SSBV addresses the Defence and Security market with a number of products and services related to mapping, monitoring and object detection, utilizing the Synthetic Aperture Radar technology developed by MetaSensing B.V., a member of SSBV Aerospace & Technology Group.

**Technology**

The SAR technology used has been field-proven and given its nature, allows high-performance and versatile systems to be implemented, assuring very good SWaP (Size, Weight and Power), yet offering high-resolution and real-time operations and at highly competitive price.

The compact airborne SAR instruments are particularly suitable for integration on UAVs and (small) aircraft.

Depending on the application, different frequency bands are supported. Presently fully polarimetric and interferometric sensors at P-, L-, C-, X- and Ku-band are available, whilst a High-resolution Ka-Band SAR is under development.

The compact SAR technology has been proven in a range of different campaigns using airborne and UAV platforms. SSBV & MetaSensing also actively participate in technology demonstrations for agencies such as ESA and NATO.

For proof-of-concept demonstration and system testing, extensive experience is available from test–flights and imaging campaigns that have been performed around the world for a wide range of applications.

Because the SAR technology is proprietary and all systems are developed in-house, customized and application specific sensors can be developed and produced at relative low cost and within a short timeframe.

### Features

- Different frequencies P, L, C, X, Ku bands
- High resolution
- Compact and portable
- Low power
- All weather, day and night capabilities
- Cost-effective
- Customizable

### Applications

- Imaging (high resolution, real-time)
- Moving target detection (off-line and real-time)
- DEM and DSM
- Terrain classification
- 3D mapping
- Counter-IED (Airborne Ground Penetrating Radar)
- Environmental monitoring
- Change detection
**2D/3D Radar mapping**

Interferometric Synthetic Aperture Radar techniques provide new opportunities to accurately measure the topography of the Earth's surface through compact, high resolution radar sensors.

By acquiring two SAR images during a single flight, the SAR interferometry uses the radar phase difference to provide topographic height information, as well as information about surface changes at centimeter resolution.

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**Airborne GeoSAR Data Services**

The innovative low power compact sensor systems provided by SSBV / MetaSensing allow for the use of small (General Aviation) airplanes instead of traditional larger aircraft that would be equipped with large antennas and equipment racks. The compact sensors can be easily mounted and powered from standard power outlets / buses.

Several scientific and commercial campaigns have been performed at different frequencies (P-, L-, C-, X- and Ku-band) for a number of International research institutes, space agencies, and commercial companies.

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**Airborne Ground Penetrating Radar Technology (AGPR)**

In recent years, SSBV and MetaSensing have been involved in the development and demonstration of a low-frequency airborne (P/L-Band) Ground Penetrating SAR sensor.

For this purpose, an end-to-end solution including a compact, yet wide-band antenna (P-Band), SAR electronics and a ground-based data processor have been developed. Operation of the radar has been demonstrated in a number of airborne campaigns with very good results, showing penetrating capabilities of dry-sand areas in the order of several meters.

The AGPR technology is a highly promising candidate for counter IED solutions.
Structural movements and/or terrain sliding information is becoming increasingly important in the areas of construction, (critical) infrastructure management, mining, disaster management and security. This creates the need for the continuous monitoring of critical structures such as dams, dikes, towers, bridges, landslides, glaciers and unstable slopes.

The Fast Ground Based Synthetic Aperture Radar (FastGBSAR) is a new ground-based solution for the real-time monitoring of unstable (deformations, vibration) natural elements and man-made structures.

The FastGBSAR is a non-invasive remote sensing tool for continuous monitoring of deformations in large areas. A compact and easy-to-install sensor can operate even under harsh conditions (low temperatures, rain, fog, dust, smoke, ash).

A FastGBSAR acquisition can be performed in less than 5 seconds when in SAR configuration mode, overcoming the limitation of low temporal coherence as are experienced with similar systems in this market.

A high spatial resolution (0.75 m in range, 4.5 mrad in cross-range) and sub-millimetre deformation accuracy of the observed scenario is possible from a distance of several kilometres, without the need for an in-situ operator.

The figure below presents an example of dike monitoring displacement maps, observed by a Fast GBSAR sensor installed 40 meters away from the dike, monitoring the displacement of the entire dike surface in real-time.

The analysis of the displacement time series allows, in combination with prediction models, a prediction of the moment in time and the location at which the dike fails.

Due to the large FastBGSAR antenna coverage, it is possible to simultaneously measure sub-millimeter displacements at different locations of a structure (for example a bridge) without any physical contact.

In the example below, a bridge with road traffic was monitored by the FastGBSAR in RAR mode, during normal traffic conditions.

When monitoring structural vibration in this mode, a measurement rate of up to 4,000 measurements per second can be achieved.
Advanced radar systems

Airborne / UAV SAR sensors
Based on a wide experience in high resolution, low SWaP sensor research, a number of flight-proven systems are available. X-Band and Ku-band sensors for (real-time) imaging, Moving Target Detection (MTD) and high resolution imaging for target (ship) classification have been implemented and used on small aircraft and UAVs. Likewise, sensors are used for maritime surveillance, ice monitoring, object surveillance and GMTI.

The systems can be static mount or utilising a gimbal/rotator for real-time area of interest pointing and autonomous data collection based on GPS / sensor-look angle. All radar systems feature built-in GPS and AHRS/IMU sensors that are integrated in the SAR data collection and processing, and as such the radars can operate independently from the host platform.

If required, also a data link can be integrated with the sensors for line-of-sight communications.

Port security radar
In several coastal areas of the Mediterranean region networks of high resolution surveillance radars are being deployed. Each network node operates independently, but is synchronized through GNSS signals.

The radar features an agile frequency and resolution configuration, allowing not only detection and tracking of maritime objects in the sea, but also the radar imaging of moving ships. This sub-metre high resolution imaging capability is implemented through advanced and innovative Inverse SAR algorithms.

About SSBV and MetaSensing
SSBV is a technology driven company, active in the domains of (aero)Space, Remote Sensing & Monitoring, Defence & Security and the development of High-Tech Systems. Within SSBV and its partnership companies, a wide range of high-tech, but product-based systems are available. These range from Test Systems, Ground Stations and communication systems to airborne and space-based SAR sensors and small satellite components and subsystems.

MetaSensing B.V. is a partnership company of the SSBV Aerospace & Technology Group, focusing on radar/SAR research and innovation, product development and imaging services.

MetaSensing and SSBV are further developing the airborne radar technology and creating new SAR applications. SSBV incorporates the MetaSensing SAR technology in their products and services. It also actively participates in engineering and production & qualification activities.

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