1
00:00:06,389 --> 00:00:04,070
i know the breaks are one of the fun

2
00:00:08,070 --> 00:00:06,399
part of these conferences but uh we're

3
00:00:09,750 --> 00:00:08,080
on a pretty tight schedule this morning

4
00:00:12,470 --> 00:00:09,760
at least because we have to conclude by

5
00:00:17,590 --> 00:00:12,480
11 45 so you can listen to jim green's

6
00:00:21,269 --> 00:00:19,590
so i hope that the folks who are outside

7
00:00:24,390 --> 00:00:21,279
getting their coffee will come back in

8
00:00:27,750 --> 00:00:25,429
but i think that we're going to get

9
00:00:30,150 --> 00:00:27,760
underway uh we have a very exciting

10
00:00:32,150 --> 00:00:30,160
panel coming up there are four excellent

11
00:00:34,630 --> 00:00:32,160
papers that are going to be given

12
00:00:36,229 --> 00:00:34,640
and uh it's a two hour panel discussion

13
00:00:38,069 --> 00:00:36,239

there's no break in this panel

14
00:00:40,389 --> 00:00:38,079
discussion either i regret so if you

15
00:00:42,790 --> 00:00:40,399
need to get up feel free to do so

16
00:00:44,709 --> 00:00:42,800
but my main job here today is to keep

17
00:00:47,830 --> 00:00:44,719
the trains running on time so that we

18
00:00:50,069 --> 00:00:47,840
are in fact out of here by 11 45 and

19
00:00:51,590 --> 00:00:50,079
each of our presenters has had an equal

20
00:00:52,950 --> 00:00:51,600
amount of time to give their

21
00:00:54,389 --> 00:00:52,960
presentations

22
00:00:57,270 --> 00:00:54,399
for those of you who don't know me i'm

23
00:00:59,510 --> 00:00:57,280
marcia smith i'm a veteran space policy

24
00:01:01,349 --> 00:00:59,520
analyst here in washington and these

25
00:01:04,310 --> 00:01:01,359
days i have a website called

26
00:01:05,990 --> 00:01:04,320
spacepolicyonline.com

27
00:01:07,190 --> 00:01:06,000
that builds on my

28
00:01:08,789 --> 00:01:07,200
very long experience at the

29
00:01:11,190 --> 00:01:08,799
congressional research service although

30
00:01:12,789 --> 00:01:11,200
i've been in a lot of other places also

31
00:01:14,710 --> 00:01:12,799
while i've been in washington i've

32
00:01:16,469 --> 00:01:14,720
actually been a space policy analyst for

33
00:01:18,469 --> 00:01:16,479
40 of the 50 years that we're

34
00:01:20,870 --> 00:01:18,479
celebrating here today so it's been

35
00:01:22,870 --> 00:01:20,880
quite a long time

36
00:01:24,789 --> 00:01:22,880
but as i said my job is to keep the

37
00:01:27,109 --> 00:01:24,799
trains running on time and what we all

38
00:01:28,950 --> 00:01:27,119

agreed to is that each speaker will

39
00:01:30,469 --> 00:01:28,960
speak for 20 minutes

40
00:01:31,990 --> 00:01:30,479
and then there will be a five minute

41
00:01:33,270 --> 00:01:32,000
question and answer period for that

42
00:01:35,429 --> 00:01:33,280
speaker

43
00:01:39,749 --> 00:01:35,439
and that should give us 15 minutes at

44
00:01:41,030 --> 00:01:39,759
the end for a broad question and answer

45
00:01:42,310 --> 00:01:41,040
discussion

46
00:01:46,149 --> 00:01:42,320
and i'm not sure where everybody is

47
00:01:48,789 --> 00:01:47,190
maybe they're all going to have the

48
00:01:49,590 --> 00:01:48,799
march in here in unison i'm not quite

49
00:01:51,030 --> 00:01:49,600
sure

50
00:01:52,389 --> 00:01:51,040
but in any case

51
00:01:54,149 --> 00:01:52,399
i am going to change the order of the

52
00:01:56,870 --> 00:01:54,159
presentations a little bit we're gonna

53
00:01:59,350 --> 00:01:56,880
dwane day will be first and then jason

54
00:02:00,789 --> 00:01:59,360
and then roger and then john and andre

55
00:02:01,990 --> 00:02:00,799
so there is a little switch there in the

56
00:02:03,670 --> 00:02:02,000
middle because it made the flow of the

57
00:02:05,270 --> 00:02:03,680
papers better

58
00:02:07,350 --> 00:02:05,280
and just to remind you to again please

59
00:02:10,150 --> 00:02:07,360
silence your cell phones

60
00:02:11,670 --> 00:02:10,160
and we of course encourage questions in

61
00:02:13,589 --> 00:02:11,680
between each of the speakers and then at

62
00:02:15,430 --> 00:02:13,599
the end but as a courtesy to everybody

63
00:02:17,030 --> 00:02:15,440

else who wants to ask questions when you

64
00:02:19,910 --> 00:02:17,040
do would you please keep your questions

65
00:02:22,550 --> 00:02:19,920
very concise and directed at a speaker

66
00:02:23,510 --> 00:02:22,560
so i'm going to start off with dwayne

67
00:02:25,910 --> 00:02:23,520
day

68
00:02:27,190 --> 00:02:25,920
there are longer biographies for the

69
00:02:29,430 --> 00:02:27,200
speakers

70
00:02:31,670 --> 00:02:29,440
on the website and in your program

71
00:02:34,309 --> 00:02:31,680
except for dwayne dwayne gave the most

72
00:02:36,550 --> 00:02:34,319
concise biography i've ever seen it was

73
00:02:39,030 --> 00:02:36,560
one sentence long which says that he is

74
00:02:40,949 --> 00:02:39,040
in fact a senior program officer at the

75
00:02:42,390 --> 00:02:40,959
aeronautics and space engineering board

76
00:02:44,630 --> 00:02:42,400
at the national academy of sciences

77
00:02:47,270 --> 00:02:44,640
right now but dwayne is actually a very

78
00:02:49,509 --> 00:02:47,280
well-known military space historian and

79
00:02:51,350 --> 00:02:49,519
he often writes for the space review and

80
00:02:52,949 --> 00:02:51,360
i know jeff faust who runs the space

81
00:02:54,150 --> 00:02:52,959
review is here in the audience there he

82
00:02:56,309 --> 00:02:54,160
is hey jeff

83
00:02:57,910 --> 00:02:56,319
and so uh dwayne is actually very well

84
00:02:59,750 --> 00:02:57,920
known in the space policy and space

85
00:03:00,949 --> 00:02:59,760
history business and i'd like to invite

86
00:03:03,110 --> 00:03:00,959
duane to come up now and give his

87
00:03:05,190 --> 00:03:03,120
presentation and by the way just so no

88
00:03:07,030 --> 00:03:05,200

one thinks i'm being rude everybody

89
00:03:08,470 --> 00:03:07,040
knows that after they've spoken for 20

90
00:03:09,670 --> 00:03:08,480
minutes i'm going to come up here to the

91
00:03:11,270 --> 00:03:09,680
podium to make certain that they

92
00:03:17,030 --> 00:03:11,280
conclude so we can keep the trains

93
00:03:20,550 --> 00:03:19,589
thank you marcia um

94
00:03:22,229 --> 00:03:20,560
i'm

95
00:03:23,430 --> 00:03:22,239
reminded that this is a pretty small

96
00:03:24,869 --> 00:03:23,440
community

97
00:03:26,630 --> 00:03:24,879
uh

98
00:03:28,229 --> 00:03:26,640
the field that we're in and i was

99
00:03:30,869 --> 00:03:28,239
reminded of it even more when i looked

100
00:03:32,869 --> 00:03:30,879
at the agenda a few weeks ago

101
00:03:35,350 --> 00:03:32,879
and i looked at my panel

102
00:03:38,229 --> 00:03:35,360
marsha smith used to be my boss

103
00:03:40,309 --> 00:03:38,239
and now she serves on a committee for

104
00:03:44,149 --> 00:03:40,319
which i am a study director

105
00:03:46,070 --> 00:03:44,159
also on this panel is andre bermanes

106
00:03:47,910 --> 00:03:46,080
and andre and i used to work for john

107
00:03:49,509 --> 00:03:47,920
logsdon who is also

108
00:03:52,470 --> 00:03:49,519
on the panel

109
00:03:54,789 --> 00:03:52,480
and uh as well as jason callahan

110
00:03:55,990 --> 00:03:54,799
who is who used to work with me at space

111
00:03:58,309 --> 00:03:56,000
studies board

112
00:03:59,589 --> 00:03:58,319
and jason now works for my girlfriend at

113
00:04:03,030 --> 00:03:59,599

nasa

114
00:04:05,270 --> 00:04:03,040
and uh and also on this panel is uh

115
00:04:07,190 --> 00:04:05,280
uh roger hamburg who i actually don't

116
00:04:10,070 --> 00:04:07,200
know but i am sure that very soon i'm

117
00:04:13,270 --> 00:04:10,080
gonna be working for you so um

118
00:04:18,789 --> 00:04:13,280
uh it is a really small community

119
00:04:24,150 --> 00:04:22,310
i also noticed that on the agenda is a

120
00:04:25,749 --> 00:04:24,160
there's a number of speakers who have

121
00:04:28,070 --> 00:04:25,759
worked

122
00:04:30,790 --> 00:04:28,080
on various national academies studies

123
00:04:34,070 --> 00:04:32,390
in particular a few of the ones that are

124
00:04:36,230 --> 00:04:34,080
up here when when i was putting together

125
00:04:37,189 --> 00:04:36,240
this presentation i thought about

126
00:04:39,430 --> 00:04:37,199
uh

127
00:04:42,150 --> 00:04:39,440
throwing a whole bunch of

128
00:04:44,950 --> 00:04:42,160
covers from national academy's reports

129
00:04:47,430 --> 00:04:44,960
onto a slide and i i started to look and

130
00:04:50,390 --> 00:04:47,440
it turns out that over the past 50 years

131
00:04:52,790 --> 00:04:50,400
there have been something like

132
00:04:55,189 --> 00:04:52,800
95 plus

133
00:04:57,110 --> 00:04:55,199
studies that the academies have done

134
00:05:00,310 --> 00:04:57,120
on

135
00:05:01,830 --> 00:05:00,320
science

136
00:05:03,510 --> 00:05:01,840
the exact number is

137
00:05:05,909 --> 00:05:03,520
somewhat iffy

138
00:05:08,310 --> 00:05:05,919

but you know it works out to almost two

139
00:05:10,230 --> 00:05:08,320
studies a year that we've done for uh

140
00:05:12,550 --> 00:05:10,240
for nasa a few for the national science

141
00:05:14,629 --> 00:05:12,560
foundation

142
00:05:17,189 --> 00:05:14,639
i put four of them up here

143
00:05:19,350 --> 00:05:17,199
and uh

144
00:05:22,150 --> 00:05:19,360
the two on the left were ones that i was

145
00:05:24,070 --> 00:05:22,160
directly involved with

146
00:05:27,590 --> 00:05:24,080
and i think you can you can actually

147
00:05:31,110 --> 00:05:27,600
trace some direct uh you can directly

148
00:05:33,189 --> 00:05:31,120
trace some recent space policy decisions

149
00:05:34,629 --> 00:05:33,199
to the work that we did

150
00:05:35,670 --> 00:05:34,639
for the at the national academy of

151
00:05:36,469 --> 00:05:35,680
sciences

152
00:05:37,830 --> 00:05:36,479
um

153
00:05:39,590 --> 00:05:37,840
the one

154
00:05:41,510 --> 00:05:39,600
second from the left there opening new

155
00:05:44,870 --> 00:05:41,520
frontiers in space

156
00:05:46,950 --> 00:05:44,880
we helped develop a list of possible

157
00:05:48,390 --> 00:05:46,960
science missions the planetary science

158
00:05:49,990 --> 00:05:48,400
missions that could be conducted and one

159
00:05:52,790 --> 00:05:50,000
of the missions that's currently under

160
00:05:55,749 --> 00:05:54,230
osiris-rex

161
00:05:57,830 --> 00:05:55,759
resulted

162
00:05:59,909 --> 00:05:57,840
from the work that we did on

163
00:06:01,430 --> 00:05:59,919

on that study the

164
00:06:03,590 --> 00:06:01,440
study on the left

165
00:06:06,070 --> 00:06:03,600
grading nasa's solar system exploration

166
00:06:08,950 --> 00:06:06,080
program was a midterm assessment of the

167
00:06:10,070 --> 00:06:08,960
planetary science decadal survey

168
00:06:11,909 --> 00:06:10,080
and

169
00:06:12,950 --> 00:06:11,919
that study

170
00:06:15,189 --> 00:06:12,960
i think

171
00:06:17,510 --> 00:06:15,199
deserves a fair amount of the blame for

172
00:06:20,390 --> 00:06:17,520
the cuts that the mars program got a few

173
00:06:23,270 --> 00:06:20,400
years ago that was not our intention

174
00:06:25,430 --> 00:06:23,280
we we provided report card on what nasa

175
00:06:27,909 --> 00:06:25,440
was doing in in space and planetary

176
00:06:29,189 --> 00:06:27,919
exploration and we gave the mars program

177
00:06:30,950 --> 00:06:29,199
an a plus

178
00:06:33,830 --> 00:06:30,960
said they're doing a great job and that

179
00:06:35,990 --> 00:06:33,840
was used by the then

180
00:06:38,070 --> 00:06:36,000
associate administrator for

181
00:06:39,990 --> 00:06:38,080
science as an excuse for cutting the

182
00:06:41,510 --> 00:06:40,000
program because he figured you know a

183
00:06:43,270 --> 00:06:41,520
plus was probably too good they needed

184
00:06:46,390 --> 00:06:43,280
to spend some some of their effort on

185
00:06:48,950 --> 00:06:46,400
the the things where we gave them an f

186
00:06:52,150 --> 00:06:48,960
the two studies on the right

187
00:06:54,230 --> 00:06:52,160
are the uh 2001 decadal survey and then

188
00:06:56,150 --> 00:06:54,240

the most recent decadal survey and i

189
00:06:58,469 --> 00:06:56,160
actually uh um

190
00:07:00,469 --> 00:06:58,479
brought copies of the popular version

191
00:07:03,830 --> 00:07:00,479
and i also have a copy of the much

192
00:07:08,230 --> 00:07:05,990
report itself if anybody wants them i'm

193
00:07:09,749 --> 00:07:08,240
not carrying them back with me

194
00:07:11,350 --> 00:07:09,759
so i'll

195
00:07:13,670 --> 00:07:11,360
gladly hand them out

196
00:07:15,589 --> 00:07:13,680
