

# GLONASS technology application for mining transport dispatching

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«**VIST Group**» develops dispatch control systems for mining enterprises since 1998. These systems are based on satellite navigation technologies and now are successfully applied at more than 20 open pits.

The first project with **GLONASS/GPS** technologies application is:  
1999 – 2001 - Poltavsky GOK (Ukraine).

### **MONITORING PARAMETERS:**

Truck location, shown on open pit map

Fuel level in truck tank

Load weight

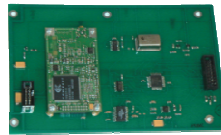


# Initial stage of dispatch control system “KARJER” development

## Transport monitoring



Load and fuel level control system



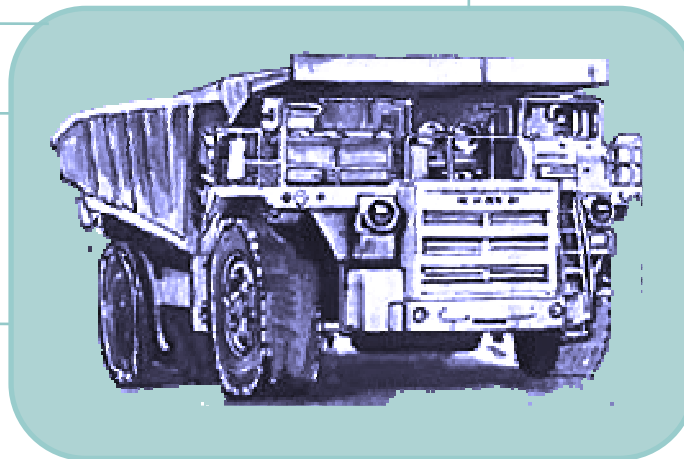
Radio-navigation module with GPS/GLONASS navigation unit Navior-14 (produced by “Orizon-Navigatsia”, Smela) or GPS receiver Jupiter 12 (produced by “Navman”)



