Management of Interaction of Unmanned Aircraft Systems of Fixed-Wing and Rotorcraft Type, and Ground Vehicles in the Solution of Tasks for Gasprom JSC Benefit

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Goal of the experiment

- practice of operational interaction of unmanned aircraft systems (UAS), ground forces and means for the solution of tasks of vehicles and infrastructure objects monitoring in the area of Gasprom JSC operating activities;

- demonstration of the possibility to use ADS-B hardware and software for safe execution of UA flights including simultaneous flights with piloted aviation in common airspace, interaction of attracted forces and means;

- practice of the problems of unauthorized vehicles detection in the protected zone of energy complex infrastructure.

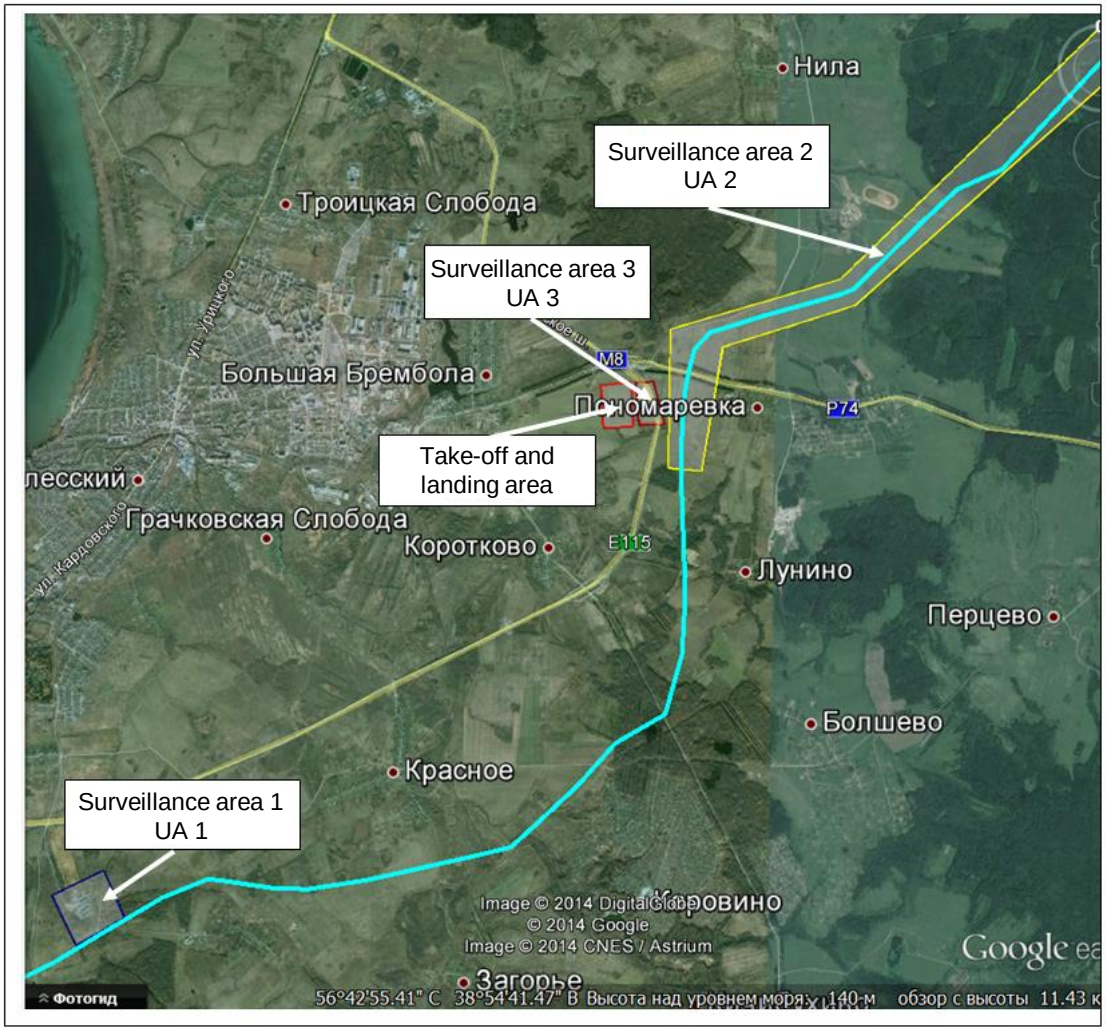
ADS-B as the basis for the forces and means interaction in the area of experiment

- ICAO concept (CNS/ATM) considers ADS-B as one of basic technologies of communications, navigation and surveillance development;
- The Program of ADS-B implementation in the Russian Federation is based on two types of data links: 1090ES and VDL Mode 4, and is adopted by Ministry of Transportation (Mintrans) of Russian (May 19, 2011);
- VDL Mode 4 is a comprehensive standardized digital data link providing for ADS-B operation in «In» and «Out» formats, implementation of adjacent FIS-B, TIS-B, A-SMGCS, DGNSS functions, search-and-rescue works;
- FGUP GosNIIAS researches and flight experiments (Siverskoye airdrome, 2011; Lytkino airdrome, 2014, Alferyevo, 2014) have confirmed the ability of VDL 4 and adjacent applications to provide the control of piloted and unmanned aircraft flights in common airspace.

