



1
00:01:45,210 --> 00:01:58,420

you

2
00:02:03,800 --> 00:02:01,280

welcome to another in the series of

3
00:02:07,640 --> 00:02:03,810

guest lectures on NASA's program and

4
00:02:09,889 --> 00:02:07,650

project management today we will be

5
00:02:12,170 --> 00:02:09,899

discussing management issues as they

6
00:02:16,370 --> 00:02:12,180

have appeared in the manned spaceflight

7
00:02:19,040 --> 00:02:16,380

programs our participants are Aaron

8
00:02:23,030 --> 00:02:19,050

Cohen director of NASA's Lyndon B

9
00:02:26,690 --> 00:02:23,040

Johnson Space Center Henry Pohl JSC's

10
00:02:29,270 --> 00:02:26,700

director of engineering I'm Joe Loftus

11
00:02:32,390 --> 00:02:29,280

assistant director for plans at the

12
00:02:34,820 --> 00:02:32,400

Johnson Space Center I'd like to begin

13
00:02:37,040 --> 00:02:34,830

our discussion by asking each of our

14

00:02:40,460 --> 00:02:37,050

participants to briefly talk about

15

00:02:42,199 --> 00:02:40,470

themselves Aaron would you briefly

16

00:02:44,690 --> 00:02:42,209

summarize your career since you

17

00:02:46,460 --> 00:02:44,700

graduated from Texas A&M and tell us a

18

00:02:49,430 --> 00:02:46,470

little about what you did before you

19

00:02:53,870 --> 00:02:49,440

became a manager ok I after getting out

20

00:02:59,360 --> 00:02:53,880

of Texas am I went to I went to the army

21

00:03:02,180 --> 00:02:59,370

from 1952 to 1954 and then from 54 to 58

22

00:03:05,539 --> 00:03:02,190

I was with RCA Radio Corporation of

23

00:03:07,640 --> 00:03:05,549

America and then from 58 to 62 I was

24

00:03:10,070 --> 00:03:07,650

with the General Dynamics Corporation

25

00:03:12,530 --> 00:03:10,080

and then in 62 I came to the Johnson

26
00:03:15,140 --> 00:03:12,540
Space Center at various jobs in Johnson

27
00:03:17,360 --> 00:03:15,150
Space Center primarily in the guidance

28
00:03:20,840 --> 00:03:17,370
navigation area and managing that

29
00:03:22,370 --> 00:03:20,850
activity with the Draper labs and MIT

30
00:03:25,430 --> 00:03:22,380
instrumentation lab at that time and

31
00:03:32,930 --> 00:03:25,440
then deputy of the systems integration

32
00:03:34,940 --> 00:03:32,940
office in the period of 1968 272 I was a

33
00:03:40,670 --> 00:03:34,950
command service module project manager

34
00:03:44,030 --> 00:03:40,680
and then from us 72 to 80 to it was the

35
00:03:45,979 --> 00:03:44,040
orbiter project manager 8286 I was the

36
00:03:48,710 --> 00:03:45,989
director of research and engineering and

37
00:03:51,979 --> 00:03:48,720
from 86 to the current time director the

38
00:03:53,240 --> 00:03:51,989

Johnson Space Center Thank You Henry

39

00:03:57,380 --> 00:03:53,250
would you tell us a little bit about

40

00:04:00,820 --> 00:03:57,390
yourself well I graduated from Texas A&M

41

00:04:03,760 --> 00:04:00,830
two hours crafting spent two years

42

00:04:06,130 --> 00:04:03,770
service I started out as a test engineer

43

00:04:10,800 --> 00:04:06,140
on the red stone in Huntsville Alabama I

44

00:04:13,420 --> 00:04:10,810
worked on the Jupiter on the Saturn I

45

00:04:14,920 --> 00:04:13,430
got in some design work designed the

46

00:04:17,590 --> 00:04:14,930
small rocket motors that were put in

47

00:04:19,780 --> 00:04:17,600
wind tunnels at the Tullahoma I came

48

00:04:23,050 --> 00:04:19,790
down here over subsystem manager on the

49

00:04:28,080 --> 00:04:23,060
RCS for Apollo our section head from

50

00:04:35,740 --> 00:04:28,090
about 64 65 aqui remember when to about

51
00:04:41,110 --> 00:04:35,750
67 brace G from 67 279 division chief

52
00:04:44,590 --> 00:04:41,120
from 79 to 86 in the propulsion power

53
00:04:50,590 --> 00:04:44,600
division and in 86 I became director of

54
00:04:53,380 --> 00:04:50,600
engineering very good Aaron would you

55
00:04:56,350 --> 00:04:53,390
briefly summarize what you think are the

56
00:04:59,290 --> 00:04:56,360
key things that a manager must do to

57
00:05:03,970 --> 00:04:59,300
achieve success well I rethink that one

58
00:05:05,230 --> 00:05:03,980
of the key things is have some in your

59
00:05:07,090 --> 00:05:05,240
career have some early hands-on

60
00:05:10,330 --> 00:05:07,100
experience but I think you have to start

61
00:05:12,820 --> 00:05:10,340
out with saying that the key elements

62
00:05:14,350 --> 00:05:12,830
are the exact elements of managing being

63
00:05:16,480 --> 00:05:14,360

good manager of the programs of

64

00:05:18,520 --> 00:05:16,490

yesterday or yesteryear may not be

65

00:05:20,740 --> 00:05:18,530

exactly the same key elements of today

66

00:05:22,120 --> 00:05:20,750

so I think you have to take you have to

67

00:05:23,830 --> 00:05:22,130

understand that and they have to start

68

00:05:25,060 --> 00:05:23,840

with that point the new program managers

69

00:05:27,220 --> 00:05:25,070

project managers gonna have different

70

00:05:30,610 --> 00:05:27,230

pressures in the olden on the other hand

71

00:05:33,430 --> 00:05:30,620

I do think there's some factors that are

72

00:05:35,400 --> 00:05:33,440

common one is start off I think some

73

00:05:38,770 --> 00:05:35,410

early hands-on experience is important

74

00:05:40,659 --> 00:05:38,780

whatever small project they may be to

75

00:05:43,620 --> 00:05:40,669

carry a project through to see how

76

00:05:46,780 --> 00:05:43,630

drawings are made to see how design a

77

00:05:48,580 --> 00:05:46,790

design that comes about to see how parts

78

00:05:52,390 --> 00:05:48,590

or machine how the process parts in the

79

00:05:54,070 --> 00:05:52,400

factory how you do the testing I think

80

00:05:55,990 --> 00:05:54,080

that's all very important if a person

81

00:05:58,540 --> 00:05:56,000

can do that I think you set a good

82

00:06:02,680 --> 00:05:58,550

foundation for a project manager of

83

00:06:04,780 --> 00:06:02,690

course that is 11 item I think that's

84

00:06:07,030 --> 00:06:04,790

important the other item I think is key

85

00:06:10,650 --> 00:06:07,040

is very important is you need to be

86

00:06:13,930 --> 00:06:10,660

patient you need to you need to

87

00:06:15,730 --> 00:06:13,940

understand people and be people oriented

88

00:06:18,550 --> 00:06:15,740

you need to be able to communicate with

89

00:06:21,970 --> 00:06:18,560

people communicate with people both in

90

00:06:23,440 --> 00:06:21,980

the in all directions down words upwards

91

00:06:26,110 --> 00:06:23,450

and laterally you need to be able to

92

00:06:28,450 --> 00:06:26,120

communicate the people oriented and make

93

00:06:30,970 --> 00:06:28,460

people feel you want to hear what they

94

00:06:33,460 --> 00:06:30,980

have to say I think you have to be able

95

00:06:35,620 --> 00:06:33,470

to take criticism you've got to be able

96

00:06:39,960 --> 00:06:35,630

to take criticism and not become

97

00:06:43,840 --> 00:06:39,970

defensive and and do that type of thing

98

00:06:46,360 --> 00:06:43,850

and I think you need to know have to

99

00:06:49,540 --> 00:06:46,370

know when to compromise you need to know

100

00:06:51,310 --> 00:06:49,550

when to to compromise and get a solution

101
00:06:52,780 --> 00:06:51,320
rather than argue for a point that you

102
00:06:56,680 --> 00:06:52,790
feel that's wrong so those I think are

103
00:07:01,630 --> 00:06:56,690
some of the the key elements that make

104
00:07:03,400 --> 00:07:01,640
up i think the the attributes and if

105
00:07:05,380 --> 00:07:03,410
programs for yesteryear and programs of

106
00:07:06,940 --> 00:07:05,390
tomorrow or similar key elements i think

107
00:07:12,730 --> 00:07:06,950
in a person in becoming a program

108
00:07:14,500 --> 00:07:12,740
manager project what are the major

109
00:07:16,330 --> 00:07:14,510
changes that you've seen in the

110
00:07:19,360 --> 00:07:16,340
management of NASA projects over the

111
00:07:21,159 --> 00:07:19,370
years well I think you know the two big

112
00:07:23,650 --> 00:07:21,169
programs that I managed was the proud

113
00:07:25,810 --> 00:07:23,660

the command service module for the

114

00:07:26,920 --> 00:07:25,820

Apollo program and Henry might want to

115

00:07:30,400 --> 00:07:26,930

add a little bit on this and then the

116

00:07:32,980 --> 00:07:30,410

the the arbiter the one in the 60s and

117

00:07:36,970 --> 00:07:32,990

one in the 70s and I think if you had to

118

00:07:39,150 --> 00:07:36,980

say the the differences are are the are

119

00:07:41,880 --> 00:07:39,160

the pressures you may have the both the

120

00:07:45,520 --> 00:07:41,890

little bit from the external pressures

121

00:07:48,370 --> 00:07:45,530

if you go back to the Apollo era I think

122

00:07:51,490 --> 00:07:48,380

the if you look at the Apollo program I

123

00:07:55,450 --> 00:07:51,500

think you say they the key thing you had

124

00:07:57,880 --> 00:07:55,460

to do was to look at performance I think

125

00:08:00,070 --> 00:07:57,890

performance was primary schedule was

126

00:08:01,180 --> 00:08:00,080

second and then cost and I think those

127

00:08:03,780 --> 00:08:01,190

are the three elements of course a

128

00:08:05,830 --> 00:08:03,790

program management or performance

129

00:08:07,360 --> 00:08:05,840

schedule and cost and those are the

130

00:08:10,810 --> 00:08:07,370

three trade-offs that a program manager

131

00:08:13,180 --> 00:08:10,820

has to continually do I think in the

132

00:08:15,070 --> 00:08:13,190

shuttle era you still had performance

133

00:08:17,730 --> 00:08:15,080

was still very key is still I would say

134

00:08:20,350 --> 00:08:17,740

number one but i think cost was

135

00:08:23,409 --> 00:08:20,360

overriding schedule I think cost was

136

00:08:25,910 --> 00:08:23,419

more important than scheduled in the

137

00:08:29,150 --> 00:08:25,920

space station era I'm not sure I

138

00:08:31,160 --> 00:08:29,160

I can tell yet I think certainly all

139

00:08:33,680 --> 00:08:31,170

three are still very important and i'm

140

00:08:35,210 --> 00:08:33,690

not sure i'm not sure that all the

141

00:08:37,010 --> 00:08:35,220

pressures that the space station people

142

00:08:39,320 --> 00:08:37,020

are going to have yet come to bear i

143

00:08:41,600 --> 00:08:39,330

think costs I think cost may even

144

00:08:42,800 --> 00:08:41,610

override with schedule being second and

145

00:08:44,210 --> 00:08:42,810

maybe performance going oh Henry you

146

00:08:46,250 --> 00:08:44,220

might want to add something to it I

147

00:08:48,830 --> 00:08:46,260

agree with that I think one of the

148

00:08:51,290 --> 00:08:48,840

things that we've got into now is the

149

00:08:54,380 --> 00:08:51,300

lack of flexibility in cost you know

150

00:08:56,570 --> 00:08:54,390

Apollo we never had enough money in

151

00:08:58,880 --> 00:08:56,580

Apollo but we did have a lot more

152

00:09:01,100 --> 00:08:58,890

flexibility and how we can use it than

153

00:09:03,230 --> 00:09:01,110

we have oh yeah an Apollo I would say

154

00:09:05,510 --> 00:09:03,240

that if you had a problem in Apollo you

155

00:09:07,820 --> 00:09:05,520

and you got a problem you could go

