1

00:00:00,000 --> 00:00:04,300

On this extra special episode of Mythbusters,

2

00:00:04,300 --> 00:00:08,000

I expect you guys to get to the bottom of this once and for all and then report back to me.

3

00:00:08,000 --> 00:00:08,500

We're on it.

4

00:00:08,500 --> 00:00:15,000

At the President's request, Adam and Jamie breathe new light into the myth of Archimedes' solar ray.

5

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

That's it. That's what I'm talking about. That's perfect.

6

00:00:18,000 --> 00:00:21,500

Finding out if supersizing their mirror military...

7

00:00:21,500 --> 00:00:23,500

Do you want to save your own city?

8

00:00:25,500 --> 00:00:29,000

Can catch the sun's rays and set a boat ablaze.

9

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

If mirrors are really intense, that's a spirit solution.

10

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

Meanwhile, Kari Torian Grant...

11

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

Red bean, stop!

12

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

Take on a fiendish, filmic flip.

13

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

Investigating if a superhuman punch...

14

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

Trigger away!

15

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

Can make an SUV's somersault head over wheels.

16

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

There's so much that can go wrong on this.

17

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

Who are the Mythbusters?

18

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

Adam Savage...

19

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

It's so different!

20

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

And Jamie Heineman...

21

00:01:02,000 --> 00:01:04,000

Is that hot enough for ya?

22

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

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

23

00:01:08,000 --> 00:01:10,000

Joining them...

24

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

Grant Imahara...

25

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

He's alive!

26

00:01:13,000 --> 00:01:14,000

Kari Byron...

27

00:01:14,000 --> 00:01:17,000

I was less excited after my first kiss.

28

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

And Tori Belichi...

29

00:01:18,000 --> 00:01:20,000

This is real science.

30

00:01:20,000 --> 00:01:22,000

They don't just tell the myth.

31

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

They put them to the test.

32

00:01:27,000 --> 00:01:29,000

The Mythbusters

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00:01:35,000 --> 00:01:38,000

First up, the Mythbusters have a viewer request...

34

00:01:38,000 --> 00:01:40,000

Straight from the top.

35

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

You know, some viewers may be watching us and thinking,

36

00:01:42,000 --> 00:01:43,000

Huh?

37

00:01:43,000 --> 00:01:46,000

The boys are standing on a very accurate set of the White House Library.

38

00:01:46,000 --> 00:01:47,000

But they'd be wrong.

39

00:01:47,000 --> 00:01:49,000

Indeed, they would be.

40

00:01:49,000 --> 00:01:51,000

Because this is not a set.

41

00:01:51,000 --> 00:01:52,000

This is the real deal.

42

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

Because on today's special episode of Mythbusters,

43

00:01:54,000 --> 00:01:55,000

the myth we're busting...

44

00:01:55,000 --> 00:01:58,000

Comes courtesy of a very special guest.

45

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

In fact, here he is.

46

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

Hey guys.

47

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

How are you?

48

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

Very good.

49

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

Good to see ya.

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

Welcome to the White House.

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

Thank you, Mr. President.

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

It is a thrill to have you here.

53

00:02:07,000 --> 00:02:08,000

So what can we do for you?

54

00:02:08,000 --> 00:02:11,000

Well, I am a big fan of Mythbusters.

55

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

Really?

56

00:02:12,000 --> 00:02:13,000

I am and so are the girls.

57

00:02:13,000 --> 00:02:17,000

Partly because we are just fascinated by science.

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00:02:17,000 --> 00:02:19,000

You guys make it fun and exciting and interesting.

59

00:02:19,000 --> 00:02:21,000

And occasionally you blow things up.

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00:02:21,000 --> 00:02:23,000

Which is always cool.

61

00:02:23,000 --> 00:02:26,000

But I have a personal interest in this as president.

62

00:02:26,000 --> 00:02:29,000

Because nothing's more important to our country's future

63

00:02:29,000 --> 00:02:32,000

than getting young people engaged in math and science.

64

00:02:32,000 --> 00:02:34,000

A lot of the challenges that we face as a country

65

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

are going to depend on how engaged young people are in science.

66

00:02:37,000 --> 00:02:40,000

And so I'm just thrilled that you guys do such a great job making it fun.

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00:02:40,000 --> 00:02:41,000

Thank you, sir.

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00:02:41,000 --> 00:02:42,000

That means a great deal to us.

69

00:02:42,000 --> 00:02:43,000

Well, I appreciate that.

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00:02:43,000 --> 00:02:46,000

Now, I do know that science requires a lot of trial and error.

71

00:02:46,000 --> 00:02:50,000

Part of what Mythbusters is about is testing out various hypotheses.

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00:02:50,000 --> 00:02:52,000

And I think that we've got a big one that hasn't been thoroughly tested.

73

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

Which one is that?

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00:02:53,000 --> 00:02:56,000

Well, it is Archimedes solar ray.

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00:02:56,000 --> 00:02:57,000

Well, that is a classic.

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

It is a classic.

77

00:02:58,000 --> 00:03:01,000

And so I'm hoping that we can take one more crack at it.

78

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

Okay.

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00:03:04,000 --> 00:03:07,000

The story goes that Archimedes designed a solar weapon

80

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

that focused the sun's rays with such ferocity,

81

00:03:10,000 --> 00:03:13,000

it set an invading Roman navy ablaze.

82

00:03:16,000 --> 00:03:19,000

But when the Mythbusters duplicated his ancient design,

83

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

It's 280 degrees.

84

00:03:21,000 --> 00:03:23,000

It failed to fuel a fire.

85

00:03:23,000 --> 00:03:25,000

I'm standing right in it.

86

00:03:25,000 --> 00:03:27,000

And I'm not dead yet.

87

00:03:27,000 --> 00:03:33,000

So they reloaded the ray with the help of MIT and 300 mirrors.

88

00:03:33,000 --> 00:03:34,000

Look at that!

89

00:03:35,000 --> 00:03:38,000

But that still didn't set this myth alight.

90

00:03:38,000 --> 00:03:41,000

I see a little smoke, but I've seen worse than that before.

91

00:03:42,000 --> 00:03:45,000

Which leaves Adam with a burning question.

92

00:03:46,000 --> 00:03:47,000

If you don't mind me saying so, sir,

93

00:03:47,000 --> 00:03:49,000

what do you think we actually got wrong on this?

94

00:03:49,000 --> 00:03:51,000

Well, there's one thing you didn't do.

95

00:03:51,000 --> 00:03:54,000

Well, we did use a giant solar mirror ray.

96

00:03:54,000 --> 00:03:59,000

And we did use 300 bronze mirrors on shelving units that were amable.

97

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

True, but we didn't use, what, manpower?

98

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

Exactly.

99

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

Ah, and the Greeks had plenty of access to manpower.

100

00:04:07,000 --> 00:04:09,000

So if we could get a whole bunch of people, like 500 people,

101

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

each with their own mirror, we might just be able to test this.

102

00:04:12,000 --> 00:04:14,000

So how do you want us to do that?

103

00:04:14,000 --> 00:04:16,000

Well, I'm going to leave that up to you guys.

104

00:04:16,000 --> 00:04:17,000

You're the experts.

105

00:04:17,000 --> 00:04:18,000

I'm going to stay here in Washington.

106

00:04:18,000 --> 00:04:20,000

I've got a little bit of business to attend to,

107

00:04:20,000 --> 00:04:23,000

but I expect you guys to go back to San Francisco, figure this out,

108

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

get to the bottom of this once and for all,

109

00:04:25,000 --> 00:04:27,000

and then report back to me.

110

00:04:27,000 --> 00:04:28,000

We're on it.

111

00:04:29,000 --> 00:04:32,000

The Presidential Challenge has been issued.

112

00:04:32,000 --> 00:04:36,000

And it'll take a crack team of mythbusters to mastermind this one.

113

00:04:37,000 --> 00:04:42,000

Not only will they need 500 stand-in soldiers armed with 500 mirrors,

114

00:04:42,000 --> 00:04:48,000

they'll have to find a way to focus 500 beams into a spot small enough

115

00:04:48,000 --> 00:04:50,000

to fire up this myth.

