1
00:00:10,810 --> 00:00:15,680
[Music]

2
00:00:19,650 --> 00:00:17,670
good morning and welcome to today's

3
00:00:22,320 --> 00:00:19,660
pre-launch news conference for the

4
00:00:25,109 --> 00:00:22,330
launch of NASA's next tracking and data

5
00:00:27,630 --> 00:00:25,119
relay satellite the teeters M spacecraft

6
00:00:29,730 --> 00:00:27,640
which will launch on top of a United

7
00:00:31,740 --> 00:00:29,740
Launch Alliance Atlas 5 rocket I'm

8
00:00:34,530 --> 00:00:31,750
Katherine Hamilton from NASA's office of

9
00:00:36,300 --> 00:00:34,540
communications the Atlas 5 rocket is

10
00:00:38,670 --> 00:00:36,310
ready to lift off tomorrow morning at

11
00:00:40,920 --> 00:00:38,680
8:03 a.m. Eastern Time during a

12
00:00:43,560 --> 00:00:40,930
40-minute window from Space Launch

13
00:00:46,050 --> 00:00:43,570

Complex 41 at Cape Canaveral Air Force

14
00:00:48,420 --> 00:00:46,060
Station here in Florida joining me here

15
00:00:50,400 --> 00:00:48,430
at Kennedy Space Center today to talk

16
00:00:51,960 --> 00:00:50,410
about the mission and how preparations

17
00:00:55,560 --> 00:00:51,970
for tomorrow's launch are progressing

18
00:00:58,940 --> 00:00:55,570
are tim dunn launch director at nasa's

19
00:01:02,400 --> 00:00:58,950
kennedy space center in florida

20
00:01:04,469 --> 00:01:02,410
Badri eunice deputy associate

21
00:01:06,780 --> 00:01:04,479
administrator for space communications

22
00:01:11,760 --> 00:01:06,790
and navigation at NASA headquarters in

23
00:01:14,760 --> 00:01:11,770
Washington Dave Littman project manager

24
00:01:18,289 --> 00:01:14,770
for TDRs m at NASA's Goddard Space

25
00:01:21,959 --> 00:01:18,299
Flight Center in Greenbelt Maryland

26
00:01:27,080 --> 00:01:21,969
James Wilson the third Boeing program

27
00:01:36,480 --> 00:01:30,719
Scott Messer ula program manager for

28
00:01:39,149 --> 00:01:36,490
NASA missions and claice Lyn launch

29
00:01:41,809 --> 00:01:39,159
weather officer with the 45th Space Wing

30
00:01:44,279 --> 00:01:41,819
at Cape Canaveral

31
00:01:44,789 --> 00:01:44,289
after opening comments we'll take your

32
00:01:47,129 --> 00:01:44,799
questions

33
00:01:50,069 --> 00:01:47,139
forward those on the phone please press

34
00:01:52,949 --> 00:01:50,079
star-1 at any time to be entered into

35
00:01:56,010 --> 00:01:52,959
the queue for questions Tim would you

36
00:01:58,349 --> 00:01:56,020
start us off Thank You Kathryn well

37
00:02:00,209 --> 00:01:58,359
welcome and good morning I'm proud to be

38
00:02:02,899 --> 00:02:00,219

here today representing the women and

39
00:02:05,099 --> 00:02:02,909
men of NASA's launch services program

40
00:02:07,010 --> 00:02:05,109
and I'm thrilled to be the launch

41
00:02:09,840 --> 00:02:07,020
director for the teachers in mission

42
00:02:11,970 --> 00:02:09,850
working alongside our United Launch

43
00:02:15,270 --> 00:02:11,980
Alliance colleagues the engineers and

44
00:02:17,760 --> 00:02:15,280
analysts of NASA LSP take great pride in

45
00:02:20,970 --> 00:02:17,770
launching the next satellite in the

46
00:02:23,790 --> 00:02:20,980
tigress constellation nASA has a

47
00:02:25,980 --> 00:02:23,800
terrific record flying on Atlas 5

48
00:02:28,980 --> 00:02:25,990
we've successfully launched 14 missions

49
00:02:32,490 --> 00:02:28,990
on this magnificent rocket missions to

50
00:02:35,600 --> 00:02:32,500
Pluto Jupiter the moon the Sun the

51
00:02:37,590 --> 00:02:35,610
radiation belts three spacecraft to Mars

52
00:02:41,090 --> 00:02:37,600
the asteroid Bennu

53
00:02:44,010 --> 00:02:41,100
as well as two previous TDRs spacecraft

54
00:02:47,520 --> 00:02:44,020
Tigres M will be the 15th NASA mission

55
00:02:51,090 --> 00:02:47,530
on Atlas 5 and the 72nd Atlas 5 mission

56
00:02:53,310 --> 00:02:51,100
overall teacher sim will launch on an

57
00:02:57,050 --> 00:02:53,320
Atlas five four oh one configuration

58
00:03:00,690 --> 00:02:57,060
vehicle from Space Launch Complex 41

59
00:03:03,180 --> 00:03:00,700
affectionately known as slick 41 that

60
00:03:06,420 --> 00:03:03,190
launch pad has hosted 58 Atlas 5

61
00:03:08,370 --> 00:03:06,430
launches to date now I'd like to show a

62
00:03:10,890 --> 00:03:08,380
video with some great shots of the

63
00:03:12,810 --> 00:03:10,900

spacecraft as well as the ula crew

64
00:03:14,850 --> 00:03:12,820
receiving and assembling the Atlas 5

65
00:03:17,970 --> 00:03:14,860
launch vehicle and mating the teacher

66
00:03:21,810 --> 00:03:17,980
sent spacecraft at complex 41 please

67
00:03:23,940 --> 00:03:21,820
roll the tape okay here we are just

68
00:03:26,670 --> 00:03:23,950
under two months ago with the arrival of

69
00:03:28,830 --> 00:03:26,680
the teacher sim spacecraft over at the

70
00:03:31,620 --> 00:03:28,840
Space Coast Regional Airport in

71
00:03:34,020 --> 00:03:31,630
Titusville the satellite was flown from

72
00:03:37,290 --> 00:03:34,030
California on this Air Force c-17

73
00:03:39,810 --> 00:03:37,300
aircraft and from the runway here it's

74
00:03:42,210 --> 00:03:39,820
just a short drive over to Astrotech

75
00:03:46,590 --> 00:03:42,220
facility the spacecraft payload

76
00:03:49,890 --> 00:03:46,600
processing here you see the arrival a

77
00:03:52,949 --> 00:03:49,900
few days later down at Port Canaveral of

78
00:03:55,410 --> 00:03:52,959
the Atlas 5 first stage booster as well

79
00:03:57,960 --> 00:03:55,420
as the second stage centaur these Atlas

80
00:03:59,880 --> 00:03:57,970
5 stages are manufactured at ula Factory

81
00:04:03,210 --> 00:03:59,890
in Decatur Alabama and transported to

82
00:04:05,190 --> 00:04:03,220
the Cape via the Mariner ship here you

83
00:04:08,430 --> 00:04:05,200
see the first stage offloaded and

84
00:04:10,320 --> 00:04:08,440
transported over to the ESOP back over

85
00:04:13,500 --> 00:04:10,330
at Astro Tech in Titusville you get a

86
00:04:17,130 --> 00:04:13,510
glamour shot here of teacher sim in the

87
00:04:18,780 --> 00:04:17,140
processing Bay and then after about two

88
00:04:20,970 --> 00:04:18,790

weeks of processing on the first stage

89
00:04:24,120 --> 00:04:20,980
at the a sock we rolled out the first

90
00:04:26,510 --> 00:04:24,130
stage Atlas 5 booster and did what we

91
00:04:28,740 --> 00:04:26,520
call Elvis launch vehicle on stand

92
00:04:31,230 --> 00:04:28,750
putting it onto the mobile launch

93
00:04:31,890 --> 00:04:31,240
platform in the vertical integration

94
00:04:34,830 --> 00:04:31,900
facility

95
00:04:37,710 --> 00:04:34,840
the next day we roll out with the

96
00:04:41,189 --> 00:04:37,720
integrated second stage

97
00:04:43,680 --> 00:04:41,199
the OVI we call it take it out to the

98
00:04:45,900 --> 00:04:43,690
viv and made it to the top of the first

99
00:04:49,140 --> 00:04:45,910
stage you see the ula crew here working

100
00:04:51,810 --> 00:04:49,150
very carefully back at Astrotech another

101
00:04:54,110 --> 00:04:51,820
great shot of the final encapsulation

102
00:04:57,180 --> 00:04:54,120
sequence of the teacher sim spacecraft

103
00:05:01,740 --> 00:04:57,190
getting it ready to take out to the vist

104
00:05:05,090 --> 00:05:01,750
for mate to the rocket and there we are

105
00:05:08,520 --> 00:05:05,100
just last week on the 9th of August

106
00:05:10,440 --> 00:05:08,530
raising and mating the encapsulated

107
00:05:13,710 --> 00:05:10,450
Assembly of the spacecraft to the top of

108
00:05:15,870 --> 00:05:13,720
the Atlas five rocket really great work

109
00:05:20,969 --> 00:05:15,880
by the entire team to get us to that

110
00:05:24,690 --> 00:05:20,979
point well the teachers in launch

111
00:05:28,020 --> 00:05:24,700
campaign has been exciting we

112
00:05:30,659 --> 00:05:28,030
encountered a incident during processing

113
00:05:32,790 --> 00:05:30,669

over at aster Tech that delayed us we

114
00:05:35,670 --> 00:05:32,800
had planned on launching around the

115
00:05:38,550 --> 00:05:35,680
first part of August and I want to say

116
00:05:40,920 --> 00:05:38,560
that the team did an incredible job to

117
00:05:44,490 --> 00:05:40,930
get us back on track after that I would

118
00:05:47,400 --> 00:05:44,500
like to point out in particular the Air

119
00:05:49,830 --> 00:05:47,410
Force working with the range here at the

120
00:05:52,290 --> 00:05:49,840
eastern range as well as United Launch

121
00:05:55,830 --> 00:05:52,300
Alliance working their manifest were

122
00:05:58,110 --> 00:05:55,840
able to fit us back into a very busy

123
00:06:00,540 --> 00:05:58,120
range schedule during the month of

124
00:06:02,670 --> 00:06:00,550
August so it's a it's really great

125
00:06:04,200 --> 00:06:02,680
within our launch community when we can

126
00:06:07,219 --> 00:06:04,210
all come together and help each other

127
00:06:10,350 --> 00:06:07,229
out so I would like to reach out to my

128
00:06:11,879 --> 00:06:10,360
colleagues over at SpaceX as well as the

129
00:06:14,430 --> 00:06:11,889
folks that are working the minutes are

130
00:06:17,129 --> 00:06:14,440
for launch because earlier this week

131
00:06:19,500 --> 00:06:17,139
there was a SpaceX launch and later next

132
00:06:21,500 --> 00:06:19,510
week there will be a Minotaur 4 o RS 5

133
00:06:24,480 --> 00:06:21,510
launch from the Cape both missions

134
00:06:27,060 --> 00:06:24,490
really did some accommodation to fit us

135
00:06:30,600 --> 00:06:27,070
in to enable an opportunity for us to

136
00:06:33,000 --> 00:06:30,610
launch tomorrow so in the past week

137
00:06:35,040 --> 00:06:33,010
since we did spacecraft mate the Atlas 5

138
00:06:37,529 --> 00:06:35,050

team has been busy with a lot of launch

139
00:06:39,210 --> 00:06:37,539
preps last Friday we performed the

140
00:06:41,730 --> 00:06:39,220
integrated systems tests between the

141
00:06:44,219 --> 00:06:41,740
spacecraft and rocket and the combined

142
00:06:46,589 --> 00:06:44,229
NASA and ula launch team held our Flight

143
00:06:48,330 --> 00:06:46,599
Readiness review where we assessed all

144
00:06:49,999 --> 00:06:48,340
processing and pre-launch preps for the

145
00:06:51,980 --> 00:06:50,009
mission

146
00:06:53,679 --> 00:06:51,990
earlier this week on Tuesday morning we

147
00:06:56,749 --> 00:06:53,689
