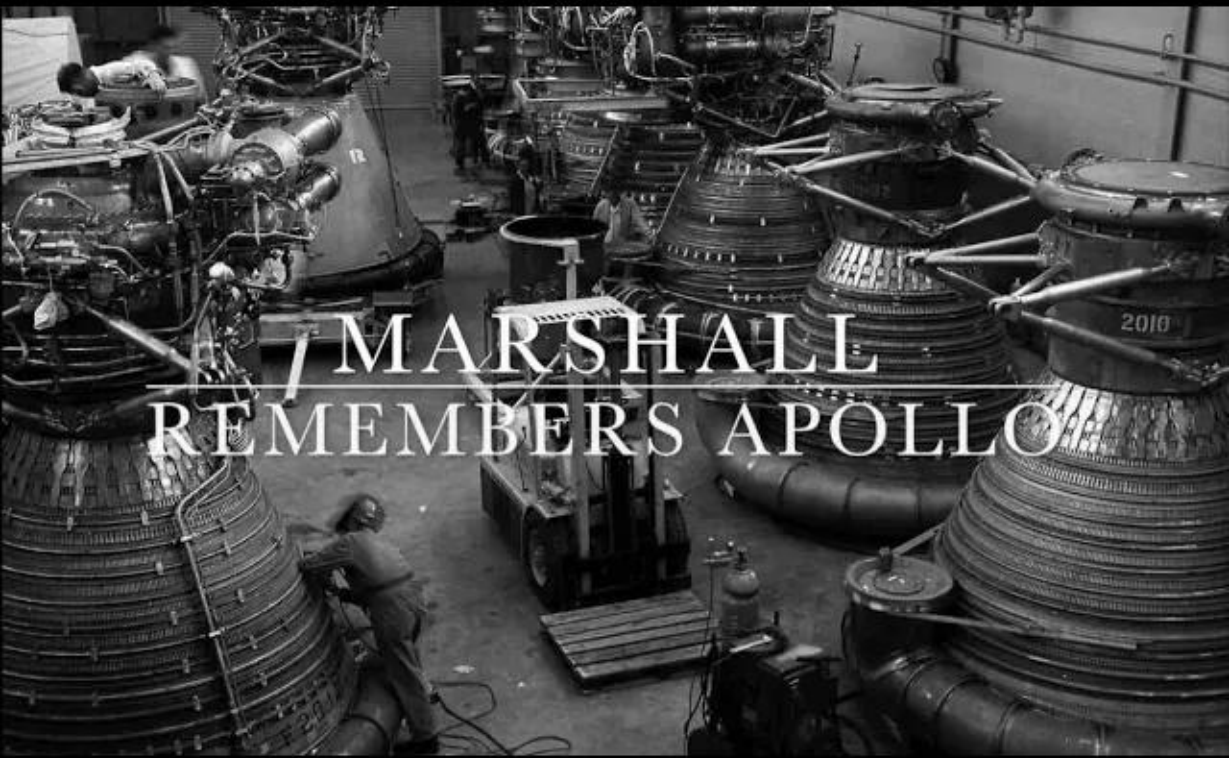
MARSHALL
REMEMBERS APOLLO

1
00:00:01,130 --> 00:00:14,390
[Music]

