00:00:00.000 --> 00:00:03.840
Doble Nathan
And so we recommend that the FAA determine how to harmonize.

00:00:03.890 --> 00:00:04.090
Doble Nathan
Yes.

00:00:05.220 --> 00:00:08.000
Doble Nathan
Your algorithm performance and operational environments.

00:00:11.750 --> 00:00:29.240
Doble Nathan
We also heard from air traffic controllers and pilots dispatchers that airmets despite being sort of the standard product for for forecasting moderate turbulence are not as much use to them.

00:00:29.300 --> 00:00:31.760
Doble Nathan
Uh or view to their large size.

00:00:32.290 --> 00:00:34.290
Doble Nathan
Uh and we think that.

00:00:35.360 --> 00:00:42.510
Doble Nathan
With the the move away from Textarea Medicine, going to only graphical airmets that there is an opportunity to.

00:00:44.000 --> 00:00:53.510
Doble Nathan
To make the elements a bit more granular and talking to the meteorologists at the National Weather Service. They also seem to think that was perhaps feasible, especially in the in the vertical dimension.

00:00:54.060 --> 00:01:00.690
Doble Nathan
Uhm and so we should recommendation to the FAA on National Weather Service around how parents are issue.

00:01:04.150 --> 00:01:06.340
Doble Nathan
And then we also.

00:01:08.150 --> 00:01:10.120
Doble Nathan
Issued some recommendations around.

00:01:10.170 --> 00:01:10.710
Doble Nathan
Uhm.

00:01:11.560 --> 00:01:12.090
Doble Nathan
Uh.

00:01:12.980 --> 00:01:18.430
Doble Nathan
Getting weather information directly onto the the scopes of the aircraft controllers under there under their radar displays.

00:01:19.280 --> 00:01:22.470
Doble Nathan
So that you know when they're interpreting a.

00:01:24.190 --> 00:01:30.330
Doble Nathan
A weather advisory that it's not you know, I I text print out that they don't have to interpret.

00:01:31.900 --> 00:01:33.730
Doble Nathan
Fix radial distance that sort of thing.

00:01:34.820 --> 00:01:51.750
Doble Nathan
And so we recommend that the FAA put Airmets Sigmets Center. Weather advisories total lightning and hail information onto controller radar displays in the center. Centric ONS as selectable layers that they can turn on and off.

00:01:55.100 --> 00:01:59.110
Doble Nathan
And then finally we in this section we?

00:02:00.740 --> 00:02:06.080
Doble Nathan
Heard from the folks have been using jug that it's a It's a great product.

00:02:06.140 --> 00:02:16.920
Doble Nathan
Uh and so we made a recommendation to the FAA and National Weather Service to operationalize up to take it from that semi operational state to operational state.

00:02:17.960 --> 00:02:28.520
Doble Nathan
And then we also noted that aircraft control hasn't we felt band discussion much about how they would use a product log.

00:02:28.570 --> 00:02:34.040
Doble Nathan
Then come and I think the controllers in general would like to provide.

00:02:35.990 --> 00:02:58.110
Doble Nathan
Better or perhaps more more corrective service around turbulence, but they don't really have the the tools to do so. They mention number of times you know if they have really good turbulence forecast. Then they could provide better service. But when they're only data point is you know a single point in space, a pirate that's that's in the past, it's hard to know how to interpret that.

00:02:59.370 --> 00:03:02.760
Doble Nathan
How to modify their their crafting management so we're hopeful that?

00:03:05.370 --> 00:03:07.380
Doble Nathan
Moving on to entry mitigation.

00:03:08.900 --> 00:03:10.030
Doble Nathan
Most of the

00:03:10.080 --> 00:03:19.830
Doble Nathan
you know the aircraft talking points that are injured in these accidents are flight attendants and so we made a recommendation to the FAA that they?

00:03:21.430 --> 00:03:32.320
Doble Nathan
Include some guidance to carriers on what altitudes and phases of flight. That flight attendants should be seated and secured in their seats focusing particularly on the descent phase of flight.

00:03:33.320 --> 00:03:49.230
Doble Nathan
And the the reason that we, we focus on descent is that looking at our accident data. We broke it down by some kind of broad phases of flight, you know take off to top of climb cruise and then top it is sent.

00:03:50.710 --> 00:03:55.250
Doble Nathan
To approach landing and then we also broke it down by altitude and when you look at that data.

00:03:55.300 --> 00:03:57.310
Doble Nathan
Yeah, UM about.

00:03:58.780 --> 00:04:05.210
Doble Nathan
Half of the accidents occurring from top of descent down and about 2/3 of those occur.

00:04:05.270 --> 00:04:07.570
Doble Nathan
Come under 20,000 feet.

00:04:09.000 --> 00:04:14.480
Doble Nathan
So we think that getting applied Tennessee at a bit earlier is you know, maybe a?

00:04:15.070 --> 00:04:19.200
Doble Nathan
A pretty straightforward way of eliminating some of these injuries.

00:04:21.610 --> 00:04:22.280
Doble Nathan
Uhm.

00:04:22.930 --> 00:04:23.590
Doble Nathan
And then

00:04:24.250 --> 00:04:25.330
Doble Nathan
we also heard.

00:04:26.880 --> 00:04:40.940
Doble Nathan
In the stakeholder interviews that current is often worse in the back of the aircraft and looking at our own accident data looking at the locations of unrestrained flight attendants during these events and whether or not they were.

00:04:42.180 --> 00:04:43.000
Doble Nathan
Injured or not.

00:04:44.340 --> 00:04:53.960
Doble Nathan
Flight attendants are or injured at a much higher rate when they're in the the the really aircraft. During these events, but there's there's very little quantitative data on.

00:04:55.130 --> 00:04:58.220
Doble Nathan
Just how the behavior of the aircraft varies from front to back.

00:04:59.290 --> 00:05:01.060
Doble Nathan
So we recommend that the FAA study that.

00:05:02.700 --> 00:05:12.550
Doble Nathan

Looking at the different aircraft that are operated in part, 121 operations because when we spoke with folks you know certain aircraft types kept coming up again and again.

00:05:13.800 --> 00:05:15.000
Doble Nathan
And we also looked at some of our.

00:05:15.050 --> 00:05:15.490
Doble Nathan
Or.

00:05:15.570 --> 00:05:25.600
Doble Nathan
Uhm flight data recorder data from past accidents and tried to estimate differences at the pilot station at the CG and at.

00:05:26.640 --> 00:05:47.350
Doble Nathan
You know uh location approximately half galley and here's one example of an accident involving a 737 where the the most severe vertical accelerations were at the after the aircraft and we estimated that it was actually lightest at the the friendly aircraft.

00:05:51.490 --> 00:05:52.650
Doble Nathan
We also note that.

00:05:52.710 --> 00:05:58.360
Doble Nathan
Uhm nearly all the folks that are injured in these accidents are unbelted at the time.

00:05:59.630 --> 00:06:13.370
Doble Nathan
The only occupants that aren't guaranteed a restraint our children, 2 the NTSB has a long history of recommending that children be secured inappropriate to child restraint system.

00:06:14.950 --> 00:06:26.230
Doble Nathan
The FAA similarly has a long history of not agreeing with those recommendations, and so we made a recommendation couple recommendations around.

00:06:27.720 --> 00:06:34.060
Doble Nathan
Increasing voluntary usage of CRS by by caregivers and at the board meeting.

00:06:35.220 --> 00:06:39.480
Doble Nathan
The the board members added a recommendation to the 3 major.

00:06:41.000 --> 00:06:52.440
Doble Nathan
Early associations to work with their members to develop a program to increase voluntary usage of CRSS end to include and to collect data.

00:06:52.490 --> 00:06:55.200
Doble Nathan
Set up to measure its effectiveness.

00:06:56.520 --> 00:06:57.180
Doble Nathan
And then

00:06:57.760 --> 00:06:58.560
Doble Nathan
Lastly.

00:06:58.610 --> 00:06:59.210
Doble Nathan
Uhm.

00:07:00.070 --> 00:07:06.240
Doble Nathan
Uh I think report we mentioned that the FAA has this advisory circular on true once injuries.

00:07:06.610 --> 00:07:12.230
Doble Nathan
Uh there's like good stuff in there, but it hasn't been updated about 15 years and so we have a recommendation to.

00:07:12.280 --> 00:07:17.590
Doble Nathan
Do for them to revise that and there's some suggestions. We have for what we think is going there.

00:07:19.600 --> 00:07:28.870
Doble Nathan
So that's my presentation here is a link to the the report. You can find it on the NTSB website. Also, if you're so inclined can look at.

00:07:28.930 --> 00:07:31.880
Doble Nathan
Uh from the public board meeting that happened in August.

00:07:32.260 --> 00:07:37.330
Doble Nathan
Uh and there's my my email there if you have any further questions thank you.

00:07:51.280 --> 00:07:52.940
Steve Abelman
Well, I'm not sure if anybody is on.

00:07:52.290 --> 00:07:53.790
Flowe, Tammy (FAA)
Thank you thank you.

00:07:55.120 --> 00:07:57.210
Flowe, Tammy (FAA)
So Steve do you have any questions?

00:07:57.520 --> 00:08:24.620
Steve Abelman
Yeah, there's there's quite a few UM so, so I'll start so I'll start with Nathan, who's who has a question and then he clarifies it a little bit. It is my understanding that carriers can implement an automated turbulence detection application software without even specific approval will these 3rd party technologies now require an airline to develop and receive a full bone erentz events program at the net do not already have one.

00:08:26.170 --> 00:08:29.040
Doble Nathan
So I I think the answer to that is.

00:08:31.070 --> 00:08:34.720
Doble Nathan
Is no and and the the the reason? We we?

00:08:37.250 --> 00:08:40.310
Doble Nathan
Yeah, we, we put that that he wins clause in there is that?

00:08:41.830 --> 00:08:44.040
Doble Nathan
Yeah, with the proper trying to get at is.

00:08:43.700 --> 00:08:44.050
Lyons, Danielle M (FAA)
Yes.

00:08:47.210 --> 00:08:50.640
Doble Nathan
Airlines you know, having triplets observations that that make it to the dispatcher.

00:08:51.420 --> 00:08:54.290
Doble Nathan
You know dispatcher might enter it into.

00:08:55.880 --> 00:08:58.890
Doble Nathan
There are commercial you know weather information provider software.

00:09:01.030 --> 00:09:01.480
Doble Nathan
Uh.

00:09:03.710 --> 00:09:12.490
Doble Nathan
You know from IBM or or flex for whoever but that because that's a lot easier than, say using the National Weather Service website and so.

00:09:12.770 --> 00:09:13.480
Doble Nathan
Uhm.

00:09:15.410 --> 00:09:28.830
Doble Nathan
So those those observations never make it back out to the Nas there might be sure within the company. They may be shared with other users of that software, but they never make it back out the mass and and so that was our way of trying to say you know if you got this, you know.

00:09:29.750 --> 00:09:31.440
Doble Nathan
Really capable software there.

00:09:31.800 --> 00:09:43.000
Doble Nathan
Uh it looks like the FAA has you know already done some work on. I'm getting observations from the providers of those software back out of the Mass that.

00:09:46.460 --> 00:09:48.460
Doble Nathan
That you know it exchanged for.

00:09:49.850 --> 00:09:51.310
Doble Nathan
You know be able to use this cool technology.

00:09:52.560 --> 00:09:53.150
Doble Nathan
That.

00:09:53.830 --> 00:10:03.070
Doble Nathan
You should be able to work with the The commercial weather providers to try and come up the better way of of getting this back out the NASA knockers sharing within the company.

00:10:05.120 --> 00:10:07.930
Steve Abelman
OK thanks Tammy can I squeeze one or 2 more in?

00:10:10.840 --> 00:10:11.920
Flowe, Tammy (FAA)
Yeah, please.

00:10:12.140 --> 00:10:40.190
Steve Abelman
OK, so I'm gonna try to combine 2, * 1, here so from Maddox Maddox, Tina. Yet Delta and from Jason prints at IBM. Matt notes, there are other automatic automated and objectively based turbulence reports capability to deployed in the 121 world. Besides those that calculate edr or these intentionally admitted from the recommendations for example, iPad accelerometers and then Jason mentions RMSG has been established for over 2 decades now.

00:10:40.850 --> 00:10:51.290
Steve Abelman
Uh and just it aligns well with the sections on aircraft response and reaction inside the cabin. So I guess that's try to combine those 2, * 1 for comment for you.

00:10:48.350 --> 00:10:48.600
Doble Nathan
Or.

00:10:51.290 --> 00:10:54.750
Flowe, Tammy (FAA)
That that that's a really good question as a really good question.

00:10:55.710 --> 00:10:57.440
Doble Nathan
Yeah, I think the UM.

00:10:59.050 --> 00:11:02.090
Doble Nathan
The reason we went with, we focus a bit more on.

00:11:02.490 --> 00:11:05.190
Doble Nathan
Well done DDR is that?

00:11:07.200 --> 00:11:08.470
Doble Nathan
You know those were the.

00:11:09.880 --> 00:11:13.310
Doble Nathan
That's the I Ko Standard and and that seemed to be the.

00:11:13.370 --> 00:11:18.970
Doble Nathan
The UM the standard of you know, some of the products that you're we already see out there like.

00:11:21.110 --> 00:11:22.450
Doble Nathan
Like for example.

00:11:29.850 --> 00:11:35.240
Flowe, Tammy (FAA)
Yeah, so on, and and this is just Tammy. I mean, I'm I. I think that the uh I ko.

00:11:30.850 --> 00:11:31.160
Steve Abelman
OK.

00:11:35.290 --> 00:11:40.760
Flowe, Tammy (FAA)
So uhm standard is is is an important thing.

00:11:44.570 --> 00:11:56.350
Steve Abelman
K got a couple more in here, UM did you do to do? Is there a climate for an outcast from from Brian Pettigrew as a as a retirement for an outcast limited to an NWS gridded product.

00:11:57.860 --> 00:12:01.190
Doble Nathan
No, I mean, we, we tried to.

00:12:01.240 --> 00:12:14.310
Doble Nathan
Do we don't wanna always be too prescriptive recommendations and so we try to leave it a little bit vague and say that you know, there there seems to be a need for a product that can support.

00:12:14.630 --> 00:12:16.860
Doble Nathan
Uhm tackle turbos avoidance.

00:12:18.560 --> 00:12:20.630
Doble Nathan
And you know, so far.

00:12:21.040 --> 00:12:24.890
Doble Nathan
Uhm GM seems to be kind of the UM.

00:12:25.510 --> 00:12:37.070
Doble Nathan
You know the big player there and so we've mentioned it sort of as an example. We kind of figured if

you know, probably would be that if anything, but but no it. It doesn't happen this would be a gridded product.

00:12:38.930 --> 00:12:42.470
Steve Abelman
OK, Tammy a couple more or do we need to move on.

00:12:43.540 --> 00:12:45.630
Flowe, Tammy (FAA)
Ah we probably should move on.

00:12:46.410 --> 00:12:50.800
Flowe, Tammy (FAA)
Uh so the next speaker is Greg Numeris.

00:12:52.490 --> 00:12:56.150
Flowe, Tammy (FAA)
I'm gonna talk about the easier implementation update.

00:12:59.860 --> 00:13:01.770
Greg Meymaris (Guest)
Hello can you hear me?

00:13:00.150 --> 00:13:00.420
Flowe, Tammy (FAA)
So.

00:13:01.200 --> 00:13:01.620
Flowe, Tammy (FAA)
Great.

00:13:02.280 --> 00:13:05.510
Flowe, Tammy (FAA)
Yeah, Greg can you run it yourself or do you need us to run it?

00:13:05.110 --> 00:13:08.990
Greg Meymaris (Guest)
I am going to try to share it here.

00:13:09.250 --> 00:13:09.720
Flowe, Tammy (FAA)
OK.

00:13:10.230 --> 00:13:11.410
Greg Meymaris (Guest)
Where is it there it is?

00:13:14.800 --> 00:13:15.770
Greg Meymaris (Guest)
Can you see my screen?

00:13:16.140 --> 00:13:16.510
Flowe, Tammy (FAA)
Yep.

00:13:17.740 --> 00:13:49.530
Greg Meymaris (Guest)
Alright get this thing out of the way Alright Good morning. Good afternoon, good evening to everyone. I'm going to talk to you about the in situ. And when I Insitu edr implementation. Update sometimes when we short hand in situ or when we short hand in Edr. We we really mean aircraft observation. Edr of course, is a turbulence metric and it can be 4. Castor now Castor inferred from remote detection, but

00:13:50.770 --> 00:13:55.180
Greg Meymaris (Guest)
in this particular moment, we're actually talking about at the aircraft observation.

00:13:57.280 --> 00:13:57.940
Greg Meymaris (Guest)
Ah.

00:13:59.430 --> 00:13:59.710
Greg Meymaris (Guest)
Right.

00:14:00.990 --> 00:14:25.000
Greg Meymaris (Guest)
There we go right, I'm not gonna read through the list. But there is a long list of of people that I'd like to acknowledge that have really pushed the the in situ. ER algorithm forward through either development or through operational use and these are just some of those people. They're probably more than I've forgotten.

00:14:26.910 --> 00:14:44.880
Greg Meymaris (Guest)
So aircraft based turbulence observations there, of course, are critical right, yeah, we need truth. About a turbulent situation right because it drives all turbulence products right if we have no aircraft observations, we really have no idea.

00:14:46.400 --> 00:14:52.110
Greg Meymaris (Guest)
What's going on there so you know they they feed into various?

00:14:53.900 --> 00:15:01.280
Greg Meymaris (Guest)
Important tasks that we do so basic research like Climatologies, Characterizations Case Studies.

00:15:02.820 --> 00:15:13.640
Greg Meymaris (Guest)
They're important for our product developments for research and tuning for example, and you know products can be a little bit more diverse than you think in that OK, yeah, GT?

00:15:13.790 --> 00:15:19.240
Greg Meymaris (Guest)
Craig you know, those sorts of forecasting terminals forecasting turtles now casting.

00:15:20.400 --> 00:15:26.660
Greg Meymaris (Guest)
Those all need aircraft observations, but also you know remote, sensing techniques.

00:15:27.430 --> 00:15:41.550
Greg Meymaris (Guest)
Based you know satellite based or radar base, they need aircraft observations and even you know, we're going to hear Larry Talk, a little later about this, but you know it, it, it turbulence.

00:15:42.290 --> 00:16:05.240
Greg Meymaris (Guest)
Uhm observation ull system based on 80 SB data will also require something like you know in situ. Edr for research for tuning for verification so they're used so aircraft. Obzor used for evaluation verification of products and they can be used in in a real time ingest into products such as like in.

00:16:08.600 --> 00:16:09.280
Greg Meymaris (Guest)
Ah.

00:16:10.180 --> 00:16:10.750
Greg Meymaris (Guest)
So.

00:16:11.380 --> 00:16:16.380
Greg Meymaris (Guest)
The first aircraft observation turf for turbulence was.

00:16:17.650 --> 00:16:23.050
Greg Meymaris (Guest)
Pireps and in fact, the first pirate was you know the very first day of of flight.

00:16:24.800 --> 00:16:30.090
Greg Meymaris (Guest)
So this goes way back to the Wright brothers as as Bill Watts always love to point out.

00:16:32.580 --> 00:16:36.670
Greg Meymaris (Guest)
You know, so there, but there are a lot of problems with Pireps.

00:16:36.990 --> 00:16:41.970
Greg Meymaris (Guest)
Uh yes that's good because a human is actually making that report but.

00:16:42.730 --> 00:16:47.980
Greg Meymaris (Guest)
That's also a problem, so there are non uniform measure in space and time.

00:16:48.930 --> 00:16:51.780
Greg Meymaris (Guest)
Pilots report them when they think.

00:16:52.710 --> 00:16:55.310
Greg Meymaris (Guest)
It requires it when when there's a need for it.

00:16:55.890 --> 00:17:00.050
Greg Meymaris (Guest)
Uh they're generally very low occurrence their subjective and categorical.

00:17:00.920 --> 00:17:01.640
Greg Meymaris (Guest)
Uhm.

00:17:02.400 --> 00:17:10.640
Greg Meymaris (Guest)
There are serious position in time in accuracies. There was a an event that we studied many years ago.

00:17:12.180 --> 00:17:28.530
Greg Meymaris (Guest)
And I don't remember all the details. But what I do remember was a very serious turbulence. Accidents and it was so serious that the pilots couldn't make the report for something like 20 minutes later. So you know you can imagine that the worst, the turbulence event.

00:17:29.210 --> 00:17:35.730
Greg Meymaris (Guest)
The more of the pilot has to do before they can go and actually make a pilot report.

00:17:36.570 --> 00:17:49.400
Greg Meymaris (Guest)
Uh and there are other problems with that, so but there are also it is aircraft. In flight condition. Dependent so not only is it pilot dependent but it's aircraft dependent and its flight condition dependent.

00:17:50.060 --> 00:17:55.060
Greg Meymaris (Guest)
Uhm so it's not a good system for.

00:17:55.780 --> 00:18:12.040
Greg Meymaris (Guest)
You know necessarily for warning people or it's not as good for warning people of what's going on. Because you know a pilot, a a moderate for a someone flying and a 380 is not going to be the same. It's not going to mean the same as to somebody flying a Cessna.

00:18:13.560 --> 00:18:19.990
Greg Meymaris (Guest)
So much better would be a an automated atmospheric measure that is aircraft independent.

00:18:20.930 --> 00:18:28.000
Greg Meymaris (Guest)
So to address this at the FAA sponsored Encarta develop an automated in situ turbulence, detection algorithm.

00:18:28.610 --> 00:18:33.300
Greg Meymaris (Guest)
Uh it's uniformly measured in time, though, it's not always reported.

00:18:34.640 --> 00:18:38.750
Greg Meymaris (Guest)
It it, it's computed every every minute in flight.

00:18:39.640 --> 00:18:49.690
Greg Meymaris (Guest)
There's frequent reporting every 15 to 20 minutes of routine reporting plus then event triggered reports if if an event is encountered.

00:18:51.290 --> 00:18:57.980
Greg Meymaris (Guest)
Their objective and quantitative they're based on existing aircraft sensors, so there's no additional equip edge needed.

00:18:58.600 --> 00:19:02.450
Greg Meymaris (Guest)
Uh they have reliable and accurate position in time information.

00:19:03.100 --> 00:19:10.770
Greg Meymaris (Guest)
Uhm and it measures ADR, which is an atmospheric turbulence intensity metric and it is not aircraft dependent.

00:19:11.930 --> 00:19:12.370
Greg Meymaris (Guest)
Uh.

00:19:15.630 --> 00:19:19.080
Greg Meymaris (Guest)
So there are operational benefits to it, it's used.

00:19:19.120 --> 00:19:19.830
Greg Meymaris (Guest)
Uhm.

00:19:21.420 --> 00:19:35.710
Greg Meymaris (Guest)
Basically improved situational awareness for dispatchers pilots you know, I I from Nathans. Talk you know it's not going to ATC from what I understand and and that is something that is completely possible to be included.

00:19:36.200 --> 00:19:45.260
Greg Meymaris (Guest)
Uh so but it can be a It's both from a strategic for example, and that forecast or tactical like an outcast standpoint.

00:19:46.460 --> 00:19:49.250
Greg Meymaris (Guest)
And here's just a couple of viewers that you can see.

00:19:49.310 --> 00:19:53.230
Greg Meymaris (Guest)
Say that that are using in situ right now.

00:19:55.720 --> 00:19:58.850
Greg Meymaris (Guest)
And we'll hear more about some of these later.

00:19:58.900 --> 00:20:11.970
Greg Meymaris (Guest)
Uh knowing better went to turn on the seat belt sign or still the beverage cart fewer injuries and deaths wasting less fuel searching for a smooth ride, so these are our various use cases.

00:20:13.010 --> 00:20:13.450
Greg Meymaris (Guest)
And.

00:20:17.130 --> 00:20:26.220
Greg Meymaris (Guest)
So here's the timeline just of really of the software package. I'm not going to go into all the different implementations as it's grown but in the 90s.

00:20:26.430 --> 00:20:29.320
Greg Meymaris (Guest)
Uh the FAA sponsored the development.

00:20:30.180 --> 00:20:30.860
Greg Meymaris (Guest)
Uhm.

00:20:31.530 --> 00:20:34.880
Greg Meymaris (Guest)
In the early 2000s, UM.

00:20:35.710 --> 00:20:46.040
Greg Meymaris (Guest)
The version one which was accelerometer based uh was deployed in the early 2000s on the United Boeing 73 Sevens and 757 's?

00:20:47.210 --> 00:20:48.970
Greg Meymaris (Guest)
Uh in the

00:20:49.630 --> 00:20:57.890
Greg Meymaris (Guest)
mid 2000s, UM and then and finally in 2008. We developed a version 2, which was vertical winds based.

00:20:58.630 --> 00:21:00.340
Greg Meymaris (Guest)
That was dumb.

00:21:02.440 --> 00:21:09.270
Greg Meymaris (Guest)
Well, we, we, we think that the vertical wind based is has some advantages over the accelerometer based.

00:21:09.920 --> 00:21:10.520
Greg Meymaris (Guest)
Uhm.

00:21:11.260 --> 00:21:26.290
Greg Meymaris (Guest)
And so is deployed in 2008 and it was updated in 2016 to be more easily adapted to different aircraft types, it that the original version 2, you needed to.

00:21:28.080 --> 00:21:43.100
Greg Meymaris (Guest)
Tune to in order to tune it to a different aircraft type, you actually had to change some of the C code you had to recompile and that was problematic. If you if it was a limitation to us being able to to deploy the software package wide widely.

00:21:43.950 --> 00:21:55.540
Greg Meymaris (Guest)
Uhm also in 2016, we built a 10. Hertz version of it and that was in particular for the Triple Sevens and 787 's, which operated at that sampling frequency.

00:21:56.600 --> 00:22:05.720
Greg Meymaris (Guest)
A year later we built up a tech transfer package and and that was in order to simplify the deployment including.

00:22:05.770 --> 00:22:16.300
Greg Meymaris (Guest)

Uhm some support for other data rates, but it included a lot of software for tuning and verification for ground based in jest.

00:22:17.510 --> 00:22:18.960
Greg Meymaris (Guest)
As well as documentation.

00:22:19.050 --> 00:22:25.410
Greg Meymaris (Guest)
Uh and then 2 years later in 2019, I Otta incorporated it into their.

00:22:25.460 --> 00:22:28.030
Greg Meymaris (Guest)
Or tech transfer package.

00:22:28.930 --> 00:22:32.780
Greg Meymaris (Guest)
And so in this graphic you can see over the years the.

00:22:33.540 --> 00:22:34.200
Greg Meymaris (Guest)
Uhm.

00:22:35.080 --> 00:22:46.260
Greg Meymaris (Guest)
That coverage of in situ has uh and the end car in situ. Algorithm has really increased from just really a small konus based area too.

00:22:46.320 --> 00:22:48.500
Greg Meymaris (Guest)
Go up to more global.

00:22:59.450 --> 00:23:11.810
Greg Meymaris (Guest)
So currently there are about 1600 aircraft worldwide. It's actually a little hard to estimate because we don't get all of the data from all the different aircraft.

00:23:12.420 --> 00:23:13.190
Greg Meymaris (Guest)
Uhm.

00:23:14.170 --> 00:23:17.590
Greg Meymaris (Guest)
So there are about 1300 that are US based.

00:23:19.010 --> 00:23:40.780
Greg Meymaris (Guest)
And uh about 65,000 ADR reports are received every day at at end car. Now we also have a feed coming from the from my OTA we get about another 10 thousands come along from from that feed.

00:23:42.880 --> 00:23:59.350
Greg Meymaris (Guest)
There are a lot of different aircraft types for Boeing. There's the 737 NGS 737. Max is the 767 's 304 hundreds the Triple Sevens 203 hundreds.

00:24:00.130 --> 00:24:08.140
Greg Meymaris (Guest)
Uh I'm not worrying about the ER or I'm not ER just come and then the 787 's the 8 nines and 10s.

00:24:08.830 --> 00:24:15.830
Greg Meymaris (Guest)
For the Airbus A there is uh implementations on 319 through 2320 ones.

00:24:16.550 --> 00:24:20.700
Greg Meymaris (Guest)
And then the error 330 is the 200 309 hundreds.

00:24:21.380 --> 00:24:32.190
Greg Meymaris (Guest)
Uh and then in the works very, very soon well in over the next you know years or so is is the 777 X is and the.

00:24:32.850 --> 00:24:34.480
Greg Meymaris (Guest)
Airbus 350.

00:24:35.680 --> 00:24:37.330
Greg Meymaris (Guest)
And a little bit more of that in a minute.

00:24:38.240 --> 00:24:41.370
Greg Meymaris (Guest)
So there's several deployment paths, UM.

00:24:42.020 --> 00:24:50.240
Greg Meymaris (Guest)
How am I doing on time here? I'm doing OK so uh there's several different deployment paths one is just off the shelf.

00:24:50.910 --> 00:24:53.040
Greg Meymaris (Guest)
So you can get the.

00:24:53.970 --> 00:24:58.050
Greg Meymaris (Guest)
Onboard edr option from several different.

00:24:58.470 --> 00:25:01.640
Greg Meymaris (Guest)
Uhm vendors depending on your?

00:25:02.270 --> 00:25:22.020
Greg Meymaris (Guest)
Uh you know what your aircraft is and or your acms there's from Teledyne. There's you can get on the Boeing 737 NGS. They have the an off the shelf option. They have an off the shelf option for the 3 20s and they're working on the A 330 's that's that's close to to finished.

00:25:23.250 --> 00:25:32.220
Greg Meymaris (Guest)
For the Boeing you can get off the shelf for the 777 the 787 the 737 Max is and there are working on the 777 X is.

00:25:33.330 --> 00:25:45.560
Greg Meymaris (Guest)
Uh and then a through Airbus through a 350. This is very soon. And it's actually I guess available now, so they're performing some non mandatory flight tests.

00:25:47.060 --> 00:25:58.380
Greg Meymaris (Guest)
But it's it's now available, so you can reach out to any if anybody needs to they can reach out to these people and and to look for the off the shelf options.

00:25:59.460 --> 00:26:18.950
Greg Meymaris (Guest)
On the left we have a graphic table of the different number of aircraft per aircraft type that are currently reporting. Edr some of these numbers are a little fuzzy because again we don't necessarily receive all of the.

00:26:20.650 --> 00:26:22.800
Greg Meymaris (Guest)
Edr observations from.

00:26:23.450 --> 00:26:24.060
Greg Meymaris (Guest)
Uhm.

00:26:24.740 --> 00:26:42.280
Greg Meymaris (Guest)
All the different airlines that are reporting so this is somewhat of an estimate but you can see that the 73 Sevens in particular are dominate. But there are quite a few internationally. It's the Triple Sevens in the 8th Sevens that are that are dominating.

00:26:46.600 --> 00:27:13.960
Greg Meymaris (Guest)
And by internationally, I mean, not I you know outside of the US is really what I mean, sorry about that,

so uh another deployment path is the sort of do it yourself, so for example, if if the airline has Teledyne Acms. Many of them have the if not all of them. But many of them have the capability to allow the airline or a vendor working for the airline to integrate the software themselves.

00:27:14.800 --> 00:27:23.630
Greg Meymaris (Guest)
This has been successfully done on a number of aircraft frames. The 7379 Jesus 76. Sevens the the baby buses and the 83 30s.

00:27:24.390 --> 00:27:25.120
Greg Meymaris (Guest)
Uhm.

00:27:26.320 --> 00:27:30.840
Greg Meymaris (Guest)
And there's actually other do-it-yourself options.

00:27:31.350 --> 00:27:50.020
Greg Meymaris (Guest)
Uh error links for example, has put this on an FB there has been worked on on and on a IDs the aircraft interface device, which is the device that talks to any FB for example, it connects into the acms is is how I understand it.

00:27:50.740 --> 00:27:51.230
Greg Meymaris (Guest)
Uhm.

00:27:51.820 --> 00:27:59.610
Greg Meymaris (Guest)
On the right, I'm sorry on the right on the left we again see a graphic or table of the.

00:28:01.490 --> 00:28:05.420
Greg Meymaris (Guest)
The number of aircraft types and number of aircraft per type.

00:28:05.970 --> 00:28:13.960
Greg Meymaris (Guest)
For these the do it yourself option again. There's a lot of 73, Sevens but there's also a lot of the 83 20s.

00:28:19.280 --> 00:28:24.200
Greg Meymaris (Guest)
In a comparison about 2/3 of the.

00:28:25.430 --> 00:28:30.840
Greg Meymaris (Guest)
The aircraft that are out there right now have actually done it in a in an off the shelf fashion.

00:28:31.770 --> 00:28:33.740
Greg Meymaris (Guest)
Which is I guess not too surprising?

00:28:33.970 --> 00:28:43.260
Greg Meymaris (Guest)
Uh and then about a 3rd or the do-it-yourself errors and then the graphic on the right shows you sort of those those 2 things altogether.

00:28:44.120 --> 00:28:53.690
Greg Meymaris (Guest)
Uhm 73 Sevens obviously dominate but there's but after that, it's pretty well spread out throughout a whole number of different aircraft types.

00:28:58.740 --> 00:29:01.090
Greg Meymaris (Guest)
The end car in yeah.

00:28:59.220 --> 00:29:05.200
Flowe, Tammy (FAA)
So so, so Greg I think we, we probably need to move to some questions.

00:29:06.040 --> 00:29:06.580
Flowe, Tammy (FAA)
Uhm.

00:29:06.300 --> 00:29:06.790
Greg Meymaris (Guest)
OK.

00:29:07.930 --> 00:29:10.450
Flowe, Tammy (FAA)
Uhm so Steve.

00:29:15.150 --> 00:29:17.490
Flowe, Tammy (FAA)
I I think probably have a bunch of questions.

00:29:15.290 --> 00:29:15.770
Steve Abelman
OK.

00:29:18.270 --> 00:29:24.250
Steve Abelman
Yeah, we do, we we, we do have quite a few so let let's look at.

00:29:25.420 --> 00:29:50.720
Steve Abelman
Uh I was going to make a comment one quick comment for the for for you. Tammy there was a second

question in the last section that I think we ought to make note of to make sure we cover later in the day and that was from at Strahan on turbulence costs and I suspect between Nathan and and so many of the speakers. Today we ought to have at least a little conversation about cost of turbulence encounters if we can't so.

00:29:49.740 --> 00:29:55.260
Flowe, Tammy (FAA)
Yeah, yeah, absolutely so can, we can make a note of that in our notes.

00:29:56.280 --> 00:29:56.580
Steve Abelman
Yeah.

00:29:56.470 --> 00:29:56.710
Flowe, Tammy (FAA)
And.

00:29:57.760 --> 00:30:02.610
Flowe, Tammy (FAA)
Make a note of that in our notes and and will take care of that, Yep thanks.

00:29:59.510 --> 00:30:00.010
Steve Abelman
Right.

00:30:02.890 --> 00:30:05.110
Steve Abelman
OK. Let me go through a few questions real quick for you.

00:30:05.160 --> 00:30:14.570
Steve Abelman
Uh from what Rodgers can latest video output environment aircraft or derived vertical velocity, which would be great for mountain wave detection.

00:30:18.560 --> 00:30:21.050
Greg Meymaris (Guest)
Uh wait what was the question I'm sorry.

00:30:21.040 --> 00:30:28.200
Steve Abelman
Yeah, I'm reading it verbatim so can the latest EV output. Edr output environment derive.

