# Light Assault Mech - Instructions for Customising and exporting Mech Components for Printing.

# -Also useful as a general guide to using Blender-

The Light Assault Mech Digital Miniature relies on the use of **Blender**, a free and open source CAD program, to customise and select from the many different options before exporting the parts for print.

You can download Blender here :

https://www.blender.org/

The entire process has been designed to be very user friendly and allow for reliable high-quality prints which need very little cleanup, but it is important that you take the time to both read these written instructions, AND watch the video in order to get maximum value and use from your files.

You can find the Instructional video here:
https://www.youtube.com/watch?v=Yubc0k_wlcE

**Important General Advice**

- Stop reading right now and **save a separate backup of your .Blender files** in a separate folder. Use copies of these files to do any editing/customising, rather than risk saving over the originals.
- The guide refers to Chitubox throughout, but the procedure should work the same in any similar SLA print preparation software.
- The Pre-Supports are custom made specifically for these components and work really well, but are a little different to standard auto supports. Some of the supports are quite thick and you **will need to use clippers** to remove them. We advise using clippers for all thicker supports and a sharp hobby knife to cut smaller ones flush with the surface. Many supports *can* be removed by tearing but more clean up is then needed and you may damage the parts - you don't save any time!
When removing the supports, start from the outside and cut all supports 1-2mm away from the part. When all the supports are gone, go over the part again and remove all the small stumps. This will ensure optimal results.
- A lot of the parts in the kit fit together very closely - it's very important your print settings are not over-exposing as the resulting expansion will make the build difficult!
- As with any model, it's highly likely some work with a knife/file will be needed to get an optimal final fit, and we strongly recommend dry test fitting all parts before applying glue.
- You can model and paint the fully detailed interior, or select options which mean you don't have to. Instructions are given for both.

**File Structure**

The unzipped folder contains:

- **Blender Files for construction and reposing** - To use these files you will need to download Blender from blender.org, These files are used to create custom poses of legs and arms, and also a custom Mech Rifle/Weapon System and Torso.
- **Separate Supported STL's - Legs** - See instructions in the next section.
- **Separate Supported STL's - Torso**. These components are parts which are always printed separately and are used to complete the torso in combination with the Torso Blender File.
- Two **Pre Supported Rifle arm poses**, ready to print. 'Shooting' is as close as possible to firing from the shoulder, while "Neutral" is a more relaxed holding the rifle across the body. These arm poses work with any unmodified weapon from the Mech Rifle Builder.
  *Both these files can be mirrored in Chitubox to print a left handed shooter. Using Blender you can also separate out the individual arms, and remove the shoulder pads and upper arm armour if desired (the supports will still work).*
- **'One Click Print' Armoured Torso and GAU Minigun**, which combined with the pre supported legs and rifle arms, make it possible to print a simple mech with just Chitubox or another slicer program.
- *A folder called 'STL files for Non-Blender Users - NOT RECOMMENDED'. This contains an STL export from the Blender files. These files should be ignored by almost all users, and are supplied without warranty or instructions only because we know not everyone wants/is able to use Blender.*

**Mirroring Parts in Chitubox (or other slicer program)**

In cases where a component can be used on either side of the Mech, a single version is supplied (labelled either left or right). To create the other side, duplicate and mirror the component in the X Axis in Chitubox.
Similarly, if you are using the Direct Mount weapons, the configuration file will produce a Right side version of the weapon. Importing the configured weapon, and the shoulder mount into Chitubox and mirroring both components will give you a Left sided weapon.

**Making a Leg Pose using the Pre Supported Leg components**

The Pre Supported STL components are suitable for constructing the vast majority of poses you might want to build.

They are supplied as some separate components so that you can finalise the exact final pose in the real world when you have the base your model will stand on. The Legs fit into the hip and feet with "snap fit" ball sockets and have a huge range of motion, so you can try different poses before using any super glue!