2
00:00:22,429 --> 00:00:18,859
I came to work for the dr. von Braun

3
00:00:25,040 --> 00:00:22,439
team in 1959 when he was still with the

4
00:00:27,019 --> 00:00:25,050
army ballistic missile agency when the

5
00:00:32,630 --> 00:00:27,029
army ballistic missile agency was

6
00:00:35,630 --> 00:00:32,640
transferred to NASA in 1960 dr. von

7
00:00:39,440 --> 00:00:35,640
Braun agreed with the army to leave the

8
00:00:41,630 --> 00:00:39,450
Persian weapon system office which was I

9
00:00:43,580 --> 00:00:41,640
was a part of behind to finish the

10
00:00:47,290 --> 00:00:43,590
development of that program and after

11
00:00:53,630 --> 00:00:47,300
that we would rejoin him at NASA in

12
00:00:55,520 --> 00:00:53,640
February of 1961 I joined the office of

13
00:00:58,069 --> 00:00:55,530

manned spaceflight system engineering

14
00:00:59,959 --> 00:00:58,079
and integration office as a part of the

15
00:01:01,939 --> 00:00:59,969
resident office here at the Marshall

16
00:01:03,680 --> 00:01:01,949
Space Flight Center was not working for

17
00:01:06,530 --> 00:01:03,690
Marshall was working for NASA

18
00:01:09,200 --> 00:01:06,540
headquarters at the time and in November

19
00:01:18,630 --> 00:01:09,210
of 1969 I John Marshall Space Flight

20
00:01:26,190 --> 00:01:22,920
a manager of the program control group

21
00:01:27,810 --> 00:01:26,200
within a Saturn 5 program office and my

22
00:01:30,600 --> 00:01:27,820
office had the responsibilities for

23
00:01:35,130 --> 00:01:30,610
scheduling all the launch vehicle

24
00:01:38,040 --> 00:01:35,140
activities also for budgeting of the

25
00:01:42,000 --> 00:01:38,050
active is allocating resources to the

26
00:01:43,830 --> 00:01:42,010
various elements of the program and then

27
00:01:48,780 --> 00:01:43,840
later on I was assigned the

28
00:01:50,370 --> 00:01:48,790
responsibility of developing a and

29
00:01:52,710 --> 00:01:50,380
administering a configuration management

30
00:01:54,150 --> 00:01:52,720
system for baselining and controlling

31
00:01:56,190 --> 00:01:54,160
all the technical requirements and

32
00:01:58,490 --> 00:01:56,200
interfaces of the of the launch vehicle

33
00:02:01,560 --> 00:01:58,500
within and within the various stages

34
00:02:04,320 --> 00:02:01,570
within it that was a vehicle at the Cape

35
00:02:09,090 --> 00:02:04,330
and the vehicle and the spacecraft so it

36
00:02:11,100 --> 00:02:09,100
was a pretty demanding task which pretty

37
00:02:13,140 --> 00:02:11,110
much got me involved in about everything

38
00:02:15,180 --> 00:02:13,150

going on because anything had happened

39
00:02:19,410 --> 00:02:15,190
would usually affect the schedule or a

40
00:02:21,949 --> 00:02:19,420
budget and I had to be a part to that to

41
00:02:24,660 --> 00:02:21,959
help in in the in the dealing with it

42
00:02:28,890 --> 00:02:24,670
adjusting schedules reallocating

43
00:02:30,750 --> 00:02:28,900
resources to provide funding for areas

44
00:02:32,400 --> 00:02:30,760
that that that were running a little bit

45
00:02:39,020 --> 00:02:32,410
behind schedule or we're having a

46
00:02:42,360 --> 00:02:40,770
the Saturn was

47
00:02:46,170 --> 00:02:42,370
very much getting underway at that time

48
00:02:48,210 --> 00:02:46,180
was underway at that time we were in the

49
00:02:51,000 --> 00:02:48,220
early stages of the design and

50
00:02:53,070 --> 00:02:51,010
development phase not so much in the

51
00:02:56,309 --> 00:02:53,080
hardware phase on to many of the

52
00:02:58,440 --> 00:02:56,319
elements but the Saturn one was well

53
00:03:02,190 --> 00:02:58,450
underway the Saturn 1b was getting

54
00:03:04,710 --> 00:03:02,200
underway Saturn 5 was under contract to

55
00:03:07,590 --> 00:03:04,720
be started so a lot of activity was

56
00:03:09,990 --> 00:03:07,600
going on at the at the center especially

57
00:03:13,290 --> 00:03:10,000
on the s-1 sea stage the first

58
00:03:17,220 --> 00:03:13,300
propulsive stage of the Saturn 5 vehicle

59
00:03:24,300 --> 00:03:17,230
and on the instrument unit for both the

60
00:03:31,440 --> 00:03:27,900
our early challenges were getting

61
00:03:34,650 --> 00:03:31,450
facilities in place the Mississippi test

62
00:03:37,580 --> 00:03:34,660
facility was a kind of a swamp down in

63
00:03:40,440 --> 00:03:37,590

Mississippi the way to get that built

64
00:03:42,030 --> 00:03:40,450
the Kennedy Space Center was a part of

65
00:03:44,940 --> 00:03:42,040
the Marshall Space Flight Center at that

66
00:03:47,250 --> 00:03:44,950
time they were spun off to Marshall

67
00:03:50,309 --> 00:03:47,260
became a separate Center and they were

68
00:03:53,870 --> 00:03:50,319
busy purchasing land and building the

69
00:03:57,240 --> 00:03:53,880
launch complex designing a means for

70
00:03:59,940 --> 00:03:57,250
checking out the vehicle rolling it out

71
00:04:02,460 --> 00:03:59,950
to the pad launching it so a lot of

72
00:04:05,600 --> 00:04:02,470
activities going that way on that way we

73
00:04:09,449 --> 00:04:05,610
had a lot of work in-house at Marshall

74
00:04:12,600 --> 00:04:09,459
only s1c stage because Marshall was

75
00:04:16,259 --> 00:04:12,610
responsible for building I think it was

76
00:04:19,050 --> 00:04:16,269
four of the first flight four of the

