I

908
00:38:07,980 --> 00:38:10,970
and it wasn't

909
00:38:14,270 --> 00:38:13,010
excellent thank you

910
00:38:19,130 --> 00:38:14,280
um operator do we have any other

911
00:38:23,450 --> 00:38:20,390
yes

912
00:38:26,450 --> 00:38:23,460
Jeff Frost your line is open and please

913
00:38:28,550 --> 00:38:26,460

State your immediate affiliation

914
00:38:30,410 --> 00:38:28,560
good afternoon Jeff how's the space news

915
00:38:31,849 --> 00:38:30,420
I know one of the factors you talked

916
00:38:34,609 --> 00:38:31,859
about leading up to the impact was

917
00:38:37,609 --> 00:38:34,619
measuring beta the efficiency of of the

918
00:38:39,470 --> 00:38:37,619
uh the impact on on the asteroid do you

919
00:38:41,390 --> 00:38:39,480
have like a range of beta values that

920
00:38:44,030 --> 00:38:41,400
are consistent with this 32-minute

921
00:38:46,069 --> 00:38:44,040
orbital change that you've seen thanks

922
00:38:48,290 --> 00:38:46,079
I'll start in Nancy Consignment Nancy

923
00:38:50,930 --> 00:38:48,300
knows beta is my favorite subject

924
00:38:53,870 --> 00:38:50,940
um so uh we're we're going to be working

925
00:38:56,390 --> 00:38:53,880
really hard to get a beta

926
00:38:58,190 --> 00:38:56,400
um it is as we said it seems virtually

927
00:39:01,430 --> 00:38:58,200
certain that the ejecta were a

928
00:39:03,829 --> 00:39:01,440
significant contributor to the uh to the

929
00:39:05,150 --> 00:39:03,839
period change and so we know beta is not

930
00:39:07,910 --> 00:39:05,160
equal to one because that would have

931
00:39:09,770 --> 00:39:07,920
been no ejecta but there are a lot of

932
00:39:12,410 --> 00:39:09,780
ingredients that go into a definitive

933
00:39:13,910 --> 00:39:12,420
beta determination so that work is uh is

934
00:39:15,890 --> 00:39:13,920
ongoing Nancy do you want to add

935
00:39:17,569 --> 00:39:15,900
anything to that no I'm just happy that

936
00:39:19,550 --> 00:39:17,579
people are asking these questions and so

937
00:39:21,290 --> 00:39:19,560
interested and uh that'll motivate the

938
00:39:22,910 --> 00:39:21,300

team even more to get to work and come

939
00:39:24,589 --> 00:39:22,920
back at you with an answer once we've

940
00:39:26,990 --> 00:39:24,599
done run some more of these models I

941
00:39:28,849 --> 00:39:27,000
think they're working now

942
00:39:30,230 --> 00:39:28,859
okay I understand we have several

943
00:39:31,670 --> 00:39:30,240
questions on the line but I wanted to

944
00:39:34,490 --> 00:39:31,680
check in the room to see if we had any

945
00:39:39,589 --> 00:39:37,370
okay operator let's have our next um

946
00:39:41,930 --> 00:39:39,599
media question

947
00:39:44,329 --> 00:39:41,940
thank you

948
00:39:49,310 --> 00:39:44,339
Sarah your line is open please State

949
00:39:52,790 --> 00:39:51,349
it's close to the New York Times I was

950
00:39:54,470 --> 00:39:52,800
hoping hoping to say a little bit more

951
00:39:56,569 --> 00:39:54,480
about with the continuing follow-up

952
00:39:57,950 --> 00:39:56,579
observation plan looks like and a little

953
00:39:59,750 --> 00:39:57,960
more about what you hope to learn from

954
00:40:01,550 --> 00:39:59,760
that campaign

955
00:40:03,890 --> 00:40:01,560
thank you

956
00:40:06,349 --> 00:40:03,900
so the observational campaign for the

957
00:40:08,750 --> 00:40:06,359
dart team will continue the timing of

958
00:40:10,849 --> 00:40:08,760
dart's impact into dimorphos was

959
00:40:12,710 --> 00:40:10,859
actually chosen um when the distance

960
00:40:14,750 --> 00:40:12,720
between Earth and this asteroid system

961
00:40:16,910 --> 00:40:14,760
is at a relative minimum and so

962
00:40:19,910 --> 00:40:16,920
observations can actually continue into

963
00:40:22,790 --> 00:40:19,920

early 2023. so right now we have this

964
00:40:24,710 --> 00:40:22,800
orbital period change of 32 minutes with

965
00:40:27,109 --> 00:40:24,720
an uncertainty of plus or minus two

966
00:40:30,050 --> 00:40:27,119
minutes additional observations will

967
00:40:32,690 --> 00:40:30,060
help to better refine that answer in

968
00:40:34,550 --> 00:40:32,700
addition the tail is spectacular and

969
00:40:38,030 --> 00:40:34,560
this amount of ejecta that you're seeing

970
00:40:40,130 --> 00:40:38,040
and it's continually evolving and so the

971
00:40:42,650 --> 00:40:40,140
observations are going on in order to

972
00:40:45,230 --> 00:40:42,660
fully track and watch that evolution of

973
00:40:46,730 --> 00:40:45,240
the ejecta and so these are the two main

974
00:40:48,589 --> 00:40:46,740
things that the observations will

975
00:40:51,230 --> 00:40:48,599
continue to be doing for the weeks and

976
