1

00:00:00,000 --> 00:00:05,000

On this episode of Mythbusters, Adam and Jamie...

2

00:00:05,000 --> 00:00:08,000

That is really just creepy and distasteful.

3

00:00:08,000 --> 00:00:09,000

But scientific!

4

00:00:09,000 --> 00:00:12,000

Get the jump on a blockbuster boom.

5

00:00:12,000 --> 00:00:13,000

Blowing up, please.

6

00:00:13,000 --> 00:00:18,000

Can freezing a bomb Hollywood style...

7

00:00:18,000 --> 00:00:19,000

We're getting power!

8

00:00:19,000 --> 00:00:21,000

And taking cover in a bathtub...

9

00:00:21,000 --> 00:00:22,000

We're going free!

10

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

Really save your life.

11

00:00:24,000 --> 00:00:25,000

Wow!

12

00:00:25,000 --> 00:00:26,000

Oh!

13

00:00:26,000 --> 00:00:29,000

Meanwhile, Carri-Torre and Grant...

14

00:00:29,000 --> 00:00:30,000

Oh!

15

00:00:30,000 --> 00:00:31,000

Oh, whoa!

16

00:00:31,000 --> 00:00:33,000

Fly by the seat of their pants.

17

00:00:33,000 --> 00:00:36,000

I hope they can never float this close to another plane.

18

00:00:36,000 --> 00:00:38,000

Can flying like birds in a V-formation?

19

00:00:38,000 --> 00:00:41,000

And we started getting sucked in towards the lead plane.

20

00:00:41,000 --> 00:00:43,000

Save planes fuel...

21

00:00:43,000 --> 00:00:44,000

Ah!

22

00:00:44,000 --> 00:00:46,000

Why are we doing this?

23

00:00:46,000 --> 00:00:48,000

And you, money.

24

00:00:48,000 --> 00:00:51,000

There's a lot of sexy data we got going here.

25

00:00:51,000 --> 00:00:53,000

Sexy data, not just the normal stuff.

26

00:00:56,000 --> 00:00:58,000

Who are the Mythbusters?

27

00:00:59,000 --> 00:01:00,000

Adam Savage...

28

00:01:00,000 --> 00:01:02,000

Oh, it's scientific!

29

00:01:02,000 --> 00:01:03,000

And Jamie Heinemann...

30

00:01:03,000 --> 00:01:04,000

I'll be darned.

31

00:01:04,000 --> 00:01:09,000

Between them more than 30 years of special effects experience...

32

00:01:09,000 --> 00:01:11,000

Together with Carri Byron...

33

00:01:11,000 --> 00:01:12,000

Time to wreck this car.

34

00:01:12,000 --> 00:01:13,000

Tori Belachie...

35

00:01:13,000 --> 00:01:15,000

We only have one shot at this.

36

00:01:15,000 --> 00:01:17,000

And Grant Himahara...

37

00:01:17,000 --> 00:01:18,000

I'm okay!

38

00:01:18,000 --> 00:01:21,000

They don't just tell the Myths...

39

00:01:22,000 --> 00:01:24,000

They put them to the test.

40

00:01:29,000 --> 00:01:33,000

First up, Adam and Jamie have a tub-thumping jump.

41

00:01:35,000 --> 00:01:39,000

This is a story that is about literally almost kissing your ass goodbye.

42

00:01:39,000 --> 00:01:40,000

How's that?

43

00:01:40,000 --> 00:01:42,000

This one comes from Lethal Weapon 2.

44

00:01:42,000 --> 00:01:47,000

In the movie, Danny Glover sits down on the toilet in his house for a regular constitution,

45

00:01:47,000 --> 00:01:48,000

and he hears a click.

46

00:01:48,000 --> 00:01:52,000

When he looks down, he notices that his toilet's been rigged with a pressure switch

47

00:01:52,000 --> 00:01:56,000

that will set off a bomb the moment he stands up. Are you with me?

48

00:01:56,000 --> 00:01:58,000

Yeah, I haven't seen the movie.

49

00:01:58,000 --> 00:01:59,000

That doesn't surprise me.

50

00:01:59,000 --> 00:02:03,000

Anyway, he waits there all night before getting up the courage to call his partner, Mel Gibson,

51

00:02:03,000 --> 00:02:08,000

who shows up and they can cock this plan that they will leap from the toilet into the bathtub

52

00:02:08,000 --> 00:02:10,000

for protection from the bomb.

53

00:02:10,000 --> 00:02:13,000

The bomb squad has this technique, which they use in the film,

54

00:02:13,000 --> 00:02:15,000

where they pour liquid nitrogen on the bomb,

55

00:02:15,000 --> 00:02:18,000

blowing it down for, quote, a few seconds,

56

00:02:18,000 --> 00:02:23,000

which supposedly is enough time for Mel and Danny to get from the toilet into the bathtub,

57

00:02:23,000 --> 00:02:24,000

covered with a bomb blanket,

58

00:02:25,000 --> 00:02:27,000

to survive the blast.

59

00:02:28,000 --> 00:02:30,000

I like the fact that there are several parts to this story,

60

00:02:30,000 --> 00:02:34,000

and the first one is how fast can you get from the toilet into the tub?

61

00:02:34,000 --> 00:02:37,000

Yes, and the second one is how much, if at all,

62

00:02:37,000 --> 00:02:39,000

could liquid nitrogen slow down the detonation of a bomb?

63

00:02:39,000 --> 00:02:42,000

And lastly, if you did get into the tub in time,

64

00:02:42,000 --> 00:02:44,000

would it and the bomb blanket actually protect you?

65

00:02:44,000 --> 00:02:45,000

Precisely.

66

00:02:45,000 --> 00:02:49,000

So what say we start with reaction time, set up a toilet and a bathtub in the proper geometry

67

00:02:49,000 --> 00:02:52,000

and just see how fast we can make it from one end to the other?

68

00:02:52,000 --> 00:02:53,000

Works for me.

69

00:02:53,000 --> 00:02:54,000

All right.

70

00:02:54,000 --> 00:02:57,000

So first, the guys will attempt some lethal leaping.

71

00:02:57,000 --> 00:02:58,000

Found us a toilet.

72

00:02:58,000 --> 00:02:59,000

Good.

73

00:03:01,000 --> 00:03:06,000

And for that, they decide to precisely recreate the scene of the crime.

74

00:03:08,000 --> 00:03:09,000

Oh, man.

75

00:03:09,000 --> 00:03:13,000

So to replicate the bathroom, we're using the same type of bathtub as was used in the movie,

76

00:03:13,000 --> 00:03:16,000

an annoyingly large and heavy cast iron one.

77

00:03:16,000 --> 00:03:17,000

That's the real deal.

78

00:03:18,000 --> 00:03:20,000

And I've got to fit in there with you?

79

00:03:20,000 --> 00:03:21,000

Yeah, unfortunately.

80

00:03:21,000 --> 00:03:24,000

And we've got the same type of toilet, a one-piece porcelain one.

81

00:03:24,000 --> 00:03:28,000

We're going to place them the same distance apart, just like in the movie.

82

00:03:28,000 --> 00:03:33,000

And we've even got a corner wall so that every last thing is exactly the same.

83

00:03:33,000 --> 00:03:35,000

Everything matches exactly.

84

00:03:35,000 --> 00:03:39,000

But how will they time the jump from toilet to tub?

85

00:03:39,000 --> 00:03:43,000

While it's never explicitly stated, it's pretty obvious that the bomb in the movie

86

00:03:43,000 --> 00:03:46,000

is triggered by a pressure switch under the toilet seat,

87

00:03:46,000 --> 00:03:50,000

which is convenient because we're going to use the same thing to trigger

88

00:03:50,000 --> 00:03:51,000

our timing runs.

89

00:03:52,000 --> 00:03:53,000

This little pressure switch right here.

