1
00:00:32,329 --> 00:00:43,810
32

2
00:00:43,820 --> 00:00:51,069
Oh

3
00:00:51,079 --> 00:01:09,960
bugger of a high gas key

4
00:01:09,970 --> 00:01:13,420
you

5
00:01:13,430 --> 00:01:17,980
I am

6
00:01:23,719 --> 00:01:20,719
welcome to this edition of NASA images

7
00:01:26,179 --> 00:01:23,729
I'm Lynn Bondurant during this show will

8
00:01:28,940 --> 00:01:26,189
be focusing on historic NASA footage of

9
00:01:31,609 --> 00:01:28,950
airplane work will see many tests

10
00:01:33,980 --> 00:01:31,619
including crash tests let's go back to

11
00:01:36,260 --> 00:01:33,990
nineteen seventy-four to the NASA

12
00:01:48,370 --> 00:01:36,270
Langley Research Center in Virginia for

13
00:01:52,940 --> 00:01:50,630

although the safety record of light

14
00:01:55,580 --> 00:01:52,950
aircraft continues to improve there

15
00:01:58,130 --> 00:01:55,590
still were 700 crashes in the US last

16
00:02:01,310 --> 00:01:58,140
year resulting in more than 1,300

17
00:02:03,200 --> 00:02:01,320
fatalities up till now there has been no

18
00:02:05,660 --> 00:02:03,210
reliable method of predicting the

19
00:02:08,660 --> 00:02:05,670
behavior of general aviation planes when

20
00:02:11,330 --> 00:02:08,670
they do crash in a joint project with

21
00:02:13,670 --> 00:02:11,340
the FAA NASA is beginning a light

22
00:02:16,820 --> 00:02:13,680
aircraft crash safety program at the

23
00:02:19,160 --> 00:02:16,830
langley research center in Virginia this

24
00:02:23,510 --> 00:02:19,170
is one of 20 flood-damaged planes that

25
00:02:26,150 --> 00:02:23,520
will be tested the actual facility was

26
00:02:28,390 --> 00:02:26,160
originally used by Apollo astronauts to

27
00:02:31,580 --> 00:02:28,400
practice landing on the moon the

28
00:02:34,100 --> 00:02:31,590
240-foot high by 400 foot long lunar

29
00:02:36,320 --> 00:02:34,110
landing practice area is now laced with

30
00:02:38,570 --> 00:02:36,330
cables which are attached to the highly

31
00:02:42,440 --> 00:02:38,580
instrumented aircraft before it comes

32
00:02:44,330 --> 00:02:42,450
crashing to the ground dummies riding in

33
00:02:48,020 --> 00:02:44,340
the passenger seats are instrumented to

34
00:02:50,120 --> 00:02:48,030
measure g-forces engineers hope to learn

35
00:02:52,460 --> 00:02:50,130
what happens to an airframe structure

36
00:02:54,740 --> 00:02:52,470
when it impacts and to develop an

37
00:02:56,509 --> 00:02:54,750
analytical design tool that can be

38
00:02:59,810 --> 00:02:56,519

turned over to the designers and

39
00:03:02,180 --> 00:02:59,820
builders of general aviation planes for

40
00:03:04,220 --> 00:03:02,190
this first check out test the plane is

41
00:03:06,680 --> 00:03:04,230
complete except for tail section and

42
00:03:08,720 --> 00:03:06,690
engines comparable weights take the

43
00:03:10,640 --> 00:03:08,730
place of missing parts and the fuel

44
00:03:15,920 --> 00:03:10,650
tanks are filled with water for weight

45
00:03:18,140 --> 00:03:15,930
and balance this first crash was made at

46
00:03:21,140 --> 00:03:18,150
an impact speed of 30 miles per hour

47
00:03:34,839 --> 00:03:21,150
future drops will be at speeds up to 60

48
00:03:39,830 --> 00:03:37,490
here you can see some of the resulting

49
00:03:42,099 --> 00:03:39,840
damage most of which was confined to the

50
00:03:44,330 --> 00:03:42,109
nose and underside of the aircraft

51
00:03:46,699 --> 00:03:44,340
describing the program that will follow

52
00:03:49,729 --> 00:03:46,709
this series of Christ tests Langley

53
00:03:52,670 --> 00:03:49,739
engineer Bob Thompson or in the future

54
00:03:55,429 --> 00:03:52,680
what we hope to learn is to to integrate

55
00:03:59,119 --> 00:03:55,439
some energy absorption concepts into

56
00:04:01,789 --> 00:03:59,129
airframe design technology this gives

57
00:04:04,039 --> 00:04:01,799
the aircraft designer some means of

58
00:04:07,990 --> 00:04:04,049
putting together the energy absorption

59
00:04:10,670 --> 00:04:08,000
concepts with the airframe

60
00:04:12,410 --> 00:04:10,680
crashworthiness tests like these may one

61
00:04:14,449 --> 00:04:12,420
day lead to the design of lightweight

62
00:04:17,089 --> 00:04:14,459
aircraft that can absorb much of the

63
00:04:22,730 --> 00:04:17,099

impact energy of a crash and hopefully

64