77
00:04:22,230 --> 00:04:19,060
five ground test articles at that time

78
00:04:25,050 --> 00:04:22,240
and two of the first flight articles for

79
00:04:28,140 --> 00:04:25,060
the vehicle Marshall was also busy

80
00:04:29,790 --> 00:04:28,150
designing and building in-house the

81
00:04:31,500 --> 00:04:29,800
instrument unit for the Saturn wouldn't

82
00:04:35,370 --> 00:04:31,510
be in the Saturn five so there was a lot

83
00:04:37,890 --> 00:04:35,380
of activity going on at the center as

84
00:04:41,100 --> 00:04:37,900
well as well other things that were

85
00:04:45,480 --> 00:04:41,110
going on was the designing and testing

86
00:04:49,710 --> 00:04:45,490
of the umbilical arms that were used at

87
00:04:52,980 --> 00:04:49,720
the Cape we also were busy designing

88
00:04:54,510 --> 00:04:52,990

developing fabricating the ground

89
00:04:56,909 --> 00:04:54,520
support equipment that was used for

90
00:04:59,670 --> 00:04:56,919
checking out the launch vehicle at the

91
00:05:03,420 --> 00:04:59,680
Cape so there was just a lot of activity

92
00:05:05,840 --> 00:05:03,430
going on here in addition we were busy

93
00:05:09,110 --> 00:05:05,850
kind of getting our contractors on board

94
00:05:12,420 --> 00:05:09,120
to assume the responsibility for the

95
00:05:15,150 --> 00:05:12,430
fabrication and and and really building

96
00:05:17,010 --> 00:05:15,160
and delivery of the flight stages for

97
00:05:18,779 --> 00:05:17,020
the entire vehicle so a lot of

98
00:05:21,740 --> 00:05:18,789
activities going on getting them up to

99
00:05:25,500 --> 00:05:21,750
speed Marshall had a yeah a real jump on

100
00:05:27,360 --> 00:05:25,510
on the contractors because dr. ben brown

101
00:05:32,520 --> 00:05:27,370
team had been together for many many

102
00:05:35,250 --> 00:05:32,530
years we had built the s-1 stage for the

103
00:05:37,130 --> 00:05:35,260
Saturn one vehicle in-house and of

104
00:05:39,500 --> 00:05:37,140
course all of this

105
00:05:43,520 --> 00:05:39,510
unit boxes at that time we did not have

106
00:05:45,490 --> 00:05:43,530
a separate slice for the for the

107
00:05:49,940 --> 00:05:45,500
instrument unit then they were mounted

108
00:05:53,000 --> 00:05:49,950
inside some of the structures within the

109
00:05:54,440 --> 00:05:53,010
launch vehicle so there was just just a

110
00:06:00,320 --> 00:05:54,450
lot of activity going on we were

111
00:06:03,290 --> 00:06:00,330
building the engine test stands the s1c

112
00:06:04,910 --> 00:06:03,300
test and a dynamic tower which is the

113
00:06:06,980 --> 00:06:04,920

large it was at the time the largest

114
00:06:08,960 --> 00:06:06,990
structure in the state of Alabama so

115
00:06:14,560 --> 00:06:08,970
there was just all kind of activity

116
00:06:20,440 --> 00:06:17,350
while the Saturn one was the clustering

117
00:06:22,990 --> 00:06:20,450
of redstone and and Jupiter launch

118
00:06:25,120 --> 00:06:23,000
vehicle system stages so that was the

119
00:06:27,430 --> 00:06:25,130
first clustering of the vehicle so there

120
00:06:30,070 --> 00:06:27,440
was a learning process there that went

121
00:06:32,980 --> 00:06:30,080
into it and course the start of the

122
00:06:34,960 --> 00:06:32,990
guidance and control system which you

123
00:06:36,760 --> 00:06:34,970
know that would ultimately evolve on

124
00:06:39,460 --> 00:06:36,770
into the Saturn one being Saturn five

125
00:06:42,430 --> 00:06:39,470
was also being developed and utilized on

126
00:06:45,240 --> 00:06:42,440
them on that Saturn one program on the

127
00:06:48,730 --> 00:06:45,250
Saturn 1b of course the we used the

128
00:06:54,310 --> 00:06:48,740
first stage from the from the Saturn one

129
00:06:58,180 --> 00:06:54,320
and then we developed an s4 stage which

130
00:07:01,420 --> 00:06:58,190
evolved own into an s4 B stage that was

131
00:07:05,290 --> 00:07:01,430
a common stage used for the Saturn 5 so

132
00:07:08,650 --> 00:07:05,300
we got a real jump on the s4 B stage by

133
00:07:10,540 --> 00:07:08,660
virtue of using it on the Saturn 1b the

134
00:07:13,870 --> 00:07:10,550
same was true for the instrument unit

135
00:07:16,810 --> 00:07:13,880
the it was flown initially on the Saturn

136
00:07:19,090 --> 00:07:16,820
1b and then was used almost intact on

137
00:07:22,300 --> 00:07:19,100
the Saturn 5 so you can see we had a

138
00:07:25,930 --> 00:07:22,310

real jump on that and then the s1 work

139
00:07:28,000 --> 00:07:25,940
that we did on the Saturn 1 and 1b was a

140
00:07:31,210 --> 00:07:28,010
learning process for developing the

141
00:07:36,670 --> 00:07:31,220
cluster for the first stage on a Saturn

142
00:07:38,440 --> 00:07:36,680
5 vehicle the one part that was not did

143
00:07:41,560 --> 00:07:38,450
not benefit from some of this early work

144
00:07:44,020 --> 00:07:41,570
was the s2 stage and that proved to be

145
00:07:49,460 --> 00:07:44,030
our most challenging undertaking on the

146
00:07:54,980 --> 00:07:52,520
we did not encounter any thing that

147
00:07:56,840 --> 00:07:54,990
threatened our schedule on the s1c stage

148
00:07:59,720 --> 00:07:56,850
because of all of the preliminary work

149
00:08:02,930 --> 00:07:59,730
and a jump that Marshall was able to get

150
00:08:05,690 --> 00:08:02,940
