



How to tow an L-39?

...definitely not on the Nose Landing Gear (NLG)!

Many times the question arose “Can I tow my L-39 on the nose landing gear and what’s the best way to do that?”

History

The L-39 family was designed for military operations, always towed by trucks over bigger distances and pushed and pulled by man power on the ramp.

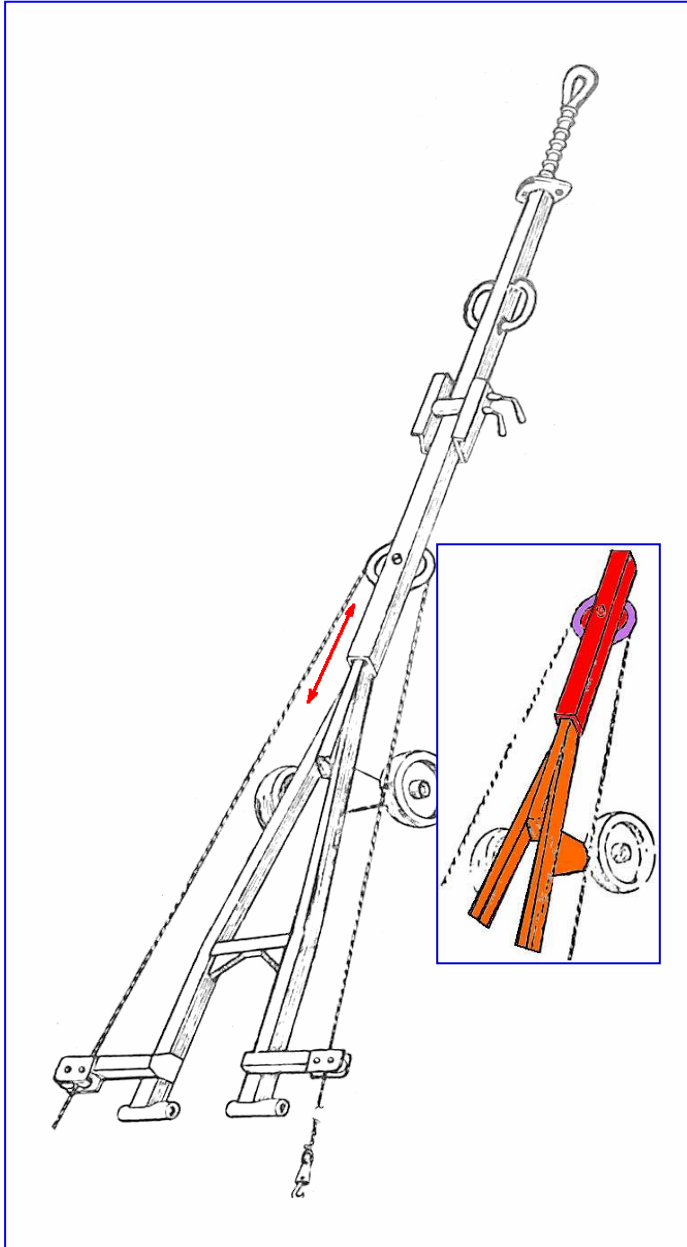
A private use of the L-39, where the pilot is handling his airplane alone, was never intended by the designers of Aero Vodochody.

Consequently special equipment (tow bars) has been developed for the military operation.



The tow bar is fitted with the bolt to the Nose Landing Gear for steering purposes only. While towing an L-39 with up to 5600 kgs MTOW, the steel cables are hooked up to the Main Landing Gear and transfer the towing force via the MLG into the airframe. Therefore the MLG suspension is specially designed to accept the towing force. The NLG is not!

To ensure that under no circumstances any load in longitudinal direction is applied to the NLG, the tow bar has been made in its rear part as a telescoped unit.



Before attaching the tow bar to the NLG, the tow bar must be pushed together in its telescope part and the cables must be attached with their hooks to the towing lugs on the MLG.

(Never to the up lock eye!)

After this, the tow bar must be stretched until the cables are tight. This must happen before the tow bar is fully stretched in its telescope part. With that it is ensured that only the cables transfer the towing force of the tug to the MLG and no towing force is applied to the NLG, except some small force to deflect the nose wheel for steering to the left and to the right. (On new tow bars the cables must be adjusted to the correct length before the first use.)

How to brake a towing vehicle with an L-39?

