WEBVTT

1
00:00:00.185 --> 00:00:01.245
That's a lot to think about.

2
00:00:01.345 --> 00:00:03.365
And I have not joined SFTE yet,

3
00:00:04.185 --> 00:00:05.525
but I'll certainly look into that.

4
00:00:05.585 --> 00:00:09.285
My, my cube mate is A SFT. There you go.

5
00:00:10.875 --> 00:00:12.165
Okay, so we are a little bit

6
00:00:12.165 --> 00:00:13.245
ahead of schedule, so that's good.

7
00:00:13.905 --> 00:00:18.405
Uh, next presentation up is simplifying the test hazard

8
00:00:18.845 --> 00:00:21.285
analysis by Taylor Oxford from Honda

9
00:00:22.065 --> 00:00:23.845
Taylor is the test

10
00:00:23.845 --> 00:00:27.445
and evaluation manager, uh, at HRI currently working

11
00:00:27.515 --> 00:00:28.885
with their EVOL project.

12
00:00:29.335 --> 00:00:31.005
After graduating from Georgia Tech,

13
00:00:31.065 --> 00:00:33.965
Taylor started his tour in Wichita at Cessna,

14
00:00:33.965 --> 00:00:35.405
where he worked as a flight controls

15
00:00:35.605 --> 00:00:36.685
engineer and a loads engineer.

16
00:00:37.765 --> 00:00:40.285
Received his master's degree in control law from Wichita

17
00:00:40.285 --> 00:00:43.085
State, and Taylor worked for Gulfstream Aerospace

18
00:00:43.105 --> 00:00:46.085
for several years as an FTE Aircraft Project Lead

19
00:00:46.085 --> 00:00:47.245
and FTE group lead.

20
00:00:47.245 --> 00:00:50.525
Prior to moving to Honda, he has a family of seven,

21
00:00:50.525 --> 00:00:53.085
which OCC occupies his, uh, time outside of work.

22
00:00:53.145 --> 00:00:57.285
So Nathan, uh, or Nathaniel, I don't know what it is.

23
00:00:57.285 --> 00:01:00.525
With the Gulfstream FTEs and the huge families.

24
00:01:00.525 --> 00:01:01.685
There's probably something in the water.

25
00:01:01.965 --> 00:01:03.965
Savannah, I don't know. We're competing. Yeah. Alright.

26
00:01:04.985 --> 00:01:06.765
Uh, here you go over Taylor. Thank you.

27
00:01:12.745 --> 00:01:14.125

All right. Good morning everyone.

28
00:01:14.745 --> 00:01:19.645
Um, so moving over to Honda Research Institute.

29
00:01:19.905 --> 00:01:23.445
We more along the startups, um,

30
00:01:23.735 --> 00:01:28.285
going into ev toll different from, uh, the tour that most

31
00:01:28.285 --> 00:01:29.645
of you got to see with the Honda Jet.

32
00:01:29.745 --> 00:01:33.045
So, you know, we're going into something that's, you know,

33
00:01:33.045 --> 00:01:34.565
just a bit different.

34
00:01:34.825 --> 00:01:37.525
So we got the opportunity to think about

35
00:01:37.665 --> 00:01:39.365
how we do all of our processes.

36
00:01:39.985 --> 00:01:42.365
Um, do we wanna just steal

37
00:01:42.705 --> 00:01:45.565
or leverage what you know, hacky has already done before

38
00:01:45.805 --> 00:01:48.405
'cause it's a sister company, or do we need to take the time

39
00:01:48.465 --> 00:01:52.165
to really look at how we do things, um,

40
00:01:52.705 --> 00:01:55.645
and tailor it specifically to the areas

41
00:01:55.675 --> 00:01:56.845
that we're working in,

42
00:01:57.015 --> 00:01:59.485
which are just a little bit different now.

43
00:01:59.665 --> 00:02:01.845
You know, many of you think about things like

44
00:02:02.315 --> 00:02:03.605
test hazard analysis.

45
00:02:03.665 --> 00:02:04.965
Oh, how do you simplify that?

46
00:02:04.965 --> 00:02:06.405
That's already something that's, you know,

47
00:02:06.705 --> 00:02:09.925
really simple, right?

48
00:02:10.195 --> 00:02:12.845
Most of you could do this in your sleep. You do it for fun.

49
00:02:13.825 --> 00:02:16.805
We have all different types. How do we do these?

50
00:02:16.875 --> 00:02:18.205
This is what our looks like.

51
00:02:18.665 --> 00:02:21.605
Um, I was even going through the airport the other day

52
00:02:21.665 --> 00:02:24.805
and some people are just like really into tpha.

53
00:02:25.405 --> 00:02:28.965
I picked up the Tom Huffs test hazard

54
00:02:29.485 --> 00:02:30.685

analysis crossword puzzle.

55
00:02:31.225 --> 00:02:33.525
So many of you know Tom Huff.

56
00:02:33.545 --> 00:02:37.285
He is really into explaining why causes and hazards

57
00:02:37.285 --> 00:02:38.765
and the differences between the two.

58
00:02:39.265 --> 00:02:42.125
Um, and since we're, you know, a little ahead of schedule,

59
00:02:42.225 --> 00:02:45.045
you guys won't mind if I do one real quick, right?

60
00:02:45.795 --> 00:02:50.565
Okay. So let's see here. I've got a three letter.

61
00:02:51.575 --> 00:02:56.405
Let's see. Last letter is s says helicopter descent rate.

62
00:02:56.865 --> 00:03:01.805
Hazard. Ah, vortex ring state. Okay. VRS.

63
00:03:01.945 --> 00:03:04.365
Got it. Alright, I'll just fill that in real quick. Okay.

64
00:03:04.395 --> 00:03:08.365
Alright. Thank you for taking my time. Let me take the time.

65
00:03:09.345 --> 00:03:11.925
But you know, how much can really go into this

66
00:03:12.385 --> 00:03:13.445
one page document?

67
00:03:13.865 --> 00:03:15.685
You know, everything's really condensed.

68
00:03:16.475 --> 00:03:18.805
Sometimes you try to squeeze too much in,

69
00:03:18.825 --> 00:03:22.915
you shrink the font down, a lot can go into it.

70
00:03:23.135 --> 00:03:25.675
So that's the thing that we really started thinking about is

71
00:03:26.135 --> 00:03:27.635
we could do this a little bit better.

72
00:03:27.975 --> 00:03:29.435
We have a new organization

73
00:03:29.975 --> 00:03:32.195
who doesn't necessarily have the formal

74
00:03:32.255 --> 00:03:33.395
flight test training.

75
00:03:33.815 --> 00:03:38.675
Um, we use the same process for flight test articles

76
00:03:38.695 --> 00:03:40.115
as for ground test articles.

77
00:03:40.535 --> 00:03:42.235
Um, it makes it simpler

78
00:03:42.335 --> 00:03:45.675
for the organization if we don't have multiple things going

79
00:03:45.695 --> 00:03:47.515
on for how we do all of our stuff.

80
00:03:49.055 --> 00:03:52.515
We make it easy and not feel like a burden for everyone.

81
00:03:53.015 --> 00:03:57.475

Um, easily, especially the less experienced, um,

82
00:03:57.495 --> 00:04:00.115
flight test engineers can really become concerned

83
00:04:00.455 --> 00:04:04.115
and just kind of turn off when we start arguing about little

84
00:04:04.275 --> 00:04:05.355
nitpicky type of things.

85
00:04:05.735 --> 00:04:06.795
So we wanted to make sure

86
00:04:06.795 --> 00:04:08.555
that it doesn't feel like a burden for them.

