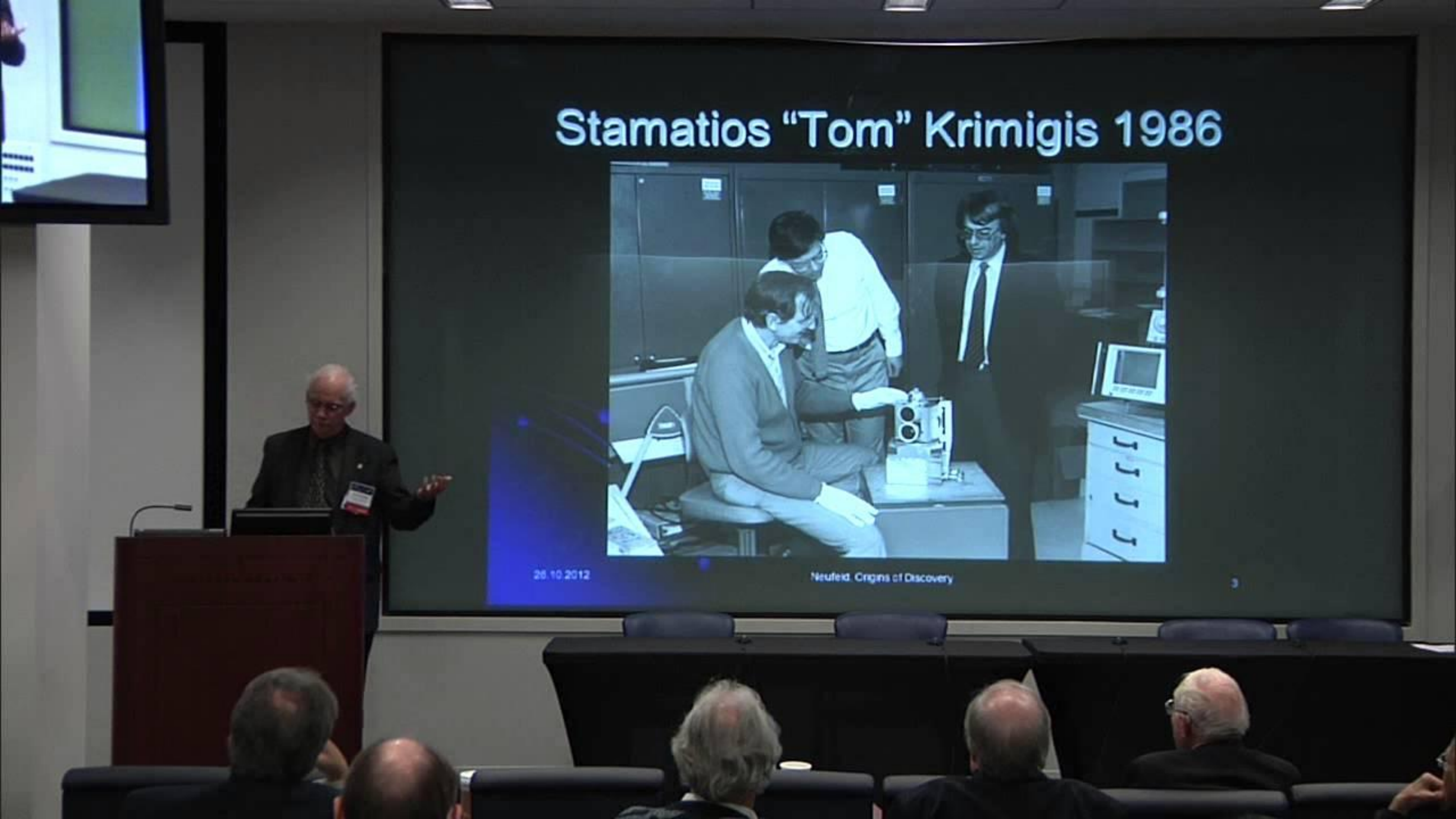
Stamatios “Tom” Krimigis 1986
26.10.2012
Neufeld: Origins of Discovery