To make one pose you need:
- 1 x Mech Waist Hip Socket
- 2 x Hip Ball Joint
- 1 x Left Foot (Flat or Bent Toe options are supplied)
- 1 x Right Foot - Import Left foot into Chitubox and mirror it in the X Axis.
- 1x Left Leg
- 1 x Right Leg (Import and Mirror)
- OPTION - Print 2 x Shin Armour. These are glued over the shin and make the lower leg bulkier.

The three legs have a very thick support in the base of the ankle sphere for reliable and stable printing. This is hidden when the model is assembled so it doesn't matter how mangled it gets when you remove it. The options (Compact, Neutral and Extended), refer to the leg length and different combinations give you different posing options:

- 2 x the same = Mech standing at ease at different heights, or with one foot slightly further forward. This will be the simplest build to get looking right.
- 1x extended and 1 x compact - great for all kinds of more dynamic walking/running poses with one leg raised. Take care with the final model as it will be more fragile with only one leg attached to the base.
- 1 x extended/compact and 1x Neutral - Ideal if you want one leg just lifting off the ground a little or being planted. Also good for having one foot "standing on a rock" or other terrain feature, or having one leg further out to the side for dynamic planted shooting poses.

In all cases, think about your Mech centre of gravity when building. You may find it helpful to watch videos of people running, jogging/walking etc and freeze framing the pose you want, to ensure the position of the legs/feet/torso looks natural.

## Blender Information necessary to use the Mech Rifle And Torso Builders in conjunction with the Pre Supported Leg and Rifle Poses

All the files are set up with the correct defaults.   Your model is visible in the 3D window, and all the separate parts are listed in a menu to the right hand side.

**IMPORTANT:** To the right of each separate object in the menu is a little "eye" symbol which you can use to make a part visible or not. Wherever this guide refers to switching a part ON or OFF, it means switch on/off its visibility using the eye - OFF= Not Visible.

For simplicity and brevity, the following guide misses out a lot of functionality which would be useful but is not strictly necessary. There are lots of Blender Tutorials available if you want to learn more (and we will likely do some advanced level guides in future).

**Moving the Camera View - Three ways**

1. With the mouse- scroll to zoom in/out, hold the scroll/Middle button and move mouse to pan around the model. Shift+hold middle mouse button to pan the view.
2. Using the red/blue/green dots in the upper right corner of the view - click to lock onto different views.
3. Use the Num Pad buttons 1, 3, 7 and 9 in the same way.
4. Use Num Pad 5 to change the perspective between perspective and orthographic - both are good for different things.
5. Use Shift+C at any time to re center the 3D cursor and reset your view.

**Selecting Objects**

● Press 'A' to select every visible object. Press 'A' Twice quickly to deselect everything.
● LMB click on any object to select it,SHIFT+LMB to select multiple objects. You can also SHIFT+LMB to remove an object from a selection.
● You can also press 'B' and draw a box to select multiple objects, but this is less precise.

# Using the Mech Rifle and Torso Builder Files

It is highly recommended you watch the Video instructions as it will be a lot clearer. It is hard to explain in writing.

# Mech Rifle Builder

This file is designed so that no matter which options you choose, you have a complete pre supported weapon ready to export and print immediately.

All the options are clearly labelled in the menu to the right. Some default options have been switched on already.

**Starting from the Top :**

A Supports Base - Leave this on if you are using the pre supports.

AMMO - Hard round ejector port, this should be ON if using hard rounds, or OFF if using power lines or universal coupler. Otherwise, have a single option from the remaining AMMO options ON. All ammo options are compatible with all mags, but some options make more sense than others.

BARREL - Have one Barrel visible. If you are using 7 barrel rotary cannon, you should also switch one of the flash hiders ON (or not, it will print fine still).

