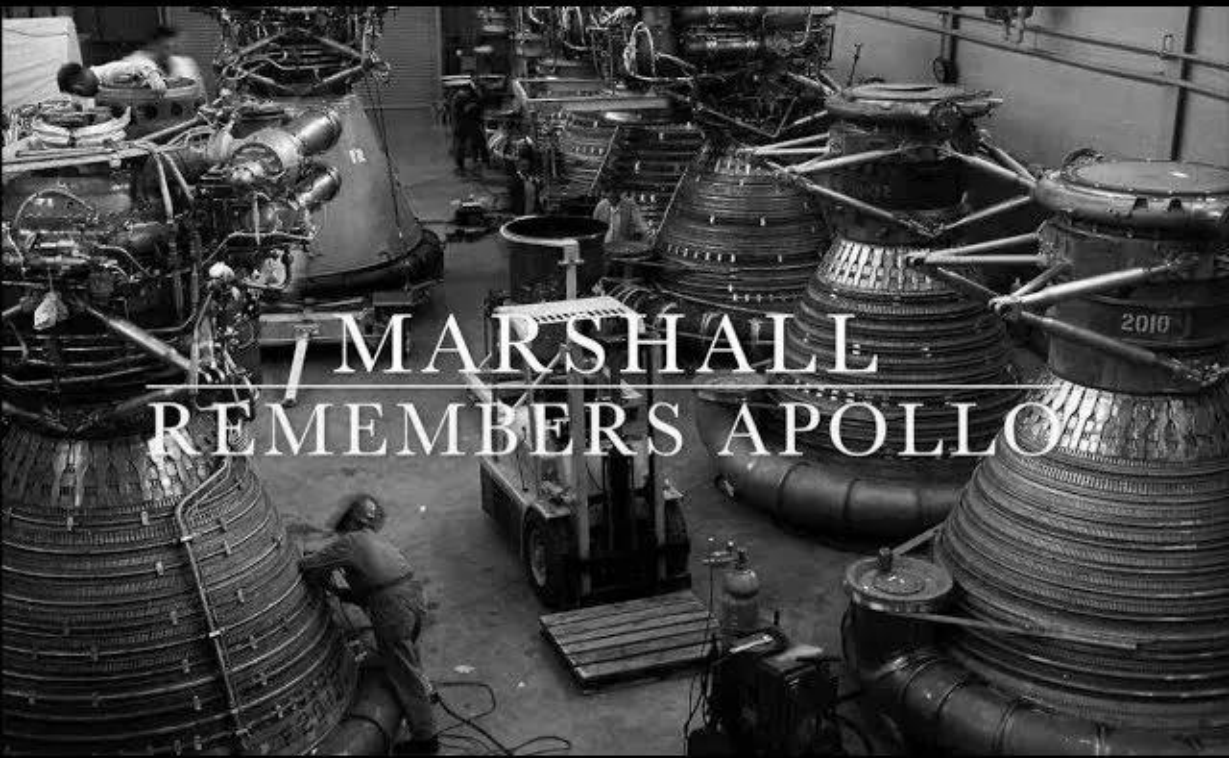
MARSHALL
REMEMBERS APOLLO

1
00:00:19,810 --> 00:00:16,680
[Music]