conducted the launch readiness review

148
00:07:00,019 --> 00:06:56,759
for the mission senior managers from

149
00:07:02,869 --> 00:07:00,029
NASA KSC NASA Goddard Space Flight

150
00:07:04,600 --> 00:07:02,879
Center NASA headquarters as well as

151
00:07:08,959 --> 00:07:04,610
United Launch Alliance and the air force

152
00:07:10,549 --> 00:07:08,969
assess all phases of the mission to

153
00:07:13,519 --> 00:07:10,559
enable us to proceed with launch

154
00:07:16,100 --> 00:07:13,529
tomorrow on Tuesday afternoon we did our

155
00:07:19,029 --> 00:07:16,110
mission dress rehearsal we exercised and

156
00:07:22,100 --> 00:07:19,039
prepared the entire team for launch

157
00:07:24,439 --> 00:07:22,110
yesterday we began our final lunch preps

158
00:07:25,969 --> 00:07:24,449
at 9:00 a.m. Eastern time when we rolled

159
00:07:28,610 --> 00:07:25,979
the Atlas 5 on its mobile launch

160
00:07:31,119 --> 00:07:28,620
platform out of the vith about a quarter

161
00:07:34,429 --> 00:07:31,129
mile to the north to the launch pad and

162
00:07:37,059 --> 00:07:34,439
then the crew deftly navigated local

163
00:07:40,279 --> 00:07:37,069

thunderstorm activity and safely loaded

164
00:07:43,639 --> 00:07:40,289
approximately 26,000 gallons of rp1 fuel

165
00:07:45,350 --> 00:07:43,649
on the first stage if you were here in

166
00:07:48,799 --> 00:07:45,360
the local area yesterday you know what

167
00:07:50,209 --> 00:07:48,809
that activity was all about later

168
00:07:52,129 --> 00:07:50,219
tonight the launch crew will begin

169
00:07:54,709 --> 00:07:52,139
arriving on console and begin with the

170
00:07:56,629 --> 00:07:54,719
power-on sequence for the spacecraft the

171
00:07:58,730 --> 00:07:56,639
crew will then perform final preps for

172
00:08:00,920 --> 00:07:58,740
the Atlas 5 power on and electrical

173
00:08:03,529 --> 00:08:00,930
checks beginning about 1 a.m. early

174
00:08:06,049 --> 00:08:03,539
tomorrow morning this will be followed

175
00:08:07,909 --> 00:08:06,059
around 5:30 a.m. by loading of the super

176
00:08:10,189 --> 00:08:07,919
cold cryogenic propellants on board

177
00:08:13,429 --> 00:08:10,199
Atlas 5 we'll start with the liquid

178
00:08:15,649 --> 00:08:13,439
oxidizer liquid oxygen into the tanks of

179
00:08:18,889 --> 00:08:15,659
the first and second stages and then

180
00:08:22,149 --> 00:08:18,899
we'll begin loading the fueled liquid

181
00:08:24,110 --> 00:08:22,159
hydrogen into the second stage Centaur

182
00:08:25,939 --> 00:08:24,120
final flight control tests will be

183
00:08:28,399 --> 00:08:25,949
performed along with final tests with

184
00:08:29,809 --> 00:08:28,409
eastern range instrumentation and then

185
00:08:32,959 --> 00:08:29,819
will be ready for launch tomorrow

186
00:08:36,110 --> 00:08:32,969
morning at 8:03 a.m. Eastern Time with a

187
00:08:39,350 --> 00:08:36,120
40-minute window to summarize the

188
00:08:41,209 --> 00:08:39,360

spacecraft the Atlas 5 rocket and all

189
00:08:42,529 --> 00:08:41,219
range equipment are ready and the

190
00:08:44,990 --> 00:08:42,539
combined government and contractor

191
00:08:48,079 --> 00:08:45,000
launch team is prepared to launch teed

192
00:08:50,629 --> 00:08:48,089
resume a critical national asset for

193
00:08:53,569 --> 00:08:50,639
space communications back to you

194
00:08:55,430 --> 00:08:53,579
Katherine thank you Tim and next Badri

195
00:08:58,610 --> 00:08:55,440
units will tell us a bit about the space

196
00:09:01,910 --> 00:08:58,620
network Thank You Katherine thank you

197
00:09:03,769 --> 00:09:01,920
Tim we are counting on you thank you

198
00:09:05,929 --> 00:09:03,779
hopefully bye bye this

199
00:09:09,079 --> 00:09:05,939
time tomorrow we'll all be celebrating

200
00:09:12,379 --> 00:09:09,089
the successful launch of Peters M the

201
00:09:14,689 --> 00:09:12,389
new addition to the scan family scan is

202
00:09:16,730 --> 00:09:14,699
the headquarter program that's

203
00:09:20,840 --> 00:09:16,740
responsible for all of NASA space

204
00:09:24,439 --> 00:09:20,850
communication navigations at the within

205
00:09:26,989 --> 00:09:24,449
scan we manage all all of all of NASA's

206
00:09:29,449 --> 00:09:26,999
space communication networks that

207
00:09:31,460 --> 00:09:29,459
include the Deep Space Network the

208
00:09:34,249 --> 00:09:31,470
near-earth network as well as the space

209
00:09:37,280 --> 00:09:34,259
network they all cater to different kind

210
00:09:39,579 --> 00:09:37,290
of users the Deep Space Network supports

211
00:09:42,860 --> 00:09:39,589
missions that are billions of miles away

212
00:09:45,470 --> 00:09:42,870
sending very faint signals to earth and

213
00:09:48,110 --> 00:09:45,480

given us some data about the universe

214
00:09:50,420 --> 00:09:48,120
and primarily scientific data the

215
00:09:52,970 --> 00:09:50,430
near-earth network is a little bit more

216
00:09:55,900 --> 00:09:52,980
robust supporting anything between earth

217
00:09:58,129 --> 00:09:55,910
and the moon and a little bit beyond

218
00:10:01,100 --> 00:09:58,139
support and primarily mission that do

219
00:10:04,460 --> 00:10:01,110
not require a global coverage or near

220
00:10:07,100 --> 00:10:04,470
real-time support the space network is

221
00:10:09,590 --> 00:10:07,110
the youngest of all networks and it has

222
00:10:13,910 --> 00:10:09,600
two components the ground infrastructure

223
00:10:17,150 --> 00:10:13,920
and a fleet of data relay satellite of

224
00:10:17,929 --> 00:10:17,160
which Peters M is going to be a member

225
00:10:22,369 --> 00:10:17,939
of this family

226
00:10:26,240 --> 00:10:22,379
so teeters M is going to be critical to

227
00:10:29,269 --> 00:10:26,250
our future operation and the future of

228
00:10:31,819 --> 00:10:29,279
the space network next chart I would

229
00:10:34,369 --> 00:10:31,829
like to you to see some charts about the

230
00:10:37,309 --> 00:10:34,379
history of launching the feeder

231
00:10:41,629 --> 00:10:37,319
spacecraft and where we are in terms of

232
00:10:44,629 --> 00:10:41,639
fleet capacity okay here you here we go

233
00:10:48,819 --> 00:10:44,639
we have three generations of spacecraft

234
00:10:52,009 --> 00:10:48,829
that are somehow different in their

235
00:10:55,009 --> 00:10:52,019
functional performance but architectural

236
00:10:59,780 --> 00:10:55,019
II they are the same launched since the

237
00:11:03,230 --> 00:10:59,790
early 1980 with the first generation T

238
00:11:06,350 --> 00:11:03,240

dresses and we have they have been

239
00:11:09,199 --> 00:11:06,360
operating for more than 20 years some of

240
00:11:12,740 --> 00:11:09,209
them are retired some are sitting in

241
00:11:15,490 --> 00:11:12,750
storage having limited capability and

242
00:11:17,570 --> 00:11:15,500
all of them have been launched you know

243
00:11:20,360 --> 00:11:17,580
by the year nineteen nine

244
00:11:23,380 --> 00:11:20,370
if five the second generation teaser

245
00:11:27,290 --> 00:11:23,390
says they have been lost also on Atlas

246
00:11:29,680 --> 00:11:27,300
launch vehicle at Atlas 2a and they are

247
00:11:33,740 --> 00:11:29,690
still operating and operating pretty

248
00:11:36,890 --> 00:11:33,750
robustly you know and they are already

249
00:11:41,150 --> 00:11:36,900
active provide an active support to NASA

250
00:11:43,550 --> 00:11:41,160
Space Network customer community the

251
00:11:47,270 --> 00:11:43,560
last of the feeders generation is the

252
00:11:50,210 --> 00:11:47,280
third generation of which teasers M is a

253
00:11:51,800 --> 00:11:50,220
member and we are hoping it will be

254
00:11:54,650 --> 00:11:51,810
launched successfully and will be

255
00:11:57,830 --> 00:11:54,660
deployed and will take its place among

256
00:12:00,320 --> 00:11:57,840
the start supporting is you know it's

257
00:12:03,140 --> 00:12:00,330
brothers and sisters and performing

258
00:12:04,940 --> 00:12:03,150
their function it's critical because the

259
00:12:08,240 --> 00:12:04,950
space network as you see in the middle

260
00:12:11,410 --> 00:12:08,250
of that chart depends on Peters to do

261
00:12:14,960 --> 00:12:11,420
its function we need at least six

262
00:12:17,420 --> 00:12:14,970
spacecraft you know active active

263
00:12:20,240 --> 00:12:17,430

spacecraft and one active spare so we

264
00:12:23,870 --> 00:12:20,250
need seven spacecraft to be ready to

265
00:12:26,840 --> 00:12:23,880
meet all of our mission requirements we

266
00:12:30,200 --> 00:12:26,850
have most of the first generation will

267
00:12:32,210 --> 00:12:30,210
have been retired and sent to a super

268
00:12:35,390 --> 00:12:32,220
sync orbit where we retire our

269
00:12:37,880 --> 00:12:35,400
spacecraft and will we may have some

270
00:12:40,670 --> 00:12:37,890
residual capability so teeters M is so

271
00:12:42,680 --> 00:12:40,680
critical you know without any undue

272
00:12:47,480 --> 00:12:42,690
pressure Tim I definitely need this

273
00:12:49,940 --> 00:12:47,490
spacecraft and and while we are

274
00:12:52,310 --> 00:12:49,950
deploying Peters M we are already

275
00:12:56,060 --> 00:12:52,320
working next chart please on the next

276
00:12:59,630 --> 00:12:56,070
generation architectural capability a

277
00:13:03,620 --> 00:12:59,640
next generation communication networks

278
00:13:07,460 --> 00:13:03,630
and in particular the next generation

279
00:13:09,710 --> 00:13:07,470
data relay capability over the past few

280
00:13:12,860 --> 00:13:09,720
years nASA has been investing very

281
00:13:17,350 --> 00:13:12,870
heavily in transformational technology

282
00:13:21,440 --> 00:13:17,360
such as optical communication quantum

283
00:13:24,050 --> 00:13:21,450
entanglement smart radios and cognitive

284
00:13:27,890 --> 00:13:24,060
radios as well as robust communication

285
00:13:29,630 --> 00:13:27,900
systems we are working toward an

286
00:13:32,810 --> 00:13:29,640
architecture where we have

287
00:13:38,050 --> 00:13:32,820
more robustness and where the users and

288
00:13:40,730 --> 00:13:38,060

the you know our levy are communicating

289
00:13:44,120 --> 00:13:40,740
robustly was through a data relay

290
00:13:46,970 --> 00:13:44,130
