
SMITHSONIAN
INSTITUTION

1
00:00:05,510 --> 00:00:03,350
i think we're just about ready to start

2
00:00:07,430 --> 00:00:05,520
our first afternoon panel

3
00:00:09,270 --> 00:00:07,440
my name is steve garber from the nasa

4
00:00:11,430 --> 00:00:09,280
history program office

5
00:00:13,589 --> 00:00:11,440
i'm delighted to have four really

6
00:00:15,589 --> 00:00:13,599
distinguished panelists most of whom you

7
00:00:17,189 --> 00:00:15,599
probably know already and need no

8
00:00:19,189 --> 00:00:17,199
introduction

9
00:00:22,870 --> 00:00:19,199
we're going to have a slate of excellent

10
00:00:23,830 --> 00:00:22,880
talks about the early years of the naca

11
00:00:28,710 --> 00:00:23,840
and

12
00:00:30,790 --> 00:00:28,720
titles of the presenters papers in your

13
00:00:32,389 --> 00:00:30,800

materials so let me just try and tell

14
00:00:34,150 --> 00:00:32,399
you one or two things about each speaker

15
00:00:35,750 --> 00:00:34,160
that maybe you don't know

16
00:00:37,590 --> 00:00:35,760
debbie douglas

17
00:00:38,869 --> 00:00:37,600
got a phd

18
00:00:41,590 --> 00:00:38,879
from

19
00:00:45,910 --> 00:00:41,600
the university of pennsylvania

20
00:00:55,189 --> 00:00:45,920
in and has been at the mit museum since

21
00:01:00,549 --> 00:00:56,830
will the

22
00:01:05,189 --> 00:01:00,559
um first slide come up automatically

23
00:01:10,950 --> 00:01:07,910
so first thank you to all the organizers

24
00:01:13,590 --> 00:01:10,960
i have this sense of

25
00:01:17,350 --> 00:01:13,600
a morning of crowdsourcing the history

26
00:01:19,749 --> 00:01:17,360
of the naca and that each of us are

27
00:01:21,990 --> 00:01:19,759
telling the story with uh just a

28
00:01:24,070 --> 00:01:22,000
slightly different perspective and i've

29
00:01:26,390 --> 00:01:24,080
been picking up interesting

30
00:01:27,590 --> 00:01:26,400
facts from each of the talks so i hope

31
00:01:31,350 --> 00:01:27,600
that

32
00:01:32,469 --> 00:01:31,360
mine will add a couple more details

33
00:01:35,109 --> 00:01:32,479
to that

34
00:01:37,270 --> 00:01:35,119
larger narrative

35
00:01:38,830 --> 00:01:37,280
i want to begin by

36
00:01:43,429 --> 00:01:38,840
making this simple

37
00:01:47,590 --> 00:01:45,830
which is this do you ever think that you

38
00:01:49,830 --> 00:01:47,600

know a story

39
00:01:52,230 --> 00:01:49,840
only to have it completely rearrange

40
00:01:54,870 --> 00:01:52,240
itself when a single

41
00:01:57,510 --> 00:01:54,880
element is added

42
00:01:59,190 --> 00:01:57,520
in this short talk today relates to one

43
00:02:00,230 --> 00:01:59,200
such example

44
00:02:02,069 --> 00:02:00,240
it's

45
00:02:04,870 --> 00:02:02,079
i thought i knew the story about

46
00:02:07,109 --> 00:02:04,880
bringing aerodynamics

47
00:02:11,510 --> 00:02:07,119
to america

48
00:02:17,270 --> 00:02:11,520
and that changed when i encountered

49
00:02:17,280 --> 00:02:21,830
let's see if we can get this to

50
00:02:25,750 --> 00:02:23,110
there you go

51
00:02:28,150 --> 00:02:25,760
this is a uh national physical

52
00:02:30,229 --> 00:02:28,160
laboratory designed wind tunnel balance

53
00:02:32,710 --> 00:02:30,239
it was manufactured by the cambridge

54
00:02:35,350 --> 00:02:32,720
scientific instrument company

55
00:02:38,390 --> 00:02:35,360
and it was purchased and installed in

56
00:02:40,710 --> 00:02:38,400
mit's first reel meaning purpose-built

57
00:02:43,430 --> 00:02:40,720
wind tunnel in 1914

58
00:02:46,229 --> 00:02:43,440
it is a amazing instrument

59
00:02:49,030 --> 00:02:46,239
and the historian william trimble argued

60
00:02:50,869 --> 00:02:49,040
that the mit wind tunnel and its balance

61
00:02:53,270 --> 00:02:50,879
represents one of the most important

62
00:02:55,750 --> 00:02:53,280
examples of technology transfer from

63
00:02:58,869 --> 00:02:55,760

europe to the us

64
00:03:01,670 --> 00:02:58,879
but its status as a sacred artifact is

65
00:03:03,990 --> 00:03:01,680
extremely recent we almost junked it

66
00:03:06,710 --> 00:03:04,000
observed mit professor mark drala

67
00:03:09,990 --> 00:03:06,720
privately after i gave a short talk to

68
00:03:11,990 --> 00:03:10,000
mit aerospace notables last fall

69
00:03:13,670 --> 00:03:12,000
it is my hope that in this short

70
00:03:15,750 --> 00:03:13,680
presentation

71
00:03:18,390 --> 00:03:15,760
i might convince you of its historic

72
00:03:19,670 --> 00:03:18,400
significance and that it will seem to

73
00:03:21,910 --> 00:03:19,680
you useful

74
00:03:30,550 --> 00:03:21,920
in important ways to understanding the

75
00:03:30,560 --> 00:03:34,309
whoops

76
00:03:39,270 --> 00:03:37,670
so in his 1914 president's report

77
00:03:40,550 --> 00:03:39,280
richard mclaren the great thing about

78
00:03:42,309 --> 00:03:40,560
this talk is you've already been

79
00:03:44,309 --> 00:03:42,319
introduced to many of these people so

80
00:03:46,949 --> 00:03:44,319
richard cockburn mclaurin was the

81
00:03:49,270 --> 00:03:46,959
president of mit he started in 1909 he

82
00:03:51,509 --> 00:03:49,280
was 39 years old

83
00:03:53,509 --> 00:03:51,519
he had never administered anything he'd

84
00:03:55,670 --> 00:03:53,519
never been a department chairman a dean

85
00:03:57,990 --> 00:03:55,680
or anything and so it was an enormous

86
00:03:59,670 --> 00:03:58,000
gamble to bring him to

87
00:04:01,110 --> 00:03:59,680
mit

88
00:04:04,149 --> 00:04:01,120

precisely at the point when the

89
00:04:05,350 --> 00:04:04,159
institute was in enormous upheaval

90
00:04:10,710 --> 00:04:05,360
it was

91
00:04:12,630 --> 00:04:10,720
bursting at the seams at its location in

92
00:04:15,190 --> 00:04:12,640
downtown boston

93
00:04:16,870 --> 00:04:15,200
financially it was a mess they had

94
00:04:19,749 --> 00:04:16,880
thought they could rectify that by

95
00:04:21,670 --> 00:04:19,759
merging with harvard university uh that

96
00:04:24,469 --> 00:04:21,680
had failed when the supreme judicial

97
00:04:28,469 --> 00:04:24,479
court of massachusetts had um

98
00:04:30,629 --> 00:04:28,479
ruled against this particular

99
00:04:33,749 --> 00:04:30,639
merger or acquisition i guess you could

100
00:04:35,749 --> 00:04:33,759
call it by harvard of mit so it was a

101
00:04:37,350 --> 00:04:35,759
mess and then comes this guy richard

102
00:04:39,510 --> 00:04:37,360
mclaren

103
00:04:40,870 --> 00:04:39,520
who turns out to be a brilliant

104
00:04:42,950 --> 00:04:40,880
administrator

105
00:04:47,670 --> 00:04:42,960
and he

106
00:04:49,909 --> 00:04:47,680
was also very canny in his

107
00:04:51,909 --> 00:04:49,919
selection of fields that he thought had

108
00:04:55,590 --> 00:04:51,919
great promise fields that he thought the

109
00:04:57,590 --> 00:04:55,600
institute should develop curriculum in

110
00:05:00,070 --> 00:04:57,600
and aeronautical engineering and

111
00:05:04,469 --> 00:05:00,080
aeronautics and flight was one of those

112
00:05:07,189 --> 00:05:04,479
fields and he wrote this uh in his 1914

113
00:05:10,550 --> 00:05:07,199

report mere descriptive lectures dealing

114
00:05:12,710 --> 00:05:10,560
with aerial flight in general and and in

115
00:05:15,430 --> 00:05:12,720
a popular manner would be out of place

116
00:05:17,830 --> 00:05:15,440
in the curricula of the institute an

117
00:05:19,590 --> 00:05:17,840
aeronautical engineer cannot be trained

118
00:05:21,990 --> 00:05:19,600
by such lectures

119
00:05:24,230 --> 00:05:22,000
what he needs is a carefully planned

120
00:05:26,310 --> 00:05:24,240
course in the theory and practice of

121
00:05:28,950 --> 00:05:26,320
aircraft design

122
00:05:31,110 --> 00:05:28,960
to make this possible mclaren continued

123
00:05:33,590 --> 00:05:31,120
in a way worthy of the institute's

124
00:05:35,710 --> 00:05:33,600
traditions it will be necessary to have

125
00:05:38,310 --> 00:05:35,720
a properly equipped laboratory for

126
00:05:40,710 --> 00:05:38,320
experimentation and research in certain

127
00:05:43,270 --> 00:05:40,720
subjects not dealt with in the existing

128
00:05:45,510 --> 00:05:43,280
laboratories of the institute so this

129
00:05:48,870 --> 00:05:45,520
structure that you see depicted on the

130
00:05:51,270 --> 00:05:48,880
screen is mit's first wind tunnel and it

131
00:05:53,430 --> 00:05:51,280
became the centerpiece of the new mit

132
00:05:57,670 --> 00:05:53,440
aerodynamic laboratory that was

133
00:05:58,629 --> 00:05:57,680
constructed in the summer of 1914.

134
00:06:01,749 --> 00:05:58,639
now

135
00:06:08,070 --> 00:06:06,150
fun carmen and before max monk of giants

136
00:06:10,469 --> 00:06:08,080
in the history of aerodynamics the

137
00:06:11,909 --> 00:06:10,479
subject of many important books

138
00:06:14,390 --> 00:06:11,919

were

139
00:06:17,189 --> 00:06:14,400
these two fellows that you have

140
00:06:18,469 --> 00:06:17,199
already met albert zam and jerome

141
00:06:21,670 --> 00:06:18,479
hunsicker

142
00:06:24,390 --> 00:06:21,680
theory and practice are um

143
00:06:25,749 --> 00:06:24,400
is a hearty perennial in the history of

144
00:06:27,590 --> 00:06:25,759
technology

145
00:06:29,670 --> 00:06:27,600
uh i think the story of bringing

146
00:06:31,510 --> 00:06:29,680
aerodynamics uh

147
00:06:33,430 --> 00:06:31,520
aerodynamic theory to the u.s has been

148
00:06:34,790 --> 00:06:33,440
well told by many authors some of whom

149
00:06:39,270 --> 00:06:34,800
are in this room

150
00:06:42,390 --> 00:06:39,280
paul hanley takashimoto john anderson

151
00:06:45,510 --> 00:06:42,400
bloor alex roland and jim hansen

152
00:06:47,990 --> 00:06:45,520
chronicle in exceptional and outstanding

153
00:06:49,990 --> 00:06:48,000
and fascinating detail how the u.s

154
00:06:52,469 --> 00:06:50,000
borrowed from the british advisory

155
00:06:54,950 --> 00:06:52,479
committee for aeronautics

156
00:06:58,070 --> 00:06:54,960
how we've heard this morning all of the

157
00:07:00,390 --> 00:06:58,080
nuances of the creation of the naca but

158
00:07:02,950 --> 00:07:00,400
what we've not spent much time on is

159
00:07:05,909 --> 00:07:02,960
early pedagogy and how this too is

160
00:07:09,029 --> 00:07:05,919
profoundly shaped by the european

161
00:07:12,230 --> 00:07:09,039
experience so the two key figures here

162
00:07:15,029 --> 00:07:12,240
on the left is albert albert francis sam

163
00:07:17,670 --> 00:07:15,039

and jerome clark hunsaker i'd like to

164
00:07:19,670 --> 00:07:17,680
give a shout out to felix powelski who

165
00:07:21,589 --> 00:07:19,680
initiated the university of michigan's

166
00:07:25,749 --> 00:07:21,599
undergraduate aeronautical engineering

167
00:07:28,230 --> 00:07:25,759
program in the fall of 1914 as well

168
00:07:31,350 --> 00:07:28,240
now again you've already learned zam and

169
00:07:33,189 --> 00:07:31,360
clark spent august and september of 1913

170
00:07:35,510 --> 00:07:33,199
touring europe to meet with the leaders

171
00:07:37,830 --> 00:07:35,520
of the field and quote learning at first

172
00:07:40,790 --> 00:07:37,840
hand what is being done at the centers

173
00:07:43,270 --> 00:07:40,800
of research now i'll quibble with tom a

174
00:07:45,749 --> 00:07:43,280
little bit zam as far as i understand

175
00:07:48,469 --> 00:07:45,759
was the senior partner on this trip and

176
00:07:51,589 --> 00:07:48,479
hunsaker went because mclaren wanted him

177
00:07:54,230 --> 00:07:51,599
to go mclaren had just had seen a great

178
00:07:56,950 --> 00:07:54,240
deal of success the u.s navy ran a

179
00:07:58,710 --> 00:07:56,960
postgraduate training program for naval

180
00:08:01,029 --> 00:07:58,720
engineering naval architecture and

181
00:08:02,469 --> 00:08:01,039
maritime design it's called course 13 in

182
00:08:08,070 --> 00:08:02,479
mit

183
00:08:10,230 --> 00:08:08,080
and uh he thought the navy paid a great

184
00:08:12,070 --> 00:08:10,240
deal of money to the institute

185
00:08:14,230 --> 00:08:12,080
to run this

186
00:08:15,749 --> 00:08:14,240
graduate training program and master's

187
00:08:17,830 --> 00:08:15,759
degree program and he thought wouldn't

188
00:08:18,790 --> 00:08:17,840

it be great to do that with aeronautics

189
00:08:21,029 --> 00:08:18,800
as well

190
00:08:23,029 --> 00:08:21,039
so uh he

191
00:08:23,830 --> 00:08:23,039
he urged

192
00:08:27,270 --> 00:08:23,840
that

193
00:08:29,110 --> 00:08:27,280
hunsaker be invited along on this trip

194
00:08:30,550 --> 00:08:29,120
now you've seen some of these pictures

195
00:08:33,509 --> 00:08:30,560
before

196
00:08:36,550 --> 00:08:33,519
this is zam's laboratory and wind tunnel

197
00:08:38,870 --> 00:08:36,560
at the catholic university of america

198
00:08:40,310 --> 00:08:38,880
and maybe you've picked up this morning

199
00:08:43,589 --> 00:08:40,320
that

200
00:08:47,110 --> 00:08:43,599
unlike chanute or really any of the uh

201
00:08:49,670 --> 00:08:47,120
you know giants in the early

202
00:08:52,949 --> 00:08:49,680
area of aeronautical research zam is the

203
00:08:55,829 --> 00:08:52,959
one that has academic degrees

204
00:08:58,630 --> 00:08:55,839
in this who actually uh did

205
00:09:01,430 --> 00:08:58,640
undergraduate graduate uh

206
00:09:04,310 --> 00:09:01,440
you know his master's in and uh ph.d

207
00:09:06,310 --> 00:09:04,320
training where the subject of his

208
00:09:08,870 --> 00:09:06,320
investigations was

209
00:09:11,110 --> 00:09:08,880
flight he built and tested models and

210
00:09:13,910 --> 00:09:11,120
improvised wind tunnels in the 1880s and

211
00:09:16,070 --> 00:09:13,920
90s that apparently was quite common

212
00:09:18,389 --> 00:09:16,080
there were students at mit in the mid

213
00:09:20,710 --> 00:09:18,399

1890s who also

214
00:09:23,509 --> 00:09:20,720
commandeered they took the ventilation

215
00:09:25,829 --> 00:09:23,519
system uh created a little channel in

216
00:09:28,790 --> 00:09:25,839
one of the ductwork they shut down the

217
00:09:30,949 --> 00:09:28,800
ventilation in the entire uh

218
00:09:33,350 --> 00:09:30,959
building and so that all the air might

219
00:09:34,389 --> 00:09:33,360
be channeled through this one vent shaft

220
00:09:36,230 --> 00:09:34,399
and

221
00:09:40,310 --> 00:09:36,240
so there were several undergraduate

222
00:09:42,790 --> 00:09:40,320
theses that uh used um these improv

223
00:09:45,509 --> 00:09:42,800
improvised wind tunnel here

224
00:09:47,509 --> 00:09:45,519
um obviously as you know zam was a

225
00:09:50,310 --> 00:09:47,519
tireless advocate he wrote numerous

226
00:09:52,630 --> 00:09:50,320
articles but his focus was on the

227
00:09:54,630 --> 00:09:52,640
establishment of a national laboratory

228
00:09:56,630 --> 00:09:54,640
what you don't find in all of these

229
00:09:58,550 --> 00:09:56,640
research and writings is any discussion

230
00:10:00,790 --> 00:09:58,560
about teaching

231
00:10:01,910 --> 00:10:00,800
about making the next generation of

232
00:10:04,790 --> 00:10:01,920
students

233
00:10:07,829 --> 00:10:04,800
by contrast jerome hunsaker made

234
00:10:10,470 --> 00:10:07,839
engineering education his primary focus

235
00:10:14,470 --> 00:10:10,480
in fact that's he was detailed by the

236
00:10:16,829 --> 00:10:14,480
u.s navy to mit precisely to create a

237
00:10:20,069 --> 00:10:16,839
formal educational

238
00:10:21,910 --> 00:10:20,079

curriculum uh now many in this room well

239
00:10:24,470 --> 00:10:21,920
half of this room probably knows that

240
00:10:26,389 --> 00:10:24,480
mit started its life in boston and moved

241
00:10:27,350 --> 00:10:26,399
to cambridge where you see

242
00:10:31,590 --> 00:10:27,360
um

243
00:10:33,590 --> 00:10:31,600
here this is an aerial taken in 1917 so

244
00:10:36,069 --> 00:10:33,600
it's just you see the beginnings of

245
00:10:38,949 --> 00:10:36,079
development in the famous uh dome there

246
00:10:42,710 --> 00:10:38,959
in the front and what you see circled in

247
00:10:43,750 --> 00:10:42,720
red there in the sort of left middle is

248
00:10:44,949 --> 00:10:43,760
a

249
00:10:47,030 --> 00:10:44,959
structure

250
00:10:50,310 --> 00:10:47,040
that became the

251
00:10:53,190 --> 00:10:50,320
home of the mit aeronautics laboratory

252
00:10:55,509 --> 00:10:53,200
so mit moved officially to cambridge in

253
00:10:58,949 --> 00:10:55,519
1916.