2
00:00:25,540 --> 00:00:19,820
the history goes back all the way back

3
00:00:27,820 --> 00:00:25,550
to 1956 when I arrived here as a result

4
00:00:29,560 --> 00:00:27,830
of an army decision to send me down here

5
00:00:33,070 --> 00:00:29,570
to Redstone Arsenal to work on that

6
00:00:36,970 --> 00:00:33,080
redstone and Jupiter missiles at that

7
00:00:40,990 --> 00:00:36,980
time those two projects were reaching

8
00:00:43,479 --> 00:00:41,000
their maximum effort and the army

9
00:00:47,410 --> 00:00:43,489
desperately needed people out of college

10
00:00:51,880 --> 00:00:47,420
to to help them manage those programs at

11
00:00:54,040 --> 00:00:51,890
work those programs I had graduated from

12
00:00:56,049 --> 00:00:54,050
Johns Hopkins University I was in the

13
00:00:58,509 --> 00:00:56,059

ROTC and as a result I received my

14
00:01:01,810 --> 00:00:58,519
commission as a second lieutenant and

15
00:01:05,020 --> 00:01:01,820
right after I graduate from basic

16
00:01:07,800 --> 00:01:05,030
training they pulled me into Redstone to

17
00:01:10,450 --> 00:01:07,810
work on those two two missile programs I

18
00:01:14,740 --> 00:01:10,460
worked in those programs for two years

19
00:01:17,920 --> 00:01:14,750
and I was released from the Army in 1958

20
00:01:21,460 --> 00:01:17,930
and it so happened that right after I

21
00:01:26,289 --> 00:01:21,470
was available to work in the private

22
00:01:29,140 --> 00:01:26,299
industry the development operations part

23
00:01:33,010 --> 00:01:29,150
of the army that was out here at at

24
00:01:35,920 --> 00:01:33,020
Redstone received the authority to start

25
00:01:38,620 --> 00:01:35,930
work on the Saturn one program and the

26
00:01:41,410 --> 00:01:38,630
Saturn one manager talked me into

27
00:01:43,060 --> 00:01:41,420
staying here and working on this what

28
00:01:47,740 --> 00:01:43,070
looked to be a very exciting and a new

29
00:01:49,810 --> 00:01:47,750
program it was still within the army and

30
00:01:51,069 --> 00:01:49,820
because NASA was not established till

31
00:01:54,310 --> 00:01:51,079
1960

32
00:01:56,830 --> 00:01:54,320
well I worked on those two programs in

33
00:01:59,709 --> 00:01:56,840
the systems office actually in the

34
00:02:03,730 --> 00:01:59,719
project manager's office and was helping

35
00:02:09,249 --> 00:02:03,740
them define the overall development

36
00:02:11,850 --> 00:02:09,259
concept for the Saturn one and the basic

37
00:02:15,490 --> 00:02:11,860
definition of the program in terms of

38
00:02:17,620 --> 00:02:15,500

project requirements overall systems

39
00:02:20,590 --> 00:02:17,630
requirements doing that kind of staff

40
00:02:23,110 --> 00:02:20,600
work for the project manager the Saturn

41
00:02:25,930 --> 00:02:23,120
one program was

42
00:02:27,520 --> 00:02:25,940
at that time of course it was a compared

43
00:02:29,890 --> 00:02:27,530
to what we're doing today it was a very

44
00:02:33,270 --> 00:02:29,900
simple program because all Saturn one

45
00:02:36,790 --> 00:02:33,280
was the objective Saturn one were to

46
00:02:40,180 --> 00:02:36,800
take the existing hardware or existed

47
00:02:44,650 --> 00:02:40,190
the redstone tanks and the Jupiter tank

48
00:02:46,600 --> 00:02:44,660
and the Redstone engines and cluster

49
00:02:49,229 --> 00:02:46,610
them it was the objective of that

50
00:02:52,330 --> 00:02:49,239
program was to a clustering of engines

51
00:02:56,039 --> 00:02:52,340
so that this country would be able to

52
00:02:58,390 --> 00:02:56,049
develop higher thrust launch vehicles

53
00:03:00,130 --> 00:02:58,400
most of the work had already been

54
00:03:01,930 --> 00:03:00,140
accomplished the development work one of

55
00:03:07,120 --> 00:03:01,940
the tanks and the engines and so forth

56
00:03:09,699 --> 00:03:07,130
what they had to do was just do the

57
00:03:10,960 --> 00:03:09,709
overall systems work to put all those

58
00:03:14,530 --> 00:03:10,970
things together cluster them together

59
00:03:17,830 --> 00:03:14,540
structurally make some modifications to

60
00:03:21,339 --> 00:03:17,840
the control concept since we now had

61
00:03:25,809 --> 00:03:21,349
multiple engines and all those things

62
00:03:27,479 --> 00:03:25,819
were new concepts which of course made

63
00:03:31,870 --> 00:03:27,489

the program that much more interesting

64
00:03:35,319 --> 00:03:31,880
so I worked on the Saturn on Saturn one

65
00:03:37,680 --> 00:03:35,329
for a couple of years in the early

66
00:03:39,819 --> 00:03:37,690
stages and they were starting to

67
00:03:43,509 --> 00:03:39,829
manufacture the hardware here at

68
00:03:46,539 --> 00:03:43,519
Marshall and I performed some of the

69
00:03:51,509 --> 00:03:46,549
liaison between the management office

70
00:03:54,879 --> 00:03:51,519
engineering part of structures and

71
00:03:59,740 --> 00:03:54,889
mechanics laboratory and the amine after

72
00:04:03,900 --> 00:03:59,750
manufacturing people in 1960 I decided

73
00:04:08,349 --> 00:04:03,910
to go after a master's degree and I

74
00:04:10,410 --> 00:04:08,359
