



1
00:00:06,950 --> 00:00:04,630
hi i'm beth wilson and i'm here today

2
00:00:09,589 --> 00:00:06,960
with ken hyde how are you ken i'm well

3
00:00:11,669 --> 00:00:09,599
thank you and we are at your workshop

4
00:00:13,669 --> 00:00:11,679
the right experience and i was wondering

5
00:00:15,669 --> 00:00:13,679
what the right experience does and what

6
00:00:17,189 --> 00:00:15,679
fascinates you about the wright brothers

7
00:00:19,349 --> 00:00:17,199
well we're inspired by the wright

8
00:00:21,910 --> 00:00:19,359
brothers just the simple fact that they

9
00:00:24,150 --> 00:00:21,920
were so secretive about their work

10
00:00:26,230 --> 00:00:24,160
and how they were able to use just

11
00:00:28,230 --> 00:00:26,240
simple math to develop the airplane

12
00:00:30,470 --> 00:00:28,240
where no one else could do that so

13
00:00:31,910 --> 00:00:30,480

that's our job is to figure out what

14

00:00:33,590 --> 00:00:31,920

they were thinking and how they were

15

00:00:35,990 --> 00:00:33,600

building airplanes and do you build

16

00:00:38,150 --> 00:00:36,000

these airplanes correct we do we build

17

00:00:39,670 --> 00:00:38,160

the aircraft and we reverse engineer

18

00:00:41,750 --> 00:00:39,680

them we have

19

00:00:44,389 --> 00:00:41,760

aerodynamics look at them we put them in

20

00:00:46,790 --> 00:00:44,399

wind tunnels we flight test them and get

21

00:00:48,790 --> 00:00:46,800

as much data as we possibly can

22

00:00:51,110 --> 00:00:48,800

and are you all fearless enough to fly

23

00:00:52,389 --> 00:00:51,120

these things oh yes the airplanes need

24

00:00:53,750 --> 00:00:52,399

to be flown

25

00:00:56,389 --> 00:00:53,760

to barely have

26

00:00:58,709 --> 00:00:56,399

the full joy of the work that we do so

27

00:01:00,549 --> 00:00:58,719

the 1902 glider and the right model b

28

00:01:31,830 --> 00:01:00,559

are all airplanes that we've flown plus

29

00:01:31,840 --> 00:01:55,670

this is 730.