00:40:59,150 --> 00:40:53,930
excellent thank you uh can we have our

977
00:41:03,130 --> 00:41:01,670
Daniel your line is open please State

978
00:41:07,329 --> 00:41:03,140
your affiliation

979
00:41:12,190 --> 00:41:10,010
Spanish reviews thank you

980
00:41:16,069 --> 00:41:12,200
congratulations for all the NASA team

981
00:41:19,190 --> 00:41:16,079
and the question is what is the largest

982
00:41:20,990 --> 00:41:19,200
mass that we could impact on a

983
00:41:23,630 --> 00:41:21,000
restaurant and worked in local

984
00:41:25,730 --> 00:41:23,640
communities now we have to do

985
00:41:26,290 --> 00:41:25,740
abbreviation

986
00:41:30,950 --> 00:41:26,300
um

987
00:41:33,109 --> 00:41:30,960
the other one is is permanent do you

988
00:41:35,870 --> 00:41:33,119

want to change we made to the muffins

989
00:41:39,770 --> 00:41:38,270
can we can we ask to have you repeat the

990
00:41:41,690 --> 00:41:39,780
question please there was a little bit

991
00:41:44,710 --> 00:41:41,700
of feedback in the room

992
00:41:48,950 --> 00:41:44,720
can you repeat the questions again

993
00:41:51,250 --> 00:41:48,960
that we could impact on an asteroid and

994
00:41:54,950 --> 00:41:51,260
whether the technological limitations

995
00:41:57,230 --> 00:41:54,960
you know we have and these the other one

996
00:42:00,650 --> 00:41:57,240
the second question you see the change

997
00:42:04,190 --> 00:42:00,660
of the demonstrate blood is permanent or

998
00:42:08,210 --> 00:42:06,050
understand it's the largest mess that we

999
00:42:10,849 --> 00:42:08,220
can look at well I heard I heard the end

1000
00:42:12,849 --> 00:42:10,859
of the question it is a it is a

1001
00:42:16,310 --> 00:42:12,859
permanent change

1002
00:42:18,829 --> 00:42:16,320
although we have done more to the system

1003
00:42:22,250 --> 00:42:18,839
than simply change the orbit we may have

1004
00:42:24,290 --> 00:42:22,260
left dimorphos wobbling a bit so over

1005
00:42:26,150 --> 00:42:24,300
time there may be some interaction

1006
00:42:29,030 --> 00:42:26,160
between the wobble and the orbit and

1007
00:42:31,010 --> 00:42:29,040
things will adjust but it's certainly

1008
00:42:36,470 --> 00:42:31,020
never going to go back to the old 11

1009
00:42:41,270 --> 00:42:38,329
and I think the other part of your quest

1010
00:42:42,250 --> 00:42:41,280
had to do with the mass and how large of

1011
00:42:45,650 --> 00:42:42,260
a mass

1012
00:42:48,589 --> 00:42:45,660
and I I think there's a lot of factors

1013
00:42:50,630 --> 00:42:48,599

in play there in just how large or how

1014
00:42:52,370 --> 00:42:50,640
far this technique could go

1015
00:42:54,230 --> 00:42:52,380
um so yeah and I think uh you know

1016
00:42:56,210 --> 00:42:54,240
there's some studies out there and the

1017
00:42:58,010 --> 00:42:56,220
national academies of science uh decadal

1018
00:43:00,770 --> 00:42:58,020
survey had planetary defense included

1019
00:43:02,990 --> 00:43:00,780
for the first time and it really is

1020
00:43:05,329 --> 00:43:03,000
related to the mass of the asteroid but

1021
00:43:07,970 --> 00:43:05,339
then the x-axis is always warning time

1022
00:43:09,950 --> 00:43:07,980
it's always how much time you have to

1023
00:43:11,690 --> 00:43:09,960
deal with this so if you find the

1024
00:43:14,150 --> 00:43:11,700
asteroids ahead of time it's a very

1025
00:43:16,370 --> 00:43:14,160
reliable that NASA and other space

1026
00:43:18,650 --> 00:43:16,380
agencies can have Decades of warning

1027
00:43:21,349 --> 00:43:18,660
time can track these things reliably for

1028
00:43:23,870 --> 00:43:21,359
a hundred plus years and so that's

1029
00:43:25,849 --> 00:43:23,880
really lets you deal with larger objects

1030
00:43:27,230 --> 00:43:25,859
if you have that warning time so I think

1031
00:43:28,730 --> 00:43:27,240
I just want to stress this is

1032
00:43:31,010 --> 00:43:28,740
spectacular that we've taken this first

1033
00:43:33,050 --> 00:43:31,020
step for a kinetic impactor deflection

1034
00:43:35,510 --> 00:43:33,060
to potentially be used in the future if

1035
00:43:38,030 --> 00:43:35,520
we need to but we really need to also

1036
00:43:40,550 --> 00:43:38,040
have that warning time for it for a

1037
00:43:42,829 --> 00:43:40,560
technique like this to be effective

1038
00:43:44,990 --> 00:43:42,839

excellent thank you I understand we have

1039
00:43:46,250 --> 00:43:45,000
several questions on the line but I

1040
00:43:47,990 --> 00:43:46,260
wanted to check back in the room to see

1041
00:43:50,870 --> 00:43:48,000
if we had any other questions from media

1042
00:43:50,880 --> 00:43:56,089
um sure

1043
00:44:00,410 --> 00:43:58,790
hi uh Lori you mentioned uh the Neo