90

00:03:53,000 --> 00:03:57,000

When we sit down on the toilet, we will compress the pressure switch

91

00:03:57,000 --> 00:03:59,000

and the system is armed.

92

00:03:59,000 --> 00:04:02,000

At that point, when we get up from the toilet,

93

00:04:02,000 --> 00:04:07,000

the timer starts going until we're in the bathtub covered with the blanket.

94

00:04:07,000 --> 00:04:11,000

We'll film it on high speed, we'll be able to see exactly how many seconds it takes us to get there.

95

00:04:11,000 --> 00:04:12,000

And if that's enough.

96

00:04:13,000 --> 00:04:17,000

And with the final piece of the puzzle, a 30-pound bomb blanket,

97

00:04:17,000 --> 00:04:22,000

just like the one from the movie, the guys will just have to get up close and press them.

98

00:04:22,000 --> 00:04:23,000

All right, ready?

99

00:04:23,000 --> 00:04:25,000

And it's going to be three, two, one, and then go.

100

00:04:25,000 --> 00:04:26,000

Okay.

101

00:04:26,000 --> 00:04:28,000

Three, two, one.

102

00:04:34,000 --> 00:04:37,000

We got to do it one more time. I missed the blanket.

103

00:04:39,000 --> 00:04:42,000

That is really creepy and distasteful.

104

00:04:42,000 --> 00:04:44,000

But scientific!

105

00:04:44,000 --> 00:04:46,000

Scientific indeed.

106

00:04:46,000 --> 00:04:48,000

All right, let's see how we did here.

107

00:04:49,000 --> 00:04:52,000

The jump is even more hilarious in slow motion.

108

00:04:52,000 --> 00:04:54,000

Your form is excellent.

109

00:04:54,000 --> 00:04:56,000

You're hugging the side.

110

00:04:56,000 --> 00:05:02,000

But it's clear that having Jamie stay low while Adam deals with the blanket is the right strategy.

111

00:05:02,000 --> 00:05:04,000

That is unbelievable.

112

00:05:04,000 --> 00:05:05,000

There we go.

113

00:05:05,000 --> 00:05:08,000

We are at two seconds and two guys are fully covered in that bathtub.

114

00:05:08,000 --> 00:05:09,000

Nice work!

115

00:05:12,000 --> 00:05:15,000

Two seconds ain't bad, but to see if they can improve.

116

00:05:17,000 --> 00:05:19,000

The guys go for the best of three.

117

00:05:19,000 --> 00:05:21,000

Two, one, go!

118

00:05:23,000 --> 00:05:25,000

Hey, that was pretty darn good!

119

00:05:28,000 --> 00:05:30,000

I'm getting all bruised along this side.

120

00:05:30,000 --> 00:05:31,000

Me too.

121

00:05:33,000 --> 00:05:39,000

Jamie and I were able to get from the toilet into the tub and covered by the bomb blanket in just under two seconds flat.

122

00:05:40,000 --> 00:05:49,000

Now the question is, will pouring liquid nitrogen on our plastic explosives bomb slow its detonation down by at least that amount of time?

123

00:05:49,000 --> 00:05:56,000

If it can, then it would seem that Mel and Danny could get to the relative and possible safety of the bathtub in time.

124

00:05:56,000 --> 00:05:59,000

If it doesn't, then I guess they'd be vaporized.

125

00:05:59,000 --> 00:06:02,000

Either way, it's going to be awesome.

126

00:06:05,000 --> 00:06:08,000

Next, Carri-Torre and Grant are winging it.

127

00:06:10,000 --> 00:06:11,000

Alright, so what's the myth?

128

00:06:11,000 --> 00:06:13,000

So I'm sure you've seen birds flying in a V.

129

00:06:13,000 --> 00:06:14,000

Yeah.

130

00:06:14,000 --> 00:06:18,000

Okay, well supposedly they do that because it's more energy efficient, which leads into our myth.

131

00:06:18,000 --> 00:06:21,000

If it works for birds, can it work for planes?

132

00:06:21,000 --> 00:06:23,000

So do you actually save fuel by flying in a V formation?

133

00:06:23,000 --> 00:06:24,000

Exactly.

134

00:06:24,000 --> 00:06:26,000

And more importantly, save money.

135

00:06:28,000 --> 00:06:30,000

Birds of a feather flock together.

136

00:06:31,000 --> 00:06:33,000

And they also fly in V formations.

137

00:06:33,000 --> 00:06:35,000

But does that conserve energy?

138

00:06:35,000 --> 00:06:38,000

And if it does, is what's good for the goose?

139

00:06:39,000 --> 00:06:42,000

Also good for planes in the wide blue yonder.

140

00:06:44,000 --> 00:06:47,000

Alright, so I think the first thing we should do is go talk to a bird expert.

141

00:06:47,000 --> 00:06:50,000

Let's find out if they actually do fly in a V formation because it's more energy efficient.

142

00:06:50,000 --> 00:06:55,000

Then we could get some small scale models of planes taken to NASA's water channel and see if they do the same thing.

143

00:06:55,000 --> 00:06:57,000

Sounds like a great plan.

144

00:06:58,000 --> 00:07:00,000

It's a two-pronged plan.

145

00:07:00,000 --> 00:07:05,000

And to find out why birds fly in a V, Carri and Torre head to Chrissy Field's bird sanctuary.

146

00:07:05,000 --> 00:07:07,000

Come on, Carri.

147

00:07:07,000 --> 00:07:08,000

I know you're going to do that.

148

00:07:08,000 --> 00:07:12,000

Where bird expert Peter Pyle can answer their feathery inquiries.

149

00:07:12,000 --> 00:07:16,000

Alright, now why is it that you see birds flying in V formation?

150

00:07:16,000 --> 00:07:27,000

The birds behind the lead individual, all birds going back in the V, will save energy by flying within the vortices of the wing beats of the bird in front of them.

151

00:07:27,000 --> 00:07:30,000

Now, you're talking about writing the vortex. What does that mean?

152

00:07:30,000 --> 00:07:36,000

Each bird, as it flaps its wing, creates a vortex behind that wing.

153

00:07:36,000 --> 00:07:43,000

And the vortex is created because there's a pressure differential between higher pressure below the wing and lower pressure above.

154

00:07:43,000 --> 00:07:47,000

And this creates an eddy that filters behind each wing.

155

00:07:47,000 --> 00:07:52,000

So as a wing moves through air, it creates a wingtip vortex.

156

00:07:52,000 --> 00:08:00,000

These low pressure spinning cones of air create upwash, giving the bird behind a boost and making it easier to sail off.

157

00:08:00,000 --> 00:08:02,000

But do the birds save energy?

158

00:08:02,000 --> 00:08:13,000

Researchers studying this have filmed birds and have seen that the birds behind the lead bird will flap less deeply and flap less often than that lead bird will.

159

00:08:13,000 --> 00:08:18,000

So that's the first clue that they're saving energy through flying in that formation.

160

00:08:18,000 --> 00:08:26,000

Ok, so less slapping means birds do save energy flying in the V formation, meaning Carrie can start on stage two.

161

00:08:26,000 --> 00:08:31,000

Now, after talking to our bird expert, I'm starting to think this myth is looking really, really good.

162

00:08:31,000 --> 00:08:34,000

But birds are not aircraft.

163

00:08:34,000 --> 00:08:44,000

So, I'm building a model airplane to take to NASA's water tunnel so I can see if flying in a flock formation has the same benefits for airplanes as it does for birds.

164

00:08:44,000 --> 00:08:51,000

Since planes don't flap their wings, the team will examine the aerodynamics behind a fixed wing aircraft.

165

00:08:51,000 --> 00:08:53,000

Sand to paint it, put it in the tunnel.

166

00:08:53,000 --> 00:08:58,000

And after a luminous paint job, Carrie's model is ready to strut its stuff.

167

00:08:58,000 --> 00:08:59,000

Love coming here.