00:30:28.780 --> 00:30:33.640
Steve Abelman
Vertical velocity would like is what I'm getting I think would be great for Mount wave detection.

00:30:32.820 --> 00:30:36.200
Greg Meymaris (Guest)
Yeah, no, I mean, it's in this uh.

00:30:37.920 --> 00:31:04.910
Greg Meymaris (Guest)
I think the answer is no I think actually for something like that. You'd be better off looking at, I mean, I think that's true for all of the turbulence measurements that are computed whether it be an arm, SG or an ADR. I don't think you can recover the velocity. You can get an idea of accelerations, but it's really more like a standard deviation of acceleration so the.

00:31:06.360 --> 00:31:16.290
Greg Meymaris (Guest)
I don't yeah, I don't think you can really you're not gonna be able to pull out that now 80, SB for example, has vertical rates and so I think that would be a more fruitful direction to look at.

00:31:17.360 --> 00:31:27.540
Steve Abelman
OK thanks Bill Holtzman from mosaic ATM. What is vertical wind based mean does the system maintain some kind of vertical wind model similar to traditional win models?

00:31:28.530 --> 00:31:50.900
Greg Meymaris (Guest)
So the the vertical the short answer is the the true airspeed and the angle of Itzhak are used to estimate the vertical wind time series. So you can essentially think of it as a an anemometer out the front of the aircraft on the nose of the aircraft.

00:31:51.610 --> 00:31:57.180
Greg Meymaris (Guest)
That is a man I mean, there are there's more complications to it of course, but

00:31:57.980 --> 00:32:12.210
Greg Meymaris (Guest)
that's that's uh that's sort of the essential fact of it is that we can compute the vertical ones from the true airspeed and the angle of attack and then once you have the vertical rate times here vertical time series vertical winds time series.

00:32:12.790 --> 00:32:16.760
Greg Meymaris (Guest)
Then you can estimate Eddy dissipation rate directly.

00:32:18.050 --> 00:32:30.900
Steve Abelman
OK, 22 more Tammy I'll try to sneak him in if you want come first one, from Jason prints at IBM does the 65,000 daily reports include include null reports and if So what percentage of the daily reports are null?

00:32:32.020 --> 00:32:39.730
Greg Meymaris (Guest)
Ah that is that does not include the interpolated nulls, UM, I'd.

00:32:40.980 --> 00:32:46.560
Greg Meymaris (Guest)
Yeah. Let me let me look real quick, I can probably get that information. I think I have that information.

00:32:47.940 --> 00:32:51.200
Greg Meymaris (Guest)
Right here it's something like.

00:32:52.850 --> 00:33:10.580
Greg Meymaris (Guest)
Uh so at 66,000 is the last measurement for per month daily values averaged over the last month. But it's 540, 6000, when you include the per day when you include the interpolated.

00:33:11.180 --> 00:33:13.130
Flowe, Tammy (FAA)
So so great, so great.

00:33:11.440 --> 00:33:13.430
Greg Meymaris (Guest)
So it's not quite a factor of 10.

00:33:13.870 --> 00:33:20.260
Flowe, Tammy (FAA)
So Greg that at website is is that open to anybody that wants to see those numbers.

00:33:20.740 --> 00:33:28.530
Greg Meymaris (Guest)
It is except it just they they broke it because uh but yeah, I can. I'll I'll have to fix it because?

00:33:27.140 --> 00:33:31.900
Flowe, Tammy (FAA)
OK, I mean, I mean, but we can, we can give that information to Jason right.

00:33:32.420 --> 00:33:32.940
Greg Meymaris (Guest)
Sure.

00:33:33.430 --> 00:33:33.930
Flowe, Tammy (FAA)
OK.

00:33:36.350 --> 00:33:44.300
Steve Abelman
OK and then uh overcrowded question. But I think Larry Korman. Just answered it. So Tammy I'm gonna throw it back to you so we can keep moving.

00:33:46.560 --> 00:33:53.360
Flowe, Tammy (FAA)
Yeah, yeah, so let me pull up the uh I think the next.

00:33:56.040 --> 00:34:09.670
Matt Fronzak
And and Tammy this is Matt while you're doing that can I ask all of the participants to please unless you're a presenter? Please turn off your video camera your video feed and Kent Goodrich. If you're listening. It you could turn yours off that would be great.

00:33:56.510 --> 00:33:56.780
Flowe, Tammy (FAA)
Yes.

00:34:10.210 --> 00:34:14.990
Flowe, Tammy (FAA)
Yeah, so I am Oh my goodness, UM.

00:34:17.540 --> 00:34:21.470
Flowe, Tammy (FAA)
I think Tim Ramos is our next presenter.

00:34:22.940 --> 00:34:24.180
Tim Rahmes (Guest)
Yeah, can you hear me?

00:34:23.120 --> 00:34:23.440
Flowe, Tammy (FAA)
Ah.

00:34:24.570 --> 00:34:26.330
Flowe, Tammy (FAA)
Yeah, we can hear you Tim.

00:34:26.130 --> 00:34:29.060
Tim Rahmes (Guest)
And I need to share my screen.

00:34:30.610 --> 00:34:31.820
Tim Rahmes (Guest)
Do you see my screen?

00:34:32.600 --> 00:34:33.660
Flowe, Tammy (FAA)
Not yet.

00:34:34.630 --> 00:34:36.000
Tim Rahmes (Guest)
Oh boy OK.

00:34:36.350 --> 00:34:36.920
Tim Rahmes (Guest)
Uhm.

00:34:37.530 --> 00:34:47.660
Flowe, Tammy (FAA)
So Tim Robbins is an engineer with Boeing, he's been working a lot of turbulence stuff for many, many, many years now.

00:34:48.390 --> 00:34:49.120
Flowe, Tammy (FAA)
Uhm.

00:34:50.170 --> 00:34:51.940
Flowe, Tammy (FAA)
So hopefully.

00:34:50.210 --> 00:34:55.190
Tim Rahmes (Guest)
And and I'm having a hard time figuring out how to share my screen.

00:34:58.260 --> 00:35:00.420
Tim Rahmes (Guest)
Any any advice from anybody.

00:35:03.020 --> 00:35:04.310
Tim Rahmes (Guest)
There's a share tray.

00:35:07.120 --> 00:35:07.830
Tim Rahmes (Guest)
Uh.

00:35:07.740 --> 00:35:10.110
Matt Fronzak
Tim what what kind of system are you operating on.

00:35:09.860 --> 00:35:13.490
Tim Rahmes (Guest)
I'm on a I'm on my Mac right now, I'm at, I'm.

00:35:16.250 --> 00:35:23.290
Matt Fronzak
And and I I apologize but I I know the Mac. Layout is different and I don't. I don't exactly know what to tell you.

00:35:24.390 --> 00:35:26.260
Tim Rahmes (Guest)
Uh OK hold on a second.

00:35:28.690 --> 00:35:35.770
Klipfel, Stephanie

Tim this is step. I have a Mac. And it I just have a share content icon next to the leave button do you have a shared contact?

00:35:34.850 --> 00:35:36.030
Tim Rahmes (Guest)
Next to that which button.

00:35:36.500 --> 00:35:37.500
Klipfel, Stephanie
Next to the leave.

00:35:39.080 --> 00:35:39.600
Tim Rahmes (Guest)
Leave.

00:35:39.300 --> 00:35:40.050
Klipfel, Stephanie
Bradley.

00:35:41.380 --> 00:35:42.270
Bob Avjian
An up arrow.

00:35:41.960 --> 00:35:42.370
Tim Rahmes (Guest)
Uh.

00:35:43.870 --> 00:35:44.540
Tim Rahmes (Guest)
Yeah.

00:35:43.920 --> 00:35:44.530
Kory Gempler
Upper right.

00:35:46.290 --> 00:35:49.130
Klipfel, Stephanie
There's a It's a square or rectangle with an up arrow in it.

00:35:50.350 --> 00:35:56.930
Klipfel, Stephanie
And if you hover it says share content. It also says you can do the command shift E to share might be able to try that.

00:35:58.590 --> 00:35:59.900
Tim Rahmes (Guest)
Shift E.

00:36:01.920 --> 00:36:05.450
Tim Rahmes (Guest)
No, that's not working so why don't we go to the Plan B?

00:36:05.500 --> 00:36:11.630
Tim Rahmes (Guest)
He unfortunately we're I guess Matt will share his screen sorry about this guys.

00:36:12.720 --> 00:36:20.500
Mark Phaneuf - ALPA (Guest)
I know for me. Uh Tim it's a security issue inside Max and my IT folks had to switch that for me.

00:36:13.790 --> 00:36:15.140
Flowe, Tammy (FAA)
No thanks.

00:36:21.320 --> 00:36:21.840
Tim Rahmes (Guest)
OK.

00:36:25.270 --> 00:36:25.650
Flowe, Tammy (FAA)
So.

00:36:26.370 --> 00:36:33.390
Flowe, Tammy (FAA)
There you go alright or oh yay I can see the slide thanks good good good. Thank you.

00:36:33.150 --> 00:36:48.900
Tim Rahmes (Guest)
OK, that will work OK well. Good morning, or afternoon. Everyone UM and thanks to the organizers for inviting me and and it's great to follow Greg because he's been a big part of the progress made here at Boeing as well. So let's go to the next slide.

00:36:51.740 --> 00:37:03.790
Tim Rahmes (Guest)
Uh you know much as I've done in the past and kind of following along on what Greg was showing I'll give you know status updates for our progress. I'll talk a little bit about the concept of operations.

00:37:04.530 --> 00:37:12.640
Tim Rahmes (Guest)
A few words because the Boeing company also includes Jefferson and 4 flight where the end use and the value will come out for for our industry.

00:37:13.180 --> 00:37:20.500
Tim Rahmes (Guest)
Ummm, but I also want to do something new, and that'll be a tropopause analysis. Now, that we're starting to get a lot of data geographically.

00:37:21.800 --> 00:37:30.100
Tim Rahmes (Guest)
Let's test and see how much data. We have and is it. You know can, we draw. Some conclusions from that, so that's that's my plan so next line.

00:37:33.470 --> 00:37:34.220
Tim Rahmes (Guest)
Uhm.

00:37:35.430 --> 00:37:50.840
Tim Rahmes (Guest)
You know really from our customers perspective their request to us had over the last couple years, few years, actually has been to generate meteorological data to support their operations so starting with the aircraft on top you know, we offer this with the airplane.

00:37:51.470 --> 00:38:21.920
Tim Rahmes (Guest)
Uh my purchase or in retrofit to really expand how we can get the adoption out there. We've talked about ayata turbulence aware efforts on their the airline sharing and a lot of progress. It really has been made. There, which is fantastic, but that's it's beyond that, as well. It's up to the airline worth who they want to share their data. So a lot of this data is going to other you know commercial weather services or other regional or?

00:38:21.980 --> 00:38:28.330
Tim Rahmes (Guest)
Governmental Weather Service providers, which is great. We want to get it shared to the maximum extent possible.

00:38:29.070 --> 00:38:33.210
Tim Rahmes (Guest)
Uh then comes the end use up you know, we certainly have seen a lot of.

00:38:34.080 --> 00:38:57.450
Tim Rahmes (Guest)
Uhm papers on research for it, but to really make a difference and the reason our our customers are equipping and and taking this is really they expect some values so I know we're like well. Here's some more from the customers here. Following my talk at least but the you know the Jeppesen flight deck pro integration is coming as we go into the next year.

00:38:58.400 --> 00:39:07.200
Tim Rahmes (Guest)
We've been waiting for that, but it's got to be done right, and then 4. Flight folks are also working on their end for applications as well so let's go to the next slide.

00:39:10.030 --> 00:39:27.960
Tim Rahmes (Guest)
Uh and I'm not going to go through this in a lot of detail and Greg talked about it already. But you know.

Basically, the long and short of it is, we offer this for all Triple Sevens and the dash 8 dash 9 at the end of that is the 777 X and obviously it's already working in flight test for us, which is great.

00:39:28.510 --> 00:39:42.510
Tim Rahmes (Guest)
Uhm nothing like having it already as part of the flight test program. We have it on the 87 's across the board as well as every Max that's out there in our view on this, if you look in the the Middle Box is really more of a comprehensive meteorological.

00:39:43.070 --> 00:39:46.720
Tim Rahmes (Guest)
Uhm capability Kaiperm met reporting capability.

00:39:47.390 --> 00:39:55.180
Tim Rahmes (Guest)
Uh so for that whole big parameter list. Certainly the reason for recent adoption has been the turbulence. There's no question about that.

00:39:55.750 --> 00:40:19.110
Tim Rahmes (Guest)
But really depending on who I'm talking to there are there are operators who will say. Yeah, we want the humidity integration. We want the you know what might be evolving with cloud and ash properties. So we've already made. Some provisions for that. I'm looking towards the future. Some of the integration on particularly on the widebodies is more complex than just the acms so lot of details, there, you can always follow up with me if you have questions on that.

00:40:20.360 --> 00:40:21.650
Tim Rahmes (Guest)
So alright let's go to next slide.

00:40:23.420 --> 00:40:53.470
Tim Rahmes (Guest)
Ah so I know what you're thinking not another what? What did the pandemic cause and in our industry. This actually this bar chart tells us quite a bit more than that. You know for example, if you look at the number of Triple Sevens. Although the number of observations in this is by the end of September has gone up regardless of the pandemic. But if you look at the Triple Sevens. That's down. That's the blue. The blue bars. So I know there's some of our customers that have taken the option were reporting.

00:40:53.890 --> 00:41:08.460
Tim Rahmes (Guest)
And many of those triple Sevens are unfortunately parked so that is definitely a an indication of the pandemic. 8 Sevens in the end of grown in terms of number of observations and then the return of the Max is fantastic, so this little.

00:41:09.180 --> 00:41:15.390
Tim Rahmes (Guest)
Kind of echo through the next couple of slides come as we draw some conclusions from this data right next.

00:41:16.880 --> 00:41:17.800
Tim Rahmes (Guest)
Yeah, this is working great.

00:41:17.860 --> 00:41:22.990
Tim Rahmes (Guest)
Uh just as feedback from somebody else showing your slides I don't have to move up.

00:41:23.970 --> 00:41:43.360
Tim Rahmes (Guest)
Yeah, regionally and we're just I'd say, we're over 20 airlines now and some of these are large and contributing to OTA so certainly the lion share of all data that we've assisted customers with is going to OTA and is being used by you know other companies or entities.

00:41:43.950 --> 00:41:44.600
Tim Rahmes (Guest)
Uhm.

00:41:46.560 --> 00:41:50.190
Tim Rahmes (Guest)
I hear somebody typing if they could go on mute, maybe uh.

00:41:51.440 --> 00:42:16.300
Tim Rahmes (Guest)
In North America, you were up to 5. Europe, 5, Asia is is a lot of customers or have taken the the option over in Asia, but the big news is South America. Last time I spoke publicly. We had known we had zero airlines so as an industry that's great. We want to see the the Americas grow as well. OK, I think that's all for this line will move on.

00:42:17.350 --> 00:42:40.140
Tim Rahmes (Guest)
So with that in mind kind of Orient yourself for the geography. I use large dots. I guess when I paint. The screen in the following slides, but you quickly lose the geographic reference. Yeah, you can go into the next but South America was a key area Triple Sevens. No big surprise really getting a lot of good worldwide data from those and then if we go one more.

00:42:41.290 --> 00:42:57.730
Tim Rahmes (Guest)
And we paint over with the the 787 's in magenta and the 737 Max in Green. It looks great now just keep in mind. This is just where Boeing has helped this is not the larger data set that like for example, Greg was showing which we know includes.

00:42:58.360 --> 00:43:29.370
Tim Rahmes (Guest)
Many many more aircraft, particularly in the United States so this is just where we've helped some customers. Some takeaways from this, particularly as we laid over the 787 's on top of the Triple Sevens. There's definitely some routes that the 87 fly. I know we've talked spoken publicly about United Airlines.

That's a Newark down. South Africa flight going across the South Atlantic and some other Pacific routes as well so which is great. We want to get more density, which is a good segue to the next.

00:43:29.740 --> 00:43:43.950
Tim Rahmes (Guest)
One more comment about this slide. This is just September right. This is you know, there are some seasonal routes. There are some routes that haven't happened here and in a few months. But this is just for the month of September. This year, so let's go to the next line.

00:43:45.930 --> 00:43:50.500
Tim Rahmes (Guest)
So what do I do here again just for September. Let's make a heat map uh?

00:43:51.450 --> 00:44:23.080
Tim Rahmes (Guest)
I I pinned the maximum in a grid cell and these are 5 degree by 5 degree grid boxes just 20,000 feet and higher and I pinned the color red here. We really wanna see where we're getting some observations. You start to see some oranges over South America, which we never had time 'cause. We always had some routes over there for the last several years. But there's just really in the last couple months. Are we starting to get some density with the the 3 airlines that are based out of South America and you know a lot of those are 737 Max.

00:44:23.500 --> 00:44:46.620
Tim Rahmes (Guest)
Uh, which has been fantastic, you know architecturally for us, the Max is great. It comes out of the factory already with the software installed and to turn it on. We just need to send an uplink message. Uh we don't have that luxury yet on a triple Sevens and Eights Sevens, but it is working great on the 737 Max that you know, we don't have to send a main maintainer out to go load software.

00:44:47.320 --> 00:44:51.280
Tim Rahmes (Guest)
Uh or or that kind of thing it's just done and you just activate it.

00:44:52.500 --> 00:45:02.270
Tim Rahmes (Guest)
Uh he could probably figure out some of the customers based on recent press releases, and we we see high density say from you know 20 degrees North up to 60 degrees North.

00:45:02.890 --> 00:45:14.790
Tim Rahmes (Guest)
Uh where most of the population is so no real surprises, there as good as some of that looks. I guess we'd really like to see red everywhere in terms of high density of of Edr reporting.

00:45:15.650 --> 00:45:17.040
Tim Rahmes (Guest)
OK let's go to the next slide.

00:45:18.030 --> 00:45:47.940
Tim Rahmes (Guest)
So now that we were getting a lot of data again just looking at September and I've talked about this before. You know one of the key points about 78. Sevens is they go right up the cruise and so here I I. I use altitude on the X axis. So 40,000 feet and up there. You see the 787 's really get up get up there. the Y axis is on a log scale, so probability of where you're going to be. You know, finding a 777 or 787 on this planet at what altitudes is how you could look at this, this chart.

00:45:48.740 --> 00:45:57.100
Tim Rahmes (Guest)
So that's a good point. Uh 87 do cruise higher potentially you know up in the stratosphere. Or they may be experiencing smoother rides.

00:45:57.420 --> 00:46:24.340
Tim Rahmes (Guest)
Uh and I show some of the statistics there for how many Triple Sevens and eights. Sevens in the middle OK great. Let's let's take a one next step and much like we always showed geographically which you know geopolitical boundaries or continental boundaries. There's also the tropopause. So here I take and sum up all of the observations from South Pole. the North Pole by latitude.

00:46:26.430 --> 00:46:36.150
Tim Rahmes (Guest)
And I pinned the maximum at 40,000 right there's there's definitely a core of where we're receiving observations between 30,000 feet and 40,000 feet.

00:46:36.790 --> 00:47:02.020
Tim Rahmes (Guest)
Uh and and also by latitude there between like like I said 20 degrees to about 60 degrees North and then we overlay. The mean tropopause, which you know it. Almost looks like it's bisecting the core of our observations and this is all data. I should have mentioned that this is from January of 2019 will not all data. But a good last couple years through October of this year, so quite a bit.

00:47:03.470 --> 00:47:05.810
Tim Rahmes (Guest)
Many many observations being put in here.

00:47:06.720 --> 00:47:20.480
Tim Rahmes (Guest)
And that of course makes us want to see well now that we're getting a lot of observations potentially and maybe we can see how this behaves so looking between about 10 degrees North and 70 degrees North if you Orient yourself there.

00:47:21.150 --> 00:47:32.900
Tim Rahmes (Guest)
Uhm and and seeing you know where the we're not really getting any observations down low over the polar routes. Everything is at cruise. Obviously so let's go to the next slide just remembering that.

00:47:34.410 --> 00:47:41.530
Tim Rahmes (Guest)
So let's yeah, let's talk about moderate or greater that's always been an area where we as an industry certainly want to collaborate.

00:47:43.220 --> 00:47:55.210
Tim Rahmes (Guest)
And so I for arguments sake. I'm using edr 0.2. Maybe it's 0.22. Maybe it depends on what size they were playing. But for this study. I just used let's go look at any ER is greater than 0.2.

00:47:56.000 --> 00:48:26.330
Tim Rahmes (Guest)
Uh Greg reminded me about this. The other day to great thing with that number also is you get all observations if any, time there's an edr greater than 0.2 or 0.18 per the the triggering logic. We're going to get an observation from those and again. This is from January of 2019 through October. This year and I I run latitudes just from like I said 10 degrees North up to 70 and from flight level 250 up to 420 and then and then I'm overlaying a few tropopause.

00:48:26.380 --> 00:48:34.810
Tim Rahmes (Guest)
You know the mean like I showed in the previous slide, but also the the winner in the summer tropopause altitudes by latitude.

00:48:35.950 --> 00:49:03.220
Tim Rahmes (Guest)
And you know, let's let's handle that up front If you see the the red boxes in the polar routes. You know 6 degrees 70 degrees North like I showed in the previous slide. There's not a lot of data there so don't try to draw too many conclusions from that that could have just been one interesting flight right so but where we knew the core was again you know 30,000 to 40,000 feet between 20 and 60 that would be an area to to look at and say, yeah well.

00:49:04.260 --> 00:49:27.840
Tim Rahmes (Guest)
So what and and and and again, I'm I'm pinning the maximum percent of of reports that were greater than 1.2% in the darkest of red so you can see the color scale on the bottom So what did we do, we discovered the tropopause. And the stratosphere. Yeah, yeah. No, it's It's good to have data to see what it tells us are we seeing anything unusual.

00:49:28.270 --> 00:49:35.630
Tim Rahmes (Guest)
Uhm I I also feel looking at this that there's some you know, stark contrast between going from green to red.

00:49:36.230 --> 00:49:49.770
Tim Rahmes (Guest)
Uhm depends how you analyze this, I think maybe getting some more data after another year of triple

SEC and 87 's reporting. Maybe there's smooth out a little bit, but I would say The upshot is yeah, we see for sure. If you're cruising in the stratosphere.

00:49:49.820 --> 00:49:50.820
Tim Rahmes (Guest)
There uh.

00:49:52.000 --> 00:49:58.680
Tim Rahmes (Guest)
You're more than likely gonna have less occurrence of moderate or greater turquoise and we should know that right that's expected.

00:50:00.010 --> 00:50:11.660
Tim Rahmes (Guest)
So you know this is a first effort. Uh we wanted to do something I show. This data, and make some use of the data and then see what it shows us let's go to the my summary and conclusions.

00:50:12.360 --> 00:50:13.690
Tim Rahmes (Guest)
Think I'm doing OK on time.

00:50:14.680 --> 00:50:15.230
Tim Rahmes (Guest)
Uhm.

00:50:16.290 --> 00:50:22.210
Tim Rahmes (Guest)
As we know and we've heard a lot of talks were certainly gaining a better understanding of global turbulence.

00:50:22.810 --> 00:50:32.240
Tim Rahmes (Guest)
Uh the wmo regions are becoming more representative with Edr. We're not there yet. By any means, but it's it's it's a start from where we were in the last year or 2.

00:50:33.280 --> 00:50:39.790
Tim Rahmes (Guest)
Uh and as we would expect observations below or near the tropopause show higher occurrence of moderate or greater.

00:50:40.410 --> 00:51:01.430
Tim Rahmes (Guest)
And next steps, UM industry data sharing I think everyone would agree on that it and if we're going to get full value from these observations and create the full solution. You know, bringing the information concisely back into the flight deck where for flight planning or for air traffic controllers. Yeah, we it needs to be shared.

00:51:02.040 --> 00:51:17.410
Tim Rahmes (Guest)

Uh we, we want to make sure our plans beyond met parameters as I had mentioned these observations are better when they're comprehensive if you're going to simulate data into a GTG or forecast models. You want it to be.

00:51:18.690 --> 00:51:30.090
Tim Rahmes (Guest)
All right all the parameters at a certain time for example, and the last point and I've made this before you know, these edr observations and Greg touchdown in a little bit as well.

00:51:30.140 --> 00:51:38.700
Tim Rahmes (Guest)
Or you know, one of the very interesting uses of this data is as truth. If we're going to use satellites, which are always watching the planet.

00:51:39.290 --> 00:51:57.780
Tim Rahmes (Guest)
Uh and and there, there's no bias. We we, as aircraft avoid turbulence. But the satellites won't have that limitation, but nonetheless. We want to continue to remember that that could be a big benefit to turbulence detection in the coming years, all right questions.

00:52:02.290 --> 00:52:06.470
Flowe, Tammy (FAA)
OK, Steve so I'm gonna throw it over to you if you could.

00:52:06.030 --> 00:52:13.130
Steve Abelman
OK, I've got it got a few UM got a few 4, yeah, I'm so Tim Miner at American notes.

00:52:14.420 --> 00:52:19.740
Steve Abelman
So the software for the Max is now working and usable we heard there were issues in the past.

00:52:20.980 --> 00:52:31.420
Tim Rahmes (Guest)
Uhm yeah, well it's returned to service. Uh there are some issues with the supplier. I'm not going to get into details to him, we can talk offline.

00:52:31.820 --> 00:52:47.020
Tim Rahmes (Guest)
Uhm but yeah, it is working the calibration looks good. We have 5 airlines using it. There's some intermittent observations that having a problem calculating turbulence. But if you want to chat and we can talk about that offline.

00:52:49.500 --> 00:52:51.650
Steve Abelman
Alright thanks, so Jason at IBM.

00:52:51.910 --> 00:53:06.890
Steve Abelman

A comment and question anecdotal evidence from airlines noted an increase in Pireps and reported intensity at the onset and early months of the pandemic was observed any normalized month to month or year to year comparisons from your viewpoint.

00:53:07.520 --> 00:53:13.210
Tim Rahmes (Guest)
Oh, Jason I didn't look at that. That sounds interesting uh, but I I have not taken time to look at that.

00:53:17.170 --> 00:53:18.740
Steve Abelman
I think that's all I have Tammy.

00:53:20.730 --> 00:53:22.770
Flowe, Tammy (FAA)
All righty then up.

00:53:24.980 --> 00:53:30.870
Flowe, Tammy (FAA)
So I'm I'm getting a question from my boss. Did you see no no no no no.

00:53:33.000 --> 00:53:44.450
Flowe, Tammy (FAA)
Nothing related to this so uhm Soleri Cornyn is the next can, we Larry Are you ready to go.

00:53:45.160 --> 00:53:45.820
larry cornman (Guest)
I am

00:53:46.270 --> 00:53:47.860
Flowe, Tammy (FAA)
Alright so let's do it.

00:53:52.200 --> 00:53:54.760
Flowe, Tammy (FAA)
Thank you Tim thank you very much.

00:53:55.910 --> 00:53:58.040
larry cornman (Guest)
can you guys see my screen?

00:54:01.280 --> 00:54:02.130
larry cornman (Guest)
Are you hearing me?

00:54:02.620 --> 00:54:05.920
Matt Fronzak
Yes, Sir and in presentation mode with cursor visible thank you.

00:54:05.970 --> 00:54:07.520
larry cornman (Guest)
Awesome great OK.

00:54:08.770 --> 00:54:18.160
larry cornman (Guest)
So we're going to talk about a a new source potential new source of turbulence observations and that is from a DSB.

00:54:18.880 --> 00:54:23.250
larry cornman (Guest)
Reports and I want to point out our sponsor here is the.

00:54:23.820 --> 00:54:26.310
larry cornman (Guest)
Uh Wyrick Program at the FA.

00:54:26.950 --> 00:54:43.560
larry cornman (Guest)
And putting these slides together reminded me of the origins of this work, which happened to be somewhat coordinated with the last workshop. We had there was some work done by a air traffic controller who won a Shark Tank.

00:54:43.610 --> 00:54:52.240
larry cornman (Guest)
Come competition at the FAA to look into a DSP for certain operational use one of them one of them was turbulence.

00:54:52.990 --> 00:55:06.290
larry cornman (Guest)
And when I heard about that and saw some of the results. He was showing that looked promising. I I talked to Tammy at the last workshop and said Hey. This sounds right up our alley. You know, we should look into this and here we are.

00:55:08.770 --> 00:55:20.130
larry cornman (Guest)
So I think we've heard plenty about the need for observations of turbulence in that temporal and spatial variability of turbulence is quite large.

00:55:20.750 --> 00:55:22.550
larry cornman (Guest)
But I'd also like to point out that.

00:55:23.470 --> 00:55:28.620
larry cornman (Guest)
The utility of observations go hand in hand with forecasts because.

00:55:29.410 --> 00:55:57.700
larry cornman (Guest)

If you have observations in an area with high traffic. They're very useful. If you don't have observations in areas with low traffic. You need the forecast to step in now where you have the combination of the 2. You have something like Ken that can provide the benefit from both so I think it's important to realize that both aspects are very important to help solve this problem, you need forecasts you need observations.

00:55:58.890 --> 00:56:06.470
larry cornman (Guest)
Now 80, SB is a as I mentioned a potential new source of information it's a system that's been.

00:56:06.800 --> 00:56:07.450
larry cornman (Guest)
Uhm.

00:56:09.080 --> 00:56:20.930
larry cornman (Guest)
Kind of rolled out over a number of years. But as of I think last year. January these observations or the reports or required for most.

00:56:21.000 --> 00:56:21.620
larry cornman (Guest)
Uhm.

00:56:22.470 --> 00:56:23.060
larry cornman (Guest)
Uh.

00:56:23.690 --> 00:56:25.840
larry cornman (Guest)
User users of Nacin.

00:56:25.890 --> 00:56:50.640
larry cornman (Guest)
In in open air space and the idea is that the aircraft itself is broadcasting position and rate information. Among other things, and this information is collected on the ground and then used an air traffic and the idea here is to grab that information and see if we can do something with regard to turbulence.

00:56:52.510 --> 00:57:20.020
larry cornman (Guest)
So for example, right now as of last month. There's about 150, 8000 aircraft in the US reporting, including quite a bit of those being GA. Now of course, not, all the GA or flying all the time, but still this is a huge amount of aircraft that are reporting and compare this to some of the numbers. We've heard before about in situ. ER and the pirate information. We get on average of course.

00:57:21.460 --> 00:57:33.630
larry cornman (Guest)
So this is you know, maybe 2 orders of magnitude more reports that we get so if we can get some useful turbulence information out of this source, it would be very beneficial, especially.

00:57:34.960 --> 00:57:39.560
larry cornman (Guest)
As we further promulgate the in situ Edr out into the system.

00:57:40.350 --> 00:57:47.990
larry cornman (Guest)
Getting information at 80 SB might help backfill where we don't have information from aircraft reporting in situ edr.

00:57:48.660 --> 00:58:18.920
larry cornman (Guest)
So what are the advantages here over pireps of course is very good spatial and temporal accuracy and very important here also is that the aircraft side of mental mentation is already going on or has already happened and that's one of the big issues with the in situ. ER we have to get the software on board aircraft and the communications set up so that the the ability to get deployment on of in situ. ATR aircraft is much more.

00:58:18.970 --> 00:58:49.590
larry cornman (Guest)
Complicated and it's kind of held up the rollout of edr over the years, so here. The aircraft sites already happened what we'd be doing is collecting the data on the ground and doing something in real time with that and also I'd point out that there's also not only ground based receipt of these data but space based diet. I.e. satellite links from the aircraft up to satellites and then back down to the ground and these would be very useful for Oceanic.

00:58:49.860 --> 00:58:57.260
larry cornman (Guest)
And remote regions, but we don't have ground based reports of Edr. I mean excuse me of a DSB easily available.

00:58:58.980 --> 00:59:06.920
larry cornman (Guest)
So at a very high level what we're trying to do is work this problem backwards, so the aircraft encounters turbulence.

00:59:07.700 --> 00:59:21.350
larry cornman (Guest)
It responds to the turbulence and then for example, with a DSB. We have vertical rate information, which is the key parameter. We're using here we have positioned information also but the vertical rate is the one we're using?

00:59:22.330 --> 00:59:45.070
larry cornman (Guest)
And the idea is to take that vertical rate, and work backwards in order to estimate the atmospheric turbulence intensity. This is similar to our phase one or original Insitu approach which uses used vertical accelerations on the aircraft to work backwards to ER. It's a very similar process here, but we're using vertical rate.

00:59:47.620 --> 01:00:15.340
larry cornman (Guest)
So, in a high level again, the items that we're working on is dealing with the issues here and these are actually rather severe So what advantage of doing in situ. IVR is that we have access to high rate information on board. The aircraft whereas here from these downlinks. We have approximately one second updates as opposed to say 8 or 10 seconds on board the aircraft.

01:00:16.750 --> 01:00:21.460
larry cornman (Guest)
And also we have pretty significant quantity quantization of the data.

01:00:22.250 --> 01:00:52.910
larry cornman (Guest)
And if someone had originally told me you know what I would expect the biggest problem in terms of data signal processing approaches. I would have thought the sampling rate would have been the big one here. 'cause obviously the lower the sampling rate. The larger the spatial scales. You're estimating from the turbulence and of course. We want to get the smaller scales that really correspond to the turbulence so having low sampling rate, you know gives us larger scales.

01:00:52.970 --> 01:01:17.850
larry cornman (Guest)
Which is not necessarily turbulence often it's waves or other large scale phenomena that are the air crafters responding to but it turned out that quantization turn was the big problem and I'll describe some of the issues there as we go forward here and then obviously we need the a scaling between the vertical rate, and der so that's the middle box of the previous slide, we got to go backwards.

01:01:18.430 --> 01:01:39.550
larry cornman (Guest)
So we need some sort of scaling per aircraft type per altitude weight. Air speed things like that that allow us to get an atmospheric measure of turbulence and there's been discussions before about well. Do we want to report or MSG or ADR? What's the difference here? Well, my philosophy is?

01:01:40.220 --> 01:02:04.140
larry cornman (Guest)
We should have something aircraft neutral that we're just using the aircraft as a sensing platform, so we want some measure of the turbulence in the atmosphere at that point we don't care how it was measured. It was just the measure of the atmosphere. So if it came from accelerations. We need to scale it into some atmospheric measure. Now the next aircraft that flies through that airspace.

01:02:04.880 --> 01:02:24.740
larry cornman (Guest)
They may want edr or they may want RMSG some some scaling to them so that's fine. But the idea is to transmit information that's aircraft neutral to all users and then the scaling into an aircraft dependent metric can happen on board or on the ground and transmitted up to an aircraft.

01:02:26.980 --> 01:02:35.770
larry cornman (Guest)

Alright this is a little complicated plot so I'll go through it, a little slowly and carefully here so on the left side, the black data is.

01:02:37.170 --> 01:02:50.770
larry cornman (Guest)
The vertical rate sampled and quantized this is from a from high rate data from a commercial aircraft, and then we sample and quantized the data to make it look like a DSB.

01:02:51.540 --> 01:02:56.040
larry cornman (Guest)
And then the magenta curve is the RMS of the vertical rate.

01:02:57.060 --> 01:03:27.740
larry cornman (Guest)
So you can see very responsive to these longer wavelengths phenomena. There's some waves going on here more small scale turbulence here and now you see the vertical rate is more commensurate with the ERS which are the yellow and green points and then I looked at 2:00 other metrics. One is RMS vertical acceleration, which is the blue curve and again during turbulence. You see very good, matching there and then when the waves happen.

