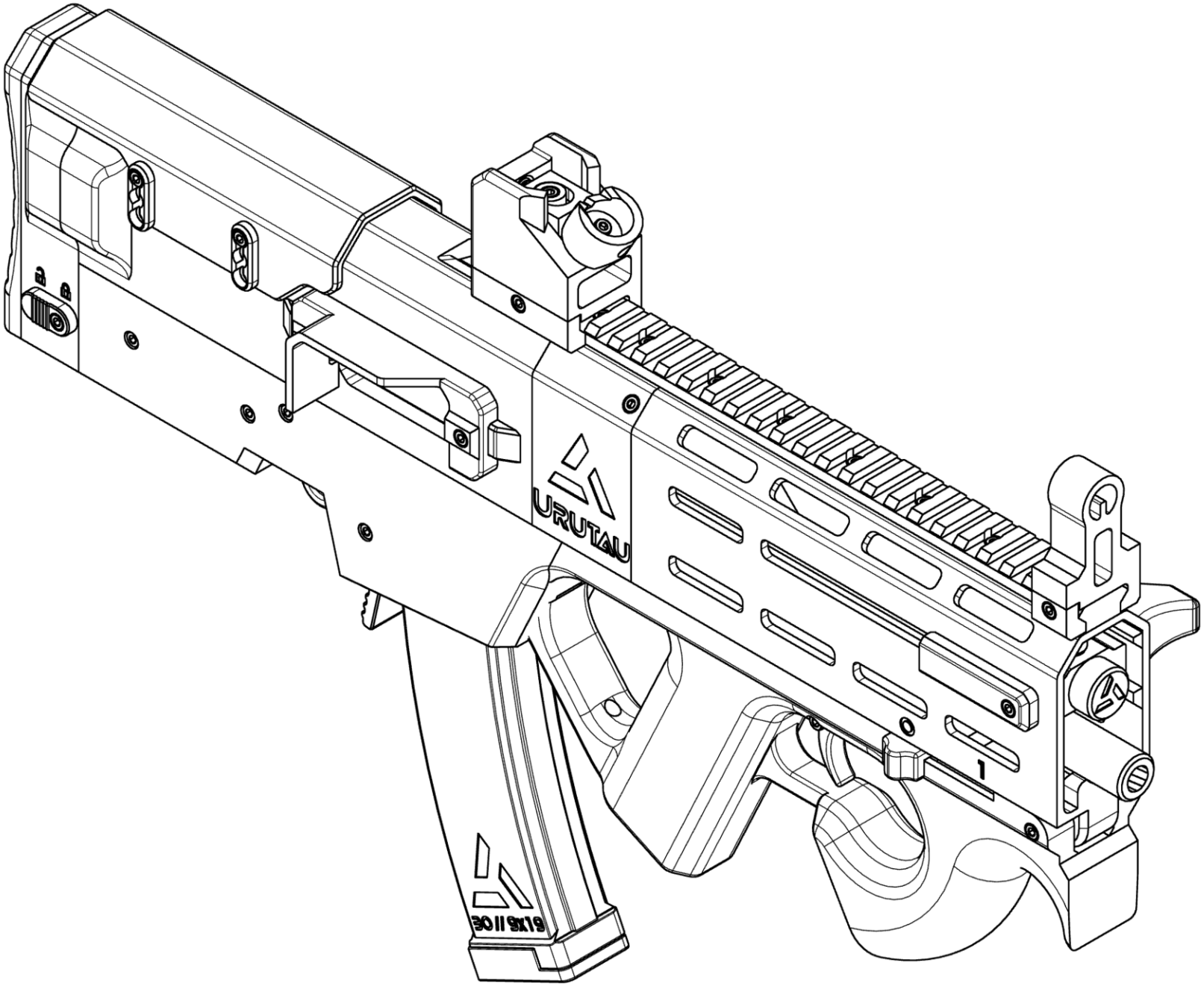

URUTAU

RESEARCH & DESIGN BY JOSEPH THE PARROT
DOCUMENTATION BY RSMITH28

PUBLISHED BY:
THE GATALOG

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Please use our PGP keys when emailing us. All unencrypted emails will be ignored.

https://cariocaworks.com
https://thegatalog.com

Per our interpretation of FOSS standards, we did not put any noncommercial stipulations on the Urutau. However, if you paid any person or website to access this digital work, *you got ripped off*. Please seek out a refund by any means available.

SPECIAL THANKS TO:

All the beta testers from AWCY? and The Gatalog. Without their help, the Urutau would never have existed.