and the the decadal surveys are

197
00:07:17,589 --> 00:07:15,599
ultimately the

198
00:07:18,469 --> 00:07:17,599
i think the most important

199
00:07:20,070 --> 00:07:18,479
uh

200
00:07:22,230 --> 00:07:20,080
documents most important studies that

201
00:07:24,230 --> 00:07:22,240
the academies do right now

202
00:07:25,189 --> 00:07:24,240
for the space sciences

203
00:07:26,950 --> 00:07:25,199
and

204
00:07:28,870 --> 00:07:26,960
if you've been paying attention to

205
00:07:29,990 --> 00:07:28,880
what's going on in the planetary science

206
00:07:30,950 --> 00:07:30,000
field

207
00:07:32,870 --> 00:07:30,960
that's

208
00:07:35,350 --> 00:07:32,880
very closely this year

209
00:07:36,629 --> 00:07:35,360
you may have noticed some extraordinary

210
00:07:37,670 --> 00:07:36,639
things that have happened in the

211
00:07:39,830 --> 00:07:37,680
political

212
00:07:42,070 --> 00:07:39,840
aspects of it

213
00:07:44,710 --> 00:07:42,080

there was earlier this year some

214
00:07:46,150 --> 00:07:44,720
rather startling legislation

215
00:07:47,189 --> 00:07:46,160
draft legislation that came out of

216
00:07:49,749 --> 00:07:47,199
congress

217
00:07:51,990 --> 00:07:49,759
which essentially cited

218
00:07:54,869 --> 00:07:52,000
the planetary language from the the

219
00:07:56,469 --> 00:07:54,879
decadal survey and then told nasa you

220
00:07:57,350 --> 00:07:56,479
will do this

221
00:07:59,189 --> 00:07:57,360
and

222
00:08:02,070 --> 00:07:59,199
uh of course we have a dysfunctional

223
00:08:04,710 --> 00:08:02,080
political system so that uh

224
00:08:06,790 --> 00:08:04,720
congress is not actually uh turning any

225
00:08:07,749 --> 00:08:06,800
uh any of their budgets into law at the

226
00:08:10,629 --> 00:08:07,759
moment

227
00:08:12,070 --> 00:08:10,639
but uh had that continued had that gone

228
00:08:13,670 --> 00:08:12,080
on

229
00:08:15,110 --> 00:08:13,680
you would have seen i think an

230
00:08:17,189 --> 00:08:15,120
interesting

231
00:08:21,029 --> 00:08:17,199
example of something that's it turns out

232
00:08:22,230 --> 00:08:21,039
that has existed for quite a long time

233
00:08:24,070 --> 00:08:22,240
where

234
00:08:25,670 --> 00:08:24,080
the national academy of sciences

235
00:08:27,830 --> 00:08:25,680
produces report

236
00:08:30,070 --> 00:08:27,840
and then congress

237
00:08:31,670 --> 00:08:30,080
tells the the administration tells the

238
00:08:33,029 --> 00:08:31,680

executive branch that they should be

239
00:08:37,430 --> 00:08:33,039
following the guidance that's

240
00:08:42,469 --> 00:08:39,269
this relationship goes back a very long

241
00:08:44,710 --> 00:08:42,479
long way in fact the space sciences

242
00:08:47,829 --> 00:08:44,720
board was established before nasa it was

243
00:08:50,550 --> 00:08:47,839
established a few months before nasa was

244
00:08:52,949 --> 00:08:50,560
but you can go back even earlier to this

245
00:08:54,870 --> 00:08:52,959
very famous picture here and

246
00:08:56,949 --> 00:08:54,880
that picture was actually

247
00:08:58,389 --> 00:08:56,959
that photograph was actually taken in

248
00:09:00,949 --> 00:08:58,399
the national academy of sciences

249
00:09:03,590 --> 00:09:00,959
building downtown on the mall if you

250
00:09:05,269 --> 00:09:03,600
know where the einstein statue is

251
00:09:07,430 --> 00:09:05,279
you go in that building and you can find

252
00:09:09,269 --> 00:09:07,440
the corner of the the main atrium where

253
00:09:10,550 --> 00:09:09,279
that photograph was taken and there's a

254
00:09:12,150 --> 00:09:10,560
great account

255
00:09:13,269 --> 00:09:12,160
uh i think it's in the pickering book

256
00:09:16,230 --> 00:09:13,279
actually

257
00:09:18,230 --> 00:09:16,240
uh that's that's on the stand back there

258
00:09:21,910 --> 00:09:18,240
about how after explorer one was

259
00:09:23,590 --> 00:09:21,920
successfully launched how the scientists

260
00:09:25,110 --> 00:09:23,600
they held a press conference there and

261
00:09:27,910 --> 00:09:25,120
it was a

262
00:09:29,110 --> 00:09:27,920
3 a.m in washington dc and it was cold

263
00:09:30,150 --> 00:09:29,120

and rainy

264
00:09:31,110 --> 00:09:30,160
and

265
00:09:33,670 --> 00:09:31,120
they were

266
00:09:35,030 --> 00:09:33,680
in a taxi cab coming across the river

267
00:09:36,310 --> 00:09:35,040
and they expected that you know it's

268
00:09:37,829 --> 00:09:36,320
three in the morning there's not going

269
00:09:39,990 --> 00:09:37,839
to be anybody there

270
00:09:41,750 --> 00:09:40,000
and they showed up and the room was

271
00:09:43,350 --> 00:09:41,760
packed with reporters this was a very

272
00:09:46,870 --> 00:09:43,360
big deal

273
00:09:49,190 --> 00:09:46,880
i think it's an interesting um

274
00:09:51,030 --> 00:09:49,200
it's an interesting fact that you know

275
00:09:54,150 --> 00:09:51,040
this was a military rocket that launched

276
00:09:55,509 --> 00:09:54,160
the spacecraft and this was an american

277
00:09:57,350 --> 00:09:55,519
achievement

278
00:09:58,870 --> 00:09:57,360
and they could have held the press

279
00:10:00,150 --> 00:09:58,880
conference at the pentagon they could

280
00:10:01,670 --> 00:10:00,160
have held the press conference at the

281
00:10:03,030 --> 00:10:01,680
white house but where did they hold the

282
00:10:04,870 --> 00:10:03,040
press conference they held it in the

283
00:10:08,550 --> 00:10:04,880
national academy of sciences building

284
00:10:13,190 --> 00:10:11,670
there's a lot of symbolism to that

285
00:10:16,550 --> 00:10:13,200
and

286
00:10:19,350 --> 00:10:16,560
but it makes the point i think that when

287
00:10:20,630 --> 00:10:19,360
the science when the the american space

288
00:10:23,269 --> 00:10:20,640

program

289
00:10:24,870 --> 00:10:23,279
looks for scientific legitimacy

290
00:10:26,870 --> 00:10:24,880
ultimately they come to the national

291
00:10:29,110 --> 00:10:26,880
academy of sciences to look for that uh

292
00:10:30,790 --> 00:10:29,120
to gain that legitimacy

293
00:10:32,310 --> 00:10:30,800
the space science board as i said was

294
00:10:34,550 --> 00:10:32,320
established

295
00:10:37,110 --> 00:10:34,560
in the summer of 1958

296
00:10:39,750 --> 00:10:37,120
and there was an early

297
00:10:42,550 --> 00:10:39,760
struggle between

298
00:10:43,750 --> 00:10:42,560
nasa and the academies over establishing

299
00:10:45,670 --> 00:10:43,760
who would be responsible for

300
00:10:48,389 --> 00:10:45,680
establishing the goals

301
00:10:51,910 --> 00:10:48,399
in space science and they came to a

302
00:10:54,150 --> 00:10:51,920
a rather awkward uh compromise that you

303
00:10:57,190 --> 00:10:54,160
know nasa of course would be in charge

304
00:10:59,190 --> 00:10:57,200
because it is the you know the executive

305
00:11:00,790 --> 00:10:59,200
part of the executive branch but that

306
00:11:03,190 --> 00:11:00,800
the goals would be

307
00:11:05,509 --> 00:11:03,200
recommended by national academy of

308
00:11:06,790 --> 00:11:05,519
sciences reports

309
00:11:08,389 --> 00:11:06,800
and so

310
00:11:10,710 --> 00:11:08,399
soon after the

311
00:11:12,150 --> 00:11:10,720
the academy the space sciences board was

312
00:11:13,190 --> 00:11:12,160
was established

313
00:11:15,269 --> 00:11:13,200

they

314
00:11:18,550 --> 00:11:15,279
stood up a bunch of different committees

315
00:11:20,310 --> 00:11:18,560
and one of their committees was the uh

316
00:11:22,949 --> 00:11:20,320
right up there at the top committee one

317
00:11:25,590 --> 00:11:22,959
geochemistry of space and exploration of

318
00:11:28,630 --> 00:11:25,600
moon and planets now that committee

319
00:11:31,030 --> 00:11:28,640
existed for a little over a decade

320
00:11:32,550 --> 00:11:31,040
it was one of i think initially eight

321
00:11:35,190 --> 00:11:32,560
that were established

322
00:11:36,790 --> 00:11:35,200
and over the years has been replaced by

323
00:11:38,150 --> 00:11:36,800
different entities

324
00:11:40,630 --> 00:11:38,160
complex

325
00:11:43,910 --> 00:11:40,640
was established in 1971

326
00:11:46,069 --> 00:11:43,920
existed until a few years ago

327
00:11:49,509 --> 00:11:46,079
when it stood down for the planetary

328
00:11:53,430 --> 00:11:49,519
decadal survey and has now been

329
00:11:56,310 --> 00:11:53,440
superseded by what we call caps

330
00:11:58,069 --> 00:11:56,320
there was also for a long period of time

331
00:12:00,310 --> 00:11:58,079
the committee on planetary biology and

332
00:12:02,470 --> 00:12:00,320
chemistry i'm sorry political committee

333
00:12:04,470 --> 00:12:02,480
on planetary biology and chemical

334
00:12:05,509 --> 00:12:04,480
evolution

335
00:12:07,829 --> 00:12:05,519
and then

336
00:12:09,829 --> 00:12:07,839
that was rolled into complex for a while

337
00:12:13,269 --> 00:12:09,839
and then we had the committee on the

338
00:12:15,430 --> 00:12:13,279

origins in evolution of life or seal

339
00:12:19,110 --> 00:12:15,440
which is now you know once again merged

340
00:12:21,590 --> 00:12:19,120
into the planetary exploration committee

341
00:12:23,750 --> 00:12:21,600
now as caps

342
00:12:26,470 --> 00:12:23,760
these were the the standing committees

343
00:12:29,750 --> 00:12:26,480
that addressed the issue of planetary

344
00:12:35,430 --> 00:12:31,910
and as i said over the years we've had

345
00:12:38,069 --> 00:12:35,440
over 90 studies that have been performed

346
00:12:39,509 --> 00:12:38,079
usually at nasa request occasionally a

347
00:12:42,230 --> 00:12:39,519
congressional or

348
00:12:44,949 --> 00:12:42,240
even omb direction

349
00:12:47,350 --> 00:12:44,959
i'm going to focus on a few

350
00:12:48,949 --> 00:12:47,360
on only a couple of key areas

351
00:12:50,389 --> 00:12:48,959
in key events in the history of the

352
00:12:51,590 --> 00:12:50,399
program or the history of this

353
00:12:52,949 --> 00:12:51,600
relationship

354
00:12:55,190 --> 00:12:52,959
and the first one is the scientist

355
00:12:55,870 --> 00:12:55,200
astronaut decision

356
00:12:58,790 --> 00:12:55,880
in

357
00:13:00,550 --> 00:12:58,800
1962 there was a

358
00:13:04,310 --> 00:13:00,560
academy report

359
00:13:06,310 --> 00:13:04,320
a space sciences board report that among

360
00:13:07,910 --> 00:13:06,320
many other things that addressed the the

361
00:13:12,550 --> 00:13:07,920
broad

362
00:13:15,350 --> 00:13:12,560
but among many other

363
00:13:18,310 --> 00:13:15,360

issues it recommended that nasa needed

364
00:13:20,310 --> 00:13:18,320
scientist astronauts

365
00:13:21,350 --> 00:13:20,320
it's actually an entire chapter in the

366
00:13:23,509 --> 00:13:21,360
report

367
00:13:25,509 --> 00:13:23,519
it's a rather amazing chapter in the

368
00:13:27,829 --> 00:13:25,519
report because of the enthusiasm that

369
00:13:29,110 --> 00:13:27,839
comes through you can see

370
00:13:31,030 --> 00:13:29,120
that these were

371
00:13:33,430 --> 00:13:31,040
scientists who were very much caught up

372
00:13:35,350 --> 00:13:33,440
in the excitement of the the early space

373
00:13:36,870 --> 00:13:35,360
program

374
00:13:41,750 --> 00:13:36,880
uh

375
00:13:45,030 --> 00:13:41,760
seen an academy report that actually

376
00:13:47,030 --> 00:13:45,040
uses exclamation marks at points um they

377
00:13:48,790 --> 00:13:47,040
they were they thought this was a great

378
00:13:50,550 --> 00:13:48,800
idea and i think one of the things that

379
00:13:52,230 --> 00:13:50,560
struck me about this was that i was

380
00:13:55,030 --> 00:13:52,240
familiar with

381
00:13:57,189 --> 00:13:55,040
the uh the skepticism within the

382
00:13:58,069 --> 00:13:57,199
scientific community if you know about

383
00:14:00,870 --> 00:13:58,079
um

384
00:14:03,189 --> 00:14:00,880
you know james van allen's uh

385
00:14:06,150 --> 00:14:03,199
comments about human space flight if you

386
00:14:08,550 --> 00:14:06,160
know about uh jerome wiesner's

387
00:14:11,829 --> 00:14:08,560
skepticism of the apollo program it's

388
00:14:12,629 --> 00:14:11,839

rather amazing to see

389
00:14:34,710 --> 00:14:12,639
a

390
00:14:41,269 --> 00:14:35,990
the

391
00:14:43,030 --> 00:14:41,279
scientific community and legitimized it

392
00:14:44,470 --> 00:14:43,040
in some ways

393
00:14:47,509 --> 00:14:44,480
um

394
00:14:48,949 --> 00:14:47,519
so that report came out and i think nasa

395
00:14:51,670 --> 00:14:48,959
rather

396
00:14:53,910 --> 00:14:51,680
you know ex reluctantly accepted the

397
00:14:56,949 --> 00:14:53,920
recommendation that was there

398
00:15:00,790 --> 00:14:58,470