1
00:00:06,070 --> 00:00:03,510
good afternoon

2
00:00:08,870 --> 00:00:06,080
my name is joan johnson freeze and it is

3
00:00:10,950 --> 00:00:08,880
my pleasure to share this fifth panel on

4
00:00:13,030 --> 00:00:10,960
institutional arrangements in solar

5
00:00:15,110 --> 00:00:13,040
system exploration

6
00:00:17,510 --> 00:00:15,120
we have four papers prison to be

7
00:00:19,269 --> 00:00:17,520
presented by for astute individuals who

8
00:00:21,670 --> 00:00:19,279
will consider relevant issues based on

9
00:00:24,310 --> 00:00:21,680
their experience and their research all

10
00:00:26,150 --> 00:00:24,320
their bios are available to you so i

11
00:00:26,870 --> 00:00:26,160
won't take the time to go through them i

12
00:00:29,669 --> 00:00:26,880
will

13
00:00:32,310 --> 00:00:29,679

just briefly mention we have jim burke

14
00:00:34,150 --> 00:00:32,320
from jpl the legendary jim burke it's

15
00:00:35,670 --> 00:00:34,160
been my pleasure to work with him for

16
00:00:36,950 --> 00:00:35,680
years with the international space

17
00:00:39,670 --> 00:00:36,960
university

18
00:00:42,470 --> 00:00:39,680
john cercosian an operations scientist

19
00:00:44,549 --> 00:00:42,480
at csiro which i looked up in its

20
00:00:48,150 --> 00:00:44,559
commonwealth scientific and industrial

21
00:00:50,549 --> 00:00:48,160
research organization from australia

22
00:00:52,549 --> 00:00:50,559
michael neufeld museum curator in the

23
00:00:56,229 --> 00:00:52,559
space history division at the national

24
00:00:58,709 --> 00:00:56,239
air and space museum and peter markovsky

25
00:01:01,349 --> 00:00:58,719
a phd candidate in history of science at

26
00:01:03,189 --> 00:01:01,359
the university of oklahoma

27
00:01:05,429 --> 00:01:03,199
the issues they will be considering are

28
00:01:07,350 --> 00:01:05,439
several institutional management for

29
00:01:09,350 --> 00:01:07,360
example will be considered as will

30
00:01:11,990 --> 00:01:09,360
institutional focus

31
00:01:14,070 --> 00:01:12,000
how management issues arrangements and

32
00:01:15,990 --> 00:01:14,080
focus can affect the ability to execute

33
00:01:18,469 --> 00:01:16,000
a highly sophisticated

34
00:01:20,310 --> 00:01:18,479
science and engineering pro program and

35
00:01:21,990 --> 00:01:20,320
we've already been hearing about that

36
00:01:25,030 --> 00:01:22,000
this morning through different

37
00:01:27,030 --> 00:01:25,040
international collaboration uh examples

38
00:01:29,109 --> 00:01:27,040

and these papers will consider and go

39
00:01:30,550 --> 00:01:29,119
into depth on those issues including

40
00:01:31,990 --> 00:01:30,560
international collaboration the

41
00:01:33,910 --> 00:01:32,000
complexity

42
00:01:36,230 --> 00:01:33,920
and the potential that is added by

43
00:01:37,990 --> 00:01:36,240
expanding missions beyond national or

44
00:01:39,030 --> 00:01:38,000
extending missions beyond national

45
00:01:41,270 --> 00:01:39,040
borders

46
00:01:43,350 --> 00:01:41,280
and clearly the complexity expansion is

47
00:01:44,870 --> 00:01:43,360
across the board not just

48
00:01:46,950 --> 00:01:44,880
with the science and engineering

49
00:01:48,389 --> 00:01:46,960
considerations but with the political

50
00:01:50,310 --> 00:01:48,399
and legal

51
00:01:52,069 --> 00:01:50,320
one point that has really fascinated me

52
00:01:54,630 --> 00:01:52,079
over the years as an

53
00:01:57,270 --> 00:01:54,640
observer and analyst of these

54
00:02:00,550 --> 00:01:57,280
institutional arrangements

55
00:02:02,550 --> 00:02:00,560
is the role and perhaps changing role of

56
00:02:05,030 --> 00:02:02,560
the program manager

57
00:02:06,789 --> 00:02:05,040
i'll give fair warning now to the

58
00:02:09,109 --> 00:02:06,799
panelists that that'll be a question i

59
00:02:10,630 --> 00:02:09,119
will be raising to them and i hope you

60
00:02:12,949 --> 00:02:10,640
the audience will be noting your

61
00:02:15,510 --> 00:02:12,959
questions that they can

62
00:02:17,589 --> 00:02:15,520
address as well we'll follow the same

63
00:02:20,070 --> 00:02:17,599

format as we have

64
00:02:22,390 --> 00:02:20,080
already 20 minute presentations five

65
00:02:24,390 --> 00:02:22,400
minutes of q a and then the panel will

66
00:02:26,630 --> 00:02:24,400
assemble at the end

67
00:02:28,630 --> 00:02:26,640
so with that i would like to introduce

68
00:02:31,430 --> 00:02:28,640
jim burke on to talk about the

69
00:02:33,589 --> 00:02:31,440
foundations of solar system exploration

70
00:02:41,509 --> 00:02:33,599
at jpl how the first mariners and

71
00:02:46,390 --> 00:02:43,589
thank you joan i'd like to begin by

72
00:02:47,830 --> 00:02:46,400
giving you a little background on the

73
00:02:50,790 --> 00:02:47,840
co-author

74
00:02:52,869 --> 00:02:50,800
and my successor as ranger project

75
00:02:55,350 --> 00:02:52,879
manager bud schermeier

76
00:02:58,390 --> 00:02:55,360
many of you of course know him from his

77
00:03:00,390 --> 00:02:58,400
distinguished later uh reputation at jpl

78
00:03:03,910 --> 00:03:00,400
as project manager of

79
00:03:06,070 --> 00:03:03,920
various projects mariner 6 and 7 and uh

80
00:03:07,990 --> 00:03:06,080
the voyagers as of when they were

81
00:03:10,149 --> 00:03:08,000
launched he was one of the

82
00:03:13,270 --> 00:03:10,159
first of a long succession of uh

83
00:03:14,550 --> 00:03:13,280
excellent project managers on voyager

84
00:03:16,070 --> 00:03:14,560
but

85
00:03:17,589 --> 00:03:16,080
what i'd like to do here is take a

86
00:03:19,750 --> 00:03:17,599
couple minutes to tell you a little bit

87
00:03:23,509 --> 00:03:19,760
about the earlier part of

88
00:03:26,309 --> 00:03:23,519

his life he and i graduated from caltech

89
00:03:27,990 --> 00:03:26,319
after meeting each other as freshmen

90
00:03:32,630 --> 00:03:28,000
70 years ago

91
00:03:38,869 --> 00:03:34,149
and

92
00:03:42,470 --> 00:03:38,879
of course enjoyed all the

93
00:03:44,550 --> 00:03:42,480
southern california recreations soaring

94
00:03:46,630 --> 00:03:44,560
sailing skiing

95
00:03:48,309 --> 00:03:46,640
surfing whatever else there is that

96
00:03:50,710 --> 00:03:48,319
doesn't begin with s

97
00:03:52,710 --> 00:03:50,720
uh he brought me down off the mountain

98
00:03:55,670 --> 00:03:52,720
with a broken leg

99
00:04:01,509 --> 00:03:59,910
so we know each other pretty well and uh

100
00:04:04,710 --> 00:04:01,519
in any case

101
00:04:07,990 --> 00:04:04,720
it was my very good fortune to have

102
00:04:09,990 --> 00:04:08,000
him in position as manager of jpl's

103
00:04:12,149 --> 00:04:10,000
systems division which is where all the

104
00:04:13,429 --> 00:04:12,159
subsystems get to try to work with each

105
00:04:15,429 --> 00:04:13,439
other

106
00:04:16,789 --> 00:04:15,439
that's what he was doing

107
00:04:18,789 --> 00:04:16,799
while i was

108
00:04:19,830 --> 00:04:18,799
being the first project manager of

109
00:04:22,790 --> 00:04:19,840
ranger

110
00:04:27,670 --> 00:04:22,800
but our experience at jpl went way back

111
00:04:33,030 --> 00:04:30,390
so that by the time ranger came along we

112
00:04:35,510 --> 00:04:33,040
both had been working at jpl for more

113
00:04:36,629 --> 00:04:35,520

than 10 years

114
00:04:38,629 --> 00:04:36,639
and

115
00:04:40,310 --> 00:04:38,639
one part of what i'm

116
00:04:44,790 --> 00:04:40,320
going to tell you from

117
00:04:47,030 --> 00:04:44,800
here on uh is how there was a collision

118
00:04:50,230 --> 00:04:47,040
between us and everybody else involved

119
00:04:52,710 --> 00:04:50,240
in the project uh all the way up to

120
00:04:54,550 --> 00:04:52,720
congress and later in the game

121
00:04:56,469 --> 00:04:54,560
uh because we really thought we knew

122
00:04:58,390 --> 00:04:56,479
what we were doing we were experienced

123
00:05:01,830 --> 00:04:58,400
both of us were experienced project

124
00:05:04,870 --> 00:05:01,840
managers under the army and we knew how

125
00:05:06,390 --> 00:05:04,880
to do what we were doing

126
00:05:08,390 --> 00:05:06,400
ranger

127
00:05:10,550 --> 00:05:08,400
presented us with

128
00:05:11,990 --> 00:05:10,560
a more complicated and

129
00:05:15,670 --> 00:05:12,000
bigger

130
00:05:17,830 --> 00:05:15,680
project to do uh but not one that was in

131
00:05:20,070 --> 00:05:17,840
different in any essential way from the

132
00:05:21,270 --> 00:05:20,080
things we'd been doing before

133
00:05:24,070 --> 00:05:21,280
therefore

134
00:05:25,909 --> 00:05:24,080
there was a definite collision between

135
00:05:27,430 --> 00:05:25,919
us

136
00:05:28,790 --> 00:05:27,440
and

137
00:05:29,990 --> 00:05:28,800
our

138
00:05:32,710 --> 00:05:30,000

leaders

139
00:05:34,390 --> 00:05:32,720
once we were transferred out of the army

140
00:05:35,990 --> 00:05:34,400
and into nasa

141
00:05:38,150 --> 00:05:36,000
because nasa had a whole lot of

142
00:05:39,990 --> 00:05:38,160
engineers who were just as experienced

143
00:05:41,909 --> 00:05:40,000
and just as smart as us

144
00:05:43,909 --> 00:05:41,919
and it took us a while to realize that

145
00:05:45,590 --> 00:05:43,919
they were our bosses

146
00:05:46,469 --> 00:05:45,600
well that's a little bit the theme of

147
00:05:48,070 --> 00:05:46,479
this

148
00:05:51,189 --> 00:05:48,080
presentation

149
00:05:55,189 --> 00:05:53,270
no i don't have a screen well

150
00:05:57,590 --> 00:05:55,199
no i can't read it up there i'll have to

151
00:05:59,990 --> 00:05:57,600
read it here sorry about that

152
00:06:03,670 --> 00:06:02,150
jpl

153
00:06:05,430 --> 00:06:03,680
of course

154
00:06:08,550 --> 00:06:05,440
launched the first earth satellites

155
00:06:10,629 --> 00:06:08,560
explorer one four five

156
00:06:13,270 --> 00:06:10,639
but uh

157
00:06:14,790 --> 00:06:13,280
quickly it was determined that earth

158
00:06:17,029 --> 00:06:14,800
satellites were going to be a big

159
00:06:20,150 --> 00:06:17,039
business in a crowded field

160
00:06:22,070 --> 00:06:20,160
and we as a university laboratory

161
00:06:24,710 --> 00:06:22,080
shouldn't really

162
00:06:25,749 --> 00:06:24,720
be in that field so

163
00:06:27,350 --> 00:06:25,759

we

164
00:06:30,790 --> 00:06:27,360
chose to go

165
00:06:32,390 --> 00:06:30,800
beyond low earth orbit first target

166
00:06:33,430 --> 00:06:32,400
being

167
00:06:35,670 --> 00:06:33,440
mars

168
00:06:39,510 --> 00:06:35,680
for the 1960

169
00:06:41,430 --> 00:06:39,520
opposition uh the 1960 launch window

170
00:06:44,230 --> 00:06:41,440
uh which was the first time in human

171
00:06:45,909 --> 00:06:44,240
history that something could be launched

172
00:06:49,029 --> 00:06:45,919
to mars

173
00:06:50,950 --> 00:06:49,039
so that was the objective initially

174
00:06:54,710 --> 00:06:50,960
retreated back from that driven by

175
00:06:57,589 --> 00:06:54,720
circumstances to the moon

176
00:07:00,469 --> 00:06:57,599
that was the process as of

177
00:07:02,390 --> 00:07:00,479
1958

178
00:07:06,070 --> 00:07:02,400
okay the von braun team

179
00:07:06,950 --> 00:07:06,080
uh very experienced of course uh

180
00:07:09,510 --> 00:07:06,960
we

181
00:07:10,950 --> 00:07:09,520
had to go through quite a transition

182
00:07:12,629 --> 00:07:10,960
with them

183
00:07:14,469 --> 00:07:12,639
because they ended up in a very

184
00:07:17,270 --> 00:07:14,479
anomalous position

185
00:07:19,350 --> 00:07:17,280
once nasa was formed

186
00:07:22,309 --> 00:07:19,360
the phone brown people

187
00:07:25,110 --> 00:07:22,319
were nasa's agent for procuring launch

188
00:07:27,270 --> 00:07:25,120

services from the air force

189
00:07:29,749 --> 00:07:27,280
if you can find a more difficult

190
00:07:31,350 --> 00:07:29,759
situation for somebody

191
00:07:33,749 --> 00:07:31,360
that's where they were

192
00:07:35,670 --> 00:07:33,759
and it's to their great credit that

193
00:07:38,870 --> 00:07:35,680
individuals in

194
00:07:40,950 --> 00:07:38,880
both the air force and the army

195
00:07:43,189 --> 00:07:40,960
saw to it that in spite of all the

196
00:07:45,510 --> 00:07:43,199
institutional rivalries and other things

197
00:07:47,510 --> 00:07:45,520
that were happening at the time

198
00:07:50,950 --> 00:07:47,520
they managed to pull it off they got us

199
00:07:54,950 --> 00:07:53,029
tremendous confusion not just about

200
00:07:56,790 --> 00:07:54,960
launch vehicles but really about

201
00:07:59,510 --> 00:07:56,800
everything

202
00:08:01,270 --> 00:07:59,520
as to who was going to do what

203
00:08:02,710 --> 00:08:01,280
but uh

204
00:08:06,869 --> 00:08:02,720
rather quickly

205
00:08:09,990 --> 00:08:06,879
in 1958 and 59

206
00:08:13,029 --> 00:08:10,000
we discovered that we just couldn't do

207
00:08:15,270 --> 00:08:13,039
that mars launch window it was way

208
00:08:16,070 --> 00:08:15,280
beyond anything we could logically hope

209
00:08:19,029 --> 00:08:16,080
to

210
00:08:20,950 --> 00:08:19,039
so the big mariner

211
00:08:23,110 --> 00:08:20,960
called mariner a

212
00:08:25,430 --> 00:08:23,120
that was planned for that mission

213
00:08:28,869 --> 00:08:25,440

was abandoned and

214
00:08:31,189 --> 00:08:28,879
uh was decided to build a mariner for

215
00:08:33,110 --> 00:08:31,199
venus in 1962

216
00:08:35,990 --> 00:08:33,120
a couple of them

217
00:08:37,190 --> 00:08:36,000
that would be derived from the smaller

218
00:08:39,269 --> 00:08:37,200
ranger

219
00:08:40,709 --> 00:08:39,279
lunar spacecraft

220
00:08:42,870 --> 00:08:40,719
that we were building

221
00:08:46,070 --> 00:08:42,880
ranger already had

222
00:08:48,470 --> 00:08:46,080
solar mantles solar panels and a high

223
00:08:50,550 --> 00:08:48,480
gain antenna because those are features

224
00:08:52,389 --> 00:08:50,560
that you have to have for interplanetary

225
00:08:53,430 --> 00:08:52,399
missions you don't need them for the

226
00:08:56,070 --> 00:08:53,440
moon

227
00:08:58,710 --> 00:08:56,080
but we we had them on ranger because we

228
00:09:01,509 --> 00:08:58,720
visualized it as a precursor to

229
00:09:03,829 --> 00:09:01,519
planetary missions three-axis attitude

230
00:09:05,190 --> 00:09:03,839
control pointing an antenna getting

231
00:09:06,550 --> 00:09:05,200
solar power

232
00:09:09,430 --> 00:09:06,560
and

233
00:09:10,790 --> 00:09:09,440
being execute a being able to execute a

234
00:09:13,350 --> 00:09:10,800
mid-course

235
00:09:14,870 --> 00:09:13,360
maneuver trajectory correction those

236
00:09:17,350 --> 00:09:14,880
were the features

237
00:09:19,110 --> 00:09:17,360
that had to be on the mariner so they

238
00:09:21,430 --> 00:09:19,120

were on the ranger

239
00:09:25,350 --> 00:09:21,440
and the mariner became to be called

240
00:09:27,590 --> 00:09:25,360
ranger uh mariner r derived from ranger

241
00:09:30,630 --> 00:09:27,600
okay

242
00:09:33,670 --> 00:09:30,640
mariner a became mariner r

243
00:09:37,509 --> 00:09:33,680
okay the air force and our huntsville

244
00:09:40,070 --> 00:09:37,519
friends got us the atlas agena

245
00:09:43,910 --> 00:09:40,080
the deep space net and space

246
00:09:46,790 --> 00:09:43,920
flight operations facility necessary for

247
00:09:57,750 --> 00:09:46,800
both lunar and planetary missions

248
00:10:03,269 --> 00:10:01,110
common bus variable payloads

249
00:10:05,430 --> 00:10:03,279
everything you see on this slide was an

250
00:10:07,030 --> 00:10:05,440
attempt by us

251
00:10:08,870 --> 00:10:07,040
to try to

252
00:10:10,630 --> 00:10:08,880
meet the requirement of building

253
00:10:13,670 --> 00:10:10,640
reliability

254
00:10:15,269 --> 00:10:13,680
through successive operations

255
00:10:16,310 --> 00:10:15,279
and still meeting

256
00:10:18,550 --> 00:10:16,320
the

257
00:10:20,230 --> 00:10:18,560
difficult demands of planetary missions

258
00:10:22,230 --> 00:10:20,240
where you can't change the schedule

259
00:10:23,269 --> 00:10:22,240
unless you're prepared to slip it for

260
00:10:25,910 --> 00:10:23,279
years

261
00:10:28,389 --> 00:10:25,920
uh as in fact did happen with curiosity

262
00:10:32,949 --> 00:10:28,399
the big rover

263
00:10:38,069 --> 00:10:35,750

science on every flight

264
00:10:41,350 --> 00:10:38,079
i had what now seems a very peculiar

265
00:10:43,750 --> 00:10:41,360
attitude about science

266
00:10:45,670 --> 00:10:43,760
i insisted that every flight carry

267
00:10:47,910 --> 00:10:45,680
scientific instruments

268
00:10:49,190 --> 00:10:47,920
for two reasons

269
00:10:51,190 --> 00:10:49,200
one

270
00:10:53,350 --> 00:10:51,200
we didn't know which flight or flights

271
00:10:54,630 --> 00:10:53,360
might succeed

272
00:10:56,710 --> 00:10:54,640
two

273
00:10:58,630 --> 00:10:56,720
engineering development of science

274
00:11:01,190 --> 00:10:58,640
instruments in flight

275
00:11:04,230 --> 00:11:01,200
is as important as that of any other

276
00:11:06,389 --> 00:11:04,240
subsystem on the spacecraft

277
00:11:08,630 --> 00:11:06,399
and i

278
00:11:11,269 --> 00:11:08,640
simply thought it's up to the project

279
00:11:13,990 --> 00:11:11,279
manager to figure out after receiving

280
00:11:15,750 --> 00:11:14,000
advice from scientists and comparing

281
00:11:17,030 --> 00:11:15,760
that with what you can do what you can

282
00:11:18,949 --> 00:11:17,040
accommodate

283
00:11:20,949 --> 00:11:18,959
then i'll tell the scientists which of

284
00:11:23,829 --> 00:11:20,959
them get to come and which other ones

285
00:11:25,670 --> 00:11:23,839
have to wait for another launch

286
00:11:27,590 --> 00:11:25,680
can you imagine a viewpoint more

287
00:11:28,949 --> 00:11:27,600
different from

288
00:11:31,190 --> 00:11:28,959

that of

289
00:11:32,949 --> 00:11:31,200
first science is the objective of the

290
00:11:34,710 --> 00:11:32,959
mission come on guys

291
00:11:36,310 --> 00:11:34,720
two

292
00:11:38,790 --> 00:11:36,320
there's a whole structure out there of

293
00:11:40,150 --> 00:11:38,800
scientific advisory committees nasa and

294
00:11:42,230 --> 00:11:40,160
this and that

295
00:11:44,069 --> 00:11:42,240
project manager simply has to sit and

296
00:11:45,590 --> 00:11:44,079
watch all of that happen and then deal

297
00:11:46,470 --> 00:11:45,600
with the result

298
00:11:55,110 --> 00:11:46,480
well

299
00:11:59,910 --> 00:11:58,069
october 1960 i was appointed

300
00:12:02,790 --> 00:11:59,920
project manager

301
00:12:05,269 --> 00:12:02,800
on the 10th of october uh

302
00:12:07,350 --> 00:12:05,279
big rocket takes off

303
00:12:09,509 --> 00:12:07,360
it was the

304
00:12:11,670 --> 00:12:09,519
classic old original one except the

305
00:12:14,069 --> 00:12:11,680
upper stages

306
00:12:16,230 --> 00:12:14,079
weighed more than 30 tons and we watched

307
00:12:18,069 --> 00:12:16,240
the very slow acceleration of that and

308
00:12:18,870 --> 00:12:18,079
thought oh my goodness what is this

309
00:12:20,389 --> 00:12:18,880
thing

310
00:12:22,470 --> 00:12:20,399
then on the second

311
00:12:25,350 --> 00:12:22,480
one on the 14th

312
00:12:27,590 --> 00:12:25,360
of october uh our telemetry was good

313
00:12:30,069 --> 00:12:27,600

enough to show that it had four big engi

314
00:12:31,829 --> 00:12:30,079
big boosters going off like that

315
00:12:33,269 --> 00:12:31,839
so that was when we first began to

316
00:12:37,030 --> 00:12:33,279
understand

317
00:12:39,990 --> 00:12:37,040
uh what the malnea configuration

318
00:12:43,030 --> 00:12:40,000
of the soviet launch vehicle

319
00:12:47,829 --> 00:12:44,949
uh when president kennedy was

320
00:12:50,150 --> 00:12:47,839
inaugurated he gave a talk that was very

321
00:12:52,629 --> 00:12:50,160
largely about the contest between

322
00:12:55,430 --> 00:12:52,639
american values and the

323
00:12:57,269 --> 00:12:55,440
subversive and uh threatening

324
00:12:59,670 --> 00:12:57,279
emanations that were coming out of the

325
00:13:01,750 --> 00:12:59,680
ussr

326
00:13:03,190 --> 00:13:01,760
on the 4th and 12th of february as you

327
00:13:05,190 --> 00:13:03,200
heard this morning

328
00:13:08,870 --> 00:13:05,200
they got two launches off and the second

329
00:13:10,710 --> 00:13:08,880
one sent the nero one on its way

330
00:13:13,110 --> 00:13:10,720
then yuri gagarin

331
00:13:14,069 --> 00:13:13,120
kennedy announced apollo

332
00:13:17,509 --> 00:13:14,079
uh

333
00:13:19,670 --> 00:13:17,519
if you can imagine a more

334
00:13:21,030 --> 00:13:19,680
propulsive environment than the one we

335
00:13:24,069 --> 00:13:21,040
were in

336
00:13:27,190 --> 00:13:24,079
to get ranger one and two going uh

337
00:13:31,670 --> 00:13:27,200
we had a lot of uh pressure on us

338
00:13:33,430 --> 00:13:31,680

much of it provided by ourselves uh and

339
00:13:38,710 --> 00:13:33,440
we you know we really wanted to get

340
00:13:38,720 --> 00:13:45,509
things moved fast

341
00:13:51,430 --> 00:13:49,110
i skipped over a whole lot of trouble

342
00:13:53,030 --> 00:13:51,440
originally when nasa

343
00:13:55,189 --> 00:13:53,040
first

344
00:13:56,629 --> 00:13:55,199
when we and the germans were transferred

345
00:13:59,189 --> 00:13:56,639
into nasa

346
00:14:02,629 --> 00:13:59,199
we already had a plan

347
00:14:04,550 --> 00:14:02,639
for upper stages on the atlas but they

348
00:14:06,790 --> 00:14:04,560
were not the right ones

349
00:14:08,949 --> 00:14:06,800
the air force agena was the right upper

350
00:14:10,230 --> 00:14:08,959
stage to use but it took oops how did

351
00:14:14,310 --> 00:14:10,240
that happen

352
00:14:14,320 --> 00:14:19,829
i went back too far sorry okay

353
00:14:23,350 --> 00:14:21,670
oh

354
00:14:26,069 --> 00:14:23,360
what happened

355
00:14:27,990 --> 00:14:26,079
okay never mind they uh

356
00:14:31,269 --> 00:14:28,000
something about the launch vehicles was

357
00:14:36,389 --> 00:14:31,279
on the slide that is now missing

358
00:14:41,269 --> 00:14:39,110
marshall was placed in a very tough

359
00:14:43,670 --> 00:14:41,279
position but we did

360
00:14:45,910 --> 00:14:43,680
end up again because of the dedication

361
00:14:46,870 --> 00:14:45,920
of individuals in the agencies who put

362
00:14:47,829 --> 00:14:46,880
our

363
00:14:50,710 --> 00:14:47,839

needs

364
00:14:53,030 --> 00:14:50,720
above the interagency disputes that were

365
00:14:54,629 --> 00:14:53,040
all going on then

366
00:14:58,069 --> 00:14:54,639
we got

367
00:15:00,389 --> 00:14:58,079
the launch vehicles that we needed

368
00:15:01,590 --> 00:15:00,399
i told you about how we didn't

369
00:15:03,910 --> 00:15:01,600
really

370
00:15:05,910 --> 00:15:03,920
like being jerked around by people who

371
00:15:07,750 --> 00:15:05,920
were our essential colleagues

372
00:15:10,550 --> 00:15:07,760
professionally and suddenly turned out

373
00:15:12,550 --> 00:15:10,560
to be from nasa a new agency that we'd

374
00:15:15,110 --> 00:15:12,560
never heard of and they were they were

375
00:15:18,069 --> 00:15:15,120
in charge

376
00:15:21,509 --> 00:15:18,079
our lunar scientists

377
00:15:24,550 --> 00:15:21,519
were the leaders in the profession

378
00:15:29,269 --> 00:15:27,430
gamma ray spectrometer

379
00:15:31,269 --> 00:15:29,279
geophysics

380
00:15:32,749 --> 00:15:31,279
seismometer

381
00:15:35,110 --> 00:15:32,759
and

382
00:15:37,110 --> 00:15:35,120
geomorphology the television

383
00:15:39,590 --> 00:15:37,120
those were the instruments on the lunar

384
00:15:40,550 --> 00:15:39,600
rangers and the scientists in charge of

385
00:15:42,870 --> 00:15:40,560
those

386
00:15:45,030 --> 00:15:42,880
did not give us any trouble

387
00:15:47,749 --> 00:15:45,040
they really did a tremendous job and

388
00:15:49,670 --> 00:15:47,759

they are famous for it they were already

389
00:15:52,150 --> 00:15:49,680
famous for their in their own

390
00:15:54,230 --> 00:15:52,160
professions of course

391
00:15:55,509 --> 00:15:54,240
we had a problem with non-lunar

392
00:15:57,430 --> 00:15:55,519
scientists

393
00:16:01,030 --> 00:15:57,440
space physics

394
00:16:02,710 --> 00:16:01,040
uh and i'll get to that a little later

395
00:16:05,829 --> 00:16:02,720
okay and

396
00:16:07,110 --> 00:16:05,839
we had a sort of a philosophical problem

397
00:16:09,509 --> 00:16:07,120
with

398
00:16:11,829 --> 00:16:09,519
not the lunar scientists they were fine

399
00:16:14,230 --> 00:16:11,839
they were on board they followed our

400
00:16:17,590 --> 00:16:14,240
schedule

401
00:16:19,590 --> 00:16:17,600
ranger one and two were planned as test

402
00:16:21,030 --> 00:16:19,600
flights not aimed at the moon but to

403
00:16:22,389 --> 00:16:21,040
have a high enough

404
00:16:24,629 --> 00:16:22,399
apogee

405
00:16:26,949 --> 00:16:24,639
that they would take the spacecraft out

406
00:16:28,470 --> 00:16:26,959
to where it could acquire the sun and

407
00:16:30,949 --> 00:16:28,480
earth references

408
00:16:33,269 --> 00:16:30,959
and since it was going to do that out in

409
00:16:34,310 --> 00:16:33,279
the magnetosphere it might as well have

410
00:16:36,790 --> 00:16:34,320
some

411
00:16:40,069 --> 00:16:36,800
space physics instruments on board it

412
00:16:42,790 --> 00:16:40,079
had an excellent payload designed by the

413
00:16:45,030 --> 00:16:42,800

prominent space physicists of the day

414
00:16:47,910 --> 00:16:45,040
plus an ultraviolet telescope looking

415
00:16:49,829 --> 00:16:47,920
back at the earth's hydrogen corona

416
00:16:52,389 --> 00:16:49,839
three four and five i told you about

417
00:16:54,069 --> 00:16:52,399
their instruments and on ranger six to

418
00:16:58,710 --> 00:16:54,079
nine the

419
00:17:01,990 --> 00:16:58,720
objective was reduced to just television

420
00:17:03,590 --> 00:17:02,000
now here's the example of the bus

421
00:17:06,630 --> 00:17:03,600
with one of the several different

422
00:17:11,029 --> 00:17:06,640
payloads the bus is hexagonal because of

423
00:17:13,750 --> 00:17:11,039
a vanished upper stage configuration

424
00:17:16,309 --> 00:17:13,760
so it was adapted to the agena

425
00:17:18,390 --> 00:17:16,319
the tower on the top has the space

426
00:17:21,270 --> 00:17:18,400
physics instruments and at the very top

427
00:17:24,309 --> 00:17:21,280
the omnidirectional antenna

428
00:17:29,830 --> 00:17:24,319
so that was the configuration of rangers

429
00:17:35,669 --> 00:17:32,870
range of one and two because of uh genia

430
00:17:37,669 --> 00:17:35,679
upper stage troubles never got to their

431
00:17:41,190 --> 00:17:37,679
high apogee orbits

432
00:17:44,150 --> 00:17:41,200
they were stranded in low earth orbit

433
00:17:49,190 --> 00:17:46,630
they the spacecraft appeared to be okay

434
00:17:51,750 --> 00:17:49,200
as far as you could tell in that orbit

435
00:17:54,789 --> 00:17:51,760
a ranger three we had a spacecraft that

436
00:17:57,029 --> 00:17:54,799
was fine it was injected the atlas had a

437
00:17:59,430 --> 00:17:57,039
guidance error but the ranger acquired

438
00:18:00,549 --> 00:17:59,440

the sun on earth and began to do what it

439
00:18:02,230 --> 00:18:00,559
should do

440
00:18:04,630 --> 00:18:02,240
but then when the mid-course maneuver

441
00:18:06,870 --> 00:18:04,640
happened one vector was pointed the

442
00:18:08,870 --> 00:18:06,880
wrong way there had been a double sign

443
00:18:12,150 --> 00:18:08,880
inversion between the spacecraft and the

444
00:18:13,830 --> 00:18:12,160
ground equipment so it missed the moon

445
00:18:16,630 --> 00:18:13,840
range of four

446
00:18:17,990 --> 00:18:16,640
something got across a couple of pins

447
00:18:20,390 --> 00:18:18,000
between

448
00:18:22,630 --> 00:18:20,400
the agena when the when the spacecraft

449
00:18:25,029 --> 00:18:22,640
came away from the agena something

450
00:18:27,590 --> 00:18:25,039
shorted out the ranger

451
00:18:29,590 --> 00:18:27,600
if it had had the female side of the

452
00:18:32,150 --> 00:18:29,600
separation connector that probably

453
00:18:34,150 --> 00:18:32,160
wouldn't have happened

454
00:18:36,870 --> 00:18:34,160
on ranger five i'll show you a picture

455
00:18:39,750 --> 00:18:36,880
of that one a ranger six

456
00:18:42,470 --> 00:18:39,760
this is after i had been replaced as

457
00:18:44,390 --> 00:18:42,480
project manager by bud shermeyer and

458
00:18:45,750 --> 00:18:44,400
i'll tell you more about that later but

459
00:18:47,510 --> 00:18:45,760
here's this

460
00:18:51,350 --> 00:18:47,520
brief version of the story when the

461
00:18:53,750 --> 00:18:51,360
atlas staged its first stage engines off

462
00:18:57,430 --> 00:18:53,760
a plasma cloud enveloped the vehicle and

463
00:19:05,029 --> 00:18:57,440

shorted out the television

464
00:19:09,430 --> 00:19:07,190
this is the configuration of the lunar

465
00:19:10,549 --> 00:19:09,440
ones with the seismometer ball at the

466
00:19:12,870 --> 00:19:10,559
top

467
00:19:13,909 --> 00:19:12,880
and the gamma ray spectrometer out on a

468
00:19:20,549 --> 00:19:13,919
boom

469
00:19:28,950 --> 00:19:22,710
i see i seem to keep

470
00:19:34,230 --> 00:19:30,950
well okay

471
00:19:38,470 --> 00:19:36,789
power switching and logic unit in range

472
00:19:40,630 --> 00:19:38,480
of ranger 5

473
00:19:43,830 --> 00:19:40,640
proof test model of it shows you

474
00:19:46,150 --> 00:19:43,840
something about our packaging

475
00:19:49,110 --> 00:19:46,160
people look at jpl's packaging and they

476
00:19:51,110 --> 00:19:49,120
say hey those look like locomotive parts

477
00:19:53,029 --> 00:19:51,120
well we found out they have to look like

478
00:19:55,110 --> 00:19:53,039
locomotive parts if you don't want to

479
00:19:57,510 --> 00:19:55,120
amplify vibrations from the launch

480
00:19:59,990 --> 00:19:57,520
vehicle etc

481
00:20:03,029 --> 00:20:00,000
and that's why our packages look the way

482
00:20:07,110 --> 00:20:04,870
a backside of this

483
00:20:08,310 --> 00:20:07,120
little item you see the arrow pointing

484
00:20:11,350 --> 00:20:08,320
there

485
00:20:13,990 --> 00:20:11,360
uh that screw got warm and that hit us

486
00:20:16,070 --> 00:20:14,000
in we had a good spacecraft again it had

487
00:20:18,310 --> 00:20:16,080
acquired the sun on earth was on its way

488
00:20:19,270 --> 00:20:18,320

to the moon this time atlas regina was

489
00:20:21,110 --> 00:20:19,280
okay

490
00:20:24,870 --> 00:20:21,120
fine

491
00:20:24,880 --> 00:20:29,470
we went to the ranger

492
00:20:37,909 --> 00:20:33,110
6789 configuration with just television

493
00:20:42,870 --> 00:20:39,590
okay

494
00:20:47,190 --> 00:20:42,880
that's what i'm here to tell you

495
00:20:49,990 --> 00:20:47,200
robotic sp deep space exploration

496
00:20:52,230 --> 00:20:50,000
demands extreme attention to risk and

497
00:20:53,750 --> 00:20:52,240
even then

498
00:20:57,430 --> 00:20:53,760
you don't always

499
00:21:01,750 --> 00:20:59,510
technical risks all the ones in the

500
00:21:03,669 --> 00:21:01,760
ranger both in the launch vehicles and

501
00:21:07,510 --> 00:21:03,679
the spacecraft

502
00:21:10,470 --> 00:21:07,520
the failures were at interfaces

503
00:21:12,950 --> 00:21:10,480
management risks i guess i don't need to

504
00:21:14,230 --> 00:21:12,960
go too much into that

505
00:21:16,789 --> 00:21:14,240
but

506
00:21:17,909 --> 00:21:16,799
after ranger

507
00:21:21,270 --> 00:21:17,919
five

508
00:21:23,350 --> 00:21:21,280
uh the project capsized and

509
00:21:25,669 --> 00:21:23,360
schermer replaced me

510
00:21:28,830 --> 00:21:25,679
then he had the failure of ranger six

511
00:21:31,430 --> 00:21:28,840
which took it all the way up to congress

512
00:21:32,470 --> 00:21:31,440
uh enormous

513
00:21:33,750 --> 00:21:32,480

trouble

514
00:21:37,110 --> 00:21:33,760
and

515
00:21:39,029 --> 00:21:37,120
everything was focused on the rca camera

516
00:21:41,350 --> 00:21:39,039
payload

517
00:21:42,789 --> 00:21:41,360
while in fact

518
00:21:45,270 --> 00:21:42,799
the failure

519
00:21:48,310 --> 00:21:45,280
happened during the atlas booster

520
00:21:52,789 --> 00:21:48,320
staging back during ascent

521
00:21:55,590 --> 00:21:52,799
so a big long failure investigation

522
00:21:58,630 --> 00:21:55,600
entirely focused on

523
00:22:00,549 --> 00:21:58,640
the place where the failure didn't occur

524
00:22:02,870 --> 00:22:00,559
and we may never have known about the

525
00:22:05,190 --> 00:22:02,880
cause of that failure had not a solar

526
00:22:07,909 --> 00:22:05,200
physicist among us

527
00:22:10,789 --> 00:22:07,919
continued to persist in looking into it

528
00:22:12,870 --> 00:22:10,799
and investigating all the records and he

529
00:22:13,990 --> 00:22:12,880
finally decided he had a convincing

530
00:22:16,630 --> 00:22:14,000
story

531
00:22:19,669 --> 00:22:16,640
and he took it uh not to the project

532
00:22:21,430 --> 00:22:19,679
manager but to his division manager who

533
00:22:22,470 --> 00:22:21,440
uh thought about it and said that's

534
00:22:24,470 --> 00:22:22,480
interesting

535
00:22:27,190 --> 00:22:24,480
but it was quite a while before

536
00:22:29,110 --> 00:22:27,200
everybody became convinced that that was

537
00:22:30,870 --> 00:22:29,120
the actual cause of the failure when a

538
00:22:32,710 --> 00:22:30,880

plasma cloud

539
00:22:33,750 --> 00:22:32,720
went up the sides of the atlas and back

540
00:22:35,750 --> 00:22:33,760
down

541
00:22:37,830 --> 00:22:35,760
for just less than a second

542
00:22:45,270 --> 00:22:37,840
it was enough to turn on the tvs and

543
00:22:49,110 --> 00:22:46,710
thank you

544
00:22:50,950 --> 00:22:49,120
i put a couple of my references in here

545
00:22:52,950 --> 00:22:50,960
i i sort of

546
00:22:58,950 --> 00:22:52,960
stretched the point a little bit thank

547
00:23:04,070 --> 00:23:02,230
so go ahead and take five minutes

548
00:23:08,870 --> 00:23:04,080
okay

549
00:23:12,710 --> 00:23:08,880
one question why did you

550
00:23:15,870 --> 00:23:12,720
why did you put this in about the uh

551
00:23:19,270 --> 00:23:15,880
the uh yes reference four decla

552
00:23:21,830 --> 00:23:19,280
1966 declassified 94.

553
00:23:22,630 --> 00:23:21,840
the beautiful book

554
00:23:25,510 --> 00:23:22,640
by

555
00:23:28,470 --> 00:23:25,520
wes huntress and mikhail maroff

556
00:23:31,110 --> 00:23:28,480
tells the real story about

557
00:23:33,750 --> 00:23:31,120
all of the soviet missions

558
00:23:36,310 --> 00:23:33,760
what this reference is is

559
00:23:37,669 --> 00:23:36,320
my story about what we thought they were

560
00:23:38,789 --> 00:23:37,679
doing

561
00:23:41,590 --> 00:23:38,799
published

562
00:23:43,510 --> 00:23:41,600
in the studies in intelligence and

563
00:23:52,630 --> 00:23:43,520

wasn't declassified for a number of

564
00:23:57,909 --> 00:23:53,510
during

565
00:23:59,350 --> 00:23:57,919
your days under jpl i was at abma

566
00:24:00,950 --> 00:23:59,360
i was at the army ballistic missile

567
00:24:03,110 --> 00:24:00,960
agency back in those

568
00:24:05,909 --> 00:24:03,120
in those 50s years and you guys were

569
00:24:08,870 --> 00:24:05,919
transferred in october 58

570
00:24:10,390 --> 00:24:08,880
we held out with the army until july

571
00:24:11,510 --> 00:24:10,400
1960.

572
00:24:15,269 --> 00:24:11,520
the

573
00:24:16,870 --> 00:24:15,279
team it was finally eisenhower who

574
00:24:19,350 --> 00:24:16,880
personally intervened

575
00:24:22,390 --> 00:24:19,360
and so we transferred officially

576
00:24:25,990 --> 00:24:22,400
on the first of july 1960.

577
00:24:28,149 --> 00:24:26,000
also we developed the the jupiter irbm

578
00:24:30,070 --> 00:24:28,159
but then you got the air force we were

579
00:24:32,230 --> 00:24:30,080
told that the army was not going to

580
00:24:34,870 --> 00:24:32,240
deploy that missile that was going to be

581
00:24:37,269 --> 00:24:34,880
deployed by the air force so we had to

582
00:24:39,830 --> 00:24:37,279
paint out u.s army put u.s air force in

583
00:24:42,149 --> 00:24:39,840
there redstone arsenal filled with air

584
00:24:44,070 --> 00:24:42,159
force personnel learning how to operate

585
00:24:47,110 --> 00:24:44,080
the the jupiter

586
00:24:49,909 --> 00:24:47,120
irbm which was deployed in turkey but

587
00:24:52,070 --> 00:24:49,919
the but that jupiter put in your upper

588
00:24:53,830 --> 00:24:52,080

stages you remember the juno too oh yes

589
00:24:57,190 --> 00:24:53,840
of course you didn't talk about that

590
00:24:59,029 --> 00:24:57,200
could you say a few words about juno too

591
00:25:01,029 --> 00:24:59,039
i said the launch vehicle picture was a

592
00:25:03,190 --> 00:25:01,039
little bit confused that was a strong

593
00:25:04,950 --> 00:25:03,200
understatement and you've just

594
00:25:07,269 --> 00:25:04,960
heard a little more about some of the

595
00:25:10,549 --> 00:25:07,279
various pieces of spaghetti that were

596
00:25:14,789 --> 00:25:10,559
all squirming around there go ahead

597
00:25:17,590 --> 00:25:14,799
jim can you just talk a little bit about

598
00:25:19,350 --> 00:25:17,600
how everybody how you and and everybody

599
00:25:20,390 --> 00:25:19,360
realized

600
00:25:23,909 --> 00:25:20,400
the

601
00:25:26,230 --> 00:25:23,919
issues

602
00:25:28,390 --> 00:25:26,240
what what did you expect going in did

603
00:25:30,070 --> 00:25:28,400
you think you could just get away with

604
00:25:32,310 --> 00:25:30,080
you know seeing if it worked and if it

605
00:25:34,549 --> 00:25:32,320
didn't work you'd you'd fix it but then

606
00:25:36,630 --> 00:25:34,559
was there a moment when you all realized

607
00:25:38,789 --> 00:25:36,640
that you were in a much much much more

608
00:25:40,710 --> 00:25:38,799
unforgiving game

609
00:25:43,269 --> 00:25:40,720
i think the answer to the best less

610
00:25:44,710 --> 00:25:43,279
simple quick answer short answer to that

611
00:25:47,430 --> 00:25:44,720
question is

612
00:25:49,830 --> 00:25:47,440
yes reliability was dominant in our

613
00:25:51,190 --> 00:25:49,840

minds and we tried to test everything

614
00:25:52,870 --> 00:25:51,200
you can test

615
00:25:54,710 --> 00:25:52,880
and you get to a point where you've

616
00:25:57,430 --> 00:25:54,720
tested something so many times that

617
00:25:58,870 --> 00:25:57,440
you've worn it out and it's better to

618
00:25:59,909 --> 00:25:58,880
leave it alone

619
00:26:01,430 --> 00:25:59,919
but

620
00:26:03,110 --> 00:26:01,440
as i said

621
00:26:06,149 --> 00:26:03,120
these failures

622
00:26:07,909 --> 00:26:06,159
happened with extremely subtle causes

623
00:26:09,430 --> 00:26:07,919
none of which would have been revealed

624
00:26:12,710 --> 00:26:09,440
in a ground test

625
00:26:15,990 --> 00:26:12,720
for example on ranger 2

626
00:26:18,990 --> 00:26:16,000
gyros in the agina were not turning when

627
00:26:21,669 --> 00:26:19,000
it took off why because the block house

628
00:26:23,909 --> 00:26:21,679
instrumentation was designed in such a

629
00:26:25,750 --> 00:26:23,919
way no matter how much you test it you

630
00:26:26,789 --> 00:26:25,760
can't tell whether the gyros are turning

631
00:26:27,669 --> 00:26:26,799
or not

632
00:26:28,549 --> 00:26:27,679
okay

633
00:26:30,789 --> 00:26:28,559
well

634
00:26:33,750 --> 00:26:30,799
that was corrected

635
00:26:35,830 --> 00:26:33,760
but we'd already lost one mission so

636
00:26:40,310 --> 00:26:35,840
fine the next agena the gyros were

637
00:26:41,430 --> 00:26:40,320
indeed turning but we didn't have 50

638
00:26:44,149 --> 00:26:41,440

missions

639
00:26:49,909 --> 00:26:44,159
the way you do in the army

640
00:26:53,990 --> 00:26:51,510
jim

641
00:26:56,789 --> 00:26:54,000
in one of your slide and concluding one

642
00:27:00,789 --> 00:26:56,799
i guess uh it was said that the

643
00:27:02,070 --> 00:27:00,799
politicians invention of policy do not

644
00:27:04,789 --> 00:27:02,080
help but

645
00:27:08,070 --> 00:27:04,799
probably worsened the situation you know

646
00:27:11,190 --> 00:27:08,080
i completely agree with you because i

647
00:27:12,789 --> 00:27:11,200
just experienced it in my own career you

648
00:27:15,830 --> 00:27:12,799
know but

649
00:27:20,070 --> 00:27:15,840
was it just the case in the ranger

650
00:27:22,789 --> 00:27:20,080
program when the policy tried to assist

651
00:27:29,110 --> 00:27:22,799
you somehow you know but actually

652
00:27:29,120 --> 00:27:33,590
oh all the politicians

653
00:27:38,149 --> 00:27:36,230
the politic politicians were faced with

654
00:27:39,669 --> 00:27:38,159
a problem that's very difficult for a

655
00:27:42,389 --> 00:27:39,679
politician

656
00:27:45,190 --> 00:27:42,399
uh to us it looked as if they were

657
00:27:47,510 --> 00:27:45,200
wasting their time and hours

658
00:27:50,710 --> 00:27:47,520
but in their world

659
00:27:52,230 --> 00:27:50,720
they really did have to consider

660
00:27:55,590 --> 00:27:52,240
whether we were

661
00:27:57,430 --> 00:27:55,600
we happy engineers who were just going

662
00:27:59,590 --> 00:27:57,440
along always thinking we could make the

663
00:28:01,990 --> 00:27:59,600

next one work and eventually we did make

664
00:28:04,470 --> 00:28:02,000
the next three of them work fine

665
00:28:06,789 --> 00:28:04,480
everybody ended up a hero so from an

666
00:28:08,630 --> 00:28:06,799
engineering standpoint we did exactly

667
00:28:10,230 --> 00:28:08,640
the same thing we'd always previously

668
00:28:12,549 --> 00:28:10,240
done in the army

669
00:28:14,149 --> 00:28:12,559
you find a failure you fix it launch the

670
00:28:15,430 --> 00:28:14,159
next thing it has a different failure

671
00:28:17,110 --> 00:28:15,440
you fix that

672
00:28:18,149 --> 00:28:17,120
eventually you get to where you want to

673
00:28:20,789 --> 00:28:18,159
be

674
00:28:25,510 --> 00:28:20,799
okay but ranger

675
00:28:28,789 --> 00:28:25,520
was operating in a different environment

676
00:28:31,029 --> 00:28:28,799
and the answer to mikhail's question is

677
00:28:33,990 --> 00:28:31,039
politicians

678
00:28:36,549 --> 00:28:34,000
could have done us tremendous damage

679
00:28:38,710 --> 00:28:36,559
because one question that was arose and

680
00:28:39,590 --> 00:28:38,720
it was treated in the aeronautical press

681
00:28:42,149 --> 00:28:39,600
then

682
00:28:44,310 --> 00:28:42,159
is what's a university laboratory doing

683
00:28:46,070 --> 00:28:44,320
in this business anyway with a 60

684
00:28:49,029 --> 00:28:46,080
million dollar mission

685
00:28:49,990 --> 00:28:49,039
500 people working on a big deal

686
00:28:52,149 --> 00:28:50,000
you know

687
00:28:54,070 --> 00:28:52,159
so that question

688
00:28:55,830 --> 00:28:54,080

had it gone the other way

689
00:28:58,149 --> 00:28:55,840
had nasa not

690
00:29:00,470 --> 00:28:58,159
told the politicians to hey get off our

691
00:29:02,950 --> 00:29:00,480
backs we the jpl knows what it's doing

692
00:29:04,149 --> 00:29:02,960
leave us alone

693
00:29:10,070 --> 00:29:04,159
thank you very much we're gonna have

694
00:29:14,149 --> 00:29:12,230
our next presenter is john sarkisian who

695
00:29:35,909 --> 00:29:14,159
is going to talk about mariner 2 and the

696
00:29:35,919 --> 00:29:41,190
nope

697
00:29:41,200 --> 00:29:50,549
wrong john

698
00:29:50,559 --> 00:29:54,789
oh which one was that

699
00:29:59,269 --> 00:29:56,710
okay

700
00:30:01,510 --> 00:29:59,279
well firstly um i'd first like to thank

701
00:30:03,669 --> 00:30:01,520
um bill barry and the organizers for

702
00:30:05,430 --> 00:30:03,679
inviting me along here to to address you

703
00:30:10,310 --> 00:30:05,440
this afternoon and it really is a great

704
00:30:15,029 --> 00:30:13,669
the csiro parks radio telescope is one

705
00:30:16,310 --> 00:30:15,039
of the world's great research

706
00:30:18,549 --> 00:30:16,320
instruments

707
00:30:20,710 --> 00:30:18,559
it is arguably the finest single dish

708
00:30:23,269 --> 00:30:20,720
radio telescope in the world

709
00:30:24,710 --> 00:30:23,279
back in 2006 a study published in the

710
00:30:26,549 --> 00:30:24,720
journal nature

711
00:30:29,430 --> 00:30:26,559
ranked it second only to the vla in

712
00:30:31,830 --> 00:30:29,440
terms of its scientific impact

713
00:30:34,070 --> 00:30:31,840

it is owned and operated by the

714
00:30:35,990 --> 00:30:34,080
commonwealth scientific and

715
00:30:37,750 --> 00:30:36,000
industrial research organization or

716
00:30:39,029 --> 00:30:37,760
csiro

717
00:30:41,669 --> 00:30:39,039
of australia

718
00:30:44,310 --> 00:30:41,679
and when it was built in 1961 it was the

719
00:30:46,149 --> 00:30:44,320
most advanced radio telescope

720
00:30:48,630 --> 00:30:46,159
in the world

721
00:30:50,870 --> 00:30:48,640
it was also recognized very early on

722
00:30:53,190 --> 00:30:50,880
that its design made it a near ideal

723
00:30:54,870 --> 00:30:53,200
instrument for tracking spacecraft in

724
00:30:58,230 --> 00:30:54,880
deep space

725
00:31:00,149 --> 00:30:58,240
this attracted the attention of nasa jpl

726
00:31:02,389 --> 00:31:00,159
where it had its most profound impact in

727
00:31:05,269 --> 00:31:02,399
the design of the large aperture

728
00:31:08,310 --> 00:31:05,279
antennas of the the the deep space

729
00:31:13,509 --> 00:31:10,630
as you can see from this table

730
00:31:15,590 --> 00:31:13,519
um the space missions that the the parks

731
00:31:18,630 --> 00:31:15,600
telescope has been involved in

732
00:31:20,870 --> 00:31:18,640
um spans the the five decades of the

733
00:31:22,710 --> 00:31:20,880
salt system exploration from mariner 2

734
00:31:24,789 --> 00:31:22,720
at the very beginning all the way

735
00:31:27,269 --> 00:31:24,799
through to the latest mission curiosity

736
00:31:29,590 --> 00:31:27,279
just a few months ago

737
00:31:32,230 --> 00:31:29,600
the highlight was undoubtedly the apollo

738
00:31:34,470 --> 00:31:32,240

missions from especially apollos 11

739
00:31:36,230 --> 00:31:34,480
through to 17.

740
00:31:39,430 --> 00:31:36,240
we also played a critical role in the

741
00:31:41,029 --> 00:31:39,440
galileo mission to jupiter and also in

742
00:31:43,509 --> 00:31:41,039
the huygens

743
00:31:45,110 --> 00:31:43,519
landing on titan where we actually were

744
00:31:51,269 --> 00:31:45,120
able to salvage the doppler wind

745
00:31:55,190 --> 00:31:54,070
but how did it all begin

746
00:31:57,269 --> 00:31:55,200
well

747
00:31:59,430 --> 00:31:57,279
it was conceived by edward taffy bowen

748
00:32:01,430 --> 00:31:59,440
in 1954

749
00:32:03,350 --> 00:32:01,440
taffy was the visionary and dynamic

750
00:32:07,669 --> 00:32:03,360
chief of the csiro's radio physics

751
00:32:09,909 --> 00:32:07,679
division for 25 years from 1946 to 1971.

