

1

00:00:08.305 --> 00:00:10.285

All right, we admitted to our last presentation

2

00:00:10.285 --> 00:00:12.615

of the day, and, uh, I would like

3

00:00:12.615 --> 00:00:14.495

to extend a thanks here to Paul.

4

00:00:14.715 --> 00:00:17.135

Paul's stepping in. We had a, a late drop for someone

5

00:00:17.135 --> 00:00:18.615

that wasn't able to get their presentation cleared.

6

00:00:18.675 --> 00:00:20.735

So thanks to Paul for being willing to step in here.

7

00:00:21.415 --> 00:00:24.035

Uh, I'll be introducing now Paul Smith, the director

8

00:00:24.035 --> 00:00:26.955

of Flight tests and operations at ACU Bed, uh,

9

00:00:27.975 --> 00:00:31.505

US Air Force Test Pilot School over 7,000 hours

10

00:00:31.645 --> 00:00:34.185

and 50 plus aircraft, a Collier Trophy.

11

00:00:35.125 --> 00:00:38.665

Uh, he started Golden Arms Associates, uh, consulting firm

12

00:00:38.665 --> 00:00:40.145

for small aviation startups and,

13

00:00:40.205 --> 00:00:42.025

and the larger Fortune five hundreds.

14

00:00:42.705 --> 00:00:44.765  
Airbus Director of Flight Tests and Operation.

15  
00:00:44.985 --> 00:00:48.675  
And he leads AI machine learning, technology testing. Paul,

16  
00:00:56.355 --> 00:00:57.945  
Thank you, distinct honor to being here.

17  
00:00:57.945 --> 00:01:00.745  
Thanks to flight test safety community for, uh, committee

18  
00:01:01.325 --> 00:01:03.845  
as well as Claude for putting out with my, uh,

19  
00:01:04.065 --> 00:01:06.065  
Google issues and presentation.

20  
00:01:06.525 --> 00:01:08.665  
Uh, just to clarify, I did not get the Collier Trophy,

21  
00:01:08.685 --> 00:01:11.325  
but got it for the Joints Strike Fighter Program.

22  
00:01:11.825 --> 00:01:16.065  
And I'm not the director of tests for Airbus, uh,

23  
00:01:17.035 --> 00:01:19.695  
ego test to say I'm, I'm the director of flight test for aq,

24  
00:01:19.905 --> 00:01:22.535  
which is a small technical division of Airbus.

25  
00:01:23.375 --> 00:01:24.875  
I'm happy to be here today

26  
00:01:24.875 --> 00:01:27.195  
and talk to you about an exciting new AI technology

27  
00:01:27.195 --> 00:01:30.925  
application developing AI versus ml.

28

00:01:31.145 --> 00:01:33.205

So I use them interchangeably like everybody,

29

00:01:33.995 --> 00:01:37.075

but AI isn't really intelligent since we imagine the word.

30

00:01:37.495 --> 00:01:39.475

So what I'm really talking about is machine learning.

31

00:01:41.165 --> 00:01:42.585

My presentation will cover this technology

32

00:01:42.585 --> 00:01:43.905

and also the challenges we faced

33

00:01:44.325 --> 00:01:45.735

to obtain the massive amount

34

00:01:45.735 --> 00:01:47.295

of data required to develop this system.

35

00:01:47.935 --> 00:01:49.675

Now, I know that some of you're probably thinking this is

36

00:01:49.675 --> 00:01:51.635

just beginning of Skynet, you know,

37

00:01:51.775 --> 00:01:53.315

robots gonna take over the cockpit.

38

00:01:53.335 --> 00:01:55.435

I'm out of a job. Well, that's just,

39

00:01:55.615 --> 00:01:57.985

that's just crazy actually.

40

00:01:58.365 --> 00:01:58.585

Uh,

41

00:02:03.495 --> 00:02:04.715  
I'm not sure how that size it's supposed

42  
00:02:04.715 --> 00:02:05.835  
to be in next year's presentation.

43  
00:02:06.015 --> 00:02:07.685  
I'm sorry. Big mistake.

44  
00:02:08.765 --> 00:02:11.105  
Uh, a cube is a small technical division of airless.

45  
00:02:11.105 --> 00:02:13.265  
As I mentioned earlier. We're located in Silicon Valley.

46  
00:02:13.795 --> 00:02:16.145  
We're a small company of a hundred employees

47  
00:02:16.725 --> 00:02:18.705  
and my team has 40 software engineers,

48  
00:02:18.725 --> 00:02:19.905  
of which I'm the only pilot.

49  
00:02:23.145 --> 00:02:26.205  
AQ is striving to insert mature auto, uh, auto

50  
00:02:26.845 --> 00:02:28.285  
artificial intelligence from machine

51  
00:02:28.405 --> 00:02:29.445  
learning to airbus's ecosystem.

52  
00:02:29.445 --> 00:02:31.145  
And my team's mission is

53  
00:02:31.145 --> 00:02:33.945  
to address future autonomous needs for commercial flight.

54  
00:02:35.025 --> 00:02:36.715  
True autonomous flight is way in the future,

55

00:02:36.815 --> 00:02:39.155

but in the short term, these features will

56

00:02:39.815 --> 00:02:41.955

vastly improve safety and reduce workload for the air.

57

00:02:43.335 --> 00:02:44.435

We believe that autonomy,

58

00:02:45.145 --> 00:02:47.015

autonomous technologies will drive a,

59

00:02:47.175 --> 00:02:48.735

a specific step change in safety

60

00:02:48.735 --> 00:02:51.255

and efficiency for general aviation overall.

61

00:02:51.795 --> 00:02:53.985

Now, when I get up here

62

00:02:53.985 --> 00:02:56.465

and talk to people about complex systems

63

00:02:56.795 --> 00:02:58.135

and like to think about this picture,

64

00:02:59.045 --> 00:03:02.255

what we have is a very highly developed aircraft system.

65

00:03:03.305 --> 00:03:05.585

A team that, uh, performs very well.

66

00:03:05.735 --> 00:03:09.215

They have very good maintenance, uh, very competent,

67

00:03:10.515 --> 00:03:13.705

applied, very regiment scenario, fully briefed

68

00:03:13.705 --> 00:03:16.735  
and debriefed, critically analyzed the accidents like

69

00:03:16.735 --> 00:03:20.445  
misreading the altimeter accurately until result in this.

70

00:03:22.465 --> 00:03:25.655  
So let's take off every takeoff results in a landing,

71

00:03:25.655 --> 00:03:26.735  
hopefully a safe landing.

72

00:03:27.385 --> 00:03:28.845  
And the best landings are those that begin

73

00:03:28.845 --> 00:03:29.845  
with a stabilized approach.

74

00:03:30.735 --> 00:03:32.025  
When I flew the Boeing seven, five

75

00:03:32.025 --> 00:03:33.345  
and 7 6 7 internationally

76

00:03:33.345 --> 00:03:35.705  
for UPSI relearned this lesson often.

77

00:03:36.085 --> 00:03:39.115  
In fact, a company policy we had was no fault go around.

78

00:03:39.115 --> 00:03:40.195  
If you went around, you were not going

79

00:03:40.195 --> 00:03:41.515  
to be blamed or even question it.