satellite or sending their data directly

291
00:13:51,640 --> 00:13:46,980
to their Mission Operations Center but

292
00:13:53,840 --> 00:13:51,650
having the flexibility to go anywhere

293
00:13:57,380 --> 00:13:53,850
anywhere where you have a channel

294
00:13:59,300 --> 00:13:57,390
available and to provide them optimum

295
00:14:02,260 --> 00:13:59,310
support we are working with other

296
00:14:04,970 --> 00:14:02,270
government entities to build similar

297
00:14:08,180 --> 00:14:04,980
capabilities and we'll build into the

298
00:14:10,400 --> 00:14:08,190
same standard as well as well as we are

299
00:14:12,710 --> 00:14:10,410
working with the commercial sector to

300
00:14:15,370 --> 00:14:12,720
adopt these standards and to adopt the

301
00:14:18,140 --> 00:14:15,380
credit technology to provide seamless

302
00:14:21,080 --> 00:14:18,150
interoperable environment to our users

303
00:14:23,480 --> 00:14:21,090
in the future NASA is working very

304
00:14:25,580 --> 00:14:23,490
heavily to this endeavor and we have

305
00:14:28,460 --> 00:14:25,590
declared the next decade to be the

306
00:14:31,490 --> 00:14:28,470
decade of light as we intend to light up

307
00:14:37,130 --> 00:14:31,500
the communication highways all over you

308
00:14:39,170 --> 00:14:37,140
know the solar system so next chart much

309
00:14:41,330 --> 00:14:39,180
of the data you can see at our web site

310
00:14:43,820 --> 00:14:41,340
that I provide for you to to please

311
00:14:46,040 --> 00:14:43,830
visit and and see the wonderful things

312
00:14:49,150 --> 00:14:46,050
we are doing as well as the technology

313
00:14:51,710 --> 00:14:49,160

advances we made and next chart please

314
00:14:54,680 --> 00:14:51,720
you know last but not least I'd like to

315
00:14:58,250 --> 00:14:54,690
thank them and the entire launch

316
00:15:01,820 --> 00:14:58,260
services folks to include ula and the

317
00:15:04,280 --> 00:15:01,830
LSP and as well as the spacecraft folks

318
00:15:06,650 --> 00:15:04,290
you know from our project office the

319
00:15:09,740 --> 00:15:06,660
Peters project office and the Boeing for

320
00:15:11,300 --> 00:15:09,750
a wonderful job they have done we are we

321
00:15:13,880 --> 00:15:11,310
are keeping our fingers crossed but

322
00:15:16,970 --> 00:15:13,890
great folks you know and thousands of

323
00:15:19,460 --> 00:15:16,980
hours you know have have gone into it to

324
00:15:21,710 --> 00:15:19,470
get us where we are now tomorrow we

325
00:15:23,840 --> 00:15:21,720
expect it to be a successful day and we

326
00:15:27,140 --> 00:15:23,850
are going to have a major celebration by

327
00:15:28,700 --> 00:15:27,150
the end of the day thank you thank you

328
00:15:31,970 --> 00:15:28,710
and next dave Lippmann will tell us more

329
00:15:34,880 --> 00:15:31,980
about teachers itself Thank You Kathryn

330
00:15:36,560 --> 00:15:34,890
thank you Tim and Vaudrey it's really

331
00:15:39,290 --> 00:15:36,570
great to be here again back down at the

332
00:15:40,940 --> 00:15:39,300
Cape for another launch of tigress we

333
00:15:43,310 --> 00:15:40,950
were here a couple of years ago for the

334
00:15:45,980 --> 00:15:43,320
launch of tigress K & L has

335
00:15:47,810 --> 00:15:45,990
Badri mentioned 2013-2014 so it's been a

336
00:15:50,570 --> 00:15:47,820
couple of years but those are great

337
00:15:52,880 --> 00:15:50,580
launches they are operating very well in

338
00:15:55,010 --> 00:15:52,890

the space network we did look at the

339
00:15:56,900 --> 00:15:55,020
telemetry coverage planned for the

340
00:15:59,810 --> 00:15:56,910
launch tomorrow and tigress K and

341
00:16:02,860 --> 00:15:59,820
tigress L will be watching teachers m

342
00:16:05,600 --> 00:16:02,870
and tracking the launch vehicle as it

343
00:16:07,640 --> 00:16:05,610
for our successful launch so we kind of

344
00:16:09,290 --> 00:16:07,650
made a comment at the at the Flight

345
00:16:10,610 --> 00:16:09,300
Readiness review about what Tiggers m

346
00:16:13,460 --> 00:16:10,620
might think of that knowing that it's

347
00:16:16,870 --> 00:16:13,470
two siblings we're going to watch over

348
00:16:18,950 --> 00:16:16,880
seeing it come up on the launch vehicle

349
00:16:20,420 --> 00:16:18,960
so it generated a little smile across

350
00:16:22,040 --> 00:16:20,430
the team but it's great that we've got

351
00:16:23,410 --> 00:16:22,050
two great spacecraft k now and we're

352
00:16:28,730 --> 00:16:23,420
looking forward to the third one

353
00:16:30,620 --> 00:16:28,740
tomorrow the first 70 dress as a Badri

354
00:16:32,410 --> 00:16:30,630
mentioned were launched on the space

355
00:16:35,990 --> 00:16:32,420
shuttle program which has been retired

356
00:16:38,390 --> 00:16:36,000
we've retired at least two of our of the

357
00:16:39,650 --> 00:16:38,400
first seven we still have a number of

358
00:16:42,080 --> 00:16:39,660
those those that are still operating

359
00:16:44,840 --> 00:16:42,090
well beyond design life in addition

360
00:16:46,400 --> 00:16:44,850
tigress H I and J was the second

361
00:16:48,230 --> 00:16:46,410
generation built by the Boeing Company

362
00:16:50,180 --> 00:16:48,240
and those are operating as Badri

363
00:16:52,970 --> 00:16:50,190

mentioned and teachers K and L I just

364
00:16:54,830 --> 00:16:52,980
mentioned we're launch 2013 and 14 also

365
00:16:57,230 --> 00:16:54,840
built by the Boeing Company and those

366
00:16:59,210 --> 00:16:57,240
are operating very well in addition to

367
00:17:01,430 --> 00:16:59,220
that so we have a great constellation

368
00:17:04,069 --> 00:17:01,440
but we need one more for at least for

369
00:17:06,500 --> 00:17:04,079
now batteries got friends you mentioned

370
00:17:08,650 --> 00:17:06,510
to you know to maybe change paradigm of

371
00:17:11,720 --> 00:17:08,660
Technology and to continue our

372
00:17:13,069 --> 00:17:11,730
communications you know and increase the

373
00:17:15,290 --> 00:17:13,079
data rates and increase the number of

374
00:17:17,929 --> 00:17:15,300
users and bandwidth in discoveries that

375
00:17:20,870 --> 00:17:17,939
are enabled by the space communication

376
00:17:22,579 --> 00:17:20,880
that we have so what I do have is a

377
00:17:25,280 --> 00:17:22,589
little bit of video on the processing of

378
00:17:26,390 --> 00:17:25,290
our spacecraft here at Astro tech some

379
00:17:27,949 --> 00:17:26,400
of it you'll kind of there may be a

380
00:17:29,600 --> 00:17:27,959
little bit of an overlay here but this

381
00:17:32,180 --> 00:17:29,610
is the spacecraft arriving is to mention

382
00:17:34,370 --> 00:17:32,190
here June 23rd and it's taken off the

383
00:17:36,320 --> 00:17:34,380
spacecraft put on a Landoll trailer and

384
00:17:38,690 --> 00:17:36,330
take it over to astra tech where we

385
00:17:41,810 --> 00:17:38,700
process the spacecraft it's in this

386
00:17:42,800 --> 00:17:41,820
container it shipped and I think what

387
00:17:45,200 --> 00:17:42,810
you'll see here is them lifting the

388
00:17:47,420 --> 00:17:45,210

cover off of the transport container and

389
00:17:50,150 --> 00:17:47,430
the spacecraft is shipped is and it's

390
00:17:52,820 --> 00:17:50,160
horizontal it's on a strong back from

391
00:17:54,740 --> 00:17:52,830
when we were in the from there we raise

392
00:17:56,470 --> 00:17:54,750
it to a vertical position and where we

393
00:17:58,150 --> 00:17:56,480
put it on to our fueling stand

394
00:18:01,630 --> 00:17:58,160
and that is where our processing takes

395
00:18:03,700 --> 00:18:01,640
place you'll see this here we did

396
00:18:05,830 --> 00:18:03,710
encounter one issue here you know acting

397
00:18:07,510 --> 00:18:05,840
which we work through and you know

398
00:18:11,230 --> 00:18:07,520
following getting through that activity

399
00:18:12,430 --> 00:18:11,240
that Tim mentioned we were ready to feed

400
00:18:14,740 --> 00:18:12,440
you know ready to kind of move to a

401
00:18:16,450 --> 00:18:14,750
transport condition and you can see the

402
00:18:19,210 --> 00:18:16,460
encapsulation here now you saw that a

403
00:18:20,620 --> 00:18:19,220
little bit of nasaan Tim's video what

404
00:18:22,570 --> 00:18:20,630
folks will tell me though is the the

405
00:18:24,039 --> 00:18:22,580
engineers that have spent years and

406
00:18:25,539 --> 00:18:24,049
thousands of hours building the

407
00:18:27,909 --> 00:18:25,549
spacecraft this is the last time they

408
00:18:29,740 --> 00:18:27,919
physically are able to see it the next

409
00:18:32,409 --> 00:18:29,750
time we will see it is on-orbit through

410
00:18:34,480 --> 00:18:32,419
our displays in Mission Control this is

411
00:18:37,299 --> 00:18:34,490
the spacecraft and it's an encapsulated

412
00:18:39,970 --> 00:18:37,309
state and then it's being lifted up here

413
00:18:42,370 --> 00:18:39,980

on a crane and put onto the transport

414
00:18:46,210 --> 00:18:42,380
vehicle where it is taken to the vist

415
00:18:51,940 --> 00:18:46,220
and that you saw Tim showed in the lift

416
00:18:54,549 --> 00:18:51,950
and mate once we launch we have a second

417
00:18:57,909 --> 00:18:54,559
little video to come up here once we

418
00:18:59,260 --> 00:18:57,919
separate from the Atlas vehicle we go

419
00:19:01,930 --> 00:18:59,270
through a series of orbit raising

420
00:19:04,600 --> 00:19:01,940
activities here we can see that we're

421
00:19:06,700 --> 00:19:04,610
spinning about five rpms per second and

422
00:19:08,919 --> 00:19:06,710
then we're released the first thing we

423
00:19:11,110 --> 00:19:08,929
do is we unfurl our antennas and then we

424
00:19:12,460 --> 00:19:11,120
raise our orbit we have five apogee

425
00:19:14,830 --> 00:19:12,470
burns where we raise our orbit to

426
00:19:16,690 --> 00:19:14,840
geosynchronous orbit and once we are

427
00:19:19,450 --> 00:19:16,700
raised then we start our deployments and

428
00:19:21,700 --> 00:19:19,460
here's our North's phone ring then we

429
00:19:24,159 --> 00:19:21,710
deploy our SI antennas the large

430
00:19:26,980 --> 00:19:24,169
reflectors from there we deploy our cell

431
00:19:28,960 --> 00:19:26,990
solar wing and then come out come our

432
00:19:31,930 --> 00:19:28,970
omni antenna and the space-to-ground