752
00:32:11,830 --> 00:32:09,919
under his leadership the radio physics

753
00:32:13,669 --> 00:32:11,840
division developed as a pioneer and

754
00:32:15,750 --> 00:32:13,679
world leader in the emerging science of

755
00:32:17,990 --> 00:32:15,760
radio astronomy in the immediate

756
00:32:20,549 --> 00:32:18,000
post-war years

757
00:32:22,389 --> 00:32:20,559
but by the early 1950s

758
00:32:24,070 --> 00:32:22,399
taffy was thinking of the next stage of

759
00:32:26,149 --> 00:32:24,080
development of radio astronomy in

760
00:32:28,789 --> 00:32:26,159
australia and he determined that the

761
00:32:31,750 --> 00:32:28,799
best all-round instrument for continuing

762
00:32:33,509 --> 00:32:31,760
the csiro's pioneering efforts in radio

763
00:32:37,269 --> 00:32:33,519

astronomy

764
00:32:39,029 --> 00:32:37,279
was a large fully steerable dish antenna

765
00:32:41,110 --> 00:32:39,039
at the time such an instrument was

766
00:32:43,029 --> 00:32:41,120
beyond the budget of the csiro so he

767
00:32:45,190 --> 00:32:43,039
called on his old boy network so to

768
00:32:47,269 --> 00:32:45,200
speak of contacts that he built up

769
00:32:51,590 --> 00:32:47,279
during the war

770
00:32:55,509 --> 00:32:53,110
firstly

771
00:32:56,710 --> 00:32:55,519
he approached the carnegie corporation

772
00:32:59,269 --> 00:32:56,720
at the time

773
00:33:01,750 --> 00:32:59,279
it was the president of the carnegie

774
00:33:03,190 --> 00:33:01,760
institute in washington was headed by uh

775
00:33:04,149 --> 00:33:03,200
well the president of it was vanneva

776
00:33:04,950 --> 00:33:04,159
bush

777
00:33:06,389 --> 00:33:04,960
who

778
00:33:08,389 --> 00:33:06,399
during the war was

779
00:33:10,310 --> 00:33:08,399
president roosevelt's um science advisor

780
00:33:12,950 --> 00:33:10,320
the man who initiated the the manhattan

781
00:33:15,350 --> 00:33:12,960
project and he was also the the founder

782
00:33:17,830 --> 00:33:15,360
of the national science foundation

783
00:33:19,669 --> 00:33:17,840
and from his very close personal

784
00:33:21,830 --> 00:33:19,679
relationships um professional

785
00:33:23,909 --> 00:33:21,840
relationship with um

786
00:33:25,350 --> 00:33:23,919
vaneva bush he acquired a quarter of a

787
00:33:27,029 --> 00:33:25,360
million dollars to get the project

788
00:33:28,789 --> 00:33:27,039

started

789
00:33:30,630 --> 00:33:28,799
he then followed up with

790
00:33:32,789 --> 00:33:30,640
a similar

791
00:33:34,789 --> 00:33:32,799
amount from the rockefeller foundation

792
00:33:37,029 --> 00:33:34,799
the the president of of the rockefeller

793
00:33:39,509 --> 00:33:37,039
foundation was dean rusk the future

794
00:33:41,669 --> 00:33:39,519
secretary of state of um in the kennedy

795
00:33:44,710 --> 00:33:41,679
and johnson administrations again he

796
00:33:46,310 --> 00:33:44,720
knew taffy during the the war period

797
00:33:48,549 --> 00:33:46,320
and

798
00:33:50,470 --> 00:33:48,559
richard casey who is the the man who

799
00:33:52,870 --> 00:33:50,480
actually set up the radio physics

800
00:33:54,630 --> 00:33:52,880
laboratory within the csiro as a secret

801
00:33:56,870 --> 00:33:54,640
wartime laboratory

802
00:33:59,269 --> 00:33:56,880
was a minister in the then australian

803
00:34:01,990 --> 00:33:59,279
government and responsible for the csiro

804
00:34:04,549 --> 00:34:02,000
and he managed to convince and he was a

805
00:34:06,630 --> 00:34:04,559
great supporter of the of taffy and the

806
00:34:08,310 --> 00:34:06,640
telescope project and he managed to

807
00:34:09,990 --> 00:34:08,320
convince the australian

808
00:34:11,990 --> 00:34:10,000
prime minister to support it with

809
00:34:14,230 --> 00:34:12,000
matching funds and then combined with

810
00:34:15,669 --> 00:34:14,240
additional private donations and with

811
00:34:17,349 --> 00:34:15,679
the additional

812
00:34:19,510 --> 00:34:17,359
funds from the australian government and

813
00:34:21,430 --> 00:34:19,520

the rockefeller to make up a shortfall

814
00:34:24,149 --> 00:34:21,440
towards the end of the project he was

815
00:34:26,149 --> 00:34:24,159
able to acquire just over 1.4 million

816
00:34:28,230 --> 00:34:26,159
dollars to build the telescope which

817
00:34:32,790 --> 00:34:28,240
even in those days was considered

818
00:34:35,990 --> 00:34:34,710
the telescope itself

819
00:34:38,470 --> 00:34:36,000
um

820
00:34:40,389 --> 00:34:38,480
was designed by the freeman fox and

821
00:34:42,069 --> 00:34:40,399
partners a british firm they were

822
00:34:44,629 --> 00:34:42,079
actually famous especially in australia

823
00:34:46,069 --> 00:34:44,639
as being the the designers of the sydney

824
00:34:47,669 --> 00:34:46,079
harbour bridge

825
00:34:49,109 --> 00:34:47,679
and

826
00:34:52,310 --> 00:34:49,119
they were contracted to design the

827
00:34:53,109 --> 00:34:52,320
telescope to csiro specifications

828
00:34:55,109 --> 00:34:53,119
and

829
00:34:57,270 --> 00:34:55,119
the csro engineer harry minnett

830
00:35:04,069 --> 00:34:57,280
supervised the design of the telescope

831
00:35:07,829 --> 00:35:06,310
this was much longer than they expected

832
00:35:11,030 --> 00:35:07,839
but it paid off in the end because it

833
00:35:13,510 --> 00:35:11,040
meant that they got the design right

834
00:35:14,550 --> 00:35:13,520
the telescope um actually incorporated

835
00:35:17,270 --> 00:35:14,560
several

836
00:35:20,390 --> 00:35:17,280
um very innovative design features i'll

837
00:35:23,589 --> 00:35:20,400
just come to them firstly it was

838
00:35:26,069 --> 00:35:23,599

pivoted in the center it's like an

839
00:35:27,670 --> 00:35:26,079
inverted umbrella

840
00:35:30,150 --> 00:35:27,680
as you can see

841
00:35:31,990 --> 00:35:30,160
it used it was it had an azimuth mount

842
00:35:33,430 --> 00:35:32,000
which is unusual for its time for a

843
00:35:35,829 --> 00:35:33,440
structure that large

844
00:35:37,910 --> 00:35:35,839
also um in order for it to track objects

845
00:35:39,190 --> 00:35:37,920
smoothly across the sky it incorporated

846
00:35:41,030 --> 00:35:39,200
a new

847
00:35:42,630 --> 00:35:41,040
invention of the master equatorial

848
00:35:44,550 --> 00:35:42,640
system

849
00:35:46,550 --> 00:35:44,560
and it was a basically just a small

850
00:35:48,550 --> 00:35:46,560
equatorially mounted optical telescope

851
00:35:50,310 --> 00:35:48,560
located at the intersection of the

852
00:35:53,670 --> 00:35:50,320
altitude and azimuth axis of the

853
00:35:57,910 --> 00:35:55,829
um and um

854
00:35:59,589 --> 00:35:57,920
essentially the dish was slaved to that

855
00:36:02,069 --> 00:35:59,599
equatorially op mounted optical

856
00:36:04,630 --> 00:36:02,079
telescope via a servo drive system that

857
00:36:07,510 --> 00:36:04,640
enabled it to very smoothly track

858
00:36:08,390 --> 00:36:07,520
objects across the sky and finally

859
00:36:10,630 --> 00:36:08,400
it had

860
00:36:13,430 --> 00:36:10,640
spiral purlins on the dish to to give it

861
00:36:15,349 --> 00:36:13,440
strength

862
00:36:16,950 --> 00:36:15,359
the site chosen for the telescope was

863
00:36:20,230 --> 00:36:16,960

near the town of parks

864
00:36:21,990 --> 00:36:20,240
about 350 kilometers west of sydney in

865
00:36:24,230 --> 00:36:22,000
the central west of new south wales in

866
00:36:25,670 --> 00:36:24,240
australia and the reason it was chosen

867
00:36:27,829 --> 00:36:25,680
was because of those mountains in the

868
00:36:29,349 --> 00:36:27,839
background of the photograph there

869
00:36:31,030 --> 00:36:29,359
they protected us from the radio

870
00:36:32,710 --> 00:36:31,040
emissions from the larger population

871
00:36:35,030 --> 00:36:32,720
centers further east

872
00:36:38,069 --> 00:36:35,040
such as sydney for example i mean so the

873
00:36:39,990 --> 00:36:38,079
area was a very radio quiet site which

874
00:36:41,829 --> 00:36:40,000
was essential for a large sensitive

875
00:36:43,109 --> 00:36:41,839
instrument like parks

876
00:36:45,349 --> 00:36:43,119
that young

877
00:36:47,109 --> 00:36:45,359
fellow there um standing next to the

878
00:36:48,069 --> 00:36:47,119
stake where the actual telescope was

879
00:36:49,750 --> 00:36:48,079
built

880
00:36:53,990 --> 00:36:49,760
he's now 59 years old and he's a good

881
00:36:56,710 --> 00:36:54,000
friend of mine is the local farmer still

882
00:36:59,589 --> 00:36:56,720
um the main constructor for the the

883
00:37:01,990 --> 00:36:59,599
telescope was man of west germany

884
00:37:04,550 --> 00:37:02,000
um and so already you can see that it's

885
00:37:07,030 --> 00:37:04,560
it's beginning to take on the after

886
00:37:09,430 --> 00:37:07,040
of an international project with

887
00:37:11,349 --> 00:37:09,440
the united states australia um the

888
00:37:12,950 --> 00:37:11,359

british and the germans all involved in

889
00:37:18,870 --> 00:37:12,960
the construction

890
00:37:21,349 --> 00:37:18,880
1959 and over the next 21 months

891
00:37:23,829 --> 00:37:21,359
when the germans arrived to to build the

892
00:37:25,990 --> 00:37:23,839
the turret they're able to to weld the

893
00:37:27,750 --> 00:37:26,000
the ribs into into shape and then they

894
00:37:30,230 --> 00:37:27,760
lifted them one at a time bolted them

895
00:37:31,990 --> 00:37:30,240
onto the the turret and then when that

896
00:37:35,670 --> 00:37:32,000
was done they then put the focus cabin

897
00:37:38,069 --> 00:37:35,680
up on the the the apex and then paneled

898
00:37:40,230 --> 00:37:38,079
the the dish and it said it was all done

899
00:37:42,470 --> 00:37:40,240
in the amazingly short period of just 21

900
00:37:44,150 --> 00:37:42,480
months and that was a and there was very

901
00:37:45,829 --> 00:37:44,160
little problems encountered in the

902
00:37:48,870 --> 00:37:45,839
construction and it was mainly due to

903
00:37:50,950 --> 00:37:48,880
the the time spent in designing it

904
00:37:52,630 --> 00:37:50,960
initially

905
00:37:54,630 --> 00:37:52,640
the first tip of the telescope occurred

906
00:37:56,870 --> 00:37:54,640
in october 1961

907
00:37:58,390 --> 00:37:56,880
and then a mid-october 61 and then two

908
00:38:00,630 --> 00:37:58,400
weeks later it was officially opened by

909
00:38:03,589 --> 00:38:00,640
the governor general of australia

910
00:38:07,109 --> 00:38:05,510
the first director of the observatory

911
00:38:10,150 --> 00:38:07,119
was john bolton

912
00:38:11,910 --> 00:38:10,160
he was a legendary figure um

913
00:38:15,589 --> 00:38:11,920

a pioneer of radio astronomy in

914
00:38:17,349 --> 00:38:15,599
australia and he also in 1955

915
00:38:19,670 --> 00:38:17,359
moved to caltech and and started the

916
00:38:21,750 --> 00:38:19,680
radio astronomy program there

917
00:38:24,390 --> 00:38:21,760
and founded the owens valley observatory

918
00:38:26,550 --> 00:38:24,400
which is um

919
00:38:30,870 --> 00:38:26,560
which we had very close um contacts with

920
00:38:34,230 --> 00:38:32,470
but how do we get involved in the space

921
00:38:36,230 --> 00:38:34,240
missions

922
00:38:37,030 --> 00:38:36,240
well the story goes back to the period

923
00:38:39,430 --> 00:38:37,040
um

924
00:38:40,390 --> 00:38:39,440
the interest that that jpl had in in

925
00:38:43,030 --> 00:38:40,400
parks

926
00:38:45,750 --> 00:38:43,040
um went to before even that when the

927
00:38:48,630 --> 00:38:45,760
telescope was was built began on the 6th

928
00:38:52,390 --> 00:38:48,640
of march 1959 when the us army's pioneer

929
00:38:55,190 --> 00:38:52,400
4 spacecraft flew by the moon um at what

930
00:38:57,750 --> 00:38:55,200
was then a record distance of 650 000

931
00:38:59,910 --> 00:38:57,760
kilometers and unfortunately

932
00:39:01,109 --> 00:38:59,920
nasa jpl could not communicate with it

933
00:39:02,150 --> 00:39:01,119
effectively

934
00:39:04,950 --> 00:39:02,160
even though it was a perfectly

935
00:39:07,190 --> 00:39:04,960
functioning spacecraft because its small

936
00:39:09,190 --> 00:39:07,200
26 meter antenna at goldstone just

937
00:39:12,630 --> 00:39:09,200
didn't have the sensitivity to

938
00:39:13,670 --> 00:39:12,640

to communicate with it effectively

939
00:39:16,310 --> 00:39:13,680
and so

940
00:39:18,390 --> 00:39:16,320
jpl realized that what it needed was the

941
00:39:21,190 --> 00:39:18,400
it was a much larger and more sensitive

942
00:39:22,870 --> 00:39:21,200
antenna than this 26 meter antennas that

943
00:39:25,510 --> 00:39:22,880
it was planning for its deep space

944
00:39:28,069 --> 00:39:25,520
network or the fledgling deep space

945
00:39:30,230 --> 00:39:28,079
and so the requirements for such a an

946
00:39:32,310 --> 00:39:30,240
antenna were that it

947
00:39:34,550 --> 00:39:32,320
needed to be six to 12 db improvement

948
00:39:36,630 --> 00:39:34,560
over the existing 26 meter array they

949
00:39:38,069 --> 00:39:36,640
were planning

950
00:39:41,829 --> 00:39:38,079
which meant it had to be somewhere in

951
00:39:43,750 --> 00:39:41,839
the order of 60 to 80 meters in diameter

952
00:39:46,710 --> 00:39:43,760
it had to have optimum performance at

953
00:39:49,589 --> 00:39:46,720
2.2 gigahertz at s-band in other words

954
00:39:51,109 --> 00:39:49,599
the surface had to be extremely accurate

955
00:39:54,550 --> 00:39:51,119
um you needed to have a pointing

956
00:39:55,750 --> 00:39:54,560
accuracy of about 1.2 minutes of arc

957
00:39:57,430 --> 00:39:55,760
and

958
00:39:59,270 --> 00:39:57,440
finally needed to have a slew rate of

959
00:40:01,510 --> 00:39:59,280
around 10 degrees a minute

960
00:40:03,750 --> 00:40:01,520
and it was no surprise at all that these

961
00:40:07,589 --> 00:40:03,760
requirements match the the proposed park

962
00:40:09,510 --> 00:40:07,599
telescope very very closely

963
00:40:11,910 --> 00:40:09,520

consequently during the the tender and

964
00:40:14,309 --> 00:40:11,920
construction phase of the telescope

965
00:40:17,430 --> 00:40:14,319
jpl made several representations to the

966
00:40:19,270 --> 00:40:17,440
csiro with the view of of formally

967
00:40:20,630 --> 00:40:19,280
incorporating it into the deep space

968
00:40:22,309 --> 00:40:20,640
network

969
00:40:24,550 --> 00:40:22,319
finally however a cooperative space

970
00:40:25,910 --> 00:40:24,560
exploration program was proposed

971
00:40:28,150 --> 00:40:25,920
and you can see that it was for the

972
00:40:30,390 --> 00:40:28,160
occasional use of parks for data

973
00:40:32,470 --> 00:40:30,400
requisition of a short-term nature where

974
00:40:33,750 --> 00:40:32,480
an extremely strong and reliable signal

975
00:40:35,670 --> 00:40:33,760
was required

976
00:40:37,829 --> 00:40:35,680
and in fact to this day

977
00:40:39,829 --> 00:40:37,839
it is still the basis in rationale for

978
00:40:42,870 --> 00:40:39,839
parks's inclusion in space tracking

979
00:40:48,309 --> 00:40:45,910
in 1962 a nasa research grant was

980
00:40:50,630 --> 00:40:48,319
awarded to the csiro to study the dish

981
00:40:52,309 --> 00:40:50,640
characteristics with a view to it

982
00:40:55,829 --> 00:40:52,319
contributing toward the design of the

983
00:40:58,069 --> 00:40:55,839
proposed jpl large aperture antennas

984
00:41:00,630 --> 00:40:58,079
william pickering the jpl director

985
00:41:02,470 --> 00:41:00,640
invited the csro to to participate in

986
00:41:05,349 --> 00:41:02,480
the feasibility studies and

987
00:41:09,109 --> 00:41:05,359
specification reviews of the the jpl

988
00:41:13,109 --> 00:41:11,270

um the giant the grant also called for a

989
00:41:15,270 --> 00:41:13,119
detailed study to determine the

990
00:41:17,589 --> 00:41:15,280
performance parameters of the parks

991
00:41:18,950 --> 00:41:17,599
telescope in regards to to those

992
00:41:21,030 --> 00:41:18,960
premises you see there the structural

993
00:41:23,270 --> 00:41:21,040
behavior characteristics of the drive

994
00:41:25,349 --> 00:41:23,280
system radio frequency performance

995
00:41:26,870 --> 00:41:25,359
vibration characteristics but also

996
00:41:29,990 --> 00:41:26,880
measurements of the disc shape in the

997
00:41:32,550 --> 00:41:30,000
zenith and tilted positions

998
00:41:34,470 --> 00:41:32,560
as a result of these studies

999
00:41:37,190 --> 00:41:34,480
over the next few over the the next few

1000
00:41:38,550 --> 00:41:37,200
years um more than 30 research papers

1001
00:41:40,870 --> 00:41:38,560
were published on the design and

1002
00:41:42,390 --> 00:41:40,880
performance of the telescope parks was

1003
00:41:44,470 --> 00:41:42,400
not only the most advanced radio

1004
00:41:48,309 --> 00:41:44,480
telescope in the world it also became

1005
00:41:49,670 --> 00:41:48,319
the most extensively studied

1006
00:41:51,349 --> 00:41:49,680
and the reason was because this

1007
00:41:53,030 --> 00:41:51,359
information was considered to be of

1008
00:41:58,230 --> 00:41:53,040
critical importance in the design and

1009
00:42:02,550 --> 00:42:00,630
the caltech and jpl luminaries involved

1010
00:42:05,589 --> 00:42:02,560
in that design were people such as bruce

1011
00:42:07,670 --> 00:42:05,599
rule bill merrick ebrechten and sononai

1012
00:42:10,150 --> 00:42:07,680
liaise very closely with the csro

1013
00:42:14,470 --> 00:42:10,160

engineers harry minet and and others to

1014
00:42:16,950 --> 00:42:14,480
to ensure that the the dsn antennas were

1015
00:42:18,550 --> 00:42:16,960
operated as and as well as as they'd

1016
00:42:19,990 --> 00:42:18,560
hope

1017
00:42:22,550 --> 00:42:20,000
now another aspect of the park's

1018
00:42:25,510 --> 00:42:22,560
telescope impact on space tracking was

1019
00:42:27,030 --> 00:42:25,520
in the location of the dsn stations

1020
00:42:28,710 --> 00:42:27,040
as you can see the very first station

1021
00:42:31,670 --> 00:42:28,720
was located at goldstone because only

1022
00:42:33,190 --> 00:42:31,680
just a few hours drive from from jpl but

1023
00:42:34,950 --> 00:42:33,200
that then dictated where the other two

1024
00:42:36,870 --> 00:42:34,960
stations would go they needed to have

1025
00:42:39,910 --> 00:42:36,880
their stations roughly equidistant

1026
00:42:42,390 --> 00:42:39,920
around the globe um 120 degrees apart

1027
00:42:44,870 --> 00:42:42,400
roughly and so in the early 19 early

1028
00:42:46,950 --> 00:42:44,880
late 50s early 60s the other two

1029
00:42:49,750 --> 00:42:46,960
stations were located at johannesburg in

1030
00:42:51,670 --> 00:42:49,760
western um in south africa and also at

1031
00:42:53,990 --> 00:42:51,680
ireland lagoon at the women rocket range

1032
00:42:55,990 --> 00:42:54,000
in south australia but for various

1033
00:42:58,309 --> 00:42:56,000
reasons which i won't go into just lack

1034
00:43:01,190 --> 00:42:58,319
of time there they had to to shift the

1035
00:43:03,670 --> 00:43:01,200
locations of those other stations and um

1036
00:43:06,470 --> 00:43:03,680
one went to to madrid and the other went

1037
00:43:08,950 --> 00:43:06,480
to the tidman villa nature reserve very

1038
00:43:11,430 --> 00:43:08,960

close to canberra the australian capital

1039
00:43:13,510 --> 00:43:11,440
um and the reason tidbinbilla was chosen

1040
00:43:15,589 --> 00:43:13,520
was because taffy bone was the chairman

1041
00:43:17,750 --> 00:43:15,599
of the site selection committee and he

1042
00:43:19,750 --> 00:43:17,760
chose that site because

1043
00:43:22,309 --> 00:43:19,760
ted ben biller was on almost exactly the

1044
00:43:24,550 --> 00:43:22,319
same longitude as the parks telescope

1045
00:43:27,109 --> 00:43:24,560
because he argued that being on the same

1046
00:43:29,270 --> 00:43:27,119
longitude the two would see the same sky

1047
00:43:31,109 --> 00:43:29,280
simultaneously and that in the future

1048
00:43:34,710 --> 00:43:31,119
nasa may want to

1049
00:43:38,230 --> 00:43:34,720
link or array the dishes together

1050
00:43:39,910 --> 00:43:38,240
to enhance the capabilities so that

1051
00:43:41,670 --> 00:43:39,920
the two working together would be a much

1052
00:43:43,829 --> 00:43:41,680
more powerful more useful instrument

1053
00:43:46,069 --> 00:43:43,839
than the two working individually and of

1054
00:43:47,829 --> 00:43:46,079
course that was realized some 20 or so

1055
00:43:50,710 --> 00:43:47,839
years later with the voyager 2

1056
00:43:53,109 --> 00:43:50,720
encounters of uranus and neptune and

1057
00:43:58,150 --> 00:43:53,119
also very critically with the galileo

1058
00:44:03,510 --> 00:44:00,950
now it was during the this design and

1059
00:44:04,550 --> 00:44:03,520
study period that that mariner 2 was

1060
00:44:05,510 --> 00:44:04,560
launched

1061
00:44:08,230 --> 00:44:05,520
um

1062
00:44:11,030 --> 00:44:08,240
as you all know it was it flew by venus

1063
00:44:13,510 --> 00:44:11,040

on the 14th of december 1962 and it flew

1064
00:44:16,230 --> 00:44:13,520
within just under 35 000 kilometers of

1065
00:44:18,470 --> 00:44:16,240
the of the surface

1066
00:44:20,470 --> 00:44:18,480
now taffy bone harry minnett decided

1067
00:44:22,150 --> 00:44:20,480
that tracking mariner 2 would be the

1068
00:44:24,630 --> 00:44:22,160
would be an excellent demonstration of

1069
00:44:27,190 --> 00:44:24,640
the parks telescope's capabilities for

1070
00:44:28,950 --> 00:44:27,200
communication at great distances

1071
00:44:30,790 --> 00:44:28,960
and essentially the experiment would be

1072
00:44:32,630 --> 00:44:30,800
a simple one involving the measurement

1073
00:44:35,750 --> 00:44:32,640
of spacecraft position

1074
00:44:37,829 --> 00:44:35,760
signal level and doppler frequency

1075
00:44:40,309 --> 00:44:37,839
it did not include the reception of

1076
00:44:42,309 --> 00:44:40,319
telemetry but was simply intended to

1077
00:44:45,030 --> 00:44:42,319
establish the technique and measure the

1078
00:44:47,670 --> 00:44:45,040
performance of a 64 metre

1079
00:44:52,550 --> 00:44:49,430
parks tracked it for two weeks beginning

1080
00:44:54,309 --> 00:44:52,560
on the 20th of december 1962 until the

1081
00:44:56,390 --> 00:44:54,319
3rd of january

1082
00:44:58,950 --> 00:44:56,400
when the signal was finally

1083
00:45:00,870 --> 00:44:58,960
finally lost

1084
00:45:03,829 --> 00:45:00,880
jpl loaned

1085
00:45:05,829 --> 00:45:03,839
parks a nail band transportable phase

1086
00:45:07,349 --> 00:45:05,839
lock receiver which the astronomers

1087
00:45:08,630 --> 00:45:07,359
dubbed the ancient mariner as you can

1088
00:45:10,150 --> 00:45:08,640

see

1089
00:45:11,990 --> 00:45:10,160
because it looked quite old even then i

1090
00:45:13,910 --> 00:45:12,000
think

1091
00:45:16,069 --> 00:45:13,920
but but the thing that i found most

1092
00:45:18,230 --> 00:45:16,079
amazing was that it had a 20 hertz gate

1093
00:45:19,829 --> 00:45:18,240
that could be manually tuned so the

1094
00:45:22,790 --> 00:45:19,839
astronomers had to know the the

1095
00:45:23,670 --> 00:45:22,800
frequency very very precisely and tune

1096
00:45:27,109 --> 00:45:23,680
the tune

1097
00:45:29,109 --> 00:45:27,119
to with to very close to the um to the

1098
00:45:30,950 --> 00:45:29,119
um frequent doppler shifted frequency in

1099
00:45:32,870 --> 00:45:30,960
the pass span and so they could get it

1100
00:45:35,109 --> 00:45:32,880
in that 20 hertz gate and then lock on

1101
00:45:37,430 --> 00:45:35,119
to the to the signal

1102
00:45:41,910 --> 00:45:39,270
because these tracks were and if we're

1103
00:45:44,630 --> 00:45:41,920
on an informal basis jpl did not provide

1104
00:45:48,069 --> 00:45:44,640
position and frequency predicts so harry

1105
00:45:49,190 --> 00:45:48,079
minette resorted to calculating um these

1106
00:45:51,829 --> 00:45:49,200
himself

1107
00:45:54,230 --> 00:45:51,839
using slide rule and pencil and paper

1108
00:45:56,150 --> 00:45:54,240
but he needed to know both the position

1109
00:45:58,069 --> 00:45:56,160
and the frequency to lock onto the

1110
00:45:59,910 --> 00:45:58,079
signal

1111
00:46:01,270 --> 00:45:59,920
he experienced great trouble at this as

1112
00:46:03,430 --> 00:46:01,280
you could imagine because he was never

1113
00:46:06,230 --> 00:46:03,440

sure whether the position was right and

1114
00:46:07,109 --> 00:46:06,240
the frequency is wrong or vice versa or

1115
00:46:09,030 --> 00:46:07,119
both

1116
00:46:11,670 --> 00:46:09,040
um so eventually after a week of

1117
00:46:13,270 --> 00:46:11,680
fruitless effort he contacted jpl who

1118
00:46:14,390 --> 00:46:13,280
sent him the predicts and he immediately

1119
00:46:16,309 --> 00:46:14,400
was able to

1120
00:46:18,950 --> 00:46:16,319
to to lock on to the

1121
00:46:21,589 --> 00:46:18,960
um to the signal

1122
00:46:23,190 --> 00:46:21,599
um as you see there and here i found um

1123
00:46:25,270 --> 00:46:23,200
in the national archives um he's

1124
00:46:28,150 --> 00:46:25,280
hand-drawn plot of the results and we

1125
00:46:29,750 --> 00:46:28,160
just zoom in a little bit then

1126
00:46:33,430 --> 00:46:29,760
you can see that the park's telescope

1127
00:46:35,910 --> 00:46:33,440
had an overall 5 db um advantage over

1128
00:46:37,430 --> 00:46:35,920
the 26 meter antennas in this case um

1129
00:46:39,109 --> 00:46:37,440
the one at warmer

1130
00:46:42,630 --> 00:46:39,119
and it should have actually had a have

1131
00:46:44,150 --> 00:46:42,640
had an 8 db advantage but because

1132
00:46:45,829 --> 00:46:44,160
a circularly polarized feed was

1133
00:46:47,670 --> 00:46:45,839
unavailable the astronomers had used the

1134
00:46:51,910 --> 00:46:47,680
linearly polarized astronomy feed

1135
00:46:53,670 --> 00:46:51,920
instead that included a 3db penalty

1136
00:46:55,589 --> 00:46:53,680
nonetheless the experiment was

1137
00:46:57,750 --> 00:46:55,599
considered a great success and the

1138
00:46:59,670 --> 00:46:57,760

results were included in the the study

1139
00:47:02,710 --> 00:46:59,680
reports that verified the soundness of

1140
00:47:05,190 --> 00:47:02,720
the the of the design

1141
00:47:07,430 --> 00:47:05,200
and as a result of as a consequence of

1142
00:47:10,069 --> 00:47:07,440
these parks became the model for the jpl

1143
00:47:11,750 --> 00:47:10,079
large aperture antennas

1144
00:47:13,829 --> 00:47:11,760
as you can see they were all pivoted in

1145
00:47:16,150 --> 00:47:13,839
the center just like parks they had an

1146
00:47:17,910 --> 00:47:16,160
alt azimuth mount and they incorporated

1147
00:47:20,549 --> 00:47:17,920
the master equatorial system and they

1148
00:47:21,829 --> 00:47:20,559
were all 64 meters in diameter the

1149
00:47:24,390 --> 00:47:21,839
goldstone dish was eventually

1150
00:47:27,190 --> 00:47:24,400
commissioned in may 1966

1151
00:47:29,589 --> 00:47:27,200
but before then mariner 4 was flying by

1152
00:47:31,910 --> 00:47:29,599
mars and the goldstone dish was still a

1153
00:47:33,990 --> 00:47:31,920
year away from completion so pax was

1154
00:47:36,790 --> 00:47:34,000
approached to provide the

1155
00:47:39,510 --> 00:47:36,800
64 meter capability for the dsn

1156
00:47:41,670 --> 00:47:39,520
22 images were returned of the martian

1157
00:47:44,630 --> 00:47:41,680
surface and parks provided a three db

1158
00:47:46,630 --> 00:47:44,640
improvement of the existing um dsn array

1159
00:47:50,309 --> 00:47:46,640
in fact all antennas combined parks

1160
00:47:52,069 --> 00:47:50,319
provided double the the strength of that

1161
00:47:54,710 --> 00:47:52,079
the data from parks was combined with

1162
00:47:56,150 --> 00:47:54,720
those um from the other stations and

1163
00:47:57,990 --> 00:47:56,160

used to produce

1164
00:47:59,750 --> 00:47:58,000
improved images of the martian surface

1165
00:48:02,150 --> 00:47:59,760
and you've all seen this one the famous

1166
00:48:03,510 --> 00:48:02,160
image 11 which made astronomers very

1167
00:48:05,030 --> 00:48:03,520
very disappointed because they're

1168
00:48:06,549 --> 00:48:05,040
expecting to see burdened forests

1169
00:48:11,109 --> 00:48:06,559
instead they had

1170
00:48:14,309 --> 00:48:12,549
now

1171
00:48:17,829 --> 00:48:14,319
perhaps the most famous mission parks

1172
00:48:19,589 --> 00:48:17,839
was involved in was the was apollo 11.

