1
00:00:01.415 --> 00:00:01.885
Thank you.

2
00:00:06.555 --> 00:00:07.685
Okay. Is the mic on?

3
00:00:09.875 --> 00:00:12.695
So I'll try this song Turbo.

4
00:00:13.915 --> 00:00:16.335
He walks through the halls cool and slow.

5
00:00:16.925 --> 00:00:19.815
What do they call him? They call him Turbo. He's a clown.

6
00:00:20.795 --> 00:00:23.535
Anyway, uh, my apologies to the coasters.

7
00:00:24.075 --> 00:00:28.635
Anyway, um, thank you for this opportunity to come

8
00:00:28.695 --> 00:00:30.675
and present the results of some research

9
00:00:30.745 --> 00:00:32.875
that we've been doing for about the last year and a half.

10
00:00:33.475 --> 00:00:34.775
And, uh, and,

11
00:00:34.875 --> 00:00:37.495
and we've been getting some positive response from this, uh,

12
00:00:37.565 --> 00:00:39.015
from this, uh, paper, if you will.

13
00:00:39.755 --> 00:00:42.615
And in fact, uh, the Europeans have asked us to bring it

14

00:00:42.615 --> 00:00:43.975
to Europe, uh, during the summer.

15
00:00:44.195 --> 00:00:47.455
So again, I thank you for this opportunity to present, um,

16
00:00:48.055 --> 00:00:50.615
a paper that, uh, had its origin in

17
00:00:53.685 --> 00:00:56.625
the work with, uh, Mike Ravens,

18
00:00:56.625 --> 00:00:59.305
who was a test director at Northrop, uh, last year.

19
00:01:00.165 --> 00:01:02.865
And, uh, in preparation for the B 21 bomber.

20
00:01:03.165 --> 00:01:04.945
And so we were talking about a year

21
00:01:04.945 --> 00:01:07.065
and a half ago about, huh, why don't,

22
00:01:07.115 --> 00:01:08.825
since we've got first flights coming up,

23
00:01:09.005 --> 00:01:10.505
NASA's got an X 59 Boeing

24
00:01:10.965 --> 00:01:13.585
and Northrop had the B 21 and et cetera.

25
00:01:13.805 --> 00:01:15.705
Why don't we go back and do a little research on

26
00:01:16.175 --> 00:01:19.025
what anomalies might have happened on first flights

27
00:01:19.045 --> 00:01:20.185
of past projects.

28
00:01:20.845 --> 00:01:23.185
And so that was what the research was centered on.

29
00:01:23.725 --> 00:01:26.585
And since then we've had continuous inputs coming into us.

30
00:01:26.585 --> 00:01:29.305
So it's kind of a living, uh, presentation, if you will.

31
00:01:29.805 --> 00:01:31.985
So what we're gonna do today is go through a lot

32
00:01:31.985 --> 00:01:34.225
of flight test war stories of those that know me, know that

33
00:01:34.225 --> 00:01:35.745
that's one of my favorite things to do is tell

34
00:01:35.745 --> 00:01:36.865
flight test war stories.

35
00:01:37.605 --> 00:01:39.785
And so we're gonna go through several of those stories

36
00:01:40.285 --> 00:01:42.745
and we're gonna talk about what happened and what,

37
00:01:42.765 --> 00:01:44.905
and maybe dust off some of the lessons learned

38
00:01:45.175 --> 00:01:48.545
that came from those, uh, those, those various projects.

39
00:01:49.485 --> 00:01:53.985
Now to do this, what Mike Ravens did then inside, uh,

40
00:01:54.105 --> 00:01:58.745
Northrop Grumman, was to call up the old head test pilots

41

00:01:59.245 --> 00:02:00.825
and flight test engineers.

42
00:02:01.485 --> 00:02:06.105
And we had a big symposium a year ago in January where the,

43
00:02:06.105 --> 00:02:07.225
everybody got a chance

44
00:02:07.225 --> 00:02:10.745
to present their particular stories from the first flights.

45
00:02:11.005 --> 00:02:14.905
In addition, we reached out to Lockheed, uh, to Tom Feld,

46
00:02:14.905 --> 00:02:16.385
if you will, and even to nasa.

47
00:02:17.165 --> 00:02:20.905
Uh, and since then, other than those you see listed here,

48
00:02:21.285 --> 00:02:22.825
uh, in addition to Mike and

49
00:02:22.845 --> 00:02:24.625
and myself, we had, uh,

50
00:02:24.625 --> 00:02:27.505
Rick couch had inputs from the B two first flight.

51
00:02:27.525 --> 00:02:28.785
We had Ricardo Trayvin

52
00:02:28.785 --> 00:02:30.985
with inputs from d different projects he's been on.

53
00:02:31.365 --> 00:02:34.265
And even I remember back to, uh, Charlie Bach,

54
00:02:34.325 --> 00:02:35.865
who was a first, uh,

55
00:02:35.895 --> 00:02:37.785
test pilot on the first flight of the B one.

56
00:02:38.045 --> 00:02:40.145
So we'll tell one of his, uh, stories

57
00:02:40.145 --> 00:02:41.905
that came from the first flight of that airplane.

58
00:02:42.325 --> 00:02:45.225
So that's, uh, who the contributors are so far

59
00:02:45.485 --> 00:02:47.385
to this particular presentation.

60
00:02:47.725 --> 00:02:50.605
So let's get into the stories. And here we go.

61
00:02:51.145 --> 00:02:53.565
So we're gonna find out that we didn't

62
00:02:54.645 --> 00:02:58.245
actually specify the aircraft that the anomaly occurred.

63
00:02:58.585 --> 00:03:02.045
We found it, uh, uh, better just to contribute it

64
00:03:02.045 --> 00:03:05.845
to a large bomber prototype fighter, et et cetera like that.

65
00:03:06.265 --> 00:03:09.205
It helps getting it through the clearance process one way.

66
00:03:09.505 --> 00:03:12.165
And then the other way is we're not really interested in the

67
00:03:12.405 --> 00:03:15.485
airplane, per se, that the, uh, phenomena would occur too.

68

00:03:15.705 --> 00:03:17.885
But we're interested in what was the anomaly

69
00:03:17.905 --> 00:03:20.325
and what was the lesson learned that we can take from it.

70
00:03:20.675 --> 00:03:23.655
So that's why you see that we don't give attribution, uh,

71
00:03:23.655 --> 00:03:25.255
necessarily to the airplane, per se.

72
00:03:25.555 --> 00:03:27.615
So let's start out with a large bomber.

73
00:03:28.035 --> 00:03:29.895
Now, we all do engine runs initially,

74
00:03:30.115 --> 00:03:32.255
and there's even a story there from a large bomber,

75
00:03:32.255 --> 00:03:33.775
but I'll move into the taxi.

76
00:03:34.515 --> 00:03:37.175
The initial taxi, uh, that occurred again,

77
00:03:37.255 --> 00:03:39.615
a large bomber airplane went out to do its first taxi.

78
00:03:40.155 --> 00:03:45.055
During this taxi, there was a problem occurred in that one

79
00:03:45.055 --> 00:03:48.625
of the heat exchangers was showing an overheat, uh,

80
00:03:48.925 --> 00:03:51.265
and the, in fact, not just one, but several.

81
00:03:51.845 --> 00:03:56.145
And so the heat exchanger was where systems were using fuel

82
00:03:56.325 --> 00:03:57.665
as the cooling agent.

83
00:03:58.115 --> 00:04:00.215
So you had to go through the fuel, had to flow

84
00:04:00.215 --> 00:04:01.455
through a heat exchanger

85
00:04:01.715 --> 00:04:04.095
to take heat away from whatever that system was.

86
00:04:04.945 --> 00:04:06.965
And why would it overheat?

87
00:04:07.455 --> 00:04:08.995
So when they taxied back in

88
00:04:08.995 --> 00:04:11.555
and took a look inside the heat exchanger, they found

89
00:04:11.555 --> 00:04:13.995
that the filter was clogged with lint.

90
00:04:14.825 --> 00:04:17.525
Huh? Lint. How can lint get into the fuel system?

91
00:04:17.875 --> 00:04:20.165
Well, this was our introduction into fod.

92
00:04:20.505 --> 00:04:23.325
And in this particular case, the company wanted

93
00:04:23.325 --> 00:04:24.365
to do everything right.

94
00:04:25.065 --> 00:04:28.325
So they, anybody that was working inside the fuel system,

95

00:04:29.045 --> 00:04:32.425
inside the fuel tanks to be able to get 'em finalized

96
00:04:32.525 --> 00:04:35.905
and sealed up, they were all given a coverall to wear.

97
00:04:36.745 --> 00:04:40.125
And that coverall, uh, ended up such that

98
00:04:40.125 --> 00:04:42.845
as they were sliding around lint from

99
00:04:42.845 --> 00:04:44.925
that coverall was getting into the fuel tank.

100
00:04:45.645 --> 00:04:48.625
Now that lint then manifested itself in the filters

101
00:04:48.685 --> 00:04:50.145
of these heat exchanger.

102
00:04:50.785 --> 00:04:55.415
Now, as a result, they had the defuel put new fuel in

103
00:04:55.555 --> 00:04:58.415
and they adopted a thing called Slosh taxi

104
00:04:58.665 --> 00:04:59.695
where they would go out

105
00:04:59.795 --> 00:05:01.775
and actually jerk the plane around a little bit,

106
00:05:02.075 --> 00:05:05.295
let the fuel slosh around, come back, defuel,

107
00:05:05.465 --> 00:05:08.135
check the filters, go back in refuel again,

108
00:05:08.435 --> 00:05:09.655
do more Slosh taxi.

109
00:05:10.155 --> 00:05:12.015
And it took about three different iterations

110
00:05:12.015 --> 00:05:14.255
before they finally got it down to acceptable level.

111
00:05:14.795 --> 00:05:18.495
So when it comes to fod, uh, that we will find is one

112
00:05:18.495 --> 00:05:21.655
of the primary contributions to anomalies on first flight,

113
00:05:21.955 --> 00:05:24.695
and that was a, a phenomena that occurred since then.

114
00:05:24.875 --> 00:05:28.055
Uh, I think the company, T-Y-R-E-X is a company

115
00:05:28.135 --> 00:05:31.975
that now supplies the suit that's used by this company to,

116
00:05:32.075 --> 00:05:36.135
uh, uh, as a coverall that doesn't have the lint problem

117
00:05:36.355 --> 00:05:37.935
as they're finishing off the fuel tanks.

118
00:05:38.235 --> 00:05:39.815
So there's lesson number one of the day.

119
00:05:39.815 --> 00:05:40.895
Maybe you can take that away.

120
00:05:41.475 --> 00:05:44.135
So, uh, you gotta be, uh, pretty cautious of this spot.

121
00:05:44.215 --> 00:05:48.375
I had a very, very good friend who was so proud.

122

00:05:48.435 --> 00:05:51.815
He was building this amphibian home built airplane.

123
00:05:52.475 --> 00:05:54.575
Uh, and he wanted to do everything right.

124
00:05:54.625 --> 00:05:56.855
After he spent three or four years building it up,

125
00:05:56.985 --> 00:06:00.405
he actually surfaced, transported the airplane

126
00:06:00.405 --> 00:06:03.245
to the factory down in Florida to make sure

127
00:06:03.245 --> 00:06:04.325
that they could inspect it,

128
00:06:04.325 --> 00:06:05.565
make sure he did everything right.

129
00:06:05.945 --> 00:06:07.445
And it was a two seat airplane.

130
00:06:07.445 --> 00:06:08.925
And he actually flew with a factory

131
00:06:09.015 --> 00:06:10.325
pilot for the first flight.

132
00:06:10.615 --> 00:06:11.765
Everything went great.

133
00:06:12.075 --> 00:06:14.205
Factory pilot said, you did good, you're good to go.

134
00:06:14.705 --> 00:06:18.085
He fueled him up, gonna send him back to his home field.

135
00:06:18.915 --> 00:06:22.515
And on takeoff for the second flight right

136
00:06:22.515 --> 00:06:24.915
after takeoff, high power setting, engine failure

137
00:06:25.505 --> 00:06:27.555
crashed into a building and, and was killed.

138
00:06:28.665 --> 00:06:33.125
The analysis from that showed again, manufacturing debris

139
00:06:33.945 --> 00:06:36.245
had caused the fuel filter to clog up.

140
00:06:36.665 --> 00:06:39.765
And that filter had not been checked after the first flight,

141
00:06:40.225 --> 00:06:42.325
and it was a high power setting on the second

142
00:06:42.325 --> 00:06:43.525
flight that got him.

143
00:06:44.255 --> 00:06:47.775
So I think we have a takeaway from this in that, uh,

144
00:06:48.945 --> 00:06:50.435
when you're done with the first flight and

145
00:06:50.435 --> 00:06:51.835
after you're done with the first flight party,

146
00:06:52.455 --> 00:06:54.835
you're not done yet, uh, go back

147
00:06:54.895 --> 00:06:57.515
and treat the second flight just like you would the first

148
00:06:57.515 --> 00:07:00.275
flight as far as the proper inspections that you have to do

149

00:07:00.655 --> 00:07:01.955
to make sure you're good to go.

150
00:07:02.145 --> 00:07:06.365
Alright, so, um, uh, that's a lesson I wanted

151
00:07:06.365 --> 00:07:08.125
to make sure we got passed on since it did

152
00:07:08.125 --> 00:07:09.245
cost a friend of mine his life.

153
00:07:10.095 --> 00:07:13.935
Now, I had personal experience as an air vehicle

154
00:07:14.495 --> 00:07:15.735
operator on a cruise missile.

155
00:07:16.205 --> 00:07:18.825
So I'll tell you the way I saw it from the control

156
00:07:18.825 --> 00:07:19.905
room as the controller.

157
00:07:19.905 --> 00:07:22.105
And then let's go back and dissect what happened.

158
00:07:22.665 --> 00:07:25.645
So we, the missile launches from the carrier airplane

159
00:07:26.405 --> 00:07:27.505
and in the control room.

160
00:07:27.665 --> 00:07:30.625
I see, okay, launch Mark 0.4, mock, the vehicle

161
00:07:31.145 --> 00:07:35.285
stabilizes on altitude, turns direct to the first way point

162
00:07:35.285 --> 00:07:38.045
that it's being directed to everything's looking good,

163
00:07:38.435 --> 00:07:40.165
vehicle's operating at full power.

164
00:07:40.555 --> 00:07:44.175
Life is great. Interesting.

165
00:07:44.175 --> 00:07:46.255
As I'm running through the crosscheck, which is, you know,

166
00:07:46.255 --> 00:07:49.295
your standard, uh, speed altitude and track speed, altitude

167
00:07:49.295 --> 00:07:53.535
and track, I notice that the speed is 0.4 mock, huh?

168
00:07:53.665 --> 00:07:55.695
Seems like it's slower to accelerate than

169
00:07:55.695 --> 00:07:58.575
what I saw in the simulator, but whatever.

170
00:07:59.115 --> 00:08:01.255
And, uh, so we're still waiting until all

171
00:08:01.255 --> 00:08:04.055
of a sudden I hear chase say, wow,

172
00:08:04.325 --> 00:08:07.625
this thing's getting fast and fast, you know?

173
00:08:07.805 --> 00:08:10.345
And then right after that, the vehicle went into a pitch,

174
00:08:10.545 --> 00:08:14.465
PIO and we had a parachute recovery system in place

175
00:08:14.465 --> 00:08:16.905
of a warhead for this particular missile,

176

00:08:16.905 --> 00:08:18.065
for this first flight test.

177
00:08:18.405 --> 00:08:19.985
So I deployed the parachute, and

178
00:08:19.985 --> 00:08:22.825
because of that, we were able to recover the missile

179
00:08:23.085 --> 00:08:25.305
and find the following phenomena.

180
00:08:25.845 --> 00:08:28.215
When the vehicle came, uh, when the, uh,

181
00:08:28.215 --> 00:08:30.695
cruise missile dropped from the carrier vehicle,

182
00:08:31.325 --> 00:08:35.415
foreign objects from manufacturing drifted up

183
00:08:35.835 --> 00:08:40.175
and shorted out both electronic air transducers.

184
00:08:41.325 --> 00:08:42.745
The last input from

185
00:08:42.745 --> 00:08:45.425
that transducer into the flight control computer was

186
00:08:45.515 --> 00:08:46.545
0.4 mock.

187
00:08:47.045 --> 00:08:50.985
And the flight plan called for acceleration to 0.7 mark.

188
00:08:51.205 --> 00:08:53.385
So the vehicle was doing everything at thought,

189
00:08:53.725 --> 00:08:57.605
but it was still reacting to the last known value of that,

190
00:08:57.665 --> 00:09:01.005
uh, uh, uh, when, when that FOD took out that transducer.

191
00:09:01.885 --> 00:09:04.385
Now, why the pitch PIO, the gains

192
00:09:04.405 --> 00:09:07.185
for the missile was still set at 0.4 mark

193
00:09:07.185 --> 00:09:10.025
because mentally it thought it was at that condition.

194
00:09:10.365 --> 00:09:13.265
And when the vehicle was actually at the high dynamic

195
00:09:13.865 --> 00:09:16.545
pressure than the ve it was over controlling the vehicle.

196
00:09:16.885 --> 00:09:18.585
So it all made sense after the fact.

197
00:09:19.455 --> 00:09:23.795
So I think we have an achilles heel in this world

198
00:09:23.795 --> 00:09:26.755
of electronic flight control systems in

199
00:09:26.785 --> 00:09:29.115
that if you have a failed transducer,

200
00:09:29.775 --> 00:09:33.915
it very well may be continuing to send that last value,

201
00:09:34.145 --> 00:09:35.755
last value into that computer.

202
00:09:36.345 --> 00:09:39.795
Okay? So you might want to take that away as something to,

203

00:09:39.855 --> 00:09:40.955
uh, to think about.

204
00:09:41.455 --> 00:09:43.275
And in this case, it was a dual system.

205
00:09:43.275 --> 00:09:45.995
We actually had two transducers, but they both, uh, fod it.

206
00:09:46.415 --> 00:09:49.675
So FOD is one of our problems that, that,

207
00:09:49.675 --> 00:09:50.715
that, that is out there.

208
00:09:50.945 --> 00:09:55.215
Okay? You might also want

209
00:09:55.215 --> 00:09:57.375
to consider an independent readout.

210
00:09:58.275 --> 00:10:00.835
'cause here I am looking at the value of, of this.

211
00:10:00.895 --> 00:10:03.355
So, so-called 0.4 mock launch mock number

212
00:10:03.585 --> 00:10:06.315
because that was the only value I had on the display.

213
00:10:06.555 --> 00:10:08.435
'cause I assumed that's what the flight control computer's

214
00:10:08.435 --> 00:10:12.435
gonna react to, not realizing that it might be an error.

215
00:10:13.055 --> 00:10:15.315
So you might want to have an independent value

216
00:10:15.455 --> 00:10:17.155
of something like speed, altitude,

217
00:10:17.155 --> 00:10:18.675
dose parameters coming in,

218
00:10:18.935 --> 00:10:21.635
turned out in the display right next to me,

219
00:10:22.345 --> 00:10:23.535
which I did not use,

220
00:10:23.595 --> 00:10:27.735
but could have used, was the, uh, the range safety officer.

221
00:10:28.115 --> 00:10:30.855
And he was actually had the value of the speed

222
00:10:30.855 --> 00:10:33.735
of the vehicle based on radar information,

223
00:10:33.765 --> 00:10:35.895
independent radar information coming back.

224
00:10:36.415 --> 00:10:38.465
So I could have looked over

225
00:10:38.645 --> 00:10:40.705
and seen that as being the fact

226
00:10:40.705 --> 00:10:42.505
that the missile was actually faster than

227
00:10:42.505 --> 00:10:44.025
what I was seeing as an indication.

228
00:10:44.545 --> 00:10:47.275
Okay? So anyway, those are factors I wanted to pass on

229
00:10:48.095 --> 00:10:49.835
and, uh, and, and take it from there.

230

00:10:50.755 --> 00:10:52.965
Okay, let's move on

231
00:10:53.425 --> 00:10:57.325
to communication.

232
00:10:58.615 --> 00:11:01.445
So interesting

233
00:11:01.465 --> 00:11:03.045
and a lot of, lot, lot, lot goes

234
00:11:03.045 --> 00:11:04.165
with this first bullet here.

235
00:11:06.195 --> 00:11:07.735
So we got this large bomber.

236
00:11:08.495 --> 00:11:11.475
During the ground tests, all the communications are going

237
00:11:11.475 --> 00:11:13.075
through the upper antenna.

238
00:11:14.415 --> 00:11:17.195
So a decision is made by instrumentation.

239
00:11:17.535 --> 00:11:19.835
Hey, they don't use the lower antenna

240
00:11:20.185 --> 00:11:21.315
when they're communicating.

241
00:11:21.655 --> 00:11:23.555
So why don't we take over that position

242
00:11:23.855 --> 00:11:28.075
and put our TM antenna, we'll disconnect the UHF radio

243
00:11:28.455 --> 00:11:32.075
and we'll put in our own, uh, lower antenna, uh, our own,

244
00:11:32.175 --> 00:11:34.435
uh, telemetry antenna, okay?

245
00:11:34.615 --> 00:11:38.675
All well and good. However, when the airplane took off,

246
00:11:39.005 --> 00:11:43.195
there was an automatic system that said, Hey, it's better

247
00:11:43.195 --> 00:11:45.555
to communicate if you're airborne through the lower antenna.