87
00:04:09.015 --> 00:04:10.915
Um, and we wanted to make it, uh,

88
00:04:10.915 --> 00:04:13.315
I believe somebody from the, uh,

89
00:04:14.345 --> 00:04:17.835
this conference last year mentioned that we wanna make it

90
00:04:17.835 --> 00:04:20.195
so it's easier to follow the process than

91
00:04:20.195 --> 00:04:22.475
to just act like you're following the process.

92
00:04:23.255 --> 00:04:24.595
So that, that's one of the main goals

93
00:04:24.595 --> 00:04:26.155
that we are trying to achieve as well.

94
00:04:27.335 --> 00:04:30.475
And again, we don't wanna focus too much on the details,

95
00:04:31.455 --> 00:04:34.475
you know, does this change actually make us safer?

96
00:04:34.775 --> 00:04:37.475
Was a question that we want to continually ask ourself.

97
00:04:38.455 --> 00:04:40.995
So of course we gotta start with some definition of terms.

98
00:04:41.655 --> 00:04:43.235
I'm not gonna go through that here.

99
00:04:43.535 --> 00:04:46.115
So everybody can go, you can go to the FA order yourself

100
00:04:46.135 --> 00:04:47.355
as a great list

101
00:04:47.735 --> 00:04:50.675
and lots of definitions there for you to go through.

102
00:04:51.135 --> 00:04:54.515
Um, please do so at your leisure. We have a method.

103
00:04:54.815 --> 00:04:56.595
So everybody loves a good flow chart.

104
00:04:56.615 --> 00:04:57.955
You guys in the back, I'm sorry,

105
00:04:58.015 --> 00:04:59.115
you probably can't see this.

106
00:04:59.505 --> 00:05:01.515
Dave, can you put on your glasses there?

107
00:05:01.685 --> 00:05:05.155
Maybe you could see it. Um, of course we go through,

108
00:05:05.175 --> 00:05:08.195

we analyze and then at the very end,

109
00:05:08.195 --> 00:05:11.475
after we've documented, we go to our safety review board.

110
00:05:11.475 --> 00:05:15.195
We go to, um, those advocates that we bring in to help us.

111
00:05:15.535 --> 00:05:16.995
And we get them to look at it

112
00:05:16.995 --> 00:05:19.955
and make sure that hey, you're, we're seeing everything,

113
00:05:19.965 --> 00:05:22.115
we're seeing all the different possibilities here.

114
00:05:22.375 --> 00:05:24.315
And if we didn't, then we go back

115
00:05:24.855 --> 00:05:26.915
and we look at how we can mitigate again,

116
00:05:26.975 --> 00:05:29.875
how we can make our emergency procedures better.

117
00:05:32.565 --> 00:05:36.265
Now the question for us always is what's acceptable risk?

118
00:05:38.125 --> 00:05:41.105
So it can be different depending on the

119
00:05:41.465 --> 00:05:42.585
situation you're in, right?

120
00:05:43.035 --> 00:05:46.225
Doing maybe traditional certification level flight testing.

121
00:05:46.895 --> 00:05:48.465
Very different than doing new

122
00:05:48.485 --> 00:05:52.185
and novel testing on a, you know, drone

123
00:05:52.185 --> 00:05:53.785
that's less than 55 pounds.

124
00:05:54.405 --> 00:05:57.965
So it can always be different severity.

125
00:05:58.785 --> 00:06:02.085
One of the things we really talk about is the consequence.

126
00:06:02.225 --> 00:06:05.445
If a hazard occurs, what does that actually mean?

127
00:06:06.195 --> 00:06:10.885
What is the difference between, you know, a vehicle crashing

128
00:06:10.885 --> 00:06:12.205
and losing a human life?

129
00:06:12.665 --> 00:06:14.165
You know, those are actually things that you have

130
00:06:14.165 --> 00:06:16.445
to talk about and think about in this forum.

131
00:06:17.785 --> 00:06:20.365
So we get this traditional simple

132
00:06:20.365 --> 00:06:21.805
definition with just words.

133
00:06:22.065 --> 00:06:24.565
Um, I believe this comes out of the 40 40 26.

134
00:06:25.265 --> 00:06:29.085
Um, then I also pulled another eye chart for you in the back

135
00:06:29.145 --> 00:06:30.565

of the Air Force manual.

136
00:06:30.865 --> 00:06:35.485
Um, why I wanna highlight on this one is specifically

137
00:06:35.995 --> 00:06:39.825
they say that if you lose a UAV

138
00:06:39.825 --> 00:06:43.185
of a certain category, that's less than, um,

139
00:06:43.285 --> 00:06:45.825
for them $2.5 million.

140
00:06:46.285 --> 00:06:50.825
It actually cannot be a catastrophic hazard by definition.

141
00:06:51.725 --> 00:06:54.705
So you start thinking it's like, oh, well

142
00:06:56.055 --> 00:06:58.435
the severity may not be as much as we thought.

143
00:06:58.535 --> 00:07:00.755
You know, this helps level set some

144
00:07:00.755 --> 00:07:01.915
of these things that we think about.

145
00:07:02.495 --> 00:07:05.275
Um, now what about your business reputation?

146
00:07:06.095 --> 00:07:09.875
So I work for Honda. Honda while we make a Honda jet.

147
00:07:10.415 --> 00:07:14.475
We aren't necessarily known for making aircraft.

148
00:07:14.525 --> 00:07:16.355
We're now known for making vehicles.

149
00:07:17.015 --> 00:07:18.315
If I do something

150
00:07:18.735 --> 00:07:21.995
and I cause something that ends up being on the news,

151
00:07:22.265 --> 00:07:26.515
that results in an NTSB investigation, is that something

152
00:07:26.545 --> 00:07:27.835
that is actually going

153
00:07:27.835 --> 00:07:30.355
to hurt the larger company as a whole?

154
00:07:30.895 --> 00:07:33.635
So interesting things you have to consider for those

155
00:07:33.635 --> 00:07:35.395
of you in the startup world.

156
00:07:35.855 --> 00:07:37.995
Um, if you lose a vehicle,

157
00:07:38.975 --> 00:07:41.035
do you lose the company?

158
00:07:42.055 --> 00:07:44.915
So vehicles very expensive to produce.

159
00:07:45.335 --> 00:07:48.715
You know, the repairs that you have to do

160
00:07:48.715 --> 00:07:50.795
to your vehicle could actually bankrupt you.

161
00:07:50.935 --> 00:07:53.395
It could be one of those things that investors look at

162
00:07:53.415 --> 00:07:57.195

and say, you know, I'm not really thinking

163
00:07:57.195 --> 00:07:58.875
that I'm gonna invest in your product.

164
00:07:59.175 --> 00:08:00.835
I'm gonna go over here to someone else.

165
00:08:01.975 --> 00:08:04.875
So those are all things we have to think about.

166
00:08:05.015 --> 00:08:07.755
So our box ends up a little bit differently.

167
00:08:08.495 --> 00:08:11.595
We end up putting things like not just the human

168
00:08:11.775 --> 00:08:13.995
and the test asset, which are always in there,

169
00:08:14.335 --> 00:08:15.955
but we start talking about the business

170
00:08:15.955 --> 00:08:17.995
reputation outside equipment.

171
00:08:18.015 --> 00:08:21.195
We start looking at, you know, does a human not just

172
00:08:21.335 --> 00:08:23.155
for the people on board the aircraft,

173
00:08:23.215 --> 00:08:24.595
but for those around it

174
00:08:25.095 --> 00:08:29.235
or for those that, um, you know, may just be outside

175
00:08:29.235 --> 00:08:30.235
of your property.

176
00:08:30.455 --> 00:08:32.475
Is there an issue that we need to consider?

177
00:08:32.815 --> 00:08:35.635
Do we need to put them into our severity discussion as well?

178
00:08:38.375 --> 00:08:39.715
Now, how do you define probability?

179
00:08:39.735 --> 00:08:41.355
You know, we're starting with these basics

180
00:08:41.615 --> 00:08:42.755
and working through them.

