

Drone based magnetic surveying as a new system to perform magnetic surveys more productively and more environmentally friendly way

2012 Countries covered: Finland

Summary:

What is innovative is that it is a new system in exploration. It has about 10 different sensors integrated into the drone, making this more productive and environmentally friendly (no contact with the ground). It is an automated system, with a programmed flight plan, allowing for large areas to be covered in a short period of time (depending on regulation). The intention is also to reduce drilling needed (and hence costs). The system also provides a cost effective way to make mineral exploration in new, unexplored areas.



Description:

The company, Radai Oy, is innovating geophysical surveys and remote sensing by using Unmanned Aerial

Vehicles (UAV) or drones, as they are commonly known, which before were done mainly by carrying the relevant monitoring equipment.

The company's UAV measurement system is installed in a custom-made UAV (Terrain Scout). The flight is controlled by an autopilot. The autopilot records flight data including GPS time and position (latitude and longitude), the orientation (roll, pitch and yaw), and barometric pressure. The real-time flight is controlled by PC software via a telemetry (radio) link. The nominal accuracy of the GPS position is about ± 1.5 m. The magnetic field is measured using a digital 3-component flux-gate magnetometer. The magnetometer data (X, Y, Z components and total field), are recorded by the company's own data logger. The GPS time and position are synchronized with the autopilot.

A base station located near the mobile telemetry/control station measures the time variation of the total magnetic field using a proton precession magnetometer.

This allows for more cost effective (i.e. faster and more versatile (e.g. swamps or rivers are no obstacles for drones) and environmentally friendlier (no impact on the ground) exploration. Challenges remaining are the limited payload (requiring survey equipment to be modified light weight), the limited flight time (requiring comprehensive planning for larger survey areas), weather (i.e. wind) and different aviation policy requirements in different countries.

In August 2015 the company carried out a geophysical magnetic survey at Ryssänlampi site. The measurements were committed for Geological Survey of Finland (GTK) with the purpose to investigate the quality and reliability of an UAV based magnetic measurement system by comparing the results with existing GTK data. It was successful.

Good practice areas:

Resource security

New exploration method allowing to find new orebodies in an effective way.

Economic sustainability

New exploration method allowing to find new orebodies in an effective way.

Environmental sustainability

New exploration method allowing to find new orebodies in an effective way.

Organisations involved:

Radai Oy

<http://radai.fi/>

Innovation category:

Process

Product

Impact on the mining value chain

- EXPLORATION (incl. permitting)

Exploration

- safe and fast remote exploration
- reduced environmental impact

Linked policies

Aviation policies and licenses

Aviation policies and licenses - different for each country in the EU. The company considers Finland's aviation policies as a good practice example, helping its innovation.

Mining policies - it needs an exploration license, which might be easier to get for this innovation because of reduced environmental and safety impacts (e.g. there is an example where a license was given only due to no safety impact vs. conventional method that would have required entering a dangerous area)

Innovation drivers and barriers

Drivers:

Economic

Cost reductions are a big driver, but also the method delivers better/ more accurate results.

Other

Safety and environmental factors are contributing, but are not key.

Barriers:

Other

Aviation policy can be a barrier for this innovation (e.g. because of restricted areas or "line of sight" requirements).

Impact Area

Area:

Environment, Ecosystem services and quality of natural resources

Impact on listed area:

+: Less land impact during exploration phase

Area:

Environment, Quantity of natural resources

Impact on listed area:

+: Allows for exploration in new areas, which might result in new orebody discoveries

Area:

Human/Social, Occupational welfare (health and safety)

Impact on listed area:

+: Drone based exploration requires less (foot) access into potentially dangerous areas

Area:

Economic, Financial flows and profitability

Impact on listed area:

+: Reduction of costs to the company compared to land based exploration