30

00:02:00,310 --> 00:01:57,990

hi i'm beth wilson and i'm coming to you

31

00:02:02,789 --> 00:02:00,320

live from the wright brothers gallery

32

00:02:04,950 --> 00:02:02,799

at the national air and space museum and

33

00:02:07,830 --> 00:02:04,960

today we are talking about this airplane

34

00:02:09,830 --> 00:02:07,840

does anyone know what this airplane is

35

00:02:11,750 --> 00:02:09,840

any guesses

36

00:02:13,670 --> 00:02:11,760

okay well this is the very first

37

00:02:15,190 --> 00:02:13,680

airplane this is the

38

00:02:16,949 --> 00:02:15,200

uh built by the wright brothers it was

39

00:02:19,510 --> 00:02:16,959

the first successful airplane to ever

40

00:02:21,430 --> 00:02:19,520

fly and today is the 100th and 11th

41

00:02:23,430 --> 00:02:21,440

anniversary of that flight and that's

42

00:02:24,790 --> 00:02:23,440

why we're talking to you today so what

43

00:02:26,630 --> 00:02:24,800

we're going to do is i'm going to ask

44

00:02:27,589 --> 00:02:26,640

you all my students here from blow

45

00:02:29,750 --> 00:02:27,599

pierce

46

00:02:31,990 --> 00:02:29,760

what do you need to fly

47

00:02:34,470 --> 00:02:32,000

what do you need

48

00:02:35,910 --> 00:02:34,480

wings you need wings and here on my desk

49

00:02:38,309 --> 00:02:35,920

i know it's a little hard for you all to

50

00:02:39,750 --> 00:02:38,319

see it but i have i have a wing and you

51
00:02:42,070 --> 00:02:39,760
can tell it's a wing shape because it's

52
00:02:44,309 --> 00:02:42,080
fat at this end and then it tapers and

53
00:02:47,110 --> 00:02:44,319
it gets thinner at this end but just as

54
00:02:47,990 --> 00:02:47,120
important as this shape is this shape

55
00:02:49,990 --> 00:02:48,000
okay

56
00:02:53,750 --> 00:02:50,000
now i know this is a little hard to see

57
00:02:57,270 --> 00:02:55,430
so what we've done is we've essentially

58
00:02:59,350 --> 00:02:57,280
taken an airplane wing and sliced it up

59
00:03:01,750 --> 00:02:59,360
so that you could see this section this

60
00:03:03,750 --> 00:03:01,760
is called an airfoil now an airfoil is

61
00:03:05,990 --> 00:03:03,760
curved on the top and it's flat on the

62
00:03:09,430 --> 00:03:06,000
bottom and the way an airfoil works is

63
00:03:10,710 --> 00:03:09,440

it had wings okay i would be going down

64

00:03:12,949 --> 00:03:10,720

the runway

65

00:03:16,309 --> 00:03:12,959

and the air would hit the leading edge

66

00:03:17,990 --> 00:03:16,319

or this front part of the airfoil and

67

00:03:20,309 --> 00:03:18,000

some of the air would go over the top

68

00:03:22,229 --> 00:03:20,319

and some of it would go under the bottom

69

00:03:24,949 --> 00:03:22,239

now the air on the top starts moving

70

00:03:27,430 --> 00:03:24,959

more quickly and this faster moving air

71

00:03:29,270 --> 00:03:27,440

creates a lower pressure so there's less

72

00:03:31,350 --> 00:03:29,280

air pushing on the top but there's

73

00:03:33,509 --> 00:03:31,360

greater pressure up underneath and these

74

00:03:36,869 --> 00:03:33,519

two try and equal out and that's what

75

00:03:39,350 --> 00:03:36,879

lifts a wing or an airplane into the air

76

00:03:42,470 --> 00:03:39,360

now i know this is hard for you to

77

00:03:44,470 --> 00:03:42,480

understand by me just telling you

78

00:03:47,509 --> 00:03:44,480

so you all here in the museum have a

79

00:03:49,589 --> 00:03:47,519

piece of paper right so i want you all

80

00:03:51,270 --> 00:03:49,599

to pinch either end of your piece of

81

00:03:53,030 --> 00:03:51,280

paper

82

00:03:53,990 --> 00:03:53,040

and we're going to put this on our top

83

00:03:55,589 --> 00:03:54,000

lip

84

00:03:57,110 --> 00:03:55,599

and we're going to blow but before we

85

00:03:58,149 --> 00:03:57,120

blow which way is the paper going to go

86

00:03:58,830 --> 00:03:58,159

is it going to go up or is it going to

87

00:04:10,390 --> 00:03:58,840

go

88

00:04:12,710 --> 00:04:10,400

because you are pushing your breath is

89

00:04:14,309 --> 00:04:12,720

pushing the paper up into the air now

90

00:04:15,990 --> 00:04:14,319

we're going to do the same thing but

91

00:04:17,909 --> 00:04:16,000

we're going to put the paper on our

92

00:04:19,430 --> 00:04:17,919

lower lip right here and we're going to

93

00:04:20,789 --> 00:04:19,440

blow but before we blow which way is the

94

00:04:22,150 --> 00:04:20,799

paper going goes it going to go up or is

95

00:04:29,030 --> 00:04:22,160

it going to go down

96

00:04:33,670 --> 00:04:30,870

which way did the paper go

97

00:04:35,990 --> 00:04:33,680

up and it went up because you had faster

98

00:04:38,550 --> 00:04:36,000

moving air over this top surface that

99

00:04:40,950 --> 00:04:38,560

created a lower pressure and that lifted

100

00:04:43,590 --> 00:04:40,960

the paper into the air now the wright

101
00:04:45,270 --> 00:04:43,600
brothers knew that in order to make a

102
00:04:47,430 --> 00:04:45,280
good wing you'd have to have a good

103
00:04:49,909 --> 00:04:47,440
airfoil shape and they tested those

104
00:04:51,749 --> 00:04:49,919
airfoil shapes in a wind tunnel and

105
00:04:54,950 --> 00:04:51,759
right here we have

106
00:04:56,390 --> 00:04:54,960
tom crouch senior curator and

107
00:04:57,909 --> 00:04:56,400
paul glenshaw and they're going to talk

108
00:05:00,469 --> 00:04:57,919
to us a little bit about the the right

109
00:05:03,670 --> 00:05:00,479
wind tunnel

110
00:05:06,070 --> 00:05:03,680
beth well this is beth said is the right

111
00:05:08,629 --> 00:05:06,080
wind tunnel not the real one but it's an

112
00:05:11,510 --> 00:05:08,639
exact replica of it and it's pretty

113
00:05:13,909 --> 00:05:11,520

simple it's just a wooden box down here

114

00:05:15,110 --> 00:05:13,919

and there's a fan inside this metal

115

00:05:18,550 --> 00:05:15,120

housing

116

00:05:22,469 --> 00:05:18,560

so the fan moves air through the wooden

117

00:05:24,870 --> 00:05:22,479

box but the neat part is what's inside

118

00:05:27,430 --> 00:05:24,880

the tunnel this thing is called a

119

00:05:28,790 --> 00:05:27,440

balance and it's what the wright

120

00:05:32,870 --> 00:05:28,800

brothers use

121

00:05:37,270 --> 00:05:32,880

to get the data on their airfoils

122

00:05:39,990 --> 00:05:37,280

the balance is just the thing you

123

00:05:41,110 --> 00:05:40,000

put little model wings just like this

124

00:05:45,350 --> 00:05:41,120

one

125

00:05:47,590 --> 00:05:45,360

has cambers curved

126