BODY - It's recommended to leave all these parts ON if you are printing a weapon for a Mech with arms.
.
DIRECT MOUNT - If you want to mount your weapon direction on the shoulder joint, instead of giving your Mech arms, you need to switch OFF all the BODY components and switch the Direct Mount Body ON, you can also add optional armour plating.
*As well as exporting the weapon in this format you will also need to print 1x Direct Weapon Shoulder Mount from the Separate Torso STL folder - it is right hand side by default and can be mirrored, and there is an armoured option.*
*You can print two weapons for direct mount, or print the Sensor Pod or Search Light/Autocannon for the other side. You can also scale any weapon barrel down to 60% and line it up with the sensor pod to make an alternative secondary weapon.*

HAND - if you are using the pre supported Rifle arms (Recommended for beginners), leave both hands ON and the weapon will fit perfectly. You can also have no hands, or just one hand ON if you want to make a pose with only one hand on the weapon.

HANDGUARD - you **must** choose one of these three options if you are using the Foregrip rifle hand. *If you are not using a hand, then these hand guards are all optional because the barrels are fully detailed underneath.*

MAG - Pick whatever form of death your Mech will be dealing today.

MAG/AMMO Coupler -  must be left ON for all builds.

RAIL - Four options to choose from.

STOCK - these are printed separately to ensure optimum quality, they then glue easily onto the shallow locator peg on the back of the rifle body (be careful not to remove the peg along with the support!) The Recoil Compensator is ON by default. Only have one of them ON at a time.

**Printing your Gun**

Because of the way the gun is positioned in Blender to make it easier to navigate, you'll need to rotate it 90 degrees in the slicer.

When removing the supports - again you MUST use clippers, particularly for the thick supports into the hand and back of the rifle.


# Mech Torso Builder


**FIRST** - There are two options with slightly different processes.

A. **Easy - Monoblock Torso**.  Print the entire torso as a single block and not make use of the interior detail. This is much faster and less clean up so is great if you are mainly interested in a gaming model. The downside is that you must pick options which fully enclose the interior. OR
B. **Advanced - Separate Torso Parts**. Model and paint the pilot and interior. This one is for the model making enthusiasts - more work but allows full use of the detailed interior! *Instructions for Separate Parts printing are included in "Advanced Options" at the end of the Guide.*

## Monoblock Torso

The simplest possible default "Low Tech" torso print is already pre set up when you open the file. You can export the visible parts immediately and you just need to print 'Roll Cage Hatch - GLASS' and 'Low Tech Front Hatch' from the separate STL's folder to complete the torso for your mech.

In the side menu you have more options.

**Armoured options** - you can have the front and sides armoured, separately or both.

If you switch ON "Armoured Front" then for the monoblock print, you MUST also switch ON either Armoured Front hatch OR Armoured Front window Glass.

You can also switch ON Armoured Sides as long as you leave "cockpit window side glass" ON (this is the default setting).
You can switch ON the side hatches, left and right, but this is optional.
You can also open the hatches by rotating them with the Gimbal. As long as they are at least 40 degrees above horizontal, they *should* print fine as part of the torso without any supports needed. If you want an easy life, print it with hatches in the default closed position.

If you use the armoured option, instead of printing "roll cage hatch - glass" you need to print "Armoured Top Hatch" as well as "low tech front hatch"

*If you want to print the small hatches separately so they can be physically positioned on the model at the construction stage, this is possible, but they are not supplied pre-supported.*

**Monoblock High Tech Torso**

As above but turn ON High Tech Canopy instead of Low Tech elements which should all be OFF

## Completing your Torso (for both Monoblock and separate parts)

You'll need to print "Gas Turbine Power Plant" OR "Fusion Power Plant" to glue on the back, and you are done.

All the supports are designed to be easy to remove and located in areas where clean up is easy and loss of detail is minimal.

## Exporting your customised Rifle and Torso components

(Importing is covered in Advanced Build Options)

**First > You must SELECT all the parts you want to export**. You can do this by Shift+clicking on all the parts,but the easiest way is to make sure only the parts you want to export are visible (ON), then press 'A' to Select All.

