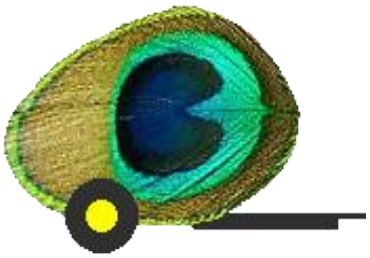
-- PHIELDBUG.CO.UK --

PHIELDBUG OPEN SOURCE VERSION USER MANUAL



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Read it at https://ohwr.org/cern_ohl_s_v2.txt

Contents

Essential DOs and DON'Ts....3

Introduction....4

Safety Notices....5

Using PhieldBug....8
- Towing....8
- Pitching....9
- Awning....10
- Occupying....10
- Striking Camp....10
- Storing....11
- Spare Key....11

Maintenance....12
- Cleaning the Interior....12
- Cleaning the Exterior....12
- Servicing the Latches....12
- Servicing the Running Gear....12
- Inspections....13
- Impact Incident....13

Furnishings and Accessories....15
- Carpet....15
- Mattress....15
- Curtains....16

Internal Electrics....17
- Maximum Permitted Power Load....17
- Flat Battery....17
- Main Fuse....17
- Persistent Fuse Failure....18

Dealing With a Puncture....19
- Lifting - Using a Jack....19
- Lifting - Without a Jack....19

Specifications....21

Appendix: Loading, Nose-Weight, People, Animals....22
- Nose-Weight....22
- Loading....22
- External Loads....23
- People, Pets, and Livestock....23

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Essential DOs and DON'Ts

1. DO NOT overload the trailer.
2. DO NOT overload the trailer. *Some rules are so good, they need saying more than once.*
3. DO NOT over-inflate the tyres. 22psi is enough, even when fully laden.
4. DO NOT over-inflate the tyres. *Yep, another one of those.*
5. DO NOT exceed the rated nose-weight. DO NOT fit a drawbar storage-locker.
6. DO fasten all internal loads securely and place padding underneath hard loads.
7. DO NOT carry external loads. DO NOT install any load, rack, or fitting on the drawbar.
8. DO NOT transport people or animals inside.
9. DO NOT cross any bridge which is closed to high-sided vehicles due to strong winds.
10. DO rehearse how to deal with a puncture and do carry the necessary tools.
11. DO drive the nose-leg into the ground and tie down the nose when freestanding.
12. DO point the nose *uphill* - **never downhill** - and chock the wheels when freestanding.
13. DO NOT occupy on a steep slope unless hitched to a securely parked vehicle.
14. DO remove the shelf-retainer elastic and hooks when the trailer is occupied.
15. DO NOT block the ventilators.
16. DO NOT use any combustion device or BBQ inside.
17. DO NOT push on the outer roof when manoevering.
18. DO NOT install combustible furnishings.
19. DO inspect and service at the specified intervals.

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Introduction

PhieldBug Open Source Version is an ultra-lightweight teardrop pod mounted on a road-going trailer-base, available as an open-source set of drawings and instructions.

Being very light - just 150kg - means that PhieldBug Open Source Version can be towed by almost any car or camper. This makes PhieldBug ideal for use with classic cars, low-powered air-cooled campers, and lightweight kitcars because it has minimal impact on performance.

As a bonus, of course, the light weight means that almost anyone can manoeuvre PhieldBug around a campsite by hand.

Add an awning or gazebo as a shelter for cooking under and PhieldBug becomes a comfortable upgrade from a tent.

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Safety Notices

For your safety and the safety of others, please pay close attention to these notices before using PhieldBug.

- **Always secure PhieldBug's nose when the trailer is in use.** PhieldBug is designed to be occupied either while hitched to a stationary vehicle or while freestanding with the nose supported on the adjustable noseleg. When the trailer is freestanding and is in use, the nose *must* be secured down to the ground by sturdy pegs driven skew or - better - by a 'corkscrew' type ground anchor. This prevents the trailer tilting suddenly backwards if (for example) a child playing inside the trailer squeezes into the rearmost end of the interior. Be aware that, if uncontrolled tilting of the trailer were allowed to occur, the occupant(s) could be injured by the sudden movement and bystanders could be severely injured by the drawbar being suddenly lifted as the trailer tilts. After securing the nose, test that the drawbar cannot tilt upwards by pulling up on the hitch with a moderate force.

- **Set the childlocks when stored.** When PhieldBug is parked freestanding without having the nose secured down to the ground, always engage the external child locks on the latches. This helps to prevent a child playing inside the unsecured trailer. Note that in an emergency rescuers can still access the inside of the trailer even if the doors have been accidentally locked - the childlocks will give way if the latches are forced by a strong pull.