Display



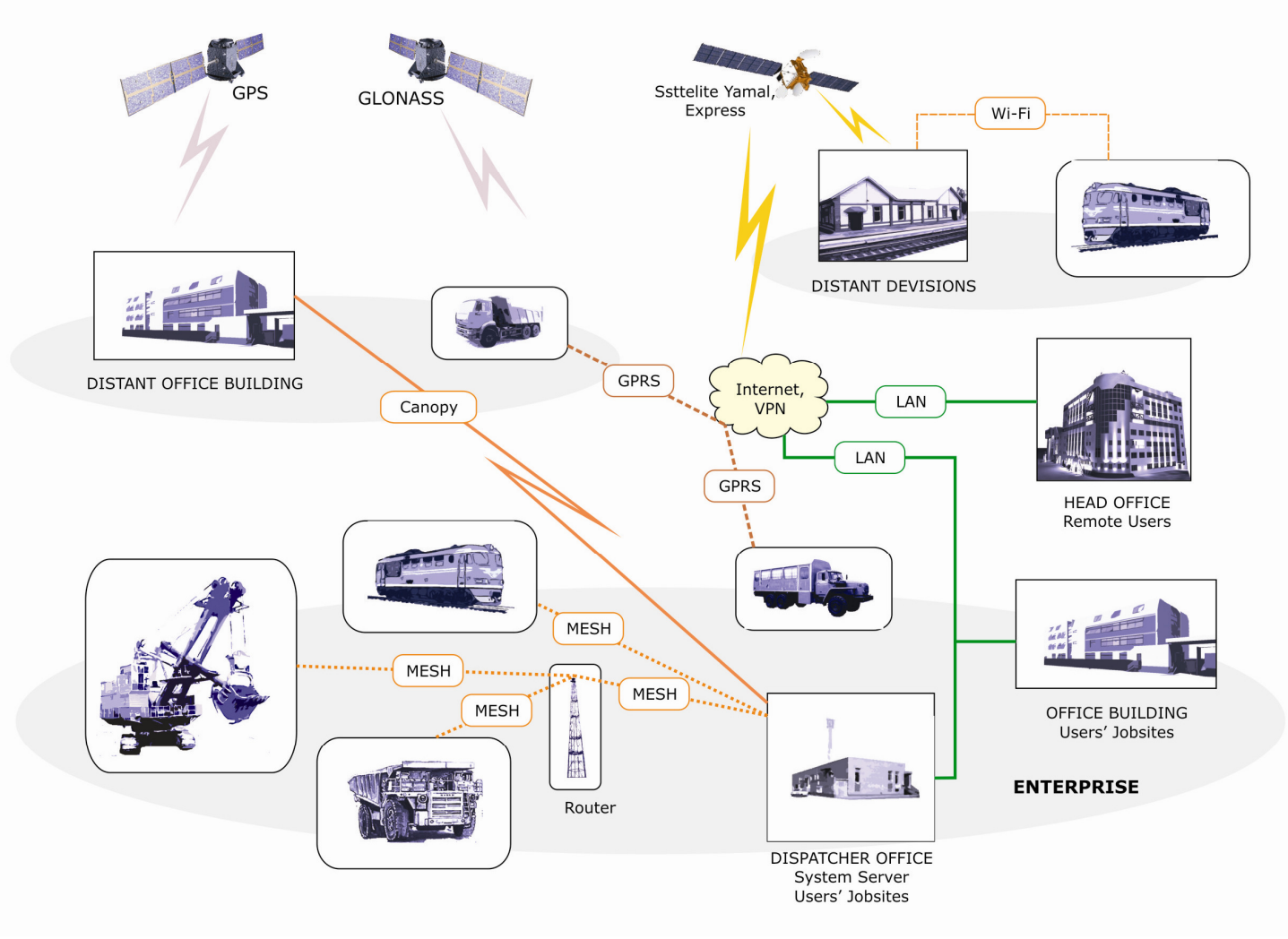
USW radio station



