1
00:00:05,200 --> 00:00:19,990
hey

2
00:00:25,349 --> 00:00:22,550
this is the nasa johnson space center

3
00:00:27,269 --> 00:00:25,359
home of america's astronauts and control

4
00:00:41,750 --> 00:00:27,279
center for the nation's manned space

5
00:00:46,069 --> 00:00:43,590
it is also the center for a team of

6
00:00:54,150 --> 00:00:46,079
highly qualified aerospace engineers who

7
00:00:57,910 --> 00:00:56,150
but before we have a closer look let's

8
00:01:00,470 --> 00:00:57,920
see if we can answer a few questions

9
00:01:02,229 --> 00:01:00,480
like what is an engineer

10
00:01:04,310 --> 00:01:02,239
what does the engineer do

11
00:01:05,590 --> 00:01:04,320
at what point does an engineer start to

12
00:01:08,070 --> 00:01:05,600
specialize

13
00:01:10,630 --> 00:01:08,080

would the field of engineering decrease

14
00:01:11,590 --> 00:01:10,640
as more people study or go into the

15
00:01:14,149 --> 00:01:11,600
field

16
00:01:16,310 --> 00:01:14,159
what type of background

17
00:01:18,469 --> 00:01:16,320
and knowledge must the aerospace

18
00:01:21,109 --> 00:01:18,479
engineer have to obtain a good job with

19
00:01:23,109 --> 00:01:21,119
a place like nasa or mcdonald douglas

20
00:01:25,109 --> 00:01:23,119
what are the newer fields of engineering

21
00:01:29,749 --> 00:01:25,119
and what does a biomedical engineer

22
00:01:33,510 --> 00:01:31,749
people help with farming

23
00:01:36,710 --> 00:01:33,520
and policemen

24
00:01:41,109 --> 00:01:38,870
but what about engineers let's talk to

25
00:01:42,870 --> 00:01:41,119
some engineers from nasa's johnson space

26
00:01:44,630 --> 00:01:42,880
center to see if we can find out how

27
00:01:46,710 --> 00:01:44,640
they became engineers

28
00:01:50,149 --> 00:01:46,720
and what they think is important about

29
00:01:52,950 --> 00:01:50,159
their jobs this is the atm science room

30
00:01:55,910 --> 00:01:52,960
during skylab we monitored the apollo

31
00:01:57,910 --> 00:01:55,920
telescope mount from this room this

32
00:02:00,069 --> 00:01:57,920
console monitored the white light

33
00:02:03,109 --> 00:02:00,079
chronograph which was an instrument to

34
00:02:05,030 --> 00:02:03,119
look at the sun in the visible spectrum

35
00:02:07,270 --> 00:02:05,040
the coronagraph worked in such a manner

36
00:02:09,510 --> 00:02:07,280
that there was a disc which blocked out

37
00:02:10,949 --> 00:02:09,520
the full face of the sun

38
00:02:13,270 --> 00:02:10,959

and we were really interested in what

39
00:02:15,270 --> 00:02:13,280
was called the corona this was a big

40
00:02:17,510 --> 00:02:15,280
mass of material and we were able to

41
00:02:19,830 --> 00:02:17,520
capture with the white light runoff

42
00:02:22,229 --> 00:02:19,840
during skylab we had to work with

43
00:02:24,470 --> 00:02:22,239
scientists across the united states and

44
00:02:27,190 --> 00:02:24,480
helped them design scientific

45
00:02:29,110 --> 00:02:27,200
instruments which would study the sun

46
00:02:31,750 --> 00:02:29,120
we designed those instruments from an

47
00:02:34,869 --> 00:02:31,760
operational standpoint the scientists

48
00:02:36,869 --> 00:02:34,879
designed it from a scientific standpoint

49
00:02:37,670 --> 00:02:36,879
knowing what their scientific objectives

50
00:02:39,910 --> 00:02:37,680
were

51
00:02:42,070 --> 00:02:39,920
we got involved and helped them to

52
00:02:44,150 --> 00:02:42,080
design the instruments in such a fashion

53
00:02:45,350 --> 00:02:44,160
