



MARSHALL
REMEMBERS APOLLO

1
00:00:20,920 --> 00:00:16,950

[Music]

2
00:00:23,380 --> 00:00:20,930

well I was living in Chicago and I had I

3
00:00:27,640 --> 00:00:23,390

had my bachelor's degree in mechanical

4
00:00:29,880 --> 00:00:27,650

engineering from Illinois Tech and I got

5
00:00:33,910 --> 00:00:29,890

drafted towards the tail end of the

6
00:00:36,250 --> 00:00:33,920

Korean Conflict and I did my basic

7
00:00:39,880 --> 00:00:36,260

training in Fort Leonard Wood Missouri I

8
00:00:42,790 --> 00:00:39,890

called it and most of my basic training

9
00:00:45,100 --> 00:00:42,800

class that gets you up to Korea but the

10
00:00:46,959 --> 00:00:45,110

army was having difficulty at that time

11
00:00:49,990 --> 00:00:46,969

in recruiting engineers in Huntsville

12
00:00:52,060 --> 00:00:50,000

Alabama but the army be in the army they

13
00:00:55,959 --> 00:00:52,070

waved their arms and about 200 of us

14

00:00:59,619 --> 00:00:55,969

showed up yong-gi engineers from all

15

00:01:02,410 --> 00:00:59,629

around the country and I understand in

16

00:01:05,890 --> 00:01:02,420

history it started in 1950 so there were

17

00:01:08,830 --> 00:01:05,900

about three different groups of 150 200

18

00:01:13,060 --> 00:01:08,840

GI engineers that came here and I was in

19

00:01:16,360 --> 00:01:13,070

the last group beginning in 1955 so I

20

00:01:19,330 --> 00:01:16,370

really worked with the Army for five

21

00:01:22,810 --> 00:01:19,340

years 55 to 62 first two years whereas

22

00:01:24,730 --> 00:01:22,820

the GI and then as a civilian and I

23

00:01:28,380 --> 00:01:24,740

worked in manufacturing production

24

00:01:32,020 --> 00:01:28,390

engineering the thing was really getting

25

00:01:36,160 --> 00:01:32,030

more busy as we went along and actually

26
00:01:39,639 --> 00:01:36,170
a couple of years with the army I was I

27
00:01:42,219 --> 00:01:39,649
became a supervisor I was running the

28
00:01:45,249 --> 00:01:42,229
planning organization production

29
00:01:48,490 --> 00:01:45,259
manufacturing plans and even had the

30
00:01:52,149 --> 00:01:48,500
opportunity at one point to present to a

31
00:01:55,270 --> 00:01:52,159
Major General Air Force general Oscar

32
00:01:57,670 --> 00:01:55,280
ander who was from ARPA advanced

33
00:02:00,609 --> 00:01:57,680
research project agency and he had

34
00:02:03,969 --> 00:02:00,619
requested a briefing on manufacturing

35
00:02:07,029 --> 00:02:03,979
plan for the very first Saturn one first

36
00:02:10,210 --> 00:02:07,039
stage the clustered vehicle which we

37
00:02:12,700 --> 00:02:10,220
call clusters last stand it had a center

38
00:02:15,490 --> 00:02:12,710

tank which was the Jupiter tank

39

00:02:18,090 --> 00:02:15,500

surrounded by eight redstone tanks and

40

00:02:23,080 --> 00:02:18,100

powered by eight Jupiter engines and

41

00:02:24,880 --> 00:02:23,090

anyway I made that presentation and that

42

00:02:26,890 --> 00:02:24,890

turned out to be rather good for my

43

00:02:28,180 --> 00:02:26,900

career in a way because we had all the

44

00:02:30,280 --> 00:02:28,190

superstructure from

45

00:02:34,900 --> 00:02:30,290

Marshall Center are there still the army

46

00:02:37,660 --> 00:02:34,910

ABMA came down and to be my backup and

47

00:02:42,229 --> 00:02:37,670

answer questions from general Oscar

48

00:02:47,000 --> 00:02:44,780

the redstone and Jupiter were what was

49

00:02:49,460 --> 00:02:47,010

really being worked on when I first came

50

00:02:51,350 --> 00:02:49,470

here redstone particularly and we had a

51
00:02:55,729 --> 00:02:51,360
real production line set up on red

52
00:02:57,920 --> 00:02:55,739
stones out in building 4705 and that

53
00:03:01,339 --> 00:02:57,930
continued on because when you went to

54
00:03:03,349 --> 00:03:01,349
the first Saturn Saturn one stage I mean

55
00:03:04,849 --> 00:03:03,359
you needed eight redstone tanks so we

56
00:03:09,470 --> 00:03:04,859
had a real production line for red

57
00:03:11,809 --> 00:03:09,480
stones and then netting on Brown team

58
00:03:14,449 --> 00:03:11,819
was requested to build a 1,500 nautical

59
00:03:18,379 --> 00:03:14,459
mile ballistic missile which we termed

60
00:03:22,460 --> 00:03:18,389
the rets the Jupiter and so we set up a

61
00:03:26,300 --> 00:03:22,470
Jupiter production line and we made that

62
00:03:29,270 --> 00:03:26,310
transition from the army to NASA on June

63
00:03:32,509 --> 00:03:29,280

30th 1960 everybody went to sleep army

64
00:03:35,809 --> 00:03:32,519
employees and you work up July 1 1960 as

65
00:03:38,809 --> 00:03:35,819
a NASA employee and it really didn't

66
00:03:41,420 --> 00:03:38,819
change much for a year I mean we still

67
00:03:45,470 --> 00:03:41,430
did red stones and Jupiter's in the

68
00:03:47,780 --> 00:03:45,480
early Saturn 1 first stages and but a

69
00:03:50,900 --> 00:03:47,790
year later roughly and I believe was

70
00:03:52,689 --> 00:03:50,910
around April of 61 when Kennedy

71
00:03:55,580 --> 00:03:52,699
announced the lunar program and

72
00:03:59,360 --> 00:03:55,590
certainly after that that thing was

73
00:04:03,530 --> 00:03:59,370
where things got very different and when

74
00:04:07,009 --> 00:04:03,540
when we became NASA the military