156

00:09:09,710 --> 00:09:07,830

mostly paths to get the solution and

157

00:09:11,420 --> 00:09:09,720

then pick the solution you want to but

158

00:09:13,160 --> 00:09:11,430

you could carry multipass for a while in

159

00:09:15,200 --> 00:09:13,170

the shuttle program and the arm pro I

160

00:09:17,270 --> 00:09:15,210

think what you had to do in that case

161

00:09:18,740 --> 00:09:17,280

was to pick pick the solute not go

162

00:09:21,980 --> 00:09:18,750

parallel paths pick the solution you

163

00:09:24,470 --> 00:09:21,990

wanted and you know with good judgment

164

00:09:26,000 --> 00:09:24,480

in good decision-making I hope that

165

00:09:27,380 --> 00:09:26,010

decision was right but not go parallel

166

00:09:29,420 --> 00:09:27,390

paths for that long and I think that's

167

00:09:30,950 --> 00:09:29,430

one of the differences in the shuttle

168

00:09:33,020 --> 00:09:30,960

program you couldn't even continue a

169

00:09:34,490 --> 00:09:33,030

program you had to start it and then you

170

00:09:36,200 --> 00:09:34,500

had to stop it because you had to take

171

00:09:38,960 --> 00:09:36,210

those funds and transfer us on the glass

172

00:09:41,360 --> 00:09:38,970

house and pick up that's right and get

173

00:09:43,460 --> 00:09:41,370

that one up up to the even keel and then

174

00:09:45,860 --> 00:09:43,470

go back and pick up the other project

175

00:09:49,820 --> 00:09:45,870

and bring it along to keep everything

176

00:09:52,670 --> 00:09:49,830

going on even keel and I think the the

177

00:09:54,110 --> 00:09:52,680

program of the of the space station air

178

00:09:55,100 --> 00:09:54,120

there's going to be a lot of pressures

179

00:09:56,690 --> 00:09:55,110

and I think you can keep those

180

00:09:59,840 --> 00:09:56,700

fundamentals I talked about in front of

181

00:10:03,740 --> 00:09:59,850

you I think you can overcome those the

182

00:10:05,330 --> 00:10:03,750

new pressures that might come about one

183

00:10:07,540 --> 00:10:05,340

of the things that has been talked about

184

00:10:11,210 --> 00:10:07,550

a great deal recently is organizational

185

00:10:13,910 --> 00:10:11,220

cultures how would you characterize the

186

00:10:17,030 --> 00:10:13,920

NASA and JSC's cultures have they

187

00:10:18,380 --> 00:10:17,040

changed do they need to change well I

188

00:10:20,540 --> 00:10:18,390

think again there's some very

189

00:10:24,860 --> 00:10:20,550

fundamental things with culture I think

190

00:10:29,060 --> 00:10:24,870

I think that at the Johnson Space Center

191

00:10:30,230 --> 00:10:29,070

I think we have a culture that is I

192

00:10:32,120 --> 00:10:30,240

don't know if you'd call a participative

193

00:10:34,600 --> 00:10:32,130

management or they're certainly an

194

00:10:36,920 --> 00:10:34,610

interactive there's an interactive

195

00:10:38,829 --> 00:10:36,930

activity interaction activity that takes

196

00:10:41,410 --> 00:10:38,839

place in making a decision

197

00:10:44,600 --> 00:10:41,420

we have been left with the legacy that

198

00:10:46,790 --> 00:10:44,610

that if you have an issue that you have

199

00:10:49,430 --> 00:10:46,800

a concern you feel free to express your

200

00:10:52,400 --> 00:10:49,440

concern we weigh the problem we work the

201
00:10:53,509 --> 00:10:52,410
problem and if the you may not always go

202
00:10:55,040 --> 00:10:53,519
the way people the answer mean always

203
00:10:57,500 --> 00:10:55,050
come out the way people want it but

204
00:11:01,939 --> 00:10:57,510
you're explained how you what decision

205
00:11:05,569 --> 00:11:01,949
you make and and you go on from there I

206
00:11:09,850 --> 00:11:05,579
think that the only culture change that

207
00:11:12,350 --> 00:11:09,860
I see that may take place is maybe the

208
00:11:15,439 --> 00:11:12,360
some external environment that says

209
00:11:18,110 --> 00:11:15,449
there are more external pressures in

210
00:11:20,210 --> 00:11:18,120
terms of overview committees but even

211
00:11:21,769 --> 00:11:20,220
then if you go back in the early days we

212
00:11:24,889 --> 00:11:21,779
still had a lot of overview committee so

213
00:11:26,300 --> 00:11:24,899

I'm not sure I see a big change except

214

00:11:31,670 --> 00:11:26,310

for the one fact at the Johnson Space

215

00:11:34,730 --> 00:11:31,680

Center is that we had previously had the

216

00:11:38,170 --> 00:11:34,740

one big program of a Mercury Gemini

217

00:11:40,340 --> 00:11:38,180

Apollo it would come up and go away

218

00:11:42,410 --> 00:11:40,350

today we have shuttle and it's going to

219

00:11:43,639 --> 00:11:42,420

be with us for a long time and we've got

220

00:11:45,230 --> 00:11:43,649

space station it's going to be with us

221

00:11:46,730 --> 00:11:45,240

for a long time and then if we go on to

222

00:11:48,139 --> 00:11:46,740

the lunar Mars initiative that's going

223

00:11:49,490 --> 00:11:48,149

to be with us for a long time so I think

224

00:11:51,650 --> 00:11:49,500

the culture is going to have to be able

225

00:11:54,370 --> 00:11:51,660

to accept and adapt to how you handle

226
00:11:57,620 --> 00:11:54,380
large multiple programs at the same time

227
00:11:59,720 --> 00:11:57,630
right you have anything well there's a

228
00:12:01,970 --> 00:11:59,730
couple of things that I see that has

229
00:12:04,009 --> 00:12:01,980
changed with time and it's kind of

230
00:12:06,680 --> 00:12:04,019
changing back now the first one we

231
00:12:10,430 --> 00:12:06,690
started out with Apollo we had a few

232
00:12:12,319 --> 00:12:10,440
what had called mature people and then

233
00:12:15,379 --> 00:12:12,329
we had a large number of people there's

234
00:12:17,990 --> 00:12:15,389
fresh out of college when the shuttle

235
00:12:20,540 --> 00:12:18,000
program started then we had that

236
00:12:22,610 --> 00:12:20,550
experience team that went through the

237
00:12:25,490 --> 00:12:22,620
Apollo program we learn an awful lot

238
00:12:27,559 --> 00:12:25,500

Apollo program and now as we start on

239

00:12:29,900 --> 00:12:27,569

Space Station we're going to develop

240

00:12:31,470 --> 00:12:29,910

space station with a few mature people

241

00:12:35,370 --> 00:12:31,480

and a lot of young

242

00:12:37,949 --> 00:12:35,380

so we're that's a good point i'm the

243

00:12:39,509 --> 00:12:37,959

type of organization that we had in

244

00:12:41,699 --> 00:12:39,519

there let me ask you Joe what do you

245

00:12:43,189 --> 00:12:41,709

think you've been you've been even

246

00:12:47,129 --> 00:12:43,199

around with what you're feeling on that

247

00:12:51,319 --> 00:12:47,139

well I think as you pointed out JSC

248

00:12:54,509 --> 00:12:51,329

developed a very unique kind of culture

249

00:12:57,590 --> 00:12:54,519

outside observers have characterized our

250

00:13:01,769 --> 00:12:57,600

decision making as being collegial and

251
00:13:04,350 --> 00:13:01,779
have had difficulty understanding why we

252
00:13:06,329 --> 00:13:04,360
seem to be able to do it but I think

253
00:13:09,569 --> 00:13:06,339
it's because we've dealt with issues

254
00:13:12,569 --> 00:13:09,579
that are very complex very technical and

255
00:13:14,910 --> 00:13:12,579
in which no one person had all the

256
00:13:17,519 --> 00:13:14,920
technical expertise to make a decision

257
00:13:19,889 --> 00:13:17,529
so there was always this collegial

258
00:13:21,930 --> 00:13:19,899
discussion and then the program manager

259
00:13:23,699 --> 00:13:21,940
because he was the appointed decision

260
00:13:25,199 --> 00:13:23,709
maker made the decision that's a good

261
00:13:28,319 --> 00:13:25,209
point I'm glad you brought that up the

262
00:13:30,300 --> 00:13:28,329
the program manager is like the border

263
00:13:31,379 --> 00:13:30,310

tremor of the board he has 51 percent of

264

00:13:32,970 --> 00:13:31,389

the vote and I think that is the

265

00:13:35,340 --> 00:13:32,980

important thing that the program manager

266

00:13:37,079 --> 00:13:35,350

has to recognize that responsibility and

267

00:13:42,269 --> 00:13:37,089

he you do have to give him fifty one

268

00:13:43,860 --> 00:13:42,279

percent of the vote Erinn one of the

269

00:13:47,069 --> 00:13:43,870

things that might be interesting to

270

00:13:48,930 --> 00:13:47,079

discuss his wyjsc uses a matrix

271

00:13:52,559 --> 00:13:48,940

management system it was fashionable

272

00:13:55,139 --> 00:13:52,569

when we were formed in the 60s it's no

273

00:13:57,389 --> 00:13:55,149

longer so fashionable in industry but we

274

00:13:59,970 --> 00:13:57,399

still use it well I think there's a

275

00:14:01,740 --> 00:13:59,980

several reasons why you basically use a

276

00:14:08,699 --> 00:14:01,750

matrix management you use a matrix

277

00:14:09,960 --> 00:14:08,709

management for one reason is if you want

278

00:14:12,449 --> 00:14:09,970

a good check and balance on the program

279

00:14:14,430 --> 00:14:12,459

that's one reason why i use it in fact i

280

00:14:17,040 --> 00:14:14,440

would say that was the reason why we

281

00:14:18,750 --> 00:14:17,050

originally used it was because we wanted

282

00:14:22,170 --> 00:14:18,760

to have a check and balance of the

283

00:14:25,319 --> 00:14:22,180

various parts of the institution on the

284

00:14:27,990 --> 00:14:25,329

program and that is a very good

285

00:14:30,780 --> 00:14:28,000

attribute to have the other reason why

286

00:14:33,000 --> 00:14:30,790

use a matrix management is because you

287

00:14:34,860 --> 00:14:33,010

have multiple programs and that's the

288

00:14:36,750 --> 00:14:34,870

way you handle multiple potent programs

289

00:14:39,030 --> 00:14:36,760

is going to matrix management now we're

290

00:14:40,259 --> 00:14:39,040

going into have to use matrix management

291

00:14:41,850 --> 00:14:40,269

for that reason but the original reason

292

00:14:43,829 --> 00:14:41,860

was more for the check in check and

293

00:14:44,889 --> 00:14:43,839

balance there are some disadvantages as

294

00:14:47,590 --> 00:14:44,899

you know make

295

00:14:49,090 --> 00:14:47,600

management you don't have the autonomy

296

00:14:51,429 --> 00:14:49,100

the program doesn't have the complete

297

00:14:53,170 --> 00:14:51,439

autonomy and as a project manager I've

298

00:14:54,970 --> 00:14:53,180

got to admit I sometimes I was very

299

00:14:56,739 --> 00:14:54,980

frustrated with that but I've got to

300

00:14:59,499 --> 00:14:56,749

tell you that has a project manager I

301
00:15:01,059 --> 00:14:59,509
learned to love it because you do have

302
00:15:02,980 --> 00:15:01,069
that check and balance and I think that

303
00:15:05,079 --> 00:15:02,990
check and balance is important of course

304
00:15:06,639 --> 00:15:05,089
at the Johnson Space Center I think

305
00:15:09,309 --> 00:15:06,649
there's another reason why it could be

306
00:15:11,199 --> 00:15:09,319
very difficult for us to eliminate the

307
00:15:12,850 --> 00:15:11,209
matrix management even though some

308
00:15:15,790 --> 00:15:12,860
