



1
00:00:00,500 --> 00:00:18,633



2
00:00:18,633 --> 00:00:22,033

What I would like to eventually see, is a supersonic airliner

3
00:00:22,033 --> 00:00:26,433

that can reduce travel time by a factor of two for the average person flying.

4
00:00:26,433 --> 00:00:30,300

Uh, LA to New York I believe it's like two, two and a half hours or so.

5
00:00:30,300 --> 00:00:33,833

Currently we're limited by sonic booms.

6
00:00:33,833 --> 00:00:35,367

There's no regulation stipulating

7
00:00:35,367 --> 00:00:38,367

what kind of sonic booms can be projected over land.

8
00:00:38,367 --> 00:00:40,833

Right now the rule is no sonic booms over land.

9
00:00:42,900 --> 00:00:46,700

The boom is actually a shock wave, a pressure change...

10
00:00:46,700 --> 00:00:49,433

you think of the aircraft here, that emanates off

11
00:00:49,433 --> 00:00:50,433
the nose of the aircraft.

12
00:00:50,733 --> 00:00:56,200
Sonic booms are uh
are really just a sound wave.

13
00:00:56,200 --> 00:00:58,133
Just like you're
hearing my voice now.

14
00:00:58,133 --> 00:01:03,733
Simply put, a sonic boom
is an acoustic disturbance
created when an aircraft,

15
00:01:03,733 --> 00:01:06,400
actually any projectile,
breaks the speed of sound.

16
00:01:09,000 --> 00:01:14,067
It makes a loud crackling
noise which can sound like
a very loud thunder.

17
00:01:14,067 --> 00:01:17,367
Loud, noisy... got a call
today from a woman heard
some sonic booms yesterday,

18
00:01:17,367 --> 00:01:18,900
said it frightened her dog.

19
00:01:18,900 --> 00:01:21,967
Wouldn't want to hear
something that's as loud
as a shotgun going off...

20
00:01:21,967 --> 00:01:24,000

um, rattle though your house.

21

00:01:24,000 --> 00:01:26,867

They're an annoyance,
they're a disturbance.

22

00:01:30,067 --> 00:01:49,733

■

23

00:01:49,733 --> 00:01:53,000

Conference room discussion: ...
in real time, get 'em a block

24

00:01:53,000 --> 00:01:56,933

a couple thousand feet around

25

00:01:56,933 --> 00:01:59,433

the altitude (unintelligible)...

26

00:01:59,433 --> 00:02:05,533

just not going to get it done.
Unless it's an east to west run
or the point is far enough,

27

00:02:05,533 --> 00:02:11,133

is uh, close enough to the
base (voice tapers off).

28

00:02:11,133 --> 00:02:15,700

The WSPR Project is,
it's part of a bigger
effort in supersonics

29

00:02:15,700 --> 00:02:19,000

that NASA is undertaking with
the long range goal to have

30

00:02:19,000 --> 00:02:20,667

business jets and
airliners that can

31
00:02:20,667 --> 00:02:24,333
fly supersonic
over the US,

32
00:02:24,333 --> 00:02:27,067
over populated
areas and not

33
00:02:27,067 --> 00:02:29,533
break windows or
even disturb the
population.

34
00:02:29,533 --> 00:02:31,400
This test in particular

35
00:02:31,400 --> 00:02:32,400
goes towards
establishing that

36
00:02:32,400 --> 00:02:36,600
FAA limitation as
to what sonic booms
will be accepted

37
00:02:36,600 --> 00:02:40,467
just like previous testing
was done with airport noise

38
00:02:40,467 --> 00:02:43,900
and seeing the tolerance that
can be tolerated there,

39
00:02:43,900 --> 00:02:45,933
uh, we're doing the same
thing with sonic booms.

40
00:02:45,933 --> 00:02:51,100
So we do analysis to

figure out what, where
the pilot needs to fly.

