1
00:00:00,000 --> 00:00:45,510
I

2
00:00:52,090 --> 00:00:49,300
by the year 2000 the FAA will likely

3
00:00:55,479 --> 00:00:52,100
require further reductions in aircraft

4
00:00:57,130 --> 00:00:55,489
noise more than a decade of research and

5
00:01:02,350 --> 00:00:57,140
development by the Aeronautics industry

6
00:01:05,049 --> 00:01:02,360
has focused on compliance after two

7
00:01:07,180 --> 00:01:05,059
years of wind tunnel tests a model

8
00:01:09,940 --> 00:01:07,190
designed to meet that proposed FAA

9
00:01:13,030 --> 00:01:09,950
standard it's crated and shipped for

10
00:01:14,920 --> 00:01:13,040
further testing designed by pratt &

11
00:01:17,920 --> 00:01:14,930
whitney a division of united

12
00:01:20,469 --> 00:01:17,930
technologies the model was tested in two

13
00:01:24,400 --> 00:01:20,479

of the six wind tunnels at NASA Lewis

14
00:01:26,469 --> 00:01:24,410
Research Center in Cleveland Ohio the

15
00:01:29,040 --> 00:01:26,479
joint effort between NASA and this

16
00:01:31,900 --> 00:01:29,050
leading manufacturer of aircraft engines

17
00:01:34,480 --> 00:01:31,910
explored the acoustics aerodynamic

18
00:01:37,300 --> 00:01:34,490
performance and the operability of the

19
00:01:41,590 --> 00:01:37,310
advanced ducted propeller known as the

20
00:01:44,350 --> 00:01:41,600
ADP initial indications are that from

21
00:01:49,340 --> 00:01:44,360
this new design a quieter better

22
00:01:55,709 --> 00:01:52,560
the model scaled to one-sixth of the

23
00:01:58,919 --> 00:01:55,719
actual design was tested here in this

24
00:02:01,139 --> 00:01:58,929
tunnel commonly called the 9 by 15 which

25
00:02:20,160 --> 00:02:01,149
are the dimensions of the wind chamber

26
00:02:26,070 --> 00:02:22,770
this tunnel is nested in the return leg

27
00:02:28,800 --> 00:02:26,080
of the eight by six tunnel while the

28
00:02:31,830 --> 00:02:28,810
eight by six has supersonic capabilities

29
00:02:35,339 --> 00:02:31,840
only the subsonic speeds were used to

30
00:02:38,010 --> 00:02:35,349
test the ADP for the arrow propulsion

31
00:02:41,910 --> 00:02:38,020
facilities and experiments division this

32
00:02:44,100 --> 00:02:41,920
project began over three years ago at

33
00:02:46,710 --> 00:02:44,110
that time Lewis engineers started

34
00:02:49,220 --> 00:02:46,720
working closely with Pratt & Whitney to

35
00:02:52,229 --> 00:02:49,230
define the test parameters for the model

36
00:02:54,750 --> 00:02:52,239
this preparation ensured that the wind

37
00:02:58,530 --> 00:02:54,760
tunnels and the model were ready for

38
00:03:01,470 --> 00:02:58,540

each other the tunnel control room is

39
00:03:03,870 --> 00:03:01,480
the hub of adp research state-of-the-art

40
00:03:08,190 --> 00:03:03,880
equipment allows researchers to collect

41
00:03:11,100 --> 00:03:08,200
valuable data and monitor testing at the

42
00:03:55,350 --> 00:03:11,110
close of this last day an engineer

43
00:04:03,010 --> 00:04:00,100
green light successful testing of any

44
00:04:05,770 --> 00:04:03,020
model requires the skills and talents of

45
00:04:08,650 --> 00:04:05,780
a number of people test day brings

46
00:04:24,280 --> 00:04:08,660
together those abilities in preparation

47
00:04:24,290 --> 00:04:32,020
two green lights

48
00:04:32,030 --> 00:04:34,990
blowing air

49
00:04:48,010 --> 00:04:45,550
and so begins the test the tunnel

50
00:04:51,400 --> 00:04:48,020
operators control tunnel systems to

51
00:04:53,590 --> 00:04:51,410
obtain desired air speeds the ADP was

52
00:04:59,680 --> 00:04:53,600
tested over a Mach number range from

53
00:05:03,040 --> 00:04:59,690
zero 2.85 the model operator controls

54
00:05:06,910 --> 00:05:03,050
rpms by regulating the compressed air to

55