00:04:36,690 --> 00:04:27,450
in 1975 NASA Langley engineers are crash

65
00:04:38,340 --> 00:04:36,700
testing helicopters they're dropping

66
00:04:41,340 --> 00:04:38,350
things on purpose at NASA's Langley

67
00:04:45,380 --> 00:04:41,350
Research Center in Virginia in this case

68
00:04:47,610 --> 00:04:45,390
a 22,000 pound army helicopter the big

69
00:04:49,770 --> 00:04:47,620
ch-47 helicopter had earlier been

70
00:04:51,900 --> 00:04:49,780
damaged by fire at the plant where it

71
00:04:54,740 --> 00:04:51,910
was manufactured making it a good

72
00:04:58,500 --> 00:04:54,750
candidate for the crashworthiness test

73
00:05:00,720 --> 00:04:58,510
watch again this time in slow motion as

74
00:05:04,800 --> 00:05:00,730
the helicopter is dropped 50 feet to the

75
00:05:06,990 --> 00:05:04,810
concrete below the highly instrumented

76
00:05:09,720 --> 00:05:07,000
craft is being used in a cooperative

77
00:05:11,940 --> 00:05:09,730
test experiment with the US Army to

78
00:05:15,120 --> 00:05:11,950
improve design and safety features of

79
00:05:17,520 --> 00:05:15,130
future helicopters crashworthiness tests

80
00:05:20,040 --> 00:05:17,530
giving aircraft designers important

81
00:05:23,490 --> 00:05:20,050
structural information before they go to

82
00:05:25,710 --> 00:05:23,500
the drawing boards one of the possible

83
00:05:28,530 --> 00:05:25,720
problems with which pilots must deal

84
00:05:36,430 --> 00:05:28,540
when landing planes is wake turbulence

85
00:05:36,440 --> 00:05:39,790
ah

86
00:05:53,930 --> 00:05:43,640
these model airplanes have something in

87
00:05:58,720 --> 00:05:56,210
they are all part of a NASA research

88
00:06:01,430 --> 00:05:58,730

program to learn more about vortices

89
00:06:03,950 --> 00:06:01,440
tornado-like patterns of air the trail

90
00:06:07,010 --> 00:06:03,960
behind the wings of airplanes causing

91
00:06:08,990 --> 00:06:07,020
varying degrees of turbulence Dave Scott

92
00:06:11,180 --> 00:06:09,000
acting director of NASA's Flight

93
00:06:14,630 --> 00:06:11,190
Research Center in California explains

94
00:06:16,940 --> 00:06:14,640
the vortices are dangerous because these

95
00:06:20,450 --> 00:06:16,950
bundles of energy as they follow behind

96
00:06:22,520 --> 00:06:20,460
the aircraft leaving a wake have the

97
00:06:25,310 --> 00:06:22,530
capability of turning over smaller

98
00:06:27,710 --> 00:06:25,320
aircraft as they approach a landing and

99
00:06:30,200 --> 00:06:27,720
because of this we have a great deal of

100
00:06:33,320 --> 00:06:30,210
concern that many accidents can be

101
00:06:35,540 --> 00:06:33,330
caused by the vortices are these bundles

102
00:06:38,390 --> 00:06:35,550
of energies that they attempt to turn

103
00:06:41,750 --> 00:06:38,400
over an aircraft while all aircraft

104
00:06:45,200 --> 00:06:41,760
cause vortices large heavy Jets such as

105
00:06:48,740 --> 00:06:45,210
the 747 and dc-10 create the more

106
00:06:51,140 --> 00:06:48,750
serious problems air traffic density

107
00:06:54,800 --> 00:06:51,150
around major airports adds to the

108
00:06:56,840 --> 00:06:54,810
severity of the problem because of the

109
00:06:59,030 --> 00:06:56,850
many aircraft coming in for a landing in

110
00:07:00,890 --> 00:06:59,040
the need to sequence one plane behind

111
00:07:03,380 --> 00:07:00,900
the other aircraft are routinely

112
00:07:06,890 --> 00:07:03,390
separated it's safe distances to avoid

113
00:07:08,870 --> 00:07:06,900

the trailing vortex problem however this

114
00:07:12,650 --> 00:07:08,880
often results in increased fuel use and

115
00:07:14,450 --> 00:07:12,660
traffic delays smoke generators mounted

116
00:07:17,240 --> 00:07:14,460
on the wings of these flames by nasa

117
00:07:19,480 --> 00:07:17,250
researchers make it possible to see and

118
00:07:22,190 --> 00:07:19,490
investigate the whirling air patterns

119
00:07:24,710 --> 00:07:22,200
the research has shown that by adjusting

120
00:07:27,080 --> 00:07:24,720
wing flaps at different angles and by

121
00:07:28,820 --> 00:07:27,090
making various design changes the

122
00:07:32,270 --> 00:07:28,830
intensity of the vortices can be

123
00:07:34,850 --> 00:07:32,280
substantially reduced this kind of

124
00:07:37,250 --> 00:07:34,860
aeronautical research today may very

125