1044
00:44:02,329 --> 00:44:00,420
surveyor Mission and I had a question

1045
00:44:05,270 --> 00:44:02,339
about that I had uh read and correct me

1046
00:44:07,010 --> 00:44:05,280
if I'm wrong that we know of about 40 of

1047
00:44:08,510 --> 00:44:07,020
the asteroids that can cause Regional

1048
00:44:11,030 --> 00:44:08,520
Devastation

1049
00:44:12,710 --> 00:44:11,040
um how was that statistic how did we

1050
00:44:14,809 --> 00:44:12,720
come up with that statistic

1051
00:44:16,490 --> 00:44:14,819
I'll I'll give you my stab at it and

1052
00:44:20,089 --> 00:44:16,500
then Tom can correct me

1053
00:44:22,010 --> 00:44:20,099
um how's that um so uh we by looking at

1054
00:44:23,750 --> 00:44:22,020
the the population of asteroids that are

1055
00:44:25,010 --> 00:44:23,760
out there we have an estimate of how

1056
00:44:26,750 --> 00:44:25,020
many there are there's a size

1057
00:44:28,309 --> 00:44:26,760
distribution we can see the various

1058
00:44:30,470 --> 00:44:28,319
sizes of different type the different

1059
00:44:33,349 --> 00:44:30,480
asteroids that that are in these near

1060
00:44:35,630 --> 00:44:33,359
Earth orbits and so we have a prediction

1061
00:44:37,490 --> 00:44:35,640
and an estimate of of how many we should

1062
00:44:40,430 --> 00:44:37,500
see at each of the various size ranges

1063
00:44:42,770 --> 00:44:40,440

so for those objects that are a

1064
00:44:45,290 --> 00:44:42,780
kilometer or larger the really big ones

1065
00:44:48,710 --> 00:44:45,300
we've actually identified I believe it's

1066
00:44:50,270 --> 00:44:48,720
like 99 of those they've been identified

1067
00:44:52,250 --> 00:44:50,280
we don't believe there's that many more

1068
00:44:54,349 --> 00:44:52,260
of them out there that we haven't found

1069
00:44:57,170 --> 00:44:54,359
but when you get down into this range of

1070
00:44:57,829 --> 00:44:57,180
about the 140 meters and larger as I

1071
00:44:59,510 --> 00:44:57,839
said

1072
00:45:00,770 --> 00:44:59,520
um or you you noted right that that's

1073
00:45:03,109 --> 00:45:00,780
the size that really could cause

1074
00:45:04,309 --> 00:45:03,119
Regional Devastation so that while it

1075
00:45:07,309 --> 00:45:04,319
wouldn't Wipe Out the whole planet

1076
00:45:09,290 --> 00:45:07,319
there's certainly of incredible concern

1077
00:45:10,910 --> 00:45:09,300
um and of those We are continuing to

1078
00:45:13,250 --> 00:45:10,920
make observations from the earth base

1079
00:45:15,710 --> 00:45:13,260
and we also have the neowise spacecraft

1080
00:45:17,690 --> 00:45:15,720
that's making some observations but

1081
00:45:19,609 --> 00:45:17,700
through those we believe we've at this

1082
00:45:22,010 --> 00:45:19,619
point only identified about 40 percent

1083
00:45:24,829 --> 00:45:22,020
of that size that population you know

1084
00:45:26,750 --> 00:45:24,839
that's larger than 140 meters

1085
00:45:29,150 --> 00:45:26,760
yeah I can add a little bit to that

1086
00:45:31,370 --> 00:45:29,160
about how how we know this so we've had

1087
00:45:32,990 --> 00:45:31,380
asteroid surveys asteroid searches going

1088
00:45:35,990 --> 00:45:33,000

on for a long time and so we've got a

1089
00:45:37,970 --> 00:45:36,000
pretty good idea of excuse me what are

1090
00:45:40,490 --> 00:45:37,980
the range of asteroid sizes and also

1091
00:45:42,950 --> 00:45:40,500
what are the distribution of orbits in

1092
00:45:46,010 --> 00:45:42,960
the solar system and we also know for

1093
00:45:48,410 --> 00:45:46,020
each one of those surveys what are their

1094
00:45:51,410 --> 00:45:48,420
capabilities right what are they able to

1095
00:45:53,569 --> 00:45:51,420
see at what what distances so for every

1096
00:45:56,510 --> 00:45:53,579
Observatory we can figure out how

1097
00:45:58,130 --> 00:45:56,520
efficiently they're able to detect an

1098
00:46:00,410 --> 00:45:58,140
asteroid of this size on this kind of an

1099
00:46:03,170 --> 00:46:00,420
orbit and so on and so knowing from that

1100
00:46:04,609 --> 00:46:03,180
how incomplete the discoveries are you

1101
00:46:06,710 --> 00:46:04,619
can work backwards and figure out what

1102
00:46:10,970 --> 00:46:06,720
has not been discovered yet

1103
00:46:17,809 --> 00:46:13,430
okay operator can we have a couple more

1104
00:46:23,410 --> 00:46:20,569
Gina your line is open please State your

1105
00:46:28,430 --> 00:46:26,089
Perry ABC News

1106
00:46:33,349 --> 00:46:31,370
International Cooperative Mission what

1107
00:46:35,569 --> 00:46:33,359
did that add to it

1108
00:46:37,849 --> 00:46:35,579
I'll take a first stab at that one I

1109
00:46:39,650 --> 00:46:37,859
think that's incredibly important as you

