

WEBVTT

1

00:00:00.300 --> 00:00:04.060

This, this should go easily. So, uh, the first presentation,

2

00:00:04.410 --> 00:00:09.260

like Stu said, uh, is going to be instead of, uh, the,

3

00:00:09.280 --> 00:00:14.140

uh, Mike's presentation on the Doo, it'll be the presentation that, uh, Stu and,

4

00:00:14.760 --> 00:00:19.450

uh, Dan Henson are gonna do. And I don't have your bio on here,

5

00:00:19.450 --> 00:00:22.730

and I don't if there's a bio for them to bring up. But everybody knows Stu,

6

00:00:22.730 --> 00:00:25.770

who is former Canadian forces tester and pilot,

7

00:00:25.990 --> 00:00:29.800

and now at Textron as safety officer. And Dan,

8

00:00:29.920 --> 00:00:33.080

I don't even know what Dan's current title is because he's probably like one

9

00:00:33.080 --> 00:00:36.720

step below CEO by now, but he used to be used to be the chief pilot for defense.

10

00:00:36.740 --> 00:00:40.920

So, uh, you guys clear to take it away. And please remember, uh,

11

00:00:41.420 --> 00:00:42.720

if there's questions at the end of this,

12

00:00:42.720 --> 00:00:45.840

cuz we'll have about five minutes wait till the mic gets to you so that we can

13
00:00:45.840 --> 00:00:49.200
record it for the, for the, uh, recording, the video recording to doing
so.

14
00:00:49.290 --> 00:00:50.600
Thank you. And guys, take it away.

15
00:00:51.760 --> 00:00:52.520
Thanks Dave.

16
00:00:52.520 --> 00:00:53.353
Thanks, Dave.

17
00:00:55.970 --> 00:00:56.260
Does

18
00:00:56.260 --> 00:00:57.093
That go on?

19
00:00:57.560 --> 00:01:00.100
Hey, can you bring up the, uh, note slide on the, uh,

20
00:01:02.970 --> 00:01:07.520
Otherwise we'll be wing it. Oh, sorry. We're gonna be, yeah. All right.

21
00:01:09.350 --> 00:01:12.200
Big green button. Sure. Uh,

22
00:01:13.310 --> 00:01:17.900
There is a process of going through, coming up with a presentation for
me.

23
00:01:18.350 --> 00:01:21.010
It comes with the jubilation and glee of signing up for something.

24
00:01:21.010 --> 00:01:24.930
How exciting is that? And then I completely ignore it, then forget about
it.

25
00:01:25.270 --> 00:01:29.930

And then there's a buildup of, uh, mild anxiety and then holy crap, you know,

26

00:01:31.040 --> 00:01:34.450

wrenching by, dug up for something. Why did, did I do that

27

00:01:34.450 --> 00:01:39.380

Myself again? Then I can hear you. Oh, sorry. I want to walk away.

28

00:01:39.920 --> 00:01:44.470

So, So when the, uh, the time comes and the muse has to hit you,

29

00:01:44.510 --> 00:01:46.670

I can't really control when that's gonna happen. In this case,

30

00:01:46.670 --> 00:01:48.990

it happened when the grandkids are over. Uh,

31

00:01:48.990 --> 00:01:51.270

I had to rough one of them up and take away his, uh,

32

00:01:51.330 --> 00:01:54.950

his paper and his crayon and write everything down really quickly before it

33

00:01:54.950 --> 00:01:56.910

leaked outta my head. So that's what we have on the right sides,

34

00:01:56.930 --> 00:01:59.870

our presentation. And if there are any, any questions too, and I'll be around,

35

00:02:00.290 --> 00:02:03.970

uh, to take them for you. Uh, more seriously put, uh,

36

00:02:04.110 --> 00:02:06.770

it did start out like that, which is why I put in there thanks to, uh,

37

00:02:06.770 --> 00:02:10.090

to mo for the recommendation on that. Uh, for the slide, the, uh,

38

00:02:10.120 --> 00:02:12.210
what we're gonna go through is, uh,

39
00:02:12.390 --> 00:02:15.290
the story of testing in the baseline modification,

40
00:02:15.310 --> 00:02:18.530
and then we change the outer mold line in this particular, uh, airplane.

41
00:02:18.590 --> 00:02:22.890
And then Stu, uh, appropriately named his event that he'll brief you on.
Uh,

42
00:02:22.890 --> 00:02:24.570
well, this sucks. And then, uh,

43
00:02:24.570 --> 00:02:28.010
with all deference to Gerald Tolkin on Unexpected journey. So Stu,

44
00:02:28.190 --> 00:02:29.090
you've got that part.

45
00:02:31.070 --> 00:02:33.290
All right. First of all, I apologize for the graphics. Uh,

46
00:02:33.350 --> 00:02:36.250
we we're eventually gonna change this into a, a beautiful looking King
air.

47
00:02:36.250 --> 00:02:39.410
It's not a caravan paper, this is King Air paper, but this is the, uh,

48
00:02:39.960 --> 00:02:43.930
best 3D representation of what happened. So we're out doing some, uh,

49
00:02:43.940 --> 00:02:47.850
power on stall characteristics, light aft, and uh, we are,

50
00:02:47.850 --> 00:02:50.010
just to give an idea of what the king air's like when you're stalling it,

51

00:02:50.320 --> 00:02:52.610

it's pretty smooth actually with, especially with power on,

52

00:02:52.610 --> 00:02:55.050

you're just pulling back one, not per second, nice smooth pull.

53

00:02:55.230 --> 00:02:59.090

You get a little bit of verbal, uh, little bit right before the stall break.

54

00:02:59.620 --> 00:03:02.480

Bit of a roll off usually, cuz as we usually have the left wing heavy.

55

00:03:02.900 --> 00:03:03.840

And then you, um,

56

00:03:04.700 --> 00:03:07.990

basically then you go into the full stall break two seconds on the stop recover

57

00:03:08.210 --> 00:03:10.630

and the king air, you have to fly it outta the recovery. It's more of a,

58

00:03:10.650 --> 00:03:12.310

if you just slam the the yolk forward,

59

00:03:12.310 --> 00:03:15.110

you'll end up having increasing more roll off usually. So,

60

00:03:15.110 --> 00:03:16.270

but it's generally pretty smooth.

61

00:03:16.930 --> 00:03:21.330

So we were finding some challenges with power on stalls

62

00:03:21.910 --> 00:03:26.290

and, uh, having a tough time getting can be compliant and, but I,

63

00:03:26.370 --> 00:03:29.090

I figured out a technique on the eighth runner. I'm like, oh, this is great.

64

00:03:29.360 --> 00:03:33.890

I've got it, we've nailed it. And uh, then tm of course is, yeah,

65

00:03:33.890 --> 00:03:37.290

that was 1.8 seconds on the stop not to, I was like, well,

66

00:03:37.290 --> 00:03:42.250

I think we got this figured out. So hopefully this starts playing. It is.

67

00:03:43.030 --> 00:03:46.970

So we're like, okay, well I got this done. Let's go ahead and do one more run.

68

00:03:47.230 --> 00:03:50.770

And, uh, if Shakka could hold my beer at that point while we go on for this run,

69

00:03:50.770 --> 00:03:53.730

that'd be perfect. So we're just getting up here. You can see, uh,

70

00:03:53.730 --> 00:03:56.650

just giving a 3D representation of the aircraft as it's, uh,

71

00:03:56.650 --> 00:04:00.010

getting close to the stall break. You can see with the power on stalls,

72

00:04:00.100 --> 00:04:04.790

we're about, that's like 67 knots. And we get a little bit of this,

73

00:04:04.790 --> 00:04:08.510

the burble coming in does a nice rapid roll off.