00:05:50,950 --> 00:05:47,600

just like best wing was

127

00:05:52,390 --> 00:05:50,960

and so when you turn the wind tunnel on

128

00:05:55,029 --> 00:05:52,400

the little wing

129

00:05:57,350 --> 00:05:55,039

reacts just the way a wing does in the

130

00:05:59,830 --> 00:05:57,360

real air so paul you want to

131

00:06:00,870 --> 00:05:59,840

show us what happens here thanks tom

132

00:06:02,230 --> 00:06:00,880

yeah what

133

00:06:03,990 --> 00:06:02,240

what i'm going to do what the balance

134

00:06:06,070 --> 00:06:04,000

does is very similar to what you might

135

00:06:07,590 --> 00:06:06,080

do if you put your hand outside a car

136

00:06:09,430 --> 00:06:07,600

window while it's moving if you put your

137

00:06:12,469 --> 00:06:09,440

hand out just like this it's going to

138

00:06:13,909 --> 00:06:12,479

blow straight back that's called drag

139

00:06:15,670 --> 00:06:13,919

but if you turn your hand a little bit

140

00:06:17,110 --> 00:06:15,680

so it's like this

141

00:06:18,870 --> 00:06:17,120

your hand's going to go up you're going

142

00:06:20,230 --> 00:06:18,880

to get faster moving air on the front

143

00:06:22,550 --> 00:06:20,240

slower air on the bottom and you're

144

00:06:23,749 --> 00:06:22,560

going to get that lift effect and so

145

00:06:25,029 --> 00:06:23,759

what the wright brothers did is they

146

00:06:28,230 --> 00:06:25,039

created a little balance where on the

147

00:06:29,990 --> 00:06:28,240

bottom we just have little metal fingers

148

00:06:31,909 --> 00:06:30,000

that only make drag and they turn the

149

00:06:33,350 --> 00:06:31,919

balance one way and we have the wing

150

00:06:35,749 --> 00:06:33,360

which wants to turn the bounce the other

151
00:06:37,749 --> 00:06:35,759
way so what i'm going to do is turn the

152
00:06:39,510 --> 00:06:37,759
tunnel on and i'm going to block the air

153
00:06:41,029 --> 00:06:39,520
off to the wing so we'll see the drag

154
00:06:42,230 --> 00:06:41,039
turn it one way and then i'll pull it

155
00:06:43,909 --> 00:06:42,240
away the

156
00:06:44,870 --> 00:06:43,919
wind will hit the airfoil and it'll

157
00:06:46,790 --> 00:06:44,880
actually

158
00:06:53,510 --> 00:06:46,800
create lift so we'll look at it up here

159
00:06:57,510 --> 00:06:55,510
so when i block it off

160
00:06:59,270 --> 00:06:57,520
balance rotates the drag is pulling the

161
00:07:01,589 --> 00:06:59,280
balance that way

162
00:07:02,710 --> 00:07:01,599
and when i pull it away the wing rotates

163
00:07:04,550 --> 00:07:02,720

it that way

164

00:07:07,189 --> 00:07:04,560

so that's drag

165

00:07:09,430 --> 00:07:07,199

and that's lift

166

00:07:11,990 --> 00:07:09,440

so it's operating in the wind tunnel

167

00:07:14,309 --> 00:07:12,000

just the little model wing just the way

168

00:07:15,749 --> 00:07:14,319

a real wing does in the air and what the

169

00:07:17,189 --> 00:07:15,759

wright brothers did is they started

170

00:07:18,629 --> 00:07:17,199

playing with the shape of the wing they

171

00:07:20,469 --> 00:07:18,639

had someone that were squares some that

172

00:07:22,150 --> 00:07:20,479

were long and they measured them all

173

00:07:24,390 --> 00:07:22,160

exactly the same way and they started to

174

00:07:26,790 --> 00:07:24,400

see that long skinny wings were going to

175

00:07:29,270 --> 00:07:26,800

work much better than short stubby wings

176

00:07:30,390 --> 00:07:29,280

which is what they had been using

177

00:07:32,390 --> 00:07:30,400

thanks paul

178

00:07:35,670 --> 00:07:32,400

thanks tom and we have an online

179

00:07:37,670 --> 00:07:35,680

question uh tom can you tell us how big

180

00:07:40,390 --> 00:07:37,680

was the wright brothers airplane

181

00:07:41,990 --> 00:07:40,400

well you can see it right back here this

182

00:07:44,629 --> 00:07:42,000

is the real

183

00:07:47,510 --> 00:07:44,639

wright brothers airplane and so you can

184

00:07:49,749 --> 00:07:47,520

see roughly what size it is there's uh

185

00:07:51,430 --> 00:07:49,759

wilbur orville rather laying there on

186

00:07:53,510 --> 00:07:51,440

the airplane so

187

00:07:55,430 --> 00:07:53,520

there it is

188

00:07:59,749 --> 00:07:55,440

okay and we have a question in the

189

00:08:02,950 --> 00:08:01,189

and i want to know

190

00:08:04,790 --> 00:08:02,960

why did they think of

191

00:08:06,629 --> 00:08:04,800

like building it why did they want to

192

00:08:08,230 --> 00:08:06,639

build an airplane why did they want to

193

00:08:10,070 --> 00:08:08,240

build an airplane tom can you tell us

194

00:08:12,309 --> 00:08:10,080

why did they want to build an airplane

195

00:08:14,150 --> 00:08:12,319

well a lot of people when they were

196

00:08:15,589 --> 00:08:14,160

working right at the beginning of the

197

00:08:17,909 --> 00:08:15,599

20th century

198

00:08:20,150 --> 00:08:17,919

a lot of people were interested in the

199

00:08:22,469 --> 00:08:20,160

invention of the flying machine flying

200

00:08:25,110 --> 00:08:22,479

is something people had dreamed about

201

00:08:27,670 --> 00:08:25,120

for a long long long time

202

00:08:30,390 --> 00:08:27,680

and bit by bit pieces had fallen into

203

00:08:32,790 --> 00:08:30,400

place and so there was a sense wilbur

204

00:08:33,589 --> 00:08:32,800

and orville had it and other people did

205

00:08:36,070 --> 00:08:33,599

too

206

00:08:38,550 --> 00:08:36,080

that the time was ripe a lot of pieces

207

00:08:39,430 --> 00:08:38,560

were in place and this was the time to

208

00:08:41,670 --> 00:08:39,440

really

209

00:08:43,350 --> 00:08:41,680

attack the flying machine problem and

210

00:08:45,990 --> 00:08:43,360

wilbur and orville have been interested

211

00:08:48,070 --> 00:08:46,000

in flight since they were your age so

212

00:08:50,630 --> 00:08:48,080

they thought about this a lot okay and

213

00:08:53,670 --> 00:08:50,640

we have another online question

214

00:08:55,910 --> 00:08:53,680

and the question is what was the right's

215

00:08:57,509 --> 00:08:55,920

very first invention

216

00:08:59,990 --> 00:08:57,519

well the wright brothers didn't start

217

00:09:01,750 --> 00:09:00,000

with the airplane their first business

218

00:09:03,990 --> 00:09:01,760

that they did together was to run a

219

00:09:06,790 --> 00:09:04,000

print shop they printed little

220

00:09:09,509 --> 00:09:06,800

neighborhood newspapers and other things

221

00:09:10,870 --> 00:09:09,519

a shopping flyers and that kind of thing

