
"AT NASA WE FIND
ASTEROIDS
BEFORE THEY
FIND US"
LIVE Q&A

1
00:00:04,870 --> 00:00:02,149
just a spacecraft that is going to go

2
00:00:06,710 --> 00:00:04,880
and smack an asteroid it is fantastic to

3
00:00:08,870 --> 00:00:06,720
see it in real life dart will only be

4
00:00:12,070 --> 00:00:08,880
changing the period of the orbit of

5
00:00:13,990 --> 00:00:12,080
dimorphose by a tiny amount and really

6
00:00:16,470 --> 00:00:14,000
that's all that's needed in the event

7
00:00:19,029 --> 00:00:16,480
that an asteroid is discovered well

8
00:00:21,750 --> 00:00:19,039
ahead of time before it might impact

9
00:00:23,990 --> 00:00:21,760
earth you can't have emission like dart

10
00:00:25,750 --> 00:00:24,000
without finding the asteroids first that

11
00:00:27,750 --> 00:00:25,760
involves searching for near-earth

12
00:00:29,990 --> 00:00:27,760
asteroids getting them in the catalog

13
00:00:31,910 --> 00:00:30,000

calculating their orbits tracking them

14
00:00:34,709 --> 00:00:31,920
keeping an eye on them you know as a kid

15
00:00:37,190 --> 00:00:34,719
i loved astronomy i love star trek so i

16
00:00:39,910 --> 00:00:37,200
became a research astronomer my first

17
00:00:42,470 --> 00:00:39,920
observing run ever was observing the

18
00:00:44,389 --> 00:00:42,480
impact of comet shoemaker lady9 with

19
00:00:45,910 --> 00:00:44,399
jupiter i never would have known

20
00:00:48,709 --> 00:00:45,920
that somehow my career would kind of

21
00:00:50,869 --> 00:00:48,719
come full circle to be part of something

22
00:00:52,790 --> 00:00:50,879
that affects people's everyday lives i

23
00:00:54,389 --> 00:00:52,800
feel really honored and humbled to be

24
00:00:56,950 --> 00:00:54,399
working in the field of planetary

25
00:00:58,470 --> 00:00:56,960
defense because it can affect people

26
00:01:00,950 --> 00:00:58,480
it's just really exciting to have that

27
00:01:03,990 --> 00:01:00,960
kind of role in an area of science that

28
00:01:10,469 --> 00:01:04,000
has such a broader impact

29
00:01:15,030 --> 00:01:12,870
hi everyone i'm josh handel and i'm a

30
00:01:17,590 --> 00:01:15,040
public affairs officer here at nasa and

31
00:01:19,590 --> 00:01:17,600
i am so excited to be joined today by dr

32
00:01:21,510 --> 00:01:19,600
kelly fast you just had the opportunity

33
00:01:23,590 --> 00:01:21,520
to meet kelly thank you so much for

34
00:01:25,350 --> 00:01:23,600
joining us today

35
00:01:28,469 --> 00:01:25,360
oh thank you josh i'm glad for this

36
00:01:30,069 --> 00:01:28,479
opportunity to answer some questions

37
00:01:31,590 --> 00:01:30,079
kelly's here to answer all of your

38
00:01:34,469 --> 00:01:31,600

burning questions about planetary

39
00:01:36,310 --> 00:01:34,479
defense at nasa and the dart mission if

40
00:01:39,190 --> 00:01:36,320
you have a question you'd like to ask

41
00:01:40,870 --> 00:01:39,200
send it in using the hashtag ask nasa or

42
00:01:42,789 --> 00:01:40,880
by writing in the comment box wherever

43
00:01:45,190 --> 00:01:42,799
you're watching today's broadcast

44
00:01:46,550 --> 00:01:45,200
so kelly in your video we learned a

45
00:01:48,389 --> 00:01:46,560
little bit more about your role with

46
00:01:50,310 --> 00:01:48,399
nasa's planetary defense coordination

47
00:01:52,230 --> 00:01:50,320
office in the dart mission and you have

48
00:01:54,870 --> 00:01:52,240
this really great line that says we need

49
00:01:56,709 --> 00:01:54,880
to find asteroids before they find us so

50
00:01:57,910 --> 00:01:56,719
if we need to we can get them before

51
00:01:59,590 --> 00:01:57,920
they get us

52
00:02:01,270 --> 00:01:59,600
can you tell me a little bit more about

53
00:02:04,310 --> 00:02:01,280
why that's important and specifically

54
00:02:06,709 --> 00:02:04,320
for a mission like dart

55
00:02:09,430 --> 00:02:06,719
well sure i think it was don yeomans who

56
00:02:11,510 --> 00:02:09,440
coined that phrase uh find them before

57
00:02:14,070 --> 00:02:11,520
they find us and then so i kind of added

58
00:02:16,949 --> 00:02:14,080
to it but get them before they get us

59
00:02:19,110 --> 00:02:16,959
but uh even though the dart is a very

60
00:02:20,949 --> 00:02:19,120
important test here to try to get some

61
00:02:23,110 --> 00:02:20,959
tools in the toolbox should an asteroid

62
00:02:25,190 --> 00:02:23,120
ever be discovered that does pose an

63
00:02:26,949 --> 00:02:25,200

impact threat we still have to do that

64
00:02:29,510 --> 00:02:26,959
other side of the coin which is really

65
00:02:32,070 --> 00:02:29,520
the primary mission of finding near

66
00:02:34,150 --> 00:02:32,080
earth asteroids and so the program at

67
00:02:35,750 --> 00:02:34,160
nasa the nearest object observations

68
00:02:39,910 --> 00:02:35,760
program

69
00:02:43,030 --> 00:02:39,920
funds projects to uh take telescopes uh

70
00:02:45,910 --> 00:02:43,040
every night surveying the skies looking

71
00:02:48,869 --> 00:02:45,920
for new near-earth asteroids and uh

72
00:02:50,949 --> 00:02:48,879
calculating their orbits uh telescopes

73
00:02:53,589 --> 00:02:50,959
like the pan stars telescopes university

74
00:02:55,990 --> 00:02:53,599
of hawaii or the catalina sky survey

75
00:02:58,070 --> 00:02:56,000
university of arizona um other

76
00:03:01,350 --> 00:02:58,080
telescopes

77
00:03:02,949 --> 00:03:01,360
both funded by nasa and then also

78
00:03:05,030 --> 00:03:02,959
observatories around the world

79
00:03:08,470 --> 00:03:05,040
continuing to follow up those

80
00:03:10,149 --> 00:03:08,480
discoveries uh in order to

81
00:03:13,430 --> 00:03:10,159
fill out the catalog so that we even

82
00:03:16,229 --> 00:03:13,440
know if we would ever need a technique

83
00:03:17,509 --> 00:03:16,239
like dart to divert an asteroid and

84
00:03:19,670 --> 00:03:17,519
you'd want to know that well ahead of

85
00:03:23,350 --> 00:03:19,680