75
00:04:09,199 --> 00:04:07,019
actually took everybody out of here and

76
00:04:12,050 --> 00:04:09,209
Von Braun was given spaces but he had to

77
00:04:14,750 --> 00:04:12,060
go recruiting in a way for our personnel

78
00:04:17,960 --> 00:04:14,760
and finance and legal counsel and all of

79
00:04:20,890 --> 00:04:17,970
that business and when Brown decided

80
00:04:24,110 --> 00:04:20,900
that he needed to have a senior staff

81
00:04:27,170 --> 00:04:24,120
somewhat analogous to a chief of staff

82
00:04:30,050 --> 00:04:27,180
in the military in fun Brown asked Hans

83
00:04:33,140 --> 00:04:30,060
miles the head of manufacturing to be

84
00:04:35,870 --> 00:04:33,150
his chief of staff and hot smiles asked

85
00:04:38,659 --> 00:04:35,880
me to go along so I I joined von Braun

86
00:04:41,210 --> 00:04:38,669
staff very shortly after Kennedy

87
00:04:44,930 --> 00:04:41,220
announced a lunar program and I stayed

88
00:04:50,410 --> 00:04:44,940

in that organization all the way till 69

89

00:04:56,960 --> 00:04:54,530
of course that was a big deal and and we

90

00:05:00,410 --> 00:04:56,970
immediately discovered that we couldn't

91

00:05:03,590 --> 00:05:00,420
really continue on as a an in-house

92

00:05:05,450 --> 00:05:03,600
manufacturer because we had all these

93

00:05:09,830 --> 00:05:05,460
big stages that we had to get under

94

00:05:11,630 --> 00:05:09,840
contract and and so we had to think

95

00:05:16,340 --> 00:05:11,640
about that and we came up with a scheme

96

00:05:18,470 --> 00:05:16,350
of technical working groups on on every

97

00:05:23,150 --> 00:05:18,480
discipline many did many separate

98

00:05:25,460 --> 00:05:23,160
deficit disciplines and because we're

99

00:05:29,840 --> 00:05:25,470
certain initially we had McDonnell

100

00:05:33,680 --> 00:05:29,850
Douglas on s4b stage but eventually we

101
00:05:35,510 --> 00:05:33,690
had we had Boeing in North American

102
00:05:38,810 --> 00:05:35,520
Rockwell and the first and second stage

103
00:05:42,860 --> 00:05:38,820
as a Saturn 5 in IBM on the instrument

104
00:05:46,300 --> 00:05:42,870
unit and so these technical working

105
00:05:51,190 --> 00:05:46,310
groups were trying to make some court

106
00:05:54,460 --> 00:05:51,200
some standardization across the way in

107
00:05:59,360 --> 00:05:54,470
among all the different stages and

108
00:06:04,640 --> 00:05:59,370
Hunt's miles actually asked me to head

109
00:06:06,800 --> 00:06:04,650
up a group on manufacturing and just

110
00:06:09,580 --> 00:06:06,810
discuss or show the power of the

111
00:06:12,410 --> 00:06:09,590
laboratories versus the program office

112
00:06:14,960 --> 00:06:12,420
there was a gentleman here but him as

113
00:06:19,040 --> 00:06:14,970

well langa who was the head of the

114

00:06:21,800 --> 00:06:19,050

program offices in our so long I thought

115

00:06:23,840 --> 00:06:21,810

I was too young and inexperienced but

116

00:06:27,560 --> 00:06:23,850

hot smiles wrote him a short note that

117

00:06:30,470 --> 00:06:27,570

said essentially you are informed that J

118

00:06:33,380 --> 00:06:30,480

Foster is the chairman of the engine of

119

00:06:36,950 --> 00:06:33,390

the manufacturing working group and it

120

00:06:39,680 --> 00:06:36,960

was startup and of course over time that

121

00:06:42,140 --> 00:06:39,690

had to change but in the program office

122

00:06:46,070 --> 00:06:42,150

became more powerful there was of course

123

00:06:48,770 --> 00:06:46,080

some power struggles if you will but on

124

00:06:51,740 --> 00:06:48,780

the other hand everybody was part of the

125

00:06:54,760 --> 00:06:51,750

team and everybody really wanted to be

126

00:06:59,870 --> 00:06:54,770

tired of the team and be productive and

127

00:07:02,600 --> 00:06:59,880

to be able to do what had to be done and

128

00:07:03,429 --> 00:07:02,610

what everybody felt was what Ron Brown

129

00:07:05,919 --> 00:07:03,439

wanted done

130

00:07:14,400 --> 00:07:05,929

I mean the team was very loyal to the

131

00:07:18,930 --> 00:07:16,830

Saturn one was in a way somewhat of a

132

00:07:23,430 --> 00:07:18,940

learning experience and we really didn't

133

00:07:25,200 --> 00:07:23,440

have a lot of major payload certainly

134

00:07:29,580 --> 00:07:25,210

now payloads that would affect the

135

00:07:31,620 --> 00:07:29,590

Saturn 5 but the Saturn 1b we flew six

136

00:07:37,320 --> 00:07:31,630

Saturn one bees that had a direct impact

137

00:07:39,300 --> 00:07:37,330

on Saturn five we had command module

138

00:07:44,370 --> 00:07:39,310

service modules and lunar excursion

139

00:07:46,500 --> 00:07:44,380

module zin they're not complete there

140

00:07:48,030 --> 00:07:46,510

and then they're not really boilerplate

141

00:07:50,160 --> 00:07:48,040

I mean they were carted to state of the

142

00:07:52,410 --> 00:07:50,170

art during the development of those

143

00:07:55,650 --> 00:07:52,420

three major elements from the Johnson

144

00:07:58,290 --> 00:07:55,660

center but we flew those things in Earth

145

00:08:01,890 --> 00:07:58,300

orbit and earth vicinity I will take

146

00:08:05,280 --> 00:08:01,900

that terminology and we we demonstrated

147

00:08:09,300 --> 00:08:05,290

