```
1
00:00:00.300 --> 00:00:03.300
Mission UK bill has an interesting
2
00:00:03.300 --> 00:00:06.600
background grew up a little bit in America and
3
00:00:06.600 --> 00:00:07.600
in Africa and
4
00:00:08.800 --> 00:00:11.800
is a royal Navy pilot with Harrier
5
00:00:11.800 --> 00:00:15.500
experience and then they came to the US and flew aviates
6
00:00:15.500 --> 00:00:18.700
and f-18s. So
7
00:00:18.700 --> 00:00:21.200
Bill welcome.
8
00:00:30.600 --> 00:00:33.200
Good afternoon, everybody. It's a great
9
00:00:33.200 --> 00:00:36.400
pleasure to be here. It's my first sctp conference.
10
00:00:36.400 --> 00:00:39.300
I usually present if I
11
00:00:39.300 --> 00:00:44.500
do present to display safety conferences
12
00:00:42.500 --> 00:00:45.800
civil aviation,
13
00:00:45.800 --> 00:00:48.600
for example, and I've
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WEBVTT

14 00:00:48.600 --> 00:00:52.500 also attended the US national warbirds 15 00:00:51.500 --> 00:00:54.400 operators conference. For example, this is 16 00:00:54.400 --> 00:00:57.700 my first flight test safety related conference. 17 00:00:57.700 --> 00:01:01.000 I'm really impressed with the the content 18 00:01:00.300 --> 00:01:04.500 and an interaction from people. So I'm 19 00:01:03.500 --> 00:01:06.200 looking forward to questions at 20 00:01:06.200 --> 00:01:09.800 the end or doing the panel at the end of my presentation. So 21 00:01:09.800 --> 00:01:12.400 I'm going to talk to you this afternoon about human performance. 22 00:01:13.500 --> 00:01:16.300 And experts and we are all experts in this room 23 00:01:16.300 --> 00:01:17.700 in the context of what I'm going to say. 24 00:01:18.600 --> 00:01:21.100 Okay, we're all experts as asked to 25 00:01:21.100 --> 00:01:25.100 introduce organizational change into the 26 00:01:26.500 --> 00:01:30.000 into this and it's been 27 00:01:29.300 --> 00:01:33.100

very interesting because a lot of the points that I 28 00:01:32.100 --> 00:01:35.200 missed in my preparation has been brought 29 00:01:35.200 --> 00:01:38.200 up in the in what's been said so far. So hopefully I'll 30 00:01:38.200 --> 00:01:39.500 be able to bring those in 31 00:01:41.400 --> 00:01:43.000 so the aim of today's presentation. 32 00:01:44.900 --> 00:01:48.300 Is to hopefully provide a useful and importantly 33 00:01:47.300 --> 00:01:50.700 a different perspective to an 34 00:01:50.700 --> 00:01:51.800 important area of human factors. 35 00:01:52.800 --> 00:01:55.600 So I'm not even beginning to think that 36 00:01:55.600 --> 00:01:58.300 you don't know a lot about the subjects. I'm going 37 00:01:58.300 --> 00:02:02.200 to talk about but my aim is to give you a maybe a different perspective and 38 00:02:01.200 --> 00:02:04.500 to introduce it into a flight test 39 00:02:04.500 --> 00:02:05.800 safety context. 40 00:02:07.500 --> 00:02:09.000 So that's the human performance.

41 00:02:10.100 --> 00:02:13.000 And experts Human Performance actually covers what people used to 42 00:02:13.100 --> 00:02:14.400 call errors human error. 43 00:02:15.100 --> 00:02:18.400 Accident causation is now human and for a 44 00:02:18.400 --> 00:02:20.800 while that's been further human performance. 45 00:02:23.300 --> 00:02:26.800 I'm also going to discuss two highly relevant cognitive and 46 00:02:26.800 --> 00:02:29.800 behavioral behavioral human factors 47 00:02:29.800 --> 00:02:32.600 concepts with a focus on organizational change. 48 00:02:32.600 --> 00:02:36.200 There are many many human factors 49 00:02:35.200 --> 00:02:37.100 models. 50 00:02:37.900 --> 00:02:40.400 I've chosen two because of the time limitation I 51 00:02:40.400 --> 00:02:43.700 have and there's one particularly which I haven't included 52 00:02:43.700 --> 00:02:46.400 which I'll be 53 00:02:46.400 --> 00:02:49.200 very happy to talk to you about but it's very relevant, but I just didn't have the

54 00:02:49.200 --> 00:02:52.300 time and that's Rasmussen skill base will base knowledge base 55 00:02:52.300 --> 00:02:52.700 model. 56 00:02:54.200 --> 00:02:57.100 But I've chosen these two because I think it ties in very 57 00:02:57.100 --> 00:03:00.200 well with what we're talking about doing this conference. 58 00:03:01.700 --> 00:03:05.400 But firstly have I got here standing up 59 00:03:05.400 --> 00:03:08.200 speaking to you how my eviction Journey has got 60 00:03:08.200 --> 00:03:08.900 me where I am today. 61 00:03:10.200 --> 00:03:13.300 So I started out as a fleetaram see Harry 62 00:03:13.300 --> 00:03:17.700 pilot. It's it's one of those very interesting 63 00:03:17.700 --> 00:03:21.200 roles. There was only at any one time about 25 qualified 64 00:03:20.200 --> 00:03:23.600 Harry pilot see Harry Pilots. 65 00:03:24.100 --> 00:03:28.300 very small cadra rigorous selection demanding training 66 00:03:29.200 --> 00:03:31.100 But I accident rate was high. 67 00:03:31.700 --> 00:03:34.500

And when I started out I did 12 Years 68 00:03:34.500 --> 00:03:37.200 operational flying lost a lot 69 00:03:37.200 --> 00:03:40.600 of friends and they were very good pilots and 70 00:03:40.600 --> 00:03:43.300 it got me thinking my deep interesting human factors. 71 00:03:44.200 --> 00:03:48.000 Was why these people meeting having accidents 72 00:03:47.600 --> 00:03:49.300 some of them fatal? 73 00:03:50.300 --> 00:03:51.900 when there's such good Pilots 74 00:03:53.200 --> 00:03:56.300 That's what where my deep interest in human factors has come 75 00:03:56.300 --> 00:04:00.100 about and just to give you a bit of maybe to 76 00:03:59.100 --> 00:04:02.500get the credibility rating maybe a little bit higher. Hopefully, 77 00:04:02.500 --> 00:04:06.400 why am I talking to you about flight tests? I 78 00:04:05.400 --> 00:04:08.300 did otny with the c Harrier. We introduced 79 00:04:08.300 --> 00:04:11.900 the amram and and I got to go to Rosie roads and fire amrams, 80 00:04:11.900 -> 00:04:14.400which is good fun for a couple of years as