01:03:28.240 --> 01:03:50.490
larry cornman (Guest)
You see at a disagreement there because the accelerations responding to the lower frequency characteristics and then I took yet another derivative and looked at the arms of the jerk and I'm not talking to anyone specific in the audience. But the jerk is a actual physics term for the 3rd derivative of position.

01:03:51.100 --> 01:04:04.980
larry cornman (Guest)
Now, for vertical rate, it would be the second derivative because you already have one derivative of the position going to vertical rate. So it's really hard to see that curve. It's the red curve here it's almost identical to the ERS.

01:04:05.550 --> 01:04:17.130
larry cornman (Guest)
So this was kind of an interesting discovery, I hadn't caught this before. In all my years working on this. But the vertical. I've excuse me, you all the vertical jerk. RMS is a very good.

01:04:17.480 --> 01:04:42.540
larry cornman (Guest)
Uhm surrogate for edr over here on the right hand side is the same type of information, but for a maneuver maneuver time period. You look at the large difference in scales here, so during maneuvers. We could have fear very large vertical rates. But the jerks and RMS accelerations do a very good, matching of the of the.

01:04:42.590 --> 01:04:50.170
larry cornman (Guest)
The Edr 's so this led me to look into RMS jerk as a good metric.

01:04:50.770 --> 01:04:55.130
larry cornman (Guest)
Or turbulence from the ATSB information.

01:04:56.220 --> 01:05:10.970
larry cornman (Guest)
So now I want to switch gears a little bit and look at issues of quantization as I mentioned before I thought sampling rate. The low sampling rate would be a big problem, but it turned out quantization was actually much more significant for the ATSB data.

01:05:11.590 --> 01:05:21.210
larry cornman (Guest)
So we have 2 sides here on the left. We have a quiescent period and on the right a more turbulence period and you can see up here is the vertical rate.

01:05:22.610 --> 01:05:29.240
larry cornman (Guest)
With the red being the sampled quantized data, the black being the sample data.

01:05:30.530 --> 01:05:52.600
larry cornman (Guest)
And the top is a time series of these quantities and then on the bottom. I have power. Spectra of these 2 time periods and the 2 quantities and what you can see is in the high frequencies. The quantization acts like some sort of effective noise very large amount here for quiescent and not so much for turbulence.

01:05:53.280 --> 01:06:00.660
larry cornman (Guest)
So this shows that it's not a constant noise being added to the data but it's dependent on the amplitude of the data.

01:06:01.420 --> 01:06:18.050
larry cornman (Guest)
And this led to an idea of OK? How do we 'cause we don't have the black data here? We don't have the sample data. All we have is the quantized data. So, how do we take out the quantization effect if we know that it's going to be more?

01:06:18.600 --> 01:06:36.930
larry cornman (Guest)
Uhm dominant during quiet us and purses turbulence, so we have to have some sort of adaptive method that knows the type of period were in and remove the effect due to quantization dependent on those 2 different time periods. So we came up with the filtering approach that took that into account.

01:06:37.840 --> 01:07:07.850
larry cornman (Guest)
And so over here on the right you can see 2 examples again. This is kind of a a filter that you might derive from the data and over here. We see for the quiescent data. We'd have more damping so a constant unit transfer function would look like this blue data here. So we'd have more damping at high frequencies during quiescent less damping at high frequencies during.

01:07:07.900 --> 01:07:12.680
larry cornman (Guest)
Turbulence and that's exactly what we want we want to remove more effective.

01:07:13.260 --> 01:07:31.360
larry cornman (Guest)
Quantization during quiescent and less during turbulence. If we remove the same amount all the time we remove all the useful information and turbulence. And if we did the opposite. We remove 2 little during quiescent so having this adaptive filtering was really the key here.

01:07:34.100 --> 01:07:58.710
larry cornman (Guest)
Right and let me go back a second so the idea, then was to to use this information to create a filter so we take the vertical rate information run it through a filter and then we'd calculate second derivatives, which would give us the jerks and then we compute the RMS of those to give us our Ms jerks and then the last step would be to convert RMS jerks into and DDR so that's kind of the process here.

01:08:00.150 --> 01:08:12.520
larry cornman (Guest)
Another kind of complicated picture here. This is the same flight that I showed data from before, but here. I'm showing the vertical rate again in black and then the altitude scaled.

01:08:13.140 --> 01:08:16.320
larry cornman (Guest)
So you can see a maneuver effects.

01:08:17.860 --> 01:08:47.920
larry cornman (Guest)
Very large effects on the vertical rate, and this case, we also have as I pointed out earlier. We have some waves kind of shorter wavelength here longer wavelength here and then turbulence and one thing I'd like to point out is we had some discussions yesterday and talks about mountain waves and and ways. In general in the atmosphere and they're very obvious in the vertical rate data so this is another potential application for this data is too.

01:08:48.780 --> 01:09:10.200
larry cornman (Guest)
You know, we you may have an algorithm that says, well I don't see turbulence yet, but I see waves in the atmosphere and the precursors and environmental conditions that are conducive to turbulence being generated from the waves so having wave information measured would be perhaps useful for those type of diagnostic algorithms.

01:09:11.500 --> 01:09:19.330
larry cornman (Guest)
OK, so next slide here is an example of the process that I discussed earlier, we take the vertical rates.

01:09:19.900 --> 01:09:25.370
larry cornman (Guest)
Will you computer filter on it, we compute the RMS and then scale into edr?

01:09:26.180 --> 01:09:55.760
larry cornman (Guest)
So the first plot. I our first date. I want to show is the blue which is the RMS jerks from the vertical rate pre filtering so you can see under relatively quiet periods. You kind of get this noise floor going on, you can see where these turbulence is happening at a stand up, but you get this washing out of the of all the other information due to this quantization problem now when you have turbulence.

01:09:56.450 --> 01:10:15.890
larry cornman (Guest)
The matching between the blue and the green points, which are the ERS which we measure from the high rate wins similar to agregat showed the very good, matching so this again shows the reason for needing a filter that takes into account whether you're in turbulence or not in turbulence.

01:10:16.800 --> 01:10:30.540
larry cornman (Guest)
So then down in red is the post filtered information. So we take the the vertical rate. We run it through the filter. We compute jerks and then we run the RMS on it, and we get pretty good, matching here.

01:10:31.370 --> 01:10:35.150
larry cornman (Guest)
So this was a very surprising and pleasing to see this.

01:10:36.140 --> 01:10:39.170
larry cornman (Guest)
Good matching but it's not always good obviously.

01:10:39.670 --> 01:10:46.160
larry cornman (Guest)
Uh so let's look at a couple cases where we get some non matching so I'm going to look at 2:00 cases here.

01:10:47.550 --> 01:10:50.950
larry cornman (Guest)
Kind of in the moderate turbulence region and.

01:10:51.000 --> 01:11:00.980
larry cornman (Guest)
Uh so you could see again the the data is showing these events may be washed out over here, but you can see the event, but we're.

01:11:01.370 --> 01:11:06.360
larry cornman (Guest)
And pretty significantly underestimating so why is that happening?

01:11:07.560 --> 01:11:38.370
larry cornman (Guest)
So, in this first case what we can see the red data here is the after the application of the filter the black data is pre filter and the blue is the high rate vertical rate so kind of our truth in this case, and you can

see the filter over here is kind of washing out what's going on and what was happening in this case, it was relatively quiet Saint before and after this and so the filter says up quiet and data. I've got a filter a lot.

01:11:38.550 --> 01:11:43.280
larry cornman (Guest)
And that's what happened here, so when we have these very short types of events.

01:11:43.890 --> 01:11:53.920
larry cornman (Guest)
The filtering can over compensate and and provide too much filtering so I say here. This is potentially recoverable if we can have.

01:11:55.200 --> 01:12:00.200
larry cornman (Guest)
A filter that's even more adaptive in a time localized sense.

01:12:00.770 --> 01:12:08.400
larry cornman (Guest)
However, here I point out this is kind of a unrecoverable scenario, so you can see the black data points here just flat.

01:12:09.060 --> 01:12:14.860
larry cornman (Guest)
That means the quantization is washed out any information, but that also means that the.

01:12:16.250 --> 01:12:45.480
larry cornman (Guest)
You know the amplitudes of these data has to be small enough. Otherwise, it would have gone up into the next quantization bins so even though the filter is washing all the information out there really was nothing in the data that says there could have been any turbulence. There even though from our high rate data. We do see something so these are events that are always going to happen with this level of quantization. It just wipes everything out and there's nothing to do to recover that.

01:12:48.000 --> 01:13:12.050
larry cornman (Guest)
Alright so another source of potential problems is manoeuvres as I pointed out before now the jerk. It's a you know from the vertical rates. The second derivative, so if you have a relatively smooth say locally linear part of a maneuver. The second derivative washer that out, so you wouldn't see that part but.

01:13:12.740 --> 01:13:28.340
larry cornman (Guest)
When maneuvers are essentially starting or ending there's these transition periods where it's not a smooth change, so the the vertical rates not linear there, so you don't remove that information from.

01:13:29.570 --> 01:13:36.020
larry cornman (Guest)

When you compute the second derivative to get the jerks So what happens in a show over here in magenta.

01:13:36.840 --> 01:13:41.560
larry cornman (Guest)
We get these elevated regions of RMS jerk.

01:13:42.450 --> 01:14:12.680
larry cornman (Guest)
And so we came up with another algorithm that kind of tries to identify these regions and filters. It out and so that did a pretty good job here, so this would kind of reduce the level of false alerts of course. These are very small. Edr 's but you could get other cases where you get it. Large variations in vertical rate during maneuvers or waves, perhaps which would produce false alerts so we have these 2 categories, the mist detections.

01:14:13.250 --> 01:14:21.390
larry cornman (Guest)
Some that might be recoverable some that are not recoverable and then these false alarms, which hopefully we can mitigate.

01:14:22.530 --> 01:14:23.750
larry cornman (Guest)
Alright so.

01:14:24.890 --> 01:14:26.830
larry cornman (Guest)
Probably doing OK on time I would think.

01:14:27.640 --> 01:14:48.880
larry cornman (Guest)
But so where are we going on this well, we're going to continue work on the filtering approach we obviously need a lot more evaluation lot more cases to study because there's obviously more data. You look at the more times. You find that didn't satisfy the conditions amount by algorithm and it screwing up so how do we fix that.

01:14:49.500 --> 01:15:18.570
larry cornman (Guest)
Uhm further looking at maneuver rejection as I was just talking about the aircraft scaling is obviously key. We haven't done a whole lot. On that here yet, but I have concepts of doing that that we've used in the past for relating RMSG to erm back so the similar approach could be used for RMS jerk. It's just one more derivative of the data so the same methodology would would hold.

01:15:19.220 --> 01:15:29.320
larry cornman (Guest)
And then Greg 's been doing a lot of work on looking at data quality and potential use of QC algorithms. So data quality as well as.

01:15:30.630 --> 01:15:31.050
larry cornman (Guest)
You know the

01:15:31.110 --> 01:16:02.030
larry cornman (Guest)
the UM the sampling interval for data so we don't get all the data. All the time so even though nominally we're supposed to be getting on the order of one sample per second. There's obviously a communication issues, where we get dropouts in that so we're going to have to deal with the fact that we don't have a continuous one sampling one second sampling rate. So we're going to have dropouts or gaps in the data and how we deal with that is going to be important.

01:16:02.090 --> 01:16:32.100
larry cornman (Guest)
When we apply this in the real world and then we've done some work on looking at the utility of the space based reports. These are even lower rate on the order of 2 seconds between samples so the question is, you know what can we do in the way of pulling turbulence out of that, so as I mentioned earlier, the turbulence is relatively high frequency information that affects the aircraft high frequency data.

01:16:32.150 --> 01:16:43.750
larry cornman (Guest)
That affects the aircraft and so as we go to lower and lower sampling rates. We're seeing more of the longer wavelength aspects in the atmosphere, so the question is whether we can get something that's

01:16:44.330 --> 01:16:55.570
larry cornman (Guest)
uh you know viable or and youthful turbulence related as opposed to waive related say for these space based reports it would be great to be able to use these because obviously?

01:16:56.850 --> 01:17:08.620
larry cornman (Guest)
Over Oceanic and remote regions. We don't have ground reception of the ATSB information. So this is a very important aspect to look at going forward and as I mentioned lots of verification.

01:17:10.790 --> 01:17:20.640
larry cornman (Guest)
And then kind of in the near term and future efforts. We want to look at moving this information out into operations, assuming it passes.

01:17:21.070 --> 01:17:30.270
larry cornman (Guest)
Uh you know verification efforts and powers that be believed that this is useful operational information and.

01:17:30.330 --> 01:18:00.230
larry cornman (Guest)
Come you know passes some level of quality. We don't think this is going to be to the quality of in situ

ADR, but it's going to be better than pireps and if this you know area in between is is good enough and especially because we have so many of these reports. We think this will be operationally useful. Now we may have to throw out cases where you know, we're missing events or were questionable on events, but still just the overwhelming number of reports we get.

01:18:00.330 --> 01:18:01.020
larry cornman (Guest)
Will be useful?

01:18:02.020 --> 01:18:27.320
larry cornman (Guest)
So we want to look at how do we get this information assuming it passes. Some criteria out into operations so with this data. The kind of a standalone pirate type information would we integrate it into DT GTG but we do, both so this is work that has to be done in concert with users to decide how would we use this information.

01:18:28.520 --> 01:18:43.590
larry cornman (Guest)
And then another aspect, I'd like to point out is you know 80 SB. I assume there will be. You know future versions that go out and one thing we'd like to obviously recommend is reducing the quantization level for the vertical rate.

01:18:44.310 --> 01:18:50.890
larry cornman (Guest)
There are 8 enormous number of bins that are used in the quantization.

01:18:51.500 --> 01:19:21.170
larry cornman (Guest)
And the range of values are absolutely immense and I assume that was chosen you know to for accident recovery. So the question is can, we reduce accident investigations can, we reduce the quantization levels. Maybe by half or by a quarter, or effect or for that is, and still get the information needed for operations for vertical rate that are not turbulence related but also satisfy.

01:19:21.590 --> 01:19:51.840
larry cornman (Guest)
Our needs to improve the quality of these turbulence reports and as well, increasing the sampling rate of the information and I don't necessarily mean the reporting rate because we could still live with one second, reporting rate if every one second, we say got 4 samples so we might be able to use the existing infrastructure for communications and and get more information packed into either unused bits in the fields or.

01:19:51.980 --> 01:19:57.670
larry cornman (Guest)
Somehow figure out how we can do that without you know, screwing up everyones implementation.

01:19:58.800 --> 01:20:06.400
larry cornman (Guest)
I think that's the end of my presentation and we can obviously if there's time go into some questions.

01:20:12.580 --> 01:20:15.650
Steve Abelman
Uh Tami do we have time for some questions. I do have a few here.

01:20:20.960 --> 01:20:21.780
Steve Abelman
Tammy might be on.

01:20:21.290 --> 01:20:22.510
Matt Fronzak
Command decision yes.

01:20:22.700 --> 01:20:23.140
Steve Abelman
OK.

01:20:23.890 --> 01:20:41.920
Steve Abelman
Uh so Wild Rogers asks that would vertical rate sustained over a certain distance and values. Save 500 feet per minute. You know be a good proxy for Mount wave situations or sustained. Non mountain wave lift thermals and convergence regions. I'm talking in terms we use for gliding.

01:20:43.350 --> 01:20:47.600
larry cornman (Guest)
Well, I guess I would answer that by saying provided criteria.

01:20:48.260 --> 01:20:51.070
larry cornman (Guest)
For vertical rate.

01:20:51.520 --> 01:20:57.760
larry cornman (Guest)
Come in terms of mountain waves? What's the? What's the information content that's needed for.

01:20:58.210 --> 01:21:01.820
larry cornman (Guest)
An operational decisions based on waves.

01:21:02.460 --> 01:21:24.220
larry cornman (Guest)
So if that information can be provided. We probably can extract something added the vertical rate information. So I'd kind of turn that question around say give us a criteria and then we can to see if we can meet that from the data. That's being measured remember vertical rates not a measure of the atmosphere, it's the measure of the aircraft response to the atmosphere.

01:21:26.000 --> 01:21:36.410
Steve Abelman
OK, thanks, UM Ivan Clark know ask will the version of of a DSB weather currently in draft significantly improved the utility badius be for this use.

01:21:37.650 --> 01:22:03.340
larry cornman (Guest)
So those are 2 parallel universes, 80, SB weather is a downlink that provide takes information that's on board. The aircraft and puts weather information in the downlink. This is taking the existing downlink of say vertical rate, and doing processing on the ground. So if we had in situ. Edr on an aircraft that would go into edsby weather.

01:22:04.020 --> 01:22:08.050
larry cornman (Guest)
The ATSB out path is what we're talking about here.

01:22:09.600 --> 01:22:18.670
Steve Abelman
And Steve Dyer notes that ADR 80 SB weather is published not in Draft. It allows direct reporting a BDR it does not change the parameters that Larry 's approach uses.

01:22:19.620 --> 01:22:20.240
Steve Abelman
Uhm.

01:22:19.620 --> 01:22:31.280
larry cornman (Guest)
That's right so but the the point is is that many aircraft do not have in Scituate. ER so they will not be providing information on turbulence via a DSP weather so this is a way.

01:22:31.870 --> 01:22:40.750
larry cornman (Guest)
You know, either to you know get it around that or to get ahead of that as we fill in more aircraft with in situ ATR reporting.

01:22:41.970 --> 01:22:42.260
Steve Abelman
Right.

01:22:43.380 --> 01:22:51.140
Steve Abelman
John Williams asks Larry can, we use aircraft to aircraft comparisons in a region assuming sufficient flight density to help improve accuracy.

01:22:53.320 --> 01:23:00.190
larry cornman (Guest)
Are you talking about verification there or utility of you know aircraft aircraft communications?

01:23:00.900 --> 01:23:30.780
larry cornman (Guest)
So if you'd have to have a some sort of receipt of a DSB on a aircraft to get aircraft aircraft. I would see more aircraft to ground to aircraft mechanism here, so you'd get information from a number of aircraft on the ground. Perhaps integrated into GGG and that information could then be disseminated up to

other aircraft. I think that would probably be a more viable approach and I'm not sure I answered the question.

01:23:30.750 --> 01:23:40.470
Steve Abelman
Yeah, John maybe you could follow up on chat on that 'cause I'm thinking. Maybe you meant something a little different with just the density of of aircraft close by just to.

01:23:39.570 --> 01:24:01.410
larry cornman (Guest)
Yeah, the the key here is that the ATSB Out is just the vertical rate information. So it's you know, we need to process that data to provide a turbulence information. So it direct link of a DSP vertical rate between aircraft wouldn't be useful unless you had some processing on on the receiving aircraft to do something with it.

01:24:04.060 --> 01:24:11.980
Steve Abelman
OK, I think I have one one final question from Jeong Hoon. I'm I'm wondering how to determine whether it is quiescent or turbulent.

01:24:15.240 --> 01:24:18.050
larry cornman (Guest)
Well, that's the secret sauce here.

01:24:19.770 --> 01:24:20.680
larry cornman (Guest)
So dumb.

01:24:21.500 --> 01:24:42.870
larry cornman (Guest)
You can let you what you do is you look at the statistical characterization of the data and I don't want to get into details of it, but there's a relationship. You can come up with between say the correlation between the unquantized data and the correlation of the quantized data and it's through that connection that you can tell.

01:24:43.620 --> 01:24:48.930
larry cornman (Guest)
So without getting into technical detail that's the the basic methodology.

01:24:50.860 --> 01:24:54.510
Steve Abelman
OK, Tammy I think we've hit the questions I'll pass it back to you.

01:25:00.290 --> 01:25:01.180
Steve Abelman
Jamie are you on mute.

01:25:04.320 --> 01:25:24.870
Matt Fronzak

So this is Matt I know I know Tammy has a bunch of stuff going on right now at the same time as this, but looking at the the agenda. We're supposed to be on break from 30 to 40 past the hour. I'm still I'm showing now 36 past the hour. Let's take that 10 minute break until 45 past the hour wherever you are.

01:25:30.100 --> 01:25:30.790
Bob Sharman (Guest)
Sounds good.

01:29:48.620 --> 01:29:50.850
Jason Craig (Guest)
Test my slides here can you guys see this OK?

01:29:53.530 --> 01:29:54.380
Jason Craig (Guest)
Penguins are.

01:29:54.670 --> 01:29:55.300
larry cornman (Guest)
I see it.

01:29:55.860 --> 01:29:56.810
Jason Craig (Guest)
Great thank you.

01:29:58.070 --> 01:30:03.750
Matt Fronzak
Jason or this is Matt I are you gonna run your own come or are you still looking for me to run it for you.

01:30:05.010 --> 01:30:07.800
Jason Craig (Guest)
If it works, fine all round, it, I guess it seems easy enough.

01:30:06.710 --> 01:30:07.080
Matt Fronzak
Sure.

01:30:08.150 --> 01:30:09.550
Matt Fronzak
Yep, sure is OK.

01:30:09.420 --> 01:30:09.980
Jason Craig (Guest)
Thanks, Matt.

01:30:10.320 --> 01:30:10.640
Matt Fronzak
Yep.

01:34:20.970 --> 01:34:23.160
Matt Fronzak
Tammy have you returned to the meeting.

01:34:31.990 --> 01:34:35.300
Wiebke Deierling (Guest)
Uh Matt I can jump in here, UM if needed.

01:34:35.790 --> 01:34:39.500
Matt Fronzak
Yeah, that would that would make me happier.

01:34:41.390 --> 01:34:43.280
Matt Fronzak
Because if if that's OK by you.

01:34:43.480 --> 01:34:44.780
Wiebke Deierling (Guest)
Yes, that sounds good.

01:34:45.270 --> 01:35:02.960
Wiebke Deierling (Guest)
Uh OK, so then uh let's uh start back from the break, our next. Speaker is Nathan Polderman from United Airlines and he will talk about the airline perspective industry turbulence the industry turbulence safety action team.

01:35:04.530 --> 01:35:05.460
Wiebke Deierling (Guest)
Hi Nathan,

01:35:05.990 --> 01:35:15.700
Polderman, Nathan
Hi I'm get the see everybody virtually again. We can hopefully you can hear me OK. Let me try to share my presentation here.

01:35:16.440 --> 01:35:18.890
Wiebke Deierling (Guest)
Sounds good. Yes, we can hear you good.

01:35:18.560 --> 01:35:21.290
Polderman, Nathan
K alright are you getting the.

01:35:22.150 --> 01:35:23.200
Polderman, Nathan
Full screen view.

01:35:23.480 --> 01:35:24.590
Wiebke Deierling (Guest)
Yes, we are.

01:35:26.430 --> 01:35:32.810
Polderman, Nathan
OK great well again. Thanks for the opportunity to speak with you all for a few minutes today.

01:35:33.260 --> 01:35:51.010
Polderman, Nathan
Uh Uh, I'd like to just talk briefly about an initiative that we started prior to covid called the industry turbulence safety action team talk a little bit about how that came about and then also one of the research proposals that came out of that it's at work.

01:35:51.590 --> 01:36:22.960
Polderman, Nathan
And and then really come today, I'm probably going to end up raising more questions than answers because what we would like to do with this research proposal is going to require you know a lot of questions that need to be really uh talked through with the experts to figure out the best way to do this so that's kind of what I'm going to propose to you guys today and obviously we'd prefer to be in person. So we can discuss through these things. But hopefully we can start a dialogue that will move us forward to accomplishing.

01:36:23.580 --> 01:36:25.560
Polderman, Nathan
What we would like to do with this with this effort?

01:36:26.860 --> 01:36:28.980
Polderman, Nathan
So, just a brief history.

01:36:29.410 --> 01:36:59.940
Polderman, Nathan
Uh back in 2018-2019, a lot of the airlines united and others were continuing to see an increase in turbulence related injuries specially to flight attendants and a lot of the work that we have been doing it wasn't that we weren't addressing the issue and analyzing it and undertaking initiatives, but it seemed that nothing was really working that well and injuries continue to rise you may remember.

01:37:00.670 --> 01:37:08.640
Polderman, Nathan
Prior to kovid the airlines are really expanding and things were going gangbusters and we were seeing a lot more injuries.

01:37:09.260 --> 01:37:39.210
Polderman, Nathan
So we decided as a group as an industry group or as colleagues that we needed to really do something more collaborative and so we took the infoshare model and for those of you who are familiar with

aviation safety info share. It is a forum that allows a lot of the industry to come together to collectively address systemic safety risks in an open sort of environment of sharing non competitive and protected.

01:37:39.430 --> 01:38:10.030
Polderman, Nathan
And so these forums are twice a year and I think the last week. They finally had the first one. After Covid I wasn't able to go, but really it's a really a very unique environment in which a lot of the industry can come together and just talk openly about safety issues and how they're mitigating them and so it's been a very successful forum. And so back in 2018-2019. We thought let's take the infoshare concept, and try to do an offshoot of it to specifically address.

01:38:10.080 --> 01:38:39.990
Polderman, Nathan
Turbulence injuries, we you know a lot of the infoshare meetings, we would talk about turbulence and you know, there will be sessions talking about turbulence and injuries but we really felt it warranted something a little bit more organized and so my colleague Steve Abelman and I decided to start a new group called the industry turbulence safety action team and we actually had a kickoff meeting back in November of 2019 and a lot of you on this call where.

01:38:40.090 --> 01:39:00.510
Polderman, Nathan
At that meeting seems like 100 years ago, now so much has changed what we were able to form some sort of notional subgroups start to take all of the issues that we were seeing and try to break them up into into categories and then sort of assign working groups to tackle all those well as you can imagine in April and May.

01:39:00.560 --> 01:39:11.330
Polderman, Nathan
May of 2020, the world changed for the airline industry and everything came to a screeching halt and we really needed to refocus.

01:39:11.390 --> 01:39:23.230
Polderman, Nathan
Yes, because you know a lot of us don't even know if we were going to still be employed and some of us ultimately didn't stay employed and so we really needed to kind of scale back and say OK.

01:39:23.830 --> 01:39:44.040
Polderman, Nathan
We don't have the resources or momentum that we had before, but we still believe this is important because regardless of what's going on in the industry in the in the world. This issue of safety is always going to be with us in turbulence isn't going anywhere. So we refocused and the effort that really survived was the data standardization effort.

01:39:44.640 --> 01:40:14.850
Polderman, Nathan
And I really like to give a shout out to my colleague Matt Eckstein from Delta. He really took the reins of this group and was the reason why we were able to continue on and keep going. He was able to to find

the time in his schedule to say get meetings organized and get us all together, we were all getting used to the whole virtual meeting thing and it was, it was a difficult time, but I think there was a bright spot amidst the turmoil of 2020 that we were able to kind of.

01:40:14.890 --> 01:40:17.640
Polderman, Nathan
Cobble this group back together and move forward.

01:40:18.250 --> 01:40:49.070
Polderman, Nathan
So in September of that year of 2020. We came together and aligned on sort of our first initiative that we felt we needed to tackle that being some kind of research study on how do we normalize in situ turbulence. Detection Methodologies and datasets OK? We've been seeing a lot of adoption of these of these technologies, which we've talked a lot about in this conference and we really we're seeing a big in a growing need to really address.

01:40:49.370 --> 01:40:53.070
Polderman, Nathan
How do we standardize all this data to maximize its benefit?

01:40:54.220 --> 01:41:02.070
Polderman, Nathan
And so that culminated in US actually submitting a formal research proposal in March of this year.

01:41:03.030 --> 01:41:26.380
Polderman, Nathan
Through the FAA 's weather needs portal and that proposal was entitled Operational Assimilation of disparate automated in situ turbulence, sensing applications, so kind of a mouthful but again, the issue. Here was we had. We had seen you know if you remember the RTC effort from years ago.

01:41:27.010 --> 01:41:57.010
Polderman, Nathan
Uh we haven't really seen a whole lot of progress following that effort. It was a great effort. A lot of detailed work was done. But what was happening in the industry was almost had leapfrog? What are TCA was meant to to to capture or be able to address and there wasn't really a whole lot of adoption of the RTCA guidelines that we saw happening and you know as as airlines we tend to.

01:41:57.060 --> 01:42:27.110
Polderman, Nathan
To run towards solutions that can be easily implemented and so there's been a number of number of things that have come up with new solutions new technologies that that we've gone and and and implemented which have only made the problem worse, so this problem we feel warrants stepping back and having an industry wide effort to A to address it so that was really the charter of of that particular it set subgroup again we would like for.

01:42:27.170 --> 01:42:52.310
Polderman, Nathan
It's set to to really reconstitute itself and I know Steve is not in his his job anymore. But he's been you

know, he's been relegated to answering questions in a teams chat, but he's still around and I still have a job. But my role has changed quite a bit, but ultimately, we would like to get this group back together and really you know expanded out into additional additional initiatives so.

01:42:53.270 --> 01:42:53.870
Polderman, Nathan
Uhm.

01:42:55.010 --> 01:43:25.890
Polderman, Nathan
So what really is the issue here well, I put together this colorful chart to really just sort of illustrate to everyone that we've got a lot of data and it doesn't all just work together nicely and some of this is self inflicted on the carriers so at like United. We literally have 4 different types of turbulence reporting going on. On her at at our airline. We have edr data coming off of a lot of our newer Boeing 's that we've worked closely with Tim.

01:43:26.390 --> 01:43:57.580
Polderman, Nathan
On turning on and implementing we have our message data on about 92100 Airbus airplanes, which is the vertical acceleration algorithm aircraft response algorithm and and then the last couple of years I about 3 years ago. We adopted a new iPad app for our pilots that actually measures turbulence using the accelerometer in the iPad and that new technology, obviously very attractive new technology because.

01:43:57.930 --> 01:44:29.460
Polderman, Nathan
It can be literally turned down overnight and so that that that application is now out there being used by every pilot or at least it's on their iPad and it has its own you know proprietary sensing algorithm, that you know they they try to filter out. The noise from the accelerometer readings in the iPad itself as it's mounted in the flight deck and then we have good old fashioned Standard Pireps, which have their own sort of a unique challenges and scales as we've as we've talked about it.

01:44:29.510 --> 01:44:59.020
Polderman, Nathan
So really the issue here is that we're in this awkward transition from trying to move away from a subjective regime into an objective based paradigm for turbulence reporting and having objective data is not the be all end all because as you see in this diagram. We've got a variety of different ways of reporting and a lot of it is still being translated back to the legacy or traditional turbulence intensity descriptors.

01:44:59.740 --> 01:45:30.250
Polderman, Nathan
So it's sort of masking in a lot of cases. The objective or numerical scale that underlies a lot of these these algorithms. So not only that, but in individual algorithms or technologies. We've got different. Thresholds right so then the edr. We have Boeing Edr. We have the end. Caridi are different implementations with slightly different scales, which are highly dependent on the aircraft weight class and so we have a variety of different numerical levels, which you can imagine.

01:45:30.300 --> 01:45:38.890
Polderman, Nathan
If you start throwing out numerical values to a pilot and having them try to make sense of it all. That's not an easy transition to make.

01:45:39.490 --> 01:45:41.990
Polderman, Nathan
We've made progress, but still have a long way to go.

01:45:42.720 --> 01:46:12.430
Polderman, Nathan
And so we're in this awkward transition that really isn't a standardized process to assign legacy turbulence. Intensity descriptors to numerical intensity scales that are generated by these systems as well. We're still in a paradigm where air traffic control relies mainly on manual pireps being transmitted by pilots over radio and we've talked about that. The NTSB highlighted that so a lot of these newer technologies, we tend to go back to what we're used to.

01:46:12.710 --> 01:46:43.520
Polderman, Nathan
As opposed to taking full advantage of the objective automated nature of these systems, so the question has to be asked is all of this data, actually making us safer because at the end of the day, the ultimate goal with all of these technology. All of these technologies has to be that we improve the decision making in the cabin of our aircraft and then mitigate the risks of turbulence and ultimately reduce the number of injuries to flight attendants and passengers.

01:46:44.050 --> 01:46:51.110
Polderman, Nathan
Is at the end of the day all this data is great? But if it doesn't result in that then our investment is wasted.

01:46:51.620 --> 01:47:21.860
Polderman, Nathan
Uh you know, we can do lots of great research. We can learn a lot more about the atmosphere. We can do all sorts of great things. But if it doesn't feedback into actually improving. The safety on border. Airplanes then we haven't reached its potential so that's really you know calibrating all of this data will help us define safety thresholds that are based on the actual threat to cabin occupants in our aircraft, so, so much of.

01:47:22.160 --> 01:47:52.470
Polderman, Nathan
Uh turbulence reporting has been a pilot centric paradigm and for you know just that's the way it and I'm not knocking pilots. I know there's a lot of pilots on this call and who do a great job. But we've got we've got to move out of this pilot centric paradigm. We have people in the back of our airplanes being injured in light or light to moderate turbulence in the in the front of the airplane. The pilot has the lowest risk of injury of anybody on the entire aircraft and so.

01:47:52.690 --> 01:48:00.320
Polderman, Nathan
Maybe our thresholds need to be redefined based on the actual risk to the people that are most at risk.

01:48:00.980 --> 01:48:22.410
Polderman, Nathan
Yeah, in the aircraft so you know being able to harness all of this data to to improve those insights is really where we want to go with all of this so some of that may involve being probabilistic and moving into risk based methodology 's as John alluded to in his talk yesterday, so really the ideal state.

01:48:23.580 --> 01:48:54.390
Polderman, Nathan
In all of this work is to maximize the number of sensors guys so we've got a lot of data and the more data. We have more sensors. We have contributing to an understanding of the atmosphere ultimately will then improve the data. That's being used to initialize and validate our forecast models so not only do we get better tactical turbulence information for our pilots and air traffic control and dispatch but we also can feed that back into models well.

01:48:54.440 --> 01:49:13.770
Polderman, Nathan
So do that now we can't have this menagerie of disparate data as you saw in the previous slide and again. I'm not saying that the airlines don't have some fault here right a lot of this is self inflicted right. We've adopted all of these different technologies and now we've got to figure out what to do with it all, so really we need to calibrate the entire industry.

01:49:14.180 --> 01:49:41.530
Polderman, Nathan
Uh in our in our standard operating procedures and all of the end users to an objective observation set that's really the you know the ideal state is that we stop talking about turbulence in a subjective way again sounds great and maybe impossible to get there. We're always going to have subjectivity when humans are involved in the process. We get that. But what can we do to really minimize the impact of that.

01:49:42.120 --> 01:49:46.310
Polderman, Nathan
Which has been well documented in in some of the research that's been done on pireps?

01:49:47.010 --> 01:50:18.010
Polderman, Nathan
So then ultimately with that also allows us to do is establish scalable standards to handle anything new that's coming along so you know you've seen just in the last few years. These different technologies that are coming on board and we we just heard about 80 SB derived turbulence information and so really. I think a big foundation for I'm sorry for this research is really to provide a foundation for a new RTC effort and I know Tammy has a lot to say about this so we've talked a lot with Tammy about it.

01:50:18.300 --> 01:50:35.550
Polderman, Nathan

And a lot of you, I'm sure have opinions about you know whether that how to do that and whether or not. It's necessary, but I really do believe that that will serve the industry well to have neutral bodies regulatory bodies to approach this issue.

01:50:35.900 --> 01:50:43.770
Polderman, Nathan
Uh to provide standards that everybody can look to when they're trying to implement new technologies.