restart capability on both the service

148

00:08:11,580 --> 00:08:09,310

module and on the s4b stage which

149

00:08:14,610 --> 00:08:11,590

essentially was identical between the

150

00:08:21,830 --> 00:08:14,620

second stage on the 1b and the third

151
00:08:26,030 --> 00:08:21,840
stage on the Saturn 5 and we also the

152
00:08:28,950 --> 00:08:26,040
contested a command module at its

153
00:08:31,170 --> 00:08:28,960
approximate approximating the speed

154
00:08:33,420 --> 00:08:31,180
returning from the moon when returns

155
00:08:37,500 --> 00:08:33,430
from the moon it's coming in at close to

156
00:08:39,960 --> 00:08:37,510
25,000 miles an hour and we came close

157
00:08:44,940 --> 00:08:39,970
to that by powering the command module

158
00:08:47,130 --> 00:08:44,950
with the service module we used the

159
00:08:50,340 --> 00:08:47,140
service module really as an accelerator

160
00:08:52,770 --> 00:08:50,350
and so we came close so we could test

161
00:08:55,830 --> 00:08:52,780
that and we could done after separation

162
00:08:57,990 --> 00:08:55,840
from the service module you could turn

163
00:09:02,700 --> 00:08:58,000

it around and you could test the heat

164

00:09:05,370 --> 00:09:02,710

shield at those high speeds and we also

165

00:09:08,490 --> 00:09:05,380

tested the lunar excursion module I mean

166

00:09:10,890 --> 00:09:08,500

we could pick some level in the

167

00:09:12,750 --> 00:09:10,900

atmosphere and say that's the lunar

168

00:09:15,990 --> 00:09:12,760

surface and we could fire up the lunar

169

00:09:17,880 --> 00:09:16,000

landing stage and we could pretend we're

170

00:09:19,800 --> 00:09:17,890

landing at that level and then

171

00:09:24,720 --> 00:09:19,810

immediately fire up the lunar takeoff

172

00:09:26,700 --> 00:09:24,730

stage so we were testing the command

173

00:09:29,070 --> 00:09:26,710

module service module Unix

174

00:09:33,660 --> 00:09:29,080

in module and a third stage of the

175

00:09:37,020 --> 00:09:33,670

Saturn 5 in MO six southern one bees

176
00:09:40,620 --> 00:09:37,030
which really when later when he we came

177
00:09:43,260 --> 00:09:40,630
to the first unmanned flight of Saturn

178
00:09:45,630 --> 00:09:43,270
five and and management headquarters

179
00:09:48,090 --> 00:09:45,640
came up with the terminology of all up I

180
00:09:50,310 --> 00:09:48,100
mean it was all up in a sense that all

181
00:09:52,710 --> 00:09:50,320
the various elements were there but the

182
00:09:54,900 --> 00:09:52,720
only new elements was the first and

183
00:09:57,450 --> 00:09:54,910
second stage of the Saturn five because

184
00:10:00,420 --> 00:09:57,460
all of the upper stage elements had had

185
00:10:06,030 --> 00:10:00,430
some form of actual testing in in

186
00:10:12,480 --> 00:10:08,280
one major critical path of course was

187
00:10:17,100 --> 00:10:12,490
the engine the big f1 engine and turbo

188
00:10:24,389 --> 00:10:17,110

pumps turbo pumps as I recall operated

189

00:10:27,120 --> 00:10:24,399

like at 3,000 rpm and 2,000 psi and when

190

00:10:30,780 --> 00:10:27,130

they were pumping that fuel into the

191

00:10:33,290 --> 00:10:30,790

combustion chamber they were always a

192

00:10:35,699 --> 00:10:33,300

problem and we were always having

193

00:10:38,670 --> 00:10:35,709

difficulty because they had turbine

194

00:10:42,600 --> 00:10:38,680

blade I mean they were turbines and you

195

00:10:44,009 --> 00:10:42,610

had turbine blades and and a lot of

196

00:10:47,610 --> 00:10:44,019

different problems he had a combustion

197

00:10:52,499 --> 00:10:47,620

instability problem and in the early

198

00:10:55,139 --> 00:10:52,509

days we had pogo we had fluid in the

199

00:10:57,240 --> 00:10:55,149

tanks creeping up the sides of the tanks

200

00:11:00,749 --> 00:10:57,250

and so we came up with a temporary

201
00:11:01,999 --> 00:11:00,759
solution what we called beer cans they

202
00:11:04,379 --> 00:11:02,009
weren't beer cans they were

203
00:11:08,129 --> 00:11:04,389
approximately the size of beer cans but

204
00:11:11,460 --> 00:11:08,139
they were very clean aluminum and we use

205
00:11:14,550 --> 00:11:11,470
them on the top of the fluid which tend

206
00:11:17,519 --> 00:11:14,560
to damp out the the perturbations and

207
00:11:23,100 --> 00:11:17,529
and that worked eventually permanent

208
00:11:26,129 --> 00:11:23,110
solution was we we put blockage on on

209
00:11:27,900 --> 00:11:26,139
the sides of the tank so that the fluid

210
00:11:30,920 --> 00:11:27,910
couldn't ride up the sides of the tank

211
00:11:33,120 --> 00:11:30,930
it kept periodically hitting these

212
00:11:38,380 --> 00:11:33,130
modules that were sticking out from the

213
00:11:44,380 --> 00:11:41,319

a major decision was a tough the very

214

00:11:48,190 --> 00:11:44,390

first Saturn 1b all up Saturn use

215

00:11:50,710 --> 00:11:48,200

me all up Saturn 5 went remarkably clean

216

00:11:53,470 --> 00:11:50,720

it was everything was pretty smooth

217

00:11:56,170 --> 00:11:53,480

almost no allow any anomalies of any

218

00:11:58,569 --> 00:11:56,180

sort and that was very encouraging

219

00:12:02,170 --> 00:11:58,579

the second Saturn 5 of a few months

220

00:12:06,519 --> 00:12:02,180