181
00:08:43.935 --> 00:08:46.835
All right? So then this is from the air force. Again.

182
00:08:47.105 --> 00:08:50.555
They have a good description there of what could be,

183
00:08:50.855 --> 00:08:51.875
and we get some numbers.

184
00:08:52.745 --> 00:08:55.365
Then you start getting into some of the, uh,

185
00:08:55.395 --> 00:08:57.525
more traditional SIF safety numbers.

186
00:08:57.745 --> 00:08:59.405
So how does this apply?

187
00:08:59.865 --> 00:09:03.845
Um, how do I get a negative 10th improbable

188
00:09:03.845 --> 00:09:04.885
hazard going on?

189
00:09:05.345 --> 00:09:06.685

Um, this is new and novel.

190
00:09:07.565 --> 00:09:09.365
I don't know how I actually get there.

191
00:09:09.615 --> 00:09:11.245
Maybe we do a time-based,

192
00:09:11.425 --> 00:09:15.405
but you know, this one, it's like every a thousand years

193
00:09:16.225 --> 00:09:17.725
for extremely improbable.

194
00:09:17.985 --> 00:09:21.125
Um, we're gonna fly this thing for maybe a total

195
00:09:21.225 --> 00:09:22.245
of a hundred hours.

196
00:09:23.025 --> 00:09:26.725
Um, does this really apply to what we're doing?

197
00:09:27.385 --> 00:09:29.605
So we end up with just definitions.

198
00:09:29.605 --> 00:09:30.965
We don't put numbers on it

199
00:09:30.965 --> 00:09:33.885
because numbers are very difficult to calculate.

200
00:09:34.195 --> 00:09:37.645
With early stage vehicles, we start going into

201
00:09:38.535 --> 00:09:40.285
using professional judgment.

202
00:09:40.665 --> 00:09:45.485
Um, we bring in people that even if we don't have the um,

203
00:09:46.425 --> 00:09:49.245
really the relevant people, we can bring those in

204
00:09:49.245 --> 00:09:51.125
through the non advocate reviews.

205
00:09:51.665 --> 00:09:53.405
Um, we have hired people

206
00:09:53.405 --> 00:09:55.885
that do have experience within flight testing.

207
00:09:56.425 --> 00:09:58.525
Um, they help us.

208
00:09:59.105 --> 00:10:02.605
The, this is the ha um, the hair standing on the back

209
00:10:02.605 --> 00:10:04.485
of your neck type situations.

210
00:10:05.025 --> 00:10:07.485
We review, we analyze, we try to go

211
00:10:07.485 --> 00:10:10.285
through all the different, um, facets.

212
00:10:10.465 --> 00:10:13.165
And we kinda get this squishy

213
00:10:13.565 --> 00:10:16.565
because we can't define number, but how we feel about it.

214
00:10:19.125 --> 00:10:21.545
Now, going into hazard identification,

215
00:10:21.815 --> 00:10:23.025
this is always a fun one.

216
00:10:23.365 --> 00:10:27.025

Um, we make sure we say we're not gonna start with

217
00:10:27.045 --> 00:10:28.065
how we've done this

218
00:10:28.065 --> 00:10:31.185
before, even though we did a test

219
00:10:31.795 --> 00:10:33.505
maybe just a few weeks ago.

220
00:10:34.565 --> 00:10:37.945
We need to go through it and re go through our process.

221
00:10:38.075 --> 00:10:39.385
Let's think about this differently.

222
00:10:39.655 --> 00:10:42.985
This test could be slightly different in the ways that,

223
00:10:43.445 --> 00:10:47.305
you know, it ends up turning out if you're developing new

224
00:10:47.305 --> 00:10:48.385
technologies as well.

225
00:10:48.685 --> 00:10:50.225
You may have never have done this before.

226
00:10:50.225 --> 00:10:52.505
It's not like you're just testing something off the shelf

227
00:10:52.815 --> 00:10:56.265
from a vehicle, um, that did this test 20 years ago.

228
00:10:56.515 --> 00:10:58.865
These are new and novel type situations.

229
00:11:00.805 --> 00:11:02.265
We of course, you know, go

230
00:11:02.265 --> 00:11:04.625
to the flight test safety committee website

231
00:11:04.625 --> 00:11:05.945
and we pull out references

232
00:11:06.365 --> 00:11:08.025
and they talk about brainstorming.

233
00:11:08.085 --> 00:11:10.785
So feel free to use this resource that's on there.

234
00:11:11.045 --> 00:11:12.465
We use it as well. Okay?

235
00:11:12.465 --> 00:11:16.695
I'll walk you through how to do that brainstorming.

236
00:11:16.955 --> 00:11:18.175
That's what focus on.

237
00:11:18.175 --> 00:11:20.055
We gotta think of all the different possibilities.

238
00:11:20.115 --> 00:11:21.935
We get all the important people

239
00:11:22.155 --> 00:11:23.215
and room, the people

240
00:11:23.235 --> 00:11:25.855
who design the system, who know the system.

241
00:11:26.875 --> 00:11:28.015
We spend some time trying

242
00:11:28.015 --> 00:11:31.735
to pry out the details from those control law engineers

243
00:11:31.755 --> 00:11:34.605

who you know, they just know it all.

244
00:11:35.185 --> 00:11:36.805
So you have to extract it.

245
00:11:36.805 --> 00:11:38.165
They just dunno how to communicate it.

246
00:11:38.165 --> 00:11:39.165
They just easy for them.

247
00:11:40.915 --> 00:11:42.805
Then you go into doing your research.

248
00:11:43.185 --> 00:11:45.605
So you do this brainstorming, then you go,

249
00:11:45.665 --> 00:11:46.965
you put all the things behind it.

250
00:11:46.965 --> 00:11:49.485
You go look at, well at one point we

251
00:11:49.485 --> 00:11:50.565
looked at the NASA database.

252
00:11:50.565 --> 00:11:52.845
We can't do that anymore. But we go through

253
00:11:53.065 --> 00:11:56.005
and we're trying to find all the different pieces and parts.

254
00:11:56.055 --> 00:11:58.565
We'll do look at accident investigations,

255
00:11:59.185 --> 00:12:00.645
um, all kinds of things.

256
00:12:01.665 --> 00:12:04.565
And this does include looking at what you did before

257
00:12:04.565 --> 00:12:06.565
because that's important as well.

258
00:12:06.565 --> 00:12:07.845
That is part of your research.

259
00:12:09.865 --> 00:12:11.925
Now, some of you might be saying,

260
00:12:11.925 --> 00:12:13.805
why don't just cut and paste, right?

261
00:12:13.825 --> 00:12:16.165
That's easy. You know, we can just go through it.

262
00:12:16.195 --> 00:12:18.485
Well, this came to me the other day.

263
00:12:18.625 --> 00:12:22.565
Um, I decided that I was going to pick up

264
00:12:22.565 --> 00:12:25.125
and start playing Mario Brothers three.

265
00:12:25.215 --> 00:12:27.485
Again, hadn't done it in a long time.

266
00:12:27.705 --> 00:12:29.725
You know, it's been several decades

267
00:12:30.385 --> 00:12:32.605
at Middle East since I've actually played this game.

268
00:12:32.945 --> 00:12:35.485
But, you know, I got some stuff lodged back here.

269
00:12:35.675 --> 00:12:39.685
Shouldn't be too bad. Um, I go through, I get into the game.

270
00:12:40.265 --> 00:12:41.925

Um, I'm just starting out.

271
00:12:42.005 --> 00:12:43.245
I kind of, it's coming back to me.

272
00:12:43.645 --> 00:12:47.925
I get to um, the uh, the third kind of level I remember,

273
00:12:47.925 --> 00:12:49.605
oh yeah, there's a secret here.

