

Artillery Launch of Light Rocket Space System into Suborbital Trajectory.

Yuzhnoye presents the project of Artillery rocket-space system, designed for launching the payloads in to suborbital trajectories. The mass of payload may be of several kilos. Payloads may be launched to the altitude of 100 km and more. The proposed technology envisages the return of the launched payloads to the launch site for their further use. This approach provides cheap and highly effective monitoring of any ground areas, including in crisis situations.

The main objective of the proposed research is development of means for solving the problems of effective real time monitoring of emergency situations, quick deployment of telecommunication channels, implementation of different experiments in zero gravity conditions, ets.

Duration of the project is 2.5-3 years when the below activities will take place:

1. Development of Artillery rocket-space system conceptual design.
2. Draft design of the Artillery rocket-space system. Development of design documentation and production of experimental samples.
3. Experimental finalizing of the system, demonstrative launches.
4. Search of business applications for the proposed technology.

The proposed system will use Galileo system for the positioning of the container with equipment. Galileo data will also facilitate the interconnection of telecommunication channels and receiving systems via the extreme precision of its atomic clocks. Using Galileo system here will be a valuable tool for the providing of emergency services (fire brigade, police, paramedics) who will respond more rapidly to people in danger.

Highly Accurate Method for Determination of Flying Vehicle Motion

Yuzhnoye presents the development of a new highly accurate method for determination of flying vehicle motion. This method is based on coordination of excessive navigational data of Galileo system and development of working version of calculation software. The proposed method allows to process data from Galileo satellite more accurately that, in turn, allows increasing the accuracy of position determination.

The main objective of the proposed research is development of more accurate, compare to existing methods, (by 2 and more times) method and software of Galileo system navigational data after session processing for its further presentation to users. After adaptation, the software may be applied for identification of any physical process, which dynamics is specified by a set of equations with finite number of parameters. The proposed method will allow increasing significantly the competitiveness of Galileo system.

Duration of the project is 2-2.5 years when the below activities will take place:

1. Theoretical research including development of methods, selection of optimal coordinated measurements method parameters and providing recommendations on the measurements procedure.
2. Simulation and optimization of the coordinated measurements method parameters, providing recommendations on improving the method as applied to measurements by the Galileo instrumentation.
3. Development of a baseline software to support coordinated measurements method as applied to measurements by the Galileo instrumentation.
4. Development of a working version of the software and the user's guide.
5. Search of business applications for the proposed technology.

The use of the above said method results in increasing accuracy of Galileo system navigational data processing. This will make Galileo system more competitive when comparing to other space navigation systems.

Integrated Automated System of Regular and Crisis Monitoring of Frontiers and Adjacent Territories

The proposed research envisages creation of the integrated automated system of regular and crisis monitoring of frontiers and adjacent territories. The research will analyse and create database of all the sources of information about state of the near-border territories and objects on both sides of the EU border and database of the satellites which make it possible to get information about the EU near-border territories.

The main objective of the proposed research is monitoring of the status of territories, systems and objects situated in frontier areas to provide decision making personnel during regular and crisis control of the monitored objects with effective, analytical and forecasting information, systems and processes, and also to issue controlled actions to the monitored systems at threat of crisis situation arising.

The works within the project will be divided in two thematic blocks. In the frameworks of the first block there will be developed basic approaches on acquisition, processing, analysis and delivery of the information (software, hardware, algorithms, organizational tools). In the frameworks of the second block there will be developed basic approaches on the processing of satellite information and its adaptation for the System's tasks. Within the second block the instruments of coordinated utilization of the existing satellites for the System's tasks will be developed also.

The proposed system will use Galileo system for satellites global positioning and for positioning of crisis areas.

Poperedzhennya Mission: Satellite Constellation for Earthquakes Forecasting

Warning-Poperedzhennya mission is a satellite project devoted to the forecasting of earthquakes. The matter of the missions is creation and launch into orbit of several satellites which monitor seismogenic disturbances of the ionospheric plasma. The life time of satellites is about 3 years; orbit altitudes are 600 km. Due to a high inclination of the orbit (73.5°) Poperdzhennya will cross the main regions of the ionosphere including the bubble, middle latitude throat and auroral oval.