by using our fields of facilities to

151
00:08:07,880 --> 00:08:05,700
build the early ground test stages and

152
00:08:10,070 --> 00:08:07,890
the flight test stages so I can't recall

153
00:08:12,470 --> 00:08:10,080
any great difficulties we had there not

154
00:08:13,940 --> 00:08:12,480
that we didn't have some we had a lot of

155
00:08:16,640 --> 00:08:13,950
them of course a lot of it was to be

156
00:08:18,710 --> 00:08:16,650
proven with new engine technology and

157
00:08:20,600 --> 00:08:18,720
new contagious but we had a lot of

158
00:08:24,650 --> 00:08:20,610
testing here on our engine test stands

159
00:08:28,280 --> 00:08:24,660
and on our own RS 1c tests and to kind

160
00:08:32,240 --> 00:08:28,290
of work out all the all the difficulties

161
00:08:34,339 --> 00:08:32,250
that we had there likewise only s4b we

162
00:08:36,710 --> 00:08:34,349
did not have that many difficulties

163
00:08:40,070 --> 00:08:36,720

because it evolved from the s4 stage of

164
00:08:42,200 --> 00:08:40,080
the s4 B got started very early so it

165
00:08:44,930 --> 00:08:42,210
was not under the same time constraint

166
00:08:46,610 --> 00:08:44,940
that the s2 the real problems came on

167
00:08:49,160 --> 00:08:46,620
the s2 it was a very challenging thing

168
00:08:50,810 --> 00:08:49,170
we brought a new contractor in that had

169
00:08:53,390 --> 00:08:50,820
not been involved on any of the previous

170
00:08:57,230 --> 00:08:53,400
programs and it was a challenge

171
00:09:00,380 --> 00:08:57,240
assignment challenging assignment you

172
00:09:04,820 --> 00:09:00,390
know from the very GetGo and then into

173
00:09:07,520 --> 00:09:04,830
the program the spacecraft began to grow

174
00:09:11,300 --> 00:09:07,530
in weight so we had to make a decision

175
00:09:14,030 --> 00:09:11,310
on whether to take the weight out of the

176
00:09:17,420 --> 00:09:14,040
spacecraft or out of the launch vehicle

177
00:09:18,980 --> 00:09:17,430
and dr. von Braun realized that it would

178
00:09:21,440 --> 00:09:18,990
be very very difficult to get it out of

179
00:09:24,110 --> 00:09:21,450
the spacecraft so he agreed to increase

180
00:09:26,900 --> 00:09:24,120
the launch performance capability of the

181
00:09:30,440 --> 00:09:26,910
saturn v to do that we had to take

182
00:09:34,790 --> 00:09:30,450
weight out of the one of the stages and

183
00:09:37,100 --> 00:09:34,800
the s2 was determined to be the most

184
00:09:38,840 --> 00:09:37,110
viable way to do that because I think we

185
00:09:41,120 --> 00:09:38,850
had to take about 13 pounds of weight

186
00:09:43,790 --> 00:09:41,130
out of es1 sea stage to get 1 pound of

187
00:09:45,620 --> 00:09:43,800
payload capability whereas only s2 we

188
00:09:48,340 --> 00:09:45,630

could take out about 4 pounds of weight

189
00:09:53,630 --> 00:09:48,350
and gain one pound in payload capability

190
00:09:57,140 --> 00:09:53,640
so that decision really complicated an

191
00:09:59,420 --> 00:09:57,150
already tough job that we had I would

192
00:10:01,340 --> 00:09:59,430
say it was the biggest threat in my

193
00:10:02,820 --> 00:10:01,350
personal opinion from a launch vehicle

194
00:10:05,280 --> 00:10:02,830
standpoint of you

195
00:10:09,780 --> 00:10:05,290
that we had in being able to meet the

196
00:10:11,640 --> 00:10:09,790
landing within the decade we also had

197
00:10:15,360 --> 00:10:11,650
great difficulties in developing this

198
00:10:17,730 --> 00:10:15,370
new stage we actually blew up a couple

199
00:10:21,200 --> 00:10:17,740
of the didn't blow up we actually

200
00:10:24,570 --> 00:10:21,210
destroyed a couple of the ground test

201
00:10:26,640 --> 00:10:24,580
stages during tests and we had to cancel

202
00:10:29,100 --> 00:10:26,650
one of the ground test stages because we

203
00:10:31,950 --> 00:10:29,110
were running so far behind schedule so

204
00:10:33,660 --> 00:10:31,960
we were very limited and tests that of

205
00:10:35,910 --> 00:10:33,670
course we distemper destroyed a couple

206
00:10:39,320 --> 00:10:35,920
of test stands in the process of those

207
00:10:44,250 --> 00:10:39,330
failures so it was a very challenging

208
00:10:47,160 --> 00:10:44,260
assignment required allocating a lot

209
00:10:49,950 --> 00:10:47,170
more funds into the program to the

210
00:10:53,100 --> 00:10:49,960
contractor to try to buy back the

211
00:10:55,230 --> 00:10:53,110
schedule and and to try to keep it on

212
00:11:02,519 --> 00:10:55,240
schedule but it was very clearly the

213
00:11:09,990 --> 00:11:06,619

it's it's a very critical part to any

214
00:11:12,030 --> 00:11:10,000
major development of understanding what

215
00:11:13,829 --> 00:11:12,040
your requirements are what you what

216
00:11:16,319 --> 00:11:13,839
requirements you have to satisfy for

217
00:11:19,199 --> 00:11:16,329
example in the case of Saturn 5 we had

218
00:11:22,170 --> 00:11:19,209
to our initial commitment wants to put

219
00:11:25,019 --> 00:11:22,180
90,000 pounds into the lunar transfer

220
00:11:26,790 --> 00:11:25,029
trajectory you know within the decade

221
00:11:29,790 --> 00:11:26,800
that was a two primary assignments we

222
00:11:32,970 --> 00:11:29,800
had well you had to design a vehicle

223
00:11:34,949 --> 00:11:32,980
