
JLG

1
00:00:05,990 --> 00:00:03,189
welcome to the jet propulsion

2
00:00:07,510 --> 00:00:06,000
laboratory a nasa facility here in

3
00:00:09,509 --> 00:00:07,520
southern california

4
00:00:11,430 --> 00:00:09,519
that specializes in the robotic

5
00:00:14,310 --> 00:00:11,440
exploration of earth

6
00:00:16,070 --> 00:00:14,320
and space i'm marina jericho and we are

7
00:00:16,790 --> 00:00:16,080
very excited up here in the viewing

8
00:00:20,070 --> 00:00:16,800
gallery

9
00:00:21,910 --> 00:00:20,080
of the space assembly building and down

10
00:00:24,870 --> 00:00:21,920
below you can see

11
00:00:27,589 --> 00:00:24,880
nysar and it is in the clean room below

12
00:00:31,189 --> 00:00:27,599
us the next earth observing satellite

13
00:00:31,669 --> 00:00:31,199

which stands for nasa isro the indian

14
00:00:33,910 --> 00:00:31,679
space

15
00:00:35,270 --> 00:00:33,920
research organization we are teaming up

16
00:00:38,790 --> 00:00:35,280
with for this mission

17
00:00:41,030 --> 00:00:38,800
synthetic aperture radar you can join in

18
00:00:42,150 --> 00:00:41,040
on the conversation here live by putting

19
00:00:44,790 --> 00:00:42,160
your questions

20
00:00:46,869 --> 00:00:44,800
in the comments here to break down how

21
00:00:49,830 --> 00:00:46,879
this satellite will give us a unique

22
00:00:50,790 --> 00:00:49,840
view of the earth is nicer's project

23
00:00:52,790 --> 00:00:50,800
scientist

24
00:00:54,470 --> 00:00:52,800
paul rosen and a little later in the

25
00:00:55,350 --> 00:00:54,480
conversation we're going to talk about

26
00:00:58,310 --> 00:00:55,360
all the cool

27
00:01:00,069 --> 00:00:58,320
new technology on board this satellite

28
00:01:03,270 --> 00:01:00,079
with instrument manager

29
00:01:03,910 --> 00:01:03,280
wendy edelstein good afternoon paul hi

30
00:01:06,550 --> 00:01:03,920
marina

31
00:01:08,789 --> 00:01:06,560
hi everybody so you guys had a very

32
00:01:09,350 --> 00:01:08,799
special delivery just a couple of days

33
00:01:11,190 --> 00:01:09,360
ago

34
00:01:12,710 --> 00:01:11,200
can you tell me about the new hardware

35
00:01:13,270 --> 00:01:12,720
that was just delivered and pointed out

36
00:01:15,670 --> 00:01:13,280
to me

37
00:01:16,310 --> 00:01:15,680
yeah we sure did we got the s band

38
00:01:19,109 --> 00:01:16,320

instrument

39
00:01:20,390 --> 00:01:19,119
from isro it's in the silver covered

40
00:01:22,230 --> 00:01:20,400
covering over there

41
00:01:23,749 --> 00:01:22,240
in the corner so it looks kind of small

42
00:01:24,789 --> 00:01:23,759
but it's a very very important

43
00:01:27,190 --> 00:01:24,799
instrument

44
00:01:28,789 --> 00:01:27,200
it will uh marry together with our

45
00:01:31,590 --> 00:01:28,799
l-band instrument

46
00:01:32,789 --> 00:01:31,600
and uh put put a two-frequency radar in

47
00:01:34,870 --> 00:01:32,799
space

48
00:01:36,230 --> 00:01:34,880
now tell me a little bit about what sets

49
00:01:37,990 --> 00:01:36,240
nysar apart from

50
00:01:40,390 --> 00:01:38,000
other earth satellites that are in orbit

51
00:01:42,950 --> 00:01:40,400
right now it's unique in almost

52
00:01:43,510 --> 00:01:42,960
every single way it combines many

53
00:01:50,230 --> 00:01:43,520
different

54
00:01:52,310 --> 00:01:50,240
modes so we have two radars one from us

55
00:01:54,149 --> 00:01:52,320
one from india there are two different

56
00:01:57,429 --> 00:01:54,159
frequencies so we can make

57
00:02:00,389 --> 00:01:57,439
color radar images of the earth which is

58
00:02:01,670 --> 00:02:00,399
unique it also has polarimetric

59
00:02:04,630 --> 00:02:01,680
capability which is

60
00:02:06,230 --> 00:02:04,640
a fancy way of saying that it has radar

61
00:02:08,550 --> 00:02:06,240
polaroid glasses

62
00:02:10,630 --> 00:02:08,560
which allows us to see the earth in a

63
00:02:13,030 --> 00:02:10,640

particular way

64
00:02:14,309 --> 00:02:13,040
which is unique also there's many many

65
00:02:16,790 --> 00:02:14,319
other features as well

66
00:02:19,190 --> 00:02:16,800
it strobes the earth measures the earth

67
00:02:20,309 --> 00:02:19,200
every 12 days repeatedly over the life

68
00:02:23,350 --> 00:02:20,319
of the mission

69
00:02:25,589 --> 00:02:23,360
at high resolution and

70
00:02:26,630 --> 00:02:25,599
high temporal sampling which allows us

71
00:02:28,949 --> 00:02:26,640
to make movies

72
00:02:30,790 --> 00:02:28,959
of the earth effectively using this

73
00:02:33,910 --> 00:02:30,800
color polaroid

74
00:02:35,589 --> 00:02:33,920
system it's very very very cool it is

75
00:02:35,990 --> 00:02:35,599
very cool and talking about how it works

76
00:02:37,430 --> 00:02:36,000
right now

77
00:02:39,509 --> 00:02:37,440
we're going to be answering your social

78
00:02:41,270 --> 00:02:39,519
media questions live just pop it in the

79
00:02:42,390 --> 00:02:41,280
comment box and we already have one from

80
00:02:45,110 --> 00:02:42,400
charles on facebook

81
00:02:46,550 --> 00:02:45,120
asking will the radar accurately see the

82
00:02:49,110 --> 00:02:46,560
surface of the earth

83
00:02:51,030 --> 00:02:49,120
and is it like a heat tray microwaves

84
00:02:52,949 --> 00:02:51,040
bonking me on the head sound dangerous

85
00:02:55,670 --> 00:02:52,959
to me

86
00:02:57,190 --> 00:02:55,680
uh yeah we will certainly make accurate

87
00:02:59,270 --> 00:02:57,200
measurements this is designed

88
00:03:01,589 --> 00:02:59,280

specifically for accuracy

89
00:03:02,390 --> 00:03:01,599
in measuring very small motions of the

90