168

00:08:59,000 --> 00:09:02,000

Water tunnel, good fun.

169

00:09:02,000 --> 00:09:11,000

At NASA, Steve Smith is on hand to help figure out the aerodynamics of the V formation.

170

00:09:11,000 --> 00:09:13,000

Ok, model's in place.

171

00:09:13,000 --> 00:09:15,000

Alright, so what are we going to see here?

172

00:09:15,000 --> 00:09:18,000

Ok, well let's go ahead and turn the die flow on.

173

00:09:18,000 --> 00:09:22,000

I can start to see it like create kind of a tube.

174

00:09:22,000 --> 00:09:28,000

As the die flows, it's clear that there is a vortex coming off the wing tip of the front plane.

175

00:09:28,000 --> 00:09:33,000

There's an upward motion from the spiral that's putting the following airplane in upwash.

176

00:09:33,000 --> 00:09:41,000

So being in the upwash of the vortex is creating lift and making it easier for the plane to fly, therefore becoming more fuel efficient.

177

00:09:41,000 --> 00:09:42,000

Exactly.

178

00:09:42,000 --> 00:09:49,000

Just like the aerodynamics of birds in a V formation, the fixed wing also creates a vortex behind its wing tip.

179

00:09:49,000 --> 00:09:54,000

And the resulting upwash makes it easier for the follow plane to stay aloft.

180

00:09:54,000 --> 00:09:58,000

Now, how far back could you be and still get the benefit?

181

00:09:58,000 --> 00:10:02,000

So the training of vortex actually persists for a long ways downstream.

182

00:10:02,000 --> 00:10:06,000

In the case of jet liners, it lasts for miles downstream.

183

00:10:06,000 --> 00:10:09,000

And that's the proof of concept that the Mythbusters need.

184

00:10:09,000 --> 00:10:13,000

Next step is to see if this model scales up to full size planes.

185

00:10:15,000 --> 00:10:18,000

Later, Adam and Jamie test the tub thumping boom.

186

00:10:18,000 --> 00:10:22,000

This whole building, I think it's going to be pretty much gone when we're done.

187

00:10:22,000 --> 00:10:26,000

But first, Kari, Tori and Grant are flying high.

188

00:10:26,000 --> 00:10:29,000

And we are off the ground.

189

00:10:29,000 --> 00:10:31,000

There's a lift off.

190

00:10:32,000 --> 00:10:37,000

So, toilet bomb.

191

00:10:37,000 --> 00:10:40,000

We left this story with the plan to do some liquid nitrogen testing.

192

00:10:40,000 --> 00:10:41,000

But we're not, are we?

193

00:10:41,000 --> 00:10:42,000

No, we're not.

194

00:10:42,000 --> 00:10:46,000

Because we look back at the original footage and we missed some of the parameters.

195

00:10:46,000 --> 00:10:48,000

Neither of us were wearing bulletproof vests.

196

00:10:48,000 --> 00:10:49,000

Exactly.

197

00:10:49,000 --> 00:10:53,000

And I'm sorry to say, you weren't wearing your pants around your ankles.

198

00:10:53,000 --> 00:10:55,000

And I hadn't sat on the toilet for 12 hours.

199

00:10:55,000 --> 00:10:56,000

Exactly.

200

00:10:56,000 --> 00:11:01,000

So I think we need to do those tests again and see how they actually affect our time.

201

00:11:01,000 --> 00:11:04,000

I'm not going to have to sit on the toilet for 12 hours, am I?

202

00:11:04,000 --> 00:11:06,000

I can't imagine that we're going to go all that way.

203

00:11:06,000 --> 00:11:09,000

But we should talk to an expert to make sure it's not too dangerous.

204

00:11:09,000 --> 00:11:11,000

Sounds like a plan to me.

205

00:11:11,000 --> 00:11:16,000

A marathon 12-hour toilet sit would limit blood flow to the legs

206

00:11:16,000 --> 00:11:19,000

and make the heroes jump harder to achieve.

207

00:11:19,000 --> 00:11:22,000

But is it even safe to attempt it?

208

00:11:22,000 --> 00:11:24,000

Just bulletproof vest, dude.

209

00:11:24,000 --> 00:11:25,000

Okay.

210

00:11:25,000 --> 00:11:30,000

You realize with full accuracy you're also going to need to pull your pants down around your ankles.

211

00:11:31,000 --> 00:11:33,000

Great.

212

00:11:33,000 --> 00:11:40,000

And to find out the maximum time that Jamie can remain on the throne, Adam sought out an expert.

213

00:11:41,000 --> 00:11:44,000

Jamie, here's our expert, Dr. Cho. He's a neurologist.

214

00:11:44,000 --> 00:11:46,000

Hi, doctor.

215

00:11:48,000 --> 00:11:50,000

So, doc, I have some questions.

216

00:11:50,000 --> 00:11:55,000

In the movie, Danny Glover sits on the toilet overnight, something like 12 hours give or take.

217

00:11:55,000 --> 00:12:00,000

Now, I was thinking maybe I'll sit on the toilet here for six or seven.

218

00:12:00,000 --> 00:12:02,000

Is there a problem with doing that?

219

00:12:02,000 --> 00:12:08,000

It is problematic, mainly because you're actually creating mechanical pressure on the nerve.

220

00:12:08,000 --> 00:12:14,000

And in a long period of time, it can damage the nerve and cause weakness and severe, severe pain.

221

00:12:14,000 --> 00:12:20,000

A minimal amount of time, maybe one to two hours is probably where you should cut off the experiment.

222

00:12:20,000 --> 00:12:22,000

Okay. Well, thanks, doc.

223

00:12:22,000 --> 00:12:24,000

Oh, you're very welcome.

224

00:12:24,000 --> 00:12:33,000

So it's only safe to sit for a maximum of two hours, which is good because the strain is starting to show.

225

00:12:33,000 --> 00:12:44,000

I've been sitting on the toilet about 26 minutes, and the first symptom has occurred, and that is

that one foot, my left foot is starting to tingle.

226

00:12:44,000 --> 00:12:46,000

It's a little numb.

227

00:12:46,000 --> 00:12:52,000

After a further hour of sitting it out, Jamie's legs are uncomfortably numb.

228

00:12:52,000 --> 00:12:58,000

All right, sir. I think we've got all the parameters in place.

229

00:12:58,000 --> 00:13:00,000

You feeling ready?

230

00:13:00,000 --> 00:13:02,000

Let's do it.

231

00:13:03,000 --> 00:13:08,000

Here we go, buddy. One, two, three.

232

00:13:11,000 --> 00:13:18,000

Amazingly, even with numb legs and patch-round ankles, the guys end up on the right side of the blanket.

233

00:13:18,000 --> 00:13:20,000

Can I pull my pants up?

234

00:13:20,000 --> 00:13:22,000

Yes. Camera off, Jamie.

235

00:13:22,000 --> 00:13:25,000

No, film him. Terrible.

236

00:13:25,000 --> 00:13:30,000

Surprisingly, the numb-legged jump was only marginally slower than their previous best time.

237

00:13:30,000 --> 00:13:32,000

I think that's a good test.

238

00:13:32,000 --> 00:13:36,000

I think two seconds is the target we want ahead.

239

00:13:36,000 --> 00:13:45,000

But with all the parameters we see in the film, Jamie and I were able to dive to safety in just under two seconds of lap, which is a lot faster than I thought it would be when we started doing this testing.

240

00:13:45,000 --> 00:13:55,000

Now it all comes down to whether or not liquid nitrogen can slow the bomb's reaction down enough to give us that mythical few seconds that are explained in the film.

241

00:13:55,000 --> 00:14:09,000

Apparently, flocks of migrating birds fly in V-formation to save energy. But if birds do it, can planes do it too?

242

00:14:09,000 --> 00:14:15,000

After their proof-of-concept test at NASA, the mythbusters are ready to take to the skies.