248
00:11:45.895 --> 00:11:49.195
So it automatically switched the radio to the lower antenna.

249
00:11:50.195 --> 00:11:52.645
This sensor, there was no radio connected.

250
00:11:52.995 --> 00:11:55.605
This resulted in total communication loss.

251
00:11:56.145 --> 00:11:58.125
You think you can't have calm loss on

252
00:11:58.125 --> 00:11:59.245
the first flight of a vehicle.

253
00:11:59.875 --> 00:12:01.565
Well, this airplane did.

254
00:12:01.945 --> 00:12:04.085
The crew couldn't talk to Chase, they couldn't talk

255
00:12:04.085 --> 00:12:05.525
to any control agencies,

256
00:12:05.675 --> 00:12:07.245
they couldn't talk to the control room.

257

00:12:07.865 --> 00:12:09.405
The control room could hear them.

258
00:12:09.405 --> 00:12:12.365
They had a hot mic system coming down the telemetry,

259
00:12:12.945 --> 00:12:17.485
the control room could hear the pilot's, uh, verbiage as far

260
00:12:17.485 --> 00:12:19.325
as, uh, what the heck's going on up here.

261
00:12:19.705 --> 00:12:21.765
But, uh, uh, there was no, uh,

262
00:12:22.205 --> 00:12:23.445
communication going the other way.

263
00:12:24.335 --> 00:12:27.785
Finally, during the flight, the crew said, okay, um,

264
00:12:29.485 --> 00:12:31.185
uh, that was one of the things

265
00:12:31.455 --> 00:12:33.185
that they had thought about maybe.

266
00:12:34.205 --> 00:12:36.625
And they went and got into the system

267
00:12:36.725 --> 00:12:39.025
and actually was able to force the communication

268
00:12:39.045 --> 00:12:40.105
to the upper antenna.

269
00:12:40.365 --> 00:12:43.345
And from that point on, communications was reestablished.

270
00:12:44.035 --> 00:12:46.885
Alright? Now, so if you think you can't have calm loss,

271
00:12:47.345 --> 00:12:49.005
I'm telling you right now, it can.

272
00:12:49.425 --> 00:12:53.285
So you'd better have a calm plan, a calm out plan available,

273
00:12:53.415 --> 00:12:55.085
going right into your first flight.

274
00:12:55.185 --> 00:12:56.765
That's kind of the takeaway from that.

275
00:12:57.655 --> 00:12:59.075
Now, there was more to this story.

276
00:12:59.985 --> 00:13:01.695
There was two control rooms

277
00:13:01.835 --> 00:13:04.775
to control this particular bomber project.

278
00:13:05.355 --> 00:13:07.895
One was for at a manufacturing facility

279
00:13:08.345 --> 00:13:11.015
where it could do its ground, uh, taxi test,

280
00:13:11.115 --> 00:13:14.775
and then eventually, uh, uh, uh, prepare for flight.

281
00:13:15.275 --> 00:13:17.535
The other facility was 20 miles away,

282
00:13:17.835 --> 00:13:19.775
and that was gonna be the landing site

283
00:13:20.005 --> 00:13:21.015
from this first flight.

284

00:13:21.985 --> 00:13:26.825
So, um, in this, they where,

285
00:13:26.825 --> 00:13:29.905
where to do the transfer of who's in control of the vehicle,

286
00:13:30.375 --> 00:13:32.305
they said at brake release,

287
00:13:32.925 --> 00:13:36.585
we will then transfer from the manufacturing site

288
00:13:36.925 --> 00:13:39.745
to the landing site as far as the control room

289
00:13:39.745 --> 00:13:41.545
that would be in charge of the vehicle.

290
00:13:41.645 --> 00:13:44.105
So brake release was gonna be the point at which they

291
00:13:44.345 --> 00:13:45.475
transferred that control.

292
00:13:46.055 --> 00:13:49.195
Now, as the airplane is trembling down the runway,

293
00:13:50.895 --> 00:13:53.215
somebody at the second landing site starts

294
00:13:53.235 --> 00:13:54.895
to see telemetry failures

295
00:13:55.435 --> 00:13:59.555
and they call out on the radio abort, single word abort.

296
00:14:00.255 --> 00:14:03.755
Now, the ground does not hear that the guys on the ground,

297
00:14:04.135 --> 00:14:06.915
uh, in the test vehicle, they didn't hear the abort call,

298
00:14:06.915 --> 00:14:09.355
but they're kind of concentrating on engine parameters

299
00:14:09.395 --> 00:14:10.395
and a lot of things here.

300
00:14:11.045 --> 00:14:14.505
On a first flight, the chase heard

301
00:14:14.605 --> 00:14:18.825
and his response was, did somebody say abort?

302
00:14:20.545 --> 00:14:23.525
Now right after that, this airplane gets airborne

303
00:14:23.525 --> 00:14:24.845
and has total communication.

304
00:14:25.305 --> 00:14:27.005
So your airborne on your first flight,

305
00:14:27.305 --> 00:14:31.045
and the last words you heard was, did somebody say abort?

306
00:14:31.545 --> 00:14:34.265
So you see how this all turned out

307
00:14:34.265 --> 00:14:35.625
to be quite an interesting story.

308
00:14:35.875 --> 00:14:38.945
Eventually they reestablished a communication and uh,

309
00:14:38.945 --> 00:14:40.105
and got it all sorted out.

310
00:14:40.485 --> 00:14:43.145
But I think the takeaway was is to brief your chase.

311

00:14:43.615 --> 00:14:46.425
They would better be more directive if they hear abort than

312
00:14:46.445 --> 00:14:48.145
put out an abort, abort, abort call.

313
00:14:48.455 --> 00:14:51.605
Even, even though the test airplane may have been too far

314
00:14:51.605 --> 00:14:52.725
down the path at this point,

315
00:14:52.785 --> 00:14:54.805
and they may elected to continue the takeoff.

316
00:14:55.145 --> 00:14:56.565
The point is, uh, you have

317
00:14:56.565 --> 00:14:58.325
to be a little more directive than just

318
00:14:58.705 --> 00:15:00.085
did somebody say aboard?

319
00:15:00.185 --> 00:15:04.515
You know, that sort of thing. Alright, let's go to another,

320
00:15:05.255 --> 00:15:09.005
uh, first flight, uh, issue that occurred.

321
00:15:09.005 --> 00:15:10.125
It's a second bullet here.

322
00:15:10.945 --> 00:15:14.085
And I had, uh, front, front row seats on both

323
00:15:14.085 --> 00:15:16.445
of these particular, uh, scenarios.

324
00:15:16.545 --> 00:15:20.525
So let's take the first scenario and it was done correctly.

325
00:15:21.285 --> 00:15:24.385
So how did that go? First flight of a fighter aircraft.

326
00:15:24.985 --> 00:15:28.205
You know what, let's use two chase airplanes that way.

327
00:15:28.265 --> 00:15:29.245
One chase of boards, we

328
00:15:29.245 --> 00:15:30.485
got the other one right there with it.

329
00:15:30.995 --> 00:15:33.445
Okay, you know what, we've got both A UHF

330
00:15:33.445 --> 00:15:35.685
and a VHF radio in both the test aircraft

331
00:15:35.685 --> 00:15:36.685
and the chase aircraft.

332
00:15:37.025 --> 00:15:41.685
So why don't we do the inter flight communication on VHF

333
00:15:42.355 --> 00:15:44.615
and let's do the communication with the tower

334
00:15:44.635 --> 00:15:46.735
and the control agency on UHF.

335
00:15:46.995 --> 00:15:50.975
And that way we don't clutter up the, the A RTC, I mean the,

336
00:15:50.975 --> 00:15:53.855
the, the en route frequency with our talks

337
00:15:53.945 --> 00:15:55.655
among our ourselves as far as

338

00:15:55.655 --> 00:15:56.935
how it's going, as far as the flight.

339
00:15:57.165 --> 00:15:59.255
Well, and good. Now this is the first

340
00:15:59.255 --> 00:16:00.295
flight of this fighter.

341
00:16:00.935 --> 00:16:03.835
So you know what, why don't we do opposite direction from

342
00:16:03.895 --> 00:16:04.915
normal traffic?

343
00:16:05.655 --> 00:16:09.225
Because if we do this, if we have to abort,

344
00:16:10.225 --> 00:16:13.325
we can have a nice long lake bed to roll out on.

345
00:16:13.715 --> 00:16:16.805
Okay? So let's take an opposite direction, take off

346
00:16:16.805 --> 00:16:18.005
to have the lake bed available.

347
00:16:18.845 --> 00:16:20.375
Okay, so far, all good.

348
00:16:21.185 --> 00:16:24.855
Uh, because there's a lot of moving parts to this thing

349
00:16:24.925 --> 00:16:27.455
with the chase that's gonna be taken off, coming back

350
00:16:27.455 --> 00:16:28.895
around doing an airborne pickup.

351
00:16:29.115 --> 00:16:30.535
All this is opposite direction.

352
00:16:31.195 --> 00:16:33.735
You know what, let's take a pilot who's assigned

353
00:16:33.735 --> 00:16:35.415
to the program but doesn't have a role

354
00:16:35.475 --> 00:16:36.655
on this particular day.

355
00:16:37.105 --> 00:16:38.735
Let's put him in the control tower.

356
00:16:39.445 --> 00:16:41.175
That way he can help the air route

357
00:16:41.235 --> 00:16:43.135
or the, the control tower sort out.

358
00:16:43.555 --> 00:16:45.655
Uh, what's actually happening on this sort

359
00:16:45.655 --> 00:16:47.615
of thing turned out to be a good decision

360
00:16:47.805 --> 00:16:52.375
because in the control tower, while the test aircraft

361
00:16:52.395 --> 00:16:54.615
and the two chasers are waiting, uh,

362
00:16:54.615 --> 00:16:58.495
getting everything finalized, there's a B 52 that wants

363
00:16:58.495 --> 00:17:00.735
to take off normal direction of traffic.

364
00:17:01.825 --> 00:17:05.365
And the pilot was able to convince the tower operator hold

365

00:17:05.365 --> 00:17:08.125
that buff because that's going to cause a lot

366
00:17:08.125 --> 00:17:09.605
of wake turbulence in the air.

367
00:17:09.905 --> 00:17:11.645
And I don't want this brand new fighter

368
00:17:11.645 --> 00:17:13.685
with a brand new flight control system to have

369
00:17:13.685 --> 00:17:15.205
to penetrate that wake vortex.

370
00:17:15.465 --> 00:17:19.175
So please hold the buff, hold the buff. And they did.

371
00:17:19.835 --> 00:17:24.085
And the other, the, uh, the other uh, test mission got, uh,

372
00:17:24.645 --> 00:17:26.565
approved for takeoff, airborne pickup went

373
00:17:26.565 --> 00:17:27.725
out, mission went fine.

374
00:17:28.115 --> 00:17:29.765
That was how to do things right.

375
00:17:30.565 --> 00:17:33.425
Now let's go two months later,

376
00:17:34.315 --> 00:17:36.405
same airplane, different engine.

377
00:17:37.075 --> 00:17:38.535
So it's a different engine contractor.

378
00:17:38.715 --> 00:17:42.295
So it really is a first flight, uh, of this, uh,

379
00:17:42.295 --> 00:17:44.975
number two prototype, uh, fighter airplane.

380
00:17:45.485 --> 00:17:47.975
Alright, let's do everything the same.

381
00:17:48.395 --> 00:17:52.725
Two chases, VHF inter flight, UHF or air traffic control.

382
00:17:53.035 --> 00:17:54.245
That all worked really good,

383
00:17:54.785 --> 00:17:58.165
but they did not put a pilot in the control tower.

384
00:17:59.915 --> 00:18:02.125
Just, uh, either oversight or for whatever.

385
00:18:02.905 --> 00:18:06.955
Uh, now, uh, the first test airplane

386
00:18:06.955 --> 00:18:08.595
after that first flight went back

387
00:18:08.595 --> 00:18:10.635
to doing normal runway operations.

388
00:18:11.095 --> 00:18:12.155
But here we are again

389
00:18:12.155 --> 00:18:14.275
with our opposite direction takeoff scenario.

390
00:18:14.885 --> 00:18:17.655
Alright? No, there's no pilot now in the control tower

391
00:18:17.995 --> 00:18:19.375
to help a RTC.

392

00:18:19.795 --> 00:18:22.685
So what happens? They get clearance for takeoff,

393
00:18:23.245 --> 00:18:27.265
the chase takeoff, they do a turnout of traffic, ask tower,

394
00:18:27.445 --> 00:18:28.985
clears them on for takeoff.

395
00:18:29.335 --> 00:18:32.465
There's a, let's just say a T 38 out in the

396
00:18:32.465 --> 00:18:33.865
area coming back.

397
00:18:34.285 --> 00:18:37.065
And they call East Lake shore straight in for touch

398
00:18:37.065 --> 00:18:41.085
and go tower says, hold your position out there.

399
00:18:41.265 --> 00:18:43.785
We have an opposite direction takeoff. Okay?

400
00:18:44.915 --> 00:18:47.415
The T 38 does the, uh, the, the little circle

401
00:18:48.595 --> 00:18:52.565
tower sees the two chase airplanes do the takeoff

402
00:18:52.585 --> 00:18:53.805
and the turnout of traffic.

403
00:18:54.225 --> 00:18:55.885
Now they're gonna do an airborne pickup,

404
00:18:56.345 --> 00:19:00.165
but tower misinterprets that as those are the two airplane

405
00:19:00.165 --> 00:19:01.525
for the opposite direction takeoff.

406
00:19:01.525 --> 00:19:02.565
And they've departed the pattern.

407
00:19:03.105 --> 00:19:05.325
He tells the T 38, okay,

408
00:19:05.325 --> 00:19:08.765
your opposite direction takeoff has, has cleared.

409
00:19:09.345 --> 00:19:11.445
You are cleared to come in for your touch and go.

410
00:19:12.225 --> 00:19:16.035
Meanwhile, while the T 38 is coming in, the chase have come

411
00:19:16.035 --> 00:19:19.475
around on VHF, they're talking about the 10 seconds,

412
00:19:19.585 --> 00:19:22.835
five seconds release brakes now on VHF,

413
00:19:23.575 --> 00:19:24.955
not nothing on UHF.

414
00:19:25.575 --> 00:19:29.355
And sure enough, as the test airplane is now about

415
00:19:29.355 --> 00:19:30.795
to rotate, he looks up

416
00:19:30.795 --> 00:19:34.155
and sees a landing light of a T 38 on very short final,

417
00:19:35.305 --> 00:19:37.275
whoa, beat to beat first flight.

418
00:19:37.335 --> 00:19:39.035
Are you kidding me? So anyway,

419

00:19:39.035 --> 00:19:40.315
the T 38 does a pretty

420
00:19:40.315 --> 00:19:41.955
serious maneuver to get out of the way.

421
00:19:42.055 --> 00:19:44.195
The chases go over the top, the, uh,

422
00:19:44.455 --> 00:19:46.155
and so no, it's, it's a near miss.

423
00:19:46.345 --> 00:19:47.715
It's not a midair, okay?

424
00:19:48.375 --> 00:19:51.915
But you see how the communication plan ended up

425
00:19:51.945 --> 00:19:53.115
with a conflict here.

426
00:19:53.975 --> 00:19:56.955
Uh, the reason I'm very familiar with this is

427
00:19:56.955 --> 00:20:00.515
because this particular day, uh, I wasn't needed as a part

428
00:20:00.515 --> 00:20:05.285
of the, the fighter part of this thing being a reserve,

429
00:20:05.395 --> 00:20:07.485
working at the Air Force Test Pilot school.

430
00:20:07.645 --> 00:20:09.645
I said, Hey, I called him up, said, Hey,

431
00:20:09.705 --> 00:20:12.205
do you need me today for being an instructor and a 38?

432
00:20:12.285 --> 00:20:14.085
I said, yeah, come on down, we got a mission for you.

433
00:20:14.425 --> 00:20:16.085
So I was in the T 38

434
00:20:16.625 --> 00:20:17.845
as the opposite direction

435
00:20:17.845 --> 00:20:19.245
takeoff was coming the other direction.

436
00:20:19.245 --> 00:20:20.885
That's why I said I had a front row seat

437
00:20:20.885 --> 00:20:22.005
on this sort of thing, you know?

438
00:20:22.345 --> 00:20:26.525
And my first thoughts were, uh, as I gra as, as a front,

439
00:20:26.545 --> 00:20:29.125
as the student in the front seat says to me, sir,

440
00:20:29.195 --> 00:20:30.565
there's an airplane on the runway.

441
00:20:31.025 --> 00:20:34.045
And I look out and I, I look at the landing area

442
00:20:34.045 --> 00:20:35.245
and I don't, I say, I don't see anybody.

443
00:20:35.505 --> 00:20:38.085
No, it's on takeoff. I look, holy cow.

444
00:20:38.145 --> 00:20:40.765
You know, here he comes. You know, so akaka maneuver

445
00:20:40.765 --> 00:20:42.885
to get out of the way and all that sort of thing, you know?

446

00:20:43.425 --> 00:20:45.725
So, uh, I can only imagine

447
00:20:45.795 --> 00:20:48.205
what would've happened if there would've been a midair.

448
00:20:49.355 --> 00:20:53.815
The news would've said, irate test pilot didn't get the fly.

449
00:20:54.315 --> 00:20:56.855
New fighter. Therefore he smashed into everybody.

450
00:20:58.915 --> 00:21:00.175
Anyway, so there we go.

451
00:21:01.015 --> 00:21:04.725
Um, there's one other little story I wanna add about

452
00:21:05.045 --> 00:21:06.245
communication, and then again,

453
00:21:06.325 --> 00:21:08.165
this is just kind of a free no charge.

454
00:21:08.665 --> 00:21:10.805
But the first time that I heard this happen,

455
00:21:10.925 --> 00:21:12.005
I thought, huh, that's pretty cool.

456
00:21:12.425 --> 00:21:14.605
So I'm an, uh, a new hire into the company

457
00:21:14.665 --> 00:21:15.965
and they're flying this, uh,

458
00:21:15.965 --> 00:21:19.125
first flight on this highly modified fighter type aircraft.

459
00:21:19.665 --> 00:21:23.845
And, uh, and sure enough, uh, during the flight, uh, uh,

460
00:21:23.855 --> 00:21:26.765
after takeoff, they're supposed to be two fuel systems.

461
00:21:26.915 --> 00:21:28.165
Each one had a fuel pump.

462
00:21:28.165 --> 00:21:29.805
They're feeding into a single engine.

463
00:21:30.145 --> 00:21:32.685
But one of the fuel pumps apparently wasn't working right?

464
00:21:32.985 --> 00:21:35.525
And so we were getting a tank discrepancy

465
00:21:35.535 --> 00:21:36.605
among the two tanks.

466
00:21:36.985 --> 00:21:41.285
So after takeoff out a burner and they see this discrepancy,

467
00:21:41.305 --> 00:21:43.725
and here was what was cool, the control room,

468
00:21:44.455 --> 00:21:46.545
everybody's listening in on the test frequency.

469
00:21:46.545 --> 00:21:49.785
The control room says, uh, uh, you know, tiger such

470
00:21:49.785 --> 00:21:51.625
and such, um, say your fuel.

471
00:21:52.085 --> 00:21:54.025
And he comes back with the two tank reading.

472
00:21:54.325 --> 00:21:56.705
One tank was, you know, a lot of fuel.

473

00:21:56.725 --> 00:21:59.625
The other tank was a lot lower than what was predicted, huh?

474
00:22:00.005 --> 00:22:02.385
And the control room says, yeah, that's what we see.

475
00:22:02.915 --> 00:22:04.265
Let's go to item 40.

476
00:22:05.285 --> 00:22:10.065
What was item 40 RTB and land. It was just as cool as heck.

477
00:22:10.155 --> 00:22:14.065
There was no subsequent large discussion on test frequency.

478
00:22:14.245 --> 00:22:15.825
It was just, Hey, let's go to item 40,

479
00:22:16.135 --> 00:22:17.665
item 40, RTB and land.

480
00:22:17.685 --> 00:22:20.185
And the test father said, oh, Roger, go to item 40.

481
00:22:20.485 --> 00:22:22.305
And that was just, I thought that was pretty cool.

482
00:22:22.445 --> 00:22:27.325
Anyway, kept a lot of press outta having to worry about

483
00:22:27.355 --> 00:22:28.645
what might have happened on that.

484
00:22:29.525 --> 00:22:30.015
Alright,

485
00:22:34.335 --> 00:22:38.635
telemetry, we're all promised that we've got

486
00:22:39.155 --> 00:22:40.795
thousands of parameters of telemetry coming

487
00:22:40.795 --> 00:22:42.035
down into the control room.

488
00:22:44.455 --> 00:22:47.635
Got over 30 engineers monitoring their various systems.

489
00:22:48.205 --> 00:22:50.875
We're here to help if anything goes wrong, Mr.

490
00:22:50.905 --> 00:22:52.555
Test Pilot, we are here to help you.

491
00:22:52.615 --> 00:22:54.795
We, we, you know, we've got all this information,

492
00:22:55.735 --> 00:22:57.995
but what if you don't have all that?

493
00:22:58.305 --> 00:23:00.755
What if you have a TM failure? Can it happen?

494
00:23:01.755 --> 00:23:06.745
Let's go to a large prototype, one of a kind airplane.

495
00:23:07.725 --> 00:23:11.985
And during the, uh, the, the, the test site

496
00:23:13.165 --> 00:23:17.455
said, let's keep the wattage on the telemetry to a low level

497
00:23:17.675 --> 00:23:20.055
for any of your ground workup operations.