1173
00:48:21,670 --> 00:48:19,599
no history of parks could be complete

1174
00:48:24,309 --> 00:48:21,680
without a mention of its role

1175
00:48:26,549 --> 00:48:24,319
it began in october 1968 when john

1176
00:48:29,109 --> 00:48:26,559
bolton was visiting caltech he was

1177
00:48:30,630 --> 00:48:29,119
invited to to dinner at the home of bob

1178
00:48:31,589 --> 00:48:30,640
leighton the friend and colleague of

1179
00:48:33,510 --> 00:48:31,599
john's

1180
00:48:34,390 --> 00:48:33,520
and one of the pis for the mariner 4

1181
00:48:36,230 --> 00:48:34,400
mission

1182
00:48:37,670 --> 00:48:36,240
i'm also at the dinner was ed brechton

1183
00:48:39,589 --> 00:48:37,680
the head of the goldstone project and

1184
00:48:41,349 --> 00:48:39,599
during the course of the dinner john was

1185
00:48:43,030 --> 00:48:41,359
asked if you could make available the

1186
00:48:45,589 --> 00:48:43,040
the parks telescope for the upcoming

1187
00:48:47,030 --> 00:48:45,599
apollo 11 mission but in particular for

1188
00:48:49,109 --> 00:48:47,040

those few short hours when the lunar

1189
00:48:51,430 --> 00:48:49,119
module was on the lunar surface and

1190
00:48:53,270 --> 00:48:51,440
because human lives were

1191
00:48:56,309 --> 00:48:53,280
were at risk both he and taffy bowen

1192
00:48:58,549 --> 00:48:56,319
agreed and as he's well known now 600

1193
00:48:59,750 --> 00:48:58,559
million people one-sixth of mankind at

1194
00:49:01,829 --> 00:48:59,760
the time

1195
00:49:04,390 --> 00:49:01,839
witnessed the apollo 11

1196
00:49:05,910 --> 00:49:04,400
moonwalk live on tv through pictures

1197
00:49:07,750 --> 00:49:05,920
received at parks

1198
00:49:09,510 --> 00:49:07,760
the story is far too long for me to go

1199
00:49:11,510 --> 00:49:09,520
into

1200
00:49:13,510 --> 00:49:11,520
detail in this short presentation but i

1201
00:49:15,750 --> 00:49:13,520
i invite you to check the park's website

1202
00:49:18,390 --> 00:49:15,760
and also the honeysuckle creek website

1203
00:49:21,270 --> 00:49:18,400
um for more details on on that

1204
00:49:23,349 --> 00:49:21,280
and um i think um oh yeah it's just that

1205
00:49:25,430 --> 00:49:23,359
there and the beginning of the broadcast

1206
00:49:27,109 --> 00:49:25,440
nasa would just um

1207
00:49:28,549 --> 00:49:27,119
tv is the thing that everyone remembers

1208
00:49:30,390 --> 00:49:28,559
nowadays

1209
00:49:32,470 --> 00:49:30,400
and um

1210
00:49:34,470 --> 00:49:32,480
but at the beginning of the broadcast

1211
00:49:36,230 --> 00:49:34,480
nasa houston was switching between the

1212
00:49:38,150 --> 00:49:36,240
signals being received at goldstone and

1213
00:49:39,829 --> 00:49:38,160

honeysuckle creek when they finally

1214
00:49:41,510 --> 00:49:39,839
switched to parks it was so much better

1215
00:49:43,430 --> 00:49:41,520
they stayed with parks for the remainder

1216
00:49:45,430 --> 00:49:43,440
of the two and a half hour moonwalk and

1217
00:49:46,309 --> 00:49:45,440
just to give you an idea of why they did

1218
00:49:47,829 --> 00:49:46,319
that

1219
00:49:49,589 --> 00:49:47,839
on the right

1220
00:49:51,829 --> 00:49:49,599
outside the left

1221
00:49:53,270 --> 00:49:51,839
you have an image of armstrong

1222
00:49:55,589 --> 00:49:53,280
descending the ladder source from

1223
00:49:57,750 --> 00:49:55,599
goldstone 20 minutes later when they

1224
00:49:59,670 --> 00:49:57,760
were using the parks feed you can see

1225
00:50:02,390 --> 00:49:59,680
aldrin coming down the ladder you can

1226
00:50:04,870 --> 00:50:02,400
see the improvement in the picture

1227
00:50:07,750 --> 00:50:04,880
honeysuckle creek had a had a very good

1228
00:50:10,150 --> 00:50:07,760
image also but because of its um

1229
00:50:12,790 --> 00:50:10,160
smaller size and lower signal to noise

1230
00:50:15,190 --> 00:50:12,800
ratio had a grainier image

1231
00:50:17,030 --> 00:50:15,200
the equivalent picture um 20 minutes

1232
00:50:19,109 --> 00:50:17,040
later when alden was about to step on

1233
00:50:20,710 --> 00:50:19,119
the lunar surface was from parks and

1234
00:50:23,589 --> 00:50:20,720
again you can see the improvement and

1235
00:50:25,430 --> 00:50:23,599
understand why it was involved

1236
00:50:27,430 --> 00:50:25,440
over the years the the we've had a

1237
00:50:30,950 --> 00:50:27,440
mutually beneficial partnership the

1238
00:50:33,349 --> 00:50:30,960

csiro and and nasa whenever parks has

1239
00:50:35,510 --> 00:50:33,359
supported a nation's nasa space mission

1240
00:50:37,270 --> 00:50:35,520
uh we've we've gotten a better radio

1241
00:50:40,150 --> 00:50:37,280
telescope out of it as a result and in

1242
00:50:41,589 --> 00:50:40,160
return nasa has a more capable antenna

1243
00:50:43,829 --> 00:50:41,599
for the next mission that they approach

1244
00:50:45,910 --> 00:50:43,839
us for you can see all the surface

1245
00:50:48,069 --> 00:50:45,920
upgrades and the focus cabin and so on

1246
00:50:50,710 --> 00:50:48,079
we're all funded by by nasa over the

1247
00:50:52,870 --> 00:50:50,720
years and we've got a much much better

1248
00:50:55,910 --> 00:50:52,880
telescope and nasa has a more capable

1249
00:50:57,829 --> 00:50:55,920
antenna for for its next mission also

1250
00:51:00,549 --> 00:50:57,839
so in conclusion i'd like to finish with

1251
00:51:03,109 --> 00:51:00,559
a quote by the us ambassador to

1252
00:51:04,150 --> 00:51:03,119
australia in 2003 when he was at parks

1253
00:51:06,829 --> 00:51:04,160
to

1254
00:51:08,870 --> 00:51:06,839
launch the the mars tracks

1255
00:51:11,270 --> 00:51:08,880
um um

1256
00:51:13,910 --> 00:51:11,280
tom schieffer um

1257
00:51:16,710 --> 00:51:13,920
and basically he said to to quote the

1258
00:51:18,630 --> 00:51:16,720
parks telescope is like a trusted friend

1259
00:51:21,750 --> 00:51:18,640
always there when we need a when we need

1260
00:51:24,150 --> 00:51:21,760
a hand the relationship between csiro

1261
00:51:26,790 --> 00:51:24,160
and nasa is very much like that between

1262
00:51:28,790 --> 00:51:26,800
the united states and australia

1263
00:51:31,109 --> 00:51:28,800

a friend that

1264
00:51:33,510 --> 00:51:31,119
has friends that share common values and

1265
00:51:35,510 --> 00:51:33,520
dreams and i have a picture there of the

1266
00:51:37,430 --> 00:51:35,520
ambassador and the officer in charge of

1267
00:51:38,950 --> 00:51:37,440
the parks telescope john reynolds

1268
00:51:41,109 --> 00:51:38,960
playing a spotted cricket on the dish

1269
00:51:42,549 --> 00:51:41,119
during the opening the ambassador had to

1270
00:51:44,309 --> 00:51:42,559
learn how to hold the cricket back

1271
00:51:46,790 --> 00:51:44,319
correctly he was he thought it was a

1272
00:51:49,270 --> 00:51:46,800
baseball bat at the time but um that it

1273
00:51:51,190 --> 00:51:49,280
worked and just to finish up just 30

1274
00:51:53,030 --> 00:51:51,200
seconds there is an epilogue to the

1275
00:51:56,230 --> 00:51:53,040
story

1276
00:51:58,150 --> 00:51:56,240
on the 27th of august 1962 mariner 2 the

1277
00:51:59,589 --> 00:51:58,160
first interplanetary spacecraft was

1278
00:52:01,109 --> 00:51:59,599
launched to venus

1279
00:52:02,549 --> 00:52:01,119
that just happened to be the day that i

1280
00:52:06,309 --> 00:52:02,559
was born

1281
00:52:10,390 --> 00:52:06,319
okay and when new horizons arrives at

1282
00:52:11,750 --> 00:52:10,400
pluto in july 2015.

1283
00:52:13,910 --> 00:52:11,760
we could say

1284
00:52:16,710 --> 00:52:13,920
in all honesty that in the space of a

1285
00:52:18,470 --> 00:52:16,720
single human lifetime um the entire

1286
00:52:20,470 --> 00:52:18,480
solar system would have been

1287
00:52:21,910 --> 00:52:20,480
explored and i think that's pretty

1288
00:52:40,790 --> 00:52:21,920

impressive and parks was there from the

1289
00:52:47,270 --> 00:52:44,390
but my my serious question is

1290
00:52:49,750 --> 00:52:47,280
i had not realized before actually that

1291
00:52:52,069 --> 00:52:49,760
uh parks was if you will a prototype of

1292
00:52:55,990 --> 00:52:52,079
these large steerable antennas

1293
00:52:57,510 --> 00:52:56,000
and what amazes me is that uh i got it

1294
00:52:59,990 --> 00:52:57,520
right the first time in terms of

1295
00:53:02,630 --> 00:53:00,000
critical things like the the loading on

1296
00:53:04,309 --> 00:53:02,640
the figure of the of the was of the

1297
00:53:06,230 --> 00:53:04,319
telescope was there was there some

1298
00:53:07,750 --> 00:53:06,240
special innovation that

1299
00:53:09,990 --> 00:53:07,760
enabled that or was it just real

1300
00:53:11,910 --> 00:53:10,000
attention to details it was it was

1301
00:53:14,150 --> 00:53:11,920
essentially just the attention to detail

1302
00:53:17,109 --> 00:53:14,160
but also i didn't have time to to go

1303
00:53:19,270 --> 00:53:17,119
into great detail but one of the the the

1304
00:53:20,950 --> 00:53:19,280
engineers that provided the the really

1305
00:53:22,870 --> 00:53:20,960
innovative ideas on how it should be

1306
00:53:24,950 --> 00:53:22,880
done was barnes wallace a famous british

1307
00:53:26,710 --> 00:53:24,960
engineer he was famous during the world

1308
00:53:29,030 --> 00:53:26,720
war during world war ii as the inventor

1309
00:53:31,829 --> 00:53:29,040
of the bouncing bombs and it was his

1310
00:53:33,270 --> 00:53:31,839
idea essentially to to have an out as a

1311
00:53:35,750 --> 00:53:33,280
mounted telescope with the master

1312
00:53:37,349 --> 00:53:35,760
recorder he invented that concept and

1313
00:53:39,510 --> 00:53:37,359

also the spiral purlins he actually

1314
00:53:41,510 --> 00:53:39,520
developed that that idea for the r 100

1315
00:53:43,430 --> 00:53:41,520
airship and the wellington bombers and

1316
00:53:45,270 --> 00:53:43,440
that's what gave the dish that that that

1317
00:53:47,190 --> 00:53:45,280
strength and it's also the reason why

1318
00:53:50,230 --> 00:53:47,200
we've been able to upgrade the surface

1319
00:53:53,030 --> 00:53:50,240
continually over the years and because

1320
00:53:55,190 --> 00:53:53,040
that it did have that strength and um

1321
00:53:57,589 --> 00:53:55,200
and the the designers of the jpl

1322
00:53:59,510 --> 00:53:57,599
antennas were extremely extremely

1323
00:54:01,270 --> 00:53:59,520
interested in that and they

1324
00:54:02,710 --> 00:54:01,280
they took a lot of those design fishes

1325
00:54:04,230 --> 00:54:02,720
as you saw

1326
00:54:05,349 --> 00:54:04,240
and incorporated

1327
00:54:06,309 --> 00:54:05,359
with the

1328
00:54:08,150 --> 00:54:06,319
added

1329
00:54:10,470 --> 00:54:08,160
they have to be able to transmit as well

1330
00:54:12,470 --> 00:54:10,480
as received so they they had a cast of

1331
00:54:13,430 --> 00:54:12,480
grain feed rather than prime focus as we

1332
00:54:16,390 --> 00:54:13,440
do but

1333
00:54:18,150 --> 00:54:16,400
um but it really did come down to the to

1334
00:54:19,430 --> 00:54:18,160
the designers designing it properly at

1335
00:54:20,870 --> 00:54:19,440
the beginning which is why they took

1336
00:54:22,870 --> 00:54:20,880
their time and then built it quickly

1337
00:54:25,030 --> 00:54:22,880
it's a good case of hastening slowly

1338
00:54:26,870 --> 00:54:25,040

where take your time design and then do

1339
00:54:28,390 --> 00:54:26,880
it quickly at the end and of course they

1340
00:54:29,750 --> 00:54:28,400
were the same people that designed the

1341
00:54:32,230 --> 00:54:29,760
sydney harbour bridge and that's still

1342
00:54:33,829 --> 00:54:32,240
up and still will be for a century or

1343
00:54:39,910 --> 00:54:33,839
two more i hope so

1344
00:54:43,990 --> 00:54:41,829
our next speaker is michael neufeld from

1345
00:54:48,870 --> 00:54:44,000
the air and space museum to talk about

1346
00:54:52,710 --> 00:54:50,470
so while we're waiting for this to come

1347
00:54:54,549 --> 00:54:52,720
up i should just say many of you or at

1348
00:54:57,190 --> 00:54:54,559
least some of you know me as

1349
00:54:59,349 --> 00:54:57,200
fun brown v2 pedamunda

1350
00:55:01,910 --> 00:54:59,359
and after 20 years of doing that i said

1351
00:55:03,670 --> 00:55:01,920
i have to find something else to do

1352
00:55:05,670 --> 00:55:03,680
i have kind of exhausted that line of

1353
00:55:08,230 --> 00:55:05,680
attack and

1354
00:55:10,789 --> 00:55:08,240
i had uh begin thinking about several

1355
00:55:13,190 --> 00:55:10,799
topics and what i've hit upon at least

1356
00:55:15,670 --> 00:55:13,200
for uh for the moment

1357
00:55:17,589 --> 00:55:15,680
uh was an interest in the entry of the

1358
00:55:19,270 --> 00:55:17,599
applied physics laboratory johns hopkins

1359
00:55:20,950 --> 00:55:19,280
of flight physics laboratory which most

1360
00:55:24,069 --> 00:55:20,960
of you in this room make an insider

1361
00:55:25,910 --> 00:55:24,079
audience know is only 30 miles or 40

1362
00:55:27,670 --> 00:55:25,920
miles away maybe less than that on the

1363
00:55:29,750 --> 00:55:27,680

way to baltimore

1364
00:55:32,150 --> 00:55:29,760
uh the fact that i was a johns hopkins

1365
00:55:33,670 --> 00:55:32,160
phd had a minor influence on my interest

1366
00:55:36,069 --> 00:55:33,680
in the apl

1367
00:55:38,710 --> 00:55:36,079
but uh it was mostly because bob

1368
00:55:41,990 --> 00:55:38,720
farquhar couldn't be here today uh was

1369
00:55:44,630 --> 00:55:42,000
in our department and wrote his memoir

1370
00:55:45,670 --> 00:55:44,640
uh well at least after he was in our

1371
00:55:46,950 --> 00:55:45,680
department he was supposed to do it

1372
00:55:48,630 --> 00:55:46,960
while he was in our department but

1373
00:55:50,230 --> 00:55:48,640
that's another story bob always does

1374
00:55:51,030 --> 00:55:50,240
what he wants to do

1375
00:55:53,670 --> 00:55:51,040
so

1376
00:55:56,789 --> 00:55:53,680
what this project actually has moved

1377
00:55:59,190 --> 00:55:56,799
into is two projects one is on this

1378
00:56:01,270 --> 00:55:59,200
origins of the discovery program

1379
00:56:03,910 --> 00:56:01,280
and the other is on the origins of the

1380
00:56:06,630 --> 00:56:03,920
new horizons mission to pluto which is

1381
00:56:08,150 --> 00:56:06,640
an entirely separate topic which i'll be

1382
00:56:10,309 --> 00:56:08,160
talking about next year i guess when

1383
00:56:11,750 --> 00:56:10,319
again go back to it

1384
00:56:13,750 --> 00:56:11,760
well of course you already had some

1385
00:56:16,870 --> 00:56:13,760
background here uh

1386
00:56:18,950 --> 00:56:16,880
in previous talks notably uh

1387
00:56:21,190 --> 00:56:18,960
mr callahan's talk yesterday with all

1388
00:56:24,230 --> 00:56:21,200

those uh budget graphs and he talked

1389
00:56:26,630 --> 00:56:24,240
about the la lost decade of the 1980s

1390
00:56:29,270 --> 00:56:26,640
and today arturo russo mentioned some of

1391
00:56:31,270 --> 00:56:29,280
the crisis and changes precisely in this

1392
00:56:32,870 --> 00:56:31,280
narrow window of time that i'm going to

1393
00:56:33,910 --> 00:56:32,880
talk about today

1394
00:56:36,630 --> 00:56:33,920
um

1395
00:56:38,230 --> 00:56:36,640
the you know of course it is almost a

1396
00:56:39,990 --> 00:56:38,240
a standard narrative in the planetary

1397
00:56:42,870 --> 00:56:40,000
scientists i've talked to

1398
00:56:44,630 --> 00:56:42,880
about this topic that there was a moment

1399
00:56:47,190 --> 00:56:44,640
that there was a real sense of crisis at

1400
00:56:49,750 --> 00:56:47,200
the end of the 1980s about this of

1401
00:56:50,789 --> 00:56:49,760
course so you saw from the graph from

1402
00:56:53,430 --> 00:56:50,799
uh

1403
00:56:55,430 --> 00:56:53,440
callahan's graph the lack of launches

1404
00:56:58,309 --> 00:56:55,440
until 1989 although i should note that

1405
00:56:59,670 --> 00:56:58,319
was partly an artifact of the shuttle

1406
00:57:02,230 --> 00:56:59,680
disaster and there might have been

1407
00:57:04,870 --> 00:57:02,240
launches at 86 87

1408
00:57:06,710 --> 00:57:04,880
but at any rate there was certainly a

1409
00:57:09,750 --> 00:57:06,720
period of

1410
00:57:11,589 --> 00:57:09,760
decline or decrease in funding

1411
00:57:14,630 --> 00:57:11,599
what i found very interesting was when i

1412
00:57:16,069 --> 00:57:14,640
phoned up leonard fisk who was the

1413
00:57:18,789 --> 00:57:16,079

associate administrator for space

1414
00:57:22,069 --> 00:57:18,799
science from i think 87 i'm not quite

1415
00:57:23,750 --> 00:57:22,079
sure exactly 87 to 1992. he gave a

1416
00:57:25,190 --> 00:57:23,760
completely different picture than what

1417
00:57:27,510 --> 00:57:25,200
the planetary scientists notably west

1418
00:57:29,430 --> 00:57:27,520
hunters who i've talked to and one of my

1419
00:57:32,390 --> 00:57:29,440
chara my chief characters tom cremiges

1420
00:57:35,910 --> 00:57:32,400
of apl he said this was a great period

1421
00:57:37,910 --> 00:57:35,920
of expansion he came in the budget of

1422
00:57:40,789 --> 00:57:37,920
nasa started going up as a result of

1423
00:57:43,190 --> 00:57:40,799
reagan and then a bush first bush at

1424
00:57:44,390 --> 00:57:43,200
least in the late 80s and the 90s

1425
00:57:54,230 --> 00:57:44,400
he

1426
00:57:57,190 --> 00:57:54,240
to space science this agreement was made

1427
00:57:58,950 --> 00:57:57,200
in 1984 it was a result of the near

1428
00:58:00,470 --> 00:57:58,960
death which was described the planetary

1429
00:58:02,230 --> 00:58:00,480
program and the general reduction in the

1430
00:58:04,309 --> 00:58:02,240
space science program at the beginning

1431
00:58:07,030 --> 00:58:04,319
of the 80s and after nasa had survived

1432
00:58:09,030 --> 00:58:07,040
that ssb was promised a 20 budget so

1433
00:58:10,390 --> 00:58:09,040
nasa's budget was going up and therefore

1434
00:58:12,710 --> 00:58:10,400
the office of space science and

1435
00:58:15,510 --> 00:58:12,720
applications as it then was that budget

1436
00:58:16,870 --> 00:58:15,520
was going up uh uh uh very quickly at

1437
00:58:18,390 --> 00:58:16,880
that time and there were a number of

1438
00:58:21,190 --> 00:58:18,400

missions in the queue delayed by the

1439
00:58:23,670 --> 00:58:21,200
shuttle disaster which were on the

1440
00:58:26,710 --> 00:58:23,680
imminently going to be launched notably

1441
00:58:29,349 --> 00:58:26,720
uh uh hubble space telescope galileo

1442
00:58:31,349 --> 00:58:29,359
magellan ulysses all were going to be

1443
00:58:33,430 --> 00:58:31,359
launched and so as far as len fisk was

1444
00:58:35,349 --> 00:58:33,440
concerned this was not a period of gloom

1445
00:58:36,789 --> 00:58:35,359
and doom at all this was a great period

1446
00:58:38,630 --> 00:58:36,799
of course he was the period coincident

1447
00:58:40,069 --> 00:58:38,640
with him being a a but so this is not

1448
00:58:41,990 --> 00:58:40,079
this is a period actually when things

1449
00:58:43,910 --> 00:58:42,000
were going started going really well and

1450
00:58:46,069 --> 00:58:43,920
there was an expansive budget certainly

1451
00:58:47,990 --> 00:58:46,079
this wasn't the feeling that the

1452
00:58:49,349 --> 00:58:48,000
planetary science

1453
00:58:51,349 --> 00:58:49,359
community

1454
00:58:53,349 --> 00:58:51,359
felt at the time because of the lack of

1455
00:58:56,230 --> 00:58:53,359
launches because of the gap and one of

1456
00:58:58,390 --> 00:58:56,240
the responses to this was do we need a

1457
00:59:01,510 --> 00:58:58,400
small spacecraft program

1458
00:59:04,309 --> 00:59:01,520
particularly in view of the failure of

1459
00:59:06,549 --> 00:59:04,319
the observer line and mars observer in

1460
00:59:08,230 --> 00:59:06,559
particular to live up to its budget

1461
00:59:10,710 --> 00:59:08,240
requirements now i know that there's a

1462
00:59:12,549 --> 00:59:10,720
little argument actually about whether

1463
00:59:14,470 --> 00:59:12,559

the mars observer narrative that we

1464
00:59:16,710 --> 00:59:14,480
usually hear namely that it was just a

1465
00:59:18,710 --> 00:59:16,720
program out of control and too expensive

1466
00:59:21,190 --> 00:59:18,720
was really the case i mean eric conway

1467
00:59:23,109 --> 00:59:21,200
among others has noted that part of the

1468
00:59:25,190 --> 00:59:23,119
big budget increase for mars observer

1469
00:59:28,390 --> 00:59:25,200
was that it had to be delayed an entire

1470
00:59:29,829 --> 00:59:28,400
uh uh mars launch opportunity from 90 to

1471
00:59:31,910 --> 00:59:29,839
92 and that

1472
00:59:34,150 --> 00:59:31,920
greatly added to its cost but at any

1473
00:59:38,150 --> 00:59:34,160
rate there was certainly a sense then

1474
00:59:40,710 --> 00:59:38,160
that there was a need for some other

1475
00:59:42,870 --> 00:59:40,720
smaller missions to increase the flight

1476
00:59:44,069 --> 00:59:42,880
rate to increase the amount of data

1477
00:59:45,910 --> 00:59:44,079
coming back

1478
00:59:48,069 --> 00:59:45,920
to deal with a problem with these

1479
00:59:50,549 --> 00:59:48,079
gigantic expensive flagship missions

1480
00:59:52,549 --> 00:59:50,559
which were eating up the entire budget

1481
00:59:54,390 --> 00:59:52,559
now as far as i can tell from the

1482
00:59:55,349 --> 00:59:54,400
documents that i've been able to so far

1483
00:59:56,309 --> 00:59:55,359
find

1484
00:59:58,630 --> 00:59:56,319
uh

1485
01:00:00,549 --> 00:59:58,640
the initiative for a small a new small

1486
01:00:02,789 --> 01:00:00,559
spacecraft program started with jeff

1487
01:00:04,789 --> 01:00:02,799
briggs who was the division director for

1488
01:00:07,589 --> 01:00:04,799

planetary sciences then called solar

1489
01:00:09,190 --> 01:00:07,599
system exploration uh in

1490
01:00:10,710 --> 01:00:09,200
that ssed me and solar system

1491
01:00:11,829 --> 01:00:10,720
exploration division

1492
01:00:14,630 --> 01:00:11,839
uh in

1493
01:00:17,670 --> 01:00:14,640
the spring of 1989.