00:07:41,260 --> 00:07:37,260
well result in even safer more

126
00:07:48,640 --> 00:07:45,730
for our next clip made in 1974 let's go

127
00:07:51,100 --> 00:07:48,650
to California where aerodynamic truck

128
00:07:57,820 --> 00:07:51,110
tests were made in an effort to reduce

129
00:08:00,100 --> 00:07:57,830
fuel use they come in all sizes these

130
00:08:02,470 --> 00:08:00,110
movers of everything from lettuce to

131
00:08:07,090 --> 00:08:02,480
Steve their box like shapes allow the

132
00:08:08,500 --> 00:08:07,100
packing of high-volume loads it's

133
00:08:10,840 --> 00:08:08,510
believed that both trucks and

134
00:08:13,150 --> 00:08:10,850
recreational vehicles like this can be

135
00:08:15,670 --> 00:08:13,160
made more economical to operate in the

136
00:08:18,250 --> 00:08:15,680
past as trucks were manufactured larger

137
00:08:20,800 --> 00:08:18,260
and larger engine size was increased to

138
00:08:23,320 --> 00:08:20,810

handle the heavier loads now with the

139
00:08:25,300 --> 00:08:23,330
continuing fuel problems engineers are

140
00:08:28,450 --> 00:08:25,310
attempting to make the big trucks more

141
00:08:30,160 --> 00:08:28,460
efficient in a joint effort NASA and the

142
00:08:32,350 --> 00:08:30,170
Department of Transportation are in the

143
00:08:35,320 --> 00:08:32,360
midst of a research program to do just

144
00:08:37,150 --> 00:08:35,330
that the tests are being done at NASA's

145
00:08:39,310 --> 00:08:37,160
Flight Research Center near the Mohave

146
00:08:42,100 --> 00:08:39,320
Desert in California on an auxiliary

147
00:08:45,550 --> 00:08:42,110
runway project engineer ed Saltzman

148
00:08:47,650 --> 00:08:45,560
explains the experience and background

149
00:08:50,560 --> 00:08:47,660
that we have here at the NASA flight

150
00:08:53,490 --> 00:08:50,570
research center that bears on the tests

151
00:08:55,750 --> 00:08:53,500
such as this goes back to the

152
00:08:59,440 --> 00:08:55,760
aerodynamics experiments that we've done

153
00:09:02,890 --> 00:08:59,450
on various aircraft and really the means

154
00:09:05,890 --> 00:09:02,900
of achieving aerodynamic efficiency on

155
00:09:08,830 --> 00:09:05,900
aircraft that different than it is on

156
00:09:10,750 --> 00:09:08,840
automobiles and trucks accepting of

157
00:09:13,460 --> 00:09:10,760
course they're on trucks and automobiles

158
00:09:15,860 --> 00:09:13,470
you're working at lower speed

159
00:09:17,380 --> 00:09:15,870
starting with a small delivery van ed

160
00:09:19,490 --> 00:09:17,390
Saltzman and his team of engineers

161
00:09:22,250 --> 00:09:19,500
reshaped the vehicle with sheet metal

162
00:09:24,590 --> 00:09:22,260
the test truck has evolved from a square

163
00:09:27,470 --> 00:09:24,600

box to its present shape with rounded

164
00:09:30,080 --> 00:09:27,480
corners the major emphasis has been on

165
00:09:31,780 --> 00:09:30,090
the elimination of drag wind resistance

166
00:09:34,910 --> 00:09:31,790
that forces the engine to work harder

167
00:09:37,070 --> 00:09:34,920
the method used to define drag is known

168
00:09:39,710 --> 00:09:37,080
as the coast down method after

169
00:09:42,440 --> 00:09:39,720
accelerating the truck to 65 miles per

170
00:09:46,010 --> 00:09:42,450
hour the gears are disengaged and the

171
00:09:51,210 --> 00:09:48,780
the deceleration is monitored closely

172
00:09:55,140 --> 00:09:51,220
because the time it takes to slow down

173
00:09:57,690 --> 00:09:55,150
can be directly converted into drag so

174
00:10:02,010 --> 00:09:57,700
far aerodynamic drag has been decreased

175
00:10:03,690 --> 00:10:02,020
a little over fifty percent the thing

176
00:10:07,080 --> 00:10:03,700
that we're all interested in of course

177
00:10:09,080 --> 00:10:07,090
is the savings in fuel the miles per

178
00:10:14,840 --> 00:10:09,090
gallon that we can achieve rather than

179
00:10:16,710 --> 00:10:14,850
the aerodynamic drag per se and the

180
00:10:21,350 --> 00:10:16,720
aerodynamic improvements that we've

181
00:10:24,480 --> 00:10:21,360
experienced so far are translatable into

182
00:10:26,310 --> 00:10:24,490
fuel savings at cruise conditions when

183
00:10:28,140 --> 00:10:26,320
you're going down the highway at highway

184
00:10:31,950 --> 00:10:28,150
speeds somewhere in the neighborhood of