116

00:04:52,000 --> 00:04:53,000

The pressure's on, man.

117

00:04:53,000 --> 00:04:55,000

It's quite a challenge, isn't it?

118

00:04:55,000 --> 00:04:58,000

Yeah, you know, I'm thinking back to the first time we shot this,

119

00:04:58,000 --> 00:05:03,000

and the trouble we had getting even 12 people to aim their mirrors on a single spot.

120

00:05:03,000 --> 00:05:04,000

Who's that?

121

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

Who's that?

122

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

I think that the biggest single challenge we're going to face in this story

123

00:05:08,000 --> 00:05:13,000

is getting all 500 of our soldiers' mirrors aimed on the smallest possible target.

124

00:05:13,000 --> 00:05:17,000

Yeah, we need to come up with some sort of a system of aiming device.

125

00:05:17,000 --> 00:05:18,000

Yeah, we do.

126

00:05:18,000 --> 00:05:19,000

Have you got any ideas?

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00:05:19,000 --> 00:05:20,000

I do, actually.

128

00:05:20,000 --> 00:05:22,000

I've got a couple myself.

129

00:05:22,000 --> 00:05:25,000

Well, why don't we mock it up and scale and see which one works best?

130

00:05:25,000 --> 00:05:27,000

Perfect. Let's do it.

131

00:05:27,000 --> 00:05:31,000

From previous experience, the guys know that the tighter the focal point,

132

00:05:31,000 --> 00:05:34,000

the hotter the temperature and the more chance of flame.

133

00:05:34,000 --> 00:05:39,000

So they divide and conquer to take aim on the aim in small scale.

134

00:05:39,000 --> 00:05:44,000

If you're out in the wild with a signal mirror and you're trying to signal, let's say, a passing aircraft,

135

00:05:44,000 --> 00:05:47,000

the way you do it is you sight the aircraft up in the sky,

136

00:05:47,000 --> 00:05:49,000

and then you put your hand directly underneath it,

137

00:05:49,000 --> 00:05:53,000

and then you use a signal mirror to sweep the sun across your hand

138

00:05:53,000 --> 00:05:56,000

and thus across that passing aircraft.

139

00:05:57,000 --> 00:06:02,000

Adam's idea is to create a hand substitute to wave his beam across.

140

00:06:02,000 --> 00:06:03,000

Yeah.

141

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

That's what I'm looking for, isn't it, little Jamie?

142

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

Meanwhile, Jamie is gunning for inspiration.

143

00:06:12,000 --> 00:06:18,000

Now, when I think of aiming and targets, of course, I think of guns.

144

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

They have gun sights, one here and one here,

145

00:06:21,000 --> 00:06:24,000

and if you line those two things up with your bullseye,

146

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

you know your bullet's going to hit it, more or less.

147

00:06:26,000 --> 00:06:29,000

Jamie's no-fuss solution is a pencil and putty,

148

00:06:29,000 --> 00:06:32,000

but unfortunately, there's a problem.

149

00:06:32,000 --> 00:06:35,000

Now let's just see what happens when I move the sun.

150

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

That's not working.

151

00:06:39,000 --> 00:06:43,000

This aiming thing is fine, except for one fatal problem,

152

00:06:43,000 --> 00:06:45,000

and that is that the sun moves.

153

00:06:45,000 --> 00:06:51,000

Its relationship with this mirror, this sight, and the target is constantly changing.

154

00:06:51,000 --> 00:06:57,000

So something as simple as a gun sight on a pistol, it's not going to help us out here.

155

00:06:57,000 --> 00:07:03,000

Jamie's system may be shot to pieces, but Adam's reticule has led him to another discovery.

156

00:07:03,000 --> 00:07:11,000

I don't want to build 500 of these, so I'm thinking actually about stringing some material across the aimers.

157

00:07:11,000 --> 00:07:16,000

It's literally a eureka moment, as Adam ditches individual aimers

158

00:07:16,000 --> 00:07:18,000

Wait a minute, netting.

159

00:07:18,000 --> 00:07:21,000

for something altogether more communal.

160

00:07:22,000 --> 00:07:24,000

Ah, yeah.

161

00:07:24,000 --> 00:07:27,000

I think I've found the perfect aiming system for our 500 soldiers,

162

00:07:27,000 --> 00:07:32,000

and it is stretching a net in front of them along the shoreline between them and the boat.

163

00:07:32,000 --> 00:07:36,000

All they have to do is line up and aim their mirror at the spot on the net

164

00:07:36,000 --> 00:07:40,000

that they can see the enemy boat, and they should be hitting that boat.

165

00:07:40,000 --> 00:07:44,000

It's cheap, it's easy, I think it's ready for a medium-scale test.

166

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

Don't you, little Jamie?

167

00:07:46,000 --> 00:07:47,000

I do.

168

00:07:47,000 --> 00:07:57,000

Next, Carrie Grant and Tori take on a fiendish flip.

169

00:07:57,000 --> 00:08:02,000

So while Adam and Jamie are doing a myth about an ancient warrior, we're going to do one about a modern one.

170

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

How so?

171

00:08:03,000 --> 00:08:06,000

Well, we're doing a myth from Hellboy, which combines two of my favorite things.

172

00:08:06,000 --> 00:08:07,000

Robots in math?

173

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

Legos and spice girls?

174

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

No, crashes and physics.

175

00:08:10,000 --> 00:08:12,000

Ah, I know the scene you're talking about.

176

00:08:12,000 --> 00:08:16,000

This is when Hellboy is walking across the road, a car is coming straight at him,

177

00:08:16,000 --> 00:08:21,000

and to stop the car, he punches the hood, causing the car to flip over his head.

178

00:08:21,000 --> 00:08:26,000

Exactly. His punch transfers the forward linear momentum of the car into circular motion.

179

00:08:26,000 --> 00:08:30,000

It's all so easy for Hellboy.

180

00:08:30,000 --> 00:08:36,000

One hammer blown to the hood, and the SUV's somersaults head over wheels.

181

00:08:36,000 --> 00:08:41,000

But are the physics of this flip true, or is it just Hollywood hype?

182

00:08:41,000 --> 00:08:44,000

Okay, there's two problems that we need to solve straight up.

183

00:08:44,000 --> 00:08:48,000

First of all, how do we measure the impact of a punch of a mythical creature?

184

00:08:48,000 --> 00:08:52,000

And secondly, how do we punch a car without running over what's punching it?

185

00:08:52,000 --> 00:08:56,000

Well, one way to get around the second problem is we could just drop a weight from a crane.

186

00:08:56,000 --> 00:08:59,000

I mean, I could build some kind of giant steel fist when the car's underneath it,

187

00:08:59,000 --> 00:09:03,000

or release it, and it'll hit the front end, bam.

188

00:09:03,000 --> 00:09:04,000

And the first problem?

189

00:09:04,000 --> 00:09:07,000

Well, essentially what we're doing here is creating a pivot at the front end.

190

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

We start off by finding out how much weight it takes to make that touch the ground.

191

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

I bet we could calculate the rest.

192

00:09:12,000 --> 00:09:14,000

Sounds like a good place to start.

193

00:09:14,000 --> 00:09:22,000

So to replicate the diabolical powers of this punch, they'll need a crane to lift a giant steel fist of fury.

194

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

Then they'll drop it 20 feet onto an oncoming SUV,

195

00:09:26,000 --> 00:09:31,000

grab the nose, and possibly flip it just like Hellboy.

196

00:09:31,000 --> 00:09:33,000

But that's one heck of a punch.

197

00:09:33,000 --> 00:09:38,000

So first they need to know just how hefty the fist they drop needs to be.

198

00:09:38,000 --> 00:09:39,000

Looks like the place.

199

00:09:39,000 --> 00:09:42,000

Yeah, man. Cranes, cranes, cranes.

200

00:09:42,000 --> 00:09:45,000

So in order to flip a vehicle, you need to do two things.