File > Export > STL (.Stl) > enter the name for your export eg "Joel's Torso with Pilot">
**REALLY IMPORTANT >>>>**  In the Export Dialogue box is a tick box (top right side) which says "Selection Only" and you MUST tick this or Blender will export everything including hidden parts.

>Hit Export STL.

**Open Chitubox, import all your STL's, check you have duplicated and mirrored where necessary, and get printing Mechs!**

## Final Thoughts

This kit and the instructions are like any physical kit - we have provided one way of doing it which will be great for most people, but it's not the only way to do it and it's just advisory. Using this guide as a starting point for some experimenting, there are all kinds of digital kit bashes you could attempt and different ways of using the kit - good luck and have fun!

Any problems or questions please let us know asap so we can improve these instructions where necessary.

# Appendix1 : Advanced Build Options

- **Printing Separate Torso Parts**
- **Reposing Arms and Legs**
- **Importing STL's, Removing Supports and Optional Elements**
- **Rescaling**

## Printing Separate Torso Parts

In the Separate STL's folder you will find 'Mech Torso Right Side" - you will need to print this twice (one of them mirrored in the X axis) to make your mech sides.

You are going to do two exports from the Torso Builder File. The Base seat with pilot, and the top section.

### Torso Base/Pilot

Start by turning OFF 'ONE BLOCK PRINT' and all the 'Roll Cage' and 'Armoured' objects so you can just see the Torso Base and Supports.

You can now switch ON and OFF the different pilot parts, starting with the legs. The Torso is the same as our male regiments torso, so at this stage you can import any torso and head from your Anvil Digital Forge Collection and move it to the correct location. The arms have control cables which are designed to allow them to print with no additional supports needed OR you can print any other arms from the male regiments range and they should be compatible.

*You could also export the pilot parts separately if you wanted to use the model to crew a different vehicle, but you'll need to add supports etc.*

Once you have the base seat with any pilot parts you need for your project, export it (instructions later).

### *Top Section - Low Tech*

To make things simpler, turn OFF all the Torso base and pilot parts.

Turn ON "Roll cage Supports" and "Roll Cage".

At this point, the process is the same as described in Monoblock, however, because the interior is on show, you have more options.

- You can turn Cockpit window side glass ON or OFF

- You can print the armoured parts with the glass options turned OFF, so that the bars are visible.
- You can print "Roll cage Hatch - OPEN" to complete your model if you want a fully visible pilot.
- The glass bits are very thin so if you want to break them and make damaged glass with the printed parts, that will be possible if you are careful.

You'll notice that the supports are at an odd angle. When you import the top section into Chitubox, you will need to use "rotate>flatten by face" then click on the bottom of the support raft to auto orientate correctly.

**Top Section - High Tech**

*For a separate parts High Tech Build, you need to print the Torso base/pilot as detailed above, using the correct "low" right arm. You then also need to print "High Tech Canopy BACK" and "FRONT" as well as your choice of low or high tech front hatch (the belly).*

# Re Posing Arms and Legs

Re Posing 'Mech arms fully rigged.Blender, and 'Mech Legs fully rigged.Blender'

*These files work in a similar way, but are split up to keep things simpler. If you want to bring the legs into the arms folder to pose an entire model at once, open both files in two copies of Blender. Select all (A) in Legs and CTRL C, then go into the Rigged Arms file and press CTRL V then G, Z, -37, Enter, G, Y, 2.5, ENTER. This will paste and move all the legs to match exactly with the arms torso blob.*

**Parented Objects**

Parenting means a relationship exists between a Parent object and a Child object. These are all set up in advance. When a movement of any kind is applied to a Parent, it is also applied to the Child. When objects are parented, the children are hidden in submenus in the list of objects to the right.

**All the parts in leg and arm files are parented and rigged so that you can move and rotate any part using the Gimbal and all the rest will follow appropriately.** It's hopefully quite intuitive. A Trial and Error approach is required to get the exact pose you want - It is best to start from the hip/shoulder and move down the leg/arm.