254
00:11:01,190 --> 00:10:58,959
construction started in 1913 but the

255
00:11:03,670 --> 00:11:01,200
first

256
00:11:07,110 --> 00:11:03,680
sort of academic or research endeavor on

257
00:11:09,590 --> 00:11:07,120
the cambridge site was the erin eridan

258
00:11:13,590 --> 00:11:09,600
excuse me aerodynamics laboratory and

259
00:11:16,710 --> 00:11:13,600
it's in that building that you uh see

260
00:11:21,190 --> 00:11:19,509
now charles wolcott who you again have

261
00:11:23,110 --> 00:11:21,200
also heard

262
00:11:25,670 --> 00:11:23,120
a lot about this morning and as a

263
00:11:27,990 --> 00:11:25,680

crucial figure to this story wrote in

264
00:11:29,430 --> 00:11:28,000
his letter of introduction for zam and

265
00:11:31,750 --> 00:11:29,440
hunsaker

266
00:11:34,069 --> 00:11:31,760
in the summer of 1913 that they were

267
00:11:36,630 --> 00:11:34,079
quote visiting europe for the purpose of

268
00:11:39,190 --> 00:11:36,640
studying aerodynamical laboratories near

269
00:11:41,990 --> 00:11:39,200
london paris and gottingen to obtain

270
00:11:44,230 --> 00:11:42,000
information concerning the latest

271
00:11:47,030 --> 00:11:44,240
developments in instruments methods and

272
00:11:49,509 --> 00:11:47,040
resources used and contemplated for the

273
00:11:52,230 --> 00:11:49,519
prosecution of scientific aeronautical

274
00:11:54,550 --> 00:11:52,240
investigations

275
00:11:56,629 --> 00:11:54,560
richard mclaren

276
00:11:59,190 --> 00:11:56,639
had written to his dear friend and

277
00:12:00,710 --> 00:11:59,200
colleague richard glazebrook who was the

278
00:12:02,949 --> 00:12:00,720
director of the national physical

279
00:12:06,150 --> 00:12:02,959
laboratory in teddington that's what you

280
00:12:08,710 --> 00:12:06,160
see pic depicted here on the screen with

281
00:12:10,790 --> 00:12:08,720
a special request

282
00:12:11,670 --> 00:12:10,800
he asked that

283
00:12:14,310 --> 00:12:11,680
uh

284
00:12:19,110 --> 00:12:14,320
the national physical laboratory extend

285
00:12:22,870 --> 00:12:19,120
a special welcome uh to uh hunsaker um

286
00:12:26,870 --> 00:12:22,880
including him in actual experiments and

287
00:12:29,430 --> 00:12:26,880
um to perhaps uh provide him detailed

288
00:12:31,190 --> 00:12:29,440

information on their facilities

289
00:12:33,590 --> 00:12:31,200
glaze brook and his colleagues were

290
00:12:36,389 --> 00:12:33,600
unstinting in their assistance and they

291
00:12:38,870 --> 00:12:36,399
provided plans for their four-foot wind

292
00:12:41,430 --> 00:12:38,880
channel as they called it this was the

293
00:12:44,150 --> 00:12:41,440
second generation

294
00:12:46,230 --> 00:12:44,160
wind tunnel that they had built in it

295
00:12:48,230 --> 00:12:46,240
they invited hunsaker to spend time

296
00:12:51,030 --> 00:12:48,240
learning the practical details of its

297
00:12:53,430 --> 00:12:51,040
operation and use most especially the

298
00:12:55,590 --> 00:12:53,440
techniques involving quote specially

299
00:12:58,389 --> 00:12:55,600
designed weighing the the specially

300
00:13:01,110 --> 00:12:58,399
designed weighing mechanism by means of

301
00:13:03,590 --> 00:13:01,120
which the forces and moments acting on a

302
00:13:06,389 --> 00:13:03,600
model whether of an airplane wing or of

303
00:13:14,230 --> 00:13:06,399
an entire airplane in any presentation

304
00:13:14,240 --> 00:13:17,750
let's

305
00:13:21,990 --> 00:13:20,310
so jerome hunsaker donald douglas and

306
00:13:24,310 --> 00:13:22,000
edward warner there are two names we

307
00:13:26,550 --> 00:13:24,320
haven't heard edward warner and donald

308
00:13:28,790 --> 00:13:26,560
douglas mentioned yet so remember them

309
00:13:30,389 --> 00:13:28,800
they're important to this larger

310
00:13:33,110 --> 00:13:30,399
narrative that we're constructing

311
00:13:35,670 --> 00:13:33,120
together built this uh wind tunnel that

312
00:13:37,670 --> 00:13:35,680
you see on the left and you had seen

313
00:13:39,910 --> 00:13:37,680

earlier the

314
00:13:42,710 --> 00:13:39,920
they wrote to the cambridge scientific

315
00:13:43,910 --> 00:13:42,720
instrument company asked them

316
00:13:45,590 --> 00:13:43,920
to build

317
00:13:48,710 --> 00:13:45,600
that bronze balance you saw at the

318
00:13:51,829 --> 00:13:48,720
beginning this entire facility

319
00:13:55,189 --> 00:13:51,839
the the the shed the wind tunnel the

320
00:13:59,750 --> 00:13:55,199
balance um costs 2500

321
00:14:01,910 --> 00:13:59,760
or about 59 000 in today's money and

322
00:14:03,269 --> 00:14:01,920
just to make a comparison a year later i

323
00:14:04,470 --> 00:14:03,279
think

324
00:14:06,629 --> 00:14:04,480
somebody mentioned the first

325
00:14:08,949 --> 00:14:06,639
appropriation for the naca was five

326
00:14:11,990 --> 00:14:08,959
thousand dollars so just to give you a

327
00:14:14,310 --> 00:14:12,000
little sense of scale of expenditures

328
00:14:17,350 --> 00:14:14,320
now hunsaker's famous paper which you

329
00:14:20,150 --> 00:14:17,360
this um is

330
00:14:22,710 --> 00:14:20,160
this slide shows uh the wind tunnel the

331
00:14:25,030 --> 00:14:22,720
massachusetts institute of technology uh

332
00:14:29,670 --> 00:14:25,040
published actually by the smithsonian in

333
00:14:33,910 --> 00:14:32,310
jim hansen did that in his uh great

334
00:14:36,470 --> 00:14:33,920
volume that many of the people here in

335
00:14:38,550 --> 00:14:36,480
this room worked on um

336
00:14:40,790 --> 00:14:38,560
but what's forgotten is that hunsaker's

337
00:14:43,750 --> 00:14:40,800
paper was one of ten based on

338
00:14:46,069 --> 00:14:43,760

preliminary investigations made

339
00:14:46,790 --> 00:14:46,079
in the tunnel during its initial period

340
00:14:49,509 --> 00:14:46,800
of

341
00:14:51,430 --> 00:14:49,519
operation in 1914

342
00:14:53,509 --> 00:14:51,440
in 1915.