274
00:12:50.105 --> 00:12:53.285
So I follow the secret. I get what's called a warp whistle.

275
00:12:53.505 --> 00:12:56.445
So for any of you, those who may remember, um,

276
00:12:56.835 --> 00:12:59.205
warp whistles allow you to go to this place

277
00:12:59.345 --> 00:13:01.765
and choose which level you want to go to.

278
00:13:02.345 --> 00:13:05.845
So as a tester, now I'm considering it's like, okay, well

279
00:13:05.845 --> 00:13:07.845
where are the different hazards associated with going

280
00:13:07.845 --> 00:13:08.965
to these different levels?

281
00:13:09.145 --> 00:13:10.925
How do I choose which one to go to?

282
00:13:11.425 --> 00:13:15.405
Um, it's been again, years since I've played this game,

283
00:13:15.545 --> 00:13:17.045
so not really sure,

284
00:13:17.265 --> 00:13:19.645
but I remember that, oh, level two's the desert

285
00:13:19.745 --> 00:13:22.445
and has that really sun thing that follow you around.

286
00:13:22.445 --> 00:13:24.285
That's really annoying. So I don't want that.

287
00:13:24.865 --> 00:13:28.445
Um, level three is a water world

288
00:13:28.445 --> 00:13:30.605
and those are just terrible in all Mario games.

289
00:13:30.665 --> 00:13:31.685
So I'm gonna avoid that.

290
00:13:32.105 --> 00:13:34.405
So I, I kind of remember level four.

291
00:13:34.725 --> 00:13:36.605
I think I might go with that one.

292
00:13:36.945 --> 00:13:39.125
Um, 'cause it's really just everything bigger

293
00:13:39.515 --> 00:13:40.805
than the initial level.

294
00:13:40.825 --> 00:13:42.165
So it should just be the same, right?

295
00:13:43.345 --> 00:13:46.405
So then I have to deploy my mitigation.

296
00:13:46.545 --> 00:13:48.045
So in Mario you have lots

297
00:13:48.045 --> 00:13:49.925

of different mitigations you can select from.

298
00:13:50.525 --> 00:13:53.125
I chose the leaf 'cause it's a pretty good standard one.

299
00:13:53.405 --> 00:13:54.405
Starting off with that level.

300
00:13:54.985 --> 00:13:57.205
And here we go, starting off

301
00:13:58.105 --> 00:13:59.975
World four, right there at the beginning.

302
00:14:01.595 --> 00:14:06.055
Now this is all based on similar patterns

303
00:14:06.055 --> 00:14:09.055
that repeat themself over and over and over and over again.

304
00:14:10.235 --> 00:14:12.525
This game, you know, you played it forever.

305
00:14:12.785 --> 00:14:14.085
The patterns just repeat.

306
00:14:14.265 --> 00:14:15.685
That's allowed so many of us

307
00:14:15.685 --> 00:14:16.845
to be really good at video games

308
00:14:17.075 --> 00:14:20.245
because it was just pattern recognition and you can remember

309
00:14:20.245 --> 00:14:22.245
and every time you played the game it was the same.

310
00:14:22.865 --> 00:14:25.685
But I started thinking, what happens if you started here

311
00:14:27.145 --> 00:14:31.045
or here or here or some other random spot?

312
00:14:32.325 --> 00:14:34.195
Would it change the mitigations

313
00:14:34.265 --> 00:14:36.475
that I put in place that I selected?

314
00:14:36.745 --> 00:14:40.075
Because it ends up slightly different than

315
00:14:40.335 --> 00:14:41.555
how I remembered it.

316
00:14:42.455 --> 00:14:44.115
So really simple example,

317
00:14:44.575 --> 00:14:48.395
but kind of helps to illustrate why you should avoid that.

318
00:14:48.855 --> 00:14:50.795
Trying to just copy and paste

319
00:14:50.795 --> 00:14:52.725
or do it like we did the last time.

320
00:14:54.355 --> 00:14:58.205
Alright, risk level again, simple breaking it down.

321
00:14:58.795 --> 00:15:00.245
When do you assess risk?

322
00:15:00.425 --> 00:15:02.485
Pre-litigation, post mitigation,

323
00:15:02.485 --> 00:15:04.405
different documentation depending on

324
00:15:04.405 --> 00:15:07.005

who puts it out says you should do one or the other.

325
00:15:08.065 --> 00:15:10.405
We said do both. That's the easy way

326
00:15:10.665 --> 00:15:12.285
and it makes a lot of sense for us.

327
00:15:13.025 --> 00:15:16.045
You know, pre mitigation sets the level of oversight.

328
00:15:16.665 --> 00:15:20.325
If we have something that's medium, that's high, this means

329
00:15:20.355 --> 00:15:22.445
that we have to go get those outside reviewers.

330
00:15:22.635 --> 00:15:24.085
It's not just gonna be easy.

331
00:15:24.465 --> 00:15:26.725
We need to make sure that we're covering all our bases

332
00:15:26.725 --> 00:15:28.645
and we need the people to help us do that.

333
00:15:29.585 --> 00:15:34.565
But if we mitigate something down, do we really need

334
00:15:34.565 --> 00:15:39.125
to function when we get to test as it was a high risk test.

335
00:15:39.665 --> 00:15:42.245
If we have crew duty requirements that allow us to,

336
00:15:42.265 --> 00:15:44.445
to fly a little longer, to do a little bit more

337
00:15:45.065 --> 00:15:47.965
and we brought these things down to a low level,

338
00:15:48.715 --> 00:15:50.325
then why shouldn't we be able to do that?

339
00:15:51.905 --> 00:15:56.045
And we always stated that if at one point we're like, Hey,

340
00:15:56.585 --> 00:15:59.245
you know, I know we got this post mitigation down here

341
00:15:59.245 --> 00:16:02.645
to low, but we, this just doesn't feel right.

342
00:16:02.645 --> 00:16:04.925
We always have the ability to bring it up

343
00:16:05.475 --> 00:16:06.805
just on the gut feel.

344
00:16:07.135 --> 00:16:09.685
Can't bring it down by gut feel, but can bring it up.

345
00:16:11.785 --> 00:16:13.325
So another quick example.

346
00:16:13.665 --> 00:16:15.365
Go back to the vortex ring state

347
00:16:15.365 --> 00:16:18.005
that we got in the crossword puzzle from e earlier.

348
00:16:18.425 --> 00:16:21.365
Um, we gotta determine the operational syn rate capabilities

349
00:16:21.665 --> 00:16:23.885
of an EV toll aircraft.

350
00:16:24.385 --> 00:16:27.565
So as we're descending new novel aircraft, lots

351
00:16:27.565 --> 00:16:30.165

of rotors still have to deal with the vortex ring state,

352
00:16:30.165 --> 00:16:31.285
like the helicopter guys.

353
00:16:31.905 --> 00:16:34.045
We gotta go in to figure out where

354
00:16:34.045 --> 00:16:35.525
that operational limit is.

355
00:16:36.825 --> 00:16:40.405
But CFD says, Hey, that test point you wanna do,

356
00:16:41.135 --> 00:16:44.485
we're predicting that Vortex re state is just beyond that.

357
00:16:45.155 --> 00:16:49.575
And all of us are like, ooh, CFD that's based on what

358
00:16:50.835 --> 00:16:52.975
not win tunnel models at this early stage.

359
00:16:53.165 --> 00:16:56.575
It's just computers. Uh, do I really trust that?

360
00:16:57.075 --> 00:16:58.495
Um, that's scary.

361
00:16:59.115 --> 00:17:01.615
So we get a hazard loss of control

362
00:17:01.615 --> 00:17:02.815
of the vehicle near the ground.

363
00:17:03.435 --> 00:17:05.615
Vortex ring stay is our cause effect.