time and so that is why you'd want to

86
00:03:25,430 --> 00:03:23,360
find them well before they find us

87
00:03:27,190 --> 00:03:25,440
it's a great answer thank you kelly

88
00:03:29,750 --> 00:03:27,200

all right well all of your questions are

89
00:03:31,589 --> 00:03:29,760
starting to fly in so let's get started

90
00:03:33,430 --> 00:03:31,599
as a reminder if you have a question

91
00:03:35,589 --> 00:03:33,440
you'd like to ask kelly about planetary

92
00:03:37,350 --> 00:03:35,599
defense at nasa or the d'art mission

93
00:03:39,670 --> 00:03:37,360
send it in using

94
00:03:40,949 --> 00:03:39,680
ask nasa or by writing in the comment

95
00:03:42,309 --> 00:03:40,959
box wherever you're watching today's

96
00:03:45,509 --> 00:03:42,319
broadcast

97
00:03:47,750 --> 00:03:45,519
so kelly zach burnett on twitter asks

98
00:03:49,670 --> 00:03:47,760
what kinds of light curve modeling are

99
00:03:52,070 --> 00:03:49,680
done on a mission like this because from

100
00:03:54,229 --> 00:03:52,080
what i understand resolving power of

101
00:03:57,030 --> 00:03:54,239
optical telescopes usually isn't enough

102
00:03:58,949 --> 00:03:57,040
to resolve asteroids so how do you infer

103
00:04:00,630 --> 00:03:58,959
the geometry without directly observing

104
00:04:03,589 --> 00:04:00,640
it

105
00:04:05,509 --> 00:04:03,599
well that's a good point because uh the

106
00:04:06,390 --> 00:04:05,519
asteroid system did a most is going to

107
00:04:07,509 --> 00:04:06,400
pass

108
00:04:09,350 --> 00:04:07,519
earth well

109
00:04:12,070 --> 00:04:09,360
well away from earth but it's a chance

110
00:04:14,470 --> 00:04:12,080
to look at it with telescopes when dart

111
00:04:16,550 --> 00:04:14,480
impacts and that is going to be how we

112
00:04:19,749 --> 00:04:16,560
determine and what happened after dart

113
00:04:23,030 --> 00:04:19,759

impacted the moon of uh of dynamos

114
00:04:24,230 --> 00:04:23,040
but uh it's still so far away like it

115
00:04:26,469 --> 00:04:24,240
was mentioned there in the question the

116
00:04:27,990 --> 00:04:26,479
resolving power is small and so you just

117
00:04:29,430 --> 00:04:28,000
see this point of light but this point

118
00:04:31,270 --> 00:04:29,440
of light gets

119
00:04:32,310 --> 00:04:31,280
brighter and fainter and brighter and

120
00:04:35,909 --> 00:04:32,320
fainter

121
00:04:37,430 --> 00:04:35,919
as that moon of dynamos dimorphose goes

122
00:04:40,150 --> 00:04:37,440
around

123
00:04:42,150 --> 00:04:40,160
dynamos and passes in front passes

124
00:04:44,150 --> 00:04:42,160
behind you see the two together you see

125
00:04:46,150 --> 00:04:44,160
one blocking the other and so that's why

126
00:04:48,629 --> 00:04:46,160
the light goes up and down

127
00:04:51,110 --> 00:04:48,639
and so the period with which that light

128
00:04:53,830 --> 00:04:51,120
goes up and down which represents the

129
00:04:55,670 --> 00:04:53,840
time of that orbit of the moon around

130
00:04:58,070 --> 00:04:55,680
dynamos

131
00:04:59,830 --> 00:04:58,080
that is what will be changed by dart

132
00:05:02,230 --> 00:04:59,840
dart will impact

133
00:05:04,230 --> 00:05:02,240
dimorophos and just change its speed

134
00:05:06,070 --> 00:05:04,240
slightly and so that will change that

135
00:05:07,830 --> 00:05:06,080
period and so in telescopes on the

136
00:05:09,590 --> 00:05:07,840
ground yes they can't resolve the

137
00:05:11,510 --> 00:05:09,600
individual asteroids but they can look

138
00:05:13,909 --> 00:05:11,520

at that combined light and through

139
00:05:15,990 --> 00:05:13,919
modeling the astronomers on the

140
00:05:16,790 --> 00:05:16,000
investigation team will do a fantastic

141
00:05:18,790 --> 00:05:16,800
job

142
00:05:20,230 --> 00:05:18,800
of backing out that information to be

143
00:05:24,710 --> 00:05:20,240
able to assess

144
00:05:26,629 --> 00:05:24,720
what effect did that dart impact have on

145
00:05:28,710 --> 00:05:26,639
the orbit and then essentially on our

146
00:05:31,909 --> 00:05:28,720
capability to be able to deflect an

147
00:05:35,749 --> 00:05:31,919
asteroid uh of that size regime should

148
00:05:37,189 --> 00:05:35,759
we ever be faced with with that need

149
00:05:39,270 --> 00:05:37,199
that's a good point kelly and you do

150
00:05:41,270 --> 00:05:39,280
mention that we are going to a binary

151
00:05:42,950 --> 00:05:41,280
asteroid system and actually targeting

152
00:05:46,390 --> 00:05:42,960
the asteroid moon so i would imagine

153
00:05:48,550 --> 00:05:46,400
that's important for this experiment

154
00:05:51,029 --> 00:05:48,560
right this is kind of a nice opportunity

155
00:05:53,749 --> 00:05:51,039
that that nature has given us to be able

156
00:05:56,790 --> 00:05:53,759
to uh test like a technique in like a

157
00:05:58,790 --> 00:05:56,800
laboratory setting uh by having a binary

158
00:06:01,189 --> 00:05:58,800
asteroid like this it's much easier to

159
00:06:03,990 --> 00:06:01,199
detect from the earth what an impact

160
00:06:06,390 --> 00:06:04,000
like dart might have on the orbit of

161
00:06:08,390 --> 00:06:06,400
like the moonlit around the asteroid

162
00:06:10,950 --> 00:06:08,400
dynamos rather than trying to test this

163
00:06:12,710 --> 00:06:10,960

just changing the asteroids orbit around

164
00:06:14,469 --> 00:06:12,720
the sun in fact an impact like dart will

165
00:06:18,469 --> 00:06:14,479
have very uh

166
00:06:21,990 --> 00:06:18,479
little or no impact uh in that sense no

167
00:06:24,710 --> 00:06:22,000
change but it's that orbit around

168
00:06:26,629 --> 00:06:24,720
dynamos by the moonlit dimorphose that

169
00:06:28,469 --> 00:06:26,639
will be affected and that is much easier

170
00:06:29,830 --> 00:06:28,479
to measure in this binary asteroid

171
00:06:32,150 --> 00:06:29,840
system so everything kind of comes

172
00:06:33,830 --> 00:06:32,160
