

1

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

Remember, do not try anything you are about to see at home.

2

00:00:07,000 --> 00:00:18,000

On this high impact episode of Most Busters, Adam and Jamie go where no boffin has ever

3

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

been.

4

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

I love this myth.

5

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

As they test whether a bullet fired and a bullet dropped simultaneously hit the ground

6

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

at the same time.

7

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

That is science.

8

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

Meanwhile, Carrie, Tori and Grant

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

I can't wait.

10

00:00:35,000 --> 00:00:41,000

Punch, bubbly, and blast their way to another fantastic fable.

11

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

That might knock Busters socks off.

12

00:00:44,000 --> 00:00:49,000

Is it ever possible to literally knock someone's socks off?

13

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

That was awesome!

14

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

Who are the Myth Busters?

15

00:00:56,000 --> 00:00:57,000

Adam Soutage.

16

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

Am I missing an eyebrow?

17

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

And Jamie Heidemann.

18

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

Hey, no guts, no glory.

19

00:01:03,000 --> 00:01:07,000

Between them more than 30 years of special effects experience.

20

00:01:07,000 --> 00:01:10,000

Joining them, Grant Imahara.

21

00:01:10,000 --> 00:01:12,000

For science.

22

00:01:12,000 --> 00:01:14,000

Tori Belleggi.

23

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

We do that again.

24

00:01:15,000 --> 00:01:16,000

And Carrie Byron.

25

00:01:16,000 --> 00:01:18,000

One word for this.

26

00:01:18,000 --> 00:01:19,000

Splash!

27

00:01:19,000 --> 00:01:21,000

They don't just tell the myths.

28

00:01:21,000 --> 00:01:25,000

They put them to the test.

29

00:01:25,000 --> 00:01:29,000

What you got there?

30

00:01:29,000 --> 00:01:31,000

This is a good one.

31

00:01:31,000 --> 00:01:33,000

Picture two bullets.

32

00:01:33,000 --> 00:01:35,000

They're not just bullets.

33

00:01:35,000 --> 00:01:37,000

They're bullets.

34

00:01:37,000 --> 00:01:39,000

They're bullets.

35

00:01:39,000 --> 00:01:41,000

They're bullets.

36

00:01:41,000 --> 00:01:43,000

They're bullets.

37

00:01:43,000 --> 00:01:45,000

They're bullets.

38

00:01:45,000 --> 00:01:47,000

They're bullets.

39

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

This is a good one.

40

00:01:48,000 --> 00:01:49,000

Picture two bullets.

41

00:01:49,000 --> 00:01:52,000

Each exactly the same distance from the ground.

42

00:01:52,000 --> 00:01:54,000

Each released at the exact same second.

43

00:01:54,000 --> 00:01:56,000

Except one bullet is dropped to the ground.

44

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

The other is fired from a gun.

45

00:01:58,000 --> 00:02:00,000

The classic physics thought experiment states

46

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

that both bullets will hit the ground at the same time.

47

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

Based on what theory?

48

00:02:05,000 --> 00:02:07,000

Based on the theory that the bullet that's fired from the gun

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00:02:07,000 --> 00:02:09,000

has no wings on it, no lift.

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00:02:09,000 --> 00:02:12,000

Thus gravity has the same effect on it as it does on the drop bullet.

51

00:02:12,000 --> 00:02:15,000

And thus they hit the ground simultaneously.

52

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

It's an age-old physics fable that says a bullet dropped

53

00:02:18,000 --> 00:02:22,000

and a bullet fired simultaneously from the same height

54

00:02:22,000 --> 00:02:25,000

will hit the ground at the same time.

55

00:02:25,000 --> 00:02:29,000

But it's so darn difficult to test that no one's tried.

56

00:02:29,000 --> 00:02:31,000

Until now.

57

00:02:31,000 --> 00:02:32,000

So what's the plan?

58

00:02:32,000 --> 00:02:35,000

Well, I've been thinking about this one for so long.

59

00:02:35,000 --> 00:02:39,000

While I have seen this experiment elucidated in textbooks to world over,

60

00:02:39,000 --> 00:02:43,000

I don't think that anyone anywhere has ever tried it

61

00:02:43,000 --> 00:02:47,000

full-sized, full-scale with real bullets coming out of real guns.

62

00:02:47,000 --> 00:02:49,000

That's what we should do.

63

00:02:49,000 --> 00:02:51,000

It sounds like it could be kind of tricky actually.

64

00:02:51,000 --> 00:02:53,000

I think we should do some shop experiments

65

00:02:53,000 --> 00:02:55,000

before we start using any live rounds.

66

00:02:55,000 --> 00:02:57,000

Fair enough. Let's start.

67

00:02:57,000 --> 00:03:01,000

So before going ballistic with the ballistics,

68

00:03:01,000 --> 00:03:07,000

Adam comes up with a more simple way to put that textbook theory to the test.

69

00:03:07,000 --> 00:03:10,000

Well, this test is going to be comprised of two separate parts.

70

00:03:10,000 --> 00:03:12,000

And I am using a bullet of sorts.

71

00:03:12,000 --> 00:03:17,000

You may recognize the steel ball bearing as some of our ammunition from Steam Machine Gun.

72

00:03:19,000 --> 00:03:21,000

Part the first.

73

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

I'll be dropping this ball bearing from exactly table height,

74

00:03:24,000 --> 00:03:26,000

handily marked by this green line right here.

75

00:03:26,000 --> 00:03:29,000

I'll be filming its drop on a high-speed camera

76

00:03:29,000 --> 00:03:32,000

and counting how long it takes to get to the ground.

77

00:03:32,000 --> 00:03:34,000

Part the second.

78

00:03:34,000 --> 00:03:38,000

I'll be shooting this ball bearing from my little pinball shooter here,

79

00:03:38,000 --> 00:03:40,000

which I've marked out to be really accurate every time I shoot it.

80

00:03:40,000 --> 00:03:43,000

And I'm going to fire it across the same grid

81

00:03:43,000 --> 00:03:48,000

and measure how long it takes to reach the floor on the same high-speed camera.

82

00:03:48,000 --> 00:03:52,000

If this myth is true, those two times should be identical.

83

00:03:52,000 --> 00:03:54,000

Okay, here we go.

84

00:03:54,000 --> 00:03:57,000

This is the drop from table height.

85

00:03:57,000 --> 00:04:00,000

And three, two, one.

86

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

Pretty simple.

87

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

Couldn't be simpler.

88

00:04:06,000 --> 00:04:09,000

But there's a lot more to this test than meets the eye.

89

00:04:09,000 --> 00:04:12,000

Counting the frames of the high-speed shot,

90

00:04:12,000 --> 00:04:15,000

the marble took exactly 201 frames to get from my hand to the ground.

91

00:04:15,000 --> 00:04:17,000

And because we were filming at 500 frames per second,

92

00:04:17,000 --> 00:04:19,000

each frame is 2 milliseconds,

93

00:04:19,000 --> 00:04:22,000

which means that the total travel was 402 milliseconds.

94

00:04:22,000 --> 00:04:24,000

Or for those of you who love fractions,

95

00:04:24,000 --> 00:04:26,000

and come on, who doesn't?

96

00:04:26,000 --> 00:04:29,000

4.02 tenths of a second.

97

00:04:29,000 --> 00:04:31,000

So, 4.02 is the benchmark.

98

00:04:31,000 --> 00:04:34,000

Now, how will the fired ball stack up?

99

00:04:34,000 --> 00:04:36,000

High-speed ready?

100

00:04:36,000 --> 00:04:38,000

Time for some pinball wizardry.

101

00:04:38,000 --> 00:04:40,000

Here we go. Pinball shooter.

102

00:04:40,000 --> 00:04:43,000

And three, two, one.

103

00:04:44,000 --> 00:04:47,000

And the results are flipping fabulous.

104

00:04:47,000 --> 00:04:49,000

What do you got?

105

00:04:49,000 --> 00:04:51,000

It's actually pretty cool.

106

00:04:51,000 --> 00:04:54,000

When I drop the ball from table height,

107

00:04:54,000 --> 00:04:57,000

it takes 402 milliseconds to reach the ground.