222

00:09:13,750 --> 00:09:10,880

and orville

223

00:09:16,070 --> 00:09:13,760

actually built a very different kind of

224

00:09:18,150 --> 00:09:16,080

printing press that just

225

00:09:19,829 --> 00:09:18,160

really impressed printers all over

226

00:09:22,790 --> 00:09:19,839

dayton their hometown

227

00:09:23,590 --> 00:09:22,800

when they were operating their bicycle

228

00:09:26,790 --> 00:09:23,600

shop

229

00:09:30,070 --> 00:09:26,800

or they invented a special bicycle wheel

230

00:09:32,470 --> 00:09:30,080

hub as well so i mean they were

231

00:09:34,310 --> 00:09:32,480

inventive creative guys and that was

232

00:09:36,550 --> 00:09:34,320

happening before they turned their

233

00:09:39,110 --> 00:09:36,560

attention to the flying machine okay and

234

00:09:42,070 --> 00:09:39,120

speaking of bicycles you all can see i

235

00:09:44,949 --> 00:09:42,080

have a bike on my table

236

00:09:50,470 --> 00:09:44,959

why do you think i would have a bicycle

237

00:09:54,630 --> 00:09:52,150

why is this bike here

238

00:09:56,630 --> 00:09:54,640

a the safety bike became popular in the

239

00:09:57,350 --> 00:09:56,640

late 1880s

240

00:10:01,110 --> 00:09:57,360

b

241

00:10:03,269 --> 00:10:01,120

flyer

242

00:10:06,389 --> 00:10:03,279

c the wright brothers built bicycles

243

00:10:23,269 --> 00:10:06,399

before they built airplanes or d all of

244

00:10:48,630 --> 00:10:44,069

so

245

00:10:51,269 --> 00:10:48,640

you were correct

246

00:10:53,590 --> 00:10:51,279

it was all of the above and to explain a

247

00:10:55,990 --> 00:10:53,600

little bit more about how bicycles and

248

00:10:57,430 --> 00:10:56,000

airplanes are related i spoke to our

249

00:10:59,350 --> 00:10:57,440

chief curator

250

00:11:32,150 --> 00:10:59,360

peter jacob and he's going to talk to us

251

00:11:35,910 --> 00:11:33,430

peter

252

00:11:37,509 --> 00:11:35,920

you're chief curator of the museum why

253

00:11:39,910 --> 00:11:37,519

why are you riding a bicycle in the

254

00:11:41,750 --> 00:11:39,920

museum because a bicycle is a wonderful

255

00:11:42,949 --> 00:11:41,760

way to show something really important

256

00:11:45,030 --> 00:11:42,959

about how the wright brothers invented

257

00:11:46,710 --> 00:11:45,040

the airplane and what was that well an

258

00:11:47,990 --> 00:11:46,720

airplane of course has to be controlled

259

00:11:49,509 --> 00:11:48,000

if you can't control the airplane you're

260

00:11:52,150 --> 00:11:49,519

not going to be very successful in the

261

00:11:54,230 --> 00:11:52,160

air and airplane is very similar to a

262

00:11:56,790 --> 00:11:54,240

bicycle in that an airplane although

263

00:11:58,310 --> 00:11:56,800

it's very unstable is very controllable

264

00:12:00,069 --> 00:11:58,320

just like a bicycle now if you look at a

265

00:12:01,829 --> 00:12:00,079

bicycle if you let it go look at that it

266

00:12:03,350 --> 00:12:01,839

falls over it's totally unstable but

267

00:12:04,790 --> 00:12:03,360

when you're riding it by turning the

268

00:12:06,470 --> 00:12:04,800

wheel and leaning in and out you can

269

00:12:08,150 --> 00:12:06,480

make it very controllable and the wright

270

00:12:10,069 --> 00:12:08,160

brothers took that idea and transferred

271

00:12:11,509 --> 00:12:10,079

it to the airplane now before the wright

272

00:12:13,190 --> 00:12:11,519

brothers got involved with airplanes

273

00:12:14,710 --> 00:12:13,200

they were bicycle manufacturers in fact

274

00:12:16,389 --> 00:12:14,720

we have one of their original bicycles

275

00:12:18,150 --> 00:12:16,399

right here in the case

276

00:12:20,790 --> 00:12:18,160

so are there any other connections

277

00:12:22,470 --> 00:12:20,800

between bicycles and the first airplane

278

00:12:23,910 --> 00:12:22,480

yeah being very familiar with bicycle

279

00:12:25,990 --> 00:12:23,920

technology the wright brothers were able

280

00:12:27,750 --> 00:12:26,000

to transfer some of those ideas to the

281

00:12:29,269 --> 00:12:27,760

airplane in addition to the control if

282

00:12:31,670 --> 00:12:29,279

you look very carefully on the bicycle

283

00:12:33,190 --> 00:12:31,680

you see the way the pedals and the

284

00:12:35,110 --> 00:12:33,200

wheels are connected is with a chain and

285

00:12:36,949 --> 00:12:35,120

sprocket transmission system so when you

286

00:12:38,470 --> 00:12:36,959

turn the pedals you see the wheel turns

287

00:12:40,310 --> 00:12:38,480

if you look at the airplane you see they

288

00:12:42,069 --> 00:12:40,320

use the same technology to connect the

289

00:12:45,430 --> 00:12:42,079

propellers to the engine

290

00:12:47,590 --> 00:12:45,440

oh that's great okay but no more riding

291

00:12:49,829 --> 00:12:47,600

in the museum all right okay as long as

292

00:12:52,629 --> 00:12:49,839

we get the ideas across i'll stop

293

00:12:54,710 --> 00:12:52,639

writing thank you

294

00:12:56,389 --> 00:12:54,720

okay so as peter mentioned you have to

295

00:12:58,389 --> 00:12:56,399

be able to control an airplane once you

296

00:13:00,230 --> 00:12:58,399

get it off the ground and the first way

297

00:13:02,550 --> 00:13:00,240

to control an airplane is pitch it's

298

00:13:04,550 --> 00:13:02,560

this up and down motion and this is

299

00:13:06,310 --> 00:13:04,560

controlled by the elevator in the front

300

00:13:08,150 --> 00:13:06,320

an easy way to remember that is an

301

00:13:10,150 --> 00:13:08,160

elevator in the building only goes up

302

00:13:12,550 --> 00:13:10,160

and down and the elevator in the front

303

00:13:15,269 --> 00:13:12,560

of a plane controls the pitch the second

304

00:13:18,790 --> 00:13:15,279

way to control a plane is yaw it's this

305

00:13:20,389 --> 00:13:18,800

motion this helps stabilize the plane

306

00:13:21,430 --> 00:13:20,399

and it's controlled back here with the

307

00:13:23,590 --> 00:13:21,440

rudder

308

00:13:26,790 --> 00:13:23,600

the third and final way to control a

309

00:13:29,190 --> 00:13:26,800

plane is roll and roll allows you to

310

00:13:31,030 --> 00:13:29,200

turn a plane while it's in flight so

311

00:13:33,430 --> 00:13:31,040

those are the three ways that you are

312

00:13:35,509 --> 00:13:33,440

able to control a plane once you get it

313

00:13:37,990 --> 00:13:35,519

off the ground so let's have you all

314

00:13:38,790 --> 00:13:38,000

stand up and anybody else watching stand

315

00:13:41,189 --> 00:13:38,800