The manual is clear in this point. The cockpit must be occupied and the hydraulic system must have suitable pressure in the main and emergency system. The whole hauler/aircraft system must be slowed down by the help of the airplanes brakes. For emergency cases a large spring is mounted on the front of the tow bar to avoid that the airplane accidentally comes too close to the tug.

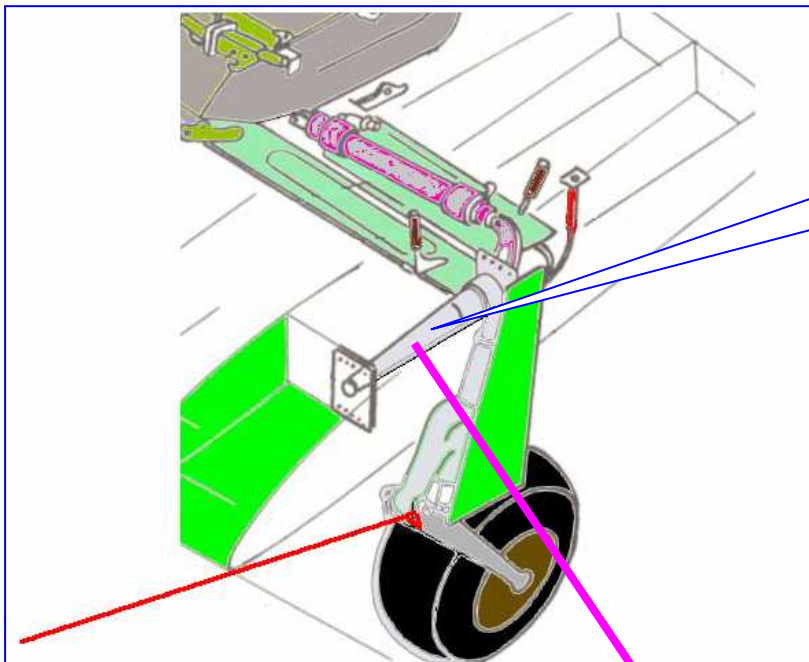


Up lock and tow eye



Why towing only on the MLG?

The MLG is designed for that.



The big steel tube transfers the load from the tow bar cables (red) forward into the reinforced wing part.

The next picture gives you an impression of how big they are:

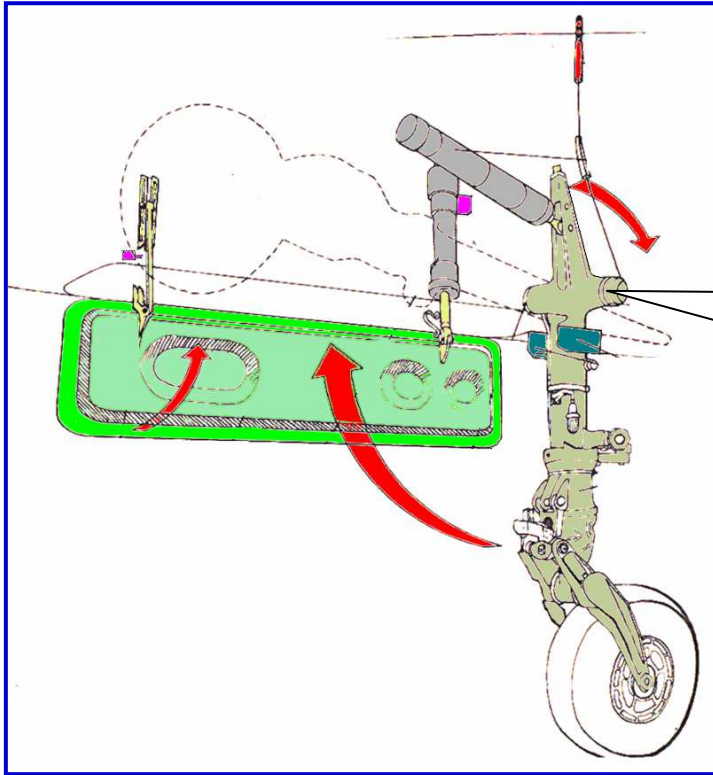


Australian Ouch!



Why not towing on the NLG?