433
00:19:34,659 --> 00:19:31,940
link antenna from there we have a full

434
00:19:37,539 --> 00:19:34,669
spacecraft and it takes about three to

435
00:19:39,789 --> 00:19:37,549
four months following deployments for us

436
00:19:40,900 --> 00:19:39,799
to fully characterize the spacecraft and

437
00:19:42,730 --> 00:19:40,910
to show that it will meet mission

438
00:19:46,330 --> 00:19:42,740

requirements and provide the RF

439
00:19:49,720 --> 00:19:46,340
performance that is needed to support

440
00:19:52,510 --> 00:19:49,730
our users that activity is done over at

441
00:19:54,100 --> 00:19:52,520
the white sands complex and after

442
00:19:56,350 --> 00:19:54,110
acceptance of the spacecraft from the

443
00:19:58,000 --> 00:19:56,360
Boeing Company then it is turned over to

444
00:20:00,460 --> 00:19:58,010
our sister organization the space

445
00:20:04,240 --> 00:20:00,470
network to operate the vehicle becomes a

446
00:20:06,490 --> 00:20:04,250
member of our constellation thank you

447
00:20:08,200 --> 00:20:06,500
next James Wilson the third we'll talk a

448
00:20:09,629 --> 00:20:08,210
little bit about Boeing's role in the

449
00:20:11,819 --> 00:20:09,639
teachers thanks

450
00:20:14,339 --> 00:20:11,829
Catherine it is truly an honor to be

451
00:20:17,489 --> 00:20:14,349
here representing the Boeing Company and

452
00:20:19,680 --> 00:20:17,499
the teachers team there are thousands of

453
00:20:22,529 --> 00:20:19,690
people behind me who have supported this

454
00:20:24,869 --> 00:20:22,539
program to bring us to this point

455
00:20:26,789 --> 00:20:24,879
you know it's really exciting to to be

456
00:20:29,759 --> 00:20:26,799
up here as part of this panel see the

457
00:20:32,699 --> 00:20:29,769
teamwork of folks our partnership with

458
00:20:35,849 --> 00:20:32,709
NASA partnership with ula that really

459
00:20:38,430 --> 00:20:35,859
brings this incredible sense of of pride

460
00:20:40,979 --> 00:20:38,440
in our national asset pride in what

461
00:20:42,389 --> 00:20:40,989
we're doing and really brings smiles to

462
00:20:45,779 --> 00:20:42,399
our faces when we get together and talk

463
00:20:48,180 --> 00:20:45,789

about the things that we do it it really

464
00:20:49,589 --> 00:20:48,190
brings everyone excitement it's a long

465
00:20:51,749 --> 00:20:49,599
time getting here

466
00:20:54,629 --> 00:20:51,759
once the contract is signed we go

467
00:20:56,699 --> 00:20:54,639
through an extensive design period we

468
00:20:59,009 --> 00:20:56,709
integrate the satellite we test it and

469
00:21:00,479 --> 00:20:59,019
then bring it to launch site but we're

470
00:21:02,729 --> 00:21:00,489
not done as dave showed in the previous

471
00:21:05,190 --> 00:21:02,739
video there's several months of on-orbit

472
00:21:07,709 --> 00:21:05,200
tests and so there's quite a bit of

473
00:21:10,109 --> 00:21:07,719
activity that will follow launch is an

474
00:21:12,899 --> 00:21:10,119
exciting time for us to go through this

475
00:21:15,289 --> 00:21:12,909
activity but there's an entire mission

476
00:21:19,289 --> 00:21:15,299
team waiting to catch that satellite

477
00:21:25,019 --> 00:21:19,299
somewhere over India and take it on the

478
00:21:27,419 --> 00:21:25,029
rest of its way to its final orbit this

479
00:21:30,359 --> 00:21:27,429
is the sixth satellite that Boeing has

480
00:21:32,669 --> 00:21:30,369
delivered to NASA for tigress and we've

481
00:21:36,329 --> 00:21:32,679
been the exclusive provider of teaser

482
00:21:40,049 --> 00:21:36,339
satellite since 1995 that is an

483
00:21:42,799 --> 00:21:40,059
incredible feat Boeing Boeing is has

484
00:21:45,329 --> 00:21:42,809
enjoyed the relationship with NASA and

485
00:21:49,019 --> 00:21:45,339
the continued relationship I think will

486
00:21:52,169 --> 00:21:49,029
be good for both entities it's important

487
00:21:54,629 --> 00:21:52,179
to know though that T drous M this

488
00:21:57,869 --> 00:21:54,639

satellite represents the last of our 601

489
00:22:01,229 --> 00:21:57,879
fleet 601 s were first launched in 1992

490
00:22:05,039 --> 00:22:01,239
and now here in 2017 we launched the

491
00:22:07,319 --> 00:22:05,049
last one I started out on 601 s when I

492
00:22:11,329 --> 00:22:07,329
was a young engineer we'll see some some

493
00:22:14,849 --> 00:22:11,339
pictures in high bay and it's incredibly

494
00:22:16,949 --> 00:22:14,859
exciting for me as an engineer as now as

495
00:22:21,029 --> 00:22:16,959
a manager to have gone through that and

496
00:22:22,649 --> 00:22:21,039
see the final final launch as I said we

497
00:22:23,460 --> 00:22:22,659
have an excellent team in place with

498
00:22:26,129 --> 00:22:23,470
NASA

499
00:22:28,320 --> 00:22:26,139
and in the ula and and we look forward

500
00:22:30,960 --> 00:22:28,330
to continuing our relationship with you

501
00:22:32,909 --> 00:22:30,970
guys now I also have a video and we can

502
00:22:35,310 --> 00:22:32,919
take a look at what it looks like to

503
00:22:38,700 --> 00:22:35,320
build and test satellites in our Factory

504
00:22:40,619 --> 00:22:38,710
so we roll the tape so here we're going

505
00:22:43,320 --> 00:22:40,629
to go through a little bit of a high bay

506
00:22:44,249 --> 00:22:43,330
tours which we call the factory and walk

507
00:22:46,499 --> 00:22:44,259
you through some of the things that

508
00:22:48,899 --> 00:22:46,509
teachers has gone through so here we are

509
00:22:50,999 --> 00:22:48,909
we're sitting on the end of an Bell and

510
00:22:52,830 --> 00:22:51,009
the satellite is prepped for spacecraft

511
00:22:54,269 --> 00:22:52,840
thermal vac we put it in a very large

512
00:22:56,430 --> 00:22:54,279
chamber you can see it being lifted up

513
00:22:58,529 --> 00:22:56,440

there and in this chamber we simulate a

514
00:23:01,440 --> 00:22:58,539
space environment we pump down to a

515
00:23:03,509 --> 00:23:01,450
vacuum we heat it we cool it we make

516
00:23:06,269 --> 00:23:03,519
sure that the spacecraft systems can

517
00:23:08,399 --> 00:23:06,279
preserve itself and then we go over to

518
00:23:10,350 --> 00:23:08,409
vibration and vibration we similarly

519
00:23:12,090 --> 00:23:10,360
simulate what it's like to ride on the

520
00:23:13,529 --> 00:23:12,100
rocket and you can see in the video that

521
00:23:16,560 --> 00:23:13,539
the antennas are shaking pretty good

522
00:23:18,600 --> 00:23:16,570
there we simulate all the different axes

523
00:23:20,369 --> 00:23:18,610
that the spacecraft will we'll see and

524
00:23:23,580 --> 00:23:20,379
make sure that it's structurally sound

525
00:23:25,830 --> 00:23:23,590
and ready to go into flight we put it on

526
00:23:27,539 --> 00:23:25,840
what we call a rollover fixture and it

527
00:23:30,749 --> 00:23:27,549
sits on some air pads and allows us to

528
00:23:33,840 --> 00:23:30,759
move it around the factory and we do our

529
00:23:36,119 --> 00:23:33,850
deployments and we simulate the exercise

530
00:23:37,320 --> 00:23:36,129
the all the the appendages that will

531
00:23:39,570 --> 00:23:37,330
come out in flight like they've showed

532
00:23:42,840 --> 00:23:39,580
in the previous video and then of course

533
00:23:45,509 --> 00:23:42,850
once it's all buttoned up we put it on

534
00:23:50,610 --> 00:23:45,519
its adapter and attach the clamp band

535
00:23:52,249 --> 00:23:50,620
and then put it in the container and so

536
00:23:54,720 --> 00:23:52,259
here you see us rolling into the

537
00:23:57,419 --> 00:23:54,730
containerization room it takes quite a

538
00:23:58,830 --> 00:23:57,429

bit of people to watch all the pieces

539
00:24:00,299 --> 00:23:58,840
make sure we go through the doors

540
00:24:02,399 --> 00:24:00,309
properly and make sure that we lift it

541
00:24:05,399 --> 00:24:02,409
properly and so here we are lifting the

542
00:24:08,539 --> 00:24:05,409
spacecraft from its four corners and

543
00:24:11,940 --> 00:24:08,549
they'll move it onto the container and

544
00:24:13,409 --> 00:24:11,950
again reattach it and you can see the

545
00:24:15,299 --> 00:24:13,419
guys very carefully making sure that

546
00:24:17,039 --> 00:24:15,309
we're perfectly precise in our

547
00:24:19,230 --> 00:24:17,049
attachment and making sure that we have

548
00:24:23,549 --> 00:24:19,240
all the proper torques and then we roll

549
00:24:26,399 --> 00:24:23,559
it over and secure it for for transport

550
00:24:29,340 --> 00:24:26,409
to the launch site for extra safety

551
00:24:32,779 --> 00:24:29,350
measure we put a mylar cover over it to

552
00:24:35,129 --> 00:24:32,789
make sure that there's no dust or

553
00:24:36,540 --> 00:24:35,139
condensation that could perhaps get on

554
00:24:39,240 --> 00:24:36,550
the spacecraft and

555
00:24:41,310 --> 00:24:39,250
we put a very heavy cover on the top of

556
00:24:42,840 --> 00:24:41,320
the container you can see the guys

557
00:24:44,310 --> 00:24:42,850
they're being very careful to make sure

558
00:24:48,260 --> 00:24:44,320
that we align it properly before

559
00:24:51,540 --> 00:24:48,270
bringing it down attach the clamps and

560
00:24:56,570 --> 00:24:51,550
we are ready to go on a trailer so we

561
00:24:58,590 --> 00:24:56,580
roll the semi truck in lift it up and

562
00:25:02,130 --> 00:24:58,600
hopefully you're getting a sense of how

563
00:25:03,450 --> 00:25:02,140

big this is this is quite a large device

564
00:25:04,740 --> 00:25:03,460
and I can imagine what the people are

565
00:25:06,840 --> 00:25:04,750
thinking on the freeways they see it

566
00:25:09,030 --> 00:25:06,850
rolled down the road what could possibly

567
00:25:11,460 --> 00:25:09,040
be in that thing little they know it is

568
00:25:15,690 --> 00:25:11,470
a beautiful spacecraft ready for launch

569
00:25:18,540 --> 00:25:15,700
so you know it's just an incredible time

570
00:25:20,990 --> 00:25:18,550
for us it's a brief moment of launch

571
00:25:23,880 --> 00:25:21,000
that we see this bright flame in the sky

572
00:25:26,880 --> 00:25:23,890
but you know for me this is a very

573
00:25:29,550 --> 00:25:26,890
exciting time to know that you know I

574
00:25:31,830 --> 00:25:29,560
started off on 601 s I remember walking

575