185
00:10:36,120 --> 00:10:31,960
all fifteen percent perhaps twenty

186
00:10:38,220 --> 00:10:36,130
percent savings and fuel other secondary

187
00:10:42,780 --> 00:10:38,230
benefits include less pollution and

188
00:10:45,090 --> 00:10:42,790

increased engine light this big tractor

189
00:10:48,190 --> 00:10:45,100
trailer typical of many on US highways

190
00:10:50,980 --> 00:10:48,200
is also being studied

191
00:10:53,230 --> 00:10:50,990
here engineers attach one of many add-on

192
00:10:59,680 --> 00:10:53,240
devices that will modify airflow around

193
00:11:01,450 --> 00:10:59,690
the truck and hopefully reduce drag to

194
00:11:04,330 --> 00:11:01,460
help them visualize the flow of air

195
00:11:06,940 --> 00:11:04,340
patterns six inch long strings or Tufts

196
00:11:09,010 --> 00:11:06,950
are attached and photographed these have

197
00:11:12,130 --> 00:11:09,020
been used in aeronautical research for

198
00:11:14,230 --> 00:11:12,140
years another method involves pumping a

199
00:11:18,050 --> 00:11:14,240
powder like substance over the truck as

200
00:11:23,610 --> 00:11:21,000
the large tractor-trailer program has

201
00:11:25,949 --> 00:11:23,620
just begun and it's too soon to predict

202
00:11:28,560 --> 00:11:25,959
how much fuel might be saved as a result

203
00:11:30,660 --> 00:11:28,570
of the truck modifications a fuel

204
00:11:32,819 --> 00:11:30,670
savings of as little as five percent

205
00:11:36,180 --> 00:11:32,829
however would save thousands of barrels

206
00:11:38,120 --> 00:11:36,190
of fuel every day the researchers are

207
00:11:40,949 --> 00:11:38,130
hopeful as they continue to apply

208
00:11:45,990 --> 00:11:40,959
aerodynamic techniques to help solve a

209
00:11:48,230 --> 00:11:46,000
ground transportation problem let's go

210
00:11:51,810 --> 00:11:48,240
back into the air for our next clip from

211
00:11:55,079 --> 00:11:51,820
1976 the clip explains at the first day

212
00:11:57,509 --> 00:11:55,089
in NASA is for Aeronautics the clip ties

213
00:12:02,970 --> 00:11:57,519

together several of the ideas from other

214
00:12:05,069 --> 00:12:02,980
films used in the show for 60 years nASA

215
00:12:07,860 --> 00:12:05,079
has been pioneering in aeronautical

216
00:12:10,040 --> 00:12:07,870
research during World War two the need

217
00:12:12,530 --> 00:12:10,050
was for real-time problem-solving and

218
00:12:14,730 --> 00:12:12,540
responding to a variety of crises

219
00:12:20,860 --> 00:12:14,740
associated with American bomber and

220
00:12:26,930 --> 00:12:23,870
today research is aimed at making planes

221
00:12:29,720 --> 00:12:26,940
fly higher faster farther quieter and

222
00:12:32,810 --> 00:12:29,730
with greater safety consider the problem

223
00:12:35,480 --> 00:12:32,820
of wake vortices invisible tornado like

224
00:12:37,850 --> 00:12:35,490
patterns of air that trail behind large

225
00:12:39,980 --> 00:12:37,860
Jets causing dangerously turbulent

226
00:12:42,350 --> 00:12:39,990
conditions for smaller planes following

227
00:12:44,300 --> 00:12:42,360
in their wake the turbulence is so

228
00:12:46,640 --> 00:12:44,310
severe that flight controllers must

229
00:12:49,670 --> 00:12:46,650
carefully space takeoffs and landings to

230
00:12:52,070 --> 00:12:49,680
avoid them research on wake vortices has

231
00:12:53,990 --> 00:12:52,080
ranged from studies like these at NASA's

232
00:12:56,270 --> 00:12:54,000
Flight Research Center in California

233
00:12:59,120 --> 00:12:56,280
where different combinations of gear and

234
00:13:01,520 --> 00:12:59,130
flaps are used to break up the vortex to

235
00:13:02,990 --> 00:13:01,530
an experimental laser system at the

236
00:13:05,780 --> 00:13:03,000
Marshall Space Flight Center in

237
00:13:08,540 --> 00:13:05,790
Huntsville Alabama working with the FAA

238
00:13:10,370 --> 00:13:08,550

the experimental laser program is an

239
00:13:12,830 --> 00:13:10,380
effort to develop an accurate wake

240
00:13:15,050 --> 00:13:12,840
vortex detection and monitoring system

241
00:13:17,530 --> 00:13:15,060
they would permit tracking the path of

242
00:13:19,730 --> 00:13:17,540
the vortices produced by large aircraft

243
00:13:22,460 --> 00:13:19,740
field tested at the John F Kennedy

244
00:13:24,650 --> 00:13:22,470
International Airport in New York the