343
00:14:55,030 --> 00:14:53,519
it wasn't an exact reproduction of the

344
00:14:56,949 --> 00:14:55,040
npl tunnel

345
00:14:59,509 --> 00:14:56,959
hunsaker notes that they chose to

346
00:15:02,150 --> 00:14:59,519
increase its length and diameter based

347
00:15:04,389 --> 00:15:02,160
on the experiences of gustav eiffel in

348
00:15:06,550 --> 00:15:04,399
the design and operation of eiffel's

349
00:15:10,389 --> 00:15:06,560
wind tunnel in paris

350
00:15:17,030 --> 00:15:13,750
here that um

351
00:15:18,710 --> 00:15:17,040
mit had commissioned this balance uh

352
00:15:21,590 --> 00:15:18,720
according to the standards and they

353
00:15:23,910 --> 00:15:21,600
invited the national physical laboratory

354
00:15:25,750 --> 00:15:23,920
staff verified the weights and

355
00:15:27,670 --> 00:15:25,760
dimensions of the balance they count and

356
00:15:29,590 --> 00:15:27,680
the calibration of the torsion wire so

357
00:15:32,310 --> 00:15:29,600
there was quite a bit of exchange as

358
00:15:35,269 --> 00:15:32,320
they were installing and bringing this

359
00:15:37,110 --> 00:15:35,279
tunnel online what the mit personnel had

360
00:15:40,150 --> 00:15:37,120
to do was figure out how to use it and

361
00:15:42,150 --> 00:15:40,160
what problems uh might be worthy it

362
00:15:43,990 --> 00:15:42,160
might be worth studying in it and

363
00:15:47,189 --> 00:15:44,000

finally most importantly how to teach

364
00:15:49,189 --> 00:15:47,199
students to use it and to do that again

365
00:15:58,389 --> 00:15:49,199
next year and the year after and the

366
00:16:02,150 --> 00:16:00,069
jumping here

367
00:16:05,110 --> 00:16:02,160
edward pearson warner who had helped

368
00:16:08,069 --> 00:16:05,120
build that mit tunnel

369
00:16:11,430 --> 00:16:08,079
is hired in 1919 to be the chief

370
00:16:13,430 --> 00:16:11,440
physicist of the naca and one of his

371
00:16:14,790 --> 00:16:13,440
first big projects is to build the wind

372
00:16:17,110 --> 00:16:14,800
tunnel this is

373
00:16:20,230 --> 00:16:17,120
wind tunnel number one

374
00:16:22,389 --> 00:16:20,240
at langley field and if it looks

375
00:16:24,790 --> 00:16:22,399
familiar to you it should because it's

376
00:16:26,629 --> 00:16:24,800
built using the exact same plans from

377
00:16:28,470 --> 00:16:26,639
the national physical laboratory that

378
00:16:31,110 --> 00:16:28,480
were given to mit

379
00:16:33,670 --> 00:16:31,120
and this one shows the balance and

380
00:16:34,710 --> 00:16:33,680
likewise warner recommended using the

381
00:16:36,629 --> 00:16:34,720
same

382
00:16:38,710 --> 00:16:36,639
national physical laboratory design

383
00:16:41,269 --> 00:16:38,720
balance he wrote

384
00:16:43,350 --> 00:16:41,279
in his technical report quote there is

385
00:16:45,990 --> 00:16:43,360
no other so simple to use yet the

386
00:16:49,749 --> 00:16:46,000
accuracy attainable is as great as with

387
00:16:52,230 --> 00:16:49,759
any of the more complicated types

388
00:16:56,150 --> 00:16:52,240

now this picture just quickly shows you

389
00:16:57,910 --> 00:16:56,160
on the left the naca and on the right um

390
00:16:58,949 --> 00:16:57,920
the mit

391
00:17:00,949 --> 00:16:58,959
uh

392
00:17:02,629 --> 00:17:00,959
balance and tunnel

393
00:17:04,549 --> 00:17:02,639
jim hanson has written that wind tunnel

394
00:17:06,630 --> 00:17:04,559
number one was really a learning tool

395
00:17:09,429 --> 00:17:06,640
something to get the united states back

396
00:17:11,270 --> 00:17:09,439
into aeronautical research um

397
00:17:13,429 --> 00:17:11,280
we've talked a lot about this feeling

398
00:17:16,390 --> 00:17:13,439
that the u.s was behind and it needed to

399
00:17:18,949 --> 00:17:16,400
catch up with europe i'm not certain

400
00:17:21,189 --> 00:17:18,959
uh we should i think maybe we should

401
00:17:23,270 --> 00:17:21,199
revisit that claim i think it's less

402
00:17:25,189 --> 00:17:23,280
about getting back and more about

403
00:17:27,750 --> 00:17:25,199
getting into

404
00:17:28,789 --> 00:17:27,760
and this uh wind tunnel was a crucial

405
00:17:30,630 --> 00:17:28,799
element

406
00:17:33,830 --> 00:17:30,640
uh in that

407
00:17:36,310 --> 00:17:33,840
process now warner norton conducted

408
00:17:37,750 --> 00:17:36,320
quite a few studies on this tunnel and

409
00:17:40,150 --> 00:17:37,760
they compared

410
00:17:43,669 --> 00:17:40,160
information with the you know using the

411
00:17:45,990 --> 00:17:43,679
naca they had tests done at mit and then

412
00:17:49,110 --> 00:17:46,000
lo and behold the curtis engineering

413
00:17:52,310 --> 00:17:49,120

corporation had also built an and

414
00:17:55,029 --> 00:17:52,320
an npl designed wind tunnel and balance

415
00:17:57,830 --> 00:17:55,039
so now we have three um

416
00:18:00,390 --> 00:17:57,840
and what's really fun is david haas who

417
00:18:03,029 --> 00:18:00,400
i think is here from the navy

418
00:18:05,070 --> 00:18:03,039
mentioned oh by the way that the navy

419
00:18:08,230 --> 00:18:05,080
built in

420
00:18:10,870 --> 00:18:08,240
1918 a four foot tunnel also on the

421
00:18:11,909 --> 00:18:10,880
national physical laboratory's

422
00:18:14,549 --> 00:18:11,919
design

423
00:18:15,430 --> 00:18:14,559
they had built a larger tunnel earlier

424
00:18:17,669 --> 00:18:15,440
but

425
00:18:20,470 --> 00:18:17,679
and as this picture makes clear of that

426
00:18:21,990 --> 00:18:20,480
tunnel uh the navy's first wind tunnel

427
00:18:25,430 --> 00:18:22,000
is not

428
00:18:26,470 --> 00:18:25,440
an open throat wind tunnel uh so we have

429
00:18:30,070 --> 00:18:26,480
four

430
00:18:31,430 --> 00:18:30,080
and this is the uh balance from that uh

431
00:18:34,230 --> 00:18:31,440
wind tunnel

432
00:18:36,230 --> 00:18:34,240
uh and i could go on revealing

433
00:18:38,950 --> 00:18:36,240
connection after connection but the

434
00:18:41,270 --> 00:18:38,960
point is this huntsacker did more than

435
00:18:42,390 --> 00:18:41,280
simply import a set of plans for wind

436
00:18:44,710 --> 00:18:42,400
tunnel

437
00:18:46,470 --> 00:18:44,720
balance that he helped set in motion the

438
00:18:48,470 --> 00:18:46,480

american aeronautical engineering

439
00:18:50,470 --> 00:18:48,480
enterprise and he figured out a way to

440
00:18:53,190 --> 00:18:50,480
make the curriculum compelling and

441
00:18:55,190 --> 00:18:53,200
useful and i i want to conclude with

442
00:18:57,430 --> 00:18:55,200
just this one

443
00:18:59,590 --> 00:18:57,440
two slides here

444
00:19:01,669 --> 00:18:59,600
this is menlo park

445
00:19:04,070 --> 00:19:01,679
and this is the national bureau of

446
00:19:06,710 --> 00:19:04,080
standards and tom crouch

447
00:19:09,350 --> 00:19:06,720
in quoting from hunter dupree made the

448
00:19:11,270 --> 00:19:09,360
observation that

449
00:19:14,870 --> 00:19:11,280
aeronautics was a little late in the

450
00:19:17,510 --> 00:19:14,880
game that uh corporate r d labs are out

451
00:19:20,549 --> 00:19:17,520
there government labs come into being

452
00:19:23,909 --> 00:19:20,559
and so i think it's really important to

453
00:19:27,110 --> 00:19:23,919
remember it when we tell this story to

454
00:19:29,549 --> 00:19:27,120
situate the naca in a larger world of

455
00:19:33,510 --> 00:19:29,559
corporate research of

456
00:19:36,390 --> 00:19:33,520
manufacturing and of the university and

457
00:19:38,549 --> 00:19:36,400
bruno latour and steve wolgar are famous

458
00:19:39,830 --> 00:19:38,559
sociologists of science and technology

459
00:19:42,630 --> 00:19:39,840
made this

460
00:19:44,870 --> 00:19:42,640
conclusion in their famous book lab life

461
00:19:47,350 --> 00:19:44,880
quote the daily activities of working

462
00:19:49,990 --> 00:19:47,360
scientists lead to the construction of

463
00:19:51,909 --> 00:19:50,000

scientific facts so the construction of

464
00:19:54,070 --> 00:19:51,919
wind tunnels and aeronautical

465
00:19:56,230 --> 00:19:54,080
engineering research laboratories

466
00:19:58,390 --> 00:19:56,240
resulted in the creation of a

467
00:20:00,710 --> 00:19:58,400
pedagogical method and a cadre of

468
00:20:02,870 --> 00:20:00,720
researchers who in turn would reshape

469
00:20:06,070 --> 00:20:02,880
the world we live in not to mention

470
00:20:08,870 --> 00:20:06,080
provide access to worlds beyond so in

471
00:20:11,270 --> 00:20:08,880
order to bring aerodynamics to america

472
00:20:12,870 --> 00:20:11,280
you first had to bring aeronautical

473
00:20:14,549 --> 00:20:12,880
engineering

474
00:20:16,549 --> 00:20:14,559
and p.s

475
00:20:19,190 --> 00:20:16,559
what happened to that tunnel the balance

476
00:20:21,350 --> 00:20:19,200
that balance is the only remnant of all

477
00:20:24,710 --> 00:20:21,360
four tunnels this is the destruction of

478
00:20:27,669 --> 00:20:24,720
the mit tunnel in 1941 and as far as i

479
00:20:30,710 --> 00:20:27,679
know there is no other artifact

480
00:20:32,310 --> 00:20:30,720
from this formative period that survives

481
00:20:44,870 --> 00:20:32,320
so

482
00:20:49,190 --> 00:20:47,029
thank you debbie that was great

483
00:20:51,909 --> 00:20:49,200
for another look at mit we're going to

484
00:20:55,430 --> 00:20:51,919
turn to john tilco who has an

485
00:20:58,149 --> 00:20:55,440
interesting background john is both an

486
00:21:00,830 --> 00:20:58,159
aerospace engineer and now he's going

487
00:21:03,590 --> 00:21:00,840
back to get his phd in the

488
00:21:14,070 --> 00:21:03,600

history of

489
00:21:17,510 --> 00:21:15,350
thank you and his pleasure to be here

490
00:21:19,909 --> 00:21:17,520
today um i'm going to be talking about

491
00:21:24,230 --> 00:21:19,919
three institutions that started

492
00:21:29,029 --> 00:21:27,430
naca which we're honoring today

493
00:21:31,029 --> 00:21:29,039
but also the

494
00:21:32,630 --> 00:21:31,039
naval aviation

495
00:21:35,669 --> 00:21:32,640
institution which effectively was

496
00:21:37,430 --> 00:21:35,679
created around 1911 and and celebrated

497
00:21:39,029 --> 00:21:37,440
its centennial

498
00:21:41,510 --> 00:21:39,039
just a few years ago

499
00:21:43,350 --> 00:21:41,520
and the mit aeronautics department which

500
00:21:46,870 --> 00:21:43,360
debbie has done a very good job of

501
00:21:48,789 --> 00:21:46,880
describing the initial formation of

502
00:21:51,909 --> 00:21:48,799
which we celebrated the centennial of

503
00:21:53,270 --> 00:21:51,919
just in october these three institutions

504
00:21:55,430 --> 00:21:53,280
are very

505
00:21:57,270 --> 00:21:55,440
intertwined in the way they interact

506
00:21:59,350 --> 00:21:57,280
with each other the way the graduates

507
00:22:01,350 --> 00:21:59,360
from the programs

508
00:22:04,789 --> 00:22:01,360
disseminate into industry but continue

509
00:22:07,029 --> 00:22:04,799
to work closely with both the navy and

510
00:22:07,990 --> 00:22:07,039
the naca and it effectively develops

511
00:22:10,149 --> 00:22:08,000
this

512
00:22:11,350 --> 00:22:10,159
axis of

513
00:22:12,390 --> 00:22:11,360

mit

514
00:22:13,350 --> 00:22:12,400
navy

515
00:22:16,310 --> 00:22:13,360
naca

516
00:22:18,710 --> 00:22:16,320
which is i think kind of a fundamental

517
00:22:21,909 --> 00:22:18,720
uh way to think about the evolution of

518
00:22:23,750 --> 00:22:21,919
this field as i looked back on it and i

519
00:22:25,669 --> 00:22:23,760
remember the days when jerome hunsaker

520
00:22:27,190 --> 00:22:25,679
was

521
00:22:31,110 --> 00:22:27,200
had an office in the aeronautics

522
00:22:33,430 --> 00:22:31,120
department when i was an undergrad

523
00:22:36,310 --> 00:22:33,440
i would have guessed it was all about

524
00:22:38,070 --> 00:22:36,320
mit and the air force and and uh and the

525
00:22:40,310 --> 00:22:38,080
reality is that it's much more about

526
00:22:43,029 --> 00:22:40,320
these three institutions so i'll be

527
00:22:45,190 --> 00:22:43,039
talking about how they

528
00:22:47,750 --> 00:22:45,200
evolved the practice of aeronautical

529
00:22:50,230 --> 00:22:47,760
engineering in the united states and

530
00:22:52,870 --> 00:22:50,240
building upon the european foundation in

531
00:22:54,710 --> 00:22:52,880
applied mathematics

532
00:22:56,789 --> 00:22:54,720
which basically was responsible for

533
00:22:58,310 --> 00:22:56,799
solving the fundamental theory of

534
00:23:04,230 --> 00:22:58,320
circulation

535
00:23:05,909 --> 00:23:04,240
uh which ludwig prandtl evolved at

536
00:23:06,830 --> 00:23:05,919
gertengen and i know

537
00:23:09,350 --> 00:23:06,840
my

538
00:23:11,990 --> 00:23:09,360

colleague dr haley and we'll be talking

539
00:23:14,789 --> 00:23:12,000
much more about that

540
00:23:17,830 --> 00:23:14,799
as it comes to mit and the mit engineers

541
00:23:20,470 --> 00:23:17,840
who who basically work in the navy and

542
00:23:21,270 --> 00:23:20,480
the and the naca it's the combination of

543
00:23:24,310 --> 00:23:21,280
those

544
00:23:26,230 --> 00:23:24,320
two threads of capability sort of the

545
00:23:29,110 --> 00:23:26,240
applied mathematics approach of

546
00:23:31,029 --> 00:23:29,120
gertengen and the ingenuity

547
00:23:33,430 --> 00:23:31,039
and design practice and empirical

548
00:23:35,990 --> 00:23:33,440
methods that the

549
00:23:38,230 --> 00:23:36,000
largely mit trained engineers adopt in

550
00:23:39,750 --> 00:23:38,240
the wind tunnels of the of the naca and

551
00:23:42,070 --> 00:23:39,760
this is the practice

552
00:23:44,470 --> 00:23:42,080
which i'm calling

553
00:23:46,310 --> 00:23:44,480
heterogeneous engineering

554
00:23:48,830 --> 00:23:46,320
which has been explored by people like

555
00:23:51,669 --> 00:23:48,840
john law and donald

556
00:23:53,990 --> 00:23:51,679
mackenzie it's also interesting to see

557
00:23:56,470 --> 00:23:54,000
this from the perspective of the first

558
00:23:58,149 --> 00:23:56,480
military industrial university complex

559
00:24:01,110 --> 00:23:58,159
many people have written about how this

560
00:24:02,789 --> 00:24:01,120
evolves after world war ii in response

561
00:24:04,710 --> 00:24:02,799
to the cold war it's actually a much

562
00:24:07,110 --> 00:24:04,720
earlier story that

563
00:24:13,430 --> 00:24:07,120

basically is starting to involve evolve

564
00:24:18,950 --> 00:24:16,230
the origins actually go back to

565
00:24:22,230 --> 00:24:18,960
an event that occurs in england

566
00:24:24,149 --> 00:24:22,240
when the royal navy college in greenwich

567
00:24:26,630 --> 00:24:24,159
basically

568
00:24:30,310 --> 00:24:26,640
the british parliament issues an edict

569
00:24:32,470 --> 00:24:30,320
in 1896 preventing all foreign students

570
00:24:34,630 --> 00:24:32,480
from being educated in that program and

571
00:24:36,710 --> 00:24:34,640
this is where the naval academy

572
00:24:39,430 --> 00:24:36,720
graduates were sent for their

573
00:24:41,350 --> 00:24:39,440
postgraduate educations at the time

574
00:24:44,310 --> 00:24:41,360
and so the navy goes into a period where

575
00:24:46,630 --> 00:24:44,320
they try to figure out how to build a

576
00:24:49,110 --> 00:24:46,640
practice of postgraduate education

577
00:24:51,750 --> 00:24:49,120
initially considering the naval academy

578
00:24:53,750 --> 00:24:51,760
is the right place to do that

579
00:24:55,269 --> 00:24:53,760
and this is where mit steps in debbie

580
00:24:56,789 --> 00:24:55,279
described the department of naval

581
00:24:58,789 --> 00:24:56,799
architecture the graduate course for

582
00:25:00,549 --> 00:24:58,799
naval construction and engineering known

583
00:25:03,029 --> 00:25:00,559
as course 13a

584
00:25:06,390 --> 00:25:03,039
this is really where the first

585
00:25:08,950 --> 00:25:06,400
naval aviators who work in the practice

586
00:25:10,549 --> 00:25:08,960
of aeronautical engineering uh in the in

587
00:25:11,590 --> 00:25:10,559
the navy come from this is a picture of

588
00:25:15,669 --> 00:25:11,600

holden

589
00:25:16,950 --> 00:25:15,679
richardson who graduates in 1907 is

590
00:25:19,750 --> 00:25:16,960
considered to be

591
00:25:21,590 --> 00:25:19,760
the navy's first engineering test pilot

592
00:25:23,269 --> 00:25:21,600
it was described how he was on some of

593
00:25:25,830 --> 00:25:23,279
the key committees

594
00:25:27,990 --> 00:25:25,840
leading to the formation of the naca and

595
00:25:32,390 --> 00:25:28,000
then was the navy's representative on

596
00:25:37,669 --> 00:25:35,029
and i'll point out what's probably even

597
00:25:40,310 --> 00:25:37,679
more significant is within a few

598
00:25:43,430 --> 00:25:40,320
years the

599
00:25:47,269 --> 00:25:43,440
that population of mit educated naval

600
00:25:50,149 --> 00:25:47,279
officers at the outset of world war one

601
00:25:52,230 --> 00:25:50,159
63 of them would become naval officers

602
00:25:53,669 --> 00:25:52,240
working in the bureau of construction

603
00:25:56,310 --> 00:25:53,679