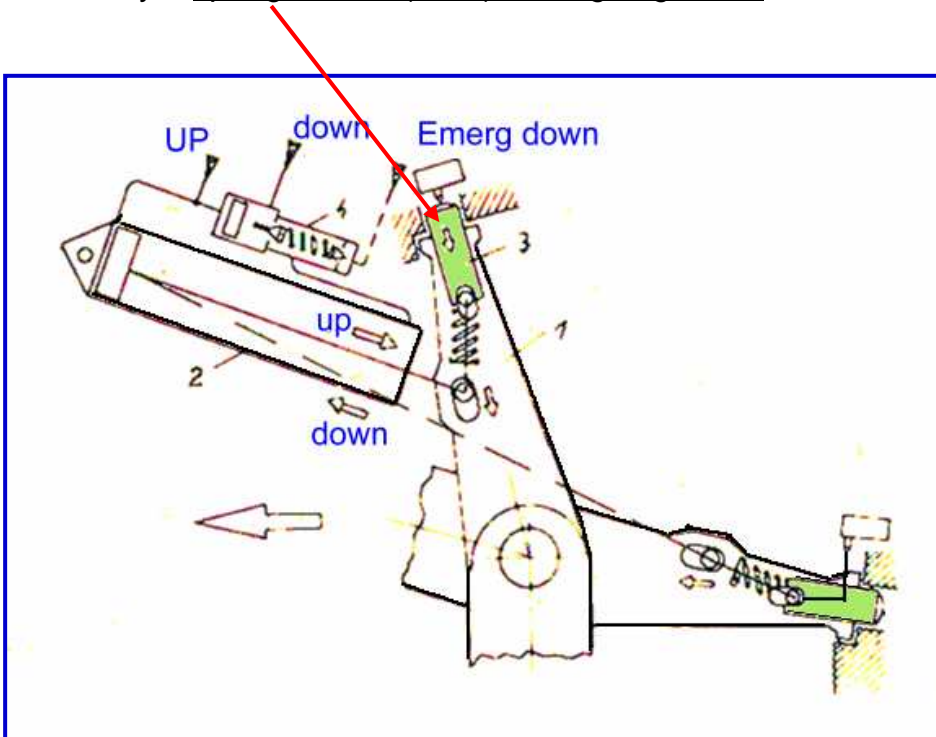
So let's take a look at the cinematic layout of the NLG:



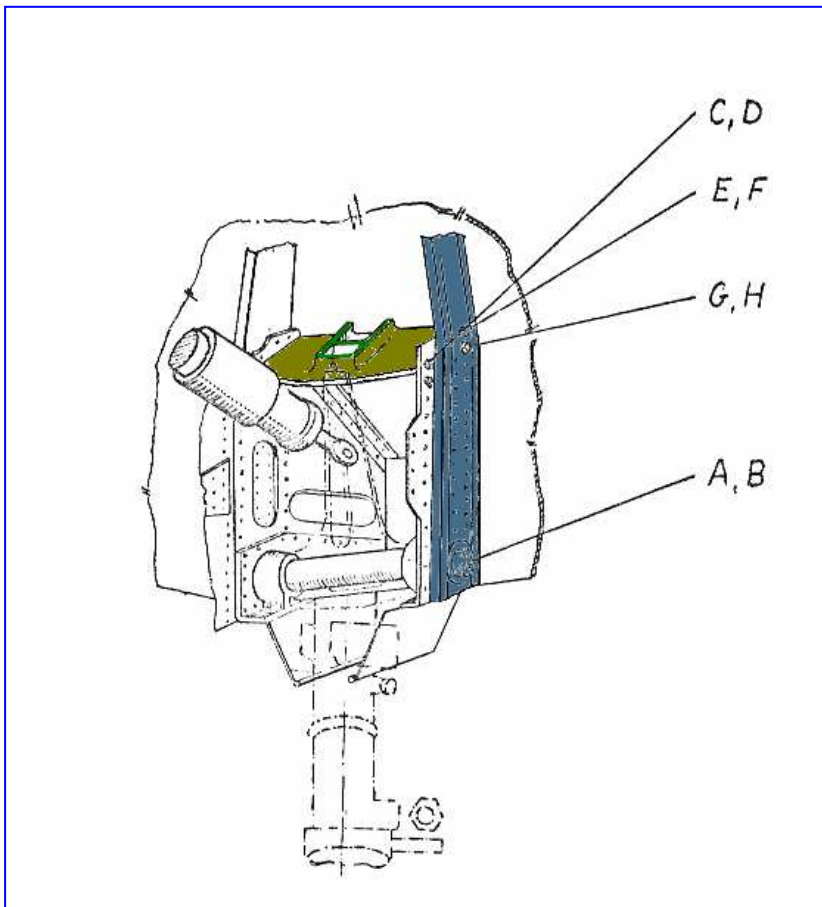
The LG turns around this suspension and is made from strong steel. Its counterpart of the airframe is made from hard aluminium cast.