80

00:03:41.695 --> 00:03:44.975  
So technology I'm gonna talk about today will help ensure

81

00:03:45.445 --> 00:03:47.815  
each approach is stabilized and results in a safe landing.

82

00:03:48.935 --> 00:03:51.275

Lastly, I'll talk about challenges we face when

83

00:03:51.275 --> 00:03:52.395

collecting data for this system.

84

00:03:53.565 --> 00:03:54.865

So like, show of hands, who

85

00:03:54.865 --> 00:03:56.385

would continue the approach at this point?

86

00:03:59.335 --> 00:04:02.395

1, 2, 3 fighter pilots flying a big airplane.

87

00:04:02.465 --> 00:04:03.815

Okay, I get it.

88

00:04:04.605 --> 00:04:05.615

This is a situation

89

00:04:05.615 --> 00:04:07.295

where you would probably want to go around.

90

00:04:07.485 --> 00:04:09.655

It's not going to result in a very safe planning.

91

00:04:09.655 --> 00:04:12.295

You may pull it out, but probably not.

92

00:04:13.395 --> 00:04:16.565

In fact, as we're probably all aware, majority of accidents

93

00:04:16.565 --> 00:04:19.345

and fatalities in the airline industry occur

94

00:04:19.895 --> 00:04:22.795

the shortest phase of the entire flight during the landing.

95

00:04:23.025 --> 00:04:24.125  
Now, that's 'cause landings

96  
00:04:24.125 --> 00:04:26.045  
provide a unique set of challenges.

97  
00:04:26.375 --> 00:04:28.445  
Often it's at the end of the long flight, especially

98  
00:04:28.445 --> 00:04:31.005  
for trans oceanic flights, uh,

99  
00:04:31.155 --> 00:04:32.805  
time arrival time's usually compressed.

100  
00:04:34.025 --> 00:04:35.065  
A lot of times there's a little bit

101  
00:04:35.065 --> 00:04:37.065  
of weather approaches are challenging.

102  
00:04:37.545 --> 00:04:41.515  
And so we result in a large, uh, portion

103  
00:04:41.695 --> 00:04:43.195  
of accidents that happen landing face.

104  
00:04:43.195 --> 00:04:45.695  
And of course, if you've ever flown commercial aircraft,

105  
00:04:45.955 --> 00:04:48.205  
the dreaded call from a TC is runway,

106  
00:04:48.285 --> 00:04:50.325  
11 o'clock five miles called site.

107  
00:04:50.945 --> 00:04:54.775  
And the pilot's ego says, I can do that. I can make it.

108  
00:04:54.775 --> 00:04:56.255  
And that's a situation we want to avoid.



109

00:04:57.065 --> 00:04:59.455

So here's one example of several.

110

00:05:00.255 --> 00:05:03.975

Uh, in this case, there were no fatalities on impact,

111

00:05:03.975 --> 00:05:06.735

but there were two fatalities in the subsequent response.

112

00:05:07.195 --> 00:05:09.315

So a lot of issues about this accident.

113

00:05:10.675 --> 00:05:12.105

But to be clear,

114

00:05:12.125 --> 00:05:14.625

the weather was ca there was very little wind and

115

00:05:14.785 --> 00:05:16.065

although there were no landing aids available,

116

00:05:16.475 --> 00:05:19.815

there were landing aids available to the pilot, uh, in uh,

117

00:05:19.815 --> 00:05:21.375

in the uh, flight management system

118

00:05:21.375 --> 00:05:23.135

where they could have provided landing guidance.

119

00:05:24.025 --> 00:05:25.725

As a result, they ended up getting

120

00:05:25.775 --> 00:05:27.805

below glide path short on power

121

00:05:27.805 --> 00:05:32.465

and crash with the brake water, the support,

122

00:05:32.465 --> 00:05:34.145  
future autonomous landing capabilities,

123  
00:05:34.145 --> 00:05:35.745  
which are not rely on any other system.

124  
00:05:36.765 --> 00:05:37.945  
We need to develop a capability

125  
00:05:37.945 --> 00:05:39.545  
that centrally replaces the pilot eyes.

126  
00:05:40.635 --> 00:05:43.175  
And we do this by identifying the roadway reference points

127  
00:05:43.315 --> 00:05:46.975  
and geo referencing, geo projecting this location back

128  
00:05:48.145 --> 00:05:50.445  
in three space to provide us a position location

129  
00:05:50.755 --> 00:05:52.165  
that we can use for landing guidance.

130  
00:05:54.765 --> 00:05:56.895  
Machine learning requires a huge amount of data.

131  
00:05:56.945 --> 00:05:59.805  
And so to collect data in a very efficient way, we had

132  
00:05:59.805 --> 00:06:01.245  
to choose a viable option to do this,

133  
00:06:02.335 --> 00:06:03.795  
we chose the Baron for several reasons.

134  
00:06:04.255 --> 00:06:07.775  
The first was cost. In the beginning, we wanted

135  
00:06:07.775 --> 00:06:08.975  
to demonstrate the capability

136

00:06:09.035 --> 00:06:11.475  
of artificial intelligence systems

137

00:06:11.695 --> 00:06:14.495  
to provide a landing solution by mounting a cockpit,

138

00:06:14.575 --> 00:06:16.015  
a camera in the cockpit, looking out

139

00:06:16.015 --> 00:06:18.825  
through the curve plexiglass canopy.

140

00:06:19.595 --> 00:06:21.415  
And that proved the concept would work,

141

00:06:22.245 --> 00:06:25.185  
but we needed to show, uh, better fidelity in the data.

142

00:06:25.325 --> 00:06:29.125  
So we reconfigured the nose to provide, uh,

143

00:06:29.805 --> 00:06:30.935  
flat plate for the cameras.

144

00:06:32.745 --> 00:06:35.805  
And uh, we wanted an airplane that had a clear visual pass

145

00:06:35.805 --> 00:06:39.425  
with the twin engines side by side seating to support, uh,

146

00:06:39.425 --> 00:06:40.625  
crew resource management.

147

00:06:41.245 --> 00:06:43.345  
And we wanted something that could be easily converted under

148

00:06:43.405 --> 00:06:45.225  
air experimental airworthiness procedure.

149

00:06:45.925 --> 00:06:47.465  
And this airplane is very well known.

150  
00:06:47.535 --> 00:06:50.265  
It's very, uh, widely supported throughout the United States

151  
00:06:50.875 --> 00:06:54.015  
and it also, um, has been modified by a lot of companies

152  
00:06:54.015 --> 00:06:55.095  
for a lot of different purposes.

153  
00:06:55.095 --> 00:06:57.515  
So we felt pretty safe about doing that.

154  
00:06:57.735 --> 00:07:00.075  
So we modified the aircraft with high resolution cameras

155  
00:07:00.955 --> 00:07:02.405  
both forward looking and obl.

156  
00:07:03.035 --> 00:07:04.535  
To provide the data collection, we needed

157  
00:07:05.255 --> 00:07:09.015  
a high precision fiber optics INU for true location data

158  
00:07:09.735 --> 00:07:10.835  
and lux meters above

159  
00:07:10.835 --> 00:07:14.355  
and below provide ambient light sources for comparison

160  
00:07:14.355 --> 00:07:15.675  
during night data collection.