498
00:23:21.045 --> 00:23:23.695
However, we understand that when you get airborne,

499
00:23:23.695 --> 00:23:26.175
you need a higher wattage for your telemetry.

500

00:23:26.905 --> 00:23:30.355
So the decision was made,

501
00:23:30.565 --> 00:23:33.155
let's use the weight off wheels switch

502
00:23:33.455 --> 00:23:35.795
as the point at which we transfer from the low

503
00:23:35.795 --> 00:23:37.195
wattage to the high wattage.

504
00:23:37.575 --> 00:23:40.195
Now, the flight test engineer did confess that he said,

505
00:23:40.215 --> 00:23:43.875
we did not adequately test that transfer system

506
00:23:44.405 --> 00:23:45.445
prior to the flight.

507
00:23:45.745 --> 00:23:47.285
He says, I'll take the hit on that one.

508
00:23:47.285 --> 00:23:51.605
We should have, but be that as asset may, uh, uh, right

509
00:23:51.605 --> 00:23:56.165
after takeoff, when the weight off wheels switch was sensed,

510
00:23:56.715 --> 00:23:59.015
the transmitter trans, uh, converted

511
00:23:59.015 --> 00:24:00.455
to the high wattage transmitter

512
00:24:00.515 --> 00:24:03.015
and it shorted out against the aircraft structure.

513
00:24:04.185 --> 00:24:07.885
So now no TM for that first flight. So it can happen.

514
00:24:07.895 --> 00:24:09.085
Total loss of tm.

515
00:24:09.725 --> 00:24:12.825
Uh, so you have to be ready and prepared for that scenario.

516
00:24:13.775 --> 00:24:16.865
Um, the chase pilot had implied later

517
00:24:16.865 --> 00:24:18.225
that when the airplane took off,

518
00:24:18.225 --> 00:24:21.385
the test pilot took it up in a very high angle climb,

519
00:24:21.835 --> 00:24:23.145
which he wasn't expected.

520
00:24:23.205 --> 00:24:25.025
He expected it to be like a normal climb.

521
00:24:25.325 --> 00:24:27.545
So later they asked the, uh, the test piloter,

522
00:24:27.545 --> 00:24:29.705
why did you go out on such a high angle climb?

523
00:24:30.205 --> 00:24:33.505
He said, I had so much confidence in this airplane.

524
00:24:33.825 --> 00:24:37.025
I was trying to get to ejection altitude as fast as I could.

525
00:24:38.715 --> 00:24:40.625
Which I thought that was a pretty cool statement.

526
00:24:40.885 --> 00:24:44.985
Anyway, alright, so, uh, loss of tm. Can it happen? Yes.

527

00:24:45.325 --> 00:24:48.505
Now lemme talk about a UAV in which, uh,

528
00:24:48.945 --> 00:24:52.935
I will say we did something right and we had a TM failure,

529
00:24:53.155 --> 00:24:54.575
but because we had a TM failure,

530
00:24:54.675 --> 00:24:56.175
we still had a successful mission.

531
00:24:56.675 --> 00:24:58.485
So what was this?

532
00:24:58.985 --> 00:25:03.485
So I'm a big believer in UAVs of doing, uh,

533
00:25:04.125 --> 00:25:08.005
configuring a manned aircraft with the VMS, the MMS,

534
00:25:08.065 --> 00:25:11.595
the antennas, and putting it in a manned aircraft.

535
00:25:11.775 --> 00:25:13.355
We call that a surrogate aircraft

536
00:25:13.995 --> 00:25:16.915
'cause it's got all the components of the UAV in it,

537
00:25:17.335 --> 00:25:19.355
but it's being flown by a pilot.

538
00:25:19.925 --> 00:25:23.225
So this allows us to check the telemetry,

539
00:25:23.315 --> 00:25:26.305
check the uplink downlink commands that are gonna be going

540
00:25:26.305 --> 00:25:29.105
to the, and making sure that we have any areas

541
00:25:29.115 --> 00:25:31.385
where there might be a null location,

542
00:25:31.535 --> 00:25:32.945
whether it be on the airfield

543
00:25:32.945 --> 00:25:34.985
or whether it be on the planned flight profile,

544
00:25:35.245 --> 00:25:37.865
we can check out ahead of time with the surrogate aircraft.

545
00:25:38.175 --> 00:25:42.345
Alright, so on this particular vehicle at this particular

546
00:25:42.415 --> 00:25:45.145
test site, we had a case

547
00:25:45.155 --> 00:25:47.945
where the surrogate showed right

548
00:25:47.945 --> 00:25:51.985
after takeoff on the planned runway, there was a TM failure,

549
00:25:52.765 --> 00:25:57.145
but about halfway down the runway, the TM would come back.

550
00:25:57.745 --> 00:26:00.725
And it happened every time we used the surrogate to do this.

551
00:26:01.655 --> 00:26:03.915
We went to frequency management on the airfield

552
00:26:03.915 --> 00:26:05.475
and said, Hey, you've got some interference.

553
00:26:05.865 --> 00:26:08.395
They, they looked and tried and couldn't find anything.

554

00:26:08.975 --> 00:26:11.115
So what would we do? And we said, you know what?

555
00:26:11.625 --> 00:26:13.955
Okay, when we do the first flight of this UAV,

556
00:26:14.895 --> 00:26:16.555
if we have a TM failure

557
00:26:16.645 --> 00:26:20.035
after break release, let's keep trumbling down the runway.

558
00:26:20.165 --> 00:26:22.275
Let's not issue a quick, let's not be too quick

559
00:26:22.275 --> 00:26:23.435
with our abort command

560
00:26:23.735 --> 00:26:25.515
and let's see if we can get that TM back.

561
00:26:25.975 --> 00:26:28.435
And sure enough, when we did the UAV,

562
00:26:28.855 --> 00:26:31.355
it was exactly like the surrogate TM failure.

563
00:26:32.365 --> 00:26:34.495
Partway down the runway, the TM came back,

564
00:26:34.755 --> 00:26:36.415
we ended up with a successful flight.

565
00:26:36.895 --> 00:26:39.395
So I'm a big believer in surveying the airfield

566
00:26:39.415 --> 00:26:40.555
and surveying your plan.

567
00:26:40.555 --> 00:26:42.115
First flight with the surrogate.

568
00:26:42.705 --> 00:26:45.925
First time we used a surrogate on a several

569
00:26:45.935 --> 00:26:47.125
years before a program.

570
00:26:48.025 --> 00:26:51.125
The government told us as the contractor, we said, Hey,

571
00:26:51.125 --> 00:26:52.645
we want to do this with a surrogate.

572
00:26:52.785 --> 00:26:55.405
And they said, well, that's up to you. That's on you.

573
00:26:55.425 --> 00:26:56.645
We don't think it's necessary.

574
00:26:57.225 --> 00:27:00.845
And then after, uh, they saw the value of it,

575
00:27:01.115 --> 00:27:03.725
they wouldn't let us fly the UAV

576
00:27:04.095 --> 00:27:05.845
until we had done a surrogate.

577
00:27:05.915 --> 00:27:09.445
They did an absolute 180 in their attitude toward using

578
00:27:09.455 --> 00:27:11.965
surrogates prior to the first flights of UAVs.

579
00:27:12.505 --> 00:27:13.755
Okay, so there you go.

580
00:27:13.775 --> 00:27:15.795
That's a little bit of work on the tm.

581

00:27:16.925 --> 00:27:21.665
Uh, now as far as parameters coming down,

582
00:27:21.665 --> 00:27:24.705
the tm, one thing I learned on one of the UAV projects is,

583
00:27:24.705 --> 00:27:28.625
uh, we have an uplink down link, which uses a UHF, uh, link.

584
00:27:29.275 --> 00:27:33.215
And there's generally some excess bandwidth available on

585
00:27:33.215 --> 00:27:36.895
that UHF that can be actually certain key parameters.

586
00:27:36.965 --> 00:27:40.215
Certain systems or certain keys can be brought down on the

587
00:27:40.255 --> 00:27:43.975
UHF link and displayed in the control room on a backup.

588
00:27:44.515 --> 00:27:46.415
So you're just, I throw that out there

589
00:27:46.475 --> 00:27:50.095
as something we've learned is the uplink, uh, the uplink,

590
00:27:50.155 --> 00:27:52.295
uh, frequency can sometimes be used

591
00:27:52.355 --> 00:27:54.575
to back up the TM parameters.

592
00:27:54.635 --> 00:27:55.815
You don't have a lot of bandwidth,

593
00:27:55.815 --> 00:27:57.855
but at least some of the key parameters can be on it.

594
00:28:03.575 --> 00:28:06.745
Okay? Um, let's take a brand new fighter.

595
00:28:07.335 --> 00:28:08.945
It's actually a highly modified one,

596
00:28:08.945 --> 00:28:11.025
but it was still a new fighter.

597
00:28:11.735 --> 00:28:15.715
And on takeoff, uh, the plan was to leave the gear down

598
00:28:16.175 --> 00:28:17.915
for the, at least the first part of the mission.

599
00:28:18.215 --> 00:28:19.875
Uh, for this first flight of this one.

600
00:28:20.175 --> 00:28:23.045
Not, not uncommon, but uh, right

601
00:28:23.045 --> 00:28:25.745
after takeoff, the chase come in

602
00:28:25.745 --> 00:28:27.865
and said, Hey, your nose gear is cocked.

603
00:28:28.415 --> 00:28:31.305
What do you mean? It's, rather than, than being in line,

604
00:28:31.415 --> 00:28:32.705
it's cocked off to the side.

605
00:28:33.165 --> 00:28:36.425
Really? Wow. Okay, so what to do?

606
00:28:36.895 --> 00:28:38.665
Well, of course they tried different,

607
00:28:38.685 --> 00:28:42.465
the test pilot tried different zero zero g put in rudder,

608

00:28:42.685 --> 00:28:44.025
try different roll maneuvers.

609
00:28:44.415 --> 00:28:47.385
Nothing caused that nose gear to straighten up.

610
00:28:48.005 --> 00:28:50.945
Uh, I don't know whether they thought about this method

611
00:28:51.165 --> 00:28:52.945
of just flying low over a car

612
00:28:52.945 --> 00:28:54.785
and having him straighten the nose gear,

613
00:28:54.965 --> 00:28:57.705
but that actually did occur apparently on, on, on,

614
00:28:57.705 --> 00:29:02.065
that's not just a a, an AI that really did happen

615
00:29:02.065 --> 00:29:04.905
that they had a guy reach up, try to bring the gear down on

616
00:29:04.905 --> 00:29:06.585
that one Anyway, uh,

617
00:29:06.605 --> 00:29:08.225
and I don't know what the results of that were.

618
00:29:08.375 --> 00:29:11.145
However, um, in this case, uh,

619
00:29:11.205 --> 00:29:13.865
the control room finally said, well, we've, we don't,

620
00:29:13.865 --> 00:29:14.945
we're out of ideas here.

621
00:29:15.525 --> 00:29:17.425
Um, it's up to you,

622
00:29:17.485 --> 00:29:21.175
but, uh, if you want, you're cleared to bail out the testify

623
00:29:21.175 --> 00:29:23.775
that said, wait a minute, that's pretty serious.

624
00:29:24.435 --> 00:29:25.855
Uh, said, let me try something.

625
00:29:26.035 --> 00:29:27.735
Let me just go ahead, come down back,

626
00:29:27.765 --> 00:29:30.055
I'll land a little bit fast and I'll keep the nose up

627
00:29:30.315 --> 00:29:33.135
and let me just go ahead and kiss that nose gear down

628
00:29:33.135 --> 00:29:35.255
and immediately be ready to get back airborne.

629
00:29:35.255 --> 00:29:37.855
And let's see if it affects the nose gear. He did.

630
00:29:38.195 --> 00:29:40.215
Yes, it realigned the nose gear straight

631
00:29:40.635 --> 00:29:42.685
and then he is able to come around for a normal landing.

632
00:29:43.165 --> 00:29:44.745
So I just passed it on that.

633
00:29:44.765 --> 00:29:48.025
Uh, that was a, a, a rather interesting scenario

634
00:29:48.485 --> 00:29:50.785
and I thought it was kind of a attaboy on the chase

635

00:29:50.925 --> 00:29:53.545
to have picked up on the fact that, uh, that they had

636
00:29:53.545 --> 00:29:54.825
that particular, uh, issue.

637
00:29:54.885 --> 00:29:58.545
So the chase, when you do brief your chases, uh,

638
00:29:59.425 --> 00:30:01.605
you wanna make sure that they understand

639
00:30:01.635 --> 00:30:03.565
that there can be configuration issues

640
00:30:03.565 --> 00:30:05.005
that may be a little outta line.

641
00:30:05.265 --> 00:30:08.515
And so make sure he takes a good look at that. Okay?

642
00:30:08.515 --> 00:30:09.715
We did have another scenario

643
00:30:09.725 --> 00:30:13.675
where we had one fighter had a main gear failure to retract.

644
00:30:14.465 --> 00:30:17.405
So they put the gear handle down and they got three green.

645
00:30:18.305 --> 00:30:19.925
And they did something kind of smart.

646
00:30:20.715 --> 00:30:23.285
They said, you know what, if this happens

647
00:30:24.365 --> 00:30:25.585
and we get three down

648
00:30:26.055 --> 00:30:28.355
and everybody in the control room says go,

649
00:30:29.165 --> 00:30:33.115
let's have an alternate card pre-approved so

650
00:30:33.115 --> 00:30:35.605
that we can clear some data points

651
00:30:35.605 --> 00:30:38.605
with the landing gear down and save the mission

652
00:30:39.145 --> 00:30:40.565
before we come back and land.

653
00:30:41.265 --> 00:30:44.945
And so they had a pre-approved card for that event

654
00:30:45.295 --> 00:30:47.825
that the gear didn't come all the way up back down.

655
00:30:47.965 --> 00:30:49.945
And so I just throw that out there.

656
00:30:50.685 --> 00:30:52.385
One thing that I was taught early on,

657
00:30:52.645 --> 00:30:54.505
and especially in the test business

658
00:30:54.525 --> 00:30:57.105
and uh, we cannot emphasize too much

659
00:30:57.765 --> 00:31:00.065
the first time you're gonna do a gear retraction,

660
00:31:00.685 --> 00:31:02.265
do it early in the flight

661
00:31:03.055 --> 00:31:05.185
because cycle that gear early in the flight.

662

00:31:05.205 --> 00:31:07.385
And this applies to functional check flights too.

663
00:31:07.845 --> 00:31:12.205
You know, uh, that gives you time, that gives you fuel to,

664
00:31:12.265 --> 00:31:13.925
uh, to, to, to solve the problem.

665
00:31:14.225 --> 00:31:15.925
So if you're gonna cycle a gear,

666
00:31:16.345 --> 00:31:18.445
do it early in the flight is a

667
00:31:18.605 --> 00:31:19.845
takeaway, I would say from that.

668
00:31:21.155 --> 00:31:23.335
Um, one other anomaly that occurred,

669
00:31:23.455 --> 00:31:25.335
I don't have a bullet on the slide for it,

670
00:31:25.995 --> 00:31:30.725
but, uh, we had an air launch cruise missile competition

671
00:31:30.825 --> 00:31:32.775
at Edwards, and I was one

672
00:31:32.775 --> 00:31:35.295
of the chase pilots in the F four for this.

673
00:31:36.095 --> 00:31:39.235
And so let me tell you about this particular event

674
00:31:39.235 --> 00:31:40.675
that occurred on the first flight

675
00:31:40.675 --> 00:31:42.515
of this air launch cruise missile

676
00:31:42.695 --> 00:31:43.995
for this particular company.

677
00:31:44.905 --> 00:31:46.085
The, uh, missile that, uh,

678
00:31:46.085 --> 00:31:48.845
the other company had already had a successful first flight

679
00:31:48.865 --> 00:31:50.085
on their missile.

680
00:31:50.345 --> 00:31:52.685
So now this company was gonna have their flight,

681
00:31:52.815 --> 00:31:54.045
their their first flight.

682
00:31:54.665 --> 00:31:57.485
So the missile launched from the carrier aircraft

683
00:31:58.145 --> 00:32:00.325
and I was number two, chase the number one.

684
00:32:00.325 --> 00:32:02.445
Chase then watched the missile come down,

685
00:32:02.445 --> 00:32:05.645
watched it stabilize, and then he handed it over to me

686
00:32:05.665 --> 00:32:06.765
and said, Hey, you've got it.

687
00:32:06.765 --> 00:32:08.485
Now I gotta go to the tanker and get gas.

688
00:32:08.645 --> 00:32:12.765
I said, okay, I got it. So now early in the profile,

689

00:32:13.355 --> 00:32:16.125
they take this cruise missile down to low altitude

690
00:32:16.225 --> 00:32:19.445
and start doing terrain following with the missile.

691
00:32:19.945 --> 00:32:22.165
And pretty soon I'm noted that, huh,

692
00:32:22.275 --> 00:32:25.795
this thing is getting slower and it's getting a little lower

693
00:32:26.495 --> 00:32:28.435
and it's getting slower and lower, huh?

694
00:32:28.535 --> 00:32:30.515
So I called to the control room, I said, Hey, uh,

695
00:32:30.545 --> 00:32:32.675
this item's getting slower and, and getting low.

696
00:32:32.855 --> 00:32:35.875
And they said, standby. Okay.

697
00:32:36.455 --> 00:32:38.115
Um, we had the ability

698
00:32:38.135 --> 00:32:41.565
to put an up command into the missile, uh, if, if,

699
00:32:41.565 --> 00:32:44.325
if we needed to from the chase aircraft,

700
00:32:45.045 --> 00:32:47.945
but all the decision making is in the control room.

701
00:32:48.405 --> 00:32:50.345
And when you're actually in the chase airplane,

702
00:32:50.345 --> 00:32:51.625
you're kind of out of the loop.

703
00:32:51.625 --> 00:32:53.145
You've just got a communication link,

704
00:32:53.165 --> 00:32:55.465
but you don't really know what's going on with the missile.

705
00:32:56.045 --> 00:32:59.235
So pretty soon the missile was getting pretty slow and

706
00:32:59.235 --> 00:33:00.995
or low and I couldn't stand it anymore.

707
00:33:01.055 --> 00:33:03.195
So I went ahead and said, let's give it an up command.

708
00:33:03.575 --> 00:33:05.435
And we did and it didn't do any good

709
00:33:05.535 --> 00:33:07.075
and the thing went ahead and hit the ground.

710
00:33:07.095 --> 00:33:09.875
And so this multimillion dollar cruise missile first flight

711
00:33:10.285 --> 00:33:12.195
we're orbiting this smoking hole.

712
00:33:13.125 --> 00:33:15.665
So why did the control room say standby?

713
00:33:16.085 --> 00:33:17.225
And, and what was the issue?

714
00:33:17.285 --> 00:33:20.305
It turned out because the vehicle was heavy

715
00:33:21.385 --> 00:33:24.065
and they immediately went right

716

00:33:24.065 --> 00:33:25.585
after launch into the low

717
00:33:25.825 --> 00:33:27.425
altitude maneuvering of this vehicle.

718
00:33:28.165 --> 00:33:29.905
It got behind the power curve.

719
00:33:30.315 --> 00:33:32.295
So in the control room, the

720
00:33:34.005 --> 00:33:37.435
propulsion people were happy because they see full power.

721
00:33:38.285 --> 00:33:41.675
Arrow is happy because they see a stable a OA,

722
00:33:42.265 --> 00:33:44.125
but the a OA is on the limiter,

723
00:33:44.385 --> 00:33:48.125
but it's a stable a OA, we've got full power stable, a OA,

724
00:33:48.545 --> 00:33:50.245
but it was behind the power curve.

725
00:33:50.695 --> 00:33:53.315
So it just got slower and slower and slower.

726
00:33:53.735 --> 00:33:54.985
What was the takeaway?

727
00:33:55.595 --> 00:33:57.985
Don't do a lot of heavy maneuvering

728
00:33:58.415 --> 00:34:02.425
with your airplane when you got a full load of fuel on board

729
00:34:02.425 --> 00:34:03.905
and you got a heavy, for example,

730
00:34:03.925 --> 00:34:05.345
in this case a heavy missile.

731
00:34:05.525 --> 00:34:08.385
And right away they went down to do the terrain following.

732
00:34:08.605 --> 00:34:10.425
Not smart, they should have been up

733
00:34:10.425 --> 00:34:12.065
and away a little bit doing some testing,

734
00:34:12.615 --> 00:34:14.545
burn some fuel down, get that weight down,

735
00:34:14.545 --> 00:34:17.705
especially on the first flight when you're not, may

736
00:34:17.705 --> 00:34:19.225
or may not have confidence in your

737
00:34:19.225 --> 00:34:20.585
performance of that vehicle, right?

738
00:34:20.925 --> 00:34:23.465
Anyway, just thought I would add that as a bullet that,

739
00:34:23.465 --> 00:34:24.545
uh, didn't make it.

740
00:34:24.545 --> 00:34:26.345
But, uh, i, I think it's worthy to, uh,

741
00:34:26.365 --> 00:34:27.825
to bring up that particular scenario.

742
00:34:29.855 --> 00:34:32.585
Alright, let's go to, um,

743

00:34:34.375 --> 00:34:36.915
an interesting, interesting thing that happened on

744
00:34:36.945 --> 00:34:38.075
what I think is one of the most

745
00:34:38.075 --> 00:34:39.435
beautiful airplanes ever built.