245
00:13:29,030 --> 00:13:24,660
laser research may one day help make

246
00:13:30,920 --> 00:13:29,040
commercial air traffic safer information

247
00:13:33,650 --> 00:13:30,930
gained by flights of the two thousand

248
00:13:36,579 --> 00:13:33,660
mile per hour why f12 will help the

249
00:13:39,380 --> 00:13:36,589
designers of new aircraft and spacecraft

250
00:13:42,110 --> 00:13:39,390
heating stability and control aircraft

251
00:13:44,390 --> 00:13:42,120
loads these are just a few of the many

252
00:13:47,720 --> 00:13:44,400
tests under way using the high-speed

253
00:13:51,260 --> 00:13:47,730
planes as flying research tools the

254
00:13:53,750 --> 00:13:51,270
rocket-powered x24 be has completed 36

255
00:13:55,970 --> 00:13:53,760
missions over the California desert near

256
00:13:58,370 --> 00:13:55,980
the flight research center bringing to a

257
00:14:01,630 --> 00:13:58,380
close experimental rocket powered flight

258
00:14:04,820 --> 00:14:01,640
tests that began with the excess one in

259
00:14:06,650 --> 00:14:04,830
1946 these unique planes have proved

260
00:14:10,520 --> 00:14:06,660
extremely valuable in advanced

261
00:14:13,370 --> 00:14:10,530
aeronautical research using the same

262
00:14:16,490 --> 00:14:13,380
aeronautical Noel used to design sleep

263
00:14:18,170 --> 00:14:16,500

high-speed jet planes NASA engineers are

264
00:14:19,530 --> 00:14:18,180
cooperating with the Department of

265
00:14:21,629 --> 00:14:19,540
Transportation

266
00:14:25,110 --> 00:14:21,639
test a variety of fuel saving

267
00:14:27,180 --> 00:14:25,120
modifications for large trucks even the

268
00:14:29,280 --> 00:14:27,190
simple changes have provided a forty

269
00:14:31,829 --> 00:14:29,290
percent reduction in aerodynamic drag

270
00:14:34,470 --> 00:14:31,839
wind resistance that forces the truck

271
00:14:36,720 --> 00:14:34,480
engine to work harder this translates

272
00:14:39,840 --> 00:14:36,730
directly into a highway crews fuel

273
00:14:41,309 --> 00:14:39,850
reduction of 20 to 25 percent an

274
00:14:44,069 --> 00:14:41,319
interesting ground transportation

275
00:14:51,900 --> 00:14:44,079
problem being aided by aeronautical

276
00:14:53,430 --> 00:14:51,910
research techniques at the Langley

277
00:15:00,499 --> 00:14:53,440
Research Center in Hampton Virginia

278
00:15:04,620 --> 00:15:02,579
engineers hope that these crash

279
00:15:06,960 --> 00:15:04,630
worthiness tests will help designers

280
00:15:09,269 --> 00:15:06,970
build lightweight aircraft that can

281
00:15:15,070 --> 00:15:09,279
absorb much of the impact energy of a

282
00:15:20,050 --> 00:15:17,830
this is a pilot's I've you coming in for

283
00:15:22,480 --> 00:15:20,060
a landing but there's an easier less

284
00:15:24,510 --> 00:15:22,490
expensive way to fly it's called the

285
00:15:27,400 --> 00:15:24,520
flight simulator for advanced aircraft

286
00:15:29,350 --> 00:15:27,410
what the pilot sees and hears in this

287
00:15:32,950 --> 00:15:29,360
simulator at NASA's Ames Research Center

288
00:15:34,840 --> 00:15:32,960

is like the real thing another advanced

289
00:15:37,270 --> 00:15:34,850
research tool for designing and

290
00:15:43,210 --> 00:15:37,280
evaluating aircraft performance without

291
00:15:45,690 --> 00:15:43,220
ever leaving the ground that first a in

292
00:15:48,460 --> 00:15:45,700
NASA stands for Aeronautics research

293
00:15:54,790 --> 00:15:48,470
aimed at improving the quality and

294
00:15:57,460 --> 00:15:54,800
safety of flying our next clip from 1976

295
00:16:02,350 --> 00:15:57,470
shows an unusual scissor-like plane

296
00:16:04,420 --> 00:16:02,360
design the singing is an arid lake bed

297
00:16:06,930 --> 00:16:04,430
at nasa's dryden flight research center

298
00:16:10,270 --> 00:16:06,940
near the Mojave Desert in California

299
00:16:11,950 --> 00:16:10,280
it's early morning engineers and

300
00:16:15,460 --> 00:16:11,960
technicians have been here since before

301
00:16:17,770 --> 00:16:15,470
sunup check out in preparations for the

302
00:16:21,040 --> 00:16:17,780
upcoming flight test our painstaking and

303
00:16:23,740 --> 00:16:21,050
delivered this is not an ordinary plane

304
00:16:25,780 --> 00:16:23,750
it has a scissor like design that could

305
00:16:29,470 --> 00:16:25,790