161  
00:07:16.135 --> 00:07:20.495  
And a laser altimeter for close in landing, uh, information.

162  
00:07:21.475 --> 00:07:23.015  
And the baggage compartment was large enough

163  
00:07:23.015 --> 00:07:25.135  
to provide sufficient space for our compute power

164  
00:07:25.515 --> 00:07:27.615  
and data acquisition system.

165  
00:07:30.055 --> 00:07:31.955  
So I mentioned our data needs are huge,

166  
00:07:32.225 --> 00:07:33.535  
collecting real world data.

167  
00:07:33.685 --> 00:07:36.175  
Real world data is hugely expensive

168  
00:07:36.195 --> 00:07:37.375  
and practically unattainable.

169  
00:07:38.445 --> 00:07:40.215  
I'll use an example of driverless cars.

170  
00:07:40.275 --> 00:07:42.805  
So way more right now is, uh,

171  
00:07:42.805 --> 00:07:45.405  
conducting driverless cars in San Francisco.

172  
00:07:46.095 --> 00:07:48.095  
It took a lot of effort many years to build out

173  
00:07:48.095 --> 00:07:50.615  
that data set and develop the ability to do

174  
00:07:50.615 --> 00:07:51.735  
that in San Francisco.

175  
00:07:52.595 --> 00:07:54.015  
Now, if you took that car, picked it up

176

00:07:54.015 --> 00:07:56.195  
and put it in Dallas, it would not operate

177  
00:07:56.225 --> 00:07:59.305  
because it's a different set of, uh, reference points

178  
00:07:59.325 --> 00:08:00.905  
and it's a totally different environment.

179  
00:08:01.565 --> 00:08:02.625  
Now they can do it a little bit quicker

180  
00:08:02.865 --> 00:08:03.705  
'cause they've already established

181  
00:08:03.705 --> 00:08:04.865  
the procedures for doing that.

182  
00:08:06.095 --> 00:08:09.505  
But in the aviation world, I can't build a data set

183  
00:08:09.505 --> 00:08:10.665  
that works in San Francisco

184  
00:08:10.665 --> 00:08:12.425  
for an airliner and then deploy it.

185  
00:08:12.425 --> 00:08:13.705  
It has to work worldwide.

186  
00:08:14.945 --> 00:08:17.085  
So our challenge was to collect a sufficiently wide diverse

187  
00:08:17.595 --> 00:08:21.025  
range of airports to validate a statistical premise

188  
00:08:21.775 --> 00:08:24.225  
that we could model all airports with a smaller subset.

189  
00:08:26.625 --> 00:08:28.525  
Now, you might take for granted how easy it's for a pilot

190

00:08:28.545 --> 00:08:30.125  
to identify and landed in the airport.

191

00:08:31.485 --> 00:08:33.385  
And for you, those of you who have soloed

192

00:08:33.605 --> 00:08:35.825  
and gone through pilot training, you realize

193

00:08:35.855 --> 00:08:37.425  
that I can do this at an airfield

194

00:08:37.425 --> 00:08:38.945  
and my instructor will tell me about an

195

00:08:38.945 --> 00:08:40.025  
airfield I've never been to before.

196

00:08:40.455 --> 00:08:43.835  
And on my solo cross country, I can land, I can take off

197

00:08:43.915 --> 00:08:45.235  
and land there pretty successfully

198

00:08:45.415 --> 00:08:47.065  
because I've described it to you.

199

00:08:47.475 --> 00:08:48.535  
It doesn't work that way.

200

00:08:49.585 --> 00:08:52.275  
Computers and machine learning, that's why I call it

201

00:08:52.975 --> 00:08:54.655  
a machine learning because we have to train

202

00:08:55.265 --> 00:08:57.345  
the system to identify that.

203

00:08:58.185 --> 00:09:02.245  
And that requires a lot of, um, environmental conditions

204  
00:09:02.245 --> 00:09:04.655  
and a lot of different soaps.

205  
00:09:04.655 --> 00:09:07.375  
And of course this becomes increasingly complicated at night

206  
00:09:07.375 --> 00:09:10.015  
for anyone who's tried to find an airport in the middle

207  
00:09:10.015 --> 00:09:11.415  
of a lit cityscape.

208  
00:09:11.415 --> 00:09:11.815  
It's pretty.

209  
00:09:16.635 --> 00:09:17.735  
So we developed a system,

210  
00:09:18.225 --> 00:09:21.555  
which in this case is very iterative, um,

211  
00:09:21.575 --> 00:09:23.795  
in machine learning environment, you build a system,

212  
00:09:24.435 --> 00:09:26.575  
you develop an algorithm, you test it on data,

213  
00:09:26.995 --> 00:09:29.095  
you train it on data, you test it on a data set,

214  
00:09:29.745 --> 00:09:32.325  
and then you modify it based on the metrics

215  
00:09:32.355 --> 00:09:33.645  
that you want for accuracy.

216  
00:09:34.205 --> 00:09:38.295  
And, um, I'm gonna concentrate on the deployment



217

00:09:38.755 --> 00:09:39.935

and the bottom two blocks

218

00:09:39.935 --> 00:09:43.015

because what's interesting about our project is

219

00:09:43.725 --> 00:09:45.705

we are using, uh, real world data

220

00:09:45.765 --> 00:09:47.105

to generate synthetic data.

221

00:09:47.705 --> 00:09:51.435

And we do that because it's really impossible to collect all

222

00:09:51.435 --> 00:09:53.395

of the possible environmental conditions

223

00:09:53.395 --> 00:09:55.375

that you would want to certify the system.

224

00:09:55.675 --> 00:09:58.375

So for example, if I have a model runway

225

00:09:58.375 --> 00:10:00.615

because of water brainstorm just came through,

226

00:10:01.355 --> 00:10:05.085

the system has to be able to identify that if I have, um,

227

00:10:05.325 --> 00:10:07.005

a cloud layer, that that creates

228

00:10:07.575 --> 00:10:09.425

spot on the runway in different shades,

229

00:10:09.785 --> 00:10:10.905

I have to count for that as well.

230

00:10:11.925 --> 00:10:16.355  
And so that's why we're using, um, real data to simulate

231  
00:10:17.005 --> 00:10:18.705  
or, uh, generate synthetic data.

232  
00:10:18.805 --> 00:10:22.615  
And so we have a working prototype that's shown here.

233  
00:10:32.795 --> 00:10:33.645  
Quad, help me

234  
00:10:44.725 --> 00:10:45.885  
I back it up and start again.

235  
00:10:59.695 --> 00:11:00.745  
It's worked last night.

236  
00:11:07.135 --> 00:11:07.995  
My machine's not very,

237  
00:11:25.245 --> 00:11:26.405  
should I go back there and try it?

238  
00:11:26.435 --> 00:11:26.725  
Yeah.

239  
00:13:28.320 --> 00:13:30.005  
So I apologize for that. Maybe the, uh,

240  
00:13:30.005 --> 00:13:31.645  
last slide I have will demonstrate what it is.