that they would be controllable from the

54
00:02:47,750 --> 00:02:45,360
ground

55
00:02:49,910 --> 00:02:47,760
we could look at the right type of data

56
00:02:51,670 --> 00:02:49,920
from the spacecraft and sit at the

57
00:02:53,670 --> 00:02:51,680
consoles and determine how the

58
00:02:56,150 --> 00:02:53,680
instrument is operating it looks like

59
00:02:57,750 --> 00:02:56,160
where to talk the instrument

60
00:02:59,670 --> 00:02:57,760
what to do with it

61
00:03:01,750 --> 00:02:59,680
correct for any malfunctions that

62
00:03:04,869 --> 00:03:01,760
occurred during the flight

63
00:03:07,670 --> 00:03:04,879

i got interested in engineering

64
00:03:11,270 --> 00:03:07,680
back during my high school days

65
00:03:12,790 --> 00:03:11,280
when i was influenced by my teachers

66
00:03:15,270 --> 00:03:12,800
my parents

67
00:03:17,190 --> 00:03:15,280
my father was an automotive mechanic and

68
00:03:19,750 --> 00:03:17,200
ever since i can remember i've been

69
00:03:23,110 --> 00:03:19,760
interested in mechanical gadgets

70
00:03:24,390 --> 00:03:23,120
repairing them taking them apart

71
00:03:26,229 --> 00:03:24,400
and

72
00:03:28,309 --> 00:03:26,239
i thought at that time i wanted to be an

73
00:03:30,949 --> 00:03:28,319
automotive engineer

74
00:03:32,630 --> 00:03:30,959
however during my senior year in

75
00:03:33,990 --> 00:03:32,640
high school

76
00:03:36,550 --> 00:03:34,000
i had a

77
00:03:40,309 --> 00:03:36,560
research project

78
00:03:43,509 --> 00:03:40,319
assigned to me in a chemistry class

79
00:03:49,830 --> 00:03:46,550
determining or finding out how a gadget

80
00:03:53,430 --> 00:03:49,840
word called a cyclotron

81
00:03:55,270 --> 00:03:53,440
during the process of that research i

82
00:03:58,710 --> 00:03:55,280
found out that this instrument was

83
00:04:01,910 --> 00:03:58,720
something used in the field of physics

84
00:04:05,030 --> 00:04:01,920
some magic field of physics that split

85
00:04:07,910 --> 00:04:05,040
small particles atoms

86
00:04:08,869 --> 00:04:07,920
into smaller parts

87
00:04:10,710 --> 00:04:08,879
so

88
00:04:13,509 --> 00:04:10,720

i then became interested in this field

89
00:04:17,349 --> 00:04:13,519
of physics and decided to go to college

90
00:04:20,550 --> 00:04:17,359
and major in the subject of physics

91
00:04:22,870 --> 00:04:20,560
in 1963 i started working at the johnson

92
00:04:25,670 --> 00:04:22,880
space center with the group responsible

93
00:04:28,469 --> 00:04:25,680
for designing the lunar module

94
00:04:30,870 --> 00:04:28,479
the spacecraft which landed on the moon

95
00:04:34,390 --> 00:04:30,880
and later was assigned to a group to

96
00:04:37,110 --> 00:04:34,400
study the lunar surface and to try and

97
00:04:39,510 --> 00:04:37,120
find suitable landing sites for this

98
00:04:44,150 --> 00:04:39,520
lunar module

99
00:04:46,950 --> 00:04:44,160
in 65 i was graduated and at that time

100
00:04:49,110 --> 00:04:46,960
or during that time is when i sat at

101
00:04:52,310 --> 00:04:49,120
this console

102
00:04:53,510 --> 00:04:52,320
and monitored the skylab mission

103
00:04:55,590 --> 00:04:53,520
coming from a

104
00:04:58,230 --> 00:04:55,600
poor family my dad certainly couldn't

105
00:05:00,310 --> 00:04:58,240
afford to send me to school and

106
00:05:02,469 --> 00:05:00,320
the only way that i could go was if if

107
00:05:03,670 --> 00:05:02,479
somewhere i was managed to

108