later had problems we had Pogo we had a

221

00:12:08,920 --> 00:12:06,529

fairly severe progo we had all five

222

00:12:11,680 --> 00:12:08,930

engines of the second stage started but

223

00:12:15,880 --> 00:12:11,690

two of them shut down early and also on

224

00:12:19,420 --> 00:12:15,890

the third stage it failed to restart and

225

00:12:22,329 --> 00:12:19,430

so this was rather worrying on the other

226

00:12:25,170 --> 00:12:22,339

hand we had good telemetry data and we

227

00:12:29,560 --> 00:12:25,180

concluded that we really knew how to fix

228

00:12:31,870 --> 00:12:29,570

these problems so NASA headquarters and

229

00:12:34,360 --> 00:12:31,880

the also all three of the center

230

00:12:37,630 --> 00:12:34,370

directors Marshall Houston Kennedy all

231

00:12:41,290 --> 00:12:37,640

signed on to the fact that we declared

232

00:12:43,689 --> 00:12:41,300

the Saturn 5 man rated after that second

233

00:12:46,269 --> 00:12:43,699

unmanned flight and then the third

234

00:12:49,630 --> 00:12:46,279

flight we actually put men on board and

235

00:12:52,060 --> 00:12:49,640

that was a circumlunar flight and we got

236

00:12:54,550 --> 00:12:52,070

the we got the message from the

237

00:12:56,170 --> 00:12:54,560

astronauts on Christmas Eve well they

238

00:12:58,240 --> 00:12:56,180

were circling around the moon and that

239

00:13:05,310 --> 00:12:58,250

was on the third flight and the first

240

00:13:11,970 --> 00:13:07,140

I had gone down to the Cape with my

241

00:13:15,330 --> 00:13:11,980

family and we were in that area you know

242

00:13:17,790 --> 00:13:15,340

in areas rather far away from the

243

00:13:20,670 --> 00:13:17,800

vehicle which is really determined by a

244

00:13:24,510 --> 00:13:20,680

military quantity distance you take the

245

00:13:27,390 --> 00:13:24,520

equivalent of TNT of all that propellant

246

00:13:29,730 --> 00:13:27,400

and it tells you how far you need to

247

00:13:32,550 --> 00:13:29,740

stay away to be safe but anyway we were

248

00:13:36,090 --> 00:13:32,560

out in that group and the river and

249

00:13:39,660 --> 00:13:36,100

Ralph Abernathy was there and he gave us

250

00:13:42,360 --> 00:13:39,670

a speech and his speech was really

251
00:13:45,150 --> 00:13:42,370
negative I mean he was he was arguing

252
00:13:48,800 --> 00:13:45,160
the case that the money spent in space

253
00:13:52,490 --> 00:13:48,810
should have been spent to help the poor

254
00:13:54,750 --> 00:13:52,500
individuals around the country and

255
00:13:58,230 --> 00:13:54,760
afterwards I talked to him for a little

256
00:14:00,510 --> 00:13:58,240
little bit and I actually offered him

257
00:14:02,310 --> 00:14:00,520
some I had a can of peanuts I offered

258
00:14:03,810 --> 00:14:02,320
him some peanuts he didn't accept them

259
00:14:09,420 --> 00:14:03,820
but anyway I had a little discussion

260
00:14:15,660 --> 00:14:12,060
quite frankly we were working a lot of

261
00:14:17,730 --> 00:14:15,670
long hours and I really shouldered a

262
00:14:20,010 --> 00:14:17,740
wheel type of thing and we really didn't

263
00:14:21,630 --> 00:14:20,020

pay an awful lot of attention to most of

264

00:14:23,640 --> 00:14:21,640

the kinds of things going around the

265

00:14:25,740 --> 00:14:23,650

country I mean we saw it on television

266

00:14:28,700 --> 00:14:25,750

every night and that type of thing but

267

00:14:31,560 --> 00:14:28,710

at the same time it really didn't

268

00:14:36,120 --> 00:14:31,570

intersect much with our work the one

269

00:14:42,269 --> 00:14:36,130

specific thing that really did involve

270

00:14:45,960 --> 00:14:42,279

us was trying to hire more minorities

271

00:14:48,840 --> 00:14:45,970

and this type of thing and we did we did

272

00:14:52,980 --> 00:14:48,850

try to do that quite quite quite a bit

273

00:14:56,610 --> 00:14:52,990

and one thing that people don't

274

00:15:00,269 --> 00:14:56,620

completely understand is for instance

275

00:15:02,730 --> 00:15:00,279

the Alabama A&M they didn't really

276

00:15:05,910 --> 00:15:02,740

graduate engineers they graduated

277

00:15:07,980 --> 00:15:05,920

engineering technologists and if you

278

00:15:09,750 --> 00:15:07,990

really looked in and I don't know how

279

00:15:11,280 --> 00:15:09,760

their curriculum is today but if you

280

00:15:14,190 --> 00:15:11,290

really looked into their curriculum at

281

00:15:19,380 --> 00:15:14,200

that time they were missing about two or

282

00:15:22,260 --> 00:15:19,390

plus or minus really key courses that

283

00:15:24,990 --> 00:15:22,270

would have made them quote engineers and

284

00:15:27,210 --> 00:15:25,000

so that's one side pushing to hire these

285

00:15:29,579 --> 00:15:27,220

individuals and there were a lot of good

286

00:15:30,780 --> 00:15:29,589

individuals in that group but then on

287

00:15:34,320 --> 00:15:30,790

the other side the Civil Service

288

00:15:36,750 --> 00:15:34,330

regulations you couldn't hire them as

289

00:15:41,130 --> 00:15:36,760

engineers engineering technologists

290

00:15:42,510 --> 00:15:41,140

didn't quite match and so one side of

291

00:15:43,410 --> 00:15:42,520

the government is saying you can't hire

292

