

# Cessna, Navion (no wheel pants) Aircraft Tug Assembly Instructions



1. Carefully unpack contents of shipping carton and locate the drill, charger and battery. The battery may or may not be installed in the drill. Plug in the charger and charge the battery for at least one hour. You will need a 7/16" boxed in wrench to assemble your tug.
2. **DEWALT DRILL:** Locate the 1/2" drive shaft and chuck the end with three machined flats into the Dewalt drill chuck. Be sure the flats align with the jaws in the chuck and are seated on the jaw tips. Tighten by hand as hard as you can with the drill clutch in the **drill bit image** position, and in speed selector switch setting **1**. See Dewalt drill operation instructions.
3. Visually check to see the foam drive shaft alignment insert installed 8" inside the handle tube end which inserts into the tug receiver. With the drive shaft installed in the drill, insert it into the expanded handle tube end and see that it slips through the foam alignment insert (A light source at the end of handle tube is helpful) and push the drill into the handle as far as it will go noting that it fits squarely to the drill collar and that drive shaft is centered in foam alignment insert. (Visually check inside handle tube end) Rotate drill per image above with Minimax label facing up. Tighten compression clamp to prevent drill from rotating in handle. Install charged drill battery.
4. Be sure the stainless steel compression clamp [Fig.1] is loosely fit onto the tug handle receiver 1/8" from the top. Install the handle tube into the tug receiver fully to mark, rotating if necessary or lightly "bumping" the drill trigger to engage the square drive socket. After engaging the square drive socket position drill per image above. Tighten compression clamp snugly. **It is critical that this connection is always tight when the tug is in use!** Familiarize yourself with the drill operation and assure that the drive roller rotates in both directions, trigger rheostat functions and speed changer (If equipped) function properly.
5. The aircraft attachment device comes pre-installed on your tug. (You may or may not need the free hubs parts installed in the yoke of your nose gear. See included assembly instructions.) Open the attach assembly by pulling UP on the spring loaded locking knob and turn CCW as far as it will move. Attach opened RIGHT fork onto right aircraft tow pin and turn locking knob CW so that LEFT fork engages left aircraft tow pin fully. Be sure that locking knob has sprung into locked position. (Reverse to remove)
6. Push down on the tug handle and slowly pull the drill trigger all the way in to move your plane. When stopping, slowly let off on the drill trigger until plane stops. Avoid sudden starts and stops as this can damage the chain and transmission gears in your tug. Keep chain and axel bushings lubricated per ["Use and Care Guide"](#).

**NEVER LEAVE TUG ATTACHED TO AIRCRAFT WHILE NOT IN USE!**

Practice makes perfect! Thank you for buying a Minimax Aircraft Tug!

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# PERFORMANCE CHECK-LIST

If moving your aircraft has become difficult and will weigh in on your decision to take a flight, it is probably time to consider purchasing an aircraft tug. There are several factors to consider in your decision making to help ensure you purchase the proper tug with the right power source. As pilots, we can all agree that you can never have too much power when you really need it.

Minimax Aircraft Tugs are highly engineered and designed to be affordable, light-weight, portable, and capable of towing aircraft to 4,000 lbs. gross weight. With this said, there are some considerations which should be understood before purchasing. Namely, what is the slope into your hangar and what type door track or curb do you have to cross to hangar your aircraft.

Slope is calculated as a percentage of rise and run with 45° being 100%. (i.e. 2.5" rise in 10' run = 2%)



To understand slope (gradient) consider for every 1% gradient the energy required to move an object up-slope will increase by 15%. This means at 1% gradient your aircraft is now 15% harder to move. At maximum 2% gradient it is 30% harder to move. Our tugs will move your aircraft and negotiate a maximum 2% gradient. Any gradient over this is enough for your aircraft to roll under its own weight. 6% gradient is the generally accepted maximum allowed in mountainous road construction.

Door tracks or thresholds are typically the most problematic area of moving one's aircraft, but are relatively simple to overcome. On a level surface, if you have a 1" high curb or door track, a ramp 36" long x 1" high tapered to 1/8" will create a gradient of 2%. For every 1/4" of obstacle height the ramp must be at least 9" long. We have found that most Cabinet Shops will come to your hangar to measure and estimate making the ramps (2-pcs. tapered hardwood 8" wide) for each aircraft main wheel. The aircraft nose wheel typically does not require a ramp.