41

00:02:51,100 --> 00:02:54,267

Um, we can't do that until we
have the weather of the day

42

00:02:54,267 --> 00:02:57,967

because weather plays a huge
part in sonic boom placement.

43

00:02:57,967 --> 00:02:59,633

The challenging
part for the team

44

00:02:59,633 --> 00:03:02,967

is that the weather
balloon was going up
while we were briefing,

45

00:03:02,967 --> 00:03:06,067

and the scientists and engineers
are getting the data now

46

00:03:06,067 --> 00:03:08,500

and they're frantically doing
all these calculations,

47

00:03:08,500 --> 00:03:10,567

so that by the time I get
out to the airplane,

48

00:03:10,567 --> 00:03:12,967

I've got these aim points
that I'm flying at.

49

00:03:13,000 --> 00:03:26,767

■

50

00:03:26,767 --> 00:03:29,867

Pilot to Mission Control: That was 123, 1,2,5... and that was NASA 4.

51
00:03:29,867 --> 00:03:35,533
Mission Control: Copy that, 8, 5, 0... And NASA 8,5,0 what we were reading was (unintelligible radio chatter)

52
00:03:35,533 --> 00:03:38,767
As far as the pilot's concerned, I'm the person they're talking to,

53
00:03:38,767 --> 00:03:41,867
and they're expecting me to help them out with their situation

54
00:03:41,867 --> 00:03:44,267
because they're going to be busy flying the airplane.

55
00:03:45,300 --> 00:03:46,867
Pilot: Flaps up.

56
00:03:46,867 --> 00:03:50,467
The control room is telling me a target time that they want the next boom.

57
00:03:50,467 --> 00:03:54,533
So then I set up a big racetrack out to the Northeast,

58
00:03:54,533 --> 00:03:56,533
trying to time my return so that the boom

59
00:03:56,533 --> 00:03:58,933
hits the ground at

the right time.

60

00:03:58,933 --> 00:04:00,967

We use radar tracking
from the ground

61

00:04:00,967 --> 00:04:04,400

and we can position
information from the
aircraft using the radar.

62

00:04:04,400 --> 00:04:06,633

And it tells us where they
are in the airspace and

63

00:04:06,633 --> 00:04:10,333

the two parallel lines there
– the supersonic corridor –

64

00:04:10,333 --> 00:04:12,767

so it just gives us as a
controller on the ground

65

00:04:12,767 --> 00:04:14,833

situational awareness
on where they are.

66

00:04:15,400 --> 00:04:19,067

Pilot: And just for info, seems
like about 130 knots to ...

67

00:04:19,067 --> 00:04:21,533

And uh, 8 5 0, you're
a little broken there

68

00:04:21,533 --> 00:04:25,767

but just wanted to make
sure you heard next
dive point at 0 8 4 0.

69

00:04:25,767 --> 00:04:29,467

Again we've got a steer point
out there that I'm going to
roll in and aim at,

70

00:04:29,467 --> 00:04:32,233

so actually, about 8 miles
prior to that I need to be at,

71

00:04:32,233 --> 00:04:37,233

I need to be at 49,000 ft., and
.96 Mach, so still subsonic.

72

00:04:37,233 --> 00:04:41,600

I'm going to roll, pull
down 53 degrees nose
low, so pretty steep...

73

00:04:41,600 --> 00:04:44,167

somewhere in there we're
going supersonic.

74

00:04:44,167 --> 00:04:48,500

We roll out and we're trying to
time is so that we hit 1.1 Mach

75

00:04:48,500 --> 00:04:55,233

at 40, 00 ft., aimed at
that dive point out there,
um at 53 degrees nose low.

76

00:04:55,233 --> 00:04:58,767

Oh, and on a proper
heading of 246 degrees.

77

00:04:58,767 --> 00:05:02,933

So, if all that works right,
and the weather balloon got
the right data,

78

00:05:02,933 --> 00:05:05,500

and the engineers did all
their calculations right,

79

00:05:05,500 --> 00:05:09,933

then a boom of a specific, uh,
volume will hit base housing.