prove to be the shape of aircraft to

306
00:16:31,630 --> 00:16:29,480
come studies indicate that if the design

307
00:16:34,750 --> 00:16:31,640
features of the oblique wing as this

308
00:16:37,120 --> 00:16:34,760
25-foot model is called were applied to

309
00:16:39,550 --> 00:16:37,130
full-size jets it would allow them to

310
00:16:42,010 --> 00:16:39,560
travel faster than sound without leaving

311
00:16:46,860 --> 00:16:42,020
the usual sonic boom in their wake and

312
00:16:51,930 --> 00:16:49,410
before the oblique wing plane takes off

313
00:16:58,140 --> 00:16:51,940

a television equipped aircraft sweeps

314
00:17:00,960 --> 00:16:58,150
over and scans the flight path what the

315
00:17:03,120 --> 00:17:00,970
camera sees will aid this man the pilot

316
00:17:06,350 --> 00:17:03,130
of the oblique wing model he actually

317
00:17:09,150 --> 00:17:06,360
flies the plane from inside to this van

318
00:17:11,699 --> 00:17:09,160
another television camera mounted in the

319
00:17:15,090 --> 00:17:11,709
nose of the test aircraft lets him see

320
00:17:17,309 --> 00:17:15,100
where the planes going watch now as the

321
00:17:48,159 --> 00:17:17,319
ground crew start the engine and launch

322
00:17:53,200 --> 00:17:50,499
during the flight researchers carefully

323
00:17:55,989 --> 00:17:53,210
record how the aircraft responds to a

324
00:17:58,330 --> 00:17:55,999
variety of maneuvers they compare these

325
00:18:00,669 --> 00:17:58,340
responses with wind tunnel predictions

326
00:18:06,200 --> 00:18:00,679
to better understand what the aircraft

327
00:18:13,400 --> 00:18:10,430
as you can see the the wing on the

328
00:18:17,810 --> 00:18:13,410
aircraft is at an angle to the fuselage

329
00:18:20,720 --> 00:18:17,820
such that the left wing points forward

330
00:18:22,310 --> 00:18:20,730
of the of the aircraft a normal airplane

331
00:18:25,280 --> 00:18:22,320
the wings are at right angles to the

332
00:18:28,400 --> 00:18:25,290
fuselage on this aircraft the wing is at

333
00:18:30,530 --> 00:18:28,410
an oblique angle such that the left wing

334
00:18:34,580 --> 00:18:30,540
points forward and the right wing points

335
00:18:36,350 --> 00:18:34,590
f and this this feature allows the

336
00:18:39,130 --> 00:18:36,360
aircraft to have much lower transonic

337
00:18:42,530 --> 00:18:39,140
drag than a conventional aircraft and

338
00:18:46,400 --> 00:18:42,540

for a transonic airplane designed to use

339
00:18:48,500 --> 00:18:46,410
this wing you would fly at 100 to 200

340
00:18:50,330 --> 00:18:48,510
miles an hour with the wing at zero

341
00:18:54,460 --> 00:18:50,340
degrees of y'all as the speed increases

342
00:18:59,140 --> 00:18:56,710
research has shown that oblique trimmed

343
00:19:02,470 --> 00:18:59,150
aircraft compared to fixed-wing planes

344
00:19:05,649 --> 00:19:02,480
use less fuel and can reduce sonic boom

345
00:19:08,590 --> 00:19:05,659
levels the planes designer Artie Jones

346
00:19:11,380 --> 00:19:08,600
says that using the oblique wing takes

347
00:19:13,870 --> 00:19:11,390
maximum advantage of wings sweep in a

348
00:19:15,549 --> 00:19:13,880
way that fools the wind by making it

349
00:19:18,760 --> 00:19:15,559
think you're going slower than you

350
00:19:21,340 --> 00:19:18,770
actually are the next phase of research

351
00:19:23,649 --> 00:19:21,350
could include a 1,500 pound plane with

352
00:19:26,279 --> 00:19:23,659
the 30 foot wingspan powered by jet

353
00:19:28,899 --> 00:19:26,289
engines it would have a pilot on board

354
00:19:31,390 --> 00:19:28,909
these artists concepts show how the

355
00:19:34,060 --> 00:19:31,400
oblique wing design might be applied to

356
00:19:35,680 --> 00:19:34,070
transport type aircraft the wing of

357
00:19:39,880 --> 00:19:35,690
course would swing back to a more

358
00:19:42,220 --> 00:19:39,890
conventional position for landing the

359
00:19:44,460 --> 00:19:42,230
oblique wing a unique design that may

360
00:19:51,060 --> 00:19:44,470
one day allow planes to fly faster

361
00:19:57,419 --> 00:19:54,430
NASA engineers have even tested plane

362
00:20:00,490 --> 00:19:57,429
designs underwater as we see in this

363
00:20:06,279 --> 00:20:00,500

1977 report from the NASA Dryden Flight

364
00:20:10,500 --> 00:20:06,289