together where where dynamos just kind

173
00:06:35,830 --> 00:06:33,840
of kindly comes to the right position

174
00:06:39,270 --> 00:06:35,840
where telescopes can just watch from

175
00:06:41,830 --> 00:06:39,280
earth and see what that changes after

176
00:06:43,749 --> 00:06:41,840
dart has its encounter and that that

177
00:06:45,110 --> 00:06:43,759
information will

178
00:06:47,350 --> 00:06:45,120
feed into

179
00:06:50,309 --> 00:06:47,360
understanding the kinetic impact or

180
00:06:52,230 --> 00:06:50,319
technique in general and the dart team

181
00:06:54,230 --> 00:06:52,240
and the astronomers on the team will

182
00:06:56,629 --> 00:06:54,240
will communicate and feed all that into

183
00:06:58,070 --> 00:06:56,639
their modeling so that they can

184
00:07:01,430 --> 00:06:58,080
turn that into

185
00:07:04,309 --> 00:07:01,440
some real results about uh what what we

186
00:07:06,550 --> 00:07:04,319
could expect uh should we ever need to

187
00:07:08,230 --> 00:07:06,560
design a spacecraft to do this for real

188
00:07:10,710 --> 00:07:08,240

the nice thing about the ditimo system

189
00:07:12,070 --> 00:07:10,720
is you know it poses no threat to earth

190
00:07:14,629 --> 00:07:12,080
we couldn't even make it a threat to

191
00:07:16,150 --> 00:07:14,639
earth it's a wonderful laboratory that

192
00:07:17,990 --> 00:07:16,160
nature's kind of put right at the right

193
00:07:20,309 --> 00:07:18,000
place the right time

194
00:07:21,830 --> 00:07:20,319
where we can use this combination of

195
00:07:25,830 --> 00:07:21,840
ground-based telescopes and the

196
00:07:27,749 --> 00:07:25,840
spacecraft uh to to do this experiment

197
00:07:29,350 --> 00:07:27,759
which is great because it's nice to do

198
00:07:30,950 --> 00:07:29,360
this at a time when we don't need it

199
00:07:33,670 --> 00:07:30,960
just so if there is a time that we need

200
00:07:35,270 --> 00:07:33,680
it's not the first time we've ever uh

201
00:07:36,710 --> 00:07:35,280
tried to

202
00:07:39,830 --> 00:07:36,720
kind of test some of the techniques that

203
00:07:41,909 --> 00:07:39,840
might be in the toolbox

204
00:07:43,350 --> 00:07:41,919
that's a very good point and i think you

205
00:07:45,830 --> 00:07:43,360
actually may have answered jeremy

206
00:07:47,990 --> 00:07:45,840
deutsch's question on youtube who asks

207
00:07:50,070 --> 00:07:48,000
what if the impact test makes it

208
00:07:52,230 --> 00:07:50,080
accidentally go more towards earth so

209
00:07:54,390 --> 00:07:52,240
kelly is it at all possible that dart

210
00:07:56,790 --> 00:07:54,400
can somehow redirect the asteroid moon

211
00:07:59,909 --> 00:07:56,800
dimorphis toward earth

212
00:08:03,990 --> 00:07:59,919
now all it will do is uh just change the

213
00:08:05,909 --> 00:08:04,000

speed of the uh the orbit of dimorphose

214
00:08:08,469 --> 00:08:05,919
slightly change the period of the orbit

215
00:08:10,629 --> 00:08:08,479
it's still going to be in orbit around

216
00:08:11,589 --> 00:08:10,639
the asteroid didymos the system will

217
00:08:14,550 --> 00:08:11,599
still

218
00:08:16,309 --> 00:08:14,560
be in the same orbit around the sun and

219
00:08:18,150 --> 00:08:16,319
and we couldn't change it in a way that

220
00:08:20,790 --> 00:08:18,160
would make it threatening even if we

221
00:08:23,430 --> 00:08:20,800
wanted to and so again this is why this

222
00:08:26,309 --> 00:08:23,440
is a perfect uh kind of laboratory

223
00:08:27,589 --> 00:08:26,319
setting a perfect way to be able to do

224
00:08:32,070 --> 00:08:27,599
this test

225
00:08:36,949 --> 00:08:34,949
so mandy lane on twitter asks have you

226
00:08:38,469 --> 00:08:36,959
ever had the idea that you should slow

227
00:08:40,550 --> 00:08:38,479
down the asteroid to the point where it

228
00:08:43,509 --> 00:08:40,560
stops moving instead of altering its

229
00:08:47,750 --> 00:08:45,750
well that's interesting because uh uh

230
00:08:49,750 --> 00:08:47,760
you know again trying to change the

231
00:08:51,509 --> 00:08:49,760
speed of something in space you know

232
00:08:54,230 --> 00:08:51,519
that takes a lot of energy and and you

233
00:08:57,110 --> 00:08:54,240
don't have to um it wouldn't be possible

234
00:08:58,870 --> 00:08:57,120
to just stop something altogether or

235
00:09:01,269 --> 00:08:58,880
have it go the other direction around

236
00:09:03,430 --> 00:09:01,279
the sun everything's moving very very

237
00:09:04,310 --> 00:09:03,440
fast in space around the sun

238
00:09:05,829 --> 00:09:04,320

but

239
00:09:08,230 --> 00:09:05,839
about it doesn't really matter because

240
00:09:10,310 --> 00:09:08,240
all that matters is that relative motion

241
00:09:12,230 --> 00:09:10,320
between um

242
00:09:14,389 --> 00:09:12,240
an asteroid that could pose a threat to

243
00:09:15,910 --> 00:09:14,399
earth and the earth itself and so all

244
00:09:17,430 --> 00:09:15,920
you would need to do is deflect it just

245
00:09:18,790 --> 00:09:17,440
enough so that it doesn't hit earth you

246
00:09:20,790 --> 00:09:18,800
wouldn't have to worry about like

247
00:09:22,870 --> 00:09:20,800
stopping its motion altogether or

248
00:09:24,310 --> 00:09:22,880
changing it a large amount you only need

249
00:09:25,509 --> 00:09:24,320
to do it um

250
00:09:27,670 --> 00:09:25,519
the amount that you need to so it

251
00:09:28,470 --> 00:09:27,680
doesn't doesn't hit the earth and then

252
00:09:30,070 --> 00:09:28,480
uh

253
00:09:30,870 --> 00:09:30,080
and so and that's important because the

254
00:09:35,430 --> 00:09:30,880
more

255
00:09:37,110 --> 00:09:35,440
changing an orbit that's

256
00:09:40,150 --> 00:09:37,120
a larger launch vehicle larger

257
00:09:43,590 --> 00:09:40,160
spacecraft and it and it might not even

258
00:09:45,350 --> 00:09:43,600
be possible to to do a large change

259
00:09:47,110 --> 00:09:45,360
but all we need is whatever change might