up

316

00:13:42,629 --> 00:13:41,199

put your arms to your side do not hit

317

00:13:45,430 --> 00:13:42,639

the person next to you we're going to

318

00:13:49,750 --> 00:13:45,440

practice yo roll pitch and yaw so let's

319

00:13:50,949 --> 00:13:49,760

start with pitch ready let's pitch

320

00:13:53,670 --> 00:13:50,959

okay

321

00:13:54,629 --> 00:13:53,680

now we're gonna y'all

322

00:13:58,949 --> 00:13:54,639

y'all

323

00:14:05,750 --> 00:13:58,959

roll

324

00:14:08,949 --> 00:14:06,629

what

325

00:14:10,790 --> 00:14:08,959

one of the problems that the one of the

326

00:14:12,629 --> 00:14:10,800

challenges that the wright brothers had

327

00:14:14,629 --> 00:14:12,639

was to try and figure out how to make an

328

00:14:16,230 --> 00:14:14,639

airplane roll there were a lot of people

329

00:14:18,150 --> 00:14:16,240

working on inventing the airplane at the

330

00:14:19,590 --> 00:14:18,160

same time that the wright brothers were

331

00:14:21,910 --> 00:14:19,600

and they were all trying to figure this

332

00:14:24,710 --> 00:14:21,920

problem out well the older of the two

333

00:14:26,470 --> 00:14:24,720

brothers wilbur had sold an inner tube

334

00:14:28,310 --> 00:14:26,480

at the bicycle shop and he was playing

335

00:14:29,670 --> 00:14:28,320

with the bike and he was he was bending

336

00:14:31,829 --> 00:14:29,680

or he's playing with the box and he's

337

00:14:34,230 --> 00:14:31,839

bending the box like this and he thought

338

00:14:36,870 --> 00:14:34,240

to himself gee you know if i can get

339

00:14:39,350 --> 00:14:36,880

into change shape like this i can get it

340

00:14:41,590 --> 00:14:39,360

to roll because what's happening is on

341

00:14:43,590 --> 00:14:41,600

this end when this side goes up there's

342

00:14:45,670 --> 00:14:43,600

greater lift so that'll will go up and

343

00:14:48,069 --> 00:14:45,680

this side will go down and if i switch

344

00:14:50,389 --> 00:14:48,079

it it'll go the other way so i could get

345

00:14:52,949 --> 00:14:50,399

a plane to a roll if i can change the

346

00:14:55,509 --> 00:14:52,959

shape of the wings now he didn't go out

347

00:14:57,189 --> 00:14:55,519

and just invent the airplane he had to

348

00:14:59,829 --> 00:14:57,199

do some experiments and one of their

349

00:15:01,910 --> 00:14:59,839

first experiments was their kite and tom

350

00:15:04,470 --> 00:15:01,920

crouch is going to discuss with the cut

351

00:15:05,670 --> 00:15:04,480

discuss the kite with us today

352

00:15:08,230 --> 00:15:05,680

thanks beth

353

00:15:11,670 --> 00:15:08,240

indeed what we have right here

354

00:15:13,590 --> 00:15:11,680

is a full-scale model of the very first

355

00:15:14,870 --> 00:15:13,600

aircraft the wright brothers built and

356

00:15:17,350 --> 00:15:14,880

it was a kite

357

00:15:20,150 --> 00:15:17,360

and as beth explained they began by

358

00:15:22,629 --> 00:15:20,160

figuring out how to control an airplane

359

00:15:25,269 --> 00:15:22,639

in the air in roll pitch and yaw and the

360

00:15:28,069 --> 00:15:25,279

tough one was roll and having come up

361

00:15:30,389 --> 00:15:28,079

with the notion of twisting the wings

362

00:15:32,870 --> 00:15:30,399

changing the geometry of the wings they

363

00:15:35,189 --> 00:15:32,880

wanted to test that idea and they built

364

00:15:36,870 --> 00:15:35,199

this little kite it's got about a five

365

00:15:37,910 --> 00:15:36,880

foot wingspan

366

00:15:40,150 --> 00:15:37,920

and

367

00:15:43,509 --> 00:15:40,160

these things down here are the kite

368

00:15:45,749 --> 00:15:43,519

sticks it has two lines so you actually

369

00:15:47,509 --> 00:15:45,759

apply it by holding the sticks like this

370

00:15:50,310 --> 00:15:47,519

and the kites up there

371

00:15:53,269 --> 00:15:50,320

if you move your thumbs forward

372

00:15:55,749 --> 00:15:53,279

like that what will happen is

373

00:15:58,870 --> 00:15:55,759

the bottom wing will move forward or

374

00:16:00,470 --> 00:15:58,880

backward rather the top wing will will

375

00:16:03,509 --> 00:16:00,480

move backward the bottom wing moves

376

00:16:06,550 --> 00:16:03,519

forward and just the opposite

377

00:16:09,430 --> 00:16:06,560

if you put your thumbs the other way

378

00:16:11,269 --> 00:16:09,440

but the neat thing is if you oppose your

379

00:16:14,949 --> 00:16:11,279

thumbs like this

380

00:16:15,990 --> 00:16:14,959

what happens is that you put a twist a

381

00:16:18,389 --> 00:16:16,000

torsion

382

00:16:19,189 --> 00:16:18,399

across the wing and if you look at this

383

00:16:21,269 --> 00:16:19,199

wing

384

00:16:23,670 --> 00:16:21,279

this is angled up more than that is

385

00:16:26,629 --> 00:16:23,680

right so which side is going to have the

386

00:16:29,829 --> 00:16:26,639

most lift do you think this side

387

00:16:34,629 --> 00:16:32,550

this side absolutely because you've not

388

00:16:36,629 --> 00:16:34,639

only increased the angle but the lift

389

00:16:37,910 --> 00:16:36,639

and you can do just the same thing on

390

00:16:40,629 --> 00:16:37,920

the other side

391

00:16:43,590 --> 00:16:40,639

and so this is how the wright brothers

392

00:16:46,150 --> 00:16:43,600

by maneuvering their kite discovered how

393

00:16:47,590 --> 00:16:46,160

to control an airplane and roll

394

00:16:48,710 --> 00:16:47,600

and so

395

00:16:50,870 --> 00:16:48,720

as we

396

00:16:52,790 --> 00:16:50,880

we have to be able to control

397

00:16:55,030 --> 00:16:52,800

the airplane but they didn't use strings

398

00:16:56,389 --> 00:16:55,040

on the airplane did they they didn't no

399

00:16:58,389 --> 00:16:56,399

they didn't so

400

00:17:00,550 --> 00:16:58,399

we went to the right experience and we

401
00:17:02,550 --> 00:17:00,560
have a video showing you actually how

402
00:17:04,309 --> 00:17:02,560
the wings change shape so let's take a

403
00:17:05,669 --> 00:17:04,319
look and how they're controlled and now

404
00:17:07,590 --> 00:17:05,679
the point so we've been looking at the

405
00:17:09,669 --> 00:17:07,600
1903 wright fly that we have in the

406
00:17:12,309 --> 00:17:09,679
museum but here at the wright experience

407
00:17:14,069 --> 00:17:12,319
they have vin fizz do you want to tell

408
00:17:16,710 --> 00:17:14,079
us a little bit about this airplane and

409
00:17:18,789 --> 00:17:16,720
show us how the wings warp sure

410
00:17:21,429 --> 00:17:18,799
well this airplane built here at the