00:03:04,710 --> 00:03:02,400
earth

91
00:03:06,630 --> 00:03:04,720
as far as bonking you on the head with

92
00:03:08,070 --> 00:03:06,640
uh microwaves it is a microwave

93
00:03:10,470 --> 00:03:08,080
instrument but

94
00:03:12,070 --> 00:03:10,480
the amount of energy compared to your

95
00:03:15,110 --> 00:03:12,080
microwave oven is so

96
00:03:16,869 --> 00:03:15,120
tiny you it just melds in with the light

97
00:03:18,390 --> 00:03:16,879
and all the other radiation like your

98
00:03:20,390 --> 00:03:18,400
cell phone uh

99
00:03:22,309 --> 00:03:20,400
and everything else so it's absolutely

100
00:03:24,550 --> 00:03:22,319
nothing to worry about

101
00:03:26,470 --> 00:03:24,560
we're a million miles a million meters

102
00:03:27,589 --> 00:03:26,480
in space so the amount of power we

103
00:03:29,990 --> 00:03:27,599
transmit

104
00:03:31,110 --> 00:03:30,000
is is very very small by the time it

105
00:03:33,350 --> 00:03:31,120
gets to the earth

106
00:03:34,630 --> 00:03:33,360
and that space is a good thing yes yes

107
00:03:39,190 --> 00:03:34,640
yes

108
00:03:39,910 --> 00:03:39,200
potential of seeing the ground in many

109
00:03:41,750 --> 00:03:39,920
places that

110
00:03:42,949 --> 00:03:41,760
we haven't been able to see before it's

111
00:03:44,789 --> 00:03:42,959
being called an

112
00:03:47,509 --> 00:03:44,799
all-weather satellite can you tell me

113
00:03:50,070 --> 00:03:47,519

what that means yeah well by virtue of

114
00:03:51,030 --> 00:03:50,080
the radar wavelength which is about this

115
00:03:54,710 --> 00:03:51,040
long

116
00:03:55,910 --> 00:03:54,720
it's not sensitive to raindrops or cloud

117
00:03:57,750 --> 00:03:55,920
particles in any way

118
00:04:00,149 --> 00:03:57,760
so we actually just penetrate right

119
00:04:02,789 --> 00:04:00,159
through that unlike optical lights

120
00:04:04,390 --> 00:04:02,799
and and bounce off the ground it comes

121
00:04:05,030 --> 00:04:04,400
back through the clouds and we can see

122
00:04:07,190 --> 00:04:05,040
it so it

123
00:04:08,869 --> 00:04:07,200
doesn't matter whether it's raining or

124
00:04:10,630 --> 00:04:08,879
cloudy we can see right through it so

125
00:04:13,270 --> 00:04:10,640
it's all weather in that sense

126
00:04:13,990 --> 00:04:13,280
we also have our own source of light we

127
00:04:16,789 --> 00:04:14,000
we generate

128
00:04:17,909 --> 00:04:16,799
the energy transmit it so it doesn't

129
00:04:20,310 --> 00:04:17,919
rely on sunlight

130
00:04:22,550 --> 00:04:20,320
so in that sense we're also day and

131
00:04:24,310 --> 00:04:22,560
night and all weather so it's very very

132
00:04:25,510 --> 00:04:24,320
powerful we have reliable measurements

133
00:04:27,990 --> 00:04:25,520
at all times

134
00:04:29,830 --> 00:04:28,000
day night no matter what kind of weather

135
00:04:30,710 --> 00:04:29,840
and 24 7. sounds like it's going to be

136
00:04:33,909 --> 00:04:30,720
working hard

137
00:04:36,230 --> 00:04:33,919
oh yeah as will we looking at the data

138
00:04:37,030 --> 00:04:36,240

yes now with the ability to see through

139
00:04:38,710 --> 00:04:37,040
anything

140
00:04:40,830 --> 00:04:38,720
how will that help people deal with

141
00:04:42,310 --> 00:04:40,840
natural disasters like volcanoes or

142
00:04:45,110 --> 00:04:42,320
landslides well

143
00:04:47,189 --> 00:04:45,120
we we take these data and we model them

144
00:04:48,150 --> 00:04:47,199
we try to understand the physics of the

145
00:04:51,430 --> 00:04:48,160
earth

146
00:04:53,189 --> 00:04:51,440
and we can then take that knowledge from

147
00:04:53,510 --> 00:04:53,199
understanding the physics of the earth

148
00:04:56,070 --> 00:04:53,520
and

149
00:04:56,790 --> 00:04:56,080
predict potentially how volcanoes will

150
00:04:59,110 --> 00:04:56,800
erupt

151
00:05:01,510 --> 00:04:59,120
we can also monitor the motion of the

152
00:05:02,310 --> 00:05:01,520
earth and see if it's starting to move

153
00:05:04,550 --> 00:05:02,320
before an

154
00:05:06,950 --> 00:05:04,560
eruption actually occurs which then

155
00:05:10,150 --> 00:05:06,960
allows people to respond they can

156
00:05:11,670 --> 00:05:10,160
evacuate if necessary or just take other

157
00:05:13,990 --> 00:05:11,680
mitigation steps

158
00:05:15,670 --> 00:05:14,000
and early warnings are such a key when

159
00:05:16,710 --> 00:05:15,680
it helps those people during natural

160
00:05:18,790 --> 00:05:16,720
disaster events

161
00:05:19,749 --> 00:05:18,800
absolutely yeah now this is an

162
00:05:22,070 --> 00:05:19,759
incredible

163
00:05:23,749 --> 00:05:22,080

amount of data coming down we've talked

164
00:05:23,990 --> 00:05:23,759
about this it is just hard for me to

165
00:05:25,990 --> 00:05:24,000
even

166
00:05:27,430 --> 00:05:26,000
wrap my head around it can you make us

167
00:05:29,670 --> 00:05:27,440
understand how large

168
00:05:30,710 --> 00:05:29,680
a petabyte of data is yeah i was

169
00:05:32,950 --> 00:05:30,720
thinking about this

170
00:05:35,110 --> 00:05:32,960
i've thought about this a lot actually

171
00:05:38,150 --> 00:05:35,120
you can think of it

172
00:05:41,670 --> 00:05:38,160
as something like 200 000

173
00:05:43,909 --> 00:05:41,680
dvds so a dvd contains a movie which a

174
00:05:47,029 --> 00:05:43,919
movie might be around two hours

175
00:05:50,469 --> 00:05:47,039
so like 400 000 hours worth of

176
00:05:52,070 --> 00:05:50,479
movies which if you're watching 24 7

177
00:05:54,950 --> 00:05:52,080
would take you 45 years

178
00:05:56,870 --> 00:05:54,960