260
00:09:49,030 --> 00:09:47,120
be needed in the event of an asteroid

261
00:09:50,470 --> 00:09:49,040
threat just need to deflect it enough so

262
00:09:52,630 --> 00:09:50,480
that in the future

263
00:09:54,389 --> 00:09:52,640

it doesn't find itself in the same place

264
00:09:55,829 --> 00:09:54,399
as the earth

265
00:09:57,430 --> 00:09:55,839
and i would imagine as you said that's

266
00:09:59,190 --> 00:09:57,440
why it's important to find them early

267
00:10:01,269 --> 00:09:59,200
right because the further awaited it is

268
00:10:03,030 --> 00:10:01,279
from us the smaller of an impact would

269
00:10:05,110 --> 00:10:03,040
be needed

270
00:10:07,829 --> 00:10:05,120
right and that's why nasa funds uh

271
00:10:08,949 --> 00:10:07,839
survey telescopes to be operating every

272
00:10:11,990 --> 00:10:08,959
night

273
00:10:13,829 --> 00:10:12,000
to survey the skies looking for moving

274
00:10:16,230 --> 00:10:13,839
objects against the stars and

275
00:10:19,030 --> 00:10:16,240
determining that yep these are new uh

276
00:10:20,710 --> 00:10:19,040
discoveries or okay we're here's one

277
00:10:22,870 --> 00:10:20,720
we're seeing it again from a few years

278
00:10:24,870 --> 00:10:22,880
ago building up the catalog

279
00:10:26,870 --> 00:10:24,880
and calculating the orbit so that we

280
00:10:28,230 --> 00:10:26,880
know where they are in the future you

281
00:10:29,750 --> 00:10:28,240
know of all the asteroids out in the

282
00:10:31,509 --> 00:10:29,760
asteroid belt but it's the ones that

283
00:10:34,150 --> 00:10:31,519
come into earth's neighborhood that we

284
00:10:35,670 --> 00:10:34,160
want to keep an eye on and

285
00:10:37,990 --> 00:10:35,680
the nice thing is many near-earth

286
00:10:40,550 --> 00:10:38,000
asteroids never even come into earth's

287
00:10:42,710 --> 00:10:40,560
uh vicinity um but there's a there's a

288
00:10:44,230 --> 00:10:42,720

class of uh near earth asteroids that

289
00:10:45,750 --> 00:10:44,240
come into the inner solar system that

290
00:10:47,350 --> 00:10:45,760
that actually come close to earth's

291
00:10:51,110 --> 00:10:47,360
orbit and so we want to keep an eye on

292
00:10:53,110 --> 00:10:51,120
those uh and then also um but continue

293
00:10:55,030 --> 00:10:53,120
to discover the ones that we don't know

294
00:10:58,150 --> 00:10:55,040
about that's the bigger concern because

295
00:11:01,030 --> 00:10:58,160
there is no known asteroid impact threat

296
00:11:02,470 --> 00:11:01,040
to earth that could cause uh damage that

297
00:11:05,030 --> 00:11:02,480
we would want to worry about sending a

298
00:11:06,949 --> 00:11:05,040
spacecraft out which is fabulous but we

299
00:11:09,990 --> 00:11:06,959
want to make sure that we continue to

300
00:11:14,310 --> 00:11:10,000
survey for asteroids utilizing

301
00:11:15,110 --> 00:11:14,320
telescopes on the ground uh utilizing uh

302
00:12:18,150 --> 00:11:15,120
a

303
00:12:21,430 --> 00:12:18,160
boulders they they do studies on

304
00:12:24,389 --> 00:12:21,440
meteorite materials uh they uh they take

305
00:12:27,110 --> 00:12:24,399
things that simulate uh asteroids and do

306
00:12:28,870 --> 00:12:27,120
impacts in the lab and so that that

307
00:12:30,629 --> 00:12:28,880
tells you so much but to actually do

308
00:12:32,230 --> 00:12:30,639
this with a real asteroid it's important

309
00:12:34,949 --> 00:12:32,240
to really understand what are their

310
00:12:37,110 --> 00:12:34,959
properties uh and what are the extra

311
00:12:39,350 --> 00:12:37,120
factors there i mean we know physics

312
00:12:42,629 --> 00:12:39,360
with perfect objects but

313
00:12:44,949 --> 00:12:42,639

to uh have an object impact an asteroid

314
00:12:46,629 --> 00:12:44,959
and then to have that material blow off

315
00:12:48,629 --> 00:12:46,639
the asteroid for something that has like

316
00:12:50,470 --> 00:12:48,639
rubble on the surface which might give

317
00:12:51,990 --> 00:12:50,480
it an extra kick you know just like if

318
00:12:53,509 --> 00:12:52,000
you're standing on a skateboard and you

319
00:12:55,269 --> 00:12:53,519
threw a baseball it would send you the

320
00:12:57,509 --> 00:12:55,279
other direction i want to understand

321
00:12:59,990 --> 00:12:57,519
those properties of just not just the

322
00:13:02,550 --> 00:13:00,000
impact but what happens afterwards and

323
00:13:04,310 --> 00:13:02,560
um how that all adds up so that that can

324
00:13:07,670 --> 00:13:04,320
be understood and a lot of that happens

325
00:13:09,509 --> 00:13:07,680
in the lab and in the modeling community

326
00:13:11,190 --> 00:13:09,519
doing calculations

327
00:13:12,870 --> 00:13:11,200
and this will be a good test of all of

328
00:13:19,430 --> 00:13:12,880
that

329
00:13:21,509 --> 00:13:19,440
zubie on youtube who asks will the

330
00:13:23,829 --> 00:13:21,519
orbital debris after the collision

331
00:13:25,430 --> 00:13:23,839
endanger any of the satellites sooner or

332
00:13:27,750 --> 00:13:25,440
later

333
00:13:30,389 --> 00:13:27,760
oh this is so far away that uh no this

334
00:13:33,750 --> 00:13:30,399
this does not pose a danger to uh

335
00:13:35,430 --> 00:13:33,760
satellites on earth or to or to uh

336
00:13:37,430 --> 00:13:35,440
anywhere because

337
00:13:39,030 --> 00:13:37,440
this is so far away

338
00:13:40,150 --> 00:13:39,040

so that's not going to be a problem at

339
00:13:42,629 --> 00:13:40,160
all

340
00:13:44,069 --> 00:13:42,639
if anything there's more

341
00:13:46,069 --> 00:13:44,079
we have

342
00:13:48,389 --> 00:13:46,079
meteor showers every year when the earth

343
00:13:50,550 --> 00:13:48,399
comes around the sun and goes through

344
00:13:52,470 --> 00:13:50,560
debris from a comet's tail and we have

345
00:13:53,829 --> 00:13:52,480
the occasional meteoroid that enters

346
00:13:55,910 --> 00:13:53,839