This allows the transfer of the vertical load during touch down, as well as a limited force to turn the aircraft to the Left/Right direction while taxiing the aircraft on the ground.

The locking system for "gear down" is in the very upper part of the NLG leg and actuated by a spring loaded (steel) locking finger bolt inside the NLG.

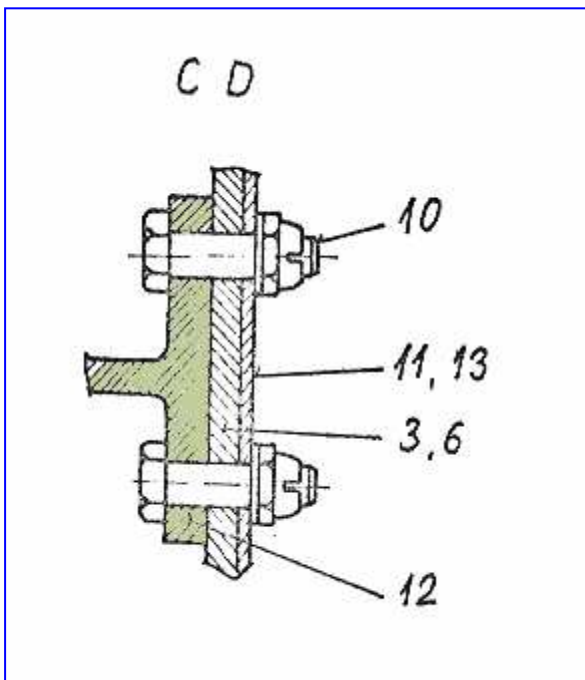


This finger bolt rests in gear down position in a gap of an 8 mm thick aluminium plate.



The khaki marked item is the aluminium plate which is attached with 12 screws (6 on each side) to the aluminium part of the airframe.

The blue marked item is a reinforced aluminium plate (one on each side) which transfers the touch down shock of the LG into the airframe.



Picture 'CD' describes the mounting system of the aluminium plate.

No 10 is an 8 mm diameter steel bolt

No 11 (left) and 13 (right) is a D-16A-T Aluminium plate

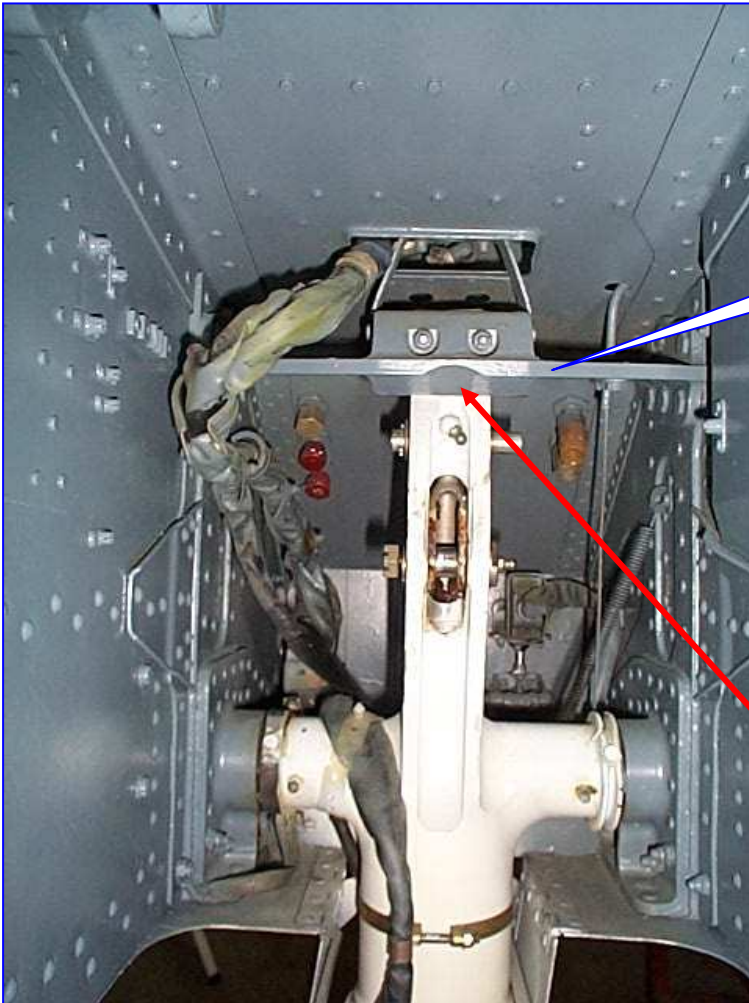
No 3 (left) and 6 (right) made from AL alloy