- **Plant the noseleg and chock the wheels when freestanding.** Whenever PhieldBug is parked or used freestanding the noseleg should be driven into the ground and the wheels should be chocked to prevent unintended rolling of the trailer. Always use the nose tie-down supplied. When freestanding on a slope, *always* pitch with the nose uphill, *never* with the nose facing downhill.

- **Do not use PhieldBug freestanding on a steep slope.** Do not load or occupy PhieldBug if it is parked freestanding on a slope greater than 1:10 (10%). The adjustable front leg is *not* capable of supporting an occupied trailer on such a gradient. Seek a more secure location or hitch PhieldBug to an immovable object such as a securely parked car. Do not try to manhandle PhieldBug up, down, or across any significant slope because you may loose control of the trailer or suffer an injury from excessive lifting.

- **Do not shift heavy loads into the rear.** PhieldBug should always be loaded so that the nose is being pressed downwards toward the ground. The rearmost area of the trailer is useful for storing bulky lightweight items - such as sleeping bags - during the day, and for accommodating the occupants' lower legs during the night. Do not move heavy loads into the rear of the trailer - not even temporarily - as this could result in the drawbar unexpectedly and suddenly lifting up if the nose is released. Don't allow children to use the overhanging rear end of the trailer as a hidey-hole or secret nook.

- **Beware pinch hazard of doors.** As with most doors, the hinge areas of PhieldBug's doors can present a pinch hazard. The doors may close unexpectedly either due to wind or due to PhieldBug being on a slope. So don't place fingers in the hinge area, and do supervise children when they are using PhieldBug.

- **Beware the strong spring in the hitch mechanism.** When removed from a towball, many

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hitches have a tensioned latching spring which is triggered when a towball - or other object - is pressed upwards into the hitch socket. It is just possible that incautious fingers could trigger the spring, causing injury. Cover the hitch if there is a risk of children accidentally triggering the mechanism.

- **Do not push or pull on the bodywork or doors.** PhieldBug's inner and outer skins and inner and outer roof are not designed for point loads. Use the hitch - not the bodywork - to manoeuvre PhieldBug.

- **Align the adjustable front leg with its cross-bar fore-and-aft.** This minimises any trip hazard.

- **Do not use any combustion device inside.** All combustion devices - including stoves, barbecues, fire pits, cigarettes, and vapes - produce poisonous carbon monoxide gas. The gas is undetectable and rapidly builds up to deadly levels if devices are used in confined spaces. Never use any combustion device inside PhieldBug. *All* BBQs and firepits - and many stoves - produce especially high levels of carbon monoxide, so do not use them near any door or vent and do not leave a smouldering BBQ or firepit under PhieldBug or under any awning that is attached to PhieldBug while PhieldBug is occupied.

- **Do not cover the ventilators.** The ventilators are essential for supplying fresh air to PhieldBug's occupants. Do not block them.

- **Do not overload PhieldBug.** PhieldBug is designed to be camped in by two occupants with their equipment, up to about 200kg. The maximum on-the-road load is significantly less than this - see Specifications.

- **Do not store pressurised gas inside.** Many popular camping stoves use pressurised butane or propane as fuel. The majority of aerosol sprays (deodorants etc) use pressurised propane as propellant. These gasses are explosive. Any unexpected pressure on the cylinder/spray valve or a small defect in the manufacture of the pressure vessel can easily start a gas leak. Even a very small escape of gas will build to dangerous levels in any enclosed space. So please don't store or transport these items inside PhieldBug. *Tip: our favourite stove for simple outdoor cooking is the Trangia 25. Easy to use. Stable base. No gas. Compact to store. Works even in low temperatures when gas stoves would lose pressure and fail. Fuel widely available and cheap if bought in bulk. Choose the hard-anodized or Teflon variants and add the Multi-Disk option for easy straining of rice and pasta.*

- **Don't leave temperature-sensitive items inside.** On a sunny day the temperature inside PhieldBug can be higher than the outside air temperature. The inside temperature is unlikely to reach as high as the inside temperature of a car parked in similar circumstances. However, any temperature-sensitive items - including pressurised gas containers, aerosols and consumer electronics - should not be left inside a closed PhieldBug on sunny days.

- **Flammable furnishings.** We advise against fitting highly flammable fixtures or furnishings which could be ignited by accidental flame or spark. Never use bare polyurethane foam as a mattress - it is extremely flammable.