241  
00:13:31.645 --> 00:13:33.565  
But basically what I had was a video

242  
00:13:33.745 --> 00:13:37.085  
of the system running against the runway where the, uh,

243  
00:13:37.085 --> 00:13:40.125  
visual system identified the edge points of the runway and

244

00:13:40.325 --> 00:13:41.885  
provided landing guidance and where it was a scale

245

00:13:41.885 --> 00:13:45.885  
that showed the, uh, true data versus the, uh,

246

00:13:45.995 --> 00:13:48.525  
generated data from the computer system.

247

00:13:50.965 --> 00:13:53.035  
Uh, can you click the next

248

00:13:53.035 --> 00:13:57.365  
slide or go back, I'm sorry.

249

00:13:57.875 --> 00:14:00.175  
So as I mentioned earlier, we can't possibly collect

250

00:14:00.945 --> 00:14:02.565  
the amount of imagery we need for every,

251

00:14:07.255 --> 00:14:08.275  
can you go back one slide?

252

00:14:08.625 --> 00:14:11.225  
Yeah. There, uh, we need for every airport runway,

253

00:14:11.225 --> 00:14:13.425  
flight condition, and abnormal edge cases.

254

00:14:13.485 --> 00:14:16.145  
So we were asked to collect a hundred airports across the

255

00:14:16.145 --> 00:14:19.385  
United States in order to support a statistical hypothesis.

256

00:14:20.435 --> 00:14:22.455  
We need to collect this data in an eight month period last

257

00:14:22.455 --> 00:14:24.425  
year to keep our program alive.

258  
00:14:25.095 --> 00:14:26.955  
And these were top airports serviced

259  
00:14:27.375 --> 00:14:28.995  
by Airbus three 20 aircraft

260  
00:14:29.415 --> 00:14:31.955  
and included all the Class Bravo airports across the us.

261  
00:14:32.855 --> 00:14:36.025  
Plus we needed at least four approaches at each airport, 60

262  
00:14:36.025 --> 00:14:40.865  
of them a day, 20 at night, and 20 at dusk slide.

263  
00:14:42.145 --> 00:14:44.005  
So achieve this high ops tempo.

264  
00:14:47.635 --> 00:14:50.215  
Uh, we need to embrace the concept of crawl, walk, and run.

265  
00:14:50.435 --> 00:14:53.215  
So this let us iron out all the kinks except

266  
00:14:53.215 --> 00:14:54.855  
for my computer system really.

267  
00:14:55.665 --> 00:14:58.445  
But it did make management a little nervous since the rate

268  
00:14:58.505 --> 00:15:02.055  
of completion early did not match the expected rate

269  
00:15:02.055 --> 00:15:03.175  
that we would have at the end.

270  
00:15:03.695 --> 00:15:06.435  
But I knew as we moved east, we would increase our rate

271

00:15:06.435 --> 00:15:07.915  
because the airports are closer together,

272

00:15:08.505 --> 00:15:10.885  
we would be more confident in the way we operated

273

00:15:10.985 --> 00:15:13.405  
and we'd have more, uh, efficiency in the system.

274

00:15:14.845 --> 00:15:16.345  
So we flew day flights in the summer

275

00:15:16.345 --> 00:15:17.345  
because the days are longer.

276

00:15:17.485 --> 00:15:19.935  
And we flew our nights in winter from the fall

277

00:15:19.935 --> 00:15:21.695  
because it opened up our operating window.

278

00:15:22.155 --> 00:15:23.655  
It kept us in a good circadian rhythm.

279

00:15:24.315 --> 00:15:25.975  
We also need to be patient with a TC

280

00:15:26.135 --> 00:15:27.415  
'cause each airport was a little bit different

281

00:15:27.915 --> 00:15:29.635  
and most were very understanding and accepting.

282

00:15:30.055 --> 00:15:32.715  
But interfaced with commercial traffic could cause problems

283

00:15:37.985 --> 00:15:38.065  
probably.

284

00:15:39.335 --> 00:15:40.995  
So we were able to meet our objectives about

285  
00:15:40.995 --> 00:15:42.115  
a month earlier than required.

286  
00:15:42.965 --> 00:15:44.105  
In actuality, we were able

287  
00:15:44.105 --> 00:15:46.665  
to accomplish this in 81 flight days with an annual

288  
00:15:46.725 --> 00:15:49.625  
and engine with an annual inspection and an engine change.

289  
00:15:49.625 --> 00:15:51.615  
In the middle of this, our foresight

290  
00:15:51.615 --> 00:15:54.335  
and setting up a Ford operating location on the east coast

291  
00:15:54.475 --> 00:15:58.735  
at our mobile final assembly line proved to be a godsend.

292  
00:15:59.675 --> 00:16:01.975  
And what I would show here on the right if my videos were

293  
00:16:01.975 --> 00:16:03.965  
working is a time lasts photography

294  
00:16:03.965 --> 00:16:05.885  
of all the flights we flew across the United States.

295  
00:16:08.155 --> 00:16:12.725  
Next slide. So each flight resulted in a loaded four

296  
00:16:12.765 --> 00:16:14.205  
terabyte solid state drive

297  
00:16:14.205 --> 00:16:16.595  
that we sneaker netted back to our office.

298

00:16:16.895 --> 00:16:19.515

The data download was put into a dashboard

299

00:16:19.515 --> 00:16:21.365

and gave our engineers the ability

300

00:16:21.365 --> 00:16:22.645

to instantly process the data

301

00:16:22.665 --> 00:16:23.965

and validate our image quality.

302

00:16:25.015 --> 00:16:28.075

The analytics are pretty impressive to the point where each

303

00:16:28.655 --> 00:16:29.765

image is cataloged

304

00:16:29.765 --> 00:16:33.075

and available for the metrics, uh, metrics attached

305

00:16:33.075 --> 00:16:34.795

to each image for the engineers to evaluate

306

00:16:34.795 --> 00:16:38.825

and use slide for a pilot

307

00:16:38.885 --> 00:16:41.665

who has weaned on air force fighters, systems maintenance,

308

00:16:42.245 --> 00:16:44.975

very qualified, uh, systems like I showed in that slide

309

00:16:44.975 --> 00:16:46.935

of the, uh, 16th Thunderbird

310

00:16:47.355 --> 00:16:49.295

and operating in commercial airlines

311

00:16:49.295 --> 00:16:52.255  
where you have a dispatcher and, uh, scheduled maintenance

312  
00:16:52.255 --> 00:16:54.295  
or anything else doing all this flying

313  
00:16:54.295 --> 00:16:55.495  
around the, around the country.

314  
00:16:56.115 --> 00:16:57.645  
And the twin engine barren was,

315  
00:16:57.645 --> 00:16:58.885  
to be honest, a little unsettling.

316  
00:17:00.185 --> 00:17:01.805  
As I mentioned earlier, the only,

317  
00:17:02.045 --> 00:17:03.565  
I was the only pilot in my entire team

318  
00:17:03.565 --> 00:17:06.805  
and leadership, except in my, uh,

319  
00:17:06.865 --> 00:17:09.205  
recommendations gracefully and wholeheartedly.