No 12 is made from AL alloy AK-6-1-T1

So while towing your L-39 on the NLG only, the whole load of the airplane (up to 5600 kgs) will be transferred from the NLG finger into the aluminium plate No 12 and from there over the 12 screws (only!) into a relatively soft aluminium structure part of the



airframe! No way that this will last forever! Please compare it again with the design of the MLG leg suspension which is made much stronger to absorb the load.



This is the 8 mm AL plate where all towing/pushing forces are applied

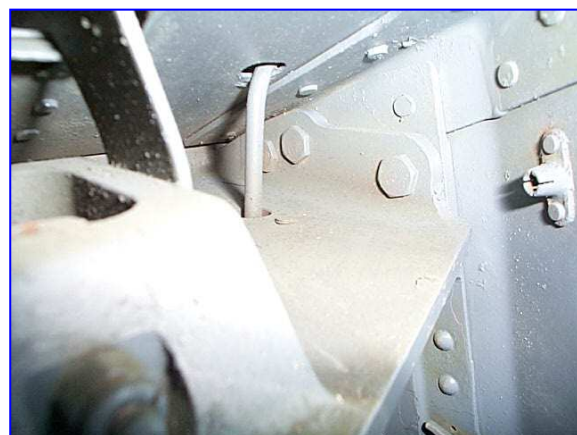


And in the middle part of the plate it is even much thinner.

The plate is attached to the fuselage (nose wheel well) with 6 bolts on each side.



Lower 3 bolts left side

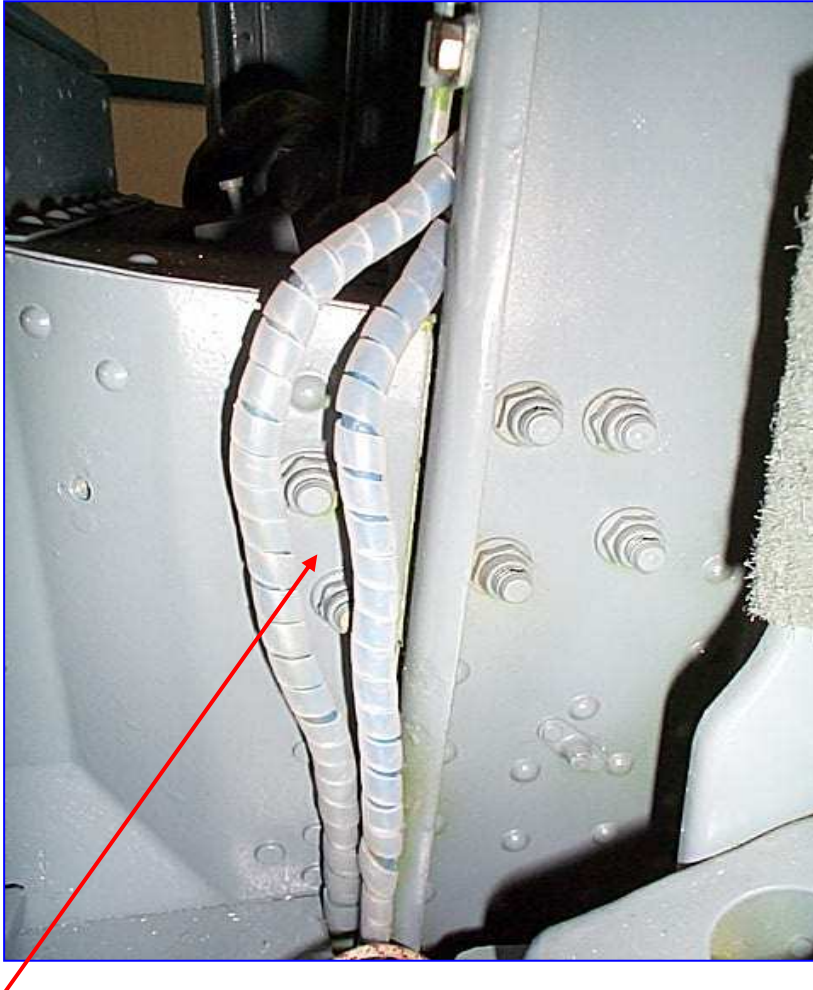


Upper 3 bolts left side

Check this out on your L-39!



