1
00:00:26,480 --> 00:00:47,510
ignition sequence start six

2
00:00:51,910 --> 00:00:49,830
good afternoon i'm stephen dick the nasa

3
00:00:54,790 --> 00:00:51,920
chief historian and i want to welcome

4
00:00:55,830 --> 00:00:54,800
our nasa tv audience as well as everyone

5
00:00:57,350 --> 00:00:55,840
here at

6
00:00:59,349 --> 00:00:57,360
nasa headquarters

7
00:01:02,150 --> 00:00:59,359
this is an exciting time as we look both

8
00:01:04,070 --> 00:01:02,160
backward and at history and we

9
00:01:07,190 --> 00:01:04,080
contemplate the future we're here today

10
00:01:09,590 --> 00:01:07,200
to celebrate the apollo 40th anniversary

11
00:01:13,030 --> 00:01:09,600
and we've convened a distinguished panel

12
00:01:15,270 --> 00:01:13,040
to discuss apollo's history and legacy

13
00:01:16,789 --> 00:01:15,280

today we have with us to my left here

14
00:01:18,950 --> 00:01:16,799
john logsdon

15
00:01:21,830 --> 00:01:18,960
the lindbergh chair in aerospace history

16
00:01:24,710 --> 00:01:21,840
at the national air and space museum

17
00:01:27,429 --> 00:01:24,720
roger lonius the senior curator in space

18
00:01:28,870 --> 00:01:27,439
history at the air and space museum

19
00:01:30,310 --> 00:01:28,880
michael neufeld

20
00:01:32,390 --> 00:01:30,320
the chair of the division of space

21
00:01:34,069 --> 00:01:32,400
history at the air and space museum

22
00:01:36,710 --> 00:01:34,079
and the author of the most recent

23
00:01:39,429 --> 00:01:36,720
biography of werner von braun dreamer of

24
00:01:42,310 --> 00:01:39,439
space engineer of war

25
00:01:44,149 --> 00:01:42,320
next to michael we have chris christina

26
00:01:45,910 --> 00:01:44,159
guidi the deputy director of

27
00:01:48,069 --> 00:01:45,920
constellation systems

28
00:01:50,710 --> 00:01:48,079
uh in the exploration systems mission

29
00:01:52,710 --> 00:01:50,720
directorate here at nasa headquarters

30
00:01:54,950 --> 00:01:52,720
and on the far end we have craig nelson

31
00:01:58,069 --> 00:01:54,960
who's the author of the very recently

32
00:02:00,149 --> 00:01:58,079
published book rocketmen the epic story

33
00:02:01,670 --> 00:02:00,159
of the first men on the moon

34
00:02:03,670 --> 00:02:01,680
before we proceed let me say that we're

35
00:02:06,550 --> 00:02:03,680
going to hold all questions for the

36
00:02:08,389 --> 00:02:06,560
press until the the end of this hour

37
00:02:10,630 --> 00:02:08,399
and before we go to the panel

38
00:02:13,350 --> 00:02:10,640

it's my pleasure to introduce

39
00:02:15,750 --> 00:02:13,360
the acting nasa administrator chris

40
00:02:24,949 --> 00:02:15,760
scalise who will say a few words on this

41
00:02:30,309 --> 00:02:27,430
thanks steve uh good afternoon everybody

42
00:02:32,390 --> 00:02:30,319
uh it really is a historic uh time here

43
00:02:33,990 --> 00:02:32,400
the 40th anniversary of the launch of

44
00:02:36,070 --> 00:02:34,000
apollo 11.

45
00:02:36,949 --> 00:02:36,080
just yesterday we launched uh space

46
00:02:39,030 --> 00:02:36,959
shuttle

47
00:02:40,309 --> 00:02:39,040
mission sts-127

48
00:02:42,790 --> 00:02:40,319
from uh

49
00:02:44,470 --> 00:02:42,800
launch complex 39a a cape

50
00:02:45,830 --> 00:02:44,480
at kennedy space center

51
00:02:48,949 --> 00:02:45,840
the same pad

52
00:02:51,430 --> 00:02:48,959
that launched apollo 11 40 years ago

53
00:02:52,869 --> 00:02:51,440
to give sort of a chronology of what

54
00:02:55,190 --> 00:02:52,879
that was

55
00:02:56,630 --> 00:02:55,200
if we were living 40 years ago

56
00:02:58,630 --> 00:02:56,640
many of us were though looking in the

57
00:03:00,710 --> 00:02:58,640
audience many of us weren't

58
00:03:02,710 --> 00:03:00,720
uh i was i was glued to a black and

59
00:03:05,110 --> 00:03:02,720
white television watching this this

60
00:03:08,070 --> 00:03:05,120
whole thing transpire

61
00:03:09,190 --> 00:03:08,080
at 9 32 a.m this morning apollo 11 would

62
00:03:10,470 --> 00:03:09,200
have

63
00:03:13,589 --> 00:03:10,480

lifted off

64
00:03:15,270 --> 00:03:13,599
at 12 22 p.m the translunar injection

65
00:03:16,869 --> 00:03:15,280
would have occurred after several orbits

66
00:03:19,190 --> 00:03:16,879
of the earth

67
00:03:21,670 --> 00:03:19,200
at 12 56

68
00:03:23,190 --> 00:03:21,680
40 years and a few minutes ago

69
00:03:24,550 --> 00:03:23,200
the command and service modules would

70
00:03:25,750 --> 00:03:24,560
have docked with a lunar module and

71
00:03:27,910 --> 00:03:25,760
pulled it out

72
00:03:29,270 --> 00:03:27,920
and headed on the way to the moon for a

73
00:03:31,670 --> 00:03:29,280
three-day journey

74
00:03:33,910 --> 00:03:31,680
and on july 20th at

75
00:03:36,070 --> 00:03:33,920
4 17

76
00:03:37,910 --> 00:03:36,080
eastern daylight time the first humans

77
00:03:40,070 --> 00:03:37,920
landed on the moon and later that

78
00:03:42,869 --> 00:03:40,080
evening neil armstrong was the first

79
00:03:44,630 --> 00:03:42,879
human to set foot on another planet the

80
00:03:46,390 --> 00:03:44,640
moon

81
00:03:48,710 --> 00:03:46,400
i think many of us

82
00:03:50,630 --> 00:03:48,720
that remember those days

83
00:03:52,149 --> 00:03:50,640
and i was you know not yet in high

84
00:03:53,190 --> 00:03:52,159
school at the time

85
00:03:54,949 --> 00:03:53,200
um

86
00:03:56,869 --> 00:03:54,959
it was an absolutely incredible

87
00:03:57,750 --> 00:03:56,879
incredible event and how that inspired

88
00:03:58,869 --> 00:03:57,760

us

89
00:04:01,509 --> 00:03:58,879
um

90
00:04:03,429 --> 00:04:01,519
only we can each speak individually

91
00:04:06,149 --> 00:04:03,439
about that

92
00:04:08,949 --> 00:04:06,159
but those events were set forth by a

93
00:04:11,190 --> 00:04:08,959
goal set by president kennedy in 1961

94
00:04:12,710 --> 00:04:11,200
when he said before this decade is out

95
00:04:14,630 --> 00:04:12,720
of landing a man on the moon and

96
00:04:17,349 --> 00:04:14,640
returning him safely to earth that was

97
00:04:18,870 --> 00:04:17,359
accomplished in 1969 it was one of the

98
00:04:19,670 --> 00:04:18,880
grand challenges

99
00:04:21,590 --> 00:04:19,680
that

100
00:04:24,070 --> 00:04:21,600
humanity seeks and what this nation

101
00:04:26,230 --> 00:04:24,080
seeks to accomplish it shows the best of

102
00:04:29,350 --> 00:04:26,240
what we can accomplish and it shows how

103
00:04:31,510 --> 00:04:29,360
we can accomplish it collectively as

104
00:04:33,430 --> 00:04:31,520
as a nation and as a world

105
00:04:34,710 --> 00:04:33,440
when you think about apollo

106
00:04:35,830 --> 00:04:34,720
think that it took twelve thousand

107
00:04:37,670 --> 00:04:35,840
companies

108
00:04:39,189 --> 00:04:37,680
four hundred thousand people

109
00:04:41,270 --> 00:04:39,199
and twenty five billion dollars to

110
00:04:43,110 --> 00:04:41,280
complete the program

111
00:04:45,030 --> 00:04:43,120
that was an incredible investment in the

112
00:04:47,189 --> 00:04:45,040
1960s

113
00:04:48,629 --> 00:04:47,199

yet 500 years from now

114
00:04:51,990 --> 00:04:48,639
when people look back on the 20th

115
00:04:53,430 --> 00:04:52,000
century i think the the challenge

116
00:04:54,710 --> 00:04:53,440
the accomplishment

117
00:04:55,830 --> 00:04:54,720
and the landing on the moon will be

118
00:04:59,110 --> 00:04:55,840
remembered as one of the great

119
00:05:00,550 --> 00:04:59,120
achievements of the 20th century perhaps

120
00:05:02,070 --> 00:05:00,560
one of the

121
00:05:03,670 --> 00:05:02,080
maybe the greatest achievement of the

122
00:05:05,270 --> 00:05:03,680
20th century

123
00:05:07,110 --> 00:05:05,280
but many questions still surround the

124
00:05:08,950 --> 00:05:07,120
apollo program

125
00:05:11,430 --> 00:05:08,960
was it really worth it

126
00:05:13,350 --> 00:05:11,440
what were the lessons that we learned

127
00:05:16,070 --> 00:05:13,360
what has been what's been the impact

128
00:05:19,110 --> 00:05:16,080
over the last 40 years

129
00:05:21,110 --> 00:05:19,120
what is its legacy in science technology

130
00:05:23,430 --> 00:05:21,120
the history of exploration and the way

131
00:05:25,590 --> 00:05:23,440
we see the earth

132
00:05:27,510 --> 00:05:25,600
i don't think it's a surprise that

133
00:05:28,629 --> 00:05:27,520
that if you can remember and you see the

134
00:05:30,710 --> 00:05:28,639
image

135
00:05:33,430 --> 00:05:30,720
in the back of the auditorium here

136
00:05:36,150 --> 00:05:33,440
of the earth that was taken by apollo 8

137
00:05:37,189 --> 00:05:36,160
in 1968 in december

138
00:05:39,029 --> 00:05:37,199

that

139
00:05:40,870 --> 00:05:39,039
shortly thereafter earth day came along

140
00:05:43,510 --> 00:05:40,880
and an awareness of the earth

141
00:05:45,430 --> 00:05:43,520
and how fragile it is and how much we

142
00:05:47,909 --> 00:05:45,440
need to protect it came

143
00:05:49,909 --> 00:05:47,919
probably from apollo

144
00:05:52,150 --> 00:05:49,919
so these questions are still relevant

145
00:05:54,070 --> 00:05:52,160
today as we seek to go on and do bigger

146
00:05:56,150 --> 00:05:54,080
and bolder things with our new

147
00:05:59,110 --> 00:05:56,160
challenges and the new

148
00:06:01,510 --> 00:05:59,120
the new program that we're pursuing

149
00:06:02,870 --> 00:06:01,520
we're driving onwards towards mars

150
00:06:05,029 --> 00:06:02,880
but we still need to ask some of the

151
00:06:07,430 --> 00:06:05,039
questions to look back to understand

152
00:06:09,749 --> 00:06:07,440
what happened today as steve mentioned

153
00:06:13,029 --> 00:06:09,759
we have a convenient distinguished panel

154
00:06:14,550 --> 00:06:13,039
to discuss apollo's history its legacy

155
00:06:16,390 --> 00:06:14,560
and what it means for the future now

156
00:06:17,189 --> 00:06:16,400
i'll turn it over to steve to take it

157
00:06:20,070 --> 00:06:17,199
over

158
00:06:22,870 --> 00:06:20,080
thank you

159
00:06:24,469 --> 00:06:22,880
deal to discuss today so i think we'll

160
00:06:26,550 --> 00:06:24,479
just get right to it

161
00:06:28,309 --> 00:06:26,560
i think it's a safe bet that uh the

162
00:06:30,309 --> 00:06:28,319
united states never would have gone to

163
00:06:32,469 --> 00:06:30,319

the moon if it hadn't been for the

164
00:06:34,390 --> 00:06:32,479
competition with the soviet union the

165
00:06:36,070 --> 00:06:34,400
geopolitical context was

166
00:06:37,830 --> 00:06:36,080
was very important

167
00:06:59,990 --> 00:06:37,840
so before we start let's take a quick

168
00:07:00,000 --> 00:07:06,710
all right

169
00:07:06,720 --> 00:07:29,029
g cabinet

170
00:07:31,990 --> 00:07:31,029
i believe that this nation should commit

171
00:07:33,909 --> 00:07:32,000
itself

172
00:07:35,909 --> 00:07:33,919
to achieving the goal

173
00:07:37,670 --> 00:07:35,919
before this decade is out

174
00:07:56,469 --> 00:07:37,680
of landing a man on the moon and

175
00:08:01,270 --> 00:07:58,790
we choose to go to the moon in this

176
00:08:03,670 --> 00:08:01,280
decade and do the other things not

177
00:08:06,550 --> 00:08:03,680
because they are easy but because they

178
00:08:12,790 --> 00:08:08,869
john logsdon we've been uh

179
00:08:14,869 --> 00:08:12,800
uh yeah i know you've been researching a

180
00:08:16,869 --> 00:08:14,879
new book on president kennedy's role in

181
00:08:18,710 --> 00:08:16,879
the space race have you found anything

182
00:08:21,350 --> 00:08:18,720
new or revealing during your research

183
00:08:22,790 --> 00:08:21,360
well a number of things steve

184
00:08:26,150 --> 00:08:22,800
one was

185
00:08:27,350 --> 00:08:26,160
how directly involved john f kennedy was

186
00:08:29,189 --> 00:08:27,360
in in

187
00:08:31,189 --> 00:08:29,199
not only the decision to go to the moon

188
00:08:33,909 --> 00:08:31,199

but in carrying out that decision he

189
00:08:38,829 --> 00:08:33,919
paid careful attention to the program as

190
00:08:42,149 --> 00:08:38,839
it evolved after may 25th of 1961.

