1
00:00:43,840 --> 00:01:34,980
you

2
00:01:39,610 --> 00:01:37,750
when looking in aviation history books

3
00:01:42,220 --> 00:01:39,620
you can see the importance of NASA's

4
00:01:43,840 --> 00:01:42,230
Dryden Flight Research Facility the list

5
00:01:45,490 --> 00:01:43,850
of flight accomplishments at Dryden as

6
00:01:49,150 --> 00:01:45,500
long as we have searched for ways to

7
00:01:50,469 --> 00:01:49,160
improve flight in the early days NASA or

8
00:01:53,740 --> 00:01:50,479
the national aeronautics and space

9
00:01:55,240 --> 00:01:53,750
administration was known as NACA the

10
00:01:58,090 --> 00:01:55,250
National Advisory Committee on

11
00:02:00,609 --> 00:01:58,100
Aeronautics engineers from the NACA

12
00:02:02,950 --> 00:02:00,619
facility at Langley Virginia were lured

13
00:02:05,380 --> 00:02:02,960

here in 1946 because of the vast

14
00:02:07,810 --> 00:02:05,390
wide-open spaces in which the test

15
00:02:09,460 --> 00:02:07,820
aircraft one of the earliest vehicles

16
00:02:13,360 --> 00:02:09,470
tested here was the first to reach

17
00:02:15,430 --> 00:02:13,370
supersonic speeds the excess one we take

18
00:02:20,290 --> 00:02:15,440
our name from dr. huge riding one of

19
00:02:22,630 --> 00:02:20,300
these early aviation pioneers Dryden is

20
00:02:24,790 --> 00:02:22,640
located 90 miles north of Los Angeles

21
00:02:27,030 --> 00:02:24,800
California in the Mojave Desert the

22
00:02:30,640 --> 00:02:27,040
clear skies relatively sparse population

23
00:02:32,380 --> 00:02:30,650
wide-open spaces and dry weather make it

24
00:02:35,380 --> 00:02:32,390
the perfect place for aeronautical

25
00:02:38,020 --> 00:02:35,390
flight testing from dryden pilots have

26
00:02:40,390 --> 00:02:38,030
access to over 20,000 square miles of

27
00:02:42,280 --> 00:02:40,400
restricted airspace over a portion of

28
00:02:45,039 --> 00:02:42,290
the western United States and off the

29
00:02:47,020 --> 00:02:45,049
west coast the NASA facility is on

30
00:02:50,080 --> 00:02:47,030
Edwards Air Force Base on the edge of

31
00:02:52,630 --> 00:02:50,090
Rogers dry lakebed this is a 44 square

32
00:02:54,789 --> 00:02:52,640
mile smooth flat surface providing

33
00:03:00,970 --> 00:02:54,799
supplemental landing runways to the hard

34
00:03:03,130 --> 00:03:00,980
runway complex at Edwards many of the

35
00:03:04,830 --> 00:03:03,140
early X series aircraft paved the way

36
00:03:08,259 --> 00:03:04,840
for even more productive and successful

37
00:03:12,570 --> 00:03:08,269
experimental aircraft like the x-15 it

38
00:03:14,910 --> 00:03:12,580

flew at Dryden between 1959 and 1968

39
00:03:18,340 --> 00:03:14,920
experimental test pilots fluid at Mach

40
00:03:21,430 --> 00:03:18,350
6.7 or over 4,500 miles an hour and

41
00:03:27,640 --> 00:03:21,440
reached peak altitudes of 350,000 feet

42
00:03:32,449 --> 00:03:30,229
during the decade it flew the x-15

43
00:03:34,610 --> 00:03:32,459
program provided information which

44
00:03:36,979 --> 00:03:34,620
benefited the aircraft and space

45
00:03:39,920 --> 00:03:36,989
industries for many years to come the

46
00:03:42,740 --> 00:03:39,930
program produced over 750 technical

47
00:03:48,349 --> 00:03:42,750
reports on the results of the x-15

48
00:03:50,240 --> 00:03:48,359
experiments another breakthrough here

49
00:03:53,179 --> 00:03:50,250
was the first flight of the lifting body