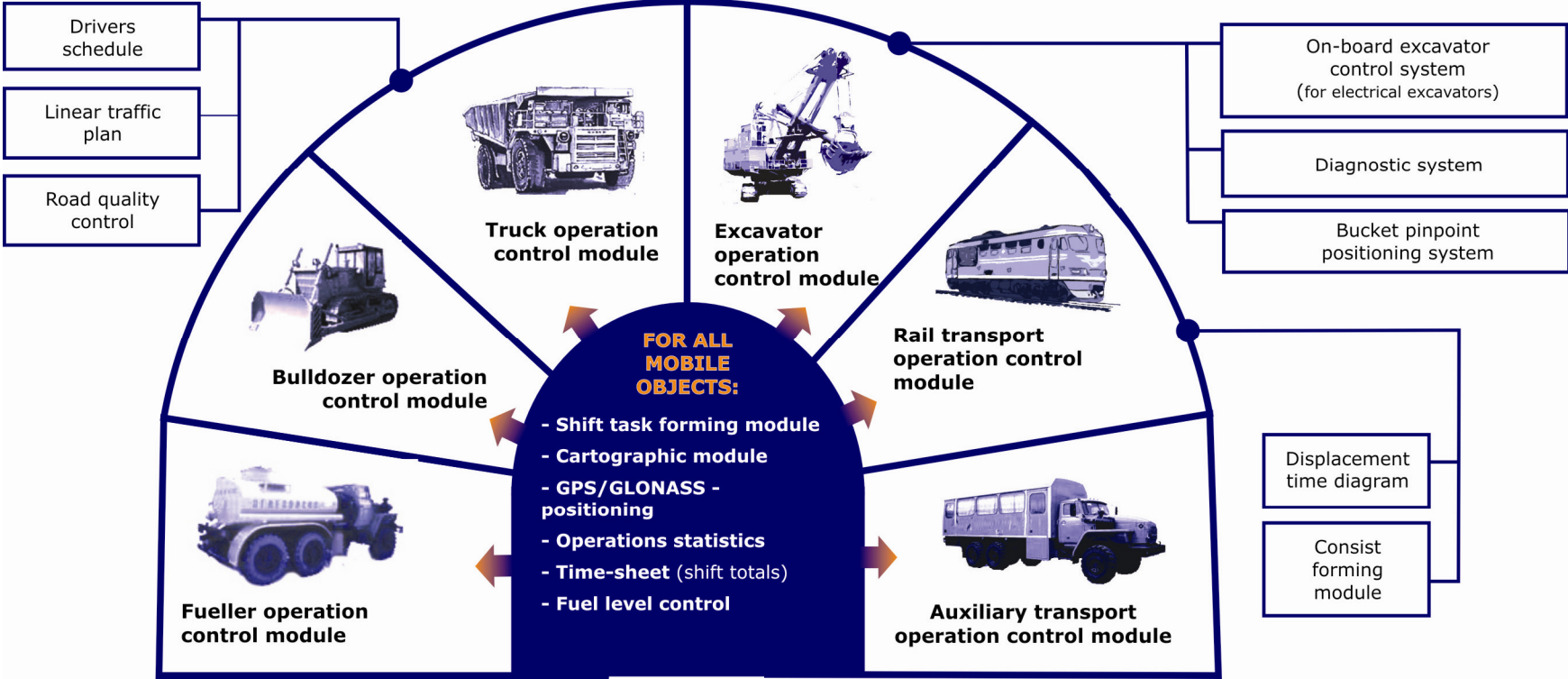
Sensors (fuel level, suspension pressure, etc.)



