

ED-291

TEST PROCEDURES FOR QUANTIFIED VISUAL ADVANTAGE

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FOREWORD

1. This document was developed jointly by EUROCAE Working Group 79 “Enhanced Vision Systems (EVS), Synthetic Vision System (SVS)” and RTCA Special Committee 213 “Standards for Enhanced Flight Vision Systems and Synthetic Vision Systems (EFVS/SVS)”, and was approved by the Council of EUROCAE on 13 May 2021.
2. This document is technically identical to RTCA DO-390. Coordination has been achieved with RTCA SC-213.
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EXECUTIVE SUMMARY

This document provides a consensus standard for a method to measure and quantify the visual advantage performance of an installed Enhanced Flight Vision System (EFVS).

In the European Union (EU), the requirement to demonstrate a visual advantage using an EFVS is introduced through the NPA 2018-06 subpart B which includes the proposed amendments to CS-AWO (airworthiness requirements). For the EFVS operator to be granted certain operational approvals, the applicant must demonstrate and document a quantifiable measure of the EFVS visual advantage performance.

In 2016 the FAA published revised EFVS-related regulations that expanded the types of approved EFVS operations and the number of operators that could use the new EFVS regulations. While, demonstrating a quantified visual advantage is not required for an installed EFVS to be certified, any operator that uses the installed EFVS to dispatch the aircraft in accordance with 14 CFR §121.613, §125.361, or §135.219 or commence an instrument approach under §121.561, §125.325, §125.381, or §135.225 requires an operational approval from FAA flight standards.

This document provides a consensus standard for a method via flight test to measure and quantify the visual advantage performance of an installed Enhanced Flight Vision System (EFVS).

This document has been developed with RTCA SC-213 and is technically equivalent to DO-390.

CHAPTER 1

PURPOSE AND SCOPE

1.1 INTRODUCTION AND PURPOSE OF DOCUMENT

1.2 SCOPE OF THE DOCUMENT

This document is limited to providing a method to determine and document the quantified visual advantage (QVA) of an installed Enhanced Flight Vision System (EFVS). This document does not provide any guidance on the design of the EFVS.

QVA determination in this document is based on extensive experience with EFVS systems using infrared (IR) sensors. Future EFVS sensor technologies may require alternate methods to evaluate QVA.

In this document, the term “shall” is used to indicate an agreed to means of measurement of QVA. An approved design should comply with every requirement, which can be assured by inspection, test, analysis, or demonstration. The term “should” is used to denote a recommended method in the collection or analysis of data, but does not constitute a requirement.

1.3 BACKGROUND

In 2016 the FAA published revised EFVS related regulations that expanded the type of EFVS operations and the types of operators that could make use of the new EFVS regulations. Demonstrating a quantified visual advantage is not required for an installed EFVS to be certified. However, any operator that uses the installed EFVS to dispatch the aircraft in accordance with 14 CFR §121.613, §125.361, or §135.219 or commence an instrument approach under §121.561, §125.325, §125.381, or §135.225 require an operational approval from FAA flight standards. For the operator to receive the required operational approval, the applicant must demonstrate and document a quantifiable measure of the EFVS visual advantage performance.

Additionally, in the European Union through the NPA 2018-06, published on 17 July 2018, the principles of the EFVS have been proposed for introduction into the European regulatory system. The EFVS’s main function is to electronically provide the pilot the required visual references supporting the proposed operational procedure before the required references can be seen using natural vision.

EFVS visual advantage should be demonstrated during certification flight testing before descending below the DA/H or the MDA because this is the point in an instrument approach procedure where the operating rules permit an EFVS to be used in lieu of natural vision for operational benefit/credit. The EFVS performance will be documented as a quantifiable measure of the EFVS visual advantage performance allowing the operator to receive the required operational approval from the competent national aviation authority.

While previous RTCA/EUROCAE standards provide a means to design and demonstrate the intended function of the EFVS they did not provide any standardized means of quantifying the visual advantage. This document provides a consensus method of demonstrating and documenting the QVA in order to support the granting of operational approval by the competent national aviation authority.

CHAPTER 2

OPERATIONAL PERFORMANCE ASSESSMENT

2.1 INTRODUCTION

The main function of the EFVS is to provide a visual advantage over the pilot's out-the-window view using natural vision.

The EFVS shall provide a demonstrated vision performance in low-visibility conditions (enhanced flight visibility) and a level of safety suitable for the proposed operational procedure that will allow the required visual references to become visible in the image before they are visible naturally out-the-window.

In low-visibility conditions, the 'enhanced flight visibility' should exceed the 'flight visibility' and the required visual references should become visible to the pilot at a longer distance with an EFVS than they would out-the-window using natural vision.

In the United States (US) as of 2016, the documented QVA of the installed EFVS is required by FAA Flight Standards in order to grant operational approval if an applicant intends for the installed EFVS to be used by operators under 14 CFR Parts 121, 125, 135 to release a flight under §121.613, §125.361, or §135.219 or commence an instrument approach under §121.561, §125.325, §125.381, or §135.225.

In the US, the requirements to determine a quantified visual advantage are separate from the requirements to demonstrate the intended function of the EFVS. In the European Union (EU), the requirement to demonstrate a visual advantage using an EFVS is introduced through the NPA 2018-06 subpart B which includes the proposed amendments to CS-AWO (airworthiness requirements).

Flight test data collected in the manner described in this document can support the requirements of both certification and QVA tests. Thus, it is recommended that the data required to justify a QVA be collected for every EFVS approach flown during an EFVS certification program. Collecting these data elements on every EFVS flight test approach can support future certification or operational approval applications and mitigate the need to fly additional flight tests.

The guidance in this document provides a means, but perhaps not the only means, by which to demonstrate the QVA of the EFVS. While the methods described in this document have been acceptable to the FAA and EASA, other acceptable means are subject to review and approval by the authorizing authorities.

2.2 KEY TERMS

Enhanced Flight Vision System (EFVS) (14 CFR 1.1/ED-179B). An installed aircraft system which uses an electronic means to provide a display of the forward external scene topography (the natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, including but not limited to forward-looking infrared, millimeter wave radiometry, millimeter wave radar, or low-light level image intensification. An EFVS includes the display element, sensors, computers and power supplies, indications, and controls.

EFVS Operation (14 CFR 1.1/ED-179B). An operation in which visibility conditions require an EFVS to be used in lieu of natural vision to perform an approach or landing, determine enhanced flight visibility, identify required visual references, or conduct a rollout.

Flight Visibility (14 CFR 1.1/ED-179B). The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night. Measured in feet or meters.

Slant Range Flight Visibility (SRFV). The range at which the unaided eye of the pilot can detect a visual reference listed in 14 CFR 91.176(a)(3) and/or the applicable paragraphs of EU regulation No.965/2012 for the Commencement and continuation of