Center California ever see a jet plane

365
00:20:14,919 --> 00:20:10,510
fly underwater for this model of a 747

366
00:20:17,080 --> 00:20:14,929
almost does just that but consider first

367
00:20:21,909 --> 00:20:17,090
what led to these interesting underwater

368
00:20:24,820 --> 00:20:21,919
studies NASA researchers are trying to

369
00:20:27,220 --> 00:20:24,830
solve the problem of wake vortices those

370
00:20:29,409 --> 00:20:27,230
funnel-like patterns of air that swirl

371
00:20:34,149 --> 00:20:29,419
off the wings of planes as they speed

372
00:20:37,200 --> 00:20:34,159
along the larger the plane the larger

373
00:20:40,120 --> 00:20:37,210
the vortex and resulting problem

374
00:20:45,220 --> 00:20:40,130
vortices can't be seen a less smoke or

375
00:20:47,560 --> 00:20:45,230
die pods are attached to the wings here

376
00:20:50,409 --> 00:20:47,570
the second test plane intentionally

377
00:20:53,080 --> 00:20:50,419
follows much closer than normal this

378
00:21:18,390 --> 00:20:53,090
allows engineers to visually observe and

379
00:21:23,740 --> 00:21:21,520
right now air traffic controllers avoid

380
00:21:26,860 --> 00:21:23,750
the problem altogether by carefully

381
00:21:28,780 --> 00:21:26,870
spacing takeoffs and landings if the

382
00:21:31,780 --> 00:21:28,790
vortices can be reduced or eliminated

383
00:21:41,020 --> 00:21:31,790
however it will cut down air traffic

384
00:21:41,030 --> 00:21:45,840
this is Hydra nautic sin Laurel Maryland

385
00:21:51,460 --> 00:21:49,090
it was here that NASA recently completed

386
00:21:52,950 --> 00:21:51,470
a series of tests to look at the vortex

387
00:21:57,640 --> 00:21:52,960
problem from a different angle

388
00:22:02,040 --> 00:21:57,650

underwater the tank used is 425 feet

389
00:22:04,540 --> 00:22:02,050
long 25 feet wide and 12 feet deep

390
00:22:06,340 --> 00:22:04,550
testing an aircraft in water may seem

391
00:22:10,720 --> 00:22:06,350
like a strange idea but water and air

392
00:22:13,870 --> 00:22:10,730
are both fluid medium and the advantage

393
00:22:15,550 --> 00:22:13,880
of using water in this case is that you

394
00:22:17,470 --> 00:22:15,560
can simulate a reynolds number much

395
00:22:20,200 --> 00:22:17,480
closer to the reynolds number that you

396
00:22:22,510 --> 00:22:20,210
use in flight and reynolds number is one

397
00:22:24,250 --> 00:22:22,520
of the correlations that you do with one

398
00:22:26,830 --> 00:22:24,260
of the ways that you get the scale

399
00:22:29,380 --> 00:22:26,840
effects from model testing to flight

400
00:22:33,190 --> 00:22:29,390
testing the vortex generating model is

401
00:22:35,170 --> 00:22:33,200
mounted on the carriage and this motor

402
00:22:38,350 --> 00:22:35,180
driven carriage moves the model through

403
00:22:40,960 --> 00:22:38,360
the water channel the following models

404
00:22:43,120 --> 00:22:40,970
the small business jet is mounted on a

405
00:22:47,050 --> 00:22:43,130
separate carriage downstream of the

406
00:22:50,290 --> 00:22:47,060
generating aircraft and the to the test

407
00:22:53,140 --> 00:22:50,300
last approximately 25 seconds and you

408
00:22:55,660 --> 00:22:53,150
get maybe 15 seconds of data from this

409
00:22:57,610 --> 00:22:55,670
test run where the two miles are moving

410
00:23:00,010 --> 00:22:57,620
on separate carriages through the water

411
00:23:04,570 --> 00:23:00,020
telling facilities as the test

412
00:23:07,180 --> 00:23:04,580
progresses dye is let out of the wing

413
00:23:10,000 --> 00:23:07,190

tips of the generator aircraft and this

414
00:23:11,950 --> 00:23:10,010
dye will swirl up in in the vortex the

415
00:23:16,330 --> 00:23:11,960
axial velocity so that you can actually

416
00:23:21,950 --> 00:23:16,340
see the vortex in the films that we take

417
00:23:27,510 --> 00:23:24,570
results of the wake vortices research

418
00:23:29,790 --> 00:23:27,520
are encouraging while NASA is having

419
00:23:32,220 --> 00:23:29,800
success in changing airflow over the

420
00:23:36,299 --> 00:23:32,230
wings using flaps and deflectors to

421
00:23:38,400 --> 00:23:36,309
break up the vortices the FAA is working

422
00:23:41,580 --> 00:23:38,410
to develop instruments to detect and

423
00:23:43,830 --> 00:23:41,590
thus avoid them all part of a continuing

424
00:23:54,290 --> 00:23:43,840