74

00:04:09.950 --> 00:04:12.490

And then it says, I'm gonna go the other direction now too,

75

00:04:12.490 --> 00:04:14.170

and slice off back the other direction.

76

00:04:15.800 --> 00:04:20.740

And we end up about 88 degrees nose down going, wow, this sucks.

77

00:04:22.360 --> 00:04:26.120

We recovered the aircraft. Um, we managed to, uh,

78

00:04:26.780 --> 00:04:28.440

get the aircraft recovered with just, uh,

79

00:04:28.440 --> 00:04:31.600

about a end up pulling about 3G on what was a two G aircraft at the time,

80

00:04:31.600 --> 00:04:35.360

about 3.3 in the recovery to avoid hitting the ground. Uh, well not,

81

00:04:35.360 --> 00:04:36.320

we weren't that close to the ground,

82

00:04:36.320 --> 00:04:39.800

but just to get the aircraft recovered and overspeed the, uh, the,

83

00:04:39.860 --> 00:04:43.840

the flaps as well. So we got back home table to your legs, like, okay,

84

00:04:43.840 --> 00:04:48.280

what the hell happened there? So, sure, this moves on.

85

00:04:49.780 --> 00:04:52.550

Okay, that was the incident. Back to you. Alright,

86

00:04:52.650 --> 00:04:56.070

Thanks sir. So, big picture wise, I know this is a bit of a busy slide,

87

00:04:56.070 --> 00:04:59.190

but this was the program that we're on and, and just a little bit of a,
uh,

88

00:04:59.350 --> 00:05:04.110

a setup for you to get you in the mind that we were, uh, did some
initial, uh,

89

00:05:04.110 --> 00:05:06.790

testing on the airplane after it was born, so to speak.

90
00:05:06.810 --> 00:05:09.630
And then it went into this, what we call long nose modification. Uh,

91
00:05:09.630 --> 00:05:09.990
if you're not,

92
00:05:09.990 --> 00:05:13.830
I'll show you pictures and then if you see that baseline cert in 20 20
20,

93
00:05:13.830 --> 00:05:17.310
that was for the long nose. And we just proceeded through bumping along,

94
00:05:17.310 --> 00:05:20.550
doing all the different tests that we had to do, uh, to get to that
point.

95
00:05:20.550 --> 00:05:22.310
Then we go, okay, let's change this. Uh,

96
00:05:22.360 --> 00:05:25.430
outer mold line is the oml there modification period.

97
00:05:25.490 --> 00:05:28.830
We come out of that and our expectation at this point is to go bump it
along,

98
00:05:28.830 --> 00:05:32.390
doing the same thing that we just did. Uh, didn't realize that, uh,

99
00:05:32.710 --> 00:05:34.710
that power installs were going to be an issue.

100
00:05:34.770 --> 00:05:37.910
So they weren't really brought forward in the test program as, uh,

101
00:05:38.050 --> 00:05:41.510
as going after the risk reduction. Now the rest of it is very busy.

102
00:05:41.710 --> 00:05:45.430
I I appreciate that. Flight 1 74 is, uh, is up there.

103

00:05:45.580 --> 00:05:46.870

What Stu just showed you,

104

00:05:47.090 --> 00:05:50.510

the unexpected stall characteristics journey in total is about 30 different

105

00:05:50.510 --> 00:05:53.870

flights and 648 stalls, seven different pilots,

106

00:05:53.870 --> 00:05:55.550

and four different aircraft configurations.

107

00:05:55.890 --> 00:05:59.320

And we went all over the place with exploration before that until we finally

108

00:05:59.320 --> 00:06:02.720

figured out that there's some dependencies we need to start addressing.

109

00:06:02.720 --> 00:06:05.880

And let's try and use handling quality ratings to do so.

110

00:06:07.270 --> 00:06:09.570

So introduce you to the airplane. It's a, uh,

111

00:06:09.570 --> 00:06:13.570

model three 50 or a King Air three 50 is actually beast 300 is the type on it.

112

00:06:13.760 --> 00:06:15.250

This one's been modified, uh,

113

00:06:15.250 --> 00:06:19.530

with the long nose modification to put an MX 20 class, uh,

114

00:06:19.530 --> 00:06:22.610

sensor in the, in the, uh, nose of it up there. Uh,

115

00:06:22.610 --> 00:06:26.890

we're gonna be in pitch attitudes anywhere from 35 to 45 degrees in, uh,

116

00:06:27.070 --> 00:06:31.090

all the way up to 50 alpha was our, uh, or 50 units anyway,

117

00:06:31.090 --> 00:06:33.370

was our knock it off criteria. So kind of important,

118

00:06:33.370 --> 00:06:36.610

especially for your fighter guys in the room to guys and gals in the room to

119

00:06:36.610 --> 00:06:38.210

look underneath there and be thinking, Hey,

120

00:06:38.310 --> 00:06:41.810

what's the underside of the nose look like? That's what it looks like. Anyhow,

121

00:06:41.830 --> 00:06:44.290

the rest of the airplane, we have four bladed props on it. There,

122

00:06:44.310 --> 00:06:48.490

we went back and forth. These are dash 67 alpha engines, uh,

123

00:06:48.730 --> 00:06:51.610

17,500 pound airplane. Uh, as, uh,

124

00:06:51.610 --> 00:06:54.810

as stated here with some other modifications that will show in other pictures.

125

00:06:55.390 --> 00:06:58.730

Our, our basic plan for this outer mold line, uh,

126

00:06:58.750 --> 00:07:00.810

change was to certify that.

127

00:07:01.270 --> 00:07:05.570

And the point underlined is that we were doing it for a customer who we're not

128

00:07:05.570 --> 00:07:09.210

going to name and we're gonna respect by covering up some of the important bits

129

00:07:09.210 --> 00:07:13.090

on the mod, uh, here, but we were not the certification authority.

130

00:07:13.110 --> 00:07:17.010

It was going company data to someone else's certification authority.

131

00:07:17.310 --> 00:07:18.890

We were just looking to finish up this,

132

00:07:18.890 --> 00:07:23.010

gather all the data and provide that and get on with the rest of our lives.

133

00:07:23.750 --> 00:07:27.690

So, uh, ground photo, the baseline oml, this doesn't give you much I, I know,

134

00:07:27.690 --> 00:07:31.170

but I was having fun with, uh, with PowerPoint and blocking stuff out and said,

135

00:07:31.170 --> 00:07:33.890

yeah, I think I could do that. So I figured I'd show it to you. So there you go.

136

00:07:34.000 --> 00:07:36.490

It's, uh, on the bell of the airplane, it's also on the top of the tail.

137

00:07:36.490 --> 00:07:39.130

Great out there. And, uh, you can, uh,

138

00:07:39.390 --> 00:07:41.530

get a different perspective for the airplane here.

139

00:07:41.750 --> 00:07:44.730

You can see the boxes a little bit longer, so it must be a longer, uh,

140

00:07:44.730 --> 00:07:47.490

type of mod. It's also a good shot of the bell of the airplane,

141

00:07:47.490 --> 00:07:51.210

particularly those, uh, maritime configuration, large ventral strikes,

142

00:07:51.300 --> 00:07:56.250

which is helping us with directional control or stability, I should say.

143

00:07:56.700 --> 00:07:59.740

Alrighty, I think this is back to you for slacking, that part.