- **Tow safely.** When towing, observe all good practice. So you *must* firmly secure all loads inside the trailer, you *must* ensure that heavy items are stowed and are firmly strapped directly over the axle, you *must* use padding or wadding under any hard or sharp loads, and

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you *must* maintain a correct nose-weight. You *must not* place heavy items on the shelves where they would adversely affect centre-of-gravity and you *must not* exceed the maximum gross weight of the trailer. You *must not* mount any external load on the pod or drawbar. Never exceed the maximum legal speed-limit of the jurisdiction that you are in and - even if that limit is higher - do not exceed 75mph. You *must* substantially reduce speed if the surface is very rough or when traversing speed-humps. See also the Appendix *'Loading'*.

- **Beware strong winds when towing.** PhieldBug is affected by strong winds in much the same way that a caravan or a high-sided vehicle would be. Take extra care in strong winds and if wind warnings or restrictions are in effect for high-sided vehicles or for caravans, then observe those restrictions when towing PhieldBug.

- **Do not overinflate or underinflate tyres.** Never tow the trailer with over-inflated tyres. The pressure specified in the technical information has been chosen to minimise tyre wear, improve handing and - above all - to prevent excessive bouncing of the trailer. Do not tow the trailer with under-inflated tyres as this creates a severe risk of sudden tyre disintegration and loss of control. Never tow the trailer with a flat or punctured tyre - not even at reduced speed.

- **Use only a fused 12V power supply.** Any external power supply connected to PhieldBug must be 12V DC and it must be fused with a maximum 8A fuse. Use of any other power supply would create a risk of fire. On campsites - where a mains supply is available - it is possible to use a mains-to-12VDC converter to power PhieldBug provided the 12V supply is fused at no more than 8A. But beware the risk of electric shock should the converter develop an internal fault or if it becomes damp.

- **Remove the shelf retainer from the trailer** whenever the trailer is occupied, especially by youngsters. The shelf retainer could be a choking hazard, especially for babies, toddlers and small children. The retainer can be completely removed from the trailer by unsnapping both hooks and unthreading it. No tools are required to do this. Stow it outside the trailer and out of reach of children. See website **capt.org.uk/blind-cords** for information relevant to cord and elastic dangers.

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Using PhieldBug

If you've towed a trailer before, and if you've camped before, then please don't let us teach you how to suck eggs. But even so, please do read through the following important notes.

If you are a beginner, then these notes should be enough to get you started but you should also consider seeking expert towing tuition, particularly regarding loading, reversing, parking and cornering.

Towing

Read the Safety Notices before towing.

PhieldBug should be towed in much the same manner as a general-purpose 'box trailer' would be.

If you have not previously towed, or if you are at all uncertain, please consult a suitable instructor. Note especially that *reversing* a vehicle with a trailer attached is a special skill and should not be attempted without training because severe damage to the towing vehicle - and destruction of the trailer - can quickly result from incautious or inexpert reversing.

Check that the hitch fitted to PhieldBug is compatible with the towing vehicle hitch. Typically, this means that both will need to be a 50mm ball type. The trailer should be loaded so that the nose-weight is approximately 15kg (which is the same noseweight as when empty) up to 20kg.

A 13-pin socket (or adapter) will be required on the towing vehicle. A spare wheel and suitable tools should be carried on the towing vehicle. If the towing vehicle has a 13-pin socket, and if its pin-9 is correctly wired-up inside the vehicle, then PhieldBug’s interior electrics will be permanently powered whenever the trailer plug is connected to the vehicle.

Before hitching, raise the adjustable front leg to its highest point and clamp securely in place. Optionally, completely remove the front leg while towing. This may be necessary if the hitch-point is low or if the leg would interfere with something on the car such as a boot-mounted rack.

Some hitches have a partially automated latching feature. Familiarise yourself with how the hitch works and particularly what any indicators mean such as “+” and “-” symbols.

Before setting off check that the floor of the hitched trailer is approximately parallel to the ground, that the safety cable has been securely attached, that the hitch is properly connected and has no 'play' on the towball, that tyre pressures are correct, and that the rear lights all operate correctly. Ensure that all loads are properly secured. Check that the doors are closed and locked.

If any extra load is being carried externally on the towing vehicle - for example a cycle rack - then check that PhieldBug's pod will safely clear that load even when tightly cornering on full steering lock.

PhieldBug has no brake so, if parked on a slope, chock PhieldBug's wheels *before* unhitching from the tow vehicle.

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Pitching

Please read the Safety Notices before pitching or occupying PhieldBug.

PhieldBug can be pitched either attached to a vehicle or freestanding.