earth's atmosphere you see a nice

347
00:13:58,710 --> 00:13:55,920
fireball that's happening all the time

348
00:14:02,069 --> 00:13:58,720
anyway and so this is not going to add

349
00:14:04,949 --> 00:14:02,079
add to any of that

350
00:14:06,710 --> 00:14:04,959
simon taylor on youtube asks what is the

351
00:14:09,030 --> 00:14:06,720
percentage chance of us meeting the

352
00:14:12,629 --> 00:14:09,040
possibility of having a life-threatening

353
00:14:14,710 --> 00:14:12,639
asteroid strike in the near future

354
00:14:18,230 --> 00:14:14,720
well the the nice thing is this is a

355
00:14:19,670 --> 00:14:18,240
very rare event um and hopefully we'll

356
00:14:22,310 --> 00:14:19,680
never even have to deal with this in our

357
00:14:24,150 --> 00:14:22,320
lifetime and our children's lifetime

358
00:14:24,949 --> 00:14:24,160
grandchildren's lifetimes

359
00:14:27,829 --> 00:14:24,959
um

360
00:14:30,550 --> 00:14:27,839
but we still would want to search and

361
00:14:33,509 --> 00:14:30,560
know even if uh something like a

362
00:14:36,310 --> 00:14:33,519
an asteroid uh impact that could cause

363
00:14:37,350 --> 00:14:36,320

like regional damage on the earth you

364
00:14:40,470 --> 00:14:37,360
know it might be like a once a

365
00:14:43,509 --> 00:14:40,480
millennium type event uh or even

366
00:14:44,470 --> 00:14:43,519
something like the uh chelyabinsk impact

367
00:14:49,750 --> 00:14:44,480
over

368
00:14:51,189 --> 00:14:49,760
asteroid uh disrupted in the atmosphere

369
00:14:54,230 --> 00:14:51,199
and there was a shock wave and it still

370
00:14:55,670 --> 00:14:54,240
did damage on the ground uh and so that

371
00:14:57,509 --> 00:14:55,680
was kind of the most serious thing we've

372
00:15:00,790 --> 00:14:57,519
seen and that's maybe like a maybe a

373
00:15:02,150 --> 00:15:00,800
once a century event and so it's so rare

374
00:15:04,069 --> 00:15:02,160
hopefully we'll never even deal with

375
00:15:06,949 --> 00:15:04,079
this in our lifetimes but

376
00:15:09,269 --> 00:15:06,959
again we still would want to look just

377
00:15:10,790 --> 00:15:09,279
so that we know um and so continue

378
00:15:13,430 --> 00:15:10,800
surveying the skies

379
00:15:15,430 --> 00:15:13,440
and cataloging those objects you know

380
00:15:17,910 --> 00:15:15,440
just so that there there is no surprise

381
00:15:19,750 --> 00:15:17,920
and so that um uh

382
00:15:22,870 --> 00:15:19,760
you know we've we we might know

383
00:15:26,310 --> 00:15:22,880
statistics and be able to infer from uh

384
00:15:29,670 --> 00:15:26,320
the geologic record but we still

385
00:15:31,269 --> 00:15:29,680
still need to look just to know

386
00:15:32,949 --> 00:15:31,279
absolutely we need to know what's out

387
00:15:34,150 --> 00:15:32,959
there before we can potentially mitigate

388
00:15:37,509 --> 00:15:34,160

anything

389
00:15:39,910 --> 00:15:37,519
so michael kilgore on facebook asks if

390
00:15:43,350 --> 00:15:39,920
dart is successful would it help enable

391
00:15:44,949 --> 00:15:43,360
nasa to deflect larger asteroids if so

392
00:15:47,509 --> 00:15:44,959
what is the largest asteroid that could

393
00:15:50,069 --> 00:15:47,519
be redirected

394
00:15:51,749 --> 00:15:50,079
i'm not sure of that answer offhand but

395
00:15:55,509 --> 00:15:51,759
certainly

396
00:15:57,269 --> 00:15:55,519
in this size regime demorphos the

397
00:15:58,389 --> 00:15:57,279
satellite of dynamos that is going to be

398
00:16:01,990 --> 00:15:58,399
impacted

399
00:16:03,910 --> 00:16:02,000
is about 160 meters in size and that

400
00:16:06,550 --> 00:16:03,920
kind of represents the

401
00:16:09,350 --> 00:16:06,560
uh sort of the size range that and

402
00:16:11,829 --> 00:16:09,360
larger uh with which the congress has

403
00:16:14,310 --> 00:16:11,839
tasked nasa with you know finding these

404
00:16:17,350 --> 00:16:14,320
asteroids because these could pose a

405
00:16:20,069 --> 00:16:17,360
regional uh damage threat to uh the

406
00:16:21,269 --> 00:16:20,079
earth should one impact and so the nice

407
00:16:22,629 --> 00:16:21,279
thing is that

408
00:16:25,509 --> 00:16:22,639
for that size

409
00:16:27,269 --> 00:16:25,519
a technique like dart you know could be

410
00:16:30,710 --> 00:16:27,279
very effective which is why this is

411
00:16:33,430 --> 00:16:30,720
being tested uh if there were

412
00:16:34,870 --> 00:16:33,440
asteroids that were much larger

413
00:16:37,670 --> 00:16:34,880

something that posed an impact threat

414
00:16:39,749 --> 00:16:37,680
that was much larger or if there was

415
00:16:41,590 --> 00:16:39,759
far less notice so that it wasn't

416
00:16:43,910 --> 00:16:41,600
possible to divert it with the kinetic

417
00:16:47,269 --> 00:16:43,920
impactor technique uh there are other

418
00:16:49,990 --> 00:16:47,279
techniques that can be utilized uh in

419
00:16:51,749 --> 00:16:50,000
the case of if there was a lot of uh

420
00:16:54,710 --> 00:16:51,759
warning there's some other techniques

421
00:16:56,629 --> 00:16:54,720
like a gravity tractor just using

422
00:16:58,470 --> 00:16:56,639
using gravity in nature having a

423
00:17:00,790 --> 00:16:58,480
spacecraft sitting next to an asteroid

424
00:17:02,150 --> 00:17:00,800
and kind of uh letting letting the aster

425
00:17:03,590 --> 00:17:02,160
letting the spacecraft tug on the

426
00:17:06,309 --> 00:17:03,600
asteroid with the natural force of

427
00:17:08,870 --> 00:17:06,319
gravity or enhancing it by picking up a

428
00:17:09,909 --> 00:17:08,880
boulder or what have you uh that's just

429
00:17:12,789 --> 00:17:09,919
another

430
00:17:14,230 --> 00:17:12,799
with long notice

431
00:17:15,829 --> 00:17:14,240
there's also

432
00:17:17,189 --> 00:17:15,839
you see it in the movies but never quite

433
00:17:19,829 --> 00:17:17,199
the right way

434
00:17:21,590 --> 00:17:19,839
for instance nuclear deflection is used