144

00:08:00.970 --> 00:08:03.270

Thanks Shakka. Okay, so let's talk a little bit about, uh,

145

00:08:03.270 --> 00:08:06.190

as we mentioned we're, um, certification basis. So it's,

146

00:08:06.190 --> 00:08:10.070

we're collecting certification, data development data for a customer,

147

00:08:10.630 --> 00:08:12.270

a foreign customer who is then good,

148

00:08:12.270 --> 00:08:16.440

but wants to use the FA rules as their baseline for how they're gonna comply

149

00:08:16.440 --> 00:08:20.440

with the, the aircraft. So let's talk a little bit about amendment levels. So,

150

00:08:21.500 --> 00:08:24.600

and specifically the stalls on the part 23 world for this is obviously the King

151

00:08:24.600 --> 00:08:25.960

air has been around for a while as an older cert basis.

152

00:08:26.380 --> 00:08:30.200

So standard 50 degrees of Roland. Yah, that's what you're looking for.

Uh,

153

00:08:30.200 --> 00:08:31.760
and of course that one wonderful caveat,

154

00:08:31.870 --> 00:08:33.920
without requiring exceptional pilot skill,

155

00:08:33.920 --> 00:08:36.680
which for those who are familiar with 25, it's must be possible to,

156

00:08:36.980 --> 00:08:40.200
and this one has this caveat that it's gotta be no exceptional pilot,

157

00:08:40.200 --> 00:08:42.720
which is a very big difference when you're talking about things like
this.

158

00:08:44.830 --> 00:08:48.530
Now for power on stalls, um, if you go back to the original amendment
level,

159

00:08:48.530 --> 00:08:49.410
amendment 50,

160

00:08:50.280 --> 00:08:55.160
it's 75% power or powerful level flight in the landing

161

00:08:55.400 --> 00:08:58.390
configuration. Uh, but gotta be at least 50%.

162

00:08:59.130 --> 00:09:03.430
Now this rule was really written back in the days of pistons when I
didn't have

163

00:09:03.430 --> 00:09:08.270
the amount of excess power that most modern turbo props can produce. Um,

164

00:09:08.730 --> 00:09:09.990
so really they gave you,

165

00:09:09.990 --> 00:09:12.790

at least it gave you a caveat that you can pull the power back from 75% and go

166

00:09:12.790 --> 00:09:14.910

to 50%. But that's still an awful lot of power.

167

00:09:15.330 --> 00:09:19.470

And the deck angles you create doing these kind of maneuvers are really extreme

168

00:09:19.620 --> 00:09:21.870

because of the amount of excess power that we have. I,

169

00:09:21.870 --> 00:09:23.790

when you think we're light aft doing the stall characteristics,

170

00:09:23.790 --> 00:09:28.030

it can climb like a bane. So, um, but if you look at Amendment 62,

171

00:09:28.030 --> 00:09:28.863

you can see the,

172

00:09:28.890 --> 00:09:33.270

the rules are maturing and recognizing the fact that this is getting silly with

173

00:09:33.270 --> 00:09:36.910

this amount of power on these aircraft. Um, so we gave you a better caveat.

174

00:09:37.090 --> 00:09:39.950

And the biggest thing is, yeah, you're now, you got the gear up,

175

00:09:39.950 --> 00:09:42.950

you're in approach, flat position, but there's no minimum 50% floor.

176

00:09:43.300 --> 00:09:45.190

It's just whatever power's required for that.

177

00:09:47.890 --> 00:09:51.750

So here we are flying along. Um, this is our test conditions coming down here.

178

00:09:51.750 --> 00:09:55.670

We've worked our way all the way down through the first nine lines and we're

179

00:09:55.670 --> 00:09:59.030

happy. And then we get to that one and that's flight 1 74.

180

00:09:59.290 --> 00:10:02.070

And that's when we hit the brick wall and like, ah, this isn't good. Uh,

181

00:10:02.070 --> 00:10:03.470

we've got a problem we need to solve here.

182

00:10:03.810 --> 00:10:06.830

And it is obviously a very clear problem that needs to be solved because of the

183

00:10:06.830 --> 00:10:09.670

departure. It wasn't just someone coming back saying it's non-compliant.

184

00:10:09.820 --> 00:10:12.950

It's like, you can tell things aren't working out so well. Um,

185

00:10:15.800 --> 00:10:19.540

so for our standard, uh, risk assessment for the stalls, uh,

186

00:10:19.540 --> 00:10:21.780

we'd already built in, uh, our, this is kind of our,

187

00:10:21.930 --> 00:10:24.460

kind of our standard library of things that we'll do for these types of

188

00:10:24.740 --> 00:10:27.980

maneuvers. Uh, we do idle before power on, which makes sense, right?

189

00:10:27.980 --> 00:10:29.460

Get to learn the aircraft. Uh,

190

00:10:29.460 --> 00:10:32.180

we do wings level before the other stalls turning and accelerated.

191

00:10:32.180 --> 00:10:35.300

And these were wings level stalls. That's where we got stuck. We, of course,

192

00:10:35.520 --> 00:10:40.500

we require margin, right? We talked a lot about the unknown unknowns. Well,

193

00:10:40.500 --> 00:10:42.140

we always talk about building in margin. Well,

194

00:10:42.140 --> 00:10:44.380

we always require a certain amount of altitude for these maneuvers.

195

00:10:44.680 --> 00:10:46.900

And we were above 10,000 foot ag when this occurred.

196

00:10:47.000 --> 00:10:49.500

So the al the ground was we had to recover the aircraft,

197

00:10:49.500 --> 00:10:51.980

but at the same time we weren't gonna hit the ground when we departed flight.

198

00:10:51.980 --> 00:10:56.200

Cause we had plenty of margin there. Um, we had, uh, TM calls for knock it off,

199

00:10:56.200 --> 00:10:59.520

which was, uh, 50 50 boom aoa, which is a lot.

200

00:10:59.660 --> 00:11:01.680

But that when you have this much power on the aircraft, it's,

201

00:11:01.710 --> 00:11:05.600

it's can conduc a lot of aa. So, and then standard uh, recovery. Mm-hmm.

202

00:11:07.460 --> 00:11:09.840

Now here we are with an aircraft that's got lots of, uh, lots of,

203

00:11:09.840 --> 00:11:12.880
now we've gotta go back to this pilot of exceptional skill has to be able to do

204
00:11:12.880 --> 00:11:13.713
this. So we're not using,

205
00:11:13.850 --> 00:11:17.720
we've got this great instrumentation system with boom data AOA and side slip.

206
00:11:17.740 --> 00:11:21.610
But that's not what we can use cuz it has to be a pilot can't have to have

207
00:11:21.610 --> 00:11:23.730
exceptional skill to be able to stall the aircraft. So they need,

208
00:11:23.800 --> 00:11:26.530
what do they have in front of 'em? Well, they got the pfd. Um,

209
00:11:27.190 --> 00:11:30.210
so as you come into the test technique, you got the stall entry,

210
00:11:30.210 --> 00:11:33.370
nice and stable, looking for that two seconds from the control stop.

211
00:11:33.470 --> 00:11:37.320
And your only feedback loop is really that, that's all you got.

212
00:11:37.580 --> 00:11:39.840
How much slide slip do you have is trying to keep the ball centered.

213
00:11:40.140 --> 00:11:42.200
And of course your bank angle that you're looking at,

214
00:11:42.200 --> 00:11:44.040
that's all you got to work with as the,

215
00:11:44.060 --> 00:11:45.960
if you're gonna take it on a production aircraft,

216
00:11:46.380 --> 00:11:49.400
and of course this aircraft doesn't mentioned earlier the King air,

217
00:11:49.400 --> 00:11:51.800
you have to fly it out of the stall. A lot of other aircraft,

218
00:11:51.860 --> 00:11:53.760
if you just shove the yolk forward,

219
00:11:53.760 --> 00:11:57.440
it break AOA breaks the aircraft com becomes a complete gentle beast.