Attached to a Vehicle

PhieldBug can be used while still attached to its towing vehicle. This will be possible only if the combination of the vehicle hitch-height and the terrain slope results in PhieldBug's floor being approximately level.

Provided that the vehicle is securely parked, and PhieldBug is securely hitched to it, there is no need to chock PhieldBug's wheels nor to carry out any other preparation prior to occupying PhieldBug.

Freestanding

Most users will wish to unhitch PhieldBug and use it freestanding.

We suggest unloading any heavy items from PhieldBug before unhitching, to save strain on the person who is manoeuvring PhieldBug.

When moving PhieldBug by hand, take care to keep the nose low enough that the rear end does not impact the ground.

To manoeuvre PhieldBug solo over short distances, simply unhitch from the vehicle, hold the hitch handle, and wheel the trailer either forwards or backwards in a similar manner to a wheelbarrow or small cart.

To pull PhieldBug over a longer distance - such as across a festival ground - remove the adjustable front leg, refit it inverted, and use its crossbar as a handgrip (checking first for any sharp edges.) Take care to mind the pointed tip of the front leg. Immediately refit the front leg with the point downwards as soon as the manoeuvre is finished. Do not leave the point exposed and unattended.

After moving PhieldBug to the desired location use the front leg to level the floor fore-and-aft. If on a slight slope it is important to turn PhieldBug until it faces directly *up* the slope (nose-uphill). This not only ensures that the floor is level from side-to-side but also minimises strain on the nose-leg. *Note that PhieldBug must never be pitched nose-downhill on any slope as this would place excessive bending strain on the nose-leg.*

When camping, the adjustable front leg should be driven into the ground until its cross-bar is flush to the ground. (Stand on the front leg’s cross-bar to apply body-weight to the front leg, if necessary.) Then adjust the floor until it is level and, making sure that the adjustable front leg is exactly perpendicular to the drawbar, firmly tighten the clamp. The ground anchor should then be used to secure the nose down to the ground so that the nose of the trailer cannot unexpectedly tilt upwards.

After pitching, manually wiggle the draw-bar side-to-side and fore-and-aft, to check that the front leg is securely seated in its clamp.

If PhieldBug is on a slope then the wheels must be chocked to prevent risk of the trailer running

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down the slope. Do not rely on the front leg alone unless the ground is perfectly level.

Awning

Our favourite awning option:

- Erect a Eurohike Adventure Tarp. Use PhieldBug’s roof to support one long side of the tarp. Use the tarp’s pole to support the peak. These tarps work extremely well and are very quick to erect. Their ridge shape means they don’t puddle water, and they cost under £30. Highly recommended.

Two other good options:

- Park the tow vehicle parallel to PhieldBug. Stretch a simple lightweight tarpaulin between the two to create a private sheltered sitting space. DD Hammock's 'DD Tarp S' is a reasonable size for this - 1.5m x 2.8m. Beware that larger tarps will sag in the middle and collect water.

- Erect a freestanding gazebo adjacent to, or partially above, PhieldBug. The drawback is that these can be very heavy to transport and are time-consuming to erect.

Do not use a tarp or awning in strong winds - the constant motion of the fabric against PhieldBug would damage the coatings, and there may be risk of pulling out the anchor points.

Occupying

PhieldBug is designed with one or two occupants in mind.

The interior space is useful for sitting, reading, eating, preparing cold foods, and sleeping. The back-rests provide comfort when seated and the overhead lights are ideal for reading.

Stoves and heating devices should never be used in the interior space. Nor should any combustion device be used under or near the pod.

When sleeping, we prefer to make up a 'proper' bed using a self-inflating mattress, a sheet, and duvet. But single or double sleeping bags are equally suitable.

The bedding and sleeping mats can be rolled up during the day and tucked into the rear end of the interior space out of the way.

The exterior space - created by an optional awning - can be used for cooking provided that sparks and dangerous fumes are not allowed to drift into the interior and that any awning is high enough to be safely clear of sparks, flames and heat.

The mudguards are not structural and cannot be used as seats. They do make useful mug stands, though. Never place any stove, nor anything excessively hot, on the mudguards.

Striking Camp

To 'unpitch' PhieldBug simply pack PhieldBug's contents into the towing vehicle (optionally leaving

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lightweight bulky items such as mattress and duvet inside) then proceed as in 'Towing' above.

The shutters should be stowed in the space between the seat-backs and the front of the trailer while towing. Do not leave them fitted in the doors and do not leave them loose inside the trailer.

