INTEGRATED HUD/EFVS SYSTEM

Advanced Passive Millimeter Wave Sensor Technology
Safe and efficient

Together with our partner Vû Systems, Saab offers the Next Generation of Enhanced Flight Vision Systems (EFVS), using innovative passive millimeter wave (PMMW) sensor technology to enable low visibility operations in all weather conditions.

The PMMW Long Range Sensor solution is complemented by an Infrared Sensor (IR) and Synthetic Vision System (SVS) function, to provide an integrated Combined Vision System (CVS). The EFVS functions are fully integrated in our high-performance HUD System Computer.

EFVS is an Equivalent Visual Operation (EVO); EFVS extends the visual segment of an instrument approach procedure by enabling acquisition of the required visual references.

The value of EFVS is directly proportional to the performance of the sensor; our unique blended IR/PMMW sensor system enables acquisition of the visual references at significantly longer ranges, enabling low-visibility access to RNAV procedures with higher minimums.

HUD/EFVS systems can also significantly contribute to the mitigation of well known safety issues, such as Loss of Control Inflight (LOC-I), Controlled Flight Into Terrain (CFIT) and ground runway incursions.

**Next Generation EFVS: A New Value Proposition**

**Maximum operational advantage**

Rapidly evolving rulemaking will enable significant HUD/EFVS operational benefits for dispatch, take-off, approach and landing operations. These benefits are available to all aviation sectors including general, business, cargo and scheduled passenger operations.

Our blended sensor EFVS, using the unique PMMW sensor, enables maximum benefit from the new regulatory environment, for all types of instrument approach procedures in all weather conditions.

**Increased all-weather airport accessibility**

Our integrated HUD/EFVS with PMMW sensor technology significantly increases the detection range of the runway environment. With a demonstrated performance in excess of 2NM, our unique system enables all-weather access to lesser-equipped airports utilising RNAV/LPV procedures with higher minimums than an ILS.

The increased accessibility is a key enabler for route expansion and network growth to under-utilised airports.

**Full-feature integrated HUD/EFVS solution**

In addition to our next generation blended PMMW EFVS sensor, our HUD/EFVS system provides a complete integrated solution. This includes multiple symbology modes, optimised for each phase of flight, and multiple vision system modes including Enhanced (EVS), Synthetic (SVS), and Combined (CVS). Symbology and vision system modes can be customised and optimised for each application due to our open system architecture.

Saab’s High-performance HUD has been designed with pilot comfort as a priority. By focusing on key optical characteristics, we have developed a HUD that is comfortable to use for long periods of time and during all phases of flight.

**Visual Advantage: The importance of sensor performance!**

The new EFVS regulatory environment offers a unique opportunity for significant operational advantages. However, the value of the EFVS is only as good as the demonstrated performance of the sensor system: the Visual Advantage.

Our unique blended PMMW IR EFVS sensor solution offers a Visual Advantage significantly greater than traditional IR and electro-optical sensors. This directly enhances the value of the EFVS system.

**Blended PMMW EFVS Benefits:**

- Enables utilisation of high-capacity RNAV/RNP procedures where minimums are typically higher than ILS
- Increases reliable access to regional and under-utilised airports
- Reduces operational delays which increases utilisation of the fleet
- Reduced delay and block times reduce harmful emissions
EFVS sensor for all weather conditions

The Vū Cube is the unique Saab Vū PMMW Long Range EFVS sensor. With demonstrated performance in excess of 2NM, this is the first technology to offer a reliable all-weather EFVS capability.

The Enabler: Passive Millimeter Wave Technology

The unique Vū Cube is the first commercially available PMMW sensor for airborne EFVS applications. With a demonstrated performance in excess of 2NM, it provides unparalleled performance, enabling a certified Visual Advantage significantly greater than any other sensor. The passive technology avoids the requirement for frequency spectrum approval, and alleviates concerns for electromagnetic interference.

Combined Vision Solution

The Saab Vū EFVS solution includes integrated image enhancement and smart blending of the PMMW and IR images. The blended EFVS image is complemented with synthetic vision to provide an optimized Combined Vision System (CVS). The CVS imagery is presented on our high-performance Head Up Display (HUD).

PMMW Long Range Sensor sees full runway length.
SVS provides Combined Vision for maximum situational awareness.

PMMW Long Range Sensor extends the visual segment.
Enables acquisition of required references at significantly higher decision altitudes.
Advanced vision system solutions for all applications

Saab offers a complete range of advanced vision system solutions, ranging from fully integrated HUD/EFVS solutions to high-performance graphics processing computers, and software applications for integration on host avionics platforms.

Integrated System Solutions
Saab offers a complete integrated display and HUD/EFVS solutions for optimised SWaP (Size, Weight and Power) and system performance. Our high-performance HUD System provides superior optical performance based on detailed human-centred design. Saab can provide sensor integration, image processing & enhancement, easily adaptable symbology, configurable I/O & display logic, and high-performance graphic processing.

Advanced Synthetic Vision System
Saab has developed advanced synthetic vision engines for rendering existing digital terrain elevation data and the next generation of high-resolution terrain elevation databases. The SVS engines can support both HUD and full colour head-down displays, and can be integrated within the HUD Computer or hosted on the aircraft avionics platform.

In addition to a new, high-resolution terrain elevation database, Saab is also developing a unique 3D high-resolution, image-based database and rendering engine.

This new 3D image database will be qualified in accordance with EASA DAT1 (LOA1), and will provide global coverage, at an accuracy of 3m and resolution of 10m. The render engine will enable the first, true 3D photo-realistic Synthetic Vision System (SVS).

Image Processing
Saab continues to develop and evolve advanced image processing capabilities including image enhancement, image quality indexing and smart blending algorithms. These capabilities enable our unique blended sensor EFVS solutions.

Further developments of our image processing include artefact recognition, extraction, and artefact correlation between multiple sensors and our high-resolution image database. These developments are the foundation of our image-based navigation developments.

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SVS rendered with Saab’s unique high-resolution aeronautical terrain elevation database.

Saab’s High-performance Head Up Display

Saab’s unique 3D Image database & rendering software enables the next generation of high-resolution, photo-realistic SVS.
You can rely on Saab’s thinking edge to deliver innovative, effective products and solutions that enhance your capabilities and deliver smarter outcomes.