we don't i see everybody looking

399
00:15:04,310 --> 00:15:00,800
skeptically as to where it's coming from

400
00:15:09,030 --> 00:15:07,110
but what nasa agreed to to do was to ask

401
00:15:11,670 --> 00:15:09,040
the academies to actually recommend

402
00:15:13,829 --> 00:15:11,680
space scientists uh for

403
00:15:15,829 --> 00:15:13,839
for to become astronauts and so the

404
00:15:17,509 --> 00:15:15,839
academies held a

405
00:15:18,870 --> 00:15:17,519
um

406
00:15:21,509 --> 00:15:18,880
they held a review panel they

407
00:15:23,590 --> 00:15:21,519
recommended 16 candidates

408
00:15:26,949 --> 00:15:23,600
most of them did

409
00:15:28,069 --> 00:15:26,959
get accepted into the astronaut program

410
00:15:29,030 --> 00:15:28,079
and

411
00:15:35,430 --> 00:15:29,040
the key

412
00:15:37,590 --> 00:15:35,440
effort was of course to put a geologist

413
00:15:38,949 --> 00:15:37,600

on the moon

414
00:15:41,110 --> 00:15:38,959
nasa

415
00:15:44,949 --> 00:15:41,120
accepted a geologist into the program

416
00:15:46,470 --> 00:15:44,959
and then put them put him as well as uh

417
00:15:49,189 --> 00:15:46,480
the other scientist astronauts at the

418
00:15:51,990 --> 00:15:49,199
back of the the the list

419
00:15:55,990 --> 00:15:52,000
and unfortunately um

420
00:15:58,629 --> 00:15:56,000
uh as apollo kept getting scaled back

421
00:16:00,470 --> 00:15:58,639
uh that person actually uh harrison

422
00:16:03,670 --> 00:16:00,480
schmidt fell off the list

423
00:16:06,870 --> 00:16:03,680
uh he was assigned to apollo 18 and then

424
00:16:09,350 --> 00:16:06,880
there was an apollo 18 got cancelled and

425
00:16:11,590 --> 00:16:09,360
then there was some backroom uh pressure

426
00:16:14,550 --> 00:16:11,600
applied to nasa

427
00:16:16,870 --> 00:16:14,560
and ultimately got him reassigned to

428
00:16:19,189 --> 00:16:16,880
apollo 17 and he flew

429
00:16:21,509 --> 00:16:19,199
to the moon i think it's an uh it's a

430
00:16:23,509 --> 00:16:21,519
great case of the interaction between

431
00:16:25,430 --> 00:16:23,519
the scientific community and

432
00:16:28,629 --> 00:16:25,440
and nasa

433
00:16:31,110 --> 00:16:28,639
to introduce science into the program

434
00:16:34,230 --> 00:16:31,120
it ultimately did not have as great an

435
00:16:35,749 --> 00:16:34,240
effect upon apollo as it did elsewhere

436
00:16:38,389 --> 00:16:35,759
but there were a number of scientist

437
00:16:39,829 --> 00:16:38,399
astronauts who did fly on skylab and

438
00:16:42,629 --> 00:16:39,839

then on the shuttle

439
00:16:47,189 --> 00:16:42,639
and um and it you know really opened up

440
00:16:50,870 --> 00:16:49,590
and then i want to jump ahead to

441
00:16:52,470 --> 00:16:50,880
about

442
00:16:56,550 --> 00:16:52,480
a decade later

443
00:16:57,990 --> 00:16:56,560
to the early 1970s on the grand tour

444
00:16:59,350 --> 00:16:58,000
recommendation

445
00:17:01,590 --> 00:16:59,360
now a lot of you know what the grand

446
00:17:03,509 --> 00:17:01,600
tour was the grand tour was

447
00:17:05,069 --> 00:17:03,519
the plan there's a planetary alignment

448
00:17:08,789 --> 00:17:05,079
that happens every

449
00:17:10,949 --> 00:17:08,799
176 or 179 years i forget the exact uh

450
00:17:12,470 --> 00:17:10,959
the exact amount

451
00:17:15,189 --> 00:17:12,480
but you can

452
00:17:17,429 --> 00:17:15,199
lie you can send out a spacecraft and uh

453
00:17:19,909 --> 00:17:17,439
and hit a whole bunch of the planets

454
00:17:21,189 --> 00:17:19,919
as you you fly past them

455
00:17:24,309 --> 00:17:21,199
and it

456
00:17:27,350 --> 00:17:24,319
it was a very rare opportunity

457
00:17:28,470 --> 00:17:27,360
there was a big push for this mission

458
00:17:31,190 --> 00:17:28,480
and yet

459
00:17:33,190 --> 00:17:31,200
in the early 1970s the

460
00:17:36,150 --> 00:17:33,200
the space science board

461
00:17:37,990 --> 00:17:36,160
did a uh an assessment

462
00:17:39,669 --> 00:17:38,000
where they produced a study where they

463
00:17:41,990 --> 00:17:39,679

they assessed

464
00:17:43,750 --> 00:17:42,000
space science across the disciplines so

465
00:17:46,390 --> 00:17:43,760
they looked at astronomy and planetary

466
00:17:48,710 --> 00:17:46,400
science and solar physics and what they

467
00:17:50,789 --> 00:17:48,720
came out to they came to the conclusion

468
00:17:52,310 --> 00:17:50,799
that the grand tour mission was not a

469
00:17:54,789 --> 00:17:52,320
top priority now there were a lot of

470
00:17:55,830 --> 00:17:54,799
reasons for this uh one of which was

471
00:17:57,510 --> 00:17:55,840
that they were concerned about the

472
00:17:59,909 --> 00:17:57,520
reliability of the spacecraft they were

473
00:18:01,350 --> 00:17:59,919
concerned about the cost of the mission

474
00:18:03,270 --> 00:18:01,360
and um

475
00:18:05,830 --> 00:18:03,280
but ultimately they did not recommend

476
00:18:08,230 --> 00:18:05,840
this as their top priority

477
00:18:10,230 --> 00:18:08,240
and according to a contemporary uh

478
00:18:12,630 --> 00:18:10,240
account that appeared in nature

479
00:18:14,390 --> 00:18:12,640
nature magazine at the time this was a

480
00:18:15,510 --> 00:18:14,400
rather uh rather surprising

481
00:18:16,870 --> 00:18:15,520
recommendation to come from the

482
00:18:18,549 --> 00:18:16,880
academies

483
00:18:20,310 --> 00:18:18,559
and yet uh

484
00:18:21,430 --> 00:18:20,320
when the nasa budget came out a few

485
00:18:23,110 --> 00:18:21,440
months later

486
00:18:25,350 --> 00:18:23,120
the grand tour mission was at the top of

487
00:18:27,830 --> 00:18:25,360
their list they wanted it funded

488
00:18:30,070 --> 00:18:27,840

and so they were they were ignoring the

489
00:18:33,909 --> 00:18:30,080
ssb's

490
00:18:38,390 --> 00:18:36,549
what uh ultimately happened was that

491
00:18:40,710 --> 00:18:38,400
even though the

492
00:18:43,110 --> 00:18:40,720
the budget process rolled forward grand

493
00:18:44,150 --> 00:18:43,120
tour was uh was approved

494
00:18:45,669 --> 00:18:44,160
uh

495
00:18:48,150 --> 00:18:45,679
it then got

496
00:18:50,150 --> 00:18:48,160
it died a little later that summer there

497
00:18:51,430 --> 00:18:50,160
were a lot of reasons for the for that

498
00:18:53,750 --> 00:18:51,440
but if you go back and look at the

499
00:18:54,870 --> 00:18:53,760
congressional legislation at the time

500
00:18:58,710 --> 00:18:54,880
um

501
00:19:02,150 --> 00:18:58,720
the uh congress specifically cited the

502
00:19:02,950 --> 00:19:02,160
lack of uh of support from the ssb

503
00:19:05,190 --> 00:19:02,960
uh

504
00:19:07,590 --> 00:19:05,200
in killing that mission now it got

505
00:19:09,350 --> 00:19:07,600
killed ultimately got killed the nixon

506
00:19:11,909 --> 00:19:09,360
administration took the

507
00:19:14,950 --> 00:19:11,919
uh took the hint and they killed the

508
00:19:15,909 --> 00:19:14,960
mission there's a very good um

509
00:19:19,510 --> 00:19:15,919
uh

510
00:19:22,150 --> 00:19:19,520
explaining the grand tour mission and

511
00:19:25,510 --> 00:19:22,160
and why it fell apart uh that appeared

512
00:19:27,990 --> 00:19:25,520
in 1997 it's got far more detail than i

513
00:19:32,150 --> 00:19:28,000

could ever uh assemble on this

514
00:19:33,430 --> 00:19:32,160
but that paper by david rubish rubishkov

515
00:19:37,029 --> 00:19:33,440
he actually

516
00:19:38,470 --> 00:19:37,039
cites the lack of support for

517
00:19:40,310 --> 00:19:38,480
this mission from the scientific

518
00:19:42,710 --> 00:19:40,320
community as the main reason why it got

519
00:19:44,630 --> 00:19:42,720
killed it got reinstated shortly later

520
00:19:47,590 --> 00:19:44,640
as the voyager missions that we all know

521
00:19:49,350 --> 00:19:47,600
about um they were in many ways less

522
00:19:51,270 --> 00:19:49,360
ambitious than the grand tour and they

523
00:19:53,510 --> 00:19:51,280
were not supposed to do the uh the full

524
00:19:55,430 --> 00:19:53,520
grand tour

525
00:19:58,310 --> 00:19:55,440
but

526
00:20:00,630 --> 00:19:58,320
that experience at the time prompted jim

527
00:20:02,870 --> 00:20:00,640
green's uh predecessor the person who

528
00:20:05,510 --> 00:20:02,880
was in charge of the planetary program

529
00:20:08,230 --> 00:20:05,520
in the early 1970s

530
00:20:11,430 --> 00:20:08,240
to develop a kind of

531
00:20:13,350 --> 00:20:11,440
model for what leads ultimately to

532
00:20:15,990 --> 00:20:13,360
successful scientif science missions

533
00:20:17,830 --> 00:20:16,000
getting approved successfully approved

534
00:20:20,149 --> 00:20:17,840
and he said that they essentially had to

535
00:20:21,909 --> 00:20:20,159
pass through four gates and the first

536
00:20:24,470 --> 00:20:21,919
gate was approval from the scientific

537
00:20:27,590 --> 00:20:24,480
community the second gate was approval

538
00:20:29,669 --> 00:20:27,600

from nasa senior management management

539
00:20:32,149 --> 00:20:29,679
and then congress and omb also had to

540
00:20:33,110 --> 00:20:32,159
approve these missions but but the key

541
00:20:34,950 --> 00:20:33,120
was

542
00:20:37,029 --> 00:20:34,960
of the initial

543
00:20:39,110 --> 00:20:37,039
he was getting scientific approval and

544
00:20:41,669 --> 00:20:39,120
of course that had to come through the

545
00:20:43,669 --> 00:20:41,679
uh ssb

546
00:20:45,909 --> 00:20:43,679
and that leads me to

547
00:20:50,470 --> 00:20:45,919
uh a number of conclusions about the

548
00:20:54,470 --> 00:20:52,310
you know this relationship between the

549
00:20:56,070 --> 00:20:54,480
two

550
00:20:58,070 --> 00:20:56,080
which i think ultimately has been very

551
00:20:59,029 --> 00:20:58,080
beneficial over these uh the past 50

552
00:21:00,950 --> 00:20:59,039
years

553
00:21:02,630 --> 00:21:00,960
i think one of the things

554
00:21:05,270 --> 00:21:02,640
one of the benefits of this relationship

555
00:21:06,950 --> 00:21:05,280
is that it has legitimized the planetary

556
00:21:08,230 --> 00:21:06,960
science program

557
00:21:10,310 --> 00:21:08,240
it's actually

558
00:21:12,390 --> 00:21:10,320
you know congress takes it more

559
00:21:14,950 --> 00:21:12,400
seriously because you have a bunch of

560
00:21:16,710 --> 00:21:14,960
eggheads with a uh

561
00:21:19,110 --> 00:21:16,720
producing a report

562
00:21:21,110 --> 00:21:19,120
with the national academy's

563
00:21:22,710 --> 00:21:21,120

logo on the cover

564
00:21:24,630 --> 00:21:22,720
i think it's increased the overall

565
00:21:26,630 --> 00:21:24,640
efficiency of the program

566
00:21:30,549 --> 00:21:26,640
there are fewer programs that get

567
00:21:33,029 --> 00:21:30,559
approved that ultimately

568
00:21:34,310 --> 00:21:33,039
fail to uh to produce decent science i

569
00:21:36,310 --> 00:21:34,320
think because they're they're going

570
00:21:38,789 --> 00:21:36,320
through a lot more scrutiny organized

571
00:21:40,149 --> 00:21:38,799
scrutiny right from the beginning

572
00:21:43,029 --> 00:21:40,159
i think

573
00:21:44,549 --> 00:21:43,039
it's helped assist in the the limit

574
00:21:46,630 --> 00:21:44,559
legitimization

575
00:21:49,029 --> 00:21:46,640
of planetary science is a as a

576
00:21:50,630 --> 00:21:49,039
discipline

577
00:21:52,710 --> 00:21:50,640
rather than

578
00:21:55,590 --> 00:21:52,720
a subset of geology

579
00:21:57,750 --> 00:21:55,600
or astrophysics there are planetary

580
00:21:59,669 --> 00:21:57,760
science departments in various

581
00:22:01,830 --> 00:21:59,679
universities around the country

582
00:22:04,789 --> 00:22:01,840
and you may not have seen that if you

583
00:22:07,270 --> 00:22:04,799
did not have uh the prestige that came

584
00:22:09,669 --> 00:22:07,280
from having a a national academy of

585
00:22:12,710 --> 00:22:09,679
sciences uh

586
00:22:14,390 --> 00:22:12,720
imprimatur on that

587
00:22:16,710 --> 00:22:14,400
i think it's increased the stability

588
00:22:19,350 --> 00:22:16,720

over very long periods of time right now

589
00:22:22,310 --> 00:22:19,360
they're in the science program you can

590
00:22:25,669 --> 00:22:22,320
trace back current recommendations that

591
00:22:29,029 --> 00:22:25,679
are being made through decades of

592
00:22:31,350 --> 00:22:29,039
ssb reports you can find

593
00:22:33,430 --> 00:22:31,360
advocacy for things like mars sample

594
00:22:36,149 --> 00:22:33,440
return in reports that came out in the

595
00:22:38,230 --> 00:22:36,159
early 1970s you can find planetary

596
00:22:40,950 --> 00:22:38,240
protection protocols being developed in

597
00:22:43,590 --> 00:22:40,960
1963.

