

ENHANCED FLIGHT VISION SYSTEM (EFVS) DEMO FLIGHTS AT ANTWERP AIRPORT

SESAR AAL2 - Improving accessibility of regional aerodromes

Wim Verbist
Alexander Vanwelsenaere

*Airport Commander
Senior Air Traffic Environment Expert*

Antwerp Airport
skeyes

member of FABEC



1/ INTRODUCTION TO SESAR AAL2 & EFVS



SESAR VLD - Augmented Approaches to Land 2 (AAL2)

- International consortium of airports, airspace users, ANSPs, airframe/avionics manufacturers, regulatory bodies, etc.
- **EFVS** (WP3) goals:
 - Demonstrate **EFVS** concept on a larger scale, for a wide range of airports
 - Use demonstrations as input for **upcoming regulation** on **all-weather operations**



What is EFVS?

- provides a **real-time and enhanced display** of the external scene topography
- to the **flight crew**
- **using onboard imaging sensors**
- integrated with a **flight guidance system**
- **implemented on a head-up display (or equivalent)**

Enhanced Flight Vision System



© Dassault Aviation

Benefits of EFVS technology

- Improved **safety**
- Increased **accessibility** of airport in degraded weather, at a relatively **low cost**
- Focused on **small/medium-size airports** (no CAT II or CAT III infrastructure)
- **Environment**: reduced holding, diversions and overloading hub airports in degraded visibility



© SESAR AAL2 report

Regulatory Framework

- 3 types of EFVS Operations

- EFVS-Approach (EFVS-A)
 - Approach Operations
 - Down to 100 ft HAT

Existing

Current AIR OPS 'EVS'

- EFVS-to-Land (EFVS-L)
 - Approach + Landing Operations
 - Including roll-out

New

SESAR AAL2

- EFVS 200 operations (EFVS-200)
 - Descend below published minima
 - Down to 200 ft HAT
 - RVR > 550 m

New

'Light' operational credits

Specific Approval

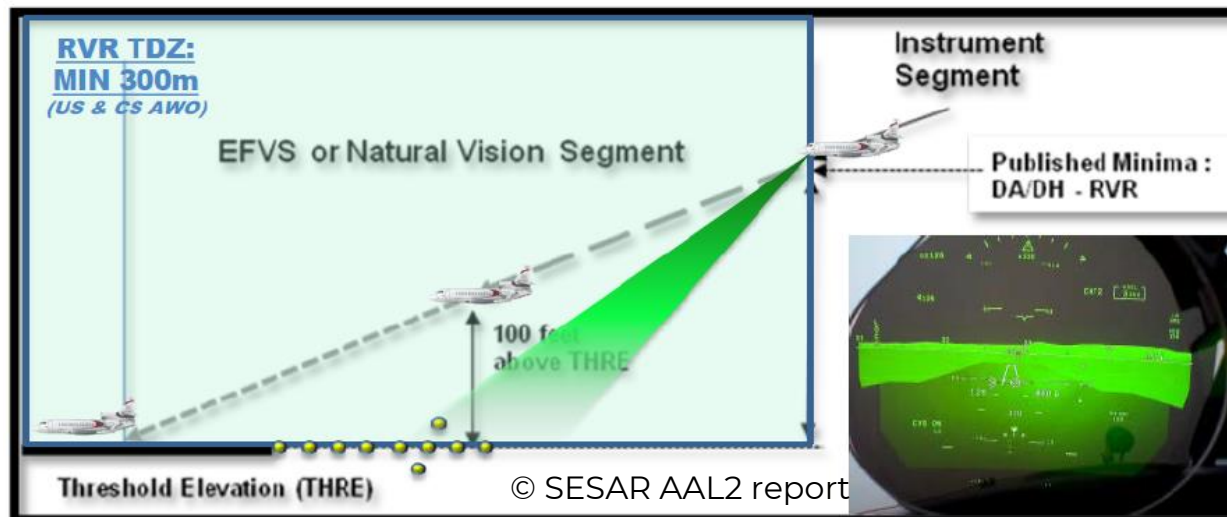
Low-Visibility Operations (**LVO**):

- DH < 200 ft; and/or
- RVR < 550 m

No Specific Approval
No LVO

EFVS-to-Land & Operational Credits

- EFVS-to-Land (**new** in upcoming regulation)
 - Crew flies instrument approach – as usual – down to DA/H (Decision Altitude/Height)
 - Crew can **use the EFVS** (instead of natural vision) **to descend below DA/H, and land**
 - EFVS not only used to increase situational awareness, but to **actively help guiding the aircraft down and landing it**
 - **DA/H remains identical** (instrument segment not impacted)
 - **RVR operational credits: 30% reduction of RVR (Runway Visual Range) minima**



2/ WHY ANTWERP AIRPORT?