00:05:05,830 --> 00:05:03,680
get the money

109
00:05:07,670 --> 00:05:05,840
either through a scholarship or

110
00:05:10,710 --> 00:05:07,680
through the military which is one of the

111
00:05:13,189 --> 00:05:10,720
areas that was certainly open to me and

112
00:05:15,350 --> 00:05:13,199
i went went ahead through school and i

113
00:05:16,070 --> 00:05:15,360

finally got involved in the classes such

114
00:05:18,550 --> 00:05:16,080
as

115
00:05:21,350 --> 00:05:18,560
math and science and physics and these

116
00:05:23,749 --> 00:05:21,360
are courses that i really enjoyed and

117
00:05:25,270 --> 00:05:23,759
the thing that distinguished

118
00:05:28,550 --> 00:05:25,280
students that were in the math and the

119
00:05:31,430 --> 00:05:28,560
physics area you know this type of

120
00:05:33,029 --> 00:05:31,440
scientific type courses was that hey if

121
00:05:35,189 --> 00:05:33,039
you're taking these kind of courses

122
00:05:37,510 --> 00:05:35,199
you're able to say that you're different

123
00:05:39,830 --> 00:05:37,520
from the average type student which

124
00:05:42,070 --> 00:05:39,840
taking the related math courses or the

125
00:05:43,749 --> 00:05:42,080
easy way out through school and this

126
00:05:45,909 --> 00:05:43,759
this was a challenge to me to be able to

127
00:05:48,710 --> 00:05:45,919
say that i was taking the hard courses

128
00:05:50,950 --> 00:05:48,720
and was still able to get the grades

129
00:05:53,189 --> 00:05:50,960
and this was important to me as far as

130
00:05:55,510 --> 00:05:53,199
as a golden life i always wanted to to

131
00:05:58,870 --> 00:05:55,520
be able to do good in school

132
00:06:00,950 --> 00:05:58,880
and once once i got through my junior

133
00:06:02,390 --> 00:06:00,960
year in high school i had taken most of

134
00:06:04,790 --> 00:06:02,400
the courses that would

135
00:06:06,629 --> 00:06:04,800
make me able to go to college and i had

136
00:06:08,950 --> 00:06:06,639
always been interested in electricity

137
00:06:11,430 --> 00:06:08,960
and it kind of fascinated me and playing

138
00:06:13,189 --> 00:06:11,440

with radios when i was smaller had

139
00:06:15,749 --> 00:06:13,199
helped me to have respect for

140
00:06:17,909 --> 00:06:15,759
electricity and engineering as a whole

141
00:06:19,350 --> 00:06:17,919
and so i stayed with engineering all the

142
00:06:22,550 --> 00:06:19,360
way through school

143
00:06:24,710 --> 00:06:22,560
and finally when i graduated in 74 i

144
00:06:26,629 --> 00:06:24,720
came to work here at nasa and i've been

145
00:06:29,029 --> 00:06:26,639
here for now two and a half years

146
00:06:30,950 --> 00:06:29,039
working with with the electrical

147
00:06:32,790 --> 00:06:30,960
distribution system of the

148
00:06:34,150 --> 00:06:32,800
shuttle itself and we're in charge of

149
00:06:36,309 --> 00:06:34,160
making sure that the right amount of

150
00:06:38,150 --> 00:06:36,319
power gets to the right places now

151
00:06:40,790 --> 00:06:38,160
cheryl and chavarri works in the other

152
00:06:42,390 --> 00:06:40,800
section which is the equipment section

153
00:06:44,469 --> 00:06:42,400
they're in charge of the components

154
00:06:46,790 --> 00:06:44,479
themselves the testing of the components

155
00:06:48,950 --> 00:06:46,800
just to go through the chronology of

156
00:06:51,270 --> 00:06:48,960
what it takes to be an engineer here

157
00:06:53,029 --> 00:06:51,280
take one of my components maybe the

158
00:06:57,110 --> 00:06:53,039