364
00:17:05.975 --> 00:17:10.895
Complete loss of the aircraft and crew. Hi, easy, right?

365
00:17:11.785 --> 00:17:13.695
Don't even need to start going through everything.

366
00:17:13.835 --> 00:17:16.545
But we really go through the mitigations

367
00:17:16.545 --> 00:17:20.705
and we're like, huh, well let's take the pilot out, right?

368
00:17:20.775 --> 00:17:22.785
Pilot's no longer on board the aircraft,

369
00:17:24.385 --> 00:17:26.005
we should be able to bring it down, right?

370
00:17:26.295 --> 00:17:27.685
We're only talking about the vehicle,

371
00:17:27.735 --> 00:17:29.525
we're not talking about loss of human life.

372
00:17:29.585 --> 00:17:34.165
Now let's use a subscale to validate that CFD

373
00:17:34.705 --> 00:17:36.885
is what the engineers are telling us, correct?

374
00:17:37.225 --> 00:17:38.605
We go through and it's like, oh

375
00:17:39.395 --> 00:17:41.405
well the CFT iss way off, huh?

376
00:17:41.865 --> 00:17:42.925
Who would've thought that happened?

377
00:17:43.825 --> 00:17:46.565
And we're gonna create a giant pile of mattresses

378
00:17:46.865 --> 00:17:48.325

to soften the landing, right?

379
00:17:49.395 --> 00:17:53.525
Yeah, that's gonna work out well. So low, we're down to low.

380
00:17:54.025 --> 00:17:56.965
So little bit of a facetious bit with the pile

381
00:17:56.965 --> 00:17:58.685
of mattresses, but you know,

382
00:17:58.735 --> 00:18:00.445
maybe it's not such a great idea.

383
00:18:01.185 --> 00:18:04.685
So hopefully none of the, the Harrier guys are in here

384
00:18:04.685 --> 00:18:06.245
who actually were on that aircraft.

385
00:18:07.075 --> 00:18:08.075
Nope.

386
00:18:09.785 --> 00:18:10.925
But everybody knows About it.

387
00:18:11.145 --> 00:18:15.165
Yes, but everybody knows about it. All right?

388
00:18:15.305 --> 00:18:17.565
So now we, we do something.

389
00:18:17.665 --> 00:18:20.645
So we're gonna make this easier for our people.

390
00:18:20.655 --> 00:18:22.565
We're not gonna just have that one sheet.

391
00:18:22.655 --> 00:18:24.325
We're gonna create a worksheet.

392
00:18:24.665 --> 00:18:27.045
So how many of you remember high school math class?

393
00:18:27.805 --> 00:18:30.845
Probably very, very easy for everyone in this room.

394
00:18:31.505 --> 00:18:34.445
Um, we would go through, you get problems like this.

395
00:18:36.105 --> 00:18:39.205
How do you answer it? Oh well the answer's 200 bags.

396
00:18:39.225 --> 00:18:42.285
And you'd write that on your paper, submit it.

397
00:18:42.505 --> 00:18:45.885
The teacher comes back with, show your work, right?

398
00:18:46.425 --> 00:18:49.445
You're like, ah, if I can do this in my head, why I have

399
00:18:49.445 --> 00:18:52.645
to show my work and here it is, whatever.

400
00:18:52.665 --> 00:18:53.925
I'm doing it to appease the teacher.

401
00:18:54.525 --> 00:18:55.565
I could do this in my sleep.

402
00:18:55.945 --> 00:18:57.525
Why do I really need to show my work?

403
00:18:58.705 --> 00:19:01.685
But we're thinking it's like, ah, it actually helps,

404
00:19:01.855 --> 00:19:03.765
especially for those newer people

405
00:19:04.065 --> 00:19:05.565

who haven't done this a lot before.

406
00:19:05.905 --> 00:19:08.165
You need to go through and actually show your work.

407
00:19:10.575 --> 00:19:14.195
So we take your normal one page, but we have it broken down

408
00:19:14.295 --> 00:19:15.355
before we get there.

409
00:19:15.615 --> 00:19:17.755
So we created this long worksheet.

410
00:19:18.275 --> 00:19:21.795
I say long, it's just a, uh, document that has questions

411
00:19:21.795 --> 00:19:24.755
that simulate your mind of an FTE

412
00:19:24.755 --> 00:19:26.235
or a pilot as you're going through.

413
00:19:26.495 --> 00:19:27.675
And so you think about this

414
00:19:27.775 --> 00:19:31.235
and it allows you a place to, to put all of that homework

415
00:19:31.305 --> 00:19:35.395
that you do that's not in a simple one page document.

416
00:19:38.255 --> 00:19:40.195
All right? So now we break it down.

417
00:19:40.365 --> 00:19:41.675
Sorry again for the eye chart.

418
00:19:43.615 --> 00:19:44.955
You can always come and watch the video

419
00:19:45.005 --> 00:19:47.555
later, but we break it down.

420
00:19:47.975 --> 00:19:49.955
All right, so we got a test plan, test points

421
00:19:50.495 --> 00:19:52.475
not necessarily specific to a technique,

422
00:19:52.475 --> 00:19:53.835
it's just all the test points we happen

423
00:19:53.835 --> 00:19:54.875
to be doing for this program.

424
00:19:56.015 --> 00:19:59.435
The hazard is rotor blade failure and detachment.

425
00:20:00.855 --> 00:20:02.475
We go through hazard.

426
00:20:02.705 --> 00:20:05.515
This is hazard number two of the series Breakdown.

427
00:20:05.515 --> 00:20:09.675
Our causes excessive stress due to wing wind loads.

428
00:20:09.675 --> 00:20:12.315
Vibration manufacturing defects are higher than

429
00:20:12.315 --> 00:20:13.715
predicted RPM usage.

430
00:20:15.375 --> 00:20:17.715
Ah, two causes, two causes for this hazard.

431
00:20:17.935 --> 00:20:19.955
So we talk about bird damage

432
00:20:20.095 --> 00:20:22.795

and other debris that may um, come about.

433
00:20:24.125 --> 00:20:27.155
Where are the effects? So this is very simple.

434
00:20:27.455 --> 00:20:28.955
Our spreadsheet says,

435
00:20:29.095 --> 00:20:31.795
or our, um, worksheet says causes, Hey,

436
00:20:31.795 --> 00:20:34.635
why might the hazard happen then you think effects.

437
00:20:35.385 --> 00:20:38.195
What will be the effect if this is uncontrolled?

438
00:20:38.975 --> 00:20:40.435
And we just get people to think about it.

439
00:20:40.575 --> 00:20:44.555
So we blade detachment resulting in unlikely uncontrollable

440
00:20:44.555 --> 00:20:46.595
vehicle, um, shrapnel

441
00:20:46.595 --> 00:20:48.605
that may come off at a higher velocity.

442
00:20:49.755 --> 00:20:51.725
Then we start asking more questions

443
00:20:52.025 --> 00:20:54.965
and we yet determine the enlist the probability, um,

444
00:20:55.345 --> 00:21:00.205
of every cause justification on why that level was selected.

445
00:21:00.745 --> 00:21:04.085
And include considerations for repeated exposure.

446
00:21:05.345 --> 00:21:08.085
And we write a paragraph. No one in this room can read this.

447
00:21:08.185 --> 00:21:09.725
I'm not expecting you to.

448
00:21:10.425 --> 00:21:12.805
The idea is we don't just write a couple

449
00:21:12.865 --> 00:21:15.525
of like bullet points, details,

450
00:21:15.575 --> 00:21:17.925
explaining exactly your thought process.

451
00:21:18.465 --> 00:21:19.725
You can list it all out here.

452
00:21:20.305 --> 00:21:23.365
Um, this helps when you're coming to understand it later.

453
00:21:23.545 --> 00:21:25.645
And when you start getting questions about it,

454
00:21:25.745 --> 00:21:27.285
you've got everything documented.