435
00:17:23,990 --> 00:17:21,600
but that really you know the goal

436
00:17:26,150 --> 00:17:24,000
wouldn't be to to blow something up

437
00:17:28,710 --> 00:17:26,160
again it's all about deflection and just

438
00:17:31,110 --> 00:17:28,720

uh just nudging it off its path and if

439
00:17:33,590 --> 00:17:31,120
there's something that is very large it

440
00:17:35,110 --> 00:17:33,600
would be possible to use a device to do

441
00:17:37,190 --> 00:17:35,120
a deflection

442
00:17:39,110 --> 00:17:37,200
so so there are other techniques that

443
00:17:42,549 --> 00:17:39,120
can be used but the kinetic impactor

444
00:17:44,950 --> 00:17:42,559
technique you can be used with uh the

445
00:17:47,110 --> 00:17:44,960
asteroids that are toward that smaller

446
00:17:49,270 --> 00:17:47,120
range that actually there are far more

447
00:17:51,510 --> 00:17:49,280
of them and so that the odds are that if

448
00:17:53,350 --> 00:17:51,520
something ever did pose an impact threat

449
00:17:55,430 --> 00:17:53,360
it would probably be in that size range

450
00:17:57,909 --> 00:17:55,440
and so that's why it's nice to test this

451
00:17:59,590 --> 00:17:57,919
technique but then continue modeling

452
00:18:01,990 --> 00:17:59,600
with the other techniques so that if

453
00:18:03,430 --> 00:18:02,000
they are required for a larger size you

454
00:18:06,549 --> 00:18:03,440
know that that's something that has been

455
00:18:08,150 --> 00:18:06,559
studied so uh again there's no there's

456
00:18:09,830 --> 00:18:08,160
no one solution but you try to do

457
00:18:11,510 --> 00:18:09,840
studies in all areas just so that you're

458
00:18:14,150 --> 00:18:11,520
prepared and you have a nice tool box to

459
00:18:15,990 --> 00:18:14,160
work with

460
00:18:18,070 --> 00:18:16,000
and for those just tuning in remember to

461
00:18:20,870 --> 00:18:18,080
send your questions in using the hashtag

462
00:18:22,710 --> 00:18:20,880
asknasa or by writing in the comment box

463
00:18:25,990 --> 00:18:22,720

of wherever you're watching today

464
00:18:28,310 --> 00:18:26,000
so kelly robert nolan on facebook asks

465
00:18:29,909 --> 00:18:28,320
before this process goes down do you

466
00:18:32,710 --> 00:18:29,919
believe it will move the asteroid

467
00:18:36,710 --> 00:18:35,029
no in fact we we really couldn't as you

468
00:18:39,430 --> 00:18:36,720
saw in some of those animations you know

469
00:18:42,230 --> 00:18:39,440
the dart spacecraft is far smaller than

470
00:18:44,710 --> 00:18:42,240
in this little moon uh demorphos and and

471
00:18:47,669 --> 00:18:44,720
certainly a whole lot smaller than than

472
00:18:49,750 --> 00:18:47,679
didimos um and the goal isn't to move it

473
00:18:51,669 --> 00:18:49,760
significantly is just to test a

474
00:18:54,310 --> 00:18:51,679
deflection technique and to change the

475
00:18:57,270 --> 00:18:54,320
period of the orbit with that impact

476
00:18:58,549 --> 00:18:57,280
uh and uh because again that's all that

477
00:19:00,549 --> 00:18:58,559
would be needed in the event of an

478
00:19:03,510 --> 00:19:00,559
actual impact uh threat just to be able

479
00:19:05,350 --> 00:19:03,520
to divert it a small amount and so

480
00:19:07,029 --> 00:19:05,360
so as you can see here

481
00:19:10,630 --> 00:19:07,039
you know the size difference is pretty

482
00:19:12,870 --> 00:19:10,640
large and so the change in the speed of

483
00:19:15,669 --> 00:19:12,880
the orbit is also going to be small of

484
00:19:17,430 --> 00:19:15,679
the orbit of dimorphose around dynamos

485
00:19:20,630 --> 00:19:17,440
but again that's all is needed we don't

486
00:19:22,870 --> 00:19:20,640
need to uh to do a large deflection and

487
00:19:25,430 --> 00:19:22,880
especially for this to

488
00:19:28,470 --> 00:19:25,440

be able to get the data on

489
00:19:30,950 --> 00:19:28,480
what comes out of uh the first ever you

490
00:19:31,750 --> 00:19:30,960
know planetary defense test

491
00:19:33,270 --> 00:19:31,760
uh

492
00:19:35,669 --> 00:19:33,280
this is just gonna be really valuable

493
00:19:37,270 --> 00:19:35,679
and then useful for modeling other cases

494
00:19:39,669 --> 00:19:37,280
you know where maybe something larger is

495
00:19:41,430 --> 00:19:39,679
needed but it isn't going to be a large

496
00:19:42,950 --> 00:19:41,440
deflection here but certainly a

497
00:19:45,350 --> 00:19:42,960
significant one that can be measured

498
00:19:47,510 --> 00:19:45,360
from earth that's that's the plan here

499
00:19:50,470 --> 00:19:47,520
and uh and folks are gearing up for that

500
00:19:52,710 --> 00:19:50,480
to be ready to watch that

501
00:19:55,190 --> 00:19:52,720
so speaking of watching things eldora on

502
00:19:58,549 --> 00:19:55,200
youtube asks does the spacecraft have a

503
00:20:01,990 --> 00:19:58,559
camera to record the impact

504
00:20:03,990 --> 00:20:02,000
well it has a camera actually to guide

505
00:20:05,990 --> 00:20:04,000
uh the trajectory

506
00:20:07,029 --> 00:20:06,000
so it's a very simple spacecraft you

507
00:20:09,590 --> 00:20:07,039
know with what it needs to be a

508
00:20:10,950 --> 00:20:09,600
spacecraft like solar panels to generate

509
00:20:13,110 --> 00:20:10,960
electricity

510
00:20:15,029 --> 00:20:13,120
and uh the other instruments needed for

511
00:20:18,310 --> 00:20:15,039
it to actually navigate to where it

512
00:20:21,270 --> 00:20:18,320
needs to go but that camera is to make

513
00:20:23,270 --> 00:20:21,280

sure that it can line up on dimorphose

514
00:20:25,110 --> 00:20:23,280
and impact it which is done autonomously

515
00:20:27,110 --> 00:20:25,120
there's some fantastic

516
00:20:28,789 --> 00:20:27,120
uh computer work that's done to make

517
00:20:32,070 --> 00:20:28,799
sure that uh

518
00:20:33,830 --> 00:20:32,080
it can line up on it itself because

519
00:20:35,590 --> 00:20:33,840