1494
01:00:20,870 --> 01:00:17,680
and he actually created a small

1495
01:00:22,630 --> 01:00:20,880
initiative uh it

1496
01:00:24,390 --> 01:00:22,640
and it was part of the strategic

1497
01:00:26,630 --> 01:00:24,400
planning that

1498
01:00:27,589 --> 01:00:26,640
ossa was making at that time and len

1499
01:00:29,430 --> 01:00:27,599
fisk

1500
01:00:31,190 --> 01:00:29,440
told me probably that he thinks he

1501
01:00:34,150 --> 01:00:31,200
invented the idea of strategic planning

1502
01:00:36,150 --> 01:00:34,160
at nasa for mission planning at any rate

1503
01:00:39,109 --> 01:00:36,160
there was a strategic planning process

1504
01:00:43,430 --> 01:00:39,119
going on in ossa

1505
01:00:45,510 --> 01:00:43,440
in that in 1989 and one of these

1506
01:00:47,589 --> 01:00:45,520
workshops that was coming up was at the

1507
01:00:50,549 --> 01:00:47,599
university of new hampshire

1508
01:00:53,430 --> 01:00:50,559
in june 1989 and so that this small

1509
01:00:55,030 --> 01:00:53,440
program initiative was going to be

1510
01:00:57,589 --> 01:00:55,040
discussed there

1511
01:01:00,069 --> 01:00:57,599
but there was a lot of hostility in the

1512
01:01:02,710 --> 01:01:00,079
community as well or at least skepticism

1513
01:01:06,150 --> 01:01:02,720

in the community about a small mission

1514
01:01:07,910 --> 01:01:06,160
program because the basic uh message was

1515
01:01:09,589 --> 01:01:07,920
well we tried it with observer and it

1516
01:01:11,349 --> 01:01:09,599
was a complete failure so why should we

1517
01:01:12,950 --> 01:01:11,359
try another small mission program we

1518
01:01:14,710 --> 01:01:12,960
can't control costs

1519
01:01:17,190 --> 01:01:14,720
planetary missions just cost hundreds of

1520
01:01:18,870 --> 01:01:17,200
millions to billions of dollars so

1521
01:01:21,190 --> 01:01:18,880
there's nothing you can really do about

1522
01:01:23,349 --> 01:01:21,200
that and and others have mentioned

1523
01:01:25,190 --> 01:01:23,359
already this problem of piling on

1524
01:01:26,309 --> 01:01:25,200
everybody says the last bus out of town

1525
01:01:27,910 --> 01:01:26,319
therefore we all have to get our

1526
01:01:29,829 --> 01:01:27,920
instruments on it

1527
01:01:31,030 --> 01:01:29,839
well um

1528
01:01:37,750 --> 01:01:31,040
the

1529
01:01:39,430 --> 01:01:37,760
near earth asteroid rendezvous we've

1530
01:01:41,270 --> 01:01:39,440
already heard in several presentations

1531
01:01:43,349 --> 01:01:41,280
mentions of the fact that asteroid

1532
01:01:44,950 --> 01:01:43,359
missions and asteroid rendezvous were

1533
01:01:47,190 --> 01:01:44,960
constantly under discussion in this

1534
01:01:49,990 --> 01:01:47,200
period and there was the more ambitious

1535
01:01:51,589 --> 01:01:50,000
comet run do asteroid flyby craft

1536
01:01:52,549 --> 01:01:51,599
mission to be combined with cassini

1537
01:01:54,950 --> 01:01:52,559
program

1538
01:01:57,109 --> 01:01:54,960

at the time but it would appear that a

1539
01:02:00,069 --> 01:01:57,119
near-earth asteroid mission which was

1540
01:02:03,430 --> 01:02:00,079
relatively low energy and low complexity

1541
01:02:06,630 --> 01:02:03,440
might be a good candidate mission for uh

1542
01:02:09,510 --> 01:02:06,640
for a small spacecraft however again

1543
01:02:11,829 --> 01:02:09,520
there was this hostility or skepticism

1544
01:02:13,750 --> 01:02:11,839
in the planetary sciences community

1545
01:02:16,150 --> 01:02:13,760
and that's where uh

1546
01:02:17,670 --> 01:02:16,160
i first of might think two key actors

1547
01:02:19,990 --> 01:02:17,680
while the other being wes huntress i'll

1548
01:02:23,510 --> 01:02:20,000
talk about it was here with this is tom

1549
01:02:26,390 --> 01:02:23,520
crumgius of apl

1550
01:02:28,150 --> 01:02:26,400
uh and this is a picture of tom cremidis

1551
01:02:30,150 --> 01:02:28,160
which is this is an audience i mostly

1552
01:02:33,349 --> 01:02:30,160
don't have to introduce him to but he's

1553
01:02:36,309 --> 01:02:33,359
a very eminent uh space plasma physicist

1554
01:02:39,349 --> 01:02:36,319
student of van allen had had experiments

1555
01:02:41,829 --> 01:02:39,359
beginning uh as a postdoc

1556
01:02:46,150 --> 01:02:41,839
at iowa a doctoral student in the

1557
01:02:48,470 --> 01:02:46,160
postdoc on mariner 4 and had uh

1558
01:02:49,589 --> 01:02:48,480
i think he's there's i don't i don't

1559
01:02:50,710 --> 01:02:49,599
know who these other gentlemen are

1560
01:02:53,190 --> 01:02:50,720
somebody in the room might be able to

1561
01:02:55,029 --> 01:02:53,200
tell me uh i think this is the low

1562
01:02:58,630 --> 01:02:55,039
energy charge particle experiment he was

1563
01:03:02,230 --> 01:02:58,640

the principal investigator for lecp on

1564
01:03:04,710 --> 01:03:02,240
the voyager mission so he had a a con

1565
01:03:08,309 --> 01:03:04,720
position of considerable influence in

1566
01:03:11,270 --> 01:03:08,319
the in the area of uh uh space physics

1567
01:03:14,789 --> 01:03:11,280
as a student of van allen as a very uh

1568
01:03:16,470 --> 01:03:14,799
successful uh pi and co i and many many

1569
01:03:19,029 --> 01:03:16,480
experiments

1570
01:03:21,750 --> 01:03:19,039
to virtually every planet and he says

1571
01:03:23,829 --> 01:03:21,760
when when new horizons pass pluto he

1572
01:03:25,510 --> 01:03:23,839
will become the only scientist who has

1573
01:03:27,430 --> 01:03:25,520
had an experiment that's gone to every

1574
01:03:29,589 --> 01:03:27,440
single planet i can't verify whether

1575
01:03:31,910 --> 01:03:29,599
that's true or not but it's probably

1576
01:03:32,950 --> 01:03:31,920
true um

1577
01:03:35,750 --> 01:03:32,960
in in

1578
01:03:37,190 --> 01:03:35,760
at this point in time uh tom cremidis or

1579
01:03:39,109 --> 01:03:37,200
stomatius

1580
01:03:42,150 --> 01:03:39,119
as his greek name is

1581
01:03:43,430 --> 01:03:42,160
was the chief scientist of apl space

1582
01:03:46,950 --> 01:03:43,440
department and i should say something

1583
01:03:48,470 --> 01:03:46,960
about apl space department here

1584
01:03:50,870 --> 01:03:48,480
for context

1585
01:03:52,950 --> 01:03:50,880
although in this discussion in my paper

1586
01:03:54,789 --> 01:03:52,960
and everybody else has written about apl

1587
01:03:57,270 --> 01:03:54,799
and jpl a competition between two

1588
01:03:59,430 --> 01:03:57,280

institutions in fact it's not the

1589
01:04:00,870 --> 01:03:59,440
competition between jpl and the entire

1590
01:04:03,190 --> 01:04:00,880
apl which has

1591
01:04:05,750 --> 01:04:03,200
always has been a predominantly navy

1592
01:04:07,589 --> 01:04:05,760
funded laboratory but between space

1593
01:04:10,549 --> 01:04:07,599
department which was actually only at

1594
01:04:13,990 --> 01:04:10,559
that time about 10 percent of apl's

1595
01:04:17,029 --> 01:04:14,000
complement of around 3000 people

1596
01:04:19,190 --> 01:04:17,039
the space department had built its

1597
01:04:23,270 --> 01:04:19,200
reputation and history on the transit

1598
01:04:25,990 --> 01:04:23,280
program for the navy and then had

1599
01:04:28,309 --> 01:04:26,000
had been involved heavily with sdio

1600
01:04:31,109 --> 01:04:28,319
missions in the 1980s

1601
01:04:33,910 --> 01:04:31,119
and as we transitioned into this period

1602
01:04:35,750 --> 01:04:33,920
is actually uh looking essentially for a

1603
01:04:37,670 --> 01:04:35,760
new uh

1604
01:04:39,829 --> 01:04:37,680
would be transitioning again under the

1605
01:04:41,270 --> 01:04:39,839
leadership of chris who became head of

1606
01:04:45,109 --> 01:04:41,280
space department at the beginning of

1607
01:04:46,710 --> 01:04:45,119
1991 to having more nasa emissions so it

1608
01:04:49,190 --> 01:04:46,720
had done significant numbers of

1609
01:04:52,470 --> 01:04:49,200
heliophysics type or earth orbital

1610
01:04:57,670 --> 01:04:55,589
at the new hampshire conference in in

1611
01:05:00,150 --> 01:04:57,680
june 1989

1612
01:05:01,750 --> 01:05:00,160
uh crimea just talked uh comey just

1613
01:05:02,789 --> 01:05:01,760

intervened in one of the discussions

1614
01:05:04,870 --> 01:05:02,799
about

1615
01:05:07,510 --> 01:05:04,880
what kind of low-cost program could

1616
01:05:09,510 --> 01:05:07,520
there be and his intervention was you

1617
01:05:11,589 --> 01:05:09,520
guys are looking at the wrong model it's

1618
01:05:14,549 --> 01:05:11,599
not mars observer it's the explorer

1619
01:05:17,029 --> 01:05:14,559
program explorer should be the model for

1620
01:05:18,390 --> 01:05:17,039
what a small spacecraft line should be

1621
01:05:20,390 --> 01:05:18,400
not only in its

1622
01:05:24,390 --> 01:05:20,400
constant level of funding but also in a

1623
01:05:27,349 --> 01:05:24,400
small spacecraft is constrained cost and

1624
01:05:29,430 --> 01:05:27,359
science focus and he was challenged to

1625
01:05:32,309 --> 01:05:29,440
present something to demonstrate how

1626
01:05:35,910 --> 01:05:32,319
that could even be possible and he was

1627
01:05:38,789 --> 01:05:35,920
he called a secretary had her fax up the

1628
01:05:40,710 --> 01:05:38,799
uh the view graphs that had made for ace

1629
01:05:43,190 --> 01:05:40,720
the advanced composition explorer which

1630
01:05:44,549 --> 01:05:43,200
actually was launched in 1997 apl was

1631
01:05:46,710 --> 01:05:44,559
going to build

1632
01:05:48,309 --> 01:05:46,720
and and presented and this is actually a

1633
01:05:50,390 --> 01:05:48,319
page from the facts that was set up to

1634
01:05:53,270 --> 01:05:50,400
new hampshire in the presentation the

1635
01:05:55,349 --> 01:05:53,280
view graphs that he made uh about this

1636
01:05:57,029 --> 01:05:55,359
and and and i just want to read from

1637
01:05:59,109 --> 01:05:57,039
oral history because it tells the story

1638
01:06:01,430 --> 01:05:59,119

much better than i would ever tell it he

1639
01:06:02,950 --> 01:06:01,440
said it had all the ingredients this is

1640
01:06:04,630 --> 01:06:02,960
his time crimes all the ingredients of

1641
01:06:06,549 --> 01:06:04,640
planetary spacecraft it had a rocket

1642
01:06:08,870 --> 01:06:06,559
engine it had the instruments it had the

1643
01:06:10,630 --> 01:06:08,880
orientation it had the solar panels then

1644
01:06:12,309 --> 01:06:10,640
at the end joe viverco was charging and

1645
01:06:15,029 --> 01:06:12,319
said all right cremages how much does

1646
01:06:16,870 --> 01:06:15,039
that cost i said you guys seem to be

1647
01:06:19,109 --> 01:06:16,880
experts in cost you tell me what do you

1648
01:06:21,190 --> 01:06:19,119
think this mission should cost he said

1649
01:06:23,109 --> 01:06:21,200
400 million dollars

1650
01:06:25,109 --> 01:06:23,119
i said you're in the right ballpark for

1651
01:06:26,309 --> 01:06:25,119
the spacecraft except you have one zero

1652
01:06:28,150 --> 01:06:26,319
too many

1653
01:06:30,470 --> 01:06:28,160
he said what are you talking about i

1654
01:06:31,990 --> 01:06:30,480
said the spacecraft is actually 45

1655
01:06:34,470 --> 01:06:32,000
million dollars and the instruments

1656
01:06:36,150 --> 01:06:34,480
another 30 million dollars so at least

1657
01:06:38,069 --> 01:06:36,160
in his telling of the story this is the

1658
01:06:41,109 --> 01:06:38,079
origin story of discovery from tom

1659
01:06:43,109 --> 01:06:41,119
cremagious's perspective that he that

1660
01:06:44,630 --> 01:06:43,119
coming out of that workshop they decided

1661
01:06:48,470 --> 01:06:44,640
indeed well at least we should study

1662
01:06:50,470 --> 01:06:48,480
that study the concept of a small

1663
01:06:52,390 --> 01:06:50,480

spacecraft mission maybe uh based on an

1664
01:06:54,870 --> 01:06:52,400
explorer model and i think it's

1665
01:06:56,470 --> 01:06:54,880
interesting that tom cremiges is a

1666
01:06:58,390 --> 01:06:56,480
participant in both the planetary

1667
01:07:00,470 --> 01:06:58,400
sciences community and the space physics

1668
01:07:03,510 --> 01:07:00,480
are now called most likely called

1669
01:07:05,990 --> 01:07:03,520
heliophysics communities and he had this

1670
01:07:08,789 --> 01:07:06,000
dual disciplinary perspective which

1671
01:07:10,390 --> 01:07:08,799
allowed him to look across it

1672
01:07:12,390 --> 01:07:10,400
lines that the planetary scientists

1673
01:07:14,069 --> 01:07:12,400
didn't think it didn't hadn't known much

1674
01:07:15,190 --> 01:07:14,079
about explorer he said to his great

1675
01:07:18,870 --> 01:07:15,200
surprise

1676
01:07:20,870 --> 01:07:18,880
so in in fiscal year 1990 jeff briggs

1677
01:07:22,710 --> 01:07:20,880
started the discovery program created a

1678
01:07:25,349 --> 01:07:22,720
discovery science program

1679
01:07:27,510 --> 01:07:25,359
a science working group

1680
01:07:30,230 --> 01:07:27,520
named bob farquhar who was at goddard to

1681
01:07:33,270 --> 01:07:30,240
be the program chief program head at

1682
01:07:35,029 --> 01:07:33,280
least part time of this little program

1683
01:07:37,349 --> 01:07:35,039
the science working group held two

1684
01:07:39,270 --> 01:07:37,359
meetings and yet somehow the near

1685
01:07:41,510 --> 01:07:39,280
concept which had emerged from the new

1686
01:07:43,990 --> 01:07:41,520
hampshire workshop as the

1687
01:07:45,750 --> 01:07:44,000
probable next mission and a way to go

1688
01:07:48,069 --> 01:07:45,760

didn't really go anywhere and i'm

1689
01:07:49,589 --> 01:07:48,079
actually it's a long story and i don't

1690
01:07:51,990 --> 01:07:49,599
i'm and i'm going to take up way too

1691
01:07:54,390 --> 01:07:52,000
much time here to talk about it but it

1692
01:07:58,230 --> 01:07:54,400
did does seem to have languished during

1693
01:08:00,390 --> 01:07:58,240
the year 1989 1990. one theory that i

1694
01:08:02,870 --> 01:08:00,400
have is that us lack of a sense of

1695
01:08:04,950 --> 01:08:02,880
urgency from the top from lynn fisk and

1696
01:08:07,349 --> 01:08:04,960
others at the time things seemed to be

1697
01:08:09,910 --> 01:08:07,359
going well there was lots of money was

1698
01:08:12,789 --> 01:08:09,920
this urgent maybe not another question

1699
01:08:14,710 --> 01:08:12,799
is whether the creation of bush's uh

1700
01:08:17,269 --> 01:08:14,720
space exploration initiative which

1701
01:08:19,269 --> 01:08:17,279
caused the replanting process in the

1702
01:08:21,349 --> 01:08:19,279
planetary program to consider what we're

1703
01:08:23,669 --> 01:08:21,359
going to do to support a human mission

1704
01:08:26,229 --> 01:08:23,679
to mars might have resulted in a

1705
01:08:28,390 --> 01:08:26,239
distraction but at any rate not much of

1706
01:08:31,510 --> 01:08:28,400
anything happened during that fiscal

1707
01:08:35,749 --> 01:08:31,520
year and near was not funded as

1708
01:08:38,950 --> 01:08:37,430
now of course we have wes huntress who's

1709
01:08:41,349 --> 01:08:38,960
sitting here so it's an interesting

1710
01:08:44,229 --> 01:08:41,359
experience i'm used to writing about

1711
01:08:46,390 --> 01:08:44,239
about dead people or not nazis that

1712
01:08:48,470 --> 01:08:46,400
won't talk to me

1713
01:08:50,390 --> 01:08:48,480

so it's very it's a little intimidating

1714
01:08:53,590 --> 01:08:50,400
to sit here and talk to the participants

1715
01:09:00,550 --> 01:08:56,950
uh wes huntress became uh chief of ssed

1716
01:09:03,669 --> 01:09:00,560
in august 1990 uh replacing briggs and

1717
01:09:05,189 --> 01:09:03,679
uh uh discovery as he said instead of

1718
01:09:07,030 --> 01:09:05,199
three oral histories that i have with

1719
01:09:09,110 --> 01:09:07,040
him and a person in a phone conversation

1720
01:09:10,870 --> 01:09:09,120
we had discovery was one of his three

1721
01:09:12,789 --> 01:09:10,880
major objectives interesting enough one

1722
01:09:14,550 --> 01:09:12,799
of them was extra solar plants he

1723
01:09:16,309 --> 01:09:14,560
initiated an extra solar planetary

1724
01:09:18,390 --> 01:09:16,319
program out of the planetary

1725
01:09:21,189 --> 01:09:18,400
solar system exploration division

1726
01:09:23,030 --> 01:09:21,199
and he decided that in order to revive

1727
01:09:26,630 --> 01:09:23,040
this initiative which seemed to be

1728
01:09:28,550 --> 01:09:26,640
languishing he revised the

1729
01:09:30,390 --> 01:09:28,560
science working group put joe vaverka in

1730
01:09:32,789 --> 01:09:30,400
command of that or in the leadership of

1731
01:09:34,870 --> 01:09:32,799
that he created a technical committee

1732
01:09:37,749 --> 01:09:34,880
jim martin of langley a

1733
01:09:40,229 --> 01:09:37,759
legendary manager of viking as the head

1734
01:09:43,189 --> 01:09:40,239
of a technical community and hope said

1735
01:09:45,749 --> 01:09:43,199
go out and try to get this thing going

1736
01:09:49,430 --> 01:09:45,759
and and go somewhere

1737
01:09:51,829 --> 01:09:49,440
at this point in time at least by

1738
01:09:53,669 --> 01:09:51,839

west hunter's account he basically was

1739
01:09:56,470 --> 01:09:53,679
looking at the options who could be a

1740
01:09:58,950 --> 01:09:56,480
competitor to jpl and this is a story

1741
01:10:00,470 --> 01:09:58,960
that is uh unfortunately all our jpl

1742
01:10:02,709 --> 01:10:00,480
friends in the room is not entirely

1743
01:10:04,390 --> 01:10:02,719
flattering to jpl because the perception

1744
01:10:07,430 --> 01:10:04,400
that he had and several other people and

1745
01:10:10,070 --> 01:10:07,440
tom cremicha's had was place was

1746
01:10:12,870 --> 01:10:10,080
very wedded to giant expensive projects

1747
01:10:14,550 --> 01:10:12,880
could not adapt to a small low-cost

1748
01:10:17,189 --> 01:10:14,560
mission

1749
01:10:18,950 --> 01:10:17,199
was uh very resistant to any other

1750
01:10:21,270 --> 01:10:18,960
organization having any piece of its

1751
01:10:22,870 --> 01:10:21,280
turf was very afraid that some other

1752
01:10:26,149 --> 01:10:22,880
organization would come and steal its

1753
01:10:28,070 --> 01:10:26,159
charter and so it was very resistant and

1754
01:10:30,390 --> 01:10:28,080
he and and

1755
01:10:33,030 --> 01:10:30,400
and hunters looked around and uh what

1756
01:10:35,590 --> 01:10:33,040
are the options nrl was an option but

1757
01:10:39,189 --> 01:10:35,600
they didn't seem terribly interested uh

1758
01:10:40,950 --> 01:10:39,199
uh uh sorry our friends at ames uh but

1759
01:10:42,229 --> 01:10:40,960
he's told me and or told several oral

1760
01:10:43,910 --> 01:10:42,239
history interviews he didn't have much

1761
01:10:45,750 --> 01:10:43,920
confidence in ames anymore and ability

1762
01:10:49,189 --> 01:10:45,760
to do an interplanetary mission

1763
01:10:52,550 --> 01:10:49,199

and that left apl as one of the most

1764
01:10:53,270 --> 01:10:52,560
like the the most likely candidates for

1765
01:11:10,390 --> 01:10:53,280
a

1766
01:11:12,070 --> 01:11:10,400
so

1767
01:11:14,950 --> 01:11:12,080
this led to the funding of the near

1768
01:11:16,390 --> 01:11:14,960
project in fiscal 1991

1769
01:11:19,590 --> 01:11:16,400
uh

1770
01:11:20,950 --> 01:11:19,600
and a showdown that happened in pasadena

1771
01:11:23,189 --> 01:11:20,960
in in

1772
01:11:25,590 --> 01:11:23,199
may 1991

1773
01:11:29,510 --> 01:11:25,600
apl versus jpl near this is an early

1774
01:11:33,030 --> 01:11:29,520
near sketch near proposal idea

1775
01:11:35,830 --> 01:11:33,040
the outcome of that was rather

1776
01:11:38,870 --> 01:11:35,840
a legend at apl and forgotten the jpl

1777
01:11:41,430 --> 01:11:38,880
because basically jpl's proposal was a

1778
01:11:43,990 --> 01:11:41,440
disaster and uh

1779
01:11:45,990 --> 01:11:44,000
was proposed for a 450 million dollar

1780
01:11:48,470 --> 01:11:46,000
program that would monopolize discovery

1781
01:11:50,870 --> 01:11:48,480
for a decade uh and take three missions

1782
01:11:53,750 --> 01:11:50,880
just to get to the asteroid and apl

1783
01:11:57,350 --> 01:11:53,760
proposed 110 mission 110 million dollar

1784
01:12:00,070 --> 01:11:57,360
mission and so huntress decided to pick

1785
01:12:02,070 --> 01:12:00,080
apl although it's interesting i really

1786
01:12:04,709 --> 01:12:02,080
i'm talking too long i don't running out

1787
01:12:05,750 --> 01:12:04,719
of time to to to tell the rest of this

1788
01:12:09,430 --> 01:12:05,760

story

1789
01:12:12,149 --> 01:12:09,440
but uh he he decided in part because it

1790
01:12:14,149 --> 01:12:12,159
the superior proposal was apl even after

1791
01:12:16,470 --> 01:12:14,159
jpl got a second chance

1792
01:12:19,189 --> 01:12:16,480
but it was also because he was looking

1793
01:12:21,110 --> 01:12:19,199
for a way to stimulate jpl to think

1794
01:12:23,669 --> 01:12:21,120
about doing something new

1795
01:12:25,830 --> 01:12:23,679
and to try it a different way and he has

1796
01:12:28,630 --> 01:12:25,840
specifically picked out tony speer who

1797
01:12:30,790 --> 01:12:28,640
had been project manager on magellan has

1798
01:12:33,110 --> 01:12:30,800
saved magellan to be

1799
01:12:34,070 --> 01:12:33,120
run a small project office

1800
01:12:35,430 --> 01:12:34,080
uh

1801
01:12:37,590 --> 01:12:35,440
at the time

1802
01:12:40,310 --> 01:12:37,600
then this near mission seemed like it

1803
01:12:42,070 --> 01:12:40,320
should go to apl he picked apl so he

1804
01:12:43,590 --> 01:12:42,080
decided to create a lunar mission called

1805
01:12:45,669 --> 01:12:43,600
lunar scout

1806
01:12:48,149 --> 01:12:45,679
but unfortunately shortly after lunar

1807
01:12:50,229 --> 01:12:48,159
scouts creation it was stolen away by

1808
01:12:53,350 --> 01:12:50,239
mike griffin who just been appointed the

1809
01:12:55,430 --> 01:12:53,360
head of a new codex for exploration to

1810
01:12:58,149 --> 01:12:55,440
try to revive the bush

1811
01:13:01,669 --> 01:12:58,159
space exploration initiative and so

1812
01:13:03,669 --> 01:13:01,679
ossa lost the moon for a little while

1813
01:13:05,910 --> 01:13:03,679

while codex existed

1814
01:13:08,470 --> 01:13:05,920
which as he said and i quote that really

1815
01:13:09,750 --> 01:13:08,480
pissed me off so

1816
01:13:12,950 --> 01:13:09,760
there's an oral history there's an

1817
01:13:14,390 --> 01:13:12,960
uncensored oral history i like that

1818
01:13:17,030 --> 01:13:14,400
so

1819
01:13:19,750 --> 01:13:17,040
he decided we got to find a mars mission

1820
01:13:21,590 --> 01:13:19,760
for jpl a some way and of course they're

1821
01:13:24,390 --> 01:13:21,600
already you know there's a lot of other

1822
01:13:28,070 --> 01:13:24,400
things going on which eric conway is is

1823
01:13:30,550 --> 01:13:28,080
has a history in in the works about that

1824
01:13:32,550 --> 01:13:30,560
and so out of this came the pathfinder

1825
01:13:34,870 --> 01:13:32,560
proposal

1826
01:13:35,830 --> 01:13:34,880
and there was an aim study for so-called

1827
01:13:39,189 --> 01:13:35,840
measure

1828
01:13:40,950 --> 01:13:39,199
mars environmental survey mission and

1829
01:13:41,990 --> 01:13:40,960
there'd be a pathfinder mission to a

1830
01:13:44,310 --> 01:13:42,000
network

1831
01:13:46,470 --> 01:13:44,320
and all of that and let me summarize

1832
01:13:49,430 --> 01:13:46,480
more quickly here

1833
01:13:51,270 --> 01:13:49,440
a micro rover was added and at the end

1834
01:13:52,390 --> 01:13:51,280
of this process which sort of happened

1835
01:13:56,630 --> 01:13:52,400
during the

1836
01:13:58,790 --> 01:13:56,640
of winter of 91 92

1837
01:14:00,870 --> 01:13:58,800
the decision was his decision was to

1838
01:14:04,870 --> 01:14:00,880

incorporate the

1839
01:14:08,709 --> 01:14:04,880
pathfinder into discovery uh this it was

1840
01:14:10,390 --> 01:14:08,719
uh the hunt the the basic measure for uh

1841
01:14:13,990 --> 01:14:10,400
discovery had been decided it would be

1842
01:14:16,310 --> 01:14:14,000
150 million dollar fy ninety two dollars

1843
01:14:18,470 --> 01:14:16,320
project this would have to come under

1844
01:14:20,870 --> 01:14:18,480
the 150 million dollar cap but the rover

1845
01:14:23,350 --> 01:14:20,880
was counted as a separate thing it came

1846
01:14:25,030 --> 01:14:23,360
from a different part of nasa and it was

1847
01:14:27,910 --> 01:14:25,040
it was extra

1848
01:14:30,630 --> 01:14:27,920
and that was the decision then that his

1849
01:14:32,950 --> 01:14:30,640
decision was to make

1850
01:14:35,189 --> 01:14:32,960
pathfinder first and to push near into

1851
01:14:37,350 --> 01:14:35,199
the background to push near to not in

1852
01:14:38,790 --> 01:14:37,360
the background but push near to second

1853
01:14:40,870 --> 01:14:38,800
to push it off

1854
01:14:44,390 --> 01:14:40,880
out of being the first in line which did

1855
01:14:45,750 --> 01:14:44,400
not make tom creme just happy at all

1856
01:14:48,149 --> 01:14:45,760
and so

1857
01:14:52,470 --> 01:14:48,159
this would bump the near launch which

1858
01:14:54,950 --> 01:14:52,480
had been scheduled for 1997 into 1998.

1859
01:14:57,430 --> 01:14:54,960
uh this is of course now we're talking

1860
01:15:00,229 --> 01:14:57,440
about 1992

1861
01:15:02,470 --> 01:15:00,239
but the funding for discovery could not

1862
01:15:03,750 --> 01:15:02,480
happen until the next fiscal year so it

1863
01:15:07,110 --> 01:15:03,760

would not come up for budget

1864
01:15:09,270 --> 01:15:07,120
consideration until the spring of 1993

1865
01:15:10,550 --> 01:15:09,280
and so essentially there was a year

1866
01:15:12,790 --> 01:15:10,560
where

1867
01:15:15,350 --> 01:15:12,800
apl which was

1868
01:15:18,790 --> 01:15:15,360
ticked off by this sudden demotion to

1869
01:15:20,790 --> 01:15:18,800
second in the in discovery program

1870
01:15:22,870 --> 01:15:20,800
didn't come about into a political

1871
01:15:25,510 --> 01:15:22,880
consideration

1872
01:15:27,669 --> 01:15:25,520
however uh tom comey just told bob

1873
01:15:29,430 --> 01:15:27,679
farquhar you should go look for other

1874
01:15:32,550 --> 01:15:29,440
options and they found another option

1875
01:15:34,310 --> 01:15:32,560
they found a launch to eros in early

1876
01:15:37,030 --> 01:15:34,320
1996.

1877
01:15:39,110 --> 01:15:37,040
uh this would in fact greatly accelerate

1878
01:15:42,790 --> 01:15:39,120
the program result in apl having to

1879
01:15:46,229 --> 01:15:42,800
produce a spacecraft in only two years

1880
01:15:49,750 --> 01:15:46,239
pathfinder was still first in the budget

1881
01:15:50,790 --> 01:15:49,760
consideration when it came up in 1993

1882
01:15:56,870 --> 01:15:50,800
and

1883
01:16:00,310 --> 01:15:56,880
that year but tom cremidis was not about

1884
01:16:01,910 --> 01:16:00,320
to take that lying down basically

1885
01:16:03,590 --> 01:16:01,920
and the reason that he was able to do

1886
01:16:06,870 --> 01:16:03,600
anything at all was because he had a

1887
01:16:07,669 --> 01:16:06,880
long history of close association

1888
01:16:10,709 --> 01:16:07,679

with

1889
01:16:13,189 --> 01:16:10,719
senator barbara mikulski in using the

1890
01:16:15,990 --> 01:16:13,199
political system to lobby for apl's

1891
01:16:19,030 --> 01:16:16,000
projects and he intervened directly with

1892
01:16:21,990 --> 01:16:19,040
the office of senator mikulski who then

1893
01:16:24,870 --> 01:16:22,000
uh changed the whole dynamic the budget

1894
01:16:27,669 --> 01:16:24,880
consideration of fy93 would have funded

1895
01:16:31,030 --> 01:16:27,679
pathfinder basically and near on a very

1896
01:16:33,510 --> 01:16:31,040
small budget for a 1998 launch instead

1897
01:16:36,550 --> 01:16:33,520
by using the political system tom

1898
01:16:39,270 --> 01:16:36,560
chrimigious was able to get mikulski to

1899
01:16:42,070 --> 01:16:39,280
insert into the bill the full funding

1900
01:16:44,310 --> 01:16:42,080
for near on a honor accelerated launch

1901
01:16:46,550 --> 01:16:44,320
schedule to reach eros by launching in

1902
01:16:49,030 --> 01:16:46,560
february 1996.