81 00:04:14.400 --> 00:04:17.400 we introduced that and I also did an exchange at China 82 00:04:17.400 --> 00:04:21.300 Lake. So I flew the av8b and the f-18c. The 83 00:04:20.300 --> 00:04:23.600 Legacy are they went on to mission systems 84 00:04:23.600 --> 00:04:26.500 the jpo for two years as UK mission systems 85 00:04:26.500 --> 00:04:29.600 lead leaving this service as UK Deputy 86 00:04:29.600 --> 00:04:30.800 Force Commander on harriers. 87 00:04:31.600 --> 00:04:34.200 And I'm currently our safety lead for Boeing teeny in 88 00:04:34.200 --> 00:04:37.700 the UK. I joined in 2020 after 20 years at Rolls-Royce as 89 00:04:37.700 --> 00:04:40.200 cheap Park defense so a very career but it 90 00:04:40.200 --> 00:04:43.800 does allow me to talk to you hopefully about flight 91 00:04:43.800 --> 00:04:45.100 test and safety. 92 00:04:47.100 --> 00:04:50.800 I do still fly. I'll fly historic aircraft, which is which 93 00:04:50.800 --> 00:04:53.800 keeps me keeps the the pleasurable 94 00:04:53.800 --> 00:04:56.900

aspect of flying still there and I 95 00:04:56.900 --> 00:04:59.400 got myself an MSC Innovation safety. 96 00:04:59.400 --> 00:05:03.000 I thought well runs is talking about it. Let's get some qualifications as 97 00:05:02.200 --> 00:05:05.300 well. So hopefully that gives you 98 00:05:05.300 --> 00:05:08.400 a bit of a background and why I'm up here today. So let's 99 00:05:08.400 --> 00:05:11.000 talk about these two models of cognitive behavior. 100 00:05:14.400 --> 00:05:17.600 the first one is Gary Klein's naturalistic decision making 101 00:05:20.200 --> 00:05:24.000 the second one is kahneman's cognitive biasing 102 00:05:23.600 --> 00:05:26.200 Professor. Rob talked about 103 00:05:26.200 --> 00:05:30.000 biasing I will talk about it as well. There are 104 00:05:29.300 --> 00:05:32.400 many many more models based on the initial 105 00:05:32.400 --> 00:05:35.700 work of kahnemann, particularly Fast and Furious 106 00:05:35.700 --> 00:05:38.200 heuristics. For example, I'm going 107 00:05:38.200 - > 00:05:41.600to base my talk on kahneman's original

108 00:05:41.600 --> 00:05:44.200 cognitive biasing work because I think 109 00:05:44.200 --> 00:05:46.900 it is very good Baseline for us to talk about 110 00:05:48.700 --> 00:05:51.500 I'll then use these models to discuss briefly how 111 00:05:51.500 --> 00:05:55.000 experts tend to respond to organizational change. 112 00:05:59.400 --> 00:06:01.600 So naturalistic decision making 113 00:06:03.400 --> 00:06:04.600 it attempts to explain. 114 00:06:05.900 --> 00:06:09.300 How people and particularly experts make decisions 115 00:06:08.300 --> 00:06:11.700 in real world settings and 116 00:06:11.700 --> 00:06:14.800 this is really important in the context of flight test. It's 117 00:06:14.800 --> 00:06:17.100 real world settings. So every day 118 00:06:17.100 --> 00:06:19.500 how do people how to experts make decisions? 119 00:06:22.300 --> 00:06:25.200 It assumes satisficing probably one of 120 00:06:25.200 --> 00:06:27.700 the most unpleasant words around but satisfying. 121 00:06:28.700 --> 00:06:29.500

It's good enough. 122 00:06:30.800 --> 00:06:33.300 And particularly it's emphasizing. It 123 00:06:33.300 --> 00:06:36.500 is not optimizing so rational Choice Theory 124 00:06:36.500 --> 00:06:39.400 assumes the human beings make the 125 00:06:39.400 --> 00:06:43.100 best choice that always looking for the most optimal solution. 126 00:06:43.900 --> 00:06:45.900 but in fact the way experts operate 127 00:06:47.100 --> 00:06:50.100 It doesn't mean they can't achieve very high standards. But the 128 00:06:50.100 --> 00:06:53.300 way they do it is they look for the good enough 129 00:06:53.300 --> 00:06:55.100 to move forward to the next. 1.30 00:06:56.200 --> 00:06:59.800 Okay, it's really key. It's not rational thinking 131 00:06:59.800 --> 00:07:03.100 optimization. It's satisficing good 1.32 00:07:02.100 --> 00:07:03.400 enough. 133 00:07:04.600 --> 00:07:08.100 and a key aspect is what's called recognition primed 134 00:07:07.100 --> 00:07:09.200 decision making

135 00:07:10.500 --> 00:07:13.600 so another way of looking at that is is what I'm experiencing familiar 136 00:07:13.600 --> 00:07:13.800 to me. 137 00:07:16.400 --> 00:07:18.300 And what what worked last time? 138 00:07:20.900 --> 00:07:23.900 And in order to do this intuition is 139 00:07:23.900 --> 00:07:26.600 a really key feature and I 140 00:07:26.600 --> 00:07:29.300 do remember Rod mentioning at 141 00:07:29.300 --> 00:07:32.200 the beginning how he can go to an organization and he gets 142 00:07:32.200 --> 00:07:32.600 a feel. 143 00:07:33.200 --> 00:07:34.400 and can pretty much say 144 00:07:35.500 --> 00:07:38.200 in his mind what that culture aspects of 145 00:07:38.200 --> 00:07:41.100 that culture is like it's intuition you need experience you need 146 00:07:41.100 --> 00:07:44.500 lots and lots of examples but intuition allows 147 00:07:44.500 --> 00:07:46.700 you to make some pretty good decisions and accurate as well. 148 00:07:50.100 --> 00:07:53.800