50
00:03:56,089 --> 00:03:53,189
spacecraft configuration the first of

51
00:03:58,729 --> 00:03:56,099
these lifting bodies the m2 f 1 was

52
00:04:00,979 --> 00:03:58,739
unpowered and first towed in the flight

53
00:04:04,129 --> 00:04:00,989
behind a car racing up and down Rogers

54
00:04:09,860 --> 00:04:04,139
dry lake bed and later behind a c-47

55
00:04:12,440 --> 00:04:09,870
aircraft another was the HL 10 lifting

56
00:04:15,349 --> 00:04:12,450
body it's on display just outside the

57
00:04:17,779 --> 00:04:15,359
Dryden main front gate these are two of

58
00:04:19,370 --> 00:04:17,789
the five lifting body designs that led

59
00:04:22,279 --> 00:04:19,380
to development of our space shuttle

60
00:04:24,230 --> 00:04:22,289
fleet tested Dryden helped prove certain

61
00:04:27,080 --> 00:04:24,240
theories about space flight were correct

62
00:04:29,230 --> 00:04:27,090
for example man could fly a vehicle into

63
00:04:32,300 --> 00:04:29,240

space re-enter the Earth's atmosphere

64
00:04:34,820 --> 00:04:32,310
maneuver the craft safely landed back on

65
00:04:38,870 --> 00:04:34,830
earth unpowered and reused the

66
00:04:40,969 --> 00:04:38,880
spacecraft through the years some rather

67
00:04:42,890 --> 00:04:40,979
unusual looking vehicles were tested at

68
00:04:45,830 --> 00:04:42,900
Dryden and help benefit the space and

69
00:04:48,200 --> 00:04:45,840
aviation industry for example this the

70
00:04:50,120 --> 00:04:48,210
Paris of it was a space-age kite

71
00:04:52,219 --> 00:04:50,130
engineers thought could be used in place

72
00:04:55,550 --> 00:04:52,229
of parachutes that were used to recover

73
00:04:57,560 --> 00:04:55,560
America's early spacecraft in early 1960

74
00:04:59,960 --> 00:04:57,570
to the Paris f was tested at Dryden

75
00:05:02,570 --> 00:04:59,970
Holden the flight behind a car racing

76
00:05:04,550 --> 00:05:02,580
down the dry lake bed the parasail was

77
00:05:06,230 --> 00:05:04,560
never used for this purpose but the

78
00:05:11,659 --> 00:05:06,240
technology developed into modern-day

79
00:05:13,969 --> 00:05:11,669
paragliders and hang gliders another

80
00:05:16,219 --> 00:05:13,979
alien looking project tested at Dryden

81
00:05:19,969 --> 00:05:16,229
was the lunar landing research vehicle

82
00:05:22,430 --> 00:05:19,979
ll RV nicknamed the flying bedstead the

83
00:05:25,070 --> 00:05:22,440
ll RV was designed to create

84
00:05:27,260 --> 00:05:25,080
gravitational conditions similar to what

85
00:05:29,300 --> 00:05:27,270
was thought to exist on the moon this

86
00:05:31,129 --> 00:05:29,310
help train our Apollo astronauts for

87
00:05:37,570 --> 00:05:31,139
what to expect when they landed on the

88
00:05:43,130 --> 00:05:40,400

too highly modified f eight aircraft

89
00:05:45,620 --> 00:05:43,140
tested at Dryden in the 1970s proved to

90
00:05:48,290 --> 00:05:45,630
be extremely valuable one was testing

91
00:05:50,360 --> 00:05:48,300
digital fly-by-wire theory this is where

92
00:05:52,240 --> 00:05:50,370
computer systems replace mechanical

93
00:05:54,980 --> 00:05:52,250
control systems on an aircraft

94
00:05:57,020 --> 00:05:54,990
fly-by-wire systems reduce aircraft

95
00:05:59,090 --> 00:05:57,030
weight take up less space than

96
00:06:01,190 --> 00:05:59,100
mechanical systems and allow for

97
00:06:05,750 --> 00:06:01,200
advanced aircraft configuration designs

