WEBVTT

1
00:00:00.025 --> 00:00:02.885
Uh, if we're ready here, I guess we're still getting some,

2
00:00:02.885 --> 00:00:04.045
uh, refreshments here.

3
00:00:04.785 --> 00:00:08.565
But, um, so the next, uh, presentation is on the, uh,

4
00:00:08.565 --> 00:00:10.205
king Air two 50, and I think this is another

5
00:00:11.115 --> 00:00:12.925
non-technical fly by wire one.

6
00:00:12.945 --> 00:00:14.685
So that's, uh, they're all good,

7
00:00:14.685 --> 00:00:16.445
but, uh, nice to have a little variety.

8
00:00:17.065 --> 00:00:21.285
Um, we have two presenters, Robert Stoney, James Young, uh,

9
00:00:21.285 --> 00:00:25.525
Robert Stoney's with the, uh, FAA, um, another, um,

10
00:00:25.755 --> 00:00:26.845
another Navy guy.

11
00:00:26.945 --> 00:00:29.525
So, uh, he had 23 years in the Navy.

12
00:00:29.985 --> 00:00:33.965
Um, uh, graduated from the, uh, naval test pilot school, uh,

13
00:00:34.065 --> 00:00:35.925
in 19, uh, 86.

14
00:00:36.745 --> 00:00:38.605
And the, uh, Naval Postgraduate School.

15
00:00:39.505 --> 00:00:42.805
Um, he was the, um, CEO of the, uh,

16
00:00:42.805 --> 00:00:45.485
naval test pilot school at some point there.

17
00:00:45.665 --> 00:00:49.405
Uh, he currently serves with the, uh, FA Seattle office

18
00:00:49.465 --> 00:00:51.885
as a test pilot and is qualified,

19
00:00:51.905 --> 00:00:52.925
or, uh, flies as the, uh,

20
00:00:52.925 --> 00:00:55.885
7 87, 7 47 King Air and helicopter.

21
00:00:56.625 --> 00:00:59.525
And, uh, he's also worked on the, uh, Cessna Sovereign

22
00:00:59.585 --> 00:01:04.165
and, um, uh, Cessna Mustang in CJ three,

23
00:01:04.745 --> 00:01:06.885
and did some, uh, certification of the Garmin 1000.

24
00:01:07.115 --> 00:01:10.085
Well, uh, with Roberts also, uh, James Young

25
00:01:10.545 --> 00:01:12.245
of MMO, uh, aviation Services.

26
00:01:12.665 --> 00:01:17.045
Um, he graduated, uh, has a BSN

27
00:01:17.045 --> 00:01:19.565

and MS from the, uh, university of Boulder, uh,

28
00:01:19.565 --> 00:01:21.205
or I'm sorry, university of Colorado at Boulder.

29
00:01:21.985 --> 00:01:25.445
Uh, he's been in the flight test, uh, for 26 years

30
00:01:25.475 --> 00:01:27.165
with time at Boeing and Gulfstream.

31
00:01:28.385 --> 00:01:31.645
Uh, he's a DER for the FAA, uh,

32
00:01:31.665 --> 00:01:34.325
as a flight analyst in test about, uh,

33
00:01:34.325 --> 00:01:36.405
and for the past six years, Jim has run his own, uh,

34
00:01:36.585 --> 00:01:38.125
flight test and engineering company.

35
00:01:38.265 --> 00:01:40.565
So, um, uh, entrepreneur as well.

36
00:01:40.665 --> 00:01:42.965
So, uh, out there making things happen.

37
00:01:43.105 --> 00:01:46.605
So, uh, without further ado, Robert and, uh, I guess, Jim,

38
00:01:55.585 --> 00:01:58.325
So thank you very much for inviting us here on, uh, behalf

39
00:01:58.325 --> 00:02:00.045
of Bob and I, I say it's a real nice pleasure

40
00:02:00.045 --> 00:02:02.885
to be down here from Seattle and get outta the heat wave

41
00:02:02.905 --> 00:02:04.005
and the sunshine from Seattle

42
00:02:04.025 --> 00:02:06.085
and come back to, uh, what we're really used

43
00:02:06.085 --> 00:02:07.165
to here with the cold weather and the rain.

44
00:02:08.865 --> 00:02:11.365
So we're today to talk about the flight testing

45
00:02:11.385 --> 00:02:13.605
and the King Air two 50, uh,

46
00:02:15.185 --> 00:02:16.525
is green is forward, right?

47
00:02:16.745 --> 00:02:18.805
We should have practiced. So here's the airplane.

48
00:02:18.805 --> 00:02:21.205
Here's our heroes. I'll, uh, I'll mention

49
00:02:21.205 --> 00:02:22.925
that Bob is probably about the only guy

50
00:02:22.925 --> 00:02:23.965
in the FAAI look up to.

51
00:02:28.435 --> 00:02:30.925
There's another guy in, there's another guy in Seattle, uh,

52
00:02:31.315 --> 00:02:33.725
Sean Ripple, who's also about the same height as, uh, Bob,

53
00:02:33.725 --> 00:02:35.165
and they call themselves 13 feet

54
00:02:35.165 --> 00:02:36.485

of the FAA when they're working together.

55
00:02:37.585 --> 00:02:39.805
So, today we're gonna talk about, uh, the overview

56
00:02:39.805 --> 00:02:41.725
of the test aircraft description, the, uh,

57
00:02:41.725 --> 00:02:43.125
program objectives and results.

58
00:02:43.865 --> 00:02:46.245
And then Bob's gonna take over, uh, to talk about,

59
00:02:46.385 --> 00:02:47.405
uh, flight test incident.

60
00:02:47.405 --> 00:02:49.325
We had, kind of how it happened, what it happened,

61
00:02:49.505 --> 00:02:51.245
and, uh, why it's applicable here to,

62
00:02:51.345 --> 00:02:52.605
uh, fly by wire program.

63
00:02:54.385 --> 00:02:56.685
So, the test aircraft description, the King Air two 50,

64
00:02:56.785 --> 00:02:59.085
you start off with a King Air 200 gt.

65
00:02:59.345 --> 00:03:00.525
We did this a couple years ago.

66
00:03:01.455 --> 00:03:03.565
We're gonna take a couple existing s STCs.

67
00:03:03.565 --> 00:03:05.645
So an SEC is a supplemental type certificate.

68
00:03:06.235 --> 00:03:08.285
It's how we modify an existing airplane.

69
00:03:08.385 --> 00:03:10.925
The, uh, the two existing SDCs were the BLR

70
00:03:10.925 --> 00:03:12.285
Winglets you see there on the left picture.

71
00:03:13.465 --> 00:03:16.605
And then the, uh, raise back RAM recovery system, auroras.

72
00:03:16.945 --> 00:03:19.725
The PT six installation on the King Air is a reverse flow.

73
00:03:20.385 --> 00:03:22.845
The RAR system, uh, straightens out that flow

74
00:03:22.845 --> 00:03:24.925
as it makes reversible, makes the engines run cooler

75
00:03:24.945 --> 00:03:27.285
so we can run it, uh, full torque longer

76
00:03:27.285 --> 00:03:28.805
before we temp out the engine.

77
00:03:28.825 --> 00:03:30.765
So it, it provides a lot more thrust for you.

78
00:03:31.315 --> 00:03:34.285
Then we're gonna add a new product, which is the, uh, heart.

79
00:03:34.305 --> 00:03:36.765
So composite propellers, you see those there on the right.

80
00:03:37.775 --> 00:03:39.685
Those, uh, propellers are about 60

81
00:03:39.785 --> 00:03:42.845

to 65 pounds lighter than the propellers they, uh, replaced.

82
00:03:42.915 --> 00:03:45.205
It's the first time we ever put composite propellers on the

83
00:03:45.205 --> 00:03:47.805
king air, and that,

84
00:03:47.805 --> 00:03:49.605
that weight difference is actually gonna come in.

85
00:03:49.795 --> 00:03:51.245
It's gonna influence our decisions

86
00:03:51.245 --> 00:03:53.765
and our, our thinking later, uh,

87
00:03:53.865 --> 00:03:55.125
as we go through the program here.