00:15:45,870 --> 00:15:43,420

them when the other side of the

293

00:15:48,960 --> 00:15:45,880

government is saying hey when yo hire I

294

00:15:51,449 --> 00:15:48,970

mean so this was real trouble we did do

295

00:15:54,329 --> 00:15:51,459

two things I think as a counter counter

296

00:15:56,940 --> 00:15:54,339

point we did send recruiting people down

297

00:15:58,980 --> 00:15:56,950

to South America and we did bring back I

298

00:16:02,910 --> 00:15:58,990

hired a number of engineers from South

299

00:16:05,100 --> 00:16:02,920

America not enough to complete two

300

00:16:08,490 --> 00:16:05,110

satisfied necessarily NASA headquarters

301
00:16:11,280 --> 00:16:08,500
but at least we made that effort and we

302
00:16:13,260 --> 00:16:11,290
had a computer expert at a black

303
00:16:17,579 --> 00:16:13,270
computer expert at that time by the name

304
00:16:20,400 --> 00:16:17,589
of Clyde Foster and we gave Clyde foster

305
00:16:22,210 --> 00:16:20,410
a two-year sabbatical and he went to

306
00:16:25,570 --> 00:16:22,220
Alabama A&M

307
00:16:28,360 --> 00:16:25,580
he established a computer department in

308
00:16:31,420 --> 00:16:28,370
a computer degree program at Alabama A&M

309
00:16:33,400 --> 00:16:31,430
he did come back later and continued

310
00:16:35,920 --> 00:16:33,410
working here at Marshall but we thought

311
00:16:38,650 --> 00:16:35,930
that two-year sabbatical for Clyde

312
00:16:40,840 --> 00:16:38,660
Foster was very helpful and I think it

313
00:16:43,930 --> 00:16:40,850

certainly helped at the Alabama A&M

314

00:16:46,870 --> 00:16:43,940

becoming you know in sort of a major way

315

00:16:49,390 --> 00:16:46,880

in the area of computer experts Alabama

316

00:16:51,340 --> 00:16:49,400

A&M was always very interested I mean he

317

00:16:54,660 --> 00:16:51,350

thought that the computer partment is

318

00:16:59,370 --> 00:16:54,670

one one thing but they also encouraged

319

00:17:03,700 --> 00:16:59,380

their professors and others at A&M to

320

00:17:06,850 --> 00:17:03,710

come up with experiments to fly so I

321

00:17:12,750 --> 00:17:06,860

think Alabama A&M was very interested at

322

00:17:21,059 --> 00:17:17,640

he never completely agreed that things

323

00:17:22,799 --> 00:17:21,069

were impossible you know they were some

324

00:17:26,010 --> 00:17:22,809

things took longer to accomplish than

325

00:17:28,650 --> 00:17:26,020

others and it took you longer to find a

326

00:17:31,410 --> 00:17:28,660

solution to go around something that was

327

00:17:36,120 --> 00:17:31,420

impossible but you know he was always

328

00:17:39,320 --> 00:17:36,130

very optimistic and he also in his

329

00:17:44,310 --> 00:17:39,330

management style he really wanted to

330

00:17:47,130 --> 00:17:44,320

hear the ideas from everybody you know

331

00:17:49,380 --> 00:17:47,140

he as part of his management technique

332

00:17:51,840 --> 00:17:49,390

he had developed what he called a board

333

00:17:53,400 --> 00:17:51,850

meeting Board of Directors government

334

00:17:55,020 --> 00:17:53,410

organizations don't have boards of

335

00:17:59,130 --> 00:17:55,030

directors like industry but he'd

336

00:18:01,740 --> 00:17:59,140

invented one and it was fairly big it

337

00:18:04,620 --> 00:18:01,750

had director and deputy director of each

338

00:18:07,169 --> 00:18:04,630

of the laboratories and it had a

339

00:18:08,760 --> 00:18:07,179

sprinkling a fairly big sprinkling of

340

00:18:11,760 --> 00:18:08,770

the next level down from the lab

341

00:18:15,419 --> 00:18:11,770

directors division Chiefs went in the

342

00:18:21,049 --> 00:18:15,429

laboratory a division chief normally was

343

00:18:24,330 --> 00:18:21,059

the head of a technology like optics or

344

00:18:28,740 --> 00:18:24,340

computational fluid dynamics or stress

345

00:18:30,840 --> 00:18:28,750

and so he wanted those guys there and he

346

00:18:33,570 --> 00:18:30,850

also depending on the agenda of the

347

00:18:35,490 --> 00:18:33,580

meeting this board meeting it met

348

00:18:39,000 --> 00:18:35,500

regularly monthly but it could meet at

349

00:18:41,909 --> 00:18:39,010

any time and the problems that you

350

00:18:43,950 --> 00:18:41,919

wanted he wanted somebody put up on the

351
00:18:47,549 --> 00:18:43,960
board originally these were paper charts

352
00:18:49,650 --> 00:18:47,559
they eventually got more into view

353
00:18:51,870 --> 00:18:49,660
graphs and stuff but you could put up

354
00:18:53,669 --> 00:18:51,880
there the prime one or two problems that

355
00:18:56,570 --> 00:18:53,679
you wanted to discuss at this meeting

356
00:18:59,880 --> 00:18:56,580
and then you could put the two or three

357
00:19:02,220 --> 00:18:59,890
potential solutions to that problem with

358
00:19:05,850 --> 00:19:02,230
the pros and cons for each potential

359
00:19:09,570 --> 00:19:05,860
solution and and then he opened it up to

360
00:19:11,549 --> 00:19:09,580
the group to discuss and those meetings

361
00:19:13,710 --> 00:19:11,559
could last for one or two hours or one

362
00:19:16,289 --> 00:19:13,720
or two or three days you know depending

363
00:19:18,150 --> 00:19:16,299

on the magnitude of the problem and

364

00:19:21,210 --> 00:19:18,160