effort to improve the safety and comfort

425
00:24:11,099 --> 00:23:57,500
our final historic clip is called from

426
00:24:46,760 --> 00:24:14,109
today sports enthusiasts around the

427
00:24:51,380 --> 00:24:49,370
this is the man responsible for Co

428
00:24:53,600 --> 00:24:51,390
inventing the specially designed wing

429
00:24:56,690 --> 00:24:53,610
that is making hang gliding a rapidly

430
00:25:00,080 --> 00:24:56,700
growing sport 63 year old aeronautical

431
00:25:02,150 --> 00:25:00,090
engineer Francis M regalo now retired

432
00:25:03,920 --> 00:25:02,160
from NASA's Langley Research Center in

433
00:25:06,800 --> 00:25:03,930
Hampton Virginia he and his wife

434
00:25:09,800 --> 00:25:06,810
Gertrude hukou invented the wing live in

435
00:25:11,780 --> 00:25:09,810
Kitty Hawk North Carolina regalo enjoys

436
00:25:13,910 --> 00:25:11,790
flying a couple of times a week from

437
00:25:21,789 --> 00:25:13,920
what's been called the highest sand dune

438
00:25:33,489 --> 00:25:29,430

turn to the left and come down four up

439
00:25:36,759 --> 00:25:33,499
and land and what's it like to hang

440
00:25:41,590 --> 00:25:36,769
glide with a hang glider as with other

441
00:25:45,570 --> 00:25:41,600
aircraft you have a freedom of up and

442
00:25:48,909 --> 00:25:45,580
down direction as well as the others and

443
00:25:53,560 --> 00:25:48,919
just getting your feet off the ground

444
00:25:56,950 --> 00:25:53,570
and being lifted by by the air it is a

445
00:25:59,139 --> 00:25:56,960
new experience for regalo the renewed

446
00:26:02,139 --> 00:25:59,149
interest is represented by hang gliding

447
00:26:04,629 --> 00:26:02,149
takes on particular significance the big

448
00:26:07,499 --> 00:26:04,639
kites represent more than two decades of

449
00:26:10,869 --> 00:26:07,509
research much of it on his own time in

450
00:26:13,570 --> 00:26:10,879
1963 he and his wife Gertrude received

451
00:26:16,149 --> 00:26:13,580
from NASA one of the highest cash awards

452
00:26:20,710 --> 00:26:16,159
ever given for an invention the

453
00:26:25,090 --> 00:26:20,720
invention was not an accident at all it

454
00:26:29,259 --> 00:26:25,100
was a purposeful search for a kind of

455
00:26:32,409 --> 00:26:29,269
wing that would be less expensive more

456
00:26:37,379 --> 00:26:32,419
rugged more practical than the

457
00:26:40,659 --> 00:26:37,389
conventional kind of wing and we studied

458
00:26:44,639 --> 00:26:40,669
everything along that line that there

459
00:26:49,210 --> 00:26:44,649
had already been like boat sails

460
00:26:53,759 --> 00:26:49,220
windmills parachutes and and airplane

461
00:26:55,749 --> 00:26:53,769
wings before coming up with this design

462
00:26:58,210 --> 00:26:55,759
experimenting with small gliders and

463
00:27:01,509 --> 00:26:58,220

kites a good performing completely

464
00:27:04,419 --> 00:27:01,519
flexible wing finally evolved in 1948

465
00:27:06,460 --> 00:27:04,429
ten years later NASA was searching for

466
00:27:08,830 --> 00:27:06,470
devices that could be used to bring

467
00:27:11,950 --> 00:27:08,840
astronauts in their spacecraft to a safe

468
00:27:15,009 --> 00:27:11,960
landing on earth early versions had many

469
00:27:18,430 --> 00:27:15,019
names paraglider para wing gliding

470
00:27:21,129 --> 00:27:18,440
parachute and flexible wings the basic

471
00:27:22,370 --> 00:27:21,139
design seen in all these can be seen in

472
00:27:25,400 --> 00:27:22,380
most hang glider

473
00:27:27,410 --> 00:27:25,410
flying today intensive testing ranged

474
00:27:29,690 --> 00:27:27,420
all the way from small wind tunnel

475
00:27:31,700 --> 00:27:29,700
models to full-scale flight tests

476
00:27:39,080 --> 00:27:31,710
complete with man and spacecraft

477
00:27:40,790 --> 00:27:39,090
attached while the regalo wing as it is

478
00:27:43,190 --> 00:27:40,800
known by many as had limited

479
00:27:45,200 --> 00:27:43,200
applications regalo himself is

480
00:27:47,600 --> 00:27:45,210
optimistic that the new interest

481
00:27:50,690 --> 00:27:47,610
generated by some 20,000 Flyers

482
00:27:55,700 --> 00:27:50,700
worldwide will produce other uses in the

483
00:28:01,050 --> 00:27:58,050
that's it for this edition of NASA

484
00:28:02,820 --> 00:28:01,060
images until next time this is Lynn