88
00:03:55.665 --> 00:03:56.925
Anyway, when you combine all these,

89
00:03:56.925 --> 00:03:58.285
we call this now King Air two 50.

90
00:03:58.285 --> 00:04:00.245
That's the only way you can buy your King Air from,

91
00:04:00.265 --> 00:04:01.725
uh, Beachcraft.

92
00:04:01.875 --> 00:04:04.645
It's actually not Beachcraft anymore, is it? Uh, Raytheon.

93
00:04:05.155 --> 00:04:07.805
Textron. What's that? Textron Textron Close.

94
00:04:09.945 --> 00:04:14.645
Or, or you can also, uh,

95
00:04:14.645 --> 00:04:16.725
you can also put it on your, uh, existing King Air.

96
00:04:16.745 --> 00:04:19.045
Uh, we saw a, uh, performance package for it.

97
00:04:20.505 --> 00:04:23.205
So, again, the key, uh, question is what does a kinger have

98
00:04:23.205 --> 00:04:25.045
to do with a, uh, fly by air conference?

99
00:04:25.045 --> 00:04:27.125
It wasn't just that Bob and I didn't read the, uh,

100
00:04:27.145 --> 00:04:28.765
the instructions on the, uh, conference.

101
00:04:30.115 --> 00:04:31.925
I'll, uh, I'll give up making the, uh,

102
00:04:31.925 --> 00:04:34.045
the cheap joke about the flyby braided wire since

103
00:04:34.045 --> 00:04:35.565
that was made in the previous conversation.

104
00:04:36.785 --> 00:04:37.805
You know, we sat yesterday

105
00:04:37.805 --> 00:04:40.605
and we watched a bunch of people put up the, uh, the slides

106
00:04:40.665 --> 00:04:42.085
and, and descriptions of their really

107
00:04:42.085 --> 00:04:43.445
fancy flyby wire systems.

108
00:04:43.515 --> 00:04:45.645

They had their primary flight control computers

109
00:04:45.645 --> 00:04:48.325
and their reus and their ACEs,

110
00:04:48.325 --> 00:04:49.965
and their deuces and their ESPNs.

111
00:04:50.085 --> 00:04:53.005
And we were, we were kind of feeling a little bit left out,

112
00:04:53.145 --> 00:04:55.805
but, uh, then we realized that we had the most, uh,

113
00:04:56.045 --> 00:04:57.285
advanced primary flight control

114
00:04:57.485 --> 00:04:58.645
computers ever put on an airplane.

115
00:04:58.825 --> 00:05:00.965
In fact, we have a backup one, we call 'em a, uh,

116
00:05:01.295 --> 00:05:02.405
pilot and a copilot.

117
00:05:04.345 --> 00:05:08.725
We also, you know, heard multiple times about airplanes kind

118
00:05:08.805 --> 00:05:12.965
of behaving not the way they were expected as, uh, as mo

119
00:05:12.965 --> 00:05:15.165
so gracefully put it, the, uh, the gerbils in the, uh,

120
00:05:15.165 --> 00:05:17.885
boxes weren't, uh, making the best decisions.

121
00:05:17.945 --> 00:05:20.365
And, uh, we'll talk about a case here where, uh,

122
00:05:20.415 --> 00:05:22.125
maybe the gerbils in our brains were the ones

123
00:05:22.125 --> 00:05:23.125
that didn't make the best decisions.

124
00:05:24.675 --> 00:05:28.605
Okay? So the program objectives, we took the existing STCs,

125
00:05:28.605 --> 00:05:30.325
they were all certified as is good

126
00:05:30.325 --> 00:05:33.205
or better, which in the STC world is a way

127
00:05:33.205 --> 00:05:36.205
of doing things cheaply without putting out a, uh,

128
00:05:36.205 --> 00:05:37.445
new flight manual supplement.

129
00:05:37.445 --> 00:05:38.885
So we know that we make improvements,

130
00:05:38.885 --> 00:05:40.045
we just don't take credit for it.

131
00:05:40.045 --> 00:05:41.045
We let the marketing department

132
00:05:41.045 --> 00:05:42.005
go say whatever they want about it.

133
00:05:42.005 --> 00:05:45.565
But as far as the SFAA is concerned, they're just

134
00:05:45.565 --> 00:05:46.765
as good as the original one.

135
00:05:47.785 --> 00:05:50.445

So after, uh, we take those, so we already knew from the,

136
00:05:50.445 --> 00:05:52.965
the, uh, WINGLET program that we had quite a bit

137
00:05:52.965 --> 00:05:54.925
of performance improvement over the baseline airplane.

138
00:05:55.825 --> 00:05:58.325
So we were gonna redefine the saw speeds in the VMC.

139
00:05:58.435 --> 00:06:00.085
This would allow us to do a new takeoff

140
00:06:00.085 --> 00:06:01.165
and landing speed schedule.

141
00:06:01.945 --> 00:06:05.165
We wanted to increase the MMO from 0.52 to 0.58.

142
00:06:05.665 --> 00:06:06.885
It allows you to stay up higher

143
00:06:06.945 --> 00:06:08.645
and come down faster, save some gas.

144
00:06:09.345 --> 00:06:11.365
And then we wanted to do some really good low speed drag

145
00:06:11.365 --> 00:06:13.125
measurements to allow us to, uh,

146
00:06:13.125 --> 00:06:15.765
do a full flight manual update with the, uh,

147
00:06:15.785 --> 00:06:17.085
all the second segment climb

148
00:06:17.085 --> 00:06:18.125
and all the performance numbers.

149
00:06:20.475 --> 00:06:22.205
Testing was done in three phases.

150
00:06:22.665 --> 00:06:25.525
The, uh, first phase was the, uh, baseline flying

151
00:06:25.525 --> 00:06:29.165
with no modifications for, uh, the two of the rest

152
00:06:29.165 --> 00:06:30.685
of us in the room that do SDCs.

153
00:06:31.675 --> 00:06:33.365
This is really, really important.

154
00:06:33.515 --> 00:06:35.925
It's, uh, the program managers always complain about

155
00:06:35.925 --> 00:06:37.045
this, 'cause this is expensive.

156
00:06:37.045 --> 00:06:39.045
But when you take an airplane that's already been out flying

157
00:06:39.785 --> 00:06:41.725
and you try to modify it, if you don't know what

158
00:06:41.725 --> 00:06:44.405
that particular airplane does, then you're stuck with

159
00:06:44.405 --> 00:06:46.525
what the certified basis is for the airplane.

160
00:06:47.265 --> 00:06:49.405
In this case, we didn't end up catching

161
00:06:50.285 --> 00:06:53.405
a really weird corner point on the airplane

162
00:06:53.475 --> 00:06:54.605

with the landing flaps.

163
00:06:55.585 --> 00:06:57.685
And because we didn't have baseline data to show

164
00:06:57.685 --> 00:07:00.485
that the existing airplane did that, we weren't able

165
00:07:00.485 --> 00:07:02.045
to take credit for the landing performance

166
00:07:02.045 --> 00:07:03.565
that we should have been able to take credit for.

167
00:07:04.225 --> 00:07:05.485
It didn't matter that both Bob

168
00:07:05.485 --> 00:07:08.525
and I agreed that our modification was in no way impacting

169
00:07:08.525 --> 00:07:09.645
how the airplane was flying.

170
00:07:10.385 --> 00:07:12.485
It wasn't what we thought it was, what we could prove,

171
00:07:12.485 --> 00:07:14.645
and all we could prove was the original beachcraft data,

172
00:07:14.645 --> 00:07:16.205
which showed that the airplane was marginally

173
00:07:16.205 --> 00:07:17.485
certifiable in that area.

174
00:07:19.025 --> 00:07:21.205
Excuse me, afterwards. So then we did the winglets

175
00:07:21.205 --> 00:07:23.045
and the roars, and then we did the Winglet roars

176
00:07:23.105 --> 00:07:26.485
and propellers Program highlights.

