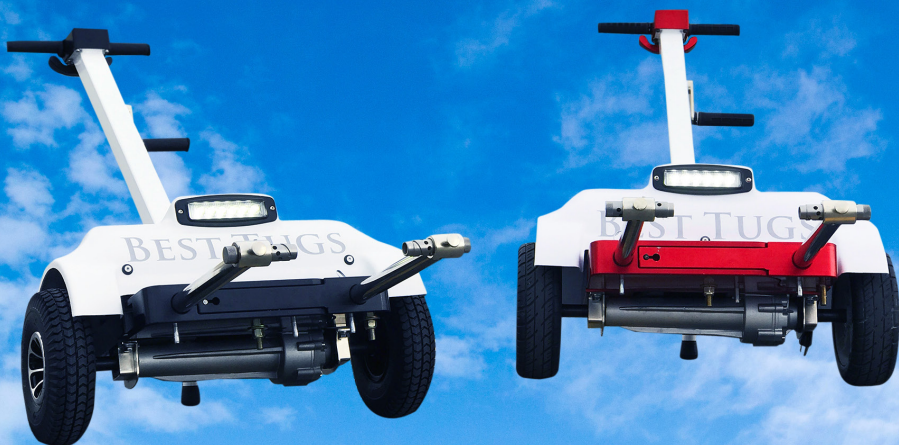


BEST TUGS

— BECAUSE YOUR PLANE DESERVES IT —



ALPHA A2 and A3 USER MANUAL



INTRODUCTION

At BEST TUGS™, we pride ourselves on building the most innovative and advanced tugs in the world. We work diligently to ensure that the quality and workmanship of your tug exceeds your expectations and are confident that you will see the difference in every part of your BEST TUGS™ experience.

We designed this guide to provide you the information needed to make your experience even better... and while we are confident that this guide will answer your questions, we are always here to chat with you on the phone. You can reach us at 800-914-2003.

Thank you again for choosing BEST TUGS™.



BEST AVIATION
PRODUCTS

252 West 3560 North
Spanish Fork, UT 84660
800.914.2003

UNCRATING INSTRUCTIONS

**Please read these instructions
before beginning.
For any questions
call us at 800.914.2003**

Tools Needed:

- Phillips Head Screwdriver
(Drill/Impact is easiest)
- 7/16 Socket

1. Start by removing the screws marked with red paint from the lid marked with red "1". Remove the top lid from the crate.
2. On side 4 (FIG 1) of the crate, cut the two black retaining straps.
3. On the opposite end of the crate, the required wall is marked with a red "4" and stripes, remove the screws securing the end wall to the crate. Remove the end wall. (FIG 2)
4. In the crate, cut the band securing the control arm.
5. Grab the tug's handle and pivot the tug up with the tug's weight resting on the tires.
6. Push the master switch to the "on" position.
7. Left thumb pressure moves the tug backward. **Slowly** increase pressure on the throttle with your left thumb and back your tug out of the crate.



FIG 1



FIG 2

UNCRATING INSTRUCTIONS

Continued

8. Once out of the crate, carefully rotate your tug forward and rest the aluminum base on the ground.

Be sure to place foam from the crate or some other padding between the aluminum base and the ground to avoid scuffs. (FIG 3)

9. Remove the kickstand from inside of the crate. With the provided 5/32 Allen wrench, screw the kickstand to the back of the Alpha's control arm.
10. Observing all safety precautions, attach your BEST TUGS™ tug to your aircraft.
11. Most importantly, enjoy your new BEST TUGS™ Tug!



FIG 3

Note: Foam filled tires have a screw in the tire from the factory. It is safe to remove the screw.

Please Email cool pictures of your tug and plane to sales@besttugs.com. You may see it on our website or social media. (By sending images, you expressly permit us to use these images for marketing purposes.)