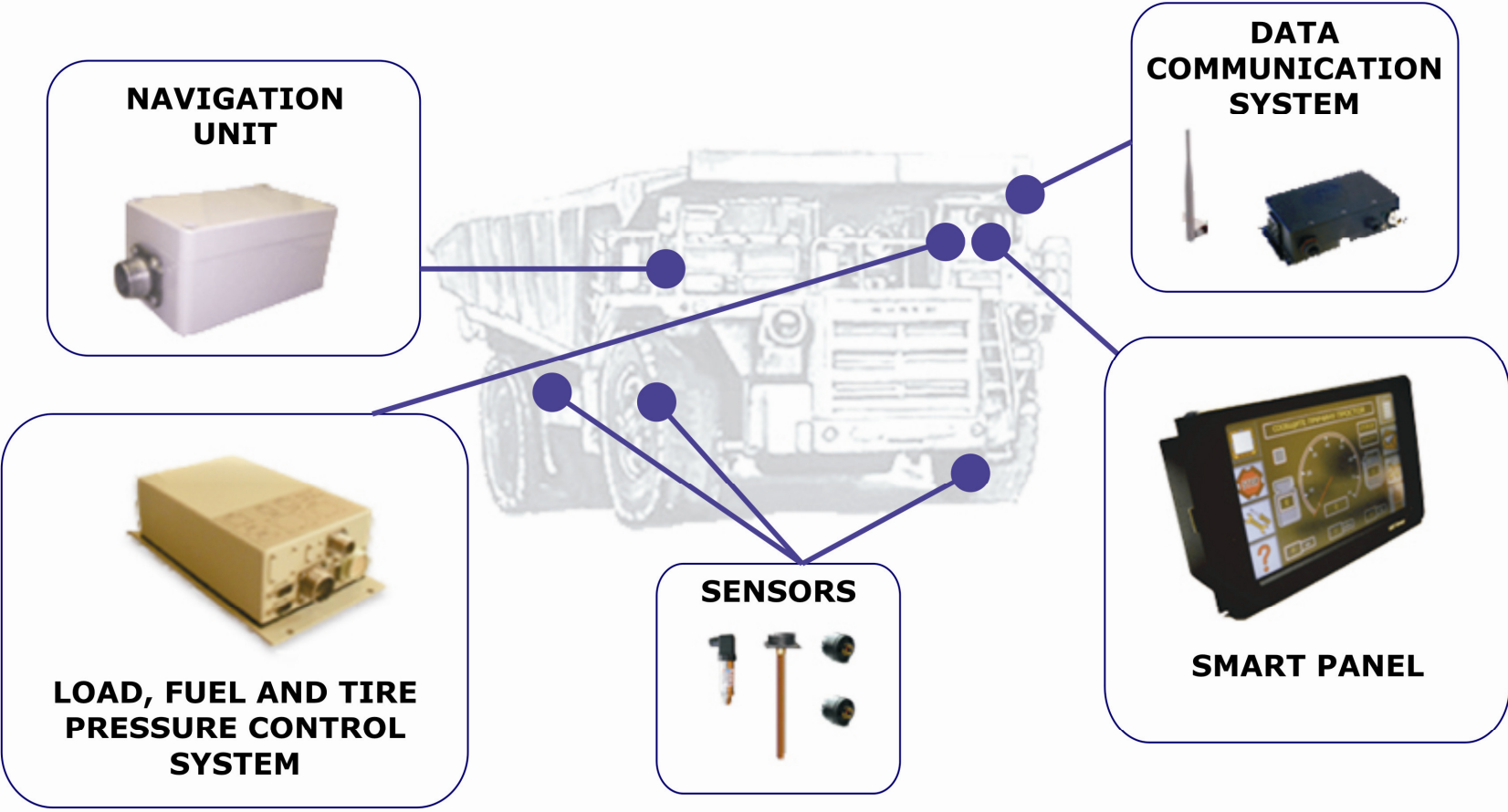
# Structure of Dispatch control system



# On-line enterprise control System modules

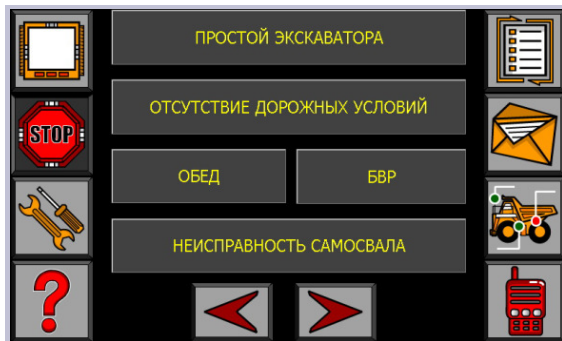


# On-board equipment of mobile objects



# Visualization of truck operation parameters

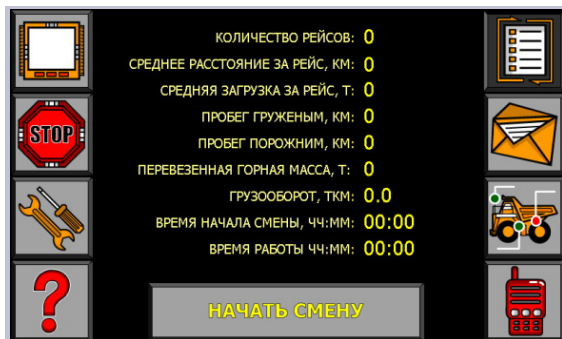
## Standart windows



Downtime reasons entry



Sensors indication,  
Extended diagnostics



Shift statistics



# Visualization of truck operation parameters

## Complementary windows



Fuel consumption diagram

Номер	Погрузка	Разгрузка	Время дв.	Ср.скор.	Расст.	Масса	Экскават
48	13:57:44	14:09:24	10:55	15.0	2.7	80	21
48	14:21:24	14:38:54	13:08	13.2	2.9	97	21
48	14:52:21	15:20:03	16:23	16.2	4.4	76	50
48	15:39:07	16:02:30	13:54	16.5	3.8	99	50
48	16:08:15	16:21:45	8:20	19.5	2.7	63	21
48	16:32:07	16:42:10	7:35	20.2	2.6	66	50
...							

Events log





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# System Users:

## RUSSIA:

- Holding company "SDS" ("Chernigovets", "Razrez Kiselevsky")
- Siberian Coal Energy Company (SUEK) (Tugnujsky razrez, Zarechny razrez, etc.)
- Magnitogorsk Iron & Steel Works (MMK)
- MECHEL ("Southern Kuzbass Coal Company", "Korshunovsky GOK")
- United Company RUSAL
- Ural Mining and Metallurgical Company (UMMC) (Managing company "Kuzbassrazrezugol")
- Stoylensky GOK
- Mineral and chemical company "EuroChem" (Kovdorsky GOK)
- "Polyus Gold" ("Aldanzoloto GRK")
- "Polymetal" ("Nothern Urals Gold company")

## UKRAINE:

- Severny GOK
- Centralny GOK
- Inguletsky GOK
- ArcellorMittal Krivoj Rog
- Poltavsky GOK

## KAZAKHSTAN:

- SSGPO (ENRC)