Participants of the experiment

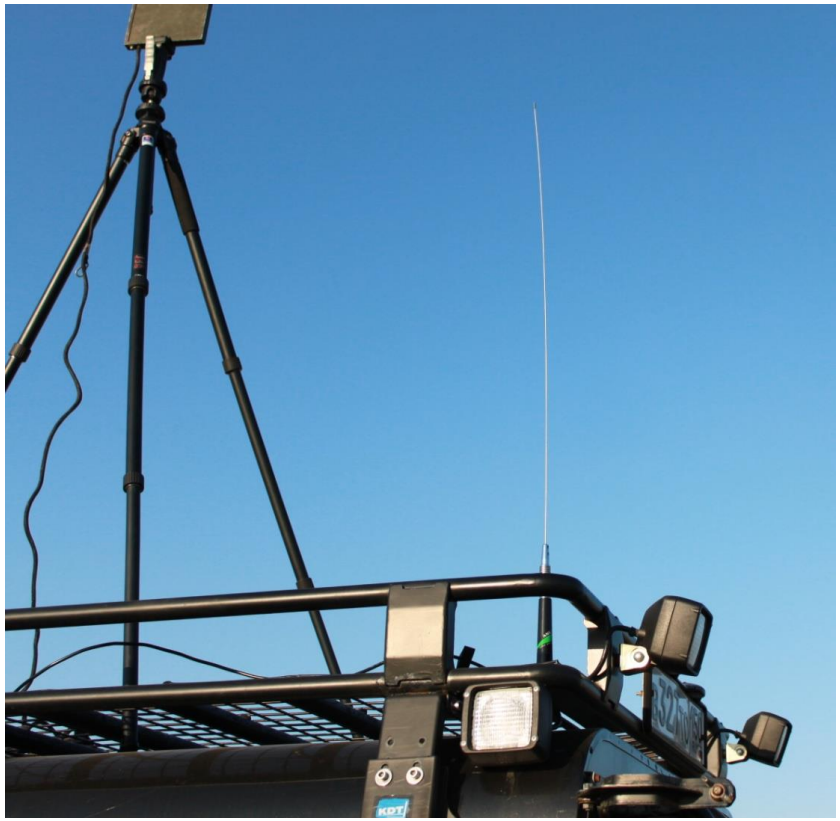
- Gasprom. Space systems JSC, Aerospace monitoring data collection center: fixed-wing UA as a component of a remote pilot station and Supercam S350 UA-C;
- MAI: rotorcraft UA as a component of a remote pilot station and VORON UA-B;
- FGUP GosNIIAS: ADS-B Mode 4 implementation, equipping of UA and ground vehicles of the participants of the experiment.

Area of the experiment



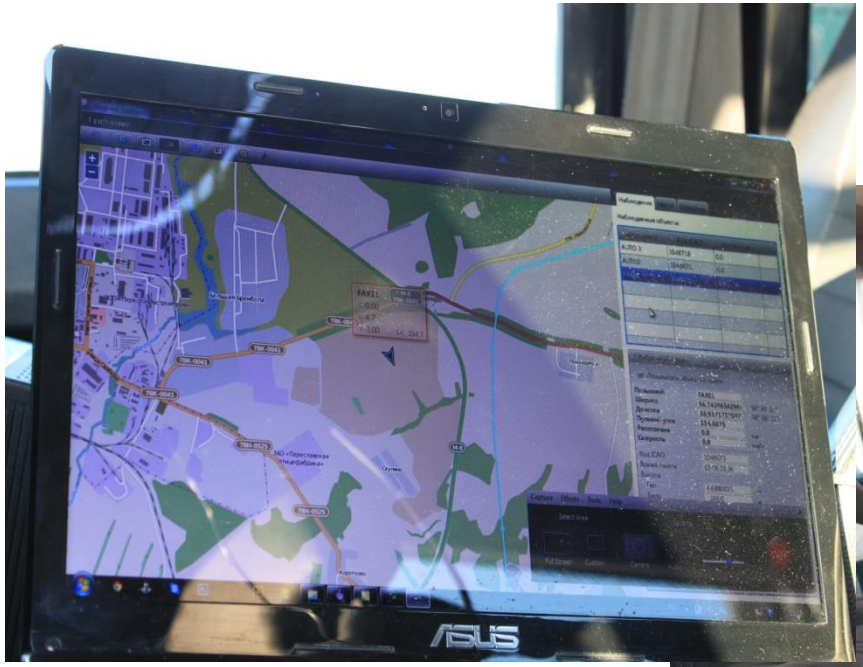
Remote pilot station for Supercam S350 fixed-wing UA