201

00:09:45,000 --> 00:09:49,000

One, stop the forward movement, and two, drive the front end into the ground,

202

00:09:49,000 --> 00:09:51,000

forming a pivot point to flip over.

203

00:09:51,000 --> 00:09:54,000

So that's why we're here at Doc Bailey's Crane Yard.

204

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

We're going to find out how much mass it takes to ground the front end of this vehicle.

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00:09:58,000 --> 00:10:03,000

So the way that we're going to do that is drop heavier and heavier weights on the front end of our vehicle

206

00:10:03,000 --> 00:10:05,000

until the nose is actually touching the ground.

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

Once we have that, we'll know exactly how much force our fist needs to punch with.

208

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

And they're starting with 1,200 pounds.

209

00:10:13,000 --> 00:10:18,000

Okay, so the whole goal here is to get this edge down into the ground.

210

00:10:18,000 --> 00:10:21,000

Now, the standard ground clearance in this vehicle is 18 inches.

211

00:10:21,000 --> 00:10:24,000

We have gotten it to about 12.

212

00:10:24,000 --> 00:10:27,000

So we need to move on to something larger.

213

00:10:27,000 --> 00:10:33,000

To get the nose to the ground, they ramp up the weight to a mighty 5,000 pounds.

214

00:10:33,000 --> 00:10:36,000

This is definitely going to scratch the paint.

215

00:10:36,000 --> 00:10:37,000

Run!

216

00:10:37,000 --> 00:10:45,000

At more than the weight of the car, unsurprisingly, 5,000 pounds does more than just scratch the paint.

217

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

Look at that. That is all 5,000 pounds on the front end of our vehicle,

218

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

and the front end is not going any lower than that.

219

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

So we've got our weight of 5,000 pounds.

220

00:10:55,000 --> 00:11:00,000

That's what it's going to take to drive the front end of this vehicle down 18 inches into the ground.

221

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

That gives us 7,500 foot-pounds of work.

222

00:11:03,000 --> 00:11:06,000

Now we take that, plug it into our big hairy equation,

223

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

choose a height of about 20 feet to drop the fist from, something manageable.

224

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

That gives us an approximate weight of the fist of 1,500 pounds to produce this effect. Hope.

225

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

That's the mass of our infernal impact.

226

00:11:22,000 --> 00:11:26,000

So now it's over to Tori to create this fist of fury.

227

00:11:27,000 --> 00:11:32,000

What I have here is a 5-foot-tall, 10-inch diameter steel rod.

228

00:11:32,000 --> 00:11:39,000

Now this is what we're going to raise up 20 feet and drop it on the front end of the vehicle to see if we get that car to flip.

229

00:11:40,000 --> 00:11:47,000

Yep, it's taken a lot of welding, angle grinding, and polishing to make a fist of 1,500 pounds of steel.

230

00:11:47,000 --> 00:11:51,000

But finally, the fist of doom is ready.

231

00:11:51,000 --> 00:11:53,000

Ha! Ha! Ha!

232

00:11:54,000 --> 00:11:58,000

After the break, the mythbusters go full tilt for a flip.

233

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

And later...

234

00:11:59,000 --> 00:12:01,000

Do you want to save your own city?

235

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

At the president's request...

236

00:12:13,000 --> 00:12:16,000

I think that we've got a big one that hasn't been thoroughly tested.

237

00:12:16,000 --> 00:12:17,000

Which one is that?

238

00:12:17,000 --> 00:12:19,000

It is Archimedes solar ray.

239

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

The mythbusters are going back to the looking glass.

240

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

I think it's ready for prime time.

241

00:12:24,000 --> 00:12:25,000

Don't you, little Jamie?

242

00:12:25,000 --> 00:12:26,000

I do.

243

00:12:27,000 --> 00:12:32,000

But before they're 500 fighters armed with 500 mirrors, take aim.

244

00:12:32,000 --> 00:12:35,000

First, there's pause for reflection.

245

00:12:35,000 --> 00:12:40,000

Now before we go and implement this aiming system times 500 soldiers, we want to make sure that it

works.

246

00:12:40,000 --> 00:12:43,000

So we're going to test it in small scale up here on Jamie's roof.

247

00:12:43,000 --> 00:12:46,000

And that's where this scrappy band of Greek soldiers comes in.

248

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

They're going to use their mirrors to try and see just how good this system is.

249

00:12:49,000 --> 00:12:50,000

You guys ready?

250

00:12:50,000 --> 00:12:52,000

Ha! Ha! Ha! Ha!

251

00:12:52,000 --> 00:12:53,000

I think they're ready.

252

00:12:53,000 --> 00:12:57,000

I'll be standing right here with my fire extinguisher just in case.

253

00:12:57,000 --> 00:13:03,000

And when I give the go-ahead, our 12 mirror holders will have 60 seconds by my stopwatch

254

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

to redirect the energy of the sun through their mirrors towards the red dot in the middle of the target.

255

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

At that point, we'll take two readings.

256

00:13:11,000 --> 00:13:19,000

This is our stills camera. We'll be photographing both tests with this to find and compare the smallest possible surface area of the beams on the target.

257

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

This is our thermal imaging camera.

258

00:13:21,000 --> 00:13:23,000

It's going to be reading the temperature of both tests.

259

00:13:23,000 --> 00:13:27,000

And we're going to look for the test to give us the hottest and smallest beam.

260

00:13:27,000 --> 00:13:34,000

Okay, no aiming device starting in three, two, one, go!

261

00:13:34,000 --> 00:13:39,000

The volunteers swing into action, attempting to focus on the target 100 feet away.

262

00:13:39,000 --> 00:13:43,000

And for this control, they'll be aiming without a net.

263

00:13:43,000 --> 00:13:44,000

Try and shake your beam.

264

00:13:44,000 --> 00:13:46,000

That's often a really good way to figure out where it is.

265

00:13:46,000 --> 00:13:47,000

30 seconds.

266

00:13:47,000 --> 00:13:49,000

Come on, what are you guys doing?

267

00:13:49,000 --> 00:13:51,000

Light my fire. Come on.

268

00:13:51,000 --> 00:13:57,000

But with 12 beams all vying for the same target, it's hard to tell who's hitting a spot.

269

00:13:57,000 --> 00:13:58,000

You guys are still moving around.

270

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

Come on, zone it in.

271

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

Dial it in.

272

00:14:00,000 --> 00:14:02,000

And after 60 seconds...

273

00:14:02,000 --> 00:14:05,000

And mirrors down.

274

00:14:05,000 --> 00:14:07,000

That wasn't very good at all.

275

00:14:07,000 --> 00:14:09,000

The two cameras get the shot.

276

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

Here's what I see when I look at both the stills and the thermal imaging camera on test one.

277

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

I see in the stills camera a beam that's really diffused covering this whole area.

278

00:14:18,000 --> 00:14:21,000

On the thermal camera, I see the whole thing being warm.

279

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

I want to see only this spot warm, not all of this.

280

00:14:24,000 --> 00:14:27,000

That's going to give me the chance of fire.

281

00:14:27,000 --> 00:14:31,000

So will the addition of the netting help our reflective regiment?

282

00:14:31,000 --> 00:14:33,000

Cue test two.

283

00:14:33,000 --> 00:14:38,000

In three, two, one, go.

284

00:14:38,000 --> 00:14:41,000

Now remember, the smaller the focus...

285

00:14:41,000 --> 00:14:43,000

That's it. That's what I'm talking about.

286

00:14:43,000 --> 00:14:45,000

Focus in like that. That's perfect.

287

00:14:45,000 --> 00:14:49,000

...the more concentrated the beam and the more heat.

288

00:14:49,000 --> 00:14:54,000

I can feel that. The black is way too hot to touch.

289

00:14:54,000 --> 00:14:58,000

Once again at the 60 second mark, the data is recorded.

290

00:14:58,000 --> 00:14:59,000

And you're done.

291

00:14:59,000 --> 00:15:01,000

Mirrors down.

292

00:15:01,000 --> 00:15:05,000

We've got two tests under our belt and here's the comparison that I want you to see.