departed for one year on a sabbatical to

75
00:04:15,190 --> 00:04:10,420
Purdue University to receive my degree

76
00:04:19,750 --> 00:04:15,200
and as it turned out when I receive my

77
00:04:23,940 --> 00:04:19,760
degree and came back the organization

78
00:04:28,480 --> 00:04:23,950
had been changed from Army to NASA and

79
00:04:30,580 --> 00:04:28,490
of all the things the Saturn 5 concept

80
00:04:34,540 --> 00:04:30,590
was just being defined

81
00:04:35,800 --> 00:04:34,550
while I was at Purdue they were looking

82
00:04:37,300 --> 00:04:35,810
at their various

83
00:04:43,030 --> 00:04:37,310
Brown and his team we're looking at

84
00:04:47,440 --> 00:04:43,040
various concepts of higher thrust larger

85
00:04:51,159 --> 00:04:47,450
cap ability boosters they had to C 1 and

86
00:04:55,500 --> 00:04:51,169
C 2 C 4 C 5 and then C 5 even had

87
00:04:58,360 --> 00:04:55,510
several several versions to it but they

88
00:05:02,140 --> 00:04:58,370

about that time when I came back they

89
00:05:05,230 --> 00:05:02,150
settled on this on the c5 version that

90
00:05:09,659 --> 00:05:05,240
actually became Saturn 5 which had five

91
00:05:12,670 --> 00:05:09,669
large F on engines two on the first

92
00:05:14,500 --> 00:05:12,680
stage and then the second stage they

93
00:05:18,460 --> 00:05:14,510
call the s2 and the third stage to

94
00:05:23,020 --> 00:05:18,470
called s4 B when I came back that

95
00:05:27,100 --> 00:05:23,030
program was just starting and a project

96
00:05:28,930 --> 00:05:27,110
manager had been had been identified and

97
00:05:30,670 --> 00:05:28,940
he had a small staff of just three or

98
00:05:32,740 --> 00:05:30,680
four people and I ended up being

99
00:05:35,500 --> 00:05:32,750
probably the fifth or sixth person in

100
00:05:39,190 --> 00:05:35,510
that office and the project matters it

101
00:05:42,279 --> 00:05:39,200
used me to do basically systems type

102
00:05:46,930 --> 00:05:42,289
work again similar to what I had done on

103
00:05:50,830 --> 00:05:46,940
on the Saturn one defining the project

104
00:05:54,490 --> 00:05:50,840
concept the development concept of how

105
00:05:59,260 --> 00:05:54,500
many launches would be appropriate for

106
00:06:05,499 --> 00:05:59,270
this kind of a complex system doing some

107
00:06:12,439 --> 00:06:10,909
overall program requirements and working

108
00:06:15,379 --> 00:06:12,449
with at laboratories here who were

109
00:06:20,749 --> 00:06:15,389
defining now the details of the Saturn 5

110
00:06:24,320 --> 00:06:20,759
and the s1c stage I did that work

111
00:06:29,269 --> 00:06:24,330
actually in the what was the development

112
00:06:33,950 --> 00:06:29,279
part of Devon Brown's team well as the

113
00:06:36,859 --> 00:06:33,960

program grew they established the Saturn

114
00:06:42,019 --> 00:06:36,869
Systems office responsible for both the

115
00:06:43,639 --> 00:06:42,029
the Saturn one and Saturn 5 and this

116
00:06:46,010 --> 00:06:43,649
small group that I was part of the

117
00:06:49,760 --> 00:06:46,020
Saturn 5 group was part of the Saturn

118
00:06:52,399 --> 00:06:49,770
systems office the program grew to the

119
00:06:55,389 --> 00:06:52,409
point where it needed some

120
00:07:00,709 --> 00:06:55,399
reorganization and some additional

121
00:07:04,149 --> 00:07:00,719
staffing they reorganized and brought in

122
00:07:07,659 --> 00:07:04,159
dr. art rudolph who was one of the

123
00:07:10,670 --> 00:07:07,669
famous people within this von braun team

124
00:07:15,309 --> 00:07:10,680
made him program manager and of course

125
00:07:17,540 --> 00:07:15,319
he established a a organization that had

126
00:07:19,760 --> 00:07:17,550
individuals responsible for the various

127
00:07:22,579 --> 00:07:19,770
parts of the program like each of the

128
00:07:25,339 --> 00:07:22,589
stages then they also established the

129
00:07:26,659 --> 00:07:25,349
systems engineering office and they

130
00:07:30,889 --> 00:07:26,669
appointed me head of the systems

131
00:07:33,619 --> 00:07:30,899
engineering so we proceeded to now go

132
00:07:35,719 --> 00:07:33,629
into more detail and what it took to put

133
00:07:39,199 --> 00:07:35,729
this program together and and in

134
00:07:42,649 --> 00:07:39,209
requirements program requirements

135
00:07:44,629 --> 00:07:42,659
program development approach the big

136
00:07:47,869 --> 00:07:44,639
issue of course in this complex program

137
00:07:50,570 --> 00:07:47,879
was to do the coordination between the

138
00:07:52,790 --> 00:07:50,580

various people that participated in the

139
00:07:54,320 --> 00:07:52,800
program that various contractors the

140
00:07:56,420 --> 00:07:54,330
contractors had already been brought on

141
00:08:00,649 --> 00:07:56,430
board during the first couple of years

142
00:08:05,239 --> 00:08:00,659
and so we came up with a number of

143
00:08:06,740 --> 00:08:05,249
concepts to try to help expedite that

144
00:08:11,190 --> 00:08:06,750
kind of thing

145
00:08:13,650 --> 00:08:11,200
also there were new new ideas on how to

146