320  
00:17:10.055 --> 00:17:11.395  
So we did this by setting a rigid

321  
00:17:11.455 --> 00:17:13.275  
yet adaptable standard operating procedure,

322  
00:17:13.465 --> 00:17:15.105  
clearly understood and spelled out

323  
00:17:15.405 --> 00:17:17.465  
and available to the pilots, both, uh,

324  
00:17:17.485 --> 00:17:18.985  
in the cockpit and on our website.



325

00:17:20.495 --> 00:17:22.735

Although the Baron is, uh, allowed

326

00:17:22.735 --> 00:17:25.455

to operate in icing conditions, I had a policy

327

00:17:25.455 --> 00:17:26.495

where we would not do that.

328

00:17:26.635 --> 00:17:29.015

We could climb or descend through light rhyme only,

329

00:17:29.435 --> 00:17:31.015

and that was just to get to the next base.

330

00:17:32.385 --> 00:17:35.245

We addressed maintenance issues very quickly and, uh,

331

00:17:35.245 --> 00:17:38.605

because, uh, beach Crab Textron service, uh,

332

00:17:38.605 --> 00:17:42.325

field agents were around all over the us we were able to,

333

00:17:42.545 --> 00:17:43.765

uh, coordinate that with them

334

00:17:44.265 --> 00:17:45.925

and make sure any maintenance was transmitted

335

00:17:45.925 --> 00:17:47.045

back to our home office maintenance.

336

00:17:49.870 --> 00:17:51.835

With today's technology, we were able

337

00:17:51.835 --> 00:17:53.435

to monitor the flight using Flight Aware.

338

00:17:53.775 --> 00:17:55.315  
And of course, for flight was really

339  
00:17:55.315 --> 00:17:56.555  
helpful in planning the emissions.

340  
00:17:57.985 --> 00:17:59.785  
The data collection review was, uh,

341  
00:18:00.225 --> 00:18:02.385  
provided by the solid state devices that were shipped back.

342  
00:18:02.385 --> 00:18:03.705  
So we had a way to make sure

343  
00:18:04.015 --> 00:18:05.505  
that the data we collected was good.

344  
00:18:05.925 --> 00:18:08.545  
And as I mentioned earlier, the Ford operating location

345  
00:18:09.245 --> 00:18:11.345  
on the East coast provide us with a dispatcher

346  
00:18:11.425 --> 00:18:12.905  
who gave us a three hour time difference.

347  
00:18:12.925 --> 00:18:15.185  
So really helped, uh, spread out the days.

348  
00:18:17.695 --> 00:18:20.755  
And we had a SMS program with accountable executive.

349  
00:18:20.785 --> 00:18:22.755  
It's been really nice to have the thing we talked about

350  
00:18:22.755 --> 00:18:26.315  
yesterday because I had to go to, uh, EA, uh,

351  
00:18:26.315 --> 00:18:30.275  
the F-A-A-S-E-T-P and develop our own SMS program.

352

00:18:31.645 --> 00:18:35.025

We do do have emergency response procedures and a call tree.

353

00:18:35.955 --> 00:18:37.015

And those are, um,

354

00:18:37.685 --> 00:18:40.145

we had two exercises at the Airbus corporate level

355

00:18:40.715 --> 00:18:43.135

and we also had a, a critical incident response

356

00:18:43.165 --> 00:18:44.615

plan program in place.

357

00:18:45.415 --> 00:18:47.795

And as I mentioned earlier, as a freight dog flying night,

358

00:18:47.795 --> 00:18:49.075

backside of the clock, I was very

359

00:18:49.435 --> 00:18:50.515

sensitive about circadian rhythm.

360

00:18:51.125 --> 00:18:53.305

So we went very slow in the transition phase.

361

00:18:53.765 --> 00:18:55.985

And then when we went from one day to night,

362

00:18:55.985 --> 00:18:58.875

we made sure we had plenty of, uh, cycle time for the crews.

363

00:19:00.215 --> 00:19:03.635

Our communication was, uh, through interactive websites

364

00:19:04.135 --> 00:19:07.155

and we provided an iPhone in the airplane dedicated

365

00:19:07.155 --> 00:19:08.355  
to the airplane with its own phone numbers.

366  
00:19:08.495 --> 00:19:10.895  
So when the uh, crew was calling us, we knew

367  
00:19:10.895 --> 00:19:12.825  
that it was them and not spam.

368  
00:19:13.105 --> 00:19:17.575  
'cause I'm sure everybody gets lots of spam. Next slide.

369  
00:19:18.845 --> 00:19:21.065  
We operate, we could operate on part 91,

370  
00:19:21.655 --> 00:19:25.275  
but I insisted we do part 1 35 for maintenance

371  
00:19:25.275 --> 00:19:26.555  
and crew risk procedures.

372  
00:19:27.735 --> 00:19:29.585  
Each of our con contract pilots are well

373  
00:19:29.585 --> 00:19:30.745  
trained, experienced pilots.

374  
00:19:31.005 --> 00:19:33.355  
And I try to pick corporate business pilots

375  
00:19:33.355 --> 00:19:37.205  
because those guys are really the heroes of, uh, a DH

376  
00:19:37.875 --> 00:19:41.265  
planning from hotel to hotel, all the maintenance, uh,

377  
00:19:41.375 --> 00:19:44.225  
fueling, making sure that the catering's on board

378  
00:19:44.685 --> 00:19:45.985  
and also all the flight planning.

379

00:19:48.295 --> 00:19:49.745

Each pilot was checked out by me,

380

00:19:49.975 --> 00:19:51.665

made sure they were, met our requirements.

381

00:19:52.185 --> 00:19:54.125

We made sure we had flight test engineers on every flight

382

00:19:54.305 --> 00:19:57.425

to make sure that they were providing, uh,

383

00:19:57.425 --> 00:19:58.745

support from the system as well

384

00:19:58.745 --> 00:20:00.695

as crew resource management task

385

00:20:01.665 --> 00:20:04.205

and, uh, extreme rigid adherence to crew rest.

386

00:20:05.435 --> 00:20:08.585

So I made clear to every pilot that their future

387

00:20:08.605 --> 00:20:11.785

of 40 people back home really relied on them taking care

388

00:20:11.785 --> 00:20:13.105

of the aircraft to make sure we didn't have,

389

00:20:14.955 --> 00:20:17.235

I had very good supportive leadership that, uh,

390

00:20:17.285 --> 00:20:19.435

would gimme whatever I needed within reason

391

00:20:19.935 --> 00:20:22.155

and make sure that we were flying a well, uh,

392

00:20:23.325 --> 00:20:27.425  
a maintained program and for planning.

393  
00:20:27.525 --> 00:20:29.905  
It turned out that the crawl walk run worked really well

394  
00:20:29.905 --> 00:20:31.865  
because going from the west coast to the east coast,

395  
00:20:31.965 --> 00:20:33.105  
the airports were spread out.

396  
00:20:33.365 --> 00:20:35.465  
So we'd fly maybe one or two airports in a day and,

397  
00:20:35.465 --> 00:20:37.065  
and RO in on the east coast.

398  
00:20:37.085 --> 00:20:40.185  
We could pick an airport that was central and fly four

399  
00:20:40.265 --> 00:20:42.745  
or five airports and then be able to ar in the state nights.