places are getting away from it is

309
00:15:18,189 --> 00:15:15,800
because we have the very intricate

310
00:15:21,519 --> 00:15:18,199
interweaving of our operations activity

311
00:15:22,749 --> 00:15:21,529
with our design activity and I think

312
00:15:24,040 --> 00:15:22,759
that is probably the only way you're

313
00:15:25,509 --> 00:15:24,050

going to be really able to do that is

314

00:15:27,369 --> 00:15:25,519

with a matrix management system here at

315

00:15:29,879 --> 00:15:27,379

the Johnson Space Center but I'm not

316

00:15:32,139 --> 00:15:29,889

sure I'll car that fits all all all

317

00:15:36,129 --> 00:15:32,149

organizations are companies today no

318

00:15:39,009 --> 00:15:36,139

Henry yet yeah i think you know in our

319

00:15:42,519 --> 00:15:39,019

situation matrix management gives us a

320

00:15:45,220 --> 00:15:42,529

great deal more flexibility to use the

321

00:15:47,019 --> 00:15:45,230

expertise that you have when you not you

322

00:15:48,850 --> 00:15:47,029

don't have a great deal of depth you can

323

00:15:50,769 --> 00:15:48,860

use the experts on a lot of different

324

00:15:52,540 --> 00:15:50,779

programs you can use them this week on

325

00:15:54,579 --> 00:15:52,550

this program next week on this program

326

00:15:56,889 --> 00:15:54,589

and next month on that program over

327

00:15:59,530 --> 00:15:56,899

there as problems arise in each one of

328

00:16:01,780 --> 00:15:59,540

those those programs they usually don't

329

00:16:03,579 --> 00:16:01,790

happen at the same time and I think

330

00:16:07,689 --> 00:16:03,589

there's another message here about the

331

00:16:10,540 --> 00:16:07,699

management that any organization can

332

00:16:12,759 --> 00:16:10,550

work so long is this the will of the

333

00:16:15,549 --> 00:16:12,769

people and the will of all of the people

334

00:16:17,230 --> 00:16:15,559

to want it to work I think that's one of

335

00:16:19,869 --> 00:16:17,240

the key ingredients to make an

336

00:16:23,350 --> 00:16:19,879

organization work the best organization

337

00:16:25,900 --> 00:16:23,360

in the world will not work if the people

338

00:16:27,189 --> 00:16:25,910

don't want it to work and I think that's

339

00:16:31,629 --> 00:16:27,199

one of the things that we've been able

340

00:16:34,299 --> 00:16:31,639

to do here is to keep arrow body with

341

00:16:37,299 --> 00:16:34,309

with a sense of responsibility as sense

342

00:16:39,939 --> 00:16:37,309

to do the wont to do the job or feeling

343

00:16:42,340 --> 00:16:39,949

responsible for making the hardware work

344

00:16:44,799 --> 00:16:42,350

and that's been a key ingredient to

345

00:16:46,359 --> 00:16:44,809

making matrix manage my work here at

346

00:16:47,199 --> 00:16:46,369

this Center so I'd like to you know I

347

00:16:48,639 --> 00:16:47,209

don't care what you have to say because

348

00:16:49,840 --> 00:16:48,649

I know if you studied management systems

349

00:16:54,569 --> 00:16:49,850

for some time and I'd like to hear what

350

00:16:56,999 --> 00:16:54,579

you had to say that well I think that

351
00:16:59,850 --> 00:16:57,009
as a government organization responsible

352
00:17:04,169 --> 00:16:59,860
for the initiation and the continuing

353
00:17:07,169 --> 00:17:04,179
management of programs we do not have as

354
00:17:10,470 --> 00:17:07,179
narrow and sharper focus as you can

355
00:17:13,350 --> 00:17:10,480
create in a business enterprise and I

356
00:17:15,120 --> 00:17:13,360
think the complexity of our task forces

357
00:17:18,799 --> 00:17:15,130
us into a matrix meaning that's the

358
00:17:26,639 --> 00:17:22,699
in the context and of this management

359
00:17:29,399 --> 00:17:26,649
structure how would you deal with the

360
00:17:32,879 --> 00:17:29,409
various elements of cost schedule and

361
00:17:34,680 --> 00:17:32,889
performance as they are embodied in the

362
00:17:37,620 --> 00:17:34,690
various functional elements that work

363
00:17:40,740 --> 00:17:37,630

with you well of course you hit the key

364

00:17:43,919 --> 00:17:40,750

of the whole program management theme of

365

00:17:46,769 --> 00:17:43,929

the balance of performance cost and

366

00:17:49,110 --> 00:17:46,779

schedule that is a continuing trade and

367

00:17:51,180 --> 00:17:49,120

that is the you might say that is the

368

00:17:53,669 --> 00:17:51,190

life a project or program manager lives

369

00:17:56,490 --> 00:17:53,679

with from the from the conception of the

370

00:17:59,580 --> 00:17:56,500

program to its end it's a continuing

371

00:18:01,710 --> 00:17:59,590

trade off and you can ever you can never

372

00:18:03,690 --> 00:18:01,720

solve you cannot marry everybody happy

373

00:18:05,580 --> 00:18:03,700

but maybe we'll never make everybody

374

00:18:07,350 --> 00:18:05,590

happy with those three elements let's

375

00:18:09,509 --> 00:18:07,360

continue trade off you know I used to

376

00:18:11,370 --> 00:18:09,519

use a very simple analogy when I used to

377

00:18:12,840 --> 00:18:11,380

used to work with people they've come to

378

00:18:15,539 --> 00:18:12,850

my office and I'd say okay now what I

379

00:18:18,480 --> 00:18:15,549

want you to do is help me I would like

380

00:18:21,419 --> 00:18:18,490

you to play like for a moment that

381

00:18:24,509 --> 00:18:21,429

you're in business for yourself and you

382

00:18:25,980 --> 00:18:24,519

can't afford to to give it to produce a

383

00:18:28,019 --> 00:18:25,990

bad product so you want to you want to

384

00:18:30,330 --> 00:18:28,029

improve it on the other hand you're in

385

00:18:31,830 --> 00:18:30,340

business to make a profit and you can't

386

00:18:34,080 --> 00:18:31,840

afford to put all this money into it now

387

00:18:36,450 --> 00:18:34,090

now help me figure out how to do that

388

00:18:38,310 --> 00:18:36,460

how to get that product out on time so I

389

00:18:39,299 --> 00:18:38,320

really think it boils down to that that

390

00:18:41,279 --> 00:18:39,309

one thing though I think you can't

391

00:18:43,259 --> 00:18:41,289

afford to do in a man program and I

392

00:18:45,480 --> 00:18:43,269

think it's true in the any unmanned

393

00:18:47,340 --> 00:18:45,490

programs too is you can't afford a

394

00:18:49,620 --> 00:18:47,350

failure failures are very expensive and

395

00:18:51,450 --> 00:18:49,630

so other safety and reliability and

396

00:18:53,279 --> 00:18:51,460

quality has got to be maintained in that

397

00:18:55,769 --> 00:18:53,289

and so and there's ways to do that and

398

00:18:57,480 --> 00:18:55,779

you can still balance off those three

399

00:19:00,570 --> 00:18:57,490

parameters and still get a very high

400

00:19:02,760 --> 00:19:00,580

quality high quality product reliable

401
00:19:05,639 --> 00:19:02,770
product and safe product so it is a

402
00:19:08,110 --> 00:19:05,649
tough job and there is no closed-form

403
00:19:09,670 --> 00:19:08,120
solution there's by there

404
00:19:12,010 --> 00:19:09,680
let me believe me there are is no

405
00:19:14,080 --> 00:19:12,020
closed-form solution to to that

406
00:19:17,830 --> 00:19:14,090
trade-off it is a continuing continuing

407
00:19:19,510 --> 00:19:17,840
trade of those three parameters we've

408
00:19:21,970 --> 00:19:19,520
talked a good bit about engineering

409
00:19:24,940 --> 00:19:21,980
could you talk a little bit about how

410
00:19:27,490 --> 00:19:24,950
you use your program control and your

411
00:19:29,800 --> 00:19:27,500
business analysis people yeah let me do

412
00:19:34,000 --> 00:19:29,810
that and let me do that in the context

413
00:19:36,130 --> 00:19:34,010

of a term I call avoiding pitfalls if

414

00:19:38,080 --> 00:19:36,140

you go back and you look at history of

415

00:19:40,600 --> 00:19:38,090

program managers and project managers

416

00:19:41,680 --> 00:19:40,610

the first pitfall the first thing that

417

00:19:43,270 --> 00:19:41,690

happens is when you become a project

418

00:19:44,290 --> 00:19:43,280

manager you have you for you you know

419

00:19:46,600 --> 00:19:44,300

that's the greatest thing that ever

420

00:19:47,740 --> 00:19:46,610

happened to you in fact my wife used to

421

00:19:48,970 --> 00:19:47,750

say the greatest thing could happen Erin

422

00:19:50,980 --> 00:19:48,980

is the day you became the auger project

423

00:19:54,520 --> 00:19:50,990

manager and then from then on it was is

424

00:19:56,350 --> 00:19:54,530

really tough but it is the before you

425

00:19:58,780 --> 00:19:56,360

become but then you got to avoid the

426

00:20:01,840 --> 00:19:58,790

pitfalls in the first pitfall you really

427

00:20:04,300 --> 00:20:01,850

have it as a project manager is normally

428

00:20:07,090 --> 00:20:04,310

cost overruns that's the first thing you

429

00:20:09,760 --> 00:20:07,100

normally see is cost overruns the second

430

00:20:12,010 --> 00:20:09,770

problem a project manager pitfall the

431

00:20:14,710 --> 00:20:12,020

project manager has a schedule and then

432

00:20:18,190 --> 00:20:14,720

you you saw normally you'll you'll solve

433

00:20:20,410 --> 00:20:18,200

your they let solve the the cost problem

434

00:20:21,700 --> 00:20:20,420

by either replacing the project manager

435

00:20:24,250 --> 00:20:21,710

or somebody figuring out how to do it

436

00:20:25,960 --> 00:20:24,260

and then the schedule gets the is the

437

00:20:27,400 --> 00:20:25,970

problem you have to run into and then of

438

00:20:29,170 --> 00:20:27,410

course it becomes the performance

439

00:20:31,240 --> 00:20:29,180

problems of getting it done and getting

440

00:20:33,010 --> 00:20:31,250

a good product but getting back to your

441

00:20:37,270 --> 00:20:33,020

specific question I think in that

442

00:20:39,490 --> 00:20:37,280

context the project control is the

443

00:20:42,790 --> 00:20:39,500

important element in helping you avoid

444

00:20:45,610 --> 00:20:42,800

those pitfalls you need to use your

445

00:20:48,070 --> 00:20:45,620

contract as a good tool you need to have

446

00:20:50,140 --> 00:20:48,080

the project control office help you

447

00:20:53,290 --> 00:20:50,150

manage that contract you need to have a

448

00:20:55,510 --> 00:20:53,300

good configuration control you need to

449

00:20:57,520 --> 00:20:55,520

be able to have them give you a good

450

00:20:59,830 --> 00:20:57,530

budget estimate keeping up with your

451
00:21:03,040 --> 00:20:59,840
schedules and if you do that give you

452
00:21:04,300 --> 00:21:03,050
that insight those are the ways over and

453
00:21:06,010 --> 00:21:04,310
above the technical as you pointed out

454
00:21:08,620 --> 00:21:06,020
those are the ways that you can

455
00:21:10,600 --> 00:21:08,630
potentially you have the best chance of

456
00:21:12,040 --> 00:21:10,610
avoiding those pitfalls and I think it's

457
00:21:14,440 --> 00:21:12,050
extremely important element of it

458
00:21:16,360 --> 00:21:14,450
engineering is good and is important but

459
00:21:19,120 --> 00:21:16,370
believe me the business management end

460
00:21:22,200 --> 00:21:19,130