The most important thing to learn is that each part can be rotated in any of three axis, but to keep the arm looking mechanically correct, only certain axis should be used for certain parts.

**Arms**

Rotation starts from the shoulder ball, which should be used to set the angle in the X axis (red) only. The top section of the arm can then be adjusted a little bit in the Z (blue) and up to 90 degrees in the Y (green). The shoulder pad is linked to the upper arm, but the rotation in Y (green) can be adjusted separately. You can also turn off visibility for the shoulder pad to get rid of it.
Moving down the arm, the elbow joint can be rotated in Z (blue) to turn the arm out or in. The forearm is then rotated in X (red).
To get a more natural connection to the hand ball socket, you can separately adjust the wrist socket a little in the X (red) axis.

If you want to make a new rifle pose, there is a very low res "Rifle Blob" which matches the full gun from the Rifle builder, so you can use this to get the arms posed properly, then print the gun separately.

### Hand
The Rifle Builder already has an open hand and a pistol grip hand which are optimised for the gun and not reposable. To make any other hand pose you like, the Arms file contains a hand with individually reposeable fingers and thumb, using the same system as the arm.

Once you have your posed arm, with or without a hand (you can print a hand attached by slightly overlapping the ball and socket so it's solid), you'll need to export it and add supports. This is covered later.

### Legs
These are a little more complicated because there are more parts.
Rotation starts from the Hip, which should be used to set the angle in the X axis (red) only. The Thigh can then be adjusted a little bit in the Z (blue) and up to 90 degrees in the Y (green).
The Knee bone, Knee plate, shin and Ankle rotate around the X (red) axis only. (You can turn the knee plate visibility off to remove it).
If you rotate the knee bone or Ankle, you will also need to rotate and adjust the actuator ram on the back - this is best explained in the video.
The foot can be rotated in any axis, and the toes can bend in the X(red) axis only.

**Important - Legs *can* be printed as a single block, but consider if it's best:**

You can pose a full set of legs and export the whole thing, add supports and print it as a solid model, it will work fine and is potentially quite quick, BUT you will likely need to add (and clean off) a lot of supports and depending on your pose the quality of the print is likely be lower.

Our recommendation is to use the Legs builder to design the pose you want, then consider if you can make the pose (or close enough) using the pre supported components. Getting the exact balance and pose right is easier if you have the flexibility to make small adjustments in the real world using the ball sockets.
If you can't make the pose using the supplied pre supported parts, the next best option is to print the hips, hip balls and feet using the pre supported components, then select your legs and rotate them so they are upright and support them in the same way as the pre supported

examples - this will get you the highest quality print results because that's how the legs were designed to print with minimal supports needed.

## Importing STL's into Blender and Removing Optional Elements.

You may want to **Import** some of the Pre Supported STLs into Blender. The main reason is that some of the parts have separate sub shells which you may wish to remove and then re export as a new file version, using the instructions for removing shells (Appendix 2):

- Arms and legs:  You can switch OFF the knee and shoulder pad objects in the Pose programs. You can also edit the Thigh and Bicep to remove upper armour plates.
- You can remove the optional plates from the Pre Supported Arms/Legs and the supports will still work.
- Gas Turbine: external armour plates and roll cage elements can be removed.
- Low Tech Front Hatch: the D Handle and Search Light/Camera element can be removed.
- High Tech Canopy FRONT and BACK (side gubbins, front sensor elements)

**To Import, go to File > Import > STL (.Stl) and find and open the file.**

You can also Import any other elements from your Anvil Digital Forge collection if you want to further kit bash.