220
00:11:57.460 --> 00:12:00.720
The King Air, if you just do that, it'll start to roll off on you more.
So,

221
00:12:01.920 --> 00:12:04.890
so there we are. How are we gonna move forward with this? Well,

222
00:12:06.030 --> 00:12:07.410
we really did focus. We knew,

223
00:12:07.410 --> 00:12:09.970
we did spend some time a little bit on the why it happened,

224
00:12:09.970 --> 00:12:12.770
but we really focused on how are we gonna move forward and, uh,

225
00:12:13.010 --> 00:12:16.970
keep the test program moving. Um, so we did a couple things. We, uh,

226
00:12:18.350 --> 00:12:20.210
we reduced the, to get the variation down,

227
00:12:20.210 --> 00:12:23.170
we actually made a very small pool of pilots that would fly the maneuvers
to try

228
00:12:23.170 --> 00:12:25.010
and get some consistency. Um,

229

00:12:25.350 --> 00:12:29.250

and then we started working our way back in CG and power to be able to figure

230

00:12:29.250 --> 00:12:32.570

out where's the line here, where things are gonna go wrong for us. Uh,

231

00:12:32.630 --> 00:12:34.730

we also did a couple things to our instrumentation displays.

232

00:12:34.730 --> 00:12:37.370

You can see that in the, uh, top right we, uh,

233

00:12:37.760 --> 00:12:40.090

made the NZ a little larger so it's more obvious.

234

00:12:40.090 --> 00:12:42.130

So we can catch that hopefully if we have a, have a departure.

235

00:12:42.630 --> 00:12:45.250

And then we start to explore what we thought was the biggest thing,

236

00:12:45.250 --> 00:12:46.083

which was power.

237

00:12:46.230 --> 00:12:49.430

How much is the power affecting us and doing additional buildup. Um,

238

00:12:49.580 --> 00:12:51.910

fortunately for us, with the way that the, the,

239

00:12:51.910 --> 00:12:53.310

the customer is looking for this data,

240

00:12:53.580 --> 00:12:56.790

they were happy to move up to an Amendment 62 level,

241

00:12:57.200 --> 00:13:01.030

which LA allowed us to have a lower power setting from what was required to

242

00:13:01.190 --> 00:13:05.680

complete the maneuver with the Amendment 50. And I know this is gonna get asked.

243

00:13:06.190 --> 00:13:09.520

Most of our, we are fortunate, most of our aircraft detection aviation, uh,

244

00:13:09.520 --> 00:13:13.560

quit was the recovery shoots and, uh, bailout options for our crews.

245

00:13:13.900 --> 00:13:17.120

But the King Airs is an old enough aircraft and the the original prototypes for

246

00:13:17.120 --> 00:13:21.280

those don't exist. And each King Air is essentially unique. Um,

247

00:13:21.300 --> 00:13:24.720

so we didn't have the option for recovery shoots on the aircraft,

248

00:13:24.780 --> 00:13:27.840

or at least not a simple easy solution for recovery shoots.

249

00:13:28.140 --> 00:13:30.360

So we had to ask ourselves, how do we continue doing this?

250

00:13:30.360 --> 00:13:32.720

Cuz we obviously had a nasty departure. Well,

251

00:13:32.720 --> 00:13:35.040

if we actually figured out from that departure what the,

252

00:13:35.040 --> 00:13:37.040

the slice back to the right would look like,

253

00:13:37.040 --> 00:13:41.120

maybe an incipient spin entry is actually just the aircraft saying, oh,

254

00:13:41.120 --> 00:13:44.440

that's what you want. Now I've got some cue back over the tail. It's like,

255

00:13:44.440 --> 00:13:45.760

I'll give you exactly what you're asking for.

256

00:13:45.980 --> 00:13:48.120

And that's me fighting at the roll off.

257

00:13:48.340 --> 00:13:51.280

And then the aircraft suddenly got fast again, just enough q on the tail,

258

00:13:51.280 --> 00:13:52.240

it goes, all right, here we go.

259

00:13:52.240 --> 00:13:53.960

Here's your full rudder and here's your full elron.

260

00:13:54.100 --> 00:13:55.600

And that's why it rapidly sliced back.

261

00:13:55.600 --> 00:13:59.600

So the king air actually behaves exceptionally well as soon as you get just a

262

00:13:59.600 --> 00:14:00.720

little bit of speed back over it.

263

00:14:01.060 --> 00:14:03.480

So if you couple that with a margin and careful buildup,

264

00:14:03.480 --> 00:14:07.200

we've came up with an approach that allowed us to move forward. All right,

265

00:14:07.470 --> 00:14:08.303

back to Dan.

266

00:14:10.170 --> 00:14:11.003

Sure.

267

00:14:11.330 --> 00:14:15.550

So a lot of the kind of things that we did from that point on were basically

268

00:14:15.550 --> 00:14:18.230

hunting and stabbing and trying to find something that would work.

269

00:14:18.360 --> 00:14:21.950

We're still in the black or white, this works, or this is certifiable,

270

00:14:21.950 --> 00:14:24.510

this is not certifiable. And we're trying a bunch of different things.

271

00:14:24.510 --> 00:14:27.030

We're taking pieces of the airplane off, uh, take the,

272

00:14:27.130 --> 00:14:30.990

the tail rate 'em off or take the uh, uh, eventually even took the, uh,

273

00:14:30.990 --> 00:14:32.190

the belly modification off,

274

00:14:32.190 --> 00:14:34.470

changed the four blade of props to five blade of props,

275

00:14:34.650 --> 00:14:38.790

trying to find what is it that is going on and how do we get out of the woods.

276

00:14:39.490 --> 00:14:41.830

Uh, and, and the whole process there.

277

00:14:42.210 --> 00:14:46.750

We started to get pretty dang good at doing stalls. And it was, uh,

278

00:14:46.750 --> 00:14:50.390

starting to question are, are we getting too good at this?

279

00:14:50.450 --> 00:14:54.560

Are we becoming exceptional? And fortunately the answer was no. But, uh,

280

00:14:55.420 --> 00:14:58.000
we keep trying, we keep trying, uh,

281
00:14:58.000 --> 00:15:01.080
just to show you that we did our due diligence and just because I think
CFD is

282
00:15:01.100 --> 00:15:03.880
so dang cool, uh, we put, uh,

283
00:15:03.900 --> 00:15:06.680
we took a look at it and what you can see here on the left is without the

284
00:15:06.680 --> 00:15:08.160
modifications to the airplane on the right.

285
00:15:08.160 --> 00:15:11.320
So that baseline I was telling you about, uh, you look at the tail,

286
00:15:11.320 --> 00:15:14.200
it looks like it's stolen. And, and critically the unboard wing is too,

287
00:15:15.250 --> 00:15:19.310
on the right side. It's not. Uh, so what you have is, uh, what you don't
want.

288
00:15:19.450 --> 00:15:21.590
The Aron uh, roll control has gone away,

289
00:15:22.130 --> 00:15:24.590
but the inside of the wing is still flying, you know,

290
00:15:24.690 --> 00:15:29.070
so we got some significant pitch attitudes, uh, through this whole
process and,

291
00:15:29.450 --> 00:15:32.790
and, uh, control shaping to pull back on the yoke. And that was, uh,

292
00:15:32.790 --> 00:15:35.990
entertaining, especially with folks that hadn't flown this before. And,
uh,

293

00:15:36.210 --> 00:15:39.230

you see some really big eyeballs in the right seat, uh, for that.

294

00:15:39.250 --> 00:15:42.670

But we did our due diligence and, uh, and revised, uh,

295

00:15:42.670 --> 00:15:43.750

our risk mitigation process.