remote power control

159
00:06:59,189 --> 00:06:57,120
we start out with a vendor coming in

160
00:07:01,909 --> 00:06:59,199
with the conception they

161
00:07:02,870 --> 00:07:01,919
they think they've got a design that's

162
00:07:04,629 --> 00:07:02,880
going to

163
00:07:06,950 --> 00:07:04,639

do all the great things for the space

164
00:07:08,790 --> 00:07:06,960
program so they come in and tell us

165
00:07:10,870 --> 00:07:08,800
about their designs

166
00:07:12,150 --> 00:07:10,880
we have to look over the design so you

167
00:07:14,070 --> 00:07:12,160
have to have

168
00:07:16,629 --> 00:07:14,080
some engineering background and you have

169
00:07:18,469 --> 00:07:16,639
to keep up with state of the art because

170
00:07:21,270 --> 00:07:18,479
when people are coming in with something

171
00:07:23,510 --> 00:07:21,280
new it's really new you have to know the

172
00:07:25,589 --> 00:07:23,520
state of art at that time

173
00:07:28,150 --> 00:07:25,599
so they come in with this idea we have

174
00:07:30,710 --> 00:07:28,160
to look over their divine and say yep i

175
00:07:31,749 --> 00:07:30,720
think it will do what we wanted to

176
00:07:33,909 --> 00:07:31,759
and

177
00:07:36,950 --> 00:07:33,919
we go on contract to these people to

178
00:07:39,830 --> 00:07:36,960
maybe make us up some prototypes and

179
00:07:42,469 --> 00:07:39,840
they bring those prototype models in we

180
00:07:45,110 --> 00:07:42,479
take my laboratory and run evaluation

181
00:07:47,270 --> 00:07:45,120
tests and see if they really perform as

182
00:07:49,510 --> 00:07:47,280
they're supposed to once they get all

183
00:07:51,510 --> 00:07:49,520
the bugs out we go up to management and

184
00:07:53,270 --> 00:07:51,520
say these people have a real good idea

185
00:07:55,510 --> 00:07:53,280
it's going to save us money and it's

186
00:07:58,150 --> 00:07:55,520
going to save us space and weight which

187
00:08:00,710 --> 00:07:58,160
is you know our primary concerns on the

188
00:08:02,790 --> 00:08:00,720

shuttle well we have to attend design

189
00:08:05,510 --> 00:08:02,800
reviews to make sure they're doing all

190
00:08:07,670 --> 00:08:05,520
the things that we need to have done we

191
00:08:09,670 --> 00:08:07,680
have environmental requirements that are

192
00:08:12,790 --> 00:08:09,680
different from what the average

193
00:08:14,469 --> 00:08:12,800
industrial person might require and we

194
00:08:17,110 --> 00:08:14,479
have to know something about their

195
00:08:19,830 --> 00:08:17,120
manufacturing techniques because we kind

196
00:08:22,070 --> 00:08:19,840
of have to foresee any problems that

197
00:08:23,830 --> 00:08:22,080
might show up later on when we've

198
00:08:25,749 --> 00:08:23,840
launched something out in space we can't

199
00:08:27,350 --> 00:08:25,759
have any batteries happening

200
00:08:28,790 --> 00:08:27,360
so you have to have a pretty good

201
00:08:30,469 --> 00:08:28,800
background you have to know something

202
00:08:32,469 --> 00:08:30,479
maybe about a little

203
00:08:34,550 --> 00:08:32,479
business you have to know a little

204
00:08:36,630 --> 00:08:34,560
something about production and you have

205
00:08:39,190 --> 00:08:36,640
to know something about engineering so

206
00:08:41,750 --> 00:08:39,200
it takes a very background to do work

207
00:08:44,070 --> 00:08:41,760
here other nasa engineers are looking

208
00:08:45,509 --> 00:08:44,080
beyond the year 2000.