But intuition has different definitions depending on the context. So 149 00:07:53.800 --> 00:07:56.500 in the context of naturalistic decision 1.50 00:07:56.500 --> 00:07:56.600 making 151 00:07:58.800 --> 00:08:00.400 intuition is inductive. 152 00:08:01.500 --> 00:08:02.800 as opposed to deductive 153 00:08:03.700 --> 00:08:06.800 A deductive thinking is very resource hungry 154 00:08:06.800 --> 00:08:10.400 as they talk about human factors. It requires 155 00:08:09.400 --> 00:08:12.400 specific attention and your 156 00:08:12.400 --> 00:08:15.100 your making logical decisions to an endpoint. 157 00:08:16.600 --> 00:08:19.200 Inductive thinking you end up with smaller data 158 00:08:19.200 --> 00:08:22.600 sets you end up with a with a general assessment a 159 00:08:22.600 --> 00:08:22.900 theory. 160 00:08:23.800 --> 00:08:27.400 And that is all about schema. So your brain one's 161 00:08:26.400 --> 00:08:29.600 brain is looking for cues to

162 00:08:29.600 --> 00:08:32.300 come up with. What is the scheme? What is happening here 163 00:08:32.300 --> 00:08:33.400 as an inductive process? 164 00:08:34.200 --> 00:08:37.100 And it's a lot less resource hungry. 165 00:08:39.300 --> 00:08:43.000 And intuition in the NDM context centers around this concept 166 00:08:42.300 --> 00:08:44.100 of pattern matching. 167 00:08:44.800 --> 00:08:47.400 Mental models you can only do this if you've 168 00:08:47.400 --> 00:08:47.900 seen something before. 169 00:08:49.100 --> 00:08:50.900 You can only do this if you've got experience. 170 00:08:54.600 --> 00:08:55.300 and as experts 171 00:08:56.500 --> 00:08:59.100 We all build a library of past experiences. 172 00:09:01.500 --> 00:09:04.500 and experts learn to compare this library with 173 00:09:04.500 --> 00:09:05.400 the Here and Now 174 00:09:06.600 --> 00:09:07.200 and make 175 00:09:08.900 --> 00:09:11.300

fine-tune discriminations and this is probably the key sentence of 176 00:09:11.300 --> 00:09:13.500how experts operate in this model. 177 00:09:15.700 --> 00:09:16.400 You've got a library. 178 00:09:17.900 --> 00:09:20.400 Something's happening. You compare it to the here and now and 179 00:09:20.400 --> 00:09:23.600 then you can make a fine-tune discrimination about the comparison. 180 00:09:25.500 --> 00:09:27.500 And importantly this is not available to novices. 181 00:09:28.100 --> 00:09:31.300 If you're learning something you haven't got that that library of 182 00:09:31.300 --> 00:09:34.500experiences to compare something to you. So you must follow rules 183 00:09:34.500 --> 00:09:37.500 or you must be told what to do an expert 184 00:09:37.500 --> 00:09:40.200 is able to compare with past experience with 185 00:09:40.200 -> 00:09:41.000the Here and Now 186 00:09:43.700 --> 00:09:46.700 Semantic memory by the way is talking 187 00:09:46.700 --> 00:09:49.300 about the knowledge of things and how they relate to 188 00:09:49.300 --> 00:09:49.500each other.

189 00:09:50.500 --> 00:09:53.700 And episodic memory is as it says it's episodes. 190 00:09:53.700 --> 00:09:56.600 And apparently we have an infinite capacity. 191 00:09:57.700 --> 00:09:58.800 for episodic memory 192 00:10:00.700 --> 00:10:00.900 Yeah. 193 00:10:03.600 --> 00:10:06.900 So intuition does not require precise repetitions. 194 00:10:08.800 --> 00:10:12.000 So if you want to do something really really well in a visual 195 00:10:11.400 --> 00:10:14.600 motor skill you need to practice it over and over again, but 196 00:10:14.600 --> 00:10:17.500 for intuition you just need repetition around a theme. 197 00:10:18.600 --> 00:10:21.600 To enable these cues and patterns in a 198 00:10:21.600 --> 00:10:24.400 flying context. You don't want to just you don't want to get airborne 199 00:10:24.400 --> 00:10:27.200 all the time in 15 knots crosswind from the 200 00:10:27.200 --> 00:10:30.200 left. What you want is to get airborne with Crosswinds from 201 00:10:30.200 --> 00:10:33.400 different points and understand your brain. Your 202 00:10:33.400 --> 00:10:36.300

skill set will allow you to use these 203 00:10:36.300 --> 00:10:39.200 repetitions around a theme to have 204 00:10:39.200 --> 00:10:41.400 a very good ability to land acrosswinds. 205 00:10:45.400 --> 00:10:47.600 And here we go again with the close enough is good enough. 206 00:10:49.100 --> 00:10:52.200 so you can recognize queues and patterns and close enough is 207 00:10:52.200 --> 00:10:53.400 good enough for experts to make 208 00:10:54.200 --> 00:10:55.900 consistently vague decisions 209 00:10:57.500 --> 00:11:00.600 You may be asking thinking what vade is it's valid without 210 00:11:00.600 --> 00:11:02.300 an L, but it was good enough. 211 00:11:06.700 --> 00:11:08.000 That was not deliberate. 212 00:11:12.900 --> 00:11:15.500 Intuition requires little attention and 213 00:11:15.500 --> 00:11:17.000 this is a key Point again for us. 214 00:11:18.300 --> 00:11:21.500 Therefore you have greater essay. If you're not using a lot 215 00:11:21.500 -> 00:11:24.600of attention to make decisions, you've got greater essay

216 00:11:24.600 --> 00:11:28.000 for other things that going on and therefore it's it's favored 217 00:11:27.000 --> 00:11:28.500 by experts. 218 00:11:29.400 --> 00:11:30.500 particularly in our domain 219 00:11:32.400 --> 00:11:35.400 but there are flaws. So it's a model therefore. It's got limitations 220 00:11:35.400 --> 00:11:38.500 and it's not 100% accurate of course is a 221 00:11:38.500 --> 00:11:40.400 way of representing how people think 222 00:11:42.700 --> 00:11:44.900 and courtesy of some wonderful research 223 00:11:47.900 --> 00:11:50.200 It has limitations. So if you were over 224 00:11:50.200 --> 00:11:52.300 rely over rely on intuition. 225 00:11:53.600 --> 00:11:56.900 Then you'll have poor judgment in ambiguous 226 00:11:56.900 --> 00:11:57.200 situations. 227 00:11:58.500 --> 00:12:00.400 It's ambiguous. You're not quite sure which scheme. 228 00:12:01.400 --> 00:12:02.000 to follow 229 00:12:04.200 --> 00:12:07.300