293

00:15:05,000 --> 00:15:08,000

First, stills camera, test one and test two.

294

00:15:08,000 --> 00:15:09,000

Check that out.

295

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

Test two, a lot more focus, but that is not the one I want to show you.

296

00:15:14,000 --> 00:15:16,000

Out for the real fire.

297

00:15:16,000 --> 00:15:20,000

Check out the thermal imaging camera, test one and test two.

298

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

Look at that. Look how tight that spot is in test two.

299

00:15:24,000 --> 00:15:26,000

That's the kind of fire I'm talking about.

300

00:15:26,000 --> 00:15:29,000

That's telling me that this system works.

301

00:15:32,000 --> 00:15:36,000

All right, let's see if we can flip a car with a punch.

302

00:15:36,000 --> 00:15:41,000

We're out at the Alameda runway to test whether a superhero punch can flip a car.

303

00:15:41,000 --> 00:15:47,000

No, we decided to just go for it because it's really hard to scale things like gravity.

304

00:15:47,000 --> 00:15:50,000

So we're taking our 1,500 pound steel fist.

305

00:15:50,000 --> 00:15:52,000

I can't wait to see that thing come down.

306

00:15:52,000 --> 00:15:55,000

Dropping it on a car and seeing where we need to go from there.

307

00:15:55,000 --> 00:15:58,000

And here's how it's going to go down.

308

00:15:58,000 --> 00:16:01,000

This car is going to be towed 30 miles an hour too.

309

00:16:01,000 --> 00:16:04,000

Here, where there's a pressure sensor on the ground.

310

00:16:04,000 --> 00:16:06,000

The car will hit the pressure sensor.

311

00:16:06,000 --> 00:16:10,000

That will trigger the quick release and drop the fist at the perfect time.

312

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

And when that fist comes crashing down, it will strike the perfect spot,

313

00:16:14,000 --> 00:16:17,000

the front end of the vehicle with a huge amount of force.

314

00:16:17,000 --> 00:16:22,000

And if this myth is true, we should see that vehicle flip and over in.

315

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

This experiment all comes down to levers.

316

00:16:25,000 --> 00:16:31,000

The impact on the edge of the hood should cause the car to pivot over the fulcrum of the front

wheels.

317

00:16:31,000 --> 00:16:36,000

And then the forward momentum of the car should propel the rear end up and over.

318

00:16:36,000 --> 00:16:39,000

Well, that's the theory.

319

00:16:39,000 --> 00:16:42,000

All right, this is car flip. Get it up to 30 miles an hour.

320

00:16:42,000 --> 00:16:46,000

Here we go in 3, 2, 1, go.

321

00:16:46,000 --> 00:16:47,000

We're moving.

322

00:16:47,000 --> 00:16:48,000

Here we go.

323

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

Here it comes.

324

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

It looks good. Looks good.

325

00:16:52,000 --> 00:16:54,000

Trigger away.

326

00:16:54,000 --> 00:16:59,000

It just wouldn't be MythBusters if it worked perfectly the first time.

327

00:16:59,000 --> 00:17:01,000

That didn't go well.

328

00:17:01,000 --> 00:17:06,000

But it is MythBusters when the car plows through the barriers.

329

00:17:06,000 --> 00:17:08,000

Oh, not another fence. Go Grant.

330

00:17:08,000 --> 00:17:09,000

Yeah, you'll get it.

331

00:17:09,000 --> 00:17:11,000

And into the fence.

332

00:17:11,000 --> 00:17:14,000

But this is the end of the video.

333

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

Yeah, you'll get it.

334

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

And into the fence.

335

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

Ah!

336

00:17:19,000 --> 00:17:25,000

But if at first you don't succeed, replace the car, check the alignment, and try again.

337

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

The vehicle is rolling.

338

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

It looks really good.

339

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

Yeah, it's looking nice and straight.

340

00:17:30,000 --> 00:17:32,000

Here we go.

341

00:17:32,000 --> 00:17:34,000

Trigger.

342

00:17:34,000 --> 00:17:36,000

Oh!

343

00:17:36,000 --> 00:17:38,000

Oh!

344

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

Oh!

345

00:17:40,000 --> 00:17:43,000

Oh, that's a good dash.

346

00:17:43,000 --> 00:17:48,000

This time the car stayed on course, but the fence triggered too late.

347

00:17:48,000 --> 00:17:50,000

No! No!

348

00:17:50,000 --> 00:17:52,000

Oh!

349

00:17:52,000 --> 00:17:55,000

All right, put that fence in our tab.

350

00:17:55,000 --> 00:18:02,000

We hit it way in the back, which means we have to fix our timing, and hopefully hit the front end of the vehicle.

351

00:18:02,000 --> 00:18:08,000

MythBusters history has shown just how complex it is to hit a target from a height.

352

00:18:09,000 --> 00:18:12,000

And as take three reveals...

353

00:18:12,000 --> 00:18:13,000

Trigger.

354

00:18:13,000 --> 00:18:17,000

That's true for a distance of only 20 feet.

355

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

Oh!

356

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

So close! Just one foot away.

357

00:18:21,000 --> 00:18:28,000

The challenge that we have here is that timing and position are both critical.

358

00:18:28,000 --> 00:18:37,000

You have to hit X, Y, and Z, all three dimensions perfectly within milliseconds of each other, or else it all goes wrong.

359

00:18:37,000 --> 00:18:46,000

Getting the fist to drop it precisely the right moment is like scoring a bullseye with the dartboard moving at 30 miles per hour.

360

00:18:46,000 --> 00:18:49,000

But the MythBusters will find a way.

361

00:18:49,000 --> 00:18:50,000

Next up...

362

00:18:50,000 --> 00:18:52,000

I'm good to go.

363

00:18:52,000 --> 00:18:54,000

Eve on that black sun!

364

00:18:54,000 --> 00:18:58,000

And can the MythBusters finally get a flip head over wheels?

365

00:19:04,000 --> 00:19:06,000

Red paint, stop!

366

00:19:06,000 --> 00:19:07,000

Is it a bird?

367

00:19:07,000 --> 00:19:08,000

Is it a plane?

368

00:19:08,000 --> 00:19:11,000

No, it's a car that's been punched by a hellboy.

369

00:19:11,000 --> 00:19:15,000

But could an infernal impact really flip a car?

370

00:19:15,000 --> 00:19:17,000

Triggered away!

371

00:19:17,000 --> 00:19:21,000

So far their methodology has failed to flip.

372

00:19:21,000 --> 00:19:24,000

So they've got a plan B.

373

00:19:24,000 --> 00:19:27,000

We have two trench plates on either side of the runway.

374

00:19:27,000 --> 00:19:29,000

In between it is a cable.

375

00:19:29,000 --> 00:19:30,000

That is going to be our guide light.

376

00:19:30,000 --> 00:19:33,000

It's under tension, and that will hook in to the towing system.

377

00:19:33,000 --> 00:19:37,000

That's going to guide our vehicle into the crash snow where the fist is.

378

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

Three, two, one, hit it.

379

00:19:43,000 --> 00:19:45,000

Here that we are in the channel.

380

00:19:45,000 --> 00:19:47,000

The car gets up to 30 miles per hour.

381

00:19:47,000 --> 00:19:49,000

So it's going straight.

382

00:19:49,000 --> 00:19:50,000

And...

383

00:19:51,000 --> 00:19:53,000

Oh!

384

00:19:54,000 --> 00:19:57,000

Look at that fist into that car.

385

00:19:57,000 --> 00:19:59,000

Rather than flippin' the lid of the SUV...

386

00:20:01,000 --> 00:20:02,000

That is crazy!

387

00:20:02,000 --> 00:20:04,000

They crushed it.

388

00:20:05,000 --> 00:20:08,000

But the guys are actually encouraged by this result.

389

00:20:10,000 --> 00:20:13,000

So I'm standing at the impact point where the fist hit the truck.

390

00:20:13,000 --> 00:20:16,000

And as you can see, it triggered a little bit late.

391

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

So we're going to go back, adjust our trigger time, and then give them another shot.