which is where the

604
00:25:59,029 --> 00:25:56,320
navy's aviation branch started so that

605
00:26:01,830 --> 00:25:59,039
was 75 percent of the

606
00:26:03,990 --> 00:26:01,840
of the officers in place in the in the

607
00:26:06,149 --> 00:26:04,000
uh in the navy's bureau of construction

608
00:26:08,149 --> 00:26:06,159
at the time

609
00:26:10,630 --> 00:26:08,159
so we've heard about richard mclaren

610
00:26:13,269 --> 00:26:10,640
i'll just add that two people arrive in

611
00:26:15,350 --> 00:26:13,279
the fall of 1909 at mit one is richard

612
00:26:17,190 --> 00:26:15,360
mclaren the other is jerome hunsaker and

613
00:26:18,789 --> 00:26:17,200

it's actually a friendship between their

614
00:26:21,190 --> 00:26:18,799
wives that

615
00:26:23,190 --> 00:26:21,200
bring the two of them together

616
00:26:25,350 --> 00:26:23,200
mclaren is actually interested in

617
00:26:28,789 --> 00:26:25,360
creating this first national

618
00:26:31,669 --> 00:26:28,799
aeronautical laboratory at mit

619
00:26:33,430 --> 00:26:31,679
and as you've heard uh from this morning

620
00:26:35,510 --> 00:26:33,440
that runs into sort of political

621
00:26:39,510 --> 00:26:35,520
problems both the navy

622
00:26:42,789 --> 00:26:39,520
and and the smithsonian are both

623
00:26:45,510 --> 00:26:42,799
involved in as sponsors of research at

624
00:26:47,990 --> 00:26:45,520
mit so politically he looks for a

625
00:26:50,789 --> 00:26:48,000
compromise and that effectively becomes

626
00:26:54,390 --> 00:26:50,799
this idea of asking the navy

627
00:26:55,269 --> 00:26:54,400
to detail uh jerome hunsaker to mit

628
00:26:56,390 --> 00:26:55,279
which

629
00:26:58,470 --> 00:26:56,400
uh

630
00:27:00,149 --> 00:26:58,480
starts after jerome hunsker completes

631
00:27:01,750 --> 00:27:00,159
his master's degree in the ocean

632
00:27:04,470 --> 00:27:01,760
engineering department

633
00:27:06,470 --> 00:27:04,480
and then uh goes on this tour of the

634
00:27:07,350 --> 00:27:06,480
european facilities it's a five-month

635
00:27:09,110 --> 00:27:07,360
tour

636
00:27:11,750 --> 00:27:09,120
they spent about a month working with

637
00:27:13,110 --> 00:27:11,760
eiffel in paris they go to gurtengen

638
00:27:15,110 --> 00:27:13,120

which is where really where he

639
00:27:15,990 --> 00:27:15,120
encounters ludwig prandtl for the first

640
00:27:18,789 --> 00:27:16,000
time

641
00:27:20,389 --> 00:27:18,799
and then they go to the um to see the

642
00:27:22,149 --> 00:27:20,399
the british operation

643
00:27:24,789 --> 00:27:22,159
and this is the period that i think is

644
00:27:27,830 --> 00:27:24,799
particularly important in the history of

645
00:27:31,269 --> 00:27:27,840
aeronautics because it's the

646
00:27:33,909 --> 00:27:31,279
debate that is ongoing about what is the

647
00:27:36,310 --> 00:27:33,919
basis for lyft so the wright brothers

648
00:27:39,029 --> 00:27:36,320
fly without the invention of

649
00:27:41,110 --> 00:27:39,039
uh aerodynamic lift theory that comes

650
00:27:43,269 --> 00:27:41,120
really in this debate between the

651
00:27:44,950 --> 00:27:43,279
british and the and the germans between

652
00:27:47,110 --> 00:27:44,960
cambridge university

653
00:27:49,510 --> 00:27:47,120
and guertingen

654
00:27:52,149 --> 00:27:49,520
that debate is covered in with a with

655
00:27:52,950 --> 00:27:52,159
great detail and and and exceedingly

656
00:27:54,950 --> 00:27:52,960
well

657
00:27:57,269 --> 00:27:54,960
in a book by um

658
00:27:58,470 --> 00:27:57,279
david bloor called enigma of the airfoil

659
00:28:00,830 --> 00:27:58,480
which really

660
00:28:03,990 --> 00:28:00,840
describes these competing

661
00:28:07,350 --> 00:28:04,000
ideologies competing methods of practice

662
00:28:10,710 --> 00:28:07,360
that ultimately result i would say the

663
00:28:11,510 --> 00:28:10,720

the the key change event is in 1926 when

664
00:28:15,510 --> 00:28:11,520
the

665
00:28:17,909 --> 00:28:15,520
correct and invite ludwig prandtl to

666
00:28:19,990 --> 00:28:17,919
give a distinguished lecture

667
00:28:21,830 --> 00:28:20,000
about circulation lift there and about

668
00:28:23,110 --> 00:28:21,840
boundary layers

669
00:28:25,350 --> 00:28:23,120
so

670
00:28:27,909 --> 00:28:25,360
kind of jumping forward to what these

671
00:28:29,430 --> 00:28:27,919
guys accomplish and i'll just touch

672
00:28:31,430 --> 00:28:29,440
a little bit there's the wind tunnels

673
00:28:33,110 --> 00:28:31,440
debbie as described the picture on the

674
00:28:35,269 --> 00:28:33,120
left comes from the first master's

675
00:28:36,389 --> 00:28:35,279
degree thesis at mit

676
00:28:37,350 --> 00:28:36,399
um

677
00:28:39,190 --> 00:28:37,360
on

678
00:28:41,510 --> 00:28:39,200
with the sort of what i want to show you

679
00:28:43,830 --> 00:28:41,520
in this image is the idea that you put

680
00:28:45,029 --> 00:28:43,840
the entire airplane into the wind tunnel

681
00:28:47,029 --> 00:28:45,039
which is

682
00:28:49,590 --> 00:28:47,039
i'll touch on again

683
00:28:52,669 --> 00:28:49,600
in the talk this is

684
00:28:54,230 --> 00:28:52,679
jerome hunsicker's phd thesis

685
00:28:57,430 --> 00:28:54,240
1916

686
00:28:59,510 --> 00:28:57,440
becomes nac technical report one and

687
00:29:01,350 --> 00:28:59,520
it's really interesting to look at this

688
00:29:02,789 --> 00:29:01,360

from a couple of standpoints first the

689
00:29:06,310 --> 00:29:02,799
naca

690
00:29:08,470 --> 00:29:06,320
pays mit for jerome hunsaker and his

691
00:29:11,269 --> 00:29:08,480
colleague edward b wilson to write this

692
00:29:14,230 --> 00:29:11,279
report it's in two sections the hunsaker

693
00:29:16,070 --> 00:29:14,240
section is basically the phd thesis and

694
00:29:18,789 --> 00:29:16,080
it's about stability and control it's

695
00:29:20,630 --> 00:29:18,799
about the process by which putting these

696
00:29:23,269 --> 00:29:20,640
models into the wind tunnels can be used

697
00:29:25,350 --> 00:29:23,279
to describe to derive the

698
00:29:27,110 --> 00:29:25,360
key performance characteristics of the

699
00:29:29,590 --> 00:29:27,120
airplanes and that's an example that's

700
00:29:31,830 --> 00:29:29,600
figure 3 that shows

701
00:29:33,510 --> 00:29:31,840
the detail of how these

702
00:29:35,190 --> 00:29:33,520
performance curves

703
00:29:37,110 --> 00:29:35,200
are actually

704
00:29:38,549 --> 00:29:37,120
calculated and that becomes i think the

705
00:29:41,750 --> 00:29:38,559
model for these

706
00:29:43,830 --> 00:29:41,760
future nasa naca technical

707
00:29:46,389 --> 00:29:43,840
reports probably what's even more

708
00:29:48,789 --> 00:29:46,399
important is the co-author that second

709
00:29:52,149 --> 00:29:48,799
section is written by edwin b wilson who

710
00:29:54,630 --> 00:29:52,159
basically was an applied mathematician

711
00:29:57,190 --> 00:29:54,640
starts at mit in 1907

712
00:29:58,789 --> 00:29:57,200
tutors hunsaker for three years in

713
00:30:01,269 --> 00:29:58,799

mathematics

714
00:30:03,990 --> 00:30:01,279
helps him with his thesis and co-authors

715
00:30:06,389 --> 00:30:04,000
this critical report and effectively

716
00:30:09,669 --> 00:30:06,399
that applied mathematics perspective is

717
00:30:11,269 --> 00:30:09,679
what you really see evolving much more

718
00:30:13,590 --> 00:30:11,279
in a complete way

719
00:30:16,710 --> 00:30:13,600
in germany and and england leading to

720
00:30:20,830 --> 00:30:16,720
the circulation lift theory adoption

721
00:30:25,430 --> 00:30:22,549
engineers

722
00:30:27,110 --> 00:30:25,440
are very clever in the way they create

723
00:30:29,430 --> 00:30:27,120
airplanes and the way they create

724
00:30:31,190 --> 00:30:29,440
companies and this is the first

725
00:30:33,190 --> 00:30:31,200
airplane i'll talk about three briefly

726
00:30:35,750 --> 00:30:33,200
this is the

727
00:30:37,669 --> 00:30:35,760
airplane that was created the nc4 by

728
00:30:40,230 --> 00:30:37,679
three of these graduates holden

729
00:30:42,470 --> 00:30:40,240
richardson

730
00:30:45,669 --> 00:30:42,480
george westervelt and

731
00:30:48,310 --> 00:30:45,679
jerome hunsicker in 1917 hunsaker leaves

732
00:30:50,389 --> 00:30:48,320
mit goes back into the navy

733
00:30:52,310 --> 00:30:50,399
and in the bureau of what becomes the

734
00:30:55,350 --> 00:30:52,320
bureau of aeronautics they create this

735
00:30:57,669 --> 00:30:55,360
airplane it's actually built by curtis

736
00:30:58,710 --> 00:30:57,679
uh but it's designed by the three of

737
00:31:00,470 --> 00:30:58,720
them

738
00:31:03,190 --> 00:31:00,480

the second example

739
00:31:04,710 --> 00:31:03,200
is the example of

740
00:31:07,430 --> 00:31:04,720
this is another picture this is from

741
00:31:09,350 --> 00:31:07,440
hunsaker's archives of the of a postcard

742
00:31:11,350 --> 00:31:09,360
of the of that airplane

743
00:31:12,389 --> 00:31:11,360
second example is the boeing model c

744
00:31:14,470 --> 00:31:12,399
trainer

745
00:31:18,070 --> 00:31:14,480
uh george westervelt one of these

746
00:31:20,070 --> 00:31:18,080
original naval engineers at mit

747
00:31:21,830 --> 00:31:20,080
is assigned to seattle where he meets

748
00:31:24,470 --> 00:31:21,840
william boeing they create a company

749
00:31:26,230 --> 00:31:24,480
called pacific aero products the modern

750
00:31:27,750 --> 00:31:26,240
boeing corporation

751
00:31:30,389 --> 00:31:27,760
and this is the first commercial

752
00:31:33,430 --> 00:31:30,399
airplane that they create

753
00:31:36,870 --> 00:31:33,440
and when when westervelt is recalled to

754
00:31:39,430 --> 00:31:36,880
the to by the navy to washington he

755
00:31:40,870 --> 00:31:39,440
asked jerome hunsaker for the name of an

756
00:31:42,950 --> 00:31:40,880
engineer that could actually work on

757
00:31:46,950 --> 00:31:42,960
this project and hunsaker

758
00:31:49,909 --> 00:31:46,960
uh gives him the name of um wong soo who

759
00:31:51,750 --> 00:31:49,919
is actually at mit on a box rebellion

760
00:31:54,070 --> 00:31:51,760
scholarship

761
00:31:56,310 --> 00:31:54,080
has two more years in the united states

762
00:32:00,070 --> 00:31:56,320
becomes boeing's first engineer where he

763
00:32:03,269 --> 00:32:02,389

the last example

764
00:32:06,950 --> 00:32:03,279
is

765
00:32:07,909 --> 00:32:06,960
role in helping to set up that wind

766
00:32:10,389 --> 00:32:07,919
tunnel

767
00:32:13,669 --> 00:32:10,399
this airplane establishes

768
00:32:16,789 --> 00:32:13,679
douglas aircraft it's the first product

769
00:32:19,350 --> 00:32:16,799
it's actually designed by douglas and

770
00:32:20,470 --> 00:32:19,360
hunsaker on a drafting table and

771
00:32:23,669 --> 00:32:20,480
douglas's

772
00:32:26,870 --> 00:32:23,679
in hunsker's office at the naval yard

773
00:32:29,590 --> 00:32:26,880
this is the dt-1 which is basically

774
00:32:32,470 --> 00:32:29,600
dt2 which is basically the airplane that

775
00:32:35,830 --> 00:32:32,480
uh puts uh douglas in into business in

776
00:32:37,269 --> 00:32:35,840
1921. hunsaker issues a purchase order

777
00:32:39,430 --> 00:32:37,279
for three of these

778
00:32:41,350 --> 00:32:39,440
that becomes the first uh

779
00:32:44,630 --> 00:32:41,360
commercial product of

780
00:32:47,029 --> 00:32:44,640
of douglas aircraft

781
00:32:49,110 --> 00:32:47,039
debbie's disgust at warner i think he's

782
00:32:50,950 --> 00:32:49,120
significant because he's in all three of

783
00:32:53,269 --> 00:32:50,960
these camps he's an mit educated

784
00:32:56,470 --> 00:32:53,279
aeronautical engineer goes to work at

785
00:32:59,430 --> 00:32:56,480
the naca as its chief physicist then

786
00:33:01,750 --> 00:32:59,440
comes back to mit in 1920 for the next

787
00:33:04,549 --> 00:33:01,760
six years he runs the mit aeronautics

788
00:33:06,310 --> 00:33:04,559

department until 1926 when he's

789
00:33:09,990 --> 00:33:06,320
appointed as the first assistant

790
00:33:12,549 --> 00:33:10,000
secretary of the navy for aeronautics so

791
00:33:15,190 --> 00:33:12,559
a great career but in the span of a

792
00:33:17,669 --> 00:33:15,200
of a decade crossing all three of these

793
00:33:19,269 --> 00:33:17,679
organizations

794
00:33:20,950 --> 00:33:19,279
richard hallian will go into much more

795
00:33:23,430 --> 00:33:20,960
detail on the variable density wind

796
00:33:25,190 --> 00:33:23,440
tunnel jerome hunsaker helps bring that

797
00:33:27,509 --> 00:33:25,200
wind tunnel to the united states in the

798
00:33:30,789 --> 00:33:27,519
sense that he recruits max monk from

799
00:33:32,789 --> 00:33:30,799
gertingen to the united states to set up

800
00:33:35,430 --> 00:33:32,799
the variable density wind tunnel the

801
00:33:38,870 --> 00:33:35,440
significance of this is actually

802
00:33:40,630 --> 00:33:38,880
i think in sort of the merger of two

803
00:33:42,389 --> 00:33:40,640
schools of engineering if you will the

804
00:33:45,350 --> 00:33:42,399
applied mathematics

805
00:33:47,990 --> 00:33:45,360
from gertingen and the empirical methods

806
00:33:50,470 --> 00:33:48,000
analytical methods that you see from the

807
00:33:52,789 --> 00:33:50,480
american engineers and effectively this

808
00:33:54,149 --> 00:33:52,799
is the creation of the four-digit series

809
00:33:56,950 --> 00:33:54,159
air foils

810
00:33:58,950 --> 00:33:56,960
what i call the

811
00:34:01,269 --> 00:33:58,960
inscription of the airfoil and this is

812
00:34:03,509 --> 00:34:01,279
in in tribute to brno

813
00:34:06,149 --> 00:34:03,519

to bruno latour who

814
00:34:08,230 --> 00:34:06,159
talks about the way

815
00:34:11,030 --> 00:34:08,240
the properties of being mobile but also

816
00:34:13,589 --> 00:34:11,040
immutable presentable readable and

817
00:34:15,589 --> 00:34:13,599
combinable with one another the concept

818
00:34:17,750 --> 00:34:15,599
that you can actually

819
00:34:19,109 --> 00:34:17,760
create mathematically this definition of

820
00:34:21,589 --> 00:34:19,119
the airfoil so there's two key

821
00:34:25,030 --> 00:34:21,599
parameters in the in the naca

822
00:34:27,510 --> 00:34:25,040
airfoil definition one is the

823
00:34:29,669 --> 00:34:27,520
curvature of the airfoil the second is

824
00:34:32,069 --> 00:34:29,679
the thickness distribution the

825
00:34:35,270 --> 00:34:32,079
mathematical formulas which derive those

826
00:34:37,510 --> 00:34:35,280
result in a whole series of

827
00:34:38,710 --> 00:34:37,520
naca airfoils

828
00:34:41,030 --> 00:34:38,720
that are then

829
00:34:44,310 --> 00:34:41,040
evaluated in the wind tunnels and

830
00:34:46,310 --> 00:34:44,320
eventually published as a catalog

831
00:34:48,149 --> 00:34:46,320
for the collection

832
00:34:49,829 --> 00:34:48,159
classification compilation and

833
00:34:51,589 --> 00:34:49,839
dissemination of scientific and

834
00:34:54,149 --> 00:34:51,599
technical information those are the

835
00:34:56,069 --> 00:34:54,159
exact words that are in the legislation

836
00:34:59,190 --> 00:34:56,079
creating the naca

837
00:35:01,589 --> 00:34:59,200
this is the legislative charter for it

838
00:35:03,109 --> 00:35:01,599

and effectively

839
00:35:05,270 --> 00:35:03,119
you know langley takes on this

840
00:35:07,910 --> 00:35:05,280
appearance of being a system of literary

841
00:35:09,270 --> 00:35:07,920
inscription in the same way that latour

842
00:35:12,550 --> 00:35:09,280
talks about

843
00:35:14,630 --> 00:35:12,560
how that operates in the uh in in the uh

844
00:35:17,910 --> 00:35:14,640
biology laboratory

845
00:35:20,310 --> 00:35:17,920
so that's the first convergence that

846
00:35:22,230 --> 00:35:20,320
occurs and the and the end product is

847
00:35:24,870 --> 00:35:22,240
the dc3

848
00:35:26,470 --> 00:35:24,880
just two years after that first report

849
00:35:28,950 --> 00:35:26,480
with the airfoil

850
00:35:30,910 --> 00:35:28,960
method in 1933

851
00:35:33,990 --> 00:35:30,920
you have the dc3 in

852
00:35:35,670 --> 00:35:34,000
1935 which wins the collier prize and

853
00:35:37,910 --> 00:35:35,680
this sort of brings together the

854
00:35:41,190 --> 00:35:37,920
significant primarily because it's the

855
00:35:43,510 --> 00:35:41,200
first commercially viable airplane

856
00:35:45,430 --> 00:35:43,520
the airliners can operate it for a

857
00:35:48,390 --> 00:35:45,440
profit

858
00:35:51,190 --> 00:35:48,400
the second major convergence occurs

859
00:35:53,270 --> 00:35:51,200
at the same in the same year 1935 the

860
00:35:55,589 --> 00:35:53,280
seeds of it and this is when jerome

861
00:35:59,190 --> 00:35:55,599
hunsker is brought back to mit actually

862
00:36:01,349 --> 00:35:59,200
in 1933 by

863
00:36:03,510 --> 00:36:01,359

carl compton he first leads the

864
00:36:05,349 --> 00:36:03,520
mechanical engineering department

865
00:36:09,109 --> 00:36:05,359
and he makes two appointments to the

866
00:36:11,109 --> 00:36:09,119
faculty in 1935.