of the program is vitally important to

461
00:21:26,770 --> 00:21:22,210
the success of a program

462
00:21:28,960 --> 00:21:26,780
and may perhaps you and Aaron could

463
00:21:32,050 --> 00:21:28,970

463 speak to the subject of what should be

464

00:21:34,060 --> 00:21:32,060

the proper relationship between the

465

00:21:36,430 --> 00:21:34,070

government engineering organization and

466

00:21:39,730 --> 00:21:36,440

program management organization and its

467

00:21:41,380 --> 00:21:39,740

contractors yeah but could I come back

468

00:21:44,620 --> 00:21:41,390

to the last question for just a minute

469

00:21:47,220 --> 00:21:44,630

on program control you know one of the

470

00:21:50,830 --> 00:21:47,230

things that you find about engineers is

471

00:21:53,890 --> 00:21:50,840

that engineers for some reason do not

472

00:21:57,280 --> 00:21:53,900

like to deal with budgets they do not

473

00:21:59,740 --> 00:21:57,290

like to deal with costs they'll deal

474

00:22:01,690 --> 00:21:59,750

with schedules fairly well but they

475

00:22:04,750 --> 00:22:01,700

don't like to deal with budgets and

476
00:22:08,620 --> 00:22:04,760
costs and frequently don't keep track of

477
00:22:10,060 --> 00:22:08,630
the effort that's being produced per

478
00:22:12,040 --> 00:22:10,070
length of time that they're working on

479
00:22:14,290 --> 00:22:12,050
it and their costs will get out of hand

480
00:22:16,420 --> 00:22:14,300
and I think that's one of the key areas

481
00:22:18,820 --> 00:22:16,430
where a good program control office

482
00:22:24,610 --> 00:22:18,830
comes into play is they tend to keep the

483
00:22:28,870 --> 00:22:24,620
schedule the budget and and that balance

484
00:22:30,490 --> 00:22:28,880
of the program in proper focus okay you

485
00:22:31,900 --> 00:22:30,500
want me to take a shot linea let me

486
00:22:34,840 --> 00:22:31,910
answer that the other question because I

487
00:22:39,880 --> 00:22:34,850
didn't think about it like I think if

488
00:22:42,400 --> 00:22:39,890

you if you go back to the Apollo 20 for

489

00:22:44,590 --> 00:22:42,410

fire and I this thing all sticks in my

490

00:22:47,610 --> 00:22:44,600

mind there was a statement in the report

491

00:22:52,060 --> 00:22:47,620

that said that I'll paraphrase it that

492

00:22:54,700 --> 00:22:52,070

the doing spaceflight human spaceflight

493

00:22:57,340 --> 00:22:54,710

you have to overcome a hostile external

494

00:22:58,480 --> 00:22:57,350

environment and to overcome a hostile

495

00:23:00,970 --> 00:22:58,490

external environment you need teamwork

496

00:23:03,870 --> 00:23:00,980

so I think that's the thing you need a

497

00:23:06,100 --> 00:23:03,880

teamwork between you're the contractor

498

00:23:07,360 --> 00:23:06,110

and the government I don't think there's

499

00:23:10,960 --> 00:23:07,370

any question about that that you need

500

00:23:14,410 --> 00:23:10,970

teamwork on the other hand you need to

501
00:23:18,070 --> 00:23:14,420
have a plan an implementation plan that

502
00:23:19,750 --> 00:23:18,080
you can award the contract contractor

503
00:23:21,340 --> 00:23:19,760
when he does a good job but she also

504
00:23:23,470 --> 00:23:21,350
need to penalize the contractor when he

505
00:23:26,320 --> 00:23:23,480
does a bad job so I do think you need

506
00:23:28,810 --> 00:23:26,330
teamwork and to get a good safe reliable

507
00:23:30,670 --> 00:23:28,820
efficient product but she do need a way

508
00:23:31,270 --> 00:23:30,680
to penalize him when he doesn't do a

509
00:23:36,190 --> 00:23:31,280
good job

510
00:23:37,840 --> 00:23:36,200
morning leaders yeah the only thing I

511
00:23:40,780 --> 00:23:37,850
could add to that Aaron would be that

512
00:23:42,760 --> 00:23:40,790
that you both need a good understanding

513
00:23:46,300 --> 00:23:42,770

of the product that you're going to

514

00:23:48,790 --> 00:23:46,310

prove your son you know you both need to

515

00:23:51,070 --> 00:23:48,800

be working toward the same game plan and

516

00:23:53,830 --> 00:23:51,080

both parties need to understand that

517

00:23:56,080 --> 00:23:53,840

very very clearly and that's what you

518

00:23:58,330 --> 00:23:56,090

mean by teamwork it's like that but you

519

00:24:00,130 --> 00:23:58,340

got to have that it's very very critical

520

00:24:02,140 --> 00:24:00,140

and also to the teamwork I mean the fact

521

00:24:04,300 --> 00:24:02,150

that the way NASA operates I think

522

00:24:06,910 --> 00:24:04,310

that's typical at all centers we do

523

00:24:09,490 --> 00:24:06,920

pride ourselves and I think we justified

524

00:24:11,940 --> 00:24:09,500

be so that we do have a technical

525

00:24:14,770 --> 00:24:11,950

capability and technical excellence and

526

00:24:17,170 --> 00:24:14,780

many times we have the technical

527

00:24:18,760 --> 00:24:17,180

capability because of our facilities

528

00:24:21,490 --> 00:24:18,770

because of the the way we have done

529

00:24:24,160 --> 00:24:21,500

things that our technical t I think and

530

00:24:26,020 --> 00:24:24,170

sometimes it tends to be in selected

531

00:24:27,730 --> 00:24:26,030

areas greater than some of our

532

00:24:29,260 --> 00:24:27,740

contractors in some areas our

533

00:24:31,390 --> 00:24:29,270

contractors have better technical

534

00:24:33,700 --> 00:24:31,400

capability then then we have and I think

535

00:24:35,860 --> 00:24:33,710

we need to know how to utilize both of

536

00:24:37,840 --> 00:24:35,870

those two full advantage that's

537

00:24:39,250 --> 00:24:37,850

especially true hearing in those areas

538

00:24:41,200 --> 00:24:39,260

where we've had the opportunity to go

539

00:24:43,090 --> 00:24:41,210

through several programs and sequence

540

00:24:47,980 --> 00:24:43,100

and then you got another contractor

541

00:24:49,630 --> 00:24:47,990

that's a new honor on a straight Aaron

542

00:24:51,400 --> 00:24:49,640

how would you like to talk for a moment

543

00:24:53,470 --> 00:24:51,410

or two to the subject of the

544

00:24:56,290 --> 00:24:53,480

relationship between the program office

545

00:24:59,530 --> 00:24:56,300

and the institution of the center itself

546

00:25:01,960 --> 00:24:59,540

well of course with a with a matrix

547

00:25:04,900 --> 00:25:01,970

management system they're very

548

00:25:07,480 --> 00:25:04,910

intertwined you know you can always

549

00:25:08,860 --> 00:25:07,490

argue are the programs here to serve the

550

00:25:10,960 --> 00:25:08,870

for the institution or is the

551
00:25:13,630 --> 00:25:10,970
institution here to serve the program

552
00:25:18,660 --> 00:25:13,640
and i think it's it's a little bit of

553
00:25:22,470 --> 00:25:18,670
both I think that as we stated before

554
00:25:26,680 --> 00:25:22,480
there is a support from the institution

555
00:25:28,390 --> 00:25:26,690
to the to the program if you look at the

556
00:25:29,440 --> 00:25:28,400
Johnson Space Center specifically we

557
00:25:30,970 --> 00:25:29,450
have basically an engineering

558
00:25:33,220 --> 00:25:30,980
organization under Henry we have an

559
00:25:34,690 --> 00:25:33,230
Operations organization and a science

560
00:25:37,710 --> 00:25:34,700
organization and then we have the

561
00:25:40,600 --> 00:25:37,720
supporting functions and those are all

562
00:25:43,780 --> 00:25:40,610
matrix you might say support to the

563
00:25:45,070 --> 00:25:43,790

program manager and as we said before he

564

00:25:47,530 --> 00:25:45,080

gets inputs from that there's

565

00:25:49,780 --> 00:25:47,540

check and balance where the institution

566

00:25:51,640 --> 00:25:49,790

does support the program manager but you

567

00:25:53,200 --> 00:25:51,650

do have to say that the program manager

568

00:25:56,550 --> 00:25:53,210

you have to give somebody that rain and

569

00:25:59,230 --> 00:25:56,560

the program manager he fulfills the

570

00:26:01,060 --> 00:25:59,240

criteria I said out with that we start

571

00:26:03,580 --> 00:26:01,070

off this discussion on fulfills that

572

00:26:05,230 --> 00:26:03,590

criteria he's justifiable having 51

573

00:26:08,410 --> 00:26:05,240

percent of the vote and making the right

574

00:26:10,300 --> 00:26:08,420

decision I think I could even make a

575

00:26:12,850 --> 00:26:10,310

stronger case for the it for the feet to

576

00:26:15,520 --> 00:26:12,860

one percent because if it was not for

577

00:26:20,080 --> 00:26:15,530

the programs you would have little need

578

00:26:22,450 --> 00:26:20,090

for an institution because our total

579

00:26:26,530 --> 00:26:22,460

endeavor is in support of the projects

580

00:26:28,000 --> 00:26:26,540

are the programs at hand and it's a

581

00:26:33,910 --> 00:26:28,010

matter of how you go about doing it

582

00:26:38,770 --> 00:26:33,920

that's right Aaron it might be good to

583

00:26:42,870 --> 00:26:38,780

take a couple of cases in point what was

584

00:26:45,190 --> 00:26:42,880

your most trying decision during Apollo

585

00:26:47,170 --> 00:26:45,200

well there are a couple Joe and I'd like

586

00:26:49,630 --> 00:26:47,180

to you and Henry were there too I there

587

00:26:52,030 --> 00:26:49,640

was a couple one I remember very

588

00:26:55,750 --> 00:26:52,040

distinctly which I probably learned one

589

00:26:58,090 --> 00:26:55,760

of my biggest lessons from was I I think

590

00:27:01,330 --> 00:26:58,100

the admission was Apollo 11 but i think

591

00:27:04,270 --> 00:27:01,340

it was there was an inertial measurement

592

00:27:07,630 --> 00:27:04,280

unit that was a little bit out of spec

593

00:27:09,750 --> 00:27:07,640

not much out of spec and we were we were

594

00:27:12,720 --> 00:27:09,760

thrashing around whether we should

595

00:27:15,010 --> 00:27:12,730

remove that initial measurement unit and

596

00:27:17,350 --> 00:27:15,020

if you know the lunar module was a

597

00:27:18,670 --> 00:27:17,360

pretty flimsy and i would say flimsy but

598

00:27:20,110 --> 00:27:18,680

it wasn't it didn't have a very hefty

599

00:27:22,150 --> 00:27:20,120

structured was on the stack out of the

600

00:27:23,170 --> 00:27:22,160

pad and we had to make a decision where

601
00:27:24,520 --> 00:27:23,180
we should replace that inertial

602
00:27:27,850 --> 00:27:24,530
measurement unit or should we live with

603
00:27:30,130 --> 00:27:27,860
it and and we went to we talked about a

604
00:27:31,600 --> 00:27:30,140
long time we went to George Lowe and we

605
00:27:33,070 --> 00:27:31,610
really recommended give him all the data

606
00:27:35,050 --> 00:27:33,080
but we came up with a recommendation

607
00:27:36,820 --> 00:27:35,060
that says we really should not change

608
00:27:38,680 --> 00:27:36,830
that at IMU out the inertial measurement

609
00:27:41,320 --> 00:27:38,690
unit now there's a risk in doing it we

610
00:27:43,390 --> 00:27:41,330
could live with it and he thought for a

611
00:27:46,750 --> 00:27:43,400
moment and looked at us he said if you

612
00:27:49,000 --> 00:27:46,760
can if we can remove that issue from the

613
00:27:50,740 --> 00:27:49,010