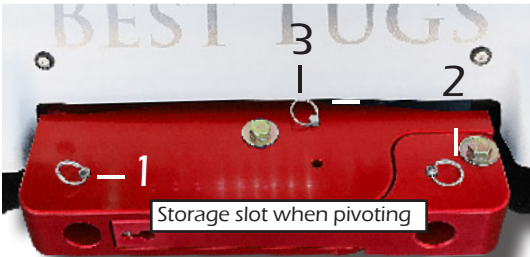
WHAT'S IN THE CRATE?

Adapters may not be included depending on your plane type. If you have more planes you'd like to move with your tug, give us a call, and we can ship the appropriate adapters out to you.

Charger

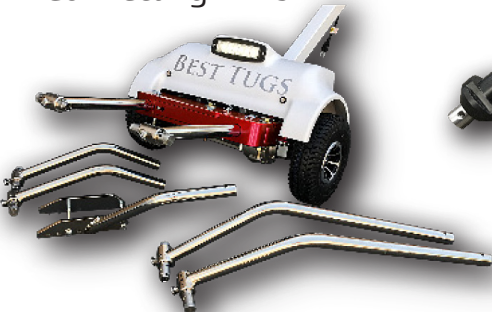


Quick Connect Pins - 3



Items Depending on Aircraft

Connecting Arms



Adapters



CONTROL PANEL FUNCTIONS

1. POWER SWITCH

Turns tug on and off. Do not leave tug turned on for long periods of time or while charging to avoid draining the batteries

2. LED LIGHT

Make sure this switch is off while the tug is charging.

3. HIGH / LOW (A3 only)

High will move your plane at a higher speed. Low is great for safe movements around your hangar.

4. OVER CENTER LOCK

The locking arm travels in an arching motion. When locking, make sure the arm is fully rotated down and secured in place.

5. VARIABLE SPEED THROTTLE

Right thumb pressure moves tug forward, left thumb pressure moves tug backward.

6. DIGITAL READ OUT

Displays your tug's state of charge.



INITIAL USE

We strongly recommend using your tug without an aircraft attached to get used to the controls and movements; this is a very user-friendly system, but it can take a bit of practice to get familiar with it initially. Make sure you are comfortable with the throttle, maneuverability, and functionality of the tug before moving your plane.

Please familiarize yourself with how long it takes for your plane to ramp up/down and stop; that “coast” when slowing is due to the software that protects your nose gear from unnecessary damage and stress. Take the time to get used to this feature and be aware of it as you move your aircraft.

Check your plane’s POH to verify the maximum turn radius for your particular nose gear. The tug can turn your plane at an angle that may exceed the nose gear’s maximum turn radius. Best Tugs™ assumes no responsibility for any damage caused by the tug operator misusing the equipment. As the operator, you have the responsibility to be familiar with your tug, your plane, and their specific limitations.

Check the plane’s surroundings, remove any obstructions, verify that your path is clear, and your propulsion systems (prop), wings, and tail clear. Please verify that your wheel is secure on the tug, including strapping it down. Finally, remove the wheel chocks. You are ready to move your plane.

First Time Set Up

Right Connecting Arm - Pull out Drop Pin and spin the Slide out, so the open end is as close as possible to the center of the connecting arm. (FIG 1)

Left Connecting Arm - Repeat step one process on left arm.

1. Rotate locking arm upwards to open right connecting arm and move the tug, position the Slides, so they are close to the tow pin.
2. Close the arms. (FIG 2 & 3) Slides are not expected to close on the tow pin in this step.
3. Twist Slides until firmly attached to the tow points. Correct set up should leave very little to no slop on the connection.
4. Wiggle tug slightly to confirm the pins are firmly cupped and secured.