Storing

If possible, store PhieldBug when not in use under cover so that it is not exposed to rain and strong UV from direct sunlight. Storing PhieldBug out of the weather in this way will increase the lifespan of the coatings on the timber.

If PhieldBug must be stored outdoors long-term then a cover must be used to prevent deterioration. Any high-quality *breathable* outdoor car cover will serve. Halford’sAll Seasons Car Cover XS 268790 works well, installed back-to-front. Be sure to secure the trailer’s nose against the risk of weather-cocking in strong winds. Padlocking the safety cable to a post or tree is a good way to do this, and also ensures that no late-night inebriated passer-by of limited comedic talent can wheel it away into someone else's driveway 'for a laugh'.

Spare Key

Beware that the child-locks on the latches lock the *outside* handles but not the *inside* handles. Therefore, it would be a fairly easy mistake to accidentally step outside and slam the door closed *leaving the keys inside*. Not an ideal situation when on a campsite.

To save being locked out of the trailer we suggest permanently storing one of the keys in a hidden location on the outside of the trailer.

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Maintenance

Cleaning the Interior

The interior can be gently wiped down with a soft, damp cloth - optionally with a small dab of washing-up detergent. Do not use any aggressive chemicals such as household surface cleaners. Do not vigorously rub the surfaces and never use solvents, abrasive cloths, or scourers.

Problematic stains can be removed using a soft cloth damped with denatured ethanol.

Cleaning the Exterior

The outside can be hosed off with clean, cold water but don't direct a strong jet at the door edges or the ventilators. Optionally a soft brush - such as those designed specifically for vehicle cleaning - can be used to dislodge mud and grime. Do not use aggressive chemical cleaners nor any washing product which is designed for motor vehicle paint.

Never use a pressure washer on PhieldBug. It *will* shred the external skin.

Servicing the Latches

Occasionally apply some *light* mineral oil into the moving parts of the latches, to keep them free. Wipe away any oil runs quickly to prevent damage to the coatings.

The doors will close more easily if a little candle-wax is rubbed onto the exposed sloping/curved faces of the door latch-bolts. This helps them to spring more smoothly against the strike-plate which is set into the bodywork. A very thin wipe of cooking oil can be used as a substitute while on camp if required.

Servicing the Running Gear

PhieldBug is a very simple trailer with only a few moving parts which require any servicing.

- The hitch should be oiled annually or as indicated in the manufacturer's instructions. More often if exposed to weather.
- The wheel bearings should be checked for play and have the grease topped-up every 3000 miles or annually, whichever comes first. Do not over-grease.
- Wheelnut torques should be checked every six months or 1500 miles, whichever comes first.
- Tyres should be frequently checked for correct pressure and for damage and wear. If replacement is required then it is generally more economic to replace an entire wheel, rather than just the tyre.

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Inspections

PhieldBug should be visually examined every six months or 1500 miles - whichever comes first - to check that it remains sound. The inspection takes only a couple of minutes and requires no special tools and no lifting equipment.

- The two bolts which secure the hitch should be visually checked. They should be tight and at least one clear turn of thread should be visible below each nut.

- The hitch and the break-away cable should be checked for corrosion, damage, failed springs, and excessive wear. Replace as necessary.

- The vertical bolt that holds the hinged part of the nose-leg clamp assembly (M8) should be visually checked. At least one clear turn of thread should be visible below the nut.

- The nine pod mounting bolts (M10) should be visually checked from beneath, to ensure they have not worked loose. Several clear turns of thread should be visible below the nut on each bolt. The timber around these bolts should be inspected for integrity. Any sign of failure of the timber is a serious concern as it may cause detachment of the pod from the chassis with serious consequences on the road. *Do not excessively tighten these bolts: they must* not *crush the chassis drawbar.*

- The twelve suspension-unit mounting bolts (M8) should be visually checked from beneath, to ensure they are tight.

- The sixteen door-hinge securing bolts should be viewed from inside, to ensure they have not worked loose. The end of each bolt should be at least flush with the end of the nuts which are fitted, and those nuts should not be loose.

- The four latch securing screws should be visually checked from the inside, to ensure they are securely holding the latches into the doors.

- All interior and exterior fittings should be visually and manually checked for security and damage. Include the over-door drip-guards in this check.

- The lighting cable, and any optional 12V power cable, should be checked for damage and repaired if necessary.

- Exterior timber coatings should be visually checked for splits. If any are found then a fine filler should be applied to close the split, before re-sealing the surface.