209
00:08:47,910 --> 00:08:45,519
i'm our electrical engineer here at the

210
00:08:51,269 --> 00:08:47,920
johnson space center in houston

211
00:08:53,509 --> 00:08:51,279
right now we're located in building 32

212
00:08:55,430 --> 00:08:53,519
in a vacuum chamber

213
00:08:57,590 --> 00:08:55,440

this vacuum chamber here is probably the

214
00:08:59,829 --> 00:08:57,600
largest in the free world it's an

215
00:09:02,389 --> 00:08:59,839
engineering test unit designed to

216
00:09:05,509 --> 00:09:02,399
simulate the conditions and outer space

217
00:09:06,710 --> 00:09:05,519
it's approximately 120 feet high 65 feet

218
00:09:09,030 --> 00:09:06,720
in diameter

219
00:09:10,470 --> 00:09:09,040
and this door alone here weighs about 40

220
00:09:12,070 --> 00:09:10,480
tons

221
00:09:13,509 --> 00:09:12,080
but for the moment i want to talk to you

222
00:09:16,550 --> 00:09:13,519
a little about

223
00:09:18,310 --> 00:09:16,560
how i got into engineering

224
00:09:19,269 --> 00:09:18,320
i grew up in a small town in central

225
00:09:21,670 --> 00:09:19,279
texas

226
00:09:23,430 --> 00:09:21,680
and my childhood experiences

227
00:09:25,269 --> 00:09:23,440
work very much different than what you

228
00:09:27,190 --> 00:09:25,279
have experienced

229
00:09:28,630 --> 00:09:27,200
as a kid i was a neighborhood bicycle

230
00:09:30,070 --> 00:09:28,640
mechanic

231
00:09:31,990 --> 00:09:30,080
got involved in other activities

232
00:09:34,710 --> 00:09:32,000
involving fixing carburetors on

233
00:09:37,590 --> 00:09:34,720
automobiles and so forth

234
00:09:39,750 --> 00:09:37,600
well my interest in engineering

235
00:09:40,710 --> 00:09:39,760
only flourished after i got into high

236
00:09:44,470 --> 00:09:40,720
school

237
00:09:45,829 --> 00:09:44,480
who

238
00:09:47,509 --> 00:09:45,839

more or less

239
00:09:48,630 --> 00:09:47,519
explained to me what engineering was all

240
00:09:51,269 --> 00:09:48,640
about

241
00:09:53,350 --> 00:09:51,279
and encouraged me to pursue that field

242
00:09:56,150 --> 00:09:53,360
right now we're looking at systems which

243
00:09:57,829 --> 00:09:56,160
will collect energy from the sun

244
00:10:00,070 --> 00:09:57,839
bring it back to the earth and form a

245
00:10:02,470 --> 00:10:00,080
microwave energy and convert electricity

246
00:10:05,509 --> 00:10:02,480
to be used by people like you

247
00:10:07,269 --> 00:10:05,519
these systems are aimed at

248
00:10:09,030 --> 00:10:07,279
solving the problem we have in energy

249
00:10:11,509 --> 00:10:09,040
right now

250
00:10:12,949 --> 00:10:11,519
it gets us away from using coal oil and

251
00:10:14,389 --> 00:10:12,959
natural gas

252
00:10:17,269 --> 00:10:14,399
natural resources that are in short

253
00:10:19,670 --> 00:10:17,279
supply in addition to

254
00:10:21,030 --> 00:10:19,680
collecting solar energy from space

255
00:10:23,269 --> 00:10:21,040
in the future we're going to be looking

256
00:10:25,590 --> 00:10:23,279
at using space in other ways

257
00:10:27,269 --> 00:10:25,600
perhaps by the year 2000 to the year

258
00:10:29,350 --> 00:10:27,279
2025

259
00:10:31,509 --> 00:10:29,360
we'll have thousands of people living

260
00:10:34,230 --> 00:10:31,519
and producing in space

261
00:10:37,190 --> 00:10:34,240
uh we'll have manufacturing