ADS-B location at the remote pilot station



Mobile control station based on Bargusin car

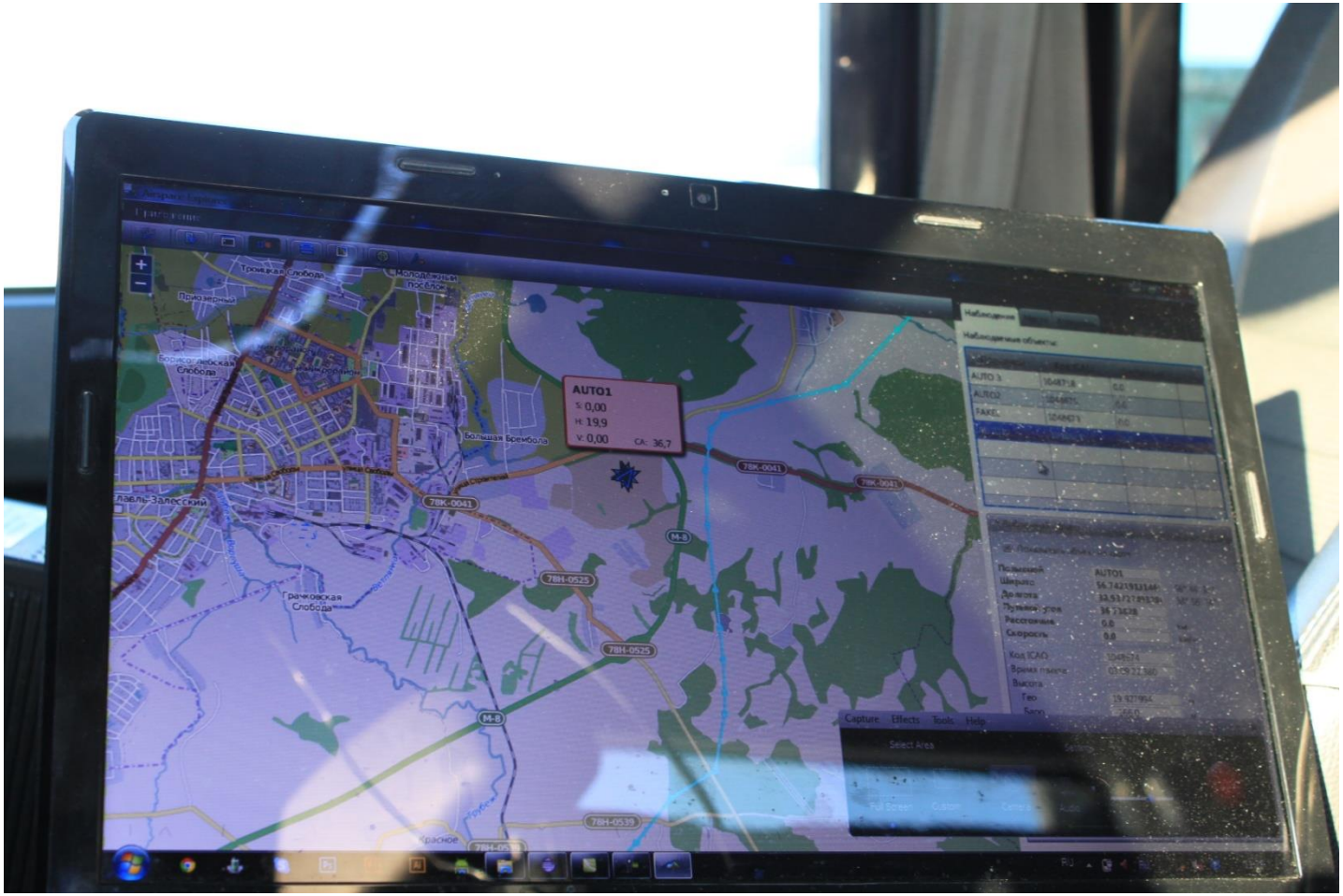
ADS-B Mode 4 in a mobile control station