411
00:17:23,029 --> 00:17:21,439
right experience is an exact replica as

412
00:17:25,750 --> 00:17:23,039
close as you can come

413
00:17:26,789 --> 00:17:25,760

to the original vin phys which is on

414

00:17:30,150 --> 00:17:26,799

exhibit

415

00:17:33,350 --> 00:17:30,160

in the pioneers gallery in our museum

416

00:17:35,270 --> 00:17:33,360

this really is um incredibly accurate

417

00:17:38,230 --> 00:17:35,280

and of course it's the airplane that cal

418

00:17:41,029 --> 00:17:38,240

rogers did make the first coast-to-coast

419

00:17:42,390 --> 00:17:41,039

flight with but a good many stops not

420

00:17:45,270 --> 00:17:42,400

all of them

421

00:17:47,750 --> 00:17:45,280

intended or pleasant in fact it's a

422

00:17:51,270 --> 00:17:47,760

right model ex it's called

423

00:17:53,510 --> 00:17:51,280

and it's a fairly typical

424

00:17:55,750 --> 00:17:53,520

control system for right airplanes of

425

00:17:59,990 --> 00:17:55,760

this period of course

426

00:18:01,909 --> 00:18:00,000

in 19 from 1900 to 1905

427

00:18:04,070 --> 00:18:01,919

they were laying down on the airplane so

428

00:18:06,310 --> 00:18:04,080

they had different controls

429

00:18:08,390 --> 00:18:06,320

when they went to upright seating to

430

00:18:10,870 --> 00:18:08,400

carry a passenger they had to have

431

00:18:13,350 --> 00:18:10,880

upright controls and again these are

432

00:18:14,470 --> 00:18:13,360

typical of right controls for this

433

00:18:17,270 --> 00:18:14,480

period

434

00:18:18,710 --> 00:18:17,280

and this stick is the stick that warps

435

00:18:19,669 --> 00:18:18,720

the wings

436

00:18:22,390 --> 00:18:19,679

you go

437

00:18:24,950 --> 00:18:22,400

back and you can see the wings warp

438

00:18:28,230 --> 00:18:24,960

and forward

439

00:18:28,240 --> 00:18:31,430

forward

440

00:18:37,590 --> 00:18:34,390

and this is what we call the bent wrist

441

00:18:40,549 --> 00:18:37,600

control this is the control

442

00:18:43,909 --> 00:18:40,559

that feeds rudder into the ends of the

443

00:18:46,549 --> 00:18:43,919

system and that control is the pitch

444

00:18:48,470 --> 00:18:46,559

control that controls the elevator in

445

00:18:52,150 --> 00:18:48,480

the back of the airplane well thank you

446

00:18:54,830 --> 00:18:52,160

very much tom that's really interesting

447

00:18:58,390 --> 00:18:54,840

so tom we have an online

448

00:19:00,950 --> 00:18:58,400

question uh how did the rights fly

449

00:19:04,230 --> 00:19:00,960

how high did the rights fly well in the

450

00:19:07,430 --> 00:19:04,240

beginning with this airplane in 1903

451
00:19:10,470 --> 00:19:07,440
really not very high probably never more

452
00:19:12,630 --> 00:19:10,480
than 20 feet or so off the ground but as

453
00:19:15,750 --> 00:19:12,640
they continue to practice and develop

454
00:19:18,070 --> 00:19:15,760
the airplane by 1905 they've been

455
00:19:19,830 --> 00:19:18,080
practicing for two years and then they

456
00:19:22,070 --> 00:19:19,840
could fly basically as high as they

457
00:19:23,909 --> 00:19:22,080
wanted to and stay up as long as they

458
00:19:24,870 --> 00:19:23,919
wanted to okay and i think we have one

459
00:19:31,510 --> 00:19:24,880
question

460
00:19:34,789 --> 00:19:31,520
what inspired dwayne bros

461
00:19:36,950 --> 00:19:34,799
oh what inspired the wright brothers

462
00:19:38,390 --> 00:19:36,960
well as i said

463
00:19:41,430 --> 00:19:38,400

a lot of people

464

00:19:43,430 --> 00:19:41,440

wanted to fly at the time the wright

465

00:19:45,909 --> 00:19:43,440

brothers became involved they weren't

466

00:19:47,830 --> 00:19:45,919

the only ones lots of people did

467

00:19:50,950 --> 00:19:47,840

and the wright brothers were really

468

00:19:53,270 --> 00:19:50,960

fascinated by problem solving solving

469

00:19:55,270 --> 00:19:53,280

difficult technical problems that's

470

00:19:57,750 --> 00:19:55,280

really what made them get up in the

471

00:20:01,110 --> 00:19:57,760

morning and why they push forward with

472

00:20:03,669 --> 00:20:01,120

this they really enjoyed that problem

473

00:20:05,750 --> 00:20:03,679

solving and really that's what inspired

474

00:20:08,070 --> 00:20:05,760

them once they got started they just

475

00:20:12,230 --> 00:20:08,080

couldn't let go until they had solved

476

00:20:15,590 --> 00:20:13,990

okay so we had do we have one more

477

00:20:20,710 --> 00:20:15,600

question

478

00:20:22,549 --> 00:20:20,720

how long did it take him to

479

00:20:24,230 --> 00:20:22,559

build the airplane how long did it take

480

00:20:26,390 --> 00:20:24,240

to build the airplane from the kite to

481

00:20:28,950 --> 00:20:26,400

the airplane well they began again with

482

00:20:31,750 --> 00:20:28,960

the kite in 1899

483

00:20:34,870 --> 00:20:31,760

they built three gliders to get used to

484

00:20:36,110 --> 00:20:34,880

flying and to develop the technology

485

00:20:37,669 --> 00:20:36,120

1900

486

00:20:39,270 --> 00:20:37,679

191-1902

487

00:20:42,390 --> 00:20:39,280

and then they built the world's first

488

00:20:45,190 --> 00:20:42,400

powered airplane in 1903

489

00:20:46,870 --> 00:20:45,200

and two more after that this airplane

490

00:20:50,230 --> 00:20:46,880

was successful

491

00:20:52,630 --> 00:20:50,240

but it wasn't really practical by 1905

492

00:20:54,789 --> 00:20:52,640

they had an airplane that would go up as

493

00:20:58,230 --> 00:20:54,799

lines stay as long as the pilot wanted

494

00:21:00,950 --> 00:20:58,240

it to and operate fully under control so

495

00:21:04,149 --> 00:21:00,960

1899 1905

496

00:21:06,870 --> 00:21:04,159

okay so we have this thing

497

00:21:09,190 --> 00:21:06,880

sitting on our block and

498

00:21:10,789 --> 00:21:09,200

we're going to guess what it is but

499

00:21:12,470 --> 00:21:10,799

i want you to give us one little hint

500

00:21:15,029 --> 00:21:12,480

before we start the clock

501
00:21:16,470 --> 00:21:15,039
well when you look at the airplane it's

502
00:21:22,310 --> 00:21:16,480
made out of what

503
00:21:26,549 --> 00:21:24,070
this is one of the metal parts of the

504
00:22:08,070 --> 00:21:26,559
airplane okay so let's

505
00:22:13,430 --> 00:22:10,470
okay so what do you guys think this is

506
00:22:15,029 --> 00:22:13,440
shout it out okay it is part of an

507
00:22:17,190 --> 00:22:15,039
engine and

508
00:22:20,070 --> 00:22:17,200
tom i think that you went to the right

509
00:22:22,310 --> 00:22:20,080