1903
01:16:51,910 --> 01:16:49,040
and as a result of that very uh it's an

1904
01:16:54,310 --> 01:16:51,920
abbreviated version of that history

1905
01:16:57,510 --> 01:16:54,320
the discovery program started in the

1906
01:16:59,189 --> 01:16:57,520
fall of 1993 as a much better funded

1907
01:17:00,870 --> 01:16:59,199
program with two

1908
01:17:03,669 --> 01:17:00,880
new start missions

1909
01:17:05,350 --> 01:17:03,679
than it would otherwise have been and

1910
01:17:08,149 --> 01:17:05,360
one of the questions we have to ask is

1911
01:17:09,750 --> 01:17:08,159
whether it might have resulted if it had

1912
01:17:11,350 --> 01:17:09,760
not been funded that way would it have

1913
01:17:13,590 --> 01:17:11,360

become a one mission program for

1914
01:17:14,550 --> 01:17:13,600
pathfinder west hunter says well at

1915
01:17:16,870 --> 01:17:14,560
least

1916
01:17:18,709 --> 01:17:16,880
golden was really only interested in

1917
01:17:21,510 --> 01:17:18,719
pathfinder and didn't know much about

1918
01:17:23,669 --> 01:17:21,520
near at the very least discovery became

1919
01:17:26,709 --> 01:17:23,679
a viable program at a higher funded

1920
01:17:28,390 --> 01:17:26,719
level early on and so i would say my my

1921
01:17:29,910 --> 01:17:28,400
fundamental interpretation that i've

1922
01:17:32,390 --> 01:17:29,920
offered in this paper

1923
01:17:34,630 --> 01:17:32,400
is although jeff briggs had a role in

1924
01:17:36,790 --> 01:17:34,640
starting the project that the two key

1925
01:17:39,030 --> 01:17:36,800
actors which made it happen

1926
01:17:41,430 --> 01:17:39,040
were wes huntress and tom cremiges and

1927
01:17:43,430 --> 01:17:41,440
without them discovery might not have

1928
01:17:44,630 --> 01:17:43,440
emerged at all

1929
01:17:46,870 --> 01:17:44,640
and certainly

1930
01:17:49,189 --> 01:17:46,880
led it to become the successful and

1931
01:17:51,030 --> 01:17:49,199
transformative project for plantar

1932
01:18:04,630 --> 01:17:51,040
exploration that has become thank you

1933
01:18:08,310 --> 01:18:07,030
speaking of participants talking to my

1934
01:18:11,110 --> 01:18:08,320
paper

1935
01:18:14,149 --> 01:18:11,120
is this thing dangerous

1936
01:18:16,470 --> 01:18:14,159
uh uh just just a comment uh yeah on

1937
01:18:17,510 --> 01:18:16,480
your last slide there

1938
01:18:21,350 --> 01:18:17,520

uh

1939
01:18:23,510 --> 01:18:21,360
dan golden and i were not unaware

1940
01:18:24,550 --> 01:18:23,520
of what the final outcome

1941
01:18:26,149 --> 01:18:24,560
might be

1942
01:18:27,590 --> 01:18:26,159
we're actually happy to see it happen

1943
01:18:29,110 --> 01:18:27,600
that way

1944
01:18:31,110 --> 01:18:29,120
which final outcome are you meet you

1945
01:18:33,830 --> 01:18:31,120
mean that we would get a new start for

1946
01:18:35,830 --> 01:18:33,840
two not yet yeah but in one of your oral

1947
01:18:37,990 --> 01:18:35,840
histories you say that you you that he

1948
01:18:40,950 --> 01:18:38,000
was really angry because of mulkulski's

1949
01:18:43,510 --> 01:18:40,960
intervention he was yeah he was

1950
01:18:45,430 --> 01:18:43,520
yeah i know you weren't yeah

1951
01:18:47,110 --> 01:18:45,440
i mean i should add as an

1952
01:18:48,709 --> 01:18:47,120
appendix to that i have not mentioned

1953
01:18:50,149 --> 01:18:48,719
gold in this talk for the very simple

1954
01:18:52,310 --> 01:18:50,159
reason that he actually doesn't deserve

1955
01:18:54,790 --> 01:18:52,320
much credit or blame or anything else

1956
01:18:55,510 --> 01:18:54,800
for this this is a project that became

1957
01:19:00,390 --> 01:18:55,520
the

1958
01:19:02,550 --> 01:19:00,400
was launched without him and his basic

1959
01:19:04,870 --> 01:19:02,560
uh contribution was to stay out of the

1960
01:19:06,550 --> 01:19:04,880
way now maybe in later years you could

1961
01:19:08,149 --> 01:19:06,560
argue you know it would not have

1962
01:19:10,229 --> 01:19:08,159
necessarily continue without the

1963
01:19:11,830 --> 01:19:10,239

continual support of a of an

1964
01:19:13,110 --> 01:19:11,840
administrator who wanted to keep it

1965
01:19:15,030 --> 01:19:13,120
going

1966
01:19:16,950 --> 01:19:15,040
that's probably a contribution this is

1967
01:19:19,270 --> 01:19:16,960
really more of a comment than a question

1968
01:19:21,830 --> 01:19:19,280
that was a lot of fantastic background

1969
01:19:23,669 --> 01:19:21,840
that i have wanted to have for years and

1970
01:19:24,950 --> 01:19:23,679
i'm coming at this from the perspective

1971
01:19:27,189 --> 01:19:24,960
of somebody who's been involved with

1972
01:19:28,709 --> 01:19:27,199
discovery almost since its inception but

1973
01:19:31,510 --> 01:19:28,719
not that far back

1974
01:19:33,669 --> 01:19:31,520
in 1996 i was asked by charles zalachi

1975
01:19:36,470 --> 01:19:33,679
who was an assistant director of the lab

1976
01:19:39,669 --> 01:19:36,480
to head jpl's discovery program

1977
01:19:41,910 --> 01:19:39,679
and i knew about apl i knew what a

1978
01:19:44,709 --> 01:19:41,920
formidable technical powerhouse they

1979
01:19:46,950 --> 01:19:44,719
were i'd heard about tom cremidis and i

1980
01:19:48,550 --> 01:19:46,960
knew about barbara mikulski's special

1981
01:19:50,470 --> 01:19:48,560
relationship with him

1982
01:19:52,550 --> 01:19:50,480
and so we took that competition

1983
01:19:54,470 --> 01:19:52,560
extremely seriously in fact i think a

1984
01:19:56,790 --> 01:19:54,480
lot he asked me to do that job because i

1985
01:19:58,790 --> 01:19:56,800
was the pi on a on an earth science

1986
01:20:00,790 --> 01:19:58,800
mission about the size of an explorer

1987
01:20:02,470 --> 01:20:00,800
but i'll tell you this at the lab my

1988
01:20:04,310 --> 01:20:02,480

friend said greg why are you doing this

1989
01:20:06,070 --> 01:20:04,320
as a dead end you know it's the flagship

1990
01:20:08,229 --> 01:20:06,080
missions account this this discovery

1991
01:20:10,629 --> 01:20:08,239
thing is never going to last that was

1992
01:20:13,669 --> 01:20:10,639
the attitude there for quite for quite a

1993
01:20:15,510 --> 01:20:13,679
while and now i can tell you uh that

1994
01:20:17,750 --> 01:20:15,520
that today i just passed the reins to

1995
01:20:19,910 --> 01:20:17,760
someone else after insight was selected

1996
01:20:22,950 --> 01:20:19,920
it's a core part of what we do at the

1997
01:20:24,950 --> 01:20:22,960
lab and not only that but it has also

1998
01:20:26,790 --> 01:20:24,960
had a very profound impact on how we do

1999
01:20:29,669 --> 01:20:26,800
strategic mission planning in terms of

2000
01:20:31,590 --> 01:20:29,679
the way we formulate them we have

2001
01:20:34,229 --> 01:20:31,600
fallback options we have more robust

2002
01:20:36,390 --> 01:20:34,239
reserves we have baseline payloads we

2003
01:20:38,229 --> 01:20:36,400
have the threshold payloads and we also

2004
01:20:39,990 --> 01:20:38,239
have a review process

2005
01:20:41,750 --> 01:20:40,000
over the strategic missions now that we

2006
01:20:44,070 --> 01:20:41,760
never had before and i think it's really

2007
01:20:46,470 --> 01:20:44,080
going to help us keep them on track in

2008
01:20:49,189 --> 01:20:46,480
the future so i think the ramifications

2009
01:20:50,870 --> 01:20:49,199
of discovery are far uh

2010
01:20:53,430 --> 01:20:50,880
far beyond what we might even think

2011
01:20:55,510 --> 01:20:53,440
today yeah certainly the west planning

2012
01:21:02,390 --> 01:20:55,520
dimension that's been important in terms

2013
01:21:07,350 --> 01:21:05,110

final paper this afternoon is from peter

2014
01:21:09,350 --> 01:21:07,360
markowski from university of oklahoma on

2015
01:21:17,830 --> 01:21:09,360
a subject near and dear to my heart on

2016
01:21:21,669 --> 01:21:19,830
i just wanted to make a quick note

2017
01:21:23,350 --> 01:21:21,679
on the program agenda

2018
01:21:25,430 --> 01:21:23,360
i originally wanted to talk about

2019
01:21:27,270 --> 01:21:25,440
ulysses and giado

2020
01:21:29,990 --> 01:21:27,280
but my paper and my project sort of

2021
01:21:31,350 --> 01:21:30,000
evolved to only just talk about ulysses

2022
01:21:33,430 --> 01:21:31,360
i think in kind of grander scheme of

2023
01:21:35,189 --> 01:21:33,440
things i'm going to fold giato in there

2024
01:21:38,870 --> 01:21:35,199
but for today i'm only going to focus on

2025
01:21:44,470 --> 01:21:42,470
in may 1987 former esa director rymar

2026
01:21:47,189 --> 01:21:44,480
lust upon reflection on american and

2027
01:21:49,510 --> 01:21:47,199
european cooperation in space emphasized

2028
01:21:51,430 --> 01:21:49,520
quote the importance of a free and open

2029
01:21:53,030 --> 01:21:51,440
exchange of views between the scientific

2030
01:21:54,790 --> 01:21:53,040
communities of the united states and of

2031
01:21:57,189 --> 01:21:54,800
europe end quote

2032
01:21:58,790 --> 01:21:57,199
he further stated that it is true and we

2033
01:22:00,790 --> 01:21:58,800
should never deny the fact that we live

2034
01:22:02,550 --> 01:22:00,800
in a world of conflicting or at least

2035
01:22:03,669 --> 01:22:02,560
divergent political and economic

2036
01:22:05,590 --> 01:22:03,679
interests

2037
01:22:07,430 --> 01:22:05,600
but in spite of that i do believe that

2038
01:22:09,030 --> 01:22:07,440

many of our present problems can be

2039
01:22:10,550 --> 01:22:09,040
solved more easily when there is an

2040
01:22:12,310 --> 01:22:10,560
international community

2041
01:22:14,070 --> 01:22:12,320
of scientists and scholars free to

2042
01:22:15,910 --> 01:22:14,080
follow common goals and comment

2043
01:22:17,750 --> 01:22:15,920
objectives

2044
01:22:19,270 --> 01:22:17,760
his reflective statements are perhaps in

2045
01:22:21,510 --> 01:22:19,280
light of the tumultuous period of

2046
01:22:23,189 --> 01:22:21,520
cooperation earlier in the decade

2047
01:22:25,830 --> 01:22:23,199
involving the collapse of the original

2048
01:22:29,750 --> 01:22:25,840
agreement of the on the international

2049
01:22:32,070 --> 01:22:29,760
solar polar mission ispm in 1981.