191
00:08:45,269 --> 00:08:42,159
um he became increasingly concerned

192
00:08:46,949 --> 00:08:45,279
about the costs and he kept emphasizing

193
00:08:47,829 --> 00:08:46,959
that even in the speech that was just

194
00:08:51,430 --> 00:08:47,839
shown

195
00:08:53,590 --> 00:08:51,440
to congress in may of 1961 he improvised

196
00:08:55,350 --> 00:08:53,600
saying this is a decision we all have to

197
00:08:57,509 --> 00:08:55,360
make because it's going to cost a lot of

198
00:09:00,310 --> 00:08:57,519
money we have to make that commitment

199
00:09:02,150 --> 00:09:00,320
and and he was willing at least for most

200
00:09:05,430 --> 00:09:02,160
of his presidency to sustain that

201
00:09:07,350 --> 00:09:05,440
commitment and at the end of 1962

202
00:09:09,590 --> 00:09:07,360
he was trying to figure out ways of

203
00:09:12,389 --> 00:09:09,600
accelerating the first landing to be

204
00:09:15,190 --> 00:09:12,399
sure to be there before the soviet union

205
00:09:17,670 --> 00:09:15,200
the nasa target was late 67 at that

206
00:09:20,150 --> 00:09:17,680
point and he was told maybe it could be

207
00:09:23,990 --> 00:09:20,160
six months even up to 12 months earlier

208
00:09:26,870 --> 00:09:24,000
he seemed willing to pay that price but

209
00:09:29,509 --> 00:09:26,880
10 months later he went before the u.n

210
00:09:31,910 --> 00:09:29,519
and said why should it be a

211
00:09:33,910 --> 00:09:31,920
an area of national competition why

212
00:09:35,269 --> 00:09:33,920
don't we do it together with the soviet

213
00:09:38,310 --> 00:09:35,279

union so

214
00:09:40,630 --> 00:09:38,320
it's where i am right now is is trying

215
00:09:42,870 --> 00:09:40,640
to figure out what he was thinking in

216
00:09:44,949 --> 00:09:42,880
those last couple of months of his life

217
00:09:47,990 --> 00:09:44,959
was he ready i don't think he was ready

218
00:09:50,710 --> 00:09:48,000
to abandon apollo but he may have been

219
00:09:52,389 --> 00:09:50,720
ready to slip the date a bit and see if

220
00:09:54,470 --> 00:09:52,399
we could do it together

221
00:09:55,910 --> 00:09:54,480
so why didn't we do it together

222
00:09:59,190 --> 00:09:55,920
well i think

223
00:10:02,790 --> 00:09:59,200
the political support was strongly tied

224
00:10:05,750 --> 00:10:02,800
to the competitive elements of apollo

225
00:10:07,990 --> 00:10:05,760
the soviet union at that point had not

226
00:10:10,470 --> 00:10:08,000
decided that it was going to race us to

227
00:10:12,470 --> 00:10:10,480
the moon it did in the following year so

228
00:10:16,949 --> 00:10:12,480
there wasn't a soviet program to

229
00:10:23,190 --> 00:10:20,150
and basically the soviet union and

230
00:10:25,030 --> 00:10:23,200
nikita khrushchev was only just coming

231
00:10:27,590 --> 00:10:25,040
to the notion that kennedy could be

232
00:10:30,069 --> 00:10:27,600
trusted uh that the united states could

233
00:10:31,670 --> 00:10:30,079
possibly be a partner so and one of

234
00:10:33,110 --> 00:10:31,680
these questions will never be able to

235
00:10:34,790 --> 00:10:33,120
answer is what would have happened if

236
00:10:36,550 --> 00:10:34,800
kennedy had lived

237
00:10:38,310 --> 00:10:36,560
so let me turn to roger roger how

238
00:10:40,150 --> 00:10:38,320

serious was the space race were the

239
00:10:42,069 --> 00:10:40,160
soviets ever close to

240
00:10:43,910 --> 00:10:42,079
getting humans on the moon was it a real

241
00:10:45,670 --> 00:10:43,920
race it was a real race no question

242
00:10:47,590 --> 00:10:45,680
about that but the soviets were never

243
00:10:50,069 --> 00:10:47,600
really close to reaching the moon before

244
00:10:52,710 --> 00:10:50,079
us by any means we didn't necessarily

245
00:10:54,790 --> 00:10:52,720
know that and we made decisions based

246
00:10:57,350 --> 00:10:54,800
upon perceptions rather than the reality

247
00:10:59,750 --> 00:10:57,360
of the soviet program but there was a

248
00:11:01,829 --> 00:10:59,760
sense all the time that

249
00:11:03,509 --> 00:11:01,839
you come up to the point where we decide

250
00:11:05,350 --> 00:11:03,519
to race to the moon where kennedy does

251
00:11:07,190 --> 00:11:05,360
make a 61 speech

252
00:11:08,630 --> 00:11:07,200
where it looks like the soviets are kind

253
00:11:12,870 --> 00:11:08,640
of

254
00:11:14,870 --> 00:11:12,880
are moving forward in a very aggressive

255
00:11:16,870 --> 00:11:14,880
program with sputnik with their first

256
00:11:19,350 --> 00:11:16,880
human flight with yuri gagarin with a

257
00:11:22,230 --> 00:11:19,360
succession of other firsts and it's not

258
00:11:25,110 --> 00:11:22,240
until the mid 1960s when really gemini

259
00:11:27,110 --> 00:11:25,120
starts to be successful that you get a a

260
00:11:29,509 --> 00:11:27,120
a change in public opinion where people

261
00:11:31,430 --> 00:11:29,519
start thinking that well maybe the us is

262
00:11:32,949 --> 00:11:31,440
as good as the soviet union and is

263
00:11:35,509 --> 00:11:32,959

actually surpassing them in their

264
00:11:37,509 --> 00:11:35,519
capabilities

265
00:11:38,870 --> 00:11:37,519
so with uh kennedy's proclamation that

266
00:11:41,030 --> 00:11:38,880
we saw there in that first clip the

267
00:11:43,190 --> 00:11:41,040
course was set for the moon as chris

268
00:11:45,509 --> 00:11:43,200
mentioned the there were 12 000

269
00:11:48,150 --> 00:11:45,519
companies 400 000 people

270
00:11:49,190 --> 00:11:48,160
20 or 25 billion dollars for the apollo

271
00:11:50,310 --> 00:11:49,200
program

272
00:11:52,069 --> 00:11:50,320
uh

273
00:13:30,710 --> 00:11:52,079
let's take a look at another clip before

274
00:13:35,430 --> 00:13:33,269
so mike neufeld you wrote the biography

275
00:13:36,389 --> 00:13:35,440
of on brown we saw von braun earlier in

276
00:13:37,750 --> 00:13:36,399
that clip

277
00:13:40,790 --> 00:13:37,760
could the united states have won the

278
00:13:42,389 --> 00:13:40,800
space race uh without von braun

279
00:13:44,150 --> 00:13:42,399
well uh the moon race

280
00:13:45,430 --> 00:13:44,160
it would have been hard to do it as soon

281
00:13:47,189 --> 00:13:45,440
as we did it whether we could have

282
00:13:49,509 --> 00:13:47,199
beaten the soviets kind of depends also

283
00:13:51,110 --> 00:13:49,519
on them and they clearly failed in many

284
00:13:52,949 --> 00:13:51,120
ways to fulfill their program he did

285
00:13:55,110 --> 00:13:52,959
play a very very central role in having

286
00:13:57,670 --> 00:13:55,120
a booster that worked and that was

287
00:13:59,910 --> 00:13:57,680
certainly his great uh contribution to

288
00:14:02,629 --> 00:13:59,920

the thing the fact that saturn 5 was so

289
00:14:04,870 --> 00:14:02,639
incredibly successful and never fail in

290
00:14:06,310 --> 00:14:04,880
spite of being the most challenging

291
00:14:07,829 --> 00:14:06,320
rocket engineering project ever

292
00:14:09,350 --> 00:14:07,839
attempted

293
00:14:11,350 --> 00:14:09,360
so von braun certainly was one of the

294
00:14:15,030 --> 00:14:11,360
key players

295
00:14:16,870 --> 00:14:15,040
i'd like to go to

296
00:14:17,990 --> 00:14:16,880
craig i know in your book you talk about

297
00:14:19,430 --> 00:14:18,000
a lot of the key players who would be

298
00:14:21,110 --> 00:14:19,440
your

299
00:14:22,550 --> 00:14:21,120
candidate for

300
00:14:24,230 --> 00:14:22,560
one or two more of the key players in

301
00:14:26,230 --> 00:14:24,240
this program well i'd have to pick three

302
00:14:28,310 --> 00:14:26,240
my number one would be lyndon johnson

303
00:14:29,509 --> 00:14:28,320
who was at the birth of nasa by heading

304
00:14:31,670 --> 00:14:29,519
up the senate in eisenhower

305
00:14:34,470 --> 00:14:31,680
administration who was behind the speech

306
00:14:36,230 --> 00:14:34,480
we saw kennedy giving and who made sure

307
00:14:38,710 --> 00:14:36,240
to reach those goals during his

308
00:14:41,670 --> 00:14:38,720
presidency saying he owed it to kennedy

309
00:14:44,069 --> 00:14:41,680
my other two heroes of apollo would be

310
00:14:46,629 --> 00:14:44,079
the politburo who deposed khrushchev and

311
00:14:48,790 --> 00:14:46,639
the medical team who let sergey korliov

312
00:14:51,509 --> 00:14:48,800
die on the operating table i think that

313
00:14:53,350 --> 00:14:51,519

the soviets losing their uh premier

314
00:14:55,829 --> 00:14:53,360
rocket scientist or premier rocket

315
00:14:57,670 --> 00:14:55,839
engineer excuse me mike uh and their

316
00:14:59,509 --> 00:14:57,680
premier supporter of that rocket

317
00:15:02,069 --> 00:14:59,519
scientist was a profound blow to them

318
00:15:04,150 --> 00:15:02,079
that khrushchev could use corey of space

319
00:15:07,189 --> 00:15:04,160
achievements to imply that he had a

320
00:15:08,949 --> 00:15:07,199
military operation as powerful as as the

321
00:15:10,550 --> 00:15:08,959
rockets orbiting in space when he did

322
00:15:12,629 --> 00:15:10,560
not and those two were formidable

323
00:15:14,389 --> 00:15:12,639
opponents

324
00:15:15,750 --> 00:15:14,399
so chris i know you weren't very old at

325
00:15:18,069 --> 00:15:15,760
the time that apollo was launched but

326
00:15:20,230 --> 00:15:18,079
from a point of view of operations uh

327
00:15:22,389 --> 00:15:20,240
would you have a candidate for a person

328
00:15:23,829 --> 00:15:22,399
who was crucial to uh to the apollo

329
00:15:25,590 --> 00:15:23,839
program

330
00:15:27,189 --> 00:15:25,600
i think i would have to say again von

331
00:15:29,110 --> 00:15:27,199
braun i mean he he designed an

332
00:15:31,030 --> 00:15:29,120
incredible launch vehicle the saturn v

333
00:15:32,790 --> 00:15:31,040
and and in the constellation program

334
00:15:35,910 --> 00:15:32,800
we're currently using a tremendous

335
00:15:39,030 --> 00:15:35,920
amount of legacy hardware heritage from

336
00:15:40,870 --> 00:15:39,040
the apollo program so i think i think

337
00:15:43,030 --> 00:15:40,880
we're building on 40 years of space

338
00:15:45,430 --> 00:15:43,040

flight experience and employing it into

339
00:15:46,550 --> 00:15:45,440
the current program for constellation

340
00:15:48,069 --> 00:15:46,560
and we're going to talk about that a

341
00:15:50,550 --> 00:15:48,079
little later also

342
00:15:52,389 --> 00:15:50,560
uh well of course we all know that the

343
00:15:55,030 --> 00:15:52,399
first

344
00:15:56,790 --> 00:15:55,040
manned apollo flight was apollo 7

345
00:15:58,629 --> 00:15:56,800
but things really heated up with apollo

346
00:16:00,069 --> 00:15:58,639
8 with that circumnavigation of the moon

347
00:16:03,430 --> 00:16:00,079
that we all remember with the christmas

348
00:16:05,110 --> 00:16:03,440
eve reading uh of genesis uh

349
00:16:18,310 --> 00:16:05,120
from around the moon let's take a look

350
00:16:23,030 --> 00:16:20,550
this is apollo saturn launch control we

351
00:16:28,389 --> 00:16:23,040
are still go at this time

352
00:16:29,430 --> 00:16:28,399
t-minus 15 14 13 12 11

353
00:16:30,790 --> 00:16:29,440
10

354
00:16:33,269 --> 00:16:30,800
9.

