



## Vorobyev Advanced Drone-based Solutions



### Sources of Competitive Advantage

- Advanced mathematics and IT solutions
- One person can operate several drones
- Market dominating 'Photoscan'
- Ability to come out with great creative solutions to difficult problems within few hours

#### DRONE TYPES



4 Engines 33 minute flight 3.5 kg max payload 3000m max flight height 0.1 - 15 m/s Speed	12 Engines 20 minute flight 35 kg max payload 4000m max flight height 0.1 - 8 m/s Speed	8 Engines 23 minute flight 6 kg max payload 3000m max flight height 0.1 - 15 m/s Speed
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#### WINGED UAV TYPES



8 Engines 23 minute flight 6 kg max payload 3000m max flight height 0.1 - 15 m/s Speed	8 Engines 23 minute flight 6 kg max payload 3000m max flight height 0.1 - 15 m/s Speed
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## Vorobyev Drone-based Super-Solutions

# EXPANDING the range of services

by using  
**INNOBALL**  
simulation game and  
KoRe 10  
Innovative Thinking Tools




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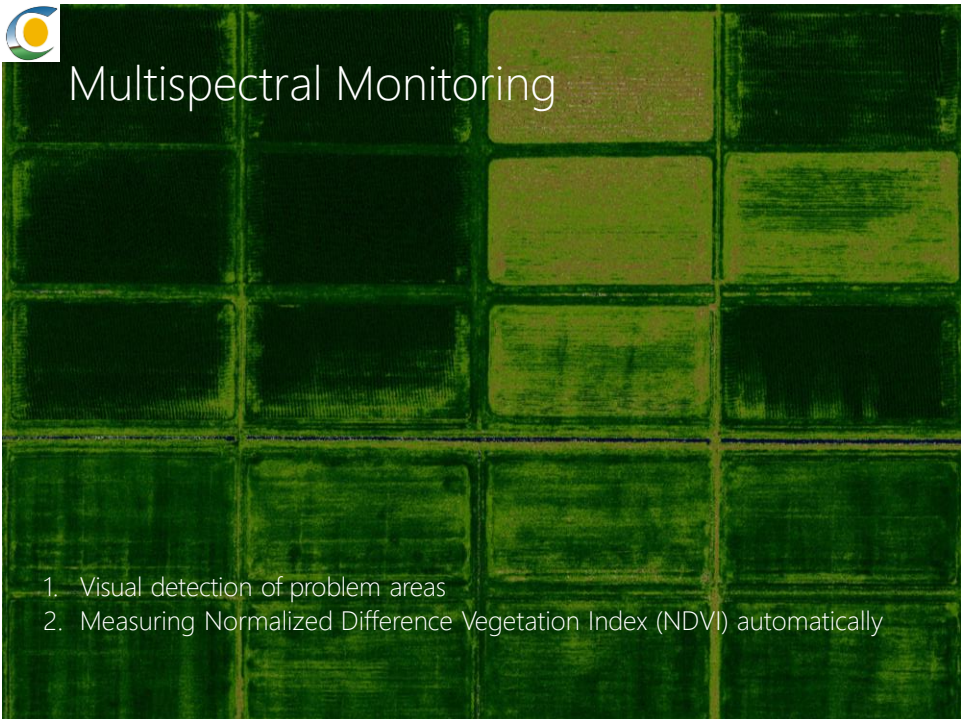
# Agriculture



Increasing harvest  
Increasing profits  
Reducing pollution

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 **Multispectral Monitoring**



1. Visual detection of problem areas
2. Measuring Normalized Difference Vegetation Index (NDVI) automatically

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## Vorobyev Drone-based Super-Solutions

### CHALLENGE



High-quality spectral cameras are too expensive

### SOLUTION



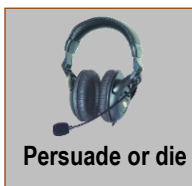
Modifying a standard camera thus achieving 10-fold cost reduction

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## Vorobyev Drone-based Super-Solutions

### CHALLENGE



The modified camera may record incorrect parts of the spectrum

### SOLUTION



To prove the correctness of the results, a 100% stable source of light will be used to check which part of the spectrum is recorded

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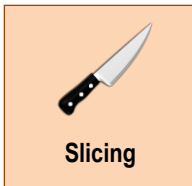
## Vorobyev Drone-based Super-Solutions

### CHALLENGE



There are only two 100% stable light sources in the country, and they both are impossible to get

### SOLUTION



Optical physics: the spectrum of the light is sliced into small parts to prove through a series of measurements that the modified camera records the correct part of the spectrum

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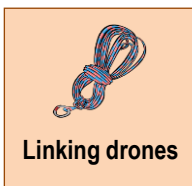
## Vorobyev Drone-based Super-Solutions

### CHALLENGE



The cost of using drones in agriculture is high compared with airplane-based services