Antwerp Airport as a strategic player



- Small/medium sized A/P – RWY 1510 m
- Orientation RWY 29/11
- ILS CAT I – RWY 29
- RNP/LPV app – RWY 11
- 306.000 Pax in 2019
- Regular flights - Business Aviation
- 2nd Seaport in Europe
- First PetroChem cluster in the World
- Main industrial/financial area in Belgium

Why EFVS at Antwerp Airport?

Why trials at Antwerp Airport?

- only CAT I ILS on RWY 29 available
- trials possible during normal OPS without obstruction for other operators
- type of airport for which this technology is interesting
- business aviation operator at airport interested in EFVS development
- simple lay-out of the movement area
- average of 20 days LVP operations / year – so real degraded meteo conditions

Benefits for the airport?

- no main investments needed in airport infrastructure or equipment
- reduction of deflections to other A/P – increased accessibility
- already existing LVP for take-off. Only slight changes were needed for EFVS demos
- financial, operational and environmental benefits

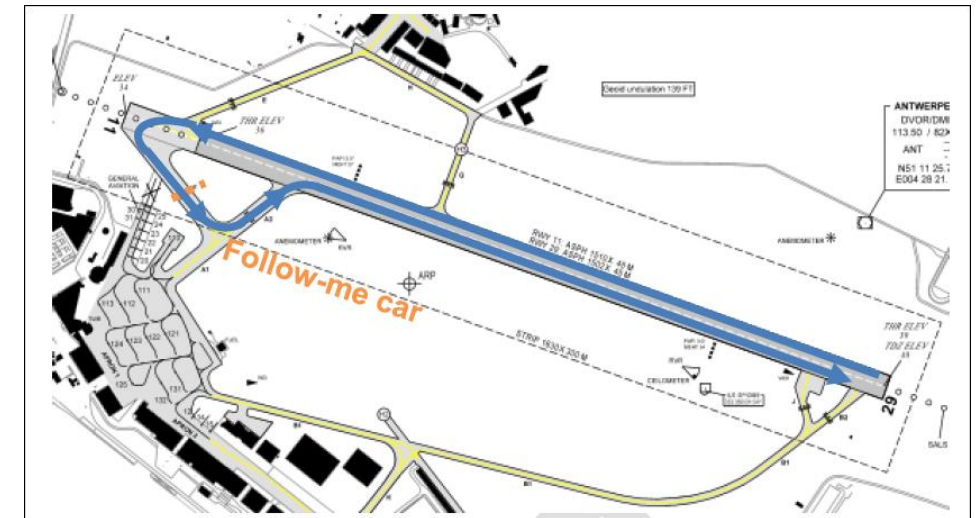
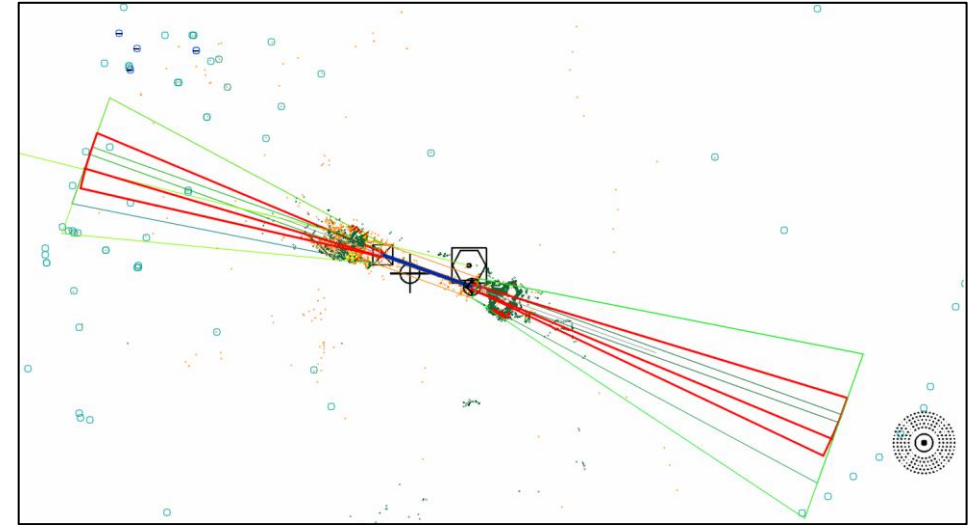
3/ ORGANIZING THE DEMO FLIGHTS