that would would do that to get that

224
00:11:36,900 --> 00:11:34,959
payload and to achieve that you had to

225
00:11:39,840 --> 00:11:36,910
allocate those requirements down to the

226
00:11:42,179 --> 00:11:39,850
various levels of the work breakdown

227
00:11:45,329 --> 00:11:42,189
structure right on down to the stage the

228
00:11:46,980 --> 00:11:45,339
engine and the various components had

229
00:11:49,530 --> 00:11:46,990
had to be determined and you had to

230
00:11:52,319 --> 00:11:49,540
define the the interfaces between the

231
00:11:54,900 --> 00:11:52,329
stages we had to define interfaces

232
00:11:57,090 --> 00:11:54,910
between our launch vehicle and the

233
00:12:00,689 --> 00:11:57,100
launch complex and between the launch

234
00:12:04,889 --> 00:12:00,699
vehicle and the spacecraft those have to

235
00:12:06,960 --> 00:12:04,899
be baselined and and track to be assured

236
00:12:07,889 --> 00:12:06,970
that you meet him they have to be

237
00:12:10,530 --> 00:12:07,899
qualified you have to have a

238
00:12:13,620 --> 00:12:10,540

qualification test program to prove that

239
00:12:16,889 --> 00:12:13,630
you have satisfy those requirements and

240
00:12:20,910 --> 00:12:16,899
once you have qualified it then you have

241
00:12:24,170 --> 00:12:20,920
to control that any change that you have

242
00:12:27,150 --> 00:12:24,180
active qualified hardware or software

243
00:12:29,780 --> 00:12:27,160
you you have to keep very close track of

244
00:12:32,850 --> 00:12:29,790
that to make sure that you have

245
00:12:35,490 --> 00:12:32,860
qualified that change and that you have

246
00:12:38,160 --> 00:12:35,500
incorporated it into the design so it's

247
00:12:40,410 --> 00:12:38,170
really a closed loop system that you

248
00:12:43,620 --> 00:12:40,420
have from requirements to incorporation

249
00:12:44,970 --> 00:12:43,630
of whatever that change is in the end of

250
00:12:48,960 --> 00:12:44,980
the system it came from the DoD

251
00:12:50,939 --> 00:12:48,970
primarily we we used the I believe it

252
00:12:53,759 --> 00:12:50,949
was the Air Force configuration

253
00:12:56,100 --> 00:12:53,769
management manual and tailored it for

254
00:13:01,530 --> 00:12:56,110
the saturn v launch vehicle system and

255
00:13:05,819 --> 00:13:01,540
then that system was used then for the

256
00:13:07,410 --> 00:13:05,829
Saturn 1b and I think that did not apply

257
00:13:09,650 --> 00:13:07,420
the Saturn one it was pretty much behind

258
00:13:12,850 --> 00:13:09,660
us and Marshall had another means of

259
00:13:17,560 --> 00:13:12,860
controlling the requirements before the

260
00:13:22,430 --> 00:13:17,570
more formal system came along during the

261
00:13:28,940 --> 00:13:25,640
the only other thing that I felt that

262
00:13:31,340 --> 00:13:28,950
threatened our ability to get the job

263
00:13:34,160 --> 00:13:31,350

done in two decade was the launch of a s

264
00:13:36,410 --> 00:13:34,170
502 which was a second Saturn 5 vehicle

265
00:13:38,960 --> 00:13:36,420
when we had the anomalies there we had a

266
00:13:43,130 --> 00:13:38,970
couple of engines to go out on on the

267
00:13:46,700 --> 00:13:43,140
second stage and were able fortunately

268
00:13:49,040 --> 00:13:46,710
because of the ingenuity of our in-house

269
00:13:51,710 --> 00:13:49,050
design people to design in such a way we

270
00:13:53,300 --> 00:13:51,720
were able to get on the spacecraft only

271
00:13:55,220 --> 00:13:53,310
into orbit by burning the three

272
00:13:57,740 --> 00:13:55,230
remaining engines only as two longer

273
00:13:59,960 --> 00:13:57,750
firing up the s4 be getting into Earth

274
00:14:03,110 --> 00:13:59,970
orbit but then after we got into Earth

275
00:14:05,350 --> 00:14:03,120
orbit we were unable to start the s4b

276
00:14:08,810 --> 00:14:05,360
stage because of a failure and the

277
00:14:13,910 --> 00:14:08,820
ignition spark ignition line of the j2

278
00:14:15,980 --> 00:14:13,920
engine but still again ingenuity of the

279
00:14:19,250 --> 00:14:15,990
Johnson spacecraft Center people were

280
00:14:22,100 --> 00:14:19,260
able to fire up the service module and

281
00:14:25,130 --> 00:14:22,110
get a partial completion of our mission

282
00:14:28,040 --> 00:14:25,140
objectives on that flight and then after

283
00:14:32,330 --> 00:14:28,050
that things really smooth out they were

284
00:14:39,980 --> 00:14:32,340
we did not have any other major threats

285
00:14:49,430 --> 00:14:44,240
I really hope the first one AAS 501 very

286
00:14:53,870 --> 00:14:49,440
high in my in my treasure chest I would

287
00:14:56,120 --> 00:14:53,880
say that is when all of the flight

288
00:14:58,930 --> 00:14:56,130

articles came together for the very

289
00:15:01,519 --> 00:14:58,940
first time at the Kennedy Space Center

290
00:15:04,420 --> 00:15:01,529
not only did we have a new launch

291
00:15:08,000 --> 00:15:04,430
vehicle going there that had not been

292
00:15:09,290 --> 00:15:08,010
flown before but we had a new launch

293
00:15:11,949 --> 00:15:09,300
complex

294
00:15:16,070 --> 00:15:11,959
we had a new automatic checkout system

295
00:15:17,630 --> 00:15:16,080
all the software flight software was

296
00:15:18,860 --> 00:15:17,640
coming together for the first time that