177
00:07:26.485 --> 00:07:28.405
This is just kind of shows you this wasn't really a weekend

178
00:07:28.405 --> 00:07:32.765
program, quite a bit of flying of that 319 hours, Bob

179
00:07:32.765 --> 00:07:34.925
and I probably did a hundred to 120 of it together,

180
00:07:35.575 --> 00:07:37.685
quite a bit of, uh, differential thrust time there

181
00:07:37.685 --> 00:07:41.325
with the single engine Quick results.

182
00:07:41.545 --> 00:07:43.285
You can see that the, uh, stall speeds,

183
00:07:43.285 --> 00:07:44.525
we did exactly what we thought we were gonna do.

184
00:07:44.525 --> 00:07:46.125
We lowered the stall speeds pretty dramatically.

185
00:07:47.345 --> 00:07:48.965
You can see that there's quite a bit of difference

186
00:07:48.965 --> 00:07:50.805
between the yellow, which is the published data,

187
00:07:51.585 --> 00:07:53.525
and just the red, which was the baseline data.

188
00:07:53.585 --> 00:07:56.005
So, essentially, as beach was modifying the airplane from

189
00:07:56.205 --> 00:08:00.925

1970 on to 2005, 2008, every time they made a small change,

190
00:08:01.035 --> 00:08:02.885
they were getting a little bit better stall performance on

191
00:08:02.885 --> 00:08:04.285
the airplane, but they never took credit for it.

192
00:08:04.285 --> 00:08:05.325
So we already knew that was there.

193
00:08:06.195 --> 00:08:07.805
Then we put our winglets on there

194
00:08:08.025 --> 00:08:09.525
and we got an even better result.

195
00:08:09.585 --> 00:08:13.245
So almost, uh, 8%, 9% improvement in published stall speeds.

196
00:08:16.385 --> 00:08:19.725
And together with the, uh, BMC testing we did

197
00:08:20.315 --> 00:08:23.765
that improvement in stall speeds allowed us to take credit

198
00:08:23.785 --> 00:08:25.245
for takeoff distance improvement

199
00:08:25.405 --> 00:08:27.325
of almost 18% across the board.

200
00:08:27.905 --> 00:08:28.965
We did this primarily

201
00:08:28.965 --> 00:08:31.045
because the original King Air was certified

202
00:08:31.065 --> 00:08:32.565
as a fixed takeoff speed schedule.

203
00:08:32.625 --> 00:08:35.005
It just rotated at 95, climb 121.

204
00:08:35.705 --> 00:08:38.765
We actually went back and did a, uh, part 23 Subpart k

205
00:08:39.515 --> 00:08:41.485
takeoff speed schedule, which is very similar

206
00:08:41.485 --> 00:08:44.965
to the part 25, which allows, takes into account altitude

207
00:08:45.025 --> 00:08:47.125
and temperature and, you know, changes

208
00:08:47.185 --> 00:08:48.405
and the numbers aren't fixed.

209
00:08:48.465 --> 00:08:50.885
So, but by doing all that other testing,

210
00:08:50.945 --> 00:08:52.045
we were able to take credit for this.

211
00:08:52.065 --> 00:08:54.125
And again, going back to the baseline testing,

212
00:08:54.185 --> 00:08:55.420
if we'd been able to take, take credit

213
00:08:55.420 --> 00:08:57.845
for the landing distance, we would've shown somewhere

214
00:08:57.845 --> 00:08:58.925
between 25%

215
00:08:58.925 --> 00:09:01.925
and 30% improvement in published landing distances, which

216
00:09:02.535 --> 00:09:04.205

shows you just how expensive that was.

217
00:09:04.225 --> 00:09:05.405
The program that we didn't test

218
00:09:05.405 --> 00:09:06.925
that in the, uh, baseline flying.

219
00:09:09.925 --> 00:09:13.265
So, again, quick results, uh, saw speed's about 9% improved.

220
00:09:13.565 --> 00:09:14.865
We did do the new VMC.

221
00:09:14.865 --> 00:09:16.345
We got the new takeoff speed schedule,

222
00:09:17.285 --> 00:09:20.745
and we successfully expanded the, uh, MMO out to a point,

223
00:09:20.845 --> 00:09:23.185
uh, five eight, which is a, uh,

224
00:09:23.185 --> 00:09:25.065
blistering speed for a, uh, turbo prop.

225
00:09:26.805 --> 00:09:28.185
So now we'll do a quick video

226
00:09:28.185 --> 00:09:30.865
because no, uh, no presentations complete without a video.

227
00:09:32.505 --> 00:09:34.855
Let's see if this works. So, here we are.

228
00:09:34.885 --> 00:09:37.495
This is, uh, and there's kind of a point to the video here.

229
00:09:37.905 --> 00:09:40.735
We're out here doing single engine drag flying about 200

230
00:09:40.735 --> 00:09:43.135
miles off the coast of San Diego and Whiskey 2 91.

231
00:09:44.435 --> 00:09:46.695
The, uh, key difference here when you do single engine

232
00:09:46.695 --> 00:09:48.415
flying in a propeller airplane is you gotta sit there

233
00:09:48.415 --> 00:09:49.575
and look at the stupid thing as opposed

234
00:09:49.575 --> 00:09:50.695
to just a bunch of zeros.

235
00:09:51.405 --> 00:09:54.175
This is what the, uh, the flight test company we're working

236
00:09:54.175 --> 00:09:55.415
with calls a cool guy display.

237
00:09:55.415 --> 00:09:58.495
And we'll actually gonna pause this, maybe, can we pause it?

238
00:09:59.925 --> 00:10:02.375
Just come back, just right there.

239
00:10:02.375 --> 00:10:04.135
Yeah, well, so the, the charts were there

240
00:10:04.135 --> 00:10:05.375
for quick navigation reference.

241
00:10:05.375 --> 00:10:07.935
They would never be used for, uh, just blocking the sun.

242
00:10:11.575 --> 00:10:13.295
I, I, I've got my regulator sitting right here,

243
00:10:13.295 --> 00:10:14.575

so I gotta be careful, you know what I say.

244
00:10:15.075 --> 00:10:18.215
So this, uh, this display here allows us to put up, uh,

245
00:10:18.215 --> 00:10:20.975
front anything we're recording on the airplane.

246
00:10:22.595 --> 00:10:24.815
And this was kind of new when we started doing this about

247
00:10:24.815 --> 00:10:26.615
eight, 10 years ago of using these displays.

248
00:10:27.595 --> 00:10:29.415
But what's really nice about this is a,

249
00:10:29.575 --> 00:10:31.375
a picture goes a long way towards,

250
00:10:31.475 --> 00:10:32.575
uh, seeing what's happening.

251
00:10:33.005 --> 00:10:34.535
This happens to be low speed drag.

252
00:10:34.555 --> 00:10:36.575
So those of you that have been stuck out doing drag data

253
00:10:36.575 --> 00:10:39.095
before, you know that the, uh, mantra of the, uh,

254
00:10:39.095 --> 00:10:40.455
arrow weenies is one more minute.

255
00:10:40.635 --> 00:10:43.575
And, uh, so this allows us to see, now you got five minutes

256
00:10:43.595 --> 00:10:45.255
of straight lines we're, we're moving on.

257
00:10:45.315 --> 00:10:47.895
But the real key for this, we also heard from a bunch

258
00:10:47.895 --> 00:10:48.935
of people talk about going

259
00:10:48.935 --> 00:10:50.335
through windshields and inversions.

260
00:10:51.045 --> 00:10:52.255
Well, while we're climbing up

261
00:10:52.255 --> 00:10:54.775
through an air mass, I can have a chart up.

262
00:10:55.045 --> 00:10:56.375
This is all done in lab view.

263
00:10:57.175 --> 00:10:58.735
I can make this up with our,

264
00:10:58.735 --> 00:11:00.415
with our FTEs to do whatever I want.

265
00:11:00.955 --> 00:11:02.175
And we can actually have these

266
00:11:02.245 --> 00:11:03.655
screens turn different colors.