296

00:15:44.250 --> 00:15:47.630

We pretty much just didn't want to do the bad things again. Uh,

297

00:15:47.630 --> 00:15:51.230

and then we want to figure out which configuration con and, um,

298

00:15:51.320 --> 00:15:54.790

conditions that the stall characteristics would be certifiable.

299

00:15:55.170 --> 00:15:58.310

So we really integrated TM as part of the crew there. Uh,

300

00:15:58.420 --> 00:16:01.590

some good tight parameter feedback after each run, uh,

301

00:16:01.590 --> 00:16:04.430

really learned through the process, uh, cuz we had a lot of time to practice it,

302

00:16:04.690 --> 00:16:07.910

uh, what we wanted to know and when, and when to be quiet. Uh,

303

00:16:07.910 --> 00:16:12.870

that is an old story, but, uh, but we continued to evolve that too and, uh,

304

00:16:12.870 --> 00:16:15.430

knock it off. Sometimes we were already in the knock it off. It's,

305

00:16:15.430 --> 00:16:18.790

it's hard to actually get the knock it off out that fast. Uh,

306

00:16:18.850 --> 00:16:23.190

before we were already doing it, uh, CRM and the cockpit was critical, uh,

307

00:16:23.190 --> 00:16:26.750

both the right seat and left seat to flying or whoever was flying the thing.

308

00:16:26.750 --> 00:16:30.670

The, and we briefed it before each of them, and there were some automatic, uh,

309

00:16:30.670 --> 00:16:32.350

things that could be done. Uh,

310

00:16:32.350 --> 00:16:34.590

there was a certain point in these if they were not gonna go well,

311

00:16:34.590 --> 00:16:37.510

it just feel like somebody shoved you off to the side. And it was like,

312

00:16:37.530 --> 00:16:40.550

I'm no longer really flying this thing. And at that point, uh,

313

00:16:40.650 --> 00:16:44.510

we would initiate the recovery if we had an excessive roll angle or the,

314

00:16:44.570 --> 00:16:47.630

it rolled to the point that where pitch is starting to look down, uh,

315

00:16:47.630 --> 00:16:50.110

throttle movement was automatic, uh,

316

00:16:50.260 --> 00:16:54.590

from the co-pilot's perspective or pilot not flying as was the, uh, the flaps.

317

00:16:54.590 --> 00:16:57.830

You could bring the flaps up to approach, which bought us another, uh,

318

00:16:57.830 --> 00:17:01.710

30 knots or so or, or up as need be. So, uh,

319

00:17:02.230 --> 00:17:06.310

additionally we automatically started a G cadence. So if you're, ah,

320

00:17:06.310 --> 00:17:09.950

trying to pull, uh, and save yourself, uh, kind of thing,

321

00:17:10.020 --> 00:17:14.110

it's really helpful to hear a 1.4, 1.5, 1.6, 1.6.

322

00:17:14.110 --> 00:17:15.430

And that way we kept the below two,

323

00:17:15.430 --> 00:17:19.550

which was just a limitation based upon our ballast. So the airplane, uh,

324

00:17:19.750 --> 00:17:22.430

continued to evolve in configuration as we went along. As I've shown,

325

00:17:22.430 --> 00:17:26.470

here's a nice picture, uh, with the sensor hanging out. And you can see, uh,

326

00:17:26.530 --> 00:17:30.910

we were required to cleverly wrap, uh, the, uh, the external shape,

327

00:17:31.040 --> 00:17:34.390

which makes it look like a Christmas present in exactly the same shape that it

328

00:17:34.390 --> 00:17:36.950

is, but it's, uh, pretty funny. So, uh,

329

00:17:37.210 --> 00:17:40.270

we went back and forth with the four blades and five blades, uh,

330

00:17:40.330 --> 00:17:43.830

per customer requirement. And, um, and we saw what that did,

331

00:17:45.080 --> 00:17:48.860
had a tremendous mixed bag of results throughout this entire evolution.

332
00:17:49.220 --> 00:17:53.200
But we ultimately discovered a dependency with, with gross weight and cg.
It's,

333
00:17:53.200 --> 00:17:55.000
uh, makes a lot of sense that it would be cg.

334
00:17:55.000 --> 00:17:58.560
That's what we started tinkering with first. But we, uh, we stumbled upon
like,

335
00:17:58.560 --> 00:18:00.080
Hey, you know, when we're heavy at this cg,

336
00:18:00.080 --> 00:18:03.200
it's a lot easier than when we're not. Mm-hmm. So, uh,

337
00:18:03.200 --> 00:18:06.880
we also found some dependencies of control shaping and, uh, you know, uh,

338
00:18:06.900 --> 00:18:11.360
as far as the test technique of, uh, getting that, uh,

339
00:18:11.360 --> 00:18:16.080
pitch the ass stop and, uh, also the amount of roll coordination to go
along,

340
00:18:16.080 --> 00:18:19.440
which is sort of a natural thing, but how much roll coordination with,
uh,

341
00:18:19.440 --> 00:18:23.240
pedal are gonna use with the Aron, uh, as you come into it, uh,

342
00:18:23.240 --> 00:18:24.480
what's depicted there is,

343
00:18:24.820 --> 00:18:28.200
is the top one is the right amount of roll coordination. The bottom one,

344

00:18:28.200 --> 00:18:30.920

there's a lag or a little to no roll coordination.

345

00:18:31.380 --> 00:18:35.880

And that brief moment is enough to, uh, to let that, uh,

346

00:18:35.940 --> 00:18:40.420

get away from you. So it really, uh, was a matter of going into it, very stable.

347

00:18:40.880 --> 00:18:44.220

And then, uh, and then getting the, uh, the job done with the roll coordination.

348

00:18:45.000 --> 00:18:48.660

Uh, so what we looked at each other here at this point went, uh,

349

00:18:48.680 --> 00:18:53.550

how do we take the fact that we've done 600 stalls or so off the table?

350

00:18:54.170 --> 00:18:55.830

And, and that was really, well,

351

00:18:56.420 --> 00:18:59.030

I've heard of this thing called the Cooper Harper Rating Scale.

352

00:18:59.420 --> 00:19:02.590

What do you think about trying that? And just see how hard these things are.

353

00:19:03.410 --> 00:19:06.310

And when we go out there in the corner of the top part of it,

354

00:19:06.310 --> 00:19:09.150

which I'll show you here in a bit, and we're heavy and it wasn't hard at all.

355

00:19:09.160 --> 00:19:12.430

We're getting twos and threes of, you know, we set ourselves a, uh,

356

00:19:12.580 --> 00:19:15.710

desired performance at 10 degrees of roll and 10 degrees of side slip.

357

00:19:15.930 --> 00:19:18.190

Not that we could really control the side slip that tightly,

358

00:19:18.190 --> 00:19:22.390

but at least we got the feedback. And then 15 degrees of course for certifiable,

359

00:19:22.390 --> 00:19:25.270

we called that adequate and went into the table there and just took a,

360

00:19:25.420 --> 00:19:29.910

took a look at it and we eventually reduced the pilots down to a couple and, uh,

361

00:19:29.910 --> 00:19:33.220

started working from there. Uh,

362

00:19:33.220 --> 00:19:37.980

with that we were hunting for the line between okay and not okay.