262
00:10:38,949 --> 00:10:37,200
uh production facilities in space

263
00:10:40,389 --> 00:10:38,959

at this point in time

264
00:10:42,790 --> 00:10:40,399
i probably won't be here or even

265
00:10:43,990 --> 00:10:42,800
involved but you will

266
00:10:45,430 --> 00:10:44,000
and these are going to be the kind of

267
00:10:46,710 --> 00:10:45,440
problems that are going to be left to

268
00:10:49,829 --> 00:10:46,720
people like you

269
00:10:51,829 --> 00:10:49,839
and your peers to solve

270
00:10:54,949 --> 00:10:51,839
let's talk to a biomedical engineer and

271
00:10:57,030 --> 00:10:54,959
see what that job's like at nasa i was

272
00:10:58,870 --> 00:10:57,040
really interested in the space program

273
00:11:01,190 --> 00:10:58,880
so that's what i started

274
00:11:04,310 --> 00:11:01,200
really working towards was trying to get

275
00:11:06,870 --> 00:11:04,320
in into nasa and working for nasa

276
00:11:09,190 --> 00:11:06,880
i was i took all the prerequisites for

277
00:11:11,430 --> 00:11:09,200
all the science and engineering courses

278
00:11:13,910 --> 00:11:11,440
in high school once i got into high

279
00:11:19,350 --> 00:11:13,920
school i took just mostly science

280
00:11:20,310 --> 00:11:19,360
courses my in my major was in biophysics

281
00:11:21,430 --> 00:11:20,320
that

282
00:11:23,910 --> 00:11:21,440
really

283
00:11:26,470 --> 00:11:23,920
is also made up of a lot of biochemistry

284
00:11:28,710 --> 00:11:26,480
i have a minor in chemistry and a lot of

285
00:11:30,870 --> 00:11:28,720
physics courses a lot of mathematics

286
00:11:32,870 --> 00:11:30,880
courses started getting interested into

287
00:11:35,269 --> 00:11:32,880
the engineering aspects of it when i

288
00:11:37,190 --> 00:11:35,279

started to look at nasa more seriously

289
00:11:38,230 --> 00:11:37,200
and i started looking for a job with

290
00:11:40,150 --> 00:11:38,240
nasa

291
00:11:42,230 --> 00:11:40,160
i am currently taking courses at the

292
00:11:44,949 --> 00:11:42,240
university of houston as a graduate

293
00:11:47,750 --> 00:11:44,959
student in electronics and i think my

294
00:11:49,990 --> 00:11:47,760
field has really has come

295
00:11:52,230 --> 00:11:50,000
started to be more into electronics

296
00:11:53,509 --> 00:11:52,240
background now

297
00:11:56,150 --> 00:11:53,519
some of the things that i've been

298
00:11:58,630 --> 00:11:56,160
working here at nasa have been three

299
00:12:01,030 --> 00:11:58,640
cardiovascular experiments that had

300
00:12:04,069 --> 00:12:01,040
mainly to do with fluid shifts in the

301
00:12:07,269 --> 00:12:04,079
cardiovascular systems and the way that

302
00:12:08,790 --> 00:12:07,279
the blood circulated within your body in

303
00:12:12,230 --> 00:12:08,800
zero g

304
00:12:14,710 --> 00:12:12,240
now here before you see the lower body

305
00:12:17,030 --> 00:12:14,720
negative pressure device

306
00:12:20,710 --> 00:12:17,040
a device just like this one was flown in

307
00:12:24,710 --> 00:12:22,629
what this device did

308
00:12:25,590 --> 00:12:24,720
is that the person gets in it

309
00:12:27,110 --> 00:12:25,600
and

310
00:12:29,509 --> 00:12:27,120
the legs first

311
00:12:32,230 --> 00:12:29,519
and it seals at your waist then we

312
00:12:34,470 --> 00:12:32,240
reduce the pressure within the module