Is inadequate in unusual situations, you haven't 230 00:12:07.300 --> 00:12:10.200 you haven't met it before so which scheme do I 231 00:12:10.200 --> 00:12:13.300 use so you're now relying on pattern matching, but 232 00:12:13.300 --> 00:12:14.700 the pattern doesn't exist. 233 00:12:17.100 --> 00:12:20.600 And under challenging conditions where there's probably a mixture 2.34 00:12:20.600 --> 00:12:21.800 of ambiguous and unusual. 235 00:12:22.700 --> 00:12:23.500 poor execution 236 00:12:24.600 --> 00:12:26.200 So there's definitely got limitations. 237 00:12:28.100 --> 00:12:31.900 And what it's basically saying is quick accurate decision making using schema 238 00:12:31.900 --> 00:12:33.900 doesn't work. Well in the above situations. 239 00:12:36.700 --> 00:12:39.400 Slips and oversights lapses and 240 00:12:39.400 --> 00:12:42.500 memory for getting a checklist doing a checklist being 241 00:12:42.500 --> 00:12:45.100 interrupted and not going back to the original point. 242 00:12:46.100 --> 00:12:47.500 classic slip

243 00:12:48.200 --> 00:12:51.800 Is something that can happen when you overly when 244 00:12:51.800 --> 00:12:54.500 you're using intuition particularly for low 245 00:12:54.500 --> 00:12:55.300 task load? 246 00:12:56.600 --> 00:12:59.600 Highly practiced tasks and this is what's called underarousal. 247 00:13:00.400 --> 00:13:04.800 And I know a test pilot who was flying 248 00:13:03.800 --> 00:13:06.200 The Aviator at the 249 00:13:06.200 --> 00:13:09.100 time and many other aircraft and he got into a hawk and was doing 250 00:13:09.100 --> 00:13:12.200 some patent flying and landed in the undershoot. 2.51 00:13:13.500 --> 00:13:16.400 And in the accent report, it was under arousal. 252 00:13:17.900 --> 00:13:20.100 He was so used to being busy. He was just doing 253 00:13:20.100 --> 00:13:24.000 patent working in a nice simple T45 equivalent and he 254 00:13:23.100 --> 00:13:26.400 landed in the unshoot. He hit to this day. He can't work 255 00:13:26.400 --> 00:13:27.200 out why he did it.

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00:13:28.200 --> 00:13:31.400 But possibly that was the under arousal. He was flying on intuition flying 2.57 00:13:31.400 --> 00:13:34.300 on his skills, and he just didn't notice the sink 258 00:13:34.300 --> 00:13:34.500 rate. 259 00:13:38.200 --> 00:13:41.900 This is again important for experts regular deviation from 260 00:13:41.900 --> 00:13:44.800 explicit instructions. So my 2.61 00:13:44.800 --> 00:13:47.500 example with this one is the parking your 262 00:13:47.500 --> 00:13:47.700 car. 263 00:13:48.400 --> 00:13:50.500 Going to reverse and it starts going B. 264 00:13:51.500 --> 00:13:54.100 IP and then you get to the point where it says you're close enough and it does 265 00:13:54.100 --> 00:13:54.200 the 266 00:13:55.800 --> 00:13:58.400 Beep but you go, but I've just need a little bit more and I know it's 267 00:13:58.400 --> 00:14:01.300 got a big gap and so you keep reversing just 268 00:14:01.300 --> 00:14:05.300 that little bit more because you know what you're doing and bang you

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00:14:05.300 --> 00:14:08.000 hit the little stump that you didn't see so as an expert 270 00:14:08.300 --> 00:14:10.500 you go you're telling me to do something, but I know. 271 00:14:12.400 --> 00:14:16.300 I know better than you effectively so experts can deviate. 272 00:14:17.600 --> 00:14:19.700 from explicitly instructions 273 00:14:20.900 --> 00:14:23.200 When they regard something as intuitively better. 274 00:14:23.900 --> 00:14:26.200 And that will come again about organizational change. 275 00:14:32.100 --> 00:14:35.200 So that was naturalistic decision making so the use 276 00:14:35.200 --> 00:14:38.300 of intuition to make good accurate decisions is something 277 00:14:38.300 --> 00:14:39.300 that experts can do. 278 00:14:41.700 --> 00:14:44.600 cognitive biases Professor Rob 279 00:14:44.600 --> 00:14:47.600 mentioned there are thousands certainly hundreds and 280 00:14:47.600 --> 00:14:47.900 there are 281 00:14:51.600 --> 00:14:53.100 An overview is we tend. 282 00:14:53.900 --> 00:14:56.400 That's a great human factors fudge word

283 00:14:56.400 --> 00:14:59.100 tend you don't give any numbers on it. But we tend to 284 00:14:59.100 --> 00:15:02.900 do something. We tend to use cognitive biases unconsciously and 285 00:15:02.900 --> 00:15:05.600 this is the really key point. So unconscious what thinking? 286 00:15:07.100 --> 00:15:08.700 when there's confusion 287 00:15:10.100 --> 00:15:11.900 ambiguity mention that already 288 00:15:13.100 --> 00:15:16.600 time pressure to act you feel as either perceived time 289 00:15:16.600 --> 00:15:19.100 pressure to act or somebody's giving you time pressure to act. 290 00:15:20.900 --> 00:15:21.800 high workload 291 00:15:25.200 --> 00:15:28.300 Fatigue, which is one of the highest causes of 292 00:15:28.300 --> 00:15:29.300 poor performance. 293 00:15:30.300 --> 00:15:33.300 If you're really tired all bets 294 00:15:33.300 --> 00:15:35.200 are off your brain is just not functioning. 295 00:15:36.000 --> 00:15:36.200 Yeah.