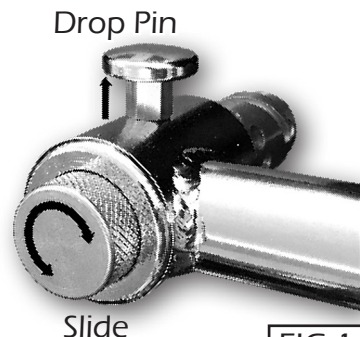


FIG 1

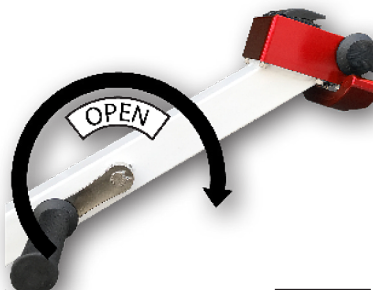


FIG 2



First Time Set Up

Continued



Most users prefer their tug to pivot while pulling their aircraft because it eliminates the need to pick up and move the tug when turning. The same feature that makes pulling so incredibly easy can make pushing your tug feel awkward at first; it drives like backing up a trailer, meaning it drives the opposite of where you turn.

Once you are used to the throttle, start/stop speeds, and movements of the tug, we strongly recommend you push/pull your plane in an open area to familiarize yourself with how your plane moves. Pushing may take a few tries before you're comfortable, but once you find your system, it is easy.

If you prefer to use your Best Tugs™ tug with the pivoting base locked, place pin 3 back in the lock slot. Make sure the pin seats as shown. (FIG 4)

Go to besttugs.com/pages/videos for instructional videos and tips for moving your plane.

Loading Your Plane

Double check your plane to make sure the tug is correctly attached and the First Time Setup instructions were followed.

1. Drive up to within one to two feet of the airplane. Use locking arm to open left connecting arm. Turn power OFF and manually push tug into position. We strongly recommend following this step in case you accidentally bump the throttle while close to your aircraft.
2. Position the tug with arms on either side of the plane.
3. Insert the right arm into/onto tow connection.
4. Use locking arm to close the left connecting arm.

If anything ever looks wrong or like it may damage your aircraft, please call us. 800.914.2003



Moving Your Plane

Check the surroundings of the plane, remove any obstructions, and verify you have removed the wheel chocks. We recommend slow and steady movements when moving your plane. The right thumb control moves the tug forward, and the left thumb moves the tug backward. As you are moving your plane, be sure your nose gear can make the turns you are taking.

As the operator, you are responsible for knowing the limitations of your specific aircraft.

Unloading Your Plane

1. Chock the aircraft's mains.
2. Make sure the tug is in line with your plane.
3. Rotate locking arm upwards to open the arms. (FIG 5)
4. Make sure the connecting arms are going to easily clear your plane as you pull the tug away from the aircraft.

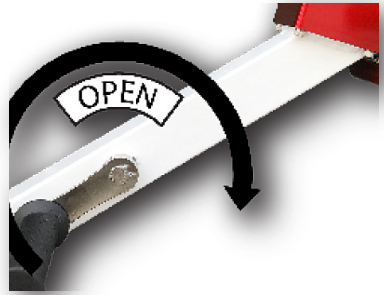


FIG 5

Switching Out Arms

1. Pull the detention pin holding the connecting arm in place and slide out connecting arm.
2. Insert new connecting arm, reinsert pin.



FIG 6

Attaching Trailer Attachment (option)

1. Remove both connecting arms with accompanying pins from the tug.
2. Insert trailer attachment connections into connecting arm slots. Insert pins to secure the attachment in place. (FIG 6)



3. To change the ball size, push down, and rotate the center of the ball counter-clockwise (FIG 7), the center springs up, freeing the ball. Put on the desired size, push the center down, and rotate clockwise to lock the ball into place.

Storage

Store your tug in an area that is dry and safe from the elements. Limited exposure to rain and snow does not affect the electrical systems. However, we do not recommend extended exposure.

If you do not plan on using your tug for an extended time, leave your tug plugged in, and our smart charger can take care of the battery. Always turn off your tug and accessories.