Equipping car 1 with ADS-B Mode 4

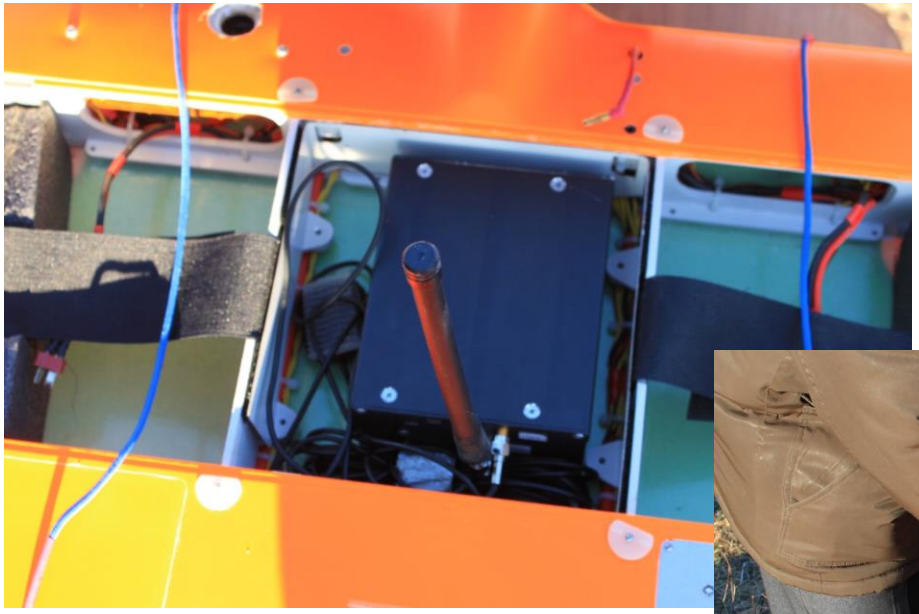
Equipping car 2 with ADS-B

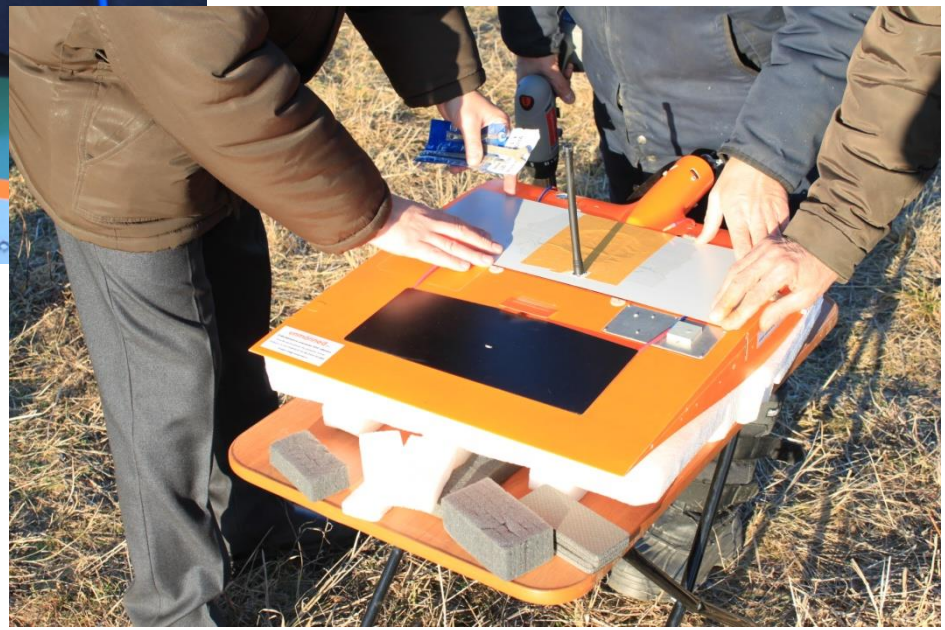
ADS-B display in a mobile control station