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00:15:38.100 --> 00:15:41.700 Which is why flight time limitations and sleep awareness of 297 00:15:41.700 --> 00:15:42.900 sleep patterns Etc. So important. 298 00:15:44.400 --> 00:15:47.500 Personal stress only you as an individual know 299 00:15:47.500 --> 00:15:50.300 this last one unless you communicate it to your 300 00:15:50.300 --> 00:15:50.600 teams. 301 00:15:51.500 --> 00:15:54.100 But personal stress is something that can change 302 00:15:54.100 --> 00:15:54.800 during the day. 303 00:15:55.700 --> 00:15:58.400 You know, we're looking at our text. 304 00:15:58.400 --> 00:16:01.500 So we get a phone call so stress goes up and down throughout the 305 00:16:01.500 --> 00:16:04.300 day and it will impact how good your 306 00:16:04.300 --> 00:16:05.000 decision making is. 307 00:16:07.500 --> 00:16:10.400 And these can and do occur in the Ovation domain. 308 00:16:11.300 --> 00:16:14.700 So cognitive biasing is really important to understand as a 309 00:16:14.700 --> 00:16:17.000 working in the aviation domain.

310 00:16:20.900 --> 00:16:23.200 That is a real picture of a formation that Duxford. 311 00:16:23.900 --> 00:16:24.300 in English 312 00:16:25.200 --> 00:16:28.200 so you can imagine if the guy at the back there says oh crap, who's I meant 313 00:16:28.200 --> 00:16:28.400 to Joy? 314 00:16:29.300 --> 00:16:32.200 You'll do a cognitive bias. You will make a decision that person 315 00:16:32.200 --> 00:16:35.200 because he doesn't want to lose formation he or she doesn't want to get out 316 00:16:35.200 --> 00:16:35.500 information. 317 00:16:36.400 --> 00:16:37.600 And they want to look bad. 318 00:16:38.600 --> 00:16:41.200 So this is a classic case where you would 319 00:16:41.200 --> 00:16:43.800 a cognitive bias would come in. It could be availability bias. 320 00:16:44.700 --> 00:16:45.600 the closest aircraft 321 00:16:46.700 --> 00:16:49.400 or it could be the most familiarity bias the one that you 322 00:16:49.400 --> 00:16:52.400 normally form a time. Anyway, we it's all subjective.

323 00:16:52.400 --> 00:16:55.300 But what I'm saying is constant biasing happens to us 324 00:16:55.300 --> 00:16:55.800 all the time. 325 00:16:56.600 --> 00:16:58.200 For the reasons I gave in the previous slide. 326 00:17:00.500 --> 00:17:03.600 But biasing can also occur during low workload flying too. 327 00:17:04.600 --> 00:17:07.300 And we had the 328 00:17:07.300 --> 00:17:10.400 the descending below The Descent altitude example 329 00:17:10.400 --> 00:17:11.500 yesterday Aspen. 330 00:17:13.200 --> 00:17:16.000 When that was being described was going that's probably one of 331 00:17:16.200 --> 00:17:17.800 those situations done a lot before. 332 00:17:19.600 --> 00:17:22.500 Relatively low workload and you can make a bias 333 00:17:22.500 --> 00:17:23.700 decision and make the wrong decision. 334 00:17:27.400 --> 00:17:30.400 I'm going to continue mention continuation bias a 335 00:17:30.400 --> 00:17:33.600 little bit later. I think this affects Pilots more than

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00:17:33.600 --> 00:17:35.800 is is currently in the literature. 337 00:17:39.200 --> 00:17:42.700 So quickly go through them. I'm looking at the time availability bias. This 338 00:17:42.700 --> 00:17:45.800 is the one where you take 339 00:17:45.800 --> 00:17:48.100 the easiest choice, but it's actually more subtle than that. 340 00:17:48.900 --> 00:17:51.300 We've often heard about when you're under stress. If 341 00:17:51.300 --> 00:17:54.100 something happens to you flying, you'll often 342 00:17:54.100 --> 00:17:57.100 revert to what you learned first or learn 343 00:17:57.100 --> 00:17:57.400 best. 344 00:17:58.800 --> 00:17:59.000 Yeah. 345 00:18:00.600 --> 00:18:03.200 And this this is based. This is 346 00:18:03.200 --> 00:18:06.500 the basic for the the issue with with transfer behaviors 347 00:18:06.500 --> 00:18:09.000 between pilots particularly test pilots when you fly lots of 348 00:18:09.100 --> 00:18:11.400 different types if something happens in an aircraft. 349 00:18:12.400 --> 00:18:16.300

You will have a biasing to respond in 350 00:18:15.300 --> 00:18:18.400 a way that you learned first and learn 351 00:18:18.400 --> 00:18:18.700 best. 352 00:18:20.700 --> 00:18:21.300 availability bias 353 00:18:22.100 --> 00:18:25.400 a more common example of driving if you learned to drive in 354 00:18:25.400 --> 00:18:26.200 a manual stick shift. 355 00:18:27.100 --> 00:18:30.100 And then you've driven that for many many years and then you 356 00:18:30.100 --> 00:18:33.300 go to an automatic car. If you have an emergency brake situation, 357 00:18:33.300 --> 00:18:36.300 I would put my hand up that most of you would put 358 00:18:36.300 --> 00:18:37.600 your foot on the clutch. 359 00:18:38.200 --> 00:18:41.200 To break absolutely guarantee. It's what you learn first and best 360 00:18:41.200 --> 00:18:43.600 but you've been driving automatic car for years and years. 361 00:18:45.700 --> 00:18:48.000 It affects flying to familiar to bias. 362 00:18:49.300 --> 00:18:52.100 I'll talk about that in the organizational change.