equation we ought to go change it out so

614

00:27:52,090 --> 00:27:50,750

I want to go change the IMU out so that

615

00:27:54,610 --> 00:27:52,100

was a good point I was good that was a

616

00:27:55,640 --> 00:27:54,620

good lesson that I learned and always

617

00:27:58,010 --> 00:27:55,650

keep in the back of my

618

00:27:59,600 --> 00:27:58,020

the other one was one I think it was wow

619

00:28:01,910 --> 00:27:59,610

if it was Henry of one of his people in

620

00:28:04,640 --> 00:28:01,920

propulsion area that came to me in as

621

00:28:06,620 --> 00:28:04,650

well that was on Apollo 8 where we had

622

00:28:09,050 --> 00:28:06,630

this issue on the injector of the sps

623

00:28:12,020 --> 00:28:09,060

edge and where we found that it's a long

624

00:28:14,360 --> 00:28:12,030

story we found that if you fired the

625

00:28:17,720 --> 00:28:14,370

ejector dry with both banks of the of

626

00:28:19,730 --> 00:28:17,730

the in the engine that you could have a

627

00:28:23,510 --> 00:28:19,740

detonation essentially causes pressure

628

00:28:25,160 --> 00:28:23,520

spike and damage the chamber and I have

629

00:28:29,210 --> 00:28:25,170

one of Henry's guys i Henry bought it to

630

00:28:30,680 --> 00:28:29,220

me and and here we ready to fly Apollo 8

631

00:28:32,770 --> 00:28:30,690

to the moon first time we ever left the

632

00:28:35,480 --> 00:28:32,780

Earth's gravity going to the moon and

633

00:28:37,880 --> 00:28:35,490

the way we were going to do it is we

634

00:28:41,930 --> 00:28:37,890

were going to fire both banks of those

635

00:28:44,890 --> 00:28:41,940

engines when we got into lunar orbit so

636

00:28:47,810 --> 00:28:44,900

we could be sure we got into a good burn

637

00:28:49,250 --> 00:28:47,820

and that could have been a bad that's

638

00:28:51,920 --> 00:28:49,260

the way the process was set up so these

639

00:28:53,450 --> 00:28:51,930

guys brought that to me and I I got

640

00:28:55,610 --> 00:28:53,460

pretty excited about it here was 11th

641

00:28:57,260 --> 00:28:55,620

hour and I had a fair of it but they

642

00:28:59,270 --> 00:28:57,270

came to me with a solution they said

643

00:29:01,070 --> 00:28:59,280

what she could do is you could fire on

644

00:29:02,960 --> 00:29:01,080

way out she could fire out a plane just

645

00:29:04,610 --> 00:29:02,970

what the bank one with one engine and as

646

00:29:05,930 --> 00:29:04,620

you go fire the other bank with the

647

00:29:07,190 --> 00:29:05,940

other engine get back and playing not to

648

00:29:08,810 --> 00:29:07,200

store your free return trajectory and

649

00:29:10,340 --> 00:29:08,820

have both banks wedded so you can then

650

00:29:12,110 --> 00:29:10,350

when you got you could fire both engine

651
00:29:13,760 --> 00:29:12,120
be saved but I was the one who had to

652
00:29:16,010 --> 00:29:13,770
call George Lowe tell him that that at

653
00:29:18,290 --> 00:29:16,020
the cape and that was an interesting

654
00:29:20,990 --> 00:29:18,300
experience and I did that but I think

655
00:29:23,420 --> 00:29:21,000
the message there was that and I think

656
00:29:24,410 --> 00:29:23,430
there's a very key message there and I

657
00:29:27,350 --> 00:29:24,420
think that's probably one of the most

658
00:29:30,680 --> 00:29:27,360
important important lessons to learn and

659
00:29:33,470 --> 00:29:30,690
that is that you should a project

660
00:29:35,900 --> 00:29:33,480
manager our manager should give the

661
00:29:38,290 --> 00:29:35,910
feeling to the people that he works with

662
00:29:40,670 --> 00:29:38,300
that they can bring him problems and

663
00:29:42,950 --> 00:29:40,680

they can bring him any kind of problem

664

00:29:45,020 --> 00:29:42,960

and that he's willing to understand that

665

00:29:47,090 --> 00:29:45,030

and work with him to us to a solution

666

00:29:49,510 --> 00:29:47,100

and so that was a very healthy situation

667

00:29:52,490 --> 00:29:49,520

I think if you can expel that type of

668

00:29:56,780 --> 00:29:52,500

feeling amongst all your people I think

669

00:29:58,850 --> 00:29:56,790

you'll be very successful Henry how do

670

00:30:03,549 --> 00:29:58,860

you try to create that sense in your

671

00:30:09,709 --> 00:30:06,649

you do it by giving them a feeling of

672

00:30:11,599 --> 00:30:09,719

responsibility that it is their

673

00:30:13,849 --> 00:30:11,609

responsibility to make absolutely

674

00:30:16,999 --> 00:30:13,859

certain that their hardware is going to

675

00:30:18,769 --> 00:30:17,009

fail it's going to work if they feel

676

00:30:21,619 --> 00:30:18,779

like it's going to fail it is their

677

00:30:23,659 --> 00:30:21,629

responsibility to bring it forward and

678

00:30:25,759 --> 00:30:23,669

it's not always pleasant one of the most

679

00:30:27,469 --> 00:30:25,769

difficult things sometimes is go in and

680

00:30:32,749 --> 00:30:27,479

tell you boss something that you know

681

00:30:36,259 --> 00:30:32,759

your boss is not going to like I I can

682

00:30:38,029 --> 00:30:36,269

remember when this excuse me one night

683

00:30:40,459 --> 00:30:38,039

they called me at home by eleven o'clock

684

00:30:42,109 --> 00:30:40,469

at night and told me they had a pop in

685

00:30:45,139 --> 00:30:42,119

the command module when they were

686

00:30:46,969 --> 00:30:45,149

servicing nor RCS and I was up there are

687

00:30:49,039 --> 00:30:46,979

a few weeks before an attention creaking

688

00:30:50,899 --> 00:30:49,049

and popping and I didn't think too much

689

00:30:53,719 --> 00:30:50,909

about it but next morning I walked into

690

00:30:56,029 --> 00:30:53,729

one of my engineers that they had a pop

691

00:30:59,239 --> 00:30:56,039

in the tanks that shoot they brought a

692

00:31:01,159 --> 00:30:59,249

standpipe into says I just ran those

693

00:31:03,949 --> 00:31:01,169

calculations last week before I stand

694

00:31:05,659 --> 00:31:03,959

pipe into that was the one who we pulled

695

00:31:08,359 --> 00:31:05,669

the command module up we didn't replace

696

00:31:10,039 --> 00:31:08,369

the tank on it that was a pleasant thing

697

00:31:11,629 --> 00:31:10,049

to head and go forward tell somebody

698

00:31:14,329 --> 00:31:11,639

that we thought they school to stand

699

00:31:16,519 --> 00:31:14,339

pipe into no way to get in there sure

700

00:31:18,649 --> 00:31:16,529

enough they did they put it into that

701
00:31:20,479 --> 00:31:18,659
that is good that's the right way i can

702
00:31:23,869 --> 00:31:20,489
give you another if you got just ten

703
00:31:26,389 --> 00:31:23,879
seconds another good example on the RCS

704
00:31:28,579 --> 00:31:26,399
tanks they were made out of titanium 28

705
00:31:32,209 --> 00:31:28,589
days into a 30 day test one story

706
00:31:34,189 --> 00:31:32,219
leaking various all leak they cut that

707
00:31:37,579 --> 00:31:34,199
piece out analyzed it said it was caused

708
00:31:40,879 --> 00:31:37,589
from finger print that paper came across

709
00:31:44,359 --> 00:31:40,889
my desk I looked at it it looked fine I

710
00:31:46,669 --> 00:31:44,369
signed it sent it on its way sent one of

711
00:31:48,349 --> 00:31:46,679
the engineers out to look at those tanks

712
00:31:49,819 --> 00:31:48,359
he came back says henrik we can't let

713
00:31:52,279 --> 00:31:49,829

him get away with that there was not a

714

00:31:54,859 --> 00:31:52,289

fingerprint I said why he said he'd take

715

00:31:56,050 --> 00:31:54,869

a monkey to get in there put his finger

716

00:31:59,690 --> 00:31:56,060

in there

717

00:32:03,980 --> 00:31:59,700

make a long story short we wouldn't put

718

00:32:07,610 --> 00:32:03,990

10 tanks and test after much arguing

719

00:32:09,950 --> 00:32:07,620

over it but he wouldn't give up every

720

00:32:11,780 --> 00:32:09,960

day he came in at least once it says

721

00:32:14,140 --> 00:32:11,790

Henrik we have to do something about

722

00:32:17,950 --> 00:32:14,150

that that was not a random failure and

723

00:32:20,330 --> 00:32:17,960

so finally I got the nerve to go forward

724

00:32:23,180 --> 00:32:20,340

tell the program manager that we had a

725

00:32:25,220 --> 00:32:23,190

problem and when I did we got 10 tanks

726

00:32:28,010 --> 00:32:25,230

and tests and ninety eight hours in the

727

00:32:29,870 --> 00:32:28,020

test three of them blew up just broke

728

00:32:31,640 --> 00:32:29,880

wide open of course then you didn't have

729

00:32:36,140 --> 00:32:31,650

to worry about it anymore we fixed it

730

00:32:39,380 --> 00:32:36,150

but it is through his integrity and his

731

00:32:41,480 --> 00:32:39,390

concern and him not letting it die that

732

00:32:46,510 --> 00:32:41,490

kept us from having a problem on the

733

00:32:50,300 --> 00:32:46,520

first Paula Paula fight and somehow that

734

00:32:53,180 --> 00:32:50,310

needs to be reinforced every day of

735

00:32:56,000 --> 00:32:53,190

every week you know if you don't do your

736

00:33:00,350 --> 00:32:56,010

job and you don't do it good the bird

737

00:33:03,560 --> 00:33:00,360

will fly and so I see that is one of our

738

00:33:07,340 --> 00:33:03,570

major jobs as managers is to convince

739

00:33:10,940 --> 00:33:07,350

the people that we're working with every

740

00:33:13,430 --> 00:33:10,950

day that it's their responsibility to

741

00:33:16,550 --> 00:33:13,440

understand their hard work and if they

742

00:33:19,340 --> 00:33:16,560

see something that they feel is not

743

00:33:21,470 --> 00:33:19,350

right bring it forward and talk about it

744

00:33:23,830 --> 00:33:21,480

if you don't get the answer you want

745

00:33:26,420 --> 00:33:23,840

that day you bring it forward again and

746

00:33:29,990 --> 00:33:26,430

try to convince the people that you're

747

00:33:33,800 --> 00:33:30,000

right in the final analysis it after you

748

00:33:35,630 --> 00:33:33,810

do that two or three times then you go

749

00:33:37,910 --> 00:33:35,640

back and you do it the way that you've

750

00:33:39,290 --> 00:33:37,920

been directed to do it but you make

751
00:33:43,040 --> 00:33:39,300
every effort to convince them that

752
00:33:46,730 --> 00:33:43,050
you're right we've taken some examples

753
00:33:50,540 --> 00:33:46,740
from Apollo do you have one or two

754
00:33:52,630 --> 00:33:50,550
similar cases and settle progress of

755
00:33:54,920 --> 00:33:52,640
course the thing we didn't talk about

756
00:33:56,150 --> 00:33:54,930
which i think is important as decision

757
00:34:03,440 --> 00:33:56,160
making

758
00:34:05,750 --> 00:34:03,450
even more important in that didn't by

759
00:34:07,760 --> 00:34:05,760
definition not by Tommy decision making

760
00:34:09,020 --> 00:34:07,770
i'm not i don't really mean that you

761
00:34:10,700 --> 00:34:09,030
have to make decision right away it's

762
00:34:12,470 --> 00:34:10,710
got to be timed properly sometimes it's

763
00:34:13,909 --> 00:34:12,480

right away and sometimes you wait and

764

00:34:15,050 --> 00:34:13,919

sometimes you don't always have all the

765

00:34:17,360 --> 00:34:15,060