Supercam S350 UA-C preparation for flight

MGTR-4 ADS-B transponder location in UA-C body

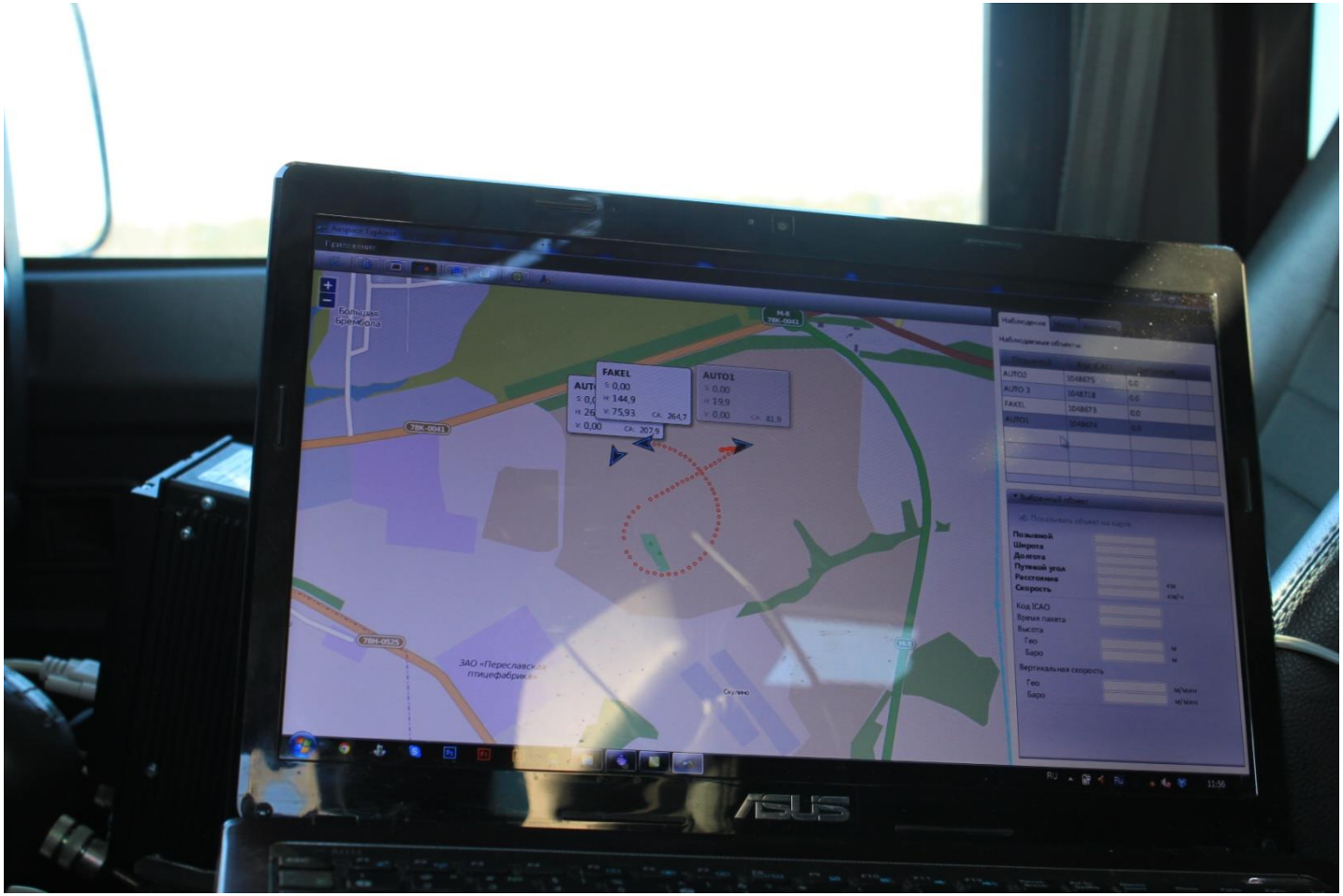




Supercam S350 UA-C with ADS-B

Supercam S350 UA-C launch and flight with the aim to patrol infrastructure objects and monitor unauthorized actions