243

00:14:15,000 --> 00:14:21,000

So we've come to the Tracy Airport to test the myth that flying in a V-formation actually saves you fuel.

244

00:14:21,000 --> 00:14:24,000

What a beautiful day to fly.

245

00:14:24,000 --> 00:14:26,000

This could serve some fuel.

246

00:14:26,000 --> 00:14:34,000

Now because this could be a significant savings, we've got not one, not two, not three, but nine planes.

247

00:14:34,000 --> 00:14:44,000

Nine planes and nine pilots, courtesy of the West Coast Raiders. Aerial acrobatics is their specialty.

248

00:14:44,000 --> 00:14:48,000

And the guy leading them is Tim Cole, aka Slick.

249

00:14:48,000 --> 00:14:52,000

Alright, so you're going to be helping us fly in this formation to see if we'll be able to save fuel.

250

00:14:52,000 --> 00:14:53,000

Absolutely.

251

00:14:53,000 --> 00:14:54,000

What's dangerous is that.

252

00:14:54,000 --> 00:15:01,000

It's a little more dangerous than normal formation flying. We get upside down together in these formations, but we're not doing it in the wake turbulence.

253

00:15:01,000 --> 00:15:06,000

So adding the wake turbulence is an element that we've been practicing a little bit, so hopefully everything will work out alright.

254

00:15:06,000 --> 00:15:10,000

Hopefully is right, but it might be a bumpy ride.

255

00:15:10,000 --> 00:15:14,000

We have nine planes that are going to fly in a random pattern at different altitudes.

256

00:15:14,000 --> 00:15:17,000

We're going to establish a set speed of 110 knots.

257

00:15:17,000 --> 00:15:26,000

Now we're going to fly for 10 minutes, and every 30 seconds I'm going to write down a data point for their flow rate and then we can establish a baseline, and then we can compare all our other results to it.

258

00:15:26,000 --> 00:15:31,000

So first up, all nine planes will get airborne for a fuel consumption baseline.

259

00:15:31,000 --> 00:15:35,000

Feel the need, need for data.

260

00:15:35,000 --> 00:15:40,000

To tray tables and seats in the landing positions.

261

00:15:40,000 --> 00:15:45,000

The planes taxi down the runway and take off one after the other.

262

00:15:45,000 --> 00:15:49,000

And we are off the ground.

263

00:15:49,000 --> 00:15:51,000

There's a lift off.

264

00:15:51,000 --> 00:15:54,000

Alright, let's start the 10 minute clock.

265

00:15:54,000 --> 00:15:58,000

Now, every 30 seconds I'm going to take down a data point.

266

00:15:58,000 --> 00:16:05,000

With the squad in random positions maintaining a speed of 110 knots, the control test is off to a flying start.

267

00:16:05,000 --> 00:16:11,000

Flow rate holding around 7 to 7.9 gallons per hour.

268

00:16:11,000 --> 00:16:13,000

This is a great control test.

269

00:16:13,000 --> 00:16:16,000

This is going to give us some juicy data.

270

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

Yeah, you've never heard that before. Juicy data, not just the normal stuff.

271

00:16:20,000 --> 00:16:22,000

There's a lot of sexy data we got going here.

272

00:16:22,000 --> 00:16:30,000

Every 30 seconds that sexy fuel flow is collected for each plane as they'll test against themselves, not the other planes.

273

00:16:30,000 --> 00:16:33,000

We're only a minute to go in our control test. We're getting some really consistent results.

274

00:16:33,000 --> 00:16:37,000

We're looking at 6.5, 6 gallons per hour.

275

00:16:37,000 --> 00:16:42,000

And after 10 minutes of non-formation flying, the test comes to an end.

276

00:16:42,000 --> 00:16:44,000

Copy that. Stop data logging.

277

00:16:44,000 --> 00:16:46,000

Okay, that completes our test.

278

00:16:48,000 --> 00:16:50,000

We made it!

279

00:16:50,000 --> 00:16:52,000

Nice flying, G-Force.

280

00:16:52,000 --> 00:16:55,000

Alright, let's see if next time we can save some fuel.

281

00:16:55,000 --> 00:16:59,000

Back on solid ground, the results of the control are in.

282

00:16:59,000 --> 00:17:05,000

So for the control test in my plane cruising along at 110 knots at an altitude of approximately 4,000 feet,

283

00:17:05,000 --> 00:17:11,000

as you can see in the graphics, we get an average fuel consumption of 6.6 gallons per hour.

284

00:17:11,000 --> 00:17:13,000

The data for the other planes is similar.

285

00:17:13,000 --> 00:17:20,000

Fuel rate varies, but what's key is that the formation results for each plane will be compared against this baseline.

286

00:17:20,000 --> 00:17:24,000

Now it's time to try out a few formations and see if that makes a difference.

287

00:17:24,000 --> 00:17:31,000

Next up, can freezing C4 create enough of a delay to make a getaway?

288

00:17:31,000 --> 00:17:33,000

We're getting power!

289

00:17:34,000 --> 00:17:42,000

With the good cop sitting on a time bomb, it's down to some liquid nitrogen,

290

00:17:42,000 --> 00:17:45,000

a quick jump at a bathtub to save his life.

291

00:17:45,000 --> 00:17:50,000

Adam and Jamie have proven it takes two seconds for two men to make the leap.

292

00:17:50,000 --> 00:17:58,000

But can pouring freezing liquid nitrogen onto a bomb create the two-second delay needed for a getaway?

293

00:17:58,000 --> 00:18:02,000

The guys are headed to the top of the range to find out.

294

00:18:03,000 --> 00:18:11,000

In the movie, they pour liquid nitrogen on the bomb behind the toilet in order to slow it down and give themselves an extra few seconds.

295

00:18:11,000 --> 00:18:16,000

Now when we hear that statement, we figured that the liquid nitrogen could be acting in one of two ways.

296

00:18:16,000 --> 00:18:23,000

Either it is slowing down the C4's own reaction to the blasting cap going off and delaying the explosion,

297

00:18:23,000 --> 00:18:29,000

or it's actually slowing down the chemical reaction within the batteries that initiate that blasted cap going off.

298

00:18:29,000 --> 00:18:35,000

Whichever it is, we're going to find out here in the bomb range because we're going to try all those permutations right here.

299

00:18:35,000 --> 00:18:40,000

For that, Adam has built a disposable rig to pour liquid nitrogen onto the bomb.

300

00:18:40,000 --> 00:18:41,000

Perfect!

301

00:18:41,000 --> 00:18:48,000

But the trickiest part will be capturing the detonation delay, so the Mythbusters' brains trust has designed this.

302

00:18:48,000 --> 00:18:52,000

We've set up a system whereby when I press these buttons...

303

00:18:52,000 --> 00:18:55,000

It sends power to this relay switch right here.

304

00:18:55,000 --> 00:18:57,000

Now one leg of this relay...

305

00:18:57,000 --> 00:19:00,000

Instantly lights up this LED sign.

306

00:19:00,000 --> 00:19:05,000

Simultaneously, the relay's other leg sends power over to this block of C4.

307

00:19:05,000 --> 00:19:07,000

Enough power, in fact, to detonate it.

308

00:19:07,000 --> 00:19:16,000

If there is any difference at all between the power impulse and the detonation, we should see it in the difference between the lighting of that sign and the detonation of this explosive.

309

00:19:16,000 --> 00:19:22,000

And the first test of the system will be straight C4 to find the normal detonation delay.

310

00:19:22,000 --> 00:19:25,000

Okay, arming the system.

311

00:19:25,000 --> 00:19:28,000

Alright, this is straight C4 in...

312

00:19:28,000 --> 00:19:30,000

Three, two, one...

313

00:19:33,000 --> 00:19:34,000

That was lovely.

314

00:19:34,000 --> 00:19:36,000

That was really nice!