1110
00:46:41,750 --> 00:46:39,660
can imagine of course planetary defense

1111
00:46:43,849 --> 00:46:41,760
is not just a problem for the United

1112
00:46:46,490 --> 00:46:43,859
States nor is it a problem just for the

1113
00:46:50,150 --> 00:46:46,500

Italians that cooperated on this Mission

1114
00:46:51,530 --> 00:46:50,160
but this is a planet-wide issue that if

1115
00:46:53,750 --> 00:46:51,540
there were an asteroid that were a

1116
00:46:55,309 --> 00:46:53,760
threat to Earth we should all be

1117
00:46:58,130 --> 00:46:55,319
concerned we all need to be working

1118
00:47:00,050 --> 00:46:58,140
together to identify the asteroids which

1119
00:47:01,790 --> 00:47:00,060
we do with our ground-based programs the

1120
00:47:04,670 --> 00:47:01,800
entire world with telescopes around the

1121
00:47:06,890 --> 00:47:04,680
world looking for these objects and

1122
00:47:08,990 --> 00:47:06,900
working together when one is identified

1123
00:47:10,730 --> 00:47:09,000
to follow up with observations to

1124
00:47:12,530 --> 00:47:10,740
characterize them so that we can put

1125
00:47:14,690 --> 00:47:12,540
them into a database and keep track of

1126
00:47:16,670 --> 00:47:14,700
them over time and so working together

1127
00:47:19,069 --> 00:47:16,680
as an International Community I think

1128
00:47:22,089 --> 00:47:19,079
this is one of the most important things

1129
00:47:25,370 --> 00:47:22,099
we can do for planetary defense

1130
00:47:30,349 --> 00:47:25,380
if you if you like is Georgia or sarcosa

1131
00:47:37,609 --> 00:47:33,470
a term of course that uh and protect us

1132
00:47:42,050 --> 00:47:37,619
protecting our planet is from space and

1133
00:47:44,870 --> 00:47:42,060
from ground uh to to crisis comes from

1134
00:47:46,670 --> 00:47:44,880
space is by definition something that we

1135
00:47:48,010 --> 00:47:46,680
have to do together and for this reason

1136
00:47:51,230 --> 00:47:48,020
that uh

1137
00:47:54,290 --> 00:47:51,240
the only way to go is to cooperate at

1138
00:47:57,589 --> 00:47:54,300

the international level it has been

1139
00:47:59,809 --> 00:47:57,599
mentioned a ground-based observatories

1140
00:48:01,210 --> 00:47:59,819
that would monitor our environment for

1141
00:48:05,530 --> 00:48:01,220
example here

1142
00:48:09,530 --> 00:48:05,540
from Italy we have developed uh adult

1143
00:48:13,030 --> 00:48:09,540
telescopes that we that works as the

1144
00:48:22,490 --> 00:48:18,470
of its life as a computer mirror and

1145
00:48:27,890 --> 00:48:22,500
lenses uh telescope to monitor why the

1146
00:48:30,410 --> 00:48:27,900
areas of of the of the sky to detect as

1147
00:48:33,829 --> 00:48:30,420
soon as I spoke to a possible friend in

1148
00:48:36,230 --> 00:48:33,839
addition as you have to have seen we we

1149
00:48:39,770 --> 00:48:36,240
were very very happy to go back to NASA

1150
00:48:41,630 --> 00:48:39,780
with a Nisha Cube Southern nights and

1151
00:48:44,390 --> 00:48:41,640
there would be many many others

1152
00:48:46,250 --> 00:48:44,400
initiatives that would be dedicated as

1153
00:48:49,910 --> 00:48:46,260
International level to protect our

1154
00:48:52,190 --> 00:48:49,920
planet by the way we we took 720 and

1155
00:48:54,290 --> 00:48:52,200
more pictures in those 10 minutes of

1156
00:48:56,510 --> 00:48:54,300
observations so I'm sure that scientists

1157
00:48:59,030 --> 00:48:56,520
will be working on those pictures for

1158
00:49:01,670 --> 00:48:59,040
for a long time to get the best out of

1159
00:49:03,710 --> 00:49:01,680
what we have done together with NASA

1160
00:49:06,650 --> 00:49:03,720
I have no doubt about that Giorgio

1161
00:49:07,490 --> 00:49:06,660
fantastic data set can I also add that

1162
00:49:10,190 --> 00:49:07,500
um just from an international

1163
00:49:12,710 --> 00:49:10,200

perspective that the next mission to fly

1164
00:49:15,290 --> 00:49:12,720
to the dittimo system is going to be the

1165
00:49:17,030 --> 00:49:15,300
Hera Mission which Tom mentioned uh that

1166
00:49:20,290 --> 00:49:17,040
is being planned by the European Space

1167
00:49:23,870 --> 00:49:20,300
Agency again a multinational

1168
00:49:25,790 --> 00:49:23,880
Endeavor to uh to again go back to this

1169
00:49:29,150 --> 00:49:25,800
system and get a chance to look at it

1170
00:49:30,950 --> 00:49:29,160
again a little later on so again I think

1171
00:49:32,990 --> 00:49:30,960
the the international participation this

1172
00:49:35,349 --> 00:49:33,000
is a real opportunity for the entire

1173
00:49:37,309 --> 00:49:35,359
world to participate

1174
00:49:39,170 --> 00:49:37,319
excellent

1175
00:49:46,069 --> 00:49:39,180