## **LOW AIRCRAFT TIRE AIR PRESSURE IS THE NUMBER ONE REASON FOR POOR TOWING PERFORMANCE!**

In our experience this condition can make moving your aircraft extremely difficult. For safety's sake and easy towing, it's good practice to often check aircraft tire air pressure.

Our cordless electric tugs are considered "assist" tugs in the industry and are not designed for continuous, long distance towing over 500' at a time or continuous tight radius turning as they do not have transaxles. Although the tug itself will function without issue in these conditions, the Lithium Ion battery providing power to the drill will by design shut down to prevent damage from over-heating. The battery will automatically reset to function once cooled. Auto reset can take 10-30 minutes.

## USE AND CARE GUIDE

*For best results using your Minimax Aircraft Tug please read and understand the following:*

- Aircraft must not exceed 4,000 lbs. gross weight. (Unless tug specifically engineered by Minimax)
- Always make sure the tires on your aircraft are aired to the manufacturer's specifications. **Low aircraft tire pressure is the number one reason for poor towing performance.**
- Given maximum aircraft gross weight, 2% (2.5" rise in 10' run) grade is maximum towing capacity using our Milwaukee 28v cordless power system.
- Our tractor tire driven tugs are most effective "pushing" your aircraft due to simple mechanical advantage. This is a benefit as most aircraft are hangered tail first up-slope to the hangar. Pulling your plane uphill will require extra down pressure on the handle. As our tugs are light weight, some down force may be required to maintain tire traction while towing. Especially when first getting the airplane moving.
- Always keep your battery charged. New Lilon battery technologies have improved that batteries are unaffected by overcharging and will accept 2000 charges. A fully charged battery will provide enough power to move your aircraft (*depending on model*) on a hard level surface the length of a football field!
- Always maintain tug tire pressure as noted on tires or instructions . Tractor tire driven tugs are NOT for use on turf unless equipped with snow tires or chains. Turf must be hard, level and dry.
- Our tugs are designed for use on hard level surfaces such as asphalt or concrete. Our Dewalt 20v Lilon system will provide plenty of power as such. Grades up to 2% may require our Milwaukee 28v cordless power system depending upon the weight of your aircraft.
- Curbs or door tracks up to 1" high may require ramps at main wheel crossing points. Please read our [Performance Checklist](#) to determine if our product is suitable for your particular towing needs. Cracks in the surface wider than 3" should be filled in with like material. Gritty and sandy surfaces should be swept clean for adequate tire traction. Tires will roughen after a few uses and provide better traction as they wear.
- Our Milwaukee 28v cordless power system will provide ample power crossing curbs as high as 1" at 90 degrees ([ramps may be required](#)) with a gradient not higher than 2%.
- Ours and all tugs of this design category are considered "assist" tugs and are not designed for continuous sharp turn towing as they do not have transaxles. Lifting tug to adjust nose wheel position in turns may be required. Our tugs will provide on average 6 or more cycles (1 cycle= 50') of continuous towing on a hard, level surface on one battery charge depending on the weight of your aircraft.
- Please remember operating your Aircraft tug on inclines can pose a risk of serious personal injury and/or property damage! Always use good judgment while operating your tug, NEVER leave attached to aircraft while not in use.
- On drive roller style tugs, keep the chain and sprockets free from grit and grime and oiled with a good quality chain lube. Failure to keep chain and sprockets lubricated will result in premature chain breakage. Lubricate bushings with 20 weight non detergent oil. Check grease in gear box after 10 hours continuous use. Use grease zirc on underside to re-fill with "VALVOLINE-Crimson" HD grease or equivalent. NEVER use low viscosity lubricants such as WD40 on drive chain, bearings, or any moving parts. Doing so will void your warranty.
- The transmission on our two-wheeled tug is filled with synthetic gear oil and should not require any maintenance.
- The transmission drive shaft receiver socket is packed with grease. Re-grease every 10 hours of continuous use.
- Clean tug with products such as ArmorAll multi-purpose cleaner and keep dry for long service life.

*Understanding these operational tips will make moving your aircraft easy and enjoyable.*