355
00:16:34,870 --> 00:16:33,279
we have ignition sequence start

356
00:16:44,550 --> 00:16:34,880
the engines are on

357
00:16:44,560 --> 00:16:59,990
7 51 a.m

358
00:17:03,990 --> 00:17:02,150
the crew of apollo 8

359
00:17:06,069 --> 00:17:04,000
has a message that we would like to send

360
00:17:07,669 --> 00:17:06,079
to you

361
00:17:10,789 --> 00:17:07,679
in the beginning

362
00:17:14,230 --> 00:17:10,799
god created the heaven and the earth

363
00:17:16,150 --> 00:17:14,240

and the earth was without form and void

364
00:17:29,350 --> 00:17:16,160
and darkness was upon the base of the

365
00:17:33,190 --> 00:17:31,590
so apollo 8 really was an incredible

366
00:17:34,870 --> 00:17:33,200
journey some people say was one of the

367
00:17:35,830 --> 00:17:34,880
riskiest missions the first time we

368
00:17:37,270 --> 00:17:35,840
actually

369
00:17:39,590 --> 00:17:37,280
left the

370
00:17:40,470 --> 00:17:39,600
earth orbital area and went around the

371
00:17:42,470 --> 00:17:40,480
moon

372
00:17:43,909 --> 00:17:42,480
just how risky was that mission let's

373
00:17:45,190 --> 00:17:43,919
talk a little bit about how risky it was

374
00:17:47,029 --> 00:17:45,200
and what was involved in that mission

375
00:17:49,669 --> 00:17:47,039
roger why don't you start us off oh sure

376
00:17:51,430 --> 00:17:49,679
absolutely apollo 8 was truly remarkable

377
00:17:52,870 --> 00:17:51,440
and and quite frankly adding to your

378
00:17:54,230 --> 00:17:52,880
comment earlier about who were some of

379
00:17:55,669 --> 00:17:54,240
the key people that that made

380
00:17:57,750 --> 00:17:55,679
contributions you've got a couple of

381
00:18:00,230 --> 00:17:57,760
them that come to the fore pretty

382
00:18:02,549 --> 00:18:00,240
importantly in the apollo 8 story and

383
00:18:04,630 --> 00:18:02,559
that is george miller who headed the

384
00:18:06,470 --> 00:18:04,640
uh the human space flight program man's

385
00:18:08,870 --> 00:18:06,480
office of man space flight in those days

386
00:18:11,909 --> 00:18:08,880
and sam phillips who ran the program

387
00:18:14,710 --> 00:18:11,919
office for apollo and

388
00:18:16,950 --> 00:18:14,720

the idea was and it was a very gutsy

389
00:18:19,669 --> 00:18:16,960
decision to

390
00:18:22,390 --> 00:18:19,679
fly humans the second time we had flown

391
00:18:24,310 --> 00:18:22,400
a crew on the apollo spacecraft

392
00:18:26,310 --> 00:18:24,320
and this really the second time we had

393
00:18:27,990 --> 00:18:26,320
flown the saturn v stack

394
00:18:31,029 --> 00:18:28,000
to go to the moon with it that was a

395
00:18:33,430 --> 00:18:31,039
remarkable uh and gutsy call on the part

396
00:18:35,350 --> 00:18:33,440
of some key people who had who had done

397
00:18:37,270 --> 00:18:35,360
assessments and decided that this was

398
00:18:39,350 --> 00:18:37,280
something they could pull off

399
00:18:42,070 --> 00:18:39,360
and that they believed was probably

400
00:18:44,150 --> 00:18:42,080
necessary to ensure that they remained

401
00:18:45,750 --> 00:18:44,160
on schedule to make a a landing by the

402
00:18:46,710 --> 00:18:45,760
end of the next year by the end of the

403
00:18:47,990 --> 00:18:46,720
decade

404
00:18:50,150 --> 00:18:48,000
and uh

405
00:18:53,110 --> 00:18:50,160
and they and they did it it was it was a

406
00:18:56,630 --> 00:18:53,120
wonderful success story and it was a

407
00:19:00,390 --> 00:18:56,640
remarkable end to a pretty awful year in

408
00:19:02,310 --> 00:19:00,400
1968 a year that started with uh with

409
00:19:03,990 --> 00:19:02,320
enormous difficulties in vietnam with

410
00:19:05,750 --> 00:19:04,000
the access with the assassinations of

411
00:19:08,150 --> 00:19:05,760
martin luther king and

412
00:19:09,590 --> 00:19:08,160
uh and robert kennedy with

413
00:19:11,270 --> 00:19:09,600

riots at the democratic national

414
00:19:13,669 --> 00:19:11,280
convention in the summer and just on and

415
00:19:15,830 --> 00:19:13,679
on and on and the whole the whole nation

416
00:19:18,070 --> 00:19:15,840
seemed to be blowing up and at the end

417
00:19:20,070 --> 00:19:18,080
of the year this apollo 8 flight which

418
00:19:23,669 --> 00:19:20,080
was truly remarkable where the

419
00:19:25,350 --> 00:19:23,679
astronauts uh uh talk about

420
00:19:27,190 --> 00:19:25,360
the good earth and send christmas

421
00:19:28,390 --> 00:19:27,200
greetings to all the people that reside

422
00:19:30,710 --> 00:19:28,400
there

423
00:19:33,350 --> 00:19:30,720
john your thoughts i'd add to the hero

424
00:19:36,150 --> 00:19:33,360
list george lowe absolutely george was

425
00:19:38,870 --> 00:19:36,160
the one one morning in july with the

426
00:19:40,630 --> 00:19:38,880
lunar modules being late on its schedule

427
00:19:42,630 --> 00:19:40,640
went to see bob gilruth head of the

428
00:19:45,669 --> 00:19:42,640
manned spacecraft center and said i've

429
00:19:47,590 --> 00:19:45,679
got an idea let's go around the moon

430
00:19:50,310 --> 00:19:47,600
chris craft was brought in

431
00:19:52,870 --> 00:19:50,320
could you could operations support that

432
00:19:54,470 --> 00:19:52,880
they called up von braun in huntsville

433
00:19:57,510 --> 00:19:54,480
and said could we come over and talk to

434
00:19:59,510 --> 00:19:57,520
you flew to huntsville sam phillips was

435
00:20:02,310 --> 00:19:59,520
at the cape and kurt dibus i believe it

436
00:20:03,990 --> 00:20:02,320
was at the cave came to huntsville

437
00:20:06,310 --> 00:20:04,000
by that afternoon

438
00:20:08,870 --> 00:20:06,320

the fundamental decision was made to do

439
00:20:11,510 --> 00:20:08,880
this mission you know like six hours can

440
00:20:14,310 --> 00:20:11,520
you imagine in today's world making a

441
00:20:15,909 --> 00:20:14,320
decision like that in six hours not

442
00:20:17,270 --> 00:20:15,919
really mike do you want to elaborate on

443
00:20:19,669 --> 00:20:17,280
that

444
00:20:20,950 --> 00:20:19,679
i wanted to mention bob gilruth and john

445
00:20:23,430 --> 00:20:20,960
already mentioned him but if we're going

446
00:20:26,470 --> 00:20:23,440
to make lay out the the key players in

447
00:20:29,669 --> 00:20:26,480
apollo here was a guy who built uh

448
00:20:32,070 --> 00:20:29,679
houston from a little group at uh at the

449
00:20:34,950 --> 00:20:32,080
langley center in 1958 creating the

450
00:20:36,950 --> 00:20:34,960
mercury program and going from that to

451
00:20:39,190 --> 00:20:36,960
this giant center that was an enormous

452
00:20:42,549 --> 00:20:39,200
accomplishment building the spacecraft

453
00:20:44,549 --> 00:20:42,559
and astronaut part of the apollo program

454
00:20:46,549 --> 00:20:44,559
and how did von braun

455
00:20:49,270 --> 00:20:46,559
feel about this apollo 8 going to the

456
00:20:52,310 --> 00:20:49,280
moon after the after the only one

457
00:20:54,070 --> 00:20:52,320
well i mean you know as as uh roger

458
00:20:56,630 --> 00:20:54,080
outlined that was a decision they made

459
00:20:58,310 --> 00:20:56,640
in his office and basically he felt okay

460
00:21:00,470 --> 00:20:58,320
with the saturn v because in fact it was

461
00:21:03,110 --> 00:21:00,480
the third launch and the second one

462
00:21:06,230 --> 00:21:03,120
hadn't gone well at all so it was also a

463
00:21:08,470 --> 00:21:06,240

risky decision to put a human on of the

464
00:21:10,950 --> 00:21:08,480
saturn v after the second test didn't go

465
00:21:13,029 --> 00:21:10,960
so well but he had the total confidence

466
00:21:15,590 --> 00:21:13,039
in the system in his engineers and in

467
00:21:18,230 --> 00:21:15,600
the testing program that had revealed

468
00:21:20,310 --> 00:21:18,240
what had gone wrong on the second launch

469
00:21:22,950 --> 00:21:20,320
in agency history what's fantastic about

470
00:21:25,510 --> 00:21:22,960
apollo 8 is that the apollo one fire had

471
00:21:27,590 --> 00:21:25,520
crippled the agency so terribly and with

472
00:21:29,430 --> 00:21:27,600
so many executives and management people

473
00:21:31,510 --> 00:21:29,440
leaving that really they they're almost

474
00:21:34,390 --> 00:21:31,520
in a doldrums and then apollo 8 comes

475
00:21:36,710 --> 00:21:34,400
along and this completely insane idea

476
00:21:38,390 --> 00:21:36,720
that works propels the agency forward

477
00:21:39,909 --> 00:21:38,400
and really we're ahead in the space race

478
00:21:41,110 --> 00:21:39,919
with the soviets for the first time at

479
00:21:43,350 --> 00:21:41,120
that moment really amazing when you

480
00:21:46,230 --> 00:21:43,360
think about it the fire in 1967 and then

481
00:21:48,549 --> 00:21:46,240
this in 1968 the end of 1968 but we were

482
00:21:50,149 --> 00:21:48,559
already going around the moon

483
00:21:51,830 --> 00:21:50,159
i'd like to make a comment obviously i'm

484
00:21:53,909 --> 00:21:51,840
of the younger generation i was for

485
00:21:55,669 --> 00:21:53,919
during the apollo program but the one

486
00:21:57,510 --> 00:21:55,679
thing that does amaze me is the entire

487
00:21:59,669 --> 00:21:57,520
program itself they were learning how to

488
00:22:01,190 --> 00:21:59,679

fly in space while also developing the

489
00:22:03,190 --> 00:22:01,200
launch vehicles and spacecraft and i

490
00:22:04,789 --> 00:22:03,200
think that's a huge feat

491
00:22:06,310 --> 00:22:04,799
something that once again in the

492
00:22:08,470 --> 00:22:06,320
constellation program we're building on

493
00:22:09,830 --> 00:22:08,480
that experience over 40 years and we

494
00:22:12,470 --> 00:22:09,840
don't have that extra challenge of

495
00:22:14,070 --> 00:22:12,480
learning how to fly in space so i think

496
00:22:16,149 --> 00:22:14,080
that was amazing

497
00:22:17,990 --> 00:22:16,159
i think there's one still unresolved

498
00:22:20,310 --> 00:22:18,000
historical question

499
00:22:21,830 --> 00:22:20,320
related to apollo 8.

