EUROCAE WG-129 "Take-off Performance Monitoring System Strategy"
and
RTCA SC-244 "Take-off Performance Monitoring System Strategy"

Second Plenary Meeting Minutes

Date	*4-5 June 2024 (9:00 am to 1:00 pm EDT/3:00 pm to 7:00 pm CEST)*
Place	*RTCA HQ + WebEx Online*
Venue	*RTCA, Inc* *1150 18th Street NW Suite 910* *Washington, DC 20036*
Hosted by	*RTCA*

Minutes of Meeting:

- **Presentation of EUROCAE and RTCA policies, introduction, and processes, WG-129 Terms of Reference and WG leadership.**

- **Introduction of Mr. Tom Landers as RTCA SC-244 chairman, collaborating with WG-129 chairman, Mr. Brian Roberts**

- **Request for co-chairs for SC-244 and WG-129, and a Secretary for each group**

- **Mr. Landers agreed to be the acting Secretary for Plenary #2**

- **Action Item review from Plenary #1**
  - 1.1 : Included in proposed outline, further discussion to follow
  - 1.2 : Input collected on updated Terms, to be discussed shortly
  - 1.3 : proposed Outline shared, to be primary point of discussion at Plenary #2
  - 1.4 : Jeff can upload & email to Esther and Karan
  - 1.5 : Will try to get an update per AI

- **Review of the Terms of Reference (TOR)**
  - TOR : RTCA's TOR will inform "Standards Development" (not EUROCAE). RTCA and EUROCAE document will have slightly different titles
  - RTCA TOR not yet approved but we do have approval to meet
  - TOR2 : Erek: Is the output related to a disparity of speed and position is the right way to do it. There may be other ways to do it. Should this be more generic?
  - Karan : this is what we were provided as a given. Our report can refine this
  - Paulo : aircraft position should also be considered

- o Kevin : don't get hung up on this slide, these are just to TOR used to open up the working group

- **Presentation of the Chairman's proposed document outline (materials to be shared):**
  - o Proposed structure
  - o Paulo : Is there a timeframe of accidents we're considering? Brian has a list
  - o   Current technology : is that based on the
  - o Are we thinking about different size aircraft ? Discussion
  - o Yasuo : ED-250 is very prescriptive, giving people headaches. Has low tolerances to any kind of margin. Suggest WG make it not too prescriptive / restrictive
  - o Kevin : MOPS/MASPS needs to be a set of objectives, shouldn't be written around specific technology

- Feasibility Question 1
  - o Tom's comment on phase of flight – may be able to address these issues in a later phase of flight, but earlier is generally better (but not required).
  - o Joscha – first comment, has not seen this technology before (Kirk has it)
  - o Comment on being off a few hundred pounds for passenger weight / taxi fuel
  - o Kevin – automated check has be fairly high integrity. Kirk : there are technologies that measure this
  - o Tom – looking at this as the safety net, not the primary system
  - o AC 20-161 – calls out accuracy for an onboard W&B (98%)
  - o AC 25-15 (1989) has details on take-off monitoring
  - o Daniel Lopez : may establish a rate of exposure to different scenarios. E.G. typically see use of wrong weight in EFB computations
  - o Kirk's group has done statistical modeling on passenger weight distributions : 1/1000 has weight error of 2000 lb (airliners)
  - o Daniel : 1-2,000 lb 1% or is it the 15% case?

- Feasibility Question 2
  - o Kirk : CG control – by moving after reduces carbon footprint, can manage tip back
  - o Ross : Out of range can drive failure to rotate and high speed abort

- Feasibility Question 3
  - o Paulo : some FMS systems already provide a range check, depends on how sophisticated FMS is. Some FMS's calculate the speed. Fully independent speed check may not be possible unless you have an accurate weight.
  - o Erek : Trap errors vs. make the take-off unsafe
  - o Helen : automatic transfer from the EFB, but that could be wrong too
  - o Paulo : TOPM or input errors? Do we have to check all the independent variables?
  - o Daniel : weight, thrust, etc. compatible with the runway you're on. EFB uses Take-off weight, but on-board systems are based on ZFW. Gross error in EFB can result too low V2 speed, etc, such that we can catch these errors. A340 example – take-off weight error at the EFB, V2 was 20 kt lower than expected
  - o Brian : there are errors that are unforeseen, may need change in velocity as it affects take-off
  - o Kirk : Q for pilot, does an independent weight system create more complications for the crew?
  - o Dean : experience has ACARS updated weights provided from home base. What we're doing here should not be a third source to be checked that increases workload. There is great opportunity to catch mistakes, but be sensitive to increased workload.