363 00:18:53.200 --> 00:18:54.500 confirmation bias 364 00:18:55.600 --> 00:18:58.200 we this is a strong one. It's often mentioned for 365 00:18:58.200 --> 00:19:00.400 flying and people tend. 366 00:19:01.400 --> 00:19:02.200 to seek out 367 00:19:03.200 --> 00:19:06.000 and use information that confirms what they already believe. 368 00:19:08.600 --> 00:19:11.300 Yeah, and this impacts. 369 00:19:12.200 --> 00:19:15.100 Flight test a lot particularly the person puts their hands 370 00:19:15.100 --> 00:19:18.000 up saying hey, I think there's a problem you're going to 371 00:19:18.100 --> 00:19:21.100 have to get through. Everyone else is confirmation bias. 372 00:19:22.500 --> 00:19:22.800 Yeah. 373 00:19:26.300 --> 00:19:29.400 And continuation bias. I got a nice picky. I hope you 374 00:19:29.400 --> 00:19:29.700 for this one. 375 00:19:31.500 --> 00:19:33.700 So continuation bias is experts. 376 00:19:34.400 --> 00:19:36.900

Tend to not seek information. 377 00:19:38.300 --> 00:19:41.300 Or not use information that will prevent them 378 00:19:41.300 --> 00:19:43.500 from completing a task of its nearly done. 379 00:19:46.700 --> 00:19:49.300 Okay, it's not just experts actually, that's all of us, but it 380 00:19:49.300 --> 00:19:50.700 definitely applies to us as well. 381 00:19:51.700 --> 00:19:54.300 And Landing here landing gear 382 00:19:54.300 --> 00:19:57.800 related accidents are massive in the number of 383 00:19:57.800 --> 00:20:00.200 accidents that happened in proportion to all those 384 00:20:00.200 --> 00:20:01.400 reports. I think it's 50% 385 00:20:02.400 --> 00:20:05.200 Of FAA reported accidents and incidents a landing 386 00:20:05.200 --> 00:20:08.300 gear related and it's usually for not putting the gear down or 387 00:20:08.300 --> 00:20:09.400 retracting it on the ground. 388 00:20:10.900 --> 00:20:11.100 Yeah. 389 00:20:15.100 --> 00:20:18.600 And it normally happens for repetitive and relatively

390 00:20:18.600 --> 00:20:21.100 low-risk tasks. So your guard is 391 00:20:21.100 --> 00:20:21.300 down. 392 00:20:22.700 --> 00:20:26.000 And you're just about to land in this particular case. I fly 393 00:20:25.300 --> 00:20:28.800 this aircraft now. It's been repaired. This particular 394 00:20:28.800 --> 00:20:31.100 pilot was being it is in France 395 00:20:31.100 --> 00:20:34.300 and she was had to go around three times because it 396 00:20:34.300 --> 00:20:34.700 was busy. 397 00:20:36.400 --> 00:20:39.400 And and she admits. She just wanted 398 00:20:39.400 --> 00:20:42.300 to get on the ground fuels getting low. So time pressure 399 00:20:42.300 --> 00:20:45.100 to act so she does time pressure. There was lots of 400 00:20:45.100 --> 00:20:47.800 other pressures and that was the result. 401 00:20:49.700 --> 00:20:52.700 Yeah and continuation bias. She 402 00:20:52.700 --> 00:20:54.200 wanted to finish the task. 403 00:20:58.100 --> 00:21:02.800

So there's there was a review of two models that 404 00:21:01.800 --> 00:21:04.200 I thought were highly relevant. As I said, 405 00:21:04.200 --> 00:21:07.700 there's many more and actually if I had time I would have introduce her asmussen's 406 00:21:07.700 --> 00:21:10.400 school-based rule base knowledge base because it 407 00:21:10.400 --> 00:21:14.200 does very much explain how we manage 408 00:21:13.200 --> 00:21:16.200 Aviation tasks so checklists and 409 00:21:16.200 --> 00:21:19.200 and the use of skill-based but then having 410 00:21:19.200 --> 00:21:22.700 to revert back or even I call it ebb and flow between raw based 411 00:21:22.700 --> 00:21:23.900 and skill based. 412 00:21:24.800 --> 00:21:26.200 But it wasn't time for that. 413 00:21:27.200 --> 00:21:29.600 organizational change and experts 414 00:21:31.800 --> 00:21:34.000 so when all organizational change occurs 415 00:21:34.600 --> 00:21:37.500 It is often but not always met with 416 00:21:37.500 --> 00:21:39.500 a healthy dose of questioning by experts.