- The chassis should be checked for corrosion or cracks. *Tip: the chassis is a robust item and you are extremely unlikely ever to find a crack or other metallic failure. However, it is still important to check. Any deformation or any crack - no matter how small - anywhere in the metal of the chassis would render the trailer* immediately *unroadworthy.*

Impact Incident

If PhieldBug is involved in an accident - including any impact incident which occurs to the towing vehicle even if PhieldBug is not directly impacted - then the whole trailer must be checked for

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integrity before it is towed or occupied again.

Checks should include the integrity of the hitch, the condition and straightness of the chassis, the security of the pod attachment to the chassis, and the condition of the pod itself. These checks should be carried out by an expert in trailers and/or accident repair.

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Furnishings and Accessories

The buyer will wish to add some accessories.

Carpet

Carpeting the floor of the pod will make the interior more cosy, quieter, less cold to the touch and, crucially, will prevent fabrics and mattresses from sliding on the glossy floor.

A lightweight gel-backed ‘contract’ carpet is ideal because the gel backing grips to the floor. Simply cut to the size of the floor, and lay inside. Gluing is not necessary.

Mattress

A mattress will typically be furnished in one of two ways:

- Using self-inflating camping mats. These have the advantage that they are easily moved out of the way during the day and can also be used outdoors for sitting on. They are also easy to keep clean and dry and are cheaply replaced if they suffer damage.

- A bespoke foam mattress. This may seem initially appealing. However, it would have the considerable disadvantage that - during wet days especially - it cannot easily be moved out of the way of muddy feet so it may therefore become grubby and damp.

If fitting a foam mattress the following points should be noted:

- We strongly recommend selecting the *softest* foam available. Any foam - except the very softest - will provide very little 'give' indeed after it has been covered in fabric. Standard 'medium' grade seat-cushion foam creates an unpleasantly unyielding mattress.

- A mattress can usefully be made by combining two densities of foam: a 30cm strip of seat-cushion (medium-density) foam across the head of the mattress, edge-glued to a larger area of the very softest polyurethane foam. The large soft area is for sleeping purposes. The small firm area supports pillows at night and is comfortable for sitting on during the day.

- We suggest at most 3” foam for the mattress. Any more is excessively bulky.

- A thin layer of closed-cell foam (such as a budget camping-roll) laid between the mattress and the floor can improve comfort especially in the hip area. It will also - in challenging conditions - prevent condensation of vapour in the lower levels of the mattress.

- Beware that foam is extremely flammable, so a foam mattress *must* be covered in a fire-retardant fabric. Any good haberdasher will stock this in many different patterns.

- During long-term storage - over winter especially - it may be necessary to remove the mattress to a warm location to prevent mildew.

- For ease of installing and removing a double mattress, we suggest having it made in two equal-width strips. This also offers advantages if using PhieldBug solo occasionally.

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Curtains

Curtains may be preferable to shutters. They help to deaden sound, allow natural morning daylight to enter, and are generally more homely than shutters. If fitting curtains, we recommend:

- Use lightly-tensioned lengths of curtain spring/wire to carry the curtains.
- Make the curtains only from thin, lightweight material. Heavy material, if snagged in the door closure, may cause damage.
- When fitting screw-eyes into the inner door skin, apply a tiny smear of *slow-setting* Araldite or similar epoxy adhesive to the threads. Allow this to set completely hard (24 hours) before attaching the spring/wire.
- Consider sewing a small magnet into the rear edge of the curtain, so that the edge can be held in place on the inner door handle. Otherwise it is difficult to arrange a curtain that covers the entire glazing. A small washer screwed near the hinge-edge of the inside of the door might allow the same magnet to be used as a neat curtain hold-back during the day.

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Internal Electrics

PhieldBug’s internal 12V harness is wired positive to pin 9 and negative to pin 3 in the 13-pin trailer plug. This feeds the internal LED lights, the USB power points, and the internal 12V power point. The maximum draw is rated at 7.5A continuous and the harness is protected by a 7.5A fuse.

Maximum Permitted Power Load

The maximum total load which can be sustained by the trailer’s 12V system is 7.5A or 95W. This means that most low-power 12V in-car devices such as phone chargers, video players or even some small televisions can be used. Substantial, power-hungry devices, such as inverters, 12V kettles, space-heaters, and water-heaters, *cannot* be used. These should be plugged directly into the towing vehicle's power point instead.

Flat Battery

When PhieldBug is powered from a power point in a vehicle, then that vehicle's main battery will be gradually discharged by the load. Take care not to so discharge the battery that the vehicle cannot be started.