500
00:22:24,310 --> 00:22:21,840
the cia

501
00:22:26,710 --> 00:22:24,320
projected that the soviet union might

502
00:22:29,669 --> 00:22:26,720
send a crew around the moon looping

503
00:22:32,230 --> 00:22:29,679
around the moon by the end of 1968

504
00:22:33,990 --> 00:22:32,240
uh and and question is

505
00:22:35,669 --> 00:22:34,000
and i've i've looked at this paper

506
00:22:38,070 --> 00:22:35,679
record pretty carefully but that would

507
00:22:39,750 --> 00:22:38,080
have been highly classified stuff how

508
00:22:41,750 --> 00:22:39,760
much that

509
00:22:44,149 --> 00:22:41,760
influenced the decision to fly a mission

510
00:22:46,630 --> 00:22:44,159
to the moon to make sure that we got not

511
00:22:48,630 --> 00:22:46,640
only on the moon but to the moon

512
00:22:50,230 --> 00:22:48,640
before the soviet union well that had to

513
00:22:52,470 --> 00:22:50,240

be one of the drivers if we hadn't been

514
00:22:54,390 --> 00:22:52,480
in this race and been worried really in

515
00:22:55,669 --> 00:22:54,400
a real sense that that they might beat

516
00:22:57,750 --> 00:22:55,679
us surely we wouldn't have done this

517
00:22:59,909 --> 00:22:57,760
apollo 8 mission at that time right

518
00:23:02,789 --> 00:22:59,919
we were flying blind pretty much they

519
00:23:04,630 --> 00:23:02,799
the the the pentagon and cia did not

520
00:23:07,110 --> 00:23:04,640
share much with nasa who they considered

521
00:23:08,710 --> 00:23:07,120
civilian blabbermouth so they kept a lot

522
00:23:09,990 --> 00:23:08,720
of stuff to themselves but a lot of

523
00:23:11,590 --> 00:23:10,000
stuff they kept to themselves wasn't

524
00:23:13,350 --> 00:23:11,600
worth sharing in the first place so it

525
00:23:15,350 --> 00:23:13,360
didn't really miss out but i i believe

526
00:23:18,070 --> 00:23:15,360
nasa executives were pretty much flying

527
00:23:19,110 --> 00:23:18,080
blind against the soviets

528
00:23:21,270 --> 00:23:19,120
you know i would

529
00:23:23,590 --> 00:23:21,280
to you know agree with your point steve

530
00:23:26,230 --> 00:23:23,600
i think they really were driven by this

531
00:23:28,390 --> 00:23:26,240
in a way that wouldn't be replicated now

532
00:23:31,029 --> 00:23:28,400
because they they took decisions that

533
00:23:32,789 --> 00:23:31,039
were risky at several points in time and

534
00:23:34,470 --> 00:23:32,799
if they had been in another situation

535
00:23:36,470 --> 00:23:34,480
would said well do this when when it's

536
00:23:39,190 --> 00:23:36,480
con when it's feasible

537
00:23:40,710 --> 00:23:39,200
uh don't take any chances then it would

538
00:23:43,510 --> 00:23:40,720

have taken two or three years longer to

539
00:23:45,510 --> 00:23:43,520
land on the moon probably uh so when did

540
00:23:48,870 --> 00:23:45,520
we find out that the soviets were not

541
00:23:55,190 --> 00:23:48,880
really that much in the race

542
00:23:58,870 --> 00:23:57,269
of what was taking place it turns out

543
00:24:01,350 --> 00:23:58,880
they were blowing up rockets as we were

544
00:24:03,110 --> 00:24:01,360
going to the moon right but we did know

545
00:24:06,789 --> 00:24:03,120
that they were building a moon rock our

546
00:24:09,110 --> 00:24:06,799
our now declassified corona satellites

547
00:24:11,190 --> 00:24:09,120
took images of the n1 rocket on the

548
00:24:13,430 --> 00:24:11,200
launch pad we knew that they

549
00:24:14,870 --> 00:24:13,440
were developing the the launch vehicle i

550
00:24:17,029 --> 00:24:14,880
guess we didn't see

551
00:24:18,870 --> 00:24:17,039
uh the i mean

552
00:24:21,909 --> 00:24:18,880
alexi lee enough was trained for the

553
00:24:23,510 --> 00:24:21,919
mission they built a lunar lander uh

554
00:24:25,110 --> 00:24:23,520
i guess we didn't see that until much

555
00:24:26,149 --> 00:24:25,120
later they built a moon suit which you

556
00:24:29,669 --> 00:24:26,159
mean

557
00:24:31,669 --> 00:24:29,679
on july 4th 69 the cia corona satellite

558
00:24:33,830 --> 00:24:31,679
captured one of these giant rockets on

559
00:24:35,990 --> 00:24:33,840
the pad at the baikonur cosmodrome and

560
00:24:38,390 --> 00:24:36,000
when it passed over a second time it was

561
00:24:39,590 --> 00:24:38,400
gone and it exploded on the pad and when

562
00:24:41,269 --> 00:24:39,600
it exploded

563
00:24:43,350 --> 00:24:41,279

they they knew something bad had

564
00:24:45,269 --> 00:24:43,360
happened but it was not clear from this

565
00:24:47,029 --> 00:24:45,279
what happened and we found out i think

566
00:24:49,190 --> 00:24:47,039
in 1974

567
00:24:50,710 --> 00:24:49,200
that this rocket if apollo 11 had failed

568
00:24:53,430 --> 00:24:50,720
this rocket was immediately going to

569
00:24:55,110 --> 00:24:53,440
attempt a moon landing

570
00:24:57,350 --> 00:24:55,120
i i would argue with that because i

571
00:24:59,110 --> 00:24:57,360
think in fact they were not ready to man

572
00:25:01,669 --> 00:24:59,120
the vehicle in fact they were several

573
00:25:03,909 --> 00:25:01,679
years away from manning that n1 vehicle

574
00:25:05,750 --> 00:25:03,919
this was just a launch test and they

575
00:25:07,510 --> 00:25:05,760
hadn't had one that worked and that one

576
00:25:10,390 --> 00:25:07,520
didn't work either and in fact it never

577
00:25:13,430 --> 00:25:10,400
did work so so i mean i think the race

578
00:25:15,990 --> 00:25:13,440
was over in 68 uh but it was hard to

579
00:25:17,510 --> 00:25:16,000
tell that until the day that apollo 11

580
00:25:19,269 --> 00:25:17,520
pulled it off and then you could look in

581
00:25:20,870 --> 00:25:19,279
hindsight and say sure we beat them on

582
00:25:22,950 --> 00:25:20,880
all fronts you know did they ever have a

583
00:25:24,950 --> 00:25:22,960
fancier name for the n1 like i mean we

584
00:25:26,950 --> 00:25:24,960
had the saturn v which you know has a

585
00:25:28,390 --> 00:25:26,960
little class but the n1 was never never

586
00:25:31,269 --> 00:25:28,400
had a name no no

587
00:25:33,029 --> 00:25:31,279
i mean i think the fact that is uh yeah

588
00:25:34,310 --> 00:25:33,039

they only had acronyms

589
00:25:36,070 --> 00:25:34,320
that was the problem with losing

590
00:25:39,110 --> 00:25:36,080
khrushchev he came up with all these

591
00:25:41,909 --> 00:25:39,120
spiffy names for the rockets

592
00:25:44,230 --> 00:25:41,919
okay let's move on then uh with apollo

593
00:25:45,110 --> 00:25:44,240
10 we came within a few thousand feet of

594
00:25:48,630 --> 00:25:45,120
the

595
00:25:52,149 --> 00:25:48,640
watch

596
00:26:08,950 --> 00:25:52,159
down two and a half picking up

597
00:26:12,870 --> 00:26:10,950
engine command override off

598
00:26:16,310 --> 00:26:12,880
engine arm off

599
00:26:19,750 --> 00:26:18,549
we've had shut down we copy you down

600
00:26:23,510 --> 00:26:19,760
eagle

601
00:26:25,750 --> 00:26:23,520
okay everybody key one standby for d1

602
00:26:29,029 --> 00:26:25,760
tranquility base here the eagle has

603
00:26:30,789 --> 00:26:29,039
landed roger 20 tranquility we copy you

604
00:26:32,630 --> 00:26:30,799
on the ground you got a bunch of guys

605
00:26:33,830 --> 00:26:32,640
about to turn blue we're breathing again

606
00:26:36,870 --> 00:26:33,840
thanks a lot

607
00:26:47,909 --> 00:26:36,880
okay t1 stay no stay retro

608
00:26:47,919 --> 00:26:57,750
now

609
00:26:57,760 --> 00:27:02,710
that's one small step for man

610
00:27:21,510 --> 00:27:03,669
one

611
00:27:26,230 --> 00:27:23,750
here men from the planet earth

612
00:27:30,549 --> 00:27:26,240
first set foot upon the moon

613
00:27:36,870 --> 00:27:34,630

it came in peace for all mankind

614
00:27:39,110 --> 00:27:36,880
those are all iconic images that many of

615
00:27:41,190 --> 00:27:39,120
us remember maybe not chris but

616
00:27:43,110 --> 00:27:41,200
a lot of us remember where we were at

617
00:27:44,710 --> 00:27:43,120
that time and just today nasa released

618
00:27:46,789 --> 00:27:44,720
some of the uh

619
00:27:49,110 --> 00:27:46,799
new higher resolution footage from from

620
00:27:50,789 --> 00:27:49,120
those images there are lots of questions

621
00:27:54,310 --> 00:27:50,799
we can we can uh

622
00:27:55,990 --> 00:27:54,320
address here uh let's start with uh

623
00:27:58,710 --> 00:27:56,000
the question of how

624
00:28:00,870 --> 00:27:58,720
did it happen that armstrong and aldrin

625
00:28:03,590 --> 00:28:00,880
uh were the first uh two humans on the

626
00:28:05,669 --> 00:28:03,600
moon

627
00:28:08,549 --> 00:28:05,679
well it's because

628
00:28:09,669 --> 00:28:08,559
all the missions before 11 were went off

629
00:28:12,549 --> 00:28:09,679
perfectly

630
00:28:15,750 --> 00:28:12,559
i mean the the crews were uh

631
00:28:17,990 --> 00:28:15,760
chosen for a sequence of missions uh the

632
00:28:20,789 --> 00:28:18,000
first g mission which was a landing

633
00:28:22,710 --> 00:28:20,799
mission crew was chosen in january

634
00:28:25,110 --> 00:28:22,720
but that meant that apollo 9 and apollo

635
00:28:27,990 --> 00:28:25,120
10 had to be successful for them to be

636
00:28:30,149 --> 00:28:28,000
the ones to try the landing on 11.