to get through so it's a lot of data of

179
00:05:58,469 --> 00:05:56,880
course we're not going to take 45 years

180
00:06:01,189 --> 00:05:58,479
to look at it we use

181
00:06:03,270 --> 00:06:01,199
very fast computers to analyze it and

182
00:06:04,870 --> 00:06:03,280
reduce that data down to the scientific

183
00:06:06,870 --> 00:06:04,880
results that we're interested in

184
00:06:08,230 --> 00:06:06,880
but you will still be busy nonetheless

185
00:06:10,629 --> 00:06:08,240
oh yeah yeah yeah

186
00:06:11,270 --> 00:06:10,639
excited but busy all right our next

187
00:06:13,749 --> 00:06:11,280
question from

188
00:06:14,469 --> 00:06:13,759

social media comes from hari raj on

189
00:06:17,350 --> 00:06:14,479
twitter

190
00:06:18,070 --> 00:06:17,360
asking can nicer detect a volcanic

191
00:06:20,150 --> 00:06:18,080
eruption

192
00:06:21,270 --> 00:06:20,160
before it happens yeah so that's what i

193
00:06:23,670 --> 00:06:21,280
was saying earlier

194
00:06:24,870 --> 00:06:23,680
we can monitor the motion of the ground

195
00:06:28,070 --> 00:06:24,880
down to a fraction

196
00:06:31,430 --> 00:06:28,080
of an inch in as it's moving so

197
00:06:34,070 --> 00:06:31,440
if there is pre-eruptive behavior

198
00:06:36,469 --> 00:06:34,080
as they call it then yes we can see it

199
00:06:39,749 --> 00:06:36,479
inflating or deflating

200
00:06:42,710 --> 00:06:39,759
moving around on the ground and and

201
00:06:43,990 --> 00:06:42,720
and predict whether it will erupt or not

202
00:06:47,029 --> 00:06:44,000
and our next question

203
00:06:49,270 --> 00:06:47,039
from greg on facebook asking is it

204
00:06:52,309 --> 00:06:49,280
similar to lidar

205
00:06:55,350 --> 00:06:52,319
a lidar

206
00:06:57,589 --> 00:06:55,360
is an active sensor meaning it generates

207
00:07:00,710 --> 00:06:57,599
its own source of energy

208
00:07:02,790 --> 00:07:00,720
it transmits a pulse of some sort it

209
00:07:04,390 --> 00:07:02,800
goes to the object it's interested in

210
00:07:05,749 --> 00:07:04,400
bounces off and then receives that

211
00:07:09,670 --> 00:07:05,759
signal so it's the same

212
00:07:12,150 --> 00:07:09,680
process lidar uses optical wavelengths

213
00:07:14,070 --> 00:07:12,160

or near optical wavelengths which are

214
00:07:16,550 --> 00:07:14,080
very very tiny they're in the micron

215
00:07:18,150 --> 00:07:16,560
range whereas for radar we're looking at

216
00:07:19,350 --> 00:07:18,160
wavelengths that are quite a bit longer

217
00:07:22,150 --> 00:07:19,360
so we're sensitive to

218
00:07:23,350 --> 00:07:22,160
entirely different things that's really

219
00:07:25,270 --> 00:07:23,360
fascinating and i

220
00:07:27,350 --> 00:07:25,280
briefly mentioned this earlier but you

221
00:07:29,029 --> 00:07:27,360
partnered with isro to make this

222
00:07:31,589 --> 00:07:29,039
satellite can you tell me a little bit

223
00:07:32,950 --> 00:07:31,599
about why nasa chose to internationally

224
00:07:35,270 --> 00:07:32,960
collaborate

225
00:07:37,110 --> 00:07:35,280
well international collaborations are

226
00:07:38,390 --> 00:07:37,120
extremely important for a variety of

227
00:07:40,390 --> 00:07:38,400
reasons

228
00:07:41,990 --> 00:07:40,400
all of the space faring nations and

229
00:07:42,629 --> 00:07:42,000
other nations for that matter are

230
00:07:44,710 --> 00:07:42,639
interested

231
00:07:46,790 --> 00:07:44,720
in the same kinds of things from a

232
00:07:48,790 --> 00:07:46,800
scientific and an applications point of

233
00:07:50,710 --> 00:07:48,800
view we care about the earth

234
00:07:52,869 --> 00:07:50,720
we care about our people we want to

235
00:07:55,749 --> 00:07:52,879
understand the earth so that we can

236
00:07:57,270 --> 00:07:55,759
properly steward our resources and all

237
00:08:00,550 --> 00:07:57,280
the people that are that are

238
00:08:04,309 --> 00:08:00,560

in our countries so isro and

239
00:08:06,629 --> 00:08:04,319
nasa share that common desire

240
00:08:08,790 --> 00:08:06,639
and we know that radar is a very very

241
00:08:11,909 --> 00:08:08,800
useful scientific tool for doing this

242
00:08:14,150 --> 00:08:11,919
we each had our own ideas about putting

243
00:08:15,909 --> 00:08:14,160
radars in space by collaborating

244
00:08:17,909 --> 00:08:15,919
we can create a system that's even more

245
00:08:18,710 --> 00:08:17,919
powerful than any one nation could do by

246
00:08:23,430 --> 00:08:18,720
itself

247
00:08:24,309 --> 00:08:23,440
helps share resources towards a common

248
00:08:25,909 --> 00:08:24,319
goal

249
00:08:27,430 --> 00:08:25,919
and what's incredible is that space

250
00:08:30,950 --> 00:08:27,440
really knows no boundaries

251
00:08:33,990 --> 00:08:30,960
that's absolutely true in many ways

252
00:08:34,709 --> 00:08:34,000
all right now wim on facebook asks what

253
00:08:37,190 --> 00:08:34,719
kind of

254
00:08:38,149 --> 00:08:37,200
ground stations will be in charge of

255
00:08:42,149 --> 00:08:38,159
downlinking

256
00:08:44,230 --> 00:08:42,159
all that data okay so we have

257
00:08:45,990 --> 00:08:44,240
we have i think three or four different

258
00:08:47,030 --> 00:08:46,000
locations where we're downlinking the

259
00:08:49,190 --> 00:08:47,040
data we have

260
00:08:50,070 --> 00:08:49,200
by the way a extremely high rate

261
00:08:52,550 --> 00:08:50,080
downlink system

262
00:08:54,230 --> 00:08:52,560
specially designed for this mission for

263
00:08:55,990 --> 00:08:54,240

those who care about the numbers it's on

264