00:25:34,560 --> 00:25:31,840
through the high bay and getting my

576
00:25:37,170 --> 00:25:34,570
first tour on my on my interview and I

577
00:25:38,580 --> 00:25:37,180
asked the the the guy that was walking

578
00:25:40,710 --> 00:25:38,590
me through what am I going to do every

579
00:25:41,700 --> 00:25:40,720
day and he pointed to a guy that was

580
00:25:42,960 --> 00:25:41,710
standing in the middle of a satellite

581
00:25:45,120 --> 00:25:42,970
with just his legs showing he said

582
00:25:46,560 --> 00:25:45,130
you're going to do that every day and

583
00:25:50,280 --> 00:25:46,570
that's an incredible thing when you

584
00:25:51,630 --> 00:25:50,290
think about coming up and you work hard

585
00:25:53,550 --> 00:25:51,640
to get through college in school and

586
00:25:55,350 --> 00:25:53,560
then you get the opportunity to do such

587
00:25:57,630 --> 00:25:55,360
a very very cool thing and now here we

588
00:26:01,260 --> 00:25:57,640

are at launch getting to see all these

589
00:26:05,070 --> 00:26:01,270
complex machines come together to to put

590
00:26:06,750 --> 00:26:05,080
this asset in space and then hand it

591
00:26:09,210 --> 00:26:06,760
over to our customer with you know

592
00:26:12,000 --> 00:26:09,220
feeling of a job well done so looking

593
00:26:15,060 --> 00:26:12,010
forward to a great mission go atlas go

594
00:26:16,800 --> 00:26:15,070
teacher Sam thank you next we'll hear

595
00:26:18,570 --> 00:26:16,810
from James Wilson the third to talk a

596
00:26:20,630 --> 00:26:18,580
little bit about launch preparations for

597
00:26:23,460 --> 00:26:20,640
Atlas and what to expect during launch

598
00:26:23,790 --> 00:26:23,470
we've got this sorry I'm sorry about

599
00:26:28,140 --> 00:26:23,800
that

600
00:26:30,210 --> 00:26:28,150
- Scott Messer from ula okay good

601
00:26:32,850 --> 00:26:30,220
morning on behalf of United Launch

602
00:26:37,190 --> 00:26:32,860
Alliance I'd like to welcome everyone to

603
00:26:40,320 --> 00:26:37,200
the tigress M launch tomorrow it's a

604
00:26:44,520 --> 00:26:40,330
thrill for me personally to be here just

605
00:26:47,520 --> 00:26:44,530
one day away from from this launch of

606
00:26:50,280 --> 00:26:47,530
this great tigress satellite which is a

607
00:26:53,340 --> 00:26:50,290
critical asset for the United States

608
00:26:56,550 --> 00:26:53,350
America and all of space as Tim

609
00:26:59,280 --> 00:26:56,560
mentioned we have rolled the vehicle out

610
00:27:02,220 --> 00:26:59,290
to the pad yesterday and completed all

611
00:27:04,320 --> 00:27:02,230
of our closeout preparations so at the

612
00:27:06,540 --> 00:27:04,330
moment the vehicle is just sitting over

613
00:27:08,880 --> 00:27:06,550

there waiting for us to to get there

614
00:27:13,230 --> 00:27:08,890
this evening and begin the processing

615
00:27:16,320 --> 00:27:13,240
this will be the 72nd launch of an Atlas

616
00:27:19,950 --> 00:27:16,330
5 vehicle for the United Launch Alliance

617
00:27:23,850 --> 00:27:19,960
and of those 72 vehicles

618
00:27:26,520 --> 00:27:23,860
37 have been the 401 configuration so

619
00:27:29,220 --> 00:27:26,530
for one configuration has definitely

620
00:27:32,850 --> 00:27:29,230
been the work for the workhorse of the

621
00:27:35,520 --> 00:27:32,860
Atlas family and is delivering a little

622
00:27:39,810 --> 00:27:35,530
over half of the the Atlas missions to

623
00:27:43,380 --> 00:27:39,820
date so the 401 is got several

624
00:27:46,160 --> 00:27:43,390
components it first of all is a four

625
00:27:51,720 --> 00:27:46,170
meter fairing which houses the tigress

626
00:27:56,240 --> 00:27:51,730
spacecraft it is powered by a first

627
00:28:00,930 --> 00:27:56,250
stage which has Artyom Ross rd-180

628
00:28:03,510 --> 00:28:00,940
engine and then the second stage the

629
00:28:08,450 --> 00:28:03,520
Centaur second stage which is powered by

630
00:28:11,160 --> 00:28:08,460
a jet Rocketdyne RL 10 C engine this

631
00:28:16,380 --> 00:28:11,170
vehicle performance-wise does not

632
00:28:18,630 --> 00:28:16,390
require any strap-on boosters the Atlas

633
00:28:21,900 --> 00:28:18,640
vehicle is very flexible and that way to

634
00:28:24,300 --> 00:28:21,910
match the just the right vehicle with

635
00:28:27,390 --> 00:28:24,310
the performance needs of the spacecraft

636
00:28:30,210 --> 00:28:27,400
so with that we'll take a minute and see

637
00:28:32,790 --> 00:28:30,220
a video that will show some of the we'll

638
00:28:36,720 --> 00:28:32,800

show the actual flight profile that we

639
00:28:38,430 --> 00:28:36,730
expect tomorrow the following profile

640
00:28:42,180 --> 00:28:38,440
details the important events of this

641
00:28:43,740 --> 00:28:42,190
mission using approximate time - we have

642
00:28:46,830 --> 00:28:43,750
ignition

643
00:28:49,919 --> 00:28:46,840
we have liftoff of the United be at

644
00:28:52,520 --> 00:28:49,929
least five rd-180 main engine ignites to

645
00:28:55,169 --> 00:28:52,530
lift the vehicle away from the pad

646
00:28:56,820 --> 00:28:55,179
shortly after liftoff at let's begin

647
00:28:59,130 --> 00:28:56,830
this initial pitch yaw and roll

648
00:29:02,120 --> 00:28:59,140
maneuvers to attain the proper acent

649
00:29:05,520 --> 00:29:02,130
profile and minimize aerodynamic loads

650
00:29:10,110 --> 00:29:05,530
the Atlas 5 reaches Mach 1 the speed of

651
00:29:11,940 --> 00:29:10,120
sound at 80 seconds at 92 seconds the

652
00:29:15,539 --> 00:29:11,950
vehicle experiences maximum dynamic

653
00:29:17,520 --> 00:29:15,549
pressure approaching booster engine

654
00:29:20,039 --> 00:29:17,530
cutoff the Atlas 5 is burning propellant

655
00:29:22,560 --> 00:29:20,049
at a rate of 1,600 pounds per second

656
00:29:26,520 --> 00:29:22,570
traveling at over 11,000 miles per hour

657
00:29:30,539 --> 00:29:26,530
and located 61 miles in altitude and 148

658
00:29:32,970 --> 00:29:30,549
miles downrange booster engine cutoff

659
00:29:36,240 --> 00:29:32,980
occurs four minutes two seconds after

660
00:29:40,350 --> 00:29:36,250
liftoff the booster stage is jettisoned

661
00:29:42,990 --> 00:29:40,360
6 seconds later 10 seconds after booster

662
00:29:46,799 --> 00:29:43,000
separation the first centaur main engine

663
00:29:49,470 --> 00:29:46,809

start takes place the payload fairing is

664
00:29:51,810 --> 00:29:49,480
jettisoned 8 seconds later the vehicle

665
00:29:53,730 --> 00:29:51,820
now weighs just 8 percent of what it did

666
00:29:57,180 --> 00:29:53,740
it ripped off four and a half minutes

667
00:29:59,669 --> 00:29:57,190
earlier cut off of the Centaur main

668
00:30:02,940 --> 00:29:59,679
engine occurred nearly 18 minutes after

669
00:30:06,720 --> 00:30:02,950
launch the mission now enters a 1 and a

670
00:30:09,570 --> 00:30:06,730
half hour cook space at just over one

671
00:30:13,260 --> 00:30:09,580
hour 48 minutes the Centaur main engine

672
00:30:15,140 --> 00:30:13,270
is restarted this burn will last less

673
00:30:17,060 --> 00:30:15,150
than a minute

674
00:30:20,420 --> 00:30:17,070
following the second scent our main

675
00:30:22,130 --> 00:30:20,430
engine cutoff at one hour 49 seconds the

676
00:30:24,110 --> 00:30:22,140
mission enters a nearly four-minute

677
00:30:27,020 --> 00:30:24,120
Coast phase in preparation for

678
00:30:29,810 --> 00:30:27,030
spacecraft separation at approximately

679
00:30:35,720 --> 00:30:29,820
one hour 53 minutes centaur releases

680
00:30:38,510 --> 00:30:35,730
NASA's cedrus and satellite thank you so

681
00:30:42,500 --> 00:30:38,520
this will be the fifth launch for United

682
00:30:45,650 --> 00:30:42,510
Launch Alliance in 2017 and the hundred

683
00:30:48,980 --> 00:30:45,660
and twentieth successful launch since

684
00:30:51,710 --> 00:30:48,990
the company was formed in 2006 I do want

685
00:30:55,520 --> 00:30:51,720
to say that United Launch Alliance we

686
00:30:59,510 --> 00:30:55,530
are honored to deliver this basic agency

687
00:31:02,150 --> 00:30:59,520
capability we're excited because it has

688
00:31:05,750 --> 00:31:02,160

mentioned it enables our missions as

689
00:31:08,980 --> 00:31:05,760
well the tigress spacecraft up there all

690
00:31:12,230 --> 00:31:08,990
six of them or seven of them I guess

691
00:31:14,930 --> 00:31:12,240
monitor the Atlas vehicle and our

692
00:31:16,520 --> 00:31:14,940
telemetry and so it's exciting for us to

693
00:31:19,400 --> 00:31:16,530
launch something that will actually

694
00:31:23,000 --> 00:31:19,410
enable our missions I will tell you our

695
00:31:25,720 --> 00:31:23,010
team is laser focused on mission success

696
00:31:30,080 --> 00:31:25,730
and reliability United Launch Alliance

697
00:31:32,600 --> 00:31:30,090
we pride ourselves on making sure that

698
00:31:34,490 --> 00:31:32,610
every mission is successful we we

699
00:31:37,549 --> 00:31:34,500
treated every mission as a unique

700
00:31:40,150 --> 00:31:37,559
satellite and a unique mission but we

701
00:31:43,490 --> 00:31:40,160
also recognize that our success is

702
00:31:47,390 --> 00:31:43,500
because of our partnerships with NASA

703
00:31:50,660 --> 00:31:47,400
and spacecraft partners like Boeing and

704
00:31:53,840 --> 00:31:50,670
so just want to get a thanks out there

705
00:31:58,040 --> 00:31:53,850
to the NASA team and the Boeing team for

706
00:31:59,810 --> 00:31:58,050
working with us to get to this point we

707
00:32:02,290 --> 00:31:59,820
look forward to tomorrow to maintaining

708
00:32:05,180 --> 00:32:02,300
our 100% mission success record and

709
00:32:08,210 --> 00:32:05,190
continuing our unmatched reliability and

710
00:32:11,450 --> 00:32:08,220
with that I'm going to turn the time

711
00:32:13,850 --> 00:32:11,460
over to clay to tell us what weather

712
00:32:15,860 --> 00:32:13,860
looks like tomorrow so clay thank you

713
00:32:18,530 --> 00:32:15,870

very much sir the weather is favorable

714
00:32:20,660 --> 00:32:18,540
for tomorrow's count high pressure axis

715
00:32:22,310 --> 00:32:20,670
is suppressed to the south what that

716
00:32:23,720 --> 00:32:22,320
will do for us is give us westerly flow

717
00:32:26,480 --> 00:32:23,730
generally during the summer months

718