400  
00:20:42.745 --> 00:20:44.305  
So bag drags were kept to a minimum,

401  
00:20:44.935 --> 00:20:46.315  
and as I mentioned, nights in the winter

402  
00:20:46.415 --> 00:20:48.805  
and days in the summer really helped out in the data

403  
00:20:48.805 --> 00:20:53.025  
collection slide.

404  
00:20:53.785 --> 00:20:56.045  
So lessons learned or as I like to say,

405  
00:20:56.045 --> 00:21:00.525  
and I someone else said earlier today, relearned, um, uh,

406

00:21:00.745 --> 00:21:02.405  
for the first bullet, can anybody see a

407

00:21:02.405 --> 00:21:03.485  
potential hazard here?

408

00:21:06.265 --> 00:21:11.125  
Anybody flying multiple approaches with the gear up?

409

00:21:14.235 --> 00:21:16.525  
Exactly. So, uh, one

410

00:21:16.525 --> 00:21:18.925  
of the things we did was install spoilers on the airplanes

411

00:21:18.925 --> 00:21:20.125  
so we could fly at a higher power setting

412

00:21:20.125 --> 00:21:23.805  
because to do that, um, would, would require a, uh,

413

00:21:23.805 --> 00:21:25.925  
lower power setting and, uh, set off the horn.

414

00:21:26.325 --> 00:21:30.465  
So we also had the co, uh, policy of calling, uh,

415

00:21:30.515 --> 00:21:33.915  
final approach fix gear up intentional so that it would kind

416

00:21:33.915 --> 00:21:35.995  
of remind you for the gear down

417

00:21:36.145 --> 00:21:38.385  
call listened to the airplane.

418

00:21:38.385 --> 00:21:40.705  
I took out a mo, flew off outta mobile one day

419

00:21:40.705 --> 00:21:42.065  
and heard a lot of clapping, which sounded,

420  
00:21:42.065 --> 00:21:43.225  
I thought the engine was falling apart.

421  
00:21:43.775 --> 00:21:47.025  
Came right back around, landed, turned out that the seal

422  
00:21:47.025 --> 00:21:48.905  
between the wing and the Fusel logic come loose.

423  
00:21:48.995 --> 00:21:50.435  
The rubber was flapping against the side

424  
00:21:50.435 --> 00:21:51.695  
of the, of the airplane.

425  
00:21:51.795 --> 00:21:53.335  
Not a big deal, but, uh,

426  
00:21:53.335 --> 00:21:55.095  
we accepted no minor maintenance issues.

427  
00:21:55.095 --> 00:21:57.535  
They were addressed right away, no hip pocket.

428  
00:21:57.875 --> 00:22:00.415  
Uh, I'll, I'll save this for the next guy.

429  
00:22:00.835 --> 00:22:03.415  
We made sure that was communicated at the daily Check-ins

430  
00:22:03.415 --> 00:22:06.795  
and Hand Up had a dedicated operation supervisor Thomas

431  
00:22:07.415 --> 00:22:09.785  
with me today was a guy that stayed up late all nights

432  
00:22:09.785 --> 00:22:11.785  
and during the weekends to make sure the crew was ready



433  
00:22:11.785 --> 00:22:14.525  
to go and, um, had everything they need.

434  
00:22:15.475 --> 00:22:17.285  
Mentioned good coordination with at TC.

435  
00:22:17.365 --> 00:22:19.005  
So we had a standard script with emails,

436  
00:22:19.215 --> 00:22:20.525  
phone calls, and on the radio.

437  
00:22:21.385 --> 00:22:23.645  
Um, a lot of times we had to work through shift changes

438  
00:22:23.745 --> 00:22:24.925  
and get messages passed,

439  
00:22:24.985 --> 00:22:26.565  
but for the most part it worked really well.

440  
00:22:27.405 --> 00:22:28.945  
And the biggest issue we had was

441  
00:22:28.945 --> 00:22:30.425  
with one airport, which I won't mention.

442  
00:22:31.045 --> 00:22:34.185  
Um, but all the other airports, class Bravos were really,

443  
00:22:34.845 --> 00:22:36.145  
uh, mice to work with.

444  
00:22:37.305 --> 00:22:38.595  
It's kind of hard to have street cred

445  
00:22:38.595 --> 00:22:40.795  
with a baron when you check in with a Class Bravo

446

00:22:40.795 --> 00:22:43.075  
between a seven six and a 7 3 7.

447  
00:22:43.785 --> 00:22:46.005  
Um, but we were able to fly the faster speeds

448  
00:22:46.005 --> 00:22:47.165  
and so we really were not much

449  
00:22:47.165 --> 00:22:48.725  
of an impact once we convinced 'em

450  
00:22:48.725 --> 00:22:51.815  
that we could interface fairly well with commercial traffic

451  
00:22:52.075 --> 00:22:53.735  
and we were always willing to sit and hold

452  
00:22:53.875 --> 00:22:55.745  
and make sure we were faced in,

453  
00:22:55.785 --> 00:22:57.945  
and sometimes we would have to fly at odd hours to,

454  
00:22:57.965 --> 00:23:00.125  
to miss the, uh, high load density load.

455  
00:23:01.135 --> 00:23:03.235  
And lastly, every tower Rapcon approach

456  
00:23:03.235 --> 00:23:04.715  
controller airport authority are different.

457  
00:23:04.895 --> 00:23:06.835  
We had to be flexible and just be patient

458  
00:23:06.935 --> 00:23:08.765  
and not be, um, angry.

459  
00:23:09.145 --> 00:23:10.285  
And sometimes we'd have to leave

460

00:23:10.285 --> 00:23:11.605  
and come back another day, which was fine.

461

00:23:12.025 --> 00:23:13.515  
Uh, next slide.

462

00:23:13.695 --> 00:23:17.405  
So no really program has things that don't go wrong.

463

00:23:17.405 --> 00:23:18.845  
We tried to anticipate all of 'em.

464

00:23:19.685 --> 00:23:21.545  
We, uh, bought the airplane, had been sitting on the ground

465

00:23:21.545 --> 00:23:24.275  
for two years, and so I insisted on 50 hour,

466

00:23:24.575 --> 00:23:25.635  
uh, oiled samples.

467

00:23:26.135 --> 00:23:29.115  
Turned out that iron was starting to increase in levels

468

00:23:29.175 --> 00:23:33.865  
and that's typical of a comb, um, rusting

469

00:23:33.865 --> 00:23:35.065  
and causing engine bearing

470

00:23:35.065 --> 00:23:36.345  
problems when it's been sitting for a while.

471

00:23:36.725 --> 00:23:37.785  
So we ordered a new engine

472

00:23:37.785 --> 00:23:40.385  
before we started, got that installed, and we took that core

473

00:23:40.385 --> 00:23:42.465  
and bought another engine and had it set in reserve,

474  
00:23:42.795 --> 00:23:44.145  
which was fortunate because halfway

475  
00:23:44.145 --> 00:23:46.405  
through the test collection campaign last year,

476  
00:23:46.825 --> 00:23:49.005  
the right engine started having the same issues.

477  
00:23:49.465 --> 00:23:52.205  
And fortunately, Lycoming has its factory at mobile.