00:08:16,050 --> 00:08:13,660
manage large programs basically they

147
00:08:19,920 --> 00:08:16,060
established something called

148
00:08:22,140 --> 00:08:19,930
configuration management which really

149
00:08:25,050 --> 00:08:22,150
hadn't existed until that time it was a

150
00:08:27,300 --> 00:08:25,060
much more less informal approach before

151
00:08:31,620 --> 00:08:27,310
and configuration management made it a

152
00:08:41,180 --> 00:08:31,630
much more formal approach to making sure

153
00:08:49,720 --> 00:08:46,059
the Saturn 5 concept as I've mentioned

154
00:08:53,360 --> 00:08:49,730
was created here by the Von Braun team

155
00:08:56,749 --> 00:08:53,370
the s1c stage specifically was being

156
00:08:58,579 --> 00:08:56,759
designed in detail of course contractors

157
00:09:01,100 --> 00:08:58,589
were being brought on board because the

158
00:09:05,300 --> 00:09:01,110
size of the program like on s1c stage

159
00:09:09,460 --> 00:09:05,310
Boeing was contracted to help do the the

160
00:09:12,439 --> 00:09:09,470
detailed design of the s1c but the basic

161
00:09:14,780 --> 00:09:12,449
ideas of concept had already been put in

162
00:09:16,879 --> 00:09:14,790
place additional contractors were

163
00:09:18,829 --> 00:09:16,889

required to work to s2 stage of s4 B

164
00:09:21,139 --> 00:09:18,839
stage so that Marshall was also

165
00:09:24,470 --> 00:09:21,149
responsible for contracting for those

166
00:09:27,499 --> 00:09:24,480
activities the idea of coordinating

167
00:09:29,180 --> 00:09:27,509
between all these different people

168
00:09:32,689 --> 00:09:29,190
particularly as the program guru

169
00:09:34,400 --> 00:09:32,699
required a systems contractor to pull

170
00:09:38,870 --> 00:09:34,410
all these little pieces together make

171
00:09:40,670 --> 00:09:38,880
sure the communication was working the

172
00:09:42,620 --> 00:09:40,680
systems engineering office that I was

173
00:09:44,629 --> 00:09:42,630
involved in was responsible and and

174
00:09:46,819 --> 00:09:44,639
interfaced with Boeing on that too

175
00:09:50,030 --> 00:09:46,829
of course boring was helping us do all

176
00:09:52,220 --> 00:09:50,040
this kind of coordination we came up

177
00:09:54,769 --> 00:09:52,230
with a concept of working groups where

178
00:09:59,600 --> 00:09:54,779
they were the marshal people and the

179
00:10:02,629 --> 00:09:59,610
contractors met together regularly to to

180
00:10:05,090 --> 00:10:02,639
coordinate each of the system's ideas

181
00:10:07,150 --> 00:10:05,100
and and changes and so forth they were

182
00:10:09,829 --> 00:10:07,160
going on so the working groups were a

183
00:10:14,030 --> 00:10:09,839
very important part of the overall

184
00:10:15,230 --> 00:10:14,040
activity in Marshall people of course

185
00:10:18,829 --> 00:10:15,240
were very much involved with the

186
00:10:23,319 --> 00:10:18,839
contractors and and also in defining the

187
00:10:29,900 --> 00:10:23,329
the upper stages a good example of that

188
00:10:32,210 --> 00:10:29,910

might be the the s4b stage which had a

189
00:10:36,800 --> 00:10:32,220
single engine and the contractor did not

190
00:10:39,079 --> 00:10:36,810
want to go beyond a six degree freedom

191
00:10:42,170 --> 00:10:39,089
on the gambling of the all its engine

192
00:10:44,120 --> 00:10:42,180
because it made the made the system a

193
00:10:47,110 --> 00:10:44,130
little bit more complicated but the

194
00:10:49,730 --> 00:10:47,120
marshal people insisted that with that

195
00:10:54,090 --> 00:10:49,740
that'd be eight degrees and it turned

196
00:10:57,960 --> 00:10:54,100
out that on I guess it was Apollo six

197
00:11:00,270 --> 00:10:57,970
the second saturn v launch that

198
00:11:03,780 --> 00:11:00,280
difference made a difference between a

199
00:11:06,450 --> 00:11:03,790
successful mission and a failure so it

200
00:11:09,750 --> 00:11:06,460
was those kind of things that were going

201
00:11:11,670 --> 00:11:09,760
on all the time and you can imagine with

202
00:11:13,940 --> 00:11:11,680
with all of the participants in the

203
00:11:17,490 --> 00:11:13,950
program and so forth it was it was a

204
00:11:19,160 --> 00:11:17,500
quite a quite a fascinating thing to see

205
00:11:22,200 --> 00:11:19,170
all these kind of things fall in place

206
00:11:26,670 --> 00:11:22,210
the program had grown to such complexity

207
00:11:29,250 --> 00:11:26,680
that in 1965 NASA decided to change the

208
00:11:33,110 --> 00:11:29,260
whole organizational structure again on

209
00:11:36,090 --> 00:11:33,120
Saturn 5 bringing in some Mary's senior

210
00:11:38,640 --> 00:11:36,100
managers some of them army officer

211
00:11:41,250 --> 00:11:38,650
generals to take care of some of the

212
00:11:43,770 --> 00:11:41,260
management requirements that needed to

213
00:11:46,380 --> 00:11:43,780

be done for each one of the which one of

214
00:11:51,020 --> 00:11:46,390
the stages so as a result the Saturn 5

215
00:11:52,190 --> 00:11:51,030
project office was was changed and

216
00:11:56,670 --> 00:11:52,200
[Music]