598
00:22:44,870 --> 00:22:43,600
and the ssb really has

599
00:22:46,870 --> 00:22:44,880
i think

600
00:22:50,310 --> 00:22:46,880
contributed to the fact that these

601
00:22:52,230 --> 00:22:50,320
things get revisited again and again

602
00:22:53,750 --> 00:22:52,240
until ultimately somebody flies a

603
00:22:55,510 --> 00:22:53,760
mission

604
00:22:57,190 --> 00:22:55,520
i think it's created a single place for

605
00:22:59,270 --> 00:22:57,200
advice and coordination across the

606
00:23:00,549 --> 00:22:59,280
scientific disciplines

607
00:23:02,630 --> 00:23:00,559
for instance

608
00:23:04,710 --> 00:23:02,640
how else would you get the astronomers

609
00:23:06,950 --> 00:23:04,720
to be talking to the planetary

610
00:23:08,710 --> 00:23:06,960
scientists on the issue of discovering

611
00:23:09,909 --> 00:23:08,720
planets around other stars and what

612
00:23:12,630 --> 00:23:09,919
would they be looking for in the

613
00:23:18,470 --> 00:23:15,830

when they're looking at that data

614
00:23:20,310 --> 00:23:18,480
the the ssb is ultimately

615
00:23:21,590 --> 00:23:20,320
a good place to do that

616
00:23:23,750 --> 00:23:21,600
it's probably the only place that can

617
00:23:26,230 --> 00:23:23,760
really bring those communities together

618
00:23:29,750 --> 00:23:26,240
effectively

619
00:23:30,470 --> 00:23:29,760
it's also created an honest broker

620
00:23:35,510 --> 00:23:30,480
the

621
00:23:37,510 --> 00:23:35,520
representing a geographic location or a

622
00:23:39,750 --> 00:23:37,520
specific constituency it's representing

623
00:23:42,149 --> 00:23:39,760
a bunch of different constituencies

624
00:23:45,350 --> 00:23:42,159
constituencies and finally i think it's

625
00:23:47,350 --> 00:23:45,360
it's led to better ties between the the

626
00:23:48,630 --> 00:23:47,360
dispersed scientific community and the

627
00:23:50,470 --> 00:23:48,640
agency

628
00:23:52,470 --> 00:23:50,480
nasa doesn't have a lot of scientists

629
00:23:54,230 --> 00:23:52,480
working directly for it it has them

630
00:23:57,350 --> 00:23:54,240
spread all over the country

631
00:23:59,110 --> 00:23:57,360
and the national academy of sciences the

632
00:24:01,990 --> 00:23:59,120
national academies i've used those terms

633
00:24:05,269 --> 00:24:02,000
interchangeably is a way of

634
00:24:07,269 --> 00:24:05,279
of connecting them all and ultimately i

635
00:24:09,830 --> 00:24:07,279
think this all contributes to

636
00:24:11,590 --> 00:24:09,840
a better scientific program so

637
00:24:13,909 --> 00:24:11,600
with that i think i exceeded my time for

638
00:24:19,669 --> 00:24:13,919

about 30 seconds so

639
00:24:23,510 --> 00:24:21,590
so now we have about four and a half

640
00:24:25,110 --> 00:24:23,520
minutes for questions for dwayne just on

641
00:24:27,110 --> 00:24:25,120
dwayne's paper are there any questions

642
00:24:28,789 --> 00:24:27,120
and please do come to the microphone and

643
00:24:30,390 --> 00:24:28,799
identify yourself

644
00:24:40,630 --> 00:24:30,400
and be considerate of others and make

645
00:24:46,310 --> 00:24:42,149
yes ralph

646
00:24:48,710 --> 00:24:46,320
laboratory so dwayne one of the things

647
00:24:51,909 --> 00:24:48,720
that has happened just recently in the

648
00:24:53,750 --> 00:24:51,919
most recent decadal surveys is that

649
00:24:55,830 --> 00:24:53,760
of course because of the budgetary

650
00:24:57,269 --> 00:24:55,840
issues that are always involved with

651
00:24:59,510 --> 00:24:57,279
with doing these missions there were

652
00:25:02,789 --> 00:24:59,520
these analyses that were done

653
00:25:05,430 --> 00:25:02,799
of the cost that would be involved for

654
00:25:07,909 --> 00:25:05,440
carrying out the program and this is

655
00:25:10,950 --> 00:25:07,919
something new that the academies have

656
00:25:12,710 --> 00:25:10,960
have sort of gotten into looking at

657
00:25:14,630 --> 00:25:12,720
trying not only to look at the science

658
00:25:15,990 --> 00:25:14,640
but also to look at the economics behind

659
00:25:17,590 --> 00:25:16,000
all of this at least this is something

660
00:25:18,470 --> 00:25:17,600
that certainly didn't come up

661
00:25:20,549 --> 00:25:18,480
uh

662
00:25:23,029 --> 00:25:20,559
the past several decades and i was

663
00:25:25,190 --> 00:25:23,039

wondering if you could just make a

664
00:25:27,430 --> 00:25:25,200
since now all the decadals are are in

665
00:25:29,110 --> 00:25:27,440
we've and we've had all of these these

666
00:25:30,870 --> 00:25:29,120
recent economic issues i was wondering

667
00:25:33,110 --> 00:25:30,880
if you could comment on whether

668
00:25:34,789 --> 00:25:33,120
that looks like a good thing a bad thing

669
00:25:36,470 --> 00:25:34,799
something it's going to be in the future

670
00:25:38,230 --> 00:25:36,480
or

671
00:25:39,590 --> 00:25:38,240
what well i think it's going to be in

672
00:25:41,669 --> 00:25:39,600
the future regardless of whether it's

673
00:25:43,350 --> 00:25:41,679
good or bad

674
00:25:44,870 --> 00:25:43,360
clearly congress and the administration

675
00:25:48,390 --> 00:25:44,880
want this to happen it's now been

676
00:25:50,310 --> 00:25:48,400
enshrined in in legislation

677
00:25:51,990 --> 00:25:50,320
saying that if you do a decadal survey

678
00:25:53,350 --> 00:25:52,000
it has to include the independent cost

679
00:25:54,630 --> 00:25:53,360
estimation

680
00:25:56,950 --> 00:25:54,640
there's actually going to be in a couple

681
00:25:59,350 --> 00:25:56,960
of weeks out in irvine california

682
00:26:01,669 --> 00:25:59,360
there's going to be a lessons learned

683
00:26:02,789 --> 00:26:01,679
symposium workshop

684
00:26:04,870 --> 00:26:02,799
on

685
00:26:07,269 --> 00:26:04,880
the different decadal surveys and so

686
00:26:08,789 --> 00:26:07,279
that's going to be discussed a lot

687
00:26:10,870 --> 00:26:08,799
i think what

688
00:26:13,029 --> 00:26:10,880

you've seen there's always been a

689
00:26:14,149 --> 00:26:13,039
constant tension

690
00:26:17,190 --> 00:26:14,159
in

691
00:26:19,430 --> 00:26:17,200
ssb studies over this long period of

692
00:26:21,990 --> 00:26:19,440
time of the scientists being way up here

693
00:26:23,510 --> 00:26:22,000
looking at lofty issues versus getting

694
00:26:25,350 --> 00:26:23,520
down into the organizational

695
00:26:26,070 --> 00:26:25,360
nitty-gritty and the management issues

696
00:26:31,029 --> 00:26:26,080
and

697
00:26:33,750 --> 00:26:31,039
you know here's the questions that we

698
00:26:36,230 --> 00:26:33,760
want to to to answer

699
00:26:37,909 --> 00:26:36,240
uh go out and do that and we're not

700
00:26:43,190 --> 00:26:37,919
going to get involved in in the

701
00:26:45,830 --> 00:26:43,200
day-to-day um decision making on on that

702
00:26:49,350 --> 00:26:45,840
that worked i think for a very long time

703
00:26:51,669 --> 00:26:49,360
and unfortunately now because of of cost

704
00:26:54,070 --> 00:26:51,679
overruns and because of uh you know the

705
00:26:56,070 --> 00:26:54,080
change in emphasis within the scientific

706
00:26:59,190 --> 00:26:56,080
community i think that that there's been

707
00:27:01,110 --> 00:26:59,200
a a real push to actually

708
00:27:04,310 --> 00:27:01,120
get them involved more

709
00:27:05,669 --> 00:27:04,320
in those kinds of issues

710
00:27:07,990 --> 00:27:05,679
i don't want to go into whether it's a

711
00:27:09,750 --> 00:27:08,000
good or bad idea i think it's it's good

712
00:27:11,510 --> 00:27:09,760
if it's implemented well

713
00:27:15,909 --> 00:27:11,520

um and

714
00:27:18,389 --> 00:27:15,919
also in some ways not fair to the

715
00:27:19,510 --> 00:27:18,399
science scientists to ask them to kind

716
00:27:28,870 --> 00:27:19,520
of

717
00:27:33,190 --> 00:27:30,789
yeah john what more

718
00:27:36,549 --> 00:27:33,200
to what extent do the international

719
00:27:37,909 --> 00:27:36,559
science community participate in ssb and

720
00:27:39,750 --> 00:27:37,919
to what extent do

721
00:27:41,029 --> 00:27:39,760
foreign space programs pay attention to

722
00:27:42,710 --> 00:27:41,039
your reports

723
00:27:43,590 --> 00:27:42,720
uh the second

724
00:27:45,430 --> 00:27:43,600
and

725
00:27:47,190 --> 00:27:45,440
they participate quite a bit when it

726
00:27:49,269 --> 00:27:47,200
comes to the decadal survey we actually

727
00:27:51,830 --> 00:27:49,279
had a number of foreign represent

728
00:27:55,909 --> 00:27:51,840
representatives

729
00:28:00,149 --> 00:27:58,230
as to the degree that they pay attention

730
00:28:02,549 --> 00:28:00,159
i think they definitely pay attention

731
00:28:03,750 --> 00:28:02,559
because they have to um

732
00:28:05,669 --> 00:28:03,760
there's a

733
00:28:07,990 --> 00:28:05,679
you know a decadal survey can come out

734
00:28:09,590 --> 00:28:08,000
and can wreck their own program so you

735
00:28:11,830 --> 00:28:09,600
know they they read these things

736
00:28:14,389 --> 00:28:11,840
intensely they they had a

737
00:28:17,110 --> 00:28:14,399
uh an intense reaction to

738
00:28:19,029 --> 00:28:17,120

our recommendations on on our sample

739
00:28:21,830 --> 00:28:19,039
return for instance

740
00:28:26,549 --> 00:28:21,840
direct impact on it so

741
00:28:29,430 --> 00:28:27,909
it's a quick question i don't know about

742
00:28:32,149 --> 00:28:29,440
the answer though that's up to dwayne

743
00:28:34,470 --> 00:28:32,159
yeah yeah go go so so the so the

744
00:28:37,909 --> 00:28:34,480
question is uh a lot of us have noticed

745
00:28:40,389 --> 00:28:37,919
here in this past year in particular

746
00:28:42,470 --> 00:28:40,399
a trend toward dismissing decadal

747
00:28:45,190 --> 00:28:42,480
surveys as being of any value this is

748
00:28:47,029 --> 00:28:45,200
particularly true in the planetary area

749
00:28:48,310 --> 00:28:47,039
i won't name names or anything but i'm

750
00:28:50,149 --> 00:28:48,320
sure a lot of folks in this room know

751
00:28:52,310 --> 00:28:50,159
what i'm talking about the question i

752
00:28:53,830 --> 00:28:52,320
have for you is is this a trend does

753
00:28:55,750 --> 00:28:53,840
this fit into a pattern that you've seen

754
00:28:58,230 --> 00:28:55,760
in the past what briefly could you say

755
00:28:59,430 --> 00:28:58,240
about that uh you know i i looked for

756
00:29:01,029 --> 00:28:59,440
trends i

757
00:29:03,190 --> 00:29:01,039
i had um

758
00:29:05,190 --> 00:29:03,200
the astronomy decadal survey has been

759
00:29:06,950 --> 00:29:05,200
around for a very long time

760
00:29:08,470 --> 00:29:06,960
and um they've built up a lot of

761
00:29:10,549 --> 00:29:08,480
credibility over a very long time

762
00:29:12,870 --> 00:29:10,559
planetary hasn't been around as long and

763
00:29:15,029 --> 00:29:12,880

so i you know i'd be

764
00:29:17,190 --> 00:29:15,039
wary of drawing too many conclusions i

765
00:29:18,230 --> 00:29:17,200
think give them another uh

766
00:29:20,149 --> 00:29:18,240
another

767
00:29:21,590 --> 00:29:20,159
10 or 20 years and and then we can

768
00:29:23,510 --> 00:29:21,600
decide whether or not that's that's

769
00:29:25,430 --> 00:29:23,520
really a trend but we've only had two

770
00:29:26,630 --> 00:29:25,440
decadal surveys and

771
00:29:29,990 --> 00:29:26,640
is done

772
00:29:32,149 --> 00:29:30,000
six or something like that so

773
00:29:34,389 --> 00:29:32,159
i wouldn't say it's a trend yet but

774
00:29:40,549 --> 00:29:34,399
that's just because i'm overly cautious

775
00:29:43,669 --> 00:29:42,070
and i would just ask everyone to check

776
00:29:44,950 --> 00:29:43,679
their pockets and their purses to make

777
00:29:47,350 --> 00:29:44,960
certain that all of your electronic

778
00:29:49,590 --> 00:29:47,360
devices are on vibrate and not on ring

779
00:29:51,669 --> 00:29:49,600
or buzz or it was a lovely chime we were

780
00:29:52,950 --> 00:29:51,679
listening to but it's rather distracting

781
00:29:55,909 --> 00:29:52,960
for the speakers

782
00:29:58,470 --> 00:29:55,919
so our next speaker is jason callahan

783
00:29:59,990 --> 00:29:58,480
jason has two master's degrees one in

784
00:30:03,029 --> 00:30:00,000
international science and technology

785
00:30:05,190 --> 00:30:03,039
policy from gw and another from hit with

786
00:30:07,269 --> 00:30:05,200
in history and sociology of technology

787
00:30:09,029 --> 00:30:07,279
and science from georgia tech

788
00:30:10,310 --> 00:30:09,039

and as you already know from duane's

789
00:30:11,830 --> 00:30:10,320
introduction

790
00:30:14,470 --> 00:30:11,840
he now works for the tory group but he

791
00:30:21,990 --> 00:30:14,480
works for dwayne's girlfriend at nasa so

792
00:30:26,310 --> 00:30:23,830
morning

793
00:30:28,710 --> 00:30:26,320
so i'll be speaking today on funding

794
00:30:30,630 --> 00:30:28,720
planetary science uh planetary science

795
00:30:32,310 --> 00:30:30,640
in the united states is a public

796
00:30:34,230 --> 00:30:32,320
activity in that the federal government

797
00:30:36,149 --> 00:30:34,240
provides nearly all of the required

798
00:30:38,549 --> 00:30:36,159
funding and the vast majority of that

799
00:30:39,990 --> 00:30:38,559
funding flows through nasa but why does

800
00:30:41,990 --> 00:30:40,000
the government fund exploration of the

801
00:30:43,350 --> 00:30:42,000
solar system and how does it decide the

802
00:30:44,870 --> 00:30:43,360
amount of money to provide to the

803
00:30:46,789 --> 00:30:44,880
researchers that engage in this

804
00:30:49,269 --> 00:30:46,799
exploration these questions are

805
00:30:51,510 --> 00:30:49,279
fundamental importance to the scientists

806
00:30:53,830 --> 00:30:51,520
engineers technicians managers

807
00:30:56,070 --> 00:30:53,840
accountants students and others who make

808
00:30:57,909 --> 00:30:56,080
up the planetary science community

809
00:30:59,750 --> 00:30:57,919
clearly this is an uncertain time in

810
00:31:01,909 --> 00:30:59,760
planetary science but is it

811
00:31:03,509 --> 00:31:01,919
unprecedented the united states has

812
00:31:05,430 --> 00:31:03,519
suffered several recessions since the

813
00:31:07,190 --> 00:31:05,440

formation of nasa and the planetary

814
00:31:08,870 --> 00:31:07,200
science community has dealt with limited

815
00:31:11,190 --> 00:31:08,880
resources and directional uncertainty

816
00:31:12,549 --> 00:31:11,200
many times in the past it remains to be

817
00:31:14,149 --> 00:31:12,559
seen whether the current political

818
00:31:16,470 --> 00:31:14,159
pressures the depth of the current

819
00:31:18,389 --> 00:31:16,480
economic downturn or the increasing size

820
00:31:19,430 --> 00:31:18,399
of the national debt will have lasting

821
00:31:21,110 --> 00:31:19,440
effects

822
00:31:22,950 --> 00:31:21,120
on the federal budget generally or how

823
00:31:24,950 --> 00:31:22,960
those effects will in turn relate to the

824