363

00:19:38.400 --> 00:19:39.380

So, uh,

364

00:19:39.380 --> 00:19:43.500

it resolved down to the only configuration that mattered here was the gear and

365

00:19:43.500 --> 00:19:46.500

flaps down with the power on configuration. Uh,

366

00:19:46.600 --> 00:19:49.900

and then we went out and with a methodical process and started looking at gross

367

00:19:49.900 --> 00:19:54.580

weight, a lot down center of gravity lines, uh, with the power set where, uh,

368

00:19:54.640 --> 00:19:57.180

Stu was talking about, we had elected to go ahead and put that,

369

00:19:57.180 --> 00:20:01.900

I think it was 43%. So they started okay. And they ended up not okay,

370

00:20:01.960 --> 00:20:05.500

how do we tell the inflection point between them? And, uh, I tell you,

371

00:20:05.500 --> 00:20:08.620

we got seriously tired of doing stalls even on each of these.

372

00:20:08.620 --> 00:20:12.060

There's a lot of scatter in here with, uh, with those. But, uh,

373

00:20:12.060 --> 00:20:15.940

that sometimes we were taking a break. We go out in the, in the heavy,
uh,

374

00:20:15.940 --> 00:20:19.220

you'll see great, uh, weight on the left, ASEs, of course.

375

00:20:19.220 --> 00:20:23.460

And across the bottom is, uh, CG as you might imagine. Uh,

376

00:20:23.480 --> 00:20:27.780

and then we started mapping what they were. Uh, and using hqr as well.

377

00:20:27.780 --> 00:20:31.300

Typically you'd start off with a, with a, uh, level one, you know,

378

00:20:31.300 --> 00:20:32.180

maybe in the threes.

379

00:20:32.400 --> 00:20:35.820

And then you'd start walking your way down into four if you believe in a
four

380

00:20:35.820 --> 00:20:37.820

and a half. Uh, that seemed applicable too,

381

00:20:37.840 --> 00:20:42.140

but fives and sixes and then holy crap sevens, uh, all happened.

382

00:20:42.680 --> 00:20:46.700

And there usually was a pretty clear break point in between those two.

383

00:20:46.700 --> 00:20:50.120

That inflection point happened pretty quickly. And then we'd back it off, uh,

384

00:20:50.120 --> 00:20:53.440

from there and said, I think it's about there. So, uh,

385

00:20:53.500 --> 00:20:57.480

we brought handling qualities into the mix and that allowed us to,

386

00:20:57.660 --> 00:21:00.080

to figure out the inflection point between good and bad.

387

00:21:01.890 --> 00:21:05.090

I wanted to give you a detailed picture of the final test configuration.

388

00:21:07.300 --> 00:21:12.020

Maybe someday, uh, I don't know. We did go back to four bladed props.

389

00:21:12.020 --> 00:21:16.220

The last one was five bladed. And this is where we went deliberately down, uh,

390

00:21:16.410 --> 00:21:20.660

each uh, CG line at this point. We were, uh,

391

00:21:20.660 --> 00:21:21.780

trying to be definitive.

392

00:21:22.090 --> 00:21:26.820

It's like this is the answer for the configuration that the customer has. Uh,

393

00:21:26.820 --> 00:21:30.780

what the customer does with that information is up to them and the certification

394

00:21:30.780 --> 00:21:34.180

authority that they operate under. But we needed to provide the information.

395

00:21:34.450 --> 00:21:37.780

It's okay here, it's not okay there. So that's exactly what we were doing.

396

00:21:38.160 --> 00:21:42.500

And we took out, uh, the, um, other pilot, uh,

397

00:21:42.500 --> 00:21:45.300

type information limited down to a clean set of data.

398

00:21:45.640 --> 00:21:48.660

And we got ourselves a pretty clear one. There was still like the occasional,

399

00:21:48.900 --> 00:21:51.300

I was like, oh, they didn't quite make it in there, but, uh,

400

00:21:51.520 --> 00:21:56.470

but by and large it looked pretty clean. Tell us what we learned,

401

00:21:56.490 --> 00:21:57.323

sir.

402

00:21:57.990 --> 00:22:01.740

Thank you, sir. All right. So lots of good stuff came out of this, uh,

403

00:22:01.740 --> 00:22:06.210

program for us. Um, so typically when we're out doing stalls for cert,

404

00:22:06.560 --> 00:22:09.610

it's a pass fail. It either worked or it didn't. You're not trying to,

405

00:22:09.910 --> 00:22:12.490

and then if you don't like what you have, you don't go around and say, well,

406

00:22:12.490 --> 00:22:15.090

where does it work? You fix the aircraft aerodynamically.

407

00:22:15.090 --> 00:22:18.370

But that was not an aerodynamic fix or something like similar.

408

00:22:18.470 --> 00:22:20.930

We had a similar issue with power on stalls in the Sky carrier where we put a

409

00:22:20.930 --> 00:22:24.450

pusher on it because you just got the inner part of the wings just energized

410

00:22:24.450 --> 00:22:28.250

with the way the, the, the flow goes through there. So, but here now we're like,

411

00:22:28.250 --> 00:22:29.890

no, we need to define where that line is,

412

00:22:30.350 --> 00:22:34.590

but you gotta define that line for a non exceptional pilot who were by people

413

00:22:34.590 --> 00:22:35.870

that have been doing lots of stalls.

414

00:22:35.870 --> 00:22:39.310

And that's a different challenge than what we typically do when we try to do

415

00:22:39.310 --> 00:22:43.280

stalls. So it really did allow us to, so the,

416

00:22:43.280 --> 00:22:46.800

the Cooper Harper Scale and using that allowed us to really isolate what are we

417

00:22:46.800 --> 00:22:50.000

doing with our hands and feet? What is the level of workload we're doing?

418

00:22:50.420 --> 00:22:53.880

And then backing off a little bit from that to make sure that we're not biasing

419

00:22:53.880 --> 00:22:56.160

it too much cuz we're experienced doing this maneuver.

420

00:22:56.660 --> 00:22:59.640

One thing that's important is that, yeah, we had the occasional one that was,

421

00:22:59.700 --> 00:23:03.840

uh, would roll off more, but, uh, those, the, the workload increased,

422

00:23:03.860 --> 00:23:07.640

but we were still, what we, we would what's often called non-hazardous stalls.

423

00:23:08.020 --> 00:23:11.480

So you may have sometimes exceeded the bank angle as you start to, uh,

424

00:23:11.480 --> 00:23:13.080

as you start to get to the bottom of the,

425

00:23:13.100 --> 00:23:16.080

of the area where you're getting a little bit more bank angle, maybe side slips,

426

00:23:16.120 --> 00:23:17.800

building up a little more than you wanted,

427

00:23:18.060 --> 00:23:20.280

but at the same time it's never been hazardous per se.

428

00:23:20.580 --> 00:23:22.120

So then we're at least we're saying, okay,

429

00:23:22.120 --> 00:23:24.800

we ought at least be non-hazardous if we start to see these things go wrong.

430

00:23:24.800 --> 00:23:26.080

And of course we're looking for that compliance,

431

00:23:26.080 --> 00:23:28.120

we're all backing up from there to try and know,

432

00:23:28.120 --> 00:23:32.520

cause we need to have a margin for the non, for the customer pilot. Uh,

433

00:23:32.700 --> 00:23:35.680

and this, this customer will probably stall the aircraft for training.

434

00:23:36.260 --> 00:23:40.320

And so we obviously wanna make sure that it's safe for our customer and that the

435

00:23:40.320 --> 00:23:43.320

line we define is good for them cuz they're gonna take a a probably a cut out of

436

00:23:43.320 --> 00:23:44.153

the cg.