### Removing Supports

For the Separate STL's, you can import them into Blender, remove the support shells and re export **with a different file name!**

For the Torso and Rifle builders, some support shells can simply be switched OFF. Some of the support shells are combined with the elements they support (mainly in the Rifle Builder). To remove these supports, the quickest way is to build whatever element you want eg a complete rifle, Copy and Paste or Duplicate it, Join the Objects (CTRL+J) then Separate to Loose Parts (CTRL+P) then select and delete any support elements, and recombine the remaining components.

# Rescaling

**Scaling up OR down by up to 25%**
This should work using the existing pre supports without any major issues but we have NOT tested this and you attempt it at your own risk.

**25-50% Scale Increase**
The existing supports should in theory work fine still but will be thicker and harder to remove. Big Flat areas may have a bit more blurring/distortion on the bottom surfaces facing the build plate

**25-50% Scale Decrease**
Supports are increasingly likely to fail the smaller you go, and some components will be too fragile to print successfully. The "cockpit glass" elements will not print at this scale. We suggest combining as many components as possible and printing the Mech as a single figure with new supports.

**50% or more scale increase up or down**
We don't recommend this. Proceed with caution. Good luck.

## Appendix 2:  More Advanced Blender Info

*This section is not required for using the standard Builder Files to make a standard Mech, but is useful for more advanced poses/options and kit bashing.*

**Duplicating Objects**

CTRL+ D will create a duplicate of all currently selected Objects.

**Copy Paste between files**

You can CTRL+C a selection of Objects and then CTRL+V in a second, separate Blender file (Two copies of the program open at once). This might be useful if you want to build a Rifle then paste it into an "Arms Pose" file.

**Moving Objects with Key commands**

Press 'G' to move, 'S' to scale and 'R' to rotate, make your move with the mouse and LMB or ENTER to confirm. BY default the movement is free and the parts will move relative to the view or to the set centre of rotation, you can also press X, Y or Z to lock movement to that specific Axis or to the other two axis (double press). You can also make specific movements by pressing the key then entering a number.

Example - G, X, 5, ENTER. will move the object 5mm along the X axis, -5 would move it 5mm the other way.

Normally you will NOT need to use the Move commands detailed above, The information is included for completeness.

**Moving Objects with the built-in Gimbal ball**

When you click on an object, a Gimbal (three coloured circles and three coloured arrows) appears. Click and drag a part of the Gimbal to either rotate it (circle) or move it (arrow) along a particular axis. Hold SHIFT at the same time to make very fine adjustments.
For the fully rigged poseable files, the Gimbal has been positioned exactly on the centre of rotation for that component.
The current location and rotation of the Gimbal is displayed in number format in the "Transform" box directly to the right of the view window. You can click on these numbers and enter specific values, or enter '0' to reset the location/rotation.

**Objects with multiple Shells**

A shell is a single STL element which is a "watertight" mesh suitable for 3D printing. An Object can contain multiple overlapping shells.  You can add or remove shells and the object remains printable. This is the basis of a lot of the customisation options in the model.

**Splitting and grouping Shells in Objects**

This is not required for basic construction, but it is useful for some of the advanced options.

The default view in Blender is "Object Mode" in which the model is rendered in grey. If you want to split an object to remove certain shells, you need to enter "Edit Mode" which is done using the dropdown box in the top left, or the quick way - Press TAB to enter/exit edit mode.

In Edit mode, you can see the individual Vertices, Edges and Faces which make up the 3D object This is the mathematical information which defines the shape of a 3D model.

Press 'P' to bring up the separation menu. The two options you need are "By loose parts" which will split the object to all separate parts, and "Selection" which is more precise.
To remove a single shell, click on that shell to select an individual vertice, face or edge, and then press 'L' to select the entire linked shell. Then use P, Selection. The split element will become a new object with its own name in the side bar.

As well as splitting separate shells, you can also use this feature to quickly separate and remove supports from parts.

To combine several objects into one, select them all and press CTRL+J.  The name of the new object will be whichever object was selected last. Combining objects will move the Gimbal/centre of the object to a new location. It's normally best to NOT combine objects.


**Mirroring in Blender**

Coming soon