00:31:26,549 --> 00:31:24,960
planetary science community

825
00:31:28,310 --> 00:31:26,559
but it may be informative to look back

826
00:31:30,789 --> 00:31:28,320
over the history of planetary science at

827
00:31:32,310 --> 00:31:30,799
nasa particularly through a fiscal lens

828
00:31:36,470 --> 00:31:32,320
in an effort to understand the role of

829
00:31:36,480 --> 00:31:39,110
oops

830
00:31:42,470 --> 00:31:40,630
uh the first thing to recognize when

831
00:31:45,269 --> 00:31:42,480
looking at the u.s economy as it relates

832
00:31:46,389 --> 00:31:45,279
to federal spending is that in the last

833
00:31:47,830 --> 00:31:46,399
three decades

834
00:31:50,389 --> 00:31:47,840
there is little correlation between the

835
00:31:52,310 --> 00:31:50,399
gross domestic product and spending uh

836
00:31:54,310 --> 00:31:52,320
that is that in the times of recession

837
00:31:56,710 --> 00:31:54,320
federal spending goes up and in times of

838
00:31:58,630 --> 00:31:56,720

expansion federal spending goes up

839
00:32:01,909 --> 00:31:58,640
uh these financial indicators over the

840
00:32:05,669 --> 00:32:03,750
demonstrate one other somewhat

841
00:32:09,350 --> 00:32:05,679
disturbing trend beginning in the late

842
00:32:12,149 --> 00:32:09,360
1970s government expenditures in red

843
00:32:14,070 --> 00:32:12,159
outpace the receipts which are in purple

844
00:32:16,389 --> 00:32:14,080
consistently and the federal debt in

845
00:32:18,470 --> 00:32:16,399
blue grew at a rate

846
00:32:20,310 --> 00:32:18,480
matching and often outpacing the rate of

847
00:32:21,990 --> 00:32:20,320
the increase in gdp

848
00:32:24,470 --> 00:32:22,000
uh the result of this expanding debt is

849
00:32:26,389 --> 00:32:24,480
an increase in an increasing cost to the

850
00:32:28,230 --> 00:32:26,399
federal government

851
00:32:29,750 --> 00:32:28,240
in each year just to pay the interest on

852
00:32:30,789 --> 00:32:29,760
the debt without bringing down the

853
00:32:33,110 --> 00:32:30,799
principal

854
00:32:36,789 --> 00:32:33,120
uh the cost of of the interest on the us

855
00:32:39,269 --> 00:32:36,799
federal debt in 2010 was 414 billion

856
00:32:40,950 --> 00:32:39,279
dollars which is roughly 23 times the

857
00:32:42,710 --> 00:32:40,960
nasa budget that year

858
00:32:43,990 --> 00:32:42,720
now this is not to suggest that the

859
00:32:45,750 --> 00:32:44,000
united states would be spending more

860
00:32:47,350 --> 00:32:45,760
money on exploring the solar system if

861
00:32:49,590 --> 00:32:47,360
it carried less debt but it does

862
00:32:51,269 --> 00:32:49,600
demonstrate that an increasing debt load

863
00:32:53,509 --> 00:32:51,279

can place a significant burden on

864
00:32:55,350 --> 00:32:53,519
limited resources and as this graph

865
00:32:57,029 --> 00:32:55,360
clearly demonstrates

866
00:32:59,669 --> 00:32:57,039
nasa has not encountered a budgetary

867
00:33:01,029 --> 00:32:59,679
environment quite like this before

868
00:33:02,630 --> 00:33:01,039
one of the clearest indications of

869
00:33:04,070 --> 00:33:02,640
national priorities is the level to

870
00:33:05,750 --> 00:33:04,080
which they're funded

871
00:33:07,190 --> 00:33:05,760
this may seem crass but one of the

872
00:33:09,269 --> 00:33:07,200
fundamental functions of government is

873
00:33:11,269 --> 00:33:09,279
the allocation of resources and nearly

874
00:33:12,950 --> 00:33:11,279
every resource that is not money still

875
00:33:14,710 --> 00:33:12,960
costs money

876
00:33:16,310 --> 00:33:14,720
therefore examining the fluctuation of

877
00:33:18,470 --> 00:33:16,320
funding levels in a government budget

878
00:33:20,310 --> 00:33:18,480
can demonstrate national priorities

879
00:33:22,149 --> 00:33:20,320
situating planetary science within the

880
00:33:23,990 --> 00:33:22,159
federal government is necessary for

881
00:33:25,750 --> 00:33:24,000
understanding the role that the plan

882
00:33:28,549 --> 00:33:25,760
that planetary exploration plays in the

883
00:33:31,669 --> 00:33:30,070
uh the federal government is broken into

884
00:33:33,590 --> 00:33:31,679
two categories excuse me the federal

885
00:33:36,230 --> 00:33:33,600
budget is broken into two categories uh

886
00:33:40,070 --> 00:33:36,240
mandatory and discretionary spending uh

887
00:33:43,269 --> 00:33:41,590
mandatory spending involves social

888
00:33:44,789 --> 00:33:43,279

security medicare medicaid and other

889
00:33:46,789 --> 00:33:44,799
programs that don't require an annual

890
00:33:48,389 --> 00:33:46,799
appropriations bill from congress

891
00:33:49,669 --> 00:33:48,399
where discretionary spending includes

892
00:33:51,110 --> 00:33:49,679
everything that does require an

893
00:33:53,029 --> 00:33:51,120
appropriations bill

894
00:33:55,909 --> 00:33:53,039
including defense education energy

895
00:33:57,509 --> 00:33:55,919
commerce justice and even nasa

896
00:33:59,509 --> 00:33:57,519
the largest expenditure in the

897
00:34:01,509 --> 00:33:59,519
discretionary budget by far is for

898
00:34:03,269 --> 00:34:01,519
defense so it's common to see budget

899
00:34:07,669 --> 00:34:03,279
numbers broken down into defense and

900
00:34:11,349 --> 00:34:09,430
here we see nasa's budget line in the

901
00:34:12,389 --> 00:34:11,359
context of the non-defense discretionary

902
00:34:14,310 --> 00:34:12,399
budget

903
00:34:15,829 --> 00:34:14,320
nasa has averaged between two and two

904
00:34:16,710 --> 00:34:15,839
and a half percent of the discretionary

905
00:34:18,470 --> 00:34:16,720
budget

906
00:34:20,149 --> 00:34:18,480
uh and roughly six and a half percent of

907
00:34:22,629 --> 00:34:20,159
the non-defense discretionary budget

908
00:34:24,470 --> 00:34:22,639
since the early 1960s but looking at

909
00:34:26,149 --> 00:34:24,480
nasa since the end of the apollo program

910
00:34:29,909 --> 00:34:26,159
it's averaged less than five percent of

911
00:34:33,589 --> 00:34:31,909
uh what we see here is a comparison to

912
00:34:35,109 --> 00:34:33,599
the non-defense discretionary line to

913
00:34:37,190 --> 00:34:35,119

the budget for the department of defense

914
00:34:38,629 --> 00:34:37,200
which is in orange

915
00:34:39,909 --> 00:34:38,639
if you look closely at the bottom of the

916
00:34:41,829 --> 00:34:39,919
graph

917
00:34:43,430 --> 00:34:41,839
you'll see the budget lines for nasa the

918
00:34:44,950 --> 00:34:43,440
department of energy the national

919
00:34:46,950 --> 00:34:44,960
national institutes of health and the

920
00:34:48,069 --> 00:34:46,960
national science foundation along with

921
00:34:49,430 --> 00:34:48,079
the department of defense these

922
00:34:51,430 --> 00:34:49,440
organizations receive the highest

923
00:34:54,950 --> 00:34:51,440
budgets in the federal government uh for

924
00:34:59,030 --> 00:34:56,069
uh i think this slide is

925
00:35:00,950 --> 00:34:59,040
self-explanatory no i'm sorry um

926
00:35:04,230 --> 00:35:00,960
so

927
00:35:06,390 --> 00:35:04,240
with the largest research budgets in the

928
00:35:07,589 --> 00:35:06,400
non-defense discretionary line

929
00:35:09,270 --> 00:35:07,599
i should stress here that the term

930
00:35:10,950 --> 00:35:09,280
non-defense means only that these budget

931
00:35:12,710 --> 00:35:10,960
lines are outside of the department of

932
00:35:15,030 --> 00:35:12,720
defense and not that they're completely

933
00:35:16,230 --> 00:35:15,040
removed from any military application

934
00:35:18,150 --> 00:35:16,240
there is in fact a fair amount of

935
00:35:20,069 --> 00:35:18,160
discourse between researchers uh in the

936
00:35:22,310 --> 00:35:20,079
civilian and military worlds but that's

937
00:35:23,829 --> 00:35:22,320
outside the scope of this presentation

938
00:35:25,670 --> 00:35:23,839

uh what we see on this graph though is a

939
00:35:27,190 --> 00:35:25,680
good representation of the shifting

940
00:35:30,870 --> 00:35:27,200
research priorities for the nation over

941
00:35:32,550 --> 00:35:30,880
the past five decades uh in the 1960s we

942
00:35:35,910 --> 00:35:32,560
see

943
00:35:37,109 --> 00:35:35,920
represented by a spike in nasa's budget

944
00:35:39,750 --> 00:35:37,119
in red

945
00:35:41,349 --> 00:35:39,760
in the 1970s the focus moves toward move

946
00:35:42,630 --> 00:35:41,359
towards energy and we see this reflected

947
00:35:44,630 --> 00:35:42,640
in the green line representing the

948
00:35:47,349 --> 00:35:44,640
department of energy beginning in the

949
00:35:49,349 --> 00:35:47,359
late 1980s or in the in the 1980s rather

950
00:35:50,950 --> 00:35:49,359
and lasting for the next 20 years we see

951
00:35:51,829 --> 00:35:50,960
a shift towards health and medicine in

952
00:35:55,589 --> 00:35:51,839
the

953
00:35:56,790 --> 00:35:55,599
nih budget line which is shown in blue

954
00:35:58,790 --> 00:35:56,800
following the spike in each of these

955
00:36:00,150 --> 00:35:58,800
budget lines the general trend seems to

956
00:36:02,390 --> 00:36:00,160
level out a bit

957
00:36:04,230 --> 00:36:02,400
give or take a few billion dollars

958
00:36:05,990 --> 00:36:04,240
what this demonstrates is that barring a

959
00:36:07,750 --> 00:36:06,000
renewed interest in space as a national

960
00:36:09,670 --> 00:36:07,760
priority on the scale of the race to the

961
00:36:11,990 --> 00:36:09,680
moon nasa is unlikely to see a

962
00:36:13,589 --> 00:36:12,000
significant increase in its budget a far

963
00:36:15,829 --> 00:36:13,599

more likely scenario is the projects and

964
00:36:18,069 --> 00:36:15,839
programs within nasa will continue to

965
00:36:19,910 --> 00:36:18,079
continue to compete for resources

966
00:36:22,870 --> 00:36:19,920
that are set near the current levels

967
00:36:24,630 --> 00:36:22,880
again give or take a few billion dollars

968
00:36:27,030 --> 00:36:24,640
so where does planetary science fit into

969
00:36:28,950 --> 00:36:27,040
all of this

970
00:36:30,310 --> 00:36:28,960
nasa has averaged 1.2 percent of the

971
00:36:31,750 --> 00:36:30,320
federal budget though this average is

972
00:36:34,230 --> 00:36:31,760
skewed by the massive investment in the

973
00:36:35,910 --> 00:36:34,240
human spaceflight program during the 60s

974
00:36:37,430 --> 00:36:35,920
uh in recent decades the average is

975
00:36:40,390 --> 00:36:37,440
below 1

976
00:36:42,069 --> 00:36:40,400
space science has a hole in blue here

977
00:36:43,990 --> 00:36:42,079
averaged less than 20 percent of nasa's

978
00:36:45,589 --> 00:36:44,000
budget over the last 50 years while the

979
00:36:48,870 --> 00:36:45,599
planetary science portion of the budget

980
00:36:50,470 --> 00:36:48,880
in green averaged about 6.5 percent uh

981
00:36:53,430 --> 00:36:50,480
these averages are all a bit less if we

982
00:36:55,270 --> 00:36:53,440
discount the 1960s

983
00:36:57,270 --> 00:36:55,280
planetary science was the dominant

984
00:36:59,829 --> 00:36:57,280
portion of the space science budget uh

985
00:37:02,230 --> 00:36:59,839
in the mid 1970s prior to that many of

986
00:37:03,589 --> 00:37:02,240
the space or space science efforts were

987
00:37:06,230 --> 00:37:03,599
attached to the human space flight

988
00:37:07,829 --> 00:37:06,240

program and following that period the

989
00:37:09,910 --> 00:37:07,839
planetary community met with increasing

990
00:37:12,150 --> 00:37:09,920
competition from astrophysics earth

991
00:37:15,670 --> 00:37:12,160
science and heliophysics

992
00:37:17,030 --> 00:37:15,680
between 2003 and 2006 however planetary

993
00:37:20,790 --> 00:37:17,040
science enjoyed its highest level of

994
00:37:23,910 --> 00:37:22,390
when we look at the history of

995
00:37:25,829 --> 00:37:23,920
funding for the exploration of the solar

996
00:37:28,230 --> 00:37:25,839
system this graph sort of naturally

997
00:37:29,990 --> 00:37:28,240
divides itself into decades with peaks

998
00:37:32,310 --> 00:37:30,000
in three of those decades and then a

999
00:37:33,910 --> 00:37:32,320
plateau in between uh to be sure there

1000
00:37:35,990 --> 00:37:33,920
are not distinct breaks in the story

1001
00:37:37,910 --> 00:37:36,000
effects of planetary exploration aligned

1002
00:37:39,510 --> 00:37:37,920
with the change in decades but dividing

1003
00:37:42,550 --> 00:37:39,520
the story into five chapters helps to

1004
00:37:45,670 --> 00:37:42,560
clarify a very complex narrative

1005
00:37:47,910 --> 00:37:45,680
a very brief discussion of a few of the

1006
00:37:49,030 --> 00:37:47,920
events in each in each decade

1007
00:37:51,030 --> 00:37:49,040
can help demonstrate how the

1008
00:37:52,870 --> 00:37:51,040
interactions between nasa the rest of

1009
00:37:54,630 --> 00:37:52,880
the planetary science community and

1010
00:37:56,150 --> 00:37:54,640
government stakeholders work to

1011
00:37:59,349 --> 00:37:56,160
establish the federal allocation of

1012
00:38:01,190 --> 00:37:59,359
resources for solar system exploration

1013
00:38:03,190 --> 00:38:01,200

if the u.s civil space program was

1014
00:38:05,270 --> 00:38:03,200
formed as a cold war counter

1015
00:38:06,790 --> 00:38:05,280
to soviet space efforts why did the

1016
00:38:08,630 --> 00:38:06,800
united states engage in planetary

1017
00:38:11,270 --> 00:38:08,640
science so early in the space program

1018
00:38:12,710 --> 00:38:11,280
and why does such engagement continue

1019
00:38:14,550 --> 00:38:12,720
the answer to that question dates back

1020
00:38:16,470 --> 00:38:14,560
to the post-war period

1021
00:38:18,150 --> 00:38:16,480
and involves communities of researchers

1022
00:38:19,589 --> 00:38:18,160
in fields as disparate as radio and

1023
00:38:21,589 --> 00:38:19,599
radar research

1024
00:38:23,430 --> 00:38:21,599
cosmic ray research ionospheric physics

1025
00:38:24,870 --> 00:38:23,440
and meteorology

1026
00:38:27,109 --> 00:38:24,880
scientists in these communities began to

1027
00:38:28,550 --> 00:38:27,119
coalesce around the idea that the data

1028
00:38:30,230 --> 00:38:28,560
required to answer

1029
00:38:31,510 --> 00:38:30,240
some of their most pressing questions

1030
00:38:32,710 --> 00:38:31,520
could only be obtained by sending

1031
00:38:33,990 --> 00:38:32,720
instruments outside of the earth's

1032
00:38:35,510 --> 00:38:34,000
atmosphere

1033
00:38:37,750 --> 00:38:35,520
a few scientific leaders in several of

1034
00:38:39,349 --> 00:38:37,760
these space related fields met in 1950

1035
00:38:40,870 --> 00:38:39,359
to determine the best path forward for

1036
00:38:42,310 --> 00:38:40,880
their research

1037
00:38:43,430 --> 00:38:42,320
the outcome of this meeting was the

1038
00:38:45,030 --> 00:38:43,440

proposal for an international

1039
00:38:46,470 --> 00:38:45,040
geophysical year modeled on the

1040
00:38:49,030 --> 00:38:46,480
international polar years that were held

1041
00:38:50,390 --> 00:38:49,040
in 1882 and 1932.