315

00:19:36,000 --> 00:19:39,000

Kind of a refreshing fo-

316

00:19:39,000 --> 00:19:41,000

Refreshingly explosive.

317

00:19:41,000 --> 00:19:44,000

But was there any kind of delay?

318

00:19:46,000 --> 00:19:50,000

Alright, it took 10 frames between the light lighting up and the C4 exploding.

319

00:19:50,000 --> 00:19:58,000

10 frames, we were shooting at 3,000 frames per second, so it's effectively 3.3 milliseconds between initiation and detonation.

320

00:19:58,000 --> 00:20:01,000

Just over 3,000ths of a second.

321

00:20:01,000 --> 00:20:06,000

Three milliseconds is the standard C4 detonation delay.

322

00:20:06,000 --> 00:20:09,000

So now, crack open the liquid nitrogen.

323

00:20:09,000 --> 00:20:13,000

This is exactly what I imagined being a mad scientist would be like when I was a child.

324

00:20:13,000 --> 00:20:18,000

With one cup in the flask and an identical piece of C4 in the dish...

325

00:20:18,000 --> 00:20:19,000

Okay, we're set.

326

00:20:19,000 --> 00:20:26,000

The guys retire to safety, where they wait the two minutes of the movie for the C4 to fully freeze.

327

00:20:28,000 --> 00:20:29,000

Okay, here we go.

328

00:20:29,000 --> 00:20:33,000

And three, two, one...go!

329

00:20:38,000 --> 00:20:40,000

I heard stuff hitting.

330

00:20:40,000 --> 00:20:42,000

Yeah, no delay either.

331

00:20:42,000 --> 00:20:43,000

No delay.

332

00:20:43,000 --> 00:20:44,000

Really?

333

00:20:44,000 --> 00:20:48,000

Well, I mean, maybe a few milliseconds, but I heard three, two, one, boom.

334

00:20:48,000 --> 00:20:52,000

I didn't hear three, two, one...boom!

335

00:20:52,000 --> 00:20:57,000

Maybe not, but perhaps the high-speed camera caught a freeze-frame delay.

336

00:20:57,000 --> 00:20:59,000

46 frames.

337

00:20:59,000 --> 00:21:07,000

It's four and a half times greater of a delay when it was super, super cool than when it was just normal.

338

00:21:07,000 --> 00:21:08,000

Wow.

339

00:21:08,000 --> 00:21:11,000

It still wouldn't help you get into that bathtub, though.

340

00:21:11,000 --> 00:21:13,000

It's a pretty tiny difference.

341

00:21:13,000 --> 00:21:19,000

Fifteen thousandths of a second is far from the mythical two-second delay of the film.

342

00:21:19,000 --> 00:21:20,000

So what's next?

343

00:21:20,000 --> 00:21:25,000

Now we're going to take a period-correct battery that's attached to our bomb that would absolutely ignite it.

344

00:21:25,000 --> 00:21:31,000

We're going to immerse that in the liquid nitrogen and see if that gives us the extra time that we're looking for.

345

00:21:31,000 --> 00:21:34,000

And with one cup of liquid nitrogen in the flask...

346

00:21:34,000 --> 00:21:35,000

Here we go.

347

00:21:35,000 --> 00:21:39,000

It's time for the 80s-style alkaline battery to chill out.

348

00:21:39,000 --> 00:21:40,000

It's immersed.

349

00:21:40,000 --> 00:21:41,000

Yep.

350

00:21:41,000 --> 00:21:47,000

With the battery immersed in minus 300-degree liquid nitrogen, the guys wait the two minutes of the film.

351

00:21:47,000 --> 00:21:56,000

Alright, this is battery and C4 immersed in liquid nitrogen in three, two, one, go!

352

00:21:58,000 --> 00:21:59,000

No boom.

353

00:21:59,000 --> 00:22:00,000

Whoa!

354

00:22:01,000 --> 00:22:03,000

I'll hold it down again.

355

00:22:04,000 --> 00:22:06,000

We're getting power.

356

00:22:06,000 --> 00:22:08,000

The system is still working because the sun's lighting up.

357

00:22:08,000 --> 00:22:09,000

Yeah.

358

00:22:09,000 --> 00:22:13,000

But we seem to have inhibited the battery's ability to set off the blasted cap.

359

00:22:13,000 --> 00:22:18,000

It looks like the bomb has frozen up, but is there another reason it's not detonating?

360

00:22:18,000 --> 00:22:20,000

You're sure it's properly wired?

361

00:22:20,000 --> 00:22:26,000

Now what we've got is a bowl full of liquid nitrogen, capped in C4 and a battery.

362

00:22:26,000 --> 00:22:32,000

We're just going to sit here and wait until the liquid nitrogen boils off, and then we're going to try and blow it up again.

363

00:22:32,000 --> 00:22:40,000

After 15 minutes, the liquid nitrogen has evaporated, and now the moment of truth of the myth is if the delay will still remain.

364

00:22:40,000 --> 00:22:42,000

Blowing up, please.

365

00:22:42,000 --> 00:22:46,000

In three, two, one.

366

00:22:47,000 --> 00:22:48,000

Whoa!

367

00:22:50,000 --> 00:22:51,000

Nice!

368

00:22:51,000 --> 00:22:53,000

That worked beautifully.

369

00:22:53,000 --> 00:22:54,000

Whoo!

370

00:22:54,000 --> 00:23:03,000

Well, you know what that means for the movie? That means those guys could have just strolled right on out of that building.

371

00:23:03,000 --> 00:23:08,000

They didn't need to worry about the bathtub or bomb blankets or any of that stuff.

372

00:23:08,000 --> 00:23:14,000

Totally. They got a lot more than a couple of extra seconds. They got an extra 15 minutes by my watch.

373

00:23:14,000 --> 00:23:17,000

And we wouldn't have had to have gotten into the bathtub together either.

374

00:23:17,000 --> 00:23:19,000

I guess all that experimentation was a waste.

375

00:23:19,000 --> 00:23:20,000

Yeah.

376

00:23:21,000 --> 00:23:25,000

Not always. At least you'll always have the high speeds.

377

00:23:25,000 --> 00:23:34,000

Well, it would appear that the lethal weapon 2 bomb squad's technique for slowing down a bomb are far more effective in reality than they are in the movies. When does that ever happen?

378

00:23:34,000 --> 00:23:40,000

Yeah, I know. But we're not done yet. There's still quite a few more pieces to this puzzle that we have to de-zout.

379

00:23:40,000 --> 00:23:42,000

I know. Let's get to it.

380

00:23:51,000 --> 00:24:00,000

Alright, so we're back. We're out at the Tracy Airport to test whether flying in a V-formation will actually save you fuel.

381

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

But we're not just going to test the V-formation. We're also going to test flying abreast side by side and a congaline to see if maybe there are other formations that might save you fuel.

382

00:24:09,000 --> 00:24:16,000

Just like the control test, we'll be flying in these formations for 10 minutes. We'll be monitoring how much fuel is being used.

383

00:24:16,000 --> 00:24:23,000

Once we're done, we'll see which formation is the most efficient. Most importantly, to see whether or not flying in a V-formation is the best way to go.

384

00:24:23,000 --> 00:24:36,000

This myth is all about the fuel efficiency of the V. But that's not the only formation that could save fuel. For a complete set of results, they'll also test the side-by-side and the congaline.

385

00:24:38,000 --> 00:24:43,000

But the first formation for our squad of nine planes is the mythical V.

386

00:24:44,000 --> 00:24:53,000

Now this is the dangerous part as we move into V-formation. Because remember, we are flying in the vortices of the airplane in front of us.

387

00:24:53,000 --> 00:24:57,000

Alright, let's start the 10 minute clock now.

388

00:24:57,000 --> 00:25:06,000

Flow rate is now 6.8. So right now each plane is in the other's sweet spot. That sounds creepy, but it's true.

389

00:25:06,000 --> 00:25:15,000

And that sweet spot just happens to be in the wingtip vortex of the plane in front. And although it creates lift, it's also very unstable.