108

00:04:57,000 --> 00:05:00,000

When I shoot it from this pinball shooter,

109

00:05:00,000 --> 00:05:03,000

410 milliseconds to reach the ground.

110

00:05:03,000 --> 00:05:05,000

It's 8 tenths of 1% difference.

111

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

That's pretty much identical.

112

00:05:07,000 --> 00:05:09,000

With less than 1% difference,

113

00:05:09,000 --> 00:05:11,000

that's a pretty powerful result.

114

00:05:11,000 --> 00:05:13,000

Add a provisional thumbs up for the myth.

115

00:05:13,000 --> 00:05:16,000

But Jamie's not impressed.

116

00:05:17,000 --> 00:05:21,000

Okay, but I thought the story was about guns.

117

00:05:21,000 --> 00:05:23,000

You really want to get to shooting guns?

118

00:05:23,000 --> 00:05:26,000

Well, yeah.

119

00:05:27,000 --> 00:05:32,000

The next myth in the bag.

120

00:05:32,000 --> 00:05:35,000

Check this out.

121

00:05:35,000 --> 00:05:37,000

What's with your dirty laundry?

122

00:05:37,000 --> 00:05:39,000

It's not mine. It's theirs.

123

00:05:39,000 --> 00:05:41,000

Remember we asked the fans to send us their socks?

124

00:05:41,000 --> 00:05:43,000

Yeah, exactly. The fans wanted to know

125

00:05:43,000 --> 00:05:45,000

what happens to their missing socks in the laundry.

126

00:05:45,000 --> 00:05:47,000

Well, yes, that was the original idea,

127

00:05:47,000 --> 00:05:50,000

but I think we're going to have to make a little bit of a difference.

128

00:05:50,000 --> 00:05:53,000

I think we're going to have to make a little bit of a difference.

129

00:05:53,000 --> 00:05:55,000

What's the difference between the socks and the laundry?

130

00:05:55,000 --> 00:05:57,000

Well, yes, that was the original idea,

131

00:05:57,000 --> 00:05:59,000

but I think we're going to have to make a little

132

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

last-minute change here.

133

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

Alright, so what's the change?

134

00:06:01,000 --> 00:06:02,000

We'll check this out.

135

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

Dear Mythbusters, here's some socks of mine,

136

00:06:05,000 --> 00:06:07,000

but rather than the washing tests,

137

00:06:07,000 --> 00:06:09,000

can you use them to test the phrase,

138

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

it knocked my socks off.

139

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

I like it.

140

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

Yeah, take a look.

141

00:06:14,000 --> 00:06:16,000

A lot of these letters say the same thing.

142

00:06:16,000 --> 00:06:18,000

They want us to test that phrase.

143

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

Well, if the fans want us to test the knock your socks off idiom,

144

00:06:21,000 --> 00:06:22,000

that sounds good to me.

145

00:06:23,000 --> 00:06:26,000

This Socket to a M saga comes from the world of boxing.

146

00:06:26,000 --> 00:06:30,000

When a particularly powerful pugilist was said to be so strong,

147

00:06:30,000 --> 00:06:33,000

he could knock someone clean out of their socks.

148

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

But is it really possible?

149

00:06:37,000 --> 00:06:38,000

Alright, knocking your socks off.

150

00:06:38,000 --> 00:06:40,000

I mean, this is a weird one, but I like it.

151

00:06:40,000 --> 00:06:41,000

What's the plan?

152

00:06:41,000 --> 00:06:43,000

Well, since this idiom has its roots in boxing,

153

00:06:43,000 --> 00:06:46,000

I think we definitely need to start with some sort of heavy impact punch.

154

00:06:46,000 --> 00:06:48,000

And that pretty much rules any of us out.

155

00:06:48,000 --> 00:06:50,000

Okay, I got an idea.

156

00:06:50,000 --> 00:06:52,000

Let's get the nitrogen cannon from the superhero special.

157

00:06:52,000 --> 00:06:54,000

But instead of firing a grappling hook,

158

00:06:54,000 --> 00:06:56,000

we reconfigure it to fire a fist,

159

00:06:56,000 --> 00:06:59,000

giving Buster the biggest uppercut of his life.

160

00:06:59,000 --> 00:07:01,000

Well, you know what it sounds like to me?

161

00:07:01,000 --> 00:07:03,000

It's time for the main event.

162

00:07:03,000 --> 00:07:05,000

What are your corners?

163

00:07:08,000 --> 00:07:10,000

In a long line of lethal inventions,

164

00:07:10,000 --> 00:07:14,000

Grant says this is one of the most dangerous he's ever built.

165

00:07:14,000 --> 00:07:17,000

But will it do the job on Buster?

166

00:07:17,000 --> 00:07:20,000

So, to deliver the kind of punch that might knock Buster's socks off,

167

00:07:20,000 --> 00:07:22,000

I've taken this out of retirement.

168

00:07:22,000 --> 00:07:25,000

It's our nitrogen cannon from the superhero special.

169

00:07:25,000 --> 00:07:28,000

We've fired a grappling hook to try and turn the Batmobile

170

00:07:28,000 --> 00:07:30,000

around a 90-degree corner.

171

00:07:30,000 --> 00:07:31,000

We hit it!

172

00:07:31,000 --> 00:07:34,000

And today, Grant is modifying the cannon

173

00:07:34,000 --> 00:07:37,000

to blast a killer punch to Buster's jaw,

174

00:07:37,000 --> 00:07:41,000

while Tori's turning out the all-important fist.

175

00:07:42,000 --> 00:07:44,000

So, what I have here is a solid steel rod

176

00:07:44,000 --> 00:07:46,000

that's going to go into the cannon.

177

00:07:46,000 --> 00:07:48,000

On the end of it, I'm going to attach a rubber fist.

178

00:07:48,000 --> 00:07:50,000

So, I'm going to be using a high-density,

179

00:07:50,000 --> 00:07:52,000

high-impact resistant rubber.

180

00:07:52,000 --> 00:07:55,000

I'll be able to weld it to the punching rod,

181

00:07:55,000 --> 00:07:57,000

stick it into Grant's cannon,

182

00:07:57,000 --> 00:07:59,000

fire it up at Buster's jaw,

183

00:07:59,000 --> 00:08:01,000

and see if we can knock his socks off.

184

00:08:01,000 --> 00:08:04,000

But even before the fists start flying,

185

00:08:04,000 --> 00:08:07,000

Carrie's worried about collateral damage.

186

00:08:07,000 --> 00:08:10,000

Last time we tested Grant's nitrogen cannon,

187

00:08:10,000 --> 00:08:13,000

we shot a hole through our wall and into our neighbor's space.

188

00:08:13,000 --> 00:08:15,000

I might have to go have a chat with them.

189

00:08:15,000 --> 00:08:19,000

So, we thought, hey, maybe this time, a few safety measures.

190

00:08:19,000 --> 00:08:22,000

And after a couple of mattresses are roosted in the roof,

191

00:08:22,000 --> 00:08:25,000

the scene is set for round one of this myth.

192

00:08:26,000 --> 00:08:29,000

Right, pal. This is your big chance.

193

00:08:29,000 --> 00:08:31,000

Don't blow it.

194

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

Previous research says that a heavyweight boxer

195

00:08:34,000 --> 00:08:37,000

can pack a punch of 4,000 Newtons.

196

00:08:38,000 --> 00:08:40,000

Pressurizing.

197

00:08:40,000 --> 00:08:42,000

So, to match that kind of power,

198

00:08:42,000 --> 00:08:47,000

Grant primes up his pride and joy for the knock your socks off rumble.

199

00:08:47,000 --> 00:08:48,000

Okay.

200

00:08:48,000 --> 00:08:51,000

Knock him out of his socks?

201

00:08:51,000 --> 00:08:54,000

I think that this is actually just powerful enough

202

00:08:54,000 --> 00:08:57,000

to make that old boxing adage true.

203

00:08:57,000 --> 00:09:00,000

But Grant ain't convinced.