## MONGOLIA:

- ERDENET

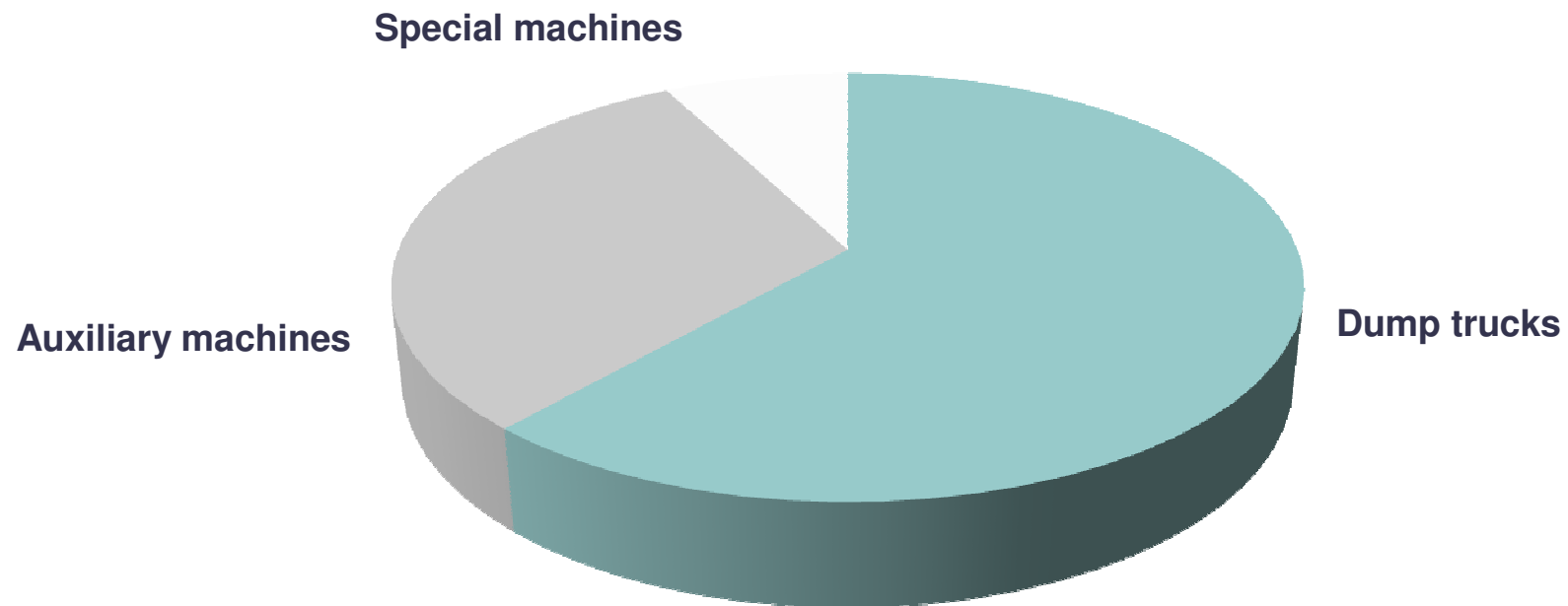


# System Users:

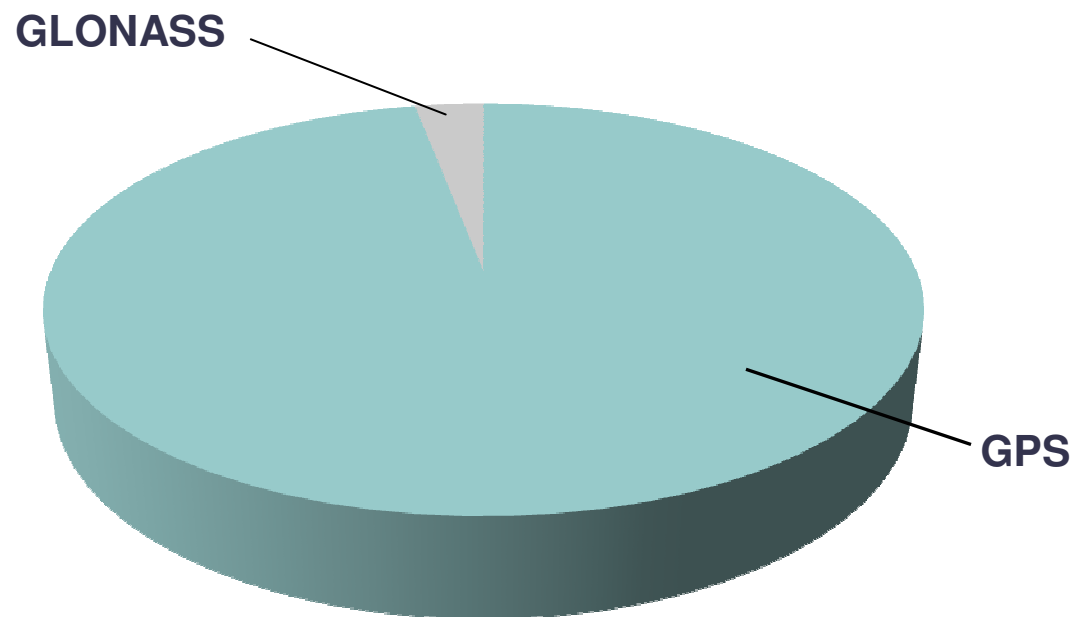


# Potential of mining transport fleet conversion to GLONASS receivers (for dispatch control system “KARJER”)

**Mining transport , equipped with navigation units**  
(in dispatch control system “KARJER” – about 2.500 vehicles)



## GPS and GLONASS/GPS using proportion (mining)



**The proportion of GLONASS/GPS receivers is less than 1-2%.**

Nowadays MNP-M3 receivers (multichannel receiver, produced by “IRZ”) are being used as an initiative.



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## Advantages of GLONASS using in mining

**High precision location is guaranteed even on the bottom of the open pit,** as more GLONASS/GPS satellites are visible from the pit. In addition GLONASS satellites observability in the north is better than for GPS.

Use of dual-systems receivers (GLONASS/GPS) allows to create reliable **pinpoint positioning** systems, which are operated in real-time mode while using cheaper mono-frequency equipment.