Werner really wanted to hear from

365

00:19:24,720 --> 00:19:21,220

everybody and in particular he wanted

366

00:19:26,430 --> 00:19:24,730

the experts on that subject in the room

367

00:19:29,190 --> 00:19:26,440

and they weren't necessary

368

00:19:30,659 --> 00:19:29,200

early members of the board but he wanted

369

00:19:33,629 --> 00:19:30,669

them from wherever they were in the

370

00:19:36,090 --> 00:19:33,639

bowels of the organization or in some

371

00:19:39,360 --> 00:19:36,100

cases they were at the contractors plant

372

00:19:41,129 --> 00:19:39,370

and so he would like to have them there

373

00:19:43,619 --> 00:19:41,139

because he wanted to hear what they said

374

00:19:46,049 --> 00:19:43,629

not that you would necessarily accept it

375

00:19:48,690 --> 00:19:46,059

but you wanted to hear what the experts

376

00:19:52,440 --> 00:19:48,700

had to say about the particular subject

377

00:19:56,960 --> 00:19:52,450

and Werner had a about an eight inch

378

00:19:59,999 --> 00:19:56,970

block of walnut in a gavel and when the

379

00:20:04,639 --> 00:20:00,009

discussion one down unwinds if you will

380

00:20:08,310 --> 00:20:04,649

he would stand up and he would repeat or

381

00:20:10,619 --> 00:20:08,320

summarize his understanding of the way

382

00:20:13,440 --> 00:20:10,629

where the whole group was leaning and

383

00:20:14,820 --> 00:20:13,450

but then before he pounded that gavel

384

00:20:17,129 --> 00:20:14,830

and said you know this is the way we're

385

00:20:19,950 --> 00:20:17,139

gonna go he would look around the room

386

00:20:24,210 --> 00:20:19,960

one last time and you know anybody have

387

00:20:26,220 --> 00:20:24,220

any last minute comment and you know one

388

00:20:29,190 --> 00:20:26,230

day when everybody had really had their

389

00:20:33,360 --> 00:20:29,200

say and in effect everybody was agreeing

390

00:20:35,759 --> 00:20:33,370

with the with the direction that Werner

391

00:20:39,869 --> 00:20:35,769

summarized and it really was a summary

392

00:20:43,169 --> 00:20:39,879

from the group and then he would finally

393

00:20:45,690 --> 00:20:43,179

pound his gavel on that walnut block and

394

00:20:49,649 --> 00:20:45,700

that was a decision for the day he had a

395

00:20:51,779 --> 00:20:49,659

staff luncheon group you know if he was

396

00:20:54,470 --> 00:20:51,789

here he was always in that if he wasn't

397

00:20:57,419 --> 00:20:54,480

here and he did do a lot of traveling

398

00:20:59,789 --> 00:20:57,429

his deputies his two deputies ever heard

399

00:21:01,889 --> 00:20:59,799

Reese on the technical side and hairy

400

00:21:04,440 --> 00:21:01,899

garment on a management management side

401
00:21:07,169 --> 00:21:04,450
they had to staff luncheon with all the

402
00:21:12,149 --> 00:21:07,179
direct reports and as I recall was like

403
00:21:18,240 --> 00:21:12,159
16 or so direct reports and so you had

404
00:21:18,930 --> 00:21:18,250
in a way it was a bit of a tough

405
00:21:21,840 --> 00:21:18,940
luncheon

406
00:21:24,119 --> 00:21:21,850
you know the 1618 people sitting around

407
00:21:26,129 --> 00:21:24,129
this table and the discussion was

408
00:21:28,649 --> 00:21:26,139
flowing around and then all of a sudden

409
00:21:30,830 --> 00:21:28,659
somebody asks a question or makes a

410
00:21:33,330 --> 00:21:30,840
comment that affects your area and

411
00:21:35,039 --> 00:21:33,340
suddenly you got the ulcer lunch you

412
00:21:37,169 --> 00:21:35,049
know you suddenly got this question and

413
00:21:40,210 --> 00:21:37,179

you're on a hot seat but on the other

414

00:21:42,039 --> 00:21:40,220

hand all the key people

415

00:21:44,320 --> 00:21:42,049

in the organization tended to know

416

00:21:47,799 --> 00:21:44,330

pretty much everything is really going

417

00:21:50,499 --> 00:21:47,809

on in the organization and at least at

418

00:21:53,799 --> 00:21:50,509

the editin senior level and particularly

419

00:21:56,619 --> 00:21:53,809

on smiles and I being in the staff or

420

00:21:58,539 --> 00:21:56,629

the executive staff type thing it would

421

00:22:00,100 --> 00:21:58,549

particularly beneficial to us to really

422

00:22:01,810 --> 00:22:00,110

know what was going on

423

00:22:06,879 --> 00:22:01,820

more or less across the total

424

00:22:10,450 --> 00:22:06,889

organization yeah but it's it's a little

425

00:22:13,919 --> 00:22:10,460

bit that you don't really know until you

426

00:22:16,899 --> 00:22:13,929

get there type of thing that man

427

00:22:19,210 --> 00:22:16,909

historically has always clamored around

428

00:22:21,820 --> 00:22:19,220

the edges of technology I mean you go

429

00:22:24,970 --> 00:22:21,830

all the way back to you know the

430

00:22:26,980 --> 00:22:24,980

beginnings of time I mean you know you

431

00:22:29,499 --> 00:22:26,990

go to like Crystal Cove Christopher

432

00:22:33,820 --> 00:22:29,509

Columbus exploring and that type of

433

00:22:38,139 --> 00:22:35,440

you know after the first lunar landing

434

00:22:40,029 --> 00:22:38,149

things relax a bit and von Braun took

435

00:22:42,279 --> 00:22:40,039

his family and went on a vacation and

436

00:22:45,630 --> 00:22:42,289