455
00:21:27.285 --> 00:21:28.325
You've got your homework done.

456
00:21:28.905 --> 00:21:30.925
And we do the same thing with the severity.

457
00:21:32.225 --> 00:21:34.325
We write a paragraph for it.

458
00:21:34.435 --> 00:21:36.685
It's not just a simple, here's a couple

459
00:21:36.685 --> 00:21:38.885

of bullets on why the severity is as it is.

460
00:21:40.305 --> 00:21:42.085
And then we do something a little different.

461
00:21:42.425 --> 00:21:45.645
Um, we come in, we talk about a human based risk

462
00:21:46.145 --> 00:21:48.325
or a non-human rate based risk

463
00:21:48.505 --> 00:21:50.725
and we have a slightly different, um,

464
00:21:50.755 --> 00:21:54.445
risk matrices depending on if it's human or non-human.

465
00:21:54.865 --> 00:21:57.525
Um, just because we value that human life so much more.

466
00:21:58.545 --> 00:22:02.045
And so we do that and we determine that hey, this hazard

467
00:22:02.145 --> 00:22:05.045
for us high risk are pre mitigation analysis.

468
00:22:06.165 --> 00:22:08.945
We then go through, we break it down some more. All right?

469
00:22:09.005 --> 00:22:13.745
So mitigations note if it's acceptable, reuse a,

470
00:22:14.005 --> 00:22:15.585
uh, mitigation if it's applicable.

471
00:22:15.765 --> 00:22:17.065
But we go through and want

472
00:22:17.125 --> 00:22:20.985
to mitigate each individual hazard or probability.

473
00:22:23.815 --> 00:22:28.065
Alright? So cause we start, we just RealList the cause

474
00:22:28.065 --> 00:22:30.545
that we had from the first page and we go through

475
00:22:30.765 --> 00:22:31.785
and we mitigate.

476
00:22:32.285 --> 00:22:34.065
So we have several mitigations.

477
00:22:34.205 --> 00:22:37.545
We include links to specific limitations

478
00:22:37.545 --> 00:22:39.025
that the aircraft has.

479
00:22:39.085 --> 00:22:42.225
We include links to um, maybe a memo

480
00:22:42.415 --> 00:22:45.025
that our engineering team pro, uh, had.

481
00:22:45.205 --> 00:22:47.665
So we have all of that data now referenced

482
00:22:48.005 --> 00:22:49.265
and can refer to it later.

483
00:22:50.165 --> 00:22:51.425
So we go from occasional

484
00:22:51.445 --> 00:22:55.305
or probability of occasional to remote cause alright,

485
00:22:55.485 --> 00:22:57.625
the damage is, uh, from bird strike

486
00:22:57.625 --> 00:22:59.945

or other debris go through do the same thing.

487
00:22:59.945 --> 00:23:02.785
We're gonna conduct a fo sleep prior to the test.

488
00:23:03.355 --> 00:23:06.065
Brown crew is gonna monitor for bird activity in the area.

489
00:23:06.645 --> 00:23:09.545
Um, we're going to have some inspections to make sure

490
00:23:09.615 --> 00:23:12.105
that the blades on this vehicle are okay

491
00:23:12.445 --> 00:23:14.145
before we even get into it.

492
00:23:14.145 --> 00:23:16.905
So it's not like it's gonna just fly off on its own.

493
00:23:18.125 --> 00:23:19.185
And we include our checklist.

494
00:23:19.685 --> 00:23:23.345
And this one of course breaks down to occasional from

495
00:23:23.565 --> 00:23:25.545
or to improbable from occasional.

496
00:23:26.885 --> 00:23:28.905
And of course we gotta continue at breaking it down.

497
00:23:29.685 --> 00:23:31.385
So how do you reduce the severity we go through

498
00:23:31.385 --> 00:23:33.145
and we follow the same process,

499
00:23:33.725 --> 00:23:35.145
but we're listing things out.

500
00:23:35.355 --> 00:23:40.265
We're going through the details in this, um, form so

501
00:23:40.265 --> 00:23:44.385
that we don't really have to do it in the THA type form.

502
00:23:44.715 --> 00:23:47.125
We're listing it all out, making sure it's all there.

503
00:23:48.305 --> 00:23:50.365
All right. So we even have this nice little

504
00:23:50.375 --> 00:23:51.645
whiteboard document.

505
00:23:52.065 --> 00:23:54.325
Um, by the way, chat, GPT

506
00:23:54.955 --> 00:23:56.765
does way better pictures than I

507
00:23:56.765 --> 00:23:57.805
could draw on the whiteboard.

508
00:23:57.865 --> 00:24:00.525
So I'm using theirs instead of my little chicken scratch.

509
00:24:02.025 --> 00:24:03.045
No idea if this is right.

510
00:24:03.105 --> 00:24:05.285
It just produced a di uh, picture for me.

511
00:24:05.665 --> 00:24:08.365
So we have everybody stand far away from the vehicle.

512
00:24:08.665 --> 00:24:10.725
The pilot actually has physical barriers

513
00:24:10.915 --> 00:24:12.605

because he has to be a little closer,

514
00:24:12.865 --> 00:24:15.445
but that, uh, prevents a blade in the event

515
00:24:15.445 --> 00:24:17.645
that it did detach from, uh, impacting him.

516
00:24:18.105 --> 00:24:20.885
Uh, the minimum crew is going to be outside during testing.

517
00:24:21.465 --> 00:24:23.125
We go catastrophic to major.

518
00:24:23.505 --> 00:24:27.405
We do the same thing for impact with the ground.

519
00:24:28.145 --> 00:24:32.275
But we realize that there are no mitigations for this.

520
00:24:33.025 --> 00:24:36.635
Like if we lose control of the vehicle,

521
00:24:38.275 --> 00:24:40.085
there's nothing we're gonna be able

522
00:24:40.085 --> 00:24:44.045
to do based on the immaturity of the vehicle early on.

523
00:24:44.515 --> 00:24:49.485
Some of the, uh, loss of a rotor type features that

524
00:24:50.125 --> 00:24:52.285
a lot of the other companies you've seen, um,

525
00:24:52.745 --> 00:24:53.845
you know, they have those available.

526
00:24:53.985 --> 00:24:56.405
But for this, we're not there yet. We're early.

527
00:24:57.515 --> 00:24:59.485
It's just gonna stay catastrophic.

528
00:24:59.755 --> 00:25:01.205
There's nothing we can do about it.

529
00:25:02.115 --> 00:25:04.005
Emergency procedures, again, we work

530
00:25:04.005 --> 00:25:05.285
through those, we write 'em out.

531
00:25:05.625 --> 00:25:07.365
So we have the details here,

532
00:25:07.945 --> 00:25:11.165
but we think we get it down, we get it down to medium.

533
00:25:14.025 --> 00:25:16.125
All right? Now of course, you know, with everything

534
00:25:16.125 --> 00:25:19.855
that you set up new, you have well

535
00:25:20.735 --> 00:25:22.545
long ago referred to 'em as problems.

536
00:25:22.975 --> 00:25:23.985
Then later we said,

537
00:25:24.005 --> 00:25:26.665
oh well this is a challenge Now all the management people

538
00:25:26.725 --> 00:25:28.505
say, Hey, it's an opportunity, right?

539
00:25:28.735 --> 00:25:31.625
Opportunity for you to succeed. Show us how you succeed.

540
00:25:31.965 --> 00:25:35.545

Um, we started off with an attempt to differentiate

541
00:25:35.655 --> 00:25:39.665
between a human based risk and a non-human based risk.

542
00:25:40.125 --> 00:25:43.065
Um, maybe it's more acceptable, you know, for us,

543
00:25:43.065 --> 00:25:45.225
because a human's not involved with this,

544
00:25:46.365 --> 00:25:48.465
really all it did was shift things.