experience and saw more this is the

510
00:22:24,710 --> 00:22:22,320
crankshaft this is part of it crankcase

511
00:22:26,630 --> 00:22:24,720
crankcase and tom went to the right

512
00:22:30,230 --> 00:22:26,640
experience and we're going to show you

513
00:22:32,630 --> 00:22:30,240

some inside workings of an engine

514

00:22:34,470 --> 00:22:32,640

i'm here with my friend greg cohn who's

515

00:22:38,070 --> 00:22:34,480

the machinist here at the wright

516

00:22:40,310 --> 00:22:38,080

experience and the best machinist i know

517

00:22:44,470 --> 00:22:40,320

greg does all of the engine work here

518

00:22:47,830 --> 00:22:44,480

and a good deal else and this is

519

00:22:49,750 --> 00:22:47,840

uh a copy really of the first the

520

00:22:52,149 --> 00:22:49,760

airplane the engine that powered the

521

00:22:54,870 --> 00:22:52,159

1903 right airplane the world's first

522

00:22:57,350 --> 00:22:54,880

airplane and greg would you tell us a

523

00:22:59,830 --> 00:22:57,360

little bit about it be glad to

524

00:23:01,350 --> 00:22:59,840

all right like he says this is a cutaway

525

00:23:04,710 --> 00:23:01,360

of their first

526
00:23:08,070 --> 00:23:04,720
engine for their 1903 airplane

527
00:23:10,149 --> 00:23:08,080
and their idea was to make it as simply

528
00:23:11,909 --> 00:23:10,159
and as light as possible

529
00:23:13,430 --> 00:23:11,919
they were looking for 12 horsepower

530
00:23:15,350 --> 00:23:13,440
which they

531
00:23:17,669 --> 00:23:15,360
knew would fly the airplane

532
00:23:18,950 --> 00:23:17,679
they chose aluminum

533
00:23:21,750 --> 00:23:18,960
which was

534
00:23:23,350 --> 00:23:21,760
new on the scene at that time and when

535
00:23:24,870 --> 00:23:23,360
it comes to simple construction

536
00:23:26,390 --> 00:23:24,880
otherwise

537
00:23:28,870 --> 00:23:26,400
they had

538
00:23:31,750 --> 00:23:28,880

thin sheet steel for covers

539

00:23:33,830 --> 00:23:31,760

they had bicycle chain

540

00:23:36,549 --> 00:23:33,840

for camshaft driving

541

00:23:38,870 --> 00:23:36,559

they had bicycle tubing for lightweight

542

00:23:40,310 --> 00:23:38,880

connecting rods

543

00:23:44,310 --> 00:23:40,320

no fuel pump

544

00:23:47,830 --> 00:23:44,320

it used gravity feed to supply gasoline

545

00:23:50,789 --> 00:23:47,840

to the engine which was then fed to a

546

00:23:52,230 --> 00:23:50,799

sheet metal manifold

547

00:23:54,630 --> 00:23:52,240

they used

548

00:23:56,710 --> 00:23:54,640

what was called automatic intake valves

549

00:24:00,149 --> 00:23:56,720

the suction stroke will actually pull

550

00:24:02,830 --> 00:24:00,159

this valve open to emit the fuel

551
00:24:05,669 --> 00:24:02,840
they use mechanically operated exhaust

552
00:24:06,630 --> 00:24:05,679
valves the ignition system also very

553
00:24:08,549 --> 00:24:06,640
simple

554
00:24:11,909 --> 00:24:08,559
called make and brake

555
00:24:14,149 --> 00:24:11,919
it has a copper bus bar that is

556
00:24:16,149 --> 00:24:14,159
supplied with low voltage

557
00:24:19,430 --> 00:24:16,159
the voltage is then

558
00:24:21,350 --> 00:24:19,440
enters the combustion chamber itself

559
00:24:23,590 --> 00:24:21,360
by a contact

560
00:24:25,830 --> 00:24:23,600
and at the proper instant the points

561
00:24:27,669 --> 00:24:25,840
break creates a spark

562
00:24:31,590 --> 00:24:27,679
well thanks greg you're welcome tom

563
00:24:35,350 --> 00:24:33,830

okay tom so you can't just have an

564

00:24:37,190 --> 00:24:35,360

engine you have to have something else

565

00:24:38,870 --> 00:24:37,200

to propel the plane so do you want to

566

00:24:41,909 --> 00:24:38,880

talk to us a little bit about what we

567

00:24:44,710 --> 00:24:41,919

have on the back here right the right

568

00:24:47,029 --> 00:24:44,720

airplanes were all pusher airplanes in

569

00:24:49,669 --> 00:24:47,039

other words the propellers on the back

570

00:24:51,669 --> 00:24:49,679

and pushes it forward instead of being

571

00:24:54,870 --> 00:24:51,679

on the nose and pulling it and the

572

00:24:56,470 --> 00:24:54,880

propellers in fact were one of the most

573

00:24:58,870 --> 00:24:56,480

difficult problems that the wright

574

00:25:01,830 --> 00:24:58,880

brothers had to face they looked pretty

575

00:25:03,510 --> 00:25:01,840

simple but in fact they're really pretty

576
00:25:05,510 --> 00:25:03,520
complicated

577
00:25:08,390 --> 00:25:05,520
a propeller

578
00:25:11,430 --> 00:25:08,400
isn't like a screw going into wood it's

579
00:25:14,789 --> 00:25:11,440
a rotary wing you drive a wing through

580
00:25:17,590 --> 00:25:14,799
the air and it generates lift well the

581
00:25:20,710 --> 00:25:17,600
propellers are shaped like wings too and

582
00:25:23,269 --> 00:25:20,720
as they rotate they develop when

583
00:25:25,830 --> 00:25:23,279
lift just like the wing only instead of

584
00:25:27,990 --> 00:25:25,840
lift since they're faced this way it

585
00:25:30,070 --> 00:25:28,000
becomes thrust and it moves the airplane

586
00:25:31,669 --> 00:25:30,080
forward okay so we've looked at a lot of

587
00:25:33,990 --> 00:25:31,679
things today but there's one more

588
00:25:35,830 --> 00:25:34,000

question we need to answer and to answer

589

00:25:38,149 --> 00:25:35,840

that question i talked to peter jacob

590

00:25:42,549 --> 00:25:39,990

so peter we're standing here in front of

591

00:25:44,310 --> 00:25:42,559

the actual 1903 wright flyer and during

592

00:25:47,110 --> 00:25:44,320

this stem and 30 we've looked at a lot

593

00:25:50,470 --> 00:25:47,120

of elements we've looked at airfoils and

594

00:25:52,149 --> 00:25:50,480

control surfaces and propulsion but the

595

00:25:54,149 --> 00:25:52,159

thing we haven't answered the question

596

00:25:55,750 --> 00:25:54,159

we haven't answered is why the wright

597

00:25:57,190 --> 00:25:55,760

brothers why were they successful in

598

00:25:59,190 --> 00:25:57,200

inventing the airplane when so many

599

00:26:00,630 --> 00:25:59,200

others had failed well of course wilbur

600

00:26:02,789 --> 00:26:00,640

norbel wright were extremely good

601
00:26:04,470 --> 00:26:02,799
engineers and had great ingenuity and

602
00:26:05,990 --> 00:26:04,480
applied those skills to solving all of

603
00:26:07,350 --> 00:26:06,000
these elements that you've talked about

604
00:26:08,789 --> 00:26:07,360
but what really separated them from

605
00:26:10,549 --> 00:26:08,799
everyone else is they understood that

606
00:26:12,310 --> 00:26:10,559