1042
00:38:53,109 --> 00:38:50,400
the igy

1043
00:38:56,069 --> 00:38:53,119
took place from july of 1957 to december

1044
00:38:57,510 --> 00:38:56,079
of 1958. the purpose of the igy was to

1045
00:38:59,109 --> 00:38:57,520
bring together researchers from various

1046
00:39:01,349 --> 00:38:59,119
fields and nationalities to address

1047
00:39:03,030 --> 00:39:01,359
fundamental scientific questions some of

1048
00:39:05,270 --> 00:39:03,040
the research was not space related but

1049
00:39:06,870 --> 00:39:05,280
several of the fields could benefit from

1050
00:39:08,310 --> 00:39:06,880
instruments aboard sounding rockets or

1051
00:39:09,510 --> 00:39:08,320
satellites

1052
00:39:11,510 --> 00:39:09,520
many of the scientific questions

1053
00:39:13,589 --> 00:39:11,520
addressed during the igy required vast

1054
00:39:15,109 --> 00:39:13,599
resources to acquire data

1055
00:39:16,630 --> 00:39:15,119
resources that were beyond the rece the

1056
00:39:19,270 --> 00:39:16,640
reach of individuals academic

1057
00:39:21,030 --> 00:39:19,280
departments or even most military labs

1058
00:39:22,790 --> 00:39:21,040
by consolidating their efforts into a

1059
00:39:24,069 --> 00:39:22,800
unified enterprise the scientific

1060
00:39:26,630 --> 00:39:24,079
communities were able to petition

1061
00:39:28,390 --> 00:39:26,640
support from their governments including

1062
00:39:30,310 --> 00:39:28,400
military resources not normally

1063
00:39:31,910 --> 00:39:30,320

associated with science which led to

1064
00:39:33,109 --> 00:39:31,920
projects like vanguard orbiter and

1065
00:39:36,470 --> 00:39:33,119
explorer

1066
00:39:38,310 --> 00:39:36,480
by the end of 1957 the space race was on

1067
00:39:40,230 --> 00:39:38,320
and as the united states tried to

1068
00:39:41,750 --> 00:39:40,240
determine how best to compete

1069
00:39:43,910 --> 00:39:41,760
lawmakers were consulting with many of

1070
00:39:46,230 --> 00:39:43,920
the scientists who represented the

1071
00:39:47,750 --> 00:39:46,240
united states during the igy including

1072
00:39:48,870 --> 00:39:47,760
one prominent group of researchers who

1073
00:39:50,310 --> 00:39:48,880
made up the rocket and satellite

1074
00:39:52,710 --> 00:39:50,320
research panel

1075
00:39:54,470 --> 00:39:52,720
the rsrp delivered a proposal to

1076
00:39:56,710 --> 00:39:54,480
congress titled a national mission to

1077
00:39:58,310 --> 00:39:56,720
explore outer space which advocated a

1078
00:40:00,390 --> 00:39:58,320
civilian organization that would allow

1079
00:40:01,829 --> 00:40:00,400
scientists to conduct basic research

1080
00:40:04,309 --> 00:40:01,839
similar to the experience of the

1081
00:40:06,230 --> 00:40:04,319
experience of the igy but on a permanent

1082
00:40:07,589 --> 00:40:06,240
and sustainable basis

1083
00:40:09,910 --> 00:40:07,599
when congress passed the national

1084
00:40:11,109 --> 00:40:09,920
aeronautics and space act in 1958 which

1085
00:40:12,470 --> 00:40:11,119
formed nasa

1086
00:40:14,069 --> 00:40:12,480
much of the language in the document

1087
00:40:15,270 --> 00:40:14,079
echoed the proposal put forth by the

1088
00:40:17,270 --> 00:40:15,280

rsrp

1089
00:40:18,710 --> 00:40:17,280
researchers placing scientific

1090
00:40:22,390 --> 00:40:18,720
exploration at the forefront of the new

1091
00:40:26,630 --> 00:40:25,109
in 1961 the soviet cosmonaut yuri

1092
00:40:28,470 --> 00:40:26,640
gagarin became the became the first

1093
00:40:29,670 --> 00:40:28,480
person to orbit the earth uh president

1094
00:40:31,190 --> 00:40:29,680
kennedy determined that sending an

1095
00:40:33,270 --> 00:40:31,200
astronaut to the moon before the

1096
00:40:35,589 --> 00:40:33,280
russians were able uh was the best

1097
00:40:37,670 --> 00:40:35,599
opportunity for the united states to to

1098
00:40:38,550 --> 00:40:37,680
demonstrate the superiority uh over the

1099
00:40:42,470 --> 00:40:38,560
soviet

1100
00:40:43,829 --> 00:40:42,480
this decision had significant

1101
00:40:45,750 --> 00:40:43,839
ramifications on the direction of the

1102
00:40:48,069 --> 00:40:45,760
new space administration and on its

1103
00:40:49,430 --> 00:40:48,079
planetary science aspirations

1104
00:40:51,430 --> 00:40:49,440
the moon mission became an overriding

1105
00:40:53,349 --> 00:40:51,440
national priority and nearly every

1106
00:40:55,829 --> 00:40:53,359
aspect of nasa was recruited to support

1107
00:40:57,750 --> 00:40:55,839
the lunar program nasa's early planetary

1108
00:40:59,990 --> 00:40:57,760
efforts uh focused heavily on lunar

1109
00:41:03,190 --> 00:41:00,000
exploration with the exceptions

1110
00:41:04,630 --> 00:41:03,200
of the mariner and pioneer programs

1111
00:41:06,390 --> 00:41:04,640
this came as a disappointment to many in

1112
00:41:08,630 --> 00:41:06,400
the space science community considering

1113
00:41:11,030 --> 00:41:08,640

that nasa after the marine or during the

1114
00:41:14,150 --> 00:41:11,040
mariner program had begun planning for

1115
00:41:16,150 --> 00:41:14,160
in 1960 for a class of robotic explorers

1116
00:41:17,750 --> 00:41:16,160
to replace the mariner family

1117
00:41:19,829 --> 00:41:17,760
this new class of spacecraft called

1118
00:41:22,230 --> 00:41:19,839
voyagers would be considerably larger

1119
00:41:24,069 --> 00:41:22,240
and more capable platforms allowing

1120
00:41:26,470 --> 00:41:24,079
larger science payloads

1121
00:41:28,630 --> 00:41:26,480
but due to uh several technical factors

1122
00:41:30,630 --> 00:41:28,640
uh congress cut funding for voyager and

1123
00:41:32,230 --> 00:41:30,640
nasa reallocated the remaining funds uh

1124
00:41:34,630 --> 00:41:32,240
to the rising costs of its main priority

1125
00:41:36,309 --> 00:41:34,640
which was the lunar effort much of the

1126
00:41:38,069 --> 00:41:36,319
design work for the voyager program

1127
00:41:39,990 --> 00:41:38,079
would appear in the viking mission to

1128
00:41:41,589 --> 00:41:40,000
mars and the name voyager

1129
00:41:42,790 --> 00:41:41,599
would find an entirely new project

1130
00:41:44,630 --> 00:41:42,800
shortly

1131
00:41:46,390 --> 00:41:44,640
uh funding for the moon mission peaked

1132
00:41:48,710 --> 00:41:46,400
in 1967

1133
00:41:51,829 --> 00:41:48,720
two years before the success of apollo

1134
00:41:54,630 --> 00:41:51,839
11 of the apollo 11 lunar landing and uh

1135
00:41:55,990 --> 00:41:54,640
it declined through the early 1970s for

1136
00:41:57,349 --> 00:41:56,000
many in the space science community

1137
00:41:59,270 --> 00:41:57,359
however the shift and the fortune for

1138
00:41:59,910 --> 00:41:59,280

the human space flight effort uh seemed

1139
00:42:38,230 --> 00:41:59,920
a

1140
00:42:39,829 --> 00:42:38,240
centuries

1141
00:42:41,670 --> 00:42:39,839
the initial mission plan became known as

1142
00:42:43,910 --> 00:42:41,680
the grand tour planned for launch in

1143
00:42:45,510 --> 00:42:43,920
1979 the budget began to creep towards

1144
00:42:46,870 --> 00:42:45,520
one billion dollars

1145
00:42:49,910 --> 00:42:46,880
causing concentration throughout the

1146
00:42:51,270 --> 00:42:49,920
planetary science community and congress

1147
00:42:52,950 --> 00:42:51,280
of equal importance to the budget

1148
00:42:55,190 --> 00:42:52,960
challenges the scientific community did

1149
00:42:56,950 --> 00:42:55,200
not agree on what outer plans missions

1150
00:42:58,470 --> 00:42:56,960
should take precedence

1151
00:43:00,470 --> 00:42:58,480
the space science board as dwayne

1152
00:43:02,150 --> 00:43:00,480
discussed earlier

1153
00:43:03,750 --> 00:43:02,160
adopted which adopted many of the the

1154
00:43:05,430 --> 00:43:03,760
advisory functions of the rocket and

1155
00:43:06,870 --> 00:43:05,440
satellite research panel following

1156
00:43:08,950 --> 00:43:06,880
nasa's formation

1157
00:43:10,870 --> 00:43:08,960
did not fully support the mission the

1158
00:43:12,550 --> 00:43:10,880
nixon administration never a staunch

1159
00:43:13,990 --> 00:43:12,560
supporter of the space program

1160
00:43:15,750 --> 00:43:14,000
favored the space shuttle over a large

1161
00:43:17,270 --> 00:43:15,760
scientific mission and congress was

1162
00:43:18,710 --> 00:43:17,280
unwilling to back a program that didn't

1163
00:43:20,069 --> 00:43:18,720

have the support of its own scientific

1164
00:43:22,630 --> 00:43:20,079
community

1165
00:43:24,150 --> 00:43:22,640
in 1971 nasa approved the mars 73

1166
00:43:26,230 --> 00:43:24,160
mission which eventually evolved into

1167
00:43:27,829 --> 00:43:26,240
the viking program it beat out the grand

1168
00:43:30,630 --> 00:43:27,839
tour for funding based on a lower

1169
00:43:32,470 --> 00:43:30,640
initial estimated cost

1170
00:43:33,829 --> 00:43:32,480
nasa management proposed to cancel funds

1171
00:43:35,829 --> 00:43:33,839
for the outer planets mission but

1172
00:43:37,270 --> 00:43:35,839
proponents of the grand tour found an

1173
00:43:39,349 --> 00:43:37,280
unlikely ally

1174
00:43:40,870 --> 00:43:39,359
the office of management and budget

1175
00:43:42,630 --> 00:43:40,880
recognizing that this was a unique

1176
00:43:45,990 --> 00:43:42,640
opportunity omb offered to restore

1177
00:43:47,750 --> 00:43:46,000
funding to a scaled back effort

1178
00:43:49,910 --> 00:43:47,760
nasa accepted re-planning the mission to

1179
00:43:51,750 --> 00:43:49,920
include just two spacecraft based on uh

1180
00:43:53,910 --> 00:43:51,760
mariner designs

1181
00:43:56,309 --> 00:43:53,920
the proposed cost of the new mission now

1182
00:43:57,670 --> 00:43:56,319
called voyager was roughly one-third the

1183
00:43:59,430 --> 00:43:57,680
amount of the cost estimates for the

1184
00:44:01,030 --> 00:43:59,440
grand tour which allowed nasa to

1185
00:44:03,589 --> 00:44:01,040
accomplish both a deep space mission to

1186
00:44:07,670 --> 00:44:03,599
the outer planets and the 1975 viking

1187
00:44:12,150 --> 00:44:10,069
we now come to the lost decade

1188
00:44:14,550 --> 00:44:12,160

i like this slide not only because

1189
00:44:16,390 --> 00:44:14,560
it shows a lovely picture of jupiter

1190
00:44:20,150 --> 00:44:16,400
but because the planet looks like a big

1191
00:44:23,109 --> 00:44:21,510
which is a good representation of the

1192