867
00:36:13,910 --> 00:36:11,119
this is the way sort of the connection

868
00:36:14,790 --> 00:36:13,920
between the the air the airfoil and the

869
00:36:16,230 --> 00:36:14,800
uh

870
00:36:19,510 --> 00:36:16,240
the wind tunnel

871
00:36:22,230 --> 00:36:19,520
and the future of aeronautics is is uh

872
00:36:24,790 --> 00:36:22,240
juxtaposed the first is the selection of

873
00:36:27,349 --> 00:36:24,800
a of a rather obscure aeronautical

874
00:36:29,109 --> 00:36:27,359
engineer named heinrich peters who is

875
00:36:31,190 --> 00:36:29,119
one of gertie

876
00:36:34,069 --> 00:36:31,200
who is a university of guertin grad one

877
00:36:37,270 --> 00:36:34,079
of prandtl students he's brought over to

878
00:36:39,109 --> 00:36:37,280
mit with the express purpose of building

879
00:36:40,950 --> 00:36:39,119
another variable density wind tunnel

880
00:36:43,030 --> 00:36:40,960
which he builds over the next four years

881
00:36:45,829 --> 00:36:43,040
it's now still in existence the wright

882
00:36:49,030 --> 00:36:45,839
brothers wind tunnel at the same time in

883
00:36:53,550 --> 00:36:51,270
jerome hunsaker selects charles tarq

884
00:36:56,470 --> 00:36:53,560
draper now draper has been at mit since

885
00:36:59,270 --> 00:36:56,480
1922 where he originally got a

886
00:37:02,390 --> 00:36:59,280
bachelor's degree in psychology at

887
00:37:05,190 --> 00:37:02,400
stanford comes to mit repeats four years

888
00:37:06,870 --> 00:37:05,200

of bat to get a second bachelor's then

889
00:37:09,030 --> 00:37:06,880
goes on to

890
00:37:10,630 --> 00:37:09,040
to a master's degree

891
00:37:12,710 --> 00:37:10,640
and eventually he's in the physics

892
00:37:14,870 --> 00:37:12,720
department where he's kind of

893
00:37:18,150 --> 00:37:14,880
in this transition compton has come in

894
00:37:20,630 --> 00:37:18,160
he's imposed a new set of requirements

895
00:37:22,790 --> 00:37:20,640
in physics new professors

896
00:37:24,790 --> 00:37:22,800
it's even a question as to whether

897
00:37:27,670 --> 00:37:24,800
they will allow uh

898
00:37:29,750 --> 00:37:27,680
draper to continue as a as a uh

899
00:37:31,430 --> 00:37:29,760
to get his physics phd he does

900
00:37:34,710 --> 00:37:31,440
eventually graduate

901
00:37:36,950 --> 00:37:34,720
he's a self-described hands-on engineer

902
00:37:38,870 --> 00:37:36,960
uh he he is

903
00:37:40,230 --> 00:37:38,880
unique in the sense that he's actually

904
00:37:43,190 --> 00:37:40,240
pursuing

905
00:37:45,750 --> 00:37:43,200
at the time uh detonation in in the

906
00:37:48,069 --> 00:37:45,760
cylinders of aircraft engines under work

907
00:37:50,470 --> 00:37:48,079
that's jointly sponsored by the naca and

908
00:37:52,230 --> 00:37:50,480
the and the navy bureau of aeronautics

909
00:37:54,310 --> 00:37:52,240
self-described as a greasy thumb

910
00:37:56,550 --> 00:37:54,320
mechanic willing to roll up his sleeves

911
00:37:58,630 --> 00:37:56,560
in the laboratory and this becomes kind

912
00:37:59,310 --> 00:37:58,640
of the departure point where the field

913
00:38:01,589 --> 00:37:59,320

of

914
00:38:03,270 --> 00:38:01,599
aerodynamics which is one important

915
00:38:04,870 --> 00:38:03,280
piece of

916
00:38:07,589 --> 00:38:04,880
the modern field of aeronautics and

917
00:38:09,990 --> 00:38:07,599
astronautics begins to change where

918
00:38:13,750 --> 00:38:10,000
issues associated with instrumentation

919
00:38:15,510 --> 00:38:13,760
flight control navigation and computing

920
00:38:18,550 --> 00:38:15,520
come together and you'll see that in the

921
00:38:19,510 --> 00:38:18,560
next couple of examples

922
00:38:21,670 --> 00:38:19,520
so

923
00:38:24,230 --> 00:38:21,680
the next uh

924
00:38:31,030 --> 00:38:24,240
image uh jerome hunsaker

925
00:38:37,109 --> 00:38:33,910
is is now at the uh now taking over the

926
00:38:39,270 --> 00:38:37,119
responsibility for the um naca vanivar

927
00:38:40,550 --> 00:38:39,280
bush and jerome hunsker are shown in

928
00:38:42,870 --> 00:38:40,560
this image

929
00:38:44,230 --> 00:38:42,880
of the uh of the of the national

930
00:38:47,829 --> 00:38:44,240
advisory committee of aeronautics in

931
00:38:53,349 --> 00:38:50,550
van over bush basically becomes

932
00:38:55,670 --> 00:38:53,359
roosevelt's uh designated to run all

933
00:38:58,470 --> 00:38:55,680
defense department research

934
00:39:01,190 --> 00:38:58,480
for military purposes and puts hunsaker

935
00:39:03,990 --> 00:39:01,200
in charge of the naca and for the next

936
00:39:05,990 --> 00:39:04,000
16 years hunsaker is both the head of

937
00:39:14,150 --> 00:39:06,000
the aeronautics department at mit and

938
00:39:18,470 --> 00:39:16,230

this is the mark 14 gun site which

939
00:39:20,230 --> 00:39:18,480
charles stark draper developed it's the

940
00:39:22,230 --> 00:39:20,240
first example of sort of this

941
00:39:23,349 --> 00:39:22,240
integration of human and machine

942
00:39:25,510 --> 00:39:23,359
together

943
00:39:27,430 --> 00:39:25,520
solving this problem of

944
00:39:28,950 --> 00:39:27,440
artillery

945
00:39:33,430 --> 00:39:28,960
used for

946
00:39:36,790 --> 00:39:33,440
by the navy on ground ships primarily to

947
00:39:41,270 --> 00:39:38,550
japanese

948
00:39:44,470 --> 00:39:41,280
fighters it's extremely successful under

949
00:39:46,630 --> 00:39:44,480
contract to sperry corporation 85 000 of

950
00:39:49,030 --> 00:39:46,640
these are built

951
00:39:50,710 --> 00:39:49,040
it helps change the the role of the the

952
00:39:53,430 --> 00:39:50,720
navy uh

953
00:39:56,150 --> 00:39:53,440
in world war ii

954
00:39:58,230 --> 00:39:56,160
um

955
00:39:59,750 --> 00:39:58,240
this is louis de flores and i'll i'll

956
00:40:01,910 --> 00:39:59,760
kind of close with this story and

957
00:40:03,829 --> 00:40:01,920
quickly go through the remaining slides

958
00:40:06,470 --> 00:40:03,839
louis de flores is a colleague of

959
00:40:08,790 --> 00:40:06,480
hunskers at mit graduates in 1911 he

960
00:40:11,990 --> 00:40:08,800
comes he's in the navy

961
00:40:13,349 --> 00:40:12,000
first hired by hunsaker in 1917 to work

962
00:40:15,589 --> 00:40:13,359
in the bureau of aeronautics where he

963
00:40:17,510 --> 00:40:15,599

works on instrumentation he leaves the

964
00:40:18,790 --> 00:40:17,520
navy goes off into work in private

965
00:40:21,510 --> 00:40:18,800
industry

966
00:40:24,069 --> 00:40:21,520
in 1939 at the age of 50 he he

967
00:40:25,750 --> 00:40:24,079
re-enlisted the navy he's brought into

968
00:40:27,589 --> 00:40:25,760
the bureau again to the bureau of

969
00:40:30,950 --> 00:40:27,599
aeronautics where he sets up the navy

970
00:40:33,349 --> 00:40:30,960
special devices branch this branch goes

971
00:40:36,550 --> 00:40:33,359
into the subject of simulation and

972
00:40:39,589 --> 00:40:36,560
training in 1943 he wins the collier

973
00:40:41,190 --> 00:40:39,599
trophy for simulation and and training

974
00:40:44,550 --> 00:40:41,200
but the important thing is he comes to

975
00:40:46,870 --> 00:40:44,560
mit and he asks mit to put an

976
00:40:49,270 --> 00:40:46,880
airplane into the wind tunnel

977
00:40:51,190 --> 00:40:49,280
and try to derive the the critical

978
00:40:53,990 --> 00:40:51,200
flight performance characteristics the

979
00:40:56,309 --> 00:40:54,000
stability derivatives in something that

980
00:40:57,910 --> 00:40:56,319
would allow them to build a universal

981
00:41:00,950 --> 00:40:57,920
flight simulator and that's called the

982
00:41:02,710 --> 00:41:00,960
aircraft stability and control analyzer

983
00:41:05,349 --> 00:41:02,720
project now many historians have looked

984
00:41:07,270 --> 00:41:05,359
at this because it's the origins of

985
00:41:08,710 --> 00:41:07,280
what would become the whirlwind digital

986
00:41:11,030 --> 00:41:08,720
computer

987
00:41:13,430 --> 00:41:11,040
the server mechanics lab takes this

988
00:41:15,589 --> 00:41:13,440

project over but the significant thing

989
00:41:17,190 --> 00:41:15,599
is this is at the intersection of wind

990
00:41:20,950 --> 00:41:17,200
tunnels and wind tunnel models of

991
00:41:25,750 --> 00:41:20,960
airplanes the aerodynamics

992
00:41:27,910 --> 00:41:25,760
lineage of the naca and and uh

993
00:41:30,870 --> 00:41:27,920
and gertingen but it's significant

994
00:41:32,710 --> 00:41:30,880
because it shows that what is really

995
00:41:34,710 --> 00:41:32,720
going forward

996
00:41:37,109 --> 00:41:34,720
in the way that these fields uh

997
00:41:40,470 --> 00:41:37,119
intersect in the in the future

998
00:41:44,790 --> 00:41:42,470
the navy ends up

999
00:41:46,870 --> 00:41:44,800
uh sponsoring this project there's quite

1000
00:41:48,790 --> 00:41:46,880
a bit of criticism within the navy

1001
00:41:49,670 --> 00:41:48,800
jerome hunsaker is actually involved

1002
00:41:51,990 --> 00:41:49,680
both

1003
00:41:54,470 --> 00:41:52,000
as the head of the mit aeronautics

1004
00:41:56,870 --> 00:41:54,480
department advocating for this project

1005
00:42:00,470 --> 00:41:56,880
but also running interference when a

1006
00:42:02,390 --> 00:42:00,480
colleague another mit person walter deal

1007
00:42:04,870 --> 00:42:02,400
basically says that

1008
00:42:06,950 --> 00:42:04,880
this project is is uh

1009
00:42:08,710 --> 00:42:06,960
not worth pursuing

1010
00:42:11,910 --> 00:42:08,720
and then he writes a letter as the head

1011
00:42:13,670 --> 00:42:11,920
of the naca and basically advocates why

1012
00:42:15,349 --> 00:42:13,680
it should be done and that it was not

1013
00:42:17,829 --> 00:42:15,359

duplicating research being done at the

1014
00:42:19,510 --> 00:42:17,839
naca now that was effectively the work

1015
00:42:21,030 --> 00:42:19,520
of robert gilruth who we heard about a

1016
00:42:23,670 --> 00:42:21,040
little bit this morning

1017
00:42:27,030 --> 00:42:23,680
investigating the flight qualities of

1018
00:42:28,710 --> 00:42:27,040
flight trend of aircraft to uh to

1019
00:42:30,550 --> 00:42:28,720
characterize their performance so this

1020
00:42:32,150 --> 00:42:30,560
is sort of two threads coming together

1021
00:42:32,950 --> 00:42:32,160
flight test

1022
00:42:35,190 --> 00:42:32,960
and

1023
00:42:36,870 --> 00:42:35,200
wind tunnels in the in the instantiation

1024
00:42:38,470 --> 00:42:36,880
of what will become the first

1025
00:42:40,790 --> 00:42:38,480
digital computer

1026
00:42:42,870 --> 00:42:40,800
this is another project at mit this navy

1027
00:42:45,990 --> 00:42:42,880
supersonic wind tunnel the significance

1028
00:42:48,390 --> 00:42:46,000
here is it's the first time that we see

1029
00:42:49,349 --> 00:42:48,400
robert siemens coming to the stage he is

1030
00:42:52,309 --> 00:42:49,359
actually

1031
00:42:55,430 --> 00:42:52,319
selected to run that project and becomes

1032
00:42:58,870 --> 00:42:55,440
the first systems engineer at mit draper

1033
00:43:00,550 --> 00:42:58,880
picks him in 1950 to run this program

1034
00:43:02,870 --> 00:43:00,560
and then

1035
00:43:05,670 --> 00:43:02,880
over the next five years

1036
00:43:07,829 --> 00:43:05,680
manages that project a short period

1037
00:43:09,190 --> 00:43:07,839
later in 1960

1038
00:43:12,230 --> 00:43:09,200

siemens comes

1039
00:43:13,349 --> 00:43:12,240
to work at that then nasa where he

1040
00:43:15,829 --> 00:43:13,359
basically

1041
00:43:18,630 --> 00:43:15,839
makes three or four pivotal decisions in

1042
00:43:19,750 --> 00:43:18,640
in 61 and 62. first is the decision to

1043
00:43:22,230 --> 00:43:19,760
select

1044
00:43:24,950 --> 00:43:22,240
his mentor who's shown in the left-hand

1045
00:43:27,670 --> 00:43:24,960
picture there charles stark draper to

1046
00:43:29,430 --> 00:43:27,680
basically build the guidance control

1047
00:43:31,430 --> 00:43:29,440
navigation system of the apollo

1048
00:43:32,550 --> 00:43:31,440
spacecraft and that's a simulator on top

1049
00:43:34,790 --> 00:43:32,560
of the roof

1050
00:43:37,190 --> 00:43:34,800
at the draper laboratory you can see the

1051
00:43:39,430 --> 00:43:37,200
skyline of boston in the right hands

1052
00:43:41,750 --> 00:43:39,440
in the background on the right hand side

1053
00:43:44,710 --> 00:43:41,760
is apollo 8 gym level

1054
00:43:46,390 --> 00:43:44,720
navigating the first translunar flight

1055
00:43:48,790 --> 00:43:46,400
to the moon

1056
00:43:51,190 --> 00:43:48,800
langley goes off and and and develops

1057
00:43:52,790 --> 00:43:51,200
the simulation technology which brings

1058
00:43:54,870 --> 00:43:52,800
these strands together

1059
00:43:57,750 --> 00:43:54,880
this is siemens hunsker and draper

1060
00:43:59,430 --> 00:43:57,760
together they span the history

1061
00:44:02,390 --> 00:43:59,440
of this era

1062
00:44:04,630 --> 00:44:02,400
right at this time roughly 1959 the name

1063
00:44:07,030 --> 00:44:04,640

of the mit aeronautical engineering

1064
00:44:08,470 --> 00:44:07,040
department is actually changed to the

1065
00:44:10,069 --> 00:44:08,480
department of aeronautics and

1066
00:44:11,270 --> 00:44:10,079
astronautics and i think that kind of

1067
00:44:13,430 --> 00:44:11,280
reflects

1068
00:44:16,230 --> 00:44:13,440
the second major convergence how these

1069
00:44:18,870 --> 00:44:16,240
fields come together in what's now known

1070
00:44:20,390 --> 00:44:18,880
as the modern practice of aeronautics

1071
00:44:27,750 --> 00:44:20,400
and astronautics

1072
00:44:30,870 --> 00:44:29,349
thank you very much john it was really

1073
00:44:32,950 --> 00:44:30,880
intriguing to hear about those different

1074
00:44:34,550 --> 00:44:32,960
threads coming together

1075
00:44:36,790 --> 00:44:34,560
now we have the privilege of hearing

1076
00:44:38,309 --> 00:44:36,800
from dr dick hallian

1077
00:44:41,030 --> 00:44:38,319
dick used to be the

1078
00:44:42,150 --> 00:44:41,040
air force chief historian many years ago

1079
00:44:44,630 --> 00:44:42,160
he also

1080
00:44:46,230 --> 00:44:44,640
received his ph.d locally from the

1081
00:44:49,030 --> 00:44:46,240
university of maryland

1082
00:44:52,230 --> 00:44:49,040
and last but least

1083
00:44:54,390 --> 00:44:52,240
i had the privilege of hearing a great

1084
00:44:56,150 --> 00:44:54,400
lecture that he gave when i took an air

1085
00:45:05,750 --> 00:44:56,160
power history class many years ago that

1086
00:45:09,990 --> 00:45:08,309
thanks very much

1087
00:45:11,829 --> 00:45:10,000
i told him he was not to give away my

1088
00:45:14,230 --> 00:45:11,839

age

1089
00:45:16,230 --> 00:45:14,240
it's a real pleasure to be here and and

1090
00:45:19,670 --> 00:45:16,240
certainly to be involved in the

1091
00:45:21,430 --> 00:45:19,680
commemoration of such a notable event

1092
00:45:23,190 --> 00:45:21,440
you know if we take a look at the uh

1093
00:45:24,950 --> 00:45:23,200
history of the naca

1094
00:45:27,190 --> 00:45:24,960
it's it's truly staggering and i think

1095
00:45:30,550 --> 00:45:27,200
the papers that we've seen so far have

1096
00:45:32,870 --> 00:45:30,560
given us just a very brief indication of

1097
00:45:34,550 --> 00:45:32,880
of the work that that has been done in

1098
00:45:38,630 --> 00:45:34,560
the field and also much of the work that

1099
00:45:40,630 --> 00:45:38,640
remains to be done the naca is a uh is a

1100
00:45:43,589 --> 00:45:40,640
rich subject i think for anyone wishing

1101
00:45:45,750 --> 00:45:43,599
to look at the evolution of aeronautics

1102
00:45:47,910 --> 00:45:45,760
not merely in the american sense but in

1103
00:45:50,550 --> 00:45:47,920
a global sense as well now what i

1104
00:45:52,790 --> 00:45:50,560
thought i'd talk to you about today was

1105
00:45:54,550 --> 00:45:52,800
an aspect of the naca that was very very

1106
00:45:56,309 --> 00:45:54,560
important i think and that was its

1107
00:45:57,349 --> 00:45:56,319
development of

1108
00:46:21,910 --> 00:45:57,359
a

1109
00:46:24,470 --> 00:46:21,920
but then by 1912 we've lost control of

1110
00:46:25,750 --> 00:46:24,480
that revolution and so that you have

1111
00:46:27,349 --> 00:46:25,760
many of the things that people have

1112
00:46:28,870 --> 00:46:27,359
talked about already you have a gap

1113
00:46:30,790 --> 00:46:28,880

developing between the united states and

1114
00:46:32,470 --> 00:46:30,800
europe tom crouch mentioned how the

1115
00:46:34,230 --> 00:46:32,480
united states was 14th in global

1116
00:46:35,430 --> 00:46:34,240
aviation investment before the first

1117
00:46:37,990 --> 00:46:35,440
world war

1118
00:46:40,630 --> 00:46:38,000
we have more profoundly why we're really

1119
00:46:42,790 --> 00:46:40,640
here today we have a laboratory gap

1120
00:46:44,390 --> 00:46:42,800
developing between the united states and

1121
00:46:45,510 --> 00:46:44,400
europe as well

1122
00:46:47,990 --> 00:46:45,520
i like

1123
00:46:49,510 --> 00:46:48,000
debbie's comment that what is really

1124
00:46:51,990 --> 00:46:49,520
taking place with the creation of the

1125
00:46:54,069 --> 00:46:52,000
naca is really just getting in the game

1126
00:46:55,750 --> 00:46:54,079
it's not really getting back

1127
00:46:58,069 --> 00:46:55,760
something that we have lost although we

1128
00:46:59,990 --> 00:46:58,079
clearly had lost our lead in aeronautics

1129
00:47:02,230 --> 00:47:00,000
but in terms of the research

1130
00:47:04,309 --> 00:47:02,240
competencies in pursuing the the

1131
00:47:06,230 --> 00:47:04,319
scientific study of flight which is what

1132
00:47:07,910 --> 00:47:06,240
the naca was all about it was really

1133
00:47:10,630 --> 00:47:07,920
getting back in the game

1134
00:47:12,390 --> 00:47:10,640
now if we review very quickly just to

1135
00:47:14,470 --> 00:47:12,400
kind of give us a frame of reference the

1136
00:47:16,069 --> 00:47:14,480
stages in winged aeronautical research

1137
00:47:18,230 --> 00:47:16,079
i'm not talking about balloons or

1138
00:47:19,990 --> 00:47:18,240

airships or aerostatics here

1139
00:47:22,710 --> 00:47:20,000
basically all the way back to the

1140
00:47:24,710 --> 00:47:22,720
renaissance we see a bird emulative

1141
00:47:26,950 --> 00:47:24,720
model of flight that really persists all

1142
00:47:28,549 --> 00:47:26,960
the way through lillian tall lily and

1143
00:47:30,309 --> 00:47:28,559
tall

1144
00:47:32,069 --> 00:47:30,319
even wrote a book entitled bird flight

1145
00:47:33,510 --> 00:47:32,079
is the basis of aviation you know where

1146
00:47:35,829 --> 00:47:33,520
you're taking a look at very thin

1147
00:47:37,670 --> 00:47:35,839
airfoil shapes basically and you're

1148
00:47:40,470 --> 00:47:37,680
emulating design you're not really

1149
00:47:43,349 --> 00:47:40,480
looking at circulation theory

1150
00:47:46,069 --> 00:47:43,359
involving involving a lifting theory of

1151
00:47:48,230 --> 00:47:46,079
flight we go beyond this starting with

1152
00:47:50,950 --> 00:47:48,240
the work of george cayley into some very

1153
00:47:53,190 --> 00:47:50,960
basic almost mechanical engineering type

1154
00:47:54,870 --> 00:47:53,200
stuff we're looking at forces forms

1155
00:47:56,790 --> 00:47:54,880
shapes structures

1156
00:47:59,829 --> 00:47:56,800
that gives us when we take a look at the

1157
00:48:01,510 --> 00:47:59,839
contributions of chanute for example

1158
00:48:03,190 --> 00:48:01,520
that gives us the ability to move

1159
00:48:05,589 --> 00:48:03,200
forward with the rights to the first

1160
00:48:08,309 --> 00:48:05,599
successful technology demonstrator

1161
00:48:10,309 --> 00:48:08,319
we have beginnings of rudimentary

1162
00:48:11,910 --> 00:48:10,319
measurement analysis starting with the

1163
00:48:13,670 --> 00:48:11,920

development of the of the wind tunnel

1164
00:48:15,829 --> 00:48:13,680
with francis wenham and john browning

1165
00:48:17,990 --> 00:48:15,839
moving on then to the work of phillips

1166
00:48:19,589 --> 00:48:18,000
william tall with whirling arm rigs

1167
00:48:21,990 --> 00:48:19,599
don't really work very well the rights

1168
00:48:24,790 --> 00:48:22,000
with a wind tunnel that does the job for

1169
00:48:25,829 --> 00:48:24,800
them and then gustav eiffel

1170
00:48:28,309 --> 00:48:25,839
who does

1171
00:48:31,430 --> 00:48:28,319
some fairly sophisticated work for his

1172
00:48:34,069 --> 00:48:31,440
time which hunsaker brings to america

1173
00:48:35,510 --> 00:48:34,079
and then very importantly we see the

1174
00:48:37,270 --> 00:48:35,520
last part of this and that's the

1175
00:48:39,750 --> 00:48:37,280
explication of what i call a physics

1176
00:48:43,270 --> 00:48:39,760
rooted scientific aerodynamic theory

1177
00:48:44,549 --> 00:48:43,280
kuta jakowski lanchester pronto pronto

1178
00:48:46,710 --> 00:48:44,559
most of all

1179
00:48:49,589 --> 00:48:46,720
what are these characteristics that we

1180
00:48:51,510 --> 00:48:49,599
we look for in scientific aeronautics

1181
00:48:53,670 --> 00:48:51,520
well i i threw together a quick list of

1182
00:48:55,750 --> 00:48:53,680
them and you can review it here but i

1183
00:48:58,150 --> 00:48:55,760
would argue that all these the most

1184
00:49:00,150 --> 00:48:58,160
important are really the study of fluid

1185
00:49:01,670 --> 00:49:00,160
dynamics and flow circulation we're

1186
00:49:04,470 --> 00:49:01,680
getting away from just looking at the

1187
00:49:07,750 --> 00:49:04,480
mechanical engineering side of flight

1188
00:49:10,470 --> 00:49:07,760

we're getting away from the wing uh wing

1189
00:49:12,390 --> 00:49:10,480
section view of how wing produces lift

1190
00:49:14,710 --> 00:49:12,400
we're not so much looking at what

1191
00:49:16,870 --> 00:49:14,720
happens if you cut that wing

1192
00:49:19,190 --> 00:49:16,880
you know through uh and take a look at

1193
00:49:21,270 --> 00:49:19,200
the airfoil profile and the flow above

1194
00:49:22,549 --> 00:49:21,280
and below the wing you start to see

1195