- Feasibility Qustion 4
  - o Paulo : Have to put a big "if" on addressing the different types of EFB's and FMS's. Both are general terms.
  - o Dean : Do EFB's consider NOTAM's?
  - o Matt: EFB experience is that it gets the data from a central server
  - o Helen : A380 EFB is onboard, crew has to put in the NOTAM data. Have to get stop margin within 1 meter or have to reconcile
  - o Ed Hahn: looking at cybersecurity and EFB's, EFB could show corrupted data
  - o Brian : does the EFB talk to the airplane? Dean – they can be connected
  - o Jeff (FAA) : Issue Paper details security for connected EFB's. Automatic inputs have to be pilot confirmed / independently checked

- Feasibility Question 5

- o In the "is it feasible" category. Difference between measuring via a/c sensors vs confirming electronically

- Feasibility Question 6
    - o Same comment, need to know your sensor (aspiration) and it's validity at the moment
    - o Paulo : difference between actual temperature vs assumed temperature (may corrupt system to deceive the system). Flex take-off may use planned wrong temperature, so how to you confirm that you're deceiving it incorrectly
    - o Jeff : previous work on allowed range checking

- Feasibility Question 7
    - o Paulo : Cert testing has to account for mis-trim take-off. This is done under 25.113, 25.115

- Feasibility Question 8
    - o Paulo : Can be multiple take-off flap settings with different speeds
    - o Can also affect climb performance. Boeing has an automated check
    - o Monitors already exist, but we need to take it a step further
    - o Big difference in 737 field length with flap setting
    - o Brian – climb performance is not part of our charter
    - o Paulo – other case (too much flap) can affect potential RTO
    - o Dean – if flap setting is important, isn't trim then too?
    - o Are we going to design to the engine-out take-off ?
    - o V1 can have a range, do we want to alert for the engine-out case cause an RTO
    - o Kevin: Is the engine-out important?
    - o Manuel Perez: on going discussion within EASA. Idea today is to protect Take-off per CS-25, and those include with all engines as well as one engine out and RTO.
    - o Should flap check be actual vs. planned ? Concern about climb performance
    - o Brian to check on too high flap events are in the 94 events

- Feasibility Question 9
    - o Kevin – would this get noticed by the acceleration
    - o Erek – we're looking at all the contributory elements vs. the take-off performance
    - o Dean – what about poor pilot technique riding the toe brakes?
    - o Kevin – better to provide early notification\

- Feasibility Question 10
    - o Positional accuracy shows up in a lot of cases
    - o Wrong runway case – could also be a problem, even if it's long enough e.g. if it's closed/ NOTAM'd short, etc.
    - o Trying to apply NOTAM's in real-time sounds problematic
    - o Jeff – applying some of this to the navigation side   RTCA DO-283B, working on C has some of this content
    - o Dean : common to compute for an intersection departure as a just-in-case and end up doing full-length

- Feasibility Question 11
    - o Paulo : this is pandora's box.
    - o Kevin : ED-250 ? Allowed pilot entry, had to accommodate dry and wet
    - o Jeff: Runway conditions are dry, wet, contaminated
    - o Dean : DAL has "cluttered" for standing water especially half-cluttered, quarter-cluttered
    - o Brian : we'll have to use standard terminology
    - o Helen : ICAO runway condition assessment matrix exists
    - o Paulo : FAA and ANAC don't deal with contaminated much, they get guidance from EASA and RTCA
    - o Erek : AC 25-32 has it (no, that's landing)
    - o Jeff : AC 25-31 is for take-off
    - o Tom : would we consider a system that would only protect the take-off on a contaminated runway if we can't help the RTO
    - o Dean : sometimes we have to rely on the guy in the left seat
    - o Dean : on a contaminated runway, you might be on a part of the runway no one else has been on, so some of the runway condition data may be different

- Feasibility Question 12

- o Good in the sense of providing information as early as possible to avoid creating an RTO
- o Erek : can we do more than sanity checks?
- o Are there too many variables to include this?