313
00:12:36,550 --> 00:12:34,480

in zero gravity since you have no

314
00:12:38,389 --> 00:12:36,560
gravity pulling down all the fluids in

315
00:12:40,949 --> 00:12:38,399
your body really collect around your

316
00:12:42,949 --> 00:12:40,959
thorax and your head well this puts a

317
00:12:45,269 --> 00:12:42,959
great strain on your cardiovascular

318
00:12:47,750 --> 00:12:45,279
system we'd like to be seeing what type

319
00:12:48,790 --> 00:12:47,760
of stresses the astronauts are exposed

320
00:12:51,110 --> 00:12:48,800
to

321
00:12:52,790 --> 00:12:51,120
we're taking ekg

322
00:12:54,710 --> 00:12:52,800
blood pressure

323
00:12:57,670 --> 00:12:54,720
and then we've got these capacitance

324
00:12:59,750 --> 00:12:57,680
bands that were put around the legs

325
00:13:02,150 --> 00:12:59,760
and these would measure the difference

326
00:13:04,870 --> 00:13:02,160
of cardiovascular effects both in zero

327
00:13:07,030 --> 00:13:04,880
gravity and here on the ground

328
00:13:09,269 --> 00:13:07,040
before an experiment is actually flown

329
00:13:11,590 --> 00:13:09,279
it goes through a series of tests some

330
00:13:14,069 --> 00:13:11,600
of the tests that we do is deployed in

331
00:13:16,550 --> 00:13:14,079
the zero-g aircraft this aircraft

332
00:13:19,110 --> 00:13:16,560
performs parabolic flights

333
00:13:21,269 --> 00:13:19,120
and it there's a state in the parabola

334
00:13:23,190 --> 00:13:21,279
where you are in zero gravity

335
00:13:26,629 --> 00:13:23,200
now in there which has similar equipment

336
00:13:30,710 --> 00:13:26,639
to this and other experiments

337
00:13:33,190 --> 00:13:30,720
in january of 1975 we had a space lab

338
00:13:34,870 --> 00:13:33,200

simulation in which cardiovascular

339
00:13:37,590 --> 00:13:34,880
experiments and other types of

340
00:13:39,269 --> 00:13:37,600
experiments like vestibular experiments

341
00:13:41,590 --> 00:13:39,279
rat experiments

342
00:13:43,590 --> 00:13:41,600
plant experiments where the hardware was

343
00:13:46,230 --> 00:13:43,600
tested out not only that we test out

344
00:13:49,430 --> 00:13:46,240
procedures we tested out the crew

345
00:13:51,910 --> 00:13:49,440
crew procedures the hardware itself and

346
00:13:55,110 --> 00:13:51,920
the timelines and power that it took for

347
00:13:58,870 --> 00:13:56,949
this engineer is working to see that

348
00:14:01,509 --> 00:13:58,880
when payloads are constructed for the

349
00:14:03,949 --> 00:14:01,519
shuttle they will fit and work well with

350
00:14:06,470 --> 00:14:03,959
the shuttle systems one of our prime

351
00:14:10,069 --> 00:14:06,480
responsibilities in the program office

352
00:14:12,069 --> 00:14:10,079
is to make sure that as the development

353
00:14:15,430 --> 00:14:12,079
of the space shuttle

354
00:14:16,629 --> 00:14:15,440
is completed to try to integrate various

355
00:14:18,949 --> 00:14:16,639
payloads

356
00:14:20,790 --> 00:14:18,959
into the space shell

357
00:14:22,870 --> 00:14:20,800
the space shell

358
00:14:24,310 --> 00:14:22,880
here shows a

359
00:14:27,189 --> 00:14:24,320
payload bay

360
00:14:30,069 --> 00:14:27,199
and the payloads are those pieces of

361
00:14:33,030 --> 00:14:30,079
hardware that have been developed out in

362
00:14:34,310 --> 00:14:33,040