80

00:05:09,933 --> 00:05:12,967

With WSPR we're trying
to get a read back from
people on the ground

81

00:05:12,967 --> 00:05:15,233

to some kind of
annoyance level.

82

00:05:15,233 --> 00:05:20,067

Um, we have about 110
subjects in the Edwards
Air Force Base population

83

00:05:20,067 --> 00:05:22,967

that have been outfitted
with several different survey
methods.

84

00:05:22,967 --> 00:05:25,900

Pen and paper, iPhone Apple
devices, and web devices.

85

00:05:25,900 --> 00:05:30,833

This research we're looking for
low boom signatures mostly.

86

00:05:30,833 --> 00:05:34,367

Different days and different
times we're asking them to do
different levels of sonic booms

87

00:05:34,367 --> 00:05:36,233

– sometimes low,

medium or high.

88

00:05:36,233 --> 00:05:38,533

So depending on the overpressures from the booms,

89

00:05:38,533 --> 00:05:44,333

how annoying was this low boom, how annoying was this more moderate boom.

90

00:05:44,333 --> 00:05:45,767

And they'll be submitting surveys

91

00:05:45,767 --> 00:05:48,600

when they hear sonic booms produced by our F-18 jets.

92

00:05:48,600 --> 00:06:03,033

■

93

00:06:03,033 --> 00:06:07,633

We have about 14-15 different sensors out there to record the sonic booms.

94

00:06:07,633 --> 00:06:10,300

We have what we call our sonic boom field kits.

95

00:06:10,300 --> 00:06:13,333

They're remotely triggered sonic boom sensors,

96

00:06:13,333 --> 00:06:15,800

they're on light posts throughout the community.

97

00:06:15,800 --> 00:06:19,033

they're powered by
solar panel arrays and

98

00:06:19,033 --> 00:06:21,867

then we have a microphone
sitting towards the
bottom on the ground

99

00:06:21,867 --> 00:06:24,400

that actually records
the sonic booms.

100

00:06:24,400 --> 00:06:28,500

Then we use that data, convert
that into some type of metric
like a decibel level,

101

00:06:28,500 --> 00:06:34,833

and compare that to what
Jack and Jill heard in their
houses during the testing.

102

00:06:34,833 --> 00:06:36,400

■

103

00:06:36,400 --> 00:06:39,567

What we have is another
sonic boom sensor.

104

00:06:39,567 --> 00:06:42,567

This one's protected by an
all-weather dog house.

105

00:06:43,500 --> 00:06:47,667

Once I get the call that the
aircraft has started that dive
maneuver,

106

00:06:47,667 --> 00:06:51,500

I'll come over here and wait
approximately 2 minutes or so

107

00:06:51,500 --> 00:06:53,333

for the sonic boom to
reach the ground and...

108

00:06:53,333 --> 00:06:58,400

Voice on radio/phone:
NASA 2, this is
(unintelligible).... .746

109

00:06:58,400 --> 00:07:01,833

...um, come over here and
manually trigger it once
I hear a sonic boom.

110

00:07:01,833 --> 00:07:05,633

NASA 2, this is NASA Ground.
We heard boom the ground...

111

00:07:05,633 --> 00:07:09,667

might be quieter than the
last one... pretty low...

112

00:07:09,667 --> 00:07:12,667

We have specific calls that
they want us to make,

113

00:07:12,667 --> 00:07:17,700

most of it is so that the
team on the ground knows when
we're going to be rolling in,

114

00:07:17,700 --> 00:07:21,367

and then after that when the
boom is going to hit them,

115

00:07:21,367 --> 00:07:26,867

so that they make sure that the
instruments are all recording
and capture that data.

116
00:07:26,867 --> 00:07:31,100
Control Room Voice: 30
second up. 30 seconds.

117
00:07:31,100 --> 00:07:33,400
Larry Cliatt: Copy Airborne.

118
00:07:36,600 --> 00:07:38,600
Ground Operator: Six Seconds.