390

00:25:16,000 --> 00:25:27,000

We went a little bit too far in, and we started getting sucked in towards the lead plane. And if you're too far out, yeah, you get no gain at all.

391

00:25:27,000 --> 00:25:32,000

It takes a lot of skill to stay out of trouble, but the West Coast Ravens hold formation.

392

00:25:33,000 --> 00:25:42,000

Selecting data is a lot more fun from an airplane. Here we go. We're approaching 7 minutes, and we've got 6.47 gallons per hour.

393

00:25:43,000 --> 00:25:46,000

After 10 minutes, the test comes to an end.

394

00:25:47,000 --> 00:25:58,000

So we've just finished the tight V-formation. And looking at the numbers, it's already apparent that flying in a V-formation saves you more fuel than flying without it.

395

00:25:59,000 --> 00:26:07,000

But the final fuel efficiency results will stay up in the air, because the squad moves straight into the side-by-side formation.

396

00:26:07,000 --> 00:26:15,000

Okay, so this test right here is for V side-by-side. We call it shimifrest. And that's basically wingtip to wingtip.

397

00:26:15,000 --> 00:26:22,000

There's no going to be advancing or trying to get in front of like a V. This is basically side-by-side.

398

00:26:23,000 --> 00:26:29,000

There's some turbulence caused by the plane being so close together.

399

00:26:29,000 --> 00:26:36,000

I have to say, I'm a little bit nervous about this one. I don't think I've ever flown this close to another plane. On purpose at least.

400

00:26:37,000 --> 00:26:40,000

Now in formation, the data collection begins again.

401

00:26:40,000 --> 00:26:47,000

Alright, we are about 2 minutes in, and we're using 6.18 gallons per hour.

402

00:26:48,000 --> 00:26:52,000

But being only 15 feet away from each other is challenging their concentration.

403

00:26:53,000 --> 00:26:55,000

Oh yeah, data. I have to take the data.

404

00:26:55,000 --> 00:27:05,000

I am breathing a little deeper, just trained to calm down. But the fact that we are practically on top of each other side-by-side is freaking me out just a little bit.

405

00:27:05,000 --> 00:27:07,000

Luckily, collecting data is distracting me.

406

00:27:08,000 --> 00:27:14,000

It's a heavy mix of data and danger. And after 10 minutes, it's time for the final formation.

407

00:27:14,000 --> 00:27:18,000

Right now we are moving into position to set up for the Kongalai.

408

00:27:18,000 --> 00:27:21,000

Here I have the easy ride being up in front.

409

00:27:23,000 --> 00:27:26,000

I heard Tori and Grant have a little rougher time back behind me.

410

00:27:27,000 --> 00:27:32,000

Yep, because as the planes take their places, it's clear this isn't going to be smooth sailing.

411

00:27:33,000 --> 00:27:41,000

We just ran from a nice, easy, smooth flight to a roller coaster ride.

412

00:27:42,000 --> 00:27:51,000

As we are now flying through the other planes, the Rotor Wash, and it's very turbulent.

413

00:27:51,000 --> 00:27:56,000

Oh-ho! Oh-whoa! Oh-ho! Okay!

414

00:27:56,000 --> 00:28:00,000

It's a Rotor Wash roller coaster, in the name of fuel efficiency.

415

00:28:00,000 --> 00:28:03,000

Two minutes in, we have 6.35 gallons.

416

00:28:03,000 --> 00:28:07,000

But the turbulence of this test is making the others look tame.

417

00:28:07,000 --> 00:28:10,000

And I thought line of rest was scary.

418

00:28:16,000 --> 00:28:21,000

Now, here's an interesting thing. The pilot in front of us is getting kicked out of it.

419

00:28:21,000 --> 00:28:27,000

They get kicked out so do we. So it's like, it's sort of a thing that you go all the way down the line, like bang, bang, bang.

420

00:28:27,000 --> 00:28:29,000

Oh my goodness!

421

00:28:32,000 --> 00:28:34,000

I hate the Kongalai!

422

00:28:35,000 --> 00:28:42,000

Holy crap! Why are we doing this? This doesn't seem safe at all!

423

00:28:42,000 --> 00:28:48,000

Well, after the bupiest 10 minutes of their lives, the Mythbusters can finally touch down.

424

00:28:50,000 --> 00:28:57,000

Okay, and we are down. That concludes our Kongalai test. Thank goodness.

425

00:28:58,000 --> 00:29:03,000

Back on Terraferma, it's time to find out if any of the formations saved fuel.

426

00:29:04,000 --> 00:29:06,000

Alright, you guys ready to crunch some data?

427

00:29:06,000 --> 00:29:07,000

Oh yes, sir.

428

00:29:08,000 --> 00:29:12,000

And after a bumper number crunch, the results are in.

429

00:29:12,000 --> 00:29:16,000

Now there is a lot of raw data, but the results from our planes tell the story.

430

00:29:16,000 --> 00:29:21,000

Now all the control baselines are roughly similar, but what's really interesting is the formation fly.

431

00:29:21,000 --> 00:29:27,000

In the Kongalai, the fuel usage went way up by as much as 18%.

432

00:29:27,000 --> 00:29:34,000

In the side-by-side, the fuel usage was pretty much the same as the control, maybe a fraction lower, but not significantly so.

433

00:29:34,000 --> 00:29:36,000

But then there's the beat.

434

00:29:36,000 --> 00:29:43,000

Now both my and Tori's planes saved fuel. We were 5% and 3% more efficient than the baseline.

435

00:29:43,000 --> 00:29:50,000

But interestingly, even Kari's plane, which was the lead plane, saved fuel, which is what studies on birds have also reflected.

436

00:29:50,000 --> 00:29:57,000

And remember that all our tests performed at the same altitude and the same speed, so all our data is good and comparable.

437

00:29:57,000 --> 00:29:59,000

And good data is what it's all about.

438

00:29:59,000 --> 00:30:03,000

Good data. That can only lead to one conclusion.

439

00:30:03,000 --> 00:30:08,000

This myth is confirmed. We saw it work in theory in the water tunnel. We saw it work in practice in the air.

440

00:30:08,000 --> 00:30:15,000

Now 3-5% savings in fuel actually translates to a lot of money if you think about it in the long term.

441

00:30:16,000 --> 00:30:21,000

Flying in a V-formation may save you fuel, but there's a flaw.

442

00:30:21,000 --> 00:30:30,000

Is it really practical that anyone would fly that close realistically? Maybe we should try it again, but this time have our spacing be a little safer.

443

00:30:30,000 --> 00:30:34,000

See if you extend the V out further, if you still get that fuel efficiency.

444

00:30:34,000 --> 00:30:36,000

It'd be a lot safer. Let's try it.

445

00:30:36,000 --> 00:30:40,000

Coming up next, the final flight formation takes wing.

446

00:30:40,000 --> 00:30:42,000

I definitely like science better when it's got a view.

447

00:30:46,000 --> 00:31:04,000

Welcome back. We've been investigating the bomb proof bathtub buddy jump from Leafa Weapon 2 and so far we have actually determined that the techniques used by the bomb squad in that film would give you plenty of time to get from the toilet inside the protection of the bathtub under the bomb blanket.

448

00:31:05,000 --> 00:31:08,000

Nice! That worked beautifully!

449

00:31:08,000 --> 00:31:14,000

Now it's time to figure out if once you're in that bathtub you could actually survive the blast.

450

00:31:14,000 --> 00:31:23,000

Behind me, Jamie is leveling his spot for putting a real coated full-size bathroom in and then we're going to blow it up.

451

00:31:23,000 --> 00:31:28,000

It's the final part of this filmic fable, survivability.

452

00:31:29,000 --> 00:31:37,000

Regarding the Heinemann in his natural habitat and sconce within his protective shell, he nests, creating a home for future Heinemann.