Maintenance

Tighten the wheel lugs once a quarter to 70 ft/lbs. The recommended tire pressure for inner tube equipped tires is 45 PSI. The caster wheel needs to be re-greased every two years for continuous use.

Battery Care

Your tug has a smart charger with trickle charge and battery maintenance cycles. To charge, plug the charger cord into the tug, then the power cord into a standard power outlet. You cannot overcharge when using the included charger.

Always turn off the master switch when charging.

We suggest charging your tug when the battery falls below around 70% (at rest) for optimal battery life (for sure before 30% at rest). Note: The tug continuously and instantaneously calculates the state of charge, which is why the percentage fluctuates while moving your plane. We have seen as low as a 10% charge displayed when using a fresh battery and moving a heavy plane. To read the resting battery's charge, leave the tug at rest for at least 60 seconds. We have seen a 10% drop from freshly charged just by moving the tug in and out of the hanger. The discharge rate is non-linear.

If you notice shorter times needed between charges, your batteries are beginning to wear out.

Lead Acid batteries are surprisingly delicate—damaged by direct and indirect effects: environmental, user induced, misapplication, and on and on. For instance, charging with a voltage above 14.4 volts or allowing the battery to discharge completely are the two most common ways to damage a lead-acid battery.

Even new batteries can be ruined in just a few weeks by being discharged too much or left uncharged for too long; for this reason, Best Tugs cannot warranty the batteries as we have no control over the end-users' actions.

Modern microprocessor-based smart chargers use switching circuits; they are lightweight and designed to protect themselves against reverse polarity connection. They also have an annoying feature of not charging if the battery's voltage is below some arbitrary value. If you left the tug on and it no longer charges, a cheap 12-volt car charger with a volt-meter is your best option to try and restore the battery. Note: Most local battery/automotive stores carry replacement batteries.

To recover the battery pack or diagnose their condition:

- Connect a twelve (12) Volt charger with a meter across the terminals of each battery, one battery at a time.
- If you get a reading of zero (0) volts, a short circuit has occurred, replace the battery.
- If your battery reads less than 10.5VDC when charging, then the battery has a dead cell, replace the battery
- The battery charger indicates fully charged, but the voltage is below 12.4VDC? The battery is sulfated, replace the battery soon.

Are all batteries fully Charged? The tug should be able to resume normal functions. If not, call us.

Replacement Battery Specs.

12 Volt 18 Ah Sealed AGM Battery.

Acceptable brands include Duracell, UPG, Bright Way Group, Panasonic, Interstate, and others.

(The previous are registered trademarks of the respective companies.)

Length: 7.17 in

Width: 3.03 in

Height: 6.57 in

Voltage: 12

Lead Acid Type: Deep Cycle

Capacity: 18ah

Chemistry: Lead Acid

Lead Acid Design: AGM

Product Category: Sealed Lead Acid

Product Subcategory: Deep Cycle

Terminal Type: M6 Nut and Bolt, NB, Nut, and Bolt.

To access the batteries,

take off the four (4) Allen screws with a 5/32" wrench which will release the cover.

(FIG 8)



FIG 8



Critical Cautions

Our tugs do not instantly stop. This feature is to protect your aircraft's landing gear. Failure to compensate for this soft stop can cause damage to your aircraft. "Slowly" is the word to live by when you are in tight spaces or loading the tug. We recommend practicing with the tug before using it on your aircraft to allow familiarization with this soft stop feature. Exception: E-Stop stops the tug NOW! An emergency stop can damage the landing gear and damage the tug's motor control module. The "E" in E-stop stands for EMERGENCY.

Chock your mains! You don't want to push your aircraft into the hanger wall...

During operation, be aware of your surroundings. Never put yourself between the tug and any object! A tug capable of pushing thousands of pounds of aircraft can push you against an obstacle with thousands of pounds of pressure. There is a risk of serious injury, death, or dismemberment. Proper operation is your responsibility.