Preparing the demo flights

- CONOPS development by skeyes
 - EFVS suitability check (runways, procedures, etc)
 - EFVS compliance check (airport infrastructure, meteo equipment, etc)
 - PANS-OPS obstacle assessment
 - Development of low-visibility procedures for arrivals
 - Safety assessments (A/P, operators, ATC) & coordination skeyes
 - Training and documentation for OPS staff
 - Demo flight approval by BCAA and BSA, EASA support
- ...
- Collaboration by all stakeholders:**

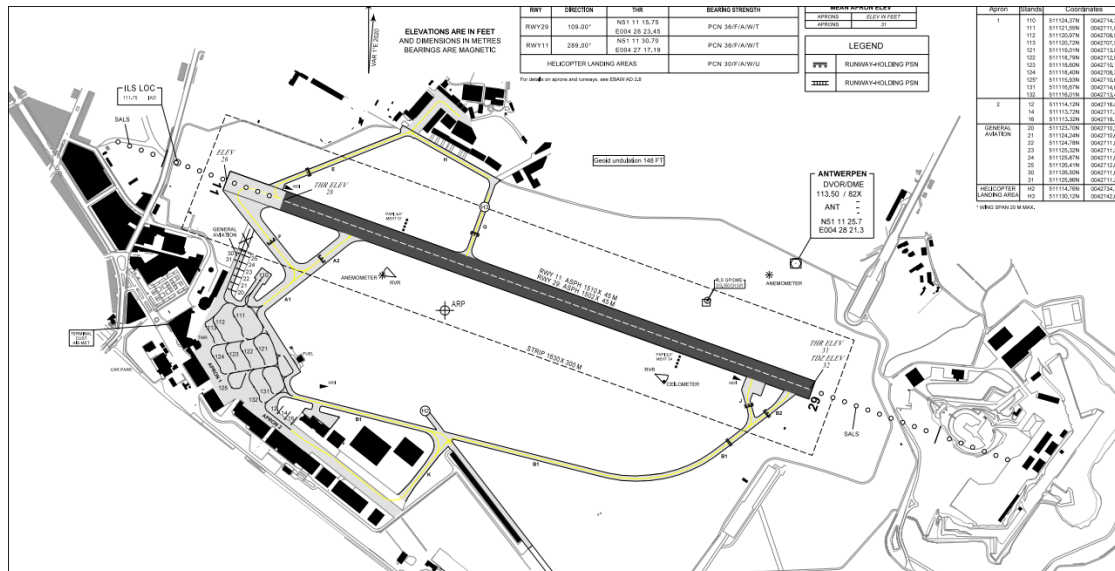
**Collaboration by all stakeholders:
operators – Antwerp Airport - skeyes**