00:32:28,220 --> 00:32:26,490
westerly flow is favorable as any type

719
00:32:28,730 --> 00:32:28,230
of nocturnal showers that develop over

720
00:32:31,100 --> 00:32:28,740
the Atlanta

721
00:32:32,870 --> 00:32:31,110
tend to stay out to the east so really

722
00:32:34,220 --> 00:32:32,880
we probably will see some showers and

723
00:32:35,390 --> 00:32:34,230
maybe an isolated thunderstorm or two

724
00:32:37,700 --> 00:32:35,400
out to the east I'll show you a

725
00:32:39,169 --> 00:32:37,710
satellite picture here momentarily but

726
00:32:42,020 --> 00:32:39,179
again I believe it will stay to the east

727
00:32:43,820 --> 00:32:42,030
given the westerly flow that high

728
00:32:45,799 --> 00:32:43,830
pressure axis lifts a little bit to the

729
00:32:47,299 --> 00:32:45,809
north over the next 24 hours what that

730
00:32:48,950 --> 00:32:47,309
will do for us is really collapse our

731
00:32:50,990 --> 00:32:48,960
winds Orleans will be relatively light

732
00:32:52,790 --> 00:32:51,000
during the overnight hours we should be

733
00:32:55,640 --> 00:32:52,800
out of the south to Southwest as we're

734
00:32:57,620 --> 00:32:55,650
on the during the count by the time we

735
00:32:59,840 --> 00:32:57,630
get to near T zero we should be gusting

736
00:33:01,880 --> 00:32:59,850
out of the southwest gusting to about 12

737
00:33:04,490 --> 00:33:01,890
knots that's well below the liftoff

738
00:33:06,919 --> 00:33:04,500

constraints so really pretty favorable

739
00:33:08,000 --> 00:33:06,929
conditions during the overnight hours if

740
00:33:08,840 --> 00:33:08,010
I could have the satellite picture

741
00:33:11,090 --> 00:33:08,850
brought up please

742
00:33:12,440 --> 00:33:11,100
as I was mentioned if you look out to

743
00:33:14,210 --> 00:33:12,450
the east of the peninsula there is a

744
00:33:15,740 --> 00:33:14,220
surface feature of surface trough there

745
00:33:16,730 --> 00:33:15,750
and you can see the clouds and showers

746
00:33:18,890 --> 00:33:16,740
and there are some isolated

747
00:33:19,910 --> 00:33:18,900
thunderstorms out there that feature

748
00:33:22,400 --> 00:33:19,920
should stay in that general vicinity

749
00:33:24,100 --> 00:33:22,410
over the next 24 hours but again with

750
00:33:26,630 --> 00:33:24,110
our westerly flow would expect to see

751
00:33:29,480 --> 00:33:26,640
the showers and the storms remaining

752
00:33:31,850 --> 00:33:29,490
Tuba to our East the system that you see

753
00:33:33,950 --> 00:33:31,860
to the west there approach in Louisiana

754
00:33:35,090 --> 00:33:33,960
migrate to the east but for the most

755
00:33:38,180 --> 00:33:35,100
part that's going to stay to our north

756
00:33:39,680 --> 00:33:38,190
and with broad surface coughing to our

757
00:33:42,740 --> 00:33:39,690
north so really not going to be a player

758
00:33:44,240 --> 00:33:42,750
for us Friday or Saturday more

759
00:33:46,280 --> 00:33:44,250
significant which is really going to be

760
00:33:48,350 --> 00:33:46,290
our principal concern for launch turn

761
00:33:50,510 --> 00:33:48,360
during the count tomorrow and and as

762
00:33:52,790 --> 00:33:50,520
we're in the window is the northeasterly

763
00:33:55,820 --> 00:33:52,800

flow the northward northeasterly above

764
00:33:57,350 --> 00:33:55,830
15,000 feet or so and it looks like we

765
00:33:58,340 --> 00:33:57,360
should get an influx of moisture in the

766
00:34:00,590 --> 00:33:58,350
mid and upper levels

767
00:34:02,000 --> 00:34:00,600
so with that influx of moisture that the

768
00:34:04,940 --> 00:34:02,010
principal concern would just be an

769
00:34:06,530 --> 00:34:04,950
increase in in thick clouds as a

770
00:34:08,180 --> 00:34:06,540
migrating it no there's really not a

771
00:34:10,550 --> 00:34:08,190
high threat of that's about a 20%

772
00:34:12,080 --> 00:34:10,560
likelihood so as I mentioned it looks

773
00:34:13,820 --> 00:34:12,090
pretty favorable for tomorrow we'll just

774
00:34:16,730 --> 00:34:13,830
have to monitor those thick clouds and

775
00:34:20,750 --> 00:34:16,740
see if they see criteria but expecting

776
00:34:21,820 --> 00:34:20,760
them to stay below criteria so if I have

777
00:34:24,500 --> 00:34:21,830
the next slide please

778
00:34:26,480 --> 00:34:24,510
so the forecast for tomorrow we just be

779
00:34:28,909 --> 00:34:26,490
looking for a few clouds at 3000 feet

780
00:34:30,109 --> 00:34:28,919
scattered ech at 22,000 feet and that's

781
00:34:32,840 --> 00:34:30,119
really the deck that we'd be concerned

782
00:34:34,639 --> 00:34:32,850
about between 0 and minus 20 degrees

783
00:34:36,950 --> 00:34:34,649
Celsius with another broken deck about

784
00:34:38,060 --> 00:34:36,960
32,000 feet or so should have good

785
00:34:40,280 --> 00:34:38,070
visibility it's going to be warm

786
00:34:42,109 --> 00:34:40,290
temperature should be about 80 to 81

787
00:34:44,569 --> 00:34:42,119
when we had looked off tomorrow with a

788
00:34:45,829 --> 00:34:44,579

20% chance of violation and as I

789
00:34:47,540 --> 00:34:45,839
mentioned that's that that cloud rule

790
00:34:48,470 --> 00:34:47,550
violation would be concerned with that

791
00:34:51,020 --> 00:34:48,480
we'll be monitoring

792
00:34:53,450 --> 00:34:51,030
next slide please should we delay for

793
00:34:55,490 --> 00:34:53,460
24-hour delay conditions look fairly

794
00:34:57,800 --> 00:34:55,500
similar to Saturday that they do to

795
00:34:59,930 --> 00:34:57,810
Friday so really similar conditions

796
00:35:04,069 --> 00:34:59,940
about 20% chance of violation again that

797
00:35:05,780 --> 00:35:04,079
would be thick cloud layer concern our

798
00:35:07,160 --> 00:35:05,790
winds be a little more subtly as that

799
00:35:08,690 --> 00:35:07,170
high-pressure access lifts to the north

800
00:35:10,520 --> 00:35:08,700
or when to go a little more southerly

801
00:35:12,710 --> 00:35:10,530
from the south-southwest about from

802
00:35:14,120 --> 00:35:12,720
about 200 degrees but still relatively

803
00:35:16,550 --> 00:35:14,130
light well below any left all

804
00:35:17,089 --> 00:35:16,560
constraints gusting to about 10 to 12

805
00:35:19,670 --> 00:35:17,099
knots

806
00:35:21,410 --> 00:35:19,680
so as in summary then what it looks

807
00:35:23,060 --> 00:35:21,420
fairly favorable for tomorrow and should

808
00:35:26,660 --> 00:35:23,070
we be on the pad for 24-hour delay it

809
00:35:29,210 --> 00:35:26,670
looks favorable as well Catherine thank

810
00:35:30,950 --> 00:35:29,220
you I will now open it up for questions

811
00:35:32,960 --> 00:35:30,960
support those in the room and those on

812
00:35:35,180 --> 00:35:32,970
the phone if you're on the phone please

813
00:35:38,690 --> 00:35:35,190

press star 1 to be entered into the

814
00:35:41,240 --> 00:35:38,700
queue when the mic comes to you please

815
00:35:46,000 --> 00:35:41,250
state your name and affiliation and to

816
00:35:48,680 --> 00:35:46,010
whom your question is directed over here

817
00:35:50,510 --> 00:35:48,690
hello this is Marcia Dennis V Associated

818
00:35:53,030 --> 00:35:50,520
Press I'm not sure who to address this

819
00:35:55,550 --> 00:35:53,040
to but could you explain how the antenna

820
00:35:57,859 --> 00:35:55,560
on the spacecraft ended up broken and I

821
00:36:03,140 --> 00:35:57,869
know there was an investigation what did

822
00:36:05,480 --> 00:36:03,150
that conclude I'm happy to take that yes

823
00:36:06,859 --> 00:36:05,490
the antenna was damaged by bumping up

824
00:36:09,620 --> 00:36:06,869
against a piece of ground support

825
00:36:11,599 --> 00:36:09,630
equipment the antenna has been removed

826
00:36:16,460 --> 00:36:11,609
replaced and retested functioning

827
00:36:18,200 --> 00:36:16,470
nominally with ground equipment was it

828
00:36:19,880 --> 00:36:18,210
what was it a crane or how could you

829
00:36:23,990 --> 00:36:19,890
give a few more details exactly what

830
00:36:26,660 --> 00:36:24,000
happened yes it was a it was prepping to

831
00:36:30,140 --> 00:36:26,670
lift the satellite and the crane did

832
00:36:34,620 --> 00:36:32,789
winger has that been close oh thank you

833
00:36:37,410 --> 00:36:34,630
know we've we've concluded all the

834
00:36:38,970 --> 00:36:37,420
investigation forty dress all the the

835
00:36:41,880 --> 00:36:38,980
incident has been contained our review

836
00:36:46,079 --> 00:36:41,890
board has met and completed all its

837
00:36:48,770 --> 00:36:46,089
activity and closed the issue thank you

838
00:36:52,230 --> 00:36:48,780

we'll take a quick teacher's question um

839
00:36:54,630 --> 00:36:52,240
so is it for sure there will be no

840
00:36:57,240 --> 00:36:54,640
teachers and that's sort of what it

841
00:36:59,970 --> 00:36:57,250
sounds like or is it maybe or how to how

842
00:37:02,789 --> 00:36:59,980
does that there were there were two

843
00:37:04,829 --> 00:37:02,799
options the contract was for two

844
00:37:08,400 --> 00:37:04,839
spacecraft he was Katie whose L there

845
00:37:10,260 --> 00:37:08,410
were options for M and n the M option

846
00:37:12,569 --> 00:37:10,270
obviously was exercised which is why

847
00:37:16,950 --> 00:37:12,579
we're here today the n option was not

848
00:37:19,710 --> 00:37:16,960
exercised well the Department of

849
00:37:22,430 --> 00:37:19,720
satellites depends on the requirements

850
00:37:26,780 --> 00:37:22,440
at this moment there is no need for an

851
00:37:29,250 --> 00:37:26,790
Peters n but we are seeing a need for

852
00:37:32,970 --> 00:37:29,260
additional data relating capability

853
00:37:35,039 --> 00:37:32,980
around the 2025 timeframe so we have

854
00:37:37,650 --> 00:37:35,049
time to insert the transformational

855
00:37:40,440 --> 00:37:37,660
technology I talked about and proceed

856
00:37:42,870 --> 00:37:40,450
with the new set of capabilities doing

857
00:37:44,280 --> 00:37:42,880
the same role that the teethers is doing

858
00:37:49,500 --> 00:37:44,290
which is tracking and data relay

859
00:37:52,740 --> 00:37:49,510
incapable but in a more robust way the

860
00:37:54,329 --> 00:37:52,750
video Phil Harvick CBS News for mr. just

861
00:37:57,599 --> 00:37:54,339
follow up on Marcia's question for mr.