204

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

I think that no matter how high we go at this cannon,

205

00:09:03,000 --> 00:09:07,000

no matter if we go through his head and punch a hole in the ceiling,

206

00:09:07,000 --> 00:09:10,000

none of that is going to be capable of knocking his socks off.

207

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

I just think that there's too much body.

208

00:09:13,000 --> 00:09:16,000

You know, we're talking about a punch to the chin.

209

00:09:16,000 --> 00:09:19,000

To get that to translate all the way down to his shoes

210

00:09:19,000 --> 00:09:21,000

and kick out and blow his socks off?

211

00:09:21,000 --> 00:09:22,000

No way.

212

00:09:22,000 --> 00:09:26,000

Let's not pull any more punches and get this show on the road.

213

00:09:27,000 --> 00:09:28,000

Here we go.

214

00:09:28,000 --> 00:09:31,000

Three, two, one.

215

00:09:40,000 --> 00:09:42,000

Oh-ho!

216

00:09:43,000 --> 00:09:46,000

500 psi was really intense.

217

00:09:46,000 --> 00:09:48,000

Yeah, we took out the lights.

218

00:09:48,000 --> 00:09:50,000

Woo!

219

00:09:51,000 --> 00:09:53,000

That was some punch.

220

00:09:53,000 --> 00:09:55,000

But it's clear that amidst the carnage,

221

00:09:55,000 --> 00:09:57,000

Buster's socks stayed put.

222

00:09:57,000 --> 00:10:00,000

But only just.

223

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

Whoa!

224

00:10:01,000 --> 00:10:02,000

Take a look at this.

225

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

Look, look, it, they'd suck slightly got dragged off.

226

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

Now that's what I call taking it on the chin.

227

00:10:09,000 --> 00:10:12,000

The punch not only sent Buster barreling backwards,

228

00:10:12,000 --> 00:10:14,000

it ripped off one of his shoes,

229

00:10:14,000 --> 00:10:16,000

partially dragging a sock with it.

230

00:10:16,000 --> 00:10:19,000

But it's not enough to call the myth a winner.

231

00:10:20,000 --> 00:10:22,000

So according to the high-speed footage,

232

00:10:22,000 --> 00:10:28,000

the Nitro Punch accelerated the fist to a final speed of 22.2 meters per second,

233

00:10:28,000 --> 00:10:32,000

giving us an overall force of over 6,000 Newtons,

234

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

which is 50% more than your heavyweight prize fighters' best punch.

235

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

And even at superhuman punching strength,

236

00:10:40,000 --> 00:10:44,000

it still wasn't enough to knock Buster's socks off.

237

00:10:44,000 --> 00:10:45,000

But you know what?

238

00:10:45,000 --> 00:10:49,000

The cannon's reputation is still intact.

239

00:10:50,000 --> 00:10:52,000

Now, I'm not saying that this is busted.

240

00:10:52,000 --> 00:10:55,000

All I'm saying is right now it's not looking good for the myth.

241

00:10:55,000 --> 00:10:58,000

But let's say it wasn't a boxer that knocked the person's socks off.

242

00:10:58,000 --> 00:11:00,000

Maybe it was something bigger with more power.

243

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

Sorry, Buster, we're gonna have to wake you up.

244

00:11:02,000 --> 00:11:04,000

We got more experimenting to do.

245

00:11:04,000 --> 00:11:05,000

Get up, buddy.

246

00:11:05,000 --> 00:11:10,000

Coming up, have Adam and Jamie drawn a blank on this one?

247

00:11:10,000 --> 00:11:12,000

This is a conundrum.

248

00:11:12,000 --> 00:11:14,000

Our experiments contradict each other.

249

00:11:14,000 --> 00:11:19,000

And later, Carrie, Tori and Grant ram up the power.

250

00:11:20,000 --> 00:11:22,000

That might knock Buster's socks off.

251

00:11:32,000 --> 00:11:34,000

Bullet Belloni or Physics Fact.

252

00:11:34,000 --> 00:11:38,000

This test is so hard, no one's ever dared try it.

253

00:11:38,000 --> 00:11:43,000

Does a bullet fired and a bullet dropped simultaneously from the same height

254

00:11:43,000 --> 00:11:46,000

hit the ground at the same time?

255

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

Before breaking out the real bullets,

256

00:11:50,000 --> 00:11:53,000

Adam's letting loose with something a little more manageable.

257

00:11:56,000 --> 00:11:57,000

A paintball gun.

258

00:11:58,000 --> 00:11:59,000

Perfect.

259

00:11:59,000 --> 00:12:02,000

We've mounted this paintball gun so that not only is it perfectly level,

260

00:12:02,000 --> 00:12:04,000

but soon backs of the paintballs will actually hit the ground

261

00:12:04,000 --> 00:12:06,000

before they hit the end of the shop.

262

00:12:06,000 --> 00:12:09,000

This should allow us to do some perfect comparisons

263

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

between a fired projectile and a dropped projectile.

264

00:12:16,000 --> 00:12:18,000

If I fire a paintball gun from this gun

265

00:12:18,000 --> 00:12:20,000

and catch a shot of it on the high speed camera at the other end of the shop,

266

00:12:20,000 --> 00:12:23,000

hitting the ground, how do I know exactly when it left the gun?

267

00:12:23,000 --> 00:12:24,000

I'll tell you how.

268

00:12:24,000 --> 00:12:27,000

I've got a switch hooked up right here to the trigger of this gun.

269

00:12:27,000 --> 00:12:31,000

When I pull it, this battery powers an LED down there,

270

00:12:31,000 --> 00:12:33,000

and it's hooked up to our high speed camera.

271

00:12:33,000 --> 00:12:34,000

Alright, here we go.

272

00:12:34,000 --> 00:12:38,000

So without further ado, Adam does the fire test.

273

00:12:41,000 --> 00:12:44,000

The high speed records the moment the light comes on,

274

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

and the paintball hitting the ground.

275

00:12:46,000 --> 00:12:49,000

Look at how beautiful that is.

276

00:12:49,000 --> 00:12:54,000

Making it possible to precisely time how long the journey from gun to ground takes,

277

00:12:54,000 --> 00:12:59,000

which, for this test, is exactly 555 milliseconds.

278

00:13:02,000 --> 00:13:03,000

That is science.

279

00:13:07,000 --> 00:13:11,000

So I'm just about to hold this paintball up at exactly the level of the barrel.

280

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

I'm going to use a laser level to help me know it.

281

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

Film it on high speed and time exactly how long it takes to get from my fingers to the ground.

282

00:13:18,000 --> 00:13:21,000

I will then compare that time to the fired paintball.

283

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

Paintball drop test in three, two, one.

284

00:13:26,000 --> 00:13:33,000

This time the difference between the fired and dropped paintball is 59 milliseconds.

285

00:13:35,000 --> 00:13:40,000

A lot more than the 8 millisecond gap between the fired and dropped ball bearing,

286

00:13:41,000 --> 00:13:44,000

which has the mythbusters scratching their heads.

287

00:13:45,000 --> 00:13:46,000

Well, this is a conundrum.

288

00:13:46,000 --> 00:13:50,000

Our first two experiments seem to contradict each other.

289

00:13:50,000 --> 00:13:54,000

However, I think the culprit lies in the paintballs themselves.

290

00:13:54,000 --> 00:13:55,000

Watch this.

291

00:13:58,000 --> 00:13:59,000

See those trajectories?

292

00:13:59,000 --> 00:14:00,000

Each one's different.

293

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

They're curving.

294

00:14:01,000 --> 00:14:06,000

That tells me that the irregular surfaces of the paintballs, manufacturing vagaries,

295

00:14:06,000 --> 00:14:11,000

is causing these things to have aerodynamic artifacts that makes them inaccurate.

296

00:14:11,000 --> 00:14:15,000

And thus, I think, renders the paintball test invalid.

297

00:14:15,000 --> 00:14:20,000

I don't see anywhere to go with this except to start using real bullets and soon.

298

00:14:25,000 --> 00:14:29,000

Carrie, Tori and Grant are trying to literally knock someone's socks off.

299

00:14:32,000 --> 00:14:35,000

A KO to the kisser put Buster down for the count.

300

00:14:36,000 --> 00:14:38,000

And just about totaled the workshop.