392

00:20:21,000 --> 00:20:27,000

And with the trigger reset by just one tenth of a second, it really is now or never.

393

00:20:27,000 --> 00:20:30,000

Talk about recycling here on the show, huh?

394

00:20:31,000 --> 00:20:36,000

Down to their last SUV, this is the final shot at a full-scale flip.

395

00:20:37,000 --> 00:20:39,000

The bar's in the slot.

396

00:20:39,000 --> 00:20:41,000

It's going straight.

397

00:20:41,000 --> 00:20:44,000

Here comes the car into the fist.

398

00:20:45,000 --> 00:20:46,000

Trigger!

399

00:20:51,000 --> 00:20:52,000

Bullseye!

400

00:20:52,000 --> 00:20:53,000

That was nice!

401

00:20:53,000 --> 00:20:55,000

How satisfying was that?

402

00:20:55,000 --> 00:20:56,000

Bullseye.

403

00:20:57,000 --> 00:21:00,000

The fist of fury finally hammers the hood.

404

00:21:01,000 --> 00:21:06,000

But despite hitting the sweet spot right above the bumper in front of the fulcrum,

405

00:21:06,000 --> 00:21:11,000

the car didn't even get rear-wheel elevation, let alone a somersault.

406

00:21:15,000 --> 00:21:19,000

Soon enough, the mythbusters will be making rays while the sun shines.

407

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

They've worked out their aiming system.

408

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

Now all they need is 500 mirrors, a boat, and a small army of scientists.

409

00:21:28,000 --> 00:21:31,000

And at the shop, those 500 mirrors have arrived.

410

00:21:33,000 --> 00:21:36,000

Along with 500 bronze Mylar sheets.

411

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

Ah, that's great.

412

00:21:40,000 --> 00:21:42,000

Look at me, I'm all hammered metal.

413

00:21:42,000 --> 00:21:47,000

Not only are the mirrors three times the size of their previous attempts, they're also double-sided.

414

00:21:47,000 --> 00:21:54,000

So that if the Archimedes era bronze can't create a flame, hopefully the modern mirrors will.

415

00:21:54,000 --> 00:22:00,000

With a mirror production line in full swing, Adam and Jamie can turn their attention to the maritime.

416

00:22:01,000 --> 00:22:05,000

And at Nelson's Marine, they found the perfect target.

417

00:22:05,000 --> 00:22:08,000

This thing is a lifeboat that was salvaged off of a ship.

418

00:22:08,000 --> 00:22:13,000

And when I'm done with it, it's going to be a classic Roman tri-reen.

419

00:22:14,000 --> 00:22:19,000

It's going to take a lot of camouflage to turn this lifeboat into an ancient mariner.

420

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

Step one is to give it a more aged look.

421

00:22:23,000 --> 00:22:25,000

And that ought to do it.

422

00:22:29,000 --> 00:22:32,000

The next step is to add a little Roman flavor.

423

00:22:34,000 --> 00:22:36,000

Look into my eye.

424

00:22:36,000 --> 00:22:40,000

Before finally hoisting the target for our mirror militia.

425

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

Oh, she rises.

426

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

Blood red stripes tied ill upon her enemies.

427

00:22:48,000 --> 00:22:50,000

Well, you know, I think our work is done here.

428

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

Nicely done.

429

00:22:55,000 --> 00:23:00,000

With the boat seaworthy, it's time to first find a battle-worthy location.

430

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

Before trying to rustle up a 500 strong band of brothers.

431

00:23:04,000 --> 00:23:05,000

This is perfect.

432

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

Our soldiers along the shore here.

433

00:23:07,000 --> 00:23:10,000

Our enemy hordes coming out there on the boat.

434

00:23:10,000 --> 00:23:12,000

We got a location.

435

00:23:12,000 --> 00:23:16,000

The first port of call is to get a leg up on the aiming system.

436

00:23:16,000 --> 00:23:20,000

In order to help our soldiers aim their beams of sunlight right at that boat,

437

00:23:20,000 --> 00:23:26,000

we're going to put up a fence using these rebar posts and this mesh all the way down the line of soldiers.

438

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

You can see clearly where it is and is not.

439

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

You know, that totally works.

440

00:23:31,000 --> 00:23:35,000

Hopefully that's all that's required to set that puppy on fire.

441

00:23:35,000 --> 00:23:37,000

With the aiming network in place,

442

00:23:37,000 --> 00:23:41,000

700 feet of fence, all I can think is one thing.

443

00:23:41,000 --> 00:23:43,000

I hope this works.

444

00:23:43,000 --> 00:23:48,000

The mirrors arrive with 700 feet of trestle tables to support them.

445

00:23:48,000 --> 00:23:52,000

Now all that remains is for Jamie to get a little bit of light.

446

00:23:52,000 --> 00:23:56,000

And a little bit of light to get the trestle tables to support them.

447

00:23:56,000 --> 00:24:01,000

Now all that remains is for Jamie to don his period correct safety gear.

448

00:24:01,000 --> 00:24:04,000

Add them to get into character.

449

00:24:04,000 --> 00:24:06,000

That's it.

450

00:24:06,000 --> 00:24:08,000

Here we go.

451

00:24:08,000 --> 00:24:13,000

And to rustle up that 500 strong science hungry horde.

452

00:24:13,000 --> 00:24:14,000

Coming up later.

453

00:24:14,000 --> 00:24:18,000

Will this be enough to flip a vehicle?

454

00:24:19,000 --> 00:24:23,000

The Mythbusters finally hit the nail on the head

455

00:24:23,000 --> 00:24:27,000

and nailed the hood of the SUV with their fist of fury.

456

00:24:27,000 --> 00:24:29,000

But with nothing close to a flip,

457

00:24:29,000 --> 00:24:33,000

that could be the nail in the coffin for this myth.

458

00:24:33,000 --> 00:24:37,000

In our first test, we were not able to get a car to flip.

459

00:24:37,000 --> 00:24:41,000

So we've decided to take this myth and test it in small scale.

460

00:24:41,000 --> 00:24:43,000

Then we're going to be running the same test.

461

00:24:43,000 --> 00:24:45,000

However, we're going to be changing a few variables.

462

00:24:45,000 --> 00:24:47,000

We're going to change the mass of the fist,

463

00:24:47,000 --> 00:24:49,000

the speed of the vehicle,

464

00:24:49,000 --> 00:24:53,000

and change the center of gravity on the vehicle.

465

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

By toying with every combination of these vital variables,

466

00:24:57,000 --> 00:25:02,000

they're hoping to find the optimal conditions to result in a small scale flip.

467

00:25:02,000 --> 00:25:06,000

And first they feel the need to test speed.

468

00:25:06,000 --> 00:25:09,000

With a fist that weighs half the weight of the car ready to fall,

469

00:25:09,000 --> 00:25:12,000

they're starting with the car at its lowest velocity.

470

00:25:12,000 --> 00:25:14,000

Alright, here we go.

471

00:25:15,000 --> 00:25:17,000

It's blind.

472

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

I'm going to have to say that didn't flip.

473

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

The slow speed failed to even get the back wheels off the ground.

474

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

So it's time to up the acceleration.

475

00:25:28,000 --> 00:25:31,000

More velocity equals more energy.

476

00:25:31,000 --> 00:25:33,000

But will that mean more tilt?

477

00:25:33,000 --> 00:25:37,000

Hopefully that extra momentum will cause the car to flip.

478

00:25:37,000 --> 00:25:42,000

Tori puts his finger to the trigger and they try maximum velocity.

479

00:25:44,000 --> 00:25:46,000

That was a direct hit.

480

00:25:46,000 --> 00:25:48,000

We're still not getting the flip.

481

00:25:48,000 --> 00:25:51,000

I think we need to get some more energy punching down on the car.

482

00:25:51,000 --> 00:25:54,000

This time the back wheels did at least get off the ground,

483

00:25:54,000 --> 00:25:56,000

but only by two degrees.

484

00:25:56,000 --> 00:25:58,000

And they'll need 90 for a flip.

485

00:25:58,000 --> 00:26:01,000

So there's a long way to go yet.