862
00:37:59,370 --> 00:37:57,609
Wilson was the antenna actually broken

863
00:38:01,650 --> 00:37:59,380

or was this just a matter of being extra

864
00:38:02,880 --> 00:38:01,660
cautious because it got noticed and you

865
00:38:04,799 --> 00:38:02,890
were just playing and safer was there a

866
00:38:07,440 --> 00:38:04,809
physical defect in the antenna and I'm

867
00:38:08,970 --> 00:38:07,450
assuming this is human error yeah there

868
00:38:15,599 --> 00:38:08,980
was no defect in the antenna the antenna

869
00:38:17,760 --> 00:38:15,609
was delivered yeah there's a protective

870
00:38:20,760 --> 00:38:17,770
cap that was damaged so there was there

871
00:38:22,530 --> 00:38:20,770
was some minor damage to the antenna but

872
00:38:25,589 --> 00:38:22,540
they hadn't that antenna was completely

873
00:38:30,480 --> 00:38:25,599
replaced and retested there or was there

874
00:38:32,549 --> 00:38:30,490
a machine malfunction in the lift we

875
00:38:36,089 --> 00:38:32,559
have very strict process control at

876
00:38:38,460 --> 00:38:36,099
Boeing and so we looked at our processes

877
00:38:41,910 --> 00:38:38,470
and made sure that that the processes

878
00:38:42,730 --> 00:38:41,920
were revisited and enhanced to make sure

879
00:38:44,560 --> 00:38:42,740
this kind of thing does

880
00:38:45,760 --> 00:38:44,570
happen again if that's not what I asked

881
00:38:48,010 --> 00:38:45,770
I mean was a human error was there a

882
00:38:50,350 --> 00:38:48,020
machine problem there was no machine

883
00:38:52,510 --> 00:38:50,360
problem in providing just a real quick

884
00:38:55,210 --> 00:38:52,520
one time how many teachers satellites

885
00:38:56,770 --> 00:38:55,220
are currently actually relaying data I'm

886
00:38:58,870 --> 00:38:56,780
confused in terms of the ones that are

887
00:39:02,040 --> 00:38:58,880
partially operable with versus fully

888
00:39:04,690 --> 00:39:02,050

operable yeah we definitely have

889
00:39:08,410 --> 00:39:04,700
approximately seven spacecraft that are

890
00:39:12,700 --> 00:39:08,420
active six are providing real-time

891
00:39:18,790 --> 00:39:12,710
support to to our customers and one is a

892
00:39:23,310 --> 00:39:18,800
hot spare you know on a standby next

893
00:39:30,660 --> 00:39:27,900
Irene Klotz right thank you very much um

894
00:39:33,910 --> 00:39:30,670
just for a minute what I mean by

895
00:39:36,580 --> 00:39:33,920
approximately seven and how old is the

896
00:39:42,310 --> 00:39:36,590
oldest one that's currently in the

897
00:39:46,210 --> 00:39:44,020
I probably didn't get all of the

898
00:39:48,160 --> 00:39:46,220
questions the sound was not coming clear

899
00:39:50,560 --> 00:39:48,170
Irene can you repeat the first part of

900
00:39:54,580 --> 00:39:50,570
your question please yes is this better

901
00:39:57,849 --> 00:39:54,590
yeah thanks I wanted to know what you

902
00:40:00,970 --> 00:39:57,859
meant by approximately seven and how old

903
00:40:03,940 --> 00:40:00,980
is the oldest satellite that's in the

904
00:40:06,580 --> 00:40:03,950
operational system well the oldest

905
00:40:08,800 --> 00:40:06,590
satellites are part of the first

906
00:40:12,670 --> 00:40:08,810
generation tracked and data relay

907
00:40:15,480 --> 00:40:12,680
satellite systems and they are as old as

908
00:40:19,480 --> 00:40:15,490
you know they were launched in 1993 and

909
00:40:23,260 --> 00:40:19,490
1995 when I talk approximately

910
00:40:26,950 --> 00:40:23,270
not all of the first duration satellites

911
00:40:30,130 --> 00:40:26,960
are operating completely you know they

912
00:40:31,890 --> 00:40:30,140
have lost some of their capabilities so

913
00:40:33,940 --> 00:40:31,900

we thought when we talk about

914
00:40:37,030 --> 00:40:33,950
approximately we look at the residual

915
00:40:38,800 --> 00:40:37,040
the capability of one mated to residual

916
00:40:41,560 --> 00:40:38,810
capability or the other to give us an

917
00:40:46,330 --> 00:40:41,570
equivalent one data relay satellite

918
00:40:48,910 --> 00:40:46,340
capability so we need seven because we

919
00:40:52,180 --> 00:40:48,920
need two spacecraft third node we have

920
00:40:54,670 --> 00:40:52,190
three nodes up in space covering or

921
00:40:56,040 --> 00:40:54,680
spanning the globe feeders provide the

922
00:40:58,740 --> 00:40:56,050
global

923
00:41:05,240 --> 00:40:58,750
support to anything that flying below

924
00:41:08,190 --> 00:41:05,250
the geosynchronous orbit thank you um

925
00:41:11,010 --> 00:41:08,200
yes you did and I had a question also

926
00:41:14,280 --> 00:41:11,020
about the damage to the teachers antenna

927
00:41:19,230 --> 00:41:14,290
what was the cost of a new antenna and

928
00:41:24,780 --> 00:41:19,240
who is paying for that I'm going to

929
00:41:26,400 --> 00:41:24,790
defer contractual issues to NASA so I

930
00:41:29,250 --> 00:41:26,410
think what is with respect to the

931
00:41:33,000 --> 00:41:29,260
antenna there was an available antenna

932
00:41:35,780 --> 00:41:33,010
that was identified by Boeing to be

933
00:41:38,250 --> 00:41:35,790
available that was brought over and

934
00:41:41,070 --> 00:41:38,260
evaluated and that it was suitable for

935
00:41:43,490 --> 00:41:41,080
the mission as James has mentioned the

936
00:41:47,490 --> 00:41:43,500
damaged antenna was removed and replaced

937
00:41:49,290 --> 00:41:47,500
and they're basically repairing it they

938
00:41:51,720 --> 00:41:49,300

have repaired it and returned the

939
00:41:55,290 --> 00:41:51,730
spacecraft to be ready for flight ready

940
00:41:57,300 --> 00:41:55,300
for launch and it's kind of you know

941
00:41:59,609 --> 00:41:57,310
it's Boeing spacecraft and so the

942
00:42:00,839 --> 00:41:59,619
government accepts it following on our

943
00:42:02,310 --> 00:42:00,849
on our on-orbit

944
00:42:03,900 --> 00:42:02,320
acceptance testing that I mentioned

945
00:42:05,490 --> 00:42:03,910
takes about three or three or four

946
00:42:08,099 --> 00:42:05,500
months as James mentioned that we do all

947
00:42:10,440 --> 00:42:08,109
with our white sands complex in New

948
00:42:13,260 --> 00:42:10,450
Mexico Boeing brings a team out to the

949
00:42:15,839 --> 00:42:13,270
white sands complex and we check out the

950
00:42:17,839 --> 00:42:15,849
performance of the satellite there and

951
00:42:19,910 --> 00:42:17,849
then have an on-orbit acceptance review

952
00:42:25,290 --> 00:42:19,920
approximately you know four months

953
00:42:28,230 --> 00:42:25,300
following the the launch the Boeing is

954
00:42:30,240 --> 00:42:28,240
providing the spare replacement antenna

955
00:42:32,390 --> 00:42:30,250
and you don't expect an additional cost

956
00:42:36,750 --> 00:42:32,400
to NASA is that right

957
00:42:38,790 --> 00:42:36,760
there's a yes the the contractual terms

958
00:42:41,579 --> 00:42:38,800
you know we're not I won't go into the

959
00:42:43,410 --> 00:42:41,589
details here but in terms of it's all

960
00:42:46,200 --> 00:42:43,420
being handled under the contract and the

961
00:42:48,480 --> 00:42:46,210
government's you know cost and then you

962
00:42:50,730 --> 00:42:48,490
know outlay is is is identified there

963
00:42:53,690 --> 00:42:50,740

and then there's not anything that I

964
00:42:56,460 --> 00:42:53,700
would identify as as an addition here

965
00:42:58,310 --> 00:42:56,470
thanks very much thank you we'll come

966
00:43:07,130 --> 00:42:58,320
back to you questions here in the room

967
00:43:12,060 --> 00:43:10,410
hi i'm raquel e with with florida today

968
00:43:15,089 --> 00:43:12,070
James I think both of these might be for

969
00:43:18,530 --> 00:43:15,099
you in regards to the antenna what what

970
00:43:21,750 --> 00:43:18,540
does that antenna do and is there a

971
00:43:24,630 --> 00:43:21,760
specific specific date in mind for when

972
00:43:26,520 --> 00:43:24,640
you would like this active when I would

973
00:43:29,820 --> 00:43:26,530
like the antenna active or the whole

974
00:43:32,099 --> 00:43:29,830
satellite not ago okay great

975
00:43:33,359 --> 00:43:32,109
well really good question what is the

976
00:43:35,790 --> 00:43:33,369
what does the antennae do that was

977
00:43:39,510 --> 00:43:35,800
damaged it actually has a pretty short

978
00:43:42,660 --> 00:43:39,520
lifespan for its nominal use this is an

979
00:43:45,870 --> 00:43:42,670
omnidirectional antenna that provides a

980
00:43:47,099 --> 00:43:45,880
hemispherical coverage for the forward

981
00:43:48,690 --> 00:43:47,109
part of the spacecraft so when the

982
00:43:51,480 --> 00:43:48,700
spacecraft is in what we call transfer

983
00:43:54,089 --> 00:43:51,490
orbit let me define what transfer orbit

984
00:43:56,460 --> 00:43:54,099
is after the after the rocket drops us

985
00:43:58,770 --> 00:43:56,470
off like I said over India it's on a

986
00:44:01,230 --> 00:43:58,780
path to get to geo but it's not there

987
00:44:02,970 --> 00:44:01,240
yet if we left it alone it wouldn't it

988
00:44:04,650 --> 00:44:02,980

wouldn't get to geo by itself and so we

989
00:44:07,050 --> 00:44:04,660
do what's called a transfer orbit and we

990
00:44:09,930 --> 00:44:07,060
use a 100-pound engine that's on the

991
00:44:12,690 --> 00:44:09,940
base of the satellite to orbit raise up

992
00:44:16,620 --> 00:44:12,700
to geosynchronous orbit alright so

993
00:44:20,099 --> 00:44:16,630
during that time it's about eight days

994
00:44:21,420 --> 00:44:20,109
that we're doing doing these burns so

995
00:44:23,940 --> 00:44:21,430
during this time the satellite is not

996
00:44:25,470 --> 00:44:23,950
pointed at the earth at all times and a

997
00:44:28,410 --> 00:44:25,480
lot of the times when we're doing our

998
00:44:30,450 --> 00:44:28,420
burns it's pointed orthogonal to the

999
00:44:33,329 --> 00:44:30,460
earth and so during that time the

1000
00:44:35,130 --> 00:44:33,339
antenna is able to broadcast toward the

1001
00:44:37,500 --> 00:44:35,140
earth and we're able to receive the

1002
00:44:39,839 --> 00:44:37,510
telemetry on the ground send up our

1003
00:44:43,680 --> 00:44:39,849
commands and do its job and so really it

1004
00:44:45,870 --> 00:44:43,690
has somewhat of a short lifespan if for

1005
00:44:49,050 --> 00:44:45,880
some reason the satellite had some

1006
00:44:52,500 --> 00:44:49,060
trouble during its nominal time when

1007
00:44:55,079 --> 00:44:52,510
when when the spacecraft is pointed at

1008
00:44:56,670 --> 00:44:55,089
the earth that antenna is a backup for

1009
00:44:58,200 --> 00:44:56,680
us to be able to communicate with it in

1010
00:45:00,240 --> 00:44:58,210
case the satellite got into an

1011
00:45:01,800 --> 00:45:00,250
orientation that was was not predictable

1012
00:45:03,750 --> 00:45:01,810
and we have we have two of these

1013
00:45:05,099 --> 00:45:03,760

antennas there's actually one on the aft

1014
00:45:09,079 --> 00:45:05,109
part of the spacecraft and one on the

1015
00:45:10,500 --> 00:45:09,089
forward so we have a nearly 4pi coverage

1016
00:45:13,620 --> 00:45:10,510
sorry

1017
00:45:15,630 --> 00:45:13,630
nearly spherical coverage where we can

1018
00:45:17,070 --> 00:45:15,640
get commands into the spacecraft and get

1019
00:45:18,900 --> 00:45:17,080
telemetry out so we can

1020
00:45:22,830 --> 00:45:18,910
to really communicate communicate with

1021
00:45:23,040 --> 00:45:22,840
the satellite that hit it great thank

1022
00:45:29,400 --> 00:45:23,050
you

1023
00:45:30,720 --> 00:45:29,410
we'll go up here in the front now hi Ken

1024
00:45:32,730 --> 00:45:30,730
Kramer Universe Today Northeast

1025
00:45:35,160 --> 00:45:32,740
astronomy for them a couple of questions

1026
00:45:37,140 --> 00:45:35,170
one quick for Tim Dunn first of all of

1027
00:45:39,390 --> 00:45:37,150
you good luck tomorrow can you tell us

1028
00:45:42,150 --> 00:45:39,400
what's the scrub possibilities if we

1029
00:45:45,150 --> 00:45:42,160
don't launch on the 18th 18th and 19th

1030
00:45:48,330 --> 00:45:45,160
what does it beyond that and for the

1031
00:45:50,430 --> 00:45:48,340
NASA gentlemen talk about the

1032
00:45:52,320 --> 00:45:50,440
capabilities you want to develop in the

1033
00:45:54,450 --> 00:45:52,330
future with the laser communication what

1034
00:45:56,820 --> 00:45:54,460
is it going to get us that we don't have

1035
00:45:58,830 --> 00:45:56,830
now and why do we need it thank you and

1036
00:46:00,900 --> 00:45:58,840
the breadth of satellites that you're

1037
00:46:01,500 --> 00:46:00,910
currently serving with teachers tell us

1038
00:46:04,050 --> 00:46:01,510

about that

1039
00:46:06,030 --> 00:46:04,060
thanks thanks can you could tell I was

1040
00:46:08,180 --> 00:46:06,040
kind of lonesome down here because James

1041
00:46:11,550 --> 00:46:08,190
and Dave were taking all the questions

1042
00:46:13,440 --> 00:46:11,560
so we we obviously have tomorrow as our

1043
00:46:15,450 --> 00:46:13,450
first attempt to secure it on the range

1044
00:46:19,290 --> 00:46:15,460
as well as a backup opportunity on

1045
00:46:21,810 --> 00:46:19,300
Saturday the 19th as the range currently

1046
00:46:24,450 --> 00:46:21,820
stands today we would then need to stand

1047
00:46:28,590 --> 00:46:24,460
down for most of next week to allow

1048
00:46:31,590 --> 00:46:28,600
Minotaur 4 to launch next Friday evening

1049
00:46:34,710 --> 00:46:31,600
they have their somewhat new to the

1050
00:46:37,320 --> 00:46:34,720
range don't launch from here very often

1051
00:46:40,380 --> 00:46:37,330
so they are using a lot of Eastern range

1052
00:46:42,450 --> 00:46:40,390
resources next week so should they stay

1053
00:46:44,490 --> 00:46:42,460
on track we would not have a launch