437

00:23:46.210 --> 00:23:49.220

Clearly we had a host of parameters that are affecting the stall

438

00:23:49.220 --> 00:23:52.980

characteristics, but we, it was just really handy,

439

00:23:52.980 --> 00:23:56.620

helpful that we're able to isolate down to a, uh,

440

00:23:57.060 --> 00:24:00.900

a control line that we could do where we were able to drive the CG into one

441

00:24:00.900 --> 00:24:03.540

spot. And then once we knew those weight dependency just burned down gas,

442

00:24:03.540 --> 00:24:07.420

which made it really easy to go through and see the workload and the amount of

443

00:24:07.420 --> 00:24:10.780
control inputs we're putting in both in elron and rudder and start to see the

444
00:24:10.780 --> 00:24:12.300
quality handling quality degrades.

445
00:24:12.300 --> 00:24:15.260
So then you can see that clearly as you just marched down in burning fuel,

446
00:24:15.430 --> 00:24:19.220
which really helped, uh, the ability to control your, uh, those parameters is,

447
00:24:19.220 --> 00:24:21.150
was such an important, uh, uh,

448
00:24:21.150 --> 00:24:25.350
parameter for us that allowed us to achieve our results. Of course, that crm,

449
00:24:25.850 --> 00:24:28.950
um, we always already talked about it this morning, but just simple things.

450
00:24:29.330 --> 00:24:32.230
We never had any more, uh, any more over speeds or over gs. Uh,

451
00:24:32.230 --> 00:24:34.550
we had a couple that where we still found some nastiness,

452
00:24:34.850 --> 00:24:38.900
but the automatic actions by pilot monitoring took care of getting the aircraft

453
00:24:38.900 --> 00:24:41.220
in a configuration that was not less light to have issues.

454
00:24:41.240 --> 00:24:42.780
Really when you took the power out,

455

00:24:43.130 --> 00:24:46.380

usually the aircraft almost immediately recovered and it was much happier.

456

00:24:47.360 --> 00:24:51.100

And of course, uh, we added in a, uh, slide slip criteria more for a, um,

457

00:24:51.150 --> 00:24:52.220

cease test criteria.

458

00:24:52.440 --> 00:24:54.980

The slide slip is not a control parameter you really have for an, uh,

459

00:24:54.980 --> 00:24:57.940

normal pilot, but if it starts to get close to the 15,

460

00:24:57.940 --> 00:25:01.170

there's no point it's gonna be non-compliant. So why would you keep going?

461

00:25:01.170 --> 00:25:03.450

You've already proven your point. And that was really,

462

00:25:03.510 --> 00:25:06.730

we kind of understood when that started to build just from the control inputs

463

00:25:06.730 --> 00:25:07.563

you're putting in.

464

00:25:08.820 --> 00:25:11.760

And of course the last thing was our flight test displays.

465

00:25:11.780 --> 00:25:15.160

We always usually focus our display systems on collecting the data for the test

466

00:25:15.160 --> 00:25:19.080

at hand, but uh, so we had NZ on that display. Uh,

467

00:25:19.080 --> 00:25:23.440

but the NZ was not a test parameter for executing the maneuver.

468
00:25:23.540 --> 00:25:28.340
It was a recovery parameter that was critical. If things went south on you,

469
00:25:28.560 --> 00:25:30.900
you needed that to be clear and unmistakable.

470
00:25:31.160 --> 00:25:32.620
So that was kinda the last thing that was like,

471
00:25:32.620 --> 00:25:36.220
just to make sure that the information presenting to you covers the if things go

472
00:25:36.220 --> 00:25:37.460
wrong scenario though,

473
00:25:37.460 --> 00:25:40.060
you'll have the right data in front of you in a clear format so that you can

474
00:25:40.060 --> 00:25:45.010
make a, an appropriate recovery. And that is it.

475
00:25:46.670 --> 00:25:47.610
We will take questions.

476
00:25:59.900 --> 00:26:00.733
There you go.

477
00:26:02.770 --> 00:26:06.860
Very interesting. I'm just wondering though, if you didn't have that SOX moment,

478
00:26:07.240 --> 00:26:11.300
uh, on your ninth or 10th flight, uh, you wouldn't have gotten into this uh,

479
00:26:11.770 --> 00:26:15.180
extensive test program, but was there anything going back, uh,

480
00:26:15.180 --> 00:26:18.460
on the data from the first nine or 10 stalls that would've given you an

481
00:26:18.460 --> 00:26:20.140
indication that, uh, this was a problem?

482
00:26:20.320 --> 00:26:24.100
So on that particular flight, we were, and this is where this is a,

483
00:26:24.200 --> 00:26:26.300
it was an interesting discussion we had at one of our safety meetings.

484
00:26:26.300 --> 00:26:30.820
So I'd already said we we're non-compliant on about stall six of that particular

485
00:26:30.820 --> 00:26:33.660
condition. Cuz like I don't have, I, I'm starting to see,

486
00:26:33.800 --> 00:26:36.540
I'm having to control side slip using my slide slip parameter on my

487
00:26:36.540 --> 00:26:39.180
instrumentation to be able to see if I can make this work and we're done.

488
00:26:39.280 --> 00:26:41.820
Cuz no product, a normal pilot doesn't have that.

489
00:26:41.820 --> 00:26:43.320
So we had already decided we were done, were done.

490
00:26:43.320 --> 00:26:45.600
But we were trying to understand the characteristics, see if it was possible,

491
00:26:45.780 --> 00:26:48.800
and then try to move forward from there. And that's a really interesting line,

492
00:26:48.800 --> 00:26:52.850
right? Where, at what point do you try to gain,

493

00:26:52.850 --> 00:26:55.610

gain information at what time you just knock it off and go home? And you know,

494

00:26:55.610 --> 00:27:00.370

obviously we had a departure so we went a little too far on the flip side. Um,

495

00:27:00.420 --> 00:27:04.930

there was no arguing that we had something to fix. So, right, it's, there was,

496

00:27:04.930 --> 00:27:06.970

there was, um, and the aircraft wasn't damaged at all.

497

00:27:06.970 --> 00:27:10.210

It was down for about a week for inspection. The king air's a beast. Um,

498

00:27:10.710 --> 00:27:15.340

but the, it really allowed us to, it was, there was no discussion.

499

00:27:15.340 --> 00:27:17.460

It was like, okay, this is a problem the customer totally knew,

500

00:27:17.460 --> 00:27:20.900

understood and trying to solve that with, uh, a, a bunch of different,

501

00:27:20.900 --> 00:27:24.910

more other methods that wouldn't other than aerodynamic fixes.

502

00:27:24.910 --> 00:27:26.700

But no, you're right. The, uh,

503

00:27:26.700 --> 00:27:30.930

it it made it easy to sell the story that, yeah. So

504

00:27:37.510 --> 00:27:38.343

question over here.

505

00:27:45.530 --> 00:27:49.310

Um, you briefly mentioned aerodynamic fixes. I didn't quite get, uh,

506

00:27:49.490 --> 00:27:54.180

why you didn't try to go that path to fix the the

507

00:27:54.300 --> 00:27:54.900

Behavior. Honestly,

508

00:27:54.900 --> 00:27:58.340

it's at a scope for what the customer's willing to do at the time.

509

00:27:58.880 --> 00:28:01.780

Now I imagine if we hadn't found a alternate solution,

510

00:28:02.540 --> 00:28:05.030

then perhaps that would've been the way to go. Like for instance,

511

00:28:05.030 --> 00:28:07.590

sky Co is a class example. We had trouble with power installs,

512

00:28:07.920 --> 00:28:10.780

brand new program, new opportunities.

513

00:28:10.790 --> 00:28:13.580

We're already doing our dynamic fixes on the aircraft is that when that aircraft

514

00:28:13.580 --> 00:28:16.610

is initial development, we're like whoa, just basically it's uh,

515

00:28:16.610 --> 00:28:19.090

we already know how to do a, Aaron can talk about this forever.