637
00:28:32,230 --> 00:28:30,159
so uh

638
00:28:33,990 --> 00:28:32,240

in a sense it was was normal program

639
00:28:35,909 --> 00:28:34,000
management

640
00:28:38,549 --> 00:28:35,919
yeah there wasn't anything magical about

641
00:28:40,149 --> 00:28:38,559
this and and uh and of course crew

642
00:28:41,830 --> 00:28:40,159
rotation is one of the great parlor

643
00:28:44,070 --> 00:28:41,840
games that those of us who are kind of

644
00:28:45,590 --> 00:28:44,080
space cadets like to play uh you know

645
00:28:47,590 --> 00:28:45,600
who would have been on what mission if

646
00:28:48,950 --> 00:28:47,600
something had happened and so on and so

647
00:28:50,149 --> 00:28:48,960
forth and we can never know the answer

648
00:28:54,549 --> 00:28:50,159
to those things

649
00:28:56,389 --> 00:28:54,559
um but uh but the reality was that uh

650
00:28:57,830 --> 00:28:56,399
through um

651
00:29:00,389 --> 00:28:57,840
through the machinations of the

652
00:29:02,549 --> 00:29:00,399
astronaut office uh this particular crew

653
00:29:04,549 --> 00:29:02,559
got put together and it was assigned to

654
00:29:08,070 --> 00:29:04,559
this particular mission the previous

655
00:29:10,310 --> 00:29:08,080
flights as john said did uh perform

656
00:29:12,389 --> 00:29:10,320
their tasks successfully had they not

657
00:29:13,510 --> 00:29:12,399
done so and had to repeat the same

658
00:29:15,590 --> 00:29:13,520
mission to

659
00:29:17,190 --> 00:29:15,600
uh to figure out how to do this thing it

660
00:29:19,909 --> 00:29:17,200
would have it would have fallen to pete

661
00:29:22,549 --> 00:29:19,919
conrad or someone else down the road to

662
00:29:24,070 --> 00:29:22,559
make that first landing

663
00:29:25,510 --> 00:29:24,080

we saw that landing on the on the

664
00:29:27,669 --> 00:29:25,520
footage there

665
00:29:29,830 --> 00:29:27,679
why was that landing so unexpectedly

666
00:29:31,669 --> 00:29:29,840
exciting with only a few seconds of fuel

667
00:29:33,669 --> 00:29:31,679
left was that planned or not planned or

668
00:29:35,269 --> 00:29:33,679
what's the story there it was the most

669
00:29:37,990 --> 00:29:35,279
difficult

670
00:29:39,669 --> 00:29:38,000
landing in general to pull off because

671
00:29:41,190 --> 00:29:39,679
of course partly because after they did

672
00:29:43,269 --> 00:29:41,200
it once they knew how to do it better

673
00:29:44,870 --> 00:29:43,279
but they had a problem with the computer

674
00:29:47,430 --> 00:29:44,880
alarms because of a conflict between the

675
00:29:49,110 --> 00:29:47,440
rendezvous radar and the landing radar

676
00:29:52,470 --> 00:29:49,120
they had a

677
00:29:53,350 --> 00:29:52,480
problem of uh targeting so they couldn't

678
00:29:55,029 --> 00:29:53,360
target

679
00:29:56,630 --> 00:29:55,039
the thing very accurately and they ended

680
00:29:59,029 --> 00:29:56,640
up coming down towards a field of

681
00:30:00,950 --> 00:29:59,039
boulders and armstrong had to go manual

682
00:30:02,789 --> 00:30:00,960
and go over top of it and stretch his

683
00:30:04,870 --> 00:30:02,799
landing out one of my favorite

684
00:30:06,950 --> 00:30:04,880
discoveries in doing this book was

685
00:30:09,190 --> 00:30:06,960
to read about how everyone at mission

686
00:30:10,870 --> 00:30:09,200
control is turning blue waiting for them

687
00:30:13,350 --> 00:30:10,880
to land fearful they're going to run out

688
00:30:14,870 --> 00:30:13,360

of gas and crash and one guy had done

689
00:30:16,149 --> 00:30:14,880
tests up at grumman with the lunar

690
00:30:17,510 --> 00:30:16,159
module and he had found that if they

691
00:30:19,430 --> 00:30:17,520
tried to come down with too much

692
00:30:21,190 --> 00:30:19,440
propellant in the tank the blowback

693
00:30:22,950 --> 00:30:21,200
might blow up the ship so while everyone

694
00:30:25,750 --> 00:30:22,960
at mission control is praying they don't

695
00:30:28,710 --> 00:30:25,760
run out of gas he's praying that they do

696
00:30:31,750 --> 00:30:28,720
well i i think chris can tell you uh

697
00:30:34,549 --> 00:30:31,760
we've got lunar reconnaissance orbiter

698
00:30:37,190 --> 00:30:34,559
in orbit around the moon now to look for

699
00:30:39,990 --> 00:30:37,200
landing sites i mean we landed on the

700
00:30:42,549 --> 00:30:40,000
moon in 1969 with very limited

701
00:30:44,789 --> 00:30:42,559
information about the lunar surface and

702
00:30:46,710 --> 00:30:44,799
so the navigation had them going to this

703
00:30:49,029 --> 00:30:46,720
field of boulders and it was only

704
00:30:51,669 --> 00:30:49,039
because you had a really good pilot

705
00:30:54,630 --> 00:30:51,679
named neil armstrong to take over manual

706
00:30:57,350 --> 00:30:54,640
control and fly that thing for what 90

707
00:30:58,710 --> 00:30:57,360
seconds or so away from danger that the

708
00:30:59,830 --> 00:30:58,720
landing was successful we did have the

709
00:31:02,070 --> 00:30:59,840
lunar orbiters but i guess the

710
00:31:04,389 --> 00:31:02,080
resolution wasn't that good right not as

711
00:31:05,909 --> 00:31:04,399
good as we're getting now right well he

712
00:31:07,590 --> 00:31:05,919
had all of these charts and pictures but

713
00:31:10,310 --> 00:31:07,600

they were from four miles behind him

714
00:31:13,350 --> 00:31:11,590
uh

715
00:31:14,870 --> 00:31:13,360
okay well let me we get a lot of

716
00:31:17,350 --> 00:31:14,880
questions from the public and they're

717
00:31:19,669 --> 00:31:17,360
about this uh this mission in particular

718
00:31:21,750 --> 00:31:19,679
uh one of the questions uh that we got

719
00:31:24,230 --> 00:31:21,760
this last week is

720
00:31:25,909 --> 00:31:24,240
were armstrong's words scripted or were

721
00:31:28,230 --> 00:31:25,919
they his own

722
00:31:29,830 --> 00:31:28,240
all his own uh he wasn't even gonna say

723
00:31:33,190 --> 00:31:29,840
a thing

724
00:31:36,070 --> 00:31:33,200
the whole 90 seconds he's landing and

725
00:31:38,230 --> 00:31:36,080
everyone is going crazy back home uh

726
00:31:40,549 --> 00:31:38,240
he he said later that he was inspired by

727
00:31:42,230 --> 00:31:40,559
the game giant steps baby steps also

728
00:31:43,669 --> 00:31:42,240
known as mother may i

729
00:31:45,590 --> 00:31:43,679
and uh

730
00:31:47,509 --> 00:31:45,600
i grew up in a family of midwestern

731
00:31:49,190 --> 00:31:47,519
drawlers so i can actually hear him say

732
00:31:50,470 --> 00:31:49,200
a man would i hear this tape but i'm

733
00:31:53,029 --> 00:31:50,480
apparently the only person who's ever

734
00:31:55,029 --> 00:31:53,039
heard him say a man

735
00:31:58,549 --> 00:31:55,039
i i think it's remarkable that someone

736
00:32:00,549 --> 00:31:58,559
as shy and as physics and math oriented

737
00:32:01,909 --> 00:32:00,559
as armstrong came up with one of the

738
00:32:04,149 --> 00:32:01,919

greatest lines in history it's a

739
00:32:05,830 --> 00:32:04,159
beautiful beautiful expression really

740
00:32:07,590 --> 00:32:05,840
fantastic so what about that one small

741
00:32:09,909 --> 00:32:07,600
step for amen that's another question we

742
00:32:11,669 --> 00:32:09,919
always get did he say amen or or not

743
00:32:15,509 --> 00:32:11,679
because there have been voice analyses

744
00:32:17,110 --> 00:32:15,519
done and they seem ambiguous well i mean

745
00:32:19,350 --> 00:32:17,120
nobody really hears it on the tape

746
00:32:20,310 --> 00:32:19,360
except of course craig

747
00:32:21,909 --> 00:32:20,320
and

748
00:32:24,230 --> 00:32:21,919
um

749
00:32:25,509 --> 00:32:24,240
so so it it and it doesn't make quite

750
00:32:27,509 --> 00:32:25,519
the same sense as it would if he said

751
00:32:29,590 --> 00:32:27,519
that's one small step for a man one

752
00:32:31,190 --> 00:32:29,600
giant leap for mankind it's quite

753
00:32:33,350 --> 00:32:31,200
conceivable that in the excitement of

754
00:32:35,190 --> 00:32:33,360
the moment he simply passed over what he

755
00:32:36,789 --> 00:32:35,200
had thought about saying

756
00:32:40,310 --> 00:32:36,799
heck that happens to everybody all the

757
00:32:42,789 --> 00:32:40,320
time the um

758
00:32:45,990 --> 00:32:42,799
if if he did indeed say it and there has

759
00:32:47,590 --> 00:32:46,000
been some voice analysis uh done by some

760
00:32:49,830 --> 00:32:47,600
engineers who've gone back and looked at

761
00:32:51,509 --> 00:32:49,840
the digital recording of this to suggest

762
00:32:53,430 --> 00:32:51,519
that there is an a in there somewhere

763
00:32:56,310 --> 00:32:53,440

that kind of got lost in the

764
00:32:59,269 --> 00:32:56,320
uh in the transmission uh if that's the

765
00:33:00,789 --> 00:32:59,279
case then terrific does it really matter

766
00:33:02,789 --> 00:33:00,799
no well the bottom line is that

767
00:33:04,470 --> 00:33:02,799
armstrong himself says that he meant to

768
00:33:06,230 --> 00:33:04,480
say it right yes he did intend to say

769
00:33:08,070 --> 00:33:06,240
right right and he's asked us to write

770
00:33:10,070 --> 00:33:08,080
it with a parenthesis and i think we owe

771
00:33:11,830 --> 00:33:10,080
him that okay in the parenthesis that

772
00:33:14,230 --> 00:33:11,840
solves that problem yeah

773
00:33:16,789 --> 00:33:14,240
another question we always get is uh did

774
00:33:18,870 --> 00:33:16,799
armstrong and and uh aldrin have cyanide

775
00:33:19,830 --> 00:33:18,880
pills in case the ascent engine didn't

776
00:33:21,350 --> 00:33:19,840
work

777
00:33:23,830 --> 00:33:21,360
all they needed to do was take off their

778
00:33:26,870 --> 00:33:23,840
helmets like i came across one report of

779
00:33:29,509 --> 00:33:26,880
someone who in a nasa experience had a

780
00:33:31,190 --> 00:33:29,519
nasa experiment had experienced vacuum

781
00:33:32,630 --> 00:33:31,200
and he said that after 12 seconds he

782
00:33:34,470 --> 00:33:32,640
could feel the saliva on the tongue

783
00:33:35,750 --> 00:33:34,480
beginning to boil and then he passed out

784
00:33:37,909 --> 00:33:35,760
and he pulled him out but i'm not sure

785
00:33:39,350 --> 00:33:37,919
how accurate that is but but all they

786
00:33:41,110 --> 00:33:39,360
had to do was put off pull off their

787
00:33:42,389 --> 00:33:41,120
helmets and they'd be gone that's a huge

788
00:33:43,430 --> 00:33:42,399

urban legend a lot of people think

789
00:33:45,430 --> 00:33:43,440
that's true

790
00:33:47,590 --> 00:33:45,440
um and finally what do you say uh to

791
00:33:50,630 --> 00:33:47,600
skeptics who say how do you prove that

792
00:33:55,029 --> 00:33:52,870
800 pounds of moon rocks for starters

793
00:33:56,549 --> 00:33:55,039
distributed all over the world that's my

794
00:33:58,950 --> 00:33:56,559
favorite there's another armstrong quote

795
00:34:00,549 --> 00:33:58,960
he says he he thinks it's it was so much

796
00:34:02,070 --> 00:34:00,559
easier to just go there than it would be

797
00:34:04,389 --> 00:34:02,080
to fake it

798
00:34:06,470 --> 00:34:04,399
with 12 000 companies 400 000 people

799
00:34:08,470 --> 00:34:06,480
exactly right exactly but but my

800
00:34:10,310 --> 00:34:08,480
favorite is in fact the the reports of

801
00:34:11,909 --> 00:34:10,320
the astronauts coming back from the moon

802
00:34:13,109 --> 00:34:11,919
when you piece them all together and get

803
00:34:15,270 --> 00:34:13,119
this whole picture of what it's like to

804
00:34:17,589 --> 00:34:15,280
be there it's so bizarre no one could

805
00:34:18,869 --> 00:34:17,599
have made this up before going

806
00:34:20,710 --> 00:34:18,879
well and

807
00:34:24,790 --> 00:34:20,720
i was

808
00:34:27,190 --> 00:34:24,800
there on uh july the 16th 1969. i got

809
00:34:29,510 --> 00:34:27,200
out in the middle of the morning uh at

810
00:34:31,510 --> 00:34:29,520
the operations building watched the crew

811
00:34:34,230 --> 00:34:31,520
walk by me

812
00:34:36,069 --> 00:34:34,240
on their way to the pad and then saw the

813
00:34:40,149 --> 00:34:36,079

launch

814
00:34:41,589 --> 00:34:40,159
so they had to go somewhere uh and and

815
00:34:44,550 --> 00:34:41,599
you know there's a law in philosophy

816
00:34:46,629 --> 00:34:44,560
called occam's razor that that says pick

817
00:34:48,710 --> 00:34:46,639
the simplest explanation and the

818
00:34:49,510 --> 00:34:48,720
simplest explanation is that they went

819
00:34:51,349 --> 00:34:49,520
right

820
00:34:52,710 --> 00:34:51,359
but there are something like five or six

821
00:34:53,990 --> 00:34:52,720
percent of the american population that

822
00:34:55,270 --> 00:34:54,000
are skeptics still

823
00:34:57,109 --> 00:34:55,280
maybe that says something about our

824
00:34:59,109 --> 00:34:57,119
society well it says a lot about our

825
00:35:01,430 --> 00:34:59,119
society i think we love conspiracies i

826
00:35:02,790 --> 00:35:01,440