For your guidance the power used by PhieldBug - when both lights are switched on to full power but nothing is plugged into the USB ports and nothing is plugged into the 12V power outlet - is a miserly 420mA. So a typical 100Ah car battery *in fully charged and as-new condition* will be reduced to approximately 95% charge after 12 hours continuous use at this load, and will be reduced to 90% charge after 24 hours continuous use.

But beware: an older car battery (say 5 years old) could have a tiny fraction of its original as-new charge capacity remaining. Yet such a battery could still function adequately to start the car - so hiding its deteriorated condition. If PhieldBug's internal lights were to be connected to such a battery, then the battery might well be unable to start the car after even a few hours of running PhieldBug's lights.

Main Fuse

The main fuse (a standard ‘blade’ rated 7.5A) is found in a water-resistant housing under the rear of the trailer.

In normal circumstances this is the only fuse which is likely ever to 'blow'. And it should only blow if an excessive load is plugged into the 12V power outlet inside PhieldBug.

Never replace this fuse with a higher-rated one. Doing so would create severe risk of fire.

Never use an unfused power supply. Use only a 12V supply. Do **not** use a 4-cell LiPo: at full charge it would have such a high voltage that it would destroy PhieldBug's internal electronics and the fuse will offer no protection against this damage.

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Persistent Fuse Failure

If any fuse persistently blows then there is a fault either with one of the fitted items (the lights, the USB socket, the interior 12V power outlet) or there is a fault with a connected item (i.e. something plugged into the USB socket or the 12V power outlet). Alternatively, it may be that a connected item has excessive power demands.

If any fuse repeatedly blows even when nothing is plugged into the USB sockets and nothing is plugged into the 12V power point inside PhieldBug then you should disconnect the external power and have the trailer tested for an electrical fault.

If the fuse repeatedly blows when something *is* plugged into either the USB sockets or the 12V power outlet then you should permanently disconnect that item from the power and check whether it is faulty.

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Dealing With a Puncture

In the event of a puncture, it may be necessary to remove the wheel and either have it repaired or to replace it with a spare.

Whenever changing a wheel take great care to keep all bystanders - especially children - safely away from the trailer. If leaving a trailer which is supported on chocks unattended first ensure that it is safely and securely chocked so that it cannot fall on an unwary passer-by. Secure the door child-locks.

To remove and replace a wheel requires lifting that wheel off of the ground. While a jack is convenient for this task, it is also possible - in the absence of a jack - for one or two reasonably strong and fit people to replace a wheel without the need for a jack.

Tip: a possible emergency alternative to replacing the wheel is to use a through-valve pressurised liquid sealant. These are widely available - for example 'Holt Tyre-Weld'. A tyre sealed with liquid sealant should be towed only at low speed and should be replaced as soon as the trailer can be moved to a safe place.

Any repaired or replaced wheel must be inflated to the correct pressure (see Specifications). Never tow with an overinflated or underinflated tyre.

If buying a spare wheel, look for the cut-out in the central hole which fits over the grease-nipple on the hub. The presence of this generally confirms that the wheel has holes on a 4” PCD, not the incompatible 100mm PCD.

Lifting - Using a Jack

Lifting the trailer with a jack should *only* be carried out while the trailer is hitched to a securely parked vehicle. This prevents the risk of the trailer suddenly tilting backwards while raised. Choose a location where the ground is reasonably level and is firm enough to support the jack and the axle-stand.

The trailer must be unladen when lifting with a jack. The jacking points *cannot* take the weight of a laden trailer.

The jacking-points are labelled on the underside of the floor, rearwards of the wheels. Use a soft pad on top of the jack.

Lifting - Without a Jack

Firstly, do *not* try to lift PhieldBug by hand directly. While you might be strong enough, PhieldBug's structure is not. It is therefore likely that incautious lifting will result in damage to a side panel. Or to you. Below, we instead describe a smart way to raise PhieldBug - without resorting to a direct lift.

To prepare to lift without a jack, unhitch from the tow vehicle and position on flat ground. Slacken the nose leg and lower the nose to the ground. Place a padded chock underneath the appropriate

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jacking point, almost touching the floor. Chock the opposite wheel to prevent it rolling.

Beware that the next step requires a lift of approximately 40kg. So it may require two people working together with careful coordination. Attempt it only if you are sure you can make a safe and controlled lift of the weight without injury.

To raise the wheel from the ground, slowly lift the nose until the jacking point touches the padded chock. Then continue to lift the nose so that the wheel is raised from the ground. Simultaneously drop the nose leg to the ground through its loosened clamp. When the wheel is slightly raised off the ground, clamp the nose leg tight.

Carefully allow the nose-leg to take the weight of the trailer.