Preparing the demo flights

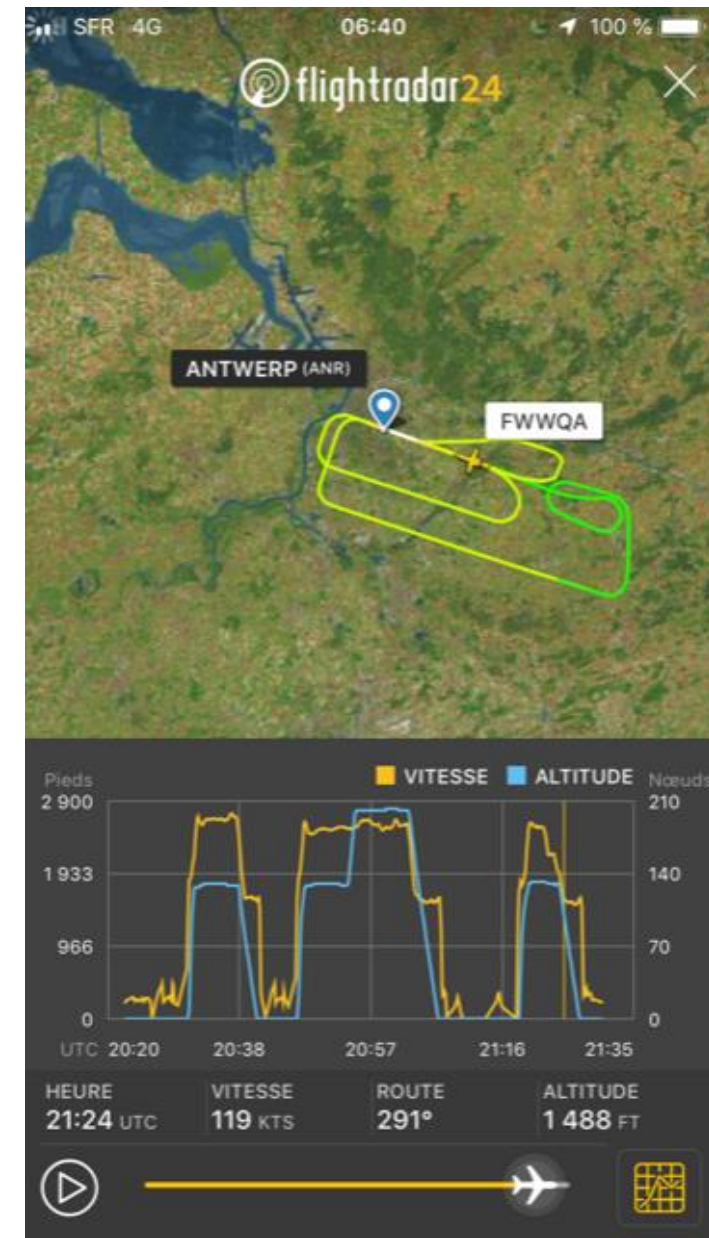
With EFVS -> take benefit of **30% OPS credits** on RVR (below CAT I)

Runway	Approach Type	'Conventional RVR'	'Reduced RVR' (30% OPS credits)
RWY 11	RNP APCH APV/BARO (LNAV/VNAV minima)	1100 m (CAT B) 1200 m (CAT C)	750 m (CAT B) 800 m (CAT C)
	RNP APCH APV/SBAS (LPV minima)	900 m	600 m
RWY 29	ILS CAT I	750 m	500 m



Performing the demo flights

- EFVS-to-Land demo flights at Antwerp Airport :
 - Dassault Falcon 8X (DEC 2019) and ATR 42-600 (APR 2019)
 - Pre-demo test flights to explore airport neighbourhood
 - ATR demo flight -> simulated LVP conditions
 - Dassault demo flight -> 3 landings on RWY 29
- **fully operational environment**
- **real degraded visibility** (RVR down to 500m)



Demo Flight Outcomes

- Antwerp Airport was the first airport for which EFVS-to-Land was demonstrated in a **fully operational environment** and in **real degraded visibility conditions**
- **Limited impact** on ATC and airport **complexity**.
- **Increased accessibility**: during the demo flights, other aircraft had to perform missed approaches (EBAW and EBBR) due to low visibility.
- **Le Bourget** also received experimental approval from French authorities, but no demo flights were performed (lack of 'bad' weather).

4/ DOCUMENTATION & KEY TAKEAWAYS



Documentation

skeyes developed an EFVS Manual for Belgian stakeholders

- Introduction to EFVS, different types, operational credits, etc
- EFVS suitability check
- EFVS compliance check
- Link to relevant requirements upcoming regulation
- Actions taken for demo flights
- Responsibilities of the stakeholders (aerodrome operator, aircraft operator, ANSP, regulator)



Documentation

- SESAR AAL2 website: <https://aal2demo.eu/>
- Promotional video: <https://www.youtube.com/watch?v=nR7Qsi42Jes>
- Deliverables: <https://cordis.europa.eu/project/id/783112>
- Articles:
 - <https://www.skeyes.be/en/blog/efvs-operations/>
 - <https://www.sesarju.eu/news/belgium-pioneer-introduction-enhanced-flight-vision-system-operations-europe>
- Upcoming regulation:
 - Notice of proposed amendment and associated drafts of AMC & GM for OPS/ FCL and ADR: <https://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2018-06>
 - EASA Opinion: <https://www.easa.europa.eu/document-library/opinions/opinion-022021>



Key takeaways



© SESAR AAL2 report

- 1/ Improved accessibility at relatively low cost – in particular for regional airports
- 2/ Compliancy check relatively straightforward (ATC, Airport)
- 3/ No increase of complexity and perceived workload (ATC, Airport)
- 4/ Successful demo flights are paving the way for future EFVS operations**

More info?

Request the **EFVS at Belgian Airports – Getting Started** documentation

via <https://forms.office.com/r/bMpvHWse96>

or QR code below:





nice to
have guided
you