746
00:34:40.545 --> 00:34:42.885
So let's call it a large bomber.

747
00:34:43.505 --> 00:34:46.845
And the way this system was designed is when you put the

748
00:34:46.845 --> 00:34:49.475
gear handle up, they wanted the wheels

749
00:34:49.475 --> 00:34:53.715
to be stopped rotating before the wheels come into the gear.

750
00:34:53.745 --> 00:34:57.735
Well, so when you put the gear handle up, it applied,

751
00:34:57.735 --> 00:35:00.615
automatically applied braking to the wheels,

752
00:35:00.935 --> 00:35:04.535
brakes were applied, and that way it was assured

753
00:35:04.535 --> 00:35:05.855
that the wheels would be stopped

754
00:35:06.115 --> 00:35:08.015
before the landing gear came all the way up.

755
00:35:09.365 --> 00:35:13.345
Um, that the problem was that

756
00:35:13.885 --> 00:35:16.025
the gear did not come all the way up.

757
00:35:16.175 --> 00:35:18.105
They had an unsafe gear for up,

758
00:35:18.445 --> 00:35:20.065
so they put the gear handle down,

759
00:35:20.575 --> 00:35:22.345
they got a good three green indication.

760
00:35:22.555 --> 00:35:24.105
Chase says everything looks good.

761
00:35:24.525 --> 00:35:26.705
So they said, okay, let's bring it back to land.

762
00:35:27.525 --> 00:35:29.135
What they did not know is

763
00:35:29.135 --> 00:35:32.335
that if the system did not complete the cycle,

764
00:35:32.995 --> 00:35:34.295
the brakes wouldn't release

765
00:35:34.465 --> 00:35:37.095
until the gear was actually all the way up in the well

766
00:35:37.425 --> 00:35:39.685
and locked and then the brakes would release

767
00:35:40.265 --> 00:35:42.435
because it did not complete the cycle.

768
00:35:43.135 --> 00:35:46.725
Now we had brakes being applied to the wheels all the time.

769
00:35:47.475 --> 00:35:50.215
And this is, uh, what happens if you land

770

00:35:50.215 --> 00:35:54.145
with your brakes on, on your big bomber airplane,

771
00:35:58.105 --> 00:36:00.945
probably we'll have some tires blow, what do you think?

772
00:36:02.395 --> 00:36:05.495
And then maybe we'll have those tires catch on fire

773
00:36:09.635 --> 00:36:12.855
and soon thereafter we'll probably have those wheel

774
00:36:12.855 --> 00:36:14.015
breaks catch on fire.

775
00:36:15.185 --> 00:36:17.645
And so you end up with a pretty dramatic landing

776
00:36:17.705 --> 00:36:21.765
to the first flight of your, one of a kind aircraft.

777
00:36:23.625 --> 00:36:25.955
Kind of cool, huh? Anyway,

778
00:36:29.415 --> 00:36:30.865
that was the story on that one.

779
00:36:31.765 --> 00:36:33.235
Let's go to high speed taxi.

780
00:36:35.035 --> 00:36:36.955
Probably the most dangerous thing we do in flight

781
00:36:36.985 --> 00:36:38.315
test, high speed taxi.

782
00:36:40.775 --> 00:36:42.115
We know how to take off and fly,

783
00:36:42.175 --> 00:36:43.475
we know how to come back and land.

784
00:36:43.815 --> 00:36:46.035
But this whole idea of intending to take off

785
00:36:46.175 --> 00:36:47.315
and then not taking off,

786
00:36:47.335 --> 00:36:50.995
but abor is, is, is, is an unnatural event.

787
00:36:51.975 --> 00:36:54.875
So the takeaway will be that if it happens,

788
00:36:55.015 --> 00:36:59.235
you probably will wanna, uh, be ready for uh, uh, the fact

789
00:36:59.235 --> 00:37:00.955
that you might have inadvertently airborne.

790
00:37:00.975 --> 00:37:02.195
But let's take this case here.

791
00:37:02.965 --> 00:37:06.505
During high speed taxi on this first new fighter, um,

792
00:37:07.015 --> 00:37:09.825
they end up with a nose wheel shimmy.

793
00:37:11.595 --> 00:37:14.135
So they go back to take a look at what might be the cause

794
00:37:14.515 --> 00:37:18.055
and they found that they had used legacy equipment

795
00:37:18.565 --> 00:37:21.295
from another airplane, not uncommon on a prototype

796
00:37:21.555 --> 00:37:23.855
to say let's use, uh, the nose gear

797

00:37:23.915 --> 00:37:26.015
or the landing gear system from another

798
00:37:26.415 --> 00:37:27.495
airplane that's already known.

799
00:37:27.495 --> 00:37:29.735
Everything works. So we don't have to spend a lot

800
00:37:29.735 --> 00:37:31.335
of time re-engineering all of that.

801
00:37:31.925 --> 00:37:34.665
But if you are gonna use legacy components from another

802
00:37:34.675 --> 00:37:37.825
plane, in this particular case, they asked

803
00:37:37.885 --> 00:37:38.905
for some components

804
00:37:38.965 --> 00:37:41.465
and there was some in the, in, in the storage facility

805
00:37:41.845 --> 00:37:42.985
and they brought that out.

806
00:37:43.085 --> 00:37:44.585
And the nose gear was, had,

807
00:37:44.585 --> 00:37:47.035
had been in the storage facility, uh,

808
00:37:47.505 --> 00:37:49.995
that had not had modifications done

809
00:37:50.225 --> 00:37:54.715
because the original airplane also had a high speed shimmy,

810
00:37:54.875 --> 00:37:56.355
a a, a shimmy at high speed.

811
00:37:56.855 --> 00:37:59.715
And so there had to be modifications done

812
00:37:59.715 --> 00:38:02.675
to the gear system to accommodate that.

813
00:38:03.215 --> 00:38:06.155
And there had to be some time compliance tech orders applied

814
00:38:06.905 --> 00:38:11.275
that was not understood by the new airplane designers.

815
00:38:11.615 --> 00:38:14.195
And so they thought they could just adopt the landing gear

816
00:38:14.195 --> 00:38:15.835
from the old system and put it on.

817
00:38:16.095 --> 00:38:18.995
And it turned out the T CTOs had not been applied to

818
00:38:18.995 --> 00:38:20.995
that original equipment coming outta storage

819
00:38:21.605 --> 00:38:23.755
after it was, uh, completed.

820
00:38:24.095 --> 00:38:26.835
Uh, the T CTOs, yes, the system worked fine

821
00:38:27.055 --> 00:38:28.395
and there was no more shimmy.

822
00:38:30.015 --> 00:38:34.175
Now let's go back to a large bomber high speed taxi.

823
00:38:34.715 --> 00:38:36.955
And, and when he went ahead

824

00:38:36.955 --> 00:38:38.755
and did the standard high speed run

825
00:38:38.895 --> 00:38:41.875
and then aborted, the airplane started to drift

826
00:38:41.895 --> 00:38:43.115
to the left side of the runway.

827
00:38:43.775 --> 00:38:46.715
Now the ejection seat and the way the rudder pedals

828
00:38:46.715 --> 00:38:48.955
and the brakes were designed, it was difficult

829
00:38:48.975 --> 00:38:50.355
to get your toes up

830
00:38:50.375 --> 00:38:53.595
and to get on the brakes, uh, adequately.

831
00:38:54.785 --> 00:38:58.605
But, uh, consequently the airplane drifted

832
00:38:58.605 --> 00:38:59.765
off to the side of the runway.

833
00:38:59.905 --> 00:39:02.515
Didn't go off the runway, but he got it stopped.

834
00:39:03.355 --> 00:39:05.965
He's at the end of the runway on the far side.

835
00:39:06.845 --> 00:39:09.905
So I said, huh, okay, well I maybe that's on me

836
00:39:10.005 --> 00:39:11.505
for not having adequate braking.

837
00:39:11.505 --> 00:39:14.225
That was the, that was the thought process at that point.

838
00:39:14.685 --> 00:39:15.745
So now unfortunately,

839
00:39:15.745 --> 00:39:18.305
when they pulled the airplane out onto the overrun

840
00:39:18.925 --> 00:39:22.105
to turn the airplane around, it was a hot day in July,

841
00:39:22.105 --> 00:39:23.985
and the overrun was a asphalt

842
00:39:24.045 --> 00:39:27.185
and the, uh, heavyweight bomber sunk into the asphalt.

843
00:39:27.245 --> 00:39:28.385
So that's a whole different problem.

844
00:39:28.725 --> 00:39:31.665
But anyway, a high speed taxi, uh, issue there.

845
00:39:32.085 --> 00:39:35.565
So now let's go to the first flight upon landing.

846
00:39:36.485 --> 00:39:39.105
Um, same exact phenomena occurred.

847
00:39:39.325 --> 00:39:42.545
The airplane started to drift off to the left after landing,

848
00:39:43.045 --> 00:39:45.385
and this time adequate, they were prepared,

849
00:39:45.705 --> 00:39:46.705
adequate braking was applied,

850
00:39:46.925 --> 00:39:48.545
but it still kept drifting left.

851

00:39:49.045 --> 00:39:51.575
So they come back in to debrief that one,

852
00:39:51.795 --> 00:39:54.535
and the debrief was, well, these are carbon carbon breaks

853
00:39:54.675 --> 00:39:57.135
and maybe they don't break in the same

854
00:39:57.275 --> 00:39:59.855
and maybe you had a little more effective braking on one

855
00:39:59.855 --> 00:40:01.935
side than the other, that was probably

856
00:40:01.955 --> 00:40:03.135
the cause of your problem.

857
00:40:03.915 --> 00:40:08.205
So let's go to flight number two. Land, same thing.

858
00:40:09.045 --> 00:40:11.445
Airplane drifts way off to the left upon landing.

859
00:40:12.085 --> 00:40:13.575
Wait a minute, there's gotta be more

860
00:40:13.575 --> 00:40:15.175
to the story than just the braking.

861
00:40:15.565 --> 00:40:19.055
Sure enough, they said, oh yeah, well, looking at it

862
00:40:19.775 --> 00:40:21.535
engineering, we thought we would help the pilot.

863
00:40:21.755 --> 00:40:25.015
So we put in an automatic crosswind correction

864
00:40:25.605 --> 00:40:28.695
into the flight controls, uh, uh, upon landing

865
00:40:28.875 --> 00:40:31.415
to help you keep the airplane straight on the runway.

866
00:40:32.195 --> 00:40:35.095
But it looks like we did it backwards.

867
00:40:36.455 --> 00:40:38.635
So rather than helping you, we hindered you.

868
00:40:38.965 --> 00:40:40.195
After they corrected that,

869
00:40:40.195 --> 00:40:42.115
then there was no longer a left drift problem.

870
00:40:42.905 --> 00:40:45.205
So just want to kind of pass on the story

871
00:40:45.515 --> 00:40:49.325
that sometimes you think it's on you when it may be on them.

872
00:40:49.795 --> 00:40:54.615
Okay? So let's now

873
00:40:54.675 --> 00:40:58.015
go to probably the most, most notorious high speed taxi.

874
00:40:58.115 --> 00:41:00.375
And I know you've all seen this and,

875
00:41:00.435 --> 00:41:02.255
but I want to kind of brief you on the rest

876
00:41:02.255 --> 00:41:03.415
of the story a little bit.

877
00:41:04.245 --> 00:41:07.945
So here we got this brand new prototype fighter airplane,

878

00:41:08.645 --> 00:41:10.585
but the brand new flight control system

879
00:41:10.635 --> 00:41:11.745
never been used before.

880
00:41:12.325 --> 00:41:14.305
So it's gonna have a fixed stick.

881
00:41:15.815 --> 00:41:17.545
When you put pitch input in,

882
00:41:17.545 --> 00:41:20.105
it's gonna generate pitch rate command,

883
00:41:20.405 --> 00:41:22.145
and when you put a roll input in,

884
00:41:22.215 --> 00:41:25.425
it's gonna generate roll rate command all well and good.

885
00:41:26.405 --> 00:41:28.905
The, the amount of of pitch rate

886
00:41:28.965 --> 00:41:32.345
and roll rate was developed in a fixed base simulator.

887
00:41:33.065 --> 00:41:35.515
Okay? They said let's take it

888
00:41:35.515 --> 00:41:38.435
to an in-flight simulator at Cal Span

889
00:41:39.095 --> 00:41:41.195
and let's kind of make sure we got everything right.

890
00:41:42.135 --> 00:41:46.335
N NT 33 was the, uh, airplane that was used for the, uh, sur

891
00:41:46.435 --> 00:41:48.775
for the, uh, in-flight simulator for this particular,

892
00:41:49.315 --> 00:41:51.195
uh, system checkout.

893
00:41:51.535 --> 00:41:56.215
During this, some of the pilots test pilots said, huh,

894
00:41:56.825 --> 00:41:59.845
that's pretty, that roll response is too responsive.

895
00:42:00.105 --> 00:42:01.565
But in just a little bit of force,

896
00:42:01.745 --> 00:42:03.685
I'm getting way too much roll response.

897
00:42:04.605 --> 00:42:08.745
In fact, one of the pilots ended up in a lateral PIO

898
00:42:09.325 --> 00:42:12.305
in the N NT 33 when he went into the flare.

899
00:42:13.005 --> 00:42:15.145
So right way red flags were going up.

900
00:42:15.725 --> 00:42:18.945
But when they took the results to management,

901
00:42:20.525 --> 00:42:22.035
management was, we kind

902
00:42:22.035 --> 00:42:23.875
of gotta get this thing on down the path.

903
00:42:24.415 --> 00:42:25.595
And if we have to go back

904
00:42:25.595 --> 00:42:27.795
and redo all this stuff, you know what,

905

00:42:28.005 --> 00:42:31.075
let's go into high speed taxi with what we got

906
00:42:31.625 --> 00:42:33.275
from the fixed base simulator.

907
00:42:33.925 --> 00:42:36.105
And, and, and then after that, if there's a problem,

908
00:42:36.105 --> 00:42:38.145
then we'll have to look at it before first flight.

909
00:42:39.375 --> 00:42:41.785
Okay? Lesson learned here is be careful

910
00:42:41.785 --> 00:42:44.905
because your high speed taxi may become your first

911
00:42:44.905 --> 00:42:46.155
flight, okay?

912
00:42:46.265 --> 00:42:47.355
Because here we go.

913
00:42:47.495 --> 00:42:49.715
So Phil Reker this day, um,

914
00:42:50.425 --> 00:42:52.875
Neil Anderson was gonna be the pilot of the first flight,

915
00:42:52.895 --> 00:42:54.595
but Phil was doing the high speed taxi

916
00:42:55.275 --> 00:42:57.615
and Phil said, yeah, release brakes going down the runway.

917
00:42:57.835 --> 00:42:59.375
The flight card called for me

918
00:42:59.375 --> 00:43:00.975
to get partially down the runway

919
00:43:01.155 --> 00:43:04.485
and to just do a little left right input here

920
00:43:04.485 --> 00:43:06.285
to see if I get any kind of roll response.

921
00:43:06.785 --> 00:43:09.245
And then when I get to a point short of

922
00:43:09.245 --> 00:43:11.325
what would be rotation, go ahead

923
00:43:11.325 --> 00:43:12.605
and bring a little laugh stick in.

924
00:43:12.605 --> 00:43:14.925
And the idea is just bring the nose up into the air,

925
00:43:15.345 --> 00:43:18.205
do a little left right, put the airplane down and land.

926
00:43:18.205 --> 00:43:20.205
That was what the flight card called for kind

927
00:43:20.205 --> 00:43:21.445
of your standard high, uh,

928
00:43:21.445 --> 00:43:23.565
high speed taxi, uh, a methodology.

929
00:43:24.395 --> 00:43:26.495
Well now let's think about this.

930
00:43:27.125 --> 00:43:28.335
When you're going down the runway

931
00:43:28.595 --> 00:43:32.215
and you put a roll control in and the airplane is trying

932

00:43:32.215 --> 00:43:33.375
and command a roll rate,

933
00:43:33.915 --> 00:43:35.455
but it's constrained to the runway,

934
00:43:36.005 --> 00:43:38.655
that control is just gonna keep driving, driving, driving,

935
00:43:38.655 --> 00:43:40.695
driving, trying to achieve the roll rate.

936
00:43:40.955 --> 00:43:44.415
So now when you do get a little bit airborne, you're going

937
00:43:44.415 --> 00:43:48.535
to have a bunch of, uh, of roll control in there, right?

938
00:43:49.015 --> 00:43:51.465
Alright, so that's what you're gonna see here

939
00:43:52.045 --> 00:43:54.505
as we run this video and, and,

940
00:43:54.525 --> 00:43:56.465
and we see what the result of that was.

941
00:43:57.255 --> 00:43:59.795
So here he is coming down the runway, just like you said,

942
00:43:59.795 --> 00:44:03.105
getting a little speed just to the point here

943
00:44:03.105 --> 00:44:04.185
where you can see the control.

944
00:44:04.245 --> 00:44:07.545
You can see the controls right there moving on him there.

945
00:44:07.545 --> 00:44:10.145
He gets airborne instant response in roll,

946
00:44:10.535 --> 00:44:12.065
instant response in jaw.

947
00:44:12.765 --> 00:44:16.665
And he, he actually hits the runway four times coming down

948
00:44:16.665 --> 00:44:19.465
the pipe here and he's in a lateral PIO

949
00:44:19.465 --> 00:44:22.185
and there's the drifting to the left going off the runway

950
00:44:22.965 --> 00:44:26.185
as I teach my young test pilots, what would you do?

951
00:44:27.725 --> 00:44:29.545
So he had every right to pull the handle

952
00:44:29.545 --> 00:44:32.875
and bail out right there, but he didn't, he stayed with it.

953
00:44:33.215 --> 00:44:35.475
And I'm not, I don't have any more of the video,

954
00:44:35.775 --> 00:44:37.675
but the bottom line is once he got up and away

955
00:44:37.675 --> 00:44:40.555
and got out of the lube, the airplane settled down,

956
00:44:41.465 --> 00:44:43.915
came back gingerly, flew the airplane back

957
00:44:43.915 --> 00:44:45.115
to a successful landing.

958
00:44:45.815 --> 00:44:47.175
I asked him, I said, did you have a

959

00:44:47.185 --> 00:44:48.695
chase airplane ready to go?

960
00:44:49.315 --> 00:44:52.175
No, we weren't expecting this to be a flight.

961
00:44:52.715 --> 00:44:55.535
So no, we had, we asked him after Phil got airborne

962
00:44:55.535 --> 00:44:56.895
and was kind of coming

963
00:44:56.895 --> 00:44:59.695
around feeling the plane out a little bit, do you want us

964
00:44:59.695 --> 00:45:01.575
to try to get an F four airborne to chase?

965
00:45:01.595 --> 00:45:03.855
He said, nah, let me just get this thing back on the ground.

966
00:45:04.485 --> 00:45:06.625
But had they have done it again, they said, yeah,

967
00:45:06.625 --> 00:45:09.265
it would've been smart to have had a chase airplane ready

968
00:45:09.265 --> 00:45:11.865
to go in case we ended up with this phenomena.

969
00:45:11.885 --> 00:45:13.545
So that might be a takeaway from this.

970
00:45:14.035 --> 00:45:17.345
Treat your high speed taxi just like it's gonna be your

971
00:45:17.345 --> 00:45:20.065
first flight 'cause it may be your first flight.

972
00:45:20.645 --> 00:45:24.145
So there we go. Now the other takeaway from this is

973
00:45:24.835 --> 00:45:26.745
after they went back and look at it,

974
00:45:26.975 --> 00:45:29.385
they actually reduced the roll response

975
00:45:29.485 --> 00:45:31.065
by more than one half.

976
00:45:32.085 --> 00:45:35.025
And it's been my experience that every airplane

977
00:45:35.025 --> 00:45:36.305
that I've been involved with,

978
00:45:36.315 --> 00:45:38.985
where the roll control was developed in a fixed base

979
00:45:39.015 --> 00:45:41.665
simulator when it comes to the real airplane,

980
00:45:41.695 --> 00:45:43.065
it's too hot in roll

981
00:45:43.575 --> 00:45:46.275
and it has to have a reduction in the gain and roll.

982
00:45:46.655 --> 00:45:50.635
So fixed base simulators do not adequately, um,

983
00:45:51.565 --> 00:45:55.055
predict the roll response does good in pitch response

984
00:45:55.275 --> 00:45:56.415
but not roll response.

985
00:45:56.715 --> 00:45:58.175
So kind of take that to the back.

986

00:45:58.395 --> 00:46:00.695
Now, if you're gonna go through a moving base simulator

987
00:46:00.755 --> 00:46:02.455
or something like an NT 33,

988
00:46:02.865 --> 00:46:05.135
it'll break out those particular issues,

989
00:46:05.475 --> 00:46:08.055
but you better honor the threat when you see those.

990
00:46:08.485 --> 00:46:10.455
Make sense? Okay.

991
00:46:12.035 --> 00:46:15.365
Alright, a couple more.

992
00:46:17.025 --> 00:46:21.735
Um, this was a great story that came after the fact.

993
00:46:23.725 --> 00:46:25.975
Sometimes when I give this presentation, I'll come,

994
00:46:26.045 --> 00:46:27.295
I'll have somebody come up and, hey,

995
00:46:27.355 --> 00:46:29.015
let me tell you about my first flight.

996
00:46:29.395 --> 00:46:31.135
And this was one of those kind of stories.