98
00:06:08,120 --> 00:06:05,760
a supercritical wing was installed on

99
00:06:10,430 --> 00:06:08,130
Dryden's other f8 aircraft the

100
00:06:12,920 --> 00:06:10,440
supercritical wing has an airfoil or

101
00:06:15,050 --> 00:06:12,930
wing shape which delays the formation of

102
00:06:17,150 --> 00:06:15,060
shockwaves as the aircraft approaches

103
00:06:19,220 --> 00:06:17,160
the speed of sound the supercritical

104
00:06:22,040 --> 00:06:19,230
wing allows an aircraft to cruise at

105
00:06:24,140 --> 00:06:22,050
higher speeds using less fuel making it

106
00:06:26,090 --> 00:06:24,150
much more efficient many of today's

107
00:06:27,830 --> 00:06:26,100
military and commercial aircraft

108
00:06:32,480 --> 00:06:27,840
incorporate fly-by-wire and

109
00:06:35,510 --> 00:06:32,490
supercritical wing technologies also in

110
00:06:38,390 --> 00:06:35,520
the 1970s NASA flew a pair of Y of 12s

111
00:06:40,760 --> 00:06:38,400
frontrunners of the sr-71 in a lengthy

112
00:06:42,650 --> 00:06:40,770
research program to study a wide range

113
00:06:46,130 --> 00:06:42,660

of disciplines associated with

114
00:06:48,560 --> 00:06:46,140
high-speed high-altitude flights today

115
00:06:50,300 --> 00:06:48,570
NASA is flying the Blackbirds once again

116
00:06:52,400 --> 00:06:50,310
using the former Air Force

117
00:06:54,770 --> 00:06:52,410
reconnaissance aircraft to conduct

118
00:07:02,810 --> 00:06:54,780
experiments to benefit future high-speed

119
00:07:05,780 --> 00:07:02,820
aircraft a more recently completed test

120
00:07:08,000 --> 00:07:05,790
project at Dryden is the x29 this

121
00:07:10,820 --> 00:07:08,010
forward swept wing concept dates back to

122
00:07:12,350 --> 00:07:10,830
Germany in the 1930s the design just

123
00:07:14,540 --> 00:07:12,360
wasn't practical back then because

124
00:07:16,250 --> 00:07:14,550
stronger lighter materials that were

125
00:07:18,020 --> 00:07:16,260
needed to keep the forward swept wings

126
00:07:20,750 --> 00:07:18,030
from ripping off in flight were just not

127
00:07:24,140 --> 00:07:20,760
available the Advanced Research Project

128
00:07:26,000 --> 00:07:24,150
agency US Air Force NASA and the grumman

129
00:07:29,950 --> 00:07:26,010
corporation tested the forward swept

130
00:07:32,630 --> 00:07:29,960
wing vehicle at Dryden through 1991 over

131
00:07:34,250 --> 00:07:32,640
374 test flights many exploring

132
00:07:37,340 --> 00:07:34,260
controlled high angles of attack were

133
00:07:39,830 --> 00:07:37,350
conducted during 1992 NASA and the Air

134
00:07:42,200 --> 00:07:39,840
Force's right labs use the aircraft for

135
00:07:44,060 --> 00:07:42,210
vortex flow control experiments these

136
00:07:46,790 --> 00:07:44,070
showed that by injecting nitrogen gas

137
00:07:47,860 --> 00:07:46,800
into the planes nose vortices gave the

138
00:07:51,430 --> 00:07:47,870

aircraft at it can

139
00:07:53,320 --> 00:07:51,440
at high angles of attack now let's take

140
00:07:55,900 --> 00:07:53,330
a look at some of the NASA Dryden family

141
00:07:58,030 --> 00:07:55,910
and their day-to-day activities constant

142
00:08:00,490 --> 00:07:58,040
close coordination is necessary before

143
00:08:02,980 --> 00:08:00,500
during and after every research flight

144
00:08:05,380 --> 00:08:02,990
the crew briefing is a chance for all

145
00:08:07,960 --> 00:08:05,390