453

00:31:37,000 --> 00:31:42,000

He seems to have noticed us. Don't make a move.

454

00:31:42,000 --> 00:31:44,000

What do you think? Is it level yet?

455

00:31:44,000 --> 00:31:45,000

Not even close.

456

00:31:45,000 --> 00:31:46,000

Okay.

457

00:31:47,000 --> 00:31:55,000

Without interaction went without instant. Just remember, the Heinemann is just as afraid of you as you are of him.

458

00:31:56,000 --> 00:32:00,000

With the ground on the level, it's a simple job of bringing in the floor.

459

00:32:00,000 --> 00:32:01,000

Close enough?

460

00:32:01,000 --> 00:32:02,000

Close enough.

461

00:32:03,000 --> 00:32:09,000

Knocking up the walls and hauling in Buster with the all-important top.

462

00:32:09,000 --> 00:32:11,000

Perfect! Here we go!

463

00:32:14,000 --> 00:32:15,000

Ta-da!

464

00:32:16,000 --> 00:32:18,000

Savage and Heinemann Construction Company.

465

00:32:19,000 --> 00:32:26,000

They're building to code, but just like all of this Buster's construction projects, the ultimate fate is detonation.

466

00:32:27,000 --> 00:32:30,000

Our little disposable outhouse is almost done.

467

00:32:30,000 --> 00:32:32,000

Not quite. I think it needs to go to paint.

468

00:32:32,000 --> 00:32:34,000

Ah, perfect. Let's do it.

469

00:32:35,000 --> 00:32:38,000

You might say it's a bog standard job.

470

00:32:38,000 --> 00:32:44,000

I know. It's the worst painting job ever. If I were hiring me to do this, I'd ask me for my money back.

471

00:32:44,000 --> 00:32:47,000

And once it's complete, they can bring in the can.

472

00:32:49,000 --> 00:32:50,000

Yeah, that feels about right.

473

00:32:50,000 --> 00:32:56,000

With the layout matching the movie, it's time for their experimental apparatus to join the John.

474

00:32:56,000 --> 00:32:59,000

I'm about to drill a hole in this bathtub for our instrumentation.

475

00:32:59,000 --> 00:33:03,000

The technical term for this drill bit is big hunkin' drill bit.

476

00:33:03,000 --> 00:33:07,000

And that makes a big hunking hole in the cast iron.

477

00:33:07,000 --> 00:33:08,000

Here we go.

478

00:33:09,000 --> 00:33:16,000

This here is the plug I just drilled out of the bathtub for our sensing equipment to find out if our dudes would actually survive this blast.

479

00:33:16,000 --> 00:33:20,000

And I noticed something really particular about it, which is it's a lot of cast iron.

480

00:33:20,000 --> 00:33:24,000

A lot of cast iron in the way between our guys and the blast.

481

00:33:24,000 --> 00:33:27,000

And it's kind of at an ideal glancing angle.

482

00:33:27,000 --> 00:33:32,000

I am starting to feel cautiously optimistic that this blast might be survivable.

483

00:33:32,000 --> 00:33:37,000

Adam's optimistic, but to precisely monitor survivability, they've got this.

484

00:33:37,000 --> 00:33:42,000

So I'm going to install this pipe cap right here in the hole at the bottom of the tub.

485

00:33:42,000 --> 00:33:45,000

And inside it are actually our two sensors.

486

00:33:45,000 --> 00:33:52,000

These sensors will give us the pressure readings and let us know whether our movie heroes actually survived the blast in this tub.

487

00:33:53,000 --> 00:33:58,000

And for a comparison, Adam fits a twin set of sensors on the outside of the bath.

488

00:33:58,000 --> 00:34:00,000

Alright, sensors are in.

489

00:34:00,000 --> 00:34:05,000

Then Jamie adds his finishing touches to their bathroom bomb backdrop.

490

00:34:05,000 --> 00:34:09,000

Water is very good at absorbing energy.

491

00:34:09,000 --> 00:34:13,000

Yep, soon it will look like a bomb has hit it.

492

00:34:13,000 --> 00:34:15,000

Come on, boy, are you ready?

493

00:34:17,000 --> 00:34:19,000

Now it looks right.

494

00:34:22,000 --> 00:34:24,000

Is it a bird?

495

00:34:24,000 --> 00:34:25,000

Is it a plane?

496

00:34:25,000 --> 00:34:30,000

No, it's the Mythbusters in planes flying like birds.

497

00:34:30,000 --> 00:34:33,000

I definitely like science better when it's got a view.

498

00:34:33,000 --> 00:34:41,000

With the V formation confirmed, the Mythbusters are taken to the air for their twist on this fuel-efficient formation.

499

00:34:41,000 --> 00:34:44,000

So we are setting up for what we're calling the extended V.

500

00:34:44,000 --> 00:34:47,000

Now this is just like the tight V with one major difference.

501

00:34:47,000 --> 00:34:52,000

Instead of being one plane length away from your leader, you're going to be ten plane lengths away.

502

00:34:52,000 --> 00:34:56,000

Now based on our results in the water channel, we should see some sort of a difference.

503

00:34:56,000 --> 00:34:59,000

We'll see if that translates into practical world.

504

00:34:59,000 --> 00:35:02,000

This is a more real-world scenario.

505

00:35:02,000 --> 00:35:10,000

The tight V is far too dangerous for normal aircraft, but will increasing the distance of the V still benefit fuel efficiency.

506

00:35:10,000 --> 00:35:14,000

We're about 200 feet from the plane in front of us and the plane behind us.

507

00:35:14,000 --> 00:35:17,000

But being this far away, it's hard to find that sweet spot.

508

00:35:17,000 --> 00:35:22,000

With all the squad fad out in their extended positions, the clock starts once more.

509

00:35:22,000 --> 00:35:30,000

Now the interesting thing out here is that even though theoretically you should have the same effect,

510

00:35:30,000 --> 00:35:33,000

I don't feel like we're flying through someone's wing.

511

00:35:33,000 --> 00:35:34,000

It's pretty smooth.

512

00:35:34,000 --> 00:35:38,000

Being in the vortex in the long V formation isn't as noticeable,

513

00:35:38,000 --> 00:35:43,000

but you can still tell the pilots have to make a lot of adjustments to stay here.

514

00:35:43,000 --> 00:35:50,000

It may be, but when it comes to applying it to fleets of passenger jets, this could be a more practical formation.

515

00:35:50,000 --> 00:35:54,000

I'm noticing a little bit more of a variation in the numbers.

516

00:35:54,000 --> 00:35:56,000

They were a lot more consistent with the tight V.

517

00:35:56,000 --> 00:35:59,000

I'm thinking it's a lot harder to stay in that sweet spot when you're in the extended V.

518

00:35:59,000 --> 00:36:00,000

It's harder to find it.

519

00:36:00,000 --> 00:36:06,000

And after ten minutes of data logging, the Mythbusters can bring this myth in for a landing.

520

00:36:06,000 --> 00:36:10,000

And that will include your in-flight entertainment on Mythbuster.

521

00:36:10,000 --> 00:36:15,000

We know you have a choice to travel, so thank you for traveling with Mythbuster.

522

00:36:16,000 --> 00:36:20,000

Alright, extended V formation, how'd you guys do?

523

00:36:20,000 --> 00:36:23,000

Well, you know what? I actually saved fuel.

524

00:36:23,000 --> 00:36:28,000

I mean, even ten airplane lengths back, I was able to benefit from that sweet spot.

525

00:36:28,000 --> 00:36:32,000

Well, in the extended V, I didn't see any savings whatsoever,

526

00:36:32,000 --> 00:36:35,000

but you know, I suspect it's from being all the way at the end of the pack.

527

00:36:35,000 --> 00:36:39,000

It's just so hard to keep compensating and trying to find that sweet spot.

528

00:36:39,000 --> 00:36:42,000

Alright, Kerry, you as the plane in the lead, how did you do?