00:44:25,510 --> 00:44:23,119
planetary science missions launched by

1193
00:44:28,790 --> 00:44:25,520
the united states in the 1980s

1194
00:44:30,390 --> 00:44:28,800
between 1974 and 1977 uh the planetary

1195
00:44:31,349 --> 00:44:30,400
science budget dropped by nearly 60

1196
00:44:33,349 --> 00:44:31,359
percent

1197
00:44:35,109 --> 00:44:33,359
uh having launched viking and voyager

1198
00:44:37,750 --> 00:44:35,119
the planetary science community expected

1199
00:44:39,510 --> 00:44:37,760
some reduction in the budget but by 1977

1200
00:44:41,270 --> 00:44:39,520
as nasa began to plan for its next

1201
00:44:43,430 --> 00:44:41,280
planetary mission the budgetary

1202
00:44:45,349 --> 00:44:43,440
situation proved daunting

1203
00:44:47,349 --> 00:44:45,359
uh the new mission initially called the

1204
00:44:48,950 --> 00:44:47,359
jupiter orbiter probe would have to

1205
00:44:50,470 --> 00:44:48,960
compete for a shrinking portion of a

1206
00:44:52,309 --> 00:44:50,480
nasa budget

1207
00:44:53,270 --> 00:44:52,319
eroded by cost overruns in the shuttle

1208
00:44:57,190 --> 00:44:53,280
program

1209
00:44:58,790 --> 00:44:57,200
slated to begin in 1978 a space

1210
00:45:00,550 --> 00:44:58,800
telescope called hubble which had

1211
00:45:02,630 --> 00:45:00,560
backing from the space science community

1212
00:45:05,030 --> 00:45:02,640
congress and the white house compounded

1213
00:45:07,030 --> 00:45:05,040

the challenging budget environment

1214
00:45:08,950 --> 00:45:07,040
recognizing the difficulty of proposing

1215
00:45:11,030 --> 00:45:08,960
two major science programs in the same

1216
00:45:12,790 --> 00:45:11,040
same year nasa management made sure they

1217
00:45:14,630 --> 00:45:12,800
had the backing of a unified planetary

1218
00:45:15,829 --> 00:45:14,640
science community and worked to ensure

1219
00:45:17,750 --> 00:45:15,839
that the hubble supporters and the

1220
00:45:19,349 --> 00:45:17,760
jupiter orbiter supporters would not

1221
00:45:20,710 --> 00:45:19,359
sell the other side out in an effort to

1222
00:45:21,750 --> 00:45:20,720
gain support for their respective

1223
00:45:23,109 --> 00:45:21,760
projects

1224
00:45:24,790 --> 00:45:23,119
congress approved funding for both

1225
00:45:26,470 --> 00:45:24,800
projects demonstrating the efficacy of

1226
00:45:29,349 --> 00:45:26,480
the strategy and the strength of the

1227
00:45:32,550 --> 00:45:29,359
unified space science community

1228
00:45:34,230 --> 00:45:32,560
following the challenger tragedy in 1986

1229
00:45:35,990 --> 00:45:34,240
the white house increased nasa's budget

1230
00:45:37,670 --> 00:45:36,000
in order to replace the lost shuttle the

1231
00:45:39,109 --> 00:45:37,680
reagan administration intended the

1232
00:45:40,790 --> 00:45:39,119
increase to be temporary but the

1233
00:45:42,790 --> 00:45:40,800
incoming bush administration decided to

1234
00:45:44,950 --> 00:45:42,800
use the adjusted budget as the baseline

1235
00:45:46,630 --> 00:45:44,960
to support a new direction for nasa the

1236
00:45:48,550 --> 00:45:46,640
budget administration wanted to push

1237
00:45:50,630 --> 00:45:48,560
nasa to operate in a manner more reliant

1238
00:45:52,390 --> 00:45:50,640

on innovation taking advantage of new

1239
00:45:54,150 --> 00:45:52,400
technologies and management concepts in

1240
00:45:56,790 --> 00:45:54,160
order to reduce the extreme costs of

1241
00:45:59,750 --> 00:45:56,800
space flight

1242
00:46:01,589 --> 00:45:59,760
1992 president bush chose dan golden as

1243
00:46:02,870 --> 00:46:01,599
the new nasa administrator and tasked

1244
00:46:04,870 --> 00:46:02,880
him with the mission of changing the

1245
00:46:06,309 --> 00:46:04,880
culture from the top down

1246
00:46:08,069 --> 00:46:06,319
the new administrator's goal was to

1247
00:46:09,829 --> 00:46:08,079
develop an organization less averse to

1248
00:46:12,230 --> 00:46:09,839
risk and willing to abandon what he saw

1249
00:46:14,309 --> 00:46:12,240
as outdated methods and thinking within

1250
00:46:16,150 --> 00:46:14,319
planetary science golden helped

1251
00:46:18,069 --> 00:46:16,160
implement the discovery program a class

1252
00:46:19,910 --> 00:46:18,079
of small cost-cap missions led by a

1253
00:46:22,309 --> 00:46:19,920
principal investigator and selected

1254
00:46:23,829 --> 00:46:22,319
competitively from within the community

1255
00:46:24,790 --> 00:46:23,839
the methods golden wanted to implement

1256
00:46:26,470 --> 00:46:24,800
for running the missions were

1257
00:46:28,870 --> 00:46:26,480
characterized as faster better cheaper

1258
00:46:30,309 --> 00:46:28,880
in a speech by vice president dan quayle

1259
00:46:32,309 --> 00:46:30,319
the projects would reduce layers of

1260
00:46:34,230 --> 00:46:32,319
management and oversight launch within

1261
00:46:36,150 --> 00:46:34,240
three years of project selection and

1262
00:46:37,910 --> 00:46:36,160
nasa would cancel any discovery program

1263
00:46:40,069 --> 00:46:37,920

mission that went over budget

1264
00:46:41,670 --> 00:46:40,079
in 1995 nasa instituted the mars

1265
00:46:43,750 --> 00:46:41,680
surveyor program comprised the two

1266
00:46:45,430 --> 00:46:43,760
spacecraft the mars climate orbiter and

1267
00:46:47,270 --> 00:46:45,440
the mars polar lander

1268
00:46:49,430 --> 00:46:47,280
which would both lift off in 1990 in the

1269
00:46:50,870 --> 00:46:49,440
1998 mars launch window

1270
00:46:52,790 --> 00:46:50,880
both missions were developed under the

1271
00:46:54,309 --> 00:46:52,800
faster better cheaper rubric

1272
00:46:56,550 --> 00:46:54,319
but after launch the mars climate

1273
00:46:58,309 --> 00:46:56,560
orbiter made it to mars but just as it

1274
00:47:00,150 --> 00:46:58,319
was entering the orbit or entering mars

1275
00:47:02,470 --> 00:47:00,160
orbit uh nasa lost all communication

1276
00:47:03,829 --> 00:47:02,480
with the spacecraft just six weeks later

1277
00:47:05,270 --> 00:47:03,839
the mars polar lander arrived at the

1278
00:47:07,349 --> 00:47:05,280
planet and it too went permanently

1279
00:47:09,109 --> 00:47:07,359
silent during its landing cycle

1280
00:47:10,950 --> 00:47:09,119
the loss of two mars missions within a

1281
00:47:12,710 --> 00:47:10,960
six-week span did not sit well with the

1282
00:47:14,230 --> 00:47:12,720
public or lawmakers

1283
00:47:15,750 --> 00:47:14,240
the accident investigation boards

1284
00:47:17,030 --> 00:47:15,760
determined that small human errors were

1285
00:47:19,190 --> 00:47:17,040
likely to blame for the loss of the

1286
00:47:21,430 --> 00:47:19,200
spacecraft but a second report issued by

1287
00:47:22,870 --> 00:47:21,440
the mars climate orbiter board addressed

1288
00:47:24,470 --> 00:47:22,880

the management issues that led to the

1289
00:47:25,910 --> 00:47:24,480
error the board found that the faster

1290
00:47:28,630 --> 00:47:25,920
better cheaper strategy did not

1291
00:47:29,990 --> 00:47:28,640
adequately address assess risks in space

1292
00:47:31,349 --> 00:47:30,000
projects

1293
00:47:33,190 --> 00:47:31,359
the emphasis on meeting cost and

1294
00:47:34,710 --> 00:47:33,200
schedule placed pressures on project

1295
00:47:36,630 --> 00:47:34,720
management to cut corners in planning

1296
00:47:38,230 --> 00:47:36,640
developing and testing and the lack of

1297
00:47:39,109 --> 00:47:38,240
oversight meant that mistakes slipped

1298
00:47:40,870 --> 00:47:39,119
through

1299
00:47:42,870 --> 00:47:40,880
in the push to change the culture at

1300
00:47:45,589 --> 00:47:42,880
nasa administrator golden's methods

1301
00:47:47,829 --> 00:47:45,599
seemed to have pushed too far

1302
00:47:49,750 --> 00:47:47,839
by the final decade of the 20th century

1303
00:47:51,349 --> 00:47:49,760
the u.s planetary science community had

1304
00:47:53,430 --> 00:47:51,359
become no more unified than any other

1305
00:47:54,950 --> 00:47:53,440
group of loosely affiliated researchers

1306
00:47:56,390 --> 00:47:54,960
but they were able to find agreement in

1307
00:47:58,069 --> 00:47:56,400
communicating their priorities to

1308
00:47:59,750 --> 00:47:58,079
government stakeholders in nasa the

1309
00:48:01,270 --> 00:47:59,760
white house and congress

1310
00:48:02,630 --> 00:48:01,280
nasa commissioned the first official

1311
00:48:05,430 --> 00:48:02,640
decadal survey from the national

1312
00:48:07,030 --> 00:48:05,440
research council delivered in 2003 that

1313
00:48:09,349 --> 00:48:07,040

same year nasa launched the mars

1314
00:48:11,190 --> 00:48:09,359
exploration rovers and in 2006 the new

1315
00:48:13,430 --> 00:48:11,200
horizons spacecraft lifted off toward

1316
00:48:15,109 --> 00:48:13,440
pluto the new frontiers program selected

1317
00:48:16,549 --> 00:48:15,119
its first candidate for the for the

1318
00:48:18,069 --> 00:48:16,559
class of medium-sized missions a

1319
00:48:20,549 --> 00:48:18,079
solar-powered mission to jupiter called

1320
00:48:22,309 --> 00:48:20,559
juno and nasa started to started work on

1321
00:48:24,390 --> 00:48:22,319
the first flagship mission to mars since

1322
00:48:26,630 --> 00:48:24,400
viking the mars science laboratory

1323
00:48:27,589 --> 00:48:26,640
recommended in the 2003 decadal

1324
00:48:28,790 --> 00:48:27,599
survey

1325
00:48:31,190 --> 00:48:28,800
congress in the white house provided

1326
00:48:32,870 --> 00:48:31,200
nasa's planetary science program with an

1327
00:48:34,630 --> 00:48:32,880
unprecedented level of resources in the

1328
00:48:36,470 --> 00:48:34,640
middle of the decade but that level

1329
00:48:38,150 --> 00:48:36,480
began to decline in the face of two wars

1330
00:48:41,190 --> 00:48:38,160
and an economic crisis unknown in the

1331
00:48:42,630 --> 00:48:41,200
united states since before world war ii

1332
00:48:43,910 --> 00:48:42,640
once more national priorities have

1333
00:48:45,430 --> 00:48:43,920
shifted and the planetary science

1334
00:48:47,349 --> 00:48:45,440
community is again faced with the

1335
00:48:50,069 --> 00:48:47,359
challenge of demonstrating to lawmakers

1336
00:48:51,829 --> 00:48:50,079
that solar system exploration is worthy

1337
00:48:53,910 --> 00:48:51,839
of a significant national investment

1338
00:48:56,390 --> 00:48:53,920