the major players like the pilot program

146
00:08:09,640 --> 00:08:07,970
manager chief engineer operations

147
00:08:12,280 --> 00:08:09,650
engineer and director of flight

148
00:08:14,680 --> 00:08:12,290
operations research to get together for

149
00:08:21,580 --> 00:08:14,690
a final review and coordination before

150
00:08:24,310 --> 00:08:21,590
each flight the key person at the crew

151
00:08:26,470 --> 00:08:24,320
brief is the research pilot the pilot

152
00:08:28,720 --> 00:08:26,480
has to be aware of all the objectives

153
00:08:31,990 --> 00:08:28,730
the researchers and engineers want to

154
00:08:33,910 --> 00:08:32,000
meet and be able to translate the paper

155
00:08:37,720 --> 00:08:33,920
requirements needed by the people on the

156
00:08:43,759 --> 00:08:37,730
ground into useful actual flight test

157
00:08:48,319 --> 00:08:45,949
Dryden's to fully equipped flight

158
00:08:50,540 --> 00:08:48,329
control wounds are used for efficient

159
00:08:53,210 --> 00:08:50,550
data acquisition and monitoring each

160
00:08:55,369 --> 00:08:53,220
research mission these control room

161
00:08:56,859 --> 00:08:55,379
occupants are a highly specialized team

162
00:08:59,299 --> 00:08:56,869
coming together from various

163
00:09:02,210 --> 00:08:59,309

organizations within Dryden for a

164
00:09:04,460 --> 00:09:02,220
specific flight on most missions at

165
00:09:06,499 --> 00:09:04,470
Dryden there's a primary or mission

166
00:09:09,410 --> 00:09:06,509
controller who's usually another one of

167
00:09:12,019 --> 00:09:09,420
our pilots there's also an operations

168
00:09:14,449 --> 00:09:12,029
engineer responsible for monitoring the

169
00:09:16,489 --> 00:09:14,459
aircraft systems and providing the

170
00:09:19,220 --> 00:09:16,499
mission controller with all the vital

171
00:09:22,069 --> 00:09:19,230
data needed during normal or emergency

172
00:09:24,979 --> 00:09:22,079
procedures other staff members are

173
00:09:27,169 --> 00:09:24,989
engineers responsible for monitoring the

174
00:09:30,350 --> 00:09:27,179
flights experiments and ensuring the

175
00:09:32,840 --> 00:09:30,360
data they want to acquire is obtained in

176
00:09:35,359 --> 00:09:32,850
addition program management personnel

177
00:09:37,759 --> 00:09:35,369
take an overview of the entire operation

178
00:09:43,910 --> 00:09:37,769
and factor in variables like the weather

179
00:09:45,759 --> 00:09:43,920
range situation and time a key component

180
00:09:48,949 --> 00:09:45,769
in the flight test data acquisition

181
00:09:52,069 --> 00:09:48,959
process is the data analysis facility

182
00:09:55,639 --> 00:09:52,079
here all flight test data is recorded

183
00:09:58,069 --> 00:09:55,649
stored and transmitted to other NASA and

184
00:10:01,160 --> 00:09:58,079
industry sites for use in various flight

185
00:10:04,100 --> 00:10:01,170
research programs here raw flight test

186
00:10:05,900 --> 00:10:04,110
data is collected formatted and printed

187
00:10:12,379 --> 00:10:05,910
for use by the different flight test

188
00:10:14,480 --> 00:10:12,389

teams many detailed aircraft tests are

189
00:10:18,169 --> 00:10:14,490
conducted under one roof that Dryden's

190
00:10:20,480 --> 00:10:18,179
integrated test facility or ITF today's

191
00:10:23,299 --> 00:10:20,490
modern aircraft contain many highly

192
00:10:27,340 --> 00:10:23,309