UA-C flight track on ADS-B display

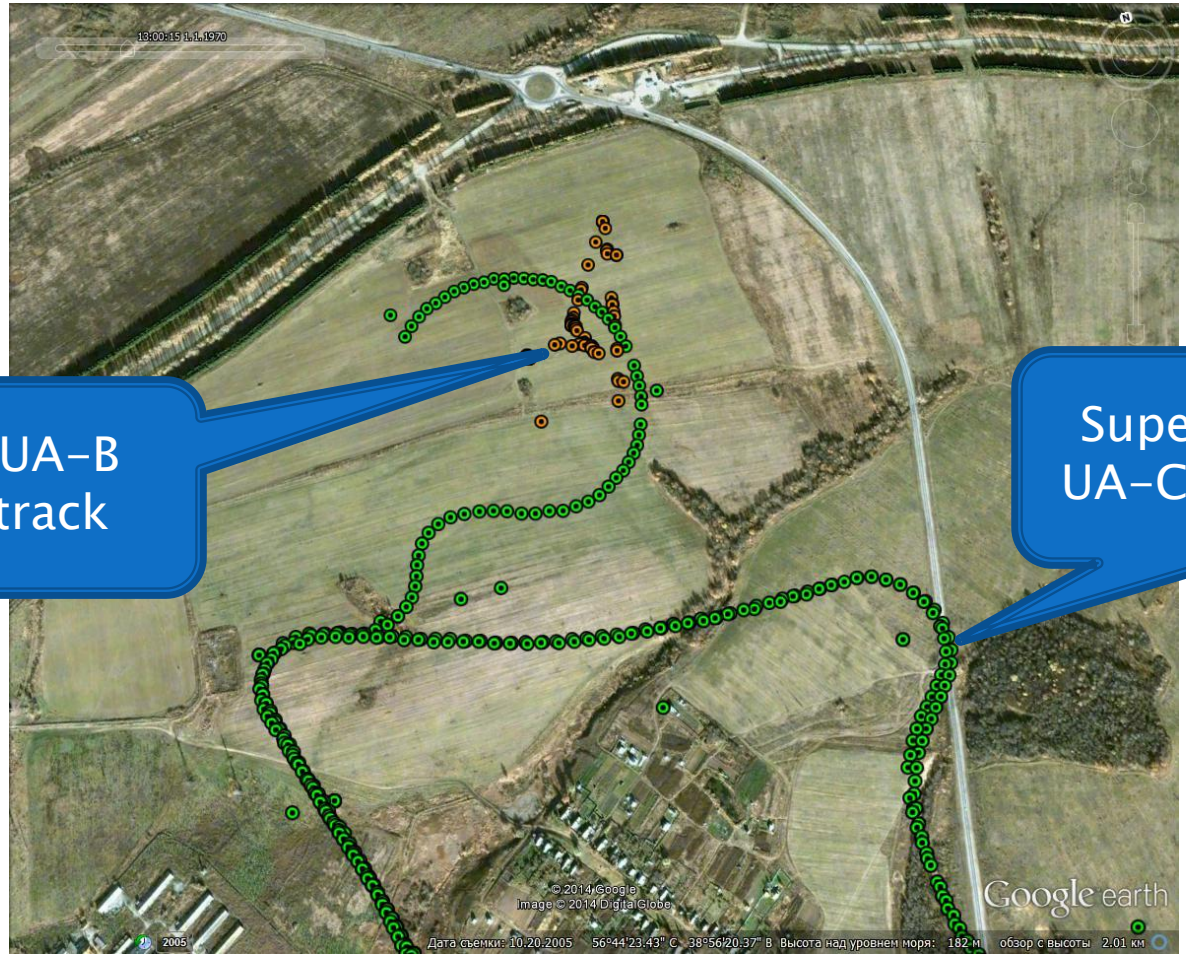


Voron UA-B with a gas sensor, video devices and ADS-B Mode 4

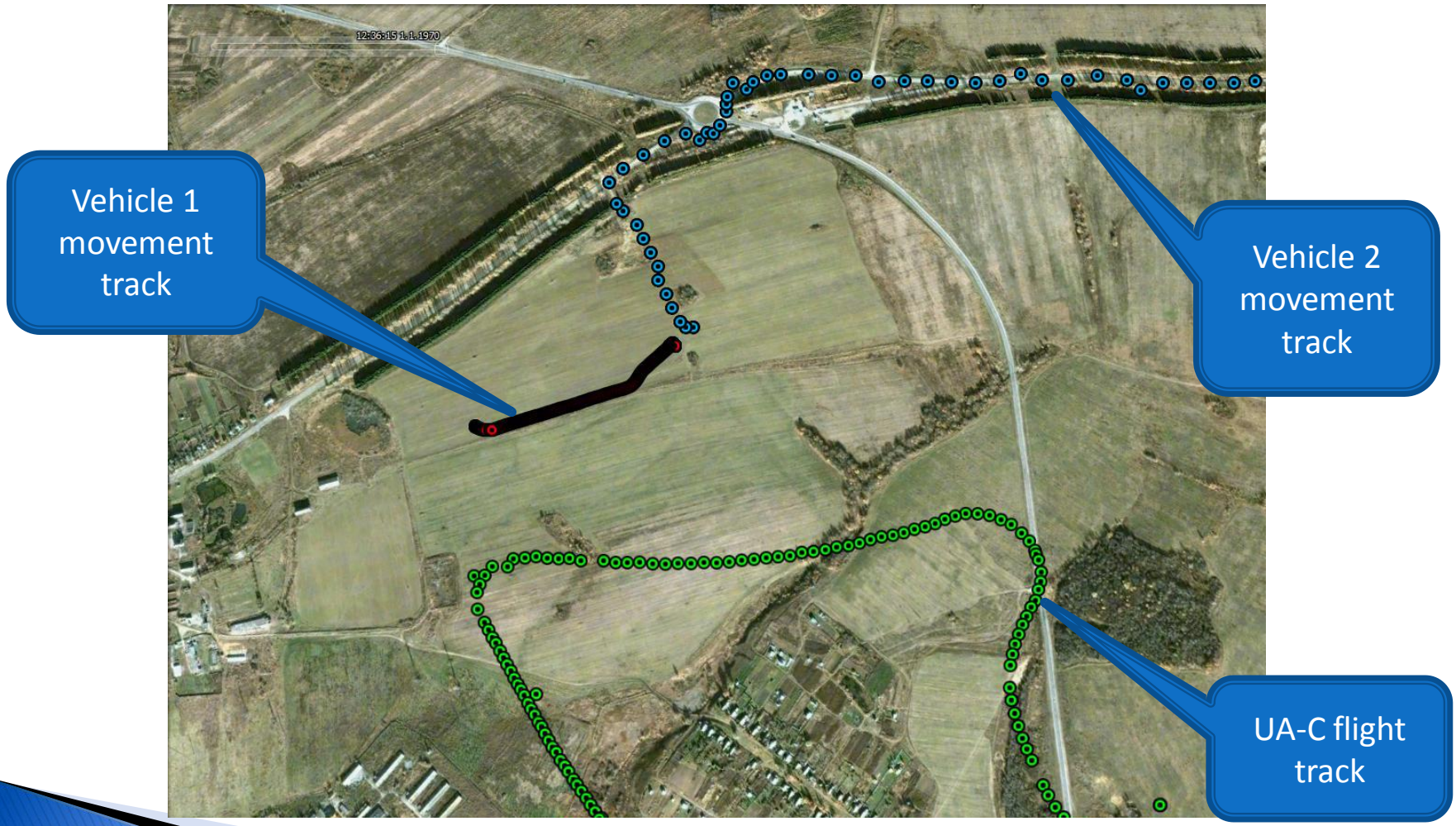
Voron UA-B take-off and flight with a gas sensor on board for the detection of possible gas leaking

ADS-B information: UA-C flight track, position parameters of the experiment participants

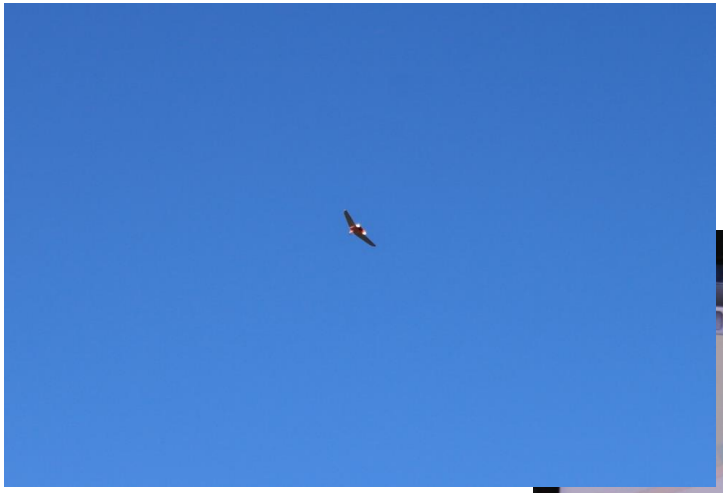
Tracks of UA-C and UA-B flights according to ADS-B information