um we'll take another question on the

1176
00:49:51,890 --> 00:49:48,230
Marvin your line is open please State

1177
00:49:57,470 --> 00:49:53,569
hi good afternoon my name is Marvin

1178
00:50:01,190 --> 00:49:59,569
and it's whoever we want that you know

1179
00:50:03,050 --> 00:50:01,200
whoever wants to answer this uh you know

1180
00:50:05,630 --> 00:50:03,060
with the data that we received from this

1181
00:50:07,970 --> 00:50:05,640
Mission how does this scale up and to

1182
00:50:09,890 --> 00:50:07,980
what size uh you know uh you know would

1183
00:50:11,329 --> 00:50:09,900
this Mission give NASA now the

1184
00:50:14,690 --> 00:50:11,339
confidence to send you know a whole

1185
00:50:16,849 --> 00:50:14,700
Colony or swarm of of these darts up

1186
00:50:18,589 --> 00:50:16,859
there and we can have any on standby and

1187
00:50:21,050 --> 00:50:18,599
we appreciate all your hard work and

1188
00:50:23,270 --> 00:50:21,060

congratulations again on a successful

1189
00:50:26,990 --> 00:50:23,280
mission

1190
00:50:29,510 --> 00:50:27,000
I I'll start it and pass it pass it to

1191
00:50:33,829 --> 00:50:29,520
you so we have a physics understanding

1192
00:50:35,930 --> 00:50:33,839
of how impact should scale with size of

1193
00:50:39,410 --> 00:50:35,940
Target and size of impactor and velocity

1194
00:50:41,750 --> 00:50:39,420
of impactor if we are ever in a

1195
00:50:44,630 --> 00:50:41,760
situation where we have to uh actually

1196
00:50:46,550 --> 00:50:44,640
deflect an asteroid we'll want to look

1197
00:50:49,849 --> 00:50:46,560
at the situation very carefully because

1198
00:50:51,829 --> 00:50:49,859
any such event would be very situational

1199
00:50:53,809 --> 00:50:51,839
it would depend on the orbit of the

1200
00:50:55,370 --> 00:50:53,819
dangerous asteroid the nature of the

1201
00:50:58,790 --> 00:50:55,380
asteroid would want we would want to

1202
00:51:00,530 --> 00:50:58,800
find out as much as we can about it the

1203
00:51:01,910 --> 00:51:00,540
accessible trajectories how could we get

1204
00:51:04,370 --> 00:51:01,920
there how soon could we get there all of

1205
00:51:06,950 --> 00:51:04,380
these things play in before you can even

1206
00:51:09,650 --> 00:51:06,960
begin talking about well should we use

1207
00:51:11,809 --> 00:51:09,660
one large impactor or several smaller

1208
00:51:15,290 --> 00:51:11,819
impactors is a kinetic impactor really

1209
00:51:17,569 --> 00:51:15,300
even the best choice at all

1210
00:51:19,430 --> 00:51:17,579
among the things that you would want to

1211
00:51:21,170 --> 00:51:19,440
think about is if it's a relatively

1212
00:51:22,970 --> 00:51:21,180
small object but you have to make a

1213
00:51:24,530 --> 00:51:22,980

large deflection you might not want to

1214
00:51:26,030 --> 00:51:24,540
do this with a single impactor because

1215
00:51:28,130 --> 00:51:26,040
you might accidentally break it

1216
00:51:29,630 --> 00:51:28,140
something we don't want to do breaking

1217
00:51:31,309 --> 00:51:29,640
an asteroid is not really the best way

1218
00:51:33,170 --> 00:51:31,319
to defend yourself from it because then

1219
00:51:34,549 --> 00:51:33,180
instead of having one large object

1220
00:51:36,890 --> 00:51:34,559
heading for you have a lot of little

1221
00:51:40,609 --> 00:51:36,900
objects heading for you and that's not

1222
00:51:43,190 --> 00:51:40,619
better so how to deal with a single

1223
00:51:46,190 --> 00:51:43,200
situation is going to be situational now

1224
00:51:49,490 --> 00:51:46,200
how do you turn that into a decision of

1225
00:51:52,309 --> 00:51:49,500
what kind of ready to go capability you

1226
00:51:53,809 --> 00:51:52,319
want to have that's more than a science

1227
00:51:55,190 --> 00:51:53,819
question more than an engineering

1228
00:51:56,990 --> 00:51:55,200
question it's really a policy question

1229
00:51:58,790 --> 00:51:57,000
and governmental questions I'm going to

1230
00:52:00,290 --> 00:51:58,800
pass to Lori for that one well I'm

1231
00:52:02,809 --> 00:52:00,300
actually going to go back to Nancy's

1232
00:52:04,790 --> 00:52:02,819
statement a little while ago that more

1233
00:52:06,829 --> 00:52:04,800
important than uh you know which

1234
00:52:09,470 --> 00:52:06,839
asteroids can we defend ourselves from

1235
00:52:11,990 --> 00:52:09,480
with this technique is we need to know

1236
00:52:13,549 --> 00:52:12,000
how you know when we need to find them

1237
00:52:15,890 --> 00:52:13,559
and we need to identify them we need to

1238
00:52:17,569 --> 00:52:15,900

characterize them as she said time is

1239
00:52:20,030 --> 00:52:17,579
the single most important factor in

1240
00:52:22,970 --> 00:52:20,040