### SOLUTION

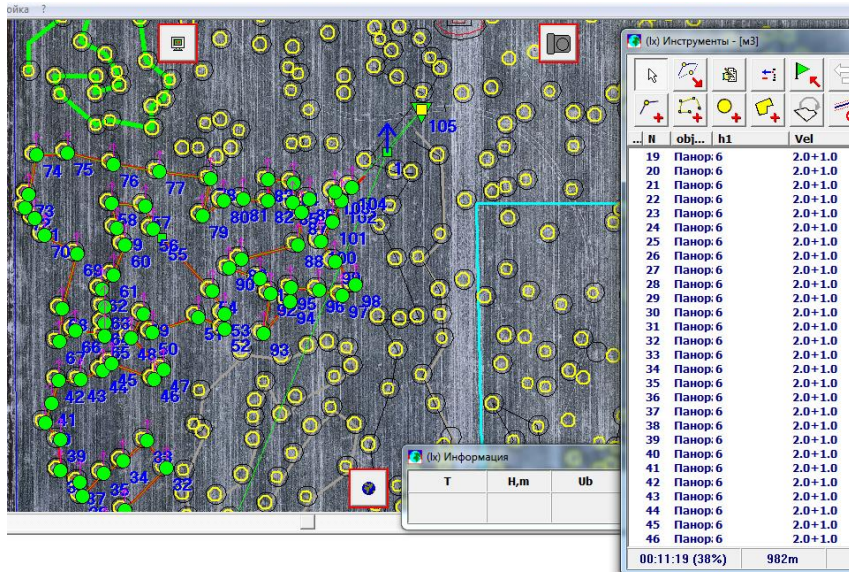


Developing a multi-drone control system for a single operator to make use of drones 3 to 5 times cheaper compared with airplanes.  
In addition, drones fly below clouds which is critical for cloudy locations.

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## Flight Chart: Optimizing Flight Efficiency



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## Vorobyev Drone-based Super-Solutions



## Results achieved

- **Increased Profitability**
  - Much cheaper than airplane-based services
  - Much less agrochemicals used
- **Environmentally sound**  
Use of chemicals reduced by 70%

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## Army, Police, Security



- Making drones more difficult to disable

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### CHALLENGE



Pirates / terrorists can shoot drones down

### SOLUTION



‘Smart Flight’ anti-bullet solution makes shooting a drone down next to impossible

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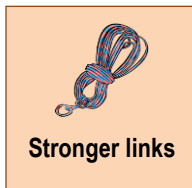
## Vorobyev Drone-based Super-Solutions

### CHALLENGE



Terrorists/pirates can cause drones to fall down by disrupting their incoming GPS signals

### SOLUTION



'Smart Flight' emergency mode is invented that enables a drone to fly even if GPS signal is not available

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## Vorobyev Drone-based Super-Solutions

# 3D Models of cities / areas / buildings

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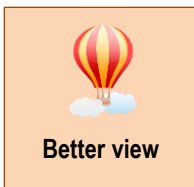
## Vorobyev Drone-based Super-Solutions

### CHALLENGE



Satellite photos are not good enough for many applications such as property tax calculation, property management, disaster prediction, and military / police operations

### SOLUTION



Drones provide a better bird's eye view; photos/videos taken at 25°-30° angles and from/of hard-to-reach locations help create more precise and useful 3D models and maps

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## Vorobyev Drone-based Super-Solutions

### CHALLENGE



Drones are prone to falling down periodically which is unacceptable in highly populated and some other areas

### SOLUTION



Extra engines are provided so that drones keep flying even if some engines stop working; additionally GPS-free navigation mode is developed

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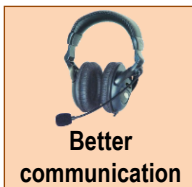
## Vorobyev Drone-based Super-Solutions

### CHALLENGE



For some time-sensitive applications (e.g. police operations) having just a 3D model is not enough

### SOLUTION



Mathematics-powered decision support systems are developed for various special applications

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## Vorobyev Drone-based Super-Solutions

# Disaster Management

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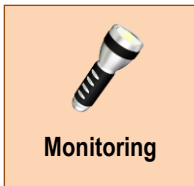
## Vorobyev Drone-based Super-Solutions

### CHALLENGE



Sudden natural disasters often create severe damages in various disaster-prone areas

### SOLUTION

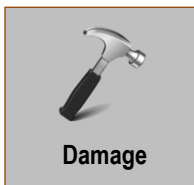


Specially programmed drones fly in disaster-prone areas, take photos, compare them with the previously taken photos, identify dangerous changes, and issue early warning signals automatically

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## Vorobyev Drone-based Super-Solutions

### CHALLENGE

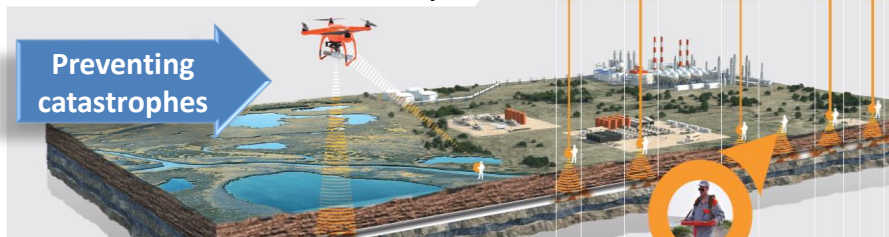


Hidden defects in oil/gas pipelines result in explosions and huge damages

### SOLUTION



Partnering with Transkor, the magnetic tomography technology owner, for detection of risk areas remotely



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## Vorobyev Drone-based Super-Solutions

# Breakthrough Expansion

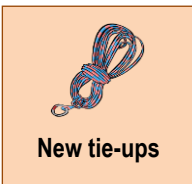
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## Vorobyev Drone-based Super-Solutions



### CHALLENGE

Flying time and load limitations don't allow the company to expand into a whole new range of applications



### SOLUTION

Searching for prospective partners, e.g. manufacturers of new-generation light-weight hybrid energy packs, who could help the company's drones to increase the flying time multifold

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**Vorobyev**  
**Drone-based Super-Solutions**

- Areas of Application**
- Civil Engineering
  - Agriculture
  - Defense
  - Air Industry
  - 3D Models
  - Oil and Gas
  - Tourism
  - Land Management

- Projects in**
- Russia
  - CIS
  - Asia
  - Latin America
  - Middle East

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