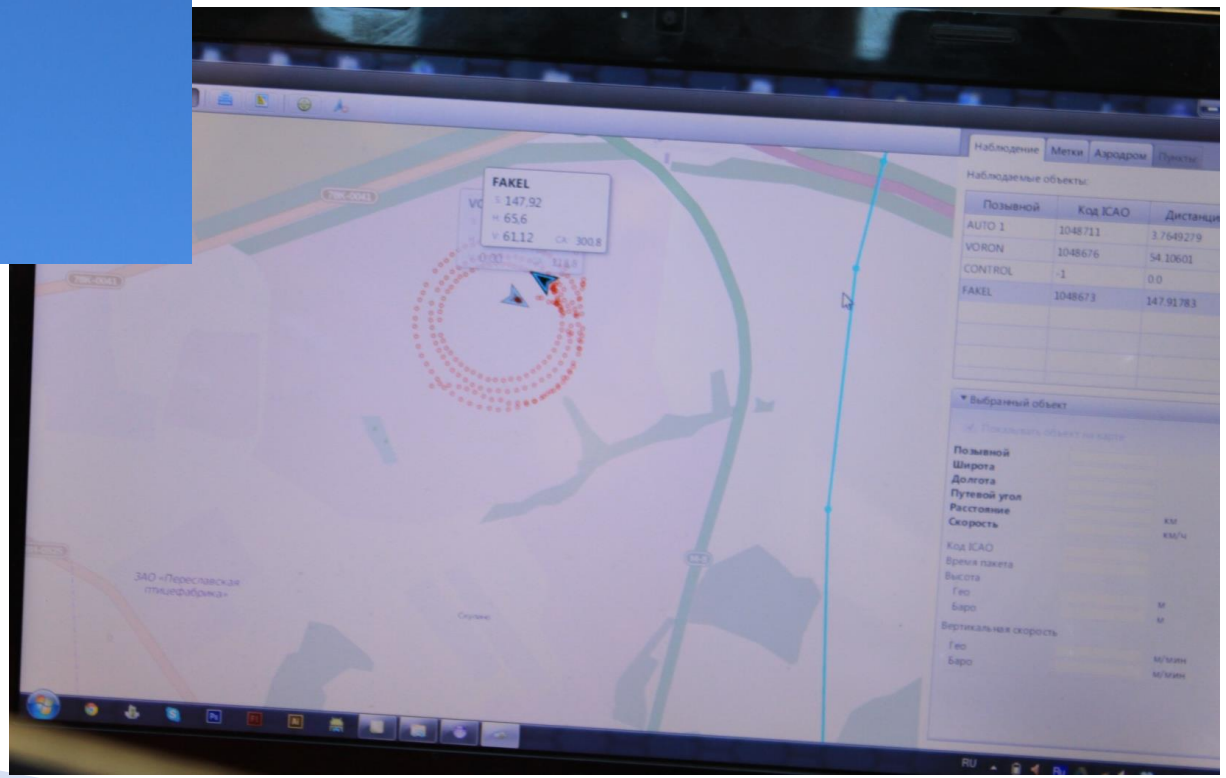


Tracks of UA-C flight and ground vehicles movement according to ADS-B information