297
00:15:20,810 --> 00:15:18,870
we had done a lot of work on a

298
00:15:22,990 --> 00:15:20,820
breadboard here at Marshall in a

299
00:15:25,910 --> 00:15:23,000
facility close to located here to the

300
00:15:27,350 --> 00:15:25,920
communication center - to get that

301
00:15:29,300 --> 00:15:27,360
checked out as best we could on the

302
00:15:32,170 --> 00:15:29,310
ground but with all that coming together

303
00:15:35,870 --> 00:15:32,180
and and that launched in November of

304
00:15:38,810 --> 00:15:35,880
1967 was remarkable I'm telling you it

305
00:15:40,579 --> 00:15:38,820
was remarkable so I hold that one right

306
00:15:43,579 --> 00:15:40,589
up at the top of my list from a launch

307
00:15:46,940 --> 00:15:43,589
vehicle standpoint I have to consider it

308
00:15:48,829 --> 00:15:46,950
one well to use dr. van brown's word he

309
00:15:51,050 --> 00:15:48,839
said it was the greatest accomplishment

310
00:15:55,070 --> 00:15:51,060
at the Marshall Space Flight Center ever

311
00:15:57,170 --> 00:15:55,080
only surpassed by a s 506 the lunar

312
00:16:00,710 --> 00:15:57,180
landing to show you the significance of

313
00:16:03,949 --> 00:16:00,720

that my next one that I hold very highly

314
00:16:07,490 --> 00:16:03,959
was a s 503 we had just had the

315
00:16:11,180 --> 00:16:07,500
anomalies on 502 we were scheduled to

316
00:16:13,840 --> 00:16:11,190
put a man on 503 but the criteria for

317
00:16:16,970 --> 00:16:13,850
putting a man on was two successive

318
00:16:20,600 --> 00:16:16,980
successful launches well five old days

319
00:16:23,860 --> 00:16:20,610
502 was not a total success as as we all

320
00:16:27,260 --> 00:16:23,870
know but because we were able to

321
00:16:29,930 --> 00:16:27,270
specifically identify the cause of the

322
00:16:32,750 --> 00:16:29,940
anomalies that we had on a s 502 and

323
00:16:35,960 --> 00:16:32,760
were able to replicate those failures or

324
00:16:37,010 --> 00:16:35,970
those anomalies on the ground design and

325
00:16:39,470 --> 00:16:37,020
build a fix

326
00:16:41,690 --> 00:16:39,480
get that qualified there was enough

327
00:16:44,500 --> 00:16:41,700
confidence at that time in fact the

328
00:16:48,460 --> 00:16:44,510
meeting was held right here at Marshall

329
00:16:50,900 --> 00:16:48,470
over in the H OSC building where the

330
00:16:53,069 --> 00:16:50,910
International Space Station payload

331
00:16:54,749 --> 00:16:53,079
Operations Group are now

332
00:16:58,949 --> 00:16:54,759
where we reviewed all the details in

333
00:17:03,180 --> 00:16:58,959
made a decision to put a man on a s 503

334
00:17:04,829 --> 00:17:03,190
that was a very very bold decision you

335
00:17:07,319 --> 00:17:04,839
know having encountered the difficulties

336
00:17:09,179 --> 00:17:07,329
on the prior flight and then I liked it

337
00:17:11,760 --> 00:17:09,189
so well because it was launched in late

338
00:17:14,669 --> 00:17:11,770

December Frank Borman and his crew were

339
00:17:18,620 --> 00:17:14,679
able to navigate the circumnavigate the

340
00:17:22,169 --> 00:17:18,630
the moon and made his wonderful

341
00:17:24,840 --> 00:17:22,179
announcement about the creation and we

342
00:17:27,329 --> 00:17:24,850
saw all the beautiful pictures of the of

343
00:17:29,909 --> 00:17:27,339
the earth from that vantage point I gave

344
00:17:32,520 --> 00:17:29,919
us great appreciation for the wonderful

345
00:17:35,909 --> 00:17:32,530
environment that we lived in and then of

346
00:17:38,909 --> 00:17:35,919
course AAS 506 was that was the climax

347
00:17:41,039 --> 00:17:38,919
of all of our efforts and of course that

348
00:17:47,190 --> 00:17:41,049
was a highlight for him for all of us

349
00:17:52,379 --> 00:17:49,830
in the past our history was that we

350
00:17:54,359 --> 00:17:52,389
would launch one stage with all dummy

351
00:17:56,099 --> 00:17:54,369
upper stages for the first slide and

352
00:17:58,560 --> 00:17:56,109
then we would add a second stage for the

353
00:18:01,249 --> 00:17:58,570
for the second flight the third stage

354
00:18:02,879 --> 00:18:01,259
for the for the third fly and so forth

355
00:18:06,450 --> 00:18:02,889
dr. Miller

356
00:18:08,369 --> 00:18:06,460
when he came to NASA and and that was in

357
00:18:10,529 --> 00:18:08,379
the early 60s on camera called exactly

358
00:18:13,619 --> 00:18:10,539
when but made the decision we were going

359
00:18:15,450 --> 00:18:13,629
all up on the very first fly that got a

360
00:18:18,259 --> 00:18:15,460
lot of discussion here at Marshall Space

361
00:18:20,879 --> 00:18:18,269
Flight Center as you can imagine because

362
00:18:24,029 --> 00:18:20,889
for the most part we were very

363
00:18:26,759 --> 00:18:24,039

conservative in our approach to to

364
00:18:28,349 --> 00:18:26,769
launch vehicle development that went

365
00:18:31,109 --> 00:18:28,359
against grain and they was a strong

366
00:18:33,749 --> 00:18:31,119
effort to get him to change his mind on

367
00:18:35,999 --> 00:18:33,759
that but he did not so dr. von Braun

368
00:18:37,889 --> 00:18:36,009
endorsed it we got behind it and it

369
00:18:44,220 --> 00:18:37,899
proved to be a right Waco we saved quite

370
00:18:52,049 --> 00:18:47,419
it was truly amazing to watch that and