they were gone for I don't remember yeah

437

00:22:48,760 --> 00:22:45,640

exactly how long two or three weeks and

438

00:22:51,190 --> 00:22:48,770

while he was gone

439

00:22:53,549 --> 00:22:51,200

somehow it leaked out of Washington and

440

00:22:57,130 --> 00:22:53,559

he was playing to leave Huntsville and

441

00:23:02,169 --> 00:22:57,140

it turned out that Tom Paine NASA

442

00:23:04,240 --> 00:23:02,179

Administrator he could see the end of

443

00:23:06,930 --> 00:23:04,250

the production line if you will I mean

444

00:23:08,889 --> 00:23:06,940

we didn't turn Saturn fives out like

445

00:23:12,159 --> 00:23:08,899

automobiles by the millions

446

00:23:15,610 --> 00:23:12,169

we flew eventually thirteen Saturn 5:12

447

00:23:19,389 --> 00:23:15,620

under the banner of Apollo and one under

448

00:23:22,060 --> 00:23:19,399

the banner of Skylab and but after the

449

00:23:24,490 --> 00:23:22,070

first successful lunar landing

450

00:23:27,399 --> 00:23:24,500

Tom Paine could see the thing running

451
00:23:29,769 --> 00:23:27,409
down there and so he knew Werner like

452
00:23:32,710 --> 00:23:29,779
this one like the dream a bit and he

453
00:23:35,950 --> 00:23:32,720
also knew that Marshall we had a advance

454
00:23:38,730 --> 00:23:35,960
project office and then we had done a

455
00:23:42,519 --> 00:23:38,740
lot of long-range planning or thinking

456
00:23:45,430 --> 00:23:42,529
in long-range area for the man part of

457
00:23:47,950 --> 00:23:45,440
the program so Tom Paine had asked

458
00:23:49,720 --> 00:23:47,960
Werner to come to Washington nobody

459
00:23:52,870 --> 00:23:49,730
hadn't talented really known about that

460
00:23:55,000 --> 00:23:52,880
but it somehow came loose during while a

461
00:23:58,090 --> 00:23:55,010
Werner's absence but there was some

462
00:24:00,549 --> 00:23:58,100
backing to tell everybody the fact that

463
00:24:04,060 --> 00:24:00,559

he was he was leaving but he was in here

464

00:24:06,310 --> 00:24:04,070

he's off on his vacation and and of

465

00:24:08,169 --> 00:24:06,320

course and he I obviously talked about

466

00:24:12,519 --> 00:24:08,179

the fact that he was really going to go

467

00:24:14,500 --> 00:24:12,529

and and then he asked me to join him and

468

00:24:17,019 --> 00:24:14,510

there was one other Frank Williams

469

00:24:19,930 --> 00:24:17,029

so Frank Williams and I and von Braun

470

00:24:23,019 --> 00:24:19,940

from Huntsville went up there and Tom

471

00:24:25,210 --> 00:24:23,029

Paine had given us a roughly 15 spaces

472

00:24:28,720 --> 00:24:25,220

and we divided our little organization

473

00:24:31,470 --> 00:24:28,730

into three groups one group was well we

474

00:24:33,880 --> 00:24:31,480

hired a gentleman from Rocketdyne and

475

00:24:35,500 --> 00:24:33,890

his little group was to look into

476

00:24:37,450 --> 00:24:35,510

propulsion what kind of engines

477

00:24:40,149 --> 00:24:37,460

propulsion systems would we have in a

478

00:24:42,940 --> 00:24:40,159

year 2000 I mean we were supposed to be

479

00:24:45,190 --> 00:24:42,950

looking at a long-range plan or what

480

00:24:46,930 --> 00:24:45,200

NASA ought to look like in the year 2000

481

00:24:50,830 --> 00:24:46,940

the center group

482

00:24:53,140 --> 00:24:50,840

headed up by Frank Williams was put

483

00:24:54,640 --> 00:24:53,150

together a program I mean how many times

484

00:24:56,260 --> 00:24:54,650

are we gonna go back to the moon how

485

00:24:58,690 --> 00:24:56,270

many times are we gonna go to Mars and

486

00:25:00,310 --> 00:24:58,700

this type of thing and it's a like

487

00:25:02,140 --> 00:25:00,320

Tinkertoys blocks you putting these

488

00:25:04,990 --> 00:25:02,150

various things in there to put together

489

00:25:06,940 --> 00:25:05,000

a program and then the third block but

490

00:25:09,790 --> 00:25:06,950

under Jim Skaggs we hired from

491

00:25:14,020 --> 00:25:09,800

headquarters and Jim Skaggs was supposed

492

00:25:16,030 --> 00:25:14,030

to put cost and schedule together in

493

00:25:19,120 --> 00:25:16,040

which that's a little dicey when you're

494

00:25:21,850 --> 00:25:19,130

talking about programs 30 years forward

495

00:25:24,670 --> 00:25:21,860

yet or you know from sixty nine to two

496

00:25:27,730 --> 00:25:24,680

thousand and but anyway we did all that

497

00:25:32,740 --> 00:25:27,740

and then Tom Paine and and Wernher

498

00:25:35,230 --> 00:25:32,750

wanted to have a long a long weekend and

499

00:25:37,780 --> 00:25:35,240

they picked us a wallop Space Flight

500

00:25:40,720 --> 00:25:37,790

Center and there were 24 individuals

501

00:25:42,430 --> 00:25:40,730

that they invited to the Wallops for a

502

00:25:45,550 --> 00:25:42,440

long weekend to dream about the future

503

00:25:48,280 --> 00:25:45,560

to talk about the future and most of

504

00:25:50,950 --> 00:25:48,290

these individuals got up and talked

505

00:25:54,040 --> 00:25:50,960

about how they saw the future Arthur

506

00:25:57,100 --> 00:25:54,050

Clarke was a subida keynote speaker here

507

00:25:59,620 --> 00:25:57,110

and my remembrance of Arthur Clarke was

508

00:26:02,190 --> 00:25:59,630

he made a nice Beach you know he talked