the scientific community an example of

363
00:14:36,470 --> 00:14:34,320

some of the

364
00:14:37,829 --> 00:14:36,480
payloads that will be flying on the

365
00:14:41,670 --> 00:14:37,839
space shuttle

366
00:14:44,230 --> 00:14:41,680
are the space lab which is a carrier

367
00:14:45,590 --> 00:14:44,240
that is designed by the european

368
00:14:47,990 --> 00:14:45,600
countries

369
00:14:51,030 --> 00:14:48,000
and once the space lab is designed it

370
00:14:54,069 --> 00:14:51,040
will be flown on the space shuttle

371
00:14:55,509 --> 00:14:54,079
i think that not only should one be good

372
00:14:58,470 --> 00:14:55,519
in the field of

373
00:15:01,509 --> 00:14:58,480
math physics or chemistry

374
00:15:03,910 --> 00:15:01,519
but he should also be good in english

375
00:15:06,949 --> 00:15:03,920
you know he should be good in writing

376
00:15:10,150 --> 00:15:06,959
because it is very important that one be

377
00:15:12,790 --> 00:15:10,160
able to communicate with people the

378
00:15:15,350 --> 00:15:12,800
ideas that he has been able to come up

379
00:15:17,110 --> 00:15:15,360
with and if he's not able to express or

380
00:15:19,110 --> 00:15:17,120
get his thoughts over

381
00:15:20,470 --> 00:15:19,120
to the person that he's trying to sell

382
00:15:23,189 --> 00:15:20,480
the idea

383
00:15:24,949 --> 00:15:23,199
the math and the physics in my opinion

384
00:15:27,590 --> 00:15:24,959
really doesn't help him

385
00:15:29,829 --> 00:15:27,600
so i think that if the person is good at

386
00:15:32,150 --> 00:15:29,839
changing their oil on his father's car

387
00:15:34,230 --> 00:15:32,160
if he's good in the field of mathematics

388
00:15:36,550 --> 00:15:34,240

if his good was just doing things with

389
00:15:38,550 --> 00:15:36,560
his hands if he want to be a builder i

390
00:15:40,470 --> 00:15:38,560
think that this is an interest that was

391
00:15:41,750 --> 00:15:40,480
generated from within

392
00:15:44,310 --> 00:15:41,760
i think that that's the most important

393
00:15:47,350 --> 00:15:44,320
thing the most important thing is to be

394
00:15:50,389 --> 00:15:47,360
in an atmosphere whereby one can be

395
00:15:53,430 --> 00:15:50,399
exposed to the field and once he's been

396
00:15:54,790 --> 00:15:53,440
exposed i think it has to be left up to

397
00:15:57,269 --> 00:15:54,800
the student

398
00:16:46,310 --> 00:15:57,279
it has to be generated from within as to

399
00:16:50,949 --> 00:16:47,350
building

400
00:16:53,749 --> 00:16:50,959
solving problems making choices

401
00:16:55,749 --> 00:16:53,759
only you know if you want to be an

402
00:16:57,749 --> 00:16:55,759
engineer

403
00:16:59,430 --> 00:16:57,759
but if you make that choice the doors

404
00:17:38,470 --> 00:16:59,440
are open to go as far as your

405
00:17:43,909 --> 00:17:41,430
in just 60 years mankind progressed from

406
00:17:47,190 --> 00:17:43,919
the first short flight at kitty hawk to

407
00:17:48,870 --> 00:17:47,200
the giant leap to the moon

408
00:17:51,110 --> 00:17:48,880
and beyond that now

409
00:17:52,870 --> 00:17:51,120
to the routine access to space with the

410
00:17:55,029 --> 00:17:52,880
space shuttle

411
00:17:57,990 --> 00:17:55,039
this achievement was attained by a team

412
00:18:00,789 --> 00:17:58,000
of specialists who perhaps like you