Review the situation and check that the trailer is safe: the trailer should now be supported on the nose-leg, the rear chock, and one wheel. The floor should be level front-to-rear. If the floor is not level then lower the nose, adjust the height of the chock, and repeat the process.

Chock the nose safely, before working on the trailer.

While working on the chocked trailer do not allow any part of your body to reach under the trailer or between the wheel and the mudguard where it might be crushed if the trailer were to be dislodged from the chocks.

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Specifications

These specification are for a PhieldBug pod mounted on the galvanised chassis as drawn.

Overall external length (incl fittings)	3.37m
Pod external length (excl fittings, doors closed)	2.44m
Overall external width (incl fittings)	1.56m
Pod external width (excl fittings)	1.22m
Overall external height	1.52m
Internal length	2.38m
Sleeping length x width	2.0m x 1.15m
Max internal headroom	1.11m
Empty weight (approx)	150kg
Maximum gross weight while towing.	250kg
Maximum occupancy when pitched static	200kg of persons and equipment
Nose-weight while towing.	Absolute maximum: *do not exceed* 25kg. Recommended: 15kg - 20kg - whether laden or unladen
Load capacity on draw-bar ('tongue')	Drawbar cannot carry any attachment or load.
Wheels	145/80R10 tyres on nil-offset trailer wheels with 4-hole 4”PCD hubs. 74N rating.
Wheelnuts	Torque: 61Nm (45 lb.ft) Thread: 3/8” UNF Spanner: typically 11/16” AF. (Approx 18mm.)
Tyre pressure	22 psi (can optionally be reduced to 19psi if unladen). Do *not* over-inflate.
Maximum road speed	No higher than the local legal maximum and in any case *never* more than 75mph (120km/h).
External power supply	12V DC only. *Must* be fused 8A max.

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Appendix: Loading, Nose-Weight, People, Animals

Loading the trailer must be undertaken with care. Please observe the following notes.

Nose-Weight

Standard construction produces a trailer with a mere 15kg nose-weight. This shouldn't trouble any vehicle - even one with soft suspension or a long rear overhang.

We like to keep the noseweight in the range 15kg-20kg, irrespective of load. This keeps it within the recommended noseweight for a fully-laden 250kg trailer - using the widely-used “5% to 7%” formula. *Do not exceed 25kg noseweight.*

Loading

It is usually better - especially for lightweight towing vehicles - to only pack bulky *lightweight* gear (such as bedding) into the trailer, while putting all the *heavier* gear (awning, groundsheet, cooker, clothing, deck-chairs) inside the towing vehicle. The least weight being towed, the better.

If carrying a heavy item in the trailer, it *must* only be installed directly above the axle. Ensure that heavy items cannot move. Ensure, too, that they cannot 'bounce' up and down on the floor of the trailer - such impacts while under way could damage the trailer structure. So if carrying heavy loads do install tie-downs on the trailer floor to secure the items to prevent them from moving or bouncing. Place padding under any hard items, to prevent them hammering on the floor as the trailer moves.

Try to load the towing-vehicle so that most of the additional weight is added between its axles - not in the boot and especially not behind the rear axle.

Never load the trailer with a loose, unsecured load no matter how light that load might be. Any unsecured load *will* move vigorously around the trailer while driving and it *will* cause internal damage to the trailer. An unsecured load may even batter open a door and escape the trailer.

Pack heavy items low down in the trailer, not on the shelves where they would adversely raise the centre-of-gravity. In any case the shelves are designed to carry only lightweight items, whilst on the move. So reserve the shelves for sleeping-bags, bed-rolls, pillows, and similar bulky but light items. Packing these on the shelves also has the advantage that - in the rare event of water seeping into the doors - they are sure to stay dry.

Never allow a load to press outwards against the doors: the latches are designed *only* to hold the doors. They are not designed to contain a load.

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External Loads

The drawbar (that part of the chassis which extends forwards from the pod) is *not* designed to carry any loads. The engineering calculations conducted for the drawbar specifically excluded any load other than the pod itself. You *must not* mount any external load - such as a battery, a locker, or a cycle carrier - on the drawbar.

The pod (the timber part of the trailer) is *not* normally designed to carry external loads and – as standard – has no location points for a roof-rack or roof bars. You *must not* mount any external load on the pod.

People, Pets, and Livestock

Never transport livestock, pets, or people in the trailer - neither on public roads nor elsewhere.

Do not leave children or animals inside the trailer in warm weather unless the doors are *secured* in an open position in such a way that they cannot slam shut. Do not rely on the spring stops to hold the doors open.

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