information you need to make the

766

00:34:20,540 --> 00:34:17,370

decision but sometimes you need to make

767

00:34:23,900 --> 00:34:20,550

the decision without all the information

768

00:34:25,700 --> 00:34:23,910

and the fact that you've the fact that

769

00:34:27,140 --> 00:34:25,710

you've made a timely decision think the

770

00:34:30,590 --> 00:34:27,150

fact that you waited you have a good

771

00:34:35,330 --> 00:34:30,600

chance to be right a couple of items in

772

00:34:39,770 --> 00:34:35,340

the orbit program that come to mind one

773

00:34:42,409 --> 00:34:39,780

was one was early in the program we had

774

00:34:46,270 --> 00:34:42,419

to decide what type of landing system to

775

00:34:48,590 --> 00:34:46,280

use and it was a technology issue which

776
00:34:50,240 --> 00:34:48,600
we were going through in terms of what

777
00:34:55,720 --> 00:34:50,250
was the right technology to pick and we

778
00:34:59,780 --> 00:34:58,730
early part of the program of 72 time

779
00:35:01,850 --> 00:34:59,790
period whether we should go with the

780
00:35:02,930 --> 00:35:01,860
microwave landing system now let it make

781
00:35:04,700 --> 00:35:02,940
the decision today would be pretty

782
00:35:06,680 --> 00:35:04,710
straightforward but in that time period

783
00:35:07,820 --> 00:35:06,690
it was pretty hard to decide whether you

784
00:35:08,750 --> 00:35:07,830
should go with the microwave landing

785
00:35:11,240 --> 00:35:08,760
system and I didn't have all the

786
00:35:14,140 --> 00:35:11,250
information you know I didn't have it

787
00:35:16,820 --> 00:35:14,150
but I thought it was timely to do it and

788
00:35:18,140 --> 00:35:16,830

we I didn't really want to pay the money

789

00:35:21,560 --> 00:35:18,150

to pick up all the technology

790

00:35:22,880 --> 00:35:21,570

development and take that risk on the

791

00:35:25,880 --> 00:35:22,890

other hand the performance looked awful

792

00:35:26,960 --> 00:35:25,890

good so weighing that I made the

793

00:35:28,130 --> 00:35:26,970

decision to go with the microwave

794

00:35:30,080 --> 00:35:28,140

landing system it turned out to be the

795

00:35:32,090 --> 00:35:30,090

right decision we went with it's been

796

00:35:37,010 --> 00:35:32,100

very successful and it's been one of our

797

00:35:40,490 --> 00:35:37,020

better systems another one is we were

798

00:35:43,100 --> 00:35:40,500

arguing one evening about the reversed

799

00:35:44,570 --> 00:35:43,110

on me this one was a good decision we

800

00:35:45,950 --> 00:35:44,580

were arguing one time about the number

801
00:35:48,380 --> 00:35:45,960
of structural test articles we need it

802
00:35:49,940 --> 00:35:48,390
and my budget was pretty tight and the

803
00:35:51,530 --> 00:35:49,950
engineering people came in and said we

804
00:35:53,600 --> 00:35:51,540
needed I forgot how many structural test

805
00:35:55,070 --> 00:35:53,610
articles and and I looked at the budget

806
00:35:57,110 --> 00:35:55,080
that would cost do that and I said no

807
00:35:58,400 --> 00:35:57,120
we're going to cut cut five of them

808
00:35:58,940 --> 00:35:58,410
three or four or five or something like

809
00:36:06,200 --> 00:35:58,950
that

810
00:36:08,510 --> 00:36:06,210
came back to me about two months later

811
00:36:11,329 --> 00:36:08,520
and they really had a very good

812
00:36:13,670 --> 00:36:11,339
technical briefing of why technically

813
00:36:15,200 --> 00:36:13,680

from a safety point of view they really

814

00:36:17,030 --> 00:36:15,210

needed the edit articles and I put them

815

00:36:18,290 --> 00:36:17,040

back in the program and didn't hurt

816

00:36:19,670 --> 00:36:18,300

anything because I didn't make a timely

817

00:36:21,829 --> 00:36:19,680

decision was able to pick up those out

818

00:36:23,150 --> 00:36:21,839

of test articles that ties in two things

819

00:36:25,069 --> 00:36:23,160

one that people were afraid to come back

820

00:36:27,470 --> 00:36:25,079

is Henry pointed out to tell you that

821

00:36:29,900 --> 00:36:27,480

you were wrong and number two I made a

822

00:36:32,359 --> 00:36:29,910

timely decision which gave me time to to

823

00:36:35,329 --> 00:36:32,369

fix the problem so I think there's two

824

00:36:37,060 --> 00:36:35,339

ends of the spectrum and I think Aaron

825

00:36:39,859 --> 00:36:37,070

that's one thing that we have to be

826

00:36:42,920 --> 00:36:39,869

constantly balancing against a correct

827

00:36:45,980 --> 00:36:42,930

decision you know sometimes we can get

828

00:36:49,280 --> 00:36:45,990

in the trap or a mold of feeling like we

829

00:36:51,200 --> 00:36:49,290

might make a mistake and a lot of times

830

00:36:52,970 --> 00:36:51,210

the greatest mistake of all is not

831

00:36:54,710 --> 00:36:52,980

making a decision well I think that's

832

00:36:58,579 --> 00:36:54,720

right and I do think the other thing is

833

00:37:00,380 --> 00:36:58,589

I think you have to be able and be able

834

00:37:02,599 --> 00:37:00,390

to accept the criticism and the fact

835

00:37:03,890 --> 00:37:02,609

that you made a bad decision and reverse

836

00:37:09,440 --> 00:37:03,900

yourself if you have to i think that's

837

00:37:12,079 --> 00:37:09,450

another absalon characteristic we've

838

00:37:15,109 --> 00:37:12,089

talked right up until now about the

839

00:37:17,359 --> 00:37:15,119

details of managing a project that both

840

00:37:19,190 --> 00:37:17,369

you and Henry have also managed line

841

00:37:22,040 --> 00:37:19,200

organizations and I'd like you to

842

00:37:23,990 --> 00:37:22,050

comment on what you perceive is the

843

00:37:28,190 --> 00:37:24,000

differences in the management of a line

844

00:37:29,569 --> 00:37:28,200

organization versus a product there are

845

00:37:30,920 --> 00:37:29,579

a lot of similarities there's no

846

00:37:34,430 --> 00:37:30,930

question there are a lot of similarities

847

00:37:38,240 --> 00:37:34,440

in managing the project in managing the

848

00:37:40,190 --> 00:37:38,250

line organization I think the biggest

849

00:37:41,300 --> 00:37:40,200

difference is I see and I'd like to hear

850

00:37:43,280 --> 00:37:41,310

what you have to say in Henry I say

851
00:37:45,079 --> 00:37:43,290
after I finish but I I think the biggest

852
00:37:47,839 --> 00:37:45,089
difference I see in managing a line

853
00:37:50,750 --> 00:37:47,849
organization that it does take a lot

854
00:37:52,730 --> 00:37:50,760
more time with your people in a line

855
00:37:54,470 --> 00:37:52,740
organization certainly a center director

856
00:37:57,050 --> 00:37:54,480
and certainly as a director of research

857
00:37:59,990 --> 00:37:57,060
and engineering than it does in managing

858
00:38:01,730 --> 00:38:00,000
a project takes a lot more time you

859
00:38:04,430 --> 00:38:01,740
still have trade-offs as managing

860
00:38:08,000 --> 00:38:04,440
institution versus managing a project

861
00:38:09,140 --> 00:38:08,010
it's not as strong on the cost and

862
00:38:11,870 --> 00:38:09,150
schedule

863
00:38:14,900 --> 00:38:11,880

performance as much as is on parameter

864

00:38:16,519 --> 00:38:14,910

parameters but like parameters so

865

00:38:18,380 --> 00:38:16,529

there's a lot of similarity and I think

866

00:38:20,990 --> 00:38:18,390

the fundamental but I do go back to say

867

00:38:22,309 --> 00:38:21,000

to you that the fundamental that way

868

00:38:24,319 --> 00:38:22,319

that we start off this discussion the

869

00:38:28,220 --> 00:38:24,329

fundamental characteristics I think are

870

00:38:31,039 --> 00:38:28,230

about the same general I think you're

871

00:38:33,260 --> 00:38:31,049

right right on here and the the major

872

00:38:36,049 --> 00:38:33,270

difference that I see between being a

873

00:38:39,410 --> 00:38:36,059

project manager and being a director of

874

00:38:43,220 --> 00:38:39,420

a lion organization is that you have the

875

00:38:46,579 --> 00:38:43,230

administrative responsibilities your

876

00:38:49,910 --> 00:38:46,589

people as a lion organization we're

877

00:38:52,210 --> 00:38:49,920

generally a project manager spends very

878

00:38:55,130 --> 00:38:52,220

little time in the administrative

879

00:38:57,049 --> 00:38:55,140

responsibilities with their people first

880

00:38:58,510 --> 00:38:57,059

off they don't have a large number of

881

00:39:01,670 --> 00:38:58,520

people that they have to supervise

882

00:39:03,620 --> 00:39:01,680

directly they have a lot of people that

883

00:39:06,200 --> 00:39:03,630

support them but they don't have to

884

00:39:08,599 --> 00:39:06,210

worry about the administrative part of

885

00:39:12,079 --> 00:39:08,609

it and that's a large part of trying to

886

00:39:15,529 --> 00:39:12,089

keep the spirit up the the can-do

887

00:39:18,109 --> 00:39:15,539

attitude up in an organization and that

888

00:39:19,940 --> 00:39:18,119

responsibility of 40 followers online

889

00:39:23,930 --> 00:39:19,950

organization tility head say about that

890

00:39:26,240 --> 00:39:23,940

well I think Henry's point I is the one

891

00:39:28,910 --> 00:39:26,250

that comes to my mind is is that line

892

00:39:30,859 --> 00:39:28,920

organizations management's primary

893

00:39:34,460 --> 00:39:30,869

responsibility is the development of

894

00:39:38,450 --> 00:39:34,470

their people and the people are then

895

00:39:42,529 --> 00:39:38,460

used to support the programs so it's a

896

00:39:46,809 --> 00:39:42,539

it's much more of a paternal kind of

897

00:39:51,270 --> 00:39:46,819

management as opposed to objective

898

00:39:58,240 --> 00:39:55,809

what do you see to be the the most

899

00:40:01,020 --> 00:39:58,250

significant issues that we're going to

900

00:40:09,640 --> 00:40:01,030

face in the next five to ten years or

901
00:40:11,829 --> 00:40:09,650
well I think as far as a NASA is

902
00:40:15,760 --> 00:40:11,839
concerned NASA specifically I think we

903
00:40:18,370 --> 00:40:15,770
need to continue to maintain our

904
00:40:23,500 --> 00:40:18,380
technical excellence I feel that we need

905
00:40:24,970 --> 00:40:23,510
to continue to bring on good people we

906
00:40:29,400 --> 00:40:24,980
need to continue to train our good

907
00:40:31,990 --> 00:40:29,410
people we need to give them the right a

908
00:40:35,530 --> 00:40:32,000
working environment in terms of

909
00:40:37,859 --> 00:40:35,540
facilities in terms of laboratories we

910
00:40:40,510 --> 00:40:37,869
want to stay a technically proficient

911
00:40:43,359 --> 00:40:40,520
organization and I think that's probably

912
00:40:47,710 --> 00:40:43,369
the fundamental thing for all NASA

913
00:40:52,359 --> 00:40:47,720

centers we want to be sure they have the

914

00:40:54,130 --> 00:40:52,369

right capability to maintain their

915

00:40:55,839 --> 00:40:54,140

educational proficiency their formal

916

00:40:59,170 --> 00:40:55,849

education whatever field it may be I

917

00:41:02,020 --> 00:40:59,180

think that's important I think we need

918

00:41:04,569 --> 00:41:02,030

to issue and I personally have talked