interdependent systems involving flight

193
00:10:30,889 --> 00:10:27,350
controls structural dynamics propulsion

194
00:10:33,379 --> 00:10:30,899
aerodynamics and avionics all requiring

195
00:10:36,169 --> 00:10:33,389
close coordination for accurate data

196
00:10:38,809 --> 00:10:36,179
acquisition in this one-of-a-kind

197
00:10:41,179 --> 00:10:38,819
national resource researchers can

198
00:10:44,739 --> 00:10:41,189
simultaneously test all of the aircraft

199
00:10:47,780 --> 00:10:44,749
systems by simulating actual flight

200
00:10:49,609 --> 00:10:47,790
engineers as well as research pilots can

201
00:10:51,859 --> 00:10:49,619
control the flight simulation and

202
00:10:52,730 --> 00:10:51,869
monitor data that's also being recorded

203
00:10:55,610 --> 00:10:52,740
for later

204
00:10:57,650 --> 00:10:55,620
analysis also at Dryden's ITF

205
00:10:59,750 --> 00:10:57,660
researchers conduct ground vibration

206
00:11:01,760 --> 00:10:59,760
testing perform routine aircraft

207
00:11:06,460 --> 00:11:01,770
maintenance and verify and validate

208
00:11:08,780 --> 00:11:06,470
flight software all in this one location

209
00:11:11,389 --> 00:11:08,790
another test area is the flow

210
00:11:14,150 --> 00:11:11,399
visualization facility or water tunnel

211
00:11:16,970 --> 00:11:14,160
here researchers take standard

212
00:11:19,010 --> 00:11:16,980
off-the-shelf model airplanes and modify

213
00:11:20,840 --> 00:11:19,020

them with tubing so they can inject

214
00:11:23,480 --> 00:11:20,850
different colored eyes into the water

215
00:11:25,850 --> 00:11:23,490
the dyes flowing through the water act

216
00:11:30,530 --> 00:11:25,860
very similar to the air around an

217
00:11:33,260 --> 00:11:30,540
aircraft in flight researchers can

218
00:11:35,389 --> 00:11:33,270
quickly accurately and inexpensively

219
00:11:38,060 --> 00:11:35,399
illustrate actual aircraft flight

220
00:11:41,000 --> 00:11:38,070
conditions to better understand air flow

221
00:11:47,609 --> 00:11:41,010
around the aircraft and to help locate

222
00:11:52,329 --> 00:11:50,289
we probably receive much outside

223
00:11:54,400 --> 00:11:52,339
attention as a landing site for the

224
00:11:56,889 --> 00:11:54,410
Space Shuttle Orbiter flips down the

225
00:11:59,590 --> 00:11:56,899
three mile long hard surface runway and

226
00:12:02,079 --> 00:11:59,600
the extra flat smooth services provided

227
00:12:04,329 --> 00:12:02,089
by Rogers dry lakebed make it an ideal

228
00:12:06,340 --> 00:12:04,339
place for landing a space shuttle with a

229
00:12:09,160 --> 00:12:06,350
heavy payload or because of bad weather

230
00:12:11,650 --> 00:12:09,170
at the Kennedy Space Center Florida when

231
00:12:14,100 --> 00:12:11,660
landing at Dryden the orbiters rd

232
00:12:17,139 --> 00:12:14,110
serviced and mounted on top of NASA's

233
00:12:24,429 --> 00:12:17,149
747 Shuttle Carrier aircraft for a

234
00:12:26,739 --> 00:12:24,439
return to the floor to launch pad as you

235
00:12:29,079 --> 00:12:26,749
have seen drive-ins past is full of many

236
00:12:31,090 --> 00:12:29,089
valuable aeronautical achievements the

237
00:12:33,729 --> 00:12:31,100
present day test projects are proving to

238
00:12:36,340 --> 00:12:33,739

be very important as well the latest

239
00:12:39,309 --> 00:12:36,350
experimental or x-series project is the

240
00:12:40,900 --> 00:12:39,319