01:50:44.810 --> 01:50:59.090
Polderman, Nathan
So and then as we heard today. The recent NTSB safety report actually highlighted this particular issue. So we're pleased to see that that was included in the report. And I believe that that is giving us the momentum to really move forward with this.

01:50:59.560 --> 01:51:02.870
Polderman, Nathan
Uh in a more formal fashion.

01:51:04.050 --> 01:51:34.230
Polderman, Nathan
So the you know the at the end of the day here. We've got to figure out how in the world did. We do this research. Some may say that it? It's impossible. Or maybe we're approaching it the wrong way. I don't have all the answers my colleagues at the other airlines don't have all the answers. We need the experts on this on this conference to really weigh in as to what is the best way to do this? Do we do a flying testbed of these algorithms on the same airplanes or do we do a simulated environment or both?

01:51:34.750 --> 01:51:52.900
Polderman, Nathan
Uh how many different aircraft types do we need to use or look at or sub fleets and what is the reporting interval or reporting rate you know as we as we talked about just in the last talk right with a different sampling rates and intervals at what's the impact of that on standardization.

01:51:53.870 --> 01:51:55.550
Polderman, Nathan
Do we need to incorporate?

01:51:55.830 --> 01:52:26.430
Polderman, Nathan
Uh yeah, digital flight data recorder data so that the what is the airplane itself sensing and recording and get that data and use that as a benchmark? What is the minimum sample size? How do we get statistical significance for this kind of study these are not easy answers lots of questions and and and it needs to be discussed. You know, do we need to look at spatial and temporal coverage. You know where where we fly the Times of day seasons altitudes? Are all have a big impact on turbulence in fact.

01:52:26.530 --> 01:52:39.470
Polderman, Nathan
Our decision making in the cabin made change based on different configurations. You know climb descent cruise and uh what's going on in the broader aviation?

01:52:39.730 --> 01:52:52.370
Polderman, Nathan
A system at the time so you know how do we capture that in a research proposal to really get the best to really maximize our ability to be successful with this proposal.

01:52:53.350 --> 01:53:03.950
Polderman, Nathan
So again that's all I that's all I have for you today again. Lots of questions. Not necessarily out. Lots of answers. But I really believe this is worthwhile to do and I know you'll hear more from my colleagues here.

01:53:04.280 --> 01:53:35.030
Polderman, Nathan
Uh in in the next couple of talks that hey. This is you know, we really need this and we need the the experts to help us make it happen. And so we appreciate your comments feedback, which we could be in person to talk through it probably could warn another day just to talk through some of this stuff but I believe we're we're really the stage has been set for us to to do something really helpful for the industry going for with all this data, so I appreciate the time and.

01:53:35.190 --> 01:53:37.080
Polderman, Nathan
Happy to take any questions.

01:53:38.540 --> 01:53:51.940
Flowe, Tammy (FAA)
Thank you. Nathan this is Tammy so I I do appreciate this is very, very, very useful information. So I'm gonna throw it over to Steve for a question or 2 before we move on.

01:53:52.620 --> 01:54:00.380
Flowe, Tammy (FAA)
So Steve and and and I you know, I don't want to downplay steves role here, I I I I I.

01:53:59.310 --> 01:54:02.860
Steve Abelman
So let me go Tammy. Let me go Tammy. I'm ready for I'm ready for this guy.

01:54:05.230 --> 01:54:18.630
Steve Abelman
So actually the quote that he got that he said about being relegated to the chat real monitor was when we were texting back and forth and it actually stemmed from the fact that he sent me his presentation and asked me if I thought it was good enough to present so, so that's where that came from.

01:54:19.350 --> 01:54:49.430
Steve Abelman
No, not really no no, I I I keep up with Nathan and he's doing real. He's doing. He's doing real good work and I really missed that stuff, so yeah. That's that's that's where we are actually just some comments not a bunch of questions. You know a lot of good jobs. A lot of a lot of questions. You know, some talk about whether you know, we could get some pilot experience to those you know who are are sitting in the

back to understand the turbulence encounters better and then Tim minor points out that's a 911 thing that.

01:54:22.810 --> 01:54:24.690
Polderman, Nathan
You taught me everything I know Steve.

01:54:49.480 --> 01:54:52.950
Steve Abelman
Really can't happen, but but again, I think there's a lot of ways to.

01:54:53.590 --> 01:55:02.350
Steve Abelman
A lot of ways to keep this keep this moving forward and like I said, I miss it. So I I don't see any other honor specific questions out there Nathan.

01:55:04.110 --> 01:55:05.900
Steve Abelman
Uh keep it up.

01:55:04.450 --> 01:55:04.710
Polderman, Nathan
Yeah.

01:55:05.640 --> 01:55:06.910
Polderman, Nathan
Well, that's yeah great.

01:55:09.140 --> 01:55:21.680
Polderman, Nathan
Yeah, so certainly do reach out to me like I said, hopefully we can, we can have a turbulence for a meeting where we just get together and talk about this, once all this covid madness is over so I do? Appreciate it.

01:55:24.790 --> 01:55:27.320
Steve Abelman
And Nathan I'll check my golf schedule, and let you know if I can be there.

01:55:28.250 --> 01:55:40.710
Flowe, Tammy (FAA)
Already then let's move on so I think our next talk is Martin. Gerber up from Swiss Airlines. The use of edr data in flight playing for turbulence avoidance so.

01:55:41.450 --> 01:55:44.750
Flowe, Tammy (FAA)
Uh Martin do you wanna run the show here?

01:55:45.310 --> 01:55:49.150
GERBER, MARTIN
Ah, yeah, hi everybody morning or evening, depending where you are.

01:55:49.480 --> 01:55:53.330
GERBER, MARTIN
Uh just trying to get the presentation running.

01:55:49.540 --> 01:55:50.890
Flowe, Tammy (FAA)
OK, thank you.

01:56:02.680 --> 01:56:07.060
GERBER, MARTIN
So nice to see so many familiar faces after almost one and a half years.

01:56:10.030 --> 01:56:11.300
GERBER, MARTIN
Is it on and running?

01:56:14.410 --> 01:56:15.120
Flowe, Tammy (FAA)
Ah.

01:56:18.600 --> 01:56:22.770
Flowe, Tammy (FAA)
I don't oh there, you go yes, we see your presentation good.

01:56:22.520 --> 01:56:38.360
GERBER, MARTIN
OK, excellent well, I couldn't agree more with what Nathan just emphasized at the end. It's about decision making and even though these presentations labeled use of edr data and flight planning and I admit that menu JD edr fan.

01:56:38.980 --> 01:56:50.690
GERBER, MARTIN
It's serves the purpose that you rented flight crews. Uh can take decisions to mitigate turbulence and this is how I would like to uh this presentation to be seen.

01:56:51.540 --> 01:56:52.110
GERBER, MARTIN
So.

01:56:51.560 --> 01:57:04.120
Matt Fronzak
Uh Martin this is Matt Fronzak and maybe this is just me, but I'm only seeing the bottom half of your slide and then underneath it are a bunch of what looked to be.

01:57:04.630 --> 01:57:10.700
Matt Fronzak
Uhm PDF type options about high contrast and translating slides and so on.

01:57:10.840 --> 01:57:11.770
GERBER, MARTIN
Ah, OK.

01:57:10.960 --> 01:57:15.390
Flowe, Tammy (FAA)
So so, so I'm I'm I'm I'm seeing it OK Matt.

01:57:16.270 --> 01:57:16.690
GERBER, MARTIN
Let's

01:57:16.280 --> 01:57:19.350
Bob Sharman (Guest)
Me too. This blob yeah, I see it OK.

01:57:18.040 --> 01:57:20.710
GERBER, MARTIN
and let's make it the other way.

01:57:18.690 --> 01:57:24.580
Matt Fronzak
OK Alright Alright, then then then this is a this is a net fronzak issue, then not a problem.

01:57:25.060 --> 01:57:25.450
Bob Swensson
Yeah.

01:57:25.790 --> 01:57:30.320
Matt Fronzak
Everybody but me sees it, so no sweat continue please. Martin, thank you.

01:57:30.310 --> 01:57:30.750
Bauman, William (FAA)
No.

01:57:30.310 --> 01:57:32.100
GERBER, MARTIN
I maybe now, it looks better.

01:57:30.800 --> 01:57:35.270
Bauman, William (FAA)
No, it's not a mat fronzak issue mad. I was seeing it. The same way you wear this is Bill Bowman.

01:57:35.580 --> 01:57:38.880
Matt Fronzak
Oh, good and Martin whatever you did, fixed it. It's I see it all now.

01:57:39.120 --> 01:57:40.100
Bauman, William (FAA)
Yep, it's fixed.

01:57:39.230 --> 01:58:08.600
GERBER, MARTIN
OK, cool, excellent thanks a lot, so we start with it's it's a pretty eurocentric approach that I'm giving to you. I see in many aspects when it comes to turbans mitigation US is clearly ahead of Europe. But this is still how we we do weather planning or most of the airlines to weather planning today. It's a black and white weather chart this so called significant weather chart that indicates you area so.

01:58:09.060 --> 01:58:18.800
GERBER, MARTIN
Clear air turbulence highlighted in red and also large scale areas with potential convective weather, development.

01:58:18.860 --> 01:58:25.660
GERBER, MARTIN
And so this is the basic information that flight crews have available when they are planning their flight.

01:58:26.470 --> 01:58:33.230
GERBER, MARTIN
When they are meeting the decapping cruise and brief them about the contact conduct off flight.

01:58:34.360 --> 01:58:34.860
GERBER, MARTIN
I'm

01:58:36.720 --> 01:58:48.080
GERBER, MARTIN
you may think, OK, this is how it looks like since maybe 3040 years. However, I found an interesting document that uh is from 1953 that's how.

01:58:48.760 --> 01:58:56.010
GERBER, MARTIN
Error uh flights were planned with weather information. This is an example from the former Swiss air from a flight servic to Midland.

01:58:56.670 --> 01:59:14.560
GERBER, MARTIN
Ah, there, you had hand drawn Maps vertical profile sections, indicating in very detail based on on. On on weather observation know of in flight reports how the weather is going to be like, so when we look at what we have today and what has been used in almost 70 years ago.

01:59:15.350 --> 01:59:17.970
GERBER, MARTIN
I think there is a need to to make a step forward.

01:59:18.640 --> 01:59:22.860
GERBER, MARTIN
And many airlines have adapted in new products.

01:59:22.920 --> 01:59:46.490
GERBER, MARTIN
Uh new solutions on electronic flight bags that is better than the black and white significant weather chart. I'm giving you some examples, so this is the first example. It's a flight Zurich and Miami Zurich in 2019. So the crew was faced with taking it decision of either crossing or circumnavigating and hurricane.

01:59:46.930 --> 01:59:55.390
GERBER, MARTIN
Uh every can compare to or crossing an area that was forecasted to have severe turbulence, so neither choices is favorable.

01:59:56.130 --> 02:00:04.830
GERBER, MARTIN
And if you just used the significant better chart. You wouldn't have really had any good information basis to take proper decision.

02:00:05.530 --> 02:00:15.480
GERBER, MARTIN
Uh Decroo was however, using a an advanced weather information product. This is a turbulence model of coming from air from media pros.

02:00:16.160 --> 02:00:33.460
GERBER, MARTIN
Which indicated a within this area of severe turbulence horizontal layer that is predicted to be smooth so eventually did the whole flight. Miami to Zurich was entirely smooth, thanks to a future or high resolution turbans forecasts.

02:00:34.940 --> 02:00:46.410
GERBER, MARTIN
We have seen from from Greg Edr Uh, so Pirates subjective aircraft dependent versus edr that is objective aircraft independent.

02:00:47.900 --> 02:01:02.990
GERBER, MARTIN
I'm going to give you a few examples about product evaluation verification and validation. This is probably the main thing. We are currently doing and at Lufthansa Group in collaboration with the German Weather Service to DWD.

02:01:04.660 --> 02:01:19.290
GERBER, MARTIN

Let's start with the eye out the terms of their platform where all the reports are collected and displayed over time frame from the last 4 hours, so it's a huge source of real time weather information.

02:01:20.290 --> 02:01:40.680
GERBER, MARTIN
And we are going to compare the The Objectivity reports first with the significant with the with the weather product coming from the German Weather Service. It's called the EDP. They they call it edit dissipation parameter to distinguish between edr but physically it's the same.

02:01:41.570 --> 02:01:45.760
GERBER, MARTIN
So there was a yesterday evening at around 8 UTC.

02:01:46.610 --> 02:02:08.560
GERBER, MARTIN
We felt terrible it's area for constant over most of Europe. This was the situation that we had based on the real time observations. It's not as Tenzing as in in in in the US airspace, but still you have quite a few uh reports heartbeat reports that also give you an idea about areas clear of turbulence.

02:02:09.250 --> 02:02:41.320
GERBER, MARTIN
Let's now overlapped or OK. These are everything in yellow is the event reports based on exceeding a certain threshold. There everything in blue or the the Neil or the the heartbeat reports. Let's compare that now with the prediction from the DWD turbans prediction model and you see that it's a It's quite a nice match so for for weather planning compared to using this evening is where the chart is a huge benefit of having a?

02:02:41.380 --> 02:02:47.550
GERBER, MARTIN
Product that matches well with what is being encountered in in the flight itself.

02:02:49.590 --> 02:02:50.140
GERBER, MARTIN
Yeah.

02:02:51.160 --> 02:02:54.960
GERBER, MARTIN
Compare if in rents II weather forecast.

02:02:55.760 --> 02:02:56.560
GERBER, MARTIN
So there is a?

02:02:57.970 --> 02:03:05.400
GERBER, MARTIN
Huge improvement from from moving from the legally required product to like future turbans prediction models.

02:03:06.060 --> 02:03:22.270
GERBER, MARTIN
Another example diseases event. We had in 2020 and severe turbans encounter that hasn't been predicted in the significant wetted chart on the lower left, you see the measurements from the 8320 and on the right how it looked in the cabin.

02:03:23.040 --> 02:03:46.870
GERBER, MARTIN
Again, the comparison between the measured edr data and predicted the forecast in these EDP product and it's a It's a very nice match between the tool so we think there is a huge benefit in using the measurement data for validating products and eventually then just using the product itself for the flight crews.

02:03:48.370 --> 02:04:14.820
GERBER, MARTIN
Uh I guess yesterday there was a talk about probabilistic models. UM we think that for flight planning purposes to probabilistic approach can have a very high value, especially when it comes to assessing different then when itself, so mountain wave turbulence as probably more stationary for not phenomenal with a higher predictability compared to convection induced turbulence.

02:04:17.100 --> 02:04:46.950
GERBER, MARTIN
And this is development ongoing at the DWD use example at based observation for turbulence prediction. It's still in an experimental state from what I learned but here again. We compare it with the case in in March 2020 and there was a very high correlation between the inside 2 observation from the aircraft and then now cost prediction based on satellite.

02:04:47.000 --> 02:04:47.810
GERBER, MARTIN
Observation.

02:04:48.940 --> 02:04:59.620
GERBER, MARTIN
So to summarize we think that in a preflight stage. It's very useful to have a probabilistic model that allows the flight crew to take a decision.

02:05:00.220 --> 02:05:02.780
GERBER, MARTIN
On for instance, planning the cabin service.

02:05:03.460 --> 02:05:25.530
GERBER, MARTIN
Uh on ground you have all the bandwidth available in the air. It looks often quite different. However, in the air. We want to have something like a Cheetah G now cost or the the the DW satellite now costs that allows tactical decisions on a on a short time frame with a very high level of accuracy.

02:05:28.030 --> 02:05:29.210
GERBER, MARTIN
I'm happy too.

02:05:29.680 --> 02:05:36.230
GERBER, MARTIN
Uh for questions and discussions. It's probably more questions that are raised here as well, then then answers.

02:05:36.880 --> 02:05:37.550
GERBER, MARTIN
But then

02:05:38.410 --> 02:05:38.900
GERBER, MARTIN
I'm.

02:05:39.110 --> 02:05:45.800
Flowe, Tammy (FAA)
Thank you. Thank you very much that was a great talk. UM Steve do we have any questions in the chat room?

02:05:46.300 --> 02:05:48.560
Steve Abelman
I don't see any questions in the chat room right now damn it.

02:05:51.070 --> 02:05:51.970
GERBER, MARTIN
Cool thanks a lot.

02:05:54.040 --> 02:06:06.060
Flowe, Tammy (FAA)
I I would like to come, maybe clarify you did refer to the GTG now cast aura and an outcast product.

02:06:06.790 --> 02:06:13.280
Flowe, Tammy (FAA)
So what product exactly are you, referring to there, I'm I. I just would like to clarify that.

02:06:13.960 --> 02:06:37.450
GERBER, MARTIN
Well, from an airline perspective. It's very nice to have competition between different developers of both power cost products and and now costs products. I think this is what brings the industry forward so it's it's risk. We have quite an agnostic approach to to which product but we are very closely collaborating now with the DWD and this.

02:06:37.510 --> 02:06:49.240
GERBER, MARTIN
You have seen in this not very scientific comparison with the measured data and the predicted data. There is A is a very high correlation so.

02:06:50.430 --> 02:06:59.650
GERBER, MARTIN
Anything that even flights that it is. This is more accurate and comes closer to allow cost of course, it's appreciated for tactical decision making.

02:07:01.470 --> 02:07:06.490
Steve Abelman
Bob at Bob Charming asked if if you use the the world area forecasts the waves forecast.

02:07:01.490 --> 02:07:01.850
Flowe, Tammy (FAA)
Yep.

02:07:07.370 --> 02:07:10.350
GERBER, MARTIN
I did not know that Lufthansa group for now.

02:07:11.980 --> 02:07:13.910
GERBER, MARTIN
For for turbulence.

02:07:17.450 --> 02:07:24.530
Flowe, Tammy (FAA)
OK, well great. Thank you so much so Steve if we don't have any other questions. I'm gonna move on.

02:07:25.790 --> 02:07:37.920
Flowe, Tammy (FAA)
To our next speaker, which is Jason Crag of in car who's gonna talk about global weather notification a real time, ground based weather notification system for pilots.

02:07:37.970 --> 02:07:38.170
Flowe, Tammy (FAA)
Yes.

02:07:39.300 --> 02:07:42.010
Flowe, Tammy (FAA)
So Jason do you wanna run it?

02:07:42.840 --> 02:07:43.300
Jason Craig (Guest)
Sure.

02:07:50.340 --> 02:07:51.550
Jason Craig (Guest)
Can you guys see that OK?

02:07:58.730 --> 02:08:01.320
Flowe, Tammy (FAA)
Ah Yep we can see it thanks.

02:08:01.820 --> 02:08:06.460
Jason Craig (Guest)
OK, hopefully my video down as well, it should go see me, I can't see it so.

02:08:07.410 --> 02:08:07.860
Jason Craig (Guest)
Uhm.

02:08:08.720 --> 02:08:24.690
Jason Craig (Guest)
I'm Jason Cook lead software engineer here at end car for the turbulence team. And here to kind of present a notification system. That's been slow in development, but it's finally ready to be shown or about.

02:08:26.030 --> 02:08:35.460
Jason Craig (Guest)
It has a new name global weather notification, but what it really came out of and was started as a tactical turbulence notification.

02:08:36.020 --> 02:08:36.720
Jason Craig (Guest)
Uhm.

02:08:37.420 --> 02:08:42.930
Jason Craig (Guest)
That we've been working on uh with the phase wittich program. The weather technology in the cockpit.

02:08:44.640 --> 02:08:52.640
Jason Craig (Guest)
And we've been working on this for a few years, but we're ready to show it off, so let's start with what it is how we got here how it works.

02:08:54.580 --> 02:09:21.200
Jason Craig (Guest)
This notification system is designed to just anticipate weather and aircraft will counter or be in close proximity to any predicted or observed adverse weather conditions and today I'm going to show at 4:00 case, basically talked about using GTG now cast as our adverse weather conditions. But we have developed this to be able to work with a forecasted system or any other now caste system really.

02:09:21.910 --> 02:09:22.440
Jason Craig (Guest)
Uhm.

02:09:23.760 --> 02:09:36.810
Jason Craig (Guest)
And what it does is it takes an aircraft position. It's very current position, that it has whether that is immediate or delayed and project it forward in time.

02:09:37.790 --> 02:10:00.850
Jason Craig (Guest)
Uh based on flight plan speed heading and any other information. It has and then calculate a qualitative categories, severity and for turbulence. The examples would be light moderate or severe based on whatever adverse weather grid. It's been given and tuned for and based on its thresholds for those severities along the aircraft path.

02:10:02.700 --> 02:10:06.040
Jason Craig (Guest)
The system is designed to run on the ground, not in the air.

02:10:06.090 --> 02:10:37.460
Jason Craig (Guest)
Or uh like on an iPad or thing. It's designed to run on the ground so that it can process many, many aircraft instead of individualized so we actually designed this and have tested running out on all commercial aircraft, and the konis at the same time, and it can do that. But what it does is process. Every aircraft that it's been asked to in a timely manner, with large whether grids so that it can only send up a notification to the cockpit instead of the entire.

02:10:37.840 --> 02:10:42.010
Jason Craig (Guest)
Weather grid such as sending hold GT cheap now cast to the cockpit.

02:10:43.160 --> 02:10:45.010
Jason Craig (Guest)
That's a bandwidth concern.

02:10:46.070 --> 02:11:02.270
Jason Craig (Guest)
Uh what it does uh it outputs this notification that will show it's designed to give the pilot, a quick heads up type message. You know it's not it's not going to show them anything or tell. It tell them too much. It's very short. It's designed as a hey look.

02:11:02.910 --> 02:11:33.520
Jason Craig (Guest)
Something up ahead, uh and that allows the pilot to seek out more info. Maybe they look at this notifications. They OK already know that or maybe they say OK. There's weather up ahead, according to this, let's look at that weather map or see if there's really something up there or perhaps it tells them there's some moderate turbulence up ahead and and the pilot. Maybe just asked the passengers to be seat. Belt fastened and maybe or maybe not tell Steve flight attendants as well, but this does not replace.

02:11:33.570 --> 02:11:42.670
Jason Craig (Guest)
Any sort of official sources of Advisors, so that's the generic of the system and how did we get here? How do we develop this system?

02:11:43.320 --> 02:11:48.930
Jason Craig (Guest)
Uh as I said, this came out of a tactical turbulence notification system project that we worked on with Wittich.

02:11:49.640 --> 02:11:54.320
Jason Craig (Guest)
Uh and the whole idea here that we wanted to see was how do we?

02:11:54.920 --> 02:12:17.400
Jason Craig (Guest)
Frequently present the log in now cast data into the cockpit. How do we get that information to a pilot frequently the product updates every 15 minutes? How does the pilot actually look at this does he does, he sit there and look at it every 15 minutes at look at the whole grid and sees where he is, and decides if there's something interesting up ahead.

02:12:18.060 --> 02:12:27.290
Jason Craig (Guest)
Uhm So what did we do, we developed. This system for getting that information to the cockpit and we demonstrated? How to do it?

02:12:28.360 --> 02:12:41.710
Jason Craig (Guest)
How it can be done we tested it we ran simulations and in the cockpit to to see what pilots thought? What their opinions were how they used the notification information and how we can improve it.

02:12:42.540 --> 02:12:47.210
Jason Craig (Guest)
Uhm we then expanded this outside of just turbulence.

02:12:48.540 --> 02:13:18.910
Jason Craig (Guest)
Uh what we're calling the global weather portion by expanding it to look into the Oceanic reasons. We evaluated using this same system with cloud top height and convective diagnosis. Oceanic, which was being demo'd via the Romeo Evaluation, which some of you may or on or may know about in which we were demo. ING these cloud top height and convective information and giving it directly to pilot 2 or flying in the Oceanic regions so we took.

02:13:19.290 --> 02:13:21.100
Jason Craig (Guest)
The CTA CDO.

02:13:21.770 --> 02:13:28.390
Jason Craig (Guest)
Data and we modified this algorithm to work in the Oceanic regions, so that it's the same.

02:13:29.060 --> 02:13:47.050
Jason Craig (Guest)

System can run either conists or globally if needed. We've now developed a full documentation at technology transfer package. That's available and that's where we've come up with this global weather note. We no longer are just calling this for turbulence. So we've come up with a new name that is very new here.

02:13:48.000 --> 02:13:54.870
Jason Craig (Guest)
Uhm so how does it really work? This is a very simplified schematic showing on the left we've got the?

02:13:55.750 --> 02:14:10.280
Jason Craig (Guest)
It the whole system is using position reports that it receives either from any source really as long as they're being updated frequently enough such as one minute is fine here. We see one minute positioner ports on the left with the black triangles.

02:14:12.130 --> 02:14:37.340
Jason Craig (Guest)
The current time that this is starting or running is here shown in the middle with the green and what it's doing is forecasting the position of the aircraft forward in time. This 3 minutes from now to the future is the time that we've developed for processing and transmission so that time is when we expect this pilot to receive any notification. That's generated, which would be 803 here so that's the start.

02:14:38.320 --> 02:14:51.600
Jason Craig (Guest)
When they would actually receive it and we're what we're doing is we're drawing a little box around where they're planned to be or where we think there will be starting right when they would receive a notification and we're calling this. The projected notification area and that's what we're going to use to.

02:14:52.910 --> 02:14:56.440
Jason Craig (Guest)
Decide what kind of notification to give that pilot.

02:14:57.330 --> 02:15:11.150
Jason Craig (Guest)
So here we're turning this box. We see the plane at the bottom same projected location of when they would receive it. We have 2 different boxes here we have the full size box and an inner box defined as half.

02:15:11.930 --> 02:15:18.880
Jason Craig (Guest)
And a box length, which we generalize to be the update frequency of the weather grid.

02:15:19.690 --> 02:15:25.470
Jason Craig (Guest)
And then underneath this we're showing our adverse weather grid and kind of see that this might be turbulence.

02:15:26.390 --> 02:15:27.010
Jason Craig (Guest)
So.

02:15:28.890 --> 02:15:58.190
Jason Craig (Guest)
We have a bunch of thresholds that have been predefined for an aircraft and and we determine what type of notification based on these 2 boxes and our thresholds and counting on the now cast turbulence information in this box. We say, Well, there might be no notification at all with null there might be enough. Light turbulence to say there's light turbulence and ahead or in this case, we do see some red which would indicate severe turbulence.

02:15:59.290 --> 02:16:06.490
Jason Craig (Guest)
Up ahead approximately 15 minutes to 10 minutes up ahead and this may generate a severe notification.

02:16:08.100 --> 02:16:16.770
Jason Craig (Guest)
Notice to the pilot now we're not saying that that's going to happen. But the GTG and now cast is predicting that it could so we want to give that pilot a heads up.

02:16:19.270 --> 02:16:49.600
Jason Craig (Guest)
Up here we see the real the real logic of the whole thing. How these how this is developed which people always interested on these these parameters all the numbers here that we're going to go through our for GTG now cast that we've tuned it for but these can be set for other weather products as well. So the system gathers all the aircraft that it can that is tasked been asked to run for from the last 3 minutes. We look at the altitude of the current.

02:16:49.650 --> 02:16:58.060
Jason Craig (Guest)
Aircraft uh we skip anything that is below 20,000 feet just because for turbulence. We're really looking at cruise.

02:16:58.700 --> 02:16:59.220
Jason Craig (Guest)
Uhm.

02:16:59.790 --> 02:17:14.990
Jason Craig (Guest)
For the aircrafts and dissent or climbing usually we have people already in their seatbelts. So it's less of an issue, there, but we could run and dissent as well, we find departure message to make sure we have the right aircraft.

02:17:16.750 --> 02:17:27.390
Jason Craig (Guest)
If we can't find any departure message for this aircraft. We're going to what we're calling revert to a

very simplified projection, which we call the simple heading and speed projectile, which I'll get to in a minute.

02:17:28.200 --> 02:17:40.410
Jason Craig (Guest)
We look based on their departure destination airports if they're too close to either of those airports. That's just getting close to their destination. We actually don't process that aircraft at all again. We assume they're on dissent.

02:17:41.130 --> 02:17:41.810
Jason Craig (Guest)
Uhm.

02:17:42.520 --> 02:17:58.430
Jason Craig (Guest)
Once we've found their flight. We looked for their most recent route that they've set with air traffic control and if we don't find any route for that aircraft at all. We can again revert to a simple projection, which we would do for any aircraft that doesn't have a route at all.

02:17:58.870 --> 02:18:09.260
Jason Craig (Guest)
And now we're going to look at its current location and if projected location. And if it is close enough to its route with, we determined to be 10 nautical miles. We're going to go ahead.

02:18:10.040 --> 02:18:29.660
Jason Craig (Guest)
And use our fancier projection method, but if it's off that route. We assume that we will back up to this simplified projection as well so using the fans are one. We will use the route. The current position. The current heading and we will project that aircraft forward in time to that 3 minutes in the future.

02:18:30.230 --> 02:18:46.600
Jason Craig (Guest)
Come to start drawing our box if we've reverted to simple heading the Earth simple projection. All we're using for that is the last few positions to calculate a heading and speed and use that as a very simplified projection method, which is less accurate.

02:18:47.700 --> 02:19:14.540
Jason Craig (Guest)
And again we're going to project that position forward and create our box for looking at our weather grid. Generally, 30 nautical miles wide and they dispense of course, is dependent on the update time with the weather for Gpgme, which is a 15 minute. Update we actually make it 17 minutes long, so that we are not. We are hopeful overlap between different runs so every 15 minutes. There's some slight overlap.

02:19:17.130 --> 02:19:29.820
Jason Craig (Guest)
So once we create a notification then we would send that up to the pilot. Somehow, we've done here is a lot of UM demonstrations using FAA flight.

02:19:32.250 --> 02:19:41.710
Jason Craig (Guest)
Cockpit simulator to get pilots and get them using this notification system and So what we've done is.

02:19:42.300 --> 02:19:48.700
Jason Craig (Guest)
Gotten feedback via these human over the loop demonstrations with pilots to see what are the flight risks.

02:19:49.000 --> 02:20:11.140
Jason Craig (Guest)
Uhm with sending them is notifications frequently such as every 15 minutes is that too much is that uh right amount of information? What format do they want to see we wanted to understand the impacts to the pilot. The impacts to dispatch or air traffic management? When they are receiving this turbulent turbulence information.

02:20:12.430 --> 02:20:30.300
Jason Craig (Guest)
What do they do with it? How how easily? Is it for them to take this notification and identify where they are what to do with it do they immediately look at the underlying grid if they have it available? Do they immediately talked to air traffic control and ask for different locations such as?

02:20:31.540 --> 02:20:51.910
Jason Craig (Guest)
Flight level up or down do they have that information. We also looked at how to validate that we can get this information to the cockpit in a timely manner, and at that time, we were using the aircraft access to swim, which is no longer the connection. We call it through swim, but other data links do exist. Nowadays, such as direct.

02:20:52.780 --> 02:21:00.400
Jason Craig (Guest)
A Wi-Fi connections in the cockpit or other type of connections to the pilots depending on if they're commercial.org.

02:21:01.640 --> 02:21:16.130
Jason Craig (Guest)
And basically once we understand all of these informations. We were able to move forward with finalizing our system. This is our demonstration. Display which we can finally see the the system working and we've got.

02:21:17.400 --> 02:21:21.020
Jason Craig (Guest)
Our first showing off the actual notification here in this box.

02:21:21.870 --> 02:21:31.850
Jason Craig (Guest)
Uh and this is what would pop up with adding or some sort of notice simple notification that something is here for the pilot. We've gotta time the flight.

02:21:32.440 --> 02:22:02.900
Jason Craig (Guest)
Uh what we assumed or project to be their altitude and heading and then our notification text, which is here. We're showing a light turbulence in the area head and when they would click on this notification. They would be presented or the the tablet would load e.g. now cast grid that was used to calculate this. It shows their look their projected location and the box that we generated. It showed a cross section of the GTG now casts they could tactically make a decision.

02:22:03.470 --> 02:22:06.570
Jason Craig (Guest)
What to do with this information?

02:22:07.580 --> 02:22:21.600
Jason Craig (Guest)
And really what we're showing here is we don't have to be looking at the turbulence grid. All the time as a pilot. We can take that information off of their load and get them. The information only when they need or want to need to see that.

02:22:23.510 --> 02:22:24.080
Jason Craig (Guest)
Uhm.

02:22:25.320 --> 02:22:56.480
Jason Craig (Guest)
Here, I want to talk about how we did some verification. Uh we show the same schematic here. But what we do know is that the pilot or the aircraft did not fly. Our exact projected location. You know here. We see our projected location of when they received the notification and like blue dot when they would, in 17 minutes ahead and then the actual locations. And what we did for verification was we would draw a second box based on their actual locations at those 2 times.

02:22:57.020 --> 02:23:04.510
Jason Craig (Guest)
And we would look at the overlap of these boxes to verify our our system and tune it so that we would be as accurate as possible.

02:23:05.130 --> 02:23:31.530
Jason Craig (Guest)
Uh you can calculate the actual 3rd downs within and without you can see what was missed or what was false alarm and you know you can do lots of statistics that we have in our paper on this. But for turbulence what we found was the projected notification classification that we said that they might versus what the actual flown route was and here we see some raw numbers for those.

02:23:32.360 --> 02:23:49.630
Jason Craig (Guest)
Norton or means we or light to light moderate to moderate these green boxes show that we hit the classification on the nose or did we miss it. These are false positives on the right and Gray and mist? Which we consider even more problematic missing?

02:23:51.290 --> 02:23:57.190
Jason Craig (Guest)
A moderate or severe when we predicted null could be could be so much more problematic so.

02:23:57.470 --> 02:24:14.790
Jason Craig (Guest)
Uh so some percentage is here for this you know when we predict a certain category and what was actually severe. We're getting 23 percentages, although moderate to severe where we're only one classification off up to 9, 10%.

02:24:16.100 --> 02:24:20.910
Jason Craig (Guest)
But that's only in the severe category where there's very small or number of.

02:24:21.260 --> 02:24:29.310
Jason Craig (Guest)
Uh count calculations basically that doesn't happen as often in the nulls. We have a much higher percentage of being accurate.

02:24:30.140 --> 02:24:34.380
Jason Craig (Guest)
On the lights as well, and you can see it's projection going down.

02:24:35.120 --> 02:24:35.580
Jason Craig (Guest)
Uh.

02:24:36.560 --> 02:24:42.790
Jason Craig (Guest)
As the severity goes up, but we still declared they believe that this is performing very well.

02:24:42.850 --> 02:24:48.850
Jason Craig (Guest)
Well uh in projecting where and what that aircraft will do and.

02:24:50.270 --> 02:25:20.030
Jason Craig (Guest)
Uhm finally I wanted to talk about you know why I mentioned that we did expand this to the Oceanic regions. This is actually R. Romeo demonstration display showing cloud top height in grayscale, which is the height of the cloud based on from a satellite and different altitudes and our convective diagnosis. Oceanic product showing a medium high severity or severe severity of a convection in the.

02:25:20.450 --> 02:25:21.260
Jason Craig (Guest)
These areas.

02:25:22.590 --> 02:25:35.940
Jason Craig (Guest)
So you know the pilot in our demonstration was actually being shown. These grids or polygons up the

grids and could make tactical decisions. But what if they didn't and we wanted to use the notification systems, they would be relying on their weather.

02:25:36.790 --> 02:25:54.850
Jason Craig (Guest)
A radar in these situations, which gives us a good look ahead of at least 160 nautical miles or so, but when we apply this algorithm. We can almost double that look ahead without the pilot doing anything and here we show the box being drawn for this Delta aircraft.