919

00:41:08,200 --> 00:41:04,579

many times I think we need to have

920

00:41:11,349 --> 00:41:08,210

successful programs I think failures are

921

00:41:14,440 --> 00:41:11,359

very devastating and we need to be able

922

00:41:17,980 --> 00:41:14,450

to maintain the momentum whether it's a

923

00:41:21,069 --> 00:41:17,990

man program whether it's a man program

924

00:41:25,450 --> 00:41:21,079

we need to have successful programs and

925

00:41:27,819 --> 00:41:25,460

we need to minimize our risks are

926

00:41:29,200 --> 00:41:27,829

failures on the other hand we can't be

927

00:41:32,920 --> 00:41:29,210

afraid to do something we've got to be

928

00:41:36,400 --> 00:41:32,930

bold we've got to be aggressive so we

929

00:41:38,859 --> 00:41:36,410

can't let that shadow the way we do

930

00:41:40,750 --> 00:41:38,869

things so I would say those are to me

931

00:41:43,359 --> 00:41:40,760

the most significant challenges that we

932

00:41:46,450 --> 00:41:43,369

have in the future the other I guess the

933

00:41:47,829 --> 00:41:46,460

final point is with the advent of the

934

00:41:50,109 --> 00:41:47,839

thing I talked about for multiple

935

00:41:52,240 --> 00:41:50,119

programs large programs things we'd like

936

00:41:55,359 --> 00:41:52,250

to do in the future I think we need to

937

00:41:56,880 --> 00:41:55,369

become even more productive than we are

938

00:42:01,140 --> 00:41:56,890

we have been in the

939

00:42:02,880 --> 00:42:01,150

past and that's in all areas Andrey what

940

00:42:06,110 --> 00:42:02,890

do you see is the meet you I agree with

941

00:42:10,530 --> 00:42:06,120

aarón totally there's two two key areas

942

00:42:14,940 --> 00:42:10,540

one is developing confidence and

943

00:42:16,500 --> 00:42:14,950

maintaining confidence in our people you

944

00:42:20,040 --> 00:42:16,510

know you have to have confidence in

945

00:42:22,500 --> 00:42:20,050

yourself you have to be able to know

946

00:42:25,260 --> 00:42:22,510

where you're coming from in order to

947

00:42:27,750 --> 00:42:25,270

direct and manage a program and that

948

00:42:29,820 --> 00:42:27,760

takes time to develop especially with

949

00:42:32,370 --> 00:42:29,830

the young people I would say five seven

950

00:42:35,760 --> 00:42:32,380

eight years to develop that confidence

951
00:42:38,790 --> 00:42:35,770
in themselves and I think we've been

952
00:42:41,070 --> 00:42:38,800
blessed with that I also think that we

953
00:42:43,830 --> 00:42:41,080
have to continue to look at more

954
00:42:47,310 --> 00:42:43,840
efficient ways and better ways of doing

955
00:42:49,590 --> 00:42:47,320
business to eliminate duplication it is

956
00:42:52,320 --> 00:42:49,600
not possible for us to continue doing

957
00:42:54,450 --> 00:42:52,330
business the way we are and support all

958
00:42:56,790 --> 00:42:54,460
of the programs that's on the plate and

959
00:42:59,070 --> 00:42:56,800
do all the things that we are to be

960
00:43:01,350 --> 00:42:59,080
doing you know we're just now to the

961
00:43:05,460 --> 00:43:01,360
point of where we can make space a fun

962
00:43:07,710 --> 00:43:05,470
place to work and play in and there's a

963
00:43:11,970 --> 00:43:07,720

lot more work out there that needs to be

964

00:43:14,070 --> 00:43:11,980

done and we can get around to so I see

965

00:43:19,320 --> 00:43:14,080

that is the two major areas that we have

966

00:43:21,840 --> 00:43:19,330

to work on Aaron what should young

967

00:43:25,110 --> 00:43:21,850

engineers or other professionals just

968

00:43:27,510 --> 00:43:25,120

starting out on their careers in NASA do

969

00:43:30,270 --> 00:43:27,520

to prepare themselves for positions in

970

00:43:31,950 --> 00:43:30,280

management well I think first and

971

00:43:33,900 --> 00:43:31,960

foremost whatever their field is as you

972

00:43:35,490 --> 00:43:33,910

pointed out whether it be in the

973

00:43:37,890 --> 00:43:35,500

business management area whether it be

974

00:43:39,930 --> 00:43:37,900

in the human resources area or whether

975

00:43:42,300 --> 00:43:39,940

it be in the technical engineering

976
00:43:44,130 --> 00:43:42,310
science area operations area I think you

977
00:43:46,110 --> 00:43:44,140
need a good formal background I think

978
00:43:49,380 --> 00:43:46,120
you cannot get away from a good formal

979
00:43:52,740 --> 00:43:49,390
background in education I think that's

980
00:43:55,740 --> 00:43:52,750
extremely important I think as we start

981
00:43:59,550 --> 00:43:55,750
off this discussion i do think trying to

982
00:44:03,750 --> 00:43:59,560
get some early hands-on experience in a

983
00:44:06,390 --> 00:44:03,760
total systems aspect of a program is

984
00:44:07,960 --> 00:44:06,400
very beneficial and I think that ought

985
00:44:10,810 --> 00:44:07,970
to be in the hardware area if you

986
00:44:13,630 --> 00:44:10,820
and even in the analysis area if you can

987
00:44:15,609 --> 00:44:13,640
or some some type of hands-on experience

988
00:44:18,070 --> 00:44:15,619

whether it be in the engineering area of

989

00:44:19,810 --> 00:44:18,080

science area operations area or even in

990

00:44:21,250 --> 00:44:19,820

as i said the human resource or business

991

00:44:23,500 --> 00:44:21,260

management I think it's very important

992

00:44:24,910 --> 00:44:23,510

to get hands on and start it from the

993

00:44:27,190 --> 00:44:24,920

grounds of the ground up sound like

994

00:44:29,520 --> 00:44:27,200

that's extremely important and I think

995

00:44:34,060 --> 00:44:29,530

the other attributes as I said before

996

00:44:36,280 --> 00:44:34,070

the patient's the integrity honesty and

997

00:44:39,070 --> 00:44:36,290

being able to communicate are the really

998

00:44:43,450 --> 00:44:39,080

the attributes for a young person if he

999

00:44:46,170 --> 00:44:43,460

wants to to make it happen you might say

1000

00:44:49,750 --> 00:44:46,180

in a successful program management arena

1001

00:44:51,550 --> 00:44:49,760

and would you want to comment on I'm not

1002

00:44:54,460 --> 00:44:51,560

too sure i can add a whole lot toward

1003

00:44:56,800 --> 00:44:54,470

hearing that came up with i usually can

1004

00:45:01,510 --> 00:44:56,810

always find something dead into

1005

00:45:04,420 --> 00:45:01,520

something but that's the that's the key

1006

00:45:07,089 --> 00:45:04,430

things that you have to develop

1007

00:45:09,280 --> 00:45:07,099

confidence in yourself and one way a

1008

00:45:12,609 --> 00:45:09,290

person goes about doing that is being

1009

00:45:15,130 --> 00:45:12,619

able to take a project and do it so you

1010

00:45:17,440 --> 00:45:15,140

get a feel for what it takes to do that

1011

00:45:19,270 --> 00:45:17,450

job and then you get a feel for what it

1012

00:45:22,900 --> 00:45:19,280

takes to do a little bit toward your job

1013

00:45:25,690 --> 00:45:22,910

and a little bit bigger job and I'm a

1014

00:45:27,640 --> 00:45:25,700

firm believer on a person starting out

1015

00:45:29,620 --> 00:45:27,650

at the bottom and an organization and

1016

00:45:32,440 --> 00:45:29,630

learning the trade and working the way

1017

00:45:34,150 --> 00:45:32,450

up through the through the system and I

1018

00:45:35,770 --> 00:45:34,160

think it's those first years the

1019

00:45:38,230 --> 00:45:35,780

foundation that you get during those

1020

00:45:41,380 --> 00:45:38,240

first few years there's extremely

1021

00:45:43,810 --> 00:45:41,390

crucial to doing a good job having the

1022

00:45:45,010 --> 00:45:43,820

tools to do a good job down let me tell

1023

00:45:47,260 --> 00:45:45,020

you into this Joe you've been around a

1024

00:45:50,050 --> 00:45:47,270

long time but you seem you've seen it

1025

00:45:54,190 --> 00:45:50,060

all happened what's your take on it well

1026

00:45:56,440 --> 00:45:54,200

I think I'm a subscriber as you and

1027

00:45:59,530 --> 00:45:56,450

Henry are to the early hands-on

1028

00:46:03,700 --> 00:45:59,540

experience and I think there's a reason

1029

00:46:07,240 --> 00:46:03,710

for that in the sense that once you have

1030

00:46:09,220 --> 00:46:07,250

become expert in something yourself when

1031

00:46:10,960 --> 00:46:09,230

you move into positions where you deal

1032

00:46:13,750 --> 00:46:10,970

with subjects that you're not so

1033

00:46:16,260 --> 00:46:13,760

knowledgeable about the content you have

1034

00:46:18,750 --> 00:46:16,270

learned how to recognize the

1035

00:46:22,230 --> 00:46:18,760

of an expert because it has

1036

00:46:24,960 --> 00:46:22,240

characteristics or tool marks and it

1037

00:46:30,630 --> 00:46:24,970

helps you in evaluating the decisions

1038

00:46:32,880 --> 00:46:30,640

you have to make we've talked about our

1039

00:46:34,800 --> 00:46:32,890

relationships with the contractor and

1040

00:46:37,320 --> 00:46:34,810

within the various elements within the

1041

00:46:39,420 --> 00:46:37,330

center one of the things that it might

1042

00:46:41,520 --> 00:46:39,430

be worthwhile to talk to Aaron about

1043

00:46:44,130 --> 00:46:41,530

program management as we're doing it in

1044

00:46:46,380 --> 00:46:44,140

the station is our relationships with

1045

00:46:48,090 --> 00:46:46,390

our headquarters and our sister setters

1046

00:46:50,820 --> 00:46:48,100

well I think that's a good point I'm

1047

00:46:52,830 --> 00:46:50,830

really glad you address that I think it

1048

00:46:55,070 --> 00:46:52,840

gets back to really what I said before

1049

00:46:58,200 --> 00:46:55,080

on item I said before is teamwork

1050

00:47:01,350 --> 00:46:58,210

there's no question that teamwork is

1051
00:47:03,180 --> 00:47:01,360
really is really the element i guess the

1052
00:47:05,790 --> 00:47:03,190
underlying element of all success I

1053
00:47:09,090 --> 00:47:05,800
think we've got to have teamwork with

1054
00:47:11,520 --> 00:47:09,100
our with our centers but the centers

1055
00:47:14,610 --> 00:47:11,530
within NASA and we certainly have to

1056
00:47:16,500 --> 00:47:14,620
support the program directors and the

1057
00:47:18,750 --> 00:47:16,510
assoc administrators and headquarters

1058
00:47:20,610 --> 00:47:18,760
because they are really the people that

1059
00:47:22,530 --> 00:47:20,620
are setting the stage for the whole

1060
00:47:24,930 --> 00:47:22,540
program and I think we need to have

1061
00:47:26,010 --> 00:47:24,940
teamwork with them and for them and with

1062
00:47:28,400 --> 00:47:26,020
the center's I think that's extremely

1063
00:47:30,900 --> 00:47:28,410

important and I think I've seen that

1064

00:47:32,730 --> 00:47:30,910

come a long way I think we have come a

1065

00:47:34,500 --> 00:47:32,740

long way in that regard I think we all

1066

00:47:38,430 --> 00:47:34,510

recognize that's going to be the element

1067

00:47:40,110 --> 00:47:38,440

of success both our man programs and our

1068

00:47:41,880 --> 00:47:40,120

unmanned programs and I think we're

1069

00:47:44,130 --> 00:47:41,890

demonstrating that more and more every

1070