417 00:21:40.800 --> 00:21:41.100 Yeah. 418 00:21:44.100 --> 00:21:47.600 And it's usually because organizational change is 419 00:21:47.600 --> 00:21:48.800 instigated from the top. 420 00:21:49.500 --> 00:21:52.200 As in the Senior Management who aren't involved in what 421 00:21:52.200 --> 00:21:52.400 you do? 422 00:21:53.700 --> 00:21:55.400 Rather than the expert operator level. 423 00:21:57.600 --> 00:22:00.900 And therefore I believe expert operators have been 424 00:22:00.900 --> 00:22:03.500 consulted beforehand most likely and you 425 00:22:03.500 --> 00:22:06.600 won't feel invested in this change is being told you will 426 00:22:06.600 --> 00:22:09.200 do change and a classic example is culture. 427 00:22:10.300 --> 00:22:13.700 Big organizations think or feel and sometimes have 428 00:22:13.700 --> 00:22:16.500 to make changes in order to change culture. 429 00:22:19.900 --> 00:22:22.800 And a lot of those changes are top-down driven,

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00:22:22.800 --> 00:22:25.500 but then you've got to convince people of this 4.31 00:22:25.500 --> 00:22:28.700 change is going to actually work. So this is the skepticism 432 00:22:28.700 --> 00:22:29.200 that comes in. 433 00:22:33.600 --> 00:22:36.100 familiarity bias tends to 434 00:22:36.100 --> 00:22:39.200 deter use of new procedures and processes 435 00:22:41.100 --> 00:22:45.200 Particularly when you're stressed, so this is what happens when there's not 436 00:22:45.200 --> 00:22:47.800 non-compliance or violation often. 437 00:22:48.800 --> 00:22:51.600 People are under stress, maybe in 438 00:22:51.600 --> 00:22:54.600 the maintenance environment and they tend 439 00:22:54.600 --> 00:22:56.300 to do things which they're more familiar with. 440 00:22:57.300 --> 00:23:00.200 Because they know it works even though it may be a violation at the time 441 00:23:00.200 --> 00:23:01.700 if they've been a change in process. 442 00:23:05.500 --> 00:23:08.900 Experts in particular often see very little reward or benefit resulting 443 00:23:08.900 --> 00:23:11.700

from this change if it's not intuitively obvious 444 00:23:11.700 --> 00:23:12.000 to them. 445 00:23:12.900 --> 00:23:15.900 They want they want to feel experts like 446 00:23:15.900 --> 00:23:18.500 to feel the intuition is consistent with 447 00:23:18.500 --> 00:23:19.100 what is happening. 448 00:23:23.200 --> 00:23:26.300 And also changes usually associated with more rules and 449 00:23:26.300 --> 00:23:29.600 regs more process and procedures not less which is 450 00:23:29.600 --> 00:23:30.600 going to stifle. 451 00:23:32.200 --> 00:23:32.900 NDM 4.52 00:23:34.800 --> 00:23:37.200 so if you're used to operating in an NDM type 453 00:23:37.200 --> 00:23:38.800 environment using your intuition 454 00:23:39.700 --> 00:23:42.700 Then having more rules and Rags more process. You're going 455 00:23:42.700 --> 00:23:45.600 to be risk. You're going to be not happy to 456 00:23:45.600 --> 00:23:48.500 make that change doesn't mean you don't do it, but it's going to be harder for

457 00:23:48.500 --> 00:23:48.600 you. 458 00:23:51.700 --> 00:23:54.800 And I've seen this in both big organizations 459 00:23:54.800 --> 00:23:58.300 and also in the military as well when you have large managerial 460 00:23:57.300 --> 00:23:59.700 work breakdown structure. 461 00:24:00.600 --> 00:24:01.000 changes 462 00:24:02.500 --> 00:24:05.200 Is often seen by experts as just moving the deck chairs on 463 00:24:05.200 --> 00:24:06.900 the Titanic nothing's going to change. 464 00:24:08.200 --> 00:24:11.400 Rather than tackling the systematic issues because 465 00:24:11.400 --> 00:24:14.300 they understand the systematic issues the experts 466 00:24:14.300 --> 00:24:14.600 do. 467 00:24:19.400 --> 00:24:22.100 And finally experts think they know best. 468 00:24:24.100 --> 00:24:24.900 because in their experience 469 00:24:25.800 --> 00:24:26.500 they usually do. 470

00:24:27.900 --> 00:24:28.100 Yeah. 471 00:24:30.800 --> 00:24:33.600 You're right. You do usually know best in your environment, but 472 00:24:33.600 --> 00:24:36.200 not always and this is the danger. You've got to be 473 00:24:36.200 --> 00:24:37.100 skeptical. 474 00:24:37.800 --> 00:24:40.200 About be curious and be 475 00:24:40.200 --> 00:24:40.500 skeptical. 476 00:24:42.500 --> 00:24:45.600 And this is actually sort of just linking back. 477 00:24:45.600 --> 00:24:48.500 This is a classic example of confirmation bias. 478 00:24:49.700 --> 00:24:52.400 You usually right so you're going to seek out 479 00:24:52.400 --> 00:24:56.100 and ignore information. That doesn't confirm that 480 00:24:55.100 --> 00:24:56.400 you're right. 481 00:24:56.900 --> 00:24:59.000 Unless somebody challenges you or you challenge yourself. 482 00:25:03.400 --> 00:25:06.300 So as a summary we can go back the aim of 483 00:25:06.300 --> 00:25:06.900 today's presentation.

484 00:25:08.100 --> 00:25:11.400 To provide a useful certainly is useful 485 00:25:11.400 --> 00:25:14.700 to think of NDM and biasing in 486 00:25:14.700 --> 00:25:17.600 how you conduct flight operations and flight tests, 487 00:25:17.600 --> 00:25:20.800 but hopefully it was a different perspective for you. 488 00:25:24.200 --> 00:25:27.800 We discussed the two relevant cognitive behavioral models 489 00:25:27.800 --> 00:25:31.100 and we finish with a focus on organizational change 490 00:25:30.100 --> 00:25:33.300 again. There 491 00:25:33.300 --> 00:25:36.400 wasn't time to really go into depth on the cultural side, 492 00:25:36.400 --> 00:25:39.200 but large organizations Boeing in 493 00:25:39.200 --> 00:25:42.100 particular is now in a process of trying to 494 00:25:42.100 --> 00:25:45.200 change culture and it is a very difficult task. 495 00:25:46.200 --> 00:25:48.200 Really difficult task, but it has to be done. 496 00:25:52.500 --> 00:25:54.800 And that's the end of my presentation. Are there any questions?