this sort of thing can't be commanded

520
00:20:36,549 --> 00:20:35,600
from earth because of the light delay

521
00:20:39,350 --> 00:20:36,559
time

522
00:20:41,830 --> 00:20:39,360
so it's going to line up itself based on

523
00:20:45,510 --> 00:20:41,840
that camera and so that is going to be

524
00:20:48,549 --> 00:20:45,520
uh all for tracking to the asteroid um

525
00:20:51,990 --> 00:20:48,559
the italian space agency has contributed

526
00:20:53,350 --> 00:20:52,000
a uh a small set called lichia cube that

527
00:20:56,310 --> 00:20:53,360
is going to

528
00:20:58,950 --> 00:20:56,320
actually take an image of the impact

529
00:21:01,270 --> 00:20:58,960
but it is going to continue past

530
00:21:04,549 --> 00:21:01,280
the adidas system after that happens so

531
00:21:07,110 --> 00:21:04,559
it will capture that but then uh

532
00:21:09,510 --> 00:21:07,120
after that it will be the telescopes on

533
00:21:12,070 --> 00:21:09,520
the earth that will have to look for a

534
00:21:15,909 --> 00:21:12,080
longer period of time to determine what

535
00:21:18,230 --> 00:21:15,919
sort of uh change was made uh in the

536
00:21:21,430 --> 00:21:18,240
period of the orbit of dimorphose about

537
00:21:25,909 --> 00:21:24,070
so orbital ploush on youtube asks how

538
00:21:28,070 --> 00:21:25,919

will the lychee cube improve your

539
00:21:30,630 --> 00:21:28,080
analysis of the impact of the dart

540
00:21:32,390 --> 00:21:30,640
spacecraft

541
00:21:34,390 --> 00:21:32,400
well certainly just getting that look at

542
00:21:36,470 --> 00:21:34,400
the impact you know that would be really

543
00:21:38,789 --> 00:21:36,480
valuable and and whatever might be

544
00:21:41,990 --> 00:21:38,799
captured during that short period of

545
00:21:44,390 --> 00:21:42,000
time that lucia cube will be

546
00:21:47,029 --> 00:21:44,400
continuing by the ditimo system

547
00:21:50,230 --> 00:21:47,039
and so uh you know just any of you will

548
00:21:53,510 --> 00:21:50,240
be really valuable uh for for uh seeing

549
00:21:56,390 --> 00:21:53,520
if there is uh uh much in the way of

550
00:22:00,310 --> 00:21:56,400
impact ejecta from the impact and uh any

551
00:22:02,870 --> 00:22:00,320
uh material coming off of demorphos so

552
00:22:06,630 --> 00:22:02,880
that will still be very valuable for uh

553
00:22:08,870 --> 00:22:06,640
understanding uh what actually happened

554
00:22:10,470 --> 00:22:08,880
and turning that into modeling that can

555
00:22:12,549 --> 00:22:10,480
be uh

556
00:22:15,510 --> 00:22:12,559
used to understand in general how

557
00:22:19,590 --> 00:22:15,520
kinetic impactors uh and the interaction

558
00:22:24,230 --> 00:22:22,390
harmonyx on youtube asks

559
00:22:25,909 --> 00:22:24,240
how will you know if your impact

560
00:22:28,710 --> 00:22:25,919
actually alters its trajectory

561
00:22:30,789 --> 00:22:28,720
significantly

562
00:22:33,990 --> 00:22:30,799
well and that's where the astronomers on

563
00:22:37,430 --> 00:22:34,000

the ground are so important here uh with

564
00:22:39,270 --> 00:22:37,440
having uh large telescopes looking at

565
00:22:41,190 --> 00:22:39,280
the dytamo system and looking at that

566
00:22:44,310 --> 00:22:41,200
light coming from the system

567
00:22:46,549 --> 00:22:44,320
which will be going kind of up and down

568
00:22:48,470 --> 00:22:46,559
up and down in this light curve as those

569
00:22:51,590 --> 00:22:48,480
two asteroids uh

570
00:22:54,390 --> 00:22:51,600
revolve around each other and

571
00:22:56,549 --> 00:22:54,400
the folks using the modeling here can

572
00:22:59,029 --> 00:22:56,559
can kind of back out from that how the

573
00:23:00,630 --> 00:22:59,039
period of the orbit changed

574
00:23:03,510 --> 00:23:00,640
and then others who

575
00:23:05,830 --> 00:23:03,520
from the dart team who

576
00:23:09,190 --> 00:23:05,840
do the modeling of what might happen you

577
00:23:11,029 --> 00:23:09,200
know once dart impacts dimorphose use

578
00:23:14,149 --> 00:23:11,039
all of that information as well as any

579
00:23:16,630 --> 00:23:14,159
properties that are known about uh the

580
00:23:18,950 --> 00:23:16,640
asteroid from from the cameras as was

581
00:23:21,270 --> 00:23:18,960
mentioned uh from other ground-based

582
00:23:23,029 --> 00:23:21,280
observations and and

583
00:23:25,190 --> 00:23:23,039
putting all of that together to have a

584
00:23:25,990 --> 00:23:25,200
better understanding of uh

585
00:23:28,710 --> 00:23:26,000
of

586
00:23:30,149 --> 00:23:28,720
what happened and and yes the um all the

587
00:23:31,830 --> 00:23:30,159
modeling states this will be something

588
00:23:34,870 --> 00:23:31,840

that's measurable from the earth and so

589
00:23:37,110 --> 00:23:34,880
this is kind of a cool uh partnering

590
00:23:39,510 --> 00:23:37,120
between a spacecraft team and

591
00:23:41,110 --> 00:23:39,520
ground-based astronomers and uh it's

592
00:23:43,669 --> 00:23:41,120
really exciting to see how this will all

593
00:23:48,549 --> 00:23:46,630
so moshe malik on facebook asks what are

594
00:23:50,549 --> 00:23:48,559
the chances that altering its course

595
00:23:54,310 --> 00:23:50,559
today will not make it hazardous to

596
00:23:55,669 --> 00:23:54,320
earth in the next 100 years or so

597
00:23:58,070 --> 00:23:55,679
well and that's what's so nice about

598
00:24:00,390 --> 00:23:58,080
this particular asteroid system it it's

599
00:24:02,230 --> 00:24:00,400
not a hazard to earth and it's not going

600
00:24:04,870 --> 00:24:02,240
to be in the future and we couldn't even

601
00:24:06,390 --> 00:24:04,880
make it a hazard should we want to

602
00:24:08,470 --> 00:24:06,400
and so uh

603
00:24:12,149 --> 00:24:08,480
which we don't want to but we can't and

604
00:24:15,990 --> 00:24:12,159
so that's why it's it's a really good uh

605
00:24:18,710 --> 00:24:16,000
laboratory for this test to have this uh

606