301

00:14:39,000 --> 00:14:41,000

We knocked Buster out.

302

00:14:42,000 --> 00:14:46,000

So now the team is ramping up outdoors with more power.

303

00:14:47,000 --> 00:14:49,000

Look at the size of this thing.

304

00:14:50,000 --> 00:14:52,000

Buster is going to be hating it.

305

00:14:52,000 --> 00:14:59,000

More power means more force and possibly a greater chance of knocking off Buster's socks.

306

00:15:00,000 --> 00:15:03,000

This is a gravitational potential energy pendulum.

307

00:15:03,000 --> 00:15:06,000

Normally, it's used for testing highway safety barriers.

308

00:15:06,000 --> 00:15:09,000

But today, it's going to be our battering ram.

309

00:15:09,000 --> 00:15:12,000

We're going to use it to try and knock Buster's socks off.

310

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

But before Buster gets put in the firing line...

311

00:15:16,000 --> 00:15:17,000

You can get off the brake now.

312

00:15:18,000 --> 00:15:19,000

No brakes.

313

00:15:20,000 --> 00:15:24,000

The team wants to see how powerful the pendulum of destruction is.

314

00:15:26,000 --> 00:15:27,000

Can't wait.

315

00:15:27,000 --> 00:15:28,000

Here we go.

316

00:15:28,000 --> 00:15:32,000

In three, two, one.

317

00:15:32,000 --> 00:15:33,000

One.

318

00:15:47,000 --> 00:15:49,000

That might knock Buster's socks off.

319

00:15:49,000 --> 00:15:50,000

Come on, let's see.

320

00:15:52,000 --> 00:15:56,000

Although the pendulum's impact is actually slower than the flying fist,

321

00:15:56,000 --> 00:15:58,000

because its mass is so much greater,

322

00:15:58,000 --> 00:16:03,000

it's able to deliver over 20 times the force of the nitro cannon.

323

00:16:03,000 --> 00:16:05,000

That's one hell of a punch.

324

00:16:06,000 --> 00:16:07,000

Look at that.

325

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

I mean, this was enough to lift this van and shift it back about four or five feet.

326

00:16:15,000 --> 00:16:18,000

Which in a crack nutshell is not good news for Buster.

327

00:16:20,000 --> 00:16:21,000

I think we're ready.

328

00:16:21,000 --> 00:16:22,000

Coming up.

329

00:16:22,000 --> 00:16:25,000

Adam and Jamie blaze a trail towards physics glory.

330

00:16:27,000 --> 00:16:29,000

That looks like we might have hit it.

331

00:16:29,000 --> 00:16:35,000

And Carrie, Tori and Grant make another bruising bid to knock Buster's socks off.

332

00:16:35,000 --> 00:16:37,000

Shoes are still there.

333

00:16:37,000 --> 00:16:39,000

Yeah, but let's see about the socks.

334

00:16:47,000 --> 00:16:54,000

So far, testing whether a slug fired and a slug dropped simultaneously hit the ground at the same time...

335

00:16:54,000 --> 00:16:56,000

Oh, a little too powerful.

336

00:16:56,000 --> 00:16:58,000

...has been a mixed bag for Adam and Jamie.

337

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

Perfect.

338

00:17:00,000 --> 00:17:08,000

In two small-scale tests, the myth was falling towards confirmed in one that's pretty much identical,

339

00:17:08,000 --> 00:17:10,000

but busted in the other.

340

00:17:10,000 --> 00:17:12,000

So what now?

341

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

We got to go full-scale with bullets, but dude, how difficult is that going to be?

342

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

I mean, for starters, I don't know how far a bullet fired level from a gun even goes.

343

00:17:22,000 --> 00:17:25,000

Well, why don't we try a .45 caliber pistol?

344

00:17:25,000 --> 00:17:27,000

I mean, that has a large, slow-moving round.

345

00:17:27,000 --> 00:17:29,000

And head out to the range and see where it hits the ground.

346

00:17:29,000 --> 00:17:30,000

Exactly.

347

00:17:30,000 --> 00:17:31,000

Perfect. Let's do it.

348

00:17:32,000 --> 00:17:38,000

And the shooting range is the perfect place to get the low-down on launching bullets.

349

00:17:38,000 --> 00:17:40,000

We're looking for a couple of different things here.

350

00:17:40,000 --> 00:17:45,000

The first is that we need to have all the bullets coming out of the gun consistently,

351

00:17:45,000 --> 00:17:48,000

so we know we're collecting accurate data.

352

00:17:48,000 --> 00:17:49,000

That's perfect.

353

00:17:49,000 --> 00:17:53,000

The second one is we're wanting to find out how they're dropping,

354

00:17:53,000 --> 00:17:58,000

how far away from that gun they travel before they hit the ground.

355

00:17:58,000 --> 00:18:06,000

And before the boys blaze away, they're rigging the gun rigid and level, exactly 36 inches off the ground.

356

00:18:06,000 --> 00:18:08,000

Nice. I think we're ready.

357

00:18:08,000 --> 00:18:14,000

The reason we've gone level is that I'm only interested in gravity's effect on the bullet once it leaves the gun.

358

00:18:14,000 --> 00:18:19,000

If I am the gun higher, that bullet will go farther, but it's going farther because of its trajectory.

359

00:18:19,000 --> 00:18:22,000

If I shoot it level, then it starts dropping.

360

00:18:22,000 --> 00:18:24,000

Gravity starts having effect the moment it leaves the barrel.

361

00:18:24,000 --> 00:18:26,000

And that's what I'm interested in.

362

00:18:26,000 --> 00:18:28,000

How fast does it drop and how far does it go?

363

00:18:30,000 --> 00:18:31,000

Gun the side.

364

00:18:31,000 --> 00:18:35,000

Right now, the guys have no idea where the bullet will land.

365

00:18:35,000 --> 00:18:46,000

So Adam and Jamie test to see how far the bullet falls over 100, 200, and 300 feet.

366

00:18:50,000 --> 00:18:53,000

That one was half an inch above the other one. Let's go take a look.

367

00:18:53,000 --> 00:18:54,000

Okay.

368

00:18:54,000 --> 00:18:59,000

What we've got so far in terms of data is actually pretty freaking cool.

369

00:18:59,000 --> 00:19:02,000

This orange line represents the bullet at 100 feet.

370

00:19:02,000 --> 00:19:07,000

The laser sight was aimed just about an inch higher than that, which is just what we'd expect to

see.

371

00:19:07,000 --> 00:19:11,000

A very little amount of drop off. 200 feet. A little more drop off.

372

00:19:11,000 --> 00:19:14,000

300 feet. That blue line, a lot more drop off.

373

00:19:14,000 --> 00:19:25,000

Armed with that info, Adam and Jamie can now zero in on the drop zone, which they've calculated to be between 350 and 370 feet away.

374

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

This right here is a runway. It's a runway for our little bullet to land on.

375

00:19:32,000 --> 00:19:37,000

I expect to be able to see where they land by the marks they make on this white paper.

376

00:19:37,000 --> 00:19:41,000

And hopefully, where they land is a reasonably discreet space.

377

00:19:42,000 --> 00:19:47,000

Firing in 3, 2, 1.

378

00:19:50,000 --> 00:19:53,000

Oh, that looks like we might have hit it.

379

00:19:53,000 --> 00:20:03,000

And after letting loose one more time, Adam and Jamie discover the bullets are biting the dust roughly 360 feet from the gun.

380

00:20:05,000 --> 00:20:07,000

I think we got what we came for.

381

00:20:08,000 --> 00:20:12,000

We've been able to predict fairly consistently where the bullets are hitting the ground.

382

00:20:12,000 --> 00:20:17,000

But the problem is we're outside. We could get a breeze that might kind of skew the results.

383

00:20:17,000 --> 00:20:22,000

And also, and this is the most important thing, the ground here is really uneven.

384

00:20:22,000 --> 00:20:27,000

So to go forward from here, we need a perfectly flat surface to work off of.

385

00:20:27,000 --> 00:20:31,000

Well, all we need now is 400 feet of flat floor.