267
00:11:03.755 --> 00:11:05.775
So if we're climbing up to do check climbs

268
00:11:06.275 --> 00:11:07.455
as we do the initial climb,

269
00:11:07.615 --> 00:11:09.135
I can actually have the screen turned yellow.

270
00:11:09.195 --> 00:11:13.055

If we see the temperature, uh, the, the line, the reverse,

271
00:11:13.115 --> 00:11:15.215
uh, excuse me, the temperature's reverse if we get an

272
00:11:15.215 --> 00:11:17.695
inversion layer or if we have a wind change.

273
00:11:18.755 --> 00:11:21.575
And so I know that we have our FTEs in the back looking at

274
00:11:21.575 --> 00:11:22.775
that, but when we can see it up front,

275
00:11:22.875 --> 00:11:24.895
we know right away this is not a good air

276
00:11:24.895 --> 00:11:25.935
mass to be working in here.

277
00:11:27.275 --> 00:11:29.255
So anyway, that's just kind of cool.

278
00:11:29.255 --> 00:11:30.335
And so anyway, I think that's,

279
00:11:30.715 --> 00:11:32.255
that's really about all I wanna see on the video.

280
00:11:32.255 --> 00:11:33.495
It's only got a few more seconds here,

281
00:11:33.555 --> 00:11:38.135
but you'll kind of be able to see, uh, see our, uh,

282
00:11:38.135 --> 00:11:39.495
instrumentation guys here in the back

283
00:11:39.495 --> 00:11:41.895
and our setup with a, with a test director,

284
00:11:41.895 --> 00:11:44.615
and then two guys at the, uh, data stations back here.

285
00:11:44.715 --> 00:11:47.175
So, cramming quite a bit of stuff into a King Air,

286
00:11:47.195 --> 00:11:48.975
but we got a lot of work done.

287
00:11:48.975 --> 00:11:50.095
And then there's Brent Hedgepath,

288
00:11:50.095 --> 00:11:51.175
which I'm sure many of you know.

289
00:11:51.275 --> 00:11:55.085
So with that, I will, uh, turn it over to, uh, Bob,

290
00:11:55.145 --> 00:11:57.285
and he will discuss the rest of it.

291
00:11:58.515 --> 00:12:00.245
Alright, uh, thank you Jim.

292
00:12:00.585 --> 00:12:02.165
And, uh, thanks again to the committee

293
00:12:02.225 --> 00:12:03.845
for letting us, uh, come talk.

294
00:12:04.505 --> 00:12:06.285
Uh, I'm gonna describe you an incident

295
00:12:06.285 --> 00:12:08.525
that occurred in the program that, uh,

296
00:12:08.595 --> 00:12:11.285
that I think is hopefully applicable to all of us.

297
00:12:11.785 --> 00:12:13.005

It occurred late in the program

298
00:12:13.185 --> 00:12:14.405
and it involved a, uh,

299
00:12:14.455 --> 00:12:16.885
power plant operating characteristics test.

300
00:12:17.785 --> 00:12:20.845
Uh, that test was not in the original test plan

301
00:12:20.905 --> 00:12:22.925
and, uh, I'm not actually sure about the details,

302
00:12:22.985 --> 00:12:25.085
but I think it was FAA propulsion talking

303
00:12:25.105 --> 00:12:26.965
to the DER for the applicant.

304
00:12:27.585 --> 00:12:29.645
And, uh, they decided that they needed

305
00:12:29.805 --> 00:12:32.205
to add this condition in as a flight test,

306
00:12:32.305 --> 00:12:33.445
uh, method of compliance.

307
00:12:34.345 --> 00:12:36.165
So it was added in, it went

308
00:12:36.165 --> 00:12:39.205
through a relatively brief review process.

309
00:12:39.425 --> 00:12:41.045
In other words, the original test plan

310
00:12:41.105 --> 00:12:42.205
was put through the whole process.

311
00:12:42.505 --> 00:12:45.445
But, uh, this particular test was put in, uh,

312
00:12:45.585 --> 00:12:47.045
in a sort of a truncated process.

313
00:12:48.385 --> 00:12:50.645
Um, Jim and I, just a little background.

314
00:12:50.665 --> 00:12:52.445
Jim and I were very familiar with the aircraft.

315
00:12:52.445 --> 00:12:55.565
We've been doing a lot of flying, a lot of low speed flying,

316
00:12:55.565 --> 00:12:57.925
high speed flying, uh, asymmetric power.

317
00:12:58.545 --> 00:13:01.765
Uh, not only were we current in the aircraft, very current

318
00:13:01.785 --> 00:13:03.125
and proficient in the aircraft

319
00:13:03.125 --> 00:13:05.005
and the test techniques we were had

320
00:13:05.005 --> 00:13:06.085
been working together a lot.

321
00:13:06.105 --> 00:13:09.685
So we had good CRM working together well as a crew.

322
00:13:10.425 --> 00:13:13.845
Uh, neither one of us had done this particular test in, uh,

323
00:13:13.845 --> 00:13:17.245
part 23, but it's similar to the tests

324
00:13:17.245 --> 00:13:19.365

that you do in part 25 that we'd both, uh,

325
00:13:19.745 --> 00:13:20.765
had some experience in.

326
00:13:21.545 --> 00:13:23.725
So what regulation is in play?

327
00:13:23.995 --> 00:13:26.005
Well, it's 23 9 39,

328
00:13:26.225 --> 00:13:29.565
you can read there basically says engine can't burp, uh,

329
00:13:29.785 --> 00:13:32.845
or the prop can't over speed when you rapidly apply power.

330
00:13:33.665 --> 00:13:36.125
Uh, actually when you do use the, use the,

331
00:13:36.185 --> 00:13:37.805
the engine in any normal fashion,

332
00:13:38.515 --> 00:13:39.725
it's, uh, not allowed to burp.

333
00:13:40.545 --> 00:13:42.605
The, uh, advisory circular goes on

334
00:13:42.605 --> 00:13:45.045
to give a little more guidance, talks about being free

335
00:13:45.045 --> 00:13:47.005
of saw stall surge flame out,

336
00:13:47.385 --> 00:13:50.205
and it sets the conditions under which you conduct the test

337
00:13:50.345 --> 00:13:53.925
all the way from V slow to V fast and with side slip on it

338
00:13:54.025 --> 00:13:56.165
and tells you to rapidly advance the throttle

339
00:13:56.305 --> 00:13:57.525
to, uh, maximum power.

340
00:13:58.825 --> 00:14:02.245
Our test plan for this program, uh, defined a procedure

341
00:14:02.245 --> 00:14:06.525
that was very consistent with, uh, with the, uh,

342
00:14:06.895 --> 00:14:08.645
lemme just back up one here, sorry.

343
00:14:09.105 --> 00:14:12.165
Uh, point out, uh, the bottom line there.

344
00:14:12.165 --> 00:14:14.685
It says, rapidly advance the throttle, okay?

345
00:14:14.685 --> 00:14:16.885
And it's singular to maximum power.

346
00:14:17.785 --> 00:14:20.565
Uh, the, our test plan talked about rapidly advancing the

347
00:14:20.765 --> 00:14:23.845
throttles, plural to, uh, maximum continuous power

348
00:14:23.845 --> 00:14:25.125
and make sure nothing bad happens.

349
00:14:26.105 --> 00:14:28.845
Our test conditions were high altitude, high speed, down

350
00:14:28.845 --> 00:14:31.925
to low altitude and lower speed, uh,

351
00:14:31.925 --> 00:14:35.485

8,000 feet MSL was our specified test condition.

352
00:14:35.745 --> 00:14:37.765
And, uh, we were supposed to do it at stall speed.

353
00:14:37.765 --> 00:14:40.445
That's what the, that's what the, uh, AC said,

354
00:14:40.445 --> 00:14:41.685
and that's what our test plan said.

355
00:14:42.665 --> 00:14:44.805
Here's a look at the test hazard analysis.

356
00:14:44.905 --> 00:14:46.845
Uh, I'll just point out a few things to you.