00:24:20,470 --> 00:24:18,720
binary asteroid system come within a

607
00:24:22,549 --> 00:24:20,480
distance to earth where it can be safely

608
00:24:24,789 --> 00:24:22,559
observed from the earth

609
00:24:26,549 --> 00:24:24,799
and do this test at the same time so

610
00:24:29,190 --> 00:24:26,559
it's really actually a unique

611
00:24:31,269 --> 00:24:29,200
opportunity that nature has given us uh

612
00:24:35,190 --> 00:24:31,279
in a nice setting where where there is

613
00:24:36,710 --> 00:24:35,200

no uh hazard to earth so it's perfect

614
00:24:38,870 --> 00:24:36,720
it's good to hear that

615
00:24:39,909 --> 00:24:38,880
dimorphos starts target is not a threat

616
00:24:40,950 --> 00:24:39,919
to earth

617
00:24:43,430 --> 00:24:40,960
so

618
00:24:45,269 --> 00:24:43,440
enderesting on youtube asks could you

619
00:24:47,510 --> 00:24:45,279
tell us more about dart's solar panel

620
00:24:51,430 --> 00:24:47,520
arrangement does the offset arrangement

621
00:24:55,350 --> 00:24:53,190
it's interesting i'm not exactly sure

622
00:24:56,070 --> 00:24:55,360
how to answer that question but these

623
00:24:57,110 --> 00:24:56,080
are

624
00:25:01,909 --> 00:24:57,120
these

625
00:25:04,070 --> 00:25:01,919
rollout solar arrays that have been used

626
00:25:06,710 --> 00:25:04,080
on the international space station

627
00:25:09,430 --> 00:25:06,720
and so this is a a neat opportunity to

628
00:25:11,590 --> 00:25:09,440
take a uh a tested technology and use it

629
00:25:13,029 --> 00:25:11,600
now on a spacecraft

630
00:25:16,230 --> 00:25:13,039
and uh

631
00:25:17,110 --> 00:25:16,240
and i don't think that their placement

632
00:25:19,190 --> 00:25:17,120
uh

633
00:25:20,470 --> 00:25:19,200
is important except that they just need

634
00:25:23,590 --> 00:25:20,480
to not be in the way of the

635
00:25:25,750 --> 00:25:23,600
instrumentation on dart but this is a a

636
00:25:26,950 --> 00:25:25,760
neat chance to utilize this technology

637
00:25:30,149 --> 00:25:26,960
that's already been used on the

638
00:25:34,230 --> 00:25:32,230

so kelly we have time for just one more

639
00:25:36,549 --> 00:25:34,240
question and i'd like to end with your

640
00:25:38,950 --> 00:25:36,559
career because your career

641
00:25:40,950 --> 00:25:38,960
at nasa sounds so interesting

642
00:25:42,630 --> 00:25:40,960
and for for anyone listening today what

643
00:25:44,549 --> 00:25:42,640
was your path like in your current

644
00:25:46,070 --> 00:25:44,559
career and what advice

645
00:25:49,190 --> 00:25:46,080
would you have for someone wanting to

646
00:25:50,950 --> 00:25:49,200
pursue something in planetary defense

647
00:25:52,710 --> 00:25:50,960
well i was a research astronomer at

648
00:25:54,789 --> 00:25:52,720
goddard space flight center before i

649
00:25:56,630 --> 00:25:54,799
came to nasa headquarters and became

650
00:25:59,190 --> 00:25:56,640
more of a bureaucrat but the nice thing

651
00:26:01,590 --> 00:25:59,200
is now i'm in this position where i can

652
00:26:04,710 --> 00:26:01,600
uh support some really fantastic people

653
00:26:07,269 --> 00:26:04,720
and uh and uh help to manage a program

654
00:26:09,029 --> 00:26:07,279
that keeps all of these efforts going

655
00:26:11,269 --> 00:26:09,039
finding asteroids following up

656
00:26:12,950 --> 00:26:11,279
characterizing them calculating orbits

657
00:26:14,310 --> 00:26:12,960
and so it's a real privilege to get to

658
00:26:16,630 --> 00:26:14,320
do that and work with some really

659
00:26:18,950 --> 00:26:16,640
fantastic people and support them

660
00:26:20,789 --> 00:26:18,960
and so science is a root i was an

661
00:26:22,830 --> 00:26:20,799
astronomer there are people engineers

662
00:26:25,110 --> 00:26:22,840
who are involved on the dart mission and

663
00:26:27,590 --> 00:26:25,120

scientists but i must say you know to

664
00:26:29,190 --> 00:26:27,600
work in planetary defense and at nasa i

665
00:26:30,870 --> 00:26:29,200
always say if it's just scientists and

666
00:26:33,430 --> 00:26:30,880
engineers we'll be in big trouble we

667
00:26:35,510 --> 00:26:33,440
need all kinds of people budget people

668
00:26:36,630 --> 00:26:35,520
public affairs people

669
00:26:38,870 --> 00:26:36,640
we need

670
00:26:40,870 --> 00:26:38,880
lawyers and policy people and i mean so

671
00:26:43,750 --> 00:26:40,880
there's there's so many ways uh to

672
00:26:45,990 --> 00:26:43,760
support any field and so it is possible

673
00:26:47,669 --> 00:26:46,000
to pursue your passion and also be

674
00:26:51,190 --> 00:26:47,679
involved in something like planetary

675
00:26:53,190 --> 00:26:51,200
defense or other activities in nasa

676
00:26:55,110 --> 00:26:53,200
well kelly thank you so much again for

677
00:26:57,590 --> 00:26:55,120
joining us today and for everything that

678
00:26:59,269 --> 00:26:57,600
you do at nasa it's been a pleasure

679
00:27:00,950 --> 00:26:59,279
well thank you josh and for all you do

680
00:27:02,710 --> 00:27:00,960
too

681
00:27:04,230 --> 00:27:02,720
and thank you all for watching at home

682
00:27:06,230 --> 00:27:04,240
you can keep up with the dart mission on

683
00:27:07,669 --> 00:27:06,240
social media by using the hashtag

684
00:27:09,430 --> 00:27:07,679
dartmission

685
00:27:12,870 --> 00:27:09,440
and you can also follow nasa's solar

686
00:27:14,549 --> 00:27:12,880
system on twitter facebook and instagram

687
00:27:16,390 --> 00:27:14,559
you can keep up with nasa's planetary

688
00:27:18,470 --> 00:27:16,400

defense coordination office and asteroid

689
00:27:21,029 --> 00:27:18,480
related efforts on twitter by following

690
00:27:24,630 --> 00:27:21,039
asteroid watch and for the latest news

691
00:27:25,669 --> 00:27:24,640
on dart visit www.nasa.gov

692
00:27:29,430 --> 00:27:25,679
dart

693
00:27:32,630 --> 00:27:29,440
currently scheduled for november 24th at