545
00:25:48.685 --> 00:25:52.065
So that avoid section now moves to high

546
00:25:52.665 --> 00:25:55.105
a high now moves to to medium.

547
00:25:56.365 --> 00:25:57.825
Um, but when we started doing

548
00:25:57.825 --> 00:25:58.945
and putting these all together,

549
00:25:59.265 --> 00:26:00.785
'cause we create these big worksheets,

550
00:26:00.785 --> 00:26:04.465
but we do have to get them down to a more manageable THA.

551
00:26:04.685 --> 00:26:07.345
And so when we start combining 'em, we realize that well

552
00:26:08.835 --> 00:26:11.495
all the things we do have some level of human

553
00:26:11.685 --> 00:26:13.175
that we have to be concerned about.

554
00:26:13.465 --> 00:26:15.855
Maybe not somebody onboard an aircraft

555
00:26:15.925 --> 00:26:16.935
with a remote vehicle,

556
00:26:17.635 --> 00:26:20.855
but there are bystanders, there are different facilities.

557
00:26:20.945 --> 00:26:24.215
We're not necessarily doing this in like a desert

558
00:26:24.305 --> 00:26:27.015
where nobody is gonna be around for the next 50 miles.

559
00:26:27.435 --> 00:26:30.055
Um, so we have to consider those aspects.

560
00:26:30.115 --> 00:26:34.335
So it really just, it's just a change in severity.

561
00:26:34.795 --> 00:26:38.135
So instead of having these two separate worksheets,

562
00:26:38.155 --> 00:26:42.055
two separate risk matrices that we follow, two separate ths,

563
00:26:42.315 --> 00:26:46.045
we just have to think of it as a change in our severity.

564
00:26:46.585 --> 00:26:48.205
Um, so then we can compress it

565
00:26:48.205 --> 00:26:49.885
and just worry about one document.

566
00:26:49.885 --> 00:26:51.045
We don't have to worry about two.

567
00:26:52.345 --> 00:26:55.445

Um, we tried to apply this to all testing,

568
00:26:55.745 --> 00:26:56.765
not just flight testing.

569
00:26:57.345 --> 00:26:59.525
Um, but that was really too much

570
00:27:00.425 --> 00:27:02.565
for simple ground test articles.

571
00:27:02.985 --> 00:27:07.675
Um, more complex ground test articles, big things

572
00:27:07.675 --> 00:27:08.955
with big spinning blades.

573
00:27:09.095 --> 00:27:11.155
Yes, little things that we're doing in a lab.

574
00:27:11.785 --> 00:27:13.155
This is, this is too much.

575
00:27:13.415 --> 00:27:16.395
You know, we really need to set the standard for

576
00:27:16.975 --> 00:27:19.915
how we handle things that is applicable to

577
00:27:19.915 --> 00:27:21.275
what we're actually doing.

578
00:27:21.775 --> 00:27:26.435
Um, and so we just developed a little simple questionnaire.

579
00:27:26.775 --> 00:27:28.395
So we simplified it down.

580
00:27:28.455 --> 00:27:30.755
We made it easier when we're doing a lab test,

581
00:27:30.895 --> 00:27:33.755
it really is like fill out, do you have rotating parts?

582
00:27:33.775 --> 00:27:34.955
If you don't have rotating parts,

583
00:27:34.955 --> 00:27:36.315
well hey, you don't have to deal with that.

584
00:27:36.415 --> 00:27:38.995
But if you have the chance of fluid, like

585
00:27:39.555 --> 00:27:41.435
squirting out everywhere, hey you gotta take some

586
00:27:41.435 --> 00:27:42.875
mitigations and work through that.

587
00:27:43.015 --> 00:27:46.475
So we made it easier for the lab guys, um, than having to go

588
00:27:46.475 --> 00:27:47.635
through this full process

589
00:27:47.705 --> 00:27:49.155
that we're gonna do for flight test.

590
00:27:50.945 --> 00:27:52.885
Um, and because we're a new startup,

591
00:27:52.945 --> 00:27:55.805
we don't necessarily have all the other processes in place.

592
00:27:56.425 --> 00:27:58.925
Um, we ended up using a test hazard analysis

593
00:27:58.925 --> 00:28:00.845
to cover operational hazards

594
00:28:01.105 --> 00:28:04.085

and that just, it wasn't great, it was clunky.

595
00:28:04.465 --> 00:28:07.405
Um, it was just working, really working through

596
00:28:07.985 --> 00:28:09.005
our spreadsheet

597
00:28:09.065 --> 00:28:12.925
or our worksheet, um, in order to come up with things

598
00:28:12.925 --> 00:28:14.765
that we then give to the maintenance team, Hey,

599
00:28:14.865 --> 00:28:16.085
you need to go do this.

600
00:28:16.155 --> 00:28:17.245
This is the hazards.

601
00:28:17.425 --> 00:28:19.325
And helping them to understand the hazards,

602
00:28:19.385 --> 00:28:22.925
but it really wasn't a good venue, uh, for doing that.

603
00:28:23.025 --> 00:28:25.445
And so we've done lots more on just creating separate

604
00:28:25.595 --> 00:28:28.005
operational type documents on its own.

605
00:28:29.865 --> 00:28:34.805
So a couple of conclusions, um, document their details.

606
00:28:35.185 --> 00:28:39.205
So for everyone here, you know, a THA is a single sheet

607
00:28:39.205 --> 00:28:42.125
of paper, but there's so much more behind it,

608
00:28:42.305 --> 00:28:45.205
making sure you're putting all that information together

609
00:28:45.545 --> 00:28:48.565
and keeping it in a concise place that when you go

610
00:28:48.565 --> 00:28:50.765
to your review boards, you're non advocate reviews

611
00:28:50.785 --> 00:28:53.445
or even the brief and somebody's like, Hey,

612
00:28:53.605 --> 00:28:55.325
I got a question, I don't remember.

613
00:28:55.385 --> 00:28:58.605
Or How are you handling that? It's very easy to go in.

614
00:28:58.605 --> 00:29:01.045
It's like, yep, we've got this covered, we followed this.

615
00:29:01.505 --> 00:29:02.925
Um, here's the actual memo

616
00:29:02.975 --> 00:29:05.045
where engineering tells us this is all right.

617
00:29:05.305 --> 00:29:06.525
And you can go through all those things

618
00:29:06.525 --> 00:29:07.885
and it's really easy for you.

619
00:29:08.985 --> 00:29:12.325
Now for the more experienced companies, you know,

620
00:29:12.505 --> 00:29:13.645
we talk about a lot.

621
00:29:14.335 --> 00:29:16.005

Don't just do it like you did before.

622
00:29:16.425 --> 00:29:17.925
You can't just copy and paste.

623
00:29:18.755 --> 00:29:20.685
Lots of these forms are filled with, Hey,

624
00:29:20.685 --> 00:29:22.405
we picked this thing up from 20 years ago,

625
00:29:22.405 --> 00:29:23.525
we're gonna do the same test.

626
00:29:23.545 --> 00:29:25.765
And found out it wasn't exactly, um,

627
00:29:25.985 --> 00:29:27.605
the same as it was before.

628
00:29:29.465 --> 00:29:33.365
And for the inexperienced companies, hey, you may need

629
00:29:33.365 --> 00:29:37.205
to consider things outside of a traditional THA, um,

630
00:29:37.475 --> 00:29:39.165
Jeff just hit on a lot of that.

631
00:29:39.625 --> 00:29:42.685
Uh, it may not be the best method for you.

632
00:29:43.025 --> 00:29:45.285
It could be a good starting point for you to think about,

633
00:29:45.505 --> 00:29:47.285
but these are complex systems.

634
00:29:47.465 --> 00:29:48.805
So how do you get through that?