357
00:14:46.985 --> 00:14:49.445
One, uh, it was in initially limited

358
00:14:49.825 --> 00:14:54.205
or listed as a medium risk test, uh, mitigated down to low,

359
00:14:54.625 --> 00:14:55.845
but if you read through here,

360
00:14:56.065 --> 00:14:59.605
and even the title of it, this was the THA that was assigned

361
00:14:59.625 --> 00:15:02.445
to this engine operating characteristics test.

362
00:15:03.105 --> 00:15:04.805
But it's all about arrow stuff.

363
00:15:04.805 --> 00:15:06.845
It's about destabilizing longitudinally,

364
00:15:06.845 --> 00:15:09.285
having a departure from controlled flight,

365
00:15:10.065 --> 00:15:13.365
and, uh, doesn't really speak to the, the what,

366
00:15:13.475 --> 00:15:14.485
what the test was about.

367
00:15:14.505 --> 00:15:16.125
Engine, uh, characteristics.

368
00:15:17.105 --> 00:15:18.965
So kind of file that in the back of your mind.

369
00:15:19.905 --> 00:15:24.475
Um, I should have pointed out on the slide here,

370
00:15:24.475 --> 00:15:26.075
we're everybody's gonna get a grade today,

371
00:15:26.075 --> 00:15:27.555
unless you've already seen this paper,

372
00:15:27.605 --> 00:15:29.075
we've given it a couple of times,

373
00:15:29.775 --> 00:15:31.835
but if you haven't seen it, you get

374
00:15:31.835 --> 00:15:35.955
to grade yourself on your personal test pilot smarts.

375
00:15:36.575 --> 00:15:38.595
And if you've already figured out what's gonna

376
00:15:38.595 --> 00:15:39.795
happen, you get an a plus.

377
00:15:39.935 --> 00:15:41.915
So in the lower right hand corner, when you go, Hey,

378
00:15:41.915 --> 00:15:44.875

I know what's gonna happen, A plus, Jim

379
00:15:44.875 --> 00:15:46.315
and I, we didn't know yet.

380
00:15:47.705 --> 00:15:50.195
Okay? So there we are.

381
00:15:50.335 --> 00:15:52.715
Day of the flight, uh, doing the pre-flight brief.

382
00:15:52.735 --> 00:15:54.475
Our original plan for the day was

383
00:15:54.475 --> 00:15:57.635
to do takeoff performance testing, including, uh,

384
00:15:57.635 --> 00:15:58.715
cutting the engine

385
00:15:59.255 --> 00:16:02.115
and, uh, determining, uh, performance, high risk test.

386
00:16:02.735 --> 00:16:04.435
But we got blown out by wind.

387
00:16:04.775 --> 00:16:07.395
So rather than lose the day, somebody said, Hey,

388
00:16:07.455 --> 00:16:09.555
can you do this, uh, kind of orphan, uh,

389
00:16:09.815 --> 00:16:11.795
engine operating condition test?

390
00:16:11.815 --> 00:16:14.075
And we said, you bet we're flight testers.

391
00:16:14.735 --> 00:16:16.955
Um, so we sat down to brief it

392
00:16:16.955 --> 00:16:19.795
and I, I would like to point out that, uh, that the company,

393
00:16:19.895 --> 00:16:21.715
the applicant's very, very professional.

394
00:16:21.715 --> 00:16:24.955
There's no everything's done right, uh,

395
00:16:24.955 --> 00:16:26.555
including the pre-flight briefing.

396
00:16:27.135 --> 00:16:29.275
And, uh, but as we were going through the briefing,

397
00:16:29.795 --> 00:16:31.755
somebody I don't really remember who said, Hey,

398
00:16:31.825 --> 00:16:34.275
what if the engine, you know, stalls surge of flame out.

399
00:16:34.275 --> 00:16:36.115
There's the THA, if you remember, back

400
00:16:36.115 --> 00:16:37.715
to the THA, it didn't talk about that.

401
00:16:38.295 --> 00:16:40.355
So we're like, Hey, we should probably talk about that.

402
00:16:41.295 --> 00:16:44.915
So we decided that rather than have two engines

403
00:16:45.625 --> 00:16:47.035
both hiccup at the same time

404
00:16:47.135 --> 00:16:49.915
and cause a problem, we were gonna just do one

405
00:16:49.915 --> 00:16:50.955

engine at a time.

406
00:16:51.785 --> 00:16:53.995
Okay? And we thought we were being safer.

407
00:16:54.655 --> 00:16:56.555
If you figured it out yet, you get a b

408
00:16:58.255 --> 00:17:00.195
if you're like us, let's keep going.

409
00:17:01.985 --> 00:17:04.995
Okay. So continuing the pre-flight brief, uh, the,

410
00:17:05.135 --> 00:17:06.835
we talked about splitting up the duties.

411
00:17:07.155 --> 00:17:08.355
I was the pilot monitoring.

412
00:17:08.435 --> 00:17:09.635
I was gonna handle the throttle

413
00:17:09.635 --> 00:17:12.035
and watch the gauges real close and look for anything bad.

414
00:17:12.735 --> 00:17:14.635
Uh, Jim was gonna fly the condition.

415
00:17:15.055 --> 00:17:17.315
We discussed timing and coordination calls.

416
00:17:17.315 --> 00:17:18.595
Everything was pretty good.

417
00:17:19.385 --> 00:17:22.555
It's launched off, went out to the, uh, working area,

418
00:17:23.455 --> 00:17:27.155
did the high altitude, high speed, uh, performance, uh,

419
00:17:27.155 --> 00:17:28.715
test, or we did that first.

420
00:17:29.575 --> 00:17:31.995
And uh, the engine operating characteristics were good

421
00:17:32.255 --> 00:17:34.515
and the handling qualities were benign.

422
00:17:34.515 --> 00:17:35.675
Even though that wasn't part of the test,

423
00:17:35.675 --> 00:17:37.515
there was nothing abnormal about it.

424
00:17:38.295 --> 00:17:41.435
One engine back, get inside slip, ram it up. All good.

425
00:17:43.145 --> 00:17:44.315
Okay? C grade.

426
00:17:44.385 --> 00:17:49.035
Some of you probably now some of you, uh, are still with us

427
00:17:49.225 --> 00:17:52.765
and are gonna get that f Um,

428
00:17:53.225 --> 00:17:55.405
so there we were, as they say.

429
00:17:55.625 --> 00:17:57.005
And, uh, but

430
00:17:57.005 --> 00:17:58.405
before I go on with this incident,

431
00:17:58.525 --> 00:18:00.565
I wanna make an observation about the beer call.

432
00:18:00.565 --> 00:18:03.205

Last night. I found out, uh, you know, all pilots have

433
00:18:03.205 --> 00:18:04.445
to talk with their hands, right?

434
00:18:04.445 --> 00:18:06.725
But I found out who the best

435
00:18:07.465 --> 00:18:09.525
people are describing there we were.

436
00:18:09.525 --> 00:18:11.085
And that's helicopter pilots.

437
00:18:12.505 --> 00:18:15.165
And that's because fighter pilots, okay,

438
00:18:15.165 --> 00:18:17.205
they're drinking a beer and they gotta put that beer down.

439
00:18:17.225 --> 00:18:19.125
And there we were, right?

440
00:18:19.155 --> 00:18:21.405
They gotta use these two hands and do all that stuff.

441
00:18:21.505 --> 00:18:26.165
And the prop guys like myself, we drinking a beer,

442
00:18:26.205 --> 00:18:28.485
we gotta put the same beer down and go there we were.

443
00:18:30.465 --> 00:18:33.365
But the helicopter guys keep that beer in their hand,

444
00:18:33.915 --> 00:18:35.685
keep drinking it and go, there we were.

445
00:18:36.105 --> 00:18:38.525
And just do that. I want you

446
00:18:38.525 --> 00:18:39.605
to know this took me a long time

447
00:18:39.605 --> 00:18:40.645
to be able to figure this out.