1054
00:46:47,280 --> 00:46:44,500
opportunity next week we would come in

1055
00:46:50,250 --> 00:46:47,290
behind them the following next weekend

1056
00:46:52,560 --> 00:46:50,260
or likely early of the week of the 28th

1057
00:46:55,500 --> 00:46:52,570
of August for our next attempt however

1058
00:46:57,540 --> 00:46:55,510
as is usual if we weren't able to get

1059
00:46:59,610 --> 00:46:57,550
off on Friday or Saturday we would

1060
00:47:01,530 --> 00:46:59,620
certainly petition the eastern range are

1061
00:47:03,810 --> 00:47:01,540
there any other opportunities how are

1062
00:47:05,790 --> 00:47:03,820
your other customers doing would they be

1063
00:47:08,250 --> 00:47:05,800

able to accommodate a third attempt for

1064
00:47:10,650 --> 00:47:08,260
us on Sunday possibly staying down on

1065
00:47:13,350 --> 00:47:10,660
Sunday so a lot of that type of

1066
00:47:18,780 --> 00:47:13,360
negotiation takes place in the event of

1067
00:47:22,740 --> 00:47:18,790
multiple scrubs so the outlets vehicle

1068
00:47:25,050 --> 00:47:22,750
has a 97% demonstrated ability to get

1069
00:47:27,120 --> 00:47:25,060
off on the first attempt once we've

1070
00:47:29,820 --> 00:47:27,130
gotten to this point so well it's

1071
00:47:30,520 --> 00:47:29,830
possible we may have to do what Tim just

1072
00:47:32,050 --> 00:47:30,530
said

1073
00:47:33,880 --> 00:47:32,060
Thank You probabilities are very good

1074
00:47:38,200 --> 00:47:33,890
that we'll get off in in the two days we

1075
00:47:40,600 --> 00:47:38,210
have okay first let me start with the

1076
00:47:43,390 --> 00:47:40,610
customers that do use the tracking and

1077
00:47:45,510 --> 00:47:43,400
data relay satellite system we are

1078
00:47:47,980 --> 00:47:45,520
talking about a number of these

1079
00:47:51,310 --> 00:47:47,990
customers they vary from a human

1080
00:47:53,950 --> 00:47:51,320
spaceflight to science missions anything

1081
00:47:56,440 --> 00:47:53,960
that requires low latency because of the

1082
00:47:58,660 --> 00:47:56,450
ability of teachers to relate in near

1083
00:48:02,650 --> 00:47:58,670
real-time the data back to earth

1084
00:48:05,170 --> 00:48:02,660
so again the main beneficiary is the

1085
00:48:07,320 --> 00:48:05,180
human spaceflight to the contact to the

1086
00:48:09,550 --> 00:48:07,330
space station the astronaut the video

1087
00:48:11,890 --> 00:48:09,560
conferencing that take place and the

1088
00:48:13,270 --> 00:48:11,900

regular communications taking place with

1089
00:48:15,940 --> 00:48:13,280
the space with international space

1090
00:48:17,950 --> 00:48:15,950
station with the aspirants as well as

1091
00:48:20,140 --> 00:48:17,960
the scientific experiments that will

1092
00:48:22,720 --> 00:48:20,150
being conducted there the teasers

1093
00:48:25,120 --> 00:48:22,730
provides two types of service services

1094
00:48:27,580 --> 00:48:25,130
one is single access and the other

1095
00:48:29,980 --> 00:48:27,590
multiple access the single access allows

1096
00:48:32,470 --> 00:48:29,990
us to go up in data rate to the 300 and

1097
00:48:35,560 --> 00:48:32,480
now we are tested and implemented a 600

1098
00:48:38,550 --> 00:48:35,570
megabit per second and in a couple of

1099
00:48:41,050 --> 00:48:38,560
years we'll have 1.2 gigabit per second

1100
00:48:42,970 --> 00:48:41,060
you know and we are evolving the

1101
00:48:45,490 --> 00:48:42,980
capabilities as the requirements are

1102
00:48:48,460 --> 00:48:45,500
evolving and we also have a multiple

1103
00:48:52,180 --> 00:48:48,470
access we multiple access allows us to

1104
00:48:55,450 --> 00:48:52,190
to provide to stay in contact with our

1105
00:48:58,600 --> 00:48:55,460
science mission like a nine nine one one

1106
00:49:00,670 --> 00:48:58,610
call as a mission has has any issue or

1107
00:49:03,460 --> 00:49:00,680
problem needs to do something so it

1108
00:49:05,650 --> 00:49:03,470
sends a message back to the Mission

1109
00:49:09,250 --> 00:49:05,660
Control Center to get that kind of

1110
00:49:12,250 --> 00:49:09,260
service done so it's low data rate in

1111
00:49:14,200 --> 00:49:12,260
addition to that we we do support other

1112
00:49:15,400 --> 00:49:14,210
science mission like the Hubble all of

1113
00:49:18,220 --> 00:49:15,410

the beautiful images that you are

1114
00:49:20,020 --> 00:49:18,230
getting from deep space way you know all

1115
00:49:22,600 --> 00:49:20,030
of the galaxies that we are discovering

1116
00:49:25,990 --> 00:49:22,610
we are seeing is brought to you thanks

1117
00:49:28,930 --> 00:49:26,000
to saying thanks to theatres now going

1118
00:49:30,790 --> 00:49:28,940
into anteaters is a concept that evolved

1119
00:49:32,800 --> 00:49:30,800
during the nineteen seventy the

1120
00:49:35,500 --> 00:49:32,810
technology relied on what was there what

1121
00:49:40,090 --> 00:49:35,510
whatever was there in the 80s and the

1122
00:49:44,530 --> 00:49:40,100
90s and and so on architectural II did

1123
00:49:46,240 --> 00:49:44,540
not evolve that much in the meantime

1124
00:49:49,060 --> 00:49:46,250
did not benefit from advances in

1125
00:49:51,070 --> 00:49:49,070
technology in the meantime NASA as well

1126
00:49:53,620 --> 00:49:51,080
as other government agencies have been

1127
00:49:57,120 --> 00:49:53,630
working on evolving the technology so we

1128
00:50:00,540 --> 00:49:57,130
got into laser communications you know

1129
00:50:02,710 --> 00:50:00,550
optical communication demonstrated great

1130
00:50:06,070 --> 00:50:02,720
potential on the ground you know

1131
00:50:08,220 --> 00:50:06,080
long-haul communication now every every

1132
00:50:11,290 --> 00:50:08,230
home now is kind of service their

1133
00:50:13,720 --> 00:50:11,300
optical fibers on the ground so the same

1134
00:50:16,570 --> 00:50:13,730
concept we are taking to space the

1135
00:50:18,790 --> 00:50:16,580
ability to have much larger bandwidth to

1136
00:50:20,740 --> 00:50:18,800
support much higher data rate for the

1137
00:50:23,350 --> 00:50:20,750
same weight and volume and power

1138
00:50:25,270 --> 00:50:23,360

requirements so the optical

1139
00:50:27,730 --> 00:50:25,280
communication does reduce the burden on

1140
00:50:30,670 --> 00:50:27,740
the user it gives you a you know an

1141
00:50:33,190 --> 00:50:30,680
equivalent of up to two order magnitude

1142
00:50:36,370 --> 00:50:33,200
and performance for the same volume and

1143
00:50:37,480 --> 00:50:36,380
power and mass requirements so that's

1144
00:50:40,060 --> 00:50:37,490
where we are going we've demonstrated

1145
00:50:44,050 --> 00:50:40,070
this technology recently a few years

1146
00:50:46,090 --> 00:50:44,060
back actually five years ago force and

1147
00:50:48,490 --> 00:50:46,100
thumb it had to be precise we flew a

1148
00:50:50,590 --> 00:50:48,500
mission to the moon called ladee and on

1149
00:50:53,770 --> 00:50:50,600
that gladdy we have a we had a laser

1150
00:50:57,370 --> 00:50:53,780
demonstration we were able to transmit a

1151
00:50:59,800 --> 00:50:57,380
signal from the moon to earth at 622

1152
00:51:02,560 --> 00:50:59,810
megabits per second from the moon to

1153
00:51:04,330 --> 00:51:02,570
here with limited capability small

1154
00:51:07,420 --> 00:51:04,340
aperture on the ground as well as in

1155
00:51:09,520 --> 00:51:07,430
space so the technology now we have we

1156
00:51:11,950 --> 00:51:09,530
continued to evolve it we have the neck

1157
00:51:14,050 --> 00:51:11,960
is the second generation optical laser

1158
00:51:16,780 --> 00:51:14,060
laser capabilities that we'll be

1159
00:51:19,990 --> 00:51:16,790
deploying in the next generation data

1160
00:51:22,450 --> 00:51:20,000
relay satellite the beauty about the

1161
00:51:24,730 --> 00:51:22,460
laser communication the the laser beam

1162
00:51:29,590 --> 00:51:24,740
is pretty thin pretty small

1163
00:51:31,240 --> 00:51:29,600

you know pixels you know thin so it

1164
00:51:33,690 --> 00:51:31,250
provides some level of security on top

1165
00:51:35,530 --> 00:51:33,700
of that we are working on quantum

1166
00:51:37,990 --> 00:51:35,540
entanglement and quantum key

1167
00:51:42,100 --> 00:51:38,000
distribution to allow us even maximum

1168
00:51:44,320 --> 00:51:42,110
security beyond the the security aspect

1169
00:51:47,130 --> 00:51:44,330
you are talking about and there are the

1170
00:51:51,070 --> 00:51:47,140
large bandwidth you are talking about

1171
00:51:53,050 --> 00:51:51,080
the the fact that laser communication

1172
00:51:55,230 --> 00:51:53,060
and optical communication operating in a

1173
00:51:57,190 --> 00:51:55,240
wavelength that's not regulated by

1174
00:51:59,890 --> 00:51:57,200
regulatory agencies

1175
00:52:01,089 --> 00:51:59,900
presently you know we have a problem if

1176
00:52:03,069 --> 00:52:01,099
you have to go from government to

1177
00:52:05,680 --> 00:52:03,079
non-government you know near earth to

1178
00:52:07,180 --> 00:52:05,690
deep space you know you have to use

1179
00:52:09,190 --> 00:52:07,190
different spectrum so our spacecraft

1180
00:52:10,750 --> 00:52:09,200
that needs to go from one place to the

1181
00:52:13,240 --> 00:52:10,760
other would need to have multiple

1182
00:52:14,650 --> 00:52:13,250
payloads so and by having so many

1183
00:52:16,599 --> 00:52:14,660
payloads on board you know you have

1184
00:52:19,300 --> 00:52:16,609
taking room and space that could be

1185
00:52:21,579 --> 00:52:19,310
occupied by other scientific instruments

1186
00:52:23,710 --> 00:52:21,589
it could be collecting more science now

1187
00:52:27,700 --> 00:52:23,720
lasercom can replace all of this will

1188
00:52:30,579 --> 00:52:27,710

allow you to cross across all of these

1189
00:52:32,550 --> 00:52:30,589
boundaries without without any problem

1190
00:52:34,420 --> 00:52:32,560
and will allow you to broadcast to earth

1191
00:52:38,349 --> 00:52:34,430
because the wavelength that we've

1192
00:52:39,280 --> 00:52:38,359
selected is pretty healthy and safe to

1193
00:52:42,190 --> 00:52:39,290
the human eye

1194
00:52:43,960 --> 00:52:42,200
so we don't expect much much of a

1195
00:52:46,000 --> 00:52:43,970
problem transmitting directly to earth

1196
00:52:48,849 --> 00:52:46,010
or transmit it to another dedicated

1197
00:52:51,010 --> 00:52:48,859
ground terminal or to go through a data

1198
00:52:53,290 --> 00:52:51,020
relay satellite so we are going for

1199
00:52:57,400 --> 00:52:53,300
maximum flexibility in the future

1200
00:53:00,640 --> 00:52:57,410
allowing our users to have you know

1201
00:53:03,579 --> 00:53:00,650
always an optimum way to get to their

1202
00:53:06,490 --> 00:53:03,589
destination and so we are working along

1203
00:53:10,120 --> 00:53:06,500
with that we are working the cognitive

1204
00:53:13,420 --> 00:53:10,130
technology that will do the the adaptive

1205
00:53:15,250 --> 00:53:13,430
routing process based on a priori you

1206
00:53:17,589 --> 00:53:15,260
know knowledge of the behavior of the

1207
00:53:20,430 --> 00:53:17,599
network we the state of health of the

1208
00:53:23,460 --> 00:53:20,440
individual channels and supported by a

1209
00:53:26,109 --> 00:53:23,470
more flexible more robust data

1210
00:53:28,230 --> 00:53:26,119
communication protocol we are going from

1211
00:53:30,940 --> 00:53:28,240
the tcp/ip to something we call

1212
00:53:34,120 --> 00:53:30,950
disruption tolerant networking so that

1213
00:53:36,190 --> 00:53:34,130

will allow us to do - you know automated

1214
00:53:38,170 --> 00:53:36,200
way to store-and-forward so if you add

1215
00:53:40,930 --> 00:53:38,180
the cognitive processes you will do it

1216
00:53:43,240 --> 00:53:40,940
in a smart way you know more optimized

1217
00:53:45,069 --> 00:53:43,250
way so we have developed the standards

1218
00:53:47,319 --> 00:53:45,079
we are working with in CCS D S which is

1219
00:53:48,760 --> 00:53:47,329
the conservative Committee for data

1220
00:53:50,650 --> 00:53:48,770
standards is an international

1221
00:53:52,140 --> 00:53:50,660
organization to produce the kind of

1222
00:53:54,730 --> 00:53:52,150
standards that will allow international

1223
00:53:56,170 --> 00:53:54,740
interoperability we are trying to add

1224
00:53:58,240 --> 00:53:56,180
water with the commercial sector to

1225
00:54:00,550 --> 00:53:58,250
infuse them into this organization and

1226
00:54:02,620 --> 00:54:00,560
to work together to ensure that future

1227
00:54:05,230 --> 00:54:02,630
standards are compatible such that we

1228
00:54:07,329 --> 00:54:05,240
can interoperate because NASA optimal

1229
00:54:09,550 --> 00:54:07,339
goal is to push the technology to enable

1230
00:54:10,520 --> 00:54:09,560
the commercial sector such that these

1231
00:54:13,400 --> 00:54:10,530
services can be

1232
00:54:15,350 --> 00:54:13,410
/ commercial providers and NASA will not

1233
00:54:17,810 --> 00:54:15,360
need in the future to build these kind

1234
00:54:20,480 --> 00:54:17,820
of capabilities they can become a user

1235
00:54:22,760 --> 00:54:20,490
like any other user and we can focus

1236
00:54:25,070 --> 00:54:22,770
primarily on advancing the future

1237
00:54:26,660 --> 00:54:25,080
technology we will be going after

1238
00:54:28,730 --> 00:54:26,670

quantum communication in the near

1239
00:54:30,380 --> 00:54:28,740
timeframe so would like to get there and

1240
00:54:34,010 --> 00:54:30,390
it's going to take all of us working

1241
00:54:35,870 --> 00:54:34,020
together thank you that's all the time

1242
00:54:38,180 --> 00:54:35,880
that we have for today I'd like to thank

1243
00:54:40,580 --> 00:54:38,190
everyone for joining us and you can find