

EASA Business Jets workshop

Low Visibility Operation, EFVS

EASA Headquarters-Cologne-Germany-3/4 dec 2019

HIGHER TOGETHER™

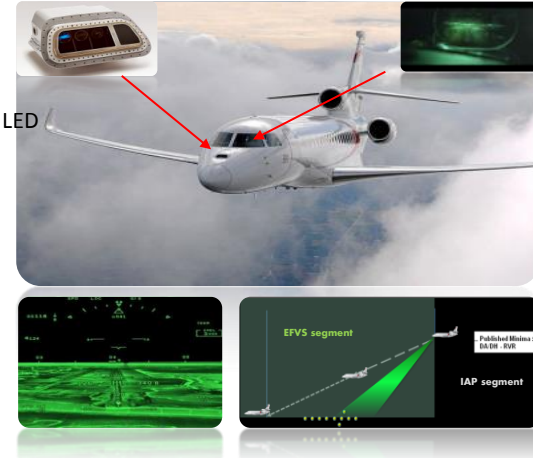
Référence	O.BAUDSON
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What is EFVS (Enhanced Flight Vision System)



- EFVS = HUD*/HWD + EVS camera
 - IR single bandwidth
 - Multisensor, fusion, capable of LED
- EFVS is an Equivalent Visual Operation
 - Enables to operate “beyond published minima” (RVR min 300m)
 - Applicable for Dispatch, at Start of the approach and at DA/ H
 - At most of runways fitted with 3D published approaches
 - Taking OPS credit of « On Board » capacity ☞ NO ADR INFRASTRUCTURE



*EFVS is a key solution to expand accessibility of secondary aerodromes in degraded weather conditions
This is applicable to Business, Regional... and Airline aviation
EFVS operations concern “all” aerodromes*



Origins of EFVS/ Ops credit



- EFVS operation born in US in 2004 (US): §91.175
 - 3 years after 1st certification issued by FAA
 - In favorable OPS environment – THR at 100ft, part 91
- EVS operation introduced in EU OPS Subpart D in 2008
 - With OPS credit of RVR

operation	year	RVR credit	EFVS segment lower limit
FAA Rule	2004	0*	100ft
EASA EU OPS	2008	30%	100ft
FAA Rule update	2016	Min 1000ft (OSR)	0ft

Ops Approval

* FAA exemption FedEx: 1000ft RVR

Example EU OPS
Published: RVR 550m
With EVS: RVR 350m

...US regulation upgraded with EFVS to touchdown and rollout operation in 2016
 ... Large part of Business jets are equipped, but few EU operators are approved
 ... There is still a need for GM/AMC for ground segment
 to facilitate & standardize OPS approvals
 ⇒ Need for NPA 2016-08 AWO

EFVS in NPA

NPA operation	year	RVR credit	EFVS segment lower limit
EASA EU OPS	2008	30%	100ft
EFVS-A	2021 ?	≥30% Pef.Based*	100ft
EFVS-L	2021 ?		≤100ft
NO OPS APPROVAL No need for LVP	2021 ?	30%*	200ft

*Based on Visual advantage

- Cross domain and comprehensive approach: 2016-2021 ?
 - Airworthiness - OPS – ADR...
- Introduce 3 EFVS operations with progressive levels of privileges/ efforts
 - Very new EVS200 concept ☞ No LVP/ No OPS Approval
- Address Aerodrome/ Runway/ APP eligibility through:
 1. Operator suitability check OR
 2. “Promulgation of the aerodrome for EFVS operation by the state of the aerodrome”
☞ No need for specific infrastructure... but aerodrome certificate to be upgraded... and AIP/ charts updated
- Defines suitable level of *initial/ recurrent-checking/ recent* training for each operation

NPA 2016-08 will bring OPS credit to all operators equipped with EFVS from the first day of use !

NPA 2016-08 will ensure that ground segment is safe for EFVS operations

NPA 2016-08 put forward an approach for maximizing proficiency of crews in EFVS

NPA 2016-18 will facilitate and standardize the Operational approval of EFVS

Industry involvement to supports the EASA NPA

1. Taking credit of the unique **SESAR ATM Framework** with relevant **Stackholders**

☞ 2016: **SESAR AAL1** (LSD*): definition of impacts of EFVS operations on ATM

- by DSNA/ Dassault.
- Recommendations were proposed to EASA RMT0379 for consideration in NPA. SES AWARD 2017 !

☞ 2018-2020: **SESAR AAL2** (VLD) on going: preparation of EU pioneer aerodromes to EFVS operation in accordance with NPA.

- Conduction of Experimental Approval
- Achievements of EFVS-L operation in Full Ops envir. and Real weather conditions
- Business and Regional Aviation, respectively with HUD and HWD
- COM/ Buy in: GSA, ARC, EBACE, WAC, SIAE...

1. Achieving **“PoC”** with EASA: 2107 for Dassault

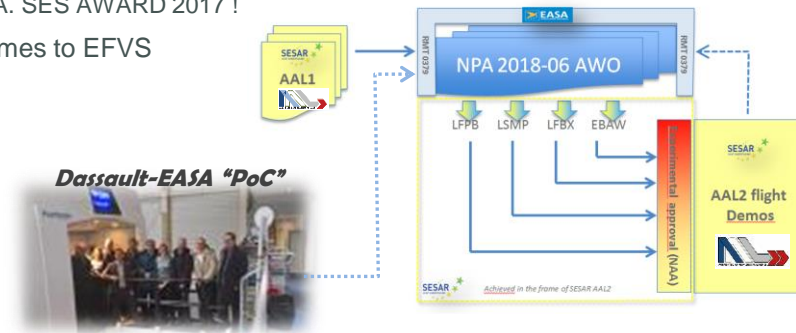
- Airworthiness (TD & OSD) pilots and engineers involved
- Airbus and business aviation Ops operator involved



