EUROCAE EUR 225-25 / WG129-11
RTCA Paper Number: 164-25/SC244-013

April 15-17, 2025

Joint EUROCAE WG-129 / RTCA SC-244
"Takeoff Performance Monitoring System Strategy" Meeting Minutes

DATE: April 15th – 17th, 2025
TIME: Tuesday, Wednesday, and Thursday (0900 to 1700 CEST)

PLACE:

EUROCAE
9-23 Rue Paul Lafargue
93200 Saint-Denis (France)

CONTACTS:

Alexander Para	RTCA Senior Program Director, apara@rtca.org
Atiqah Pillain	EUROCAE,Technical Programme Manager,atiqah.pillain@eurocae.net
Thomas Landers	SC-244 Chair, thomas.landers@gulfstream.com
Brian Roberts	WG-129 Chair, brian.roberts@caa.co.uk
Jeff Meyers	SC-244 GAR, jeffrey.meyers@faa.gov
Marino P. Garcia	WG-129 GAR, marino.perez-garcia@easa.europa.eu
Vinícius Véras	SC-244 / WG-129 Secretary, vinicius.veras@gulfstream.com

PARTICIPANTS:

Last, First Name	Organization
Baillargeon, Alexandre *	Garmin
Barhoum, Erek	Boeing
Buisson, Alexandre	Airbus
Claviere, Guillaume *	ATR
Fenton, Bryce *	Cessna
Forni, Andre Luiz Chiossi *	EMBRAER
Garcia, Marino Perez *	EASA
Genissel, Philippe	Airbus
Godwin, Ross *	Boeing
Ishihara, Yasuo *	Honeywell
Jespersen, Allan	Gulfstream
Jones, Christopher *	SAIC
Landers, Tom	Gulfstream
Maclaren, Ian *	CAA UK
Magalhães, Paulo	EMBRAER
Meyers, Jeffrey *	FAA
Nance, Kirk	Avix Aero
Olmstead, Dayne	ALPA
Para, Alexander	RTCA
Picaut, Stephane *	Dassault Systems
Pillain, Atiqah	EUROCAE
Roberts, Brian	CAA UK
Smelser, Ryan *	Collins
Spaude, Ian *	FAA
Vanderkamp, Travis	Collins
Veras, Vinicius *	Gulfstream
Vigen, Matthew	Southwest Airlines

* Indicates virtual attendance

1 Introductions, Administrative Remarks and Agenda Review

After a round-table introduction, Atiqah Pillain welcomed the participants and started the meeting. The group reviewed and approved the meeting agenda. EUROCAE and RTCA Intellectual Property (IP) policies and membership statements were also presented.

2 Review of the approved Terms of Reference for SC-244 and WG-129

The group reviewed the Terms of Reference and no issue was raised.

3 RTCA and EUROCAE review of drafting guide for Minimum Operational Performance Standards (MOPS) and document creation

4 Selection of WG-129 Chair

Brian Roberts made himself available and was selected as the EUROCAE WG-129 Chair.

5 Committee Secretary

Vinícius Véras was referred by Thomas Landers, made himself available and was accepted by the group as committee secretary for the RTCA SC-244.

6 Discussion /decision of MOPS vs MASPS

The group agreed that a MOPS only would be sufficient.

Airbus was concerned with the possibility of duplicating tests. It was decided to proceed with the MOPS template, adding wordings in Chapter 6 (Installed Equipment Performance) of the RTCA template to talk about certified equipment being used to build a TOPAAS equipment.

EASA will look for compliance at the aircraft level. It is not going to be prescriptive in this industry committee. If MOPS/MASPS is not sufficient, EASA may ask for additional demonstrations.

7 Discussion on runway databases and declared distances

Tom L. suggested that TOPAAS MOPS should use a similar approach as ED-250 sec. 3.1.3.1, that mentions "Landing Distance available" and "physical end", leaving the decision up to the manufacturer on which to use.

EASA pointed out that there is a definition of the distances that should be considered for TOPAAS system. These are part of the standard applicable to the databases.

Jeff Meyers mentioned that the DO-201 C (SC-217) is out for comments / approval. Review deadline is end of May.
ICAO Annex 14 Vol. I should provide good explanation on those data (TODA/TORA/ASDA)

DO-283 already has some kind of wording referring to DO-201.

Tom L. remarked that not all runways may have data available.