00:08:57,430 --> 00:08:56,000
the order of four gigabits per second

265
00:08:59,350 --> 00:08:57,440
downlink which is a

266
00:09:01,110 --> 00:08:59,360
several orders of magnitude more than

267
00:09:03,910 --> 00:09:01,120
nasa has done before

268
00:09:04,630 --> 00:09:03,920
the ground stations are located mostly

269
00:09:07,030 --> 00:09:04,640
in the north

270
00:09:08,389 --> 00:09:07,040
there's some in svalbard which is uh

271
00:09:10,470 --> 00:09:08,399
north of norway

272
00:09:11,990 --> 00:09:10,480
and another one at the alaska satellite

273
00:09:14,310 --> 00:09:12,000
facility in alaska

274
00:09:15,190 --> 00:09:14,320
near in fairbanks we have a couple of

275
00:09:17,590 --> 00:09:15,200
others one

276
00:09:18,389 --> 00:09:17,600
in wallops in the united states and one

277
00:09:21,030 --> 00:09:18,399
in the

278
00:09:21,990 --> 00:09:21,040
southern tip of south america so even

279
00:09:24,150 --> 00:09:22,000
with the very high data

280
00:09:25,910 --> 00:09:24,160
rate we need many different stations to

281
00:09:28,949 --> 00:09:25,920
be able to observe

282
00:09:31,190 --> 00:09:28,959
and downlink data continuously because

283
00:09:33,509 --> 00:09:31,200
of the high data volume

284
00:09:35,430 --> 00:09:33,519
well this all sounds really great paul

285
00:09:38,389 --> 00:09:35,440
what are your next milestones that your

286
00:09:41,430 --> 00:09:38,399
team wants to make as we move forward

287
00:09:43,990 --> 00:09:41,440
well uh we are integrating the two

288
00:09:46,070 --> 00:09:44,000

radars together the the ones that just

289
00:09:47,670 --> 00:09:46,080
arrived we're going to be testing it

290
00:09:48,790 --> 00:09:47,680
by itself and then integrating it

291
00:09:50,630 --> 00:09:48,800
together i think you're going to hear

292
00:09:53,670 --> 00:09:50,640
more about that later

293
00:09:54,470 --> 00:09:53,680
and then the major milestone is testing

294
00:09:57,430 --> 00:09:54,480
them together

295
00:09:59,110 --> 00:09:57,440
and then eventually delivering it back

296
00:10:00,389 --> 00:09:59,120
to india to be integrated with the

297
00:10:01,910 --> 00:10:00,399
spacecraft that's the

298
00:10:03,990 --> 00:10:01,920
that's the immediate goal that we're

299
00:10:06,310 --> 00:10:04,000
looking at and we're looking at a launch

300
00:10:07,990 --> 00:10:06,320
date of next year yeah it's towards the

301
00:10:10,310 --> 00:10:08,000
end of next year that's correct

302
00:10:12,150 --> 00:10:10,320
so a lot of work to do but exciting work

303
00:10:15,430 --> 00:10:12,160
also street kent

304
00:10:17,190 --> 00:10:15,440
on facebook asks when will it exactly

305
00:10:18,870 --> 00:10:17,200
launch which we just covered at the end

306
00:10:21,269 --> 00:10:18,880
of next year that's right yeah

307
00:10:23,110 --> 00:10:21,279
the exact date is is always a little

308
00:10:24,710 --> 00:10:23,120
uncertain because of the

309
00:10:26,150 --> 00:10:24,720
the different things that happened

310
00:10:28,550 --> 00:10:26,160
during integration but we're shooting

311
00:10:31,190 --> 00:10:28,560
for somewhere between october 22

312
00:10:32,470 --> 00:10:31,200
and january 23 somewhere in that range

313
00:10:33,829 --> 00:10:32,480

all right well we'll be looking forward

314
00:10:35,430 --> 00:10:33,839
to it and good luck to you

315
00:10:37,110 --> 00:10:35,440
and your team paul on getting it all

316
00:10:38,069 --> 00:10:37,120
assembled and thank you so much for

317
00:10:40,470 --> 00:10:38,079
being here today

318
00:10:41,269 --> 00:10:40,480
thank you my pleasure now remember if

319
00:10:43,670 --> 00:10:41,279
you want to ask

320
00:10:45,670 --> 00:10:43,680
one of the team members a question we've

321
00:10:46,069 --> 00:10:45,680
got about another 15 to 20 minutes so

322
00:10:48,790 --> 00:10:46,079
still

323
00:10:50,550 --> 00:10:48,800
pop those questions into the comment box

324
00:10:52,230 --> 00:10:50,560
and we'll make sure that they get them

325
00:10:54,949 --> 00:10:52,240
from you and once again

326
00:10:55,350 --> 00:10:54,959
we are in the space assembly building

327
00:10:57,269 --> 00:10:55,360
here

328
00:10:59,030 --> 00:10:57,279
at nasa's jet propulsion laboratory the

329
00:11:00,790 --> 00:10:59,040
clean room is right down

330
00:11:03,190 --> 00:11:00,800
below me and you can see all of the

331
00:11:05,750 --> 00:11:03,200
pieces that are coming together

332
00:11:07,190 --> 00:11:05,760
right now and we can check out how nysar

333
00:11:10,150 --> 00:11:07,200
is taking shape

334
00:11:11,350 --> 00:11:10,160
right down below us and there's a lot of

335
00:11:13,670 --> 00:11:11,360
really amazing

336
00:11:16,069 --> 00:11:13,680
technological advances that are

337
00:11:18,230 --> 00:11:16,079
happening with this spacecraft and here

338
00:11:20,630 --> 00:11:18,240

to talk to me a little bit about that

339
00:11:22,150 --> 00:11:20,640
is the instrument manager wendy

340
00:11:23,110 --> 00:11:22,160
edelstein thank you so much for being

341
00:11:25,110 --> 00:11:23,120
here today wendy

342
00:11:26,630 --> 00:11:25,120
thank you so much i'm glad to be here so

343
00:11:28,470 --> 00:11:26,640
it's only been a couple of days since

344
00:11:29,910 --> 00:11:28,480
this new hardware got here

345
00:11:31,509 --> 00:11:29,920
how do you feel are you excited seeing

346
00:11:34,150 --> 00:11:31,519
it all come together i am

347
00:11:35,670 --> 00:11:34,160
really excited i have been working on an

348
00:11:37,509 --> 00:11:35,680
isor for over five years

349