448
00:18:41.715 --> 00:18:42.845
It's kinda like one of those.

449
00:18:42.985 --> 00:18:45.925
But so, so anyway, there we were.

450
00:18:46.155 --> 00:18:50.645
Okay, we're at 8,000 feet actually, which was 8,100 A GL.

451
00:18:50.805 --> 00:18:52.925
'cause we were over the top of, uh, Palm Springs,

452
00:18:53.625 --> 00:18:56.085
and we set the throttles up to max continuous power.

453
00:18:56.145 --> 00:18:58.365
Put a piece of tape there. You can't just, there's no fade.

454
00:18:58.365 --> 00:18:59.445
It can't just jam 'em up.

455
00:19:00.585 --> 00:19:03.405
Jim said, okay, your throttle's Bob Roger that.

456
00:19:03.445 --> 00:19:05.645
He had the airplane all configured in the side slip.

457
00:19:06.305 --> 00:19:08.005
We did one thing that was kind of smart

458
00:19:08.025 --> 00:19:10.205
and we decided stall speed was too low.

459
00:19:10.225 --> 00:19:12.525

So we did it at stall warning speed, which was,

460
00:19:12.805 --> 00:19:14.285
I don't know, six or eight knots faster.

461
00:19:14.865 --> 00:19:16.005
So we're at 80 knots

462
00:19:16.985 --> 00:19:20.315
and uh, I took that left engine, okay?

463
00:19:20.575 --> 00:19:22.955
We did the, we did the calls, did the countdown,

464
00:19:23.775 --> 00:19:24.835
and I took it.

465
00:19:25.335 --> 00:19:27.875
And right before I put it up, something seemed wrong,

466
00:19:29.495 --> 00:19:30.995
but if you're like me

467
00:19:31.375 --> 00:19:32.675
and you didn't listen to a little voice

468
00:19:32.735 --> 00:19:33.835
or you don't know what's going on,

469
00:19:33.835 --> 00:19:36.075
you get the f took that engine.

470
00:19:36.155 --> 00:19:40.875
I rammed it up to, uh, the tape mark and what happened next?

471
00:19:41.025 --> 00:19:43.675
Well, off to the races, here's the, here's the data.

472
00:19:44.345 --> 00:19:46.675
It's all versus time on the x axis,

473
00:19:47.675 --> 00:19:48.975
and it's about five seconds.

474
00:19:49.035 --> 00:19:51.295
So it's a pretty expanded timescale.

475
00:19:51.305 --> 00:19:53.415
We're right on altitude, right on air speed.

476
00:19:54.035 --> 00:19:56.175
We don't have throttle position, which I wish we did

477
00:19:56.175 --> 00:19:57.975
because, uh, I think the throttle,

478
00:19:58.435 --> 00:20:00.295
actual throttle was up there.

479
00:20:00.295 --> 00:20:02.215
There's some spool up and spool downtime,

480
00:20:02.215 --> 00:20:04.175
but I don't think it was up quite as long as this.

481
00:20:04.475 --> 00:20:07.655
It was only up about, uh, you know, went from idle up to,

482
00:20:07.655 --> 00:20:09.415
uh, for about a second and a half, went up

483
00:20:09.415 --> 00:20:10.975
to max continuous power, right?

484
00:20:10.975 --> 00:20:13.815
Engine back at idle. And you can see the roll angle.

485
00:20:14.075 --> 00:20:15.615
So here's what's going on in the airplane.

486
00:20:15.785 --> 00:20:19.815

Jim's over there and, uh, of course the airplane's gonna ya

487
00:20:19.835 --> 00:20:21.375
and roll rapidly, okay?

488
00:20:21.955 --> 00:20:23.975
And it rolled to about 80 degrees,

489
00:20:24.365 --> 00:20:28.015
despite Jim putting in full lateral control, full,

490
00:20:28.395 --> 00:20:29.495
uh, counter rudder.

491
00:20:29.675 --> 00:20:31.135
And he actually unloaded the airplane.

492
00:20:31.135 --> 00:20:32.415
That's what's going on here with the, uh,

493
00:20:32.475 --> 00:20:33.615
the angle of attack trace.

494
00:20:33.635 --> 00:20:34.815
It got, uh, quite low.

495
00:20:34.815 --> 00:20:37.735
It got down, I think about half a G or so.

496
00:20:38.515 --> 00:20:39.695
And it was a good thing because

497
00:20:39.695 --> 00:20:41.295
that made the controls more effective.

498
00:20:41.315 --> 00:20:44.135
And we got over to 80 degrees. Jim recovered.

499
00:20:44.295 --> 00:20:45.735
I had the, the throttle coming back.

500
00:20:45.755 --> 00:20:47.245
As soon as I put it up, I realized

501
00:20:47.675 --> 00:20:49.245
what I was doing, that it was stupid.

502
00:20:49.305 --> 00:20:51.525
So I ripped it right back. Even.

503
00:20:51.585 --> 00:20:54.405
So, there it goes over 80 degrees. And then Jim recovered.

504
00:20:54.855 --> 00:20:57.245
Thankfully, we didn't over speed anything.

505
00:20:57.425 --> 00:20:59.405
We didn't, we violated no limits.

506
00:20:59.625 --> 00:21:03.645
But man, what a stupid thing to do. And why did it happen?

507
00:21:04.275 --> 00:21:06.845
Well, it happened 'cause we were below VMCA

508
00:21:07.105 --> 00:21:11.325
and the definition of VMCA, uh, is, is, uh,

509
00:21:12.385 --> 00:21:14.605
you know, you can't control a full asymmetric thrust

510
00:21:14.635 --> 00:21:15.885
like I put in rapidly.

511
00:21:15.985 --> 00:21:18.365
And it was kind of a dynamic VMCA condition.

512
00:21:19.225 --> 00:21:21.565
Um, now if, if you got that f you,

513
00:21:21.585 --> 00:21:22.965

you get a, a waiver from that.

514
00:21:22.965 --> 00:21:25.285
F if you're a single seat guy, you're still probably trying

515
00:21:25.285 --> 00:21:28.085
to, or not single seat, but single engine pilot.

516
00:21:28.185 --> 00:21:29.445
If you're flying Theno

517
00:21:29.445 --> 00:21:31.925
or an F 16, you're probably still wondering

518
00:21:31.925 --> 00:21:32.925
what I'm talking about.

519
00:21:32.985 --> 00:21:37.525
But for the rest of you guys that have flow,

520
00:21:37.525 --> 00:21:41.125
multi-engine, uh, you know, you know why it happened

521
00:21:41.145 --> 00:21:43.365
and you probably weren't too surprised and,

522
00:21:43.505 --> 00:21:45.685
and probably got it a lot earlier than we did.

523
00:21:46.185 --> 00:21:48.485
So how that, how did this happen to us, right?

524
00:21:49.025 --> 00:21:50.165
And our first reaction,

525
00:21:50.185 --> 00:21:52.565
and I, I will never forget, looking over at Jim

526
00:21:53.305 --> 00:21:55.965
and the silence in the cockpit was amazing.

527
00:21:56.105 --> 00:21:59.085
And we both realized that the reason that this had happened

528
00:21:59.745 --> 00:22:02.125
was because we are both bone boneheads.

529
00:22:03.255 --> 00:22:06.165
We're just absolute boneheads, right? We're just stupid.

530
00:22:06.945 --> 00:22:08.085
Uh, I'm the tall, uh,

531
00:22:08.085 --> 00:22:09.805
good looking bonehead on the right there, by the way.

532
00:22:12.265 --> 00:22:16.325
Um, quiet flight home, uh, RTB.

533
00:22:16.785 --> 00:22:19.645
And, uh, over the next couple days we talked more about it

534
00:22:20.105 --> 00:22:22.565
and we decided that yeah, we, we are boneheads.

535
00:22:22.625 --> 00:22:25.325
I'm, I'm not, you know, I can't, uh, disown that.

536
00:22:25.345 --> 00:22:27.125
It was just a stupid thing to, to do.

537
00:22:27.665 --> 00:22:31.325
But if it can happen to us, it can happen to you. Okay?