516

00:28:19.150 --> 00:28:22.580

We already know how to do pushers from the longitude and basically we copied the

517

00:28:22.580 --> 00:28:25.500

code over and put the pusher and that was the simplest path forward. Mm-hmm. Um,

518

00:28:26.220 --> 00:28:29.560
not so simple on an aircraft like this that's been around forever. Um,

519
00:28:29.890 --> 00:28:32.640
we're not, that's certainly not an option. And then aerodynamic fixes
get,

520
00:28:33.580 --> 00:28:36.610
comes into a massive science experiment and that becomes a problem.

521
00:28:36.830 --> 00:28:40.770
So we did look at a few changes to shapes on the,

522
00:28:40.770 --> 00:28:41.890
the shapes that they're providing.

523
00:28:41.890 --> 00:28:44.460
Cause obviously the baseline aircraft's compliant. Um,

524
00:28:45.350 --> 00:28:47.810
but that had a whole bunch of negative things for them too,

525
00:28:47.810 --> 00:28:50.490
cuz they couldn't necessarily meet their mission requirements. So

526
00:28:52.460 --> 00:28:54.870
Question right here, uh,

527
00:28:55.170 --> 00:28:58.320
so could you go a little slower on,

528
00:28:59.100 --> 00:29:03.160
so if you said this is non-compliant, we know that, so I,

529
00:29:03.280 --> 00:29:07.910
I missed the part that you went on and

530
00:29:08.120 --> 00:29:08.953
tried to

531
00:29:09.370 --> 00:29:10.590

Trying to understand, trying

532

00:29:10.590 --> 00:29:14.230

To find something and uh, it's kind of pushing the limit, isn't it? Or beyond?

533

00:29:15.080 --> 00:29:18.300

You can certainly say that. Absolutely. At that point it was, we were new,

534

00:29:18.300 --> 00:29:19.260

we were close to a,

535

00:29:20.230 --> 00:29:23.920

it's kind of from that part 25 world where it's possible too and you, you know,

536

00:29:23.920 --> 00:29:25.800

it's a way you can, can you do that or can you not?

537

00:29:25.940 --> 00:29:30.440

And we wanted to understand what was driving it at that point cuz everything

538

00:29:30.440 --> 00:29:33.070

else had been successful at that time. Um,

539

00:29:33.690 --> 00:29:38.230

and at that point we had seen it had a roll off that was controllable,

540

00:29:38.570 --> 00:29:41.710

but it was just exceeding an angle of bank and it had been recovering nicely

541

00:29:41.710 --> 00:29:42.543

every time.

542

00:29:42.990 --> 00:29:47.130

So the the ninth run caught us in in that we had never seen it do anything like

543

00:29:47.130 --> 00:29:47.790

it did that before.

544

00:29:47.790 --> 00:29:51.170

It just rolled off before and we were unable to keep it compliant on the bank

545

00:29:51.170 --> 00:29:55.290

angle, but not to that aggressive amount. So that's why we were thinking, okay,

546

00:29:55.330 --> 00:29:58.050

I think we've almost figured out a technique. I know we can't call us compliant,

547

00:29:58.050 --> 00:30:00.770

but at least we have something to come back and talk about. Like this is where,

548

00:30:01.350 --> 00:30:04.520

this is what we had to do and this is obviously this is why it's non-compliant,

549

00:30:04.520 --> 00:30:08.610

so we need to find a way to fix this or in terms of the role.

550

00:30:08.610 --> 00:30:10.730

But it just so happened that on that last maneuver,

551

00:30:10.790 --> 00:30:12.050

it did something we hadn't expected,

552

00:30:12.050 --> 00:30:14.650

which is it sliced back the other direction. Um,

553

00:30:14.790 --> 00:30:16.330

and that's what really caught us off guard,

554

00:30:16.330 --> 00:30:19.530

but we hadn't seen that characteristic before because I mentioned earlier that

555

00:30:19.530 --> 00:30:19.890

King Air,

556

00:30:19.890 --> 00:30:23.050

usually once it gets soon as it rolls off and starts to gain just a little bit

557

00:30:23.050 --> 00:30:25.780

of speed, responds very nicely to the control inputs.

558

00:30:25.780 --> 00:30:28.220

It just so happened on this one, we were, uh,

559

00:30:28.280 --> 00:30:30.860

had a lot of control input fighting that role that we were unexpected.

560

00:30:31.240 --> 00:30:34.740

So I I you could argue with it about did we go too far? We,

561

00:30:34.810 --> 00:30:36.100

it's great discussion. I don't know. It is,

562

00:30:36.200 --> 00:30:38.500

we had that exact discussion and safety meeting was like,

563

00:30:38.500 --> 00:30:41.460

could we have knocked it off two stalls earlier? Absolutely.

564

00:30:42.120 --> 00:30:43.580

And would that be the right decision?

565

00:30:43.980 --> 00:30:47.460

Probably because we wouldn't have had the event. Um, but at the same time,

566

00:30:47.480 --> 00:30:50.820

in real time it felt like we were close to having a solution at least that we

567

00:30:50.820 --> 00:30:51.740

understood how to make it work.

568

00:30:52.180 --> 00:30:56.500

I could add to that too, the military training will have a, a pretty wide, uh,

569

00:30:56.530 --> 00:30:59.060

band of compliance much more so than the civil ones.

570

00:30:59.060 --> 00:31:02.300

A lot tighter and non-compliant. Might've been 16 degrees a roll,

571

00:31:02.840 --> 00:31:05.380

but controlled. I just couldn't, couldn't get it there.

572

00:31:05.600 --> 00:31:08.940

So dynamically non-compliant would be a different thing and,

573

00:31:08.960 --> 00:31:10.180

and your point would be well taken,

574

00:31:10.200 --> 00:31:13.180

but we were working in the area between our experience, uh,

575

00:31:13.180 --> 00:31:16.840

going through military testing and then trying to make this, uh,

576

00:31:16.860 --> 00:31:18.560

fit within the civil certification window.

577

00:31:19.140 --> 00:31:23.510

So, so you're exactly right in the, what I call the lumps and bumps world,

578

00:31:24.130 --> 00:31:28.310

uh, you take an airplane that has really good characteristics and you have a,

579

00:31:28.330 --> 00:31:30.550

an idea from somebody's CFD that it, uh,

580

00:31:30.550 --> 00:31:34.990

should do these things and should be okay. And you're right,

581

00:31:35.610 --> 00:31:39.510

you don't have the, all of the tools available sometimes in that,

582

00:31:39.510 --> 00:31:43.790

in that analysis in a mod program to go ahead and

583

00:31:44.450 --> 00:31:46.590

do a, a deep dive into the data.

584

00:31:46.590 --> 00:31:50.580

And the only way to get the data is to go do the data. And uh, uh,

585

00:31:51.250 --> 00:31:52.083

it's that,

586

00:31:52.330 --> 00:31:56.380

that little bit of our job that says sometimes you have to walk up to the edge

587

00:31:56.380 --> 00:31:59.980

of the cliff and see where it really is. And so yeah. It's,

588

00:32:00.290 --> 00:32:03.540

it's unfortunately the world we live in, in lumps and bumps.

589

00:32:04.000 --> 00:32:06.610

Yeah. And that's why it was, uh, at the time it was like, oh, there's a,

590

00:32:06.610 --> 00:32:09.090

there's a downhill portion. Didn't realize it was a cliff. Right.

591

00:32:09.110 --> 00:32:12.250

And one of those things. And that's where we found out after the fact.

592

00:32:12.310 --> 00:32:16.080

So I stay, if you wanna stay on time, I have to cut you. Cut you off.

593

00:32:16.080 --> 00:32:17.760

Gotta kick us off. Save, save the other questions.