371
00:18:55,049 --> 00:18:52,059
to see all of the lab directors working

372
00:18:58,380 --> 00:18:55,059
with Doc Brown and with the program

373
00:19:00,690 --> 00:18:58,390
managers in a room discussing progress

374
00:19:03,960 --> 00:19:00,700
problems solution to problems and and

375
00:19:07,650 --> 00:19:03,970
what have you and he was so good about

376
00:19:10,620 --> 00:19:07,660
getting inputs from everyone I don't

377
00:19:12,660 --> 00:19:10,630
think I ever saw him force somebody into

378
00:19:16,470 --> 00:19:12,670
something that they didn't they did not

379
00:19:17,909 --> 00:19:16,480
believe in if he had a little trouble

380
00:19:20,430 --> 00:19:17,919
getting them to come around to his point

381
00:19:22,770 --> 00:19:20,440
of view like on the all up concept he

382
00:19:25,230 --> 00:19:22,780
was so patient and and and worked with

383
00:19:29,220 --> 00:19:25,240
him until such time that they actually

384
00:19:32,250 --> 00:19:29,230
came around to supporting him the same

385
00:19:34,770 --> 00:19:32,260
was true when the decision was made on

386
00:19:37,080 --> 00:19:34,780
the mode that we would that NASA would

387
00:19:40,590 --> 00:19:37,090
use to go to the moon we were looking at

388
00:19:44,159 --> 00:19:40,600

a direct descent a lunar rendezvous and

389
00:19:45,510 --> 00:19:44,169
an earth oral run of you boo Marshall

390
00:19:46,919 --> 00:19:45,520
was favoring the earth orbital

391
00:19:49,530 --> 00:19:46,929
rendezvous because it required a

392
00:19:52,169 --> 00:19:49,540
building of a space station which had

393
00:19:54,150 --> 00:19:52,179
some merit we would have had a byproduct

394
00:19:56,789 --> 00:19:54,160
of the lunar landing with the space

395
00:19:59,010 --> 00:19:56,799
station had that been made but the

396
00:20:01,680 --> 00:19:59,020
johnson space craft center favored the

397
00:20:03,840 --> 00:20:01,690
lor thinking that was the most expedient

398
00:20:06,600 --> 00:20:03,850
way to get to the moon in the decade and

399
00:20:09,270 --> 00:20:06,610
again that was a decision that was

400
00:20:10,680 --> 00:20:09,280
debated a long long time when the

401
00:20:13,020 --> 00:20:10,690
decision was made to go with the lunar

402
00:20:15,539 --> 00:20:13,030
roving vehicle but again dr. ben Brown

403
00:20:17,909 --> 00:20:15,549
supported that and the laboratory

404
00:20:19,560 --> 00:20:17,919
directors although they had difficulties

405
00:20:21,720 --> 00:20:19,570
with it they did come around to

406
00:20:24,060 --> 00:20:21,730
supporting it and once a decision made

407
00:20:26,130 --> 00:20:24,070
we put our heart into it and there was

408
00:20:28,289 --> 00:20:26,140
no looking back that's the way we we

409
00:20:31,140 --> 00:20:28,299
move forward and I think it's extremely

410
00:20:34,140 --> 00:20:31,150
important that I also mentioned the name

411
00:20:38,760 --> 00:20:34,150
of the Saturn 5 program manager dr.

412
00:20:41,909 --> 00:20:38,770
Arthur Rudolph he assumed responsibility

413
00:20:45,409 --> 00:20:41,919

for managing the Saturn 5 vehicle I

414
00:20:49,770 --> 00:20:45,419
think around that November 1963

415
00:20:51,299 --> 00:20:49,780
timeframe in fact I came with him to to

416
00:20:54,920 --> 00:20:51,309
Marshall from the office of manned

417
00:20:58,380 --> 00:20:54,930
spaceflight at that time and

418
00:21:00,750 --> 00:20:58,390
hee hee was an uncanny person tremendous

419
00:21:02,790 --> 00:21:00,760
experience had done you know technology

420
00:21:05,520 --> 00:21:02,800
work on engine development and that's

421
00:21:07,980 --> 00:21:05,530
when they were in their infancy stage of

422
00:21:10,110 --> 00:21:07,990
development and right on through the

423
00:21:13,320 --> 00:21:10,120
vehicles developed by the Germans for

424
00:21:16,740 --> 00:21:13,330
world war ii he was responsible for the

425
00:21:19,200 --> 00:21:16,750
production of those vehicles and and

426
00:21:21,630 --> 00:21:19,210
then he worked on the Redstone vehicle

427
00:21:23,580 --> 00:21:21,640
so we had a world of experience and I

428
00:21:26,370 --> 00:21:23,590
observed him as I observed him during

429
00:21:29,690 --> 00:21:26,380
the Apollo program I was always

430
00:21:32,730 --> 00:21:29,700
impressed with with his decision-making

431
00:21:36,870 --> 00:21:32,740
ability and I often told him I said art

432
00:21:38,790 --> 00:21:36,880
do you you really have a sixth sense in

433
00:21:41,040 --> 00:21:38,800
making some of those decisions it just

434
00:21:43,260 --> 00:21:41,050
always seemed to be solid and of course

435
00:21:45,000 --> 00:21:43,270
that was wisdom and knowledge gained

436
00:21:48,440 --> 00:21:45,010
from all the years of experience that he

437
00:21:53,280 --> 00:21:48,450
had as time went on I finally realized

438
00:21:55,650 --> 00:21:53,290

that it was really experience and wisdom

439
00:21:58,380 --> 00:21:55,660
not a sixth sense that he had it gave

440
00:22:01,260 --> 00:21:58,390
him a success but he just had an uncanny

441
00:22:03,900 --> 00:22:01,270
ability to analyze a problem and come up

442
00:22:06,360 --> 00:22:03,910
with a right solution so I tribute a lot

443
00:22:11,380 --> 00:22:06,370
of success to the Saturn 5 to to dr.