00:49:25,030 --> 00:49:22,559
people thinking

1196
00:49:27,109 --> 00:49:25,040
much more in terms of what pronto is

1197
00:49:30,549 --> 00:49:27,119
thinking of in terms of looking at the

1198
00:49:33,750 --> 00:49:30,559
wing as a whole uh as a as a wing

1199
00:49:35,670 --> 00:49:33,760
functioning within a bound vortex you

1200
00:49:37,430 --> 00:49:35,680
have in these laboratories that i

1201
00:49:39,910 --> 00:49:37,440
mentioned earlier you start to see some

1202
00:49:42,549 --> 00:49:39,920
of the attributes and trappings of what

1203
00:49:44,950 --> 00:49:42,559
we might call modern scientific approach

1204
00:49:47,990 --> 00:49:44,960
to flight research on aircraft dynamics

1205
00:49:50,470 --> 00:49:48,000
structural loads things of this sort

1206
00:49:51,589 --> 00:49:50,480
we've seen in the papers we've had to

1207
00:49:54,309 --> 00:49:51,599
date

1208
00:49:57,510 --> 00:49:54,319
the path to the naca and afterwards the

1209
00:49:59,349 --> 00:49:57,520
various stats stop stop efforts in the

1210
00:50:01,109 --> 00:49:59,359
united states i would throw one in that

1211
00:50:03,910 --> 00:50:01,119
hasn't really received much mention and

1212
00:50:07,589 --> 00:50:03,920
that's this last one that is created

1213
00:50:10,309 --> 00:50:07,599

actually after the naca but which gets

1214
00:50:13,190 --> 00:50:10,319
its research program up and going

1215
00:50:14,950 --> 00:50:13,200
earlier than the naca and that is the

1216
00:50:17,510 --> 00:50:14,960
cook field air service engineering

1217
00:50:20,309 --> 00:50:17,520
division it does some very profound very

1218
00:50:22,950 --> 00:50:20,319
important work by the way the original

1219
00:50:25,190 --> 00:50:22,960
mccook field tunnel survives it has been

1220
00:50:27,589 --> 00:50:25,200
restored and is on exhibit at the air

1221
00:50:29,109 --> 00:50:27,599
force museum in dayton ohio for anyone

1222
00:50:30,870 --> 00:50:29,119
who would wish to see it

1223
00:50:33,990 --> 00:50:30,880
now of course we come to the creation of

1224
00:50:34,950 --> 00:50:34,000
the naca then

1225
00:50:37,109 --> 00:50:34,960
and

1226
00:50:38,950 --> 00:50:37,119
when we take a look at the naca we have

1227
00:50:41,270 --> 00:50:38,960
of course this notable statement which

1228
00:50:43,589 --> 00:50:41,280
was drawn from the uk advisory committee

1229
00:50:46,230 --> 00:50:43,599
for aeronautics which everybody refers

1230
00:50:47,910 --> 00:50:46,240
to of course to scientif to supervise

1231
00:50:49,750 --> 00:50:47,920
and direct the scientific study of the

1232
00:50:51,589 --> 00:50:49,760
problems of flight with the view to

1233
00:50:54,470 --> 00:50:51,599
their practical solution

1234
00:50:56,710 --> 00:50:54,480
however i would argue that is much

1235
00:50:58,470 --> 00:50:56,720
easier said than done so let's take a

1236
00:51:01,430 --> 00:50:58,480
look at what actually happened when you

1237
00:51:04,470 --> 00:51:01,440
did get langley up and running in 1920

1238
00:51:07,910 --> 00:51:04,480

with its number one wind tunnel

1239
00:51:09,829 --> 00:51:07,920
well we see a laboratory institution to

1240
00:51:11,829 --> 00:51:09,839
use a modern term whose capabilities are

1241
00:51:14,549 --> 00:51:11,839
really legacy capabilities

1242
00:51:17,030 --> 00:51:14,559
you have this first tunnel its uk

1243
00:51:18,790 --> 00:51:17,040
origins have been alluded to it's

1244
00:51:20,870 --> 00:51:18,800
basically outdated it's good as a

1245
00:51:23,270 --> 00:51:20,880
training facility but that's really

1246
00:51:26,069 --> 00:51:23,280
about it it's not comparable at that

1247
00:51:28,950 --> 00:51:26,079
point in time to what exists at its

1248
00:51:30,390 --> 00:51:28,960
point of origin the npl in teddington or

1249
00:51:33,270 --> 00:51:30,400
what the french are doing at chelay

1250
00:51:36,549 --> 00:51:33,280
mudan or what you see ludwig prandtl and

1251
00:51:38,390 --> 00:51:36,559
his people doing at gertingan if we take

1252
00:51:40,230 --> 00:51:38,400
a look at the shortcut you know there

1253
00:51:42,470 --> 00:51:40,240
was a little bit of a shortcut process

1254
00:51:44,710 --> 00:51:42,480
here in the early days of naca research

1255
00:51:46,870 --> 00:51:44,720
you actually have full flight research

1256
00:51:49,670 --> 00:51:46,880
undertaken very very early on

1257
00:51:51,030 --> 00:51:49,680
even that full flight research

1258
00:51:53,829 --> 00:51:51,040
we don't find

1259
00:51:56,069 --> 00:51:53,839
as uh as advanced as what we're seeing

1260
00:51:59,030 --> 00:51:56,079
taking place at faunborough and martian

1261
00:52:01,910 --> 00:51:59,040
heath in in england or at

1262
00:52:04,230 --> 00:52:01,920
adler's hof in germany or at chele mudan

1263
00:52:06,790 --> 00:52:04,240

or via kublai or places like that

1264
00:52:10,309 --> 00:52:06,800
basically we're just getting into the

1265
00:52:13,270 --> 00:52:10,319
game if you will and as a consequence

1266
00:52:15,030 --> 00:52:13,280
when american aeronautics is viewed at

1267
00:52:16,790 --> 00:52:15,040
the end of the first world war you have

1268
00:52:20,309 --> 00:52:16,800
that statement by

1269
00:52:22,549 --> 00:52:20,319
john j pershing in his final report

1270
00:52:24,309 --> 00:52:22,559
as head of the american expeditionary

1271
00:52:26,309 --> 00:52:24,319
force he writes in aviation we were

1272
00:52:27,990 --> 00:52:26,319
completely dependent upon europe well

1273
00:52:29,750 --> 00:52:28,000
from the europeans they see that very

1274
00:52:32,630 --> 00:52:29,760
much themselves and so you have for

1275
00:52:34,790 --> 00:52:32,640
example this rather telling statement

1276
00:52:35,510 --> 00:52:34,800
that i located in a document in the in

1277
00:52:40,790 --> 00:52:35,520
the

1278
00:52:41,910 --> 00:52:40,800
public record office uh an ministry

1279
00:52:44,790 --> 00:52:41,920
mandarin

1280
00:52:47,109 --> 00:52:44,800
writing in 1921 i don't think we need

1281
00:52:50,069 --> 00:52:47,119
worry ourselves very much at present

1282
00:52:51,750 --> 00:52:50,079
about usa experimental establishments

1283
00:52:52,790 --> 00:52:51,760
you can practically hear the sarcasm

1284
00:52:55,430 --> 00:52:52,800
dripping

1285
00:52:57,349 --> 00:52:55,440
off the page as you read that

1286
00:52:58,870 --> 00:52:57,359
so what are we looking at here really i

1287
00:53:00,710 --> 00:52:58,880
would argue we're really looking at the

1288
00:53:02,710 --> 00:53:00,720

evolution of the airfoil

1289
00:53:05,910 --> 00:53:02,720
you know we go from this bird imitative

1290
00:53:08,390 --> 00:53:05,920
time of thinking which forced us down a

1291
00:53:10,549 --> 00:53:08,400
road where you had to brace the wing

1292
00:53:11,750 --> 00:53:10,559
externally you had to create some sort

1293
00:53:13,430 --> 00:53:11,760
of a truss

1294
00:53:15,430 --> 00:53:13,440
to carry the wing you did not have

1295
00:53:18,549 --> 00:53:15,440
modern composite structural materials or

1296
00:53:20,309 --> 00:53:18,559
things like that and so as a result we

1297
00:53:22,710 --> 00:53:20,319
wound up thanks to chanute with the

1298
00:53:25,510 --> 00:53:22,720
bridge truss type airplane which gave us

1299
00:53:27,910 --> 00:53:25,520
a lot of braced biplanes very thin wings

1300
00:53:30,790 --> 00:53:27,920
relatively inefficient wings in terms of

1301
00:53:34,549 --> 00:53:30,800
lifted drag ratios things of that sort

1302
00:53:37,270 --> 00:53:34,559
to a fluid dynamics based a circulation

1303
00:53:39,270 --> 00:53:37,280
flow based model that tends to favor

1304
00:53:41,109 --> 00:53:39,280
much thicker airfoils and with those

1305
00:53:43,270 --> 00:53:41,119
thicker airfoils you have of course the

1306
00:53:45,270 --> 00:53:43,280
opportunity then to put the structure

1307
00:53:48,150 --> 00:53:45,280
inside the wing which means you

1308
00:53:50,790 --> 00:53:48,160
immediately get an increase in aircraft

1309
00:53:52,790 --> 00:53:50,800
performance lifting performance as well

1310
00:53:55,030 --> 00:53:52,800
and you clearly then have the ability to

1311
00:53:57,670 --> 00:53:55,040
completely reshape the airplane and what

1312
00:54:00,630 --> 00:53:57,680
this really reflects is the back and

1313
00:54:03,750 --> 00:54:00,640

forth in airfoil design from bird

1314
00:54:06,470 --> 00:54:03,760
emulative which had inspired the rights

1315
00:54:08,309 --> 00:54:06,480
to france the eiffel school stillbird

1316
00:54:10,390 --> 00:54:08,319
emulator getting a little bit better to

1317
00:54:12,470 --> 00:54:10,400
britain where you start people

1318
00:54:14,309 --> 00:54:12,480
seeing people reflecting the thinking

1319
00:54:15,589 --> 00:54:14,319
coming out of research at the npl and

1320
00:54:17,990 --> 00:54:15,599
elsewhere it's producing thicker

1321
00:54:20,069 --> 00:54:18,000
airfoils finally to the parental school

1322
00:54:22,470 --> 00:54:20,079
which is giving you the nice fat

1323
00:54:24,870 --> 00:54:22,480
generous airfoils that we will use to

1324
00:54:29,030 --> 00:54:24,880
build the air transport revolution of

1325
00:54:33,990 --> 00:54:32,390
now moving along we come to the subject

1326
00:54:35,510 --> 00:54:34,000
really of our discussion and that's

1327
00:54:38,309 --> 00:54:35,520
ludwig pronto

1328
00:54:40,630 --> 00:54:38,319
liqvid prontol is head of the institute

1329
00:54:43,990 --> 00:54:40,640
for technical physics at guertingan in

1330
00:54:46,630 --> 00:54:44,000
1906 when he's asked by felix klein and

1331
00:54:48,309 --> 00:54:46,640
friedrich althoff to join a technical

1332
00:54:50,789 --> 00:54:48,319
committee a supervisory committee

1333
00:54:53,829 --> 00:54:50,799
overlooking a powered airship study

1334
00:54:53,839 --> 00:54:56,630
pronto

1335
00:55:01,670 --> 00:54:59,109
is an individual who is obsessed with

1336
00:55:03,630 --> 00:55:01,680
measurement he's obsessed with tests he

1337
00:55:05,750 --> 00:55:03,640
he sees this because he comes out of a

1338
00:55:08,069 --> 00:55:05,760

hydrodynamics background he's used to

1339
00:55:09,829 --> 00:55:08,079
water channels he used to he's used to

1340
00:55:11,510 --> 00:55:09,839
doing flow studies around models of

1341
00:55:13,190 --> 00:55:11,520
hulls and things like this

1342
00:55:15,829 --> 00:55:13,200
and so he stresses the development of a

1343
00:55:18,789 --> 00:55:15,839
tunnel and what he does is he goes

1344
00:55:21,109 --> 00:55:18,799
beyond the open flow tunnels that are

1345
00:55:22,710 --> 00:55:21,119
common of the day to close circuit

1346
00:55:24,549 --> 00:55:22,720
tunnels and because of his own

1347
00:55:26,549 --> 00:55:24,559
particular interest he's very much

1348
00:55:28,789 --> 00:55:26,559
interested in reducing turbulence so

1349
00:55:31,430 --> 00:55:28,799
this is really his his major

1350
00:55:32,789 --> 00:55:31,440
contribution in hardware design and

1351
00:55:34,390 --> 00:55:32,799
tunnel design

1352
00:55:36,950 --> 00:55:34,400
beyond this he's the first to

1353
00:55:39,910 --> 00:55:36,960
demonstrate the intrinsic relationship

1354
00:55:43,109 --> 00:55:39,920
of lift to the total circulation around

1355
00:55:44,950 --> 00:55:43,119
the wing the total flow of air and wash

1356
00:55:47,430 --> 00:55:44,960
of the wing the flow field if you will

1357
00:55:49,430 --> 00:55:47,440
around the wing as we think of it today

1358
00:55:51,910 --> 00:55:49,440
and not just looking at this slice in

1359
00:55:53,430 --> 00:55:51,920
time that you see in typical books of

1360
00:55:54,870 --> 00:55:53,440
you know the little air running above

1361
00:55:56,230 --> 00:55:54,880
the wing and below the wing and catching

1362
00:55:57,829 --> 00:55:56,240
up at the trailing edge and things like

1363
00:56:00,309 --> 00:55:57,839

that

1364
00:56:01,750 --> 00:56:00,319
more importantly than this is he is a

1365
00:56:03,589 --> 00:56:01,760
true

1366
00:56:04,870 --> 00:56:03,599
educator and mentor and if we take a

1367
00:56:06,789 --> 00:56:04,880
look at many of the people that he

1368
00:56:08,390 --> 00:56:06,799
mentors he's become legendary figures

1369
00:56:10,309 --> 00:56:08,400
and very influential figures in their

1370
00:56:12,069 --> 00:56:10,319
own right you have albert betts who

1371
00:56:13,910 --> 00:56:12,079
serves as his deputy for many years and

1372
00:56:16,150 --> 00:56:13,920
then succeeds him

1373
00:56:18,390 --> 00:56:16,160
you have carl wieselsberger the most

1374
00:56:22,309 --> 00:56:18,400
gifted wind tunnel designer of his time

1375
00:56:24,630 --> 00:56:22,319
jacob baccaret the swiss oscar hughes

1376
00:56:28,950 --> 00:56:24,640
max monk himself and so this is the

1377
00:56:31,589 --> 00:56:28,960
environment in which german aerodynamics

1378
00:56:33,990 --> 00:56:31,599
is is beginning to thrive by the

1379
00:56:36,390 --> 00:56:34,000
beginning of the first world war

1380
00:56:38,950 --> 00:56:36,400
you also need a structural component and

1381
00:56:41,430 --> 00:56:38,960
you get that structural component with

1382
00:56:43,270 --> 00:56:41,440
our next fellow here hugo youngers hugo

1383
00:56:45,430 --> 00:56:43,280
junckers is a thermodynamicist by

1384
00:56:47,430 --> 00:56:45,440
training classically trained

1385
00:56:49,670 --> 00:56:47,440
but he is fascinated with flight and

1386
00:56:52,150 --> 00:56:49,680
he's also fascinated with the purity of

1387
00:56:54,230 --> 00:56:52,160
flying forms particularly what he calls

1388
00:56:55,430 --> 00:56:54,240

the nerf flugel the flying wing the wing

1389
00:56:56,710 --> 00:56:55,440
only type

1390
00:56:58,710 --> 00:56:56,720
type vehicle

1391
00:57:00,710 --> 00:56:58,720
and he recognizes this symbiotic

1392
00:57:03,030 --> 00:57:00,720
relationship between aerodynamics and

1393
00:57:07,030 --> 00:57:03,040
structural design that it makes possible

1394
00:57:10,470 --> 00:57:07,040
the thick wing high lift cantilever

1395
00:57:12,950 --> 00:57:10,480
aircraft by applying dural structure

1396
00:57:15,589 --> 00:57:12,960
technology to that he winds up with

1397
00:57:18,549 --> 00:57:15,599
operational dural structured military

1398
00:57:19,910 --> 00:57:18,559
and civil airplanes in less than 20

1399
00:57:21,430 --> 00:57:19,920
years after the invention of the

1400
00:57:25,349 --> 00:57:21,440
airplane by the wright brothers so that

1401
00:57:28,150 --> 00:57:25,359
we have for example to give you the

1402
00:57:31,030 --> 00:57:28,160
technical state of the art of the time

1403
00:57:34,309 --> 00:57:31,040
this is a 1919 german transport the

1404
00:57:37,270 --> 00:57:34,319
juncker's f-13 which served the f-13 in

1405
00:57:39,430 --> 00:57:37,280
various forms served into the 1940s it's

1406
00:57:42,069 --> 00:57:39,440
a very efficient airplane very fine

1407
00:57:44,150 --> 00:57:42,079
aircraft sold worldwide in very large

1408
00:57:47,030 --> 00:57:44,160
numbers gave rise to a number of

1409
00:57:48,630 --> 00:57:47,040
successor types but it's remarkable to

1410
00:57:51,190 --> 00:57:48,640
me that we can look at this airplane and

1411
00:57:52,950 --> 00:57:51,200
realize that this is ten years

1412
00:57:55,190 --> 00:57:52,960
after the development of the first

1413
00:57:58,309 --> 00:57:55,200

practical military airplane

1414
00:58:00,390 --> 00:57:58,319
and less than uh really just about 15

1415
00:58:01,990 --> 00:58:00,400
plus years after the invention of the

1416
00:58:04,630 --> 00:58:02,000
airplane itself

1417
00:58:06,390 --> 00:58:04,640
the bottom line that we have after

1418
00:58:09,670 --> 00:58:06,400
taking a look at this

1419
00:58:13,030 --> 00:58:09,680
is uh i think well captured in this

1420
00:58:16,230 --> 00:58:13,040
particular quote by an if by a army air

1421
00:58:18,230 --> 00:58:16,240
service officer looking at

1422
00:58:20,470 --> 00:58:18,240
the relative state of american and

1423
00:58:21,829 --> 00:58:20,480
european aeronautics there's no question

1424
00:58:23,589 --> 00:58:21,839
in the minds of either the french

1425
00:58:25,910 --> 00:58:23,599
english or americans but but that

1426
00:58:28,069 --> 00:58:25,920
germany is technically miles ahead of

1427
00:58:30,710 --> 00:58:28,079
any other country in the air

1428
00:58:34,069 --> 00:58:30,720
the challenge then becomes

1429
00:58:39,109 --> 00:58:34,079
how do you translate and transplant

1430
00:58:41,990 --> 00:58:40,390
put another way

1431
00:58:44,150 --> 00:58:42,000
how do you get the advantage of this

1432
00:58:46,309 --> 00:58:44,160
gertingen process and when you do get

1433
00:58:48,150 --> 00:58:46,319
that you will you will see a total

1434
00:58:50,549 --> 00:58:48,160
transformation of american aeronautics i

1435
00:58:53,270 --> 00:58:50,559
think it's well captured in a quote from

1436
00:58:56,390 --> 00:58:53,280
ira abbott and albert von donhoff two

1437
00:58:59,349 --> 00:58:56,400
leading uh figures in in airfoil design

1438
00:59:01,589 --> 00:58:59,359

who wrote in 1949 up to about the second

1439
00:59:04,390 --> 00:59:01,599
world war when most wings most wing

1440
00:59:07,190 --> 00:59:04,400
sections in common use were derived from

1441
00:59:09,910 --> 00:59:07,200
more or less extensions of the work at

1442
00:59:11,109 --> 00:59:09,920
guertingan okay fine

1443
00:59:13,109 --> 00:59:11,119
now

1444
00:59:15,589 --> 00:59:13,119
the mechanism of transfer has been

1445
00:59:19,190 --> 00:59:15,599
alluded to and that is that jerome clark

1446
00:59:21,349 --> 00:59:19,200
honsaka goes out and recruits max monk

1447
00:59:23,510 --> 00:59:21,359
after meeting him at guertingan to come

1448
00:59:25,270 --> 00:59:23,520
and work for the naca there's a little

1449
00:59:27,670 --> 00:59:25,280
bit of a more detailed story here but

1450
00:59:29,109 --> 00:59:27,680
that that's not incorrect by

1451
00:59:30,069 --> 00:59:29,119
any means

1452
00:59:30,870 --> 00:59:30,079
okay

1453
00:59:31,670 --> 00:59:30,880
and

1454
00:59:40,390 --> 00:59:31,680
the

1455
00:59:42,309 --> 00:59:40,400
office its first chief was william

1456
00:59:43,349 --> 00:59:42,319
knight william knight was an individual

1457
00:59:45,430 --> 00:59:43,359
who was

1458
00:59:46,549 --> 00:59:45,440
extraordinarily gifted in many ways

1459
00:59:48,950 --> 00:59:46,559
although he seems to have had

1460
00:59:51,349 --> 00:59:48,960
difficulties institutionally in getting

1461
00:59:53,270 --> 00:59:51,359
along with people the most important

1462
00:59:56,789 --> 00:59:53,280
thing that knight did was secure his

1463
00:59:58,870 --> 00:59:56,799

jerome hunsacker wrote in 1920 the first

1464
01:00:00,789 --> 00:59:58,880
information on german aeronautical

1465
01:00:03,109 --> 01:00:00,799
science that has reached us

1466
01:00:04,870 --> 01:00:03,119
what that referred to were fifteen boxes

1467
01:00:08,470 --> 01:00:04,880
of german records of the so-called

1468
01:00:11,109 --> 01:00:08,480
technician bericta of the id fleeg the

1469
01:00:14,630 --> 01:00:11,119
inspectorate de frigothropen uh which

1470
01:00:16,710 --> 01:00:14,640
was the technical branch of the the uh

1471
01:00:18,789 --> 01:00:16,720
german air service administration and

1472
01:00:21,670 --> 01:00:18,799
the technician were very detailed

1473
01:00:23,750 --> 01:00:21,680
technical reports that related on a

1474
01:00:26,630 --> 01:00:23,760
number of things but primarily on

1475
01:00:29,750 --> 01:00:26,640
developments in aerodynamics

1476
01:00:31,589 --> 01:00:29,760
night spots max monk who is one of

1477
01:00:34,549 --> 01:00:31,599
pronthel's uh

1478
01:00:36,309 --> 01:00:34,559
assistants and recognizes that he is is

1479
01:00:39,030 --> 01:00:36,319
not only an extremist and would be

1480
01:00:40,950 --> 01:00:39,040
likely a good recruitment target but

1481
01:00:44,950 --> 01:00:40,960
also that he is a very very fine

1482
01:00:47,349 --> 01:00:44,960
individual that naca could benefit from

1483
01:00:49,829 --> 01:00:47,359
and then because of his associations

1484
01:00:52,069 --> 01:00:49,839
with hunsaka and also his uh getting to

1485
01:00:54,710 --> 01:00:52,079
know pronto he arranges for hunsaka to

1486
01:00:56,549 --> 01:00:54,720
approach pronto who buys prada law for

1487
01:00:59,270 --> 01:00:56,559
800 bucks to do a series of three

1488
01:01:00,470 --> 01:00:59,280

reports that the naca publishes very

1489
01:01:02,950 --> 01:01:00,480
early on

1490
01:01:04,710 --> 01:01:02,960
the point here and david bloor has

1491
01:01:07,030 --> 01:01:04,720
traced this very well looking at what

1492
01:01:09,990 --> 01:01:07,040
happens in england the point here is

1493
01:01:12,950 --> 01:01:10,000
that very early on you did not have this

1494
01:01:16,390 --> 01:01:12,960
corrosive force on force debate between

1495
01:01:18,549 --> 01:01:16,400
leonard barstow on one side and hermann

1496
01:01:21,109 --> 01:01:18,559
glauer representing the prodigal school

1497
01:01:24,069 --> 01:01:21,119
in the other that took so long in

1498
01:01:25,990 --> 01:01:24,079
england to 1926 to resolve very quickly

1499
01:01:28,470 --> 01:01:26,000
on the united states very pragmatically

1500
01:01:30,549 --> 01:01:28,480
said prandtl's the guy max monk is the

1501
01:01:33,270 --> 01:01:30,559
agent we need to get in this business we

1502
01:01:34,870 --> 01:01:33,280
need to get into it it fast

1503
01:01:37,109 --> 01:01:34,880
now i would not be

1504
01:01:39,750 --> 01:01:37,119
i would be remiss on my discussion of

1505
01:01:41,750 --> 01:01:39,760
the paris office if i did not mention

1506
01:01:44,870 --> 01:01:41,760
the most notable individual in the

1507
01:01:47,670 --> 01:01:44,880
history of that office and that's this

1508
01:01:49,750 --> 01:01:47,680
individual here john jay eyde having a

1509
01:01:51,589 --> 01:01:49,760
little bit of a hang up with this

1510
01:01:53,670 --> 01:01:51,599
john jay

1511
01:01:55,270 --> 01:01:53,680