00:05:13,000 --> 00:05:06,920
the models drive turbo rpms for the ADP

56
00:05:15,690 --> 00:05:13,010
ranged from windmill to 12300 during

57
00:05:18,490 --> 00:05:15,700
testing the models safety is ensured by

58
00:05:23,560 --> 00:05:18,500
continuous monitoring of vibration and

59
00:05:25,840 --> 00:05:23,570
temperatures the engineer who monitors

60
00:05:28,990 --> 00:05:25,850
stress ensures that the predetermined

61
00:05:35,200 --> 00:05:29,000
stress limits on blades stator veins and

62
00:05:37,210 --> 00:05:35,210
instrumentation are not exceeded the

63
00:05:40,240 --> 00:05:37,220

primary researcher has lead

64
00:05:43,540 --> 00:05:40,250
responsibility for all aspects of ADP

65
00:05:45,760 --> 00:05:43,550
testing ongoing communications about the

66
00:05:47,890 --> 00:05:45,770
tunnel and model aid the Lewis

67
00:05:51,490 --> 00:05:47,900
researcher in making decisions about

68
00:05:54,040 --> 00:05:51,500
each test condition the primary

69
00:05:58,870 --> 00:05:54,050
researcher is supported by a counterpart

70
00:06:01,840 --> 00:05:58,880
who helps monitor online test data all

71
00:06:04,630 --> 00:06:01,850
these people depend on the electronics

72
00:06:06,969 --> 00:06:04,640
engineer who has complete responsibility

73
00:06:09,580 --> 00:06:06,979
for the electronics in the model the

74
00:06:13,090 --> 00:06:09,590
hardware the instrumentation and the

75
00:06:16,090 --> 00:06:13,100
computer system the ADP is a gear-driven

76
00:06:19,750 --> 00:06:16,100
fan with variable pitch much like a

77
00:06:22,450 --> 00:06:19,760
turboprop however a duct encircles the

78
00:06:30,140 --> 00:06:22,460
fan to suppress noise generated by the

79
00:06:41,250 --> 00:06:33,300
researchers discuss a primary focus of

80
00:06:46,890 --> 00:06:44,340
various Inlet and spinner configurations

81
00:06:49,230 --> 00:06:46,900
were tested in the eighth by six to help

82
00:06:52,140 --> 00:06:49,240
determine aircraft noise affecting

83
00:06:58,760 --> 00:06:52,150
communities cabin noise affecting

84
00:07:04,020 --> 00:07:02,220
twelve microphones for these tests were

85
00:07:07,620 --> 00:07:04,030
mounted on a one-inch thick aluminum

86
00:07:11,480 --> 00:07:07,630
plate and suspended above the model they

87
00:07:14,430 --> 00:07:11,490
are calibrated daily to ensure accuracy

88
00:07:18,480 --> 00:07:14,440

Pratt & Whitney is kept informed during

89
00:07:21,420 --> 00:07:18,490
each phase of testing pratt & whitney's

90
00:07:25,020 --> 00:07:21,430
interest is supervised by company vice

91
00:07:27,600 --> 00:07:25,030
president william webb the testing here

92
00:07:29,160 --> 00:07:27,610
at lewis is possible because of the wind

93
00:07:31,290 --> 00:07:29,170
tunnel facilities here at lewis are

94
00:07:33,300 --> 00:07:31,300
capable of doing both performance

95
00:07:35,640 --> 00:07:33,310
testing and noise testing with one set

96
00:07:38,610 --> 00:07:35,650
up not many tunnels in the United States

97
00:07:40,440 --> 00:07:38,620
are capable of doing that lewis is

98
00:07:43,020 --> 00:07:40,450
developed what we call a rotating

99
00:07:45,320 --> 00:07:43,030
microphone that lets us measure noise

100
00:07:48,690 --> 00:07:45,330
and separate the things within the

101
00:07:50,760 --> 00:07:48,700
engine that create those noise such that

102
00:07:52,890 --> 00:07:50,770
if we have one component that's creating

103
00:07:55,080 --> 00:07:52,900
an offensive signal we can then work on

104
00:07:57,270 --> 00:07:55,090
that one component and not have to waste

105
00:08:01,430 --> 00:07:57,280
our time struggling through all of the

106
00:08:03,840 --> 00:08:01,440
engine that same focused approach

107
00:08:07,400 --> 00:08:03,850