00:11:39,509 --> 00:11:37,519
and i've been working and collaborating

350
00:11:41,590 --> 00:11:39,519
with india this whole time

351
00:11:43,110 --> 00:11:41,600
i went on my first trip back at the very

352
00:11:44,870 --> 00:11:43,120
beginning so we've been working very

353
00:11:45,670 --> 00:11:44,880
hard to to bring these two systems

354
00:11:48,150 --> 00:11:45,680
together

355
00:11:49,430 --> 00:11:48,160
but only right now last week that we got

356
00:11:50,629 --> 00:11:49,440
the second instrument so

357
00:11:52,389 --> 00:11:50,639
you know we've been designing these

358
00:11:53,590 --> 00:11:52,399
independently these two separate very

359
00:11:56,790 --> 00:11:53,600
powerful systems

360
00:11:57,829 --> 00:11:56,800
and just right now um on jpl we're

361
00:11:59,190 --> 00:11:57,839
bringing them together

362
00:12:01,269 --> 00:11:59,200
going to be testing them over the next

363
00:12:03,750 --> 00:12:01,279

few months so it's very exciting

364
00:12:05,670 --> 00:12:03,760
and nicer has a wavelength longer than

365
00:12:07,430 --> 00:12:05,680
most earth satellites can you tell me

366
00:12:09,509 --> 00:12:07,440
what that's going to help it do

367
00:12:11,350 --> 00:12:09,519
sure um so um so paul talked a little

368
00:12:12,629 --> 00:12:11,360
bit about its capabilities with the

369
00:12:14,550 --> 00:12:12,639
longer wavelength so

370
00:12:15,910 --> 00:12:14,560
you might think of the electromagnetic

371
00:12:17,670 --> 00:12:15,920
spectrum so

372
00:12:19,269 --> 00:12:17,680
you know at the one end of the spectrum

373
00:12:21,829 --> 00:12:19,279
are those short wavelengths you know

374
00:12:22,470 --> 00:12:21,839
uv and x-rays and the visible light and

375
00:12:24,790 --> 00:12:22,480
those have

376
00:12:26,310 --> 00:12:24,800
certain capabilities but we're on the

377
00:12:27,030 --> 00:12:26,320
other end of the spectrum we're at the

378
00:12:29,110 --> 00:12:27,040
uh the

379
00:12:30,150 --> 00:12:29,120
rf a radio frequency end of the spectrum

380
00:12:31,750 --> 00:12:30,160
microwaves

381
00:12:33,590 --> 00:12:31,760
and on that side it's much longer

382
00:12:35,990 --> 00:12:33,600
wavelengths about 10 centimeters

383
00:12:37,509 --> 00:12:36,000
and from that we can actually penetrate

384
00:12:39,750 --> 00:12:37,519
not just through the clouds that paul

385
00:12:41,590 --> 00:12:39,760
mentioned but also we can penetrate

386
00:12:43,590 --> 00:12:41,600
below the surface so what we can

387
00:12:44,629 --> 00:12:43,600
actually see with this dual frequency

388
00:12:46,710 --> 00:12:44,639

system so

389
00:12:48,230 --> 00:12:46,720
while the l-band system operates at

390
00:12:50,310 --> 00:12:48,240
about 10 inches

391
00:12:51,910 --> 00:12:50,320
the s-band system that the indians are

392
00:12:53,030 --> 00:12:51,920
providing is about five inches and what

393
00:12:55,910 --> 00:12:53,040
that helps is

394
00:12:56,629 --> 00:12:55,920
the s-van system looks more at the at

395
00:12:58,790 --> 00:12:56,639
the uh

396
00:13:00,550 --> 00:12:58,800
at the vegetation and the crops and the

397
00:13:02,150 --> 00:13:00,560
things that on the surface level

398
00:13:03,910 --> 00:13:02,160
and the l-band system can penetrate

399
00:13:04,870 --> 00:13:03,920
below that look at the tree trunks where

400
00:13:07,269 --> 00:13:04,880
the carbon is

401
00:13:08,710 --> 00:13:07,279
and look actually even penetrate the

402
00:13:10,629 --> 00:13:08,720
land surface so they can actually look

403
00:13:12,629 --> 00:13:10,639
at more geological features

404
00:13:13,990 --> 00:13:12,639
so combining these two systems we

405
00:13:16,230 --> 00:13:14,000
actually have one of the most powerful

406
00:13:17,750 --> 00:13:16,240
systems that does that's ever been built

407
00:13:20,069 --> 00:13:17,760
so if you were talking to someone

408
00:13:21,670 --> 00:13:20,079
looking at the electromagnetic spectrum

409
00:13:23,430 --> 00:13:21,680
where does it all fit a lot of people

410
00:13:25,030 --> 00:13:23,440
think okay visible is right in the

411
00:13:26,629 --> 00:13:25,040
middle right and you got the short then

412
00:13:28,710 --> 00:13:26,639
you got the long so where does it all so

413
00:13:29,990 --> 00:13:28,720

we're pretty far we're a long wavelength

414
00:13:31,590 --> 00:13:30,000
we're on the far end

415
00:13:33,030 --> 00:13:31,600
of the spectrum if you think about it

416
00:13:33,590 --> 00:13:33,040
here the visible is kind of in the

417
00:13:35,990 --> 00:13:33,600
middle

418
00:13:37,750 --> 00:13:36,000
x-rays are way over there gamma rays way

419
00:13:38,470 --> 00:13:37,760
over there we're on the other end we're

420
00:13:40,310 --> 00:13:38,480
pretty far

421
00:13:41,670 --> 00:13:40,320
on the on the right side of the spectrum

422
00:13:43,030 --> 00:13:41,680
this long wavelength is

423
00:13:44,870 --> 00:13:43,040
um you know that's why i said 10

424
00:13:47,350 --> 00:13:44,880
centimeters can uh

425
00:13:48,870 --> 00:13:47,360
uh sorry 24 centimeters or 10 inches

426
00:13:49,350 --> 00:13:48,880
let's see right through the trees and

427
00:13:51,590 --> 00:13:49,360
all the

428
00:13:53,350 --> 00:13:51,600
leaves and get right down to the other

429
00:13:55,269 --> 00:13:53,360
the the surface uh properties

430
00:13:56,870 --> 00:13:55,279
which is really what sets nicer apart

431
00:13:58,389 --> 00:13:56,880
that is right right no other satellite's

432
00:14:00,710 --> 00:13:58,399
been able to penetrate all of that

433
00:14:01,990 --> 00:14:00,720