a remarkable figure

1512
01:01:56,950 --> 01:01:55,280
he's a reserve naval intelligence

1513
01:01:58,549 --> 01:01:56,960

officer he's a trained architect

1514
01:01:59,670 --> 01:01:58,559
graduate of columbia in the ecole de

1515
01:02:02,069 --> 01:01:59,680
bozart

1516
01:02:04,390 --> 01:02:02,079
he's a very careful analyst he's the son

1517
01:02:07,430 --> 01:02:04,400
of a navy admiral who was an exploration

1518
01:02:08,710 --> 01:02:07,440
admiral he was very fond of of doing

1519
01:02:10,390 --> 01:02:08,720
long-range

1520
01:02:13,270 --> 01:02:10,400
naval what we would see almost like

1521
01:02:16,710 --> 01:02:13,280
office of naval research type journey

1522
01:02:18,710 --> 01:02:16,720
journeys for the navy in his time

1523
01:02:19,990 --> 01:02:18,720
ide is fascinated with automobiles but

1524
01:02:21,670 --> 01:02:20,000
more importantly than that he's

1525
01:02:24,150 --> 01:02:21,680
fascinated with flight the other thing

1526
01:02:27,109 --> 01:02:24,160
is he is an extremely extremely

1527
01:02:29,270 --> 01:02:27,119
intelligent young person even as a child

1528
01:02:31,589 --> 01:02:29,280
it is extraordinary taking a look at his

1529
01:02:33,349 --> 01:02:31,599
childhood diaries

1530
01:02:35,349 --> 01:02:33,359
and his

1531
01:02:37,990 --> 01:02:35,359
recollections of family trips and the

1532
01:02:40,069 --> 01:02:38,000
notes and the drawings that he made it's

1533
01:02:41,829 --> 01:02:40,079
astonishingly how astonishing how

1534
01:02:44,150 --> 01:02:41,839
rapidly he developed

1535
01:02:46,309 --> 01:02:44,160
he was fluent in french had other

1536
01:02:48,309 --> 01:02:46,319
language capabilities as well

1537
01:02:50,710 --> 01:02:48,319
and as head of this office he displayed

1538
01:02:53,270 --> 01:02:50,720

a tremendous amount of tact he was able

1539
01:02:55,029 --> 01:02:53,280
to smooth over relationships that that

1540
01:02:57,109 --> 01:02:55,039
knight had not been able to affect with

1541
01:03:00,069 --> 01:02:57,119
the military attaches and things of this

1542
01:03:01,349 --> 01:03:00,079
sort and what we see about ide is that

1543
01:03:06,470 --> 01:03:01,359
he is the

1544
01:03:08,630 --> 01:03:06,480
he is not a spy

1545
01:03:10,789 --> 01:03:08,640
to use the word spy implies you're

1546
01:03:12,710 --> 01:03:10,799
engaging in covert activities where you

1547
01:03:15,670 --> 01:03:12,720
are dealing with covert sources and you

1548
01:03:17,829 --> 01:03:15,680
are violating the law uh not your law

1549
01:03:20,789 --> 01:03:17,839
necessarily but somebody's law

1550
01:03:22,390 --> 01:03:20,799
ide was careful not to stray very

1551
01:03:25,349 --> 01:03:22,400
careful not to stray into outright

1552
01:03:27,910 --> 01:03:25,359
espionage and because of that

1553
01:03:29,990 --> 01:03:27,920
he was able to move freely among all the

1554
01:03:31,990 --> 01:03:30,000
european nations and worked very very

1555
01:03:34,470 --> 01:03:32,000
effectively in this area

1556
01:03:36,150 --> 01:03:34,480
he scored multiple coups in getting

1557
01:03:39,029 --> 01:03:36,160
information very quickly that was

1558
01:03:41,349 --> 01:03:39,039
brought back to uh to the united states

1559
01:03:43,349 --> 01:03:41,359
now moving right along here

1560
01:03:45,670 --> 01:03:43,359
we come to

1561
01:03:46,870 --> 01:03:45,680
this a sample of some of ides

1562
01:03:49,190 --> 01:03:46,880
products

1563
01:03:51,349 --> 01:03:49,200

we come to max monk

1564
01:03:52,630 --> 01:03:51,359
max monk

1565
01:03:55,430 --> 01:03:52,640
was

1566
01:03:57,910 --> 01:03:55,440
ludwig prontel's most gifted student he

1567
01:04:00,230 --> 01:03:57,920
simplified and extended pronto lifting

1568
01:04:02,390 --> 01:04:00,240
theory he wrote most of the best of the

1569
01:04:04,870 --> 01:04:02,400
so-called technical reports

1570
01:04:07,029 --> 01:04:04,880
and his great contribution was in

1571
01:04:09,670 --> 01:04:07,039
recognizing that the idealized lifting

1572
01:04:11,190 --> 01:04:09,680
distribution over a wing was that of a

1573
01:04:13,270 --> 01:04:11,200
semi ellipse

1574
01:04:15,430 --> 01:04:13,280
more importantly than this though monk

1575
01:04:17,829 --> 01:04:15,440
had an idea as a result of his airship

1576
01:04:21,510 --> 01:04:17,839
work that he thought would be very very

1577
01:04:24,150 --> 01:04:21,520
valuable and that idea was to pressurize

1578
01:04:26,470 --> 01:04:24,160
a wind tunnel to build the wind tunnel

1579
01:04:28,789 --> 01:04:26,480
inside a pressurized vessel

1580
01:04:31,430 --> 01:04:28,799
and because of this you could

1581
01:04:33,510 --> 01:04:31,440
reduce the scaling errors that one would

1582
01:04:36,870 --> 01:04:33,520
have in trying to predict aircraft

1583
01:04:37,829 --> 01:04:36,880
performance from a small model

1584
01:04:40,150 --> 01:04:37,839
now

1585
01:04:41,829 --> 01:04:40,160
monk's transformation what we can say

1586
01:04:44,470 --> 01:04:41,839
that monk does

1587
01:04:47,349 --> 01:04:44,480
working at the naca

1588
01:04:49,510 --> 01:04:47,359

is monk basically transplants

1589
01:04:50,870 --> 01:04:49,520
gertingen research practices to the

1590
01:04:53,670 --> 01:04:50,880
tidewater

1591
01:04:56,069 --> 01:04:53,680
and the combination of this plus his

1592
01:04:58,230 --> 01:04:56,079
development of the real variable density

1593
01:04:59,190 --> 01:04:58,240
tunnel and then the propeller research

1594
01:05:01,990 --> 01:04:59,200
tunnel

1595
01:05:04,789 --> 01:05:02,000
really produces the circumstances under

1596
01:05:06,630 --> 01:05:04,799
which the naca is able to best

1597
01:05:09,029 --> 01:05:06,640
contribute to the rise of the american

1598
01:05:13,510 --> 01:05:09,039
aircraft industry when fred white for

1599
01:05:16,870 --> 01:05:13,520
example developed his naca cowling he

1600
01:05:18,789 --> 01:05:16,880
did so on the basis of max monk

1601
01:05:20,230 --> 01:05:18,799
propeller research tunnel

1602
01:05:22,549 --> 01:05:20,240
now

1603
01:05:26,069 --> 01:05:22,559
if we take a look at the

1604
01:05:28,069 --> 01:05:26,079
first fruits of monk's research

1605
01:05:29,910 --> 01:05:28,079
the first application of it was to an

1606
01:05:32,390 --> 01:05:29,920
american aircraft was otherwise

1607
01:05:35,670 --> 01:05:32,400
relatively unsuccessful and that was the

1608
01:05:37,349 --> 01:05:35,680
so-called verville sperry r3 racer this

1609
01:05:39,670 --> 01:05:37,359
is the first aircraft in the united

1610
01:05:41,829 --> 01:05:39,680
states to blend relatively all the

1611
01:05:44,069 --> 01:05:41,839
elements if you will of modern aircraft

1612
01:05:47,029 --> 01:05:44,079
design including a so-called monk

1613
01:05:48,789 --> 01:05:47,039

airfoil section a so-called m-series

1614
01:05:52,870 --> 01:05:48,799
section

1615
01:05:55,990 --> 01:05:52,880
now monk was forced out of the naca uh

1616
01:05:58,630 --> 01:05:56,000
because of personality disputes uh that

1617
01:06:00,309 --> 01:05:58,640
you uh that are covered in jim hansen's

1618
01:06:02,390 --> 01:06:00,319
book very very well

1619
01:06:04,470 --> 01:06:02,400
with the langley staff i think this was

1620
01:06:05,829 --> 01:06:04,480
these were largely driven by envy and

1621
01:06:08,710 --> 01:06:05,839
the fact that they did not fully

1622
01:06:09,670 --> 01:06:08,720
appreciate the uh the

1623
01:06:11,670 --> 01:06:09,680
uh

1624
01:06:13,349 --> 01:06:11,680
capabilities that he brought to the

1625
01:06:16,789 --> 01:06:13,359
agency as well

1626
01:06:18,710 --> 01:06:16,799
i would argue that if you take a look at

1627
01:06:20,870 --> 01:06:18,720
max monk's

1628
01:06:22,390 --> 01:06:20,880
relationship with the agency you would

1629
01:06:25,190 --> 01:06:22,400
find that

1630
01:06:27,910 --> 01:06:25,200
he did not receive the top cover he did

1631
01:06:30,069 --> 01:06:27,920
not receive the support from his own

1632
01:06:32,390 --> 01:06:30,079
engineering supervisors and managers

1633
01:06:35,190 --> 01:06:32,400
that he deserved he was overshadowed

1634
01:06:38,390 --> 01:06:35,200
much more by theodor fan carmen this is

1635
01:06:39,910 --> 01:06:38,400
a december 1926 photograph you see fond

1636
01:06:42,309 --> 01:06:39,920
carmen in the center of the photograph

1637
01:06:44,470 --> 01:06:42,319
he's already the new boy if you will max

1638
01:06:48,230 --> 01:06:44,480

monks in front and behind him

1639
01:06:50,069 --> 01:06:48,240
is hje reed and monk's position obscures

1640
01:06:52,470 --> 01:06:50,079
the knife and reed's hand that's about

1641
01:06:53,750 --> 01:06:52,480
to be plunged so to speak into max

1642
01:06:55,349 --> 01:06:53,760
monk's back

1643
01:06:58,710 --> 01:06:55,359
i would just say the following after

1644
01:07:03,109 --> 01:07:01,349
he went to work for catholic university

1645
01:07:05,510 --> 01:07:03,119
and among the individuals he mentored

1646
01:07:07,829 --> 01:07:05,520
there was robert t jones the american

1647
01:07:10,150 --> 01:07:07,839
inventor of the swept wing jones by the

1648
01:07:12,150 --> 01:07:10,160
way was introduced to monk via albert

1649
01:07:13,349 --> 01:07:12,160
francis zom another point worth

1650
01:07:15,349 --> 01:07:13,359
mentioning

1651
01:07:17,109 --> 01:07:15,359
where we really lost the advantage of

1652
01:07:20,150 --> 01:07:17,119
monk was this

1653
01:07:23,109 --> 01:07:20,160
because monk was not in the naca he was

1654
01:07:25,750 --> 01:07:23,119
not present in 1935

1655
01:07:27,670 --> 01:07:25,760
when boozman gave his presentation at

1656
01:07:29,990 --> 01:07:27,680
the volta conference on high speeds in

1657
01:07:32,470 --> 01:07:30,000
aviation on the swept wing

1658
01:07:34,150 --> 01:07:32,480
eastman jacobs was present and eastman

1659
01:07:35,750 --> 01:07:34,160
jacobs in his trip reports said that

1660
01:07:37,510 --> 01:07:35,760
since he really didn't speak any of the

1661
01:07:39,829 --> 01:07:37,520
languages of the conference he didn't

1662
01:07:41,510 --> 01:07:39,839
really have an opportunity to pick up on

1663
01:07:42,710 --> 01:07:41,520

any of the technical reports but he was

1664
01:07:44,630 --> 01:07:42,720
going to wait until he got the

1665
01:07:46,870 --> 01:07:44,640
information from overseas well it never

1666
01:07:48,390 --> 01:07:46,880
arrived because if you took a look at

1667
01:07:50,150 --> 01:07:48,400
what happened after that conference

1668
01:07:52,150 --> 01:07:50,160
certainly from the german side of it

1669
01:07:53,349 --> 01:07:52,160
buzaman's work was very very quickly

1670
01:07:55,670 --> 01:07:53,359
classified

1671
01:07:58,309 --> 01:07:55,680
had monk been there i don't think we

1672
01:08:01,109 --> 01:07:58,319
would have lost that 10 years that we

1673
01:08:02,630 --> 01:08:01,119
had in the development of the swept wing

1674
01:08:05,510 --> 01:08:02,640
in the united states which was the

1675
01:08:07,430 --> 01:08:05,520
greatest gap in aviation history in

1676
01:08:11,109 --> 01:08:07,440
technical development

1677
01:08:13,510 --> 01:08:11,119
until the advent of stealth in the 1980s

1678
01:08:15,349 --> 01:08:13,520
where you had a gap of about 25 years

1679
01:08:17,749 --> 01:08:15,359
before rivals appeared

1680
01:08:20,229 --> 01:08:17,759
now monk at the end of his days was

1681
01:08:22,550 --> 01:08:20,239
richly accorded honors uh not least of

1682
01:08:25,430 --> 01:08:22,560
which by the university of

1683
01:08:28,229 --> 01:08:25,440
catholic university which accorded him

1684
01:08:29,030 --> 01:08:28,239
the title professor emeritus in 1981 he

1685
01:08:30,789 --> 01:08:29,040
said

1686
01:08:32,870 --> 01:08:30,799
what a university

1687
01:08:35,030 --> 01:08:32,880
which remembers me with my moderate

1688
01:08:36,950 --> 01:08:35,040

services after so many years and takes

1689
01:08:39,349 --> 01:08:36,960
such a positive step just to make me

1690
01:08:41,189 --> 01:08:39,359
feel good i liked better what he said at

1691
01:08:42,870 --> 01:08:41,199
the annual review of fluid mechanics

1692
01:08:44,789 --> 01:08:42,880
when he wrote it makes me happy to

1693
01:08:46,709 --> 01:08:44,799
remember that long ago

1694
01:08:48,870 --> 01:08:46,719
at the beginning of aviation heaven

1695
01:08:50,709 --> 01:08:48,880
granted me the opportunity to make

1696
01:08:53,430 --> 01:08:50,719
significant contributions to

1697
01:09:02,229 --> 01:08:53,440
aerodynamics that he did very much thank

1698
01:09:05,669 --> 01:09:03,990
thank you dick it's always interesting

1699
01:09:07,430 --> 01:09:05,679
to hear about a fascinating character

1700
01:09:08,950 --> 01:09:07,440
such as max monk

1701
01:09:10,390 --> 01:09:08,960
next up on our

1702
01:09:12,390 --> 01:09:10,400
agenda is

1703
01:09:14,550 --> 01:09:12,400
sean sire sean

1704
01:09:16,709 --> 01:09:14,560
received his phd last year from the

1705
01:09:19,110 --> 01:09:16,719
esteemed history of aerotechnology

1706
01:09:21,349 --> 01:09:19,120
program at auburn university

1707
01:09:34,070 --> 01:09:21,359
and he was a post-doc here at the

1708
01:09:38,390 --> 01:09:35,990
afternoon everyone it's a pleasure to be

1709
01:09:40,390 --> 01:09:38,400
here with you all today

1710
01:09:42,309 --> 01:09:40,400
now for something completely different

1711
01:09:44,950 --> 01:09:42,319
we're going to dive into the legislative

1712
01:09:46,950 --> 01:09:44,960
realm question of regulation of aviation

1713
01:09:48,789 --> 01:09:46,960

in the naca's role

1714
01:09:51,749 --> 01:09:48,799
in those early discussions

1715
01:09:53,110 --> 01:09:51,759
my paper is entitled the war the naca

1716
01:09:55,350 --> 01:09:53,120
and the convention

1717
01:09:57,669 --> 01:09:55,360
laying the ideological foundation for

1718
01:10:00,870 --> 01:09:57,679
federal regulation during the wilson

1719
01:10:05,510 --> 01:10:02,950
when congress established the national

1720
01:10:07,110 --> 01:10:05,520
advisory committee for aeronautics 100

1721
01:10:09,430 --> 01:10:07,120
years ago today

1722
01:10:12,070 --> 01:10:09,440
no relationship existed between civil

1723
01:10:15,590 --> 01:10:12,080
aviation and the federal government

1724
01:10:17,270 --> 01:10:15,600
eleven years later on may 20th 1926

1725
01:10:18,950 --> 01:10:17,280
president coolidge signed the air

1726
01:10:21,189 --> 01:10:18,960
commerce act

1727
01:10:23,270 --> 01:10:21,199
this foundational piece of legislation

1728
01:10:24,390 --> 01:10:23,280
declared federal sovereignty over u.s

1729
01:10:25,990 --> 01:10:24,400
airspace

1730
01:10:27,830 --> 01:10:26,000
placed the regulation of civil

1731
01:10:30,550 --> 01:10:27,840
aeronautics and the creation of air

1732
01:10:32,709 --> 01:10:30,560
routes within the department of commerce

1733
01:10:35,430 --> 01:10:32,719
and created a new assistant secretary of

1734
01:10:36,950 --> 01:10:35,440
commerce for aeronautics

1735
01:10:39,590 --> 01:10:36,960
although passed in the heart of the

1736
01:10:41,590 --> 01:10:39,600
republic in 1920s the response of

1737
01:10:43,510 --> 01:10:41,600
american policymakers to international

1738
01:10:44,630 --> 01:10:43,520

developments immediately following world

1739
01:10:47,189 --> 01:10:44,640
war one

1740
01:10:49,030 --> 01:10:47,199
not the desires of a nascent industry

1741
01:10:51,990 --> 01:10:49,040
set the legislative trajectory that

1742
01:10:54,310 --> 01:10:52,000
culminated in the air commerce act

1743
01:10:56,310 --> 01:10:54,320
the naca set at the center of this

1744
01:10:59,350 --> 01:10:56,320
formative process and three of its

1745
01:11:01,350 --> 01:10:59,360
members smithsonian secretary and naca

1746
01:11:03,510 --> 01:11:01,360
chairman charles d walcott

1747
01:11:04,470 --> 01:11:03,520
executive committee chairman joseph s

1748
01:11:06,390 --> 01:11:04,480
ames

1749
01:11:10,229 --> 01:11:06,400
and director of the bureau of standards

1750
01:11:12,229 --> 01:11:10,239
samuel s stratton played pivotal roles

1751
01:11:15,110 --> 01:11:12,239
by the time warren g harding assumed

1752
01:11:17,750 --> 01:11:15,120
office on march 4th 1921

1753
01:11:20,310 --> 01:11:17,760
a regulatory ideology had crystallized

1754
01:11:22,390 --> 01:11:20,320
within the executive branch that would

1755
01:11:24,390 --> 01:11:22,400
with further modification be

1756
01:11:26,310 --> 01:11:24,400
institutionalized as the air commerce

1757
01:11:28,390 --> 01:11:26,320
act

1758
01:11:30,870 --> 01:11:28,400
the first federal regulation of civil

1759
01:11:31,990 --> 01:11:30,880
aviation arose in response to world war

1760
01:11:34,709 --> 01:11:32,000
one

1761
01:11:36,630 --> 01:11:34,719
on february 28 1918

1762
01:11:38,790 --> 01:11:36,640
president wilson issued proclamation

1763
01:11:41,669 --> 01:11:38,800

number 1432

1764
01:11:44,229 --> 01:11:41,679
in doing so he declared the entirety of

1765
01:11:45,750 --> 01:11:44,239
u.s territory a zone of military

1766
01:11:47,990 --> 01:11:45,760
operations

1767
01:11:50,390 --> 01:11:48,000
pilots had to possess a license from the

1768
01:11:52,630 --> 01:11:50,400
joint army and navy board on aeronautic

1769
01:11:54,950 --> 01:11:52,640
cognizance and those flying without a

1770
01:11:56,550 --> 01:11:54,960
license would be considered hostile and

1771
01:11:58,630 --> 01:11:56,560
fired upon

1772
01:12:00,870 --> 01:11:58,640
during the war the board awarded

1773
01:12:02,470 --> 01:12:00,880
licenses only to those working under

1774
01:12:05,750 --> 01:12:02,480
government contract

1775
01:12:07,830 --> 01:12:05,760
effectively banning private flying

1776
01:12:09,910 --> 01:12:07,840
as the war came to a close the

1777
01:12:12,630 --> 01:12:09,920
manufacturer's aircraft association

1778
01:12:14,470 --> 01:12:12,640
hoped that the naca would take action to

1779
01:12:17,750 --> 01:12:14,480
develop air routes

1780
01:12:19,590 --> 01:12:17,760
but some naca members like joseph ames

1781
01:12:22,470 --> 01:12:19,600
viewed such work as outside the

1782
01:12:24,790 --> 01:12:22,480
committee's scientific mandate when

1783
01:12:26,950 --> 01:12:24,800
industry petitioned a second time the

1784
01:12:28,790 --> 01:12:26,960
executive committee authorized walcott

1785
01:12:30,550 --> 01:12:28,800
to discuss the possibility of a

1786
01:12:33,110 --> 01:12:30,560
legislative conference with the

1787
01:12:36,550 --> 01:12:33,120
postmaster general and the secretaries

1788
01:12:38,149 --> 01:12:36,560

of war navy and commerce

1789
01:12:41,110 --> 01:12:38,159
while industry may have sparked the

1790
01:12:43,270 --> 01:12:41,120
naca's initial action desires of allied

1791
01:12:45,750 --> 01:12:43,280
governments forced the naca to look more

1792
01:12:48,149 --> 01:12:45,760
closely at the domestic situation

1793
01:12:50,470 --> 01:12:48,159
on november 12th one day after the

1794
01:12:53,270 --> 01:12:50,480
armistice the state department received

1795
01:12:55,990 --> 01:12:53,280
an informal note from colville barclay

1796
01:12:58,149 --> 01:12:56,000
the british charged affairs at interim

1797
01:13:00,950 --> 01:12:58,159
requesting information concerning laws

1798
01:13:03,110 --> 01:13:00,960
regulating aviation in the united states

1799
01:13:04,790 --> 01:13:03,120
quote with a view to crafting an

1800
01:13:07,189 --> 01:13:04,800
international convention on aerial

1801
01:13:09,110 --> 01:13:07,199
navigation end quote

1802
01:13:10,470 --> 01:13:09,120
the naca received the request via the

1803
01:13:12,390 --> 01:13:10,480
war department

1804
01:13:14,550 --> 01:13:12,400
recognizing its limited knowledge on the

1805
01:13:17,189 --> 01:13:14,560
subject the executive committee asked

1806
01:13:19,750 --> 01:13:17,199
the 48 state governments to collect and

1807
01:13:22,550 --> 01:13:19,760
forward any and all laws pertaining to

1808
01:13:25,110 --> 01:13:22,560
aviation regulation

1809
01:13:26,950 --> 01:13:25,120
on december 14th the executive committee

1810
01:13:29,830 --> 01:13:26,960
authorized walcott to inform president

1811
01:13:32,149 --> 01:13:29,840
wilson of the urgent need for quote some

1812
01:13:35,110 --> 01:13:32,159
statement of principles which might lead

1813
01:13:37,430 --> 01:13:35,120

to an international agreement end quote

1814
01:13:39,430 --> 01:13:37,440
walcott's letter to wilson presented an

1815
01:13:41,910 --> 01:13:39,440
international aeronautical conference as

1816
01:13:43,669 --> 01:13:41,920
the best means to avoid quote future

1817
01:13:46,310 --> 01:13:43,679
irritation and international

1818
01:13:49,189 --> 01:13:46,320
complications end quote

1819
01:13:51,030 --> 01:13:49,199
walcott proposed a two-tiered system

1820
01:13:53,270 --> 01:13:51,040
an international board that would draft

1821
01:13:54,870 --> 01:13:53,280
regulations for aerial navigation over

1822
01:13:57,030 --> 01:13:54,880
international waters

1823
01:13:59,990 --> 01:13:57,040
and national boards that would draft

1824
01:14:02,630 --> 01:14:00,000
complementary domestic regulations

1825
01:14:04,870 --> 01:14:02,640
on december 31st the interdepartmental

1826
01:14:07,110 --> 01:14:04,880
conference on aerial navigation

1827
01:14:08,870 --> 01:14:07,120
meeting in response to the naca's

1828
01:14:09,990 --> 01:14:08,880
earlier proposal for a legislative

1829
01:14:12,550 --> 01:14:10,000
conference

1830
01:14:14,630 --> 01:14:12,560
agreed on draft legislation authorizing

1831
01:14:16,790 --> 01:14:14,640
the president to create such a national

1832
01:14:18,390 --> 01:14:16,800
board composed of the secretaries of

1833
01:14:20,229 --> 01:14:18,400
state war

1834
01:14:24,149 --> 01:14:20,239
navy commerce

1835
01:14:26,310 --> 01:14:24,159
treasury and the post master general

1836
01:14:28,229 --> 01:14:26,320
as the naca awaited comment from the

1837
01:14:29,990 --> 01:14:28,239
various executive departments on the

1838