mean maybe the whole world does but we

827
00:35:04,470 --> 00:35:02,800
and we and we love to think that there's

828
00:35:05,910 --> 00:35:04,480
these outrageous things that that are

829
00:35:07,910 --> 00:35:05,920
somehow being manipulated behind the

830
00:35:10,230 --> 00:35:07,920
scenes to pull one over on us

831
00:35:13,750 --> 00:35:10,240
uh and branch of psychology and and and

832
00:35:15,190 --> 00:35:13,760
of course it is nuts uh at some level uh

833
00:35:17,670 --> 00:35:15,200
but i will say that the die-hard

834
00:35:19,829 --> 00:35:17,680
believers in in a conspiracy theory will

835
00:35:21,589 --> 00:35:19,839
not be persuaded by evidence no matter

836
00:35:24,230 --> 00:35:21,599
what evidence there is so you cannot

837
00:35:26,790 --> 00:35:24,240
prove it to them we're by the way about

838
00:35:30,230 --> 00:35:26,800

to get evidence the lunar reconnaissance

839
00:35:33,030 --> 00:35:30,240
orbiter has a 1.4 meter resolution so

840
00:35:35,589 --> 00:35:33,040
it's going to show us the uh descent

841
00:35:37,270 --> 00:35:35,599
stages of the lunar modules sitting at

842
00:35:39,190 --> 00:35:37,280
the landing site i have a feeling some

843
00:35:41,670 --> 00:35:39,200
people still won't be satisfied

844
00:35:43,589 --> 00:35:41,680
simply say you faked those images and

845
00:35:45,349 --> 00:35:43,599
you're a part of the conspiracy okay

846
00:35:47,829 --> 00:35:45,359
let's turn to the science and the

847
00:35:51,349 --> 00:35:47,839
engineering aspects of apollo

848
00:35:54,150 --> 00:35:51,359
was it worth it for the for the science

849
00:35:56,150 --> 00:35:54,160
absolutely i would agree that i mean it

850
00:35:57,910 --> 00:35:56,160
was not a scientific program in its

851
00:35:59,829 --> 00:35:57,920
origins it was not done for science it

852
00:36:00,630 --> 00:35:59,839
was done to beat the soviets

853
00:36:02,950 --> 00:36:00,640
but

854
00:36:04,630 --> 00:36:02,960
after we had mastered the ability to

855
00:36:06,230 --> 00:36:04,640
land on the moon we kept going back at

856
00:36:08,550 --> 00:36:06,240
least long enough until the money ran

857
00:36:10,470 --> 00:36:08,560
out that a massive amount of lunar

858
00:36:14,950 --> 00:36:10,480
science was done in the process of

859
00:36:18,069 --> 00:36:16,390
yeah i mean

860
00:36:19,829 --> 00:36:18,079
the the key

861
00:36:21,589 --> 00:36:19,839
there's actually lunar scientists have

862
00:36:23,109 --> 00:36:21,599
come up with a top ten list of things

863
00:36:24,310 --> 00:36:23,119

that we learned from going to the moon

864
00:36:25,910 --> 00:36:24,320
and they're pretty spectacular but

865
00:36:29,990 --> 00:36:25,920
number one on that list

866
00:36:31,829 --> 00:36:30,000
is a fairly definitive statement of the

867
00:36:33,589 --> 00:36:31,839
origins of the moon

868
00:36:35,510 --> 00:36:33,599
and and it's strikingly different from

869
00:36:37,990 --> 00:36:35,520
any of the theories that had been

870
00:36:40,630 --> 00:36:38,000
promulgated before we went to the moon

871
00:36:43,510 --> 00:36:40,640
uh where now uh most scientists are of

872
00:36:47,750 --> 00:36:43,520
the belief that in the primordial solar

873
00:36:49,510 --> 00:36:47,760
system there was a uh a a body out there

874
00:36:52,150 --> 00:36:49,520
probably the size of mars or so that

875
00:36:53,910 --> 00:36:52,160
impacted the earth and and uh pieces of

876
00:36:56,950 --> 00:36:53,920
both the earth and the moon and other

877
00:36:58,630 --> 00:36:56,960
things around all coalesced to form this

878
00:37:01,430 --> 00:36:58,640
and um

879
00:37:05,910 --> 00:37:01,440
and as a result of that uh

880
00:37:08,069 --> 00:37:05,920
we learned a lot about the science of of

881
00:37:09,670 --> 00:37:08,079
of the moon and its evolution since its

882
00:37:11,190 --> 00:37:09,680
creation but isn't it a fair statement

883
00:37:12,470 --> 00:37:11,200
to say that scientists at the time

884
00:37:14,470 --> 00:37:12,480
thought they were taking a back seat to

885
00:37:17,030 --> 00:37:14,480
the engineers engineering or political

886
00:37:19,510 --> 00:37:17,040
aspects and oh by the way they were

887
00:37:21,270 --> 00:37:19,520
uh i mean i mean science wrote piggyback

888
00:37:24,069 --> 00:37:21,280

on the engineering program to go to the

889
00:37:27,030 --> 00:37:24,079
moon they did so very effectively

890
00:37:29,109 --> 00:37:27,040
but that was not the purpose of going uh

891
00:37:31,270 --> 00:37:29,119
that was at best something that they

892
00:37:34,470 --> 00:37:31,280
thought about down the road and those

893
00:37:37,030 --> 00:37:34,480
last few missions as as mike said

894
00:37:39,109 --> 00:37:37,040
were really enormously uh significant as

895
00:37:39,750 --> 00:37:39,119
treasure troves of scientific knowledge

896
00:37:42,470 --> 00:37:39,760
and

897
00:37:44,870 --> 00:37:42,480
there were several more missions planned

898
00:37:47,109 --> 00:37:44,880
uh which would have been even more

899
00:37:49,990 --> 00:37:47,119
productive scientifically i mean one of

900
00:37:52,390 --> 00:37:50,000
the points to make now in 2009 is

901
00:37:54,870 --> 00:37:52,400
there's lots of science left to do we

902
00:37:56,310 --> 00:37:54,880
didn't finish with the moon

903
00:37:58,230 --> 00:37:56,320
yeah people also forget that there were

904
00:38:00,790 --> 00:37:58,240
5 000 pounds i think of scientific

905
00:38:02,470 --> 00:38:00,800
equipment left on the moon during the uh

906
00:38:05,109 --> 00:38:02,480
during the apollo program including some

907
00:38:06,630 --> 00:38:05,119
really good cameras right

908
00:38:09,430 --> 00:38:06,640
but i think you know just the very fact

909
00:38:11,270 --> 00:38:09,440
that before apollo the interplanetary

910
00:38:13,190 --> 00:38:11,280
travel was science fiction and now it's

911
00:38:14,950 --> 00:38:13,200
a reality now we know how to use

912
00:38:16,870 --> 00:38:14,960
enormous explosions as a method of

913
00:38:18,870 --> 00:38:16,880

transportation i think it's fantastic

914
00:38:20,950 --> 00:38:18,880
it's worth it just for that right

915
00:38:23,430 --> 00:38:20,960
okay we could go on and on about apollo

916
00:38:25,670 --> 00:38:23,440
11 but let's let's move forward here

917
00:38:29,030 --> 00:38:25,680
apollo of course had six more lunar

918
00:38:32,230 --> 00:38:29,040
missions uh after apollo 11. the apollo

919
00:38:33,829 --> 00:38:32,240
12 landed near surveyor spacecraft and

920
00:38:36,310 --> 00:38:33,839
that mission was a great success but

921
00:38:37,829 --> 00:38:36,320
then there came apollo 13. let's take a

922
00:38:40,310 --> 00:38:37,839
look

923
00:38:42,870 --> 00:38:40,320
he's got it made come on in there

924
00:38:55,510 --> 00:38:42,880
24 feet contact light

925
00:38:59,109 --> 00:38:57,109
dan we've got one more item for you when

926
00:39:01,030 --> 00:38:59,119
you get a chance we'd like it to

927
00:39:03,510 --> 00:39:01,040
stir up your cryo tanks

928
00:39:03,520 --> 00:39:09,990
stand by

929
00:39:10,000 --> 00:39:17,109
hey yeah

930
00:39:21,589 --> 00:39:19,510
and the fact that apollo 12 landed

931
00:39:23,030 --> 00:39:21,599
within a few hundred feet of the

932
00:39:25,190 --> 00:39:23,040
surveyor there and actually brought back

933
00:39:28,390 --> 00:39:25,200
pieces of of surveyor let's talk a

934
00:39:29,829 --> 00:39:28,400
little bit about apollo 13. uh what's

935
00:39:31,670 --> 00:39:29,839
the most important lesson we learned

936
00:39:33,589 --> 00:39:31,680
from apollo 13 how close did we come to

937
00:39:35,750 --> 00:39:33,599
disaster with 13

938
00:39:37,750 --> 00:39:35,760

inches away but you know the lesson of

939
00:39:39,750 --> 00:39:37,760
13 you see almost every mission that

940
00:39:40,790 --> 00:39:39,760
flew in apollo they are constantly

941
00:39:42,390 --> 00:39:40,800
having

942
00:39:44,470 --> 00:39:42,400
death death-defying moments on these

943
00:39:47,270 --> 00:39:44,480
missions such as using the pen cap to

944
00:39:48,390 --> 00:39:47,280
arm the return rocket on 11

945
00:39:50,470 --> 00:39:48,400
that the

946
00:39:51,670 --> 00:39:50,480
astronauts are so well trained by nasa

947
00:39:53,670 --> 00:39:51,680
that they figure out a way around and

948
00:39:56,550 --> 00:39:53,680
figure out how to fix it and 13 is the

949
00:39:58,630 --> 00:39:56,560
most severe form of that well i think

950
00:40:02,069 --> 00:39:58,640
one of the things we forget is just how

951
00:40:03,750 --> 00:40:02,079
risky this was uh i think was roger or

952
00:40:07,430 --> 00:40:03,760
mike earlier said we've become

953
00:40:11,430 --> 00:40:09,510
maybe because we we've had the shuttle

954
00:40:12,870 --> 00:40:11,440
accidents uh

955
00:40:15,510 --> 00:40:12,880
but but

956
00:40:18,470 --> 00:40:15,520
every apollo mission was right at the

957
00:40:21,270 --> 00:40:18,480
edge of performance and and there were

958
00:40:23,109 --> 00:40:21,280
people including bob gilruth who were

959
00:40:26,309 --> 00:40:23,119
perfect would have been perfectly happy

960
00:40:28,470 --> 00:40:26,319
to quit after 11. saying we we met our

961
00:40:30,790 --> 00:40:28,480
goal beat the russians to the moon this

962
00:40:32,309 --> 00:40:30,800
is too risky to keep doing

963
00:40:35,190 --> 00:40:32,319

well let's talk about that for a minute

964
00:40:37,109 --> 00:40:35,200
have we become today too risk-averse

965
00:40:38,870 --> 00:40:37,119
with the shuttle program or with the the

966
00:40:40,309 --> 00:40:38,880
more modern programs

967
00:40:41,990 --> 00:40:40,319
you know risk is a relative thing what

968
00:40:42,870 --> 00:40:42,000
do we what are we willing to accept you

969
00:40:45,349 --> 00:40:42,880
can't

970
00:40:46,870 --> 00:40:45,359
uh get out of bed uh without accepting a

971
00:40:48,550 --> 00:40:46,880
measure of risk and we all calculate

972
00:40:49,990 --> 00:40:48,560
that all the time in our own lives in

973
00:40:52,630 --> 00:40:50,000
fact i don't think you can stay in bed

974
00:40:54,230 --> 00:40:52,640
without a measure of risk you know maybe

975
00:40:56,550 --> 00:40:54,240
the ceiling falls on you or something

976
00:40:58,230 --> 00:40:56,560
but um

977
00:41:00,710 --> 00:40:58,240
you know what is an acceptable level

978
00:41:02,550 --> 00:41:00,720
obviously flying in space uh

979
00:41:05,510 --> 00:41:02,560
takes a an acceptance of a certain

980
00:41:08,230 --> 00:41:05,520
measure of risk and and it is out on the

981
00:41:11,670 --> 00:41:08,240
margin somewhat can you calculate that

982
00:41:14,390 --> 00:41:11,680
and effectively try to bring down that

983
00:41:16,309 --> 00:41:14,400
uh that that riskiness yes you can and

984
00:41:18,710 --> 00:41:16,319
and we do that all the time

985
00:41:20,710 --> 00:41:18,720
one of the things that i think happens

986
00:41:21,510 --> 00:41:20,720
when we start talking about

987
00:41:23,349 --> 00:41:21,520
uh

988
00:41:25,270 --> 00:41:23,359

shuttle accidents for instance and let's

989
00:41:30,470 --> 00:41:25,280
not forget that we lost the crew of

990
00:41:35,190 --> 00:41:32,790
that it happened so rarely and the

991
00:41:35,990 --> 00:41:35,200
events themselves are so

992
00:41:37,109 --> 00:41:36,000
uh

993
00:41:39,349 --> 00:41:37,119
publicly

994
00:41:43,030 --> 00:41:39,359
uh seen i mean you know every launch is

995
00:41:46,230 --> 00:41:43,040
on on television and so on and so forth

996
00:41:48,870 --> 00:41:46,240
that when you have this sort of accident

997
00:41:51,510 --> 00:41:48,880
there's a very public sense about it and

998
00:41:54,069 --> 00:41:51,520
there's an expectation that we will not

999
00:41:57,349 --> 00:41:54,079
fail and nasa has demonstrated over and

1000
00:41:59,510 --> 00:41:57,359
over again its ability to uh to overcome

1001
00:42:02,069 --> 00:41:59,520
those odds and not to fail and to be

1002
00:42:04,630 --> 00:42:02,079
successful and we we take it as a given

1003
00:42:07,270 --> 00:42:04,640
that they will be successful so when the

1004
00:42:10,390 --> 00:42:07,280
risk factors come out of line when we do

1005
00:42:12,230 --> 00:42:10,400
lose a crew uh it's all the more

1006
00:42:14,950 --> 00:42:12,240
disturbing i think

1007
00:42:16,870 --> 00:42:14,960
chris you're involved in the current uh

1008
00:42:19,109 --> 00:42:16,880
operations or the future exploration

1009
00:42:20,230 --> 00:42:19,119
program these are very real life and

1010
00:42:22,390 --> 00:42:20,240
death questions to you what are your

1011
00:42:25,910 --> 00:42:22,400
thoughts well i agree with roger i think

1012
00:42:27,990 --> 00:42:25,920
i think nasa has a very strong risk

1013
00:42:29,510 --> 00:42:28,000

management system so so we are concerned

1014
00:42:31,589 --> 00:42:29,520
about risk and we need to understand the

1015
00:42:33,030 --> 00:42:31,599