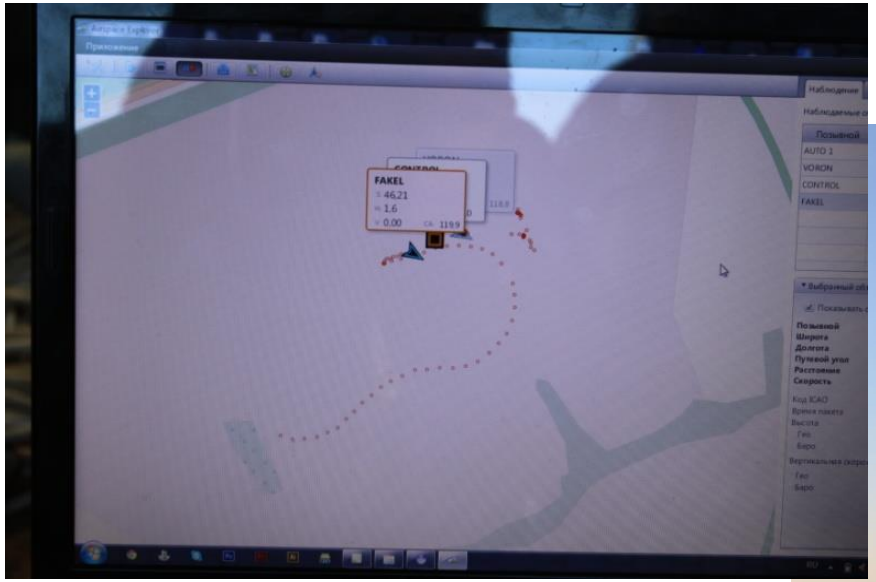


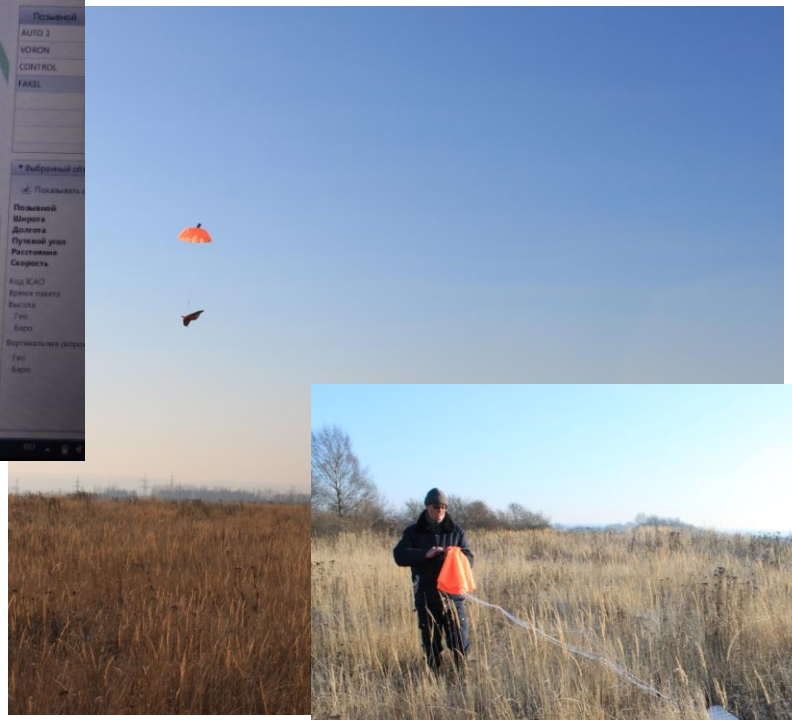
UA-C preparation for landing
(display of ADS-B data in a mobile control station)



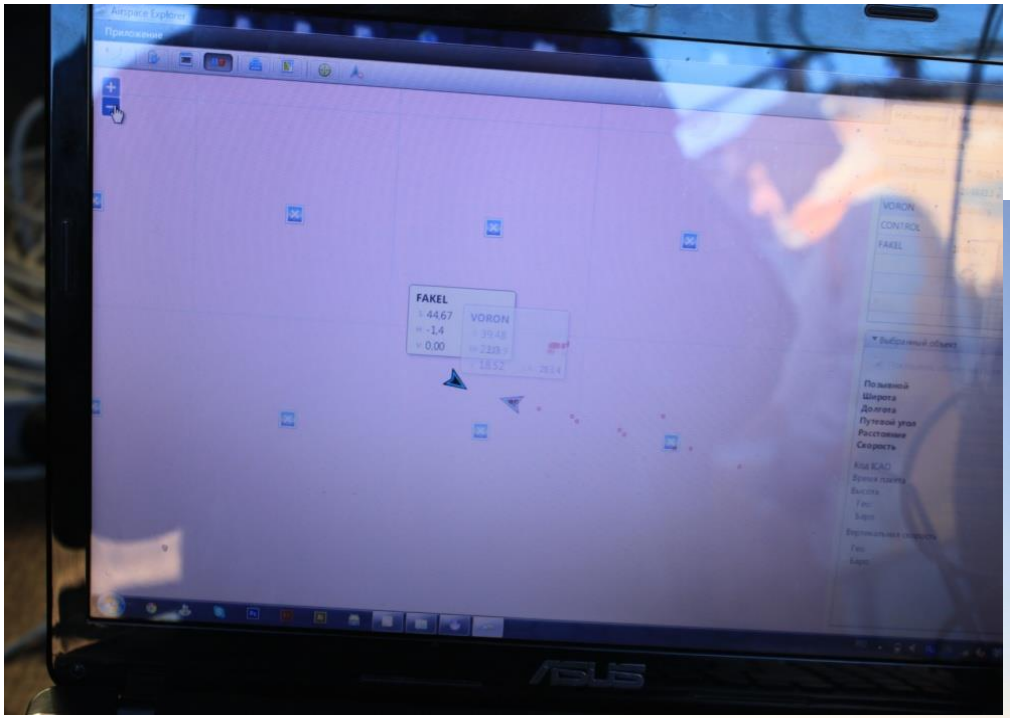


Finding of Supercam S350 UA-C landing site according ADS mode 4 information





Search for landed UA-C with UA-B help according to ADS-B information



Videoimage of UA-C position transmitted from Voron UA-B board in real time

Results of the experiment

- The experiment allowed to practice problems of the interaction of piloted and unmanned aviation, ground forces and means in the solution of tasks for Gasprom JSC benefit.

- The experiment demonstrated the possibility to use ADS-B for safe execution of flights in common airspace, provision of forces and means interaction in the flight area.

- The experiment allowed to practice the problems of vehicles search in the protected zone of infrastructure objects and landed UAs.