

# The UKRAINE project and the integration of GNSS and satellite communication technologies

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## Abstract

The UKRAINE (UKraine Replication, Awareness and INnovation based on EGNSS) project was established in January 2015 to capitalize on opportunities for partnerships created by the finalization of the EU-Ukraine Cooperation Agreement in the field of Global Navigation Satellite Systems (GNSS), and will be run until September 2016. The project is meant to strengthen Europe's position as a major space player with Galileo and EGNOS in the Ukrainian market of GNSS applications, by laying the groundwork for research and development as well as commercial alliances between existing entities. Achieving these objectives will create business opportunities in Ukraine for both national and European companies, as well as generating public benefits for the Ukrainian, businesses, economy and society.

Key components to the project are preparation of the Ukrainian aviation market to the extension of EGNOS, identification of legislative options to support the uptake of European GNSS, development of solutions for multimodal logistics and dangerous goods transport, and fostering commercial relationships between enterprises in both Ukraine and EU Member States.

The UKRAINE project intends to demonstrate and document best practices that can be replicated in other national GNSS markets with an extensive communication campaign. A final project conference will be held in Brussels to present milestones achieved in the areas of legislative framework, technological advances and procedural innovations.

## The UKRAINE project

The UKRAINE project was established in January 2015 to capitalize on opportunities for partnerships created by the finalization of the EU-Ukraine Cooperation Agreement in the field of Global Navigation Satellite Systems (GNSS). It was created with the aim of strengthening Europe's position as a major space player with Galileo and EGNOS in the Ukrainian market of GNSS applications, by laying the groundwork for research and development as well as commercial alliances between existing entities. Achieving these objectives will create business opportunities in Ukraine for both national and European companies, as well as generating public benefits for the Ukrainian economy and society.

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These objectives are being achieved through a series of activities, taking place between January 2015 and September 2016. Significant Ukrainian stakeholder involvement is being ensured thanks to direct participation of the Ukraine State Space Agency (SSAU), National Aviation University (NAU) and Technical Polytechnic of Kiev (KPI), events held in Kiev and Brussels to create

business matchmaking opportunities and other initiatives including a unique contest launched in April 2015 to develop applications using EGNSS.

## Project objectives

The objectives of the UKRAINE project - in line with the Horizon 2020 GALILEO-3-2014 Call, are to create a broad acceptance of EGNSS in Ukraine and foster application development through international cooperation, simultaneously creating opportunities for both knowledge building and commerce. More in detail, the UKRAINE project concentrates on achievement of the following impacts:

**1. Removal of cross-border legal barriers** in Ukraine by creation of a legislative roadmap to facilitate the uptake of regulated EGNSS applications. This will be accomplished by performing a study on amending the Ukrainian legal framework to key European directives and regulations on EGNSS in transport and other downstream applications. Once the study is completed, the results will be utilized to:

- ensure that all relevant decision makers, especially Ukrainian space and transport policy makers, are aware of the benefits from updating the legislative framework to the EU acquis on GNSS in transport and logistics, as well as other GNSS applications;
- itemise the required changes and the potential socio-economic impacts;
- provide a roadmap and a set of recommendations to be used as a decision-making tool by Ukrainian policymakers as they work toward harmonizing the national laws with EU legislation on GNSS applications and cooperating in the use of satellite navigations systems.

**2. Preparation of the aviation market** as the starting point for the extension of EGNOS to Ukraine by preparing the groundwork for PBN and LPV, working on GNSS signal monitoring and setting the required legal framework. This will be accomplished by making users (CAA, ANSP, Airports) aware of the potential threats and the mitigation possibilities by using GAIMS (GNSS Airport Interference Monitoring System) via a demonstration exercise as well as partnering with these users in developing the GAIMS implementation roadmap for the Ukrainian airports. An example of dangerous interference occurred at the Newark (US) airport when GBAS (Ground Based Augmentation System) had to shut down when a jamming device passed by on the highway around the airport. Another alarming situation was brought to light by a study of Taiwan's Kaohsiung airport where more than 100 interferences were found in a single day. The threat is real.

**3. Generation of innovative solutions** for multimodal logistics and tracking and tracing of dangerous goods by logistics operators active in Ukraine. This will be accomplished by performing a pilot on multimodal freight transport exploring the Ovinto solution and relevant modifications for 2 different categories of end users: hazardous goods transporters and multimodal logistics operators. Battery-powered and resistant to extreme temperatures, Ovinto currently allows chemical, oil and gas companies to reliably monitor hazardous materials regardless of location using satellite technology. A very specific goal is the introduction of the dangerous goods tracker modification that includes a state of the art gas sniffer to tackle the immense Ukrainian problem of gas trucks leaking chlorine, ammonia and bromine. Getting regular and accurate EGNSS-based information on the location of containers, wagons and other powerless multi modal transport devices will have a huge impact on the European and Ukrainian efficiency, reducing investment costs for clients and increasing the ability for the transport to guarantee arrival times and service levels. The development activities on Ovinto Monitoring solution for dangerous goods and multimodal logistics will generate commercial opportunities for EGNSS enabled (EGNOS and Galileo compatible) products in Ukraine. This will be accomplished by:

- a. organization of a workshop on dangerous goods
- b. creation of a pilot project involving a large transporter or logistics operator active in Ukraine

- c. preparation of an updated business model and business plan
- d. creation of the marketing plan to support post-project commercial activities

**4. Creation of business matchmaking opportunities** for Ukrainian and EU companies for long-term collaboration, in particular in the field of EGNSS and its applications. Ukraine is widely considered to have attained excellence in space technologies but faces the difficulty of getting in contact with EU companies to effectively explore collaboration opportunities. The creation of an environment favourable to matchmaking and cooperation between companies and institutions will be fostered through different means with the goal to impact different levels. This will be achieved through the organization of:

- a. three business matchmaking workshops to bring together Ukrainian and EU companies seeking opportunities for cooperation in Ukraine (two in Kiev and one in Brussels)
- b. a contest in Ukraine built around the development of EGNSS innovative ideas, thus engaging GNSS stakeholders in research and academia as they will be directly involved.

**5. Dissemination and awareness of project activities and results** so that stakeholders are aware of potential areas of participation as the project progresses, and final results including deliverables are showcased. Key components are the website, newsletters, press releases and events.

## **Project activities**

The specific action steps to achieve the objectives mentioned above comprise:

- preparation of the Ukrainian aviation market as the entry point of the extension of EGNOS – specifically addressing LPV procedures, GNSS signal monitoring and reinforcing systems integrity;
- performing a study on amending the Ukrainian legal framework to facilitate compliance with European directives and regulations on EGNSS in transport;
- organizing business matchmaking opportunity events for Ukrainian and EU companies and representatives;
- launching a contest for proposals for design and production of innovative EGNSS applications;
- generation of innovative solutions for tracking and tracing in multimodal logistics and transport of dangerous goods.

This last action sees both satellite navigation and satellite communication as essential building blocks of an innovative tracking solution addressing the Ukrainian market. A combination of various satellite technologies, including European GNSS solutions, could make it possible to address the problem of fleet location with a single solution. However, how this location data can be exploited in different scenarios to solve different business needs, as well as the extra business needs that can be solved by tracking additional parameters (e.g. gas leaks, nuclear radiation) is the subject of the research conducted in the Ukraine project.

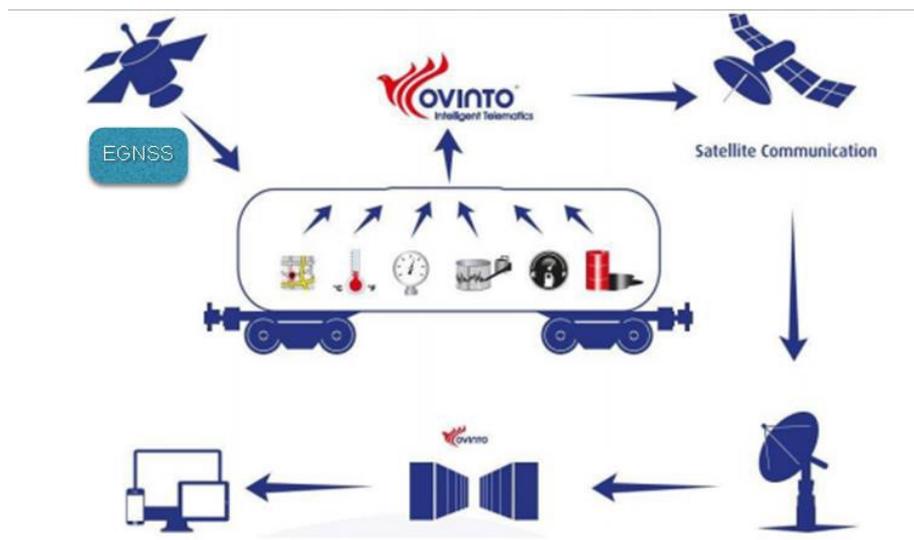
## **The Ovinto Sat solution: combination of satellite navigation and satellite communication for tracking and tracing of dangerous goods and in multimodal logistics**

The technical solution developed in the UKRAINE project, developed by Ovinto, addresses the use of satellite technology for the reduction of transport risk, security enhancement and

optimization of logistic operations by the tracking and monitoring of extremely dangerous goods in unpowered transport units such as tank wagons (rail) and tank containers (intermodal).

Many industrial activities involve the transport of dangerous goods in unpowered transport units. This project is in a first instance focus on transport in the chemical and nuclear sectors as well as their logistic business partners who are operating train wagons and tank containers. Users from the chemical and nuclear sectors are heavily involved in guiding and reviewing the proposed locally adapted service development.

The overall concept of the service is depicted in the figure below. Satellite technology is proposed for tracking (GNSS including EGNOS) and communication purposes (satellite-based M2M), via the Globalstar Low Earth Orbit constellation. The solution is fully EGNOS compatible and ready to accept Galileo signals.