119
00:07:39,367 --> 00:07:41,767
Pilot: Rolling in 3, 2, 1, now.

120
00:07:43,167 --> 00:07:45,167
Michael Holtz: Copy mark.

121
00:07:53,933 --> 00:07:55,933
Sonic boom sound

122
00:07:59,667 --> 00:08:01,500
Off Camera Voice:
How was that one?

123
00:08:01,500 --> 00:08:04,167
Very low.... Just like
its supposed to be.

124
00:08:04,167 --> 00:08:07,100
■

125
00:08:07,100 --> 00:08:10,333
We're planning on going
Mach 1.8, Mach 1.6.

126
00:08:10,333 --> 00:08:13,733
So the cruise
speed is roughly
twice as fast as

127

00:08:13,733 --> 00:08:15,867

a typical
subsonic
airliner.

128

00:08:15,867 --> 00:08:19,100

We're trying to advance to
advance the technologies
in supersonics

129

00:08:19,100 --> 00:08:21,733

to allow companies
that are around today

130

00:08:21,733 --> 00:08:23,567

and that aren't
even around today,

131

00:08:23,567 --> 00:08:27,367

will be able to
take the technology
that we develop here,

132

00:08:27,367 --> 00:08:30,400

and the understanding
of the physics that we
do here today,

133

00:08:30,400 --> 00:08:33,500

to open up a whole new
market for the future.

134

00:08:35,067 --> 00:08:37,600

If long term we're going to have
business jets and airliners,

135

00:08:37,600 --> 00:08:41,967

they're going to have to
be quieter than military
fighters or the Concord...

136

00:08:41,967 --> 00:08:45,233

everyone knows about the
Concord, well it made a
very big sonic boom

137

00:08:45,233 --> 00:08:49,033

and that disturbed
people, it couldn't fly
over land or cities.

138

00:08:49,033 --> 00:08:55,100

■

139

00:08:55,100 --> 00:08:56,867

The sonic booms we're
producing for WSPR

140

00:08:56,867 --> 00:09:01,000

are what we are
simulating will be what we
call low sonic booms

141

00:09:01,000 --> 00:09:03,500

or what the next generation
of aircraft will produce.

142

00:09:04,567 --> 00:09:06,433

■

143

00:09:06,433 --> 00:09:11,367

Performing research then becomes
technology that's transferred to
the commercial world.

144

00:09:11,367 --> 00:09:16,167

I think that, at the heart,
is what NASA's role is.

145

00:09:16,167 --> 00:09:20,000

■

146

00:09:20,000 --> 00:09:22,500

To understand where we've
been, and where we're headed

147

00:09:22,500 --> 00:09:24,000

and where we are now
along that path,

148

00:09:24,000 --> 00:09:26,467

I think is critical for the
population to realize.

149

00:09:26,467 --> 00:09:29,467

And this type of research
brings what we're doing

150

00:09:29,467 --> 00:09:32,400

right there to the homes
of the people we're
trying to do this for.

151

00:09:32,400 --> 00:09:34,667

It's a new market, a
new type of aircraft.

152

00:09:34,667 --> 00:09:36,900

If the United States
takes the lead in that,

153

00:09:36,900 --> 00:09:39,300

that's jobs for the
American tax payer.

154

00:09:39,300 --> 00:09:42,767

In 1947, Chuck Yeager
broke the sound barrier.

155

00:09:42,767 --> 00:09:45,433

So I like to think that

it's my job to fix it now.

156

00:09:46,000 --> 00:09:52,533



157

00:09:52,533 --> 00:09:54,066

Sonic boom

158

00:09:54,067 --> 00:10:00,000



159

00:10:00,000 --> 00:10:02,000

Pilot: That's the Compass

Rose behind them...

160

00:10:06,100 --> 00:10:13,933

Pilot: Pointing straight down...

holding it, holding it .62

Mach.

161

00:10:19,733 --> 00:10:22,700

Think we covered

most of it, so....