24 7. right and with the two frequencies

434
00:14:04,150 --> 00:14:02,000
we actually can do two things

435
00:14:05,430 --> 00:14:04,160
we can penetrate but we also can see the

436
00:14:06,949 --> 00:14:05,440
biomass or the

437
00:14:08,870 --> 00:14:06,959
the trees of vegetation so we can see

438
00:14:10,150 --> 00:14:08,880

both of them and by combining all that

439
00:14:11,269 --> 00:14:10,160
data they are seeing the world in a

440
00:14:13,430 --> 00:14:11,279
whole different way

441
00:14:15,030 --> 00:14:13,440
yes in a whole different light i love it

442
00:14:17,269 --> 00:14:15,040
all right now jane on facebook getting

443
00:14:20,629 --> 00:14:17,279
to another social media question

444
00:14:23,590 --> 00:14:20,639
asks awesome information what is the

445
00:14:26,230 --> 00:14:23,600
projected longevity of this satellite

446
00:14:26,870 --> 00:14:26,240
so we design it to last five years but

447
00:14:28,710 --> 00:14:26,880
generally

448
00:14:29,990 --> 00:14:28,720
you know when we build space systems we

449
00:14:31,990 --> 00:14:30,000
build them to last so

450
00:14:33,509 --> 00:14:32,000
it we anticipate it could last 10 long

451
00:14:35,750 --> 00:14:33,519
or longer years but uh

452
00:14:36,710 --> 00:14:35,760
you know we we plan for five we hope for

453
00:14:39,590 --> 00:14:36,720
10 15

454
00:14:40,870 --> 00:14:39,600
20 years yes for sure and logan on

455
00:14:43,590 --> 00:14:40,880
facebook acts

456
00:14:44,310 --> 00:14:43,600
asks does nicer use solar panels for

457
00:14:46,150 --> 00:14:44,320
power

458
00:14:48,069 --> 00:14:46,160
yes we do that we've got some pretty

459
00:14:48,629 --> 00:14:48,079
exciting activity going on behind us

460
00:14:50,550 --> 00:14:48,639
wendy

461
00:14:52,389 --> 00:14:50,560
yeah so you saw that paul pointed out

462
00:14:54,230 --> 00:14:52,399
the instrument that just arrived back in

463
00:14:55,990 --> 00:14:54,240

that corner but right here in front is

464
00:14:58,230 --> 00:14:56,000
kind of exciting this is one of our

465
00:15:00,069 --> 00:14:58,240
test structures that we use to actually

466
00:15:01,110 --> 00:15:00,079
right now the people up there on the on

467
00:15:03,269 --> 00:15:01,120
the scaffolding

468
00:15:05,110 --> 00:15:03,279
they're actually preparing to integrate

469
00:15:06,949 --> 00:15:05,120
that big dual frequency system

470
00:15:08,550 --> 00:15:06,959
into that system and so they're getting

471
00:15:10,230 --> 00:15:08,560
up there getting all ready to start

472
00:15:11,829 --> 00:15:10,240
integrating the hardware into that

473
00:15:13,269 --> 00:15:11,839
they're making sure they have room for

474
00:15:14,790 --> 00:15:13,279
all the cables and there's not going to

475
00:15:16,310 --> 00:15:14,800
be any hardware that will

476
00:15:17,750 --> 00:15:16,320
hit anything else so this is a really

477
00:15:18,949 --> 00:15:17,760
important practice run that they're

478
00:15:21,910 --> 00:15:18,959
doing right now as you're

479
00:15:23,110 --> 00:15:21,920
as you're witnessing it and so tell me a

480
00:15:24,470 --> 00:15:23,120
little bit about it now

481
00:15:26,710 --> 00:15:24,480
a lot of people saw people in the clean

482
00:15:27,750 --> 00:15:26,720
room from perseverance and they had to

483
00:15:30,150 --> 00:15:27,760
wear a much

484
00:15:31,829 --> 00:15:30,160
heavier suited oh right yeah so we we

485
00:15:33,590 --> 00:15:31,839
have slightly more relaxed

486
00:15:35,430 --> 00:15:33,600
requirements we we are on a planetary

487
00:15:37,110 --> 00:15:35,440
mission so we don't have to worry what's

488
00:15:38,949 --> 00:15:37,120

it's a term called planetary protection

489
00:15:39,430 --> 00:15:38,959
we aren't going to harm our own planet

490
00:15:42,150 --> 00:15:39,440
so we

491
00:15:42,870 --> 00:15:42,160
we have less requirements so right now

492
00:15:44,230 --> 00:15:42,880
what we may

493
00:15:45,990 --> 00:15:44,240
basically have to wear our clothes is

494
00:15:47,509 --> 00:15:46,000
just to protect the hardware from

495
00:15:49,269 --> 00:15:47,519
particles we don't want particles to get

496
00:15:50,949 --> 00:15:49,279
on anything and put dust somewhere where

497
00:15:52,710 --> 00:15:50,959
we don't want it to be so we have

498
00:15:54,230 --> 00:15:52,720
less requirements on that and this is

499
00:15:56,310 --> 00:15:54,240
pretty interesting because i've seen it

500
00:15:57,590 --> 00:15:56,320
actually uh horizontal and now it's

501
00:15:59,670 --> 00:15:57,600
completely in the vertical is there a

502
00:16:02,069 --> 00:15:59,680
reason why you do that shift up and down

503
00:16:02,949 --> 00:16:02,079
yeah so this uh we have this fixture uh

504
00:16:05,030 --> 00:16:02,959
that is used to

505
00:16:06,829 --> 00:16:05,040
rotate horizontal and vertical some

506
00:16:08,949 --> 00:16:06,839
things we need to do in the horizontal

507
00:16:09,350 --> 00:16:08,959
configuration if you can see what we're

508
00:16:11,430 --> 00:16:09,360
doing

509
00:16:13,110 --> 00:16:11,440
over there with the actual flight system

510
00:16:14,230 --> 00:16:13,120
that's all horizontal because we're

511
00:16:15,269 --> 00:16:14,240
going to be testing in that

512
00:16:17,590 --> 00:16:15,279
configuration

513
00:16:19,350 --> 00:16:17,600

we're going to be radiating through our

514
00:16:20,710 --> 00:16:19,360
antenna through this wall you might see

515
00:16:22,150 --> 00:16:20,720
in the background here so there's a lot

516
00:16:23,350 --> 00:16:22,160
of activities that we do that