486

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

But will upping the ante on the impact make a difference?

487

00:26:06,000 --> 00:26:11,000

Going for full tilt, they're dropping three times the weight of the car.

488

00:26:12,000 --> 00:26:17,000

But instead of a tilt, the weight grinds the car to a halt.

489

00:26:17,000 --> 00:26:20,000

So for the next test, they try 200%.

490

00:26:20,000 --> 00:26:23,000

Okay, this might be the magic punch.

491

00:26:24,000 --> 00:26:25,000

Good shot.

492

00:26:25,000 --> 00:26:27,000

No flip.

493

00:26:27,000 --> 00:26:32,000

That net them the highest rear wheel elevation so far of 15 degrees.

494

00:26:32,000 --> 00:26:36,000

But they're two parameters down and still miles off a flip.

495

00:26:36,000 --> 00:26:40,000

Will tweaking the final variable cause a tumble?

496

00:26:40,000 --> 00:26:46,000

If the mass is down low and far away from the pivot point, it's harder to flip.

497

00:26:46,000 --> 00:26:49,000

If you move the mass up away from the pivot point,

498

00:26:49,000 --> 00:26:52,000

suddenly it becomes easier to flip the car over.

499

00:26:52,000 --> 00:26:56,000

So we're going to put some luggage on the top here and see if that helps us out.

500

00:26:56,000 --> 00:27:02,000

It's a tiny SUV capping holiday with 25% of the car's weight in luggage.

501

00:27:02,000 --> 00:27:05,000

Alright, so this is it, the final parameters for our final test.

502

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

And everything is in our favor.

503

00:27:07,000 --> 00:27:11,000

But I mean, so far after all these tests that we have done, I think this is asking a lot.

504

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

In other words, it's now or never.

505

00:27:16,000 --> 00:27:17,000

And it's never.

506

00:27:18,000 --> 00:27:22,000

Raising the center of gravity did increase the tilt to 25 degrees,

507

00:27:22,000 --> 00:27:24,000

but that's nowhere near enough.

508

00:27:24,000 --> 00:27:30,000

Even with the combination of the optimal variables, they're no closer to a flip,

509

00:27:30,000 --> 00:27:33,000

which means this is busted.

510

00:27:33,000 --> 00:27:38,000

I'm pretty sure cars weren't meant to flip end over end over end.

511

00:27:38,000 --> 00:27:44,000

So even a big giant punch from a superhuman from hell, I don't think it's going to do it.

512

00:27:44,000 --> 00:27:49,000

So why is it that no combination of these variables seems to be making any difference with our results?

513

00:27:49,000 --> 00:27:51,000

Well, it all comes down to physics.

514

00:27:51,000 --> 00:27:54,000

See, we are applying our force too close to the full film.

515

00:27:54,000 --> 00:27:57,000

Imagine that it's like a seesaw with a large weight on one side

516

00:27:57,000 --> 00:28:02,000

and you apply weight on the other side, but here's the kicker, almost on top of the full chrome.

517

00:28:02,000 --> 00:28:07,000

Now, the force that you need to apply to get the weight to lift from here is almost astronomical.

518

00:28:07,000 --> 00:28:12,000

But the problem is, if you apply too much force, the lever will break.

519

00:28:12,000 --> 00:28:18,000

The flip in physics are busting the myth, but that's never stopped the myth busters before.

520

00:28:18,000 --> 00:28:23,000

Next, the Archimedes raid apocalypse begins.

521

00:28:23,000 --> 00:28:26,000

That's the spirit soldier!

522

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

The myth busters are testing the presidential theory that more manpower and more mirrors

523

00:28:34,000 --> 00:28:37,000

That's it, that's what I'm talking about, that's perfect!

524

00:28:37,000 --> 00:28:40,000

could create a solar death ray.

525

00:28:40,000 --> 00:28:45,000

I expect you guys to figure this out, get to the bottom of this once and for all and then report back to me.

526

00:28:45,000 --> 00:28:48,000

Well, as long as they can find the manpower.

527

00:28:50,000 --> 00:28:55,000

Now, you may be wondering, where are we going to find 500 Greek soldiers?

528

00:28:55,000 --> 00:29:02,000

Here's where. 500 middle and high school students have graciously agreed to be our Greek soldiers for science!

529

00:29:05,000 --> 00:29:06,000

It's on.

530

00:29:07,000 --> 00:29:12,000

It certainly is. So first up, the briefing on taking down the enemy.

531

00:29:12,000 --> 00:29:20,000

You guys are going to play Greek soldiers defending their home city of Syracuse from the marauding Roman army

532

00:29:20,000 --> 00:29:23,000

under General Marcellus, played by James Franklin Heineman right here.

533

00:29:26,000 --> 00:29:34,000

Now, your countrymen, the great Greek mathematician Archimedes has given you a very novel weapon to defend yourselves.

534

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

The power of the sun.

535

00:29:36,000 --> 00:29:40,000

You are going to be lined up on the water's edge in ranks.

536

00:29:40,000 --> 00:29:47,000

Evil Jamie, General Marcellus, will be coming towards you in a boat with the black sun painted on its sail.

537

00:29:47,000 --> 00:29:52,000

If you all were able to aim your sunbeams all at the single spot of the black sun on this sail,

538

00:29:52,000 --> 00:29:54,000

you're going to set his boat on fire and set it on fire.

539

00:29:54,000 --> 00:29:56,000

General Marcellus, Roman's home. Are you guys with me?

540

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

I didn't hear you. Are you with me?

541

00:30:01,000 --> 00:30:03,000

I think they're ready.

542

00:30:04,000 --> 00:30:09,000

They're certainly spoiling for a little ship broiling, so it's time to deploy the troops.

543

00:30:11,000 --> 00:30:13,000

This is crazy.

544

00:30:13,000 --> 00:30:19,000

For the best chance of success, their target will be anchored, and they'll aim at the black sun for two reasons.

545

00:30:19,000 --> 00:30:26,000

Firstly, because just like the small scale test, we want the beams to meet at a focal point to concentrate the heat.

546

00:30:26,000 --> 00:30:35,000

And secondly, because with an ignition point of 410 degrees Fahrenheit, the sail is the most flammable part of the ship.

547

00:30:38,000 --> 00:30:41,000

With the trireme 400 feet from the shore.

548

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

All right soldiers, are you feeling me? Give me a hua!

549

00:30:45,000 --> 00:30:51,000

It's time for 500 bronze mirrors to beam down a Raypocalypse.

550

00:30:51,000 --> 00:30:59,000

In the distance, the enemy ship approaches to my left and to my right, an army of 500 young men and women strong.

551

00:30:59,000 --> 00:31:04,000

With any luck, we will avert this enemy and send them back to their home country.

552

00:31:05,000 --> 00:31:07,000

The suspense is totally killing me.

553

00:31:09,000 --> 00:31:11,000

Okay, Greek soldiers!

554

00:31:12,000 --> 00:31:16,000

Do you want Marcellus to take your city of Syracuse?

555

00:31:17,000 --> 00:31:20,000

Do you want him to own the island of Sicily?

556

00:31:20,000 --> 00:31:23,000

No, it's the gateway to the Mediterranean!

557

00:31:23,000 --> 00:31:26,000

You've got to aim your sunbeam at that boat now.

558

00:31:26,000 --> 00:31:29,000

Get that beam on the center of the sail.

559

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

Adam issues the order, and 500 bronze mirrors turn simultaneously to focus their beams on the black sun.

560

00:31:37,000 --> 00:31:39,000

Do you see it on the center of the sail?

561

00:31:40,000 --> 00:31:44,000

Excellent! How do the beams look to you, Captain Marcellus?

562

00:31:44,000 --> 00:31:56,000

Well, I don't see any flames on my boat yet, but these mirrors are really intense, like a row of flash bulbs going off constantly.

563

00:31:57,000 --> 00:32:04,000

But with the bronze 20% less reflective than the modern mirrors, the results aren't lighting any fires.

564

00:32:04,000 --> 00:32:06,000

No fire.

