OPERATIONS ADVISORY NOTICE (OAN)		Transport Malta Flight Operations Inspectorate Civil Aviation Directorate Transport Malta Centre Triq Pantar Lija LJA 2021 Malta
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Subject: **EFB Performance Calculations Accuracy and Reliability**		

1.0 INTRODUCTION

During recent standardisation activities, EASA identified a number of safety concerns relating to the use of Electronic Flight Bag (EFB) applications for performance calculations. A special edition of the Air Operations Continuous Monitoring Bulletin was issued to raise awareness about this topic. This OAN is being issued in order to highlight the importance of conducting testing activities to demonstrate performance calculations' accuracy and reliability. In addition, this OAN discusses the requirement of having checking processes in place for any changes affecting EFB performance applications.

2.0 BACKGROUND

SPA.EFB.100(b)(3) requires that the operator establishes and implements procedures for the use of the EFB device (hardware) and the EFB application (software). AMC5 SPA.EFB.100(b)(3) further specifies that these procedures, in the specific case of performance calculation applications, should be supported by a demonstration of the compliance of the application, based on software testing activities, including human-machine interface (HMI), reliability and accuracy testing.

Accuracy testing aims at demonstrating that the aircraft performance computations provided by the application are correct in comparison with data derived from the AFM or other reference data sources.

3.0 REQUIREMENTS

3.1 Accuracy and Reliabiltiy of EFB performance application results

As a means to verify that the calculations carried out by EFB performance applications are accurate when compared to the applicable AFM, all operators having, or in the process of getting EFB approval, shall provide the following:

- A comparative study demonstrating the accuracy and reliability of EFB performance application results when compared to the applicable AFM. Testing should include sufficient number of comparison results from representative calculations **throughout the entire operating envelope of the aircraft**. If any discrepancies are identified, the operator shall duly substantiate the acceptance and validity of such differences to TM-CAD based on an appropriate risk assessment.

A statement by the EFB developer to confirm such accuracy and reliability does not relieve the operator from conducting these testing activities, even if the EFB developer is the aircraft manufacturer.

Such a study/studies shall be carried out by competent personnel and duly signed by the NPFO. This study shall be done for each type of EFB performance application being used by the operator (refer to Appendix A for guidelines).

3.2 Management of changes to EFB Performance Applications

AMC2 SPA.EFB.100(b) outlines the types of modifications to an EFB system that do not require approval from TM-CAD. Nevertheless, such changes should be controlled and properly tested prior to use during flights (a non-exhaustive list can be found in AMC2 SPA.EFB.100(b)).

Specifically for EFB performance applications:

- changes that do not alter the calculation algorithms (e.g. software updates or patches), and/or
- updates to an existing database/s which is/are used as an input to performance applications (e.g. addition of new runway in airport database, changes in operating masses following aircraft re-weighing, etc.), then

a checking process shall be followed prior to releasing any updates to all EFB devices. This will ensure that such updates are properly tested before being officially released.

Operators shall ensure that such a process is in place and will be checked accordingly as part TM-CAD's oversight activities by means of inspections and audits. TM-CAD requires operators to submit a copy of these procedures by not later than **30th September 2021**. This shall be submitted using procedure as that of an OM change not requiring approval on Centrik.

4.0 CONCLUSION

In view of the above, the following must be clearly understood:

- The operator's responsibility to ensure correctness of the EFB performance application/s and corresponding outputs;
- TM-CAD's responsibility is to evaluate the operator's validation and checking processes confirming the accuracy and reliability of the EFB performance application data

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APPENDIX A

EFB Performance Calculation vs AFM – Test Cases to consider

Performance data generated by the EFB must be in agreement with certified AFM data and/or the advisory performance data provided by the aircraft manufacturer within the degree of accuracy inherent in the original data. The aim of the comparative study to be submitted by operators using EFB is to confirm the accuracy and reliability of EFB performance application results when compared to the respective AFM.

Generally speaking, EFB performance applications base their calculations on published data found in the AFM or performance manual and deliver results that allow the crew to operate in compliance with the appropriate regulations. The applications may use algorithms or data spread sheets to determine results. They may have the ability to interpolate within but should not extrapolate beyond the information contained in the published data for the aircraft. The demonstration of the compliance of a performance application should include evidence of the software testing activities performed with the software version in operational use.

The tables below highlight the variables affecting aircraft take-off and landing performance. It is appreciated that it is not feasible to analyse the effect of each of these variables when testing for take-off and landing performance computation accuracy. Therefore, operators are to consider a range of operating conditions which shall adequately cover the aircraft operating envelope. A careful selection of test cases with defined conditions should therefore be made.

As per OAN 09/21, TM-CAD requires operators to provide assessments of test cases which concentrate on extreme conditions at the edge of the flight envelope (e.g. wet/dry runway, cold/hot temperatures, high elevation airports, minimum/maximum runway slope, headwind/tailwind, etc.) by considering, as a minimum, variables as listed in bold in the table below, together with any other elements derived from the safety assessment of the operator. In addition, test cases using average conditions shall also be considered.

As an example, a typical test case for take-off would consider MTOW, with high OAT and high airport elevation. Such a test case would be considering an extreme condition of the flight envelope. Similarly for landing, one could consider landing on a contaminated runway with a tailwind. This test case would be considering another extreme condition of the flight envelope.

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Variables affecting Performance Calculations

VARIABLE	APPLICABLE TO:
Weight – High/Low weights	Take-Off and Landing
Flaps – All available settings	Take-Off and Landing
Engine Thrust Setting	Take-Off
Engine or Airframe Anti-Ice	Take-Off and Landing
Engine Bleed	Take-Off
Runway Condition – Wet/Dry	Take-Off and Landing
Wind – Head/Tailwind	Take-Off and Landing
OAT – Cold/Hot Wx Ops	Take-Off and Landing
Airport Elevation	Take-Off and Landing
Runway Slope – Uphill/Downhill	Take-Off and Landing
Obstacles	Take-Off
Engine Reverse Setting	Landing
Autobrake Setting	Landing
Approach Speed Increment	Landing