- Feasibility Question 13
  - o Brian – this is about determining when the take-off is beginning
  - o Tom – also confirm pilot set the right throttle per planning
  - o Tom – may be helpful for climb perf concerns
  - o Joscha – would it be better to measure EPR / N1, something else
  - o Dean – should probably not use throttle angle, but
  - o Daniel – should look at crew errors but also system errors. What are we trying to protect against?

- Feasibility Question 14
  - o Erek – oscillation can be handled with averaging (filtering)
  - o Brian – is the acceleration sufficient for the take-off
  - o Erek – get a result by 60-90 kt, have to wait for acceleration to stabilize
  - o Kevin – if we just have one monitor, would this be the one?
  - o Erek – also have to consider positional information & runway available

Day 2

- o Boeing comments on integration of acceleration
- o Paulo: don't see an issue with monitoring acceleration. Seems feasible, problems not likely to be technical, but legal. Already some groups working on this.
- o GAC: Also need to consider position and velocity
- o Gary Wade: How are we determing the location on the runway?
- o Tom : ROAAS has this
- o Erek : May need an RNP
- o GW: What sort of accuracy?
- o Erek 0.07nm is typical
- o Brian: 5-10 meters seems
- o Kevin: Is any aircraft performance data required? Is the expected acceleration range aircraft specific
- o Kirk: If the acceleration falls out of a predetermined profile, send an alert?
- o Erek: Can use the acceleration, we should put up an alert in time for the crew to take action. Depends on the metrics we want to compare to
- o Brian : We also need to discuss alerts
- o Erek : Need to have some baseline to compare against
- o Paulo: core alerting and system can be common, and just plug in aircraft-specific perf data
- o Tom: may be able to calculate without a Performance model, but need that data to substantiate the accuracy
- o Daniel : May also have to consider independent assessment of weight. Could be as simple as determine accel from 30-60 kt, and if it is underperforming
- o For our purposes, happy to
- o Type I / II / II
- o Erek: is "indicate to the crew" an alert or some display?
- o Brian : we'll discuss monitors later
- o Ross: Type III concern about a high speed abort
- o Erek: Prefer an alert vs "continuous monitor"

- Discussion on Alerting
  - o Brian : WG94 – had an output and a final decision by the crew, with a decision point
  - o Helen : Are we talking about the specifics of what the alert will be?
  - o Brian : possibly,
  - o Helen : should include an audio
  - o Tom: ED-250 leans on the regulatory stuff
  - o Erek: 25.1322
  - o Daniel : We went for warnings, with SOP's. Maybe difficult for crew to continuously monitor a display. Alert is the best option
  - o Kevin : Alert probably will be a warning, CS 25.1322; the AMC is very detailed now. Alert should be silenced when a safe stop cannot be done
  - o Tom: may not want to be too prescriptive

- o Paulo : alerts after V1 problematic
- o Matt: there is a case during the take-off roll where there may be more power available on a de-rate, that more power is better than trying to stop
- o Helen: Don't have the decision making on the take-off roll. With a problem after V1, adding power is SOP (Airbus)
- o Daniel: Whenever we get to some speed, can compare real to expected. Extrapolation can be tricky, need to know more about the weight. Some of the cases are where the weight is not known.
- o Tom: adding an independent weight assessment takes this to the next level, we have to decide in the future if it is a required capability or not