Dayne: Aircraft arresting cables at the end of the runway (TORA) may have to be considered. We should not allow too much of flexibility. If system is capable to generate a high-speed abort, it should be able to consider the safety of it.

Tom L.: Should we mandate the use of declared distances for TOPAAS (TODA/TORA/ASDA)?

Discussion on how to consider data. Performance planning vs. TOPAAS and runway distance definitions.

ACTION: Travis is going to work on the runway definitions. Will prepare something for the next sessions.

8 Discussion of the take-off distance to be used (OEI / AEO / other)

EASA: NPA is likely to be changed to be less prescriptive. Required runway distances ASD and TOD (OEI & AEO*1.15) are the distances EASA intends to consider for the NPA/AMC.

EMBRAER: OEI scenario leads to clearly different levels of acceleration. In real-life, engine failures can go from anywhere between maximum takeoff thrust and complete failure.

Boeing shared Acceleration vs. groundspeed plots for an engine failure scenario, arguing that integration is not possible if an engine failure is assumed.

EASA recognized that real-time monitoring/prediction for the OEI distances may be too challenging, but the OEI distances shall be considered for takeoff planning and available distances check.

Vinicius: It is not clear what EASA thinks that should be considered - either the expected performance (takeoff distances) or the available runway?

EASA clarified that in terms of flight phase (operational mode) as below, adding that this is going to be published in the NPA.:

- Pre-flight: TOD OEI, ASD, TOD AEO*1.15
- Real-time check: Consider the available runway distance as a minimum requirement would be acceptable.

Tom: Would it be acceptable to provide unfactored AEO distances?

Dayne: everything is settled after brakes release. We need to look for a good time to abort. If pilots feel the airplane is underperforming, even if AEO, they may need to switch to the OEI flight profile for safety. If you are at 35ft at the end of the runway, that means you rotated because you had no choice. Something wrong had happened before VR was reached.

ACTION: Subgroup to work on the required margins to calculation was set up. This group will prepare a material to present in the upcoming meetings:

- Erek (Boeing)
- Paulo Magalhães (Embraer)
- Dayne (ALPA)
- Tom & Vinicius (Gulfstream)
- Alex (Airbus)

The group pointed out that the purpose of the TOPAAS is to provide awareness and alertness. This is not going to be a substitute for the AFM and will not show compliance with part 25 takeoff requirements.

4/16/2025

9 Discussion of vision from Regulators

Marino (EASA) pointed out that due to the expected timeline, there is a risk of the regulation not to reference the standard for a short period to allow for the standard to be released. A major concern would be the standard not addressing EASA's concerns.

Forni (Embraer) asked how long the rule would be issued before the standard. EASA said the rule may be published by 3rd - 4th quarter of 2025. We would have a gap of several months.

10 Review of new material from participants

10.1 Intended Function

"TOPAAS is intended to provide timely awareness and alerting to the crew when the airplane anticipated or actual performance is determined to be contrary to a safe take-off, prior to or during takeoff."

TOPAAS should not alleviate data validation procedures by the crew. Also, non-intended function statements could be added in the assumptions section, to capture that TOPAAS is not replace the proper takeoff planning in terms of performance calculations, but instead work as a monitor/validation system.

10.1.1 Displays & Alerts

A few considerations were made on the subject.

- Alerts should be seen by everyone in the cockpit.
- MOPS should specify warnings/alerts.
- AMC 25-11 time-critical warnings (25.1322) may be a good place to go for definitions and levels of alerts.
- Links to 25.1322 may have to be carefully discussed since not everybody may be able to comply with.
- ROAAS ED-250 already calls the 25.1322 and AMC 1322-1
- If there's a huge weight error, but available runway is also long, TOPAAS may not need to give any alert.

Vinicius proposed the following discussion:

- Let's assume a long runway, saying that there is no climb limitation. Also, let`s suppose thrust (for any reason) is significantly reduced but still compliant with minimum OEI

gradients. If we have such a difference between actual and expected performances, should TOPAAS alert?

Erek - no alerts should be generated if takeoff is safe
Tom: Based on the intended function, if tailstrike is probable then we should have means to alert. Also, VR errors more than 10kt should be considered.
Dayne: We have to be clear of what we think we need to look at.
Awareness (if provided) would be beneficial for pilot to anticipate excursions even within the envelope.
Dayne: I would like to know if it is way off from planned performance. Wrong runway would lead to an abort.
Erek: Caution alert for runway is already present on Boeing's solution.
Dayne: Caution/advisory would be enough.