565

00:32:06,000 --> 00:32:16,000

And after 15 minutes of concentrated bronze beams, the thermal image shows that the temperature on the sail has only risen by 45 degrees.

566

00:32:17,000 --> 00:32:20,000

So it's time to up the intensity.

567

00:32:20,000 --> 00:32:28,000

Greek soldiers, I need every single one of you to spin your mirrors around 180 degrees and let's get some glass going at this boat.

568

00:32:28,000 --> 00:32:33,000

That's it! Now you start to see how easy it is to see your beam, right?

569

00:32:34,000 --> 00:32:37,000

Are you feeling me? Give me a hua!

570

00:32:38,000 --> 00:32:46,000

Quick as a flash, Adam's 500 have their modern mirrors focused on the black sun, but will they prove more powerful?

571

00:32:46,000 --> 00:32:51,000

Now that's some brightness. You guys have to hold your beam super steady.

572

00:32:51,000 --> 00:32:55,000

It's the only thing that will save your home city. Do you want to save your home city?

573

00:32:56,000 --> 00:33:01,000

That's the kind of energy it'll take, except sun's energy. Point at that boat.

574

00:33:02,000 --> 00:33:04,000

That's the spirit, soldiers!

575

00:33:05,000 --> 00:33:08,000

I'm Greek, not Scottish. I don't know why I'm talking like that.

576

00:33:09,000 --> 00:33:15,000

500 silvered mirror beams on the sail have already resulted in a huge rise in temperature.

577

00:33:15,000 --> 00:33:21,000

They're getting 200 degrees of concentrated heat, but that's not yet enough to ignite the sail.

578

00:33:22,000 --> 00:33:30,000

The intensity I'm seeing from some of these mirrors is just incredible, and yet no sign of fire.

579

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

Alright, I think you've got to start pulling this boat closer to us, okay?

580

00:33:36,000 --> 00:33:43,000

Keep those mirrors focused. The closer he gets, the hotter he's going to get, and we may just get some fire. That's it. Good.

581

00:33:43,000 --> 00:33:47,000

So, Commander Savage takes one last chance to organize the troops.

582

00:33:47,000 --> 00:33:49,000

Flash, flash, flash! I want fire!

583

00:33:49,000 --> 00:33:52,000

And prevent a full-scale Heinemann invasion.

584

00:33:53,000 --> 00:33:55,000

These guys are doing great, and we're not getting fired.

585

00:33:56,000 --> 00:33:57,000

East!

586

00:33:58,000 --> 00:34:01,000

Stay tuned for the fantastic flippin' finale.

587

00:34:01,000 --> 00:34:03,000

There's so much that can go wrong on this.

588

00:34:03,000 --> 00:34:06,000

And can all the President's men take down the trireme?

589

00:34:07,000 --> 00:34:10,000

This is the last chance we have to catch this thing on fire.

590

00:34:16,000 --> 00:34:21,000

Okay, so sad to say, but I think that we've busted the myth as it appears in the movie in Small Scale.

591

00:34:21,000 --> 00:34:24,000

Well, you guys know what that means. It's time to replicate the results.

592

00:34:24,000 --> 00:34:27,000

Now, normally at this point in the myth, we would replicate it like they did it in the movie,

593

00:34:27,000 --> 00:34:30,000

probably with like a nitrogen cannon and a piston to flip the car.

594

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

But what if we just used the same physics but changed the design of the car to see if we could get it to flip?

595

00:34:36,000 --> 00:34:39,000

That could be fun, but maybe we can do this in the Small Scale first,

596

00:34:39,000 --> 00:34:42,000

because you saw how many cars we destroyed just replicating the myth.

597

00:34:42,000 --> 00:34:43,000

Are you tired of crashing cars?

598

00:34:43,000 --> 00:34:45,000

Never, but we're running out of them.

599

00:34:47,000 --> 00:34:53,000

Now, we know that this myth is down to levels, but replicating the movie and dropping the weight on the hood just isn't causing the car to flip.

600

00:34:53,000 --> 00:34:56,000

The force is applied too close to the fulcrum.

601

00:34:56,000 --> 00:34:57,000

But what if we create a lever?

602

00:34:57,000 --> 00:35:00,000

We increase the distance of the weight to the fulcrum.

603

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

That way, when we drop the weight, the vehicle should flip and over in.

604

00:35:03,000 --> 00:35:05,000

I mean, it should work like a charm.

605

00:35:05,000 --> 00:35:06,000

That's right, science fans.

606

00:35:06,000 --> 00:35:13,000

Instead of Hollywood fakery, Torey's devilish idea is to flip this car using physics.

607

00:35:13,000 --> 00:35:15,000

In three, two, one.

608

00:35:16,000 --> 00:35:19,000

Oh!

609

00:35:19,000 --> 00:35:24,000

Grant, that looked like a flip to me.

610

00:35:24,000 --> 00:35:28,000

I mean, it didn't do it exactly like the movie, but...

611

00:35:28,000 --> 00:35:30,000

Dude, I think we can move on from there.

612

00:35:30,000 --> 00:35:31,000

This might work.

613

00:35:31,000 --> 00:35:32,000

It was going.

614

00:35:32,000 --> 00:35:36,000

The lever scored a tilt on the car of over 90 degrees,

615

00:35:36,000 --> 00:35:39,000

and it's clear that the physics are working.

616

00:35:39,000 --> 00:35:42,000

So after a small scale proof,

617

00:35:42,000 --> 00:35:47,000

it's time to ramp this up and put a massive lever on the SUV's roof.

618

00:35:47,000 --> 00:35:48,000

Oh, yeah!

619

00:35:48,000 --> 00:35:50,000

It should be good.

620

00:35:50,000 --> 00:35:52,000

Now this thing is beefy.

621

00:35:52,000 --> 00:35:57,000

It's got to be strong because we're going to be dropping 5,000 pounds on the front end of it.

622

00:35:57,000 --> 00:35:59,000

If anything is going to make it flip, it's this design.

623

00:35:59,000 --> 00:36:04,000

But it's one thing to do it in small scale and another to do it in large scale.

624

00:36:04,000 --> 00:36:07,000

It's quite the engineering challenge,

625

00:36:07,000 --> 00:36:11,000

but with 1,100 pounds of steel welded into a giant lever,

626

00:36:11,000 --> 00:36:13,000

they're ready to put it to the test.

627

00:36:13,000 --> 00:36:18,000

The best case scenario here is that we hit the lever perfectly with our 5,000 pound weight.

628

00:36:18,000 --> 00:36:21,000

The car tips right at the tipping point.

629

00:36:21,000 --> 00:36:22,000

Boom!

630

00:36:22,000 --> 00:36:23,000

It crashes upside down.

631

00:36:23,000 --> 00:36:27,000

And the worst case scenario here, none of us really want to imagine.

632

00:36:27,000 --> 00:36:31,000

For timings off, we might hit the weight, smash the car and have to revisit.

633

00:36:31,000 --> 00:36:36,000

There's a lot riding on this car, and it's not just the weight of the lever.

634

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

There's only one car, and they've only got one shot at the car.

635

00:36:40,000 --> 00:36:42,000

They've only got one shot to get this ride.

636

00:36:42,000 --> 00:36:46,000

For once, failure is not an option.

637

00:36:46,000 --> 00:36:50,000

And we have done everything to engineer it in our favor.

638

00:36:50,000 --> 00:36:56,000

I think if that weight hits the front end of this vehicle, we're going to see this thing flip.

639

00:36:56,000 --> 00:36:58,000

I'm a little excited.

640

00:36:58,000 --> 00:36:59,000

I'm a little nervous.

641

00:36:59,000 --> 00:37:01,000

There's so much that can go wrong on this.

642

00:37:01,000 --> 00:37:02,000

I'm anxious.

643

00:37:02,000 --> 00:37:03,000

Let's do it.

644

00:37:03,000 --> 00:37:07,000

Okay, this is car somersaults, lever car.

645

00:37:07,000 --> 00:37:14,000

Alright, final experiment in three, two, one, go.