997
00:46:31.715 --> 00:46:34.695
Um, I asked him if I could announce his name

998
00:46:34.755 --> 00:46:37.175
and he said, sure, tell him it's uh, Ricardo.

999
00:46:37.515 --> 00:46:39.615
So I said, well, everybody knows Ricardo Trayvin.

1000
00:46:39.615 --> 00:46:42.175
So anyway, Ricardo had a story. Yeah, he says, here we do.

1001
00:46:42.515 --> 00:46:44.815
He said, we're gonna do this first flight on this highly

1002
00:46:45.335 --> 00:46:46.895
modified fighter type airplane.

1003
00:46:47.475 --> 00:46:49.455
He said the test group

1004
00:46:49.635 --> 00:46:52.535
to usually test this airplane was at the test site.

1005
00:46:53.245 --> 00:46:55.025
But he said, they told us, Hey,

1006
00:46:55.075 --> 00:46:57.745
we're gonna do the initial flight at the manufacturing

1007
00:46:58.265 --> 00:46:59.425
facility and

1008
00:46:59.425 --> 00:47:00.825
because it's highly modified,

1009
00:47:00.825 --> 00:47:04.225
we're gonna stand up a control room at the manufacturing

1010
00:47:04.745 --> 00:47:06.345
facility, not the normal people

1011
00:47:06.365 --> 00:47:08.825
to man the displays like you'd have at the test blight.

1012
00:47:09.245 --> 00:47:13.425
So Ricardo said that they gave the test group then started

1013

00:47:13.425 --> 00:47:16.105
to organize a what was gonna be a control room,

1014
00:47:16.485 --> 00:47:19.185
and they went to the design disciplines,

1015
00:47:19.185 --> 00:47:21.305
hydraulic electrical fuel flight control engines.

1016
00:47:21.405 --> 00:47:24.145
And each one, uh, offered up an engineer

1017
00:47:24.165 --> 00:47:26.665
to be the token guide to be in the control room.

1018
00:47:27.125 --> 00:47:30.445
So Ricardo says he actually, the very first day,

1019
00:47:30.985 --> 00:47:33.645
the first thing we taught was, this is a headset,

1020
00:47:34.155 --> 00:47:35.525
this is how you put it on.

1021
00:47:36.045 --> 00:47:39.245
He said, this is the level that he was dealing with as far

1022
00:47:39.245 --> 00:47:40.965
as people to train him for a control room.

1023
00:47:41.345 --> 00:47:43.885
But you know, they started to, uh, to learn

1024
00:47:44.585 --> 00:47:48.405
and uh, they had a simulation set up in,

1025
00:47:48.425 --> 00:47:51.165
as a simulated control room was gonna be their actual

1026
00:47:51.165 --> 00:47:53.565
control room, but they simulated some of the displays

1027
00:47:53.565 --> 00:47:55.485
for the various engineers and stuff like that.

1028
00:47:55.825 --> 00:47:57.525
So Ricardo said, we started going through

1029
00:47:57.525 --> 00:47:59.325
what was gonna be our normal flight card

1030
00:47:59.825 --> 00:48:01.725
so everybody could learn their responses

1031
00:48:01.745 --> 00:48:03.405
and learn what they could expect to see.

1032
00:48:03.985 --> 00:48:06.045
And then he said, we, uh, started to go

1033
00:48:06.045 --> 00:48:08.205
through some anomalies, uh, things

1034
00:48:08.205 --> 00:48:09.965
that were in the checklist as emergencies,

1035
00:48:09.965 --> 00:48:12.635
like engine failure, things like that said, okay.

1036
00:48:12.635 --> 00:48:14.875
And they, and, and everybody started to gel.

1037
00:48:15.805 --> 00:48:19.725
So now, um, program management says, you know what,

1038
00:48:19.735 --> 00:48:21.565
we're gonna fly a week from Thursday.

1039
00:48:21.755 --> 00:48:23.165
They announced a flight date.

1040

00:48:23.545 --> 00:48:25.345
And Ricardo said, I went to him

1041
00:48:25.345 --> 00:48:26.545
and said, wait, wait, wait, wait, wait.

1042
00:48:28.665 --> 00:48:30.455
Let's not announce a flight date

1043
00:48:30.485 --> 00:48:32.935
because that puts artificial engineer

1044
00:48:33.775 --> 00:48:35.895
artificial pressure on the engineers

1045
00:48:36.075 --> 00:48:38.215
to feel like they have to meet this date.

1046
00:48:38.885 --> 00:48:40.345
He said, let's use the terminology.

1047
00:48:40.395 --> 00:48:42.825
We're gonna fly when the airplane

1048
00:48:42.885 --> 00:48:44.385
and the test team is ready.

1049
00:48:45.145 --> 00:48:46.955
Okay? Program manager says, I get that.

1050
00:48:47.145 --> 00:48:49.955
Okay, so we'll fly when the airplane and test team is ready.

1051
00:48:50.495 --> 00:48:54.235
All good. So now it come time for the first flight date,

1052
00:48:54.475 --> 00:48:55.955
I mean for the actual first flight.

1053
00:48:56.255 --> 00:48:57.675
So he said he went in that morning

1054
00:48:57.735 --> 00:48:59.435
to the control room, everybody's there.

1055
00:48:59.815 --> 00:49:03.645
He says, Hey guys, we're gonna play just like we practiced.

1056
00:49:04.315 --> 00:49:09.055
Um, but I tell you what, let's just do one more, uh,

1057
00:49:09.725 --> 00:49:11.535
emergency procedure out of the checklist.

1058
00:49:11.755 --> 00:49:14.935
One more anomaly. And um, who, who, who's, he says,

1059
00:49:15.015 --> 00:49:16.815
I always pick it, but hey, when do you pick it?

1060
00:49:17.075 --> 00:49:18.265
He said, nobody said anything.

1061
00:49:18.265 --> 00:49:19.825
He says, oh, come on, gimme something.

1062
00:49:20.285 --> 00:49:21.585
So this little hand in the back

1063
00:49:21.585 --> 00:49:24.125
of the room goes up, said, yeah, what do you got?

1064
00:49:25.315 --> 00:49:28.655
AV hot. Avionics hot. Really? AV hot.

1065
00:49:29.055 --> 00:49:30.855
Ricardo's thinking, huh? It's not the one

1066
00:49:30.855 --> 00:49:32.015
that I would normally think about,

1067

00:49:32.115 --> 00:49:34.335
but okay, AV hot goes to the checklist

1068
00:49:34.515 --> 00:49:36.615
and says, I'll be shutting down the ECS system.

1069
00:49:36.725 --> 00:49:38.335
I'll do this, I'll do this and then

1070
00:49:38.335 --> 00:49:39.575
we're gonna come back and land.

1071
00:49:40.125 --> 00:49:42.455
Okay, all good. Everybody ready? Let's go fly.

1072
00:49:42.955 --> 00:49:45.015
So he said he takes off, he's on the runway,

1073
00:49:45.525 --> 00:49:48.975
down the runway, gets airborne outer burner.

1074
00:49:49.185 --> 00:49:53.515
Guess what? AV hot comes on. Are you kidding me?

1075
00:49:53.655 --> 00:49:55.595
We just talked about that, that, whoa,

1076
00:49:55.615 --> 00:49:56.755
that's kind of peculiar.

1077
00:49:57.025 --> 00:50:00.635
Okay, well okay, just did it. ECS shut down.

1078
00:50:00.695 --> 00:50:02.755
He said, nah, it's a hot humid day.

1079
00:50:03.095 --> 00:50:06.155
And he said, I'm sweating my bugs off in that cockpit.

1080
00:50:06.155 --> 00:50:07.875
Uh, you know, getting the airplane back on the ground.

1081
00:50:08.645 --> 00:50:09.745
So he said he lands

1082
00:50:10.395 --> 00:50:11.935
and he said, uh, you know, there's some press

1083
00:50:11.995 --> 00:50:13.295
and big, big guns there.

1084
00:50:13.295 --> 00:50:15.015
And he said, he kind of like, yeah, hey, great flight.

1085
00:50:15.235 --> 00:50:17.455
And then he said, he walks right into the control room

1086
00:50:17.755 --> 00:50:20.295
and he says he went right straight to that engineer,

1087
00:50:20.595 --> 00:50:23.095
put his finger in his chest and said, how did you know?

1088
00:50:23.475 --> 00:50:25.375
How did you know we were gonna get AV hot?

1089
00:50:26.175 --> 00:50:30.435
I said, well, last night we were doing some final tests in

1090
00:50:30.435 --> 00:50:34.115
the systems integration lab and we kept getting AV hot

1091
00:50:34.535 --> 00:50:36.995
and we couldn't figure out how to what caused it

1092
00:50:36.995 --> 00:50:37.995
or how to turn it off.

1093
00:50:38.825 --> 00:50:40.605
And Ricardo said his jaw drops.

1094

00:50:40.825 --> 00:50:42.005
Why didn't you tell somebody?

1095
00:50:42.765 --> 00:50:44.695
Well, everybody said we had to fly tomorrow.

1096
00:50:46.705 --> 00:50:48.165
So do we have to fly tomorrow?

1097
00:50:48.825 --> 00:50:51.685
No, we'll fly when the plane and the test team is ready.

1098
00:50:52.025 --> 00:50:54.485
So you might wanna pass that on to your crews, uh,

1099
00:50:54.505 --> 00:50:56.005
on down the path that, uh,

1100
00:50:56.345 --> 00:50:59.435
it has happened in the past aircraft flown.

1101
00:50:59.895 --> 00:51:04.235
And um, we had one more that was passed to me.

1102
00:51:04.515 --> 00:51:07.795
I haven't been able to find documentation on it,

1103
00:51:08.055 --> 00:51:09.555
but I do physically know

1104
00:51:09.585 --> 00:51:12.275
that this particular test pilot came to the

1105
00:51:12.825 --> 00:51:14.875
test pilot school when I was a student

1106
00:51:14.975 --> 00:51:17.955
and they did a first flight on a big bomber airplane.

1107
00:51:18.735 --> 00:51:22.195
And I was so impressed that the actual test pilot,

1108
00:51:22.615 --> 00:51:23.795
the two test pilots

1109
00:51:23.795 --> 00:51:27.195
and the flight test engineer came to the test by the school

1110
00:51:27.195 --> 00:51:29.995
that afternoon and briefed us on the results of that test.

1111
00:51:30.435 --> 00:51:32.595
I thought, wow, I guess I've reached the big time

1112
00:51:32.595 --> 00:51:33.715
even though I'm just a student.

1113
00:51:33.775 --> 00:51:35.915
The big boys are back here telling us about this.

1114
00:51:36.855 --> 00:51:40.565
Um, and he said, uh, the test by the said, yeah, he said,

1115
00:51:40.585 --> 00:51:44.225
uh, when we got airborne, things weren't quite right.

1116
00:51:44.405 --> 00:51:47.625
He said the flaps were not responding properly.

1117
00:51:47.885 --> 00:51:50.465
Couple other systems weren't, weren't responding.

1118
00:51:51.135 --> 00:51:54.555
So, you know, we went ahead and brought the airplane back

1119
00:51:55.095 --> 00:51:57.675
and he said, we found, but he said, I had no caution lights,

1120
00:51:57.735 --> 00:51:59.195
no tell all lights said anything was wrong.

1121

00:51:59.895 --> 00:52:01.795
So he said, uh, when we landed

1122
00:52:01.815 --> 00:52:03.995
and sorted through it, he said, we found out

1123
00:52:04.145 --> 00:52:07.475
that we had a failure of essential bus system number one,

1124
00:52:08.615 --> 00:52:12.065
but the tele light that would've told us

1125
00:52:12.335 --> 00:52:16.665
that we had a failure of bus one was wired to bus one.

1126
00:52:17.905 --> 00:52:20.365
So when bus one failed, there was no light.

1127
00:52:20.865 --> 00:52:23.705
So those items that weren't working were off

1128
00:52:23.705 --> 00:52:26.745
of essential bus and the essential bus caution light was

1129
00:52:26.755 --> 00:52:27.945
wired to the failed bus.

1130
00:52:28.205 --> 00:52:30.425
So anyway, I just thought I'd pass on that.

1131
00:52:30.425 --> 00:52:33.105
It happens and kind of an interesting, uh, uh, uh,

1132
00:52:33.225 --> 00:52:34.505
a first flight story to tell.

1133
00:52:34.895 --> 00:52:37.065
Alright, kind of getting toward the end here of my pitch.

1134
00:52:37.525 --> 00:52:37.745
Um,

1135
00:52:42.225 --> 00:52:42.855
there we go.

1136
00:52:43.045 --> 00:52:45.415
Alright, so let's go back to a large bomber.

1137
00:52:45.875 --> 00:52:49.095
As we all know, when an airplane is delivered from

1138
00:52:49.095 --> 00:52:51.855
manufacturing and turned over to flight test,

1139
00:52:52.325 --> 00:52:55.055
it's never really completed as far

1140
00:52:55.055 --> 00:52:56.095
as the build of the plane.

1141
00:52:56.405 --> 00:53:00.375
Manufacturing is always following it over to test, to try

1142
00:53:00.375 --> 00:53:03.535
to finish up their particular items that they have to do.

1143
00:53:04.275 --> 00:53:05.655
Now test is trying

1144
00:53:05.655 --> 00:53:07.815
to get on their airplane 'cause they've got stuff to do.

1145
00:53:08.155 --> 00:53:12.625
And so therefore we have this uh, um, uh, uh, uh,

1146
00:53:14.085 --> 00:53:16.045
conflict going on in the cockpit.

1147
00:53:16.305 --> 00:53:19.285
People trying to get stuff done or around the airplane.

1148

00:53:19.825 --> 00:53:22.725
So they said finally to solve this problem, we said, Hey,

1149
00:53:22.725 --> 00:53:25.005
we gotta have one person involved for each shift.

1150
00:53:25.075 --> 00:53:27.725
That is the person in charge of what work gets

1151
00:53:27.725 --> 00:53:29.005
to be done and when.

1152
00:53:29.565 --> 00:53:31.785
So come ahead of time, say the work you've gotta do

1153
00:53:31.845 --> 00:53:34.385
for this shift, this guy will rack and stack it

1154
00:53:34.565 --> 00:53:37.065
and deconflict so that we can get stuff done.

1155
00:53:37.215 --> 00:53:38.225
They said once they went

1156
00:53:38.225 --> 00:53:39.905
to the one person in charge scenario,

1157
00:53:40.535 --> 00:53:42.865
then things got done in an orderly manner.

1158
00:53:43.545 --> 00:53:45.565
And then the same thing in the control room.

1159
00:53:46.225 --> 00:53:49.565
Um, one of the p pilots said that there was an issue in that

1160
00:53:50.155 --> 00:53:52.735
the airplane was under test for ground test.

1161
00:53:52.985 --> 00:53:55.655
Other people in the control room were talking conversations

1162
00:53:55.685 --> 00:53:57.535
here, they were trying to get this done.

1163
00:53:57.685 --> 00:53:59.215
Finally, they said that they had

1164
00:53:59.215 --> 00:54:01.735
to tell the test director in the control room,

1165
00:54:01.915 --> 00:54:03.935
you have the authority to kick people out

1166
00:54:04.435 --> 00:54:07.335
and just simply concentrate on the system under test,

1167
00:54:07.685 --> 00:54:09.135
take everything else outside.

1168
00:54:09.435 --> 00:54:11.455
It says once they went to the one person in charge

1169
00:54:11.475 --> 00:54:14.055
of the control room, things went a lot quieter.

1170
00:54:14.715 --> 00:54:16.645
Okay, well this is pretty much getting toward

1171
00:54:16.645 --> 00:54:17.685
the summary phase now.

1172
00:54:18.385 --> 00:54:22.265
So what you can expect to happen on your first flight?

1173
00:54:22.735 --> 00:54:25.345
Well, you very well may have gear problems

1174
00:54:25.725 --> 00:54:28.105
and you very well may have telemetry problems

1175

00:54:28.805 --> 00:54:31.465
if it goes according to what normally happens

1176
00:54:31.685 --> 00:54:33.065
to airplanes from the past.

1177
00:54:33.715 --> 00:54:36.335
So plan your gear operations early in flight if you're gonna

1178
00:54:36.335 --> 00:54:40.415
cycle the gear and, and be prepared for backup plans.

1179
00:54:40.515 --> 00:54:43.495
If you lose telemetry or you have a gear doesn't work

1180
00:54:44.015 --> 00:54:47.385
or you lose calm, FOD is not your friend.

1181
00:54:47.845 --> 00:54:50.345
You cannot clean that airplane up enough.

1182
00:54:50.725 --> 00:54:53.545
But we found that the problems occurred primarily in the

1183
00:54:53.545 --> 00:54:57.105
fuel and the electrical system when you had the FOD issues.

1184
00:54:57.685 --> 00:55:00.145
We always think it's going to cause a flight control issue.

1185
00:55:00.165 --> 00:55:02.795
But anyway, what we found was fuel

1186
00:55:02.795 --> 00:55:04.755
and electrical seemed to be the primary issues.

1187
00:55:05.475 --> 00:55:08.965
Your high speed taxi, you need to use the same prep

1188
00:55:09.475 --> 00:55:11.285
that you would use for a first flight

1189
00:55:11.315 --> 00:55:13.565
because it may be your first flight.

1190
00:55:13.785 --> 00:55:15.085
So use the same preparation

1191
00:55:15.105 --> 00:55:16.885
and the same risk management methods

1192
00:55:16.945 --> 00:55:18.205
you use going into that.

1193
00:55:18.625 --> 00:55:20.885
If you're gonna use legacy components, be aware

1194
00:55:20.885 --> 00:55:23.165
that there might be A-T-C-T-O out there

1195
00:55:23.585 --> 00:55:24.885
and one person in charge.

1196
00:55:26.065 --> 00:55:27.325
So let be summarized.

1197
00:55:29.595 --> 00:55:31.525
Purpose of any first flight is what?

1198
00:55:31.785 --> 00:55:32.965
You got two requirements.

1199
00:55:33.425 --> 00:55:36.765
Get it in the air, get it on the ground, go have a party.

1200
00:55:37.455 --> 00:55:40.795
That's it. Get it in the air, get it on the ground. Alright?

1201
00:55:41.105 --> 00:55:43.995
Boil everything down to your anomalies.

1202

00:55:44.155 --> 00:55:48.595
I learned this from my UAV world on one of the early,

1203
00:55:49.135 --> 00:55:50.475
uh, cruise missiles.

1204
00:55:50.715 --> 00:55:52.075
I used to sit the night

1205
00:55:52.075 --> 00:55:55.235
before thinking about the 43 things we talked about could go

1206
00:55:55.245 --> 00:55:58.675
wrong and what was gonna be my response to each of these

1207
00:55:59.535 --> 00:56:01.585
when I suddenly had a eureka moment.

1208
00:56:01.735 --> 00:56:05.325
Like, so what if something goes wrong? What am I gonna do?

1209
00:56:05.865 --> 00:56:06.885
I'm gonna let it fly.

1210
00:56:08.175 --> 00:56:11.495
I'm gonna put it in an orbit, or I'm gonna RTB

1211
00:56:12.185 --> 00:56:16.265
or I'm gonna destruct or bailout four things once.

1212
00:56:16.345 --> 00:56:20.025
I don't care what goes wrong, I'm either gonna let it fly,

1213
00:56:20.485 --> 00:56:23.225
put it in an orbit, RTB

1214
00:56:23.805 --> 00:56:25.655
or destructive bailout.

1215
00:56:25.955 --> 00:56:27.445
Alright? Once you bail,

1216
00:56:27.795 --> 00:56:32.165
once you boil all these anomalies down to the inaction,

1217
00:56:32.195 --> 00:56:33.725
they should all flow down to one

1218
00:56:33.725 --> 00:56:35.725
of these four inaction actions

1219
00:56:35.725 --> 00:56:36.965
that are in the end of this thing.

1220
00:56:37.425 --> 00:56:38.925
Wow. Got a lot more sleep after that.

1221
00:56:39.305 --> 00:56:42.485
You got a lot of systems under test to the first time,

1222
00:56:42.585 --> 00:56:45.005
and this is a first time air loads are actually being

1223
00:56:45.005 --> 00:56:46.565
applied, and it may not be the same.

1224
00:56:46.665 --> 00:56:49.005
For example, the gear, you know, we do a lot

1225
00:56:49.005 --> 00:56:50.685
of gear retractions prior to first flight,

1226
00:56:50.705 --> 00:56:53.085
but it's not the same when you've got the air loads on it

1227
00:56:53.085 --> 00:56:54.605
that could be affecting, uh, uh,

1228
00:56:54.605 --> 00:56:55.725
some of those micro switches.

1229

00:56:56.415 --> 00:56:58.875
So we have all these different anomalies

1230
00:56:58.875 --> 00:57:00.275
that can, can occur.

1231
00:57:00.815 --> 00:57:02.235
How do we prepare for 'em?

1232
00:57:02.865 --> 00:57:06.955
Well, the answer is get the control team together in the

1233
00:57:06.955 --> 00:57:09.715
control room and practice, practice, practice.

1234
00:57:10.675 --> 00:57:14.445
Have a pretty high fidelity, uh, control room simulations.

1235
00:57:15.065 --> 00:57:16.955
Make sure everybody understands the test card,

1236
00:57:16.955 --> 00:57:18.315
what their responses are gonna be,

1237
00:57:18.735 --> 00:57:20.955
and then run through some of these anomalies

1238
00:57:20.955 --> 00:57:23.755
and let them understand what they might see on their

1239
00:57:23.795 --> 00:57:27.235
displays and what their responses are gonna be to be able

1240
00:57:27.235 --> 00:57:28.835
to notify the management in

1241
00:57:28.835 --> 00:57:30.435
that control room of what the problem is.