478  
00:23:52.625 --> 00:23:54.645  
We were able to intercept the delivery of that engine

479  
00:23:54.645 --> 00:23:56.965  
and bring it across the field to our maintenance

480  
00:23:57.185 --> 00:23:59.485  
and, uh, have them install the airplane in two weeks instead

481  
00:23:59.485 --> 00:24:03.105  
of maybe a month and a half, which a lot of time out of our,

482  
00:24:03.285 --> 00:24:06.715  
our program at icing all the transparencies one time

483  
00:24:06.785 --> 00:24:08.435  
that was ironically flying to Vegas.

484  
00:24:09.145 --> 00:24:11.405  
Go figure. Uh, we landed, let it,

485  
00:24:11.465 --> 00:24:12.805  
let it thaw and, and took off.

486  
00:24:13.935 --> 00:24:15.635  
And then as I mentioned earlier, de conflicting

487

00:24:15.635 --> 00:24:17.195  
with traffic at heavy congestion airports.

488

00:24:17.195 --> 00:24:21.175  
Just be flexible. Um, watch the spacing for, uh, turbulence

489

00:24:21.515 --> 00:24:22.825  
and, uh, work work.

490

00:24:22.825 --> 00:24:27.095  
Well. A TC. We haven't talked too much about data loss.

491

00:24:27.095 --> 00:24:30.015  
We had two instances out of 120, we lost one memory device.

492

00:24:30.385 --> 00:24:31.495  
Still can't find it today.

493

00:24:31.495 --> 00:24:33.215  
If you guys come across it, please send it to us.

494

00:24:33.215 --> 00:24:36.665  
There's a slight reward. Um, but unfortunately it was O'Hare

495

00:24:36.665 --> 00:24:40.005  
and Midway, which were one of the most difficult airports

496

00:24:40.005 --> 00:24:41.165  
to go to and get data.

497

00:24:41.165 --> 00:24:42.165  
Unfortunately, we were able

498

00:24:42.165 --> 00:24:43.405  
to get it this second time around.

499

00:24:44.045 --> 00:24:46.585  
Um, and we had an HMI human machine interface failure

500

00:24:46.655 --> 00:24:48.985  
with our system, with the, um,

501

00:24:49.045 --> 00:24:51.265  
flight test engineer at three o'clock in the morning

502

00:24:51.265 --> 00:24:52.425  
getting back side of the clock.

503

00:24:52.875 --> 00:24:55.505  
These two, uh, incidences were corrected

504

00:24:55.505 --> 00:24:57.665  
with operational procedures or software change,

505

00:24:58.005 --> 00:25:00.715  
but I do wanna mention that it's very important

506

00:25:00.715 --> 00:25:01.835  
that we think about data

507

00:25:01.835 --> 00:25:03.835  
because if you don't get the data,

508

00:25:03.835 --> 00:25:04.915  
you gotta go back and get it.

509

00:25:04.915 --> 00:25:07.115  
If it's a high risk mission, that is something

510

00:25:07.115 --> 00:25:08.395  
that we, uh, really need to pay attention.

511

00:25:09.045 --> 00:25:12.745  
Next slide. So I'd like to kind of talk about this slide.

512

00:25:13.315 --> 00:25:16.775  
Uh, 1973, a DC three crash at Iceland due to icing.

513

00:25:17.165 --> 00:25:18.895  
It's still there. I went there back, uh, four

514

00:25:18.895 --> 00:25:22.885

or five years ago on vacation and um, it's kind of sobering,

515

00:25:22.885 --> 00:25:23.925

but really majestic.

516

00:25:24.405 --> 00:25:26.065

And what's kind of funny is when I was there,

517

00:25:26.065 --> 00:25:27.745

this couple was getting their wedding photos taken.

518

00:25:27.905 --> 00:25:30.045

I'm not sure what message they were trying to send,

519

00:25:30.265 --> 00:25:33.165

but anyway, so I hope,

520

00:25:34.165 --> 00:25:35.485

I really hope this next one works.

521

00:25:35.625 --> 00:25:38.835

And it's super secret, so if it doesn't work, it's

522

00:25:38.955 --> 00:25:41.465

'cause Airbus headquarters made a special call.

523

00:25:41.485 --> 00:25:42.985

But can we try the next slide

524

00:25:43.045 --> 00:25:43.785

and see if it's, so

525

00:25:47.885 --> 00:25:49.885

I'll try to get it running up during one of the breaks,

526

00:25:50.185 --> 00:25:52.345

um, tomorrow and show you.

527

00:25:52.755 --> 00:25:55.455  
And basically what this slide shows is our landing system

528  
00:25:55.455 --> 00:25:56.855  
working in real time on the airplane.

529  
00:25:57.495 --> 00:26:00.275  
And it's a kind of an engineering clunky display,

530  
00:26:00.655 --> 00:26:02.155  
but it shows that the system works.

531  
00:26:02.175 --> 00:26:03.355  
And the next step is to take this

532  
00:26:03.355 --> 00:26:06.725  
and provide it into a, a pilot centric display

533  
00:26:06.745 --> 00:26:10.205  
so we can provide ILS capable, uh, information

534  
00:26:10.205 --> 00:26:12.485  
and then finally hook it up to the autopilot

535  
00:26:12.695 --> 00:26:13.765  
where we're able to do that.

536  
00:26:13.765 --> 00:26:16.285  
And so that's concludes my presentation.

537  
00:26:16.375 --> 00:26:18.525  
Sorry for all the glitches

538  
00:26:18.585 --> 00:26:22.105  
and maybe fast on my feet, got a little bit

539  
00:26:22.105 --> 00:26:23.185  
of exercise running back to quad.

540  
00:26:23.295 --> 00:26:26.105  
Next slide please. And then maybe this will work.



541

00:26:26.345 --> 00:26:30.075

I don't know. And

542

00:26:30.075 --> 00:26:31.395

that concludes my presentation.

543

00:26:31.415 --> 00:26:33.745

I'd be happy to take any questions.

544

00:26:46.495 --> 00:26:50.945

No questions. That's good. Did I answered 'em all or

545

00:26:54.345 --> 00:26:55.345

I'll add a question? Good.

546

00:26:55.345 --> 00:26:58.595

You mentioned that at least when this, uh,

547

00:26:58.985 --> 00:27:01.675

this exercise started, it was a handful

548

00:27:01.735 --> 00:27:03.835

of software engineers and and yourself.

549

00:27:04.735 --> 00:27:07.395

Did you train any of the software engineers

550

00:27:07.455 --> 00:27:09.075

to become flight test engineers?

551

00:27:09.375 --> 00:27:11.955

Did flight test engineers eventually come onto the program?

552

00:27:12.535 --> 00:27:13.915

Um, how did you manage all that?

553

00:27:15.055 --> 00:27:17.675

Uh, yes, in fact we did do some homegrown teaching

554

00:27:17.695 --> 00:27:18.755  
for our flight test engineers.

555  
00:27:18.755 --> 00:27:19.955  
Thomas is a flight test engineer.

556  
00:27:19.975 --> 00:27:21.755  
He worked for GoPro with, um,

557  
00:27:22.645 --> 00:27:25.415  
autonomous uh, systems.