Best Tugs™ tugs do not have secondary brakes. The motor/transmission provides all braking. Your aircraft can roll freely if your transmission fails. As the operator, it is your responsibility to keep your aircraft within safe limits. Never move an aircraft on a slope or environment where the loss of tug braking would put you or your aircraft in danger.

Exceeding the parameters of the tug can cause future power train failure. Best Tugs™ tugs load ratings are designed for hard flat and level surfaces. Use on a slope drastically changes those parameters. The steeper the grade, the more energy it takes to move your plane—it is as if the plane's load parameter increased. The transmission's gears have a superior hardened surface; a one-time event that exceeds the tug's parameters can degrade that surface—eventually leading to total failure.

Rough surfaces, such as grass, can increase the rolling resistance of your tires. The lower your tire pressure, the larger the tire's contact patch, the more extreme the tire deflection, resulting in more rolling resistance. It now takes more energy to move the airplane—which is functionally equivalent (In regards to the loaded weight charts) to the plane weighing more. Even a ten percent under-inflation could cause your load to be over the limit—you have just damaged the gears. Failure is now a matter of when—not if.

DC motors heat up from the inside out. If the casing is hot to your

Critical Cautions

touch, the internal components are probably red hot. The larger the aircraft, the more energy it takes to move that load, causing heat buildup. Slopes and rough terrain are like moving a larger aircraft causing more heat buildup. Moving aircraft long distances also causes heat buildup. Excessive heat buildup can damage the tug's motor, drastically reducing the tugs life span. Best Tugs™ tugs are designed for intermittent use. The larger the tug, with an appropriately smaller than rated load, the longer a tug can be in continuous usage. If you must move your aircraft a long-distance, slow down, or pause now and then (See Loaded Weight Tables) to allow for heat dissipation.

Example 1: You have a tug you bought for your Cirrus SR22, and you do your buddy a favor and move their King Air—you have just damaged the gears. Failure is now a matter of when—not if.

Example 2: You used the same tug for your Cirrus SR22, and pulled it up a 3-degree slope—you have just damaged the gears. Failure is now a matter of when—not if. It would be best if you had used a tug with a higher rating, such as the commercial version. If you find that you have the wrong tug for your plane's environment, please call us and exchange it for the appropriate model. We have a 30-day exchange policy; you only pay for the price difference and freight.

Did we mention that you need to chock your mains?

LOADED WEIGHT

A2 Load & Duty Cycle			
Degree	1,300	1,950	2,600
0.0	100	100	100
0.5	100	100	82
1.0	100	80	60
1.5	95	63	N/A
2.0	78	52	N/A
2.5	67	N/A	N/A
3.0	58	N/A	N/A

A3 Load & Duty Cycle			
Degree	1,800	2,700	3,600
0.0	100	100	100
0.5	100	100	78
1.0	100	76	57
1.5	90	60	N/A
2.0	75	N/A	N/A
2.5	64	N/A	N/A
3.0	55	N/A	N/A

TROUBLESHOOTING

QUESTION	SOLUTION
The tug was left on and the batteries are dead	A cheap 12 volt battery charger (commonly found at Walmart) can sometimes save the batteries. If recovery is unsuccessful, replacement batteries can be purchased at most battery/automotive stores in the U.S.
The master switch is "on" but the tug is not moving.	There are two possible solutions. <ol style="list-style-type: none">1. The tug will turn off the computer after 20 minutes of inactivity. To reset the computer, turn the tug's master switch off for three seconds and then back on.2. Make sure the red E-Stop is not pushed in. The tug will not turn on unless E-Stop has been twisted out.
I started to move my plane, but my tug stopped, a light is flashing.	See Error Code Translations on page 15 for details.