517
00:16:25,430 --> 00:16:23,360
are better for suited for that

518
00:16:27,030 --> 00:16:25,440
configuration but when it's time to

519
00:16:28,389 --> 00:16:27,040
install the big antenna that you're not

520
00:16:28,790 --> 00:16:28,399
going to see today because it's not here

521
00:16:30,310 --> 00:16:28,800
yet

522
00:16:31,829 --> 00:16:30,320
but we have a very large antenna and

523
00:16:33,430 --> 00:16:31,839
that's best to integrate in this

524
00:16:35,590 --> 00:16:33,440
vertical configuration

525
00:16:37,670 --> 00:16:35,600
it's also much easier to install our

526
00:16:39,430 --> 00:16:37,680
flight of the instruments in a vertical

527
00:16:41,590 --> 00:16:39,440
configuration because it's

528
00:16:43,110 --> 00:16:41,600
easier to deal with gravity effects at

529
00:16:44,150 --> 00:16:43,120
this vertical configuration you don't

530
00:16:45,910 --> 00:16:44,160
have to worry about things

531
00:16:48,310 --> 00:16:45,920
not quite fitting right so this is

532
00:16:49,829 --> 00:16:48,320
preferred for integrating our hardware

533
00:16:51,269 --> 00:16:49,839
and then we can go back and go flat if

534
00:16:52,870 --> 00:16:51,279
we need to do some more testing so it's

535
00:16:55,030 --> 00:16:52,880
a it's flexible

536
00:16:56,150 --> 00:16:55,040
that's great and you were talking about

537
00:16:58,389 --> 00:16:56,160
the reflector which

538
00:16:59,910 --> 00:16:58,399

is the size of a three-story building so

539
00:17:01,030 --> 00:16:59,920
try to wrap your head around that but

540
00:17:02,150 --> 00:17:01,040
we've got a model here

541
00:17:04,069 --> 00:17:02,160
that you're going to be able to show us

542
00:17:05,909 --> 00:17:04,079
exactly what they're trying to do

543
00:17:08,309 --> 00:17:05,919
behind us and then compare it to the

544
00:17:08,949 --> 00:17:08,319
model right so you got a good feel for

545
00:17:10,949 --> 00:17:08,959
what

546
00:17:12,710 --> 00:17:10,959
this portion of the structure looks like

547
00:17:13,669 --> 00:17:12,720
you can see this is all the radar

548
00:17:16,390 --> 00:17:13,679
instrument

549
00:17:18,150 --> 00:17:16,400
this is the feed here but this up here

550
00:17:21,189 --> 00:17:18,160
this is our big 36 foot

551
00:17:22,069 --> 00:17:21,199
antenna antenna reflector it has a nine

552
00:17:23,909 --> 00:17:22,079
meter boom

553
00:17:25,510 --> 00:17:23,919
it's got this very interesting reflector

554
00:17:26,630 --> 00:17:25,520
that's super lightweight it's only a few

555
00:17:28,870 --> 00:17:26,640
hundred pounds

556
00:17:29,669 --> 00:17:28,880
and has to be folded up very small and

557
00:17:31,270 --> 00:17:29,679
compactly

558
00:17:33,270 --> 00:17:31,280
because it has to fit into a pretty

559
00:17:36,710 --> 00:17:33,280
small launch vehicle so you it takes

560
00:17:39,350 --> 00:17:36,720
it's it has to compactly snow

561
00:17:39,830 --> 00:17:39,360
in this configuration and then it folds

562
00:17:42,150 --> 00:17:39,840
itself

563
00:17:42,870 --> 00:17:42,160

around the structure so that um on

564
00:17:44,310 --> 00:17:42,880
launch it's

565
00:17:45,990 --> 00:17:44,320
pretty small it's not much bigger than

566
00:17:47,430 --> 00:17:46,000
this structure right here but it becomes

567
00:17:49,190 --> 00:17:47,440
a very large antenna

568
00:17:50,950 --> 00:17:49,200
the antenna itself is an interesting

569
00:17:52,870 --> 00:17:50,960
technology it's called a mesh

570
00:17:54,150 --> 00:17:52,880
reflector which is like pantyhose that

571
00:17:55,350 --> 00:17:54,160
you could wear on your feet so it's

572
00:17:56,710 --> 00:17:55,360
super lightweight

573
00:17:58,950 --> 00:17:56,720
and then we have a nice structure that

574
00:17:59,350 --> 00:17:58,960
makes it nice and and stable so that it

575
00:18:02,230 --> 00:17:59,360
points

576
00:18:04,230 --> 00:18:02,240
just where we want it to point and tell

577
00:18:05,270 --> 00:18:04,240
me a little bit about the integration

578
00:18:07,270 --> 00:18:05,280
wendy of the

579
00:18:09,510 --> 00:18:07,280
l-band and the s-band because that's

580
00:18:11,430 --> 00:18:09,520
basically the next step for your project

581
00:18:12,870 --> 00:18:11,440
right so i'll walk a little bit back

582
00:18:14,950 --> 00:18:12,880
over here so

583
00:18:17,430 --> 00:18:14,960
over the next month we will stay in

584
00:18:19,190 --> 00:18:17,440
exist this exact configuration

585
00:18:20,630 --> 00:18:19,200
first there's testing the two systems by

586
00:18:22,390 --> 00:18:20,640
themselves just like

587
00:18:23,830 --> 00:18:22,400
india did their testing in india and

588
00:18:26,470 --> 00:18:23,840

we're finishing our testing at

589
00:18:28,310 --> 00:18:26,480
jpl but in about uh three or four weeks

590
00:18:30,310 --> 00:18:28,320
from now we're actually going to start

591
00:18:31,909 --> 00:18:30,320
physically and electrically integrating

592
00:18:33,029 --> 00:18:31,919
the two systems that'll take about a

593
00:18:35,029 --> 00:18:33,039
month or so

594
00:18:36,470 --> 00:18:35,039
to fully test the two systems together

595
00:18:36,870 --> 00:18:36,480
make sure that they work together that

596
00:18:41,430 --> 00:18:36,880
they

597
00:18:43,669 --> 00:18:41,440
other and then we will then take um

598
00:18:45,430 --> 00:18:43,679
uh then is when we take that structure

599
00:18:47,350 --> 00:18:45,440
bring it over here and use this big one

600
00:18:49,029 --> 00:18:47,360
that we were just looking at before

601
00:18:50,549 --> 00:18:49,039
turn it vertical and that's when we