<https://aaldemo.eu>



<https://aal2demo.eu>



Dassault-EASA “PoC”

By Q1 2020, SESAR AAL2 project will convey EASA RMT with ADR-ATC-Air operator feedbacks for consideration for regulation improvement AAL2 will bring example ... to support future update of aerodrome certificate for EFVS

EFVS key benefits



- Increase **SITUATIONAL AWARENESS** & safety margins in all phases of flight
- Enable to operate beyond published minima at « **SECONDARY AERODROMES** »
 - ☞ Increase **FLEXIBILITY** for air users and Very limited impact for aerodrome operators
 - ☞ Increase **EFFICIENCY** of the very dense **EUROPEAN AERODROME NETWORK**
 - ☞ Increase **ACCESSIBILITY** of secondary aerodromes and **RELIEVE HUB** in limited weather conditions
 - ☞ Reduce the **ENVIRONMENT FOOTPRINT** by limiting diversion and holding time as well as allowing more direct trajectories
- A family of operations adapted to user's need (NPA 2018-06) : EVS200, EFVS-A* or EFVS-L
- Add credit to ALL existing and future PBN or ILS Instrument Approach Procedures
 - ☞ The more efficient the PBN is, the more performant the EFVS is
- « on board » capacity (~ no infrastructure changes)

EFVS fleet



- **Business** aviation is well equipped

- Dassault, Gulfstream, Bombardier, Embraer



- **Regional** aviation started to be equipped in nov 2019

- ATR with HWD* as an alternative to HUD



- Fedex is one of the first operator equipped



- Air transport: In catalogue or in testing...expecting more...

- Boeing BBJ/ Airbus...

Chinese Roadmap
« 100% A/C equipped EFVS by 2025 »

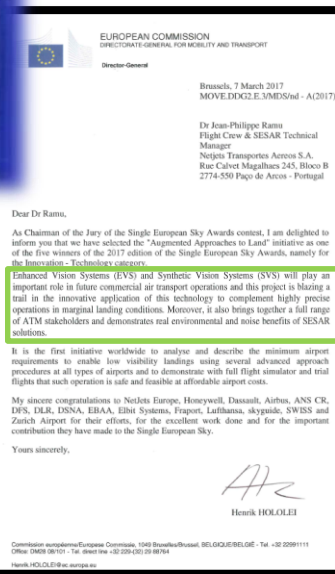


A worldwide fleet of ~3000 aircrafts
All aviation community will have aircraft equipped... in the coming years

European Commission and GSA support EFVS



SINGLE
EUROPEAN
SKY
AWARD 2017



<https://www.gsa.europa.eu/>

GNSS applications

Regulated applications in Aviation use certified equipment to achieve safe and efficient operations:

- **Performance Based Navigation (PBN)**, whereby an aircraft follows a specific procedure or route within a prescribed error margin. These procedures are available in all phases of flight.
- Applications combining **Enhanced Vision Systems (EVS)** / **Synthetic Vision Systems (SVS)** with GNSS have been developed and are being deployed enabling precision approach procedures for Business Aviation.

GNSS improving established solutions (EVS/SVS)

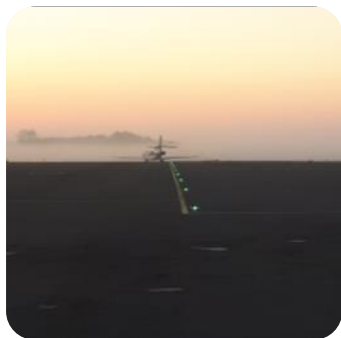
Additional funding will be allocated at European and international level for further development of Enhance Vision Systems (EVS)/Synthetic Vision Systems (SVS) based solutions for precision approach procedures (i.e. LPV). The combination of any CAT I approach (LPV 200, ILS CAT I) with an EVS or SVS solution can deliver a similar service to CAT II i.e. approaches going down to 200 feet.

FAA intends to implement approaches below 100 ft, but in Europe approaches below that have to be visual. Currently, both FAA and EASA have approved combined vision systems for operational use for approaches down to 200 feet above ground level. These systems are produced by multiple manufacturers on both continents including Dassault, BAE, Thales, Rockwell Collins, Honeywell, etc. The image on the right side shows a Dassault Falcon 8X FalconEye combined vision system while EVS/SVS in combination with GNSS-based approaches can vastly facilitate operations at difficult or unfamiliar airports.



European Commission and GSA consider EFVS operation as a good solution to complement PBN and to operate in limited weather conditions at secondary aerodromes

Conclusion



Technology is there... At least 3 000 Aircrafts are equipped including regional aviation ...Full regulation is going...Example of aerodrome approval are being conducted in SESAR AAL2...

It is time to deploy for complementing ALL precise operations i.e PBN & ILS and to operate in more weather conditions than today ... at « CAT I » aerodromes*

What Next



1. To issue the new AWO/ EFVS regulation on time: 2021 !
2. To inform Aerodromes operators, ANSPs and Local Regulators about EFVS benefits permitted by AIR OPS regulation in force as well as the new regulation
 - **What** are the EFVS OPS privileges
 - **How** to proceed to take benefit of these EFVS Ops privileges
3. To encourage publication of EFVS related information in AIP
4. To create incentive for aerodromes operators to support the promulgation of EFVS operation at secondary aerodromes
5. To determine clear objectives (date, amount of airports) for the deployment. To measure it and to assess it
6. To continue to support the update of EFVS operation at ICAO level