x31 it's an international effort with

241
00:12:42,549 --> 00:12:40,910
participation from government and

242
00:12:44,850 --> 00:12:42,559
industry groups in Germany and the

243
00:12:47,079 --> 00:12:44,860
United States high angles of attack

244
00:12:49,329 --> 00:12:47,089
performing rare turn maneuvers and

245
00:12:52,720 --> 00:12:49,339
thrust vectoring have been tested here

246
00:12:54,549 --> 00:12:52,730
on the 2 x 31 thrust vectoring means

247
00:12:56,590 --> 00:12:54,559
changing the direction of the exhaust

248
00:12:58,769 --> 00:12:56,600
from the jet engines as a way of

249
00:13:01,720 --> 00:12:58,779
improving the aircraft's performance

250
00:13:04,900 --> 00:13:01,730
some major accomplishments in the x31

251
00:13:08,229 --> 00:13:04,910
program sustained 70 degrees controlled

252
00:13:13,449 --> 00:13:08,239
angle of attack and the j-turn or the

253
00:13:15,939 --> 00:13:13,459
herbs maneuver during this j-turn

254
00:13:17,799 --> 00:13:15,949
maneuver the pilot is flying at 70

255
00:13:21,069 --> 00:13:17,809
degrees controlled angle of attack and

256
00:13:22,749 --> 00:13:21,079
will sharply turn the aircraft basically

257
00:13:29,970 --> 00:13:22,759
ending up going in the opposite

258
00:13:35,980 --> 00:13:33,550
Dryden's f18 Harv or high alpha research

259
00:13:38,920 --> 00:13:35,990
vehicle continues to provide data on

260
00:13:41,560 --> 00:13:38,930
agility handling qualities control law

261
00:13:44,620 --> 00:13:41,570
evaluations and surface pressure surveys

262
00:13:46,540 --> 00:13:44,630
the Harv is a standard f-18 aircraft

263
00:13:48,850 --> 00:13:46,550

that's been modified with three

264
00:13:51,340 --> 00:13:48,860
spoon-shaped paddles per engine to

265
00:13:53,790 --> 00:13:51,350
vector or move the exhaust thrust for

266
00:13:56,140 --> 00:13:53,800
better control at high angles of attack

267
00:13:59,140 --> 00:13:56,150
results of this research will help shape

268
00:14:01,870 --> 00:13:59,150
future military aircraft the Harbaugh

269
00:14:04,390 --> 00:14:01,880
explores 60 and 70 degrees controlled

270
00:14:06,130 --> 00:14:04,400
angle of attack and provides researchers

271
00:14:08,260 --> 00:14:06,140
with the ability to more accurately

272
00:14:14,800 --> 00:14:08,270
predict the flight characteristics of

273
00:14:17,620 --> 00:14:14,810
future jet fighters our highly modified

274
00:14:19,450 --> 00:14:17,630
f15 was used recently to test digital

275
00:14:21,910 --> 00:14:19,460
electronic engine and flight control

276
00:14:23,950 --> 00:14:21,920
systems these will help future military

277
00:14:27,010 --> 00:14:23,960
and commercial aircraft fly more safely

278
00:14:29,830 --> 00:14:27,020
and efficiently computer software on

279
00:14:31,780 --> 00:14:29,840
board our f15 throttles the engines to

280
00:14:35,470 --> 00:14:31,790
the lowest possible power settings and

281
00:14:37,780 --> 00:14:35,480
sustained supersonic flight another test

282
00:14:39,820 --> 00:14:37,790
on the f-15 high deck or highly

283
00:14:42,730 --> 00:14:39,830
integrated digital electronic controlled

284
00:14:45,480 --> 00:14:42,740
aircraft is a software system which

285
00:14:48,030 --> 00:14:45,490
compensates for control system failures

286
00:14:50,680 --> 00:14:48,040
which would render most normal aircraft

287
00:14:52,750 --> 00:14:50,690
uncontrollable this propulsion

288