**Independence from foreign systems/suppliers**



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## Potentials of GLONASS navigation systems use for mining transport dispatching:

Coordinates are used for:

- **Identification of objects interaction** within open pit (for example truck №36 is loading by excavator №12)
- **Travel calculation** (as the way which is traditionally used for this task solving (travel calculation by counting wheel turns) has significant error)
- **Optimization** (coordinates are used by Optimization module)
- **Road quality control** (coordinates are used by Road quality control module)
- Excavator bucket **pinpoint positioning**



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## Issues of mining engineering fleet conversion and new types of GLONASS/GPS equipment using within dispatch control system “KARJER”

Migration from GPS to GLONASS receivers is not cost efficient for customers

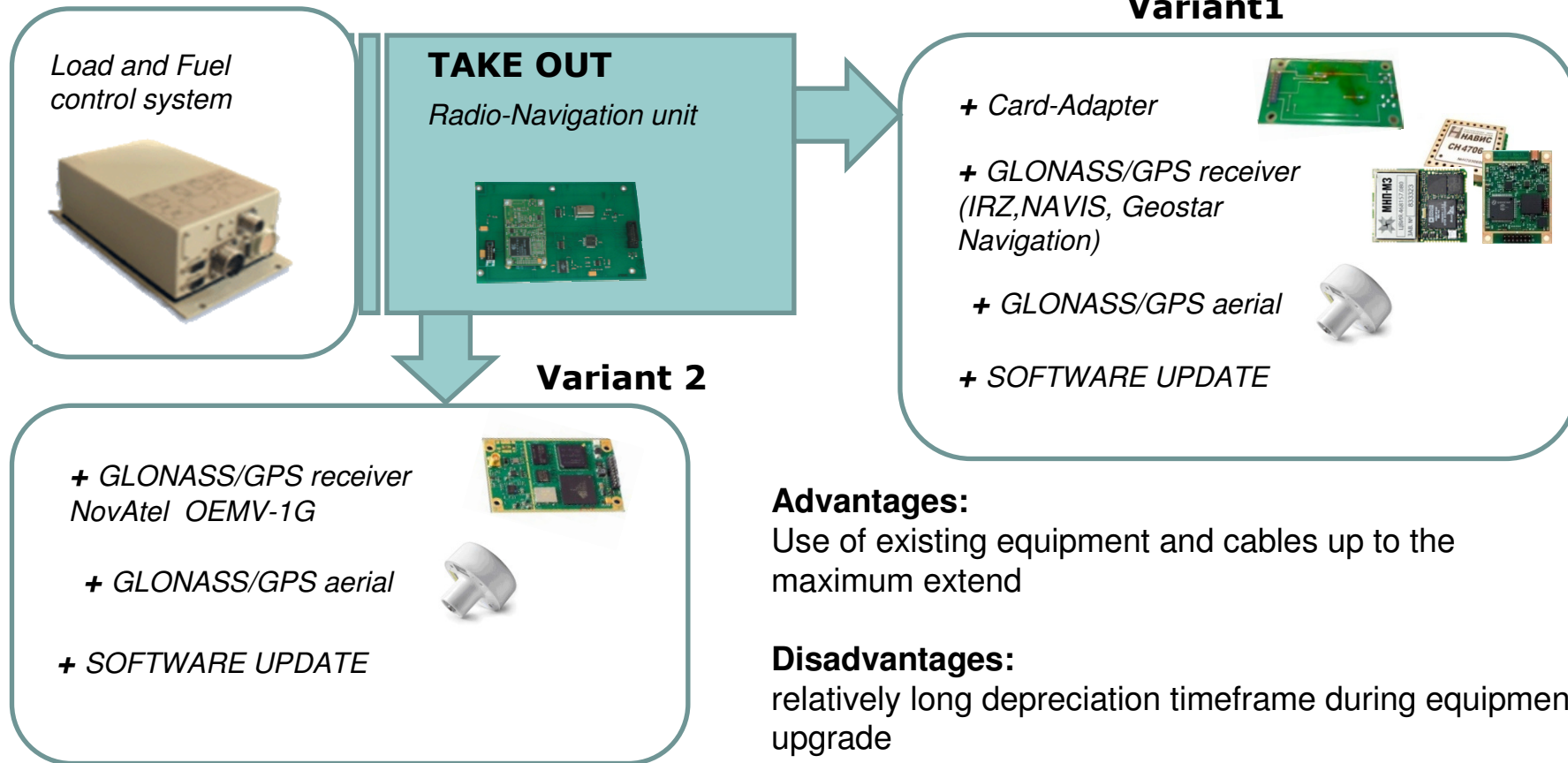
No legal background for getting benefits from using GLONASS systems by private enterprises