Optional Accessories

- **LED Flood Lamp** - A high Intensity LED light to assist in loading and unloading your airplane. The control panel light switch controls the action of the light when the main power switch is on. Note: The main power must be on for the LED lamp to light up.
- **Extinguisher** – Type BC. Class BC extinguishers handle both Class B (flammable liquid) and Class C (energized electrical equipment) threats. See the manual that comes with the extinguisher.
- **Tundra Package** – Better operation on grass fields. No user interaction required. Proper air pressure must be maintained, or the inner-tube could slip, ripping the valve stem out. Note: the tires use a 3.00x4 inner-tube.
- **Connecting Arms** – options to connect the tug to various airplanes. Call us at 1-800-914-2003 for more details
- **Trailer Attachment** - Call us at 1-800-914-2003 for more details
- **Under Glow** - LED accent lights. Depending on the selected options, you have an on/off switch or remote control. Note: Under-glow only functions when the tug is on.

Error Code Translations

Most codes are safely reset by turning the tug off, waiting five seconds, then back on again. If system fails to reset please contact BEST TUGS™ at 800.914.2003 for assistance.

Blue LED Light off: System powered down after 20 minutes of no use.

Blue LED Light on: Controller operational, no faults.

All codes have two parts. Count the sequence of flashes (*) to identify code.

Common codes are **blue**.

	Flashes	Meaning
1,1	* *	Aircraft Chocked or Brake Set
1,2	* **	Throttle Fault
1,3	* ***	Speed Limit Fault
1,4	* ****	Low Battery (Charge Required ASAP)
1,5	* *****	Over Voltage (Unplug tug before use)
2,1	** *	Main Contactor Driver Failed Open
2,3	** **	Main Contactor Stuck, driver fail, or brake coil
2,4	** ****	Main Contactor Driver Failed Closed
3,1	*** *	HPD Fault
3,2	*** **	Brake on (Electromagnetic brake open or shorted)
3,3	*** ***	Pre-Charge Fault (Low Battery)
3,4	*** ****	Brake Off (Electromagnetic Brake open or shorted)
3,5	*** *****	HPD Fault (Throttle was engaged when tug was turned on)
4,1	**** *	Current Fault (controller failure, motor or wire failure)
4,2	**** **	Motor voltage (short in motor or wiring)
4,3	**** ***	EEPROM Failure
4,4	**** ****	Power Section Fault

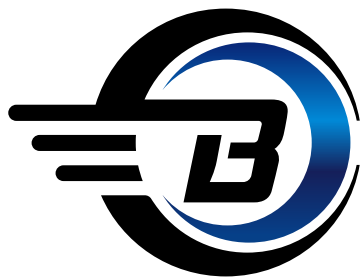
Warranty

BEST TUGS™ DOES NOT WARRANTY BATTERIES

BEST TUGS™ includes a one (1) year warranty on all parts, including the drive train, from date of delivery. Warranty excludes labor and the cost of shipping. Call sales if you want to purchase the optional extended warranty.

This warranty does not apply to any BEST TUGS™ component(s) that have damage caused by, misuse of the vehicle, accidents, collision or object striking the vehicle, vandalism, fire, explosion, water damage, customer-applied chemicals to painted surfaces, improper handling or application, nor does it extend to BEST TUGS™ parts which have been repaired or altered outside of BEST TUGS™ provided maintenance of an authorized service representative. Furthermore, any modification of BEST TUGS™ electrical system **MUST** be pre-approved and documented in writing by BEST TUGS™. Failure to do so voids the unit's electrical component warranty. BEST TUGS™ parts which have been repaired or altered outside of BEST TUGS™ provided maintenance of an authorized service representative as well as any modification of a BEST TUGS™ tugs **MUST** be pre-approved and documented in writing by BEST TUGS™. Failure to do so voids the warranty.

Exclusions may apply. Visit BestTugs.com for the full and overriding Warranty. Exclusions may apply.



BEST TUGS

Because Your Plane Deserves It

Contact us at support@besttugs.com
or call **1-800-914-2003**

Sales Ext 2
Support Ext 3

Release Date: April 22, 2020



BEST AVIATION
PRODUCTS

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