217
00:12:00,990 --> 00:11:56,680
general O'Connor who was sent in here

218
00:12:04,880 --> 00:12:01,000
was actually named us they put in a

219
00:12:08,310 --> 00:12:04,890
state a level above the project called

220
00:12:11,280 --> 00:12:08,320
industrial operations because of this

221
00:12:12,750 --> 00:12:11,290
massive amount of industrial work that

222
00:12:15,990 --> 00:12:12,760
was going on in order to pull this

223
00:12:18,480 --> 00:12:16,000
program together so as a result of of

224
00:12:24,450 --> 00:12:18,490
that reorganization all kinds of other

225
00:12:27,150 --> 00:12:24,460
things happen and as a result I decided

226
00:12:29,580 --> 00:12:27,160
that ok I have accomplished because all

227
00:12:31,770 --> 00:12:29,590
these people coming in I decided I've

228
00:12:33,150 --> 00:12:31,780
bought it contributed as much as I can

229
00:12:35,010 --> 00:12:33,160
in this I mean I there was another

230
00:12:37,890 --> 00:12:35,020
program starting called the Saturn 1b

231
00:12:40,020 --> 00:12:37,900
Centaur and I happened to be personally

232
00:12:42,920 --> 00:12:40,030
familiar with a personal friend of the

233
00:12:46,830 --> 00:12:42,930
manager of that program so I decided to

234
00:12:49,650 --> 00:12:46,840
go on that project for for a year well

235
00:12:52,200 --> 00:12:49,660
as a systems engineer and but the

236
00:12:58,280 --> 00:12:52,210
project only lasted a year so from that

237
00:13:08,900 --> 00:13:04,789
Aaron was not really identified as such

238
00:13:10,969 --> 00:13:08,910

until these complex systems started

239
00:13:12,679 --> 00:13:10,979
coming together obviously we did

240
00:13:14,719 --> 00:13:12,689
engineering we did systems engineering

241
00:13:18,379 --> 00:13:14,729
what we did work we never really called

242
00:13:21,529 --> 00:13:18,389
it that we called it whatever else you

243
00:13:24,229 --> 00:13:21,539
know coordination this whatever but then

244
00:13:27,259 --> 00:13:24,239
systems engineering again put emphasis

245
00:13:30,039 --> 00:13:27,269
and focus on doing things that were

246
00:13:33,249 --> 00:13:30,049
important to bring large organizations

247
00:13:35,719 --> 00:13:33,259
complex concepts and so forth together

248
00:13:38,779 --> 00:13:35,729
yeah and that was that was pretty much

249
00:13:40,939 --> 00:13:38,789
invented in in those early days the

250
00:13:42,590 --> 00:13:40,949
thing is it's such a you know there are

251
00:13:45,650 --> 00:13:42,600
a lot of complex things going on today

252
00:13:48,889 --> 00:13:45,660
but this is this is hardware you know

253
00:13:52,340 --> 00:13:48,899
complex pieces of equipment like pumps

254
00:13:55,309 --> 00:13:52,350
and pressure bottles and all these other

255
00:14:02,359 --> 00:13:55,319
things that can fail on you the

256
00:14:07,370 --> 00:14:02,369
structures you know it's it was a it was

257
00:14:13,640 --> 00:14:10,940
the the the Apollo program and the

258
00:14:17,810 --> 00:14:13,650
Saturn five and the Apollo program of

259
00:14:19,640 --> 00:14:17,820
course saw an end coming after so many

260
00:14:21,920 --> 00:14:19,650
launches you know we had lining the the

261
00:14:25,460 --> 00:14:21,930
we had landed the astronauts on the moon

262
00:14:27,800 --> 00:14:25,470
or several times we knew that that that

263
00:14:30,470 --> 00:14:27,810

could not continue but there was

264
00:14:34,520 --> 00:14:30,480
hardware available from that Apollo

265
00:14:37,250 --> 00:14:34,530
program that could be used to accomplish

266
00:14:40,880 --> 00:14:37,260
some different kind of missions and of

267
00:14:43,280 --> 00:14:40,890
course the the von braun team had a an

268
00:14:45,170 --> 00:14:43,290
organization within the group called

269
00:14:47,750 --> 00:14:45,180
development operations and they

270
00:14:49,670 --> 00:14:47,760
conceived how this Hardware could be

271
00:14:55,010 --> 00:14:49,680
used to establish the first space

272
00:14:59,060 --> 00:14:55,020
station called Skylab so so the the

273
00:15:01,820 --> 00:14:59,070
Apollo applications utilized the command

274
00:15:04,460 --> 00:15:01,830