being able to to implement any technique

1241
00:52:25,069 --> 00:52:22,980
for defense

1242
00:52:26,569 --> 00:52:25,079
excellent thank you

1243
00:52:29,930 --> 00:52:26,579
um do we have any other questions on the

1244
00:52:34,549 --> 00:52:32,049
some other questions

1245
00:52:36,770 --> 00:52:34,559
I'm actually going to go back to Nancy's

1246
00:52:39,109 --> 00:52:36,780
uh statement a little while ago that

1247
00:52:41,089 --> 00:52:39,119
more important than uh you know which

1248
00:52:45,910 --> 00:52:41,099
passwords can we defend ourselves from

1249
00:52:52,370 --> 00:52:49,569
ideas all right my name is

1250
00:52:55,609 --> 00:52:52,380
the most important factor in being able

1251
00:53:01,270 --> 00:52:55,619
to implement any technique for defense

1252
00:53:07,549 --> 00:53:03,890
and I wanted to know

1253
00:53:10,730 --> 00:53:07,559
um what is uh what's what combinations

1254
00:53:12,710 --> 00:53:10,740
of telescopes it's like run through uh

1255
00:53:14,210 --> 00:53:12,720
so which which combination of telescopes

1256
00:53:15,829 --> 00:53:14,220
ground-based telescopes and and

1257
00:53:20,210 --> 00:53:15,839
space-based telescopes that they were

1258
00:53:22,430 --> 00:53:20,220
also involved uh were involved in uh

1259
00:53:24,069 --> 00:53:22,440
confirming the results of your dark

1260
00:53:26,930 --> 00:53:24,079
tests

1261
00:53:28,790 --> 00:53:26,940
so the telescopes that have been used so

1262
00:53:31,790 --> 00:53:28,800
far by the dart team in order to get

1263
00:53:34,910 --> 00:53:31,800

this result are Las Cabanas observatory

1264
00:53:37,730 --> 00:53:34,920
in Chile the Las cumbras Observatory

1265
00:53:40,790 --> 00:53:37,740
Global telescope networks in both Chile

1266
00:53:43,849 --> 00:53:40,800
and in South Africa and the Danish

1267
00:53:46,730 --> 00:53:43,859
telescope in Chile as well as the two

1268
00:53:49,490 --> 00:53:46,740
planetary radar facilities facilities of

1269
00:53:51,170 --> 00:53:49,500
Goldstone observatory in California and

1270
00:53:53,750 --> 00:53:51,180
the green Bank observatory in West

1271
00:53:55,370 --> 00:53:53,760
Virginia but we have a lot more

1272
00:53:57,290 --> 00:53:55,380
telescopes than that that are

1273
00:53:58,790 --> 00:53:57,300
contributing so that was just to do do

1274
00:54:01,490 --> 00:53:58,800
the period change we saw some

1275
00:54:03,530 --> 00:54:01,500
spectacular images of the ejecta other

1276
00:54:04,970 --> 00:54:03,540
telescopes are monitoring this there's

1277
00:54:06,770 --> 00:54:04,980
actually more than three dozen

1278
00:54:09,710 --> 00:54:06,780
telescopes here on the earth that are

1279
00:54:11,630 --> 00:54:09,720
involved and three telescopes in space

1280
00:54:13,730 --> 00:54:11,640
that are also contributing

1281
00:54:15,950 --> 00:54:13,740
um so I really would direct you to the

1282
00:54:17,809 --> 00:54:15,960
dart website to get that full map of all

1283
00:54:20,329 --> 00:54:17,819
of those telescopes and their locations

1284
00:54:21,829 --> 00:54:20,339
this is a very initial result where

1285
00:54:24,650 --> 00:54:21,839
we've had contributions from

1286
00:54:26,870 --> 00:54:24,660
highlighting these six facilities but

1287
00:54:29,630 --> 00:54:26,880
many more facilities are contributing to

1288
00:54:31,309 --> 00:54:29,640

dart's Global observation campaign and

1289
00:54:34,069 --> 00:54:31,319
to just one add one note to that you'll

1290
00:54:36,470 --> 00:54:34,079
notice that the observations so far have

1291
00:54:38,150 --> 00:54:36,480
predominantly come from observatories in

1292
00:54:40,430 --> 00:54:38,160
the southern hemisphere this is because

1293
00:54:42,470 --> 00:54:40,440
didimos is in the southern sky but it's

1294
00:54:44,510 --> 00:54:42,480
moving North and so in not very many

1295
00:54:46,970 --> 00:54:44,520
more days and weeks it will be

1296
00:54:48,710 --> 00:54:46,980
accessible to uh telescopes in the

1297
00:54:50,990 --> 00:54:48,720
northern hemisphere including multiple

1298
00:54:53,270 --> 00:54:51,000
observatories in the U.S

1299
00:54:55,549 --> 00:54:53,280
okay we have time for two more so

1300
00:54:57,589 --> 00:54:55,559
operator will take one in the room

1301
00:54:59,089 --> 00:54:57,599
please come tonight state your name and

1302
00:55:01,730 --> 00:54:59,099
media affiliation

1303
00:55:03,290 --> 00:55:01,740
hi this Isom again from AFP um Nancy

1304
00:55:04,970 --> 00:55:03,300
just uh on the breakdown of the

1305
00:55:07,790 --> 00:55:04,980
telescopes again

1306
00:55:09,349 --> 00:55:07,800
um so uh the the first four you

1307
00:55:11,329 --> 00:55:09,359