509

00:26:05,380 --> 00:26:02,200

about the you know the vagaries of

510

00:26:07,090 --> 00:26:05,390

science fiction and then he sat down and

511

00:26:09,760 --> 00:26:07,100

for the rest of the period you know he

512

00:26:12,430 --> 00:26:09,770

was sitting there but then he was I felt

513

00:26:14,170 --> 00:26:12,440

was extremely quiet because here's the

514

00:26:16,900 --> 00:26:14,180

real experts getting up and talking

515

00:26:18,700 --> 00:26:16,910

about the real future and you know he

516

00:26:21,490 --> 00:26:18,710

had just talked about the fictional

517

00:26:24,250 --> 00:26:21,500

future and so he was really very quiet

518

00:26:28,240 --> 00:26:24,260

but at the end of this I think it was a

519

00:26:32,800 --> 00:26:28,250

five-day weekend we had lunch and early

520

00:26:35,260 --> 00:26:32,810

early in the day it got the 24

521

00:26:37,600 --> 00:26:35,270

individuals together and had taken a

522

00:26:41,500 --> 00:26:37,610

picture of the group and during lunch

523

00:26:45,280 --> 00:26:41,510

they passed around 24 original pictures

524

00:26:49,030 --> 00:26:45,290

and all 24 of us signed 24 pictures so

525

00:26:50,770 --> 00:26:49,040

all 24 of us have a original picture

526
00:26:55,350 --> 00:26:50,780
with all those signatures on it and

527
00:26:58,740 --> 00:26:55,360
that's in a way as one of the best

528
00:27:01,020 --> 00:26:58,750
keepsakes I have from a career with the

529
00:27:03,300 --> 00:27:01,030
NASA while we put together the

530
00:27:06,420 --> 00:27:03,310
long-range plan into a little pocket

531
00:27:09,630 --> 00:27:06,430
book sized book Tom Paine took that to

532
00:27:11,550 --> 00:27:09,640
mr. Nixon Nixon was really not

533
00:27:12,450 --> 00:27:11,560
interested in told Tom Paine he had a

534
00:27:19,140 --> 00:27:12,460
lot on his plate

535
00:27:22,250 --> 00:27:19,150
both in in space and in Aeronautics and

536
00:27:25,380 --> 00:27:22,260
then he should go work on his plate and

537
00:27:29,760 --> 00:27:25,390
very shortly after that meeting Tom

538
00:27:31,950 --> 00:27:29,770

Paine JumpShip he went to General

539

00:27:34,890 --> 00:27:31,960

Electric as a vice president charged her

540

00:27:38,280 --> 00:27:34,900

nuclear program and von Braun to also

541

00:27:42,840 --> 00:27:38,290

jump ship he decided to go to Fairchild

542

00:27:46,020 --> 00:27:42,850

industries and mrs. Gandhi at the time

543

00:27:47,400 --> 00:27:46,030

in the president of Fairchild put Werner

544

00:27:49,710 --> 00:27:47,410

on the road in India

545

00:27:52,710 --> 00:27:49,720

Fairchild had a program with NASA at

546

00:27:55,860 --> 00:27:52,720

that time to put an educational TV

547

00:27:59,040 --> 00:27:55,870

satellite in synchronous orbit over over

548

00:28:01,970 --> 00:27:59,050

India and mrs. Gandhi also at the time

549

00:28:05,340 --> 00:28:01,980

purchased a fairly sizable number of

550

00:28:08,280 --> 00:28:05,350

bicycle driven generators you could put

551
00:28:11,130 --> 00:28:08,290
a bicycle driven generator in a little

552
00:28:13,230 --> 00:28:11,140
area and a little little village and

553
00:28:15,120 --> 00:28:13,240
people could take turns pumping the

554
00:28:18,360 --> 00:28:15,130
bicycle and then sit around in a circle

555
00:28:21,090 --> 00:28:18,370
in front of the TV and pull in the

556
00:28:24,740 --> 00:28:21,100
educational program and von Braun knew

557
00:28:28,350 --> 00:28:24,750
at the time actually left Huntsville

558
00:28:31,320 --> 00:28:28,360
that he had cancer and over the time

559
00:28:35,370 --> 00:28:31,330
that thing really of course I got one

560
00:28:38,520 --> 00:28:35,380
got worse he died in 77 he was only 65

561
00:28:40,320 --> 00:28:38,530
at the time and I've often wondered what

562
00:28:43,800 --> 00:28:40,330
the space program would look like if

563
00:28:47,370 --> 00:28:43,810

he'd hung around to another 20 years or

564

00:28:49,860 --> 00:28:47,380

so I'm 87 today and if he don't live to

565

00:28:52,350 --> 00:28:49,870

87 I think this program would have been

566

00:28:55,440 --> 00:28:52,360

somewhat different I was back here

567

00:28:57,240 --> 00:28:55,450

working at Marshall and von Braun was on

568

00:29:00,780 --> 00:28:57,250

the board of directors of a bank in

569

00:29:02,400 --> 00:29:00,790

Decatur and I at those tie at that time

570

00:29:05,520 --> 00:29:02,410

I was going back and forth to Washington

571

00:29:07,020 --> 00:29:05,530

quite a bit and I got on the airplane to

572

00:29:09,690 --> 00:29:07,030

go to Washington there was Werner

573

00:29:11,370 --> 00:29:09,700

sitting in first class he invited me to

574

00:29:13,500 --> 00:29:11,380

sit down and chat with him which

575

00:29:15,030 --> 00:29:13,510

I did and then pretty soon the

576

00:29:17,070 --> 00:29:15,040

stewardess came by and looked at my

577

00:29:21,600 --> 00:29:17,080

ticket and said Fleur you have to sit

578

00:29:24,000 --> 00:29:21,610

back in coach and that was fine too the

579

00:29:26,190 --> 00:29:24,010

flight wasn't completely full so Werner

580

00:29:28,770 --> 00:29:26,200

got up and came back in coach with me

581

00:29:31,020 --> 00:29:28,780

and we we chatted all the way to