Forni asked if pilot must reject a takeoff upon alert, he's not in charge of making a decision. Is it also a supporting system?
Dayne pointed that, it would not be unacceptable. Correct language would be "should".
Tom: If TOPAAS puts an alert after V1, pilot may still decide to takeoff.

10.2 TOPAAS Modes Overview - Travis (Collins)

Travis shared a slide proposing a minimum set of operational modes and domains to be considered by the MOPS. When out of domain, TOPAAS will be inactive.

During the presentation, it was discussed how to make the transition from "out" to "in-domain".

TOPAAS requirements should consider the operational modes and domains in their rationales. Also, if system is malfunctioning, alerts should be inhibited.

Tom suggested that a provision for a degraded mode may be needed to deal with cases such as the scenario where GPS is unavailable.

Modes can have states "armed" and "disarmed".

Modes transitions and indications should consider:

- Configuration & state
- Position on runway - on taxiway?
- Remaining runway is adequate
- Performance is adequate

Ishihara: MOPS should be restricted to system-level. High-level / aircraft specific should be avoided.
It was consensus that real-time checks would only be done during takeoff acceleration. A Performance model be required to provide Performance result (reference).

There should be an indication for takeoff on grass.

Kirk: A provision for caution message could be provided before takeoff thrust selection, to allow for runway alignment/positioning.

The group agreed that the MOPS should specify a minimum number of operational modes, as ED-250 does.

Ishihara: Is there an intention to specify a light TOPAAS version that could be installed in old airplanes?
EASA: We are not going to mandate TOPAAS retrofit in old products. We are going to impose something for airplanes that are still in production.
A light-version of TOPAAS could be certified using a CRI, but if it doesn't use the MOPS, it would probably not be called as TOPAAS.
EASA: For part 26, we are going to ask for the solution to be implemented into aircraft in production.

10.3 Requirements & Recommendations

Possible requirements were discussed as below:

1. Out-of-range parameters should be checked, and it should be annunciated to the crew if the test fails

a. Recommendation: TOPAAS should annunciate errors of sufficient magnitude that a "marked increase" is expected.

After some discussion on the applicability of the 25.107e(4), it was discussed if 1% increase on the takeoff distance could be used as a criterion for alertness for TOPAAS. No agreement was reached on how to make such correlation.

2. Prior to “commitment to takeoff”, TOPAAS shall trigger warning alert when trim setting deviates from expected or planned value. No agreement was reached.

10.4 FMS Speeds Requirements

DRAFT requirements document provided by Paulo Magalhaes.

Vinicius: Requirements REQ1 and REQ2 could be improved to differentiate between range and consistency checks.

REQ3 - Long discussion on whether parameters are really / always required. What kinds of checks are applicable. If one device calculates speeds, should TOPAAS be able to independently check those? In some aircraft, takeoff speeds are electronically done by FMS and accepted by the pilot.

After a long discussion on levels of check, Kirk proposed that we may not want to check all parameters individually. Thrust lever angle may not need to be checked. Maybe N1 or EPR.

4/17/2025

Continued to review FMS draft requirements proposed by Embraer.

Thrust lever angle will not be set before the takeoff. Airbus said from their experience, 90% of alerts in service may come from checks before takeoff acceleration, but parameters such acceleration and thrust will only be effectively checked during acceleration.

REQ3 looks like a generic list of parameters that may or may not be used. There seems to be no airplane or procedure that requires a specific position of thrust lever instead of N1 or EPR.

Airbus: What would be the V1 minimum value for range check? If VMCG is used, narrow runways may need higher VMCGs.

FAA considered that we may need a definition for “gross error” or leave the implementation to the designer.

Tom: Would it be acceptable to check the lowest VR?
Airbus: Should we specify that VMCG should be checked in the standard?

EASA: If VR < VMCG we may have other type of problem.
Airbus: How can we check the airport?

Jeff: Requirements are much more granular than should be. We should ask two questions:

1. What is it?
2. Which system does it come from?

We should start with a block diagram as DO-317 and DO-283C.

Paulo: We could rewrite the requirements based on the modes.

Tom: Weight needs to be checked.