module and service module it utilized

275
00:15:07,010 --> 00:15:04,470
the s4b stage and utilize the facilities

276
00:15:12,860 --> 00:15:07,020
at at the Cape and so forth in a way it

277
00:15:15,640 --> 00:15:12,870
was a relatively unexpensive program but

278
00:15:20,810 --> 00:15:15,650
it did accomplish some new things like a

279
00:15:24,170 --> 00:15:20,820
court in including in it the the Apollo

280
00:15:26,390 --> 00:15:24,180
telescope mount which was a scientific

281
00:15:30,110 --> 00:15:26,400
mission that could be made part of that

282
00:15:32,060 --> 00:15:30,120
space station so Marshall was assigned a

283
00:15:34,190 --> 00:15:32,070
job they know putting all that together

284
00:15:38,930 --> 00:15:34,200
which we did with the contractors were

285
00:15:40,880 --> 00:15:38,940
already on board and ended up with a

286
00:15:43,970 --> 00:15:40,890
rather successful Skylab program and

287
00:15:45,740 --> 00:15:43,980
then that that went on the Skylab

288
00:15:48,530 --> 00:15:45,750

program was the first space station and

289
00:15:50,540 --> 00:15:48,540
by that time people in the aerospace

290
00:15:52,340 --> 00:15:50,550
community already thought well that

291
00:15:54,560 --> 00:15:52,350
Skylab was fine but we really need a

292
00:15:56,210 --> 00:15:54,570
bigger space station so that that

293
00:15:58,940 --> 00:15:56,220
brought up the concept of the shuttle

294
00:16:01,460 --> 00:15:58,950
because in order to build a bigger Space

295
00:16:05,830 --> 00:16:01,470
Station one need of the transportation

296
00:16:08,420 --> 00:16:05,840
system up there that was able to reflow

297
00:16:11,120 --> 00:16:08,430
rather than lose them the boosters all

298
00:16:12,890 --> 00:16:11,130
the time so this shuttle concept was was

299
00:16:14,420 --> 00:16:12,900
brought up and and and then the shuttle

300
00:16:18,860 --> 00:16:14,430
was developed

301
00:16:21,500 --> 00:16:18,870
and the program went on to do the

302
00:16:24,080 --> 00:16:21,510
shuttle and then the space station which

303
00:16:25,700 --> 00:16:24,090
were quite familiar with now well earn

304
00:16:29,470 --> 00:16:25,710
sterling our of course was a scientist

305
00:16:31,640 --> 00:16:29,480
and he was interested in what kind of

306
00:16:34,490 --> 00:16:31,650
objectives the various missions should

307
00:16:40,750 --> 00:16:34,500
take on the idea of Apollo applications

308
00:16:43,250 --> 00:16:40,760
was it was again that the the Saturn 5

309
00:16:46,340 --> 00:16:43,260
well the moon program what came to an

310
00:16:49,190 --> 00:16:46,350
end I mean the nation kind of after we

311
00:16:52,730 --> 00:16:49,200
landed the astronauts kind of lost

312
00:16:55,130 --> 00:16:52,740
interest because of the excitement of

313
00:16:58,190 --> 00:16:55,140

the moon program all of a sudden was

314
00:17:00,710 --> 00:16:58,200
accomplished and and then and then we

315
00:17:02,180 --> 00:17:00,720
had to decide what it's what else to do

316
00:17:03,590 --> 00:17:02,190
next the other thing that was happening

317
00:17:06,020 --> 00:17:03,600
at the same time was a micro

318
00:17:08,329 --> 00:17:06,030
miniaturization of electronics and a lot

319
00:17:12,800 --> 00:17:08,339
of other things that which made the

320
00:17:14,569 --> 00:17:12,810
payloads a lot lighter so large large

321
00:17:17,030 --> 00:17:14,579
launch vehicles were not required

322
00:17:18,530 --> 00:17:17,040
anymore at that point and unless you

323
00:17:21,050 --> 00:17:18,540
wanted to go back to the moon you want

324
00:17:23,360 --> 00:17:21,060
to go to Mars and you know you could do

325
00:17:25,819 --> 00:17:23,370
your missions with with smaller vehicles

326
00:17:28,340 --> 00:17:25,829
which were being developed by which had

327
00:17:30,620 --> 00:17:28,350
been developed by the military or were

328
00:17:32,360 --> 00:17:30,630
being developed by private industry the

329
00:17:37,070 --> 00:17:32,370
emphasis needed to go to something other

330
00:17:39,590 --> 00:17:37,080
than launch vehicles and so Skylab in a

331
00:17:43,370 --> 00:17:39,600
way a change also brought that change