386

00:20:31,000 --> 00:20:34,000

I think I might be able to handle that.

387

00:20:40,000 --> 00:20:45,000

Carri Tori and Grant are busting Buster's chops, trying to knock him out of his socks.

388

00:20:46,000 --> 00:20:48,000

Yeah, we took out the lights!

389

00:20:49,000 --> 00:20:55,000

Now they're winding the carnage up a notch at a car-clobbering crash test station.

390

00:20:55,000 --> 00:20:59,000

And these guys know how to wreck stuff. They smashed our moose.

391

00:21:00,000 --> 00:21:02,000

They smashed our trailer.

392

00:21:03,000 --> 00:21:05,000

And they smashed our fruit stand.

393

00:21:07,000 --> 00:21:09,000

Now they're going to smash Buster.

394

00:21:10,000 --> 00:21:14,000

So while the team dresses Buster in a pair of everyday shoes and socks.

395

00:21:14,000 --> 00:21:19,000

By the way, thanks to Andrew Parris of Houston, Texas, for letting us use his socks.

396

00:21:20,000 --> 00:21:26,000

And knocked out of Andrew's socks or not, it's clear that Buster's in for a torrent time.

397

00:21:28,000 --> 00:21:34,000

This is Knock Your Socks Off Experiment. Buster in shoes and socks versus battering ram.

398

00:21:34,000 --> 00:21:36,000

In three, two, one.

399

00:21:36,000 --> 00:21:37,000

One.

400

00:21:43,000 --> 00:21:45,000

His shoes didn't come off at all.

401

00:21:45,000 --> 00:21:46,000

Let's see if they loosened it all.

402

00:21:46,000 --> 00:21:48,000

That's a pretty massive hit.

403

00:21:48,000 --> 00:21:50,000

Dang, that looked like it hurt.

404

00:21:50,000 --> 00:21:52,000

Yep, that's a definite ouch.

405

00:21:52,000 --> 00:21:58,000

Buster just got walloped with 17,000 pounds of body-breaking force.

406

00:21:58,000 --> 00:22:00,000

But did his footwear fly?

407

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

Not this time.

408

00:22:03,000 --> 00:22:05,000

Look at that. They're not even loose.

409

00:22:05,000 --> 00:22:07,000

I bet his joints are looser than his shoes.

410

00:22:08,000 --> 00:22:10,000

We just dropped a pendulum that weighs almost a ton.

411

00:22:10,000 --> 00:22:13,000

Straight into Buster's chest and knocked it back 40 feet.

412

00:22:13,000 --> 00:22:16,000

But we were still unable to knock off his shoes or his socks.

413

00:22:16,000 --> 00:22:18,000

But we're not done yet.

414

00:22:18,000 --> 00:22:21,000

Seeing on the last test, these shoes stayed on.

415

00:22:21,000 --> 00:22:24,000

But what if he just got his socks?

416

00:22:24,000 --> 00:22:26,000

Maybe the shoes are holding the socks on.

417

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

So with Buster's feet supporting his own weight, the pendulum is once again lifted to full height.

418

00:22:32,000 --> 00:22:35,000

For full knock your socks off power.

419

00:22:36,000 --> 00:22:38,000

Okay, here we go.

420

00:22:38,000 --> 00:22:42,000

This is Buster with socks only versus a pendulum.

421

00:22:42,000 --> 00:22:45,000

In three, two, one.

422

00:22:54,000 --> 00:22:55,000

Yeah!

423

00:22:55,000 --> 00:22:57,000

His head came off.

424

00:22:57,000 --> 00:23:00,000

But look, one of his socks is knocked almost completely off.

425

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

Yeah, but still technically on.

426

00:23:02,000 --> 00:23:05,000

Yeah, he didn't get knocked out of them necessarily.

427

00:23:05,000 --> 00:23:07,000

Oh, you guys are so hard to satisfy.

428

00:23:08,000 --> 00:23:13,000

Maybe Carrie should take a look at the high speed before she gets carried away.

429

00:23:15,000 --> 00:23:17,000

Here comes the pendulum.

430

00:23:19,000 --> 00:23:25,000

That's good. That's feet go straight back, but his socks haven't come off yet.

431

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

Still on.

432

00:23:27,000 --> 00:23:29,000

Oh, there it is.

433

00:23:29,000 --> 00:23:31,000

It's dragging along the ground.

434

00:23:31,000 --> 00:23:33,000

It's not knocking him out of his socks.

435

00:23:33,000 --> 00:23:35,000

Okay, so that doesn't count.

436

00:23:35,000 --> 00:23:36,000

No.

437

00:23:36,000 --> 00:23:41,000

Confirming this myth is turning out to be as tough as Buster's stay put socks.

438

00:23:43,000 --> 00:23:45,000

Yeah, but we can't bust this now.

439

00:23:45,000 --> 00:23:47,000

I mean, I don't think we've tried hard enough to knock him out of his socks.

440

00:23:47,000 --> 00:23:51,000

No, I think we need a new technique, something a little bit more.

441

00:23:51,000 --> 00:23:54,000

Or in other words, this ain't over till it's over.

442

00:23:54,000 --> 00:23:55,000

Good work, buddy.

443

00:23:55,000 --> 00:23:59,000

And the myth busters are going in search of more power.

444

00:24:00,000 --> 00:24:04,000

Next, the team go all out on the explosives.

445

00:24:04,000 --> 00:24:07,000

That oughta knock some socks off.

446

00:24:07,000 --> 00:24:12,000

And later, Adam and Jamie get on target for a world first.

447

00:24:13,000 --> 00:24:15,000

Dude, I'd say that is absolutely perfect.

448

00:24:15,000 --> 00:24:16,000

Works for me.

449

00:24:19,000 --> 00:24:22,000

Please do not try what we do on this show at home.

450

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

We're what you call experts.

451

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

It's safer that way.

452

00:24:31,000 --> 00:24:32,000

Socks.

453

00:24:32,000 --> 00:24:35,000

Sometimes they just seem to have a mind of their own.

454

00:24:35,000 --> 00:24:38,000

But can they ever be knocked off your feet?

455

00:24:38,000 --> 00:24:42,000

Okay, so far Buster's lost a shoe, but no socks.

456

00:24:42,000 --> 00:24:44,000

Yeah, the impact doesn't seem to be working out.

457

00:24:44,000 --> 00:24:48,000

It seems like you're going to need a massive amount of force to get those socks off.

458

00:24:48,000 --> 00:24:51,000

I think you're right, and I think I have just the thing.

459

00:24:51,000 --> 00:24:52,000

What?

460

00:24:52,000 --> 00:24:53,000

Explosives.

461

00:24:53,000 --> 00:24:54,000

Surprise.

462

00:24:54,000 --> 00:24:55,000

You can see that one coming.

463

00:24:55,000 --> 00:24:56,000

Seriously?

464

00:24:56,000 --> 00:25:01,000

Yeah, there have been cases of people getting their clothes blown off from an explosion,

465

00:25:01,000 --> 00:25:02,000

yet they survived the blast.

466

00:25:02,000 --> 00:25:04,000

So socks are closed.

467

00:25:04,000 --> 00:25:05,000

I say we test this one.

468

00:25:05,000 --> 00:25:10,000

Okay, well, let's go to the quarry and take, say, like, I don't know, 500 pounds of explosives.

469

00:25:10,000 --> 00:25:11,000

I like 500.

470

00:25:11,000 --> 00:25:16,000

Get some mannequin legs, put some socks on them, and then we'll put them at different distances from the center of the blast.

471

00:25:16,000 --> 00:25:17,000

Round three.

472

00:25:17,000 --> 00:25:20,000

Knock your socks off with an explosive shockwave.

473

00:25:20,000 --> 00:25:23,000

And you couldn't have picked a nicer day for it.

474

00:25:23,000 --> 00:25:24,000

Wow.

475

00:25:24,000 --> 00:25:30,000

Oh my gosh, this is awesome.

476

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

The mannequin legs are going to be screwed onto these stands.

477

00:25:34,000 --> 00:25:41,000

Then position on a circular grid at various distances from the explosion.

478

00:25:41,000 --> 00:25:43,000

This is the blast center.