1242
00:57:34.465 --> 00:57:35.855
Scott Crossfield said,

1243
00:57:36.395 --> 00:57:39.915
first flight is worth a thousand calculations, man,

1244
00:57:39.915 --> 00:57:43.155
just getting airborne and on the ground you learn so much.

1245
00:57:43.535 --> 00:57:45.475
All those stability derivatives that were

1246
00:57:46.705 --> 00:57:47.815
based on wind tunnel

1247
00:57:47.875 --> 00:57:50.615
and computational fluid dynamics are now real

1248
00:57:50.825 --> 00:57:51.895
based on real data.

1249
00:57:52.035 --> 00:57:53.295
So just getting in the air

1250
00:57:53.635 --> 00:57:56.625
and back down, how long is it gonna take to do a test?

1251
00:57:57.175 --> 00:58:01.465
Paul Metz said you, when management asked him, he said,

1252
00:58:01.725 --> 00:58:03.545
you tell me everything that's gonna go wrong

1253
00:58:03.725 --> 00:58:05.465
and I'll tell you how long it's gonna take us

1254
00:58:05.465 --> 00:58:06.465
to test this airplane.

1255
00:58:06.925 --> 00:58:08.225
In other words, our job is

1256

00:58:08.225 --> 00:58:10.745
to find issues and fix 'em, right?

1257
00:58:11.465 --> 00:58:16.275
So, um, uh, anyway, that pretty much sums us up.

1258
00:58:16.535 --> 00:58:18.275
I'd like to say to any, uh, most

1259
00:58:18.275 --> 00:58:19.595
of you are probably old heads

1260
00:58:19.895 --> 00:58:21.715
and have been part of first flight teams.

1261
00:58:22.115 --> 00:58:25.565
I like to tell the younguns, if you ever get assigned

1262
00:58:25.585 --> 00:58:26.965
to a first flight team,

1263
00:58:27.965 --> 00:58:30.565
whatever your role crew chief in the control room

1264
00:58:31.105 --> 00:58:33.885
or flying the plane, you have hit the Super Bowl

1265
00:58:33.945 --> 00:58:36.335
of flight test and it is awesome.

1266
00:58:36.955 --> 00:58:37.975
So enjoy the moment

1267
00:58:38.365 --> 00:58:40.655
because, uh, it's an experience

1268
00:58:40.655 --> 00:58:42.295
that you'll remember for the rest of your life.

1269
00:58:42.685 --> 00:58:45.535
Alright, that's all I got. Thank you very much. Okay,

1270
00:58:53.495 --> 00:58:56.535
I guess we got time if everybody has any questions. Yes.

1271
00:58:56.715 --> 00:58:59.195
So if so, show of hands,

1272
00:58:59.885 --> 00:59:01.425
how many people have been involved

1273
00:59:01.425 --> 00:59:04.195
in a first flight of something? Okay, hands down.

1274
00:59:04.375 --> 00:59:05.435
That's kind of what I figured.

1275
00:59:05.835 --> 00:59:09.115
How many people are currently associated

1276
00:59:09.225 --> 00:59:12.845
with an organization that has a first flight

1277
00:59:12.875 --> 00:59:16.045
that may occur in the now

1278
00:59:16.185 --> 00:59:17.925
to three years from now?

1279
00:59:17.925 --> 00:59:19.165
Timeframe? Show of hands.

1280
00:59:20.025 --> 00:59:21.255
Look at that. This

1281
00:59:21.395 --> 00:59:24.945
Is why I asked Roy to come give this.

1282
00:59:25.235 --> 00:59:26.535
Uh, he, he and Mr.

1283

00:59:26.675 --> 00:59:29.575
Ravens presented a version of this in SCTP

1284
00:59:29.575 --> 00:59:30.615
and Anaheim last year.

1285
00:59:30.885 --> 00:59:33.055
They were on the podcast last month

1286
00:59:33.155 --> 00:59:35.455
and this month, um, talking about some

1287
00:59:35.455 --> 00:59:36.735
of these and some other stuff.

1288
00:59:36.875 --> 00:59:38.175
So if you haven't listened to the podcast,

1289
00:59:38.435 --> 00:59:40.635
you can get this on that.

1290
00:59:41.585 --> 00:59:45.025
But this is relevant 15 years ago.

1291
00:59:46.475 --> 00:59:48.095
If you ask pe if I asked for that,

1292
00:59:48.195 --> 00:59:49.855
how many first flights coming up?

1293
00:59:49.975 --> 00:59:52.095
I don't think there would've been as many hands.

1294
00:59:52.195 --> 00:59:53.335
We live in a very,

1295
00:59:53.805 --> 00:59:56.815
very dynamic time in the aerospace world today.

1296
00:59:56.995 --> 00:59:58.055
So this stuff is relevant.

1297
00:59:58.195 --> 01:00:00.375
So for all of you people who raised your hands

1298
01:00:00.605 --> 01:00:02.255
with an upcoming first flight event,

1299
01:00:02.555 --> 01:00:06.015
if you have any questions, that was a fantastic time to come

1300
01:00:06.015 --> 01:00:07.455
to a microphone and ask them.

1301
01:00:08.645 --> 01:00:10.825
So this briefing is kind of a living briefing.

1302
01:00:10.885 --> 01:00:13.265
We hope that'll continue on as our first flights

1303
01:00:13.265 --> 01:00:14.865
that we do value inputs, uh,

1304
01:00:14.885 --> 01:00:16.825
in either your own experience from the past

1305
01:00:16.895 --> 01:00:18.425
that might be contributing to this.

1306
01:00:18.855 --> 01:00:21.705
This information has been documented in a, in, in a,

1307
01:00:21.705 --> 01:00:23.745
in a paper, a, a white paper, if you will.

1308
01:00:24.245 --> 01:00:25.465
And so that is available.

1309
01:00:25.745 --> 01:00:28.145
I think we can get that available through SETP.

1310

01:00:28.565 --> 01:00:31.865
Uh, and I'm continually updating that paper as we go along,

1311
01:00:32.085 --> 01:00:34.065
uh, as inputs come in from different people.

1312
01:00:34.445 --> 01:00:35.585
So anyway, any questions?

1313
01:00:42.475 --> 01:00:44.415
Thanks Roy. This is a great presentation.

1314
01:00:44.915 --> 01:00:46.175
Uh, I have a good friend says,

1315
01:00:46.325 --> 01:00:48.645
test pilot says there are no lessons learned.

1316
01:00:48.645 --> 01:00:50.005
There are always lessons relearn. Yeah.

1317
01:00:50.005 --> 01:00:51.685
So I have two questions for you. Yes, sir.

1318
01:00:51.705 --> 01:00:53.525
Are we getting better? And number two,

1319
01:00:53.545 --> 01:00:56.435
are we looking ahead at new technologies

1320
01:00:56.465 --> 01:00:57.995
that have not been employed on

1321
01:00:58.155 --> 01:00:59.395
airplanes and how we're testing those

1322
01:01:00.055 --> 01:01:02.885
Where, uh, as far as are we getting better?

1323
01:01:03.025 --> 01:01:05.805
The answer is yes. But it is interesting though that some

1324
01:01:05.805 --> 01:01:07.325
of these baseline problems,

1325
01:01:07.325 --> 01:01:09.005
primarily landing gear retraction,

1326
01:01:10.185 --> 01:01:13.045
the first time they try it, is even some

1327
01:01:13.045 --> 01:01:15.285
of the most recent airplanes have still had

1328
01:01:15.285 --> 01:01:16.445
that particular issue.

1329
01:01:17.125 --> 01:01:20.405
I think as far as telemetry failures, we're getting, uh, uh,

1330
01:01:20.505 --> 01:01:22.565
uh, uh, pretty good in that area

1331
01:01:22.995 --> 01:01:26.245
because we have some of these lessons that we've adequately,

1332
01:01:26.345 --> 01:01:27.805
uh, uh, taken to heart

1333
01:01:27.905 --> 01:01:29.725
and have done a sufficient ground test.

1334
01:01:30.465 --> 01:01:31.905
I think we're getting better also

1335
01:01:31.905 --> 01:01:35.905
because of the mission control room fidelity for training.

1336
01:01:36.805 --> 01:01:39.465
Wow. It's nothing like being a part of a team

1337

01:01:40.245 --> 01:01:43.345
that's in their training and you're putting anomalies in

1338
01:01:43.345 --> 01:01:45.585
and people are learning what they're expect to see

1339
01:01:45.585 --> 01:01:47.545
and what they expect their responses to be.

1340
01:01:48.085 --> 01:01:50.705
And so they feel a little more comfortable going into

1341
01:01:50.705 --> 01:01:52.785
that first flight that I've been there, done that.

1342
01:01:53.325 --> 01:01:56.505
We always say what happens on the first flight will be

1343
01:01:56.505 --> 01:01:58.545
nothing you train to, but

1344
01:01:58.545 --> 01:02:03.185
because you did train, you will have a, uh, a a lot,

1345
01:02:03.365 --> 01:02:06.665
uh, better response as a team as to how to handle it.

1346
01:02:06.865 --> 01:02:08.725
So the answer is yes, we are getting better.

1347
01:02:09.065 --> 01:02:11.125
As far as the future, well, I don't know

1348
01:02:11.125 --> 01:02:13.205
where things like AI is gonna come into play,

1349
01:02:13.205 --> 01:02:16.125
where it's actually continually processing what's going on

1350
01:02:16.265 --> 01:02:19.365
and, and, and, and maybe helping you make decisions.

1351
01:02:19.445 --> 01:02:20.925
I hope it's a help in not actually

1352
01:02:20.925 --> 01:02:22.125
making the decision for you.

1353
01:02:22.515 --> 01:02:24.845
Time will tell as to how we incorporate that.

1354
01:02:27.915 --> 01:02:29.045
Good. Any other questions?

1355
01:02:30.005 --> 01:02:31.445
I am standing up. Oh,

1356
01:02:32.395 --> 01:02:37.325
Yeah, there you go. Very

1357
01:02:37.325 --> 01:02:38.325
Good. We go way back.

1358
01:02:38.325 --> 01:02:38.965
Right, right.

1359
01:02:39.425 --> 01:02:41.245
I'm just gonna put in a plug, uh,

1360
01:02:41.265 --> 01:02:43.645
on the flight test safety.org website.

1361
01:02:43.705 --> 01:02:47.285
On the resources links page about halfway down is the Dave

1362
01:02:47.435 --> 01:02:49.845
Houl flight test accident database,

1363
01:02:50.655 --> 01:02:53.115
and probably a bunch of the stories you've talked about.

1364

01:02:53.205 --> 01:02:57.035
There are files that are searchable, PDFs of the stuff

1365
01:02:57.035 --> 01:02:59.635
that Dave Ho had a had, you know,

1366
01:02:59.785 --> 01:03:01.235
accumulated in his lifetime.

1367
01:03:01.295 --> 01:03:04.475
He passed away from pancreatic cancer a couple years ago,

1368
01:03:04.775 --> 01:03:07.315
and after I got that, I got re-energized

1369
01:03:07.815 --> 01:03:10.835
and got those scanned searchable PDF documents.

1370
01:03:10.855 --> 01:03:12.795
And there's an index that I put together

1371
01:03:13.295 --> 01:03:16.955
to help you zero in on the several gigabytes

1372
01:03:17.015 --> 01:03:18.275
of data that are there.

1373
01:03:18.815 --> 01:03:23.235
But go, go, go wandering through those archives of stuff

1374
01:03:23.975 --> 01:03:25.915
and as you, as your point

1375
01:03:25.935 --> 01:03:29.265
and your briefing is, Dave will used to see

1376
01:03:29.265 --> 01:03:31.865
that there was a steady heading side slip test coming up.

1377
01:03:31.975 --> 01:03:35.225
He'd drop a set of folders on my desk and said, read these.

1378
01:03:35.725 --> 01:03:36.945
If you're gonna kill yourself,

1379
01:03:36.945 --> 01:03:38.385
find a different way to kill yourself.

1380
01:03:38.385 --> 01:03:39.745
Don't do it the way these guys did.

1381
01:03:39.935 --> 01:03:41.385
Exactly. So it's,

1382
01:03:41.415 --> 01:03:43.865
it's a learn the lessons from other people.

1383
01:03:44.125 --> 01:03:47.025
And I will say, from my experience reviewing

1384
01:03:47.415 --> 01:03:50.185
what happened in other accidents of similar maneuvers,

1385
01:03:50.675 --> 01:03:53.805
help me think about how I'm going to do that next test.

1386
01:03:54.895 --> 01:03:56.915
And we've saved airplanes in lives

1387
01:03:57.295 --> 01:03:59.515
and tons of money for companies.

1388
01:04:00.065 --> 01:04:02.685
If you wanna link to this paper to go, uh, to that, it's,

1389
01:04:02.685 --> 01:04:04.285
it, it, it, it'll be easy to do.

1390
01:04:04.425 --> 01:04:07.335
Yep. Uh, we are updating it.

1391

01:04:07.515 --> 01:04:09.695
I'm gonna take the Briefing to Europe in, uh, June

1392
01:04:09.715 --> 01:04:11.015
for their SETP at Europe.

1393
01:04:11.345 --> 01:04:15.895
After that, we're ready to go final with the paper as as

1394
01:04:15.895 --> 01:04:18.615
of now, and we're gonna put it in for Cockpit Magazine,

1395
01:04:18.915 --> 01:04:21.175
but I think it would be worthy to also have you have a link

1396
01:04:21.195 --> 01:04:23.185
to it, uh, in your documentation,

1397
01:04:23.185 --> 01:04:24.185
Full stuff. And,

1398
01:04:24.185 --> 01:04:26.545
uh, eternal vigilance. Roy, thank you for doing this.

1399
01:04:26.775 --> 01:04:31.235
Very good. Alright, any other, uh, yeah, questions, sir?

1400
01:04:32.265 --> 01:04:34.115
Yeah, Darren McDonald, uh,

1401
01:04:34.655 --> 01:04:37.475
Boeing Commercial Transport, uh, background.

1402
01:04:38.135 --> 01:04:42.215
Uh, first maybe a comment. Uh, I really enjoyed all this.

1403
01:04:42.415 --> 01:04:44.575
I, I think it's really important to go digging through

1404
01:04:44.575 --> 01:04:46.735
and getting the nuggets out of, out of history.

1405
01:04:47.465 --> 01:04:50.125
Uh, I also think there's a lot of good stories

1406
01:04:50.125 --> 01:04:52.045
that could be added from the commercial world.

1407
01:04:53.305 --> 01:04:55.505
Excellent. We're we're looking for stories to add.

1408
01:04:55.735 --> 01:04:58.265
Yeah, I've been in a TM room when we got two

1409
01:04:58.265 --> 01:04:59.305
greens on a first flight.

1410
01:04:59.685 --> 01:05:02.625
So, you know, there, there are some,

1411
01:05:02.895 --> 01:05:05.985
some very similar stories out there in, in the, uh,

1412
01:05:06.155 --> 01:05:07.585
other half of the, the

1413
01:05:07.705 --> 01:05:08.705
Forecast. I, I just ask you to

1414
01:05:08.705 --> 01:05:09.945
feed the stories to either myself

1415
01:05:09.945 --> 01:05:11.705
or Mike Ravens, and we will, uh,

1416
01:05:11.705 --> 01:05:13.545
then we can incorporate those stories.

1417
01:05:13.815 --> 01:05:16.065
This was just a kind of a top view overview of

1418

01:05:16.065 --> 01:05:18.085
what I think is out there Yeah.

1419
01:05:18.145 --> 01:05:20.605
As far as, uh, uh, uh, some of these little nuggets

1420
01:05:20.605 --> 01:05:22.965
of information that, that, that, that's kind of cool. Yeah.

1421
01:05:23.265 --> 01:05:25.205
One, one question that also occurred to me.

1422
01:05:25.425 --> 01:05:30.395
Um, have you been able to also dig into a little bit

1423
01:05:30.395 --> 01:05:34.125
of, uh, kind of some of the philosophy that different, uh,

1424
01:05:35.095 --> 01:05:38.695
companies and and programs have used for first flights?

1425
01:05:39.195 --> 01:05:41.735
Uh, one of the most obvious for me is

1426
01:05:42.345 --> 01:05:45.205
as we look at all our fly by wire wire airplanes

1427
01:05:45.205 --> 01:05:48.205
and all the different, um, feedback loops and,

1428
01:05:48.305 --> 01:05:51.805
and controls, uh, do you take off in a degraded mode

1429
01:05:51.825 --> 01:05:56.545
or do you take off in a fully, uh, active mode?

1430
01:05:57.125 --> 01:05:59.705
Uh, I think some of those decisions are really important,

1431
01:05:59.705 --> 01:06:02.225
especially for some of these, uh, really new

1432
01:06:02.225 --> 01:06:03.985
and novel configurations of aircraft

1433
01:06:03.985 --> 01:06:04.985
that we're seeing coming up.

1434
01:06:05.485 --> 01:06:06.825
Do you have any thoughts on that or?

1435
01:06:07.055 --> 01:06:08.945
Yeah, we've never looked at any philosophy,

1436
01:06:09.185 --> 01:06:11.985
although I have talked about philosophy outside of the paper

1437
01:06:12.165 --> 01:06:14.605
to, you know, the idea

1438
01:06:14.645 --> 01:06:17.845
of this single point failure driving a system

1439
01:06:17.875 --> 01:06:20.045
that could possibly put an airplane into an

1440
01:06:20.045 --> 01:06:21.445
uncontrollable situation.

1441
01:06:21.865 --> 01:06:25.445
And if you tie all that back to a single point, uh, uh,

1442
01:06:25.685 --> 01:06:28.765
a sensor that continually puts input into that computer

1443
01:06:29.545 --> 01:06:32.365
at Northrop, we had to have at least two sensors.

1444
01:06:32.665 --> 01:06:34.045
If it was a UAV

1445

01:06:34.465 --> 01:06:37.645
and three triplex, if it was a manned aircraft,

1446
01:06:37.915 --> 01:06:39.125
that was a philosophy.

1447
01:06:39.305 --> 01:06:42.165
So that's an example I think you're talking about, of

1448
01:06:42.165 --> 01:06:45.845
what is your company philosophy related to things like,

1449
01:06:45.995 --> 01:06:47.125
like, like that sort of thing.

1450
01:06:47.715 --> 01:06:52.285
And, uh, that has not

1451
01:06:52.355 --> 01:06:53.485
been researched.

1452
01:06:53.485 --> 01:06:54.845
That was kind of out of the scope.

1453
01:06:55.025 --> 01:06:58.565
We were just simply going to shotgun this stuff out there,

1454
01:06:58.595 --> 01:06:59.925
boom, boom, boom, this happened,

1455
01:06:59.925 --> 01:07:01.285
this happened, this happened, this happened.

1456
01:07:01.465 --> 01:07:03.605
And then let everybody take away from that

1457
01:07:03.795 --> 01:07:05.005
what they felt was important.

1458
01:07:05.305 --> 01:07:08.485
But I think a a, a background philosophy would definitely be

1459
01:07:08.485 --> 01:07:11.085
another, another exploration that would be worthy

1460
01:07:11.085 --> 01:07:12.285
to do Absolutely.

1461
01:07:12.585 --> 01:07:13.605
For the different companies.

1462
01:07:13.835 --> 01:07:15.885
Even to the point where I remember, uh,

1463
01:07:16.045 --> 01:07:17.885
a i a a flight test safety committee,

1464
01:07:18.185 --> 01:07:21.085
or not, uh, uh, a technical committee when, uh,

1465
01:07:21.165 --> 01:07:22.565
I was brand new in this game.

1466
01:07:22.825 --> 01:07:24.325
And I saw two philosophies

1467
01:07:24.535 --> 01:07:27.445
where Boeing had dedicated people in the control room

1468
01:07:27.875 --> 01:07:31.285
that were professional, uh, at their different disciplines,

1469
01:07:31.285 --> 01:07:33.205
hydraulic electrical, fuel flight control,

1470
01:07:33.465 --> 01:07:35.365
and Northrop Grumman was bringing guys,

1471
01:07:35.505 --> 01:07:38.845
or Northrop was bringing people out of the design world,

1472

01:07:39.525 --> 01:07:41.205
training them to work in the control room.

1473
01:07:41.465 --> 01:07:43.605
And it was just kind of two different philosophies.

1474
01:07:43.905 --> 01:07:47.845
The good news was the, the, the, the, the bad news was

1475
01:07:47.905 --> 01:07:51.525
for the dedicated engineers, uh, was

1476
01:07:51.525 --> 01:07:53.965
that if you had a lull in your flight test program,

1477
01:07:54.555 --> 01:07:55.805
they kind of got laid off.

1478
01:07:56.645 --> 01:07:59.245
And if you had the other group

1479
01:07:59.245 --> 01:08:00.925
that were the design engineers

1480
01:08:00.925 --> 01:08:02.485
that were working in the control room,

1481
01:08:02.595 --> 01:08:04.525
then those design engineers could transfer

1482
01:08:04.525 --> 01:08:06.245
to another program and keep doing design.

1483
01:08:06.665 --> 01:08:07.885
So that was kind of the good

1484
01:08:07.885 --> 01:08:10.685
and the bad of a philosophy, which is kind of like

1485
01:08:10.685 --> 01:08:12.085
what you're talking about there a little bit.