2050
01:22:34,229 --> 01:22:32,080
this mission would re-emerge as ulysses

2051
01:22:36,550 --> 01:22:34,239
later in the decade by the time of its

2052
01:22:38,149 --> 01:22:36,560
launch in 1990 it would cap an almost

2053
01:22:41,030 --> 01:22:38,159
three decade journey from its original

2054
01:22:42,070 --> 01:22:41,040
conception as an auto ecliptic or oee

2055
01:22:45,750 --> 01:22:42,080
probe

2056
01:22:49,830 --> 01:22:48,070
today i hope to show you that how i hope

2057
01:22:51,830 --> 01:22:49,840
to show you how the history of ulysses

2058
01:22:53,270 --> 01:22:51,840
the ulysses mission can be reframed

2059
01:22:55,350 --> 01:22:53,280
within a new emerging historical

2060
01:22:57,270 --> 01:22:55,360
literature which attempts to marry the

2061
01:22:59,430 --> 01:22:57,280
history of space within a transnational

2062
01:23:01,910 --> 01:22:59,440
framework perhaps tell a more globalized

2063
01:23:03,590 --> 01:23:01,920

narrative of space exploration

2064
01:23:06,229 --> 01:23:03,600
my work is an attempt to build upon what

2065
01:23:08,629 --> 01:23:06,239
historian asif siddiqui proclaims as the

2066
01:23:10,950 --> 01:23:08,639
issue of multiple and contradictory

2067
01:23:12,870 --> 01:23:10,960
narratives engendered by national claims

2068
01:23:14,629 --> 01:23:12,880
which which have been a staple of space

2069
01:23:16,310 --> 01:23:14,639
history

2070
01:23:18,470 --> 01:23:16,320
while these nationalistic and even cold

2071
01:23:20,870 --> 01:23:18,480
war contexts have have certainly had a

2072
01:23:23,270 --> 01:23:20,880
tremendous influence upon the american

2073
01:23:25,030 --> 01:23:23,280
and soviet programs what about those po

2074
01:23:27,030 --> 01:23:25,040
pro what about those ones which matured

2075
01:23:29,510 --> 01:23:27,040
in the post-cold war era such as the

2076
01:23:31,830 --> 01:23:29,520
chinese japanese or indian programs or

2077
01:23:33,110 --> 01:23:31,840
programs like isa which emerge in the

2078
01:23:35,030 --> 01:23:33,120
same period

2079
01:23:37,750 --> 01:23:35,040
amidst larger concerns of european

2080
01:23:39,669 --> 01:23:37,760
political integration

2081
01:23:41,910 --> 01:23:39,679
in the following talk i will detail the

2082
01:23:44,870 --> 01:23:41,920
25-year history of ulysses from its

2083
01:23:47,990 --> 01:23:44,880
origins as a proposed ooe mission to its

2084
01:23:49,750 --> 01:23:48,000
launch in 1990

2085
01:23:50,870 --> 01:23:49,760
doing so i will attempt to reframe the

2086
01:23:53,030 --> 01:23:50,880
history

2087
01:23:54,950 --> 01:23:53,040
of ulysses and transnational perspective

2088
01:23:56,470 --> 01:23:54,960

and show two things

2089
01:23:58,070 --> 01:23:56,480
first i will demonstrate that the

2090
01:24:00,870 --> 01:23:58,080
spacecraft itself can be seen as a

2091
01:24:02,709 --> 01:24:00,880
transnational object that is it's a for

2092
01:24:05,669 --> 01:24:02,719
uh it's a transnational form of

2093
01:24:08,709 --> 01:24:05,679
cooperation is embedded in this in the

2094
01:24:10,950 --> 01:24:08,719
technology itself which was negotiated

2095
01:24:12,870 --> 01:24:10,960
and shaped by the multitude of american

2096
01:24:14,790 --> 01:24:12,880
and european historical actors over its

2097
01:24:16,950 --> 01:24:14,800
25-year history

2098
01:24:18,629 --> 01:24:16,960
second and more importantly in detailing

2099
01:24:21,189 --> 01:24:18,639
this history from the perspective of a

2100
01:24:23,110 --> 01:24:21,199
number of historical actors i will show

2101
01:24:25,189 --> 01:24:23,120
that the emergence i will show the

2102
01:24:27,270 --> 01:24:25,199
emergence of varied meanings and

2103
01:24:36,870 --> 01:24:27,280
imaginings of cooperation amidst the

2104
01:24:39,910 --> 01:24:37,750
all right

2105
01:24:42,470 --> 01:24:39,920
so shortly after the launch of sputnik

2106
01:24:44,229 --> 01:24:42,480
in 1957 space scientists began to

2107
01:24:45,669 --> 01:24:44,239
discuss the advantages of utilizing

2108
01:24:47,510 --> 01:24:45,679
spacecraft for a number of scientific

2109
01:24:49,350 --> 01:24:47,520
investigations

2110
01:24:51,350 --> 01:24:49,360
almost immediately scientists on both

2111
01:24:53,669 --> 01:24:51,360
sides of the atlantic began to pursue

2112
01:24:55,430 --> 01:24:53,679
solar observatory capabilities these

2113
01:24:57,590 --> 01:24:55,440

scientists began to coalesce and develop

2114
01:24:58,790 --> 01:24:57,600
new and interesting strategies for solar

2115
01:25:00,149 --> 01:24:58,800
exploration

2116
01:25:01,750 --> 01:25:00,159
one of which was an auto ecliptic

2117
01:25:03,910 --> 01:25:01,760
mission

2118
01:25:05,350 --> 01:25:03,920
by the early to mid 1960s a number of

2119
01:25:06,709 --> 01:25:05,360
developments from both european and

2120
01:25:09,910 --> 01:25:06,719
american scientists and engineers

2121
01:25:12,790 --> 01:25:09,920
occurred in europe two champions emerged

2122
01:25:14,950 --> 01:25:12,800
german astrophysicist ludwig ludwig

2123
01:25:17,430 --> 01:25:14,960
biermann of the max planck institute and

2124
01:25:18,870 --> 01:25:17,440
british space scientist harry elliott of

2125
01:25:20,310 --> 01:25:18,880
imperial college

2126
01:25:22,229 --> 01:25:20,320
biermann's contribution included the

2127
01:25:25,510 --> 01:25:22,239
first publication to consider the

2128
01:25:27,590 --> 01:25:25,520
scientific value of an ooe mission

2129
01:25:29,030 --> 01:25:27,600
the second champion elliott was one of

2130
01:25:31,189 --> 01:25:29,040
britain's leading authorities in space

2131
01:25:32,629 --> 01:25:31,199
science in this period as an appointed

2132
01:25:34,709 --> 01:25:32,639
chair of the british national committee

2133
01:25:36,070 --> 01:25:34,719
on space reach researchers working group

2134
01:25:37,910 --> 01:25:36,080
three

2135
01:25:39,669 --> 01:25:37,920
he was he successfully steered his

2136
01:25:41,590 --> 01:25:39,679
committee to the conclusion that an auto

2137
01:25:43,590 --> 01:25:41,600
ecliptic mission would best meet the

2138
01:25:45,430 --> 01:25:43,600

dual necessities of yielding novel

2139
01:25:47,910 --> 01:25:45,440
scientific results and stimulating the

2140
01:25:50,870 --> 01:25:47,920
nation's aerospace industry

2141
01:25:52,790 --> 01:25:50,880
from 1968 to 1971

2142
01:25:54,229 --> 01:25:52,800
he had mixed success regarding support

2143
01:25:56,229 --> 01:25:54,239
and interest for an auto ecliptic

2144
01:25:58,950 --> 01:25:56,239
mission but ultimately his efforts

2145
01:26:01,189 --> 01:25:58,960
resulted in the april 1982

2146
01:26:04,790 --> 01:26:01,199
european space research organization or

2147
01:26:06,709 --> 01:26:04,800
esro's mission definition study

2148
01:26:08,470 --> 01:26:06,719
by the early 1970s there were parallel

2149
01:26:10,390 --> 01:26:08,480
domes excuse me there are parallel

2150
01:26:12,950 --> 01:26:10,400
developments amongst

2151
01:26:14,470 --> 01:26:12,960
nasa and american space scientists

2152
01:26:15,750 --> 01:26:14,480
regarding the feasibility of such a

2153
01:26:17,590 --> 01:26:15,760
mission

2154
01:26:19,510 --> 01:26:17,600
as it was also seen as a potential

2155
01:26:21,830 --> 01:26:19,520
candidate for nasa's emerging planetary

2156
01:26:23,669 --> 01:26:21,840
exploration

2157
01:26:25,189 --> 01:26:23,679
by this time american scientists and

2158
01:26:27,030 --> 01:26:25,199
engineers were already developing

2159
01:26:29,590 --> 01:26:27,040
solutions for issues that might that a

2160
01:26:31,669 --> 01:26:29,600
possible ooe mission might face and by

2161
01:26:33,910 --> 01:26:31,679
extension technical issues facing future

2162
01:26:35,669 --> 01:26:33,920
interplanetary probes

2163
01:26:39,110 --> 01:26:35,679

while not as complete as the ezro study

2164
01:26:42,149 --> 01:26:39,120
in july 1971 the ames research center

2165
01:26:44,950 --> 01:26:42,159
published the pioneer h jupiter swing by

2166
01:26:46,709 --> 01:26:44,960
out of ecliptic mission study

2167
01:26:48,070 --> 01:26:46,719
while the while the report outlined a

2168
01:26:51,910 --> 01:26:48,080
number of different launch and hardware

2169
01:26:54,310 --> 01:26:51,920
configurations the proposed pioneer ooe

2170
01:26:56,709 --> 01:26:54,320
would use the spare pioneer spacecraft

2171
01:27:00,470 --> 01:26:56,719
for pioneers fng which would eventually

2172
01:27:02,070 --> 01:27:00,480
become pioneers 10 and 11 respectively

2173
01:27:03,430 --> 01:27:02,080
for the next few years attempts by a

2174
01:27:05,590 --> 01:27:03,440
number of american scientists to

2175
01:27:07,910 --> 01:27:05,600
persuade nasa administrators to use the

2176
01:27:10,709 --> 01:27:07,920
backup pioneer probe for an oe mission

2177
01:27:12,070 --> 01:27:10,719
went largely unsuccessful

2178
01:27:13,990 --> 01:27:12,080
while a number of administrators

2179
01:27:16,550 --> 01:27:14,000
recognize the potential benefits a few

2180
01:27:19,030 --> 01:27:16,560
concerns arose regarding its use

2181
01:27:20,790 --> 01:27:19,040
writing to john nagle norman ness the

2182
01:27:23,750 --> 01:27:20,800
chief of laboratory for extra

2183
01:27:25,750 --> 01:27:23,760
extraterrestrial physics at goddard

2184
01:27:27,270 --> 01:27:25,760
expressed concerns about the use of a

2185
01:27:29,350 --> 01:27:27,280
backup pioneer

2186
01:27:31,910 --> 01:27:29,360
according to him an ooe mission seems

2187
01:27:33,750 --> 01:27:31,920
like an exceedingly worthwhile mission

2188
01:27:35,830 --> 01:27:33,760

scientifically and perhaps a backup

2189
01:27:38,390 --> 01:27:35,840
pioneer probe might not fully capture

2190
01:27:40,550 --> 01:27:38,400
the potential of an oe mission at his

2191
01:27:43,750 --> 01:27:40,560
behest he urged its adoption only if the

2192
01:27:45,830 --> 01:27:43,760
payload be entirely reconsidered

2193
01:27:47,030 --> 01:27:45,840
in response nangle cited budgetary and

2194
01:27:48,550 --> 01:27:47,040
time constraints regarding the

2195
01:27:50,390 --> 01:27:48,560
solicitation of an entirely new

2196
01:27:53,350 --> 01:27:50,400
spacecraft

2197
01:27:54,950 --> 01:27:53,360
about a year later in august 1972 home

2198
01:27:56,629 --> 01:27:54,960
renewal expressed another concern

2199
01:27:59,189 --> 01:27:56,639
regarding the use of a backup pioneer

2200
01:28:01,110 --> 01:27:59,199
probe for an ooe mission

2201
01:28:03,590 --> 01:28:01,120
his suggestion was to keep the pioneer

2202
01:28:05,750 --> 01:28:03,600
was to keep the pioneer h as a was to

2203
01:28:07,910 --> 01:28:05,760
keep pioneer h as a backup in case

2204
01:28:09,270 --> 01:28:07,920
pioneer 10 would not provide sufficient

2205
01:28:11,270 --> 01:28:09,280
data regarding

2206
01:28:13,030 --> 01:28:11,280
issues like radiation environment of the

2207
01:28:15,189 --> 01:28:13,040
interplanetary space

2208
01:28:17,430 --> 01:28:15,199
by mid-decade nasa administrators would

2209
01:28:19,110 --> 01:28:17,440
continue to solicit advice regarding an

2210
01:28:20,629 --> 01:28:19,120
ooe mission

2211
01:28:22,070 --> 01:28:20,639
but as as we have seen in yesterday's

2212
01:28:23,910 --> 01:28:22,080
talks which highlighted budgetary

2213
01:28:25,830 --> 01:28:23,920

concerns in this period

2214
01:28:27,510 --> 01:28:25,840
nasa as a result became increasingly

2215
01:28:30,229 --> 01:28:27,520
supportive of a joint international

2216
01:28:33,750 --> 01:28:32,149
american scientists reactions to such a

2217
01:28:37,270 --> 01:28:33,760
joint mission were varied

2218
01:28:39,270 --> 01:28:37,280
by summer of 1974 some expressed concern

2219
01:28:41,590 --> 01:28:39,280
about the perceived lack of consultation

2220
01:28:43,510 --> 01:28:41,600
within the scientific community

2221
01:28:45,110 --> 01:28:43,520
john simpson physicist at the enrico

2222
01:28:47,189 --> 01:28:45,120
firming institute wrote to james

2223
01:28:50,310 --> 01:28:47,199
fletcher in 1974 expressing the

2224
01:28:51,990 --> 01:28:50,320
importance of an oe mission he stated

2225
01:28:53,990 --> 01:28:52,000
i was shocked to learn when i was in

2226
01:28:55,669 --> 01:28:54,000
italy that nasa had invited the european

2227
01:28:57,990 --> 01:28:55,679
space group to consider taking over this

2228
01:28:59,830 --> 01:28:58,000
type of mission i find this incredible

2229
01:29:01,510 --> 01:28:59,840
since i can think of no other mission

2230
01:29:03,830 --> 01:29:01,520
which would guarantee as many scientific

2231
01:29:05,510 --> 01:29:03,840
discoveries per dollar spent on a major

2232
01:29:07,189 --> 01:29:05,520
mission than this one

2233
01:29:09,750 --> 01:29:07,199
thus this potential reduction of

2234
01:29:12,310 --> 01:29:09,760
participation by us scientists is hard

2235
01:29:13,910 --> 01:29:12,320
to justify within the united states

2236
01:29:15,669 --> 01:29:13,920
both for strengthening u.s science at

2237
01:29:17,590 --> 01:29:15,679
this time and for nasa's stated

2238
01:29:19,750 --> 01:29:17,600

objective of supporting u.s science this

2239
01:29:21,110 --> 01:29:19,760
mission is outstanding i am just

2240
01:29:23,270 --> 01:29:21,120
strongly enough oriented towards

2241
01:29:24,950 --> 01:29:23,280
strengthening u.s science

2242
01:29:28,390 --> 01:29:24,960
at this time to argue that this should

2243
01:29:30,070 --> 01:29:28,400
be an all-us mission if possible

2244
01:29:31,669 --> 01:29:30,080
nagel recognized by mid-decade that

2245
01:29:33,030 --> 01:29:31,679
while u.s scientists were increasingly

2246
01:29:35,189 --> 01:29:33,040
concerned about the idea of

2247
01:29:36,470 --> 01:29:35,199
international cooperation congress on

2248
01:29:38,229 --> 01:29:36,480
the other hand was becoming more

2249
01:29:40,149 --> 01:29:38,239
interested in the idea of cooperation

2250
01:29:41,830 --> 01:29:40,159
and space missions in general

2251
01:29:43,669 --> 01:29:41,840
according to him congress views such

2252
01:29:45,669 --> 01:29:43,679
cooperation as a reduction in funding

2253
01:29:47,350 --> 01:29:45,679
requirements whereas the u.s scientists

2254
01:29:49,350 --> 01:29:47,360
regard such missions which will carry

2255
01:29:51,110 --> 01:29:49,360
u.s and foreign experiments as a

2256
01:29:53,510 --> 01:29:51,120
reduction in their own opportunities to

2257
01:29:55,110 --> 01:29:53,520
do research

2258
01:29:56,870 --> 01:29:55,120
in the tight budget climate for space

2259
01:29:58,870 --> 01:29:56,880
science two different concerns from two

2260
01:30:01,830 --> 01:29:58,880
different groups seem to place their

2261
01:30:03,590 --> 01:30:01,840
opinions at odds

2262
01:30:05,510 --> 01:30:03,600
tenego and perhaps other nasa

2263
01:30:06,870 --> 01:30:05,520

administrators cooperation would

2264
01:30:08,950 --> 01:30:06,880
actually be a good compromise for all

2265
01:30:10,870 --> 01:30:08,960
parties involved as collaboration would

2266
01:30:12,629 --> 01:30:10,880
produce a net increase in the number of

2267
01:30:16,390 --> 01:30:12,639
flights and hence a net increase in the

2268
01:30:18,149 --> 01:30:16,400
total opportunities for us scientists

2269
01:30:21,189 --> 01:30:18,159
moving on

2270
01:30:24,629 --> 01:30:21,199
by the end of 1974 two main developments

2271
01:30:26,390 --> 01:30:24,639
led to what would eventually become ispm

2272
01:30:28,310 --> 01:30:26,400
in europe as ezra was considering

2273
01:30:30,470 --> 01:30:28,320
mission priorities for the 1980s a

2274
01:30:32,390 --> 01:30:30,480
stereoscopic mission to study coronal

2275
01:30:34,070 --> 01:30:32,400
phenomena emerge as a compelling and

2276
01:30:35,189 --> 01:30:34,080
worthwhile candidate for a future

2277
01:30:36,950 --> 01:30:35,199
mission

2278
01:30:39,990 --> 01:30:36,960
ezra's launching program advisory

2279
01:30:42,310 --> 01:30:40,000
committee elpac included both an o e o o

2280
01:30:44,070 --> 01:30:42,320
e and a stereoscopic mission as top

2281
01:30:45,590 --> 01:30:44,080
priorities which led to the second

2282
01:30:49,110 --> 01:30:45,600
development the combination of a

2283
01:30:51,669 --> 01:30:49,120
stereoscopic mission and then ooe one

2284
01:30:53,990 --> 01:30:51,679
and this essentially proposed that

2285
01:30:56,229 --> 01:30:54,000
the out of ecliptic mission would use

2286
01:30:57,669 --> 01:30:56,239
two you would launch two satellites one

2287
01:30:59,189 --> 01:30:57,679
which would fly over the north pole of

2288
01:31:03,270 --> 01:30:59,199

the sun and another one which would fly

2289
01:31:06,470 --> 01:31:05,030
nasa seemed to agree and according to

2290
01:31:08,310 --> 01:31:06,480
james fletcher the best chance of

2291
01:31:09,990 --> 01:31:08,320
implementing an out of ecliptic mission

2292
01:31:12,950 --> 01:31:10,000
is with a mission mode that will attract

2293
01:31:15,110 --> 01:31:12,960
as wide a constituency as possible

2294
01:31:16,950 --> 01:31:15,120
something that a combined stereoscopic

2295
01:31:18,709 --> 01:31:16,960
and oee mission would do

2296
01:31:21,830 --> 01:31:18,719
these these developments created a ripe

2297
01:31:23,350 --> 01:31:21,840
atmosphere for cooperation in 1974 ezra

2298
01:31:26,629 --> 01:31:23,360
and nasa agreed to cooperate on two

2299
01:31:29,110 --> 01:31:26,639
joint missions um at the at the joint

2300
01:31:31,030 --> 01:31:29,120
science program review held at aztec and

2301
01:31:35,030 --> 01:31:31,040
one of the agreed programs was the

2302
01:31:36,550 --> 01:31:35,040
combined stereoscopic ooe mission

2303
01:31:37,990 --> 01:31:36,560
combining two such missions was very

2304
01:31:40,070 --> 01:31:38,000
favorable to both nasa and ezra

2305
01:31:42,070 --> 01:31:40,080
administrators and as a result

2306
01:31:44,709 --> 01:31:42,080
a science working group was established

2307
01:31:47,270 --> 01:31:44,719
in order to form an optimum mission mode

2308
01:31:49,750 --> 01:31:47,280
in the first few months of 1975 based on

2309
01:31:52,149 --> 01:31:49,760
the joint study esro and science

2310
01:31:54,390 --> 01:31:52,159
planners recommended that an ooe dual

2311
01:31:55,750 --> 01:31:54,400
stereoscopic spacecraft using a jupiter

2312
01:32:00,470 --> 01:31:55,760
gravitational assist as the most

2313
01:32:04,950 --> 01:32:03,110

as historian karl hufbauer has shown esa

2314
01:32:07,910 --> 01:32:04,960
which replaced ezro as europe's prime

2315
01:32:09,750 --> 01:32:07,920
space organization in 1975 emphasized a

2316
01:32:12,629 --> 01:32:09,760
number of priorities for the cooperative

2317
01:32:13,910 --> 01:32:12,639
ooe mission such as clean interfaces

2318
01:32:17,350 --> 01:32:13,920
their involvement into choice of

2319
01:32:19,350 --> 01:32:17,360
experiments and principal investigators

2320
01:32:21,030 --> 01:32:19,360
observations of jupiter their insistence

2321
01:32:23,189 --> 01:32:21,040
on observations of jupiter be made

2322
01:32:25,110 --> 01:32:23,199
during the swing by and the conviction

2323
01:32:26,870 --> 01:32:25,120
that the two spacecraft option remain

2324
01:32:28,470 --> 01:32:26,880
essential

2325
01:32:30,950 --> 01:32:28,480
overall by mid-decade the mission

2326
01:32:35,590 --> 01:32:30,960
constituency for an ooe mission

2327
01:32:41,510 --> 01:32:38,709
in april 1977 nasa and esa began

2328
01:32:44,070 --> 01:32:41,520
soliciting proposed proposals for an oae

2329
01:32:45,750 --> 01:32:44,080
and by march 1978 a total of 16

2330
01:32:47,830 --> 01:32:45,760
experiments were chosen for more than

2331
01:32:50,390 --> 01:32:47,840
200 scientists belonging to 65

2332
01:32:51,669 --> 01:32:50,400
universities from europe and the united

2333
01:32:53,030 --> 01:32:51,679
states

2334
01:32:55,189 --> 01:32:53,040
while the specific technical and

2335
01:32:58,229 --> 01:32:55,199
scientific capabilities of the

2336
01:32:59,590 --> 01:32:58,239
ooe mission were developed from 77 to 78

2337
01:33:01,030 --> 01:32:59,600
securing funding for the cooperative

2338
01:33:02,149 --> 01:33:01,040

mission was increasingly becoming a

2339
01:33:04,709 --> 01:33:02,159
problem

2340
01:33:07,350 --> 01:33:04,719
for instance in may 1977 nasa was

2341
01:33:09,590 --> 01:33:07,360
scheduled to take a 77 million cut to

2342
01:33:11,350 --> 01:33:09,600
the fiscal year 78 budget this had a

2343
01:33:13,110 --> 01:33:11,360
particular impact on the planetary

2344
01:33:15,350 --> 01:33:13,120
missions program especially for the

2345
01:33:16,950 --> 01:33:15,360
newly planned jupiter orbiter probe in

2346
01:33:19,350 --> 01:33:16,960
july the house of representatives

2347
01:33:22,310 --> 01:33:19,360
approved 17.7 million dollars for the

2348
01:33:24,070 --> 01:33:22,320
jupiter probe and as a stipu although

2349
01:33:25,750 --> 01:33:24,080
they had a stipulation

2350
01:33:27,510 --> 01:33:25,760
and that was

2351
01:33:30,470 --> 01:33:27,520
that the

2352
01:33:32,629 --> 01:33:30,480
upcoming planned start 1979 plan start

2353
01:33:35,030 --> 01:33:32,639
for oee would use a modified version of

2354
01:33:36,390 --> 01:33:35,040
the jupiter orbiter probe

2355
01:33:38,790 --> 01:33:36,400
so thus

2356
01:33:40,550 --> 01:33:38,800
the fates both of oe and the jupiter

2357
01:33:42,310 --> 01:33:40,560
orbiter were connected with this new

2358
01:33:44,550 --> 01:33:42,320
budget approval for the for the orbiter

2359
01:33:47,350 --> 01:33:44,560
the oe mission plans would have been thr

2360
01:33:50,629 --> 01:33:47,360
without the new budget approval the oe

2361
01:33:52,070 --> 01:33:50,639
would have been threatened

2362
01:33:54,629 --> 01:33:52,080
requesting more funding for the out of

2363
01:33:56,550 --> 01:33:54,639

ecliptic mission which by late 1977 was

2364
01:33:58,390 --> 01:33:56,560
renamed as the solar polar mission was

2365
01:34:00,950 --> 01:33:58,400
becoming increasingly difficult in

2366
01:34:04,070 --> 01:34:00,960
september 1977 nasa secured

2367
01:34:06,709 --> 01:34:04,080
authorization from the uh omb

2368
01:34:08,950 --> 01:34:06,719
from onb for an initial fiscal set 78

2369
01:34:10,310 --> 01:34:08,960
budget of 13 million dollars arguing

2370
01:34:11,430 --> 01:34:10,320
that it was their only new start for

2371
01:34:13,270 --> 01:34:11,440
that year

2372
01:34:16,229 --> 01:34:13,280
despite these issues one year later in

2373
01:34:18,070 --> 01:34:16,239
1978 after intense lobbying efforts of

2374
01:34:19,830 --> 01:34:18,080
the american space science community and

2375
01:34:21,350 --> 01:34:19,840
harold glasser the first director of

2376
01:34:23,030 --> 01:34:21,360
nest of the nasa's solar terrestrial

2377
01:34:26,390 --> 01:34:23,040
division jimmy carter officially

2378
01:34:29,910 --> 01:34:26,400
approved the solar polar mission

2379
01:34:31,510 --> 01:34:29,920
six months later on march 29 1979 nasa

2380
01:34:32,950 --> 01:34:31,520
and issa signed the memorandum of

2381
01:34:36,390 --> 01:34:32,960
understanding for the international

2382
01:34:40,709 --> 01:34:38,149
as was seen prior to the signing of the

2383
01:34:42,149 --> 01:34:40,719
mou ispm was already facing budget

2384
01:34:44,950 --> 01:34:42,159
issues

2385
01:34:47,430 --> 01:34:44,960
in january 1978 nasa submitted a budget

2386
01:34:49,109 --> 01:34:47,440
request for fiscal year 79

2387
01:34:51,590 --> 01:34:49,119
which included 13 million dollars for

2388
01:34:53,270 --> 01:34:51,600

ispm

2389
01:34:55,109 --> 01:34:53,280
claiming it was one of their five new

2390
01:34:56,709 --> 01:34:55,119
start programs for that year although

2391
01:34:58,870 --> 01:34:56,719
congress approved it they cut five

2392
01:35:01,109 --> 01:34:58,880
million dollars of that budget in order

2393
01:35:02,550 --> 01:35:01,119
to reallocate those funds to cover cost

2394
01:35:04,149 --> 01:35:02,560
overruns for the space shuttle

2395
01:35:05,590 --> 01:35:04,159
development

2396
01:35:07,350 --> 01:35:05,600
by the end of the year the senate

2397
01:35:09,510 --> 01:35:07,360
appropriations subcommittee wrote to

2398
01:35:11,750 --> 01:35:09,520
nasa administrator robert frosh

2399
01:35:14,070 --> 01:35:11,760
suggesting that ispm delayed two years

2400
01:35:15,830 --> 01:35:14,080
citing two reasons to reflect the delays

2401
01:35:17,590 --> 01:35:15,840
in shuttle development and because the

2402
01:35:19,750 --> 01:35:17,600
committee was concerned with the initial

2403
01:35:21,669 --> 01:35:19,760
upper stage necessary to send the two

2404
01:35:23,430 --> 01:35:21,679
spacecraft on the flight path would not

2405
01:35:28,149 --> 01:35:23,440
be adequate and that nasa should develop

2406
01:35:33,350 --> 01:35:30,790
despite 135 million worth of contracts

2407
01:35:35,270 --> 01:35:33,360
already promised by this point ispm was

2408
01:35:36,390 --> 01:35:35,280
teetering on the edge of cancellation as

2409
01:35:37,910 --> 01:35:36,400
a carter

2410
01:35:40,870 --> 01:35:37,920
as the carter administration submitted

2411
01:35:42,229 --> 01:35:40,880
an amended budget fiscal year 1981 which

2412
01:35:45,430 --> 01:35:42,239
called for a two-year launch delay and

2413
01:35:47,109 --> 01:35:45,440

roughly 43 million dollar cut

2414
01:35:48,870 --> 01:35:47,119
the cut and delay urged protests by a

2415
01:35:50,709 --> 01:35:48,880
number of groups which included not only

2416
01:35:53,270 --> 01:35:50,719
european nations but also the white

2417
01:35:55,510 --> 01:35:53,280
house and state department

2418
01:35:57,109 --> 01:35:55,520
white house officials in a letter to

2419
01:35:59,270 --> 01:35:57,119
massachusetts representative edward

2420
01:36:01,350 --> 01:35:59,280
boland claim the action threatens not

2421
01:36:04,390 --> 01:36:01,360
only international cooperation in space

2422
01:36:05,830 --> 01:36:04,400
but other areas of technology as well

2423
01:36:07,430 --> 01:36:05,840
a few months later the house

2424
01:36:09,669 --> 01:36:07,440
appropriations committee recommended in

2425
01:36:12,310 --> 01:36:09,679
the 1980 supplemental appropriations

2426
01:36:13,750 --> 01:36:12,320
bill that ispm be cancelled

2427
01:36:15,669 --> 01:36:13,760
citing among other reasons that the

2428
01:36:18,550 --> 01:36:15,679
two-year delay would cost at least an

2429
01:36:20,149 --> 01:36:18,560
additional 150 million dollars

2430
01:36:21,910 --> 01:36:20,159
while esa reacted to the possible

2431
01:36:24,149 --> 01:36:21,920
cancellation of strong diplomatic

2432
01:36:25,990 --> 01:36:24,159
protests florida representative don

2433
01:36:27,510 --> 01:36:26,000
fuqua successfully argued that the

2434
01:36:28,870 --> 01:36:27,520
cancellation of the funds would

2435
01:36:31,189 --> 01:36:28,880
constitute legislation and

2436
01:36:32,790 --> 01:36:31,199
appropriations bill a violation of house

2437
01:36:34,790 --> 01:36:32,800
rules

2438
01:36:36,629 --> 01:36:34,800

as joan johnson freeze has shown the

2439
01:36:38,709 --> 01:36:36,639
fate of ispm took a turn for the worse

2440
01:36:40,629 --> 01:36:38,719
in the early 1980s as the whole budget

2441
01:36:42,149 --> 01:36:40,639
process and attitude fundamentally

2442
01:36:43,750 --> 01:36:42,159
changed with the election of

2443
01:36:45,109 --> 01:36:43,760
president ronald reagan and his

2444
01:36:47,109 --> 01:36:45,119
appointment of david stockton as

2445
01:36:49,590 --> 01:36:47,119
director of omb

2446
01:36:51,270 --> 01:36:49,600
by early 1981 it became clear that the

2447
01:36:53,430 --> 01:36:51,280
reagan administration's proposed budget

2448
01:36:55,270 --> 01:36:53,440
cuts for nasa would effectively cancel

2449
01:36:57,430 --> 01:36:55,280
ispm

2450
01:36:59,750 --> 01:36:57,440
after reagan took office omb amended the

2451
01:37:01,669 --> 01:36:59,760
fiscal year 82 space science budget by

2452
01:37:03,030 --> 01:37:01,679
almost 23 percent

2453
01:37:04,390 --> 01:37:03,040
this movie effectively signaled the

2454
01:37:05,910 --> 01:37:04,400
cancer the cancellation of the

2455
01:37:07,910 --> 01:37:05,920
development of the american portion of

2456
01:37:09,750 --> 01:37:07,920
ispm

2457
01:37:11,669 --> 01:37:09,760
the swift and almost unilateral decision

2458
01:37:13,750 --> 01:37:11,679
by the reagan administration elicited

2459
01:37:15,109 --> 01:37:13,760
uproar from both american and european

2460
01:37:17,590 --> 01:37:15,119
delegations

2461
01:37:19,510 --> 01:37:17,600
american politicians decried that that

2462
01:37:21,510 --> 01:37:19,520
that a lack of new start projects could

2463
01:37:22,950 --> 01:37:21,520

jeopardize the ability for nasa to keep

2464
01:37:24,470 --> 01:37:22,960
its status as a scientific and

2465
01:37:26,629 --> 01:37:24,480
engineering leader

2466
01:37:28,470 --> 01:37:26,639
esa individuals responded by declaring

2467
01:37:32,390 --> 01:37:28,480
decision to be an unacceptable breach of

2468
01:37:35,990 --> 01:37:34,229
as a response nasa and the rate and the

2469
01:37:37,990 --> 01:37:36,000
reagan administration offered vagra

2470
01:37:39,910 --> 01:37:38,000
reassurances that the u.s will remain as

2471
01:37:41,510 --> 01:37:39,920
part of the ispm mission at a reduced

2472
01:37:43,750 --> 01:37:41,520
capacity

2473
01:37:44,950 --> 01:37:43,760
which europe viewed as unacceptable as

2474
01:37:46,870 --> 01:37:44,960
well

2475
01:37:49,430 --> 01:37:46,880
by march of that year isa assembled its

2476
01:37:51,830 --> 01:37:49,440
political forces against this decision

2477
01:37:54,470 --> 01:37:51,840
director general of isa at the time eric

2478
01:37:56,149 --> 01:37:54,480
quisguard stated to the house science

2479
01:37:57,830 --> 01:37:56,159
and technology committee that it cannot

2480
01:38:00,229 --> 01:37:57,840
be accepted that it's such an advanced

2481
01:38:01,430 --> 01:38:00,239
stage of ispm development and after a

2482
01:38:04,149 --> 01:38:01,440
commitment of more than half of the

2483
01:38:06,390 --> 01:38:04,159
european funding nasa presents issa with

2484
01:38:07,750 --> 01:38:06,400
the fatal complete of its withdrawal

2485
01:38:09,669 --> 01:38:07,760
from an international cooperative

2486
01:38:11,669 --> 01:38:09,679
program especially without prior

2487
01:38:13,510 --> 01:38:11,679
consultation

2488
01:38:15,189 --> 01:38:13,520

he further went on to tell the committee

2489
01:38:17,109 --> 01:38:15,199
that the short-term financial advantage

2490
01:38:19,350 --> 01:38:17,119
for nasa might come at the cost of

2491
01:38:21,830 --> 01:38:19,360
potential future cooperative entries

2492
01:38:23,510 --> 01:38:21,840
the following weeks quiz garden at and

2493
01:38:25,750 --> 01:38:23,520
esa expressed willingness for a

2494
01:38:30,709 --> 01:38:25,760
compromise solution as long as the u.s

2495
01:38:35,109 --> 01:38:32,229
despite some promising efforts in the

2496
01:38:37,109 --> 01:38:35,119
early summer of 1981 newly instated nasa

2497
01:38:39,350 --> 01:38:37,119
administrator james baggs informed quiz

2498
01:38:41,109 --> 01:38:39,360
guard on september 9

2499
01:38:43,590 --> 01:38:41,119
that nasa would not include any request

2500
01:38:45,910 --> 01:38:43,600
for funds for the second ispm spacecraft

2501
01:38:47,590 --> 01:38:45,920
in the fiscal year 83 budget

2502
01:38:49,510 --> 01:38:47,600
he did offer support and encouragement

2503
01:38:51,669 --> 01:38:49,520
for issa to pursue a single spacecraft

2504
01:38:53,590 --> 01:38:51,679
mission in which nasa would fulfill any

2505
01:38:54,870 --> 01:38:53,600
remaining commitments

2506
01:38:57,030 --> 01:38:54,880
by the end of the year the dual

2507
01:39:01,189 --> 01:38:57,040
spacecraft ispm mission was officially

2508
01:39:05,669 --> 01:39:03,430
despite the cancellation of the us craft

2509
01:39:07,189 --> 01:39:05,679
esa decided to continue with the solar

2510
01:39:08,390 --> 01:39:07,199
polar probe

2511
01:39:10,629 --> 01:39:08,400
citing a

2512
01:39:13,189 --> 01:39:10,639
substantial commitment already made thus

2513
01:39:15,830 --> 01:39:13,199

far

2514
01:39:18,229 --> 01:39:15,840
in the early 1982 issa sought continued

2515
01:39:19,750 --> 01:39:18,239
assurance from nasa and congress

2516
01:39:21,830 --> 01:39:19,760
they also made a point to stress in

2517
01:39:23,910 --> 01:39:21,840
their discussions

2518
01:39:25,510 --> 01:39:23,920
to develop

2519
01:39:28,149 --> 01:39:25,520
and establish a framework for future

2520
01:39:29,830 --> 01:39:28,159
cooperative ventures

2521
01:39:31,990 --> 01:39:29,840
the start of what johnson freeze

2522
01:39:33,990 --> 01:39:32,000
characterizes as a strategy that all as

2523
01:39:36,229 --> 01:39:34,000
a strategy that ultimately made east a

2524
01:39:40,870 --> 01:39:36,239
stronger autonomous and more independent

2525
01:39:46,550 --> 01:39:43,510
moreover in july 1984 issa announced the

2526
01:39:47,910 --> 01:39:46,560
renaming of ispm to ulysses

2527
01:39:49,830 --> 01:39:47,920
while they suggested the name change

2528
01:39:51,830 --> 01:39:49,840
which was chosen to reflect the hero in

2529
01:39:53,830 --> 01:39:51,840
the odyssey and a reference to dante's

2530
01:39:55,430 --> 01:39:53,840
inferno perhaps this name change also

2531
01:39:58,149 --> 01:39:55,440
reflects a long arduous journey of

2532
01:39:58,159 --> 01:40:03,030
while it was scheduled

2533
01:40:06,709 --> 01:40:04,950
while the ulysses was originally

2534
01:40:09,350 --> 01:40:06,719
scheduled to be launched in 1980s in may

2535
01:40:12,870 --> 01:40:09,360
1986 aboard the space shuttle

2536
01:40:14,629 --> 01:40:12,880
the challenger the challenger accident

2537
01:40:15,510 --> 01:40:14,639
delayed further

2538
01:40:17,109 --> 01:40:15,520

launch

2539
01:40:19,270 --> 01:40:17,119
indefinitely

2540
01:40:20,790 --> 01:40:19,280
a new launch date was eventually chosen

2541
01:40:22,950 --> 01:40:20,800
after the restoration of the shuttle

2542
01:40:29,830 --> 01:40:22,960
program and ulysses was finally launched

2543
01:40:33,669 --> 01:40:31,430
so what makes the history of ulysses

2544
01:40:35,270 --> 01:40:33,679
transnational to start i would like to

2545
01:40:37,590 --> 01:40:35,280
suggest that the main technological

2546
01:40:39,830 --> 01:40:37,600
component the spacecraft itself is an

2547
01:40:41,669 --> 01:40:39,840
example of a transnational object by

2548
01:40:43,510 --> 01:40:41,679
this i mean that the mission and the

2549
01:40:45,350 --> 01:40:43,520
spacecraft was negotiated along

2550
01:40:47,270 --> 01:40:45,360
transnational lines in which a host of

2551
01:40:49,669 --> 01:40:47,280
actors and institutions helped to shape

2552
01:40:51,430 --> 01:40:49,679
the technological component itself

2553
01:40:53,030 --> 01:40:51,440
that is its development into what it

2554
01:40:54,870 --> 01:40:53,040
eventually became was a result of a

2555
01:40:56,870 --> 01:40:54,880
number of different factors in lines of

2556
01:41:02,310 --> 01:40:56,880
cooperation from both european and

2557
01:41:05,590 --> 01:41:03,590
finally i would like to conclude with

2558
01:41:07,430 --> 01:41:05,600
another aspect of ulysses history that

2559
01:41:08,550 --> 01:41:07,440
benefits from this perspective

2560
01:41:10,070 --> 01:41:08,560
the approach that i have taken

2561
01:41:11,270 --> 01:41:10,080
highlights the changing meanings and

2562
01:41:13,590 --> 01:41:11,280
imaginings of cooperation and

2563
01:41:15,590 --> 01:41:13,600

collaboration between the various actors

2564
01:41:17,830 --> 01:41:15,600
and organizations such as the number of