00:47:46,440 --> 00:47:44,140

day with the leadership we have of the

1071

00:47:47,550 --> 00:47:46,450

center directors and the Sochi

1072

00:47:48,450 --> 00:47:47,560

administrators and with the

1073

00:47:50,660 --> 00:47:48,460

administrator and deputy administrator

1074

00:47:53,000 --> 00:47:50,670

so I think it's extremely important

1075

00:47:55,350 --> 00:47:53,010

every how do you see the relationship

1076

00:48:04,030 --> 00:47:55,360

amongst the various directors of

1077

00:48:09,460 --> 00:48:06,770

Ill don't know quite how to answer that

1078

00:48:14,510 --> 00:48:09,470

because i don't know how it used to be

1079

00:48:18,700 --> 00:48:14,520

that good but i tend to agree with aarón

1080

00:48:23,810 --> 00:48:18,710

that the thing that we have to have is

1081

00:48:25,700 --> 00:48:23,820

honesty integrity teamwork you know

1082

00:48:29,540 --> 00:48:25,710

you've got to have those three and

1083

00:48:32,710 --> 00:48:29,550

you've got to have us sincere desire to

1084

00:48:36,290 --> 00:48:32,720

try to do what is right for the program

1085

00:48:41,240 --> 00:48:36,300

you know you can't let too many other

1086

00:48:45,290 --> 00:48:41,250

things creep in and as long as we can

1087

00:48:49,010 --> 00:48:45,300

keep our focus on trying to figure out

1088

00:48:51,740 --> 00:48:49,020

what is really the best thing to do and

1089

00:48:53,030 --> 00:48:51,750

get on and do it and make a decision you

1090

00:48:57,280 --> 00:48:53,040

know I think that's one of the most

1091

00:49:05,060 --> 00:49:01,370

Erin I think we've covered most of the

1092

00:49:06,800 --> 00:49:05,070

points that come to my mind as to what

1093

00:49:09,560 --> 00:49:06,810

one should address in program and

1094

00:49:13,940 --> 00:49:09,570

project management but perhaps you would

1095

00:49:19,130 --> 00:49:13,950

like to summarize what you think of as

1096

00:49:22,970 --> 00:49:19,140

the key tools that the manager has to

1097

00:49:26,750 --> 00:49:22,980

achieve his objectives well the one

1098

00:49:28,609 --> 00:49:26,760

thing that a manager doesn't like or two

1099

00:49:32,960 --> 00:49:28,619

things a manager doesn't like one is a

1100

00:49:35,780 --> 00:49:32,970

surprise and the other as a failure and

1101

00:49:39,020 --> 00:49:35,790

that surprise could be in the budgetary

1102

00:49:40,790 --> 00:49:39,030

the schedule area are the performance

1103

00:49:42,170 --> 00:49:40,800

area and the same thing with the failure

1104

00:49:45,080 --> 00:49:42,180

whether it be a test failure or whether

1105

00:49:48,740 --> 00:49:45,090

it be something more significant so I

1106

00:49:53,000 --> 00:49:48,750

think the with those underlying issues

1107

00:49:56,270 --> 00:49:53,010

and those underlying stipulations I

1108

00:49:59,930 --> 00:49:56,280

think you have to have the intelligence

1109

00:50:04,099 --> 00:49:59,940

and the staying power you might say

1110

00:50:08,150 --> 00:50:04,109

which is what I would say is almost a 24

1111

00:50:10,910 --> 00:50:08,160

hour day 7 day a week job to keep on top

1112

00:50:12,740 --> 00:50:10,920

of those parameters so that you don't

1113

00:50:14,630 --> 00:50:12,750

get surprised you don't have a failure

1114

00:50:16,850 --> 00:50:14,640

and it's just by working the details

1115

00:50:19,400 --> 00:50:16,860

have people that are willing to bring

1116

00:50:20,720 --> 00:50:19,410

you those that information and have

1117

00:50:24,070 --> 00:50:20,730

people that willing to help you make

1118

00:50:26,900 --> 00:50:24,080

those decisions whether it be your your

1119

00:50:29,210 --> 00:50:26,910

your own people or your contractors that

1120

00:50:31,670 --> 00:50:29,220

help you make those decisions so I think

1121

00:50:34,610 --> 00:50:31,680

if you can if you can set that type of

1122

00:50:36,890 --> 00:50:34,620

work if you can if you can put that type

1123

00:50:38,930 --> 00:50:36,900

of energy into it and you can get that

1124

00:50:40,370 --> 00:50:38,940

type of people around you not have yes

1125

00:50:42,320 --> 00:50:40,380

people around you but have people that

1126

00:50:44,810 --> 00:50:42,330

will bring you the problems and bring

1127

00:50:46,370 --> 00:50:44,820

you the potential solutions I think

1128

00:50:51,110 --> 00:50:46,380

you've got a very very high probability

1129

00:50:54,430 --> 00:50:51,120

of avoiding the pitfalls of the type of

1130

00:50:58,210 --> 00:50:54,440

things that would cause you to to fail

1131

00:51:00,770 --> 00:50:58,220

Henry do you have any further coming

1132

00:51:07,040 --> 00:51:00,780

program managers got to be tough as

1133

00:51:14,480 --> 00:51:07,050

nails I mean you've got to you you've

1134

00:51:20,060 --> 00:51:14,490

got to not feel intimidated or not let

1135

00:51:23,030 --> 00:51:20,070

the system overwhelming there's lots of

1136

00:51:24,380 --> 00:51:23,040

decisions that are tough tough decisions

1137

00:51:27,560 --> 00:51:24,390

decisions that's going to make

1138

00:51:29,900 --> 00:51:27,570

absolutely no one happy that has to be

1139

00:51:32,360 --> 00:51:29,910

made and they have to be made a timely

1140

00:51:35,330 --> 00:51:32,370

fashion and it takes someone with a

1141

00:51:39,230 --> 00:51:35,340

great deal of fortitude to be able to

1142

00:51:45,320 --> 00:51:39,240

make those decisions and make them in a

1143

00:51:47,120 --> 00:51:45,330

timely decisive kind of a way and I

1144

00:51:49,190 --> 00:51:47,130

think that's one of the most important

1145

00:51:51,440 --> 00:51:49,200

ingredients that a project manager has

1146

00:51:55,760 --> 00:51:51,450

to have that tends to differentiate a

1147

00:51:58,220 --> 00:51:55,770

project manager from a director of

1148

00:52:00,680 --> 00:51:58,230

engineering or division chief for some

1149

00:52:03,110 --> 00:52:00,690

of those other kinds of jobs there's

1150

00:52:05,060 --> 00:52:03,120

lots of unpopular decisions that has to

1151
00:52:06,890 --> 00:52:05,070
be made and someone has to make it in

1152
00:52:09,530 --> 00:52:06,900
that decision generally falls on a

1153
00:52:15,350 --> 00:52:13,040
for our last observation Aaron I'd like

1154
00:52:20,390 --> 00:52:15,360
to address you to address the question

1155
00:52:23,870 --> 00:52:20,400
that says we're losing the generation

1156
00:52:29,270 --> 00:52:23,880
that has had this experience of mercury

1157
00:52:31,400 --> 00:52:29,280
gemense Skylab Apollo shuttle and some

1158
00:52:34,220 --> 00:52:31,410
people express a concern as to whether

1159
00:52:37,610 --> 00:52:34,230
we will have the management capability

1160
00:52:40,460 --> 00:52:37,620
and depth as we go into the future well

1161
00:52:42,680 --> 00:52:40,470
I think we are losing we have lost a lot

1162
00:52:44,180 --> 00:52:42,690
of people that regard the time has

1163
00:52:45,110 --> 00:52:44,190

caught up with us in that regard or

1164

00:52:47,870 --> 00:52:45,120

times caught up with some of the people

1165

00:52:51,320 --> 00:52:47,880

on the other hand I really think from a

1166

00:52:55,270 --> 00:52:51,330

more positive point of view I think that

1167

00:52:58,340 --> 00:52:55,280

we do still have a lot of people around

1168

00:53:02,000 --> 00:52:58,350

good people around we do have education

1169

00:53:04,040 --> 00:53:02,010

programs we do recognize I think the key

1170

00:53:05,750 --> 00:53:04,050

elements of good program management and

1171

00:53:07,580 --> 00:53:05,760

the key elements that are going to

1172

00:53:08,960 --> 00:53:07,590

require a person to have the tools to be

1173

00:53:11,330 --> 00:53:08,970

a good program manager or a good

1174

00:53:12,890 --> 00:53:11,340

engineer or a good scientist or business

1175

00:53:15,530 --> 00:53:12,900

management I think we recognize those

1176
00:53:17,750 --> 00:53:15,540
and I would say this I would say that

1177
00:53:19,160 --> 00:53:17,760
the people that I see the young men and

1178
00:53:22,370 --> 00:53:19,170
women coming out of the universities

1179
00:53:23,690 --> 00:53:22,380
today I'm pretty high on them I look at

1180
00:53:24,920 --> 00:53:23,700
what some of the young people we've

1181
00:53:28,940 --> 00:53:24,930
hired and we're hiring quite a few as

1182
00:53:31,940 --> 00:53:28,950
I'm sure all centers are i think i have

1183
00:53:33,830 --> 00:53:31,950
no question in my mind i really have no

1184
00:53:37,010 --> 00:53:33,840
question in my mind that they will be

1185
00:53:39,530 --> 00:53:37,020
able to step up to the challenge of the

1186
00:53:40,760 --> 00:53:39,540
large new programs that i hope that that

1187
00:53:42,140 --> 00:53:40,770
we're working on that will come to pass

1188
00:53:43,880 --> 00:53:42,150

in the future which i think will come to

1189

00:53:45,020 --> 00:53:43,890

pass in the future and i just have no

1190

00:53:46,730 --> 00:53:45,030

question my mind that we're going to

1191

00:53:48,860 --> 00:53:46,740

have the right people we got the right

1192

00:53:51,350 --> 00:53:48,870

attitude we got the right leadership all

1193

00:53:53,000 --> 00:53:51,360

the center's feel that way so I just I

1194

00:53:55,310 --> 00:53:53,010

feel that we keep going down the path

1195

00:53:57,500 --> 00:53:55,320

we're going with the emphasis we have

1196

00:54:00,110 --> 00:53:57,510

that will have the capability to do the

1197

00:54:01,790 --> 00:54:00,120

big programs in the future Henry would

1198

00:54:03,620 --> 00:54:01,800

you like to come in I didn't agree with

1199

00:54:05,480 --> 00:54:03,630

air and a hundred percent I think we

1200

00:54:10,370 --> 00:54:05,490

need to remember that we went to the

1201
00:54:12,980 --> 00:54:10,380
moon with a young team of people you

1202
00:54:16,610 --> 00:54:12,990
know we had a few experienced people and

1203
00:54:18,950 --> 00:54:16,620
a lot of kids out there and not a one of

1204
00:54:19,810 --> 00:54:18,960
them let us down the ones that we're

1205
00:54:23,470 --> 00:54:19,820
getting today

1206
00:54:26,170 --> 00:54:23,480
or the country's finest you know they're

1207
00:54:28,210 --> 00:54:26,180
much better educated than we were they

1208
00:54:31,420 --> 00:54:28,220
have a much better foundation start out

1209
00:54:34,260 --> 00:54:31,430
they work just as hard they have the

1210
00:54:37,810 --> 00:54:34,270
same kind of worth a death at we had and

1211
00:54:40,150 --> 00:54:37,820
I think when the time comes for them to

1212
00:54:42,940 --> 00:54:40,160
take over this responsibility they will

1213
00:54:46,060 --> 00:54:42,950

not let the country down I'm confident

1214

00:54:48,100 --> 00:54:46,070

of that I don't think you can give them

1215

00:54:54,040 --> 00:54:48,110

too much responsibility to quick right

1216

00:54:58,540 --> 00:54:54,050

now Aaron Henry thank you very much and

1217

00:55:01,000 --> 00:54:58,550

this concludes this discussion of

1218

00:55:03,820 --> 00:55:01,010

program and project management in a

1219

00:55:07,430 --> 00:55:03,830

manned space flight program setting you