mentioned were all Optical a lot then

1308
00:55:13,190 --> 00:55:11,339
there were a couple of radar uh this

1309
00:55:16,309 --> 00:55:13,200
radio also have a plot to play or

1310
00:55:19,490 --> 00:55:16,319
potentially or um an addition to that or

1311
00:55:21,950 --> 00:55:19,500
is is or is that um not the case sorry

1312
00:55:24,049 --> 00:55:21,960
it's a kind of a technical question

1313
00:55:25,130 --> 00:55:24,059

um no I mean there's a there's a lot of

1314
00:55:27,049 --> 00:55:25,140
different things I mean really today

1315
00:55:29,210 --> 00:55:27,059
we've been focused on this period change

1316
00:55:31,130 --> 00:55:29,220
result and so those are the the six that

1317
00:55:33,349 --> 00:55:31,140
have contributed to that result for the

1318
00:55:40,250 --> 00:55:35,450
okay great we'll take two more on the

1319
00:55:45,589 --> 00:55:42,829
the healthcare line is open of NPR

1320
00:55:47,569 --> 00:55:45,599
please State your full name

1321
00:55:48,950 --> 00:55:47,579
hi there Jeff from kill with national

1322
00:55:51,410 --> 00:55:48,960
public radio

1323
00:55:54,410 --> 00:55:51,420
um thanks for taking my questions I I

1324
00:55:57,109 --> 00:55:54,420
had two one was so am I understanding

1325
00:55:58,910 --> 00:55:57,119
that there is no sort of follow-up Mac

1326
00:56:01,490 --> 00:55:58,920
and escrow admission with a bigger

1327
00:56:03,530 --> 00:56:01,500
impactor or any sort of plan for

1328
00:56:05,569 --> 00:56:03,540
follow-up missions along the lines of

1329
00:56:08,270 --> 00:56:05,579
Dart but this is it for now

1330
00:56:11,450 --> 00:56:08,280
and then secondly could you explain a

1331
00:56:13,730 --> 00:56:11,460
little more about how the ejecta helped

1332
00:56:17,030 --> 00:56:13,740
the asteroid move so so what was the

1333
00:56:18,890 --> 00:56:17,040
mechanism when when the impactor hit why

1334
00:56:21,890 --> 00:56:18,900
did this additional ejector come off and

1335
00:56:23,750 --> 00:56:21,900
how did that move the the asteroids

1336
00:56:25,250 --> 00:56:23,760
so this is Lori I'll take the first part

1337
00:56:28,250 --> 00:56:25,260
of your question about what what's

1338
00:56:30,109 --> 00:56:28,260

coming next in planetary defense

1339
00:56:32,510 --> 00:56:30,119
um you know the the dart mission was an

1340
00:56:35,930 --> 00:56:32,520
incredible demonstration of this first

1341
00:56:37,609 --> 00:56:35,940
ever test of its kind we certainly want

1342
00:56:40,790 --> 00:56:37,619
to make sure we analyze the data and

1343
00:56:43,390 --> 00:56:40,800
really understand very well what we've

1344
00:56:46,430 --> 00:56:43,400
done here as we think about other

1345
00:56:48,170 --> 00:56:46,440
potential uh you know

1346
00:56:49,549 --> 00:56:48,180
demonstrations that could occur in the

1347
00:56:52,370 --> 00:56:49,559
future either of this technique or other

1348
00:56:55,790 --> 00:56:52,380
mitigation techniques but we are in the

1349
00:56:57,530 --> 00:56:55,800
planetary uh world within NASA as Nancy

1350
00:56:59,750 --> 00:56:57,540
mentioned we have a decadal survey that

1351
00:57:01,910 --> 00:56:59,760
the national academies provides to us

1352
00:57:03,530 --> 00:57:01,920
and as Nancy said planetary defense was

1353
00:57:06,230 --> 00:57:03,540
an important part of that National

1354
00:57:08,150 --> 00:57:06,240
Academy's study that was just released

1355
00:57:10,390 --> 00:57:08,160
in April and they've actually provided

1356
00:57:13,370 --> 00:57:10,400
for us the highest priority activities

1357
00:57:15,349 --> 00:57:13,380
that we should be focused on in the

1358
00:57:17,690 --> 00:57:15,359
coming decade within planetary defense

1359
00:57:19,790 --> 00:57:17,700
and those highest priorities are first

1360
00:57:22,430 --> 00:57:19,800
of all as we've noted the ability to be

1361
00:57:24,290 --> 00:57:22,440
able to detect and characterize these

1362
00:57:27,290 --> 00:57:24,300
objects that being the single most

1363
00:57:29,210 --> 00:57:27,300

important factor that we need to know is

1364
00:57:31,190 --> 00:57:29,220
which ones out there are potentially

1365
00:57:33,410 --> 00:57:31,200
dangerous and and when might they be

1366
00:57:34,849 --> 00:57:33,420
potentially dangerous and so that's the

1367
00:57:37,970 --> 00:57:34,859
near Earth object surveyor Mission which

1368
00:57:40,430 --> 00:57:37,980
is underway the next priority mission

1369
00:57:42,650 --> 00:57:40,440
that they recommended was that we should

1370
00:57:45,530 --> 00:57:42,660
explore and look into a mission that

1371
00:57:47,089 --> 00:57:45,540
could be a rapid response primarily to

1372
00:57:49,130 --> 00:57:47,099
do the reconnaissance as we were saying