00:14:55,300 --> 00:14:52,760

controlled aircraft software system

289
00:14:58,270 --> 00:14:55,310
gives the pilot the ability to safely

290
00:15:00,730 --> 00:14:58,280
steer and land the aircraft using only

291
00:15:02,260 --> 00:15:00,740
computer control of the engines this

292
00:15:03,970 --> 00:15:02,270
will prove to be a valuable piece of

293
00:15:09,980 --> 00:15:03,980
equipment to have on an aircraft in the

294
00:15:16,770 --> 00:15:13,590
our b-52 launch aircraft is the oldest

295
00:15:19,080 --> 00:15:16,780
active b-52 in the country this vehicle

296
00:15:21,240 --> 00:15:19,090
has launched xfit teams and the

297
00:15:23,640 --> 00:15:21,250
experimental lifting bodies and has a

298
00:15:25,740 --> 00:15:23,650
long list of other accomplishments the

299
00:15:28,620 --> 00:15:25,750
drag parachute system used on todays

300
00:15:31,290 --> 00:15:28,630
space shuttle was tested behind the b-52

301
00:15:41,310 --> 00:15:31,300
the chute reduces tire and brake we're

302
00:15:43,560 --> 00:15:41,320
on our orbiter fleet the b-52 is also

303
00:15:45,360 --> 00:15:43,570
used to launch Pegasus a commercially

304
00:15:47,910 --> 00:15:45,370
developed three-stage rocket booster

305
00:15:54,120 --> 00:15:47,920
that put smaller payloads into orbit for

306
00:15:57,180 --> 00:15:54,130
less cost and ground launches NASA's

307
00:15:59,520 --> 00:15:57,190
convair CD 990 has been modified to test

308
00:16:01,950 --> 00:15:59,530
loads and stress points on space shuttle

309
00:16:04,320 --> 00:16:01,960
landing gear tires and braking systems

310
00:16:06,180 --> 00:16:04,330
this is part of the continuing effort to

311
00:16:09,480 --> 00:16:06,190
upgrade and enhance the space shuttle

312
00:16:11,850 --> 00:16:09,490
landing capabilities the CD 990 touches

313
00:16:13,350 --> 00:16:11,860

down with its own landing gear then a

314
00:16:15,420 --> 00:16:13,360
shuttle landing gear strut is

315
00:16:17,370 --> 00:16:15,430
hydraulically lowered to the runway to

316
00:16:19,470 --> 00:16:17,380
simulate shuttle touchdown conditions

317
00:16:21,690 --> 00:16:19,480
this gives engineers a better way to

318
00:16:27,740 --> 00:16:21,700
measure and isolate stress points and

319
00:16:30,030 --> 00:16:27,750
loads making the shuttles safer in

320
00:16:32,520 --> 00:16:30,040
support of future high speed civil

321
00:16:35,220 --> 00:16:32,530
transport NASA researchers are using a

322
00:16:38,070 --> 00:16:35,230
modified x16 XL to study laminar or

323
00:16:40,320 --> 00:16:38,080
smooth air flows by smoothing the air

324
00:16:43,380 --> 00:16:40,330
flow the aircraft flies more efficiently

325
00:16:45,330 --> 00:16:43,390
at all speeds the forest titanium glove

326
00:16:48,300 --> 00:16:45,340
installed in the cranked arrow wing of

327
00:16:50,790 --> 00:16:48,310
the f16 XL induces this smooth airflow

328
00:16:53,130 --> 00:16:50,800
and by monitoring the airflow during

329
00:16:55,230 --> 00:16:53,140
flight researchers at NASA's Langley and

330
00:16:57,180 --> 00:16:55,240
driving facilities can determine how

331
00:17:01,980 --> 00:16:57,190
laminar air flow is affected at

332
00:17:04,080 --> 00:17:01,990
different flight conditions frightened

333
00:17:06,200 --> 00:17:04,090
also continues to fly the sr-71

334
00:17:11,130 --> 00:17:06,210
blackbird as a high-speed high-altitude

335
00:17:13,710 --> 00:17:11,140