the airplane was not one invention but

607
00:26:13,830 --> 00:26:12,320
it was many inventions all of which had

608
00:26:15,430 --> 00:26:13,840
to work together to have a successful

609
00:26:17,190 --> 00:26:15,440
flying machine they had to have a good

610
00:26:19,430 --> 00:26:17,200
set of wings a good structure a good

611
00:26:21,350 --> 00:26:19,440
propulsion system a good control system

612
00:26:22,549 --> 00:26:21,360
and many other elements so they worked

613
00:26:24,149 --> 00:26:22,559

on each of those things and they knew

614

00:26:26,149 --> 00:26:24,159

they had to solve each of those things

615

00:26:27,990 --> 00:26:26,159

for the whole airplane to be successful

616

00:26:29,750 --> 00:26:28,000

and today we call that a technological

617

00:26:31,510 --> 00:26:29,760

system where all the components work

618

00:26:33,350 --> 00:26:31,520

together to achieve the successful

619

00:26:35,190 --> 00:26:33,360

technic engineering goal

620

00:26:36,549 --> 00:26:35,200

thank you so much for answering all of

621

00:26:40,149 --> 00:26:36,559

our questions about the wright brothers

622

00:26:45,909 --> 00:26:43,669

okay and we have another online question

623

00:26:47,750 --> 00:26:45,919

and the question is what level of math

624

00:26:49,190 --> 00:26:47,760

skills did the rights need to build

625

00:26:51,350 --> 00:26:49,200

airplanes

626

00:26:53,909 --> 00:26:51,360

well the wright brothers had enjoyed

627

00:26:57,750 --> 00:26:53,919

math in school

628

00:27:00,230 --> 00:26:57,760

they had algebra and they had geometry

629

00:27:01,990 --> 00:27:00,240

and that was really the mathematics that

630

00:27:03,750 --> 00:27:02,000

they needed to

631

00:27:05,990 --> 00:27:03,760

do what they had to do to invent the

632

00:27:08,549 --> 00:27:06,000

airplane somebody a few minutes ago

633

00:27:10,870 --> 00:27:08,559

asked me how big the airplane was and

634

00:27:13,510 --> 00:27:10,880

really that's something the rights had

635

00:27:16,310 --> 00:27:13,520

to figure out they had to calculate

636

00:27:18,230 --> 00:27:16,320

using algebra and geometry

637

00:27:20,230 --> 00:27:18,240

how much wing area they were going to

638

00:27:22,389 --> 00:27:20,240

have to have to lift the weight of the

639

00:27:25,029 --> 00:27:22,399

airplane the engine and the pilot so

640

00:27:27,909 --> 00:27:25,039

math was real important to the wright

641

00:27:29,750 --> 00:27:27,919

brothers okay and we have another online

642

00:27:32,230 --> 00:27:29,760

question

643

00:27:34,470 --> 00:27:32,240

why is it important to study the origin

644

00:27:39,029 --> 00:27:34,480

of flight today

645

00:27:40,870 --> 00:27:39,039

well rebecca in fact we fly today pretty

646

00:27:44,070 --> 00:27:40,880

much the same way the wright brothers

647

00:27:46,950 --> 00:27:44,080

did in 1903. airplanes don't look like

648

00:27:49,830 --> 00:27:46,960

this today and in fact the parts are in

649

00:27:52,549 --> 00:27:49,840

a different position sometimes we use

650

00:27:55,510 --> 00:27:52,559

jets today instead of propellers but the

651
00:27:57,269 --> 00:27:55,520
basic principles that they used of

652
00:27:59,830 --> 00:27:57,279
aircraft control

653
00:28:00,789 --> 00:27:59,840
of studying aerodynamics and that kind

654
00:28:04,310 --> 00:28:00,799
of thing

655
00:28:06,789 --> 00:28:04,320
that hasn't changed very much since 1903

656
00:28:09,269 --> 00:28:06,799
so the basic principles were there in

657
00:28:11,590 --> 00:28:09,279
the beginning and by studying those we

658
00:28:14,870 --> 00:28:11,600
can understand how we got to where we

659
00:28:17,029 --> 00:28:14,880
are today okay and so

660
00:28:19,430 --> 00:28:17,039
we actually have

661
00:28:22,789 --> 00:28:19,440
um a simulator here that's going to show

662
00:28:26,630 --> 00:28:22,799
us how the wright brothers flew in their

663
00:28:33,110 --> 00:28:29,269

hi it's paul glenshaw again and i've got

664

00:28:35,190 --> 00:28:33,120

my co-pilot here tell us your name

665

00:28:37,269 --> 00:28:35,200

mikhail and he and i are going to fly

666

00:28:38,789 --> 00:28:37,279

the wright brothers 1908

667

00:28:40,470 --> 00:28:38,799

flyer that they brought here to

668

00:28:42,789 --> 00:28:40,480

washington d.c

669

00:28:45,110 --> 00:28:42,799

to sell to the army and they flew it at

670

00:28:46,950 --> 00:28:45,120

fort myer just across the potomac river

671

00:28:48,389 --> 00:28:46,960

so how this works is this we are on the

672

00:28:50,230 --> 00:28:48,399

ground now put your hand up on the

673

00:28:51,669 --> 00:28:50,240

control and we're going to fly together

674

00:28:53,350 --> 00:28:51,679

i'm the guy who's going to get us in the

675

00:28:55,269 --> 00:28:53,360

air

676

00:28:57,269 --> 00:28:55,279

here we go we are climbing that's the

677

00:28:59,350 --> 00:28:57,279

pitch that beth was talking about and

678

00:29:01,190 --> 00:28:59,360

then i put the nose down again so you

679

00:29:02,230 --> 00:29:01,200

can see that this makes the airplane

680

00:29:03,990 --> 00:29:02,240

climb

681

00:29:05,269 --> 00:29:04,000

and this makes the airplane dive now i'm

682

00:29:07,190 --> 00:29:05,279

going to get us nice and steady and

683

00:29:09,029 --> 00:29:07,200

you're going to help us turn so if you

684

00:29:10,149 --> 00:29:09,039

push the sticks forward

685

00:29:12,549 --> 00:29:10,159

you're going to see the airplane will

686

00:29:15,269 --> 00:29:12,559

start turning to the left now pull us to

687

00:29:16,789 --> 00:29:15,279

the right which means pull come on back

688

00:29:19,510 --> 00:29:16,799

keep going until the airplane reacts

689

00:29:21,269 --> 00:29:19,520

there you go but not too much because

690

00:29:23,190 --> 00:29:21,279

then we start to go down again so push

691

00:29:24,630 --> 00:29:23,200

them to the left again

692

00:29:26,549 --> 00:29:24,640

and what we want to do is get the

693

00:29:27,350 --> 00:29:26,559

airplane to uh

694

00:29:28,950 --> 00:29:27,360

to

695

00:29:30,789 --> 00:29:28,960

just fly nice and steady now we're gonna

696

00:29:32,870 --> 00:29:30,799

see if we can land it right there on

697

00:29:34,710 --> 00:29:32,880

that field this is 1908 so there's no

698

00:29:39,990 --> 00:29:34,720

airports anywhere we can just land

699

00:29:44,950 --> 00:29:42,470

so that's stem and 30 for today i want

700

00:29:47,110 --> 00:29:44,960

to thank the alcohol foundation tom