Considering the **satellite navigation technology**, the project team is currently investigating different navigation modules for different satellite navigation systems, with a clear focus on multiconstellation and/or SBAS receivers with a short time to first fix. More in detail, the main criteria according to which receiving navigation modules have been selected are:

- Current battery consumption
- Time---to---first fix (TTFF)
- High accuracy of position determination;
- Support of satellite based augmentation system (SBAS);
- Ability to process signals from several different satellite navigation systems (GPS, Glonass, Galileo).

Considering **satellite communication technology**, its use is not only needed to cover mobile phone coverage dead zones, but also because the use of mobile phone technology poses a safety threat (ignition). Currently the Ovinto monitoring solution is the only solution on the market that has been certified up to the highest safety level for chemical transports. More in detail, it has been preferred to mobile communication due to a series of advantages within high end tracking solutions:

- Lower battery consumption, with estimated energy consumption lower up to 100 times in areas with poor mobile reception;

- Global coverage, particularly suited to cover a territory where mobile coverage is not ubiquitous;
- Highest ATEX certification thanks to increased safety against ignition events.

Empowered by satellite connectivity and GNSS positioning, the Ovinto Monitoring solution provides a **platform for integrating multiple sensors**, and feeding back any alarms to the central control unit or the transporter, the owner of the goods, public entities, etc. if parameters have been crossing a predefined limit, accompanied by the exact position of the transport.

Each hazardous goods transport has other parameters to monitor, so the approach in the Ukraine is to define what the most common safety hazards in hazardous transports are. The assumption made, and to be validated by the initial study, is that the most hazardous transports concern are the transport of bromine and chlorine dioxins (known for their use in defoliants like Agent Orange) and ammonia. The proposed solution is to include an innovative gas sniffer to the Ovinto Monitoring solution. The Polytechnic University is currently simulating the effectiveness of the proposed integrated solution in their labs to be able to demonstrate its effectiveness to the public authorities.

## Project partners

**VVA** is an international leading strategy consulting firm, with a European network. VVA was established in 1992 by a group of Bocconi University professors. Now – more than twenty years on – management consulting is the core activity, with a strong focus on the industries related to GNSS (e.g., LBS, Road, Agriculture, Transport, etc.).

**VVA-Europe**, a subsidiary of VVA, focuses on the analysis, development and assessment of European public policy. VVA-Europe has a multinational team from different backgrounds covering social and political research, economists and industry specialists. The team's focus lies in supporting the analysis of EU public policy through market economic and regulatory advice.

**State Space Agency of Ukraine (SSAU)** is a central body of executive power of Ukraine authorized to make and provide realization of the government policy in space activities. After proclaiming Ukraine's independence in August 1991, the National Space Agency of Ukraine (NSAU) was established in February 1992 aimed at: development of conceptual foundations of state policy in the exploration and use of outer space for peaceful purposes and for the benefit of national security; organisation and development of space activities in Ukraine and abroad, under its jurisdiction; participation in ensuring national security and defence capabilities; state support in commercialization of space activities; organisation and development of cooperation between Ukraine and other countries and international space organisations.

**Ovinto** is current service provider in the user domain of asset monitoring and tracking, as well as dangerous good tracking, with several hundreds of terminals currently installed for several customers all around the world. Ovinto is experienced in application of GNSS and SatCom space assets in a practical transport environment.

**GNSS Expert** is the commercial, client facing name for the legal entity Advies de With, an innovation strategy consulting company founded in 2012. The main focus of consulting activities are GNSS related applications and go-to-market strategies for innovative start-ups.

**TeleConsult Austria GmbH (TCA)** was founded in 1999 as Spin-off Company from Graz University of Technology, Institute of Navigation. The major activities of TeleConsult Austria GmbH cover the field of precise positioning and reliable navigation, particularly the areas of development and combination of navigation-, telecommunication-, and information technologies, and services for applications in the context of transport and mobility.

**National Aviation University (NAU)** of Ukraine is a powerful state-owned higher educational establishment nationally accredited to Level IV (the highest). It performs on a high level training, retraining and professional development for the students of Bachelor, Specialist and Master Degrees.

**National Technical University of Ukraine “Kiev Polytechnic Institute” (NTUU “KPI”)** is one of the biggest world-known higher education institutions in Ukraine. It was founded in 1898. NTUU "KPI" is famous for its academic excellence and leading innovative research. KPI is home to 26,000 students (including foreign students from 27 countries of the world), which represents 25% of all the technical university students in Ukraine. About 2, 500 Professors, Associate professors, assistants and full time researchers work at the University.

Founded in 2001, **PILDO Labs** is an engineering company specialized in delivering top of the edge technology within the aeronautics and space sectors. The operation of PILDO is structured in three main areas: Navigation services, in charge of delivering GNSS services to aeronautical sector; Software services, in charge of providing software development support to the other areas of the company and also directly to clients that need critical software such as Space sector and Finance clients; R&D services, responsible for developing new services and products that provide the company with a strategic position.