Vinicius: We may have at least 4 types of checks, and those can be correlated to the operational modes.
Range checks, consistency check, input validation from aircraft systems data, performance measurements.

Dayne: A good example of indication is the fuel quantity. Maybe “indication” should be used instead of “awareness” for some cases.

REQS 1 to 5 should refer to aircraft standing on ground. For REQ6 it is assumed aircraft acceleration.

Airports with a single runway, no taxiway. A back-taxi could lead to a TOPAAS alerting for wrong heading.

Erek showed a proposal for phase alerting scheme.

Airbus: Consider input uncertainties from sensors, AFM model. Unpredicted wind could lead to nuisance.
Discussion on how to consider the wind effects on distance.
Vinicius: Wind considerations for TOPAAS algorithm may be included only in Chapter 4 to allow design space.
Tom: Agreed.

The distance model distance from TOPAAS is supposed to be proprietary, and not to be equal or equivalent to AFM distances.
TPM is to calculate the actual distance expected/predicted for the current takeoff.
We should have a way to specify a minimum level of accuracy for the distances predicted by TOPAAS (TPM)

AC 120-28D Appendix 2 provides guidance for Monte Carlo analysis and addressing winds that may be helpful.

Alex: A monitoring function should cover mistakes that might have happened during takeoff plan, not during execution, otherwise we would have to specify a rotation monitor.
Tom: Improper thrust lever setting is also an error of execution.
Paulo: We should look at the thrust levers. This would be a chance to provide warnings earlier, before reaching a high speed.
Tom: If we detect low thrust setting at 30kt, should we abort, pop a caution?
Dayne: Thrust must be set at 60kt.

Potomac accident was mentioned. Discussion on engines operation. EPR was per design, N1 indication was off due to issue in the engine probes.
Thrust checks during acceleration needs more discussion.

10.5 How to write good requirements

Allan provided a NASA's reference on how to write good requirements.
Atiqah reminded EUROCAE also has guidance on requirements
EASA mentioned ARP 4754

Paulo's reflection on the requirements:
REQs 1 & 2 will be removed.
REQS 3, 4, 5 to be rewritten, associated to mode 1
6, 7, 8 dynamic checks probably mode 3

TOPAAS model distance will have to be recorded by FDR.

ACTION: Paulo will review the requirements document for the upcoming sessions.

Vinicius asked about DAL level for TOPAAS.
Tom: Reminded that erroneous abort at 40kt might be minor, but at 90kt would probably be major. Erroneous abort message above V1 may be CAT - DAL A.
There should be provisions for different DALs.

11 Work on the new MOPS

Additional and reviewed materials will be provided for the upcoming meetings.

12 Update of the approved Terms of Reference for SC-244 and WG-129 if required

No update was necessary.

13 Set Next Meeting Date

Next plenary sessions were planned for:

- Aug 5th to 7th in Washington, DC – USA
- Nov 4th to 6th in Toulouse – France
- Jan 27th to 29th in Savannah, GA – USA (tentative)

14 Close

It is noteworthy that Wi-Fi at EUROCAE was unstable throughout the week. The connectivity issue was not solved, and the attendees had to use their personal work phones to enable the meetings to continue with the participation of others from around the world.

Jeffrey Meyers (FAA) informed the committee of his impending retirement.

14.1 Meeting Notes Approval

Andre Forni asked to add his name to the plenary minutes from Jan 28th.
After corrected, the minutes were accepted with no issues as published in RTCA website.

14.2 Final Discussion

Airbus considered current level of technology may not be enough to make it possible to comply with the intended EASA AMC.

EASA: Discussion may occur during NPA, but Airbus will have to provide additional background. The other manufacturers will likely need to agree with Airbus' arguments.

Airbus: Specific Performance model will provide different results with regards to AFM Performance Model. If we stick to the same criteria that TOPAAS should comply with AFM models, there is a risk that TOPAAS will raise nuisance alerts and not comply with intended regulation from EASA as-is.

Vinicius tried to summarize the understanding, asking the colleagues from Airbus, if what they meant was that the current technology is not capable to provide some kind of "on-board and real-time AFM". Instead, what they think that is possible and must improve the safety level as it is understood to be intended by regulators, is to specify (build) a system capable to provide indications and alerts based of input and real-time performance checks that ultimately will provide awareness (either by indications, alerts, or other means) to pilot to prevent an unsafe takeoff to be executed.