479

00:25:43,000 --> 00:25:47,000

This is where we're going to be setting off a 500 pound explosion.

480

00:25:47,000 --> 00:25:51,000

Hopefully that blast will give us enough power to knock off the socks.

481

00:25:51,000 --> 00:26:01,000

Now we're going to put our first set of legs 15 feet away from the blast, then 25 feet, 35 feet, 45 feet, and finally, 55 feet away.

482

00:26:01,000 --> 00:26:06,000

This way we have a variety of distances from the blast, because the closer you are to the blast,

483

00:26:06,000 --> 00:26:09,000

probably the more likely that your socks are going to get knocked off.

484

00:26:09,000 --> 00:26:14,000

But let's face it, if you're standing too close to the blast, I'm sure you're going to lose more than just your socks.

485

00:26:15,000 --> 00:26:21,000

Which is why the team are now adding and living to tell the tale to the knock your socks off myth.

486

00:26:21,000 --> 00:26:26,000

So in addition to knocking your socks off, a big part of this myth is survivability.

487

00:26:26,000 --> 00:26:30,000

And we measure the force of an explosion in pounds per square inch, or PSI.

488

00:26:30,000 --> 00:26:37,000

Just to give you an idea of what we're talking about, at 2.5 PSI, you're likely to rupture your eardrums.

489

00:26:37,000 --> 00:26:44,000

And we've calculated with 500 pounds of explosives at a range of 20 feet, you're going to experience over 100 PSI,

490

00:26:44,000 --> 00:26:48,000

which means a very high likelihood of death.

491

00:26:48,000 --> 00:26:55,000

To measure exactly where that lethal pressure kicks in, Grant is assembling some super sensitive equipment.

492

00:26:55,000 --> 00:26:59,000

This is a burst disk made by our friends at Oseco.

493

00:26:59,000 --> 00:27:03,000

It's a very thin metal membrane that's calibrated to rupture at 100 PSI.

494

00:27:03,000 --> 00:27:10,000

Now if this is still intact at the end of the experiment, and we've blown the socks off, then there's a real chance of confirming this myth.

495

00:27:11,000 --> 00:27:14,000

Meanwhile, Carrie and Tori dull out the dummies.

496

00:27:15,000 --> 00:27:22,000

We've specifically designed these legs to give us every opportunity for a successful sock blast removal.

497

00:27:22,000 --> 00:27:26,000

Now we've got one foot on the ground, one foot in the air as if you were running or walking.

498

00:27:26,000 --> 00:27:31,000

That way if a sock is going to come off in either of these positions, myth is confirmed.

499

00:27:32,000 --> 00:27:39,000

And just to mark this explosive occasion, the official Mythbusters sneaker.

500

00:27:39,000 --> 00:27:40,000

They're blast zone shoes.

501

00:27:40,000 --> 00:27:41,000

I like them.

502

00:27:41,000 --> 00:27:46,000

And one of our fans hand knit an entire box of socks for us.

503

00:27:47,000 --> 00:27:51,000

Fag's big time patience void of Somerville, Massachusetts.

504

00:27:52,000 --> 00:27:57,000

At each foot station, some feet will have your socks and shoes.

505

00:27:57,000 --> 00:27:58,000

How's that fit, man?

506

00:27:58,000 --> 00:28:00,000

And others, just socks.

507

00:28:02,000 --> 00:28:03,000

S-15.

508

00:28:04,000 --> 00:28:07,000

That means sock only at 15 feet.

509

00:28:07,000 --> 00:28:11,000

That way when these get blown to smithereens, we might be able to track where they came from.

510

00:28:13,000 --> 00:28:17,000

But before they push the plunger, the team needs two more vital ingredients.

511

00:28:18,000 --> 00:28:19,000

Cool.

512

00:28:19,000 --> 00:28:20,000

First, the fire department.

513

00:28:20,000 --> 00:28:23,000

You know what they say, safe exploding is good exploding.

514

00:28:23,000 --> 00:28:25,000

And the explosives.

515

00:28:25,000 --> 00:28:27,000

Here comes our info.

516

00:28:27,000 --> 00:28:31,000

Courtesy of retired FBI agent Frank Doyle.

517

00:28:31,000 --> 00:28:33,000

So look so you guys have a package for us.

518

00:28:33,000 --> 00:28:35,000

Oh, I brought you a really nice package.

519

00:28:35,000 --> 00:28:36,000

Info, right?

520

00:28:36,000 --> 00:28:37,000

Yep.

521

00:28:37,000 --> 00:28:38,000

Oh, that ought to do it.

522

00:28:38,000 --> 00:28:41,000

That ought to knock some socks off.

523

00:28:42,000 --> 00:28:43,000

You better believe it.

524

00:28:43,000 --> 00:28:48,000

And if any socks are going to get knocked off soon, this is the stuff to do it.

525

00:28:48,000 --> 00:28:50,000

This is 500 pounds of anfo.

526

00:28:50,000 --> 00:28:56,000

Just to give you an idea, it took 800 pounds of anfo to completely vaporize a cement truck.

527

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

The explosives are in place.

528

00:29:01,000 --> 00:29:02,000

The legs are in place.

529

00:29:02,000 --> 00:29:04,000

The burst discs are connected.

530

00:29:04,000 --> 00:29:10,000

It's time for us to run away and let Frank and the bomb squad do their final preparations.

531

00:29:10,000 --> 00:29:12,000

And then it's boom time.

532

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

Next, the Shockwave Showdown.

533

00:29:16,000 --> 00:29:18,000

It comes to a grizzly end.

534

00:29:18,000 --> 00:29:21,000

Oh my god, there's a foot inside.

535

00:29:28,000 --> 00:29:33,000

Once upon a time in the Wild West, the shockwave was a big hit.

536

00:29:33,000 --> 00:29:35,000

And it was a big hit.

537

00:29:35,000 --> 00:29:37,000

And it was a big hit.

538

00:29:38,000 --> 00:29:46,000

Once upon a time in the Wild West, a fired bullet could just about settle any bust up.

539

00:29:49,000 --> 00:29:56,000

But is it true that a bullet dropped and a bullet fired simultaneously will hit the ground at the same time?

540

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

That is science.

541

00:30:00,000 --> 00:30:01,000

Out of the range.

542

00:30:01,000 --> 00:30:02,000

All right.

543

00:30:02,000 --> 00:30:03,000

Good to go.

544

00:30:03,000 --> 00:30:11,000

Adam and Jamie found that a bullet from their 45 automatic flew 360 feet before it bit the dust.

545

00:30:11,000 --> 00:30:12,000

I love this myth.

546

00:30:12,000 --> 00:30:20,000

Now, all they need is a location to suit one of the most sophisticated experiments the mythbusters have ever attempted.

547

00:30:24,000 --> 00:30:28,000

And down by the shores of old San Francisco Bay, they've got one.

548

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

Ah, look at that.

549

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

It's magnificent.

550

00:30:31,000 --> 00:30:33,000

I love these old military buildings.

551

00:30:34,000 --> 00:30:40,000

The historic 480 foot long Big Event Behemoth Fort Mason Center.

552

00:30:41,000 --> 00:30:44,000

Fort Mason Center is perfect for us for several reasons.

553

00:30:44,000 --> 00:30:50,000

At over 480 feet long, there's plenty of room for a fired bullet to come to rest.

554

00:30:50,000 --> 00:30:54,000

Because it's enclosed, there's no wind to worry about affecting our bullet.

555

00:30:54,000 --> 00:30:56,000

And then lastly, it's perfectly level.

556

00:30:56,000 --> 00:31:04,000

So with the gun rest in place at one end of the room, Adam's first job is to make sure it's exactly

36 inches off the floor.

557

00:31:06,000 --> 00:31:08,000

And firing level.

558

00:31:08,000 --> 00:31:11,000

I'm going to fire a bullet to that target 20 feet away.

559

00:31:11,000 --> 00:31:14,000

Now, within that 20 feet, the bullet's not going to drop at all.

560

00:31:14,000 --> 00:31:22,000

So as long as the bullet hole in that target is the exact same height off the ground as the barrel, I know I've got a perfectly level bullet.