despite a competition for resources from

1339
00:48:57,829 --> 00:48:56,400
other sectors of governance

1340
00:48:59,589 --> 00:48:57,839
back to

1341
00:49:01,109 --> 00:48:59,599
this slide

1342
00:49:02,470 --> 00:49:01,119
i began researching this project with

1343
00:49:04,150 --> 00:49:02,480
the hypothesis that members of the

1344
00:49:06,710 --> 00:49:04,160
scientific community generally and the

1345
00:49:08,230 --> 00:49:06,720
space science community specifically

1346
00:49:09,990 --> 00:49:08,240
often did an inadequate job of

1347
00:49:11,589 --> 00:49:10,000
communicating with stakeholders and that

1348
00:49:13,430 --> 00:49:11,599
this was one reason for the instability

1349
00:49:15,750 --> 00:49:13,440
and funding seen so often in the efforts

1350
00:49:17,589 --> 00:49:15,760
to explore the solar system what i found

1351
00:49:19,270 --> 00:49:17,599
was the community actually does a very

1352
00:49:21,430 --> 00:49:19,280
impressive job of communicating their

1353
00:49:23,190 --> 00:49:21,440
priorities on the whole the lessons of

1354
00:49:25,270 --> 00:49:23,200
the past were well learned and most of

1355
00:49:26,870 --> 00:49:25,280
the mistakes made today are brand new

1356
00:49:28,790 --> 00:49:26,880
but that's a good thing

1357
00:49:30,549 --> 00:49:28,800
the one place i see for improvement in

1358
00:49:32,710 --> 00:49:30,559
communicating both with stakeholders and

1359
00:49:34,230 --> 00:49:32,720
with the public is indeed in defining

1360
00:49:37,109 --> 00:49:34,240
planetary exploration as a national

1361
00:49:39,430 --> 00:49:37,119
priority uh jim green uh

1362
00:49:41,270 --> 00:49:39,440
the planetary science division director

1363
00:49:43,109 --> 00:49:41,280

uh says the community says that the

1364
00:49:45,589 --> 00:49:43,119
community nasa included needs to raise

1365
00:49:48,470 --> 00:49:45,599
the importance of the utility of

1366
00:49:49,829 --> 00:49:48,480
planetary science activities and i agree

1367
00:49:51,430 --> 00:49:49,839
but it's not just the activities

1368
00:49:53,190 --> 00:49:51,440
conducted by researchers in building and

1369
00:49:54,710 --> 00:49:53,200
launching spacecraft or in the study and

1370
00:49:56,710 --> 00:49:54,720
interpretation of the data that the

1371
00:49:59,109 --> 00:49:56,720
spacecraft returned that this is of util

1372
00:50:00,230 --> 00:49:59,119
that is of utility to the nation it also

1373
00:50:01,910 --> 00:50:00,240
includes the interactions of the

1374
00:50:03,910 --> 00:50:01,920
planetary science community with other

1375
00:50:05,829 --> 00:50:03,920
scientific communities members of

1376
00:50:07,670 --> 00:50:05,839
industry and academia both here and in

1377
00:50:09,589 --> 00:50:07,680
other countries that provide a great

1378
00:50:11,190 --> 00:50:09,599
benefit to the nation a benefit that

1379
00:50:12,470 --> 00:50:11,200
cannot be duplicated in any other

1380
00:50:13,990 --> 00:50:12,480
national undertaking

1381
00:50:15,510 --> 00:50:14,000
i think the planetary science community

1382
00:50:18,230 --> 00:50:15,520
should redouble its efforts to provide

1383
00:50:19,670 --> 00:50:18,240
stakeholders with this perspective in

1384
00:50:21,190 --> 00:50:19,680
addition to the incredible scientific

1385
00:50:22,710 --> 00:50:21,200
discoveries produced by the by the

1386
00:50:24,390 --> 00:50:22,720
community's efforts

1387
00:50:26,309 --> 00:50:24,400
after all given the world in which we

1388
00:50:27,750 --> 00:50:26,319

now find ourselves defining all of the

1389
00:50:29,589 --> 00:50:27,760
reasons that exploration in the solar

1390
00:50:31,030 --> 00:50:29,599
system is a national priority can only

1391
00:50:37,990 --> 00:50:31,040
help the cause

1392
00:50:41,750 --> 00:50:39,430
okay so we have five minutes of

1393
00:50:43,829 --> 00:50:41,760
questions just on jason's paper again

1394
00:50:45,750 --> 00:50:43,839
please come to the microphone identify

1395
00:50:47,430 --> 00:50:45,760
yourself and in consideration of others

1396
00:50:50,390 --> 00:50:47,440
who want to ask questions please be very

1397
00:50:56,710 --> 00:50:54,549
mikhail maro russian academy of sciences

1398
00:50:58,390 --> 00:50:56,720
i'm just wondering

1399
00:51:01,030 --> 00:50:58,400
how concurrent

1400
00:51:03,750 --> 00:51:01,040
are planetary science and astrophysics

1401
00:51:05,829 --> 00:51:03,760
program because usually there are strong

1402
00:51:08,069 --> 00:51:05,839
competition chasing between two

1403
00:51:11,510 --> 00:51:08,079
communities how is resolve such

1404
00:51:13,829 --> 00:51:11,520
controversial issues just based on ssb

1405
00:51:15,349 --> 00:51:13,839
recommendation or some other instruments

1406
00:51:18,069 --> 00:51:15,359
are involved

1407
00:51:20,069 --> 00:51:18,079
well uh the scientific priorities for

1408
00:51:21,430 --> 00:51:20,079
both communities uh

1409
00:51:24,069 --> 00:51:21,440
are usually

1410
00:51:25,829 --> 00:51:24,079
are first recommended by uh the space

1411
00:51:27,750 --> 00:51:25,839
studies board in separate decadal

1412
00:51:29,910 --> 00:51:27,760
surveys but the actual selection of

1413
00:51:32,309 --> 00:51:29,920

missions is done at nasa uh through

1414
00:51:35,910 --> 00:51:32,319
recommendations of the the nasa advisory

1415
00:51:38,870 --> 00:51:35,920
council uh and of course uh the the

1416
00:51:40,390 --> 00:51:38,880
science mission directorate uh and then

1417
00:51:43,349 --> 00:51:40,400
there are uh divisions within the

1418
00:51:45,349 --> 00:51:43,359
science mission directorate of course uh

1419
00:51:47,589 --> 00:51:45,359
in which estroph i'm sorry go ahead for

1420
00:51:49,430 --> 00:51:47,599
example kepler how it's regarded like

1421
00:51:51,430 --> 00:51:49,440
it's astrophysics or planetary sciences

1422
00:51:52,950 --> 00:51:51,440
i see where i see where you're going

1423
00:51:54,150 --> 00:51:52,960
just an example no that's that's a

1424
00:51:55,910 --> 00:51:54,160
really interesting question and actually

1425
00:51:57,910 --> 00:51:55,920
someone asked me the other day about uh

1426
00:52:00,150 --> 00:51:57,920
the voyager missions which began as

1427
00:52:01,829 --> 00:52:00,160
planetary science are now heliophysics

1428
00:52:08,069 --> 00:52:01,839
missions and very soon are likely to be

1429
00:52:12,549 --> 00:52:10,470
it's it's difficult to say i i

1430
00:52:14,309 --> 00:52:12,559
i think where i tend to draw the line is

1431
00:52:15,829 --> 00:52:14,319
if you're able to get up up close and

1432
00:52:18,150 --> 00:52:15,839
personal to a planet i think it falls

1433
00:52:19,750 --> 00:52:18,160
within the planetary exploration

1434
00:52:22,390 --> 00:52:19,760
rubric

1435
00:52:25,030 --> 00:52:22,400
at the moment the exoplanet

1436
00:52:26,710 --> 00:52:25,040
program isn't able to get us quite there

1437
00:52:28,470 --> 00:52:26,720
i hope that that will change in the

1438
00:52:30,710 --> 00:52:28,480

future though i don't suspect i will see

1439
00:52:32,470 --> 00:52:30,720
a lot of that

1440
00:52:35,510 --> 00:52:32,480
but at that point i i think you already

1441
00:52:38,390 --> 00:52:35,520
see a a mixing of of

1442
00:52:39,829 --> 00:52:38,400
expertise anyways a cross-cutting of of

1443
00:52:41,510 --> 00:52:39,839
of fields and i think that that will

1444
00:52:43,030 --> 00:52:41,520
continue to increase

1445
00:52:45,190 --> 00:52:43,040
all right michael newfound national air

1446
00:52:47,109 --> 00:52:45,200
and space museum uh congratulations on

1447
00:52:48,549 --> 00:52:47,119
the tacos very interesting i liked your

1448
00:52:50,069 --> 00:52:48,559
graphs and i would suggest one more

1449
00:52:51,829 --> 00:52:50,079
which actually follows up directly with

1450
00:52:54,150 --> 00:52:51,839
the other speaker's question be very

1451
00:52:56,150 --> 00:52:54,160
interesting to see the budget graph that

1452
00:52:57,829 --> 00:52:56,160
of the space science program and

1453
00:53:00,230 --> 00:52:57,839
compared how for example the

1454
00:53:02,710 --> 00:53:00,240
astrophysics heliophysics and planetary

1455
00:53:03,670 --> 00:53:02,720
and biological sciences

1456
00:53:05,270 --> 00:53:03,680
uh

1457
00:53:07,589 --> 00:53:05,280
you know where were the trade-offs and

1458
00:53:10,549 --> 00:53:07,599
priorities over the those decades and

1459
00:53:13,670 --> 00:53:10,559
how that how that played out and and i

1460
00:53:15,510 --> 00:53:13,680
and i i also noted on your graph of

1461
00:53:16,470 --> 00:53:15,520
launch you know launched node many of

1462
00:53:18,390 --> 00:53:16,480
them were

1463
00:53:20,710 --> 00:53:18,400

really heliophysics missions but that's

1464
00:53:22,710 --> 00:53:20,720
obviously a very much of a problematic

1465
00:53:25,750 --> 00:53:22,720
distinction in many places yeah

1466
00:53:27,270 --> 00:53:25,760
precisely uh yeah the definition of of

1467
00:53:28,870 --> 00:53:27,280
particularly in the early missions you

1468
00:53:30,630 --> 00:53:28,880
know what constitutes a heliophysics and

1469
00:53:32,390 --> 00:53:30,640
what constitutes planetary

1470
00:53:34,549 --> 00:53:32,400
it it really is sort of left up to the

1471
00:53:36,390 --> 00:53:34,559
interpreter i did in fact make some

1472
00:53:38,470 --> 00:53:36,400
graphs having to do with the the

1473
00:53:40,630 --> 00:53:38,480
separation i just i didn't have time to

1474
00:53:43,030 --> 00:53:40,640
bring them uh

1475
00:53:44,870 --> 00:53:43,040
it's very interesting and it it's it's

1476
00:53:46,870 --> 00:53:44,880
less complex in the early years when

1477
00:53:48,069 --> 00:53:46,880
astrophysics and planetary exploration

1478
00:53:50,309 --> 00:53:48,079
were

1479
00:53:51,990 --> 00:53:50,319
somewhat similar i mean it was

1480
00:53:53,829 --> 00:53:52,000
uh

1481
00:53:55,750 --> 00:53:53,839
you saw a lot of over overlap between

1482
00:53:57,990 --> 00:53:55,760
those those budgets which were difficult

1483
00:53:59,829 --> 00:53:58,000
to sort of extract from each other in

1484
00:54:01,190 --> 00:53:59,839
the early years uh

1485
00:54:03,270 --> 00:54:01,200
in later years it becomes far more

1486
00:54:04,549 --> 00:54:03,280
complex as you have more players but

1487
00:54:07,829 --> 00:54:04,559
you're absolutely right it is a