Land Rover fire truck modernization for improving transportation needs of the forestry farms and tree nurseries

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Agricultural and Forestry Transportation in Poland need to be improved

Reasons of dangerous situation caused by agricultural and forestry vehicles on Polish roads are as follow:

- Farm/forestry tractors are used as main transportation means in 55-99% of all transportation work but in rest (West) Europe only in 2-4%.
- Limited velocity of agricultural tractor-trailers units (25-40 km/h).
- Dangerous and not efficient actuation of one line pneumatic brake system in agricultural trailers and towed machines.
- Dangerous and outdated inertia (surge) brake system used in towed machines and trailers.
- Over 90% of forestry trailers (GVW up to 13 t) – have no brakes at all.
Forest Machines Show in Poland (4-5 September 2008)
all trailers without any brake system !!!
Idea of new agricultural and forestry road units came from USA and Canada...
PIMR as the first European R&D institute has pointed that truck-gooseneck trailer with modern brake system should be the best transportation option for:

- removing farm tractor-trailers units from main road network in Poland,
- improving quality and safety of agricultural and forestry transportation,
- improving work safety of farmers,
- protecting in better way environment.
In Poland there is great potential market on such light and medium size road units not only in agricultural or forestry sectors but also in general goods transportation.

Having it in mind we design, made and tested in lab and the fields important parts of our system.

PIMR made several patents disclosures as an added value to existing in the world (Europe) transport technology and build following devices:

- Support frame equipped with movable-up hitch ball (towball)
- New version of 60 mm and 80 mm hitch ball couplers
- Hitch ball adapter for three-point linkage of farm tractor
- Dynamometer for measuring forces on hitch ball
- Adapter for mounting electric brakes control unit in truck cabin
- Artificial Foot Device
- Artificial Leg Device
Example of transforming light trucks into new category of road units

*Lublin3* car - can be in few minutes transformed into mini-liner towing gooseneck trailer – GVW up to 5 t

60mm Ball hitch (PIMR’s patent) mounted in *Lublin3* truck

Ball diameter - 60mm, for heavier trailers could be 70, 80 or 110mm.
Sens A Brake System (SAB) is a unique electronic steering system especially well suited for hydraulic brakes in light and medium size trailers (GVW up to 10 t). SAB is equipped with Load Sensor module and ABS module as well.

System schematic
Model: EU1400ABS/LS
Market: EUROPE

Sens A Brake

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Have you ever seen such add in Europe?

AL-KO’s add is impossible to be seen in Europe but it is surely proof that PIMR’s idea of new brake system implementation into agricultural and forestry sectors is very good.
Land Rover Defender 110, forestry fire truck version, has been modified in PIMR to serve as truck tractor (mini liner) in forestry farms and tree nurseries.

Truck with fire module ready for action.
In 2007 year, 60 mm hitch ball and support frame was designed, build and mounted (by PIMR) in Land Rover Defender 110 forestry fire truck.
Hitch ball and two electric sockets are mounted between fire module’s rails
LRD110 adaptation – support frame for gooseneck trailer
Mouse on LRD110 dash board

Brake pad – piezoelectric force sensor mounted on brake pedal

EVO controller mounted on small support plate next to acceleration pedal.
Laboratory research and preliminary road and field tests of Land Rover Defender 110 fire truck and PIMR’s research gooseneck trailer GN2000 (GVW 3780 kg) proved that such road unit can easily transport goods on unpaved rural and forestry roads.

Land Rover Defender 110 coupled with research gooseneck trailer to run tests on unpaved agricultural and forestry roads and ducts.
Unit on forestry road
Unit on rural unpaved road
Unexpected results of new brake system mounted on research gooseneck trailer. Negative results of preliminary homologation tests were caused by bad quality of XP27 Michelin tires (after two harsh braking tires groove almost disappeared).
Others manufacturers tires behave in much better way

FULDA tires 215/75R17,5 after 3 years of harsh testing

Only “negative” Fulda tire property: 8 bar pressure that should be lower for agricultural/forestry transportation needs.
By the methods which are used at the moment - the time of loading block containers on truck and trailer is very long as well as time of unloading that because it is made by forestry workers.
Forestry trees transport method workout in France

Typical way for loading Styrofoam block containers with one year forest trees on truck

See how containers are located on truck’s floor – they form kind of brick walls with space for small trees laid in horizontal position
Tests on trailers stand were not so good as should be expected. After few bumps blocks loaded in way as in France were not stable and in real forestry transportation most of small trees are likely to be damaged.
Newest (August 2008) model of pallet container with four shelves for 16 Styrofoam containers with 53 trees in each) gave proper results and after small improvements new transportation system will be tested in the autumn 2008 year.

Research trailers stand with two rotating drums (800 mm in diameter) were equipped with artificial bumps - did not cause any damage of Styrofoam containers.

On left site of gooseneck trailer is mounted small collapsible hand lift (250 kg) for unloading containers on forestry roads and ducts - very close distance to the trees planting areas.
Conclusions

1. Modernization of Land Rover Defender 110 fire truck was successful and forestry road tests has shown very good traction especially during towing gooseneck trailer – GVW 3780 kg on forestry and rural unpaved roads.
2. Elements of SensaBrake system are functionally and ergonomically well located in truck cabin and electric wires are securely mounted under LRD fire truck body.
3. Design of 60mm hitch ball support frame is done well and could be only improved by expandable hitch ball version for regular LRD trucks that are used for forestry patrolling.
4. New gooseneck trailer should have wheels thread similar to LRD truck, GVW 3-3.5t and should be equipped with new forest trees transportation system based on medium size pallet containers, each with canvas cover for better forest tree protection against desiccation.
5. Tires should be much better quality than agricultural type tires XP 27 275/65 R16 and should be tested in tough research tests on unpaved forestry and agricultural roads as well as on public road network. It is important that wear of tires should be lowest as possible because in case of trailers with GVW up to 3,5 t do not need to be equipped with ABS system.
6. New forestry transportation units based on light trucks and gooseneck trailers should improve exploitation of fire trucks that are used in Regional Departments of State Forest National Forest Holding in Poland as well as they should improve work safety, forest trees transport quality and efficiency.
Hot news from PIMR

In September we bought new L200 truck and according agreement with Mitsubishi dealership in Poland we can modified truck brake system and mount hitch ball’s support frame for coupling gooseneck trailers without any warranty lost.

Sens a Brake system was mounted in L200 cabin and new support frame was design and in the end of month steel model of frame should be made.
PIMR’s next generation of research truck – Mitsubishi L200

Not typical treatment of new truck – no register plates, no paid invoice ... but next stage of R&D project
Virtual model of hitch ball support frame for PIMR’s research Mitsubishi L200 truck

Thank you very much…
and I hope that you will see in Europe ours transportation units soon.