558  
00:27:25.555 --> 00:27:26.615  
And so it was pretty familiar.

559  
00:27:27.075 --> 00:27:30.495  
Uh, AQ has a pretty interesting program where we train,

560  
00:27:30.755 --> 00:27:32.055  
we allow you to, we give you money

561  
00:27:32.055 --> 00:27:33.255  
to go get your private deposit license.

562  
00:27:33.355 --> 00:27:35.375  
So we do have a few folks doing that,

563  
00:27:35.675 --> 00:27:38.375  
but a lot of the training, um, we have a small group

564  
00:27:38.375 --> 00:27:39.655  
that does the actual flight testing.

565  
00:27:40.505 --> 00:27:42.465  
Software engineers take our product and use it.

566  
00:27:42.895 --> 00:27:44.035  
So we didn't really have to do

567  
00:27:44.035 --> 00:27:45.295  
a logging throughout the company.

568

00:27:45.295 --> 00:27:47.335

However, it's important for everybody in the company

569

00:27:47.355 --> 00:27:49.535

to understand what the end product, use it

570

00:27:50.155 --> 00:27:53.015

and make sure they know how important as we create a system

571

00:27:53.155 --> 00:27:55.135

that safe flying public.

572

00:27:55.835 --> 00:28:00.485

Great. Thanks. Good. I got one more. No. Hey

573

00:28:00.485 --> 00:28:01.485

Paul. Uh, I just wanted

574

00:28:01.485 --> 00:28:02.605

to really say thank you,

575

00:28:03.025 --> 00:28:04.125

uh, for backing up.

576

00:28:04.125 --> 00:28:07.245

My comment at the panel earlier, uh, where I said, you know,

577

00:28:07.465 --> 00:28:10.045

AI or in your words machine learning will be the next, uh,

578

00:28:10.195 --> 00:28:11.325

iteration and safety.

579

00:28:11.505 --> 00:28:13.565

So thanks for being ready to get this brief,

580

00:28:13.585 --> 00:28:15.525

but I look forward to seeing what the, the videos look like.

581

00:28:15.525 --> 00:28:16.525  
This is pretty cool.

582  
00:28:20.105 --> 00:28:23.405  
Uh, did you have any, uh, difficulties with, uh, bugs

583  
00:28:23.425 --> 00:28:26.005  
or birds, uh, during your data collection?

584  
00:28:26.145 --> 00:28:30.405  
Or did you, uh, think about, uh, purposely involving, uh,

585  
00:28:30.475 --> 00:28:33.925  
some bugs or some bird snag, uh, in,

586  
00:28:33.945 --> 00:28:35.485  
in the data collection process?

587  
00:28:36.495 --> 00:28:38.655  
I thank you for the question. We had a little bit

588  
00:28:38.655 --> 00:28:41.255  
of in incidents, the focal link doesn't really create

589  
00:28:41.255 --> 00:28:43.055  
that big of a problem, but obviously

590  
00:28:43.055 --> 00:28:44.215  
going forward we would have to do that.

591  
00:28:44.215 --> 00:28:47.095  
So if you flew through a flock of flock,

592  
00:28:47.115 --> 00:28:48.975  
but a a bunch of insects on takeoff

593  
00:28:48.975 --> 00:28:50.365  
or something, the system, to be clear,

594  
00:28:50.365 --> 00:28:52.805  
this system will be fused in with other landing systems.

595

00:28:52.915 --> 00:28:55.605

It's really a tertiary method to, um,

596

00:28:55.605 --> 00:28:57.445

provide additional safety and workload and,

597

00:28:57.445 --> 00:28:58.445

and more of a warning system.

598

00:28:58.845 --> 00:29:01.915

If we move to an autonomous, totally autonomous system, um,

599

00:29:01.915 --> 00:29:03.075

there will still be other

600

00:29:03.075 --> 00:29:04.555

systems involved that would help out.

601

00:29:04.555 --> 00:29:06.945

This is more of an augmentation,

602

00:29:06.945 --> 00:29:08.265

I think you can see for a visual approach.

603

00:29:08.325 --> 00:29:10.305

If the ILAs is off, you're out of, you know,

604

00:29:10.305 --> 00:29:11.585

if you get a wide scale deflection

605

00:29:11.605 --> 00:29:15.085

or GPS denied, the system can actually help you get the

606

00:29:20.145 --> 00:29:24.745

Airplane Once you digitize

607

00:29:24.765 --> 00:29:25.905

to all the airports.

608

00:29:26.815 --> 00:29:28.435  
How do you maintain fidelity of

609  
00:29:28.435 --> 00:29:31.315  
that data if things change at a particular airport?

610  
00:29:32.325 --> 00:29:33.935  
Yeah, that's a really excellent, uh,

611  
00:29:34.185 --> 00:29:36.815  
conceptual operational procedure for deployment.

612  
00:29:37.075 --> 00:29:40.255  
Um, when this system is deployed, every airplane

613  
00:29:40.255 --> 00:29:41.765  
that uses it will record the data

614  
00:29:41.765 --> 00:29:45.205  
and that will be put back into, um, a backend server

615  
00:29:45.275 --> 00:29:47.685  
that continually updates and modifies the data.

616  
00:29:47.945 --> 00:29:49.945  
Here's a kind of a sample

617  
00:29:49.945 --> 00:29:51.425  
of the airports that we flew in into.

618  
00:29:51.925 --> 00:29:54.865  
Um, so that's, uh, a, a continual issue.

619  
00:29:54.925 --> 00:29:56.905  
So, you know, survey points move, uh,

620  
00:29:56.905 --> 00:29:58.425  
they extend runways and things like that.

621  
00:29:58.485 --> 00:30:00.145  
So that does create a bit of a problem.

622

00:30:00.535 --> 00:30:03.265

What I did mention here is the significant amount

623

00:30:03.265 --> 00:30:05.975

of infrastructure and backend work that goes

624

00:30:05.975 --> 00:30:08.175

with the data management, curation and control.

625

00:30:09.265 --> 00:30:11.955

When you talk about landing airplanes using this kind

626

00:30:11.955 --> 00:30:14.595

of data, it's gotta be very high quality, controlled, uh,

627

00:30:14.595 --> 00:30:16.395

cyber protected, virus protected and all that.

628

00:30:16.415 --> 00:30:19.185

So that is a, that's where we have the team

629

00:30:19.185 --> 00:30:21.105

of software engineers investing in that,

630

00:30:22.635 --> 00:30:24.045

that kind of back backend system.

631

00:30:24.105 --> 00:30:29.085

But that if I, I can spell software engineers, maybe

632

00:30:29.085 --> 00:30:32.815

what they do and how they do black hole mystery to me.

633

00:30:33.915 --> 00:30:36.275

I do lgal and cobol, that's not even words anymore.

634

00:30:40.295 --> 00:30:41.685

Thank you very much. Appreciate your attention.

635

00:30:45.905 --> 00:30:50.855  
You Alright? I'd

636  
00:30:50.855 --> 00:30:53.415  
Like to intro or I would like to welcome all

637  
00:30:53.415 --> 00:30:55.615  
of the presenters from this afternoon to come up here

638  
00:30:55.615 --> 00:30:56.615  
and we'll get our panel discuss.