332
00:17:44,720 --> 00:17:43,380
into the system and we continued with

333
00:17:47,330 --> 00:17:44,730
that with the shuttle because we knew

334
00:17:52,280 --> 00:17:47,340
the shuttle okay it was going to launch

335
00:17:55,130 --> 00:17:52,290
all the space station sub parts up in a

336
00:17:57,050 --> 00:17:55,140
space but but you could also put

337
00:17:59,540 --> 00:17:57,060
scientific instruments into the shuttle

338
00:18:02,210 --> 00:17:59,550

bay and do quite a bit of scientific

339
00:18:04,520 --> 00:18:02,220
investigation on the shuttle oh there

340
00:18:06,410 --> 00:18:04,530
was of course after the after the moon

341
00:18:08,780 --> 00:18:06,420
landing and and the end of the Saturn

342
00:18:11,060 --> 00:18:08,790
program there was great concern and

343
00:18:16,490 --> 00:18:11,070
Marshall about what we might really do

344
00:18:19,310 --> 00:18:16,500
and fortunately we also had a support

345
00:18:24,170 --> 00:18:19,320
from headquarters to do other types of

346
00:18:26,890 --> 00:18:24,180
missions and that brought about the

347
00:18:29,240 --> 00:18:26,900
well of course the the Hubble telescope

348
00:18:32,210 --> 00:18:29,250
program which Marcia which was assigned

349
00:18:34,610 --> 00:18:32,220
to Marshall and Hubble telescope program

350
00:18:36,290 --> 00:18:34,620
occupied Marshall for for a number of

351
00:18:40,690 --> 00:18:36,300
years and picked up where where Saturn

352
00:18:42,920 --> 00:18:40,700
had left off but after the after the

353
00:18:45,170 --> 00:18:42,930
Saturn program was over an Apollo

354
00:18:47,510 --> 00:18:45,180
program was over Marshall which had

355
00:18:52,190 --> 00:18:47,520
grown to about 72 hundred employees

356
00:18:54,920 --> 00:18:52,200
civil service employees was downsized to

357
00:18:56,990 --> 00:18:54,930
about 3,000 or 3500 people so it was

358
00:19:02,520 --> 00:18:57,000
quite a quite a shock to the

359
00:19:10,080 --> 00:19:04,390
of course those were turbulent

360
00:19:13,390 --> 00:19:10,090
but the Saturn 5 program had the highest

361
00:19:17,140 --> 00:19:13,400
priority within the country of any

362
00:19:20,350 --> 00:19:17,150
program in fact when we went to

363
00:19:25,840 --> 00:19:20,360

suppliers of parts and materials and so

364
00:19:28,150 --> 00:19:25,850
forth they were required to deliver to

365
00:19:29,080 --> 00:19:28,160
NASA before they delivered even to the

366
00:19:33,640 --> 00:19:29,090
military

367
00:19:35,350 --> 00:19:33,650
that's how high the priority was so that

368
00:19:38,650 --> 00:19:35,360
was one thing another thing is that

369
00:19:41,260 --> 00:19:38,660
people who were working on Saturn 5 were

370
00:19:43,240 --> 00:19:41,270
exempted from being pulled into any kind

371
00:19:45,910 --> 00:19:43,250
of military duty or being exempted from

372
00:19:48,790 --> 00:19:45,920
Poland being pulled away from from the

373
00:19:51,040 --> 00:19:48,800
Apollo program and this was with all of

374
00:19:54,430 --> 00:19:51,050
NASA not just Marshall if you remember

375
00:19:57,460 --> 00:19:54,440
Kennedy gave us this fantastic challenge

376
00:20:01,000 --> 00:19:57,470
of you go to the moon before the end of

377
00:20:07,480 --> 00:20:01,010
the decade you know it's no later in

378
00:20:09,670 --> 00:20:07,490
1969 and we had a had a humongous effort

379
00:20:12,910 --> 00:20:09,680
to pull together in order to pull that

380
00:20:16,030 --> 00:20:12,920
off and because Kennedy had made that

381
00:20:19,000 --> 00:20:16,040
basically a national goal the program

382
00:20:21,850 --> 00:20:19,010
had all the priorities as far as people

383
00:20:25,300 --> 00:20:21,860
were concerned as far as hardware were

384
00:20:28,150 --> 00:20:25,310
concerned and there were no challenge to

385
00:20:29,560 --> 00:20:28,160
that from the Congress if the program

386
00:20:36,590 --> 00:20:29,570
needed money it was sent down here

387
00:20:42,950 --> 00:20:39,890
the first Saturn launch of course was

388
00:20:46,670 --> 00:20:42,960

was an extremely exciting thing because

389
00:20:50,480 --> 00:20:46,680
that's the first time that that the