- Any other topics?
  - o Ross : Do we have clarity on the problem we're trying solve? All engine vs engine out?
  - o Manuel's comment from yesterday : Take-off per CS-25 which is OEI and RTO
  - o Erek: Some discussion in workshops too, Boeing is using 35 ft screen height
  - o Daniel : Based on historical events, all are "typical" take-off conditions. What is the problem? Gross operational errors. Operational error combined with engine failure seems really low in term of probability. If we are going to protect OEI distance, can be subject to undue alerts everyday. May end up with a system with low confidence and high turn-off rate
  - o Paulo : EASA Panel 1 were concerned about not considering the OEI case and specific runway conditions. Model for AEO brings a new level of complexity.
  - o Daniel : OEI is big complexity for limited benefit
  - o Brian : accident summary data
  - o Mike: NASA ASRS data might be available to us
  - o Paulo : What about rotation technique? Scenario from Bogata with slow rotation.
  - o Brian: Probably out of scope
  - o Dean: can look for tail-strike issues, might be related to rotation at wrong speed due to Perf issues
  - o Kirk: Any value in noting pressure on nose gear at rotation
  - o Dean: could be an indicator
  - o Andre Forni : On question 14. Is it possible when the weight is in error, can integrated approach update V-speeds, is it possible to consider range of allowable. Alert if take-off speed has in significant error

- **Approval of meeting minutes: put on AerOpus yesterday**
  - o Xavier EASA – did not get the meeting minutes yet. Esther can help him get an account on EUROCAE
  - o One addition to the meeting is that the Airbus' presentation from first meeting not provided in the minutes
  - o Update AC references 2515 should be FAA AC 25-15, similar for 20-138
  - o Any objects to the minutes, anything missed or mis-represented?
  - o Accepted with noted adjustments above, June 5, 2024 12:01pm

- **RTCA TOR**
  - o Not approved yet, but approved to meet
  - o Differ from EUROCAE
  - o Changes from original draft shown
  - o Completion date : PMC's meet September 26, need two weeks to include in their meeting
  - o TOR to be presented to the PMC on June 27 by Tom and Karan
  - o Planning for MOPS/MASPS (travel)? No plans yet, let's get through this
  - o Internal report
  - o Add appendix to detail potential problem spots? Include in section 3, any missed could go there
  - o Include a draft TOR for the standards document? Might create a double-approval situation. Present the updated/proposed TOR separate from the report. Work the TOR within the group, but not in the document.

  - o Use the EUROCAE style guide – Esther to provide.
  - o Paulo has volunteered to be the Editor
  - o
  - o Chapter 3 : Paulo

- o Kirk and Ross can work W&B
- o Erek can work item 14
- o Erek can work flaps

- **Follow on activity:**
  - o Brian and Tom to put together Introduction
  - o Paulo to bring in 2-3 portions of Section 3 Current Technology
  - o Helen to work Section 5, Dean to support
  - o Kevin to help Embraer with Section 4

  - o Virtual meetings every 2 weeks starting June 18 10am ET
  - o Hybrid meeting September 4-5 in Europe
  - o Hosted by UK CAA
  - o Virtual meeting late September

List of Actions

Action No.	Question	Assigned to	Response
1.1	Xavier Vergez (EASA) asked for clarification of such standardization: is it to define objectives rather than to be technically prescriptive within the standard?	**Chairperson**	Clarified at Plenary #2
1.2	Update the list contained in the ToR to include aircraft position errors. Chairperson to draft an update to the ToR and provide to EUROCAE	**Chairperson**	Resolved at Plenary #2
1.3	Propose the structure of the Internal Report (section and §). Chairperson to draft an internal report template structure for the group)	**Chairperson**	Provided at Plenary #2 per attached presentation
1.4	Provide FAA policy on incorrect Zero Fuel Weight (ZFW)	**FAA – Jeff Meyers**	ANM-111-09-006 posted to AerOpus
1.5	Provide progress statement on EASA RMT.0741.	**EASA – Xavier Vergez**	

Participants

Name	Organization
Esther Hoyas	EUROCAE
Joscha Kurz	DLR
Kevin Hallworth	UK CAA
Karan Hofmann	RTCA
Kirk Nance	Avix Aero

Daniel Lopez	Airbus
Yasuo Ishihara	Honeywell
Jeffrey Meyers	FAA
Ross Godwin	Boeing Safety
Ed Hahn	ALPA
Marino Perez Garcia	EASA
Gary Wade	UK CAA
Helen Carvosso-White	UK CAA
Erek Barhoum	Boeing
Eric Tran	Garmin
Xavier Verguez	EASA
Ryan Smelser	Collins Aerospace
Brian Roberts	UK CAA
Paulo Eduardo Magalhaes	Embraer
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