01:14:31,669 --> 01:14:30,000

interdepartmental comp or on the

1839
01:14:32,870 --> 01:14:31,679
interdepartmental conference's draft

1840
01:14:34,870 --> 01:14:32,880
legislation

1841
01:14:37,110 --> 01:14:34,880
the domestic aeronautical situation

1842
01:14:40,229 --> 01:14:37,120
became increasingly chaotic

1843
01:14:42,870 --> 01:14:40,239
on january 20th 1919 the board on

1844
01:14:45,110 --> 01:14:42,880
aeronautic cognizance lifted wartime

1845
01:14:47,270 --> 01:14:45,120
licensing restrictions

1846
01:14:49,910 --> 01:14:47,280
unequipped to systematically regulate

1847
01:14:52,149 --> 01:14:49,920
civil aviation the joint board granted a

1848
01:14:54,310 --> 01:14:52,159
license to every applicant without

1849
01:14:55,990 --> 01:14:54,320
certifying their abilities or inspecting

1850
01:14:58,229 --> 01:14:56,000
their machines

1851
01:14:59,510 --> 01:14:58,239
director of military aeronautics general

1852
01:15:02,070 --> 01:14:59,520
william kinley

1853
01:15:04,470 --> 01:15:02,080
member of both the naca and the board of

1854
01:15:06,470 --> 01:15:04,480
aeronautic cognizants believed the board

1855
01:15:08,070 --> 01:15:06,480
lacked the authority to regulate aerial

1856
01:15:09,669 --> 01:15:08,080
traffic

1857
01:15:11,830 --> 01:15:09,679
his office brought the rapidly

1858
01:15:13,910 --> 01:15:11,840
deteriorating situation to the attention

1859
01:15:15,990 --> 01:15:13,920
of the naca

1860
01:15:17,990 --> 01:15:16,000
in response the executive committee

1861
01:15:20,229 --> 01:15:18,000
approved emergency legislation

1862
01:15:22,830 --> 01:15:20,239
authorizing the secretary of commerce to

1863
01:15:25,750 --> 01:15:22,840

create and administer civil aviation

1864
01:15:27,590 --> 01:15:25,760
regulations the treasury department with

1865
01:15:29,430 --> 01:15:27,600
wilson's approval submitted the

1866
01:15:31,030 --> 01:15:29,440
emergency legislation to congress on

1867
01:15:33,030 --> 01:15:31,040
february 26th

1868
01:15:36,870 --> 01:15:33,040
but legislators failed to address the

1869
01:15:39,110 --> 01:15:36,880
matter before adjourning on march 4th

1870
01:15:41,510 --> 01:15:39,120
during the congressional recess rear

1871
01:15:43,590 --> 01:15:41,520
admiral harry s knopp and major general

1872
01:15:45,350 --> 01:15:43,600
mason patrick led the american

1873
01:15:47,510 --> 01:15:45,360
delegation to the inter-allied

1874
01:15:49,189 --> 01:15:47,520
aeronautical commission

1875
01:15:51,189 --> 01:15:49,199
tasked with drafting an international

1876
01:15:53,590 --> 01:15:51,199
air convention as part of the versailles

1877
01:15:55,590 --> 01:15:53,600
conference the commission presented the

1878
01:15:57,990 --> 01:15:55,600
convention relating to the

1879
01:16:02,310 --> 01:15:58,000
regulation of aerial navigation to the

1880
01:16:04,149 --> 01:16:02,320
supreme council on may 22 1919

1881
01:16:06,070 --> 01:16:04,159
the convention adopted the principle of

1882
01:16:08,310 --> 01:16:06,080
air sovereignty and established

1883
01:16:10,070 --> 01:16:08,320
standardized procedures for the marking

1884
01:16:12,470 --> 01:16:10,080
registration and airworthiness of

1885
01:16:16,070 --> 01:16:12,480
aircraft the licensing of pilots and

1886
01:16:17,910 --> 01:16:16,080
navigators and in-flight documentation

1887
01:16:19,750 --> 01:16:17,920
it also called for the creation of a

1888
01:16:22,310 --> 01:16:19,760

permanent international commission for

1889
01:16:24,390 --> 01:16:22,320
air navigation a body analogous to

1890
01:16:26,950 --> 01:16:24,400
walcott's international board

1891
01:16:29,350 --> 01:16:26,960
tied to the league of nations

1892
01:16:31,990 --> 01:16:29,360
that same day members of the american

1893
01:16:33,990 --> 01:16:32,000
aviation mission set sail for europe

1894
01:16:36,709 --> 01:16:34,000
assistant secretary of war benedict

1895
01:16:38,470 --> 01:16:36,719
crowl led this crowd commission on an

1896
01:16:41,750 --> 01:16:38,480
aeronautical fact-finding tour of

1897
01:16:43,830 --> 01:16:41,760
britain france and italy

1898
01:16:46,229 --> 01:16:43,840
in his report to secretary of war newton

1899
01:16:48,470 --> 01:16:46,239
d baker crowl stressed the international

1900
01:16:50,790 --> 01:16:48,480
nature of aviation and anticipated u.s

1901
01:16:52,470 --> 01:16:50,800
ratification of the convention

1902
01:16:54,950 --> 01:16:52,480
he recommended the creation of a

1903
01:16:57,430 --> 01:16:54,960
cabinet-level aviation department as the

1904
01:17:00,149 --> 01:16:57,440
only means of establishing a quote

1905
01:17:02,310 --> 01:17:00,159
single authoritative point of contact

1906
01:17:03,590 --> 01:17:02,320
for international aviation affairs end

1907
01:17:05,669 --> 01:17:03,600
quote

1908
01:17:08,149 --> 01:17:05,679
in his minority report navy

1909
01:17:09,830 --> 01:17:08,159
representative captain henry c mustin

1910
01:17:12,149 --> 01:17:09,840
disagreed with crowl's call for a

1911
01:17:14,149 --> 01:17:12,159
unified department as did secretary

1912
01:17:15,830 --> 01:17:14,159
baker

1913
01:17:18,709 --> 01:17:15,840

though it found supporters on capitol

1914
01:17:21,110 --> 01:17:18,719
hill the unified approach never gained

1915
01:17:22,790 --> 01:17:21,120
traction within the naca

1916
01:17:25,110 --> 01:17:22,800
on july 25th

1917
01:17:27,350 --> 01:17:25,120
william duran chairman of the naca's

1918
01:17:29,189 --> 01:17:27,360
committee on civil aerial transport

1919
01:17:30,630 --> 01:17:29,199
submitted his report to the executive

1920
01:17:32,790 --> 01:17:30,640
committee

1921
01:17:35,110 --> 01:17:32,800
in it he proposed the creation of an

1922
01:17:37,750 --> 01:17:35,120
interdepartmental board with legislative

1923
01:17:40,310 --> 01:17:37,760
functions that would work in tandem with

1924
01:17:42,229 --> 01:17:40,320
a new commerce department agency vested

1925
01:17:44,390 --> 01:17:42,239
with executive power

1926
01:17:46,149 --> 01:17:44,400
his proposal essentially merged the

1927
01:17:48,310 --> 01:17:46,159
inter-departmental conference's draft

1928
01:17:50,070 --> 01:17:48,320
bill with the naca's emergency

1929
01:17:51,270 --> 01:17:50,080
legislation

1930
01:17:53,189 --> 01:17:51,280
this approach

1931
01:17:55,430 --> 01:17:53,199
one that retained existing departmental

1932
01:17:57,270 --> 01:17:55,440
separation while creating a body for

1933
01:17:59,189 --> 01:17:57,280
international coordination

1934
01:18:01,590 --> 01:17:59,199
offered an attractive alternative to

1935
01:18:03,830 --> 01:18:01,600
crowl's proposal

1936
01:18:06,229 --> 01:18:03,840
a month later director of air service

1937
01:18:08,149 --> 01:18:06,239
major general charles menoher brought

1938
01:18:10,310 --> 01:18:08,159

duran's idea to the attention of the

1939
01:18:12,310 --> 01:18:10,320
senate military affairs committee

1940
01:18:14,790 --> 01:18:12,320
testifying against senator harry

1941
01:18:17,350 --> 01:18:14,800
newsbill creating a department of air he

1942
01:18:19,510 --> 01:18:17,360
called for a civilian aviation bureau

1943
01:18:21,669 --> 01:18:19,520
quote under say the department of

1944
01:18:23,350 --> 01:18:21,679
commerce end quote that would consult

1945
01:18:25,189 --> 01:18:23,360
with the military through a control

1946
01:18:27,510 --> 01:18:25,199
board

1947
01:18:29,030 --> 01:18:27,520
in the last week of july a combination

1948
01:18:30,950 --> 01:18:29,040
of domestic and international

1949
01:18:33,110 --> 01:18:30,960
developments forced the wilson

1950
01:18:36,070 --> 01:18:33,120
administration to directly confront the

1951
01:18:38,830 --> 01:18:36,080
question of regulatory legislation

1952
01:18:41,430 --> 01:18:38,840
on july 24th the board on aeronautic

1953
01:18:43,669 --> 01:18:41,440
cognizants aware of the recently drafted

1954
01:18:45,830 --> 01:18:43,679
international convention and problems

1955
01:18:47,910 --> 01:18:45,840
with its current licensing system

1956
01:18:49,990 --> 01:18:47,920
wrote secretary baker and secretary of

1957
01:18:51,590 --> 01:18:50,000
the navy josephus daniels

1958
01:18:53,430 --> 01:18:51,600
recommending the creation of an

1959
01:18:55,110 --> 01:18:53,440
interdepartmental board to draft

1960
01:18:57,110 --> 01:18:55,120
legislation

1961
01:18:58,870 --> 01:18:57,120
that same week the state department

1962
01:19:01,030 --> 01:18:58,880
distributed drafts of the international

1963
01:19:04,630 --> 01:19:01,040

convention to the interested executive

1964
01:19:07,270 --> 01:19:04,640
departments and the naca for comment

1965
01:19:09,430 --> 01:19:07,280
on july 31st wilson rescinded

1966
01:19:11,510 --> 01:19:09,440
proclamation 1432

1967
01:19:12,790 --> 01:19:11,520
severing civil aviation from the federal

1968
01:19:14,709 --> 01:19:12,800
government

1969
01:19:16,709 --> 01:19:14,719
secretary baker discussed the urgent

1970
01:19:18,950 --> 01:19:16,719
need for legislation with the president

1971
01:19:21,189 --> 01:19:18,960
and wilson recommended that the proposed

1972
01:19:23,189 --> 01:19:21,199
interdepartmental board also include the

1973
01:19:26,470 --> 01:19:23,199
state department and address u.s

1974
01:19:28,390 --> 01:19:26,480
ratification of the convention

1975
01:19:30,149 --> 01:19:28,400
the naca created the special

1976
01:19:32,630 --> 01:19:30,159
subcommittee on international air

1977
01:19:34,950 --> 01:19:32,640
navigation to coordinate departmental

1978
01:19:37,350 --> 01:19:34,960
responses to the convention

1979
01:19:39,189 --> 01:19:37,360
under the chairmanship of charles marvin

1980
01:19:41,350 --> 01:19:39,199
the subcommittee recommended

1981
01:19:43,590 --> 01:19:41,360
ratification of the convention quote as

1982
01:19:45,910 --> 01:19:43,600
it stands end quote

1983
01:19:47,830 --> 01:19:45,920
crowl speaking for the american aviation

1984
01:19:50,149 --> 01:19:47,840
mission viewed the convention as the

1985
01:19:52,310 --> 01:19:50,159
best way to prevent the passage of 48

1986
01:19:53,750 --> 01:19:52,320
different and potentially conflicting

1987
01:19:55,510 --> 01:19:53,760
state laws

1988
01:19:57,750 --> 01:19:55,520

under the constitution's treaty powers

1989
01:19:59,590 --> 01:19:57,760
the convention if ratified

1990
01:20:01,990 --> 01:19:59,600
would justify the passage of federal

1991
01:20:04,470 --> 01:20:02,000
legislation allowing for uniform

1992
01:20:06,470 --> 01:20:04,480
domestic regulation

1993
01:20:08,950 --> 01:20:06,480
by the time secretary baker called the

1994
01:20:10,310 --> 01:20:08,960
inter-departmental board on october 10th

1995
01:20:12,709 --> 01:20:10,320
the state department had received

1996
01:20:15,750 --> 01:20:12,719
feedback overwhelmingly endorsing u.s

1997
01:20:17,430 --> 01:20:15,760
ratification of the convention

1998
01:20:18,870 --> 01:20:17,440
at its first meeting the

1999
01:20:21,350 --> 01:20:18,880
interdepartmental board members

2000
01:20:23,110 --> 01:20:21,360
determined that legislation should be in

2001
01:20:25,189 --> 01:20:23,120
agreement with the convention

2002
01:20:27,350 --> 01:20:25,199
provide for u.s representation on the

2003
01:20:29,590 --> 01:20:27,360
permanent international commission

2004
01:20:31,189 --> 01:20:29,600
establish a national commission to draft

2005
01:20:32,390 --> 01:20:31,199
rules and regulations for aerial

2006
01:20:34,470 --> 01:20:32,400
navigation

2007
01:20:36,470 --> 01:20:34,480
and create an enforcement bureau within

2008
01:20:39,110 --> 01:20:36,480
an existing department

2009
01:20:41,430 --> 01:20:39,120
after the departments of war navy post

2010
01:20:43,590 --> 01:20:41,440
office and commerce were all offered as

2011
01:20:44,470 --> 01:20:43,600
possible homes for this new enforcement

2012
01:20:46,149 --> 01:20:44,480
bureau

2013
01:20:48,229 --> 01:20:46,159

samuel stratton pointed out that

2014
01:20:50,229 --> 01:20:48,239
congress would not place civil functions

2015
01:20:52,149 --> 01:20:50,239
under military control

2016
01:20:54,070 --> 01:20:52,159
after further discussion the board

2017
01:20:57,189 --> 01:20:54,080
agreed to place the enforcement bureau

2018
01:20:58,950 --> 01:20:57,199
within the department of commerce

2019
01:21:00,470 --> 01:20:58,960
crafted for the express purpose of

2020
01:21:03,189 --> 01:21:00,480
enforcing international treaty

2021
01:21:05,110 --> 01:21:03,199
provisions the subsequent bill created

2022
01:21:06,709 --> 01:21:05,120
an air navigation board

2023
01:21:08,070 --> 01:21:06,719
composed of representatives from the

2024
01:21:12,070 --> 01:21:08,080
departments of war

2025
01:21:14,550 --> 01:21:12,080
navy commerce treasury post office state

2026
01:21:16,550 --> 01:21:14,560
agriculture and the naca

2027
01:21:19,510 --> 01:21:16,560
this body would draft both interstate

2028
01:21:21,910 --> 01:21:19,520
and intrastate regulations that would

2029
01:21:25,110 --> 01:21:21,920
then be quote approved and promulgated

2030
01:21:27,110 --> 01:21:25,120
by the secretary of commerce end quote

2031
01:21:29,510 --> 01:21:27,120
this draft bill meant with widespread

2032
01:21:32,550 --> 01:21:29,520
acceptance within the executive branch

2033
01:21:34,390 --> 01:21:32,560
and 46 pages of air regulations drawn

2034
01:21:38,390 --> 01:21:34,400
from the international convention were

2035
01:21:40,229 --> 01:21:38,400
drafted in anticipation of its passage

2036
01:21:43,510 --> 01:21:40,239
while the interdepartmental board worked

2037
01:21:44,950 --> 01:21:43,520
on its final draft the naca recognized

2038
01:21:47,590 --> 01:21:44,960

the need to formulate an official

2039
01:21:49,510 --> 01:21:47,600
position on aviation regulation

2040
01:21:51,990 --> 01:21:49,520
on november 25th

2041
01:21:54,870 --> 01:21:52,000
second assistant postmaster otto prager

2042
01:21:57,030 --> 01:21:54,880
joined walcott stratton and ames as the

2043
01:22:00,310 --> 01:21:57,040
special committee on organization of

2044
01:22:02,070 --> 01:22:00,320
governmental activities in aeronautics

2045
01:22:04,149 --> 01:22:02,080
mustin's minority report to the crowd

2046
01:22:05,910 --> 01:22:04,159
commission and men o'hare's report

2047
01:22:08,390 --> 01:22:05,920
calling for the continued independence

2048
01:22:11,110 --> 01:22:08,400
of army aviation greatly influenced

2049
01:22:13,270 --> 01:22:11,120
special committee chairman ames

2050
01:22:14,149 --> 01:22:13,280
at the executive committee's february 12

2051
01:22:16,629 --> 01:22:14,159
meeting

2052
01:22:18,709 --> 01:22:16,639
walcott presented draft legislation

2053
01:22:20,550 --> 01:22:18,719
based on the work of this exec of this

2054
01:22:22,149 --> 01:22:20,560
special committee

2055
01:22:23,270 --> 01:22:22,159
it called for a bureau in the department

2056
01:22:25,910 --> 01:22:23,280
of commerce

2057
01:22:28,470 --> 01:22:25,920
a consultative joint board and separate

2058
01:22:30,790 --> 01:22:28,480
aviation bureaus in the army navy and

2059
01:22:33,110 --> 01:22:30,800
post office departments

2060
01:22:34,709 --> 01:22:33,120
while particulars of the two differed

2061
01:22:36,870 --> 01:22:34,719
both the inter-departmental board's

2062
01:22:39,110 --> 01:22:36,880
draft legislation and that of the

2063
01:22:41,990 --> 01:22:39,120

special committee adopted the national

2064
01:22:44,550 --> 01:22:42,000
board commerce department framework

2065
01:22:48,709 --> 01:22:44,560
with ames stratton and prager serving on

2066
01:22:50,709 --> 01:22:48,719
both bodies this comes as no surprise

2067
01:22:53,030 --> 01:22:50,719
at the direction of president wilson

2068
01:22:55,510 --> 01:22:53,040
secretary baker forded copies of the

2069
01:22:57,830 --> 01:22:55,520
interdepartmental board's legislation to

2070
01:23:00,070 --> 01:22:57,840
california representative julius cahn

2071
01:23:01,830 --> 01:23:00,080
and senator wadsworth of new york in

2072
01:23:03,550 --> 01:23:01,840
early may

2073
01:23:06,870 --> 01:23:03,560
khan submitted h.r

2074
01:23:10,790 --> 01:23:06,880
14061 on may 13th and wadsworth

2075
01:23:12,470 --> 01:23:10,800
presented s 4470 two weeks later

2076
01:23:14,070 --> 01:23:12,480
in a letter to chairman of the house

2077
01:23:15,910 --> 01:23:14,080
committee on interstate and foreign

2078
01:23:17,750 --> 01:23:15,920
commerce john jay esch

2079
01:23:19,830 --> 01:23:17,760
baker discussed the urgent need for

2080
01:23:22,629 --> 01:23:19,840
legislation to protect the rights of

2081
01:23:24,149 --> 01:23:22,639
american aviation aviators wishing to

2082
01:23:26,790 --> 01:23:24,159
enter canada

2083
01:23:29,030 --> 01:23:26,800
the canadian air regulations in 1920

2084
01:23:31,270 --> 01:23:29,040
based on the international convention

2085
01:23:33,270 --> 01:23:31,280
allowed for secondary registration of

2086
01:23:35,510 --> 01:23:33,280
foreign aircraft if an official

2087
01:23:37,510 --> 01:23:35,520
agreement existed between canada and the

2088
01:23:39,189 --> 01:23:37,520

aircraft's home country

2089
01:23:41,830 --> 01:23:39,199
because the united states lacked a

2090
01:23:43,750 --> 01:23:41,840
national system for primary registration

2091
01:23:45,510 --> 01:23:43,760
and no such agreement existed between

2092
01:23:47,510 --> 01:23:45,520
the two nations

2093
01:23:49,669 --> 01:23:47,520
u.s aircraft could not legally enter

2094
01:23:51,830 --> 01:23:49,679
canadian airspace

2095
01:23:54,270 --> 01:23:51,840
baker saw the national board commerce

2096
01:23:57,270 --> 01:23:54,280
department framework within hr

2097
01:23:59,270 --> 01:23:57,280
14061 as the quickest means of achieving

2098
01:24:02,149 --> 01:23:59,280
the system of federal licensing and

2099
01:24:04,149 --> 01:24:02,159
registration necessary for cross-border

2100
01:24:06,629 --> 01:24:04,159
flight

2101
01:24:08,229 --> 01:24:06,639
drawing on the naca's draft legislation

2102
01:24:10,950 --> 01:24:08,239
of february 12th

2103
01:24:14,070 --> 01:24:10,960
committee members walcott admiral david

2104
01:24:16,470 --> 01:24:14,080
w taylor and captain thomas t craven

2105
01:24:18,390 --> 01:24:16,480
drafted a separate bill in coordination

2106
01:24:19,830 --> 01:24:18,400
with new york congressman frederick c

2107
01:24:21,669 --> 01:24:19,840
hicks

2108
01:24:24,070 --> 01:24:21,679
introduced on may 20th

2109
01:24:25,830 --> 01:24:24,080
h.r 14137

2110
01:24:28,070 --> 01:24:25,840
called for a bureau of aeronautics in

2111
01:24:29,990 --> 01:24:28,080
the department of commerce a new

2112
01:24:32,390 --> 01:24:30,000
commissioner of aeronautics and an

2113
01:24:33,910 --> 01:24:32,400

aeronautical board empowered to approve

2114
01:24:35,830 --> 01:24:33,920
the commissioner's air routes and

2115
01:24:37,510 --> 01:24:35,840
regulations as well as separate

2116
01:24:41,189 --> 01:24:37,520
aeronautical agencies in the departments

2117
01:24:43,669 --> 01:24:41,199
of war navy and post office

2118
01:24:45,510 --> 01:24:43,679
by the time u.s ambassador hugh wallace

2119
01:24:47,750 --> 01:24:45,520
signed the international convention on

2120
01:24:49,990 --> 01:24:47,760
may 31 1920

2121
01:24:52,070 --> 01:24:50,000
three pieces of enabling legislation

2122
01:24:54,149 --> 01:24:52,080
awaited congressional action

2123
01:24:56,790 --> 01:24:54,159
although possessing differences the

2124
01:24:58,950 --> 01:24:56,800
similarities among the khan wadsworth

2125
01:25:01,669 --> 01:24:58,960
and hicks bills show that six months

2126
01:25:03,430 --> 01:25:01,679
before harding's presidential victory a

2127
01:25:05,590 --> 01:25:03,440
consensus had developed within the

2128
01:25:08,709 --> 01:25:05,600
executive branch that supported federal

2129
01:25:10,550 --> 01:25:08,719
regulation of civil aviation through a

2130
01:25:11,750 --> 01:25:10,560
national board commerce department

2131
01:25:13,830 --> 01:25:11,760
framework

2132
01:25:15,910 --> 01:25:13,840
subsequent revisions to the hicks bill

2133
01:25:18,470 --> 01:25:15,920
within the executive committee provided

2134
01:25:20,229 --> 01:25:18,480
for an expansion of the naca's authority

2135
01:25:22,229 --> 01:25:20,239
essentially transforming it into the

2136
01:25:23,510 --> 01:25:22,239
proposed national board

2137
01:25:25,910 --> 01:25:23,520
when this approach was ultimately

2138
01:25:27,910 --> 01:25:25,920

rejected the national board element also

2139
01:25:29,669 --> 01:25:27,920
fell out of favor but the commerce

2140
01:25:33,110 --> 01:25:29,679
department component persisted into

2141
01:25:34,550 --> 01:25:33,120
subsequent republican administrations

2142
01:25:36,390 --> 01:25:34,560
international events provided the

2143
01:25:37,750 --> 01:25:36,400
primary impetus for this consensus

2144
01:25:39,750 --> 01:25:37,760
building process during the wilson

2145
01:25:42,390 --> 01:25:39,760
administration and the international

2146
01:25:45,189 --> 01:25:42,400
convention justified legislative action

2147
01:25:46,709 --> 01:25:45,199
in a constitutionally ambiguous area

2148
01:25:49,030 --> 01:25:46,719
after the senate's rejection of the

2149
01:25:50,870 --> 01:25:49,040
versailles treaty and u.s membership in

2150
01:25:52,790 --> 01:25:50,880
league of nations

2151
01:25:55,030 --> 01:25:52,800
the international convention no longer

2152
01:25:56,470 --> 01:25:55,040
offered a strong rationale for federal

2153
01:25:58,470 --> 01:25:56,480
regulation

2154
01:26:00,390 --> 01:25:58,480
while constitutional concerns and calls

2155
01:26:01,669 --> 01:26:00,400
for a united department of air persisted

2156
01:26:03,750 --> 01:26:01,679
throughout the harding and coolidge

2157
01:26:06,310 --> 01:26:03,760
administrations the commerce department

2158
01:26:08,629 --> 01:26:06,320
model initially proposed and agreed upon

2159
01:26:10,870 --> 01:26:08,639
at the peak of wilson internationalism