635
00:29:49.305 --> 00:29:50.645
And your severity

636
00:29:50.665 --> 00:29:53.925
and probability definitions may be very different

637
00:29:54.235 --> 00:29:56.525
because of what you're doing than

638
00:29:56.755 --> 00:29:58.845
what may be a traditional company has done

639
00:29:59.165 --> 00:30:02.325
before, maybe even what you've done at a traditional company

640
00:30:02.325 --> 00:30:06.405
before moving, um, into a kind more inexperienced company.

641
00:30:07.905 --> 00:30:11.435
So with that, I'm gonna turn it over to questions.

642
00:30:13.625 --> 00:30:15.715
Yeah, just you mentioned there's a prototype.

643
00:30:15.875 --> 00:30:18.995
I have no hard data on your, oh,

644
00:30:20.015 --> 00:30:21.595
You mentioned as a prototype,

645
00:30:21.595 --> 00:30:25.875
you had no hard data on your, um, time between failures.

646
00:30:25.875 --> 00:30:27.635
Just wondering if you did any failure modes

647
00:30:27.635 --> 00:30:30.635
and effects analysis or tried to look at component level

648
00:30:30.695 --> 00:30:32.955

or system level and how those, how those stack up.

649
00:30:32.955 --> 00:30:36.075
Right. Um, we were able to do some of that.

650
00:30:36.255 --> 00:30:38.915
Um, so we started looking at, um, we try

651
00:30:38.915 --> 00:30:40.555
to use like COTS type parts.

652
00:30:40.655 --> 00:30:42.355
And so you go through the documentation

653
00:30:42.355 --> 00:30:45.795
and you're like, okay, the manufacturer says this part's

654
00:30:45.795 --> 00:30:49.235
here and it's got, you know, this level of reliability,

655
00:30:49.575 --> 00:30:53.555
but we're not using it exactly in the manner that they

656
00:30:54.135 --> 00:30:55.355
had produced it for.

657
00:30:55.405 --> 00:30:58.915
Right? So I'm using an electric motor, electric battery

658
00:30:59.345 --> 00:31:01.795
that may just be, uh, used

659
00:31:01.795 --> 00:31:04.915
for a more traditional aviation application, um,

660
00:31:05.125 --> 00:31:07.235
where it's only for starting if you really need it,

661
00:31:07.295 --> 00:31:09.395
but I'm using it for juice all the time

662
00:31:09.455 --> 00:31:10.995
and it's not necessarily like that.

663
00:31:11.055 --> 00:31:13.915
So we have to consider those type of

664
00:31:14.585 --> 00:31:16.075
like little deviations.

665
00:31:16.375 --> 00:31:18.875
We can start with what the manufacturer provides,

666
00:31:18.875 --> 00:31:23.595
but we kind of have to consider alternates as well. Yes.

667
00:31:24.255 --> 00:31:27.035
Uh, so toward the end, uh, you were talking about

668
00:31:28.895 --> 00:31:30.635
trying to use tpha for everything

669
00:31:30.655 --> 00:31:31.915
and then everything you applied it to,

670
00:31:31.915 --> 00:31:33.555
you're like, oh, this doesn't apply.

671
00:31:34.165 --> 00:31:36.115
Which kind of makes me think,

672
00:31:36.905 --> 00:31:40.115
does do tpha still apply to test?

673
00:31:40.345 --> 00:31:44.315
Like, I mean if, if you're trying to apply this thing

674
00:31:44.655 --> 00:31:46.915
to these other things and it's, it's clunky

675
00:31:46.915 --> 00:31:48.835

and it's difficult and it takes too much time

676
00:31:48.935 --> 00:31:52.675
and all the things that people always say about tpha, like

677
00:31:52.775 --> 00:31:55.515
so uh, why stick with tpha?

678
00:31:56.015 --> 00:31:58.395
Ah, so it, we still use it

679
00:31:58.395 --> 00:32:00.755
and still find great benefit in flight test.

680
00:32:01.175 --> 00:32:03.195
Um, and working through these things,

681
00:32:03.285 --> 00:32:05.955
especially the early brainstorming, um,

682
00:32:06.185 --> 00:32:08.035
with our engineering colleagues

683
00:32:08.035 --> 00:32:10.035
who have designed the system, um,

684
00:32:10.035 --> 00:32:13.115
because they have really no experience with

685
00:32:13.835 --> 00:32:16.155
actually thinking about how the hazards happen.

686
00:32:16.615 --> 00:32:19.435
Um, severities probabilities, they just think, oh,

687
00:32:19.555 --> 00:32:23.155
I designed this system, it's gonna work perfectly, um,

688
00:32:23.155 --> 00:32:24.995
because I designed it and I know what I'm doing.

689
00:32:25.615 --> 00:32:28.435
Um, but we have to like kind of pry it out of them.

690
00:32:28.535 --> 00:32:30.595
So working through these steps we do find

691
00:32:30.615 --> 00:32:31.675
is really beneficial.

692
00:32:32.135 --> 00:32:35.915
Um, it's the smaller type ground test articles

693
00:32:35.915 --> 00:32:39.885
where it's like, eh, this is not really applicable for

694
00:32:39.885 --> 00:32:40.965
that, that we tried to.

695
00:32:41.425 --> 00:32:44.605
Um, but getting through like thinking about humans

696
00:32:44.745 --> 00:32:48.045
and humans involved and thinking about if this vehicle goes

697
00:32:48.155 --> 00:32:49.845
outside of its designated area,

698
00:32:50.055 --> 00:32:53.845
those are all like general flight test THA things

699
00:32:54.115 --> 00:32:56.445
that we feel is still very applicable for this process.

700
00:32:58.025 --> 00:33:01.085
All I'll foot stomp, I'll foot stomp what I said before.

701
00:33:01.385 --> 00:33:05.445
The, the benefit of a THA isn't the paper, it's the exercise

702
00:33:05.585 --> 00:33:07.565

of saying, okay, what are we gonna do?

703
00:33:08.475 --> 00:33:10.885
Alright. Um, and then I know we're on schedule.

704
00:33:10.985 --> 00:33:12.445
So one last thing. If any

705
00:33:12.445 --> 00:33:14.445
of you remember Walter the watermelon

706
00:33:14.465 --> 00:33:18.685
who made an appearance at last year's, uh, conference?

707
00:33:18.795 --> 00:33:21.405
Well, you know, he didn't make the the trip today,

708
00:33:21.505 --> 00:33:24.205
but he really was a great dinner guest for us,

709
00:33:24.505 --> 00:33:27.285
so, all right. Thank you everyone.

710
00:33:27.935 --> 00:33:28.605
Thank you Taylor.

711
00:33:32.995 --> 00:33:34.245
Okay, yes, cut and paste.

712
00:33:34.245 --> 00:33:36.205
That's the bane of, uh, the industry.

713
00:33:36.325 --> 00:33:37.445
I think I see that all the time.

714
00:33:37.905 --> 00:33:39.645
Uh, so we are ahead of schedule,

715
00:33:39.775 --> 00:33:41.485
which probably means I'm doing an okay job,

716
00:33:41.895 --> 00:33:42.965
which I didn't mean to do,

717
00:33:42.985 --> 00:33:44.405
but, so we're 10 minutes ahead,

718
00:33:44.405 --> 00:33:46.605
so we're gonna take the 30 minute coffee break

719
00:33:46.665 --> 00:33:48.045
and we'll start 10 minutes early.

720
00:33:48.465 --> 00:33:49.845
So you'll hear the chimes go off

721
00:33:49.845 --> 00:33:51.365
and that should be about 10 till.

722
00:33:51.905 --> 00:33:53.325
So have a good coffee break

723
00:33:53.325 --> 00:33:54.685
and we'll see you back 10 in 30 minutes.