02:25:55.510 --> 02:26:06.630
Jason Craig (Guest)
Uh and where it is, and how how it extends out the onboard radar. She's now can get tactical information about this convection, oven up to 32 minutes ahead.

02:26:07.180 --> 02:26:37.230
Jason Craig (Guest)
Uh without doing anything you know, maybe it just comes into his uh ufb or, however else we upgrade upgrade uplink. These products to him or her and here we see the actual notification. We developed for convection oven again. Same things that I'm the aircraft. The flight level and heading and now we see slightly more. We have to moderate convection ahead and the location that it's actually showing is the.

02:26:37.360 --> 02:26:50.000
Jason Craig (Guest)
Closest location to the aircraft in time that he would encounter and then we add the cloud. Top height information as well. Since this product is running on both the cloud top height and convection information.

02:26:53.630 --> 02:27:21.920
Jason Craig (Guest)
Here we have just the demonstration and lot of these system running on many aircraft. It's gets comped. You can't really see everything but we've shown this just with Romeo aircraft, which is just the Oceanic area. You know when we run this in the Co next year. There's so many flights that it's processing at once. You can't really get an idea of what it's doing. But you really see it drawing a box. For every single aircraft based on all of the information it has this system of these.

02:27:22.420 --> 02:27:27.510
Jason Craig (Guest)
Most of these are avoiding all the convection, but some are headed towards it.

02:27:28.240 --> 02:27:34.350
Jason Craig (Guest)
And they would get a notification hopefully come from the system about look at a hat.

02:27:35.740 --> 02:27:47.810
Jason Craig (Guest)
I'm in my final slide here is a future plans. I've talked a lot about how it works. But what we don't have yet is implementation options, which were We were now, finishing the research and development phase.

02:27:48.420 --> 02:27:50.750
Jason Craig (Guest)
And we're ready for implementation type phase.

02:27:50.800 --> 02:27:51.450
Jason Craig (Guest)
Uhm.

02:27:52.610 --> 02:28:13.560
Jason Craig (Guest)
The exact method for how to stand up, these notifications would be very implementation. Dependent that could be onto an ifb it could be through the on board, a flight entertainment system to get entered to get that notification sent to them. It could work for GA pilots through their existing weather.

02:28:14.020 --> 02:28:17.660
Jason Craig (Guest)
Uhm applications, we, we haven't really.

02:28:18.310 --> 02:28:39.080
Jason Craig (Guest)
Got into the implementation parts of how and tried to dictate how that would work but each implementation. You know, there's different ways for a pilot to register their flight, maybe a commercially that could be done automatically or other ways. It could be done manually in that cloud. They could register for this type of service to have these notifications generated for them.

02:28:40.140 --> 02:28:42.210
Jason Craig (Guest)
Again, this will be implementation dependent.

02:28:43.250 --> 02:29:02.270
Jason Craig (Guest)
Uhm so our future plans are to work on this implementation. We have a technology transfer package ready to go that we've developed with the wittich team and we're planning a spring meeting, with the industry to discuss our options for implementation for this and the Cth CDL product.

02:29:03.790 --> 02:29:06.490
Jason Craig (Guest)
And I'll pause there for questions.

02:29:07.970 --> 02:29:15.020
Flowe, Tammy (FAA)
Wow, what a film for May shun their Jason. Thank you so much Steve Yeah. Do we have any questions in the chat?

02:29:08.410 --> 02:29:09.110
Jason Craig (Guest)
Wow.

02:29:09.770 --> 02:29:13.920
Jason Craig (Guest)
Patient there Jason thank you so much Steve Yeah.

02:29:13.970 --> 02:29:15.480
Jason Craig (Guest)
Do you have any cash in chat?

02:29:16.240 --> 02:29:30.110
Steve Abelman
Yeah, there's a lot of comments and questions mostly mostly comments actually so that that's pretty good, and I made kind of brush through those a lot of a lot of folks talking about how this would master a hand, noting how this would fit into I chaos.

02:29:16.550 --> 02:29:18.250
Jason Craig (Guest)
Yeah, there's a lot of common yes.

02:29:21.100 --> 02:29:21.650
Jason Craig (Guest)
Also comma

02:29:25.130 --> 02:29:28.580
Jason Craig (Guest)
I'll ask again.

02:29:29.980 --> 02:29:30.230
Jason Craig (Guest)
Yeah.

02:29:30.800 --> 02:29:46.760
Steve Abelman
Hazardous weather information service, while Roger is talking about Mount Wave advisories. So I'm gonna try to sneak to to some of the questions, though, so Mark Pjanic, Mark fan of tasks and I&I. Kind of think you hit taught it at the end here? What platform is being used to transmit the notice to the flight crew.

02:29:31.180 --> 02:29:31.480
Jason Craig (Guest)
Add.

02:29:32.160 --> 02:29:32.430
Jason Craig (Guest)
Hey.

02:29:33.360 --> 02:29:33.790
Jason Craig (Guest)
Uh.

02:29:34.390 --> 02:29:35.090
Jason Craig (Guest)
Doctors appointment.

02:29:35.230 --> 02:29:35.570
Jason Craig (Guest)
Mark.

02:29:35.830 --> 02:29:37.170
Jason Craig (Guest)
I've tried it.

02:29:39.730 --> 02:29:41.120
Jason Craig (Guest)
Organic organic.

02:29:47.560 --> 02:29:58.280
Jason Craig (Guest)
Right and that's something we haven't dictated but it will be implementation dependent for our demonstration. We used an iPad tablet running application in which?

02:29:58.900 --> 02:30:03.650
Jason Craig (Guest)
It uh just received the notification from our system via the Internet.

02:30:04.280 --> 02:30:19.120
Jason Craig (Guest)
Uhm we actually shown that through the ATS VS women in the actual demonstrations. But we've been tyssa Pate that as more and more options of getting information to the cockpit exist. There's more ways. These notifications could be sent up.

02:30:20.170 --> 02:30:26.010
Jason Craig (Guest)
So it it really depends on how and what the pilot has available to them.

02:30:27.590 --> 02:30:38.630
Jason Craig (Guest)
So it's sort of like you know, we've developed this system before it was possible to even send it to the cockpit so we're just now getting to the parts, where people have these tablets available to them to actually receive it.

02:30:41.520 --> 02:30:51.490
Steve Abelman
OK uh to minor noted notes again a familiar theme about injury data below 20,000 feet. It would be critical to have this data, and climate descent.

02:30:52.520 --> 02:30:52.920
Jason Craig (Guest)
You know.

02:30:52.970 --> 02:31:01.020
Steve Abelman
From Matt Fronzak wouldn't the system be more effective if it could get actual trajectory information from the ATC source such as Iram.

02:31:02.490 --> 02:31:04.290
Jason Craig (Guest)
Yes, it would be more effective.

02:31:05.890 --> 02:31:16.240
Jason Craig (Guest)
In it, it can run on any source of the data that we actually can get available to the system. I believe it would be able to run on that source as well if it had that.

02:31:16.930 --> 02:31:17.800
Jason Craig (Guest)
Available to it.

02:31:19.310 --> 02:31:27.210
Jason Craig (Guest)
I mean as far as you know, I'm under 20,000 feet. It absolutely can run under 20,000 feet accurately.

02:31:19.440 --> 02:31:19.880
Steve Abelman
OK.

02:31:27.530 --> 02:31:37.330
Jason Craig (Guest)
Uh for our demonstration purposes. The commercial airplanes. There was less of a need. I I think in those demonstrations for it at that time.

02:31:39.110 --> 02:31:51.790
Steve Abelman
OK UMP all suffering asks does the box change size depending on what weather is causing the turbulence for example, an MCS versus an isolated thunderstorm versus Mount Wave or over a whole mountain range.

02:31:53.010 --> 02:32:22.740
Jason Craig (Guest)
The box does not change based on the source of the turbulence, but it does change based on the adverse weather grid. So if it's running on GTG and or another now cast the box is almost always designed to be slightly longer than the update rate of that weather grid. So if the now cast has a 15 minute. Update we generally make the box about 17 minutes and in the ocean. I didn't mention it but the actual box is 32 to 33 minutes long.

02:32:23.210 --> 02:32:24.560
Jason Craig (Guest)
Come to give.

02:32:25.300 --> 02:32:37.440
Jason Craig (Guest)
Much more heads up notification in that airspace so you can definitely tune. The box to the actual weather type that you are running it on.

02:32:39.660 --> 02:32:40.770
Steve Abelman
K UM.

02:32:40.470 --> 02:32:52.230
Flowe, Tammy (FAA)
OK, Steve Steve so I just I just want to kind of pull it back in here a little bit well, just to keep it on on schedule, maybe one more question and then let's move on.

02:32:41.640 --> 02:32:42.120
Steve Abelman
Go ahead.

02:32:49.140 --> 02:32:49.550
Jason Craig (Guest)
Alright.

02:32:52.310 --> 02:32:59.220
Steve Abelman
Oh lots of pressure. There's several more questions here. UM let me see, there's a question on this pitch.

02:32:59.910 --> 02:33:13.920
Steve Abelman
Uh OK, let let's do the dispatch question so Nathan and Terra from Southwest. I believe a 5 member correctly. Both asked questions about worked with any dispatch offices or disgust dispatch industry reps as part of this project.

02:33:15.280 --> 02:33:20.030
Jason Craig (Guest)
I'm not as part of the notification project popped up and.

02:33:21.310 --> 02:33:29.010
Jason Craig (Guest)
We want to uh the question is, is you don't wanna overload dispatch with these notifications.

02:33:30.740 --> 02:33:44.650
Jason Craig (Guest)
And I don't have a clear answer for that. I believe dispatcher. Maybe it, you know once GGG and or another now cast product is fully operationally would be able to look at that product themselves, whereas the pilot may not.

02:33:46.270 --> 02:34:07.790
Jason Craig (Guest)

And so we envisioned that the pilot needs these notifications to be able to let them not look at this product. But the actual weather grid. All the time, whereas dispatched may be able to quickly see oh look that plane got a notification and I see the information that severe turbulence ahead and I can use that as well.

02:34:09.920 --> 02:34:13.780
Flowe, Tammy (FAA)
So so Eldridge I think your work is cut out for you.

02:34:15.390 --> 02:34:15.940
Jason Craig (Guest)
Thank you.

02:34:17.390 --> 02:34:17.800
Flowe, Tammy (FAA)
And I.

02:34:17.430 --> 02:34:20.440
Frazier, Eldridge (FAA)
Let's do this we wanted to promote this capability.

02:34:20.780 --> 02:34:31.550
Flowe, Tammy (FAA)
Yeah, no this is great this is I. I I can see that it's generated a lot of discussion. I just want to keep things going and thank you. Jason that was a really awesome.

02:34:31.780 --> 02:34:44.480
Flowe, Tammy (FAA)
Uh talk and so we're not gonna move on now to Stephanie clip fell of Delta Airlines. He's going to talk about deltas approach to reducing turbulence injuries, so Stephanie Are you ready to go.

02:34:44.980 --> 02:34:46.020
Klipfel, Stephanie
At home.

02:34:46.490 --> 02:34:48.260
Flowe, Tammy (FAA)
OK, excellent thank you.

02:34:54.100 --> 02:34:58.250
Flowe, Tammy (FAA)
I can see you I I don't see a slide, though.

02:35:14.590 --> 02:35:15.760
Klipfel, Stephanie
You can't see any of the slides.

02:35:16.060 --> 02:35:19.900
Flowe, Tammy (FAA)
No, I'm just I'm just seeing you stuff I don't see any slides.

02:35:25.550 --> 02:35:30.100
Klipfel, Stephanie
Please stop it shows on presenting but I'll try and stop it and see if I can read it.

02:35:30.930 --> 02:35:31.250
Flowe, Tammy (FAA)
K.

02:35:40.090 --> 02:35:43.260
Flowe, Tammy (FAA)
I don't know does anybody else, slides, it, it may just be me.

02:35:46.320 --> 02:35:47.100
Wiebke Deierling (Guest)
And No.

02:35:46.330 --> 02:35:46.770
Matt Fronzak
Negative.

02:35:46.850 --> 02:35:48.350
Bob Sharman (Guest)
Now this world I see nothing.

02:35:50.430 --> 02:35:52.560
Klipfel, Stephanie
OK do you want to use the backup slides?

02:35:53.460 --> 02:36:03.180
Matt Fronzak
Yes, step, I've got your I've got your presentation up. I will share and you direct me. It'll be a lovely turn of the screw here, you tell me what to do.

02:36:04.660 --> 02:36:06.300
Flowe, Tammy (FAA)
Thanks Matt thank you.

02:36:08.830 --> 02:36:09.410
Matt Fronzak
Alright.

02:36:14.860 --> 02:36:17.130
Klipfel, Stephanie
I made a few updates, but we'll just.

02:36:18.540 --> 02:36:19.660
Klipfel, Stephanie
Continue on.

02:36:22.020 --> 02:36:22.580
Matt Fronzak
Got him.

02:36:23.030 --> 02:36:25.190
Klipfel, Stephanie
Yep, I can see it can everybody see the slides.

02:36:26.420 --> 02:36:28.930
Flowe, Tammy (FAA)
Yep, can, we can see it now thanks.

02:36:29.460 --> 02:36:52.110
Klipfel, Stephanie
Great so thanks for allowing me to talk about what Delta does to reduce our turbulence related injuries past few days. It really highlighted how complex forecasting turbulence can be. But my presentation today is more around how we deal with the complexity of developing policies and applying it consistently for all 35 to 40,000 pilots dispatchers and flight attendants at Delta.

02:36:53.190 --> 02:36:54.020
Klipfel, Stephanie
Next line.

02:36:56.480 --> 02:37:26.780
Klipfel, Stephanie
When you look at Delta 's approach to mitigating turbines injuries. There's really 4. Key roles meteorology flight control flight controllers are dispatched group who plans and monitors each flight flight operations, which is our product team and in flight service, which is our flooded tenant team each of us has our own policies for turbulence that I've briefly outlined here procedures are generally broken up into 4 phases of flight. We've talked about him in a couple different presentations that we have a pre flight planning process. Once the flight takes off the climb. The cruise and then just sent.

02:37:28.290 --> 02:37:34.410
Klipfel, Stephanie
I just briefly put the different key roles and what their responsibilities are during each phase of the flight.

02:37:35.800 --> 02:37:36.940
Klipfel, Stephanie
Next line.

02:37:37.920 --> 02:37:44.130
Klipfel, Stephanie

Let's talk about our preflight decisions. First there's a little bit of animation here. Matt so if you want to click one time.

02:37:45.020 --> 02:37:58.700
Klipfel, Stephanie
First decision is meteorologists have to decide where to forecast turbulence and what severity. We want to issue it go ahead and click again once meteorology has issued forecast products that dispatchers begin flight planning and they have a few decisions that they have to make.

02:37:59.640 --> 02:38:00.780
Klipfel, Stephanie
And click one more time.

02:38:01.650 --> 02:38:07.110
Klipfel, Stephanie
Then go around the turbulence, they can go over or under the turbulence or they could ultimately go through the turbulence.

02:38:08.400 --> 02:38:09.340
Klipfel, Stephanie
Next slide.

02:38:12.500 --> 02:38:27.930
Klipfel, Stephanie
We work to embed our policies into our products. Meteorology issues forecast in the form of threat plots or tips. This is just a 40 product that describes hazardous weather conditions, including turbulence, so there's 3 types of teepees severe turbulence is in the avoid type TP.

02:38:28.780 --> 02:38:32.450
Klipfel, Stephanie
And it's pretty simple. It's an easy one we avoid it. It doesn't really matter what the cost is.

02:38:33.080 --> 02:38:50.220
Klipfel, Stephanie
For moderate turbulence, it's issue doesn't alert TP this TP is recommended to avoid a feasible sometimes if turbulence is expected to be brief. We may may still flight plan through it. Other times, there may be no way to avoid it. These are situations that we want to make sure our flight attendants and customers are prepared for.

02:38:51.370 --> 02:39:02.620
Klipfel, Stephanie
At the bottom is our light to moderate Termins Category. There is no company policy to avoid light to moderate turbulence, but dispatchers still take this into account. The duration and help minimize exposure whenever it's possible.

02:39:03.640 --> 02:39:04.730
Klipfel, Stephanie
Next slide.

02:39:06.600 --> 02:39:36.430
Klipfel, Stephanie
Once our dispatchers make the flight plan. The pilots can view it and widget whether this is just a screenshot of our iPad application, which it whether this is an example of a westbound flight coming from Amsterdam to Atlanta so with this westbound flights are typically avoiding the jet stream, I don't get as much turbulence because of that, but pilots can view the teepees at the dispatchers used to plan the flight. They also have a pilots also have the ability to access the GTG forecast in it's in here as well.

02:39:37.290 --> 02:39:54.240
Klipfel, Stephanie
This X to provide it potentially more details about exactly when the risk for significant turbulence is greatest. We've colorized Doug based on the same categories and actions as our TPS and probably turn instructed to work with their dispatcher if there's a significant disparity between the tipis and GTG.

02:39:55.070 --> 02:40:13.440
Klipfel, Stephanie
And usually dispatchers if it's a complex situation will get meteorologists to help as well. We don't really want to provide multiple sources of turbulence to our our pilots to complete to potentially present conflicting information. So I think this is one area that will be working on going forward in the future.

02:40:14.850 --> 02:40:22.400
Klipfel, Stephanie
Or we try to be deliberate about what uh what products we offer to our products and what actions that they should take off of each overlay.

02:40:23.540 --> 02:40:37.070
Klipfel, Stephanie
Pilots can also use widget weather to break the flight attendants in this example, crossing the ocean are polychaeta meal service. So if turbulence is expected. The flight attendants can adjust the plan of when they want to offer that meal service as needed, depending on where the turbulences.

02:40:38.250 --> 02:40:39.540
Klipfel, Stephanie
Go ahead to the next slide.

02:40:41.280 --> 02:41:01.670
Klipfel, Stephanie
The next phase of flight is taking off and climbing out of a station during this stage everyone seated in their seats with their seatbelts on and really the only question is? When can the flight attendants begin service usually it's about 10,000 feet or above 10,000 feet. But if there's turbulence our product to keep them seated for longer on a flight from Atlanta to Memphis. There's less time to serve.

02:41:02.020 --> 02:41:10.330
Klipfel, Stephanie
Uh our customers then on a flight from say Atlanta, Denver. So Tom truly critical on some of these flights for our customer service piece.

02:41:11.190 --> 02:41:13.260
Klipfel, Stephanie
This is probably the phase where we have our least injuries.

02:41:14.700 --> 02:41:16.240
Klipfel, Stephanie
Next slide please.

02:41:17.660 --> 02:41:47.870
Klipfel, Stephanie
The longest part of the flight is generally the cruise phase. This is the phase when everyone is monitoring for changes and making sure no adjustments need are needed whenever meteorology issues in new TPR system will look through all active flights and determine if the flights are routed through that TP and if they are the TP will go into a queue and deliver to the potty at 60 minutes before entering it. We use 16 minutes because, on many of our longer flights. The tipis could be updated 2 or 3 times before the flights actually there and we want them to only receive the most.

02:41:48.160 --> 02:42:02.410
Klipfel, Stephanie
Will TPTP before entering it and the outlook TP you can see on the text on the right side and the red. There is an intern exit time for reference to the pilot of how long they'll they have until they enter it and how long will actually be in that turbulence zone.

02:42:04.390 --> 02:42:05.840
Klipfel, Stephanie
If you go to the next slide.

02:42:08.140 --> 02:42:38.330
Klipfel, Stephanie
We also offer our pilots for monitoring have Edr Ingmann, the app as long as there is connectivity, so about 70% of our fleet has edr installed and while edr has been helpful at looking at what's happened is specific flights for the meteorologists. There's really just too much daily volume for manual analysis, so in order to get value from these automated reports we worked with in car as they develop the GTG in now GTG and uses all the edr reports to tune with rapid updates.

02:42:38.730 --> 02:42:42.940
Klipfel, Stephanie
Internationally, we don't have a GTG end product, so we just used the GFS dog.

02:42:44.210 --> 02:43:06.100
Klipfel, Stephanie
These products are all updated in real time in widget weather as long as a flight hasn't inflight connectivity would it weather also has a built-in look ahead feature that provides our pilots. The worst gtg.org and value expects it in the next 30 minutes kind of similar to the previous presentation. Pilots can use this information to communicate with the flight attendants with enough time for them to actually react.

02:43:07.540 --> 02:43:08.640
Klipfel, Stephanie
Next slide please.

02:43:10.770 --> 02:43:40.820
Klipfel, Stephanie
Speaking about communication? How many times have you heard a pilot user term rough air. We found that a flight attendant doesn't really know what action to take on rough air does that mean we need to stop service and sit down and put our seatbelts on on or does it mean that we can continue so we've created a combined flight operations and in flight service turbulence action chart. It uses standard turbulence intensity words and then there's actions at each area takes based on the different intensities. We also encourage our.

02:43:41.460 --> 02:43:47.030
Klipfel, Stephanie
A pilot to let the customers know when flight attendants need to sit down and discontinue cabin service.

02:43:48.750 --> 02:43:49.460
Klipfel, Stephanie
Next slide.

02:43:51.030 --> 02:44:05.460
Klipfel, Stephanie
The final phase of flight is a descent phase. The big question here is when we should have a flight attendant sent down general acceptance is somewhere just after top of descent. Unfortunately, this is not standard from airport to airport if you just click Matt one time there.

02:44:09.250 --> 02:44:17.170
Klipfel, Stephanie
If you have a flight flying from Minneapolis or Grand Forks. For example, top of dissent is about 1717 minutes prior to touchdown go ahead and click again.

02:44:19.570 --> 02:44:30.020
Klipfel, Stephanie
Phone into an airport like LaGuardia dissent can last for over an hour. There's also this is also the time mode. Heaviest workload for our pilots. It's still a work in progress here and one of the things we're currently working on.

02:44:31.560 --> 02:44:32.330
Klipfel, Stephanie
Next slide.

02:44:34.460 --> 02:45:04.820
Klipfel, Stephanie
We're also working to build smarter tool sets that can use edr to determine when there's something abnormal going on so this is an actual example from severe turbulence outbreak in Salt Lake City year ago in September. We receiving more than 200 parts per hour and it's really hard for the meteorologist to manually update that and create that mental model in their head. So we are working on tools and

dashboards that take that EDR value and display it in meaningful ways. And this is just a couple of mockups that we've discussed.

02:45:04.870 --> 02:45:26.320
Klipfel, Stephanie
Underneath the map you can see, there's it says peak edr by time it's just a trend a chart that meteorologists could use for trending on the right side or some vertical altitudes. The first chart shows the average peak. Edr by altitude and then also the average wind speed by altitude. You can compare this to model data to see if it's.

02:45:27.140 --> 02:45:55.990
Klipfel, Stephanie
Actually, verifying to model data and what's a trend of the model. Data is the wind speeds getting stronger or they're getting weaker that type of things are things that we do every single time we have a climbing dissent outbreak of turbulence, but right now, it's all manual manual processes and with the addition of Edr. There's so much good information in there. We have to build the tool sets to allow us to pull out that information really, really quickly, so our focus is on building smaller smarter tools and not just following how we used traditional Pirates in the past.

02:45:57.260 --> 02:45:57.980
Klipfel, Stephanie
Next slide.

02:45:59.260 --> 02:46:28.950
Klipfel, Stephanie
The last piece, I want to talk about is one of the most important pieces. Reality is, we still have turbulence injuries. We want to send everybody home the same way that they came to work. We've talked about Archer bones policies while we plan a flight. We've talked about the tools that we've had in flight in the last few processes how we checked to know where how we're doing, and then ultimately make recommendations to improve. We want to know how effective are turbulence policies are and also want to know where they're working and where they're not we can look for other products or we can adjust our training as needed.

02:46:29.590 --> 02:46:30.400
Klipfel, Stephanie
Next slide.

02:46:31.980 --> 02:46:44.950
Klipfel, Stephanie
Here's an example of a chart that's tracking flights that report light to moderate turbulence or greater. We know we have daily fluctuations at with this, but until we started tracking we didn't know what was a normal day, versus a an abnormal turbulence day.

02:46:45.730 --> 02:47:05.280
Klipfel, Stephanie
Only time we really heard about bad days, is when we had turbulence injuries. So we want to know which days were tough and take information and integrate it into our injury information. So we can see

what type of exposure. We have on a daily basis. If you look at the chart here. You can see, there's a a couple of spikes at the end of August and beginning of September. That was one hurricane Ida was.

02:47:06.020 --> 02:47:20.810
Klipfel, Stephanie
I'm moving through the northeast and into the Atlantic and some of the lessons that we can go back and look and see if we had any injuries on these days and if we didn't we know we had a spike in turbulence. We wanna talk to the flight attendants and the pilot 's to see what worked well, not just went what went wrong.

02:47:22.160 --> 02:47:23.170
Klipfel, Stephanie
Next slide please.

02:47:24.530 --> 02:47:54.900
Klipfel, Stephanie
We do all of this through a turbulence working group that's led by our flight safety team. We have various we've had various turbines working groups over the years. This one recently came together this fall. Once we reopened our campus. The team is looking at all of our policies and what data is available to see how we can measure to make our process more effective. We want to have a system that's set up to get the information that we need some of the things we've discussed are listed here. Some of the data types are easily found in databases across Delta, but we also use surveys.

02:47:54.960 --> 02:48:25.800
Klipfel, Stephanie
To help gain a better understanding of our policies, so things like the the type of aircraft. It is was it along aircraft short aircraft somewhere in the world? What did this injury happened or turbines counter happen. You know, we've looked at the experience of a flooded tenant or new hire flight attendants getting injured at a higher rate than buttons have been working for 5 or 10 years and this is a Verity of the turbulence. You know the products that we're using effective and and forecasting it ahead of time. What's the effectiveness of the the radar on the aircraft different radars have different?

02:48:25.850 --> 02:48:41.100
Klipfel, Stephanie
Technical technical capabilities and maybe using that for a business case upgrade radar eventually from the survey were gleaning more around the communication that occurred between the flood it and the pilots or the location of the injury in the aircraft did it occur in the aisle does it in the galley?

02:48:41.160 --> 02:49:12.100
Klipfel, Stephanie
OK, now, what did they think the severity was how how bad was the injury. You know is it a bruise or is it something more serious. It was a cart related over the years we've tried to make the cards lighter that easier to push from an ergonomic step standpoint, but it also makes them a little more easy to move around in turbulence, so calculating that and and seeing the trend there and then also talking with the flight attendants and pilots about what actions they took and how they weighed customer service expectations versus personal safety. There's been many times where I've reviewed.

02:49:12.920 --> 02:49:30.570
Klipfel, Stephanie
Events where flight attendant got injured and they were helping somebody they knew turbulence was a risk, but one example. I can think of. There is a child, who was sick and the flight attendant was trying to help and got injured with because of turbulence and that was this choosing to to serve the customer over their own personal safety so trying to track that as well.

02:49:31.640 --> 02:49:44.010
Klipfel, Stephanie
Are tournaments working group includes representatives from meteorology? The flight control team flight operations and in flight service and our goal is to set up a system that monitors for these trends, they affect the effectiveness of our training and the policies.

02:49:45.500 --> 02:49:46.470
Klipfel, Stephanie
Next slide.

02:49:50.330 --> 02:50:15.560
Klipfel, Stephanie
As you can see it takes a village to create a system to reduce turbulence injuries. Some of the presentations. I've seen over the past few days have been pretty incredible. They're airline industry. Thanks all of you guys for the work. You've done to help us understand the atmosphere and its impact to our flights. I need to steal a couple of your slides to put in some training material because there's some of those pictures worth 1000 words and you know just getting people to understand how the atmosphere works. Sometimes is a challenge so thank you.

02:50:18.190 --> 02:50:39.420
Flowe, Tammy (FAA)
Thank you staff and we will definitely will be publishing. The UM the presentations along with the recordings of the talks in the upcoming weeks, so that thank you very much for your presentation that was very, very enlightening Steve do we have any questions in the chat?

02:50:39.090 --> 02:50:48.950
Steve Abelman
Yeah, quite quite a few stuff comes first of all from Tammy. You could have asked. This yourself do you find that most injuries? Are occurring at Delta during descent as well?

02:50:51.060 --> 02:50:51.740
Klipfel, Stephanie
Jones.

02:50:54.640 --> 02:50:55.890
Klipfel, Stephanie
What can you repeat that question?

02:50:56.020 --> 02:51:00.600
Steve Abelman
Shirt do you find most injuries that's from Tammy do you find most injuries during descent?

02:51:01.310 --> 02:51:05.460
Klipfel, Stephanie
So we do have quite I don't know if it's most but it is a lot. It's more than it needs to be.

02:51:06.640 --> 02:51:06.980
Steve Abelman
OK.

02:51:06.730 --> 02:51:09.460
Flowe, Tammy (FAA)
Yeah, that that's kind of what I thought so thanks.

02:51:10.590 --> 02:51:30.780
Steve Abelman
And and sort of related question from Matt. It seems to me and and Matt I. I'm going to agree with you as I with your commentary as well. It seems to me rare to see flight attendants up shortly after the 10,000 foot. Ding nowadays is that a result of policy change better turbulence forecast better understanding of the impacts of turbulence.

02:51:31.410 --> 02:51:32.670
Steve Abelman
Or all of the above.

02:51:34.120 --> 02:51:46.540
Klipfel, Stephanie
We haven't had any policy changes around that I would think Matt XI might be on and correct me if I'm wrong, but we haven't had any policy changes around when they flooded tenant stand up, so I'm not sure what the cause of that would be.

02:51:50.080 --> 02:52:06.920
Steve Abelman
OK come from Nathan to both Stephanie and or Matt? How do you blend the domestic hi-rez dog now cast and the global GFS based GT grids for pilot descend dispatched display when evaluating a long haul flight.

02:52:08.050 --> 02:52:10.140
Klipfel, Stephanie
Matt are you on are you want me to take a stab at this.

02:52:12.720 --> 02:52:23.110
Eckstein, Matthew D
Uh I'm I'm on your uh you take a shot or I'm I'm happy to try on that, too. I I wasn't sure if it was directed at the pilot app or the dispatcher tools, though.

02:52:23.930 --> 02:52:27.730
Klipfel, Stephanie
Yeah, it's specifically around how we blend the DTGN and the GFS dog.

02:52:30.820 --> 02:52:50.380
Eckstein, Matthew D
Yes, so it's for the pilot application. We actually got a GTG&G 3 and the GFS based GTG and we do kind of a of a merge and interpolation so that for the pilots they're able to view.

02:52:52.250 --> 02:53:13.110
Eckstein, Matthew D
Whatever they want to see both geographically and temporally so they can kind of scroll around look anywhere in the world or they can do one hour time increments into the future. And because the timing of those different products and the coverage of the different products is all different it requires both geographic and temporal.

02:53:14.020 --> 02:53:23.330
Eckstein, Matthew D
Merging so that to kind of force it into the the control elements in the app, but that's the best I can do is simply.

02:53:25.990 --> 02:53:43.580
Steve Abelman
OK, Bob you know, Bob Dylan has a really good question. Bob and I'm gonna suggest you re do re submit that question for the discussion session, 'cause Tammy. That's about the Tam work determines avoidance models. So we should make a point to get to that later if you think.

02:53:44.640 --> 02:53:52.270
Steve Abelman
Uh OK uh for one more from Tahara and and I've remember Southwest. Please correct me if I'm wrong.

02:53:52.770 --> 02:54:02.720
Steve Abelman
Uhm how our pilot and flight attendants surveys done phone electronic form, etc. What triggers this survey. It is it done by human in flight safety that is reviewing events.

02:54:03.630 --> 02:54:28.420
Klipfel, Stephanie
Yeah, so it's kind of a combination and it's kind of transitioning I used to be any time we had an injury that would kick it off right to to call and talk and see what happened but I think some of the transition now is going to an online form to get some of that information. Then I'll follow up. Call if it's needed, based on based on the event. So it's kind of a a separate we are. I think working towards something that's a little bit more.

02:54:28.470 --> 02:54:58.060
Klipfel, Stephanie
Or reaches out to flight attendants even when there's not an injury, so that example. I showed you with with Hurricane Ida. You know, those those stats were over the North Atlantic. You know on a day where we had quite a few of our flights encounter turbulence. You know, we could automatically push out a form to the the flight attendants were in that day and the pilots working that day to ask you know what

actions they took to help not get injuries. You know if we didn't have any injuries on that day and then we can look at the the flights that had injuries and compare the compare the answers.

02:54:58.560 --> 02:55:08.370
Klipfel, Stephanie
So it's kind of a transition right now, it's been up to now, it's been a kind of a a manual reach out by then whoever is investigating the the event and we're going to more form based.

02:55:10.360 --> 02:55:16.850
Steve Abelman
OK uh several other comments but I think we can, we can let folks in the chat read the comments Tammy I think that's.

02:55:16.120 --> 02:55:46.440
Flowe, Tammy (FAA)
Yeah, so let's let's uh my I will briefly respond to Bob Bob 's question about Tam. So yes, that is still in the planning phases. We've had some contracting challenges. But we have definitely not given up on that, so stay tuned and we can talk more offline. If you'd like to do that. So why don't we move along to Bob Sharman? Who is our last speaker before the break and then we'll have a panel discussion.

02:55:46.990 --> 02:55:50.490
Flowe, Tammy (FAA)
So Bob UM, I'm gonna turn it over to you.

02:55:57.810 --> 02:55:59.720
Flowe, Tammy (FAA)
So Bob can you can you hear me?

02:56:02.950 --> 02:56:05.350
Flowe, Tammy (FAA)
Ah, there, you go OK excellent thank you.

02:56:13.610 --> 02:56:14.710
Matt Fronzak
But you're muted Bob.

02:56:15.890 --> 02:56:19.530
Bob Sharman (Guest)
Yeah, I fixed that now I have to plan my presentation again.

02:56:19.300 --> 02:56:21.950
Flowe, Tammy (FAA)
We got it, we can see we can see your slides.

02:56:22.430 --> 02:56:24.730
Bob Sharman (Guest)
You can I can't that's the trouble?

02:56:29.760 --> 02:56:32.030
Bob Sharman (Guest)
OK, this is this the slide you're seeing.

02:56:33.520 --> 02:56:38.760
Flowe, Tammy (FAA)
I I see your your first slide open frontiers, and turbulence forecasting it direction.

02:56:37.570 --> 02:56:37.990
Bob Sharman (Guest)
OK.

02:56:39.040 --> 02:56:39.540
Bob Sharman (Guest)
OK.

02:56:41.030 --> 02:56:43.300
Bob Sharman (Guest)
OK, well. Thank you all come.

02:56:44.570 --> 02:56:52.340
Bob Sharman (Guest)
To have talk of the session and actually the whole workshop, yeah, from my point of view, it's been very interesting and quite varied.

02:56:52.950 --> 02:57:08.470
Bob Sharman (Guest)
Uhm one of the things I noticed when I was making up the summary slide is that we call it a Turbo Terminus Mitigation Workshop. However, we're not really in the position of mitigating turbulence turbulence? Is there no matter what we do.

02:57:08.530 --> 02:57:39.530
Bob Sharman (Guest)
So, but we are trying to come at least share the latest terminals research and operational advances to mitigate or at least minimize hazardous turbulence encounters the presentations. I heard seemed to be clustered in 5 areas that I've listed here. One developed better and more extensive terminals observations and detection for routine dissemination, including public, and private data sharing that.

02:57:39.580 --> 02:57:42.870
Bob Sharman (Guest)
Seemed to be a big issue that was mentioned over and over again.