In comparison with GPS receivers GLONASS domestic units are mostly of poor quality and high price



# Using GLONASS navigation system within dispatch control system “KARJER”

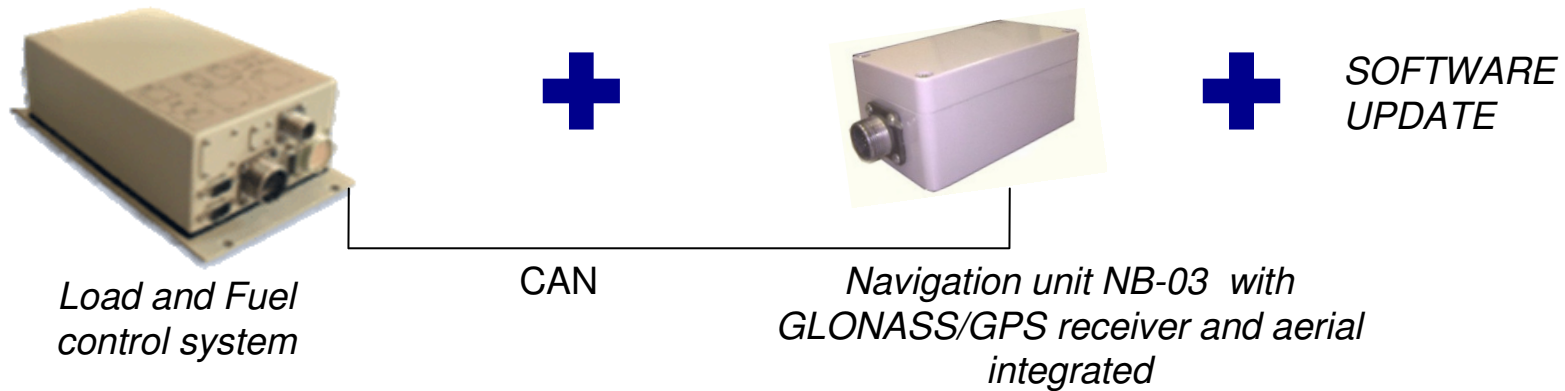
## Integration by retrofit equipment





# Using GLONASS navigation system within dispatch control system “KARJER”

## New external unit installation



### Advantages:

Re-equipment doesn't require long time, so vehicles will be stopped just for a short period.

### Disadvantages:

Sometimes it's impossible to use new units



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