1373
00:57:50,990 --> 00:57:49,140
we really need to know if there is an

1374
00:57:52,670 --> 00:57:51,000
asteroid that gets detected that could

1375
00:57:55,430 --> 00:57:52,680
would be dangerous we want to know how

1376
00:57:57,410 --> 00:57:55,440
big is it is it a solid rock or is it a

1377
00:57:59,030 --> 00:57:57,420
collection or you know pile of rubble

1378
00:58:00,950 --> 00:57:59,040
that kind of information would be

1379
00:58:02,690 --> 00:58:00,960
critically important and so those are

1380
00:58:04,190 --> 00:58:02,700
the next two highest priorities within

1381
00:58:06,650 --> 00:58:04,200
planetary defense

1382
00:58:08,809 --> 00:58:06,660
thank you we'll take one more question

1383
00:58:17,630 --> 00:58:08,819
on the line and then I'll make closing

1384
00:58:22,450 --> 00:58:20,150
Megan your line is open please State

1385
00:58:25,370 --> 00:58:22,460
your affiliation and full name

1386
00:58:27,710 --> 00:58:25,380
hi there Megan Bartels from space.com

1387
00:58:29,750 --> 00:58:27,720
and thanks for taking my question

1388
00:58:31,849 --> 00:58:29,760

um this is particularly for Nancy but as

1389
00:58:35,210 --> 00:58:31,859
others want to chime in that's great

1390
00:58:37,130 --> 00:58:35,220
um those fabulous images that you showed

1391
00:58:39,349 --> 00:58:37,140
from Hubble and others how does the

1392
00:58:41,870 --> 00:58:39,359
objecta and queen that you see there

1393
00:58:44,630 --> 00:58:41,880
compare with sort of the most dramatic

1394
00:58:46,910 --> 00:58:44,640
scenario the team had hoped for and did

1395
00:58:48,770 --> 00:58:46,920
that degree at all complicate the

1396
00:58:52,609 --> 00:58:48,780
orbital measurement to determine that

1397
00:58:55,490 --> 00:58:52,619
32-minute change thank you

1398
00:58:57,890 --> 00:58:55,500
the images of the ejecta truly are

1399
00:58:59,930 --> 00:58:57,900
spectacular and it's just fabulous that

1400
00:59:02,569 --> 00:58:59,940
telescopes and in space and around the

1401
00:59:04,370 --> 00:59:02,579
Earth are continuing to share this and

1402
00:59:06,890 --> 00:59:04,380
and understand what's happening the

1403
00:59:08,690 --> 00:59:06,900
period change is what it is this has

1404
00:59:10,849 --> 00:59:08,700
been imparted and so this continuing

1405
00:59:12,770 --> 00:59:10,859
evolution of the ejecta you know is

1406
00:59:14,450 --> 00:59:12,780
obviously no longer really contributing

1407
00:59:16,549 --> 00:59:14,460
to that in creating this spectacular

1408
00:59:18,710 --> 00:59:16,559
tale that you're seeing

1409
00:59:21,170 --> 00:59:18,720
um when the team considered this like

1410
00:59:23,089 --> 00:59:21,180
Tom's last picture I think so nicely

1411
00:59:24,890 --> 00:59:23,099
showed you know every little wiggle and

1412
00:59:27,109 --> 00:59:24,900
every little thing that the Italian

1413
00:59:28,609 --> 00:59:27,119

space agency lead to a cube so

1414
00:59:31,490 --> 00:59:28,619
dramatically shows there to understand

1415
00:59:33,950 --> 00:59:31,500
the ejecta this is beyond the resolution

1416
00:59:35,930 --> 00:59:33,960
of the models that were done but is a

1417
00:59:37,730 --> 00:59:35,940
wealth of data that the team's going to

1418
00:59:40,130 --> 00:59:37,740
be digging into to really understand

1419
00:59:43,690 --> 00:59:40,140
this event and it's very exciting to be

1420
00:59:46,370 --> 00:59:43,700
in this position to be doing this now

1421
00:59:48,470 --> 00:59:46,380
excellent thank you so much everyone for

1422
00:59:51,049 --> 00:59:48,480
participating especially our speakers

1423
00:59:54,890 --> 00:59:51,059
here at NASA headquarters and also Mr

1424
00:59:55,970 --> 00:59:54,900
Giorgio sokocha who is joining us on the

1425
00:59:57,650 --> 00:59:55,980
line

1426
00:59:59,990 --> 00:59:57,660
um and media who came to attend here

1427
01:00:02,210 --> 01:00:00,000
today for more information about the

1428
01:00:05,390 --> 01:00:02,220
dart Mission you can go to nasa.gov

1429
01:00:07,849 --> 01:00:05,400
start and also follow us on social media

1430
01:00:09,289 --> 01:00:07,859
for additional media questions if you

1431
01:00:11,210 --> 01:00:09,299
did not have the opportunity to ask

1432
01:00:13,130 --> 01:00:11,220
questions either in the room or on the

1433
01:00:15,049 --> 01:00:13,140
phone please follow up with Josh Handel

1434
01:00:16,910 --> 01:00:15,059
who's here over there

1435
01:00:19,190 --> 01:00:16,920
um and uh he'll be happy to answer any

1436
01:00:20,630 --> 01:00:19,200
questions before your deadline thanks

1437
01:00:37,320 --> 01:00:20,640
everyone and have a good rest of the

1438
01:00:37,330 --> 01:00:49,210

[Music]