02:57:43.480 --> 02:58:03.610
Bob Sharman (Guest)
And the the speakers that are listed talked to that. At least in part and that's true of all the other 4 bullets develop better forecasting and nowcasting strategies and looking to verification methods, which are not trivial, especially for probabilistic forecasts.

02:58:04.020 --> 02:58:17.090
Bob Sharman (Guest)
Uh we develop better turbulence climatologies. There was several talks on that and that seems to be gaining interest and is especially relevant given the amount of in situ data, we are.

02:58:17.680 --> 02:58:19.830
Bob Sharman (Guest)
Now uh routinely gathering.

02:58:21.080 --> 02:58:25.530
Bob Sharman (Guest)
Perform fundamental and applied research, to better understand the origin life cycle.

02:58:26.350 --> 02:58:37.080
Bob Sharman (Guest)
And the nature of turbulence and feed this information back into the forecasting an observation strategies, and we heard several talks on that, too.

02:58:37.860 --> 02:58:47.990
Bob Sharman (Guest)
And finally to improve operational procedures that use observations and forecasts to promote avoidance of hazardous turbulence we heard several talks on that as well.

02:58:49.240 --> 02:59:10.410
Bob Sharman (Guest)
I'm just a reminder of the progress we've made in the last 25 years or so and some of these were already mentioned in the workshop. I think the major one is that we are moving to a standard of energy dissipation rate. Edr for all observations where edr is the cube root of Energy Dissipation.

02:59:11.150 --> 02:59:15.220
Bob Sharman (Guest)
And part of the reason we prefer that is because.

02:59:15.880 --> 02:59:27.600
Bob Sharman (Guest)
Uh the root mean Square, a vertical acceleration is proportional. Edr and of course, it is has been the I Cal standard for terms reporting since 2001.

02:59:28.300 --> 02:59:52.020
Bob Sharman (Guest)
And the other thing I should note For Edr is that from the forecasting point of view. We prefer that because we can't provide forecasting systems that provide turbulence levels for all kinds of aircraft that might be out in the air space at any given time, so having a standard atmospheric metric for forecasting certainly makes sense.

02:59:52.630 --> 03:00:22.560
Bob Sharman (Guest)
Uh and that it would then be consistent with the observations another set of observations that are

providing edr on a routine basis is the next regiments detection algorithm in TDA and I show you just one cross section of a cloud in the bottom right that shows you edr in the cloud and you can see that there's quite a bit of measurements in there. In fact, if we start looking at edr measurements in cloud. It's it's overwhelming us.

03:00:22.760 --> 03:00:24.270
Bob Sharman (Guest)
Much much, much more.

03:00:26.660 --> 03:00:31.390
Bob Sharman (Guest)
In situ data at any given time, however, the observations are only in cloud.

03:00:32.440 --> 03:00:36.230
Bob Sharman (Guest)
Another major advancement in the last 25 years is.

03:00:37.250 --> 03:01:07.650
Bob Sharman (Guest)
The use of more sophisticated and higher resolution numerical weather prediction models that provide better terminals forecasts. They better resolve small scale features due to waves and turbulence. They include improved numerics and Parameterisations and an example of 13 kilometers versus 3 kilometres grid spacing with the 3 kilometres on the right shows that the 3 kilometer grids have much more definition have smaller areas of turbulence.

03:01:07.690 --> 03:01:11.960
Bob Sharman (Guest)
Defined in them and so they generally give a better forecast.

03:01:14.600 --> 03:01:15.210
Bob Sharman (Guest)
Uhm.

03:01:15.950 --> 03:01:21.240
Bob Sharman (Guest)
Another advancement has been in our understanding of atmospheric turbulence.

03:01:22.570 --> 03:01:23.590
Bob Sharman (Guest)
This has been.

03:01:24.690 --> 03:01:36.260
Bob Sharman (Guest)
Available because or made available because of the use of observations whether they are in situ observations or observations from research aircraft.

03:01:36.810 --> 03:01:54.300
Bob Sharman (Guest)
Coupled with high resolution simulations to better understand what exactly was causing the turbulence

that it was observed so we can better characterize the turbulence identify the sources and evaluate then how these large scale.

03:01:55.060 --> 03:02:01.710
Bob Sharman (Guest)
Uh forecasts such as GTG or performing in that situation, and if it's not performing well why not?

03:02:02.490 --> 03:02:15.460
Bob Sharman (Guest)
Another thing we've identified as the importance of gravity waves in generating all forms of Terribleness and that's clearer terminals. Mountain wave turbulence and convectively induced turbulence and the diagram in the upper right shows you.

03:02:15.520 --> 03:02:21.340
Bob Sharman (Guest)
Uhm a shot we took up here in Boulder, and you can see that there are.

03:02:22.290 --> 03:02:46.430
Bob Sharman (Guest)
All kinds of gravity waves there and we can see them because in the crests of the ways their water vapors condensing. We usually can't see that, but the point here? Is there a lot of waves of different wavelengths and these are out there in the air space all the time whether we see them or not so gravity. Waves are important, they can break. We've had several talks in the past talking about that.

03:02:47.470 --> 03:03:13.970
Bob Sharman (Guest)
Another thing that we've identified as the importance of deep convection in generating clear air turbulence. For example, the diagram on the right. The animation on the right shows a rapidly growing cumulonimbus cloud that Todd laid performed and you can see as the cloud grows and penetrates the tropopause. It generates waves and the waves are evident in the displacement of the ice and tropes in white.

03:03:14.710 --> 03:03:33.760
Bob Sharman (Guest)
And as it continues we see these great these gravity waves propagate upward away from the cloud. The red areas are areas of expected turbulence and so you can see these terminals areas are generated and propagate away from the cloud to fairly high levels above the clouds so they're occurring in clear air.

03:03:34.560 --> 03:03:37.200
Bob Sharman (Guest)
But this was definitely caused by the convection.

03:03:38.480 --> 03:03:56.370
Bob Sharman (Guest)
And we've also seen recently that convection can significantly modify the environment surrounding the convection and that can enhance the winds and that can enhance the sheer and therefore lead to more turbulence and the next diagram shows you 3 cases. We've been looking at.

03:03:57.020 --> 03:04:05.670
Bob Sharman (Guest)
The top row is a case with convection included in the simulation and the bottom row is with with it turned off.

03:04:06.350 --> 03:04:13.750
Bob Sharman (Guest)
In each case you can see that in the control run the there's an area of strong conviction. But.

03:04:14.370 --> 03:04:45.150
Bob Sharman (Guest)
The kinetic energy that comes out of the turbulence kinetic energy that comes out of the model is displaced from that, and in fact. Turns out to correlate very well with the reports of turbulence that we have in all 3 cases. Notice that the tke this generated in the turbulence. That's reported is far away from the convection, so this is basically what would be reported as a clearer terminals event, but it knows existence to the presence of convection.

03:04:45.470 --> 03:04:49.840
Bob Sharman (Guest)
Since on the bottom set of diagrams there is no turbulence at all.

03:04:53.020 --> 03:05:14.760
Bob Sharman (Guest)
And there have been advances in operational turbulence forecasting one of the advances has been we are now forecasting edr not light moderate or severe. We've moved to grid based graphics and we've replaced turbulence potential as was in earlier forecasts with a severity and atmospheric severity edr.

03:05:15.510 --> 03:05:26.900
Bob Sharman (Guest)
Uhm, however, turbulence is a small scale process much smaller than the grid sizes of current numerical weather prediction models so.

03:05:27.560 --> 03:05:48.000
Bob Sharman (Guest)
The only thing we can do is look at the large scale models and look for and try to infer regions of turbulence and this has led to the development of wait what we call turbulence diagnostics. In general, Subgrid scale terms. Parameterisations do not work well at upper levels in spite of the cases that I just showed you.

03:05:49.710 --> 03:06:05.310
Bob Sharman (Guest)
We could develop a single magic diagnostic or an ensemble of diagnostics. This approach of using ensemble of diagnostics is called dog. An example of which is shown in the upper right for a global model at a particular altitude.

03:06:06.460 --> 03:06:11.610
Bob Sharman (Guest)
In general, though, we developed different diagnostics for Cat Mountain Wave and sit.

03:06:14.880 --> 03:06:21.850
Bob Sharman (Guest)
There this approach of high resolution are rather higher resolution.

03:06:23.080 --> 03:06:33.180
Bob Sharman (Guest)
Models of turbulence that are available. Operationally are now fairly common at the institutions listed here no and you came at office and others.

03:06:35.220 --> 03:06:43.210
Bob Sharman (Guest)
However, most of them do a fairly poor job at identifying turbulence in and around conviction.

03:06:43.910 --> 03:07:07.350
Bob Sharman (Guest)
An example of GTG end to the right shows. This There is turbulence. That was forecast by the NWP slash GTG model in that band to the left, but the band to the right was missed in that forecast. However, the radar from an TDI was able to supply the edr values there.

03:07:10.150 --> 03:07:38.910
Bob Sharman (Guest)
Looking towards frontiers. I think one of the big ones is that the smaller lighter aircraft are becoming such an increasingly important component of obsolete operations specially at low levels, Matthias and Domingo talked a lot about this yesterday. So the these are referring to unmanned aerial systems and Urban Air Mobility Systems. They respond to smaller scales and the middle diagram on the right.

03:07:39.290 --> 03:08:09.320
Bob Sharman (Guest)
Shows that this is some work that Larry Cornman, did that showed that for a small fixed wing aircraft like a uas the peak and acceleration is at a fairly short wavelength for a large transport type aircraft to set longer wavelengths and it's not as sharp so the response of these UAV 's is different than it is for larger aircraft than that needs to be considered when we're developing.

03:08:10.000 --> 03:08:13.320
Bob Sharman (Guest)
Observation ull strategies and forecasting strategies.

03:08:14.210 --> 03:08:14.760
Bob Sharman (Guest)
Uhm.

03:08:16.100 --> 03:08:22.030
Bob Sharman (Guest)
Most of these systems fly in the atmospheric boundary layer where urban effects are.

03:08:22.800 --> 03:08:28.780
Bob Sharman (Guest)

Important and extremely complex, Domingo showed some nice diagrams of those in Animations yesterday.

03:08:30.400 --> 03:08:37.960
Bob Sharman (Guest)
You know the flow over obstacles depends strongly on wind speed direction stability the geometry building building interactions.

03:08:38.570 --> 03:08:47.640
Bob Sharman (Guest)
Etc. We know that's a problem, but also as Jim Doyle pointed out yesterday low level gusts, including Rotors is also a big hazard.

03:08:48.960 --> 03:08:59.210
Bob Sharman (Guest)
And when we are forecasting or measuring at upper altitudes in the Upper Class E airspace there's yet more challenges.

03:09:01.280 --> 03:09:13.540
Bob Sharman (Guest)
But one of the biggest challenges. I think is that we must deal with rare events and the lower diagram on the right shows the histogram of United Airlines 767 data.

03:09:14.090 --> 03:09:14.620
Bob Sharman (Guest)
Uhm.

03:09:16.070 --> 03:09:17.620
Bob Sharman (Guest)
And if you look at.

03:09:18.830 --> 03:09:36.640
Bob Sharman (Guest)
And the PDF there is on a log scale, so if you look at what you would think as moderate, some more in the 0.2 range. You're looking at only 10 to the -2 to 10 to the -3 frequency of occurrence and severe is less than 10 to the -4 so it truly is.

03:09:37.280 --> 03:09:50.330
Bob Sharman (Guest)
A UM rare event and therefore we're forced to over forecast because otherwise we could just forecast. No turbulence all the time and we'd be right 99% of the time.

03:09:52.010 --> 03:10:05.590
Bob Sharman (Guest)
However, in order to better represent this we are transitioning to probabilistic forecasts where verification is not trivial. John addressed this a little bit yesterday.

03:10:06.200 --> 03:10:06.730
Bob Sharman (Guest)
Uhm.

03:10:07.490 --> 03:10:18.420
Bob Sharman (Guest)
But in order to come up with verification of probabilistic forecasts. We need good terminals. Climatology to compare it to and so far. I don't think we have that.

03:10:20.560 --> 03:10:36.730
Bob Sharman (Guest)
And finally there's an issue of how do we disseminate probabilistic or deterministic forecasts of the users? When these are rare events. We must look at uh evolving climate effects. We had several talks on that and.

03:10:36.780 --> 03:10:37.250
Bob Sharman (Guest)
Uhm.

03:10:39.820 --> 03:10:40.710
Bob Sharman (Guest)
Let's see.

03:10:45.440 --> 03:10:47.010
Bob Sharman (Guest)
I lost my cursor there.

03:10:50.430 --> 03:10:51.000
Bob Sharman (Guest)
Uhm.

03:10:52.100 --> 03:10:56.740
Bob Sharman (Guest)
The observation of frontiers that we're facing are certainly we need more data.

03:10:57.290 --> 03:11:00.730
Bob Sharman (Guest)
Uhm we've been talking about this over and over again, especially today.

03:11:02.680 --> 03:11:33.360
Bob Sharman (Guest)
Pireps are useful because they do provide us information about mountain wave turbulence. Clearer turbulence and convection in the diagram to the right you see a bunch of pilot reports are particularly active day and you can see some reports are in blue. Others are in Green. The blue indicates that the pilot reported it was mountain wave turbulence. The greeting means that he reported it was unclear.

03:11:33.410 --> 03:11:36.780
Bob Sharman (Guest)
Here and the edr estimates don't tell us that right now.

03:11:37.600 --> 03:11:47.880
Bob Sharman (Guest)
Plus pilot reports give us a wider range of aircraft that it's implemented in so despite its limitations, it still has value.

03:11:48.590 --> 03:12:06.650
Bob Sharman (Guest)
Uh, however, there is a need to expand edr observations and I outta is working on this as we heard before and more data is coming from Boeing, it would be good to get water vapor estimates into this so that we can better define sit events.

03:12:07.540 --> 03:12:38.120
Bob Sharman (Guest)
Just to try to drive home the point that we still need more observations when you look at a daily or monthly reports. It looks like a lot. But if you look at 1:00 altitude band, and just say a minutes time you get the diagram that looks that's in the middle on the right you see, there really aren't that many and this is what we have to use for verification. So we really do need more reports one possibility is to use QC damned are.

03:12:38.170 --> 03:12:50.360
Bob Sharman (Guest)
Dev Ji estimates converted to EDR and Uh Soojung, Kim in Korea has done this and it provides a lot more data in the Southern Hemisphere as you can see in the diagram.

03:12:50.650 --> 03:13:11.430
Bob Sharman (Guest)
Uh in the lower right, I know a lot of you probably have not aware of that. But that's something that we could probably use operationally and we need to work towards accessing other observations, including a DSB data from uas as hey. Young was saying yesterday high resolution data from radio sounds might be useful.

03:13:12.100 --> 03:13:15.740
Bob Sharman (Guest)
A satellite feature detectors and so on.

03:13:16.150 --> 03:13:22.460
Bob Sharman (Guest)
Uh arandi areas that we need to address in the observation ull area, or

03:13:23.930 --> 03:13:40.210
Bob Sharman (Guest)
as I said earlier we would really like to get more information out of the observations whether it's a cat sit or waves. That's causing this turbulence and how to verify different DDR implement implementations and make sure that they're consistent.

03:13:40.870 --> 03:13:51.040
Bob Sharman (Guest)

Needed to develop climatologies and looks like there's a need for in situ. Wave detection algorithms. As we've been discussing the last couple of days as well.

03:13:52.170 --> 03:14:17.450
Bob Sharman (Guest)
From the forecasting and nowcasting POV frontiers include developing turbulence diagnostics to accommodate low level urban environments and complex terrain environments, including Rotors High Altitudes of the diagram on the upper right shows waves that were observed by any R 2 at flight level 600 so there's a lot happening up there.

03:14:17.960 --> 03:14:33.400
Bob Sharman (Guest)
Uh we need to better define in cloud and their cloud turbulence and incorporate the results from research studies into the development of diagnostics and we need to develop better probabilistic forecasts and as.

03:14:33.450 --> 03:14:33.790
Bob Sharman (Guest)
Uhm.

03:14:34.840 --> 03:14:43.610
Bob Sharman (Guest)
Jim Doyle pointed out there are inherent predictability issues to consider here another problem with this is if you're using NWP ensembles.

03:14:44.390 --> 03:15:09.300
Bob Sharman (Guest)
They tend to be fairly small spread over short term forecasts that we usually use for forecasting turbines. So we're exploring alternatives like using multi diagnostic ensembles. The diagram at the right shows you ugh probabilistic forecast of greater than 0.2 ADR that uses 61 different diagnostics.

03:15:10.310 --> 03:15:38.110
Bob Sharman (Guest)
There is progress in applying AI and machine learning learning techniques to the forecasting problems. We have to address verification issues. What's the best metric whether the air. We're seeing is because the error was in the NWP model that we're using or whether it was errors in the diagnostics and we know that there's poor reliability due to over forecasting we need to somehow understand and do something about that.

03:15:39.460 --> 03:15:42.190
Bob Sharman (Guest)
We also need to in the verification.

03:15:42.620 --> 03:15:44.590
Bob Sharman (Guest)
Uhm strategies.

03:15:45.470 --> 03:16:00.060
Bob Sharman (Guest)
Determine what the forecasters want how long of a forecast lead do they want. I know they want forever, but realistically? What do you use for planning? What's the most important forecast lead times we should work on?

03:16:00.680 --> 03:16:01.200
Bob Sharman (Guest)
Uhm.

03:16:02.300 --> 03:16:19.390
Bob Sharman (Guest)
And we saw that there's a lot of interest in GT GN which currently is only over the konus so it would be good to expand that to global applications and develop mountain wave forecasts and maybe we need a working group to decide how to do that.

03:16:21.160 --> 03:16:25.600
Bob Sharman (Guest)
In the fundamental research needs, uh there's several bullets. I've listed here.

03:16:26.090 --> 03:16:38.940
Bob Sharman (Guest)
Uh Tompsett Ebulus referred to a need for the better understanding of causes and life cycles of turbulence and list. Several different things. Here, more or listed in the chapter in our book.

03:16:39.440 --> 03:16:42.790
Bob Sharman (Guest)
A chapter by Sharman Lane Anshuman.

03:16:44.400 --> 03:16:56.740
Bob Sharman (Guest)
But I think one of the biggest things that comes out of this is a need for a dedicated multiple aircraft field program where we have many different observations through radio sounds penetrations.

03:16:57.280 --> 03:16:57.770
Bob Sharman (Guest)
Uhm.

03:16:58.990 --> 03:17:12.360
Bob Sharman (Guest)
And perhaps forward looking lidar radar? What have you. We need this to better understand the nature of life. Cycles of turbulence and from the simulation point of view or the modeling point of view.

03:17:13.820 --> 03:17:28.380
Bob Sharman (Guest)
We need to start working towards developing subgrid scale turbulence parameterisations that apply to the free atmosphere. Most of them have been developed for the planetary boundary layer and they may or may not work well in the free atmosphere.

03:17:29.900 --> 03:17:43.090
Bob Sharman (Guest)
And then since as the models running there's access to a lot of variables that you wouldn't normally have it's possible that we could get some better estimates of turbulence directly from the model.

03:17:43.890 --> 03:17:56.630
Bob Sharman (Guest)
A nested simulations that include large scale foreseen plus smaller scale higher resolution grids have been successful in modeling accidents and elevated ESR.

03:17:57.330 --> 03:17:58.930
Bob Sharman (Guest)
Uh data.

03:18:00.040 --> 03:18:10.830
Bob Sharman (Guest)
Ah, but we need more resolution studies. Parameterisation studies and Initializations Sensitivity Studies just to the academic community that might be out there.

03:18:11.450 --> 03:18:22.160
Bob Sharman (Guest)
I think there's a lot of good PhD topics here and so maybe we can use this opportunity to encourage some students to start helping us out with this major problem.

03:18:23.190 --> 03:18:28.740
Bob Sharman (Guest)
1,000,000 summary we reviewed 5 progress highlights mentioned in the workshop.

03:18:29.370 --> 03:18:40.210
Bob Sharman (Guest)
The widespread implementation of in situ observations. The development of sophisticated higher resolution numerical weather prediction models that drive our forecasts.

03:18:40.890 --> 03:18:59.510
Bob Sharman (Guest)
The use of observations, coupled with high resolution simulations to better understand the nature and evolution of turbulence events that we've developed a better understanding of the role of deep convection in clear air turbulence and the better understanding of gravity waves in the free atmosphere.

03:19:01.170 --> 03:19:20.090
Bob Sharman (Guest)
We've identified some short term operational and research needs, specifically providing low turbulence forecasts in complex terrain and, importantly, urban environments include more observations for verification and now casting perhaps from a DSP as Larry was indicating satellite features.

03:19:20.740 --> 03:19:27.630
Bob Sharman (Guest)
High resolution soundings and others provide global now casts that include sit.

03:19:28.060 --> 03:19:39.830
Bob Sharman (Guest)
Uh continue to do case studies using high resolution simulations develop private vendor research community collaborations where we can share data and share the latest research.

03:19:40.660 --> 03:19:47.540
Bob Sharman (Guest)
And establish mechanisms for data sharing finally we identified some longer term, and more fundamental research needs.

03:19:48.000 --> 03:20:08.460
Bob Sharman (Guest)
Uh these include more high resolution simulations of turbulence events establishment and execution of field programs established the effects of climate change and look towards ways in which numerical weather prediction. Models can directly predict Epsilon or edr that's all I have thank you.

03:20:10.340 --> 03:20:11.040
Flowe, Tammy (FAA)
Wow.

03:20:13.130 --> 03:20:15.840
Flowe, Tammy (FAA)
Thank you Bob that was very comprehensive.

03:20:16.700 --> 03:20:26.360
Flowe, Tammy (FAA)
I talk I didn't know I was hoping to retire in the next couple of years, but it seems like my my work is cut out for me and as is yours for the next couple years.

03:20:27.950 --> 03:20:41.640
Flowe, Tammy (FAA)
Anyway UM so Steve I. I'm sure there are a bunch of questions in the chat UM. Let's let's spend about 10 minutes. If we've got it and then we'll take a break before we have the panel discussion.

03:20:42.490 --> 03:21:00.240
Steve Abelman
Not sure Tammy come as more probably more comments and questions actually Bob which which means you must have been pretty thorough. Peter Bechtold noted that you can add in slide 6 ECMWFIFS to a list of operational models, providing gridded products including convection.

03:20:59.840 --> 03:21:04.360
Bob Sharman (Guest)
OK, I didn't know what the situation was there, so yeah, that's good to hear.

03:21:05.800 --> 03:21:19.140
Steve Abelman
Uh Jamie Hanson asked the question are there references describing the location of observed cat to

convection as Doctor Sharman described shown North of convection in the slide either published or otherwise.

03:21:19.930 --> 03:21:20.610
Bob Sharman (Guest)
Yeah.

03:21:21.240 --> 03:21:42.550
Bob Sharman (Guest)
We have some previous papers that we published that are usually case studies of one event and that one slide that I show that showed the 3 cases. We're in the process of writing up for publication now, so if you send me an email, I can send you some of the publications. We've previously submitted.

03:21:44.740 --> 03:21:45.040
Steve Abelman
K.

03:21:46.140 --> 03:21:47.860
Steve Abelman
Ah let's see.

03:21:49.610 --> 03:21:58.150
Steve Abelman
There are some Peter Bechtold also notes, there are several publications of gravity waves generated by convection and convection literature, not as many on cat.

03:21:59.200 --> 03:22:07.770
Steve Abelman
Let's see oh work would like to know I almost want to answer this myself when Bob but oh look would like to know what is over forecasting?

03:22:09.500 --> 03:22:10.700
Bob Sharman (Guest)
So.

03:22:11.850 --> 03:22:15.560
Bob Sharman (Guest)
When you develop a forecast system you.

03:22:18.550 --> 03:22:31.060
Bob Sharman (Guest)
You have to look at what the PODY for moderate or greater events. RSA versus null events and when you form the diagnostics and do that, if you come.

03:22:32.580 --> 03:22:34.910
Bob Sharman (Guest)
Don't count if you calibrate your.

03:22:35.770 --> 03:22:49.200
Bob Sharman (Guest)
Uh forecast so that it mimics what's actually observed out there say from a climatologist shifts in situ data on a day to day basis, you'll find that you practically never forecast anything.

03:22:50.090 --> 03:23:06.380
Bob Sharman (Guest)
So you have to re calibrate and artificially increase the areas in severities of your forecasted turbulence and that makes your PODY go up to something more reasonable but it also affects your?

03:23:07.520 --> 03:23:11.270
Bob Sharman (Guest)
Probability of false alarms and so it's.

03:23:11.890 --> 03:23:25.130
Bob Sharman (Guest)
It's a situation where our forecasting techniques just simply are not good enough to isolate turbulence events. So we have to over forecast in order to capture them. I don't know if that's answering your question or not over.

03:23:29.680 --> 03:23:31.750
Steve Abelman
OK other than that.

03:23:31.800 --> 03:23:38.070
Steve Abelman
Uhm not not many questions left so Randy says he did Randy Bass City did such a nice job.

03:23:38.810 --> 03:23:41.890
Steve Abelman
Identifying the future challenges we don't need a panel for that.

03:23:42.930 --> 03:23:52.920
Steve Abelman
I think there's more uh Matias suggests we better start. You know, I uh getting getting funds in order to conduct all this research and and Jeong Hoon says goodnight because he's up really late.

03:23:53.200 --> 03:23:54.200
Bob Sharman (Guest)
Oh yeah.

03:23:54.470 --> 03:23:58.100
Steve Abelman
So thank you for staying with those.

03:23:54.740 --> 03:23:59.380
Flowe, Tammy (FAA)
Yes, thank you. Thank you. Thank you for asking friends for hanging in there.

03:23:59.920 --> 03:24:01.060
Steve Abelman
Yeah, so.

03:24:00.500 --> 03:24:27.880
Flowe, Tammy (FAA)
Oh my goodness gracious all right, so why don't we take a 10 minute break uh come back here at 1:45 Eastern Time and will start a panel discussion. So hopefully some folks have some good questions. We have a good panel that we have set up and each of them will get a chance to give a little spiel for what they think is important, and that we need to discuss and then we'll wrap this thing up. Thank you everybody.

03:24:30.110 --> 03:24:31.140
Flowe, Tammy (FAA)
So 10 minutes.

03:33:49.060 --> 03:33:55.900
Flowe, Tammy (FAA)
Yeah, Hello, everybody, I'm I'm back so let's give it another minute or so for people to log back on after their break thanks.

03:34:12.660 --> 03:34:15.440
AAL - CA Tim Miner (Guest)
Tammy do you want the entire panel to Heather cameras on?

03:34:16.190 --> 03:34:29.680
Flowe, Tammy (FAA)
Uh actually UM thanks to him. That's a good question. I I I was going to kind of cover that I think when you're talking and then you know when for the open discussion. I think would be good to have your cameras on thanks.

03:34:32.250 --> 03:34:33.290
Flowe, Tammy (FAA)
That that makes sense.

03:34:33.990 --> 03:34:39.380
Flowe, Tammy (FAA)
It may not have met my brain is frazzled right now there's been a lot of information.

03:34:37.980 --> 03:34:38.780
AAL - CA Tim Miner (Guest)
Yeah, thanks.

03:34:40.520 --> 03:34:42.030
AAL - CA Tim Miner (Guest)
That's great thank you very much.

03:34:43.890 --> 03:34:53.500
Matt Fronzak

Tammy this is Matt I I I see a lot of button, pushing in our in the panelists future and a strong probability of.

03:34:53.590 --> 03:35:03.050
Matt Fronzak
From miss pushing buttons so I I I think and I don't. I don't I have no hard data to support this.

03:35:03.920 --> 03:35:14.490
Matt Fronzak
I think we could have the the 5 or 6 panel members videos on and let's try it and see if we if we croak teams will ask him to shut their videos done.

03:35:12.540 --> 03:35:12.870
Flowe, Tammy (FAA)
OK.

03:35:14.770 --> 03:35:23.860
Flowe, Tammy (FAA)
OK, I think we have 6 panelists so that would be fine with me have everybody turned it on so if the pen list or on the call right now.

03:35:23.920 --> 03:35:46.160
Flowe, Tammy (FAA)
Look up hold on let me pull up my my list. Here so we have Randy Bass, Brent King, Matt Strahan Matthias Steiner met Fronsac and Tim Minor and my missing somebody. I don't think I'm missing anybody. So if you all could just turn your cameras on and we could go ahead and test it.

03:35:50.490 --> 03:35:52.210
Matt Strahan (Guest)
So Matt Matt and Matt show.

03:35:52.410 --> 03:35:55.070
Flowe, Tammy (FAA)
Matt Matt Matt It Is It's the triple match show.

03:35:54.250 --> 03:35:54.580
Matt Fronzak
Yeah.

03:35:55.530 --> 03:36:08.830
Matt Fronzak
You know, we, we started we started this, this thing and and I knew right away that I was in deep trouble and I made a suggestion that I I I will adopt a different name. So you can call me. I think it was rutabaga that I decided would be a good alternative.

03:36:11.890 --> 03:36:18.920
Flowe, Tammy (FAA)
Yeah, so I I I think I see 5 folks online so we were waiting on one more who am I missing.

03:36:18.400 --> 03:36:20.030
Matt Fronzak
Net Strahan is shy.

03:36:20.700 --> 03:36:21.480
Flowe, Tammy (FAA)
OK.

03:36:24.880 --> 03:36:27.040
Flowe, Tammy (FAA)
Matt Strahan are you around.

03:36:25.010 --> 03:36:25.780
Matt Strahan (Guest)
Mikey.

03:36:27.370 --> 03:36:28.620
Matt Strahan (Guest)
My camera is on.

03:36:29.070 --> 03:36:30.670
Flowe, Tammy (FAA)
Oh, I don't see you.

03:36:31.120 --> 03:36:32.520
Matt Strahan (Guest)
Rama turn it off and on again.

03:36:33.100 --> 03:36:34.390
Matt Fronzak
I think he must have broken Matt.

03:36:33.130 --> 03:36:34.170
Flowe, Tammy (FAA)
Yeah, we don't spend.

03:36:37.480 --> 03:36:38.330
Matt Strahan (Guest)
Says it's

03:36:37.770 --> 03:36:54.980
Flowe, Tammy (FAA)
OK, so, so my instructions to the speakers. I'm gonna give you each 5 minutes to just kind of talk about what you think is important, and what you've taken away from the, The last 3 days and hopefully you've taken noise something worthwhile.

03:36:55.820 --> 03:36:58.250
Flowe, Tammy (FAA)
Uhm I so I can just retire now.

03:37:00.020 --> 03:37:19.390
Flowe, Tammy (FAA)
Uh and then we're just going to open it up and I hope Steve Abelman is still online and Steve you the mighty have not fallen. You your assistance in the last 3 days has been very, very, very appreciated so don't don't discount yourself. It'll

03:37:18.240 --> 03:37:18.920
Steve Abelman
Tammy I'm

03:37:19.730 --> 03:37:26.530
Steve Abelman
Tammy I I'm kidding. It's all it's all good. It's all good. I I I'm working a lot less hard than the rest of you and I like that.

03:37:27.320 --> 03:37:45.990
Flowe, Tammy (FAA)
OK, so let's go ahead and get started up. Let me pull up my agenda here. So where I'm just going to work down the agenda and give each you guys about 5 minutes to talk about what you think is important. So we're gonna start with Randy Bass, who is my boss.

03:37:46.040 --> 03:37:46.360
Flowe, Tammy (FAA)
US.

03:37:47.460 --> 03:37:58.030
Flowe, Tammy (FAA)
At the FAA and the aviation weather research program and so Randy go ahead and take it away. You got 5 minutes. I'm I can cut you off this is the one time I can cut you off.

03:37:59.130 --> 03:38:02.700
Bass, Randy (FAA)
well, I I guess I go first because I'm your boss so.

03:38:02.640 --> 03:38:03.220
Flowe, Tammy (FAA)
That's right.

03:38:04.230 --> 03:38:06.180
Bass, Randy (FAA)
First allocate can you see my slides?

03:38:06.790 --> 03:38:07.300
Flowe, Tammy (FAA)
No.

03:38:07.700 --> 03:38:16.100
Bass, Randy (FAA)

Good 'cause I don't have any that was just a test. But it but every other single presenter has said the same thing. So I figured I'd start with that so.

03:38:16.840 --> 03:38:17.330
Bass, Randy (FAA)
Uhm.

03:38:18.400 --> 03:38:25.040
Bass, Randy (FAA)
Again, my name is Randy Bass on the manager of the weather research branch within the aviation weather division and the FAA.

03:38:25.770 --> 03:38:26.440
Bass, Randy (FAA)
Uhm.

03:38:27.540 --> 03:38:32.000
Bass, Randy (FAA)
You know, we have 22 branches or 22 groups that.

03:38:32.520 --> 03:38:40.770
Bass, Randy (FAA)
Uhm I oversee the aviation weather research program that Tammy program falls under as well as.

03:38:43.140 --> 03:38:58.650
Bass, Randy (FAA)
CNV and and I seen and and convection and and those that do more of the traditional research and then the weather technology in the cockpit program that you know, Romeo is is the program, one of those projects that falls under that.

03:38:59.270 --> 03:38:59.850
Bass, Randy (FAA)
Uhm.

03:39:01.750 --> 03:39:16.680
Bass, Randy (FAA)
I wanna thank uh, especially Tammy and the the in car and Mitre folks on Bob and vegan and and Matt Fronzak. In particular, and I know there were tons of others, but thank them for putting this on this is a huge effort.

03:39:17.230 --> 03:39:23.030
Bass, Randy (FAA)
Uh and and then to have to change from trying to put in trying to do this in person.

03:39:23.620 --> 03:39:50.570
Bass, Randy (FAA)
Uh basically a year ago and then trying to do it in person 2 months ago and then change and all virtual. It's it's been a challenge and so I. I appreciate all the work. They've done and thanks for everybody. All

the attendees special our international folks that you know state on overnight to in some cases to to see this so I think it is. It has been a really good and and interesting workshop.

03:39:51.810 --> 03:39:52.240
Bass, Randy (FAA)
Uhm.

03:39:53.070 --> 03:40:03.900
Bass, Randy (FAA)
Uh as I put on there, you know, Bob Sharman did a great overview of some of the future challenges that I that I think we, we've got to deal with.

03:40:04.590 --> 03:40:05.140
Bass, Randy (FAA)
Uhm.

03:40:06.730 --> 03:40:25.400
Bass, Randy (FAA)
I'll kinda hit him again a little bit since I was already going to talk. But I think one of the biggest ones for us is the you know government industry collaboration is a is something that I think both sides have to do a better job at and and that includes the data sharing that that Bob mentioned.

03:40:27.560 --> 03:40:29.490
Bass, Randy (FAA)
Yeah, for example, the you know.

03:40:30.720 --> 03:40:38.250
Bass, Randy (FAA)
When I first think of government industry collaboration first thing I think of is is the airlines and getting free and Open Access to to the data.

03:40:38.900 --> 03:40:47.340
Bass, Randy (FAA)
Uh you know the The Edr Normalization Project and and Romeo when the the global weather notification. Those are those are good examples.

03:40:47.850 --> 03:40:48.560
Bass, Randy (FAA)
Uhm.

03:40:49.540 --> 03:41:03.770
Bass, Randy (FAA)
Where we where we do have some collaboration, but we need that aircraft data and and realistically. We we have pretty good collaboration among among of the airlines in most cases, some are definitely better than others.