2565
01:41:19,270 --> 01:41:17,840
individuals at nasa and esa as well as a

2566
01:41:20,390 --> 01:41:19,280
number of scientific and engineering

2567
01:41:22,149 --> 01:41:20,400
communities

2568
01:41:24,629 --> 01:41:22,159
it seems at different times different

2569
01:41:26,390 --> 01:41:24,639
individuals saw different sets of values

2570
01:41:29,830 --> 01:41:26,400
or perhaps no value at all in

2571
01:41:31,430 --> 01:41:29,840
cooperation on an auto ecliptic mission

2572
01:41:33,109 --> 01:41:31,440
furthermore ulysses provides an

2573
01:41:35,189 --> 01:41:33,119
interesting case study for such an

2574
01:41:36,950 --> 01:41:35,199
analysis as it complicates the nature of

2575
01:41:38,709 --> 01:41:36,960
cooperation in the sense that it was a

2576
01:41:40,550 --> 01:41:38,719
failed project as its original

2577
01:41:41,990 --> 01:41:40,560
conception as a dual spacecraft mission

2578
01:41:44,070 --> 01:41:42,000
dissolved

2579
01:41:45,590 --> 01:41:44,080
yet while the original vision of cooper

2580
01:41:48,550 --> 01:41:45,600
the original vision of a cooperative

2581
01:41:50,709 --> 01:41:48,560
ispm mission failed the project lived on

2582
01:41:52,149 --> 01:41:50,719
both in the sense that

2583
01:41:53,430 --> 01:41:52,159
actual material object was created

2584
01:42:00,470 --> 01:41:53,440
ulysses

2585
01:42:01,990 --> 01:42:00,480
in a different form

2586
01:42:04,709 --> 01:42:02,000
in this light i would like to ask the

2587
01:42:06,229 --> 01:42:04,719
question what exactly is a failure

2588
01:42:08,310 --> 01:42:06,239

while the ispm mission was never

2589
01:42:09,590 --> 01:42:08,320
launched some form of an oee mission did

2590
01:42:11,830 --> 01:42:09,600
eventually make its journey around

2591
01:42:13,109 --> 01:42:11,840
jupiter and towards the sun while i do

2592
01:42:15,590 --> 01:42:13,119
not think i can provide a concrete

2593
01:42:17,990 --> 01:42:15,600
historical answer as of yet i think in

2594
01:42:19,430 --> 01:42:18,000
reframing ulysses in this way

2595
01:42:21,270 --> 01:42:19,440
hopefully i can tease out some of the

2596
01:42:23,350 --> 01:42:21,280
more interesting and nuanced aspects

2597
01:42:25,109 --> 01:42:23,360
involved in failure more generally in

2598
01:42:26,830 --> 01:42:25,119
space exploration and cooperative

2599
01:42:28,950 --> 01:42:26,840
ventures in space

2600
01:42:31,109 --> 01:42:28,960
exploration so to conclude hopefully

2601
01:42:32,790 --> 01:42:31,119
i've demonstrated why and how adopting a

2602
01:42:34,950 --> 01:42:32,800
transnational perspective might enrich

2603
01:42:36,550 --> 01:42:34,960
our understanding of international of

2604
01:42:38,470 --> 01:42:36,560
international cooperation and space

2605
01:42:40,229 --> 01:42:38,480
exploration more generally while i've

2606
01:42:41,910 --> 01:42:40,239
only scratched the surface in this paper

2607
01:42:43,189 --> 01:42:41,920
i believe that ultimately adopting this

2608
01:42:44,870 --> 01:42:43,199
perspective

2609
01:42:46,229 --> 01:42:44,880
might help us understand the multiple

2610
01:42:48,390 --> 01:42:46,239
imagine and varying meanings of

2611
01:43:04,310 --> 01:42:48,400
collaboration constructed by both nasa

2612
01:43:04,320 --> 01:43:18,629
questions

2613
01:43:18,639 --> 01:43:27,430

thank you

2614
01:43:27,440 --> 01:43:30,470
encouragement

2615
01:43:34,550 --> 01:43:32,149
oh i'm sorry i can't see over here sure

2616
01:43:35,750 --> 01:43:34,560
go ahead no worries

2617
01:43:37,510 --> 01:43:35,760
thank you yeah this is for the last

2618
01:43:38,470 --> 01:43:37,520
speaker thank you for the fantastic

2619
01:43:40,070 --> 01:43:38,480
presentation

2620
01:43:41,669 --> 01:43:40,080
i wanted to ask a little bit or push a

2621
01:43:43,830 --> 01:43:41,679
little more allow you to expand a bit on

2622
01:43:45,189 --> 01:43:43,840
the notion of a transnational object

2623
01:43:47,189 --> 01:43:45,199
particularly as distinct from say a

2624
01:43:48,229 --> 01:43:47,199
boundary object and especially in the

2625
01:43:50,229 --> 01:43:48,239
light of

2626
01:43:51,990 --> 01:43:50,239
current trends in transnational theory

2627
01:43:53,590 --> 01:43:52,000
anthropology for example that would

2628
01:43:55,189 --> 01:43:53,600
inspire us to step away from any idea

2629
01:43:57,510 --> 01:43:55,199
that nation states are necessarily the

2630
01:43:59,350 --> 01:43:57,520
boundaries by means of which

2631
01:44:01,510 --> 01:43:59,360
national or transnational collaboration

2632
01:44:03,109 --> 01:44:01,520
should be understood and how that's

2633
01:44:04,390 --> 01:44:03,119
particularly tricky in the case of space

2634
01:44:06,390 --> 01:44:04,400
missions when you have these large

2635
01:44:08,229 --> 01:44:06,400
institutions that are bound up in

2636
01:44:10,709 --> 01:44:08,239
national frameworks but also especially

2637
01:44:12,550 --> 01:44:10,719
that represent national interests and

2638
01:44:14,149 --> 01:44:12,560

i'm wondering how looking at say the

2639
01:44:16,310 --> 01:44:14,159
ulysses

2640
01:44:18,709 --> 01:44:16,320
as a transnational object inspires us to

2641
01:44:21,350 --> 01:44:18,719
break apart perhaps our notions of the

2642
01:44:23,910 --> 01:44:21,360
singular um for example european space

2643
01:44:25,750 --> 01:44:23,920
agency etc

2644
01:44:27,590 --> 01:44:25,760
yeah so in the in the longer story i

2645
01:44:29,430 --> 01:44:27,600
didn't outline in the paper i mean in my

2646
01:44:30,870 --> 01:44:29,440
talk but in the paper um there are a lot

2647
01:44:33,510 --> 01:44:30,880
more discussions particularly about the

2648
01:44:34,390 --> 01:44:33,520
specific components one such thing was

2649
01:44:40,390 --> 01:44:34,400
the

2650
01:44:43,910 --> 01:44:40,400
and rtg was eventually used for ulysses

2651
01:44:46,149 --> 01:44:43,920
um but i i think that in focusing on

2652
01:44:47,910 --> 01:44:46,159
these discussions which which uh were

2653
01:44:49,910 --> 01:44:47,920
within the specific communities

2654
01:44:51,109 --> 01:44:49,920
themselves so they weren't necessarily

2655
01:44:52,950 --> 01:44:51,119
discussions

2656
01:44:54,390 --> 01:44:52,960
amongst administrators to administrator

2657
01:44:56,310 --> 01:44:54,400
but these were the different scientific

2658
01:44:57,510 --> 01:44:56,320
communities arguing well you know this

2659
01:44:59,830 --> 01:44:57,520
configuration is better this

2660
01:45:01,990 --> 01:44:59,840
configuration is worse or

2661
01:45:04,629 --> 01:45:02,000
something along those lines

2662
01:45:06,709 --> 01:45:04,639
i think of sort of prioritizing the sort

2663
01:45:08,950 --> 01:45:06,719

of top-down

2664
01:45:11,189 --> 01:45:08,960
few less and kind of teasing out these

2665
01:45:12,310 --> 01:45:11,199
these smaller kind of arrangements and

2666
01:45:14,310 --> 01:45:12,320
arguments

2667
01:45:15,510 --> 01:45:14,320
and discussions

2668
01:45:17,510 --> 01:45:15,520
it doesn't it won't necessarily

2669
01:45:19,590 --> 01:45:17,520
completely push out the national context

2670
01:45:21,030 --> 01:45:19,600
but it won't prioritize it as a kind of

2671
01:45:23,669 --> 01:45:21,040
major focus

2672
01:45:24,629 --> 01:45:23,679
right thank you

2673
01:45:26,950 --> 01:45:24,639
did the

2674
01:45:30,390 --> 01:45:26,960
clamps of the green bank telescope

2675
01:45:32,950 --> 01:45:30,400
create concerns at parks

2676
01:45:34,790 --> 01:45:32,960
uh the the the radio telescope the green

2677
01:45:37,990 --> 01:45:34,800
bank had the rather spectacular collapse

2678
01:45:39,350 --> 01:45:38,000
a few years ago from 1998 yes that one

2679
01:45:41,750 --> 01:45:39,360
yeah well that was actually that's a

2680
01:45:43,910 --> 01:45:41,760
good point because the the green bank i

2681
01:45:45,270 --> 01:45:43,920
think is the 120 foot telescope that

2682
01:45:47,910 --> 01:45:45,280
collapsed

2683
01:45:49,109 --> 01:45:47,920
was that was put together very rapidly

2684
01:45:50,070 --> 01:45:49,119
for a very

2685
01:45:53,109 --> 01:45:50,080
designed

2686
01:45:55,830 --> 01:45:53,119
to be used only for a very short period

2687
01:45:57,189 --> 01:45:55,840
and then but it was continually extended

2688
01:45:58,950 --> 01:45:57,199

of course and it was a transit

2689
01:46:01,590 --> 01:45:58,960
instrument and

2690
01:46:04,310 --> 01:46:01,600
it failed from metal fatigue and so on

2691
01:46:06,550 --> 01:46:04,320
um but the parks telescope was designed

2692
01:46:07,590 --> 01:46:06,560
to have a lifetime of about 20 or so

2693
01:46:09,350 --> 01:46:07,600
years and

2694
01:46:11,109 --> 01:46:09,360
last year we celebrated the 50th

2695
01:46:12,870 --> 01:46:11,119
anniversary and with the new upgrades

2696
01:46:15,109 --> 01:46:12,880
we're doing we're going to probably

2697
01:46:16,070 --> 01:46:15,119
continue for for many more years to to

2698
01:46:17,109 --> 01:46:16,080
come

2699
01:46:19,189 --> 01:46:17,119
um

2700
01:46:22,470 --> 01:46:19,199
but no i think a lot of the the users of

2701
01:46:24,310 --> 01:46:22,480
the parks telescope were users of of

2702
01:46:26,709 --> 01:46:24,320
the instruments at green bank the

2703
01:46:28,629 --> 01:46:26,719
national radio astronomy observatory in

2704
01:46:30,550 --> 01:46:28,639
west virginia and

2705
01:46:33,350 --> 01:46:30,560
there were always a lot of close ties

2706
01:46:36,390 --> 01:46:33,360
between the the two

2707
01:46:38,229 --> 01:46:36,400
radio astronomy communities and

2708
01:46:39,430 --> 01:46:38,239
i think at the time it came as a

2709
01:46:40,390 --> 01:46:39,440
profound

2710
01:46:43,990 --> 01:46:40,400
surprise

2711
01:46:45,510 --> 01:46:44,000
observer at the time

2712
01:46:47,590 --> 01:46:45,520
it just

2713
01:46:49,030 --> 01:46:47,600

he just was not expecting that i hope it

2714
01:46:53,510 --> 01:46:49,040
never happens to parks because the

2715
01:46:55,830 --> 01:46:55,030
so um

2716
01:47:01,030 --> 01:46:55,840
but

2717
01:47:04,070 --> 01:47:01,040
replacement of it the green the 110 foot

2718
01:47:05,430 --> 01:47:04,080
um green bank telescope is a magnificent

2719
01:47:08,070 --> 01:47:05,440
instrument you know

2720
01:47:10,149 --> 01:47:08,080
um and i certainly hope that

2721
01:47:12,310 --> 01:47:10,159
it's able to to continue i understand

2722
01:47:13,590 --> 01:47:12,320
that it's it's under some threat because

2723
01:47:16,629 --> 01:47:13,600
of the

2724
01:47:18,709 --> 01:47:16,639
reassessment of its funding and so on um

2725
01:47:20,229 --> 01:47:18,719
but it really is a magnificent

2726
01:47:23,189 --> 01:47:20,239
instrument the replacement for the one

2727
01:47:27,910 --> 01:47:23,199
that collapsed and um

2728
01:47:31,990 --> 01:47:30,070
yeah terence johnson uh this is just a

2729
01:47:33,270 --> 01:47:32,000
further comment for peter's excellent

2730
01:47:36,790 --> 01:47:33,280
study on the

2731
01:47:39,830 --> 01:47:36,800
ulysses um

2732
01:47:41,830 --> 01:47:39,840
international issues

2733
01:47:44,310 --> 01:47:41,840
and it's what i find interesting is

2734
01:47:46,470 --> 01:47:44,320
despite the natural angst which you've

2735
01:47:48,470 --> 01:47:46,480
described between the communities

2736
01:47:51,830 --> 01:47:48,480
involved because

2737
01:47:54,310 --> 01:47:51,840
everybody felt uh if not betrayed at

2738
01:47:57,189 --> 01:47:54,320

least not dealt with fairly by each

2739
01:47:59,430 --> 01:47:57,199
other's governments and so forth

2740
01:48:02,070 --> 01:47:59,440
within a few years we were actually

2741
01:48:04,070 --> 01:48:02,080
cooperating as you point out on a number

2742
01:48:06,149 --> 01:48:04,080
of things interestingly enough one of

2743
01:48:07,910 --> 01:48:06,159
the most important cooperations was on

2744
01:48:09,590 --> 01:48:07,920
the return to flight

2745
01:48:10,709 --> 01:48:09,600
launch schedules

2746
01:48:13,830 --> 01:48:10,719
because

2747
01:48:16,709 --> 01:48:13,840
as they got the shuttle going again

2748
01:48:18,229 --> 01:48:16,719
both galileo and ulysses wanted to

2749
01:48:20,310 --> 01:48:18,239
launch in the same opportunity they're

2750
01:48:23,270 --> 01:48:20,320
going to the same place jupiter

2751
01:48:24,629 --> 01:48:23,280
so that so the windows were the same

2752
01:48:26,550 --> 01:48:24,639
and as

2753
01:48:28,709 --> 01:48:26,560
it turned out it fell to peter wenzel

2754
01:48:30,950 --> 01:48:28,719
who was the project scientist for

2755
01:48:33,270 --> 01:48:30,960
ulysses and myself to work with our

2756
01:48:35,270 --> 01:48:33,280
individual project science groups to try

2757
01:48:37,590 --> 01:48:35,280
to develop the arguments as to who

2758
01:48:39,830 --> 01:48:37,600
should go first because admiral truly

2759
01:48:41,910 --> 01:48:39,840
said i can't launch you both in the same

2760
01:48:44,149 --> 01:48:41,920
month that puts too much risk on getting

2761
01:48:45,189 --> 01:48:44,159
you guys back into space

2762
01:48:47,270 --> 01:48:45,199
and

2763
01:48:49,669 --> 01:48:47,280

we did that very amicably with both of

2764
01:48:51,750 --> 01:48:49,679
our psgs having people both from europe

2765
01:48:53,910 --> 01:48:51,760
and the us on it and so forth so that's

2766
01:48:56,149 --> 01:48:53,920
another example of how that

2767
01:48:59,270 --> 01:48:56,159
the uh sort of the the

2768
01:49:01,510 --> 01:48:59,280
uh international uh gestalt if you will

2769
01:49:03,510 --> 01:49:01,520
that was was developed on on this in

2770
01:49:05,430 --> 01:49:03,520
spite of the stresses

2771
01:49:08,629 --> 01:49:05,440
ended up coming up with an amicable

2772
01:49:12,870 --> 01:49:10,629
the interesting thing aspects about this

2773
01:49:15,030 --> 01:49:12,880
story is despite all of these sort of

2774
01:49:17,669 --> 01:49:15,040
conflicts involved

2775
01:49:19,350 --> 01:49:17,679
things do happen things did happen and

2776
01:49:20,310 --> 01:49:19,360
seemingly

2777
01:49:23,350 --> 01:49:20,320
you know

2778
01:49:24,149 --> 01:49:23,360
in the early 80s issa kind of really saw

2779
01:49:28,470 --> 01:49:24,159
the

2780
01:49:30,229 --> 01:49:28,480
spacecraft as

2781
01:49:32,070 --> 01:49:30,239
to them it was a big deal as a kind of a

2782
01:49:33,430 --> 01:49:32,080
breach of an agreement almost as if they

2783
01:49:35,189 --> 01:49:33,440
would breach any other treat uh

2784
01:49:37,669 --> 01:49:35,199
political treaty

2785
01:49:40,870 --> 01:49:37,679
but despite all of that you know

2786
01:49:46,470 --> 01:49:42,470
yes okay

2787
01:49:48,390 --> 01:49:46,480
uh mr burke i would uh appreciate your

2788
01:49:50,390 --> 01:49:48,400

insight as to the

2789
01:49:53,030 --> 01:49:50,400
role or the effect that the apollo

2790
01:49:55,270 --> 01:49:53,040
program had on ranger

2791
01:49:58,870 --> 01:49:55,280
you've already indicated the reduction

2792
01:50:00,709 --> 01:49:58,880
to just the tv as the payload

2793
01:50:02,629 --> 01:50:00,719
but

2794
01:50:03,510 --> 01:50:02,639
i would be very interested to know if

2795
01:50:04,310 --> 01:50:03,520
there were

2796
01:50:06,790 --> 01:50:04,320
other

2797
01:50:09,109 --> 01:50:06,800
reasons for that related to apollo

2798
01:50:12,629 --> 01:50:09,119
especially

2799
01:50:15,669 --> 01:50:13,669
had

2800
01:50:17,189 --> 01:50:15,679
some effect on

2801
01:50:20,870 --> 01:50:17,199
ranger uh

2802
01:50:22,629 --> 01:50:20,880
primarily an indirect effect of

2803
01:50:25,350 --> 01:50:22,639
causing the

2804
01:50:28,390 --> 01:50:25,360
community interested in ranger

2805
01:50:31,830 --> 01:50:28,400
boss at jpl and the scientists

2806
01:50:37,430 --> 01:50:36,070
really really wanted some success

2807
01:50:38,390 --> 01:50:37,440
and that's why

2808
01:50:41,830 --> 01:50:38,400
the

2809
01:50:43,109 --> 01:50:41,840
uh block of four rangers six seven eight

2810
01:50:45,510 --> 01:50:43,119
and nine

2811
01:50:48,149 --> 01:50:45,520
had the much simplified objective of not

2812
01:50:50,709 --> 01:50:48,159
trying to land on the moon stop and have

2813
01:50:51,830 --> 01:50:50,719

a seismometer there but just go on and

2814
01:50:52,709 --> 01:50:51,840
crash

2815
01:50:55,430 --> 01:50:52,719
with

2816
01:50:57,910 --> 01:50:55,440
the television on the way in

2817
01:50:58,870 --> 01:50:57,920
simplifying the objective

2818
01:51:01,030 --> 01:50:58,880
uh

2819
01:51:02,950 --> 01:51:01,040
just changing the payload leaving the

2820
01:51:04,870 --> 01:51:02,960
bus the same you see

2821
01:51:07,270 --> 01:51:04,880
simplifying the objective by putting the

2822
01:51:09,910 --> 01:51:07,280
rca camera payload on

2823
01:51:12,629 --> 01:51:09,920
instead of the more complicated

2824
01:51:15,030 --> 01:51:12,639
objective of a retro rocket a radar

2825
01:51:17,270 --> 01:51:15,040
trigger a ball it has to survive

2826
01:51:18,070 --> 01:51:17,280
etcetera all the things that soviets did

2827
01:51:22,149 --> 01:51:18,080
with

2828
01:51:24,229 --> 01:51:22,159
luna 9 eventually in 1966

2829
01:51:25,669 --> 01:51:24,239
simplifying the objective

2830
01:51:28,149 --> 01:51:25,679
in the attempt

2831
01:51:30,790 --> 01:51:28,159
to get a success

2832
01:51:33,350 --> 01:51:30,800
was the number one priority the number

2833
01:51:35,750 --> 01:51:33,360
two priority was to

2834
01:51:37,030 --> 01:51:35,760
get some images that might be useful for

2835
01:51:37,830 --> 01:51:37,040
apollo

2836
01:51:39,990 --> 01:51:37,840
but

2837
01:51:41,830 --> 01:51:40,000
images can't really tell you what you

2838
01:51:43,830 --> 01:51:41,840

really want to know is is the thing

2839
01:51:44,629 --> 01:51:43,840
going to sink in

2840
01:51:49,910 --> 01:51:44,639
or

2841
01:51:52,950 --> 01:51:49,920
ranger

2842
01:51:54,709 --> 01:51:52,960
did move its objectives towards support

2843
01:51:57,189 --> 01:51:54,719
of apollo

2844
01:51:59,669 --> 01:51:57,199
but it couldn't really go very far

2845
01:52:01,350 --> 01:51:59,679
taking pictures on the way in is all you

2846
01:52:03,990 --> 01:52:01,360
can do

2847
01:52:05,750 --> 01:52:04,000
and yes we got three beautiful successes

2848
01:52:08,709 --> 01:52:05,760
with thousands and thousands of good

2849
01:52:11,430 --> 01:52:08,719
images whether the apollo

2850
01:52:15,990 --> 01:52:11,440
designers paid any attention to those

2851
01:52:20,550 --> 01:52:18,070
so in listening to all the talks what

2852
01:52:21,669 --> 01:52:20,560
what strikes me is that perhaps things

2853
01:52:24,149 --> 01:52:21,679
in the past

2854
01:52:25,589 --> 01:52:24,159
aren't as different as they are today it

2855
01:52:28,229 --> 01:52:25,599
sounds like that

2856
01:52:30,629 --> 01:52:28,239
in in each case there were

2857
01:52:33,350 --> 01:52:30,639
there were technical issues going on

2858
01:52:35,189 --> 01:52:33,360
that were running into political issues

2859
01:52:37,109 --> 01:52:35,199
and political cycles that were running

2860
01:52:39,270 --> 01:52:37,119
on time scales that were much shorter

2861
01:52:41,830 --> 01:52:39,280
than the technical ones

2862
01:52:43,589 --> 01:52:41,840
and so i guess i'm just wondering i mean

2863
01:52:45,589 --> 01:52:43,599

right now we're looking with with the

2864
01:52:47,189 --> 01:52:45,599
planetary budget here in the u.s has

2865
01:52:49,589 --> 01:52:47,199
already precipitated

2866
01:52:52,229 --> 01:52:49,599
uh new issues with uh

2867
01:52:53,589 --> 01:52:52,239
cooperation with esa not terribly unlike

2868
01:52:56,310 --> 01:52:53,599
what happened with

2869
01:52:58,070 --> 01:52:56,320
ulysses and we've got

2870
01:53:00,310 --> 01:52:58,080
we've either gotten going out of

2871
01:53:02,550 --> 01:53:00,320
business sale or we've got a bump in the

2872
01:53:04,470 --> 01:53:02,560
road uh depending upon how things come

2873
01:53:06,629 --> 01:53:04,480
out sort of like what had happened with

2874
01:53:08,870 --> 01:53:06,639
uh perhaps with the discovery program

2875
01:53:10,709 --> 01:53:08,880
and i'm just wondering you know

2876
01:53:13,350 --> 01:53:10,719
hopefully history is good because it

2877
01:53:15,669 --> 01:53:13,360
helps to inform the future and

2878
01:53:18,470 --> 01:53:15,679
i'm just wondering if if perhaps all of

2879
01:53:19,589 --> 01:53:18,480
you might comment a little bit on

2880
01:53:21,430 --> 01:53:19,599
you know

2881
01:53:22,870 --> 01:53:21,440
what are the real lessons that we

2882
01:53:25,270 --> 01:53:22,880
perhaps should have learned from all

2883
01:53:26,950 --> 01:53:25,280
this and and how can that those perhaps

2884
01:53:29,030 --> 01:53:26,960
help to inform us of

2885
01:53:31,030 --> 01:53:29,040
what perhaps we should be doing to uh to

2886
01:53:34,550 --> 01:53:31,040
keep going forward with all the physical

2887
01:53:38,870 --> 01:53:36,310
you know it's historians i guess we

2888
01:53:41,270 --> 01:53:38,880

never really want to talk about

2889
01:53:42,790 --> 01:53:41,280
predicting or influencing the future

2890
01:53:44,229 --> 01:53:42,800
we're mostly interested in explaining

2891
01:53:46,870 --> 01:53:44,239
the past

2892
01:53:48,390 --> 01:53:46,880
but clearly we've you know seen and met

2893
01:53:49,990 --> 01:53:48,400
multiple papers throughout this

2894
01:53:52,070 --> 01:53:50,000
conference that

2895
01:53:55,270 --> 01:53:52,080
the issue of budgetary cycles of

2896
01:53:57,109 --> 01:53:55,280
political uh political changes means

2897
01:53:58,870 --> 01:53:57,119
that you have to very much put the

2898
01:54:00,070 --> 01:53:58,880
current crisis in perspective and

2899
01:54:02,470 --> 01:54:00,080
realize

2900
01:54:05,510 --> 01:54:02,480
that that your problems aren't new at

2901
01:54:07,910 --> 01:54:05,520
all in most cases simply really almost

2902
01:54:09,030 --> 01:54:07,920
nothing new it's more more of a cyclical

2903
01:54:10,550 --> 01:54:09,040
nature

2904
01:54:12,629 --> 01:54:10,560
um

2905
01:54:15,109 --> 01:54:12,639
that's not a very good answer to your to

2906
01:54:17,750 --> 01:54:15,119
your question because i

2907
01:54:19,990 --> 01:54:17,760
lessons learned uh

2908
01:54:23,030 --> 01:54:20,000
probably it's useful for the actors and

2909
01:54:25,430 --> 01:54:23,040
the participants to just be conscious of

2910
01:54:27,910 --> 01:54:25,440
of this this larger context in which

2911
01:54:29,350 --> 01:54:27,920
they operate

2912
01:54:32,390 --> 01:54:29,360
i might

2913
01:54:33,990 --> 01:54:32,400

follow that in a little bit

2914
01:54:36,629 --> 01:54:34,000
different direction but i think it's

2915
01:54:39,030 --> 01:54:36,639
related they

2916
01:54:41,350 --> 01:54:39,040
the difficulty on ranger

2917
01:54:43,830 --> 01:54:41,360
that caused me to be replaced by bud

2918
01:54:45,990 --> 01:54:43,840
shermeyer my good friend

2919
01:54:50,070 --> 01:54:46,000
originated really

2920
01:54:52,310 --> 01:54:50,080
not with the five consecutive failures

2921
01:54:53,750 --> 01:54:52,320
over which i presided

2922
01:54:55,750 --> 01:54:53,760
but rather

2923
01:54:58,629 --> 01:54:55,760
with the attempt

2924
01:54:59,990 --> 01:54:58,639
by members of the scientific community

2925
01:55:01,270 --> 01:55:00,000
to

2926
01:55:02,950 --> 01:55:01,280
add

2927
01:55:04,390 --> 01:55:02,960
space physics

2928
01:55:05,830 --> 01:55:04,400
experiments

2929
01:55:08,229 --> 01:55:05,840
eight of them

2930
01:55:10,229 --> 01:55:08,239
on board rangers at a time when we were

2931
01:55:13,750 --> 01:55:10,239
in big trouble already

2932
01:55:16,070 --> 01:55:13,760
and uh my version of it is look we're

2933
01:55:18,950 --> 01:55:16,080
trying to do something about the moon

2934
01:55:21,109 --> 01:55:18,960
space physics is wonderful go do some

2935
01:55:23,189 --> 01:55:21,119
experiments on a spacecraft that's more

2936
01:55:25,350 --> 01:55:23,199
appropriately suited to that one that

2937
01:55:26,950 --> 01:55:25,360
stays out there and goes around and does

2938
01:55:29,669 --> 01:55:26,960

things and of course nowadays there are

2939
01:55:31,669 --> 01:55:29,679
hundreds of them doing beautiful space

2940
01:55:33,990 --> 01:55:31,679
physics in the magnetosphere and all the

2941
01:55:36,870 --> 01:55:34,000
way out to the voyagers to the edge of

2942
01:55:39,189 --> 01:55:36,880
the heliosphere so space physics is

2943
01:55:40,149 --> 01:55:39,199
being richly served

2944
01:55:42,390 --> 01:55:40,159
now

2945
01:55:44,390 --> 01:55:42,400
but adding them to the rangers at the

2946
01:55:45,350 --> 01:55:44,400
time when we were already in terrific

2947
01:55:47,990 --> 01:55:45,360
trouble

2948
01:55:50,149 --> 01:55:48,000
was something i just didn't want to do

2949
01:55:52,950 --> 01:55:50,159
and remember i still thought the project

2950
01:55:54,550 --> 01:55:52,960
manager had a lot more authority than

2951
01:55:59,109 --> 01:55:54,560
i really did have

2952
01:56:01,189 --> 01:55:59,119
so i pushed back at nasa very hard

2953
01:56:03,669 --> 01:56:01,199
that might have been

2954
01:56:05,589 --> 01:56:03,679
a strong contributor to the capsize of

2955
01:56:07,189 --> 01:56:05,599
the project and the replacement of the

2956
01:56:10,070 --> 01:56:07,199
project manager

2957
01:56:12,390 --> 01:56:10,080
uh argument between those communities

2958
01:56:15,270 --> 01:56:12,400
interestingly enough

2959
01:56:18,870 --> 01:56:15,280
and mr neufeld's paper

2960
01:56:20,870 --> 01:56:18,880
that exact same dispute erupted again

2961
01:56:23,030 --> 01:56:20,880
during the discussion of

2962
01:56:25,189 --> 01:56:23,040
near and the other missions

2963
01:56:28,390 --> 01:56:25,199

uh between the space physics community

2964
01:56:29,750 --> 01:56:28,400
and the planetary geology etc

2965
01:56:31,189 --> 01:56:29,760
at that stage it wasn't so much a

2966
01:56:33,430 --> 01:56:31,199
contest

2967
01:56:35,430 --> 01:56:33,440
anymore it was more about different

2968
01:56:37,510 --> 01:56:35,440
communities operating in differing

2969
01:56:38,709 --> 01:56:37,520
worlds and not actually communicating

2970
01:56:40,870 --> 01:56:38,719
that's it

2971
01:56:43,589 --> 01:56:40,880
i mean you know corridor says i was

2972
01:56:45,990 --> 01:56:43,599
amazed that the uh planetary scientists

2973
01:56:48,550 --> 01:56:46,000
didn't know anything about explorer as

2974
01:56:51,910 --> 01:56:48,560
you know a famous name in in the history

2975
01:56:54,070 --> 01:56:51,920
of of uh her satellite uh

2976
01:56:55,510 --> 01:56:54,080
a wonderful development general yeah i

2977
01:56:57,350 --> 01:56:55,520
hate to interrupt but we have two more

2978
01:56:59,589 --> 01:56:57,360
questions that if we can get them in

2979
01:57:01,109 --> 01:56:59,599
very quickly with a quick response

2980
01:57:03,910 --> 01:57:01,119
well i'm following up on ralph's

2981
01:57:05,669 --> 01:57:03,920
question which you you commented that uh

2982
01:57:07,109 --> 01:57:05,679
you know that we've been through these

2983
01:57:09,430 --> 01:57:07,119
ebbs and flows before and there's

2984
01:57:11,750 --> 01:57:09,440
nothing new under the sun in this in a

2985
01:57:14,550 --> 01:57:11,760
sense uh however when i've talked with

2986
01:57:16,790 --> 01:57:14,560
some of the folks from the early days

2987
01:57:19,189 --> 01:57:16,800
when uh when things really looked dire

2988
01:57:20,709 --> 01:57:19,199

this was back in the early 80s i mean

2989
01:57:22,870 --> 01:57:20,719
people like lou friedman i don't know if

2990
01:57:24,790 --> 01:57:22,880
lou's still here right now i've said

2991
01:57:27,109 --> 01:57:24,800
well how do things compare today on the

2992
01:57:29,270 --> 01:57:27,119
planetary the risks of the planetary

2993
01:57:31,350 --> 01:57:29,280
program future uh compared with that and

2994
01:57:33,990 --> 01:57:31,360
he said he thinks that it's much worse

2995
01:57:37,510 --> 01:57:34,000
that it's a much more dire situation

2996
01:57:39,750 --> 01:57:37,520
potentially so as a historian can you

2997
01:57:42,070 --> 01:57:39,760
help us mine from the lessons of the

2998
01:57:43,990 --> 01:57:42,080
past what are maybe some of the key

2999
01:57:45,589 --> 01:57:44,000
things that we ought to be doing today

3000
01:57:47,189 --> 01:57:45,599
in order to make sure that we don't

3001
01:57:48,310 --> 01:57:47,199
suffer the faith that we could be

3002
01:57:50,070 --> 01:57:48,320
suffering

3003
01:57:51,510 --> 01:57:50,080
the second person asked me to help you

3004
01:57:53,510 --> 01:57:51,520
do the future

3005
01:57:55,030 --> 01:57:53,520
and and i don't feel like i'm asking you

3006
01:57:56,950 --> 01:57:55,040
to look into the past and see what

3007
01:57:58,550 --> 01:57:56,960
things worked in the past and just share

3008
01:57:59,910 --> 01:57:58,560
those what were the things that really

3009
01:58:01,510 --> 01:57:59,920
helped turn things around i mean

3010
01:58:03,990 --> 01:58:01,520
actually john lawson would be the better

3011
01:58:07,750 --> 01:58:04,000
person to talk about the the survival

3012
01:58:09,910 --> 01:58:07,760
crisis of the early 80s than i would but

3013
01:58:11,109 --> 01:58:09,920

you know clearly having a program of

3014
01:58:13,669 --> 01:58:11,119
missions

3015
01:58:15,589 --> 01:58:13,679
discovery is a good model in many ways

3016
01:58:18,149 --> 01:58:15,599
for having a line and a program a

3017
01:58:19,669 --> 01:58:18,159
consistent direction

3018
01:58:21,910 --> 01:58:19,679
it's harder to sustain something like

3019
01:58:23,910 --> 01:58:21,920
that with the huge flagship programs you

3020
01:58:25,830 --> 01:58:23,920
can only afford a multi-billion dollar

3021
01:58:28,070 --> 01:58:25,840
program every once in a while so it's

3022
01:58:29,270 --> 01:58:28,080
much harder to keep a sustained project

3023
01:58:30,790 --> 01:58:29,280
like that

3024
01:58:32,149 --> 01:58:30,800
obviously there has to be considerable

3025
01:58:33,109 --> 01:58:32,159
attention to

3026
01:58:35,189 --> 01:58:33,119
to

3027
01:58:36,950 --> 01:58:35,199
convincing the political establishment

3028
01:58:38,790 --> 01:58:36,960
that there's still important new

3029
01:58:40,790 --> 01:58:38,800
information to come out of this but

3030
01:58:42,470 --> 01:58:40,800
often it boils down to as in the case of

3031
01:58:44,550 --> 01:58:42,480
tom cremejs i'm sure that barbara

3032
01:58:47,109 --> 01:58:44,560
mikulski believed the science coming out

3033
01:58:48,229 --> 01:58:47,119
of apl and goddard and space telescope

3034
01:58:50,229 --> 01:58:48,239
science institute the maryland

3035
01:58:51,510 --> 01:58:50,239
institutions were great but her first

3036
01:58:53,270 --> 01:58:51,520
concern was

3037
01:58:55,510 --> 01:58:53,280
you know high paying jobs in maryland

3038
01:58:57,669 --> 01:58:55,520

keep them keep them there and so

3039
01:58:59,750 --> 01:58:57,679
obviously often this boils down to going

3040
01:59:02,790 --> 01:58:59,760
back to politicians and arguing for

3041
01:59:04,709 --> 01:59:02,800
sustaining institutions that are

3042
01:59:07,750 --> 01:59:04,719
contributing a lot to the economy and

3043
01:59:10,790 --> 01:59:07,760
science is a nice byproduct of that of

3044
01:59:14,950 --> 01:59:12,790
okay well i'm going to commit one of the

3045
01:59:16,790 --> 01:59:14,960
things i don't the sin that i don't

3046
01:59:19,270 --> 01:59:16,800
condone which is i'm gonna comment more

3047
01:59:22,070 --> 01:59:19,280
than question but um you know i'm gonna

3048
01:59:24,870 --> 01:59:22,080
dispute what what greg said and also

3049
01:59:26,709 --> 01:59:24,880
somewhat the premise of ralph uh ralph

3050
01:59:29,430 --> 01:59:26,719
mcnutt there and i think there is a

3051
01:59:30,870 --> 01:59:29,440
fundamental difference today than the

3052
01:59:33,430 --> 01:59:30,880
past you know there's a number of

3053
01:59:35,030 --> 01:59:33,440
sayings about um you know those who fail

3054
01:59:36,550 --> 01:59:35,040
to learn from history are condemned to

3055
01:59:37,910 --> 01:59:36,560
repeat it and then there's a saying that

3056
01:59:40,310 --> 01:59:37,920
you know history doesn't repeat itself

3057
01:59:43,030 --> 01:59:40,320
but it rhymes you know but i think there

3058
01:59:44,310 --> 01:59:43,040
is a certain you know we have learned

3059
01:59:47,350 --> 01:59:44,320
things there are things that are

3060
01:59:48,550 --> 01:59:47,360
different today than what than back uh

3061
01:59:50,390 --> 01:59:48,560
in the period than a number of these

3062
01:59:53,109 --> 01:59:50,400
people were talking about you know we

3063
01:59:55,910 --> 01:59:53,119

have a decadal survey now we did not

3064
01:59:57,990 --> 01:59:55,920
have that that process and i i'm a big

3065
02:00:00,390 --> 01:59:58,000
believer in that process having seen it

3066
02:00:03,270 --> 02:00:00,400
work i think it has credibility i think

3067
02:00:05,350 --> 02:00:03,280
it has credit external credibility um to

3068
02:00:07,510 --> 02:00:05,360
important political constituencies and

3069
02:00:10,470 --> 02:00:07,520
then we have program lines like

3070
02:00:12,709 --> 02:00:10,480
discovery like new frontiers

3071
02:00:14,310 --> 02:00:12,719
i think that one of the the the big

3072
02:00:17,270 --> 02:00:14,320
difference another big difference that

3073
02:00:18,310 --> 02:00:17,280
we have is you are less likely to see

3074
02:00:21,430 --> 02:00:18,320
today

3075
02:00:23,350 --> 02:00:21,440
the the big gaps in exploration programs

3076
02:00:25,350 --> 02:00:23,360
that we saw in the past i mean how long

3077
02:00:27,830 --> 02:00:25,360
did we go between mars missions how long

3078
02:00:29,750 --> 02:00:27,840
do we go between lunar missions and now

3079
02:00:30,870 --> 02:00:29,760
those things are much more

3080
02:00:33,270 --> 02:00:30,880
uh

3081
02:00:35,270 --> 02:00:33,280
included in discovery they're included

3082
02:00:37,350 --> 02:00:35,280
in other program lines and and it seems

3083
02:00:39,109 --> 02:00:37,360
like uh you know

3084
02:00:41,589 --> 02:00:39,119
i i know you guys rely on your

3085
02:00:43,750 --> 02:00:41,599
day-to-day existence upon um you know

3086
02:00:45,030 --> 02:00:43,760
new programs coming along but but i

3087
02:00:45,830 --> 02:00:45,040
think that there's

3088
02:00:46,629 --> 02:00:45,840

you know

3089
02:00:50,390 --> 02:00:46,639
uh

3090
02:00:51,189 --> 02:00:50,400
i do see a certain progressive um trend

3091
02:00:52,950 --> 02:00:51,199
in

3092
02:00:54,470 --> 02:00:52,960
you know what has happened that we've

3093
02:00:56,229 --> 02:00:54,480
learned from some of these

3094
02:00:58,070 --> 02:00:56,239
these errors and doesn't mean we're not

3095
02:01:05,990 --> 02:00:58,080
going to commit the mistake again but

3096
02:01:10,709 --> 02:01:08,310
my last line is that perhaps our

3097
02:01:12,629 --> 02:01:10,719
troubles were a necessary step in the

3098
02:01:14,950 --> 02:01:12,639
evolution toward the harmony that we

3099
02:01:16,470 --> 02:01:14,960
have today

3100
02:01:18,950 --> 02:01:16,480
and that that sounds like a good way to

3101
02:01:20,629 --> 02:01:18,960
go take a break all right uh thank you

3102
02:01:22,310 --> 02:01:20,639
all so very much to joan for bringing an

3103
02:01:24,149 --> 02:01:22,320
uh real well-timed panel because we're

3104
02:01:26,390 --> 02:01:24,159
on time as we go into our break remember

3105
02:01:27,910 --> 02:01:26,400
to be back here at 3 15