From the outside it looks like this (left nose door open, right in front on the oxygen bottles):



The both forward screws are just attached to the thin metal of the NLG well. So it is not designed for transferring any load. If you have towed your L-39 on the NLG before....check there! BTW, it is almost the same design as in the MiG-21 NLG assy. For which everything said is valid as well!

If something goes really bad, it looks like this!





8 mm bracket
broken away



Do I really tow or push 4600...5600 kgs?

Yes, even if it appears less on plain hangar floor or ramp surface.

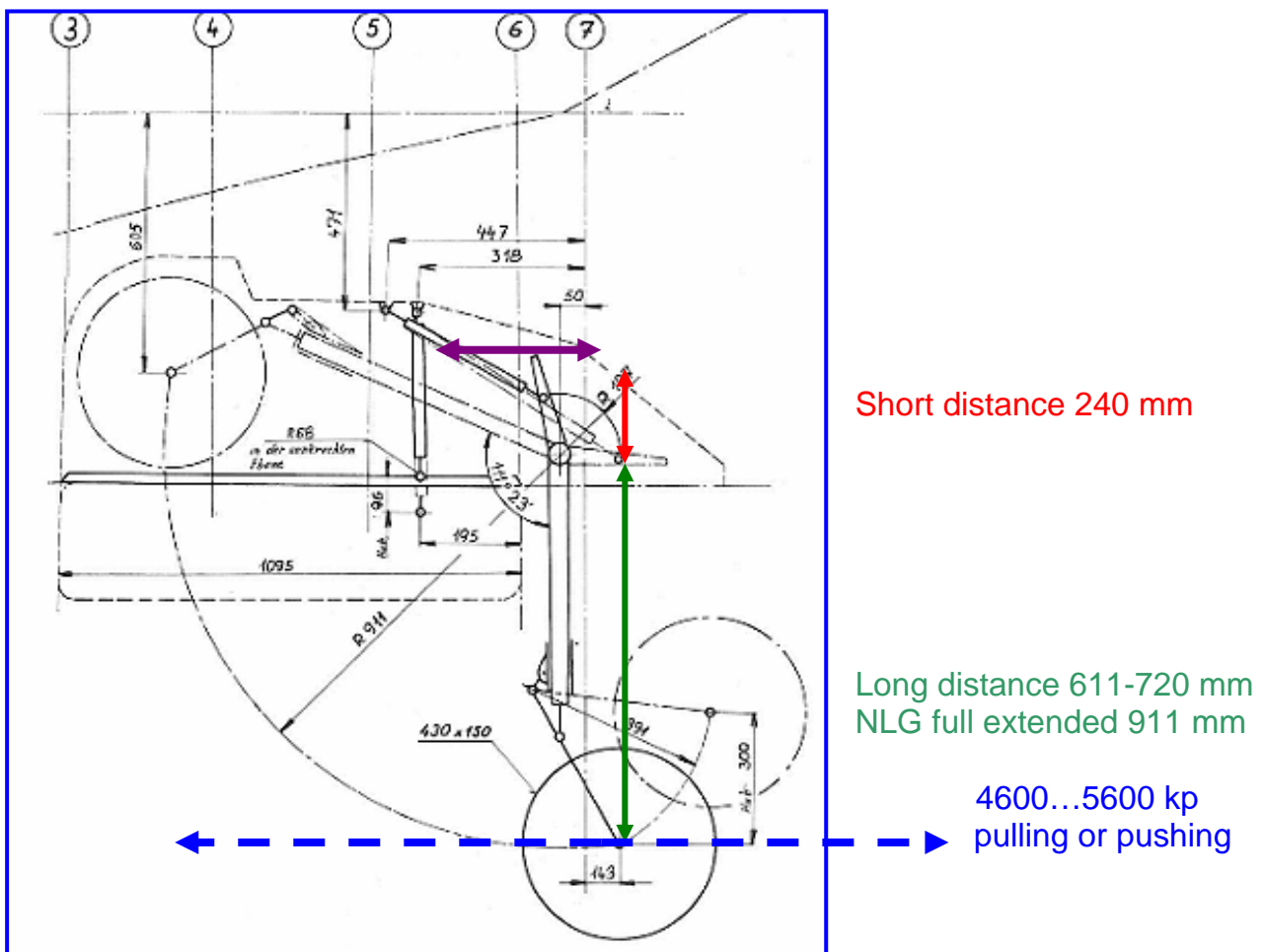
But this may change from one second to the next as soon a little obstacle is in the way of the wheels (hangar door tracks) or going a bit uphill. Then the full load applies.