390
00:20:53,210 --> 00:20:50,490
agency and the Von Braun team had had

391
00:20:55,850 --> 00:20:53,220
risked putting all the systems together

392
00:20:59,960 --> 00:20:55,860
and launching them all live at the very

393
00:21:03,470 --> 00:20:59,970
first attempt so everybody was crossing

394
00:21:07,010 --> 00:21:03,480
their fingers that that would would be a

395
00:21:09,260 --> 00:21:07,020
successful mission and it was we had

396
00:21:13,070 --> 00:21:09,270
some problems on the second one

397
00:21:14,330 --> 00:21:13,080
there were several failures and and that

398
00:21:16,340 --> 00:21:14,340
really increased the pressure

399
00:21:18,740 --> 00:21:16,350
tremendously because we were supposed to

400
00:21:21,560 --> 00:21:18,750
put the crew on a third mission and here

401
00:21:23,870 --> 00:21:21,570
we had these problems serious problems

402
00:21:25,880 --> 00:21:23,880
we had to solve those problems within

403
00:21:27,590 --> 00:21:25,890
three to four months because the next

404
00:21:30,860 --> 00:21:27,600
mission was scheduled with a with a crew

405
00:21:33,860 --> 00:21:30,870
on board and we we were able to

406
00:21:36,340 --> 00:21:33,870
accomplish that with some some good

407
00:21:38,900 --> 00:21:36,350
engineering work a lot of testing and

408
00:21:41,090 --> 00:21:38,910
made the necessary changes and had a

409
00:21:44,000 --> 00:21:41,100
successful crew mission on the third

410
00:21:46,820 --> 00:21:44,010
launch so that was that was important

411
00:21:48,740 --> 00:21:46,830
also but but but the first launch really

412
00:21:51,230 --> 00:21:48,750
sticks you in mind and the other one of

413
00:21:52,850 --> 00:21:51,240

course is Apollo 11 because now we were

414
00:21:54,680 --> 00:21:52,860
not just worrying about the launch

415
00:21:56,120 --> 00:21:54,690
vehicle what we were working worrying

416
00:21:59,290 --> 00:21:56,130
about the whole mission you know with

417
00:22:02,510 --> 00:21:59,300
all this complexity in the in the

418
00:22:05,330 --> 00:22:02,520
capsule and lunar lander and so forth

419
00:22:07,820 --> 00:22:05,340
and to live through that mission and see

420
00:22:09,500 --> 00:22:07,830
that crew land on the moon of course was

421
00:22:15,540 --> 00:22:09,510
you know just it's just a

422
00:22:22,830 --> 00:22:17,310
the thing that sticks out in my mind

423
00:22:25,140 --> 00:22:22,840
about about Saturn five the Apollo

424
00:22:29,070 --> 00:22:25,150
program and the lunar landing is two

425
00:22:32,780 --> 00:22:29,080
things that come to mind first of all it

426
00:22:36,440 --> 00:22:32,790
was such a unbelievable accomplishment

427
00:22:41,630 --> 00:22:36,450
and its complexity and it's in its

428
00:22:45,060 --> 00:22:41,640
application that it has never been

429
00:22:47,669 --> 00:22:45,070
duplicated that happened you know two

430
00:22:51,419 --> 00:22:47,679
generations ago and humanity has not

431
00:22:54,120 --> 00:22:51,429
been able to to do anything like that

432
00:22:58,680 --> 00:22:54,130
again and hopefully one of these days it

433
00:23:05,820 --> 00:22:58,690
will but but it is a goal or a challenge

434
00:23:08,640 --> 00:23:05,830
to humanity to do a more more

435
00:23:11,130 --> 00:23:08,650
challenging and more more interesting

436
00:23:13,169 --> 00:23:11,140
mission than that it's it's just it's

437
00:23:16,650 --> 00:23:13,179
just a unique thing that challenges

438
00:23:20,400 --> 00:23:16,660

humanity by mind so I think that's part

439
00:23:22,080 --> 00:23:20,410
of legacy the other part is that because

440
00:23:25,290 --> 00:23:22,090
it was accomplished and it was

441
00:23:31,470 --> 00:23:25,300
accomplished successfully it tells me at

442
00:23:33,750 --> 00:23:31,480
least that given a clear goal given all

443
00:23:34,260 --> 00:23:33,760
of the support that needs including the

444
00:23:37,740 --> 00:23:34,270
money

445
00:23:40,410 --> 00:23:37,750
I think humanity can accomplish anything

446
00:23:42,090 --> 00:23:40,420
I mean any kind of mission it's just a

447
00:23:43,890 --> 00:23:42,100
question of getting the everybody