1486
01:08:12.435 --> 01:08:15.765
Yeah. So it'd be worthy to do some exploration in that area.

1487
01:08:15.885 --> 01:08:17.685
I might pursue that. Thanks. Thank you for that.

1488
01:08:17.685 --> 01:08:20.525
Yeah, thank you. Very good. Good. Anything else?

1489
01:08:24.835 --> 01:08:26.855
Hey, good morning. Kent Vandergriff from KBR.

1490
01:08:26.995 --> 01:08:29.775
Uh, years ago I had, uh, the privilege of being part

1491
01:08:29.775 --> 01:08:31.615
of a first flight, uh, test program.

1492
01:08:31.665 --> 01:08:33.615
There. Not so much a question, but a pitch

1493
01:08:33.615 --> 01:08:36.975
and a really a pitch for SETP here, uh, in trying

1494
01:08:36.975 --> 01:08:38.495
to build a test team from scratch.

1495
01:08:38.715 --> 01:08:40.975
Uh, you mentioned, uh, Paul Metz, uh,

1496
01:08:41.265 --> 01:08:42.415
doing a literature search.

1497
01:08:42.435 --> 01:08:43.455
We found out, you know,

1498
01:08:43.455 --> 01:08:45.735
Paul Metz had written a really cool paper about standing

1499

01:08:45.735 --> 01:08:46.855
up the F 22 program.

1500
01:08:47.475 --> 01:08:50.295
Now this was a small civilian, uh, program that, uh,

1501
01:08:50.375 --> 01:08:51.695
I was privileged to be part of there,

1502
01:08:51.955 --> 01:08:54.815
but we used his paper, which we found in a literature search

1503
01:08:54.875 --> 01:08:57.695
to help stand up a, uh, a whole team from scratch.

1504
01:08:57.835 --> 01:08:59.935
And I know that he had used like an F 16

1505
01:08:59.995 --> 01:09:01.375
as a surrogate aircraft, you know,

1506
01:09:01.375 --> 01:09:02.495
and building up the test team

1507
01:09:02.495 --> 01:09:04.655
for an F 22 first flight and that kind of thing there.

1508
01:09:04.655 --> 01:09:06.495
Mm-Hmm. We used the same thing in a small civilian

1509
01:09:06.495 --> 01:09:08.775
organization, but we used a small little single engine

1510
01:09:08.975 --> 01:09:10.255
airplane and put a, uh,

1511
01:09:10.255 --> 01:09:12.215
surrogate test instrumentation program on

1512
01:09:12.215 --> 01:09:14.935
that small airplane and started running the test team

1513
01:09:14.935 --> 01:09:16.695
and building the test team through just using a,

1514
01:09:16.895 --> 01:09:17.975
a small surrogate airplane.

1515
01:09:18.035 --> 01:09:19.935
So by the time we actually did first flight there,

1516
01:09:20.275 --> 01:09:22.655
it was like a, a NASA mission control team.

1517
01:09:22.655 --> 01:09:24.855
This team was really rocking and rolling exactly.

1518
01:09:24.855 --> 01:09:26.295
And already preset with everything there.

1519
01:09:26.395 --> 01:09:27.975
So the literature is out there,

1520
01:09:28.085 --> 01:09:29.775
it's on the SETP website there,

1521
01:09:29.875 --> 01:09:31.655
and folks that are planning on doing that,

1522
01:09:31.815 --> 01:09:33.615
I really recommend they go do that,

1523
01:09:33.615 --> 01:09:35.375
especially if they're standing a team up from scratch.

1524
01:09:36.115 --> 01:09:40.775
Um, the second thing is, is, you know, our our company,

1525
01:09:41.075 --> 01:09:42.615
uh, you know, competitors

1526

01:09:42.615 --> 01:09:44.375
with other civilian companies out there,

1527
01:09:44.635 --> 01:09:46.335
and sometimes you can't go through the top

1528
01:09:46.335 --> 01:09:48.375
and communicate like brand a brand X

1529
01:09:48.435 --> 01:09:49.495
was doing the same kind of thing.

1530
01:09:49.495 --> 01:09:52.215
We were doing, um, first flight over there.

1531
01:09:52.475 --> 01:09:54.935
We couldn't go company to company because of corporate and,

1532
01:09:55.035 --> 01:09:57.015
and you know, firewalls and that kind of thing there.

1533
01:09:57.315 --> 01:10:00.255
But we were able to call Terry Tody who is, uh, you know,

1534
01:10:00.295 --> 01:10:02.495
a chief pilot on another competing program out there.

1535
01:10:02.755 --> 01:10:04.975
And we bought him a plane ticket case of beer

1536
01:10:04.975 --> 01:10:07.175
and a hotel room and said, Hey, Terry, open kimono.

1537
01:10:07.475 --> 01:10:09.095
Can you come take a look at our program?

1538
01:10:09.225 --> 01:10:10.895
We're getting ready to do high speed taxi

1539
01:10:10.955 --> 01:10:12.415
and getting ready to do first flight there.

1540
01:10:12.715 --> 01:10:14.255
And he came over and took a look at our program

1541
01:10:14.355 --> 01:10:15.495
and said, did you think about this?

1542
01:10:15.995 --> 01:10:17.615
Uh, no, we didn't think about that.

1543
01:10:17.675 --> 01:10:20.225
Did you think about this? No, we didn't think about that.

1544
01:10:20.245 --> 01:10:22.465
And I think probably, probably saved our ass just having

1545
01:10:22.655 --> 01:10:23.745
come over and taken a look

1546
01:10:23.745 --> 01:10:25.065
and given us some ideas, you know,

1547
01:10:25.065 --> 01:10:26.985
come from a military world and we got, you know, all kinds

1548
01:10:26.985 --> 01:10:29.225
of executive review and people and experience

1549
01:10:29.225 --> 01:10:31.465
and all that kind of thing, looking at the program and,

1550
01:10:31.525 --> 01:10:32.905
and you gonna get that built in.

1551
01:10:32.905 --> 01:10:35.505
But when you're a small standup program there, you know,

1552
01:10:35.505 --> 01:10:37.105
you may not have that oversight there.

1553

01:10:37.105 --> 01:10:39.505
And it's just sort of like, well, okay, you know, kind

1554
01:10:39.505 --> 01:10:41.785
of unknown unknowns and, and being able to reach out

1555
01:10:41.785 --> 01:10:44.785
and kind of go through the test pilot community, you know,

1556
01:10:44.785 --> 01:10:47.265
kind of open kimono there, you know, you know,

1557
01:10:47.265 --> 01:10:49.465
not without all the old corporate overhead there.

1558
01:10:49.845 --> 01:10:51.745
And, uh, being able to have an extra set of eyes

1559
01:10:51.745 --> 01:10:53.065
that are unrelated to your program,

1560
01:10:53.125 --> 01:10:54.825
but have the experience to come

1561
01:10:54.825 --> 01:10:56.065
and take a look at your program and kind

1562
01:10:56.065 --> 01:10:57.505
of do an executive review there,

1563
01:10:57.985 --> 01:10:59.545
I think paid huge dividends.

1564
01:10:59.545 --> 01:11:02.825
So just to pitch for SETP and the information and,

1565
01:11:02.845 --> 01:11:04.505
and not doing the same thing, you know,

1566
01:11:04.605 --> 01:11:06.225
not reinventing the same way to, you know,

1567
01:11:06.255 --> 01:11:07.425
bust an airplane up again.

1568
01:11:07.955 --> 01:11:10.565
Yeah. The genesis of this paper was in preparation

1569
01:11:10.745 --> 01:11:13.505
for the B 21 test team to, uh, come up to speed.

1570
01:11:13.965 --> 01:11:16.185
And even though they're part of it was classified

1571
01:11:16.525 --> 01:11:18.225
and we were not access to the program,

1572
01:11:18.765 --> 01:11:20.665
we could still be a one-way conversation

1573
01:11:21.115 --> 01:11:22.705
where we talk and they listen.

1574
01:11:23.125 --> 01:11:25.625
And that was the genesis that brought this on

1575
01:11:25.995 --> 01:11:28.545
where a symposium inside Northrop Grumman.

1576
01:11:28.725 --> 01:11:31.625
But we did bring outside players like, uh, you know,

1577
01:11:31.625 --> 01:11:34.665
Lockheed and other people in to talk about their projects

1578
01:11:34.665 --> 01:11:36.345
and their lessons learned, if you will.

1579
01:11:36.805 --> 01:11:38.425
And, and that was actually the genesis

1580

01:11:38.535 --> 01:11:39.665
that brought this paper on.

1581
01:11:39.665 --> 01:11:41.865
It seemed like, huh, hey, this is kind of good info.

1582
01:11:42.075 --> 01:11:45.185
Maybe we can, uh, take it out there and have, uh, approvals.

1583
01:11:45.485 --> 01:11:47.705
And so the approval process said, yeah, well,

1584
01:11:47.985 --> 01:11:49.625
companies don't like to hang out dirty laundry,

1585
01:11:49.725 --> 01:11:51.265
so why don't you just make it generic

1586
01:11:52.225 --> 01:11:53.505
fighter bomber that we did.

1587
01:11:53.505 --> 01:11:55.905
And that's kind of the source of how this thing evolved

1588
01:11:56.525 --> 01:11:59.505
as far as surrogates for, especially for UAVs or whatever.

1589
01:11:59.885 --> 01:12:02.505
Um, obviously, like I say, I'm a big believer.

1590
01:12:02.565 --> 01:12:04.545
The big pushback has always been by management.

1591
01:12:04.545 --> 01:12:06.065
Well, that costs money. That's extra money.

1592
01:12:06.065 --> 01:12:08.105
You gotta have it playing. You gotta have a crew trained.

1593
01:12:08.165 --> 01:12:09.785
You got, you know, uh, and,

1594
01:12:09.805 --> 01:12:12.305
and I said, you know, it's all about risk reduction.

1595
01:12:12.305 --> 01:12:13.465
How much are you willing to put

1596
01:12:13.465 --> 01:12:14.625
out there for risk reduction?

1597
01:12:14.845 --> 01:12:15.945
And we can keep it simple.

1598
01:12:16.365 --> 01:12:20.665
Um, I know for X 47 a, um, uh, which was a, a a prior

1599
01:12:20.665 --> 01:12:23.625
to the X 47 B, the surrogate was a beach barren.

1600
01:12:23.805 --> 01:12:24.945
And I flew to left seat.

1601
01:12:24.965 --> 01:12:28.105
The guy in the right seat actually held the laptop computer.

1602
01:12:28.445 --> 01:12:30.225
So the information was flowing up

1603
01:12:30.365 --> 01:12:32.745
and the laptop was getting the information from the back.

1604
01:12:33.085 --> 01:12:35.665
So he was holding the laptop, he would store it for takeoff

1605
01:12:35.685 --> 01:12:37.505
and then bring it up for, uh, the flight

1606
01:12:37.845 --> 01:12:39.265
to do the, uh, air fruit.

1607

01:12:39.575 --> 01:12:42.665
When it came time to stack the B-M-S-M-M-S,

1608
01:12:42.665 --> 01:12:45.985
we just stacked it on a seat, bolted it to a seat.

1609
01:12:46.165 --> 01:12:47.825
So as far as the FAA was concerned,

1610
01:12:47.825 --> 01:12:48.985
it was just another seat.

1611
01:12:49.205 --> 01:12:51.745
It was on a seat rail, so there wasn't any

1612
01:12:52.355 --> 01:12:55.865
extra work required as far as that goes to, uh,

1613
01:12:55.885 --> 01:12:59.745
to put this thing, when it came to cooling, uh, we were told

1614
01:12:59.745 --> 01:13:02.545
by the, uh, computer people, you will not exceed X degrees.

1615
01:13:02.545 --> 01:13:05.145
Something like 85 degrees with this computer.

1616
01:13:06.345 --> 01:13:08.815
We're, you know, we're at a hot place China Lake in the

1617
01:13:08.815 --> 01:13:11.455
middle of summer, so what'd we do in the morning?

1618
01:13:11.515 --> 01:13:13.735
We would pick up dry ice from the grocery store

1619
01:13:13.755 --> 01:13:15.935
and we would duct tape it to the computer.

1620
01:13:17.035 --> 01:13:20.975
And I haven't seen any problem with that excess CO2 yet.

1621
01:13:21.235 --> 01:13:24.055
But anyway, but that was a,

1622
01:13:24.055 --> 01:13:25.895
that one just shows you the innovation that kind

1623
01:13:25.895 --> 01:13:28.375
of goes into a simplified surrogate that wow,

1624
01:13:28.375 --> 01:13:29.695
am I a big believer in 'em?

1625
01:13:30.135 --> 01:13:32.575
'cause it really does make you feel comfortable on the com.

1626
01:13:32.575 --> 01:13:35.915
More comfortable on the day of. So there you go. Yeah.

1627
01:13:36.445 --> 01:13:37.445
Good stuff.

1628
01:13:38.775 --> 01:13:39.795
Hey Roy, thanks for the paper.

1629
01:13:39.975 --> 01:13:44.035
Uh, pat Deluth boundary layer in,

1630
01:13:44.215 --> 01:13:47.555
in your lead up to this, did anybody bring up,

1631
01:13:47.995 --> 01:13:50.275
I know you talked about legacy hardware.

1632
01:13:51.285 --> 01:13:54.065
Did anybody bring up legacy software?

1633
01:13:54.525 --> 01:13:55.665
Huh? Interesting

1634

01:13:55.855 --> 01:13:57.305
Because there, there's a couple

1635
01:13:57.365 --> 01:13:59.745
of programs I've been affiliated with.

1636
01:14:00.045 --> 01:14:03.935
Um, you know, one was a, a space vehicle

1637
01:14:04.075 --> 01:14:07.015
and the other one was a, uh, commercial UAV

1638
01:14:08.035 --> 01:14:11.565
and they both borrowed code

1639
01:14:12.375 --> 01:14:13.705
from other programs.

1640
01:14:13.965 --> 01:14:17.145
And in both cases, that resulted in, in problems.

1641
01:14:17.285 --> 01:14:18.625
Now, now I know Boeing

1642
01:14:19.045 --> 01:14:23.945
and the tutorial last year talked about, uh, STPA and stamp

1643
01:14:24.005 --> 01:14:26.505
and cast and all that stuff, and that would be very helpful,

1644
01:14:26.645 --> 01:14:30.365
but that's also very time consuming.

1645
01:14:30.825 --> 01:14:34.285
And I just wonder if any other programs have, have run into,

1646
01:14:35.875 --> 01:14:38.295
or, or those of you that are working on programs

1647
01:14:38.295 --> 01:14:39.735
that involve software.

1648
01:14:40.595 --> 01:14:45.015
By show of hands, how many of you have programs that have

1649
01:14:45.975 --> 01:14:48.815
borrowed software from some other program?

1650
01:14:53.415 --> 01:14:55.935
Okay, if I may, I'll give you an example.

1651
01:14:56.005 --> 01:14:59.055
Yeah, thanks Of how it didn't work, but how we handled it.

1652
01:14:59.315 --> 01:15:01.015
So, um, customer comes to us

1653
01:15:01.035 --> 01:15:03.215
and says, uh, I'd like to have an optionally piloted

1654
01:15:03.455 --> 01:15:06.335
airplane because he wants to have a, he can't run a UAV

1655
01:15:06.335 --> 01:15:07.495
through the national airspace.

1656
01:15:08.315 --> 01:15:10.375
So I'll tell you what, let's put a pilot in the plane

1657
01:15:10.435 --> 01:15:11.975
to route it through the national airspace.

1658
01:15:12.075 --> 01:15:14.615
And then when we get to the, uh, the, the location

1659
01:15:14.675 --> 01:15:16.455
for operation, we can take the pilot out,

1660
01:15:16.515 --> 01:15:18.295
put the ball in, track, the satellite.

1661

01:15:18.595 --> 01:15:20.535
So this was my last project I worked

1662
01:15:20.535 --> 01:15:22.655
with optionally piloted using this concept

1663
01:15:22.795 --> 01:15:24.495
of UAV to pilot the UAV.

1664
01:15:25.005 --> 01:15:29.105
Okay. So, uh, to do the initial work, they said, Hey Roy,

1665
01:15:29.105 --> 01:15:32.465
go out there to Texas, buy this D 40, bring it back,

1666
01:15:32.465 --> 01:15:34.905
and we're gonna put a computer in the back of this DA 40

1667
01:15:35.245 --> 01:15:37.265
and we're gonna show that we can do this concept

1668
01:15:37.435 --> 01:15:38.545
optionally piloted.

1669
01:15:38.615 --> 01:15:40.825
Okay. So I'll bring it back and we load it.

1670
01:15:40.825 --> 01:15:42.385
And so for the legacy software,

1671
01:15:42.405 --> 01:15:45.165
we said let's use the Global Hawk software

1672
01:15:45.505 --> 01:15:48.485
to be the guidance for going from Waypoint to Waypoint

1673
01:15:48.705 --> 01:15:51.765
and also for our landing, uh, all the way down to the, uh,

1674
01:15:51.945 --> 01:15:54.765
uh, takeoff and landing make it it all automatic using

1675
01:15:54.825 --> 01:15:56.725
Global Hawk software, which is

1676
01:15:56.725 --> 01:15:58.365
what you're talking about, a legacy software.

1677
01:15:58.915 --> 01:16:01.735
So, uh, the project worked pretty good, except one thing,

1678
01:16:02.225 --> 01:16:05.675
every time we come back to the pattern, it would shoot a

1679
01:16:07.175 --> 01:16:09.675
low approach, go missed approach, come back

1680
01:16:09.675 --> 01:16:11.995
around the pattern and the next time it would land,

1681
01:16:12.315 --> 01:16:14.515
I could never get it to land on the first time.

1682
01:16:15.175 --> 01:16:16.635
Huh. So how to handle it.

1683
01:16:16.865 --> 01:16:19.235
Well, the customer was coming out to see how we were doing.

1684
01:16:19.575 --> 01:16:22.635
So I briefed the customer, you know, tell you

1685
01:16:22.635 --> 01:16:23.875
what we're gonna do, gonna do,

1686
01:16:23.945 --> 01:16:25.355
show you everything automatic,

1687
01:16:25.655 --> 01:16:28.115
and I'm gonna show you that we do a low approach

1688

01:16:28.575 --> 01:16:29.955
and we can do a missed approach.

1689
01:16:30.415 --> 01:16:31.835
And that's exactly what happened.

1690
01:16:31.835 --> 01:16:34.195
And the customer was delighted and we got the next project.

1691
01:16:34.575 --> 01:16:37.355
So that may fall under the world of lying,

1692
01:16:37.635 --> 01:16:38.875
cheating contractor maybe.

1693
01:16:39.335 --> 01:16:42.315
But, uh, anyway, we did invent new software for the next one

1694
01:16:42.615 --> 01:16:44.275
and everything worked okay.

1695
01:16:44.505 --> 01:16:47.475
Yeah. Oh, Carla, how you doing? Hi Roy. How,

1696
01:16:47.535 --> 01:16:49.235
Hi Roy

1697
01:16:49.235 --> 01:16:51.355
and I worked a couple of those first flights together.

1698
01:16:51.695 --> 01:16:53.235
We go back to prehistoric times.

1699
01:16:54.385 --> 01:16:55.635
Some of this should have looked familiar

1700
01:16:56.455 --> 01:16:58.995
And as the only person in the room shorter than Pete,

1701
01:16:59.075 --> 01:17:00.195
I also am standing up.

1702
01:17:00.655 --> 01:17:03.435
Um, very good.

1703
01:17:03.495 --> 01:17:04.595
Uh, so I,

1704
01:17:04.915 --> 01:17:08.755
I had an odd comment about the calm plan

1705
01:17:09.025 --> 01:17:11.085
and the control room training.

1706
01:17:11.825 --> 01:17:16.405
Uh, so a little bit, uh, a different viewpoint, um,

1707
01:17:16.665 --> 01:17:19.845
on one of those large bomber programs that Roy talked about,

1708
01:17:20.265 --> 01:17:22.485
we had an incredibly disciplined,

1709
01:17:22.695 --> 01:17:26.045
super trained control room, uh, process

1710
01:17:26.475 --> 01:17:29.245
that you went six months and you had to go through training

1711
01:17:29.305 --> 01:17:33.685
and you had to spend, uh, uh, a, a rotation

1712
01:17:34.675 --> 01:17:36.845
overnight, second shift, third shift

1713
01:17:37.025 --> 01:17:39.285
as a control engineer on the hangar floor

1714
01:17:39.285 --> 01:17:40.885
to learn every system on the aircraft

1715

01:17:40.885 --> 01:17:43.085
before you were allowed to, to test,

1716
01:17:43.885 --> 01:17:46.265
to set foot in the control room.

1717
01:17:47.335 --> 01:17:50.395
But we had one particular flight

1718
01:17:50.485 --> 01:17:53.795
where the control room discipline worked against us

1719
01:17:54.645 --> 01:17:59.385
and we had never trained for a time critical situation

1720
01:17:59.755 --> 01:18:02.665
where passing information through the TD

1721
01:18:02.665 --> 01:18:05.745
to the airplane was not effective.

1722
01:18:06.905 --> 01:18:10.405
And, uh, I was one of the lead test engineers as Roy knows.

1723
01:18:10.865 --> 01:18:13.085
Um, and it got to the point

1724
01:18:13.085 --> 01:18:17.365
where the pilot just got on the radio very, I angry

1725
01:18:17.665 --> 01:18:22.285
and very worried and said, just put dragon lady on the radio

1726
01:18:22.625 --> 01:18:24.285
so she can tell me what to do.