561

00:31:23,000 --> 00:31:24,000

Seating in the ground.

562

00:31:25,000 --> 00:31:26,000

Seating the gun rest.

563

00:31:26,000 --> 00:31:30,000

Firing in 3, 2, 1.

564

00:31:35,000 --> 00:31:38,000

Dude, I'd say that is absolutely perfect right on our laser line.

565

00:31:39,000 --> 00:31:40,000

That gun's firing level.

566

00:31:41,000 --> 00:31:42,000

Works for me.

567

00:31:43,000 --> 00:31:48,000

With the fired bullet rig sorted for now, Jamie rolls out the other half of the experiment.

568

00:31:49,000 --> 00:32:00,000

This is my bullet drop rate and the key component is this electromagnet right here because it'll hold on to my bullet and then on cue, it'll drop the bullet.

569

00:32:01,000 --> 00:32:10,000

Okay, we've got all the sensors we need and all the equipment we need to time the exact amount of time it takes a bullet both to be dropped from 36 inches and to be fired from 36 inches off the ground.

570

00:32:11,000 --> 00:32:15,000

And we could simply compare those two times like we did with the paintball.

571

00:32:15,000 --> 00:32:17,000

But that's not good enough for us.

572

00:32:18,000 --> 00:32:19,000

For we have a bigger vision.

573

00:32:20,000 --> 00:32:26,000

We want to see that drop bullet hit the ground in the spot the fired bullet will be skipping off.

574

00:32:27,000 --> 00:32:28,000

That's what we're about to set up.

575

00:32:29,000 --> 00:32:30,000

That's right folks.

576

00:32:30,000 --> 00:32:34,000

This time both halves of the experiment are going to happen at the same time.

577

00:32:35,000 --> 00:32:44,000

So before rolling the drop rig 360 feet down the room, the boys just want to make sure their little synchronizing system is going to work.

578

00:32:45,000 --> 00:32:52,000

Simultaneous firing and bullet drop test in three, two, one.

579

00:32:56,000 --> 00:32:58,000

Let's see how it looked on high speed.

580

00:32:59,000 --> 00:33:02,000

Where the mythbusters quickly discover they have a problem.

581

00:33:03,000 --> 00:33:05,000

Let's look back at the timing about when the light goes up.

582

00:33:06,000 --> 00:33:12,000

While the gun and the timing LED go off together, the dropped bullet decides to delay its journey south.

583

00:33:13,000 --> 00:33:15,000

It sits on that electromagnet for a while.

584

00:33:16,000 --> 00:33:17,000

Yeah.

585

00:33:18,000 --> 00:33:20,000

Do you think there's any residual magnetism or something like that?

586

00:33:22,000 --> 00:33:28,000

If you look at this high speed shot of the bullet on the electromagnet, you'll notice it hangs out for 65 milliseconds.

587

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

That tells me there's a lot of residual magnetism in the electromagnet itself even though it's

turned off.

588

00:33:34,000 --> 00:33:36,000

And it's no good as a mechanism for our drop.

589

00:33:37,000 --> 00:33:39,000

We've got to rebuild a mechanism and we've got to rebuild it fast.

590

00:33:43,000 --> 00:33:51,000

Out of the quarry, the Knock Your Socks Off Squad have wisely taken themselves to higher ground and way out of the blast zone.

591

00:33:52,000 --> 00:33:54,000

Our blast zone is set up way, way, way over there.

592

00:33:55,000 --> 00:34:00,000

But we've decided to come really, really far back to make sure all mythbusters big and tiny are perfectly safe.

593

00:34:01,000 --> 00:34:07,000

Alright, this is Knock Your Socks Off using a 500 pound explosion.

594

00:34:08,000 --> 00:34:11,000

Everybody look alive. Here we go in three, two, one.

595

00:34:12,000 --> 00:34:13,000

What?

596

00:34:20,000 --> 00:34:21,000

Whoa!

597

00:34:30,000 --> 00:34:31,000

That was awesome!

598

00:34:32,000 --> 00:34:33,000

Wow!

599

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

Remember, to confirm this myth, the team needs to find a sockless foot in a critical zone of human survivability.

600

00:34:43,000 --> 00:34:44,000

Whoa!

601

00:34:45,000 --> 00:34:47,000

Look at the size of that crater!

602

00:34:48,000 --> 00:34:49,000

Oh wait, here's a sock?

603

00:34:50,000 --> 00:34:52,000

Oh my god, there's a foot inside!

604

00:34:53,000 --> 00:34:56,000

It's still in there. That's disgusting.

605

00:34:57,000 --> 00:35:00,000

No, that's definitely not blowing your socks up.

606

00:35:01,000 --> 00:35:05,000

But a closer look at the blast zone reveals some explosive results.

607

00:35:06,000 --> 00:35:07,000

Check it out! No socks!

608

00:35:08,000 --> 00:35:09,000

What distance is? What are they?

609

00:35:09,000 --> 00:35:11,000

25 foot and this is 15 feet.

610

00:35:12,000 --> 00:35:17,000

Well, they finally managed to knock some socks off. But would a human be walking away?

611

00:35:18,000 --> 00:35:21,000

Yeah, you're probably not going to survive this if your socks came off.

612

00:35:22,000 --> 00:35:23,000

Wait, here's the pressure disc. Let's see what it says.

613

00:35:24,000 --> 00:35:25,000

Okay, 25 feet.

614

00:35:26,000 --> 00:35:27,000

That's blown.

615

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

And a double check of the discs confirms that under 35 feet away, this bang would have sent a mere mortal to Kingdom come.

616

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

So that's not survivable, that doesn't count.

617

00:35:40,000 --> 00:35:45,000

But at the minimum survivable radius of 45 feet, yep, they're still on.

618

00:35:46,000 --> 00:35:49,000

We've got 45, we've got 55 and the socks are still on.

619

00:35:50,000 --> 00:35:53,000

So we have no survivability at the front, but we lost a few socks.

620

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

And then as you get to the zone of survivability, we still have our socks on.

621

00:35:57,000 --> 00:35:59,000

I think that gives us both of our criteria for calling this one busted.

622

00:36:00,000 --> 00:36:03,000

Yeah, this is totally busted. I mean, if your socks do get blown off, you're pretty much dead.

623

00:36:03,000 --> 00:36:06,000

Yeah, you wouldn't be walking away from that.

624

00:36:07,000 --> 00:36:08,000

This was cool though.

625

00:36:09,000 --> 00:36:10,000

You might say it was a blast.

626

00:36:11,000 --> 00:36:20,000

Next, the roller coaster ride to physics fame has Adam and Jamie both dazzled.

627

00:36:21,000 --> 00:36:23,000

I think this might be the shop we've been looking for.

628

00:36:24,000 --> 00:36:25,000

And baffle.

629

00:36:26,000 --> 00:36:28,000

We're not even seeing the pins start to move.

630

00:36:34,000 --> 00:36:35,000

Here we go.

631

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

Mythbusters and World Firsts go together like ham and eggs.

632

00:36:43,000 --> 00:36:44,000

Wow.

633

00:36:45,000 --> 00:36:46,000

There's the Pycrete boat.

634

00:36:47,000 --> 00:36:48,000

King of the world.

635

00:36:49,000 --> 00:36:50,000

Breaking glass.

636

00:36:52,000 --> 00:36:53,000

And the lead balloon.

637

00:36:54,000 --> 00:36:56,000

You know, if someone says it's impossible, we just take it as a challenge.

638

00:36:58,000 --> 00:37:01,000

Now, the Mythbusters are testing our real doozy.

639

00:37:01,000 --> 00:37:03,000

Everything's hot, ready to go.

640

00:37:04,000 --> 00:37:06,000

Bullet shot versus bullet dropped.

641

00:37:07,000 --> 00:37:10,000

But a malingering magnet is holding up the show.

642

00:37:11,000 --> 00:37:14,000

As soon as it's released, it's just staying there.

643

00:37:15,000 --> 00:37:18,000

But do you think Adam's going to let something like that stand in his way?

644

00:37:20,000 --> 00:37:21,000

Awesome. That works.