risks that we are taking but i agree

1016
00:42:35,030 --> 00:42:33,040
uh

1017
00:42:36,870 --> 00:42:35,040
we're trying to educate the public

1018
00:42:39,190 --> 00:42:36,880
especially during a development program

1019
00:42:41,750 --> 00:42:39,200
that there will be failures and we learn

1020
00:42:43,510 --> 00:42:41,760
from those failures so we do everything

1021
00:42:45,190 --> 00:42:43,520
that we can possible to make sure that

1022
00:42:47,510 --> 00:42:45,200
we don't have those failures but but but

1023
00:42:50,309 --> 00:42:47,520
they are going to be

1024
00:42:51,990 --> 00:42:50,319
failures i mean there will be um now

1025
00:42:53,349 --> 00:42:52,000
when it comes to crew obviously we have

1026
00:42:55,510 --> 00:42:53,359
to take that extra step to make sure

1027
00:42:56,950 --> 00:42:55,520
that the crew is protected but but

1028
00:42:58,390 --> 00:42:56,960
during a development program there will

1029
00:42:59,910 --> 00:42:58,400
be failures and and

1030
00:43:02,630 --> 00:42:59,920
that's a good thing because we do learn

1031
00:43:04,390 --> 00:43:02,640
from it well

1032
00:43:06,150 --> 00:43:04,400
almost the flip side of this the risks

1033
00:43:08,630 --> 00:43:06,160
have to be worth taking because the

1034
00:43:11,750 --> 00:43:08,640
risks are never going to be zero i mean

1035
00:43:14,150 --> 00:43:11,760
what made apollo great was we risked we

1036
00:43:15,589 --> 00:43:14,160
took pretty significant risk to do

1037
00:43:17,430 --> 00:43:15,599
something grand

1038
00:43:19,910 --> 00:43:17,440

and i think the program that chris is

1039
00:43:21,670 --> 00:43:19,920
involved in uh

1040
00:43:24,150 --> 00:43:21,680
once again preparing to send people

1041
00:43:27,750 --> 00:43:24,160
beyond earth orbit is something worth

1042
00:43:30,470 --> 00:43:27,760
taking risks to do uh so there is a

1043
00:43:32,870 --> 00:43:30,480
benefit risk calculation uh

1044
00:43:34,870 --> 00:43:32,880
and and and the benefits have to be

1045
00:43:36,710 --> 00:43:34,880
great to accept the risks that are

1046
00:43:38,790 --> 00:43:36,720
involved in space flight

1047
00:43:40,630 --> 00:43:38,800
there seems to be a difference among the

1048
00:43:42,069 --> 00:43:40,640
between the public perception and and

1049
00:43:43,910 --> 00:43:42,079
the astronauts perception i think the

1050
00:43:45,750 --> 00:43:43,920
astronauts all know that there's this

1051
00:43:47,510 --> 00:43:45,760
risk the public often doesn't seem

1052
00:43:48,790 --> 00:43:47,520
willing to accept that risk and i think

1053
00:43:50,550 --> 00:43:48,800
you know a few years ago we had a

1054
00:43:52,550 --> 00:43:50,560
symposium on risk and exploration where

1055
00:43:54,309 --> 00:43:52,560
the question was how much risk do you

1056
00:43:56,470 --> 00:43:54,319
take in the name of forward-looking

1057
00:43:59,030 --> 00:43:56,480
exploration and one of the outcomes of

1058
00:44:01,030 --> 00:43:59,040
that was that you

1059
00:44:03,190 --> 00:44:01,040
just have to let the public know and

1060
00:44:04,950 --> 00:44:03,200
realize that uh risk is part of

1061
00:44:06,470 --> 00:44:04,960
exploration and and there are going to

1062
00:44:08,150 --> 00:44:06,480
be these kinds of

1063
00:44:09,990 --> 00:44:08,160

things that happen one of the apollo

1064
00:44:12,069 --> 00:44:10,000
wives said a remarkable thing she said

1065
00:44:13,589 --> 00:44:12,079
that you know they take a lot more care

1066
00:44:16,069 --> 00:44:13,599
with these spacecraft than they do with

1067
00:44:17,430 --> 00:44:16,079
the military test craft that these guys

1068
00:44:19,270 --> 00:44:17,440
were flying before they became

1069
00:44:21,670 --> 00:44:19,280
astronauts and she also mentioned that

1070
00:44:23,349 --> 00:44:21,680
if the people during the 60s if the

1071
00:44:24,630 --> 00:44:23,359
astronauts during the 60s hadn't been

1072
00:44:27,270 --> 00:44:24,640
astronauts they would have been flying

1073
00:44:29,270 --> 00:44:27,280
in vietnam so it's a wholly different

1074
00:44:30,710 --> 00:44:29,280
origin of risk that they come to from

1075
00:44:32,950 --> 00:44:30,720
where we started

1076
00:44:34,390 --> 00:44:32,960
the test pilots brings to mind tom wolf

1077
00:44:36,550 --> 00:44:34,400
and the right stuff you read those

1078
00:44:38,309 --> 00:44:36,560
stories in there right but but also when

1079
00:44:40,309 --> 00:44:38,319
you really look into that you come into

1080
00:44:42,150 --> 00:44:40,319
this thinking astronauts are these wild

1081
00:44:43,829 --> 00:44:42,160
daredevil cowboy types when in fact

1082
00:44:46,230 --> 00:44:43,839
they're cool characters and the

1083
00:44:47,990 --> 00:44:46,240
daredevil cowboy types were the nasa

1084
00:44:50,150 --> 00:44:48,000
administrators pushing the envelope in

1085
00:44:52,390 --> 00:44:50,160
the space

1086
00:44:54,790 --> 00:44:52,400
okay so let's talk about the the ending

1087
00:44:56,790 --> 00:44:54,800
of apollo there were four more landing

1088
00:44:58,950 --> 00:44:56,800

missions there was apollo 14

1089
00:45:00,950 --> 00:44:58,960
then there were apollos 15 to 17 which

1090
00:45:18,630 --> 00:45:00,960
had the lunar rovers let's take a look

1091
00:45:18,640 --> 00:45:34,390
we're on the surface

1092
00:45:34,400 --> 00:45:57,829
miles and miles

1093
00:46:21,270 --> 00:45:59,829
i'm glad they got this great suspension

1094
00:46:25,430 --> 00:46:23,270
hey john this is perfect with the limb

1095
00:46:26,950 --> 00:46:25,440
and the rover and you and

1096
00:46:28,870 --> 00:46:26,960
stone mountain

1097
00:47:23,270 --> 00:46:28,880
and the old flag

1098
00:47:28,549 --> 00:47:25,430
mankind complete its first

1099
00:47:29,430 --> 00:47:28,559
evolutionary steps into the universe

1100
00:47:31,270 --> 00:47:29,440
three

1101
00:47:32,549 --> 00:47:31,280
two one

1102
00:47:37,670 --> 00:47:32,559
edition

1103
00:47:40,870 --> 00:47:39,670
just amazing images those rovers really

1104
00:47:42,630 --> 00:47:40,880
look like fun and they look like they

1105
00:47:46,309 --> 00:47:42,640
were exceeding the speed limit there

1106
00:47:47,829 --> 00:47:46,319
uh well we all know that uh even as the

1107
00:47:49,829 --> 00:47:47,839
first moon landings were taking place

1108
00:47:51,510 --> 00:47:49,839
that the budgets were being cut we know

1109
00:47:52,950 --> 00:47:51,520
that the last three saturn fives that

1110
00:47:57,030 --> 00:47:52,960
were destined for the moon are now in

1111
00:47:59,190 --> 00:47:57,040
museums and in florida and um in alabama

1112
00:48:01,670 --> 00:47:59,200
and in houston where they are very

1113
00:48:04,390 --> 00:48:01,680

nicely displayed but the apollo program

1114
00:48:06,390 --> 00:48:04,400
did come to a rather abrupt end

1115
00:48:07,430 --> 00:48:06,400
let's talk about what the reasons were

1116
00:48:09,510 --> 00:48:07,440
for that

1117
00:48:10,950 --> 00:48:09,520
and uh why well let's let's talk about

1118
00:48:14,230 --> 00:48:10,960
that first what were the reasons for the

1119
00:48:16,230 --> 00:48:14,240
abrupt ending of the apollo program

1120
00:48:17,990 --> 00:48:16,240
lack of public support fundamentally i

1121
00:48:20,630 --> 00:48:18,000
mean there's just no way gotta get

1122
00:48:22,790 --> 00:48:20,640
around the fact that that most americans

1123
00:48:23,589 --> 00:48:22,800
felt after apollo 11 well we've done

1124
00:48:27,030 --> 00:48:23,599
that

1125
00:48:27,990 --> 00:48:27,040
how many more times do we need to do it

1126
00:48:30,230 --> 00:48:28,000
and

1127
00:48:33,109 --> 00:48:30,240
the public support had already eroded

1128
00:48:35,750 --> 00:48:33,119
ever since the mid 60s and the missions

1129
00:48:36,549 --> 00:48:35,760
from apollo 8 to 11 essentially provided

1130
00:48:46,829 --> 00:48:36,559
a

1131
00:48:49,510 --> 00:48:46,839
riots

1132
00:48:51,510 --> 00:48:49,520
uh many other things that just seemed of

1133
00:48:53,990 --> 00:48:51,520
a higher priority than continuing to

1134
00:48:55,510 --> 00:48:54,000
spend on apollo

1135
00:48:57,589 --> 00:48:55,520
well there were there were

1136
00:48:59,349 --> 00:48:57,599
a variety of reasons and the nixon

1137
00:49:01,750 --> 00:48:59,359
administration

1138
00:49:04,710 --> 00:49:01,760

wanted to cut the federal budget overall

1139
00:49:06,309 --> 00:49:04,720
and nasa was a prime target for doing

1140
00:49:08,630 --> 00:49:06,319
that

1141
00:49:11,430 --> 00:49:08,640
there were serious

1142
00:49:12,870 --> 00:49:11,440
proposals to cut the last two kept 16

1143
00:49:15,430 --> 00:49:12,880
and 17

1144
00:49:17,430 --> 00:49:15,440
in the summer of 71 cap weinberger who

1145
00:49:20,870 --> 00:49:17,440
was at that point was deputy

1146
00:49:21,829 --> 00:49:20,880
head of of omb i wrote a memo to nixon

1147
00:49:23,910 --> 00:49:21,839
saying

1148
00:49:26,069 --> 00:49:23,920
this would confirm that we're giving up

1149
00:49:27,910 --> 00:49:26,079
our world leadership position that we

1150
00:49:30,549 --> 00:49:27,920
can do something better than welfare

1151
00:49:32,549 --> 00:49:30,559
programs uh

1152
00:49:35,829 --> 00:49:32,559
but but there was a great financial

1153
00:49:38,549 --> 00:49:35,839
pressure and nasa as an institution

1154
00:49:40,150 --> 00:49:38,559
wanted to get on to do something new

1155
00:49:42,470 --> 00:49:40,160
nasa after all is an engineering

1156
00:49:44,790 --> 00:49:42,480
development organization

1157
00:49:46,470 --> 00:49:44,800
flying repetitive missions is not what

1158
00:49:48,790 --> 00:49:46,480
nasa thought it was supposed to be doing

1159
00:49:50,549 --> 00:49:48,800
so they were ready to uh

1160
00:49:52,230 --> 00:49:50,559
houston and huntsville in particular

1161
00:49:54,630 --> 00:49:52,240
were ready to move on to the next

1162
00:49:56,950 --> 00:49:54,640
program uh which they thought at that

1163
00:49:59,270 --> 00:49:56,960

point would be using saturn fives to

1164
00:50:01,910 --> 00:49:59,280
launch space stations so there wasn't a

1165
00:50:04,549 --> 00:50:01,920
lot of support even inside the uh

1166
00:50:06,790 --> 00:50:04,559
agency for repetitive missions to the

1167
00:50:08,630 --> 00:50:06,800
moon but in retrospect

1168
00:50:10,870 --> 00:50:08,640
was it a mistake for the united states

1169
00:50:13,670 --> 00:50:10,880
to throw away this infrastructure the

1170
00:50:15,670 --> 00:50:13,680
saturn 5 and command module this this

1171
00:50:17,750 --> 00:50:15,680
entire infrastructure i think john

1172
00:50:19,589 --> 00:50:17,760
you've said that nasa at 50 is still

1173
00:50:21,510 --> 00:50:19,599
suffering from decisions made at nasa at

1174
00:50:23,670 --> 00:50:21,520
12. what about that

1175
00:50:26,630 --> 00:50:23,680
well i think it was uh

1176
00:50:30,069 --> 00:50:26,640
a tragedy to throw away the saturn v i

1177
00:50:32,630 --> 00:50:30,079
mean the the key to future exploration

1178
00:50:33,910 --> 00:50:32,640
is a heavy lift vehicle

1179
00:50:35,990 --> 00:50:33,920
we had one

1180
00:50:36,870 --> 00:50:36,000
we had a really good one

1181
00:50:40,150 --> 00:50:36,880
and

1182
00:50:43,589 --> 00:50:40,160
we let it go away i mean we wouldn't i

1183
00:50:45,990 --> 00:50:43,599
mean command modules and lunar modules

1184
00:50:48,950 --> 00:50:46,000
less less thing it's it's really giving

1185
00:50:50,710 --> 00:50:48,960
up saturn 5

1186
00:50:53,750 --> 00:50:50,720
think of what the space station would

1187
00:50:56,309 --> 00:50:53,760
look like if we could launch it on a 33

1188
00:50:58,230 --> 00:50:56,319

foot diameter launch vehicle with heavy

1189
00:51:00,710 --> 00:50:58,240
lift capability we would have had a

1190
00:51:03,349 --> 00:51:00,720
space station much more quickly and and

1191
00:51:06,710 --> 00:51:03,359
a more capable space station so that was

1192
00:51:12,390 --> 00:51:06,720
i think a a failure of national

1193
00:51:18,470 --> 00:51:16,069
i i think you also have to to

1194
00:51:19,990 --> 00:51:18,480
ask the question um

1195
00:51:23,270 --> 00:51:20,000
i mean we weren't going to fly saturn

1196
00:51:25,270 --> 00:51:23,280
fives for very much longer anyway

1197
00:51:26,950 --> 00:51:25,280
and

1198
00:51:28,870 --> 00:51:26,960
it's technology that was becoming

1199
00:51:30,470 --> 00:51:28,880
outmoded even at the time that it was

1200
00:51:31,829 --> 00:51:30,480
being flown

1201
00:51:33,750 --> 00:51:31,839
and uh

1202
00:51:35,270 --> 00:51:33,760
i've i've had people oh yeah i know

1203
00:51:37,750 --> 00:51:35,280
you've heard these stories about oh

1204
00:51:39,430 --> 00:51:37,760
nasa's lost the blueprint they usually

1205
00:51:41,030 --> 00:51:39,440
uh cast it as they've lost the

1206
00:51:43,270 --> 00:51:41,040
blueprints for the saturn v and they

1207
00:51:45,349 --> 00:51:43,280