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00:25:58.600 --> 00:25:59.500 So yeah. 498 00:26:04.500 --> 00:26:07.100 biases and human factors aspects 499 00:26:08.400 --> 00:26:11.900 as I was sitting listening you could perceive to be barriers 500 00:26:11.900 --> 00:26:14.600 to cultural change or things to watch out for so my 501 00:26:14.600 --> 00:26:16.100 question is do you have recommendations? 502 00:26:17.100 --> 00:26:20.200 That help implementation of change in organizations. 503 00:26:22.100 --> 00:26:23.900 to overcome some of these biases that 504 00:26:25.700 --> 00:26:26.200 Yes, well. 505 00:26:27.200 --> 00:26:30.900 You're asking me so I'll tell you I think organizational change 506 00:26:30.900 --> 00:26:33.600 needs to have a complete rethink. 507 00:26:33.600 --> 00:26:36.100 It tends organizational change. 508 00:26:37.300 --> 00:26:39.500 Tends to say something's broke. 509 00:26:40.500 --> 00:26:41.400 We need to fix it. 510 00:26:42.400 --> 00:26:43.600 and then managers

511 00:26:45.300 --> 00:26:47.600 are then tasked to make that change but they're 512 00:26:48.300 --> 00:26:51.200 fundamentally part of the structure that was 513 00:26:51.200 --> 00:26:52.100 there beforehand. 514 00:26:52.800 --> 00:26:55.300 So it doesn't it's a real. It's a real problem. I think. 515 00:26:56.100 --> 00:26:57.300 and there's a there's a 516 00:26:59.400 --> 00:27:02.400 So some theories and models out there which talk about 517 00:27:02.400 --> 00:27:03.800 appreciative inquiry. 518 00:27:04.700 --> 00:27:07.600 Which is almost turning on the head, which 519 00:27:07.600 --> 00:27:10.200 says don't look for what's wrong. What you 520 00:27:10.200 --> 00:27:13.500 do is you go out into the workforce. And you ask people you 521 00:27:13.500 --> 00:27:16.300 have big groups of 10 or 20 and you 522 00:27:16.300 --> 00:27:18.800 ask people. What are we doing, right? 523 00:27:20.300 --> 00:27:20.600 first

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00:27:22.100 --> 00:27:26.000 and then out of that people will naturally point 525 00:27:25.300 --> 00:27:28.500 out what's not going so well, but they 526 00:27:28.500 --> 00:27:32.000 do it from a point of a positive approach what 527 00:27:31.200 --> 00:27:34.800 we're doing right? But you must ask the Grassroots 528 00:27:34.800 --> 00:27:37.100 level the experts as well. Not necessary experts 529 00:27:37.100 --> 00:27:40.900 and that is a potentially a 530 00:27:40.900 --> 00:27:44.300 much better way of getting organizational change. Yeah. Thank 531 00:27:43.300 --> 00:27:46.600 you. Yeah consider as an accelerating factor 532 00:27:46.600 --> 00:27:49.500 to include the buy-in of the rank and fire. Yeah, I 533 00:27:49.500 --> 00:27:52.200 think that's really key because then otherwise the biasing comes in. Yeah. 534 00:27:53.200 --> 00:27:53.700 potentially 535 00:28:00.600 --> 00:28:00.900 Yeah. 536 00:28:12.300 --> 00:28:16.700 And in actual usability situation. 537 00:28:16.700 --> 00:28:18.900

So for example, let's say that 538 00:28:20.100 --> 00:28:23.700 test pilot X is executing a test point that requires 539 00:28:23.700 --> 00:28:24.700 some knowledge of 540 00:28:25.600 --> 00:28:27.800 the FMS to use a random example 541 00:28:29.400 --> 00:28:32.400 that test pilot could mistaken a situation because 542 00:28:32.400 --> 00:28:35.700 of their bias so I know what's going on. I've seen 543 00:28:35.700 --> 00:28:38.600 this before I'm just going to execute something versus the 544 00:28:38.600 --> 00:28:41.000 system's actually has a design flaw from a human 545 00:28:41.600 --> 00:28:44.300 factors point of view. Is there a way to delineate that 546 00:28:44.300 --> 00:28:47.600 or is it still a thin line that requires just extensive 547 00:28:47.600 --> 00:28:47.800 analysis? 548 00:28:51.300 --> 00:28:55.000 If I've understood your question correctly, I think the 549 00:28:54.700 --> 00:28:57.300 biasing aspect knowledge of it 550 00:28:57.300 --> 00:29:00.300 is the is the power so if you know that

551 00:29:00.300 --> 00:29:03.700 there are biases so if you if you're feeling if there's 552 00:29:03.700 --> 00:29:07.500 pressure in that particular program and there's this, you 553 00:29:06.500 --> 00:29:09.500 know, if there is a design issue, so 554 00:29:09.500 --> 00:29:12.000 it's causing issues with your flight test program and adding pressures. 555 00:29:13.300 --> 00:29:14.000 I think is a 556 00:29:14.800 --> 00:29:17.300 you know a contributor who's making a 557 00:29:17.300 --> 00:29:20.400 quick decision because and I've 558 00:29:20.400 --> 00:29:23.000 I do it myself. I regularly say, oh, it's one of 559 00:29:23.100 --> 00:29:26.300 these as in I've seen this before and you 560 00:29:26.300 --> 00:29:29.100 better put label it as this kind of issue and you start 561 00:29:29.100 --> 00:29:32.300 what you need to do I think is just and we've mentioned it today as 562 00:29:32.300 --> 00:29:35.300 well is actually question yourself and get people to question 563 00:29:35.300 --> 00:29:35.900 your thinking. 564 00:29:36.800 --> 00:29:39.200

And I think that's that's the protection against biasing is 565 00:29:39.200 --> 00:29:42.500 you encourage people to question your thinking 566 00:29:42.500 --> 00:29:45.100 because quite often because it's based on 567 00:29:45.100 --> 00:29:48.800 intuition and induction. You may only have a few data points that's 568 00:29:48.800 --> 00:29:51.500 based on and it's gonna be very hard to justify. So 569 00:29:51.500 --> 00:29:54.700 by challenging healthily positively challenging 570 00:29:54.700 --> 00:29:58.000 your colleagues. You can break down these biasing I 571 00:29:57.000 --> 00:29:58.100 believe. 572 00:30:01.600 --> 00:30:04.000 Right. Thank you.