But that's the theory only, because looking at the schematic below you will realize that your tow bar fitted to the NLG axle has an arm of 611-720 mm (wheel on ground) up to the NLG suspension.

The NLG suspension turns free in longitudinal direction.

Above the NLG is a very short arm of 240 mm (where the locking finger is located).

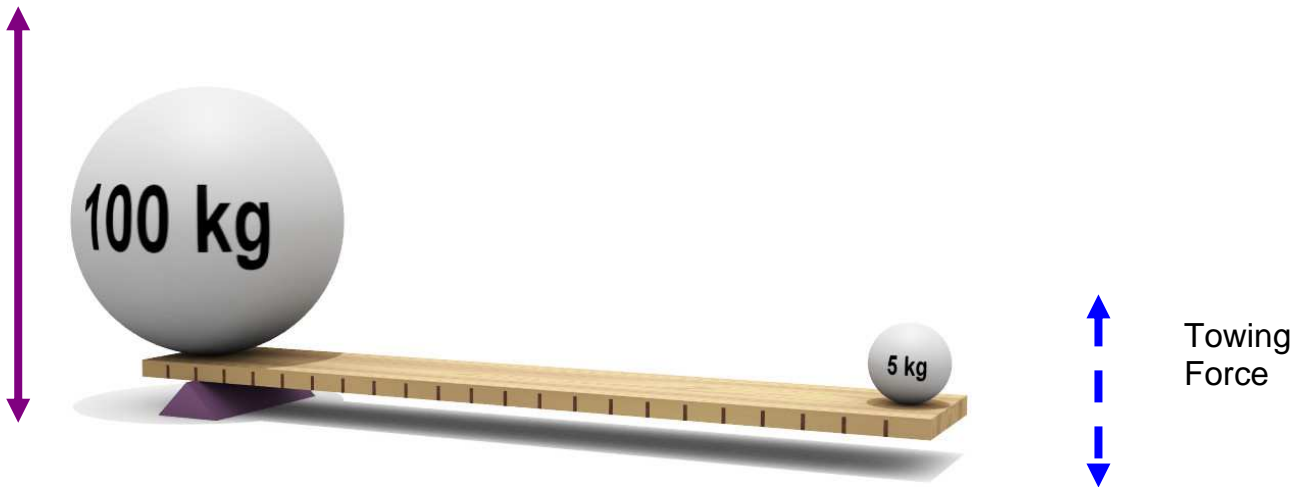
Doing some very basic math now



The **long arm** on the NLG (say 720 mm) is about 3 times of the length of the **short arm** (240 mm)....so a force of let's assume 5000 kgf (worst case scenario) applied to the NLG axle, multiplied by 3, results into an approx. 15.000 kgf (15 metric tons or 33,000 lbf) force on the short arm.



Actually towing or pushing an airplane on the NLG works like using a crowbar!



Summary:

The aluminium plate No 12 ensures only that the NLG leg is kept and locked in its vertical direction. It is not designed for transferring any load in any direction. The vertical and lateral load on the NLG is only absorbed and led into the airframe by the strong NLG leg suspension.

So now what?

Q: Towing is clear now, but how about pushing the airplane back?

A:it is the same story. It means you need to push it back with 2...3 guys on the wing leading edge!

Q: Can I use a Lektro tug which lifts the NLG off the ground?

A : You can use it....but it doesn't change anything on the explanation above! So it is not a real option.

Yelling: But I have seen you guys use a Lektro, too!!!

A: **Admitted!** But don't tell the others! **I promise to use our tow bars in the future!!!**



Please ask, if you have any questions. Fly and handle your airplane safe!

info@aero-contact.com