1727
01:18:26.175 --> 01:18:30.975
There we go. Yeah. So I would, um, I would argue

1728
01:18:31.085 --> 01:18:33.575
that you need to look at your com plans

1729
01:18:34.075 --> 01:18:35.375
and your control room plans

1730
01:18:35.755 --> 01:18:38.015
and make sure that there is a break point

1731
01:18:38.015 --> 01:18:41.855
where you recognize you have to have some flexibility to do,

1732
01:18:42.395 --> 01:18:45.095
uh, do something a little bit different if necessary.

1733
01:18:46.025 --> 01:18:49.195
Very good. Uh, also while we're talking about com plans

1734
01:18:49.215 --> 01:18:52.355
and control rooms on that one where the pilots could not

1735
01:18:53.285 --> 01:18:56.975
respond to anybody, uh, there needs to be, uh, some sort

1736
01:18:56.975 --> 01:19:00.375
of a hot bike operation from the control room to the pilot

1737
01:19:00.395 --> 01:19:02.575
that's independent of the, uh, external radio.

1738
01:19:03.355 --> 01:19:07.335
Uh, on one of the projects more the, my my, my last project,

1739
01:19:07.925 --> 01:19:10.415
they actually introduced VOIP

1740
01:19:11.205 --> 01:19:13.505
and wow, a voiceover internet protocol.

1741
01:19:14.085 --> 01:19:16.185
And, uh, we were able to talk to the control room

1742

01:19:16.365 --> 01:19:18.025
and it was so crystal clear,

1743
01:19:18.665 --> 01:19:20.385
I couldn't believe the guy wasn't sitting

1744
01:19:20.415 --> 01:19:21.785
next to me in the airplane.

1745
01:19:22.245 --> 01:19:25.025
So VOIP was a method that was one method.

1746
01:19:25.085 --> 01:19:28.905
We used to have a backup plan for control room to,

1747
01:19:29.205 --> 01:19:30.665
to pilot interface.

1748
01:19:31.365 --> 01:19:33.145
Not saying that works on all projects,

1749
01:19:33.145 --> 01:19:34.945
but that's one that we use VOIP

1750
01:19:34.945 --> 01:19:36.145
and it worked very successfully.

1751
01:19:37.235 --> 01:19:38.565
Good. Good. Carla, thank you.

1752
01:19:38.715 --> 01:19:42.205
Yeah, you're right there no matter, but again, the planning

1753
01:19:42.265 --> 01:19:44.405
and, and the testing in the control room, at least

1754
01:19:45.255 --> 01:19:47.905
everybody is up kind of on the same thing sometimes.

1755
01:19:47.905 --> 01:19:49.905
You're right. It's better just to go VFR direct

1756
01:19:49.905 --> 01:19:52.065
to the engineer and say you talk to 'em.

1757
01:19:52.095 --> 01:19:53.505
Very good sir.

1758
01:19:54.335 --> 01:19:55.865
Alright, just first off, thanks

1759
01:19:55.885 --> 01:19:57.185
for fantastic presentation.

1760
01:19:57.445 --> 01:20:00.865
Uh, Simon Hederman Rolls-Royce, you just come out

1761
01:20:00.865 --> 01:20:03.465
of a first flight with a modified airplane.

1762
01:20:03.485 --> 01:20:06.305
And a lot of this is really reflecting the lessons we

1763
01:20:07.295 --> 01:20:09.135
relearned, uh, going through that.

1764
01:20:09.845 --> 01:20:13.295
But I, I think one thing that comes to me is that

1765
01:20:14.135 --> 01:20:16.005
first flight is an interesting definition.

1766
01:20:16.355 --> 01:20:19.325
Sure. When it's first time the airplane rolls outta

1767
01:20:19.325 --> 01:20:20.405
the factory, it goes wheels up.

1768
01:20:20.405 --> 01:20:22.795
It's really obvious. But what's the line?

1769

01:20:23.185 --> 01:20:26.495
What you're making a modification for first flight?

1770
01:20:27.355 --> 01:20:29.485
It's really obvious to some people, the test team,

1771
01:20:30.155 --> 01:20:31.935
but not everyone in the organization

1772
01:20:31.955 --> 01:20:34.215
or multiple organizations view it the same

1773
01:20:34.235 --> 01:20:35.575
way for some people.

1774
01:20:35.835 --> 01:20:37.215
Oh, well it's just a small change.

1775
01:20:37.715 --> 01:20:39.095
Why do you need to go through all this?

1776
01:20:39.535 --> 01:20:43.075
And I think getting that aligned view across everyone

1777
01:20:43.135 --> 01:20:44.555
so you can actually go through this

1778
01:20:45.465 --> 01:20:47.365
and get the right mindset,

1779
01:20:47.545 --> 01:20:50.285
the right training across everyone is really interesting

1780
01:20:50.285 --> 01:20:52.565
problem that we hadn't considered before we went into it.

1781
01:20:55.375 --> 01:20:56.595
I'm just wondering is, is that something

1782
01:20:56.595 --> 01:20:59.195
that you've run into in programs you've been in?

1783
01:21:00.715 --> 01:21:03.265
Okay, very good. Well, I, uh,

1784
01:21:03.385 --> 01:21:05.025
I don't really have any comments to add,

1785
01:21:05.725 --> 01:21:06.905
add to that personally.

1786
01:21:07.045 --> 01:21:10.725
So I dunno if anybody else can respond or not. There we go.

1787
01:21:17.775 --> 01:21:19.525
Right? Mm-Hmm mm-Hmm

1788
01:21:25.195 --> 01:21:29.075
mm-Hmm mm-hmm.

1789
01:21:35.225 --> 01:21:37.305
Briefing I just gave you, Ricardo said, I'm allowed

1790
01:21:37.305 --> 01:21:40.705
to divulge that this was the F 18 G

1791
01:21:41.905 --> 01:21:43.795
growler verse fight.

1792
01:21:44.615 --> 01:21:47.675
So the answer to your question is obvious that it has

1793
01:21:47.675 --> 01:21:49.075
to carry the same weight

1794
01:21:49.375 --> 01:21:51.915
as your original aircraft first flight.

1795
01:21:52.175 --> 01:21:54.075
Yes. It carries that same weight. Yeah.

1796

01:21:54.215 --> 01:21:58.155
And that's, and I'm, I'm glad Ricardo was very forthcoming

1797
01:21:58.185 --> 01:21:59.235
with this, but he said, yeah,

1798
01:21:59.235 --> 01:22:00.235
lemme tell you about the first flight

1799
01:22:00.235 --> 01:22:01.515
of the G model when I did that.

1800
01:22:01.735 --> 01:22:03.795
And that's where this story evolved from.

1801
01:22:04.455 --> 01:22:07.875
So the one with the c**k nose gear, I can say that

1802
01:22:07.875 --> 01:22:09.355
that was an F five E,

1803
01:22:09.685 --> 01:22:12.955
which had a modified nose gear from the F five A

1804
01:22:13.615 --> 01:22:15.235
and again, should have been treated

1805
01:22:15.265 --> 01:22:18.355
with a little more understanding of where that went from.

1806
01:22:18.535 --> 01:22:20.395
So I think the answer to that question is yes,

1807
01:22:20.895 --> 01:22:25.175
the derivative deserves the same, the same, uh,

1808
01:22:26.125 --> 01:22:29.495
care and feeding that you would for just a set.

1809
01:22:29.515 --> 01:22:30.895
Now there are some things you can do.

1810
01:22:30.895 --> 01:22:34.495
You put a gun pod on a, on on on an F five,

1811
01:22:34.495 --> 01:22:36.335
you're gonna go out and shoot the pod for the first time.

1812
01:22:36.555 --> 01:22:38.135
No, you don't need to get all wrapped up

1813
01:22:38.135 --> 01:22:39.935
around the axle on some of that with all the,

1814
01:22:40.205 --> 01:22:42.055
necessarily the, the, the planning.

1815
01:22:42.315 --> 01:22:45.055
But if you're gonna go to a new derivative of the airplane,

1816
01:22:45.195 --> 01:22:48.495
yes, I believe you should go to a, uh, uh, uh,

1817
01:22:48.565 --> 01:22:51.015
from the beginning your fullblown, uh,

1818
01:22:51.085 --> 01:22:52.135
risk management process.

1819
01:22:53.635 --> 01:22:54.635
Sure.

1820
01:22:57.155 --> 01:22:58.495
Ahed, Thank you

1821
01:23:00.445 --> 01:23:03.625
On that line, be aware of prototype and

1822
01:23:03.715 --> 01:23:06.205
Sustaining programs Right.

1823

01:23:06.385 --> 01:23:10.445
On a company. Yeah. Um, yeah. That will get you.

1824
01:23:10.545 --> 01:23:13.205
And, and there's an example that where that happened,

1825
01:23:14.015 --> 01:23:16.935
there's not the same attention, uh,

1826
01:23:17.165 --> 01:23:18.895
from a prototype mentality

1827
01:23:19.035 --> 01:23:21.535
to a sustaining airplane mentality.

1828
01:23:22.645 --> 01:23:25.375
Very good. Thank you. One thing I learned was that kind

1829
01:23:25.375 --> 01:23:27.375
of in the company in any way, it seemed like when we went

1830
01:23:27.375 --> 01:23:32.095
to prototypes, we had the, a team, uh, always ready to go.

1831
01:23:32.095 --> 01:23:33.975
These were your smartest guys in the company

1832
01:23:33.995 --> 01:23:35.815
and your best, some of your best engineers

1833
01:23:35.815 --> 01:23:37.255
to work the prototype issue.

1834
01:23:37.365 --> 01:23:40.375
Sometimes when we went to the more sustained product, it was

1835
01:23:41.095 --> 01:23:45.535
bringing in other people, training them as you go and, and,

1836
01:23:45.595 --> 01:23:46.775
and, and things like that.

1837
01:23:47.355 --> 01:23:51.415
Um, uh, so I I I always found that the work I did

1838
01:23:51.415 --> 01:23:52.775
with the prototype I always wanted.

1839
01:23:52.775 --> 01:23:55.055
Yeah, yeah. Because I got, we're working a small team.

1840
01:23:55.385 --> 01:23:57.775
We're, we're working with the a team here and,

1841
01:23:57.795 --> 01:23:59.735
and that always seemed to go a lot smoother

1842
01:24:00.285 --> 01:24:03.175
than when you get into the more sustained issues

1843
01:24:03.275 --> 01:24:05.645
and problems come up and et cetera.

1844
01:24:05.645 --> 01:24:09.205
That's a good comment. Yeah. Very good. Okay. Alright.

1845
01:24:09.285 --> 01:24:12.205
I don't wanna take any more time. Um, oh, got one more.

1846
01:24:12.205 --> 01:24:15.205
Here we go. One more sir. Hey, good one to finish on

1847
01:24:16.225 --> 01:24:17.285
Too much talk about fighters,

1848
01:24:17.285 --> 01:24:18.365
I gotta represent the commercial

1849
01:24:18.435 --> 01:24:19.525
side of the house for a little bit.

1850

01:24:20.105 --> 01:24:21.235
So one of the things,

1851
01:24:21.455 --> 01:24:24.955
and I totally totally agree with Ricardo's

1852
01:24:24.955 --> 01:24:27.035
and your comments about not establishing

1853
01:24:27.115 --> 01:24:28.155
a first flight date.

1854
01:24:28.415 --> 01:24:30.235
Mm-Hmm. And not advertising that.

1855
01:24:30.615 --> 01:24:32.755
And that's not the way the world is now.

1856
01:24:34.175 --> 01:24:37.075
And so on top of that, we have the pressure

1857
01:24:37.335 --> 01:24:39.595
and it, this, it's comes from a place of

1858
01:24:41.265 --> 01:24:44.005
not knowing the people who are the marketing people

1859
01:24:44.005 --> 01:24:45.325
who are trying to put this all together.

1860
01:24:45.355 --> 01:24:46.885
They, they're just trying to sell this

1861
01:24:46.885 --> 01:24:48.805
and they're, they're not trying to make your life harder,

1862
01:24:49.465 --> 01:24:51.525
but as the testers, we need to have,

1863
01:24:52.385 --> 01:24:53.895
think about developing a plan

1864
01:24:55.075 --> 01:24:56.295
of how you're gonna deal with that.

1865
01:24:56.755 --> 01:24:59.815
Or how are you gonna deal with, as the guy walking out

1866
01:24:59.815 --> 01:25:02.975
to do the first flight of a brand new commercial airliner.

1867
01:25:02.975 --> 01:25:05.855
And you have to walk through a crowd of 3000 people

1868
01:25:06.705 --> 01:25:08.205
who are going to be watching this

1869
01:25:08.315 --> 01:25:10.685
with big screen TVs and everything like that.

1870
01:25:10.785 --> 01:25:11.885
And there's, there's a,

1871
01:25:12.045 --> 01:25:14.885
a just a little extra pressure associated with that.

1872
01:25:15.765 --> 01:25:18.685
And then top of that, the hardest part

1873
01:25:18.685 --> 01:25:22.005
because world is going that way.

1874
01:25:22.115 --> 01:25:24.365
It's like, I don't know how the football players

1875
01:25:24.545 --> 01:25:27.645
and the coaches and that do the scrum with the media, but

1876
01:25:27.645 --> 01:25:29.445
after the first flight, then you get to go

1877

01:25:29.545 --> 01:25:32.005
and talk to the world media on top of that.

1878
01:25:32.255 --> 01:25:34.205
Right? And so how do we deal with this?

1879
01:25:34.385 --> 01:25:37.725
And don't be like, not me, the other guy at the, at the,

1880
01:25:37.785 --> 01:25:41.365
on the, the stage of making the $3 billion math error in

1881
01:25:41.365 --> 01:25:43.555
public and telling the real,

1882
01:25:43.655 --> 01:25:45.235
the real numbers, not the fake numbers.

1883
01:25:45.505 --> 01:25:47.635
Yeah. Um, so anyway, something to think about.

1884
01:25:47.935 --> 01:25:49.435
How are you gonna put this plan together?

1885
01:25:49.495 --> 01:25:51.915
How are you going to get, you know, isolate the crews?

1886
01:25:52.495 --> 01:25:54.675
And then how are you going to accommodate when things,

1887
01:25:54.945 --> 01:25:57.235
when things go wrong, or if things go really wrong,

1888
01:25:57.615 --> 01:25:58.955
how are you gonna communicate that?

1889
01:25:59.505 --> 01:26:02.075
There's a, I kind of interesting a test by the school.

1890
01:26:02.075 --> 01:26:04.205
We're never trained, uh, on pub dealing

1891
01:26:04.205 --> 01:26:05.285
with the public, are we?

1892
01:26:05.305 --> 01:26:06.645
You know? Yeah. That's the, that's the world.

1893
01:26:06.745 --> 01:26:09.005
Now I said after my flight, I landed,

1894
01:26:09.205 --> 01:26:10.725
I taxied it rolled off to the end.

1895
01:26:10.775 --> 01:26:12.245
Right. Did the typical thing.

1896
01:26:12.365 --> 01:26:14.805
I pick up the phone and call my wife

1897
01:26:14.825 --> 01:26:16.565
and just say, I'm yeah, I'm okay.

1898
01:26:16.575 --> 01:26:18.005
She's 2000 miles away.

1899
01:26:18.005 --> 01:26:21.565
She Yeah, I watched the whole thing on YouTube. So

1900
01:26:21.885 --> 01:26:22.885
I love it. Different world.

1901
01:26:22.885 --> 01:26:24.045
Yeah, different world.

1902
01:26:24.225 --> 01:26:26.005
You talk about pressure, I like to tell a story

1903
01:26:26.005 --> 01:26:27.805
of on the fourth flight of the space shuttle,

1904

01:26:27.805 --> 01:26:30.005
which was gonna be coming in be the first landing.

1905
01:26:30.465 --> 01:26:33.205
Uh, and I, when I'm trying to teach you the youngins on, on,

1906
01:26:33.265 --> 01:26:35.245
on, you gotta test to a high gain.

1907
01:26:35.445 --> 01:26:37.685
'cause that's where if you've got any issues, uh,

1908
01:26:37.705 --> 01:26:39.565
flying qualities, you're gonna break 'em out under,

1909
01:26:39.725 --> 01:26:40.885
under high gain scenario.

1910
01:26:41.305 --> 01:26:43.725
So on this fourth flight of the shuttle, uh,

1911
01:26:44.275 --> 01:26:45.965
it's now gonna land on the main runway,

1912
01:26:46.115 --> 01:26:48.885
it's first shuttle landing on the main runway at Edwards.

1913
01:26:48.885 --> 01:26:51.045
And they're gonna reuse runway zero four again

1914
01:26:51.045 --> 01:26:52.165
because they wanted to uh,

1915
01:26:52.225 --> 01:26:53.885
go out onto the lake bed if there's a problem.

1916
01:26:54.425 --> 01:26:57.885
So they told, uh, the uh, Fred Hayes, the left seater.

1917
01:26:57.885 --> 01:27:00.445
I tell you what, we've got a stripe on the runway at the

1918
01:27:00.445 --> 01:27:01.605
10,000 foot marker.

1919
01:27:02.185 --> 01:27:04.925
So we would really like you to land on that stripe

1920
01:27:04.925 --> 01:27:07.685
because Prince Charles is here today from England

1921
01:27:07.865 --> 01:27:10.605
and we're gonna have him set right on that line.

1922
01:27:10.905 --> 01:27:13.485
And it would really be cool if you could touch down right in

1923
01:27:13.485 --> 01:27:17.005
front of Prince Charles, you think about all the pressure

1924
01:27:17.165 --> 01:27:18.525
that's on you just trying

1925
01:27:18.525 --> 01:27:20.125
to get this damn thing to fly, right.

1926
01:27:20.345 --> 01:27:22.685
And to get it down on earth safely anywhere.

1927
01:27:23.025 --> 01:27:24.765
And now they want you to land on this point.

1928
01:27:25.035 --> 01:27:27.325
Well, as you saw the fourth flight of the shuttle,

1929
01:27:27.345 --> 01:27:28.925
if you've ever seen the video of it,

1930
01:27:29.225 --> 01:27:31.085
he goes into a pitch PIO for a lot

1931

01:27:31.085 --> 01:27:32.445
of reasons I'm not gonna go into now,

1932
01:27:32.625 --> 01:27:35.925
but the bottom line is it didn't land on the 10,000

1933
01:27:35.985 --> 01:27:37.245
and it was an awful landing

1934
01:27:37.465 --> 01:27:39.325
and could have lost the airplane.

1935
01:27:39.535 --> 01:27:42.395
Uh, and it was a case of high gain suddenly having

1936
01:27:42.395 --> 01:27:44.355
to get it on that line, have to get it on that line.

1937
01:27:44.615 --> 01:27:46.115
And they're a little bit hot on final

1938
01:27:46.375 --> 01:27:48.475
and they got a delay in the pitch response

1939
01:27:48.495 --> 01:27:51.315
and all these things that go into PIO and, and, and,

1940
01:27:51.315 --> 01:27:55.075
and I just thought it was got a unique story about how okay,

1941
01:27:55.185 --> 01:27:56.835
landing an airplane is one thing,

1942
01:27:56.835 --> 01:27:58.875
landing an airplane exactly on this spot

1943
01:27:58.875 --> 01:28:00.715
because we've got the aviation week camera.

1944
01:28:01.105 --> 01:28:02.715
What we want to get that perfect picture,

1945
01:28:03.175 --> 01:28:04.235
that's a different game.

1946
01:28:04.465 --> 01:28:07.955
Okay. And so your point's well taken as far as

1947
01:28:07.955 --> 01:28:09.515
how do we deal with the public on that sort of thing.

1948
01:28:10.805 --> 01:28:14.025
Sir, thank you.

1949
01:28:15.385 --> 01:28:16.985
I know you probably already Had one. Oh

1950
01:28:16.985 --> 01:28:17.985
Great. Thank.

1951
01:28:17.985 --> 01:28:20.065
Hey. Excellent. Thank you sir. Thank you.

1952
01:28:20.415 --> 01:28:21.415
Alright, thanks.

1953
01:28:24.275 --> 01:28:26.975
Absolutely. And when Roy

1954
01:28:26.975 --> 01:28:29.095
and I were discussing how much time he was gonna

1955
01:28:29.095 --> 01:28:30.135
need, he said, it's probably just an hour.

1956
01:28:30.175 --> 01:28:31.695
I said, well, hour and a half is probably gonna

1957
01:28:31.695 --> 01:28:32.815
be questions Oh, whatever.

1958

01:28:32.915 --> 01:28:35.615
And almost, almost made it.

1959
01:28:35.615 --> 01:28:36.815
So, and if you didn't get a chance

1960
01:28:36.835 --> 01:28:38.815
to ask your question, uh, don't worry.

1961
01:28:39.055 --> 01:28:40.935
'cause at the end of the day, we will have everybody who's

1962
01:28:40.935 --> 01:28:42.655
talked today come up beyond a panel hearing.

1963
01:28:42.655 --> 01:28:44.455
You can ask your question then,

1964
01:28:45.175 --> 01:28:48.155
but time now is, uh, 0 9 5 3.

1965
01:28:48.155 --> 01:28:50.235
You'll get a little bit extra long break.

1966
01:28:50.415 --> 01:28:54.555
We will return on schedule at 1 0 3 0

1967
01:28:55.885 --> 01:28:56.105
go.