research platform the sr-71 and our f-16

336
00:17:15,720 --> 00:17:13,720
XL conducted acoustic studies to

337
00:17:18,210 --> 00:17:15,730
determine ways to reduce noise from

338
00:17:19,510 --> 00:17:18,220

future of high-speed aircraft Brydon

339
00:17:21,040 --> 00:17:19,520
also is conducting

340
00:17:23,920 --> 00:17:21,050
for the jet propulsion laboratory in

341
00:17:25,810 --> 00:17:23,930
pasadena highly sensitive ultraviolet

342
00:17:28,329 --> 00:17:25,820
instruments for astronomical studies

343
00:17:31,900 --> 00:17:28,339
were carried into the atmosphere aboard

344
00:17:33,520 --> 00:17:31,910
the black versions now to welcome you to

345
00:17:37,060 --> 00:17:33,530
the dryden flight research facility

346
00:17:39,160 --> 00:17:37,070
director Ken xalay aviation has played a

347
00:17:42,760 --> 00:17:39,170
major role in this country's economic

348
00:17:45,310 --> 00:17:42,770
growth and security civil aircraft carry

349
00:17:48,130 --> 00:17:45,320
business people tourists families

350
00:17:50,620 --> 00:17:48,140
students critical equipment mail and

351
00:17:52,330 --> 00:17:50,630
cargo a strong aviation infrastructure

352
00:17:54,420 --> 00:17:52,340
is vital for this nation's

353
00:17:57,190 --> 00:17:54,430
competitiveness and national security

354
00:17:59,020 --> 00:17:57,200
the sale of civil transports for example

355
00:18:01,660 --> 00:17:59,030
is a major positive contributor to the

356
00:18:03,940 --> 00:18:01,670
balance of payments military aircraft

357
00:18:07,510 --> 00:18:03,950
keep the peace and when they're called

358
00:18:09,550 --> 00:18:07,520
upon force the peace we're celebrating

359
00:18:12,360 --> 00:18:09,560
the 90th anniversary of the Wright

360
00:18:16,600 --> 00:18:12,370
brothers first flight at Kitty Hawk a

361
00:18:17,890 --> 00:18:16,610
scant 12 years later in 1915 the

362
00:18:20,050 --> 00:18:17,900
national advisory committee for

363
00:18:23,020 --> 00:18:20,060

aeronautics was formed and the United

364
00:18:24,700 --> 00:18:23,030
States began aeronautical research NASA

365
00:18:26,800 --> 00:18:24,710
continues this proud tradition of

366
00:18:29,350 --> 00:18:26,810
aeronautical research by pioneering new

367
00:18:31,960 --> 00:18:29,360
concepts transferring technology to the

368
00:18:35,050 --> 00:18:31,970
US industry and by solving problems when

369
00:18:37,870 --> 00:18:35,060
they occur in air transportation NASA's

370
00:18:40,260 --> 00:18:37,880
ultimate objective is to assure that US

371
00:18:43,090 --> 00:18:40,270
aircraft have superior performance are

372
00:18:47,200 --> 00:18:43,100
affordable to onin to operate and are

373
00:18:50,100 --> 00:18:47,210
safe NASA works in partnership with the

374
00:18:53,530 --> 00:18:50,110
US industry the Department of Defense

375
00:18:56,410 --> 00:18:53,540
universities and aircraft operators here

376
00:19:00,060 --> 00:18:56,420
at NASA Dryden we explore the realm of

377
00:19:02,890 --> 00:19:00,070
flight turning ideas into reality and

378
00:19:05,790 --> 00:19:02,900
making discoveries every day that are

379
00:19:07,900 --> 00:19:05,800
used for the design of future aircraft

380
00:19:09,970 --> 00:19:07,910
aeronautical research and development is

381
00:19:12,580 --> 00:19:09,980
really an investment in the future at

382
00:19:14,830 --> 00:19:12,590
NASA we intend to work hard for you the