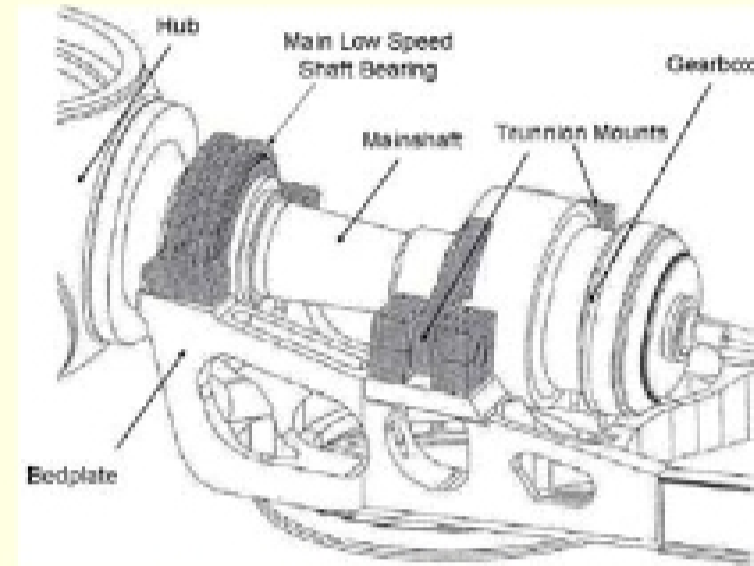


## Gearbox

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## Gearbox Mount



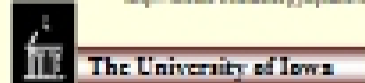
Peters, Vardapitte, and Sas (2003)



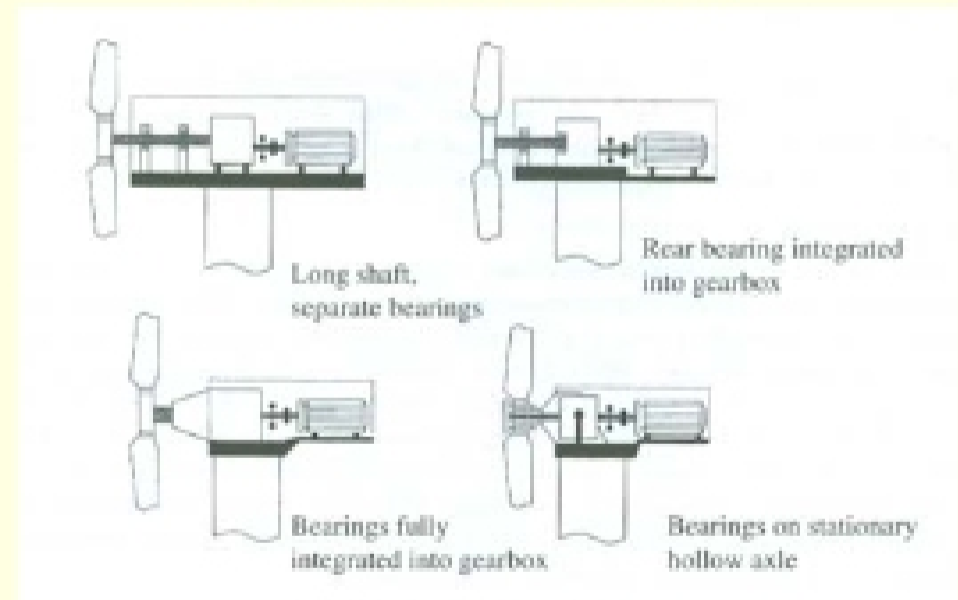
## Typical Gearbox



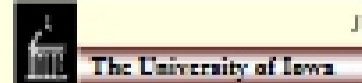
<http://social.wideningworld.com/gallery/insight/airline-technology-proactive-gearbox-maintenance>



## Main Shaft Options



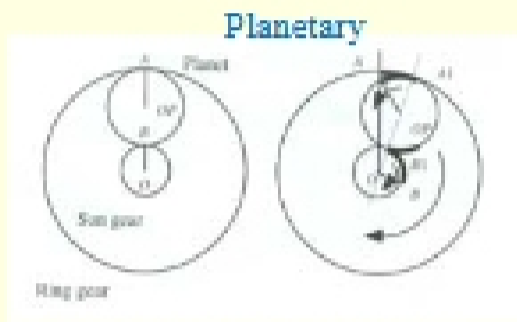
J.F. Maxwell et al. (2002), p. 298



## Gearbox Classification

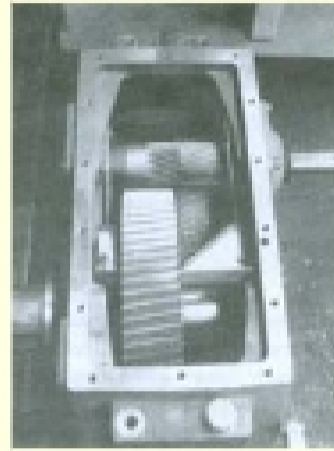
Basic types of gearboxes:

- ✓ Parallel shaft gearbox
- ✓ Planetary gearbox



J.F. Marwell et al. (2002), p. 301

Parallel shafts



J.F. Marwell et al. (2002), p. 300

## Gear Types

Basic type of gears:

- ✓ Spur (parallel teeth)
- ✓ Helical (teeth under angle)
- ✓ Herring bone ("V" shape teeth)



J.F. Marwell et al. (2002), p. 267

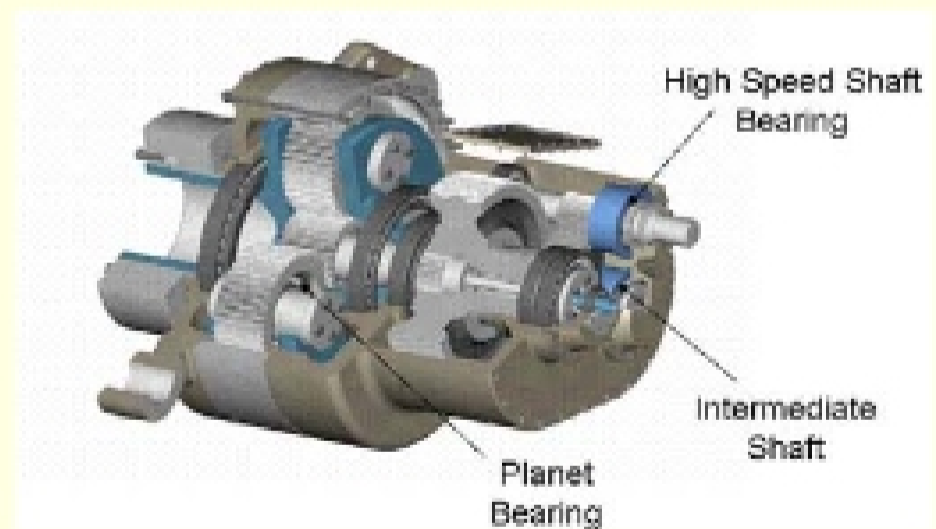
## Gearbox Configurations

Configuration	Diagram	no. of gears	rel. costs \$
Two stages parallel		70	180
Two stages parallel with torque splitting		56	154
Three stages parallel		77	192
Two stages, one parallel one planetary		61	149
Three stages, two planetary one parallel		57	110
Three stages planetary		51	90

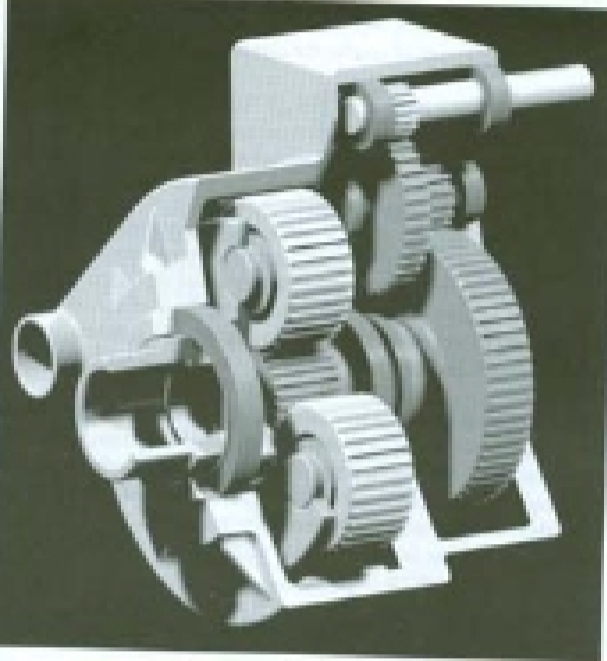
Single-stage gearbox = 2 shafts

Two-stage gearbox = 3 shafts


## Gearbox Schematics





## Standard WT Gearbox




One planetary stage and two parallel shafts


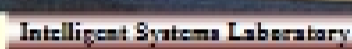


WindPower 2010

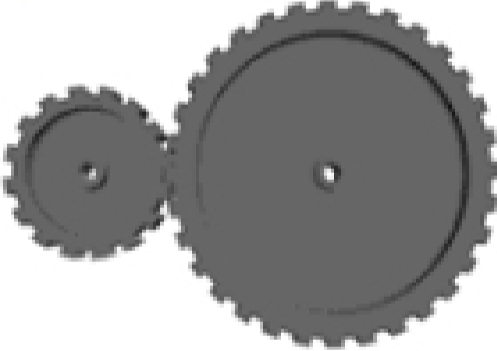

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## Gearbox (Clipper)






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WindPower 2010


## Power Train




© 1998 www.WINDPOWER.dk

- ✓ The power from the wind turbine rotor is transferred to the generator through the power train, i.e., the main shaft, the gearbox, and the high speed shaft


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## Why to Use a Gearbox?

- ✓ Could the generator be driven directly with the power from the main shaft?
- ✓ If we used an ordinary generator, directly connected to a 60 Hz AC three phase grid with two, four, or six poles, we would have to have an extremely high speed turbine with between 1200 and 3600 rpm
- ✓ A 40 meter rotor diameter would imply a tip speed of the rotor more than twice the speed of sound, which is not acceptable


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