538
00:22:31.945 --> 00:22:32.965
And, and who is us?

539
00:22:33.155 --> 00:22:35.085
Well, one of the uss taught

540
00:22:35.615 --> 00:22:38.525

asymmetric power handling qualities at the Naval Test Pilot

541
00:22:38.525 --> 00:22:41.445
school in the King Air for years.

542
00:22:41.805 --> 00:22:44.645
I taught, I mean, I taught that for, for a long time.

543
00:22:45.545 --> 00:22:48.245
Um, Jim's a fully qualified multi-engine pilot

544
00:22:48.345 --> 00:22:49.525
at handling qualities.

545
00:22:49.605 --> 00:22:52.645
DER has done a lot of VMC testing. We'd been doing it.

546
00:22:53.345 --> 00:22:55.205
Uh, I, I didn't mention on the slide,

547
00:22:55.205 --> 00:22:58.085
but you saw, we determined VMCA just days

548
00:22:58.145 --> 00:22:59.725
before doing that stupid thing.

549
00:23:00.305 --> 00:23:01.925
Uh, so how did the, how did it happen?

550
00:23:02.025 --> 00:23:03.445
And, and it can happen to you

551
00:23:03.465 --> 00:23:06.405
and I hope that we can gather some common, uh,

552
00:23:06.625 --> 00:23:07.725
common reasons why

553
00:23:07.835 --> 00:23:10.285
that maybe you can put in your back pocket and,

554
00:23:10.465 --> 00:23:11.765
and avoid doing something stupid.

555
00:23:12.165 --> 00:23:14.005
Probably won't be this, you won't be flying a king air

556
00:23:14.005 --> 00:23:15.685
and doing this propulsion test.

557
00:23:15.785 --> 00:23:17.725
But, um, what are some

558
00:23:17.725 --> 00:23:19.325
of the pitfalls and how can we help you?

559
00:23:20.265 --> 00:23:22.285
So let's take a look at our, uh, cheese.

560
00:23:23.105 --> 00:23:26.045
Uh, everybody's familiar with this test planning.

561
00:23:26.745 --> 00:23:29.285
Uh, the advisory circular wording was not helpful.

562
00:23:29.385 --> 00:23:31.885
It had the word single, uh, throttle,

563
00:23:32.065 --> 00:23:34.765
and it didn't discuss anything about, uh, safety

564
00:23:34.985 --> 00:23:37.165
and anything about multi-engine, uh,

565
00:23:37.165 --> 00:23:38.685
doing this in a multi-engine fashion.

566
00:23:38.965 --> 00:23:40.405
'cause you know, it is a, it is a balance.

567
00:23:40.545 --> 00:23:43.165

You know, if you do have two engines hiccup, uh,

568
00:23:43.165 --> 00:23:44.725
when you put it up, that's not a good thing either.

569
00:23:44.785 --> 00:23:46.525
So what's the best way to approach this?

570
00:23:46.545 --> 00:23:48.685
Uh, test, uh, the procedure

571
00:23:48.685 --> 00:23:50.205
and the test plan was insufficient.

572
00:23:50.205 --> 00:23:53.285
It didn't talk about it. And, ah, just a propulsion test,

573
00:23:53.345 --> 00:23:55.765
you know, um, risk management,

574
00:23:55.765 --> 00:23:57.725
equally unclear, not very good.

575
00:23:57.945 --> 00:24:00.965
Uh, and, uh, insufficient review of that, uh, mentioned

576
00:24:00.965 --> 00:24:04.245
that, that we kind of fast tracked, uh, change, uh,

577
00:24:04.645 --> 00:24:05.965
probably could have taken some more review.

578
00:24:07.305 --> 00:24:09.365
Uh, there's a human element here that you're,

579
00:24:09.465 --> 00:24:11.325
I'm there doing a propulsion test.

580
00:24:12.385 --> 00:24:14.765
And so I'm looking at propulsion levers

581
00:24:14.765 --> 00:24:15.965
and propulsion gauges

582
00:24:16.305 --> 00:24:18.165
and sort of lose track of the big picture.

583
00:24:19.045 --> 00:24:20.805
I also think that maybe splitting the duties

584
00:24:21.035 --> 00:24:22.525
with me handling the throttles

585
00:24:22.525 --> 00:24:25.045
and Jim flying the airplane mighta, that might've been a,

586
00:24:25.525 --> 00:24:27.805
a problem, although obviously we did that for good reasons.

587
00:24:27.985 --> 00:24:30.085
But, uh, I think that might've been a,

588
00:24:30.105 --> 00:24:31.725
uh, an aspect of this.

589
00:24:31.785 --> 00:24:33.885
And I think we were fatigued even though we were legal.

590
00:24:34.425 --> 00:24:37.085
Uh, I think there was some, uh, fatigue probably setting in.

591
00:24:38.185 --> 00:24:40.205
And the last chance, uh, there, the,

592
00:24:40.625 --> 00:24:42.645
or one of the chances would've been if

593
00:24:42.665 --> 00:24:43.845
I'd have listened to that little voice.

594
00:24:44.205 --> 00:24:45.565

I had a couple hairs up on the back

595
00:24:45.565 --> 00:24:47.365
of my neck telling me something was wrong,

596
00:24:47.905 --> 00:24:49.885
and I should just go, Hey, Jim, something's wrong.

597
00:24:49.975 --> 00:24:52.165
Let's stop, figure it out. I didn't do that.

598
00:24:52.245 --> 00:24:53.925
I had the last chance and I didn't take it.

599
00:24:54.745 --> 00:24:57.045
Now, we did not have a, a mishap.

600
00:24:57.065 --> 00:24:58.525
We didn't have, uh, an accident.

601
00:24:58.585 --> 00:25:01.325
We didn't over, uh, didn't exceed any limits.

602
00:25:01.425 --> 00:25:04.285
But the only reason why is that last piece of cheese

603
00:25:04.285 --> 00:25:06.765
that didn't have any holes in it, and that was rapid

604
00:25:07.065 --> 00:25:09.605
and proper, uh, reaction by the crew reaction

605
00:25:09.605 --> 00:25:10.845
that we hadn't briefed, by the way.

606
00:25:10.965 --> 00:25:14.085
I mean, you know, there was no procedure for if it does it,

607
00:25:14.085 --> 00:25:15.445
you know, pull a throttle back or anything.

608
00:25:15.505 --> 00:25:19.045
So, uh, you kind of call that luck, uh, frankly.

609
00:25:20.865 --> 00:25:22.725
So what did we learn and what can you learn

610
00:25:22.725 --> 00:25:25.325
and why is this maybe applicable to, uh,

611
00:25:25.465 --> 00:25:26.685
to fly by wire testing?

612
00:25:27.515 --> 00:25:29.005
Well, first of all,

613
00:25:29.005 --> 00:25:31.405
careful test planning can't be overemphasized along

614
00:25:31.405 --> 00:25:32.405
with good risk management.

615
00:25:32.945 --> 00:25:35.085
Low risk is not no risk.

616
00:25:35.855 --> 00:25:39.045
We've all heard that, uh, a lot of mishaps

617
00:25:39.045 --> 00:25:40.125
and flight tests have occurred.

618
00:25:40.265 --> 00:25:42.085
Not even doing a condition, just, uh,

619
00:25:42.345 --> 00:25:43.645
you know, returning to base.

620
00:25:44.425 --> 00:25:47.165
Uh, we did not do a good job in that test planning phase.

621
00:25:47.725 --> 00:25:50.245

Identifying the hazards. You saw it was missing in the THA,

622
00:25:50.245 --> 00:25:52.685
it was missing in the, uh, the test plan.

623
00:25:52.905 --> 00:25:54.645
Ah, it's missing in the advisory circular.

624
00:25:55.905 --> 00:25:58.405
So we, uh, we had to improvise.

625
00:25:58.585 --> 00:26:01.045
And, uh, and that's, we get paid for that, right?

626
00:26:01.125 --> 00:26:03.525
I mean, that nothing's ever exactly as written down.