645

00:37:22,000 --> 00:37:23,000

Oh no.

646

00:37:24,000 --> 00:37:26,000

So, the electromagnetic is gone. It's on the scrap heap.

647

00:37:27,000 --> 00:37:30,000

We've got a new little solenoid in there which will whoop, get out of the way and let the bullet drop.

648

00:37:31,000 --> 00:37:35,000

What we've got to do is try it once, get our timings right, confirm them and we should be ready to do this test.

649

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

So the new simultaneous release system is ready for a test fire.

650

00:37:42,000 --> 00:37:46,000

Alright, simultaneous release in three, two, one.

651

00:37:52,000 --> 00:37:54,000

Alright, let's see how it did on high speed.

652

00:37:55,000 --> 00:37:58,000

But once again, there's a timing problem.

653

00:37:58,000 --> 00:38:00,000

Solenoid's way too slow.

654

00:38:01,000 --> 00:38:02,000

Yep.

655

00:38:03,000 --> 00:38:04,000

It's not letting go.

656

00:38:05,000 --> 00:38:12,000

The most difficult thing about this whole experiment is getting the fired bullet and the dropped bullet to become airborne at exactly the same time.

657

00:38:13,000 --> 00:38:20,000

And we can't tolerate even a few milliseconds of variation in this mix to make the result that we want to see happen.

658

00:38:21,000 --> 00:38:22,000

It's hard.

659

00:38:23,000 --> 00:38:24,000

Now there's an understatement.

660

00:38:25,000 --> 00:38:26,000

So cue the brainstorm.

661

00:38:26,000 --> 00:38:29,000

We're not even seeing the pins start to move.

662

00:38:31,000 --> 00:38:34,000

It gave us the problem that we currently have which is that it's late.

663

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

Having spent the past four hours trying to sort out the solenoid.

664

00:38:39,000 --> 00:38:40,000

Look, let's do this twice.

665

00:38:42,000 --> 00:38:45,000

The boys are now staring failures square in the face.

666

00:38:46,000 --> 00:38:49,000

And all it is is about figuring out some way to mechanically push between these two.

667

00:38:50,000 --> 00:38:53,000

Until Jamie snatches victory from the jaws of defeat.

668

00:38:54,000 --> 00:38:57,000

You have a hinge that you pull in the metal.

669

00:38:58,000 --> 00:38:59,000

Yeah, that's what I meant.

670

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

It needs to be some sort of a little bitty catch that is on its edge.

671

00:39:04,000 --> 00:39:05,000

It could make a clip like that.

672

00:39:06,000 --> 00:39:13,000

He adds a small metal clip to the trigger to delay the gun the miniscule milliseconds needed to match the solenoid.

673

00:39:15,000 --> 00:39:16,000

Everything's hot. Let's do it.

674

00:39:23,000 --> 00:39:28,000

And after a few test fires at a bit of fine tuning, it works.

675

00:39:29,000 --> 00:39:30,000

Pull up these guns.

676

00:39:32,000 --> 00:39:33,000

Oh, it's good. It's good.

677

00:39:34,000 --> 00:39:37,000

It's one third of a millisecond difference.

678

00:39:38,000 --> 00:39:39,000

Wow.

679

00:39:40,000 --> 00:39:41,000

That's freaking perfect.

680

00:39:42,000 --> 00:39:43,000

Let's go do this full scale.

681

00:39:44,000 --> 00:39:45,000

Okay.

682

00:39:46,000 --> 00:39:50,000

Which means rolling up the room 360 feet to stake out a drop zone.

683

00:39:50,000 --> 00:39:54,000

Right about there. That's where they were landing out in the shooting range.

684

00:39:54,000 --> 00:39:56,000

So this is where I expect them to land here.

685

00:39:57,000 --> 00:39:58,000

Okay.

686

00:39:59,000 --> 00:40:10,000

Adam lays down a runway of white paper so the high speed camera will clearly see and measure both bullets at the same time, in the same place and in the same shot.

687

00:40:12,000 --> 00:40:15,000

All we need now in the drop zone is Jamie's drop rig.

688

00:40:16,000 --> 00:40:20,000

So the boys can take a shot at physics history.

689

00:40:22,000 --> 00:40:24,000

All right, dude. You ready to do this for real?

690

00:40:25,000 --> 00:40:27,000

I think we'll hit it on the first shot.

691

00:40:27,000 --> 00:40:28,000

Really?

692

00:40:28,000 --> 00:40:29,000

Oh, yeah.

693

00:40:29,000 --> 00:40:31,000

You never make predictions. That's awesome.

694

00:40:32,000 --> 00:40:34,000

Bullet drop versus fire.

695

00:40:35,000 --> 00:40:37,000

In three, two, one.

696

00:40:46,000 --> 00:40:52,000

But from 360 feet away, the boys can't see exactly where the fired bullet landed.

697

00:40:52,000 --> 00:40:53,000

Let's go see where it hit.

698

00:40:54,000 --> 00:40:58,000

So Adam takes a one wheeled wide down the room to check out the drop zone.

699

00:41:01,000 --> 00:41:02,000

Wow.

700

00:41:03,000 --> 00:41:05,000

And the results are simply ripping.

701

00:41:06,000 --> 00:41:07,000

Can't get much closer than that.

702

00:41:08,000 --> 00:41:09,000

I can't wait to see the high speed.

703

00:41:09,000 --> 00:41:14,000

So, dude, this bullet carved a streak right under the drop zone.

704

00:41:17,000 --> 00:41:21,000

I think this might be the shot we've been looking for.

705

00:41:22,000 --> 00:41:25,000

In real time, it's impossible to tell what happened.

706

00:41:27,000 --> 00:41:31,000

Until Adam analyzes the high speed and crunches the numbers.

707

00:41:32,000 --> 00:41:38,000

3677 minus 30915 equals 238 divided by six.

708

00:41:40,000 --> 00:41:45,000

Dude, the difference is 39.6 milliseconds.

709

00:41:46,000 --> 00:41:49,000

Which means it's less than the human eye can make out.

710

00:41:50,000 --> 00:41:57,000

So after days of brain teasing tests, the mythbusters can claim a world first for themselves.

711

00:41:58,000 --> 00:42:01,000

And a victory for physics.

712

00:42:03,000 --> 00:42:06,000

Let me put 39.6 milliseconds into some perspective for you.

713

00:42:07,000 --> 00:42:11,000

When you go to the movies and watch a projected celluloid film on the screen,

714

00:42:11,000 --> 00:42:13,000

you know that that film is made up of individual images, right?

715

00:42:14,000 --> 00:42:18,000

What you might not have known is that it takes 24 of those per second to make up the film that

you're watching.

716

00:42:18,000 --> 00:42:21,000

So each one is on screen for exactly 1.24th of a second.

717

00:42:21,000 --> 00:42:24,000

But you don't notice that because it's faster than your eye can register.

718

00:42:24,000 --> 00:42:29,000

Well, that 1.24th of a second is actually longer than 39.6 milliseconds.

719

00:42:29,000 --> 00:42:32,000

That's how close those two bullets were.

720

00:42:33,000 --> 00:42:35,000

Two bullets, one drop, one fire.

721

00:42:36,000 --> 00:42:39,000

Amazingly, they ended up in the same place at the same time.

722

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

Dude, this myth was every bit as much fun to test as I was hoping it would be.

723

00:42:47,000 --> 00:42:49,000

And I gotta say, even though the physics textbooks had it right,

724

00:42:49,000 --> 00:42:53,000

I love the fact that we did it full size with real unmodified bullets.

725

00:42:53,000 --> 00:42:56,000

I bet no one has ever tried that before.

726

00:42:56,000 --> 00:42:57,000

I think they're right.

727

00:42:57,000 --> 00:43:00,000

And whether it was ball bearings or bullets dropped or fired,

728

00:43:00,000 --> 00:43:02,000

they all hit the ground at the same time.

729

00:43:02,000 --> 00:43:07,000

Yup. Gravity, man. It's not just a good idea. It's the law.

730

00:43:07,000 --> 00:43:08,000

Confirmed.

731

00:43:08,000 --> 00:43:09,000

Confirmed.