couldn't go couldn't go find those and

1208
00:51:47,510 --> 00:51:45,359
build more saturn fives well the answer

1209
00:51:49,190 --> 00:51:47,520
to that is well actually they do exist

1210
00:51:50,470 --> 00:51:49,200
and they're in a big warehouse in the

1211
00:51:51,750 --> 00:51:50,480
national archives

1212
00:51:53,030 --> 00:51:51,760
but more important than that why would

1213
00:51:55,030 --> 00:51:53,040

you want to buy why would you want to

1214
00:51:57,270 --> 00:51:55,040
build a saturn v it's it's a piece of

1215
00:51:59,430 --> 00:51:57,280
technology that is that was outmoded

1216
00:52:00,950 --> 00:51:59,440
even at the point it was

1217
00:52:03,109 --> 00:52:00,960
being used

1218
00:52:05,190 --> 00:52:03,119
and uh and it should have been and we

1219
00:52:07,270 --> 00:52:05,200
should move on from there

1220
00:52:09,589 --> 00:52:07,280
shuttle was really designed

1221
00:52:12,950 --> 00:52:09,599
as a as a piece of a critical

1222
00:52:14,630 --> 00:52:12,960
infrastructure to move forward and uh

1223
00:52:17,270 --> 00:52:14,640
with shuttle and a station and then

1224
00:52:19,190 --> 00:52:17,280
potential to go on from uh the station

1225
00:52:21,109 --> 00:52:19,200
as a jumping off point that made a lot

1226
00:52:23,190 --> 00:52:21,119
of sense even for the people at the time

1227
00:52:25,510 --> 00:52:23,200
to pursue

1228
00:52:27,349 --> 00:52:25,520
so how about now nasa is ramping down

1229
00:52:29,109 --> 00:52:27,359
the shuttle and ramping up the new

1230
00:52:31,510 --> 00:52:29,119
system is it a mistake to get rid of

1231
00:52:33,670 --> 00:52:31,520
that technology

1232
00:52:35,430 --> 00:52:33,680
you know i mean people people of good

1233
00:52:36,710 --> 00:52:35,440
will can come down on both sides of that

1234
00:52:39,349 --> 00:52:36,720
argument

1235
00:52:41,510 --> 00:52:39,359
and and there are cases to be made on on

1236
00:52:43,510 --> 00:52:41,520
all sides of that uh

1237
00:52:45,430 --> 00:52:43,520
you know the uh the charitable thing

1238
00:52:47,510 --> 00:52:45,440

would be to say that the the shuttle was

1239
00:52:50,549 --> 00:52:47,520
a remarkable experimental vehicle and it

1240
00:52:52,309 --> 00:52:50,559
was and it has served the needs of it

1241
00:52:54,630 --> 00:52:52,319
that's true it it still is it's not

1242
00:52:56,230 --> 00:52:54,640
retired yet uh next

1243
00:52:58,790 --> 00:52:56,240
next year experimental it's still

1244
00:53:00,950 --> 00:52:58,800
experimental and um

1245
00:53:02,390 --> 00:53:00,960
uh and when it retires we should give it

1246
00:53:04,549 --> 00:53:02,400
an honorable retirement because it

1247
00:53:07,270 --> 00:53:04,559
deserves that after serving very very

1248
00:53:09,430 --> 00:53:07,280
well for a long period of time and to

1249
00:53:12,150 --> 00:53:09,440
move on to the next generation vehicle

1250
00:53:14,390 --> 00:53:12,160
uh should that vehicle look like a

1251
00:53:16,309 --> 00:53:14,400
shuttle or should it be something else

1252
00:53:18,150 --> 00:53:16,319
the architecture for constellation sends

1253
00:53:20,309 --> 00:53:18,160
us in a different direction

1254
00:53:22,390 --> 00:53:20,319
and there is there are pros and cons and

1255
00:53:23,990 --> 00:53:22,400
trade-offs on both

1256
00:53:25,190 --> 00:53:24,000
that's a good segue into our next

1257
00:53:27,349 --> 00:53:25,200
segment here

1258
00:53:30,309 --> 00:53:27,359
apollo has the many legacies but one of

1259
00:53:31,829 --> 00:53:30,319
them is its technological legacy

1260
00:53:32,870 --> 00:53:31,839
part of that technology will be used to

1261
00:53:34,309 --> 00:53:32,880
go back to the moon as part of the

1262
00:53:43,589 --> 00:53:34,319
constellation program let's look at a

1263
00:53:43,599 --> 00:55:25,190

so

1264
00:55:27,750 --> 00:55:26,470
chris you're the deputy director of

1265
00:55:29,510 --> 00:55:27,760
constellation systems some of that

1266
00:55:32,069 --> 00:55:29,520
hardware looked pretty familiar tell us

1267
00:55:34,950 --> 00:55:32,079
it does as you can see we're actually

1268
00:55:37,030 --> 00:55:34,960
using heritage from from shuttle as well

1269
00:55:38,630 --> 00:55:37,040
as apollo you saw some of the clips

1270
00:55:41,510 --> 00:55:38,640
there we're using the solid rocket

1271
00:55:43,829 --> 00:55:41,520
motors for the aries one first stage as

1272
00:55:45,589 --> 00:55:43,839
well as the first stage for the ares 5

1273
00:55:47,109 --> 00:55:45,599
launch vehicle so there's a lot of

1274
00:55:48,069 --> 00:55:47,119
commonality between the two launch

1275
00:55:49,589 --> 00:55:48,079
vehicles that we're using for

1276
00:55:52,150 --> 00:55:49,599
constellation

1277
00:55:53,829 --> 00:55:52,160
uh in addition it wasn't shown there but

1278
00:55:55,910 --> 00:55:53,839
apollo heritage

1279
00:55:57,430 --> 00:55:55,920
uh something very very obvious from a

1280
00:55:59,270 --> 00:55:57,440
physical perspective is we're using the

1281
00:56:00,789 --> 00:55:59,280
same capsule shape

1282
00:56:01,750 --> 00:56:00,799
as apollo

1283
00:56:03,990 --> 00:56:01,760
the only thing is is on the

1284
00:56:05,910 --> 00:56:04,000
constellation side it's actually just

1285
00:56:08,630 --> 00:56:05,920
over 16 feet in diameter and it's going

1286
00:56:11,750 --> 00:56:08,640
to carry four crew to lunar lunar orbit

1287
00:56:14,470 --> 00:56:11,760
where apollo was i believe just under 13

1288
00:56:16,069 --> 00:56:14,480

and and carries carried three so we're

1289
00:56:17,910 --> 00:56:16,079
actually increasing the capability of

1290
00:56:19,109 --> 00:56:17,920
apollo but using the same kind of

1291
00:56:20,069 --> 00:56:19,119
concepts

1292
00:56:22,230 --> 00:56:20,079
um

1293
00:56:25,910 --> 00:56:22,240
you mentioned that the saturn v

1294
00:56:27,670 --> 00:56:25,920
um 33 feet in diameter our current ares

1295
00:56:30,390 --> 00:56:27,680
5

1296
00:56:32,870 --> 00:56:30,400
launch vehicle concept is using a 33

1297
00:56:34,230 --> 00:56:32,880
foot diameter core stage as well so we

1298
00:56:37,430 --> 00:56:34,240
are going to be able to use some of the

1299
00:56:40,390 --> 00:56:37,440
same facilities potential uh processing

1300
00:56:41,670 --> 00:56:40,400
techniques and and tools so again we're

1301
00:56:43,990 --> 00:56:41,680
taking the lessons learned from the

1302
00:56:46,630 --> 00:56:44,000
apollo era and employing them in the

1303
00:56:50,549 --> 00:56:46,640
constellation program

1304
00:56:53,030 --> 00:56:50,559
j2x is the upper stage engine for aries

1305
00:56:55,190 --> 00:56:53,040
one as well as the earth departure stage

1306
00:56:56,870 --> 00:56:55,200
for ares five once again commonality

1307
00:56:58,549 --> 00:56:56,880
between the two launch vehicles what

1308
00:57:00,470 --> 00:56:58,559
we're trying to do is lower our life

1309
00:57:02,230 --> 00:57:00,480
cycle cost development across the two

1310
00:57:03,750 --> 00:57:02,240
launch vehicles by using a lot of common

1311
00:57:04,789 --> 00:57:03,760
elements

1312
00:57:07,750 --> 00:57:04,799
that

1313
00:57:09,349 --> 00:57:07,760

brings uh or is um heritage hardware

1314
00:57:12,870 --> 00:57:09,359
it's based on heritage hardware from the

1315
00:57:14,630 --> 00:57:12,880
apollo the j2 engine which was saturn 5

1316
00:57:16,789 --> 00:57:14,640
and s1b

1317
00:57:18,789 --> 00:57:16,799
keep me straight historians here uh

1318
00:57:20,470 --> 00:57:18,799
we're using the same components and and

1319
00:57:23,030 --> 00:57:20,480
philosophy of

1320
00:57:25,270 --> 00:57:23,040
the j2 and the j2s which was a

1321
00:57:26,789 --> 00:57:25,280
simplified version of j2

1322
00:57:28,309 --> 00:57:26,799
i wish we had more time to go into those

1323
00:57:29,190 --> 00:57:28,319
details but i do want to ask a final

1324
00:57:30,789 --> 00:57:29,200
question

1325
00:57:32,710 --> 00:57:30,799
uh which is

1326
00:57:34,309 --> 00:57:32,720
about the legacy of apollo we see there

1327
00:57:36,069 --> 00:57:34,319
that some of the technological legacy

1328
00:57:37,910 --> 00:57:36,079
how about the legacy of apollo in

1329
00:57:39,190 --> 00:57:37,920
general how important was apollo and i'd

1330
00:57:41,510 --> 00:57:39,200
like each of you to address that

1331
00:57:44,309 --> 00:57:41,520
question let me start with craig well i

1332
00:57:46,470 --> 00:57:44,319
think apollo

1333
00:57:47,829 --> 00:57:46,480
was really a reaction to a profound fear

1334
00:57:50,069 --> 00:57:47,839
and this is part of the cold war we

1335
00:57:52,069 --> 00:57:50,079
forget when the soviets established

1336
00:57:54,870 --> 00:57:52,079
their early dominance in the space race

1337
00:57:56,549 --> 00:57:54,880
many americans up to lyndon johnson and

1338
00:57:57,829 --> 00:57:56,559

the halls of the senate believe that

1339
00:57:59,589 --> 00:57:57,839
they were going to turn it into a

1340
00:58:01,670 --> 00:57:59,599
battlefield and part of what going to

1341
00:58:03,829 --> 00:58:01,680
the moon did was prove that we could

1342
00:58:06,309 --> 00:58:03,839
defend ourselves in space if that indeed

1343
00:58:07,910 --> 00:58:06,319
turned into a cold war battlefield and i

1344
00:58:09,589 --> 00:58:07,920
think another thing that's not discussed

1345
00:58:12,150 --> 00:58:09,599
enough in this history is what a

1346
00:58:14,710 --> 00:58:12,160
profound economic stimulus this was for

1347
00:58:16,470 --> 00:58:14,720
the south it created 400 000 jobs it

1348
00:58:18,390 --> 00:58:16,480
brought technology across the whole of

1349
00:58:20,950 --> 00:58:18,400
the gulf coast and created sort of a

1350
00:58:22,470 --> 00:58:20,960
whole new uh life for many people not

1351
00:58:24,390 --> 00:58:22,480
just engineers and scientists but

1352
00:58:25,910 --> 00:58:24,400
seamstresses and plumbers so i look at

1353
00:58:28,230 --> 00:58:25,920
that too okay chris has already talked

1354
00:58:29,750 --> 00:58:28,240
about technological legacy michael well

1355
00:58:31,910 --> 00:58:29,760
certainly the scientific legacy as we

1356
00:58:34,069 --> 00:58:31,920
mentioned before of the lunar landings

1357
00:58:36,950 --> 00:58:34,079
was very very important and clearly it

1358
00:58:38,710 --> 00:58:36,960
remains an inspirational legacy uh for

1359
00:58:40,789 --> 00:58:38,720
that these anniversaries always show

1360
00:58:42,549 --> 00:58:40,799
that that people around the world and

1361
00:58:45,990 --> 00:58:42,559
not just in the united states are really

1362
00:58:46,870 --> 00:58:46,000
inspired by that accomplishment

1363
00:58:48,549 --> 00:58:46,880

roger

1364
00:58:50,710 --> 00:58:48,559
i think one of the things that uh that's

1365
00:58:52,390 --> 00:58:50,720
significant that uh nobody necessarily

1366
00:58:54,150 --> 00:58:52,400
anticipated at the time but has come

1367
00:58:56,390 --> 00:58:54,160
down to us is pretty significant since

1368
00:58:58,390 --> 00:58:56,400
then is is our new perspective that we

1369
00:59:02,150 --> 00:58:58,400
saw on earth as we looked back

1370
00:59:03,910 --> 00:59:02,160
and uh and the the the sense of

1371
00:59:06,789 --> 00:59:03,920
appreciation and wonder of this little

1372
00:59:08,710 --> 00:59:06,799
spaceship that we're riding on uh and

1373
00:59:10,309 --> 00:59:08,720
and how it houses all of the life and

1374
00:59:12,710 --> 00:59:10,319
all of the things we've ever loved and

1375
00:59:15,270 --> 00:59:12,720
hated uh uh

1376
00:59:18,710 --> 00:59:15,280
are right here and uh and that it is a

1377
00:59:21,109 --> 00:59:18,720
fragile thing that must be protected

1378
00:59:23,750 --> 00:59:21,119
well and the compliment to roger's

1379
00:59:25,349 --> 00:59:23,760
observation is apollo also showed us

1380
00:59:27,109 --> 00:59:25,359
that we don't have to stay on this

1381
00:59:29,510 --> 00:59:27,119
planet forever

1382
00:59:31,829 --> 00:59:29,520
it was the first step in a

1383
00:59:33,190 --> 00:59:31,839
centuries-long process of moving

1384
00:59:35,190 --> 00:59:33,200
humanity

1385
00:59:36,789 --> 00:59:35,200
into the solar system

1386
00:59:38,950 --> 00:59:36,799
hopefully we're going to continue to do

1387
00:59:40,069 --> 00:59:38,960
that in the next few years but but

1388
00:59:42,390 --> 00:59:40,079

apollo

1389
00:59:45,349 --> 00:59:42,400
when we look back will be the first step

1390
00:59:47,750 --> 00:59:45,359
in an evolution of humanity to a

1391
00:59:49,349 --> 00:59:47,760
multi-planet species

1392
00:59:51,030 --> 00:59:49,359
okay we're going to have to wrap it up

1393
00:59:54,470 --> 00:59:51,040
there thanks very much to the panel and

1394
00:59:56,789 --> 00:59:54,480
on this day when we have 13 astronauts

1395
00:59:58,390 --> 00:59:56,799
in earth orbit thank you all for joining

1396
00:59:59,510 --> 00:59:58,400
us here at nasa headquarters on this