627
00:26:03.545 --> 00:26:04.605
And I'm not trying to imply

628
00:26:04.605 --> 00:26:07.365
that every time something feels wrong, you stop and go home.

629
00:26:07.985 --> 00:26:11.005
Uh, but just be cautious if you're, if you're kind

630
00:26:11.005 --> 00:26:15.525
of making, like we were making up new ths, uh,

631
00:26:15.685 --> 00:26:18.405
I think familiarity does breed, uh, overconfidence.

632
00:26:18.425 --> 00:26:21.045
We, we had been flying the airplane a lot, as I mentioned,

633
00:26:21.225 --> 00:26:22.485
and, uh, we're pretty comfortable,

634
00:26:22.485 --> 00:26:23.725
very, very comfortable with it.

635
00:26:23.745 --> 00:26:25.285
And I think we got overconfident.

636
00:26:25.745 --> 00:26:27.125
So don't let that happen to you.

637
00:26:27.275 --> 00:26:29.885
Keep checking on each other. Keep questioning yourself.

638
00:26:31.065 --> 00:26:33.845
Um, flexibility is important.

639
00:26:34.345 --> 00:26:36.005
I'm not gonna get the job done without it,

640
00:26:36.065 --> 00:26:38.765
but, uh, it does, it can introduce new hazards

641
00:26:38.765 --> 00:26:40.005
and you want to be, uh, on the

642
00:26:40.005 --> 00:26:41.085
lookout for that kind of thing.

643
00:26:42.025 --> 00:26:44.365
And be careful about, uh, fatigue.

644
00:26:44.945 --> 00:26:46.085
Now, we were within our limits,

645
00:26:46.145 --> 00:26:48.485
and I assume everybody has their own set of limits

646
00:26:48.585 --> 00:26:51.125
for crew duty day, a number of days of work and all that.

647
00:26:51.125 --> 00:26:52.245
And we were well within that.

648
00:26:52.785 --> 00:26:53.925

But you've gotta kind of,

649
00:26:54.265 --> 00:26:55.965
and it's not, it's not a math equation.

650
00:26:56.025 --> 00:26:57.925
You can't write down a set of limits for this.

651
00:26:57.945 --> 00:26:59.325
But when you've been doing a number

652
00:26:59.325 --> 00:27:02.765
of high risk flight tests, uh, that kind of thing,

653
00:27:02.865 --> 00:27:05.405
you may be more fatigued sooner than you think.

654
00:27:05.545 --> 00:27:08.445
So, uh, I'm not sure exactly how to tell you to look for

655
00:27:08.445 --> 00:27:10.485
that, but, but just be aware of it

656
00:27:12.385 --> 00:27:13.885
and listen to those small voices.

657
00:27:14.065 --> 00:27:16.045
We all have varying degrees of experience.

658
00:27:16.065 --> 00:27:17.445
As you get older, you get more,

659
00:27:17.905 --> 00:27:20.285
and you really at some point should listen.

660
00:27:20.395 --> 00:27:22.125
Well, you should always listen to those voices

661
00:27:22.265 --> 00:27:24.885
and try to try to resolve why you're feeling that way.

662
00:27:26.505 --> 00:27:28.365
And the last thing, the last lesson learned,

663
00:27:28.365 --> 00:27:30.405
and I, uh, I'm gonna take this opportunity

664
00:27:30.405 --> 00:27:32.485
to get up on my soapbox and, uh,

665
00:27:32.585 --> 00:27:34.365
and say that when bad things happen,

666
00:27:34.585 --> 00:27:35.805
you've gotta talk about it.

667
00:27:35.995 --> 00:27:38.645
Okay? We could have just walked away, said,

668
00:27:38.985 --> 00:27:40.405
uh, we're bone heads.

669
00:27:40.975 --> 00:27:43.005
We're, uh, we're, you know,

670
00:27:43.015 --> 00:27:44.565
we'll never talk about this again.

671
00:27:44.745 --> 00:27:47.845
You know, keep it a secret. Uh, but we didn't.

672
00:27:48.065 --> 00:27:50.045
And, uh, and I don't know if you've learned anything from

673
00:27:50.045 --> 00:27:52.365
today's brief, but I, I will say that I'm concerned

674
00:27:52.365 --> 00:27:53.645
that we've lost our way a little bit.

675
00:27:54.265 --> 00:27:57.805

Uh, some, some presentations we've seen this week have been

676
00:27:57.805 --> 00:27:58.845
extremely forthcoming.

677
00:27:59.005 --> 00:28:01.565
I particularly, uh, have a great deal of respect

678
00:28:01.565 --> 00:28:03.165
for Airbus in the way they talked about

679
00:28:03.165 --> 00:28:04.245
their, their incidents.

680
00:28:04.245 --> 00:28:06.565
But some of the other folks, it's obvious

681
00:28:06.565 --> 00:28:09.445
that our corporate culture is keeping us from being able to,

682
00:28:09.465 --> 00:28:11.965
to, to tell bonehead stories like this to say,

683
00:28:12.185 --> 00:28:14.405
and not just talk about the airplane being a problem,

684
00:28:14.585 --> 00:28:16.645
but the human, the test pilot.

685
00:28:17.465 --> 00:28:20.725
Um, we need to impress upon our leadership

686
00:28:21.595 --> 00:28:24.005
that this will save them money, okay?

687
00:28:24.105 --> 00:28:27.125
We don't talk about this stuff just

688
00:28:27.325 --> 00:28:29.125
'cause, I mean, it's not a great feeling being up here

689
00:28:29.125 --> 00:28:30.245
telling you I'm a bonehead, right?

690
00:28:30.625 --> 00:28:32.605
But we talk about it in the hopes

691
00:28:32.705 --> 00:28:36.245
and in the reality that we will all get better by sharing

692
00:28:36.315 --> 00:28:38.485
what happened and learning from each other.

693
00:28:38.945 --> 00:28:41.765
And we've, and that will prevent schedule delays

694
00:28:41.785 --> 00:28:42.805
or god forbid,

695
00:28:43.105 --> 00:28:46.365
an aircraft mishap sometime in the future for one of you in this room.

696
00:28:46.865 --> 00:28:48.565
And we've gotta convince our leadership.

697
00:28:48.775 --> 00:28:50.765
We've just absolutely gotta convince them that we need

698
00:28:50.765 --> 00:28:53.685
to have a forum where we can talk about these and learn.

699
00:28:53.745 --> 00:28:57.085
And, and, uh, for some, uh, entities,

700
00:28:57.225 --> 00:28:58.325
uh, we don't have that yet.

701
00:28:58.425 --> 00:28:59.765
So I'm hoping that, uh,

702
00:28:59.905 --> 00:29:01.565

you'll take this as a call to action.

703
00:29:02.185 --> 00:29:04.885
Uh, with that, I'd like to again, thank the committee

704
00:29:05.105 --> 00:29:07.325
and, uh, open it up for any questions.

705
00:29:07.365 --> 00:29:09.205
I guess we're almost out of time, so maybe the panel.

706
00:29:10.305 --> 00:29:11.605
So, uh, thank you very much.

707
00:29:19.705 --> 00:29:19.925
Yes,

708
00:29:31.915 --> 00:29:32.975
Bob and Jim, thanks again.

709
00:29:33.035 --> 00:29:35.735
Um, especially that kind of a candid look at, you know,

710
00:29:35.735 --> 00:29:38.335
an event that happened and, uh, I know, uh,

711
00:29:38.685 --> 00:29:40.735
anybody who's flown in here has, had something like

712
00:29:40.735 --> 00:29:42.445
that happen or what, to what extent?

713
00:29:42.545 --> 00:29:45.845
Uh, certainly varies, but, uh, we've all had that.

714
00:29:45.845 --> 00:29:48.645
And if, if, uh, you say you have it, then uh, you need

715
00:29:48.645 --> 00:29:51.165
to look a little deeper 'cause guarantee it has.

716
00:29:51.265 --> 00:29:55.165
So, um, you can, uh, repress things very well. So.