529

00:36:42,000 --> 00:36:47,000

Well, unlike the really tight V formation, in the loose formation, I did not actually get any savings.

530

00:36:47,000 --> 00:36:51,000

But honestly, I still think this myth is confirmed for the loose V formation,

531

00:36:51,000 --> 00:36:55,000

because if there's even just a little bit of savings for the following planes,

532

00:36:55,000 --> 00:36:58,000

in a large scale, that actually translates to a lot of money.

533

00:36:58,000 --> 00:37:00,000

This might be the way to fly in the future.

534

00:37:00,000 --> 00:37:01,000

It's confirmed.

535

00:37:01,000 --> 00:37:09,000

After the break, is Rub-a-Dum-Dub, will Buster survive in the tub?

536

00:37:09,000 --> 00:37:11,000

What? Wow!

537

00:37:16,000 --> 00:37:20,000

Down on the range, the Mythbusters are prepping for the bathroom boom.

538

00:37:20,000 --> 00:37:24,000

We are almost there, and here's how this experiment is going to play out.

539

00:37:24,000 --> 00:37:27,000

Our bomb will be placed exactly where it is placed in the film,

540

00:37:27,000 --> 00:37:30,000

directly behind the toilet, on the ground.

541

00:37:30,000 --> 00:37:34,000

Buster will be inside the cast iron tub, the exact same geometry as we see in the movie,

542

00:37:34,000 --> 00:37:39,000

and he will be covered by an actual bomb-proof blanket.

543

00:37:39,000 --> 00:37:45,000

Underneath this blanket are two pairs of PCB pressure transducers.

544

00:37:45,000 --> 00:37:49,000

And the signal from the sensors will be coming through wires that go into this pipe

545

00:37:49,000 --> 00:37:52,000

and are buried in the ground for their protection,

546

00:37:52,000 --> 00:37:56,000

and are picked up by this data acquisition center,

547

00:37:56,000 --> 00:37:59,000

which will take a signal and send it through that wire.

548

00:37:59,000 --> 00:38:05,000

And ends up here, where our trustee, David Hardy, will receive those electrical signals as data

549

00:38:05,000 --> 00:38:10,000

and tell us once and for all whether Buster in the tub survived the blast.

550

00:38:10,000 --> 00:38:11,000

Pretty cool, huh?

551

00:38:11,000 --> 00:38:12,000

Pretty cool.

552

00:38:12,000 --> 00:38:17,000

And the very last piece of this lethal weapon myth is the lethal weapon itself.

553

00:38:17,000 --> 00:38:20,000

It might make their outhouse more out than house,

554

00:38:20,000 --> 00:38:24,000

but it's the same amount of C4 as the bomb in the movie.

555

00:38:24,000 --> 00:38:28,000

We are going to try and find out if Buster would survive in that cast iron bathtub

556

00:38:28,000 --> 00:38:30,000

protected by the bomb blanket.

557

00:38:30,000 --> 00:38:36,000

And inside that tub, our PCB pressure transducers are actually going to give us some mighty fine readings.

558

00:38:36,000 --> 00:38:41,000

They should be able to tell us whether Buster's dead or merely severely injured,

559

00:38:41,000 --> 00:38:44,000

or maybe just had his eardrums blown out.

560

00:38:44,000 --> 00:38:47,000

This is the last piece of the mythical puzzle.

561

00:38:47,000 --> 00:38:53,000

Will the bathtub and bomb blanket protect Buster from the blast?

562

00:38:53,000 --> 00:38:58,000

With everything in position, the guys retreat to the bunker for the final countdown.

563

00:38:58,000 --> 00:39:03,000

This is the lethal weapon to bathtub blast.

564

00:39:03,000 --> 00:39:09,000

Charging, ready to go in three, two, one.

565

00:39:11,000 --> 00:39:12,000

Wow.

566

00:39:18,000 --> 00:39:22,000

Oh, look, I can see the tub is still there in one piece.

567

00:39:24,000 --> 00:39:27,000

There's nothing else in it.

568

00:39:27,000 --> 00:39:29,000

No, the room is gone.

569

00:39:29,000 --> 00:39:31,000

It's fully gone.

570

00:39:33,000 --> 00:39:38,000

There's no doubt that one kilo of C4 took out the room.

571

00:39:40,000 --> 00:39:44,000

However, the cast iron bathtub seems to be made of tougher stuff.

572

00:39:45,000 --> 00:39:47,000

The tub is fine.

573

00:39:48,000 --> 00:39:51,000

Our sensors are also intact, which is really nice.

574

00:39:51,000 --> 00:39:53,000

There's no sign of the toilet whatsoever.

575

00:39:53,000 --> 00:39:58,000

Well, I found the toilet seat and the toilet mechanism, but as far as the actual toilet.

576

00:39:58,000 --> 00:40:02,000

Yeah, there's like little bits of ceramic.

577

00:40:03,000 --> 00:40:06,000

Well, so we check with David and see what the data says.

578

00:40:06,000 --> 00:40:09,000

I don't think there's anything else left to do here.

579

00:40:11,000 --> 00:40:12,000

Hey, David.

580

00:40:12,000 --> 00:40:13,000

What do we got?

581

00:40:14,000 --> 00:40:16,000

Well, you can see for yourselves.

582

00:40:17,000 --> 00:40:20,000

The red and the blue curves are the sensors that were outside the tub.

583

00:40:20,000 --> 00:40:23,000

You can clearly right off and see the red line and the blue line.

584

00:40:23,000 --> 00:40:25,000

The pressure spike is really severe.

585

00:40:25,000 --> 00:40:26,000

180 psi.

586

00:40:26,000 --> 00:40:30,000

Am I correct that the green line looks pretty minimal?

587

00:40:30,000 --> 00:40:33,000

The maximum pressure inside the tub was 8 psi.

588

00:40:33,000 --> 00:40:34,000

You're telling me that's survivable.

589

00:40:34,000 --> 00:40:36,000

Very survivable.

590

00:40:37,000 --> 00:40:39,000

No way.

591

00:40:39,000 --> 00:40:41,000

That is crazy.

592

00:40:41,000 --> 00:40:49,000

The difference between the sensors inside the tub and the ones on the outside clearly show that the blast is survivable.

593

00:40:49,000 --> 00:40:53,000

And moreover, would they have had hearing damage?

594

00:40:53,000 --> 00:41:02,000

The threshold for a rupture of the ear drum starts around 5 psi, so there is a chance and according to our research, it's probably going to be between 10 and 15% chance of hearing damage.

595

00:41:02,000 --> 00:41:04,000

It's still pretty low.

596

00:41:04,000 --> 00:41:06,000

That blows my freaking mind.

597

00:41:06,000 --> 00:41:15,000

With only a 10 to 15% chance of hearing damage, it seems that amazingly, this lethal weapon leap is confirmed.

598

00:41:16,000 --> 00:41:26,000

While I'm standing on the only intact part of our bathroom set, the cast iron tub, or as I plan to refer to it from here on in, the bomb proof survival vessel.

599

00:41:26,000 --> 00:41:31,000

Buster here is a living being thanks to the strength of this bathtub.

600

00:41:31,000 --> 00:41:41,000

And even though I predicted that that might actually occur, it doesn't mean I'm completely blown away looking at the damage around me and finding out that it was true.

601

00:41:41,000 --> 00:41:43,000

I am totally astonished.

602

00:41:43,000 --> 00:41:52,000

I mean, first of all, it turns out that liquid nitrogen will slow down the detonation of a bomb and then it turns out that the cast iron tub will totally protect you from the blast when it does go off.

603

00:41:52,000 --> 00:41:56,000

Yeah, how often do we replicate an action sequence and everything turns out to be true?

604

00:41:56,000 --> 00:41:58,000

Everything's confirmed.

605

00:41:58,000 --> 00:41:59,000

Who knew?