444
00:22:16,720 --> 00:22:14,200
caused great concern around the world

445
00:22:20,620 --> 00:22:16,730
because communism was really on the rise

446
00:22:23,200 --> 00:22:20,630
and it was great concern of its

447
00:22:25,060 --> 00:22:23,210
dominance not only of space but of you

448
00:22:27,760 --> 00:22:25,070
know of the democracies around the world

449
00:22:30,190 --> 00:22:27,770
a lot of pressure was put on President

450
00:22:34,600 --> 00:22:30,200
Kennedy and and on our national leaders

451
00:22:37,270 --> 00:22:34,610
to do something about that and the

452
00:22:41,140 --> 00:22:37,280
president asked Vice President Lyndon

453
00:22:44,290 --> 00:22:41,150
Johnson who was I think he was sharing

454
00:22:46,060 --> 00:22:44,300
the space Council at that time to look

455
00:22:50,800 --> 00:22:46,070
into the various options that we might

456
00:22:53,380 --> 00:22:50,810
have for overcoming the Russians and the

457
00:22:55,270 --> 00:22:53,390
the options were fairly limited for us

458
00:22:58,840 --> 00:22:55,280
to do that because the Russians had such

459
00:23:02,440 --> 00:22:58,850
a tremendous lead on the United States

460
00:23:05,020 --> 00:23:02,450
and the free world in him in launch

461
00:23:07,360 --> 00:23:05,030
vehicle capability the ability to put

462
00:23:09,760 --> 00:23:07,370
large payloads into orbit Vice President

463
00:23:11,410 --> 00:23:09,770

Johnson called together some of the

464
00:23:13,930 --> 00:23:11,420
experts around the country I'm one of

465
00:23:16,420 --> 00:23:13,940
which was dr. Van Brown to explore ideas

466
00:23:18,630 --> 00:23:16,430
for doing that and decision was made

467
00:23:22,330 --> 00:23:18,640
that we had to do something very bold

468
00:23:24,250 --> 00:23:22,340
using new technology technology that the

469
00:23:26,890 --> 00:23:24,260
Soviet Union did not have and would have

470
00:23:29,230 --> 00:23:26,900
difficulty development developing that

471
00:23:31,330 --> 00:23:29,240
technology was the only way that we

472
00:23:33,340 --> 00:23:31,340
would be able to leapfrog them and

473
00:23:37,630 --> 00:23:33,350
become the dominant national power in

474
00:23:40,330 --> 00:23:37,640
space so that is when recommendation was

475
00:23:43,360 --> 00:23:40,340
made from this group that Vice President

476
00:23:45,880 --> 00:23:43,370
Johnson put together to recommend to the

477
00:23:50,080 --> 00:23:45,890
president that we we place a man on the

478
00:23:52,600 --> 00:23:50,090
moon and do that that required very much

479
00:23:54,970 --> 00:23:52,610
of a leap in technology and launch

480
00:23:56,680 --> 00:23:54,980
vehicle capability which the Soviet

481
00:23:58,450 --> 00:23:56,690
Union did not have in which we did not

482
00:24:00,460 --> 00:23:58,460
think they would be able to match us in

483
00:24:02,200 --> 00:24:00,470
the time frame that we had and by

484
00:24:05,320 --> 00:24:02,210
setting it in the end of the decade that

485
00:24:07,960 --> 00:24:05,330
put a lot of pressure on both to do that

486
00:24:09,790 --> 00:24:07,970
and of course with a successful launch I

487
00:24:12,340 --> 00:24:09,800
think we all know who won who won the

488
00:24:15,580 --> 00:24:12,350

race and there was a very significant

489
00:24:16,990 --> 00:24:15,590
political decision that he made more so

490
00:24:23,130 --> 00:24:17,000
than an engineering or scientific

491
00:24:29,760 --> 00:24:27,029
I did not see any effect on what I was

492
00:24:32,490 --> 00:24:29,770
doing or what what the agency was doing

493
00:24:34,440 --> 00:24:32,500
I think we were more of an influence on

494
00:24:37,380 --> 00:24:34,450
the solution to the problem than we were

495
00:24:42,389 --> 00:24:37,390
the cause of the problem but I did not

496
00:24:45,470 --> 00:24:42,399
see any any negative outside influence

497
00:24:48,299 --> 00:24:45,480
on the Apollo program both

498
00:24:50,250 --> 00:24:48,309
african-american and and women were

499
00:24:51,930 --> 00:24:50,260
emerging then in the science and

500
00:24:54,419 --> 00:24:51,940
engineering field and they were employed

501
00:24:57,269 --> 00:24:54,429
so you know I think we were kind of

502
00:25:00,690 --> 00:24:57,279
ahead of the power curve in making

503
00:25:03,299 --> 00:25:00,700
happen what the nation was trying to get

504
00:25:04,620 --> 00:25:03,309
accomplished you know primarily well

505
00:25:08,760 --> 00:25:04,630
throughout the nation and certainly in

506
00:25:14,910 --> 00:25:08,770
the south so yes I think that that had a

507
00:25:25,310 --> 00:25:19,470
I really believe that it demonstrated to

508
00:25:28,860 --> 00:25:25,320
the world that the United States could

509
00:25:32,880 --> 00:25:28,870
could do almost the impossible when

510
00:25:35,010 --> 00:25:32,890
they've set a firm goal to it and and

511
00:25:35,550 --> 00:25:35,020
put the resources behind it to get it

512
00:25:38,460 --> 00:25:35,560
done

513
00:25:39,210 --> 00:25:38,470

they thing which impressed me so very

514
00:25:41,520 --> 00:25:39,220
much

515
00:25:43,620 --> 00:25:41,530
was the fact that throughout the program

516
00:25:46,650 --> 00:25:43,630
even with the difficulty that we had

517
00:25:49,440 --> 00:25:46,660
along the way the president was behind

518
00:25:51,510 --> 00:25:49,450
that program the Congress was behind it

519
00:25:55,350 --> 00:25:51,520
they provided ample funds for us to get

520
00:25:57,570 --> 00:25:55,360
the job done the media was behind it we

521
00:26:00,060 --> 00:25:57,580
did not have a lot of second guessing or

522
00:26:03,500 --> 00:26:00,070
backbiting going on there and the public

523
00:26:06,480 --> 00:26:03,510
was behind it so I think the fact that

524
00:26:10,770 --> 00:26:06,490
we demonstrated with the Apollo program

525
00:26:12,930 --> 00:26:10,780
that you could accomplish whatever you