characterized all of the acoustic

108
00:08:12,410 --> 00:08:07,410
testing which included blade angles

109
00:08:17,580 --> 00:08:12,420
inlets and spinners stator veins and

110
00:08:20,700 --> 00:08:17,590
angles of attack the other primary focus

111
00:08:23,290 --> 00:08:20,710
of a DP testing was aerodynamic

112
00:08:28,029 --> 00:08:26,020
during the past two years testing

113
00:08:30,700 --> 00:08:28,039

focused on four inlet spinner

114
00:08:34,060 --> 00:08:30,710
configurations and numerous blade angle

115
00:08:37,769 --> 00:08:34,070
settings mechanics were called on to

116
00:08:40,779 --> 00:08:37,779
make changes for each configuration

117
00:08:42,690 --> 00:08:40,789
hundreds of performance tests including

118
00:08:45,870 --> 00:08:42,700
investigation of thrust and drag

119
00:08:48,970 --> 00:08:45,880
resulted in thousands of test points a

120
00:08:51,250 --> 00:08:48,980
sheet laser flow test provides an image

121
00:08:55,210 --> 00:08:51,260
of reverse thrust necessary during

122
00:08:58,420 --> 00:08:55,220
landing the laser doppler velocimeter or

123
00:09:01,720 --> 00:08:58,430
LDV is a non intrusive measurement of

124
00:09:05,400 --> 00:09:01,730
velocity with light beams it was used to

125
00:09:08,650 --> 00:09:05,410
map the reverse thrust velocity profile

126
00:09:11,110 --> 00:09:08,660
to determine the operability of the ADP

127
00:09:14,170 --> 00:09:11,120
the model was tested at various angles

128
00:09:21,210 --> 00:09:14,180
of attack simulating takeoff and landing

129
00:09:26,840 --> 00:09:23,879
when modifications were necessary for a

130
00:09:28,800 --> 00:09:26,850
specific investigation model changes

131
00:09:31,790 --> 00:09:28,810
instrumentation and repairs were

132
00:09:34,079 --> 00:09:31,800
performed on site by Lewis experts

133
00:09:40,259 --> 00:09:34,089
minimizing any delays in the test

134
00:09:42,509 --> 00:09:40,269
program NASA researchers are responsible

135
00:09:46,400 --> 00:09:42,519
for accurate gathering of the real time

136
00:09:49,740 --> 00:09:46,410
data on the escort d+ computer system

137
00:09:51,749 --> 00:09:49,750
the laborious process of analyzing and

138
00:09:55,139 --> 00:09:51,759

interpreting the information will

139
00:09:57,600 --> 00:09:55,149
continue for several months researchers

140
00:10:00,179 --> 00:09:57,610
map a trend within the test data and

141
00:10:03,410 --> 00:10:00,189
determine engine noise and performance

142
00:10:05,360 --> 00:10:03,420
this helps to validate analytical codes

143
00:10:08,579 --> 00:10:05,370
ultimately leading to improved

144
00:10:13,410 --> 00:10:08,589
technology and design codes for future

145
00:10:15,600 --> 00:10:13,420
industry use our technology readiness

146
00:10:20,309 --> 00:10:15,610
development program is scheduled to run

147
00:10:22,139 --> 00:10:20,319
through 1995 we anticipate that it we

148
00:10:24,900 --> 00:10:22,149
could be ready to start the development

149
00:10:28,230 --> 00:10:24,910
of a commercial product in the 1994 to

150
00:10:30,449 --> 00:10:28,240
1995 time period if the market is there

151
00:10:33,090 --> 00:10:30,459
that would support the cost of

152
00:10:34,980 --> 00:10:33,100
developing a new product that would let

153
00:10:37,379 --> 00:10:34,990
us put an engine in service that is

154
00:10:41,009 --> 00:10:37,389
carrying revenue-generating passengers

155
00:10:43,350 --> 00:10:41,019
around the year 2000 NASA louis's

156
00:10:46,170 --> 00:10:43,360
leading role in long-range aeronautics

157
00:10:48,240 --> 00:10:46,180
research consistently places the center

158
00:10:52,639 --> 00:10:48,250
at the forefront of technology

159
00:11:00,470 --> 00:10:57,170
as flying on the ground for the model