602
00:18:52,390 --> 00:18:50,559
start working on integrating that big

603
00:18:53,270 --> 00:18:52,400
antenna into it and then after that we

604
00:18:55,110 --> 00:18:53,280
go through a whole bunch of

605
00:18:58,470 --> 00:18:55,120
environmental tests with uh

606
00:19:00,390 --> 00:18:58,480
with thermal dynamics you know vibration

607
00:19:02,390 --> 00:19:00,400
to make sure we can survive the launch

608
00:19:04,230 --> 00:19:02,400
and then we ship it back to india and it

609
00:19:05,110 --> 00:19:04,240
will be launching from india it will be

610
00:19:06,870 --> 00:19:05,120
so in india there's

611
00:19:08,710 --> 00:19:06,880
still a lot of work to go we have to

612
00:19:10,470 --> 00:19:08,720
marry this with that spacecraft you

613
00:19:12,630 --> 00:19:10,480

we talked about the solar panels so

614
00:19:13,909 --> 00:19:12,640
there's a lot of hardware at india

615
00:19:15,190 --> 00:19:13,919
that's still getting put together so

616
00:19:17,270 --> 00:19:15,200
this instrument will go

617
00:19:19,510 --> 00:19:17,280
um back to india integrate it with the

618
00:19:20,630 --> 00:19:19,520
spacecraft and then we will launch it

619
00:19:22,470 --> 00:19:20,640
now when you found out that you were

620
00:19:23,190 --> 00:19:22,480
going to be working on nysar what were

621
00:19:25,830 --> 00:19:23,200
you the most

622
00:19:27,110 --> 00:19:25,840
excited about well i i've worked on a

623
00:19:28,789 --> 00:19:27,120
lot of radars with paul

624
00:19:30,549 --> 00:19:28,799
for that matter so i've done a lot of

625
00:19:32,470 --> 00:19:30,559
radars this is probably the most

626
00:19:33,430 --> 00:19:32,480
sophisticated radar i've ever worked on

627
00:19:35,430 --> 00:19:33,440
it's very

628
00:19:36,789 --> 00:19:35,440
it's one of these radars an l-band

629
00:19:37,990 --> 00:19:36,799
system is very complicated and

630
00:19:39,909 --> 00:19:38,000
sophisticated and we're building

631
00:19:42,390 --> 00:19:39,919
two of them so that alone is very

632
00:19:43,909 --> 00:19:42,400
exciting and i have to say that the

633
00:19:46,070 --> 00:19:43,919
the indian collaboration has been very

634
00:19:47,750 --> 00:19:46,080
exciting for me i had never actually

635
00:19:49,029 --> 00:19:47,760
left the us before i started on this

636
00:19:49,510 --> 00:19:49,039
project so my first trip out of the

637
00:19:51,110 --> 00:19:49,520
country

638
00:19:52,870 --> 00:19:51,120

was to india so i thought that was

639
00:19:54,549 --> 00:19:52,880
really exciting too and that's amazing

640
00:19:56,150 --> 00:19:54,559
you had mentioned the collaboration

641
00:19:57,750 --> 00:19:56,160
and that time change must be a little

642
00:19:59,270 --> 00:19:57,760
brutal it it is

643
00:20:01,110 --> 00:19:59,280
um in some ways it's great we are

644
00:20:02,950 --> 00:20:01,120
working 24 7. right

645
00:20:04,390 --> 00:20:02,960
we always are we're with it's we're 12

646
00:20:05,830 --> 00:20:04,400
and 12 hours apart

647
00:20:08,070 --> 00:20:05,840
so when it's our morning it's their

648
00:20:08,950 --> 00:20:08,080
night time so we're just working around

649
00:20:11,990 --> 00:20:08,960
the clock

650
00:20:14,230 --> 00:20:12,000
together that sounds great well thank

651
00:20:16,950 --> 00:20:14,240
you so much wendy for breaking down

652
00:20:17,669 --> 00:20:16,960
all the components here and as we

653
00:20:20,390 --> 00:20:17,679
continue

654
00:20:22,310 --> 00:20:20,400
to prepare just make sure that you stay

655
00:20:23,750 --> 00:20:22,320
tuned and you follow us on all our

656
00:20:27,270 --> 00:20:23,760
social platforms

657
00:20:28,950 --> 00:20:27,280
at nasa jpl also at nasa

658
00:20:31,270 --> 00:20:28,960
earth and as i mentioned before we have

659
00:20:32,470 --> 00:20:31,280
a great new article that we can link in

660
00:20:34,070 --> 00:20:32,480
the comments box

661
00:20:35,750 --> 00:20:34,080
that will actually give you a much more

662
00:20:36,789 --> 00:20:35,760
in-depth look at the mission but i'm

663
00:20:38,470 --> 00:20:36,799

going to let you take

664
00:20:40,149 --> 00:20:38,480
a sneak peek behind me because this is

665
00:20:41,909 --> 00:20:40,159
pretty amazing what's going on

666
00:20:44,710 --> 00:20:41,919
right now we've got a lot of action in

667
00:20:47,430 --> 00:20:44,720
the clean room here at the space

668
00:20:47,830 --> 00:20:47,440
at the space assembly facility and it is

669
00:20:49,669 --> 00:20:47,840
just

670
00:20:51,830 --> 00:20:49,679
amazing to be able to see all of this

671
00:20:54,230 --> 00:20:51,840
coming together the parts just came from

672
00:20:55,029 --> 00:20:54,240
india about two days ago as wendy

673
00:20:56,950 --> 00:20:55,039
mentioned

674
00:20:58,870 --> 00:20:56,960
and now they are slowly but surely

675
00:20:59,830 --> 00:20:58,880
continuing to work on the satellite here

676
00:21:01,669 --> 00:20:59,840
at jpl

677
00:21:03,350 --> 00:21:01,679
until it is ready to be sent for that

678
00:21:05,190 --> 00:21:03,360
final integration in

679
00:21:07,430 --> 00:21:05,200
india where it will launch from the

680
00:21:10,470 --> 00:21:07,440
satish dewan space center

681
00:21:12,230 --> 00:21:10,480
in srihirakota india and to get the very

682
00:21:15,990 --> 00:21:12,240
latest on that mission as i mentioned

683
00:21:19,630 --> 00:21:16,000
follow us here at nasa jpl as well as

684
00:21:23,350 --> 00:21:19,640
at nasa earth for the very latest

685
00:21:26,230 --> 00:21:23,360
information and from our home to yours