03:41:05.260 --> 03:41:12.740
Bass, Randy (FAA)

I think the larger airlines are actually better at it than the smaller ones, and and that's you know still a problem we need to get better.

03:41:12.970 --> 03:41:17.740
Bass, Randy (FAA)
Uh collaboration and and bring those other airlines into the fold.

03:41:18.600 --> 03:41:19.190
Bass, Randy (FAA)
Uhm.

03:41:21.050 --> 03:41:35.560
Bass, Randy (FAA)
Where I don't think we do as good a job as with the weather providers themselves. I think this is an area that needs improvement and and and I. I think on the government side. We haven't done a real good job on on with that, but but I think there is a.

03:41:36.550 --> 03:41:38.760
Bass, Randy (FAA)
Some improvement that can go both ways.

03:41:41.070 --> 03:41:47.790
Bass, Randy (FAA)
Nothing prohibits us from providing government developed algorithms to the commercial.

03:41:47.850 --> 03:42:11.800
Bass, Randy (FAA)
Uh commercial providers and industry that doesn't mean that it's simple. There are some proprietary issues. You've got to go through the The The The FFRDC 's in most cases to to to work that out. There's probably some contractual issues, both with our existing contracts with the with the labs as well as anything that could be done.

03:42:12.750 --> 03:42:16.570
Bass, Randy (FAA)
But I still think this opportunity that that we can work on for example.

03:42:17.000 --> 03:42:21.370
Bass, Randy (FAA)
Uh GTG and is ready, it's ready to go.

03:42:22.910 --> 03:42:27.390
Bass, Randy (FAA)
You know in car is running it in a pseudo operational configuration.

03:42:28.320 --> 03:42:41.810
Bass, Randy (FAA)
But we can't get into Weather Service for 23. Maybe 4 more years, depending on you know how fast we go or you know the things on their side because the rapid. Refresh forecast system is their big at.

03:42:43.420 --> 03:42:49.570
Bass, Randy (FAA)
Uh thing that they've got going on and that that kind of overwhelms everything else and it's put things on the back burner.

03:42:50.200 --> 03:42:54.280
Bass, Randy (FAA)
Well, there's no reason we can't work with industry to get that out there.

03:42:54.940 --> 03:43:05.750
Bass, Randy (FAA)
And and you're realistically industry can do it a lot faster than we can as far as getting transitioning to operations. So I think that's an area that we can work on.

03:43:06.290 --> 03:43:06.910
Bass, Randy (FAA)
Uhm.

03:43:07.650 --> 03:43:20.090
Bass, Randy (FAA)
Government government collaboration whether that's you know within the the US government. You know working with the Weather Service or government to government international. I think there are some opportunities there that we can still.

03:43:20.690 --> 03:43:21.200
Bass, Randy (FAA)
Uh.

03:43:21.830 --> 03:43:22.940
Bass, Randy (FAA)
Like even on.

03:43:23.640 --> 03:43:29.560
Bass, Randy (FAA)
Uhm 2 other areas, I'll I'll finish up real quick that I didn't really see mentioned here.

03:43:29.750 --> 03:43:43.890
Bass, Randy (FAA)
Uh was the acoustic measurements of turbulence. I I think that's an area that I kind of find interesting. I'd like to see more about that and and maybe that's something you know, we can uh in the FAA can take a take a look at.

03:43:43.940 --> 03:43:53.290
Bass, Randy (FAA)
Uh we, we've we've heard about it. We've been approached about it. We haven't done anything with it, but but it still seems to be an interesting concept, and I'd like to to.

03:43:54.940 --> 03:44:02.990
Bass, Randy (FAA)

Maybe some future opportunities there and then the final thing and and Bob touched on this one as well. A little bit. There's lots of discussion on a?

03:44:03.660 --> 03:44:27.250
Bass, Randy (FAA)
And research on turbulence for conventional aircraft at conventional altitudes, but really the future challenge is going to be low level turbulence for and boundary layer turbulence for uas and Umm operations and that's I think that's going to be the big key, especially in the next 2 to 5 years or or now for the next 5 years or so, so with that I'll I'll close and.

03:44:28.160 --> 03:44:30.390
Bass, Randy (FAA)
Headed out or hand it off to the next person.

03:44:31.990 --> 03:44:40.600
Flowe, Tammy (FAA)
Thanks Randy yeah, yeah, you get on a couple of things that I really felt is important is the uas aspect of themes.

03:44:32.330 --> 03:44:32.550
Bass, Randy (FAA)
Right.

03:44:41.160 --> 03:44:41.820
Flowe, Tammy (FAA)
Uhm.

03:44:42.810 --> 03:45:02.410
Flowe, Tammy (FAA)
As you know data sharing data sharing is extremely important, and I think we need to to work on that a little bit more so having said that my next speaker. The next panelist is Brent King from the International Air Transport Association. I oughta know Brent. I'm gonna turn it over to you.

03:44:59.360 --> 03:44:59.960
Brent King
Teacher.

03:45:03.590 --> 03:45:20.760
Brent King
Hi Tammy, hi everyone, good afternoon, thanks very much for the invite I might be the lone Kiwi on this call today. So they have a change of accent for most of you. We do have a habit of talking very quickly so raise your hand and tell me to slow down if it's it's a bit that quick.

03:45:21.710 --> 03:45:40.840
Brent King
First of all really congratulations on a on a wonderful workshop. You know, there's an incredible amount of knowledge. Understanding education in the United States or around turbulence. Yeah, you know you've obviously been involved in this you know since back in the 60s at all beyond I think.

03:45:41.820 --> 03:46:03.530
Brent King
In terms of ER as a as an intensity metric anyway, and and the industry. You know as this paradigm shift moving from the what we call the subjective to the objective is is really started to take place. I think from an airline perspective over the the last 4 years or so since we started the involvement with IR to with with a few of the American carriers and.

03:46:04.190 --> 03:46:35.430
Brent King
You know, Nathan Steve Math, Stephanie, even Martin Gerber from Swiss you know they've all been involved from from the outset and you know, we've really learned a lot from them. But it's just once again to stress just the depth of knowledge. You know look at United. Even probably American and Delta running 3 or 4 different metrics of turbulence. You know one subjective and and 3 objective in a Nathan really hit the nail on the head at the moment regarding the challenges you know, I have a pilot background so I have a realtor.

03:46:35.480 --> 03:47:06.010
Brent King
Operational focus like Martin and Stephanie Nathan etc. So you know trying to correlate those different data points into one usable metric is something we really we really need to get done and and not only that we need to make sure that our air traffickers, are seeing the same information that the pilots are are seeing where possible as we move to trajectory based operations. I I believe it's vital that you know? Our traffic or friends or are also able to anticipate.

03:47:06.230 --> 03:47:36.640
Brent King
Maybe even at times what we might be about to to request in the flight deck. But I I think this whole thing goes a lot further than just commercial aviation and and Jim Doyle had me shaking a bit yesterday. When I was talking about mountain wave. I I started learning to fly in the mountains of New Zealand at the Southern Alps and the Norwester and New Zealanders. There's quite lethal if you're on the lead on the on the eastern side where I learned to fly and a couple of times I I believe I was closer to death in either.

03:47:36.800 --> 03:48:07.690
Brent King
You know a little Tomahawking, PA 38 or even an Iroquois military helicopter will when I flew them. So you know, I I think sharing best practices educating pilots from a young age or or early on, and giving them the products and and letting them start to learn these types of skills with these sorts of evolving products that is really important because a lot of them end up in the commercial world. So I believe education is key. It's something we take very seriously at IR to especially as it comes to educating them about edr you know when I joined out right.

03:48:07.740 --> 03:48:31.950
Brent King
I didn't know a thing about a mile. I was light moderate severe and and something in between when I was flying my ever say 350 so you know it's education. We have to keep working on that. We have to keep growing data in the data sparse regions of the world and it's something we've really focused on the

last 4 years. Over the konis you know you have great data. We've started expanding it in South America and Asia and you know just trying to create more and more data points and.

03:48:32.570 --> 03:49:03.380
Brent King
I think I should uh Nathan Monday boy, I don't want to be seeing all these data points on the flight deck. You know, we've got to start aggregating them You know heat mapping them or whatever, but you know, depending on how you use it operationally and see the strategic or tactical and the weather integrators now is starting to do a great job and I think that's where what we've decided that I arteries look. Let's just provide them with the points. The researchers that metrologists are scientists. The integrators let them take the data and work with it. However, they need to to to gain the operational benefit? What whatever it may be so.

03:49:03.740 --> 03:49:33.310
Brent King
You know everything I heard today, I I over the last 3 days. Is is is really encouraging a lot of the science. Obviously, I don't understand with my pilot background, but obviously some very clever people working on some of these problems and and I are we look forward to being a part of it going forward. Obviously we run the turbulence aware repository and just to clarify one thing about the data. It's not a artist. We have no exclusivity over it. It's it's the airlines data they established the data governance policies.

03:49:33.840 --> 03:49:54.430
Brent King
They created them approve them and there are very strict rules around around sharing that data but when we're allowed to share it. We we, we certainly do obviously so going forward. We're gonna look to grow that data and make it available to to as many as possible to to improve the the various products to to stop the injuries to the crew and the passengers going forward thanks Tammy.

03:49:57.000 --> 03:50:07.390
Flowe, Tammy (FAA)
Thank you Brent that that was very good. Thank you and thank you for clarifying the the proprietary nature of the data so that is a challenge for us.

03:50:07.520 --> 03:50:10.270
Flowe, Tammy (FAA)
Uhm as we you know move forward.

03:50:10.990 --> 03:50:19.680
Flowe, Tammy (FAA)
So I I will just throw that out, there, so the next person on my list is Matt Strahan and and Matt I don't see you on my.

03:50:20.400 --> 03:50:24.790
Flowe, Tammy (FAA)
Camera so I I think you're online, though right.

03:50:21.880 --> 03:50:22.250
Matt Strahan (Guest)
Right.

03:50:25.430 --> 03:50:35.580
Matt Strahan (Guest)
I'm here and it's weird 'cause I can see myself on this screen. But apparently nobody else can see me so. Y'all are lucky enough to look at me, but if you can hear me that's good.

03:50:36.230 --> 03:50:36.800
Matt Strahan (Guest)
Uhm.

03:50:37.710 --> 03:50:44.240
Matt Strahan (Guest)
So I'm the operational forecaster here, I guess I worked for the National Weather Service Aviation Weather Center.

03:50:45.950 --> 03:50:52.780
Matt Strahan (Guest)
But I travel around the world and it's really neat to be in a conference again with a lot of people that are all doing the same thing.

03:50:53.600 --> 03:50:56.350
Matt Strahan (Guest)
And I've noticed we are all doing the same thing.

03:50:57.810 --> 03:51:09.390
Matt Strahan (Guest)
Most of us are kind of working with turbulence like the way we used to work with convection. We're developing diagnostics or parameters to forecast where it might be.

03:51:10.380 --> 03:51:12.210
Matt Strahan (Guest)
That we're not really resolving it.

03:51:12.930 --> 03:51:22.740
Matt Strahan (Guest)
They don't have the equivalent of a convective allowing model like we do now, with convection, so it was really, really good to see.

03:51:22.800 --> 03:51:31.320
Matt Strahan (Guest)
Come some effort being made to do so actually resolving small scale turbulence like on an urban scale.

03:51:32.040 --> 03:51:37.530
Matt Strahan (Guest)
And that that kind of thing is what's definitely going to be needed to support.

03:51:38.250 --> 03:51:44.130
Matt Strahan (Guest)
The UAV art type operations so that was really nice to see.

03:51:44.180 --> 03:51:45.490
Matt Strahan (Guest)
Be a man.

03:51:46.150 --> 03:51:49.910
Matt Strahan (Guest)
What's even better is improved observations, we're starting to see?

03:51:50.540 --> 03:52:07.410
Matt Strahan (Guest)
I even though there's still some issues with sharing them. They're starting to come online. But what's really missing in needed for the future is something besides aircraft based observations, we need some satellite based observations of turbulence.

03:52:08.270 --> 03:52:23.740
Matt Strahan (Guest)
Radar it's out there a little bit with the Nexrad but it's it's not really good enough in clear air to be useful then maybe there's rare on you know on board radar techniques for for looking ahead, it ordnance.

03:52:25.160 --> 03:52:31.340
Matt Strahan (Guest)
But we definitely need a more complete observation. Ull data set in order to improve our forecasts.

03:52:32.390 --> 03:52:35.640
Matt Strahan (Guest)
To the point where they're they're really, really useful.

03:52:36.470 --> 03:52:41.630
Matt Strahan (Guest)
And when we get there, you know forecast is useful if it doesn't trigger an action.

03:52:42.970 --> 03:52:47.760
Matt Strahan (Guest)
And we we heard a little bit about today, we heard about the.

03:52:48.420 --> 03:52:56.490
Matt Strahan (Guest)
Capabilities being developed to upload it if you know how I'm alert based on a forecast to the aircraft.

03:52:58.510 --> 03:53:14.420
Matt Strahan (Guest)
That that sort of automated alerting is is coming. It was good to see that I had seen a presentation from before covid goudam from Southwest Airlines Southwest South South African airlines where?

03:53:15.410 --> 03:53:23.350
Matt Strahan (Guest)
They had studied what the forecast look like every time a pilot turned those seatbelts. I did see plus sign on.

03:53:24.180 --> 03:53:53.350
Matt Strahan (Guest)
And they did this for every type of aircraft. They operated and they operator wide range and they discovered that there was a threshold that had to be hit that you know the pilot who consistently turn the seat belt sign on that threshold was different. For every type of aircraft. So then they're able to automate automatically alert the pilot that hey. The forecast says. You you're going to have turned seat belt sign on because you're approaching the threshold for that aircraft.

03:53:54.160 --> 03:54:01.470
Matt Strahan (Guest)
And that made the Palace decision making about seatbelts so much easier and faster and proactive.

03:54:02.100 --> 03:54:19.030
Matt Strahan (Guest)
And I asked him I said, well have you thought about just automating the seat belt sign and like well. I'd be really, really great you know we could tie that seat belt sign to the forecast or observations from other things. But the the course electronics onboard aren't aren't there yet, so let's do that.

03:54:19.960 --> 03:54:25.870
Matt Strahan (Guest)
But that's the sort of action that has to start coming you know as the forecast start getting better.

03:54:26.490 --> 03:54:35.770
Matt Strahan (Guest)
So I I think it was good to see all this talking about improving. The forecast getting down to where we can resolve turbulence and and then take take action.

03:54:37.100 --> 03:54:39.640
Matt Strahan (Guest)
And with that I'll turn it back over.

03:54:41.610 --> 03:54:50.040
Flowe, Tammy (FAA)
Thanks Matt so I I agree that I think where we need to be focused is on actionable information.

03:54:51.070 --> 03:54:52.880
Flowe, Tammy (FAA)
So I think that's a very good point.

03:54:53.620 --> 03:54:59.590
Flowe, Tammy (FAA)
Uhm so the Next One Up is Matthias Steiner Matias. I'll turn it over to you.

03:55:01.070 --> 03:55:30.060
Matthias Steiner (Guest)
Great thank you and and thank you. All for stimulating 3 days. I really enjoyed seeing the research. That's being done? How things getting into operation and also how do you information is actually used in the practical decisions in the cockpit door in dispatch in different areas, we already heard about mentioned about more observations and I want to harp again about that.

03:55:30.120 --> 03:56:01.190
Matthias Steiner (Guest)
Because it's not just more observations that it helps the scientific understanding of the environments and I'm particularly talking here. Low altitude and high altitude in the stratosphere, where we have very limited observations and anything else we can get is definitely going to be making a big difference in advancing the science and ultimately also then to validate forecasts that are being generated to guide the evaluation operations.

03:56:02.200 --> 03:56:32.490
Matthias Steiner (Guest)
In order to use these observations also in in the traditional airspace. It was mentioned many times. We need to harmonize these various metrics that are out there that give us an indication of turbulence and and that's key because it really enables better use of the information that is out there, but we need to understand what the different metrics really mean or D uncertainties. But if we can calibrate that in a good way.

03:56:32.730 --> 03:56:39.250
Matthias Steiner (Guest)
I think this goes along a long distance in opening up more information, too.

03:56:39.300 --> 03:56:48.590
Matthias Steiner (Guest)
You have to validate models to enhance now cast guidance and and makes safer operations based on that.

03:56:49.560 --> 03:57:19.170
Matthias Steiner (Guest)
Now this forecast guidance is actually let me step back and throw one more in there. We also talked about turbulence kinetic energy that the model is predicting we need to throw that in the hopper too. In terms of harmonization? How is what the model produces you know matching up with? What these different metrics are and yes, we can diagnose Eddy dissipation rate off the model, but somehow we need to get the turbulence kinetic energy into the mix there as well.

03:57:20.270 --> 03:57:50.680
Matthias Steiner (Guest)
And then once we have this guidance. We understand the observations, we understand what the models are doing. How do we translate that back into those various types of aircraft that are out there and it's not just the large transport deviation. It's the general evaluation and it's these new entrants that I showed you know, there's so many different types of Rotorcraft Filth Rotors fixed wing as some of them are evolving so rapidly.

03:57:50.820 --> 03:58:21.270
Matthias Steiner (Guest)
We don't know how they behave what is relevant for them in terms of their weather sensitivities. We need to understand this better ultimately to be able to translate what the atmospheric state is what the operational impact is on a flight path on a mission etc. And when you look at some of these aircraft that are used as pseudo satellites in the stratosphere, very delicate solar powered aircraft, but they don't.

03:58:21.570 --> 03:58:51.840
Matthias Steiner (Guest)
Space appear up here up there in the stratosphere. They actually have to start at the ground level and go through the troposphere get up there and then return back down. So there is a lot of hazards along the way and also on the operational deployment up in the stratosphere through gravity waves generated by mountains by Thunder storms that propagate up into the stratosphere, and pose hazards, etc, so there's a lot to be done.

03:58:52.050 --> 03:59:00.480
Matthias Steiner (Guest)
In terms of understanding, these things and once we understand it how to translate it into something that is more actionable.

03:59:01.400 --> 03:59:32.090
Matthias Steiner (Guest)
And I'm also thinking and that didn't come up, too much in the last 3 days as when you think about these emerging physical designs. They rely more and more on automation and ultimately autonomy. There's no more pilot in the cockpit there is some you know suite of algorithms and sensors that guide. These aircrafts, which may be a human over the loop on the ground that doesn't experience what's going on at the aircraft.

03:59:32.150 --> 03:59:53.570
Matthias Steiner (Guest)
Itself and that it requires a lot of understanding what the sense data mean the quality control and how to smartly use that data to safely guide the aircraft for its mission. So I think these are just some of the points. I would like to bring up at this moment. Thank you back to your 10.

03:59:53.920 --> 04:00:05.180
Flowe, Tammy (FAA)
So thank you Matthias and so I you know that is one thing that I feel like we kind of a let down and this workshop is is the uas.

04:00:05.990 --> 04:00:12.180
Flowe, Tammy (FAA)
Uhm aspect of turbulence, I think that that is something that we need to spend a little more time.

04:00:12.990 --> 04:00:17.870
Flowe, Tammy (FAA)
Uhm working on researching on and so Randy there, you go.

04:00:18.880 --> 04:00:19.220
Flowe, Tammy (FAA)
So.

04:00:20.440 --> 04:00:25.680
Flowe, Tammy (FAA)
Alright so Next up? Is I'm sorry go ahead Randy.

04:00:22.940 --> 04:00:23.240
Bass, Randy (FAA)
Hey.

04:00:23.830 --> 04:00:24.490
Bass, Randy (FAA)
Hey Tammy,

04:00:25.210 --> 04:00:31.050
Bass, Randy (FAA)
Tim Tammy realistically you could probably do a separate workshop just on uas charges.

04:00:29.620 --> 04:00:34.880
Flowe, Tammy (FAA)
I I could I could I could spend 3 days, easily on that you're absolutely right.

04:00:35.170 --> 04:00:37.720
Bass, Randy (FAA)
Just just make just make sure Kevin Johnston helps you.

04:00:39.140 --> 04:00:47.520
Flowe, Tammy (FAA)
Yeah, alright so let's move on to. I think Matt Fronsac is our next speaker on the panel so please. Matt take it away.

04:00:48.240 --> 04:00:53.870
Matt Fronzak
Thank you Tammy and thank you. Everybody yeah, I I've through the last 3 days. I've felt like.

04:00:53.920 --> 04:01:25.330
Matt Fronzak
Uhm the kid whose parents take them into as a kid. It doesn't have to be really high class but a good you know smorgasbord type restaurant and and everything out there is, is really delicious and you wanna go sample. Everything and there's just so much to to sample that you pretty much can't figure out what to latch onto first well. There's been 3 days of excellent presentations that that that have been have been just I haven't known which one.

04:01:25.880 --> 04:01:56.860
Matt Fronzak
You know exactly which point to grab onto and latch onto and and think about more than any other so, so that's my very long winded way of saying Congratulations to all the presenters. I found your your your

presentations to be just marvelous across the board and Brent. You talked about turbulence in the in the US since the 60s and and my my background there. No, I was not there, providing turbulence forecasts for orbital in in and Wilbur back in the days.

04:01:56.900 --> 04:02:08.780
Matt Fronzak
However, comma, I was at the same organization that Stephanie clip fell now work works for providing turbulence forecast back in the late 1970s early 1980s.

04:02:09.170 --> 04:02:27.280
Matt Fronzak
Uh with with with one 100th the information and one 100 for knowledge that that we have today and and it's just so neat to to to see how far the science has gone and and and yet at the same time.

04:02:27.930 --> 04:02:59.750
Matt Fronzak
Understand how wise some of the really wise persons like our our Delta meteorology boss. CL Chandler were 22 atmospheric turbulence and so in many ways, it's a little bit of a homecoming for me, but I don't wanna. I want to talk about that. But I do want to talk about are some things that I heard over the last 3 days that were of interest to me and Randy you're you're spot on Bob Sharman. Basically, you know, he he nailed this so there's going to be a lot of captain obvious in here.

04:02:59.800 --> 04:03:31.330
Matt Fronzak
But I I I wanted nonetheless to to to just just pull out a couple of things I heard that we have a special interest to me. Matt Strahan, who was The Who was the the first speaker based on the revised schedule talked about the use of air aircraft based observations for both turbulence and other key atmospheric parameters and we've heard a lot about that over the last 3 days, including the need for additional information in these in these missing areas or the atmosphere, especially near the planetary boundary layer.

04:03:31.380 --> 04:04:03.900
Matt Fronzak
Or are are are are emerging aircraft types that also was the first to bring up the use of probabilistic forecasts of turbulence and other atmospheric parameters of interest to the aviation community and that theme was repeated several times over the next couple of days. I was especially interested to hear Dean Locket talk about the new WMO day of policy and and the importance of global not just regional observations and especially from aircraft and I was also glad Brent because I I would have otherwise.

04:04:03.950 --> 04:04:23.180
Matt Fronzak
Probably inadvertently taking you to task glad to hear Brent mentioned that I Otta manages the data. But they don't own the data or set the rules for the turbulence data and you know what airlines if you want better turbulence forecast. Then you better. Open up that turbulence data to everybody and you can you can help I ah to make that happen?

04:04:23.400 --> 04:04:26.060
Flowe, Tammy (FAA)
Hey man, Alright Tammy says Amen.

04:04:26.490 --> 04:04:26.840
Matt Fronzak
OK.

04:04:27.870 --> 04:04:51.960
Matt Fronzak
Uh Steve Bradford talked about connected aircraft. We really didn't talk a whole lot about connected aircraft. There were several references to information going from the air to the ground back up to the air. There were also a couple of references of aircraft to aircraft type transmissions through a DSB in type capabilities, but I think this is going to at the end of the day be something that we're going to want to explore more.

04:04:53.040 --> 04:05:23.030
Matt Fronzak
I'm Steve also talked about the relationship between turbulence and Pireps and and I have a lot of skin in that latter pireps game and so as a matter of fact at the end of this meeting. I'm going to a meeting with Steve Bradford talked about Pireps and so I heard a lot of interesting angles explored in that particular arena. Matias talked about impacts being vehicle specific and not generic and this is so, so important. I know there's a lot of there's a there's a lot of desire to to create.

04:05:23.090 --> 04:05:53.100
Matt Fronzak
Things that are are widely applicable and generic. But if if you make it so widely applicable and generic. You're gonna miss some key components that apply to certain subsets of of the vehicles and you've got to get down into that vehicle specific or location specific or or or or parameter specific information to be truly useful to your customers materials also talked about the need to be able to talk freely about needs and requirements and limitations among.

04:05:53.150 --> 04:06:18.120
Matt Fronzak
Organizations commercial public, private and and in the in the area of Aviation Safety as it relates to atmospheric conditions. We need to get over this and and just and do this on a full time basis. John Williams went into the probabilistic turbulence information again, which which I found so fascinating and he talked about the shapes of the PDFs and how how you could have the same.

04:06:18.190 --> 04:06:35.530
Matt Fronzak
Uh I mean value of turbulence, but completely differently shaped PDFs, which have significant implications to the likelihood of of some of your tail conditions and we're especially interested in these tales severe or extreme turbulence conditions.

04:06:35.880 --> 04:06:54.970
Matt Fronzak

Uhm Nathan Doble. This this morning I talked about about turbulence, causing more part 120 at 1:00 accent is than any other cause and almost all of those accidents, were based on the injury classification versus the aircraft damage classification. And if we if we need anymore. Motivation for doing what we're doing right now, I don't know what it is.

04:06:55.540 --> 04:07:25.880
Matt Fronzak
Uhm Matt Strahan talked or asked a question about the cost of turbulence encounters. We had an IOU to through return back to that and look into that, if possible, Larry Korman. I I love. I love. I love the stuff you're working on with a DSB derived turbulence and I especially loved that, it was generated by the last workshop, which was held at Mitre and by Golly. We tried everything but an act of Congress to get this one. This terminals workshop for also to happen at the Mitre campus.

04:07:25.930 --> 04:07:30.860
Matt Fronzak
And for for reasons that you all are way, too familiar with, we just couldn't quite get there.

04:07:28.300 --> 04:07:28.770
Flowe, Tammy (FAA)
Ah.

04:07:30.780 --> 04:07:33.150
Flowe, Tammy (FAA)
Unfortunately, it just didn't happen.

04:07:33.930 --> 04:08:04.730
Matt Fronzak
Yep, and then Larry also talked about aircraft scaling, which goes back again to Matthias Matthias is observation, then impacts or vehicle specific and not generic. Nathan Nathan Polderman If I'm going to take away a quote and I'm paraphrasing you hear this. This is my quote of the of the conference. If all the good new information and work that we do doesn't result in improved aircraft safety and turbulence, then we failed and you're right on the money with that. Bob you said. We can't mitigate turbulence. I agree but we can't reduce impact of turbulence and that's what we're working at.

04:08:05.010 --> 04:08:34.460
Matt Fronzak
Bob Sherman and and just to put a little time piece on this. I first saw that Todd Lane at all 2003 animation about the overshooting tops gravity waves in 2003 right after it came out while I was working on an airline meteorology group at the same airline that Stephanie is now a member of the airline meteorology group of so it's almost 20 years. We've been messing with this with airline meteorology groups and we still have the problem. We gotta get after those folks, but

04:08:35.050 --> 04:09:06.100
Matt Fronzak
from this, this overall area. I've extracted what I consider to be kind of higher level areas of future interest that affect not only turbulence, but aviation weather as a whole and as as many of you know, I'm kind of A and aviation weather person not just a turbulence person. So so I've I've taken some of

these and and applied them into the broader aviation weather space 0.1. We need more in situ observations, and we need them. Now, with capabilities like a BSD derived turbulence and the hand.

04:09:06.150 --> 04:09:40.140
Matt Fronzak
Enhanced surveillance wins there's a future in which we'll have significantly more atmospheric information than we do today and I know we all say this but it's it's really literally right around the corner. But if we don't build the infrastructure to effectively use the information on the ground ground to ground and ground back up to air it will all be for not so we, we don't we can't forget about needing to have the stuff on the ground to pick up this information and do the right things with it second probabilistic turbulence forecast to me seem to be an area ripe for a lot of further exploration of leveraging.

04:09:40.650 --> 04:10:10.920
Matt Fronzak
But to me, it's as obvious as the nose on my face that if you give probabilistic weather forecast information being of turbulence or anything else directly to human decision makers. It is an ineffective use of that information. You need the decision support tools and a complimentary decision making processes that can most effectively use the probabilistic forecasts be they have turbulence or surface winds or any other aviation weather component 3rd and then I'm done. There's a lot of information in that the commercial?

04:10:10.970 --> 04:10:36.900
Matt Fronzak
Organizations can and should consider proprietary but turbulence information should not fall into that category. We need to create and use a global publicly available. No cost turbulence information database sooner rather than later. And in the self admitted shameless plug. I would propose that the FAA the science system can serve as an excellent model of how such a data. They should both be constructed and managed and I'm done Tammy. Thank you.

04:10:38.220 --> 04:10:41.700
Flowe, Tammy (FAA)
So I I am gonna you know.

04:10:43.390 --> 04:10:46.960
Flowe, Tammy (FAA)
I'm gonna jump on your bandwagon here and that.

04:10:48.010 --> 04:10:52.150
Flowe, Tammy (FAA)
Safety information is safety information and we should not.

04:10:53.920 --> 04:11:01.450
Flowe, Tammy (FAA)
Yeah, we, we should not hide that from anybody. I mean that that's just it. I mean that's Tammy opinion that's just Tammy.

04:11:02.650 --> 04:11:12.970
Flowe, Tammy (FAA)
So I'm gonna UM turn it over to my last panelist right now and that's Tim Miner from Merican so Tim take it away, please.

04:11:13.270 --> 04:11:42.870
AAL - CA Tim Miner (Guest)
Thank you very much and I really appreciate the opportunity to chat with you just a quick update it. Yeah, this year. I did turn 65. So I had to hang up my flying Spurs. But the American wants to use my 30 years of back continuous work in the aviation world and has allowed me to keep going with them to code lead our turbulent. Our national turbulence task force that American Airlines. However, I still have.

04:11:43.370 --> 04:11:56.430
AAL - CA Tim Miner (Guest)
From my licenses and and uh and I'm now a part 107 for those of you who know what that is. I've now drone operator as well. And so now I have that and are working on that background as well, then.

04:11:57.320 --> 04:11:59.900
AAL - CA Tim Miner (Guest)
With the largest fleet of small uas is.

04:12:00.870 --> 04:12:08.890
AAL - CA Tim Miner (Guest)
And the largest fleet assessing aircraft with the Air Force Auxiliary of Civil Air Patrol so I continue to contribute that way.

04:12:09.390 --> 04:12:09.870
AAL - CA Tim Miner (Guest)
Uh.

04:12:11.070 --> 04:12:20.270
AAL - CA Tim Miner (Guest)
My perspective here is it certainly comes from that aviator and when Brent said it well that you know, we talked about.

04:12:20.760 --> 04:12:41.590
AAL - CA Tim Miner (Guest)
I am really enjoying all the science that happened today, but and some of it was understandable and some of it was not. I wanna convey to you, that ultimately turbulence is a people issue because I can have the very best forecast I can have the very best models out there.

04:12:42.740 --> 04:12:55.640
AAL - CA Tim Miner (Guest)
But unless you give me the pilot the right information at the right time in the right way, so that I can make the right decision and then turn around and communicate it to the back of the aircraft in the right way, at the right time.

04:12:56.320 --> 04:13:16.180
AAL - CA Tim Miner (Guest)
Uh so that they can make the right decision and then we've kind of failed and so that's ultimately, it's about people and so that's where American Airlines and our turbulence task force is going right now and I. I do want to throw in that people issue and people policies and and and what's going on.

04:13:17.200 --> 04:13:35.120
AAL - CA Tim Miner (Guest)
The real goal for us is what's called seat belt, reliability, which is why when you talked about automated automated seat belt, turning on and off by some other algorithm. I wanted to scream because our goal is seatbelt reliability.

04:13:35.590 --> 04:14:06.060
AAL - CA Tim Miner (Guest)
Uh the passengers in the back need to respect the seat belt sign and if you just throw it on based on an algorithm and and A and you throw it on incorrectly they will learn to just disrespect. The sign and that's not safe, which is why again the right person on board, making the right decision is probably our best bet for now to keep going. American Airlines were like United.

04:14:06.110 --> 04:14:11.690
AAL - CA Tim Miner (Guest)
We are just a data rich environment and remember this is about people keeping people involved.

04:14:12.880 --> 04:14:15.970
AAL - CA Tim Miner (Guest)
I don't have an edr meter in my cockpit right now.

04:14:16.720 --> 04:14:47.930
AAL - CA Tim Miner (Guest)
And that's a That's a significant issue because you're trying to re calibrate me I. I don't even have in our our primary wins providers are MSG. I don't have an arm. SG meter in my cockpit either. And so I need to re calibrate myself as an aviator to what's going on there and to create this more objective measurement of of the atmosphere. I really, really am really excited about the iPad app that we're really.

04:14:48.580 --> 04:14:56.380
AAL - CA Tim Miner (Guest)
Working for and with that at American much like United and again, it does. Give me that that meter in my cockpit.

04:14:57.230 --> 04:15:28.500
AAL - CA Tim Miner (Guest)
Or at least a more standardized metric visible and I can watch. Things change, I can watch colors happen instantaneously and I can begin to calibrate myself as an aviator. I love the instant feedback of that kind of a system when my wife and I drive down the road we use ways. And so we're very keen on that kind of instant feedback and participation in the in the feedback loop here and and keeping the aviators engaged.

04:15:28.550 --> 04:16:00.140
AAL - CA Tim Miner (Guest)
Allows a better transmission. I think have information ultimately this is going to come down to people policies and that's again something critical to us that we're working on and focusing on an American. When do we see our flight attendants. We've created the idea of not only a pre brief on the ground for the way up with our flight attendants. But a mandatory brief at before the top of dissent on the way down to re calibrate our our of the folks in the back of what's going on.

04:16:00.290 --> 04:16:25.940
AAL - CA Tim Miner (Guest)
What can they expect within actionable time not just sometime on dissent this will happen because our flight attendants really don't have that ability to gauge we need to give them an exact time in 10 minutes. You need to be in your seat with everybody down Ala Carte Stowed. Things have to happen before a certain time and at that time. Nobody else gets up and that these are where we're going with our people policies.

04:16:26.700 --> 04:16:51.330
AAL - CA Tim Miner (Guest)
To make all the great science, you've talked about happened and and and preventing turbulence injuries, which is our metric for success in turbulence and Interestingly enough a compliance checks and the and the and the flight attendant having to do a mandatory compliance check has a real stumbling block for us because marketing wants to market gate to gate Wi-Fi.

04:16:52.170 --> 04:16:52.770
AAL - CA Tim Miner (Guest)
So.

04:16:53.890 --> 04:16:59.950
AAL - CA Tim Miner (Guest)
If I turn on that seat belt sign and I tell the flight attendants to prepare for landing at 30,000 feet.

04:17:00.650 --> 04:17:14.710
AAL - CA Tim Miner (Guest)
Their compliance check is to go back and tell all the people with who are watching their movie or finishing that presentation that you have to give as soon as they land to turn off that computer turn off your Wi-Fi capability.

04:17:15.680 --> 04:17:34.970
AAL - CA Tim Miner (Guest)
And that creates a marketing issue for us, so we have that dynamic of marketing wanting gate to gate. WiFi the FA mandating. When our flight at that hour flight attendants have to get up and check and me, as a pilot, saying no keep yourself in the seats for the remainder of the flight and so we're working on the policies.