646

00:37:14,000 --> 00:37:19,000

It's now or never as the lever car is towed towards its destiny.

647

00:37:19,000 --> 00:37:25,000

Either to be crushed by 5,000 pounds, or to be finally flipped by physics.

648

00:37:25,000 --> 00:37:27,000

Still on the channel, looks like it's going straight.

649

00:37:27,000 --> 00:37:29,000

It looks like it's going straight.

650

00:37:29,000 --> 00:37:30,000

Looks like it's going straight.

651

00:37:30,000 --> 00:37:32,000

Alright, alright, this is it, this is it.

652

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

Alright.

653

00:37:33,000 --> 00:37:38,000

Oh, yes!

654

00:37:38,000 --> 00:37:40,000

Bingo.

655

00:37:40,000 --> 00:37:42,000

Everything went exactly the plan.

656

00:37:42,000 --> 00:37:45,000

The weight triggering at the right moment,

657

00:37:45,000 --> 00:37:51,000

dropping onto the very front of the lever and tilting the car.

658

00:37:51,000 --> 00:37:55,000

But it was still only a 45 degree dangle.

659

00:37:55,000 --> 00:37:58,000

And of course, there was no flip.

660

00:37:58,000 --> 00:38:01,000

Can you believe that?

661

00:38:01,000 --> 00:38:03,000

Oh my gosh, the stars had to align.

662

00:38:03,000 --> 00:38:05,000

True, look it dug into the ground here.

663

00:38:05,000 --> 00:38:07,000

Did you see how high the back end got?

664

00:38:07,000 --> 00:38:09,000

I mean, it almost went over.

665

00:38:09,000 --> 00:38:13,000

But the important thing here is that it didn't.

666

00:38:13,000 --> 00:38:16,000

So we tested this myth just like in the movie,

667

00:38:16,000 --> 00:38:18,000

yet we couldn't get the car to flip.

668

00:38:18,000 --> 00:38:20,000

Then we moved on to the ridiculous.

669

00:38:20,000 --> 00:38:24,000

We changed the design of the car, we increased the force of the punch.

670

00:38:24,000 --> 00:38:27,000

However, we still were not able to get the car to flip.

671

00:38:27,000 --> 00:38:30,000

I really wish it had, but it didn't.

672

00:38:30,000 --> 00:38:32,000

So this myth is busted.

673

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

Enemy ship captain by Jamie, a.k.a. General Marcellus.

674

00:39:03,000 --> 00:39:08,000

If there ever was a test to determine that Paula's shields could be an effective weapon of war,

675

00:39:08,000 --> 00:39:11,000

this is that test.

676

00:39:11,000 --> 00:39:13,000

This is that test.

677

00:39:13,000 --> 00:39:16,000

And with the enemy now only 100 feet away,

678

00:39:16,000 --> 00:39:21,000

it's the last chance for Adam and his army to get their solar ray to work.

679

00:39:21,000 --> 00:39:24,000

Alright soldiers, you're doing a fantastic job.

680

00:39:24,000 --> 00:39:27,000

I'd like everyone to take their mirrors off the target briefly

681

00:39:27,000 --> 00:39:29,000

and take a deep breath with me.

682

00:39:29,000 --> 00:39:31,000

Inhale.

683

00:39:31,000 --> 00:39:33,000

Exhale.

684

00:39:33,000 --> 00:39:38,000

On the count of three, I want you all to aim your beams at that black sun

685

00:39:38,000 --> 00:39:40,000

and keep them as steady as possible.

686

00:39:40,000 --> 00:39:42,000

Are you ready?

687

00:39:42,000 --> 00:39:44,000

We're doing this for Syracuse.

688

00:39:44,000 --> 00:39:50,000

In three, two, one, aim on that black sun.

689

00:39:50,000 --> 00:39:52,000

Hold it steady.

690

00:39:52,000 --> 00:39:55,000

Find your beam, keep it centered on that sail.

691

00:39:55,000 --> 00:39:58,000

That's it. That's twice as bright as before.

692

00:39:58,000 --> 00:40:04,000

Right, but to ignite the sail, the focal point will have to reach 410 degrees Fahrenheit.

693

00:40:04,000 --> 00:40:09,000

And with the black sun at 230 degrees, that's a long way off.

694

00:40:09,000 --> 00:40:12,000

Look, he's taunting you.

695

00:40:12,000 --> 00:40:15,000

You're giving this every possible effort.

696

00:40:15,000 --> 00:40:19,000

This is the last chance we have to catch this thing on fire.

697

00:40:19,000 --> 00:40:24,000

Oh, no, he's lobbing, flinging, tennis balls at us.

698

00:40:24,000 --> 00:40:26,000

Keep those mirrors on the sail.

699

00:40:26,000 --> 00:40:29,000

Oh, he just took out one of your great cameraman.

700

00:40:29,000 --> 00:40:31,000

Are you going to stand for that?

701

00:40:31,000 --> 00:40:35,000

Keep those mirrors focused on the sail.

702

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

The tennis balls are flying and the beams are focused on the sail.

703

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

But while 280 degrees is impressive, it's still 130 off a sail ignition.

704

00:40:47,000 --> 00:40:54,000

Okay, Adam, I figure that if this was a real war, you just lost

705

00:40:54,000 --> 00:40:58,000

because I got a whole bunch of you guys and you didn't get one of me.

706

00:40:58,000 --> 00:41:01,000

I think you're right. Why don't you gear down and come on in?

707

00:41:01,000 --> 00:41:03,000

I think we've got to call this one.

708

00:41:03,000 --> 00:41:04,000

Yeah.

709

00:41:06,000 --> 00:41:10,000

Yep, after over an hour of beaming the sun's rays onto the boat,

710

00:41:10,000 --> 00:41:15,000

our 500 soldiers have earned themselves an honorable discharge.

711

00:41:15,000 --> 00:41:17,000

One, two, three.

712

00:41:17,000 --> 00:41:19,000

Yes, Boston!

713

00:41:21,000 --> 00:41:22,000

You hear that?

714

00:41:22,000 --> 00:41:25,000

I was actually kind of disappointed we didn't set the boat on fire.

715

00:41:25,000 --> 00:41:29,000

We've got plenty of sun. We've got plenty of mirrors to do the trick.

716

00:41:29,000 --> 00:41:31,000

But here's the thing.

717

00:41:31,000 --> 00:41:35,000

Mythbusters is about experimentation. It's not about demonstration.

718

00:41:35,000 --> 00:41:38,000

And when I was in the middle of this experiment out on that boat

719

00:41:38,000 --> 00:41:42,000

with all those mirrors shining in my face, I realized something really important.

720

00:41:42,000 --> 00:41:48,000

And that is that they were actually quite distracting and blinding, even painful.

721

00:41:48,000 --> 00:41:52,000

And that right there may be the grain of truth at the heart of this myth.

722

00:41:52,000 --> 00:41:57,000

Good old Archimedes may not have come up with this trick in order to set a ship on fire,

723

00:41:57,000 --> 00:42:01,000

but rather to distract and disorient invading armies.

724

00:42:01,000 --> 00:42:05,000

And that says something really important about the nature of experimentation.

725

00:42:05,000 --> 00:42:12,000

When we experiment, when we try things and we fail, we start to ask why.

726

00:42:12,000 --> 00:42:13,000

And that's when we learn.

727

00:42:13,000 --> 00:42:15,000

Let's go tell POTUS.

728

00:42:15,000 --> 00:42:16,000

Okay.

729

00:42:19,000 --> 00:42:21,000

So how'd it go, guys?

730

00:42:21,000 --> 00:42:25,000

Well, it was an awful lot of work, but in the end the myth was busted.

731

00:42:25,000 --> 00:42:26,000

Nice work.

732

00:42:26,000 --> 00:42:27,000

Thank you.

733

00:42:27,000 --> 00:42:28,000

Thank you.

734

00:42:28,000 --> 00:42:29,000

Well, thank you guys for everything you do.

735

00:42:29,000 --> 00:42:30,000

Thanks.

736

00:42:30,000 --> 00:42:31,000

Really enjoyed.