The main objectives of Poperedzhennya are the following:

- Search, observation and investigation of seismogenic electromagnetic and plasma phenomena in the ionosphere;
- Investigation of physical mechanisms responsible for the coupling between layers in system “lithosphere-atmosphere-ionosphere-magnetosphere”;
- Development of principals of satellite monitoring of the ionospheric signatures of anthropogenic and natural hazards.

Considering the fact that the main scientific results of Poperedzhennya project are:

- examination of the correlation between earthquake events and ionospheric effects interpreted as earthquake precursors;
- judgment on the reliability of related satellite observations;
- physical models of lithosphere-ionosphere coupling;
- spatial and temporal patterns of the ionospheric earthquake precursors;
- principals of they identification and separation from the background noise;
- principals of satellite data collection, storing, processing and quick primer analysis;
- principles of space-born monitoring of earthquakes precursors and other natural and anthropogenic hazards,

the proposed project will become one of Galileo elements. Poperedzhennya will be used jointly with Galileo system when predicting the disaster (earthquake) coordinates. Moreover the extreme precision of atomic clocks onboard the Galileo satellites will increase the position accuracy of the earthquake to be occurred; besides it will also help proving timely information about the occurrence of some particular earthquake.

Space Patrol - Global Space Telecommunication System for Emergency Situations Management

Space Patrol - the global warning system of the emergency and dangerous situations really threatening to a society or the person, including threat to property of the people. The system will allow an emergency and rescue services operatively and with high accuracy to help the people and locate extreme situations.

Space Patrol is the first specialized global space-based communication system providing possibility of active intervention into the process of particular emergency situation for its elimination, reduction or decreasing its consequences.

The operation of Space Patrol system has global cover and real-time work. Space Patrol will have high reliability of the emergency information channels. It will be enriched by redundancy through terrestrial GSM lines. The emergency service of Space Patrol will be accessible for the general public. The subscriber terminal service will be cheap.

Main objective of the project – low cost and efficient transmission of information to/from “Space Patrol” Customer that foresees capability of active remote operative intervention into the emergency situation process with the aim to stop or minimize crisis consequences.

Space Patrol application area can be extended to the monitoring the emergency situations of various kinds:

- Man-caused emergencies and disasters
- Natural disasters
- Protection of disastrous and vitally valuable objects (mobile and stationary)
- Peculiar tasks in the sphere of medicine, monitoring and control

These services will be provided by the low-orbit constellation, including 54 simplest satellites. Thus, the future space segment is the constellation of light and cheap communication satellites, placed at the low near-Earth orbits.

Space Patrol will use Galileo system for satellites global positioning and for positioning of people in crisis situations. Space Patrol will provide e-mail services and data transfer services using Galileo data to facilitate the interconnection of telecommunication channels.

Vibroacoustic Monitoring of Load-Bearing Structures

The Project “Vibroacoustic Monitoring of Load-Bearing Structures” is dedicated to the development of methods and instrumentation of vibrodiagnostics of the states of various loadbearing and support elements of large constructions, machines and mechanisms.

Well-known methods of discrete monitoring are not always applicable for real constructions or cannot guarantee reliable detection of flaw place or construction element, which is in state preceding to the destruction. Moreover, monitoring instrumentation used in some of these methods measure the increment of the parameter diagnosed under the impact of variable load from preset value i.e. relative values are measured.

It is obvious, that such monitoring means are not applicable for the majority of objects that are in continuous operation.

The proposed vibroacoustic method of diagnostics deals with diagnostic parameters absolute values of which define load-bearing capacity of load-bearing elements of construction at the moment of control using certain dependences.

The dynamics of change of these parameters in time allows to predict marginal state of the construction.

The methods developed under the Project will allow to conduct diagnostics of the load-bearing elements of the structures at different stages of the objects operation starting from the designing stage of an object up to stage of long operation. It will also allow to determine parameters and criteria that will enable Organizations responsible for supervising the objects to make prompt decisions on further operation or termination of the operation of the objects basing on the telemetry information received from the objects directly through satellite communication channels.

Moreover, in the result of the Project it will be possible to determine operation reserve of an object which is under long operation as well as to define flaws in the load-bearing and support elements of the constructions in order to prevent further destruction of the objects or to reinforce an object which is exposed to the impact of natural disasters such as floods, earthquakes and etc.

The proposed project will use Galileo satellites data for determination of accurate position of the monitored objects as well as for the facilitation of the interconnection of telecommunication channels needed to transfer the information from the monitored objects to the decision-making centers.