04:17:35.360 --> 04:17:38.290
AAL - CA Tim Miner (Guest)
Uh that are that help us to really.

04:17:39.010 --> 04:18:07.020
AAL - CA Tim Miner (Guest)
Create the safest airline experience while giving our passengers. There's money their money 's worth in our terms of entertainment and in terms of use of our their WI. Fi and connectivity to the ground so these are some of the people policies that are the ultimate end game of everything you've been talking about for for the last 3 days from the perspective of someone who's in the air so. Thank you for the chance to share and I look forward to to talk.

04:18:10.110 --> 04:18:12.700
Flowe, Tammy (FAA)
So thanks Tim I was just typing a question.

04:18:14.210 --> 04:18:25.380
Flowe, Tammy (FAA)
And I didn't get a chance to finish it so you. You talked about regulatory issues So what regulatory issues would you recommend?

04:18:26.120 --> 04:18:28.880
Flowe, Tammy (FAA)
Uhm that the FAA Institute.

04:18:30.270 --> 04:18:43.490
AAL - CA Tim Miner (Guest)
One of the real big things we would love from the from American Airlines. Perspective is too if I say prepare for land prepare for now for landing up at 30,000 feet.

04:18:44.140 --> 04:19:11.670
AAL - CA Tim Miner (Guest)
Uh I'd like our flight attempts to stay in their seats. But I'd like I'd like us to be able to make a PA in the back that says OK people. You're on your own best honor shut down your shut down your your computers as we get closer or as we start to approach it so that our flight attendants don't have to get up and don't have to to check every seat seat belt sign on there at the closer we get to where we think the turbulence is going to.

04:19:10.520 --> 04:19:22.240
Flowe, Tammy (FAA)
So So what I have? What what I have heard from my flight attendant colleagues is that they are under pressure from their airlines.

04:19:13.740 --> 04:19:14.120
AAL - CA Tim Miner (Guest)
Yes.

04:19:22.900 --> 04:19:23.770
Flowe, Tammy (FAA)
2.

04:19:25.220 --> 04:19:28.390
Flowe, Tammy (FAA)
To keep the service going as long as possible.

04:19:30.770 --> 04:19:37.840
Flowe, Tammy (FAA)
So that's what I've heard from my airline colleagues so how do you how do you justify that with your airline?

04:19:38.750 --> 04:19:50.530
AAL - CA Tim Miner (Guest)
And again that is that is marketing. Our marketing Department and our safety Department and our flight depart flight Department all working together for? What is best for the airline ultimately?

04:19:50.900 --> 04:19:52.360
AAL - CA Tim Miner (Guest)
Uh uh.

04:19:54.150 --> 04:20:07.460
AAL - CA Tim Miner (Guest)
The FAR is allow the captain to be the Master and commander to deviate when necessary, and to be the ultimate responsible person in the air for the safety of everyone.

04:20:07.970 --> 04:20:17.820
AAL - CA Tim Miner (Guest)
Uh and I think that it for us. It is a matter of educating our pilots at American Airlines to make sure that they are.

04:20:18.730 --> 04:20:36.380
AAL - CA Tim Miner (Guest)
Uh helping communicate as much information as possible, but when necessary, seed in the flight attendants and telling the passengers as it is for the air free. The good of the safety of everybody on board. I never once had a I had a passenger.

04:20:36.790 --> 04:21:02.220
AAL - CA Tim Miner (Guest)
Uh ever leave my airplane and say you know, I'm really upset that use at our flight attendants down at 30,000 feet and I didn't get that last drink that I wanted or something like that as long as I told them why they why it was happening that it was for safety and I think that that's part of where we are are going with this is that each flight isn't is different. That's why there has to be a second brief.

04:21:03.030 --> 04:21:03.880
AAL - CA Tim Miner (Guest)
And why.

04:21:04.280 --> 04:21:12.230
AAL - CA Tim Miner (Guest)
Uh everybody needs to be engaged. We need to engage our passengers in the 121 world or in the in the.

04:21:12.280 --> 04:21:12.630
AAL - CA Tim Miner (Guest)
Yep.

04:21:13.900 --> 04:21:27.960
AAL - CA Tim Miner (Guest)
Smaller aircraft or or the private passenger carrying world to the and and we really do need to engage our passengers as much as we engage the flight attendants and the flight crews in this whole.

04:21:28.410 --> 04:21:44.700
AAL - CA Tim Miner (Guest)
Uh working around turbulence and working around and mitigating the injuries that potential from turbulence. You know, we, we, we have. We think we have marketed everybody flying down the Queen QE 2.

04:21:45.640 --> 04:21:56.750
AAL - CA Tim Miner (Guest)
The problem is, it's they're not not every airplane into are not the QE 2 every airplane. We're flying at 6:00 miles above the ground and in a fluid flying up to 150 to 200 miles an hour.

04:21:58.420 --> 04:22:14.900
AAL - CA Tim Miner (Guest)
You know, and and it's not the QE 2 and yet we try to market that kind of experience and I think reasonable expectation is as long as everybody has briefed then we can, we can mitigate that and everybody participate.

04:22:15.030 --> 04:22:20.630
Flowe, Tammy (FAA)
See I see I I think Matt Project really wants to say something here.

04:22:23.230 --> 04:22:28.750
Flowe, Tammy (FAA)
Yeah, no no OK I mean, you have a a daughter, who's a a flight attendant right.

04:22:29.230 --> 04:22:29.820
Matt Fronzak
I do.

04:22:30.690 --> 04:22:32.930
Flowe, Tammy (FAA)
And I you know.

04:22:31.040 --> 04:22:31.400
Matt Fronzak
I don't.

04:22:32.980 --> 04:22:40.730
Flowe, Tammy (FAA)
Uh it, it, it has been my experience, having dealt with turbulence now for 13 years, almost 14.

04:22:41.430 --> 04:22:46.700
Flowe, Tammy (FAA)
Uh with the FAA that the flight attendants are the ones that get hurt.

04:22:48.230 --> 04:22:48.770
Flowe, Tammy (FAA)
Ah.

04:22:48.340 --> 04:22:48.840
Matt Fronzak
Yes.

04:22:49.620 --> 04:22:50.590
Flowe, Tammy (FAA)
So.

04:22:51.790 --> 04:22:57.960
Flowe, Tammy (FAA)
You know what do we do to protect these people I mean? That's what I wanna know I wanna I wanna protect these people?

04:22:59.530 --> 04:23:06.130
Matt Fronzak
Well, I I've I I I hear where Tim you know is going and and.

04:23:07.600 --> 04:23:20.080
Matt Fronzak
I mean that that's that's certainly a possibility. I I will I will observe but but certainly I have not flown as much in the last couple of years as I used to. But even in the last couple of years I would observe.

04:23:20.590 --> 04:23:26.200
Matt Fronzak
Uh that that on the flights that I have been on it has seemed to me.

04:23:26.970 --> 04:23:53.620
Matt Fronzak
Uh on the on the arrow line and I think I can say that that I fly on because as a as a retired airline employee. I pretty much fly exclusively on that airline that that the flight attendant stay seated longer on climb and are seated earlier in decent then I recall from days of yore. So so that was why I asked definitely the question awhile ago about whether it was processed.

04:23:53.990 --> 04:24:13.870
Matt Fronzak
Uh understanding better forecasts or understanding the impact of turbulence that that that has caused this change. I think there has been a change based on on Stephanie 's reply. I'm going to say that that change was pretty much internally generated at that airline and probably not without.

04:24:14.380 --> 04:24:43.290
Matt Fronzak

Uhm cries of anguish coming from the marketing Department because it meant that that the the service was going to be cut off earlier than than than they had planned and and tint push pull description. There between you know the we're going to provide you with this experience and we're not going to break your leg is a real thing, and and that's why there was a uh turbulence. A Meteorology Turbulence Committee in my airline 20 years ago and there is today because that I've pushed pill.

04:24:44.470 --> 04:24:46.420
Matt Fronzak
Push pull still exists.

04:24:51.160 --> 04:25:11.650
Klipfel, Stephanie
Matt this is stuff, I've been thinking about that and I'm wondering if it if they've noticed that during covid times. Certainly their customer service piece of it has been scaled back right. We're not serving as many drinks were not serving food. Those types of things, so they don't have that pressure to get up and do that customer service. If you notice that trend. Prior to Covid then I'm not sure exactly what caused it.

04:25:12.070 --> 04:25:28.930
Matt Fronzak
Yeah, well uh step my memory is is clearly about 12 and a half seconds. So I'm not sure I can remember pre covid, but but certainly the last half a dozen dozen times that I fly, flied flown. I I would say that it has been noticeable to me.

04:25:29.850 --> 04:25:33.170
Matt Fronzak
The the the IT, it's just been a different vibe.

04:25:33.870 --> 04:25:50.300
Matt Fronzak
Uh you know from as far as when the flight attendants get going when they sit down on dissent and the communication between as best I can observe from my seat in the very rare. The airplane the communication between the cabin in the cockpit I I think it's heightened.

04:25:54.010 --> 04:26:02.750
AAL - CA Tim Miner (Guest)
We certainly are training more and more of our flight crews together at American Airlines were getting the pilots and the flight attendants to talk together.

04:26:03.240 --> 04:26:26.260
AAL - CA Tim Miner (Guest)
Uh so that we can again build that team concept, and we just have to uh. Ropar passengers into that team concept as well. That really is a team up there in the air and information is critical again. Right information right time in the right way. That's actionable is is the most is the key to preventing flight attendant injuries.

04:26:27.000 --> 04:26:33.910
Flowe, Tammy (FAA)
So so I I I will tell you that I have sat next to more than one passenger that I.

04:26:34.540 --> 04:26:35.230
Flowe, Tammy (FAA)
Care too.

04:26:37.010 --> 04:26:39.310
Flowe, Tammy (FAA)
To talk about you know, and

04:26:40.570 --> 04:26:42.890
Flowe, Tammy (FAA)
who refuses to put their seat belt on.

04:26:44.070 --> 04:26:50.690
Flowe, Tammy (FAA)
It's like OK can like like show you the blood on the bulkhead here. This is what's gonna happen to you if you don't have your seat belt on?

04:26:51.760 --> 04:26:52.260
Flowe, Tammy (FAA)
Uhm.

04:26:53.550 --> 04:26:55.280
Flowe, Tammy (FAA)
I I think a lot of it.

04:26:55.890 --> 04:27:07.970
Flowe, Tammy (FAA)
Is not just the flight attendants? I think a lot of it is just educating the flying public so? How do we do that? So that's what I'm I'm asking here? How do we educate the Flying Public?

04:27:10.950 --> 04:27:28.970
AAL - CA Tim Miner (Guest)
Well, I think that's part of our overall goal to as the National Weather Service says create a weather ready nation. So we have to we have to end always show that there are weather impacts and everything. Everything that we do, and that includes the flying experience that flight.

04:27:30.120 --> 04:27:40.450
AAL - CA Tim Miner (Guest)
Uh flying is is it does have weather impacts to it, and and they have to be active participate participants in the process.

04:27:46.530 --> 04:27:48.460
Flowe, Tammy (FAA)
Alrighty then so.

04:27:49.940 --> 04:27:58.730
Flowe, Tammy (FAA)
Steve have had there been any questions come in through the chat room that we can address before we close it up in another 20 minutes.

04:28:00.030 --> 04:28:05.280
Steve Abelman
So so, so I mean, not per say there there's been a lot of there's been some comments.

04:28:06.570 --> 04:28:19.740
Steve Abelman
Uh you know, Matt I I see uh Nathan, pointing out the difference in in time of flight attendants being seated is largely due to dramatic reductions in onboard service by Covid. We've seen a dramatic reduction in flight in injury rates.

04:28:20.410 --> 04:28:24.620
Steve Abelman
Uh as well because of the amount of flying time that was recovered so.

04:28:25.430 --> 04:28:55.680
Steve Abelman
I write I'll do this, once and once only I'll put my opinion in here. I've tried to keep it out, which which is so, so you know, I I'll put a real life example, though and and and so as Tim and others know my my girlfriend and and life partner now is A is an active flight attendant for American and she will tell you unequivocally. She's noticing considerably more interaction between pilots and flight attendants than ever before and is getting seated earlier than ever before, when the crew is concerned this is.

04:28:56.390 --> 04:29:27.000
Steve Abelman
Largely associated with the good work of of this group, I. I really think that this group of folks that have been getting together and Tammy and and Bob and others that started this 678 years ago. You know, some of the good examples of stuff that that's coming out of this, but I'll also point out that that it's not going to be solved solely by proving forecasts and I think the data speaks loudly that a lot of the events that are entering flight attendants are occurring in light light to moderate.

04:29:27.150 --> 04:29:29.600
Steve Abelman
For balance and are occurring in situations where.

04:29:30.320 --> 04:29:40.030
Steve Abelman
Uh you know, we're just not expecting it. We we you know from from a climatological perspective. There wasn't supposed to be turbulence. But one little one little hop one little bump one little.

04:29:40.520 --> 04:29:44.500
Steve Abelman
Uh you know, and so it it's been refreshing for me to hear.

04:29:44.570 --> 04:30:02.320
Steve Abelman
Uhm Katie say, These things you know now that I've been out of the business and she's kind of gone back into it for a while now. So I I can only throw out there that that this group has done great work I&I. Get I think you guys are all responsible for that improvement. I mean, we're we're a long way from being there, but

04:30:03.860 --> 04:30:10.380
Steve Abelman
keep up the good work team and I think it's I think it's helping and I'm I'm kind of stalling 'cause. I'm waiting for questions to come in. I don't see any so.

04:30:11.770 --> 04:30:13.640
Steve Abelman
It you know that God.

04:30:12.150 --> 04:30:12.440
AAL - CA Tim Miner (Guest)
I.

04:30:14.290 --> 04:30:45.300
AAL - CA Tim Miner (Guest)
I was going to bring up that it's you've heard me several times talk about you know this product starts at 18:00, 1000 feet or 20,000 feet or things like that. It's just critical that we go ground to ground a cruise and and and you provide as much information. The whole in the whole flake domain as possible and especially going up and coming down and and so it's not a It's not a cruise function only so as you continue to develop your products and look at.

04:30:45.350 --> 04:30:45.880
AAL - CA Tim Miner (Guest)
Research.

04:30:46.880 --> 04:31:16.810
AAL - CA Tim Miner (Guest)
The better product you can get lower to the ground and give me again. The actionable decision. When can I really let my flight attendants get up to begin that service on that 20 minutes that they had that time in between. These 2 short cities, so that we can still provide the experience that the airline wants and yet keep them safe. So I just need as much information as you as you can give me in a vertical profile.

04:31:17.170 --> 04:31:45.560
AAL - CA Tim Miner (Guest)
And again the the instantaneous feedback of the airplanes around me is just a really important component. Letting me see what everybody else is seeing out there, you know back when we were getting T casts. I was telling Rick Heuwinkel. Can I have one bit, for turbulence and casts just to tell me what my airplane the airplanes around me, he wasn't going to give me that one bit. But now we have the opportunity to do that through some of these other logics.

04:31:43.540 --> 04:31:47.260
Flowe, Tammy (FAA)
Yeah, so, so, so data sharing.

04:31:48.240 --> 04:31:51.250
Flowe, Tammy (FAA)
And in my mind, this is Tammy talking.

04:31:51.920 --> 04:31:57.530
Flowe, Tammy (FAA)
My in my mind data sharing is the most important thing that we can address right now.

04:31:58.450 --> 04:32:05.310
Flowe, Tammy (FAA)
Uh we, we really need to address this up, especially when it comes to safety related information.

04:32:07.230 --> 04:32:09.110
Flowe, Tammy (FAA)
So that's just me talking.

04:32:11.240 --> 04:32:13.410
Flowe, Tammy (FAA)
I I think it's really important.

04:32:12.260 --> 04:32:12.570
Steve Abelman
Yep.

04:32:13.370 --> 04:32:22.150
Steve Abelman
Hey Tammy, built bill has a a point here that I think is worth discussing bill bombing can we focus you know funding research funding on improving.

04:32:22.670 --> 04:32:31.030
Steve Abelman
Uhm light to moderate turbulence as well as improving lower levels not just focused on cruise altitudes and something that maybe a WRP could focus on the future so.

04:32:31.640 --> 04:32:43.530
Flowe, Tammy (FAA)
Yeah, well, I think I think that's a very relevant comment and thank you. Bill UM so when you see my project plan come through the share maybe you'll approve it.

04:32:31.700 --> 04:32:33.270
Steve Abelman
I think a relevant comment.

04:32:45.530 --> 04:32:46.090
Flowe, Tammy (FAA)
Saying.

04:32:46.950 --> 04:32:50.890
Bauman, William (FAA)
Wait, a minute, I always approve your your project plan so if I turned that down.

04:32:51.600 --> 04:33:22.030
Bauman, William (FAA)
But UM you know this, this struck me. Tim you mentioned this at the last workshop. We had in person and you were talking about how well the forecast now are of the higher ends of turbulence. This severe and you guys don't worry about that it struck me until you finished your explanation that it's forecasted so well. It's fairly easy to avoid but the light to moderate. The models don't handle that well, just like any big storm system. The models nail it, they know where the storm is.

04:32:52.160 --> 04:32:52.500
Flowe, Tammy (FAA)
Yeah.

04:33:22.080 --> 04:33:34.430
Bauman, William (FAA)
And and we can forecast snow storms and you know, whatever else but it's those mediocre 2 liter weather events, including turbulence or icing or whatnot that the models have a harder time with.

04:33:32.310 --> 04:33:38.800
Flowe, Tammy (FAA)
0.2, 0.2, 0.2 that's that's the that's the that's the cut off.

04:33:39.470 --> 04:33:47.520
Bauman, William (FAA)
Right so, so that's why, and and Tim what you had said is turbulence isn't your issue. It's it's managing the seat belt sign and I was like what?

04:33:48.550 --> 04:33:52.700
Bauman, William (FAA)
You know now I get it, but back in 2018 or whenever we had the last meeting.

04:33:53.420 --> 04:34:04.960
Bauman, William (FAA)
When you explain it, and walked us. Through it as a airline captain what you were dealing with, and how that worked. It hit me and I talked to Randy about this before, and not just turbulence in a WRP but.

04:34:05.640 --> 04:34:12.300
Bauman, William (FAA)
What specific things should we be focusing on in our weather research program instead of just turbulence icing convection?

04:34:13.300 --> 04:34:21.750
Bauman, William (FAA)
What part of turbulence? What part of convection like we've done with convectively induced convection for the turbulence forecast and things like that. I see Randy he's nodding.

04:34:22.440 --> 04:34:36.690
Bauman, William (FAA)
Uh but we've talked about that and we need to start implementing those sort of things to focus our research on the areas where the real problems, exist instead of as broad as we are. It's not easy to do, but I think that's something we should tackle.

04:34:40.520 --> 04:34:47.840
Steve Abelman
Matt Matt Wonder shouldn't points out, the triggering approached the edr reporting makes research verification of light to moderate turbulence very difficult.

04:34:50.880 --> 04:34:56.240
Flowe, Tammy (FAA)
I I can I can just say that you know from what we've the research we've done.

04:34:57.160 --> 04:35:09.060
Flowe, Tammy (FAA)
Up to this point that 0.2 is the point where airlines make a decision whether or not to avoid a particular reason our particular region so.

04:35:09.670 --> 04:35:13.770
Flowe, Tammy (FAA)
Uhm maybe that's where we need to focus our research. I don't know.

04:35:15.730 --> 04:35:29.850
Flowe, Tammy (FAA)
I mean, nobody I mean, I mean, if you see you know a risk of severe turbulence. You're not going to go there and you're just not going to go there, so maybe this 0.2 is where we need to focus our research.

04:35:38.250 --> 04:35:45.180
Matt Fronzak
And and Steve Doris comment is echoes exactly what I was thinking as we were talking if if if a DSB.

04:35:45.230 --> 04:36:02.120
Matt Fronzak
The weather happens when a DSB weather happens, yeah, you're just going to get all the ERS and the same thing with the ADSB derived turbulence information that that Larry briefed us on it seems to me that.

04:36:02.710 --> 04:36:19.720
Matt Fronzak
Uh we, we had the possibility of having orders of magnitude more information with without the the the

the filters and the thresholds that we use today to to keep comms and costs and and and comms band width down.

04:36:24.660 --> 04:36:38.940
Steve Abelman
Tammy I remember putting something on the back burner, just now that that we maybe have a minute or 2 left to chat with and that that's related to cost I mean, the the cost of these turbulence events to the airlines are staggering. I don't know.

04:36:39.890 --> 04:36:52.370
Steve Abelman
I I know that's difficult information to share because the litigation and everything else. That's involved, but it might be worthwhile to this. I think the question was is there any issue? Is there any information out there and on cost turbulence?

04:36:53.090 --> 04:36:53.550
Steve Abelman
Event.

04:36:54.290 --> 04:36:59.950
Steve Abelman
You know cost sharing and I guess maybe we can open that to to somebody who might might know.

04:37:00.080 --> 04:37:04.540
Flowe, Tammy (FAA)
Yeah, I mean, I I you know, and this is been a challenge for me.

04:37:01.140 --> 04:37:01.640
Polderman, Nathan
Yeah, yeah.

04:37:05.420 --> 04:37:06.000
Flowe, Tammy (FAA)
So.

04:37:05.560 --> 04:37:06.220
Polderman, Nathan
You see it.

04:37:07.880 --> 04:37:31.980
Polderman, Nathan
And this Nathan, UM that's something that we talked about in the it's at the early stages of its at was to come up with a way to to really standardize how we report turbulence injuries and that data and we say data standardization. It's not just automated turbulence. But it's actually all of the data that we collect as an airline about turbulence the airlines report our injuries differently.

04:37:32.370 --> 04:37:43.130
Polderman, Nathan
Uh we some of us categorize injuries a different way than the other there's a lot of variability and so it's

almost apples and oranges when we start talking about you know airline a has X number of injuries airline B.

04:37:44.550 --> 04:37:48.420
Polderman, Nathan
You know, and so there's a lot of issues with our internal safety data.

04:37:48.900 --> 04:38:11.410
Polderman, Nathan
Uh that we've we all share the same kind of issues, so one of the things that we could do is as an industry is come up with a way to standardize the way in which we report turbulence injury related information through standard safety sharing initiatives. I think SIS was mentioned and we do a lot of safety data sharing.

04:38:12.630 --> 04:38:18.430
Polderman, Nathan
So we just we, we all do it differently. So when it comes to turbulence and that's an area that needs to be addressed.

04:38:23.320 --> 04:38:28.210
AAL - CA Tim Miner (Guest)
I can let you know that the average cost of a turbulence injury is 5 figures.

04:38:29.090 --> 04:38:29.750
AAL - CA Tim Miner (Guest)
About that.

04:38:29.270 --> 04:38:31.330
Flowe, Tammy (FAA)
So so.

04:38:31.340 --> 04:38:31.630
Polderman, Nathan
Yep.

04:38:32.310 --> 04:38:32.610
AAL - CA Tim Miner (Guest)
Yep.

04:38:32.410 --> 04:38:33.070
Flowe, Tammy (FAA)
Uhm.

04:38:35.160 --> 04:38:48.350
Flowe, Tammy (FAA)
So turbulence the metric that accepted metric in a world made a larger organization is edr. So why can't we just accept that as.

04:38:49.280 --> 04:38:51.010
Flowe, Tammy (FAA)
The reported metric.

04:38:51.340 --> 04:39:00.770
Polderman, Nathan
Well, I'm remembered Tammy I'm not talking about DDR. I'm talking about our safety data about how we actually classify an injury, so I just want to clarify.

04:38:56.710 --> 04:38:57.010
Flowe, Tammy (FAA)
Work.

04:38:59.580 --> 04:39:00.430
Flowe, Tammy (FAA)
Right right.

04:39:01.360 --> 04:39:07.360
Flowe, Tammy (FAA)
But I I understand that, but you know can't you qualify that.

04:39:08.270 --> 04:39:17.980
Flowe, Tammy (FAA)
Injury with a particular edr value. I mean, I mean, probably not. I know I'm I'm seeing Tim shaking his head, no so you know, maybe I'm wrong.

04:39:18.990 --> 04:39:42.550
Polderman, Nathan
Well, it's about putting all the data together in a standardized way, and being able to use things like data. Analytics to develop almost like a machine learning type environment where you can start to recognize relationships between patterns of data and you know injury risk so you build a risk model based off of that which then you can feed back into your flight planning.

04:39:21.400 --> 04:39:21.880
AAL - CA Tim Miner (Guest)
Yes.

04:39:42.970 --> 04:39:53.290
Polderman, Nathan
Uh and I think that gets into some of the probabilistic stuff that we talked about. But yeah, I mean, it's it's all of the data is useful together not siloed individually.

04:39:55.220 --> 04:40:02.440
Steve Abelman
Tamia 0.15 light event may cause a flight attendant to miss a month of time with a broken finger.

04:40:02.660 --> 04:40:04.950
Flowe, Tammy (FAA)
No, I get it, I get it.

04:40:03.070 --> 04:40:10.840
Steve Abelman
I versus a 0.25 that may cause her to miss you. Know have a a minor concussion and miss one shift or some so that's yeah.

04:40:09.070 --> 04:40:14.920
Flowe, Tammy (FAA)
I I get it, but how do? How do we reconcile all this that's what I'm trying to figure?

04:40:14.470 --> 04:40:14.750
Matt Strahan (Guest)
No.

04:40:15.530 --> 04:40:21.670
Matt Strahan (Guest)
I've seen it, I've seen this study is workers. Comp claims from flight attendants to put price on it.

04:40:23.740 --> 04:40:28.220
Matt Strahan (Guest)
That that that doesn't get you the ability to data mine and correlate.

04:40:29.270 --> 04:40:32.220
Matt Strahan (Guest)
Injuries to actual conditions.

04:40:32.410 --> 04:41:03.930
Polderman, Nathan
We don't even do a good job of mapping out what's happening in the cabin when an injury occurs like? Where was the flight attendant and you would think that we would have all that data but so much of our safety reporting is completely subjective, based on a narrative. That's written by somebody so data mining is really difficult with completely subjective data sets. When I'm done. I'm talking about safety data employee safety reports injury reports. They're they're they're a mess. At least United and we got a long way to go.

04:41:04.990 --> 04:41:34.600
AAL - CA Tim Miner (Guest)
At at American our greatest problem is when we have a report and the and the flight attendant rights, it up. We're trying to find out where in the flight did this actually happen. What were the weather conditions because we the flight attendant in the back of the aircraft has lost you know unless they specifically look at their watch at that time and could give me a dime. We we can't always identify what it is. We're looking for our latest or maybe a objective measurement that might correlate 2 of the injury.

04:41:15.540 --> 04:41:15.840
Polderman, Nathan
Yep.

04:41:34.650 --> 04:41:38.440
AAL - CA Tim Miner (Guest)
But we're not sure that that's exactly where it happened. We don't know for sure.

04:41:37.400 --> 04:41:43.690
Flowe, Tammy (FAA)
So so, So what I'm what I'm thinking in terms of where I need to direct my research.

04:41:44.350 --> 04:41:53.210
Flowe, Tammy (FAA)
Now I need a little more information from the airlines as to where the injuries are occurring. So where do I need to direct my research?

04:41:54.350 --> 04:41:57.930
Flowe, Tammy (FAA)
I'm and I don't know I I I honestly don't know at this point.

04:41:58.500 --> 04:42:00.960
Bass, Randy (FAA)
Yeah, and let and let me jump on that.

04:42:03.440 --> 04:42:09.030
Bass, Randy (FAA)
FY21, we took a huge budget cut up in a WRP 54%.

04:42:09.660 --> 04:42:17.830
Bass, Randy (FAA)
Uh, which kind of curtailed you know. Fortunately, we were able to hold back a little bit of money from FY20 to to keep it from being as bad as it was.

04:42:17.880 --> 04:42:22.860
Bass, Randy (FAA)
As a man but going forward 22 and and 23.

04:42:24.800 --> 04:42:30.330
Bass, Randy (FAA)
Not only are we back to normal or even above where we were at in 20 in FY20.

04:42:30.990 --> 04:42:33.690
Bass, Randy (FAA)
Uh so things are looking much better.

04:42:34.680 --> 04:42:50.990
Bass, Randy (FAA)
But that doesn't mean that we're going to continue to get that kind of funding. So one of the things that we're that we want to do is as we you know go forward and you know, we'll be working on FY24 budget here soon is to provide that justification for those budgets.

04:42:51.890 --> 04:43:23.990
Bass, Randy (FAA)
And if we can say Hey, we're going to be working with the airlines and with other weather providers to do these kind of research studies and the airlines are going to give us the data that we can use to do you know of a light to moderate study and things like that that gives us so much you know they can't really turn us down and and we you know when that goes to Congress. They look at those things that's one of the things that that that has been going on for the last 3 or 4 years and has carried over into the new administration.

04:43:24.330 --> 04:43:26.760
Bass, Randy (FAA)
They like to see that collaboration with.

04:43:28.330 --> 04:43:39.700
Bass, Randy (FAA)
You know industry and and the commercial side, so that's that's another reason that we really need to do more collaboration is you know the bottom line, it helps our funding to to help you guys out.

04:43:43.080 --> 04:43:48.120
Bauman, William (FAA)
And Tammy if you allow me to put in a plug I sent you my little add earlier.

04:43:46.620 --> 04:43:46.990
Flowe, Tammy (FAA)
Yes.

04:43:47.890 --> 04:43:48.860
Flowe, Tammy (FAA)
Yeah, please.

04:43:48.540 --> 04:44:19.130
Bauman, William (FAA)
Come in the form of a PowerPoint slide so a couple of years ago. We were talking about getting input from stakeholders and somebody asked how we do that. I think was actually done F pawn meeting Matt and I said oh just sent Miranda. European email and we'll figure out a better system. We now have a formal portal where anybody can get to it, and submit their problem statements and I I I sent the slide to Tammy. It's even got a QR code on it, Tammy if you would include that slide with the rest of the slides.

04:44:19.190 --> 04:44:20.650
Bauman, William (FAA)
Come from this meeting.

04:44:19.500 --> 04:44:24.160
Flowe, Tammy (FAA)
Absolutely we will we will include it, but I don't see it on my screen right now.

04:44:25.350 --> 04:44:55.110
Bauman, William (FAA)
So if folks would look at that one slide. It's got the URL and it takes you to faa.gov to next jam and you can fill out a form with the problem statement and let us know. You know, Hey, we have a problem on dissent between 5 and 10,000 feet with light turbulence. Can you help us with that and that will go a long way towards? What Randy was saying will have it in writing that here are the problems at stake holders of the Nas have that we'd like help with.

04:44:55.450 --> 04:45:00.720
Bauman, William (FAA)
So we do have that formal way to get those requirements into us or those requests.

04:45:08.620 --> 04:45:16.150
Flowe, Tammy (FAA)
Alrighty then I think we have 4 minutes left, UM in our in our workshop.

04:45:16.880 --> 04:45:33.670
Flowe, Tammy (FAA)
Uh is there any yeah anybody else that wants to bring something up otherwise. I'm gonna like you know it's been a long 3 days. I'm going to call it a day. Call it a week. UM is there anything else that anybody wants to bring up.

04:45:34.530 --> 04:45:38.450
Bauman, William (FAA)
Well say thanks to Randy for bringing up my slide there. There's the URL on the.

04:45:37.260 --> 04:45:38.210
Flowe, Tammy (FAA)
Yeah, I agree.

04:45:38.530 --> 04:45:39.330
Flowe, Tammy (FAA)
Affiliation.

04:45:39.670 --> 04:45:41.200
Polderman, Nathan
He did, he builds?

04:45:39.810 --> 04:45:41.230
Flowe, Tammy (FAA)
Maybe she wasn't vision problems.

04:45:41.780 --> 04:45:48.040
Polderman, Nathan
It's Nathan just curious you know, we obviously submitted our proposal through that portal.

04:45:48.670 --> 04:45:48.980
Bauman, William (FAA)
Right.

04:45:49.660 --> 04:46:19.100
Polderman, Nathan
Is there a way we can get some maybe some better transparency into what the process is once we submit and I know you I think you gave us one update when we asked for it. But maybe you could maybe in a future meeting or nay for a meeting. You could kind of give us some insight as to what's happening with you know, I feel like we've submitted probably 4 or 5 things through the a 4. A that we've some most of which we've never gotten a response on at least some official response. So we just don't know if they just go into a vacuum and disappear or

04:46:10.750 --> 04:46:11.020
Bauman, William (FAA)
Yep.

04:46:19.260 --> 04:46:22.550
Polderman, Nathan
I know you guys are working, but we could use some better transparency.

04:46:22.890 --> 04:46:43.690
Bauman, William (FAA)
Yeah, we are going to provide an update at the next day for a meeting coming up this month and we also plan to put a status of everything submitted on this website, so people can see what was submitted so they don't duplicate something that was already submitted and the status and Whatnot, but it's taken a while. It's not easy to update a government website apparently but we are working on that.

04:46:35.630 --> 04:46:36.040
Polderman, Nathan
Awesome.

04:46:36.730 --> 04:46:37.010
Polderman, Nathan
K.

04:46:44.480 --> 04:46:45.740
Polderman, Nathan
Great to hear thanks.

04:46:46.140 --> 04:46:46.570
Bauman, William (FAA)
Yep.

04:46:51.530 --> 04:46:52.690
Flowe, Tammy (FAA)
All righty then.

04:46:53.430 --> 04:47:19.580
Flowe, Tammy (FAA)
Well, I I I hope that this has been a worthwhile workshop. The last 3 days. I I want to thank Matt

Fronczek and Vica dialing and Bob Sharman and Rebecca Fuller and Alex Ali Askari and Steve able in and all the other people who helped pull this off.

04:47:20.380 --> 04:47:21.220
Flowe, Tammy (FAA)
Uhm.

04:47:21.910 --> 04:47:29.080
Flowe, Tammy (FAA)
Uh so unless anybody else, has any questions, I'm I'm ready to to.

04:47:30.190 --> 04:47:30.850
Flowe, Tammy (FAA)
Turn it off.

04:47:31.990 --> 04:47:36.440
Bass, Randy (FAA)
Hey Tammy, thank thanks for everything you did, and take tomorrow off because of it.

04:47:33.120 --> 04:47:33.410
Flowe, Tammy (FAA)
Yeah.

04:47:37.320 --> 04:47:44.030
Flowe, Tammy (FAA)
Yeah, tomorrow off I mean, my husband and I are gonna hit the Harley Tomorrow. We're gonna go riding on the Harley tomorrow so.

04:47:47.110 --> 04:48:01.770
Flowe, Tammy (FAA)
So OK well. Thank you everybody and UM again. We will be sending out minutes and everything has been recorded. I think Matt you can confirm that that we're gonna have the everything recorded so.

04:48:02.440 --> 04:48:05.490
Flowe, Tammy (FAA)
Uhm hopefully everybody will be happy.

04:48:07.050 --> 04:48:08.470
Flowe, Tammy (FAA)
So thank you everybody.

04:48:12.670 --> 04:48:13.250
Matt Strahan (Guest)
Buyer.

04:48:12.700 --> 04:48:14.250
Eick Donald
Thank you everyone.

04:48:12.780 --> 04:48:14.000
Bob Sharman (Guest)
My darling,

04:48:14.940 --> 04:48:18.280
Wiebke Deierling (Guest)
Thank you Tammy and thanks to everybody.

04:48:15.000 --> 04:48:17.100
Matt Strahan (Guest)
Could you see right right?