The following donors:
Maple
Austin Thomas Jones
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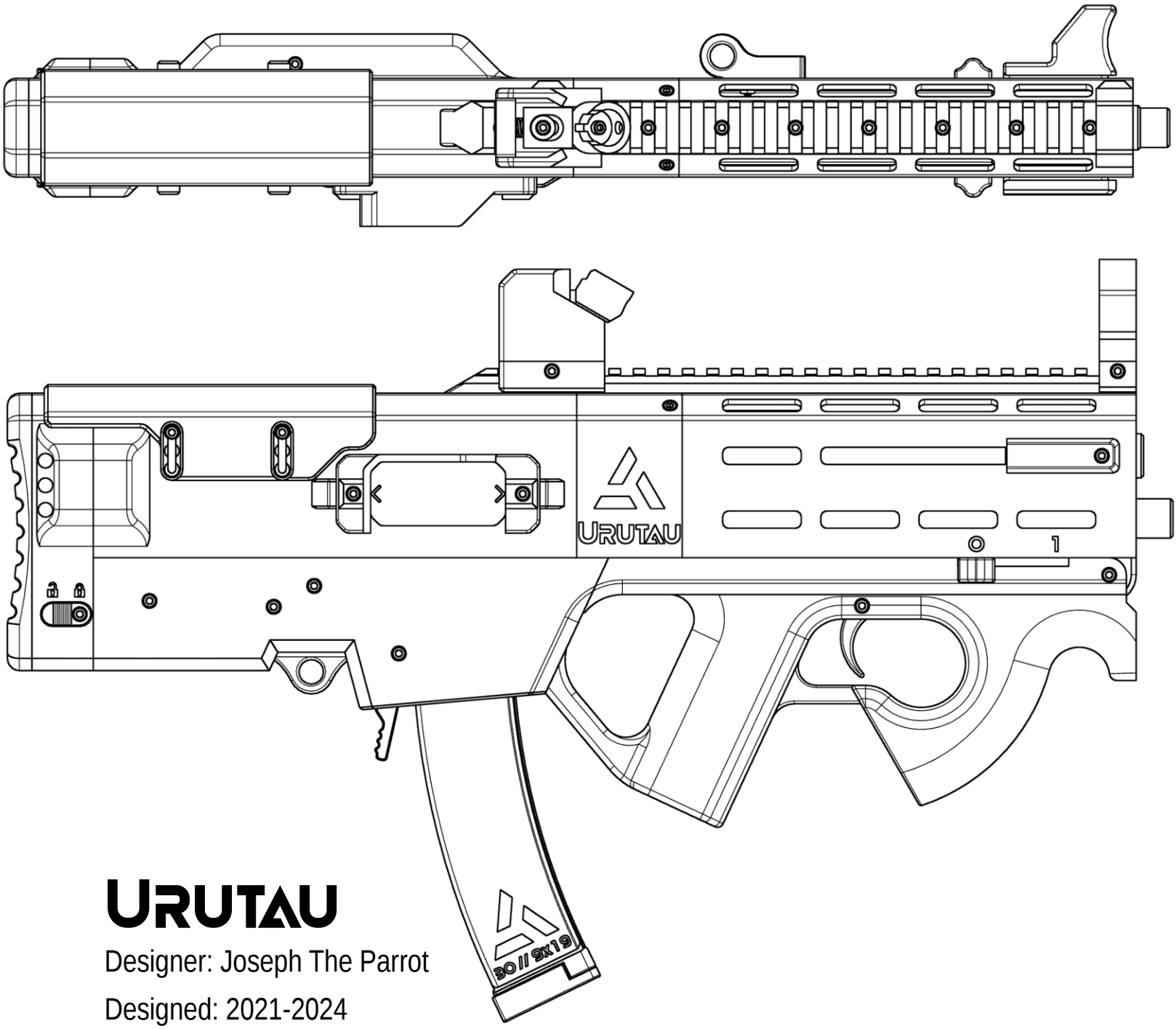
And 39 Anonymous Individuals

ImmortalRevolt, AdvancedPayment, Derwoodvw and many other designers whose creations inspired and influenced the Urutau design.

The schoolteachers who told us we could be anything we wanted when we grew up.

The People who didn't believe us.

And, most importantly, JStark1809, a man who lived free.



URUTAU

Designer: Joseph The Parrot

Designed: 2021-2024

Type: Bullpup Pistol Caliber Carbine

Mass (Empty Magazine Included): about 2830g

Default Overall Length: 475mm

Default Barrel Length: 250mm

Cartridge: 9x19mm Luger/Parabellum

Action: Closed-Bolt Straight-Blowback

Feed system: 3D Printed 30 Round Magazine or any Scorpion Evo 3 Magazine

SCIENTIA POTENTIA EST!

KNOWLEDGE IS POWER!

We hope you appreciate all the time, resources, and effort that we put into the Urutau as well as the risks we assumed in its testing and publication.

To sustain our efforts in undermining global firearm prohibition, please propagate the Urutau file package as much as possible unless/until it is superseded by something better. To avoid implicating yourself, please do so anonymously or in a way that makes it difficult to track you down. **It is our collective duty to ensure these files are always freely available to everyone.**

If you had success in producing your Urutau and/or want to perpetuate our cause, please consider donating to Zé Carioca. All donated funds will help with development and improvements to the Urutau and future designs. You can find his Monero (XMR) address below.

XMR

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SAFETY ADVISORY

You are about to manufacture a firearm that was designed, tested, and published by strangers on the internet. While we hope you find the Urutau useful and the contents of this document informative, please understand that this file package makes absolutely no promises of success or safety in any of your undertakings.

The four basic rules of firearm safety are as follows:

1. Treat every firearm as if it is loaded until you have personally verified otherwise.

2. Always keep firearms pointed in a safe direction.

3. Keep your finger off the trigger until you are ready to fire.

4. Always be aware of what is ahead of and beyond your target.

On top of those safety rules, please adhere to the following guidelines.

- Wear hearing and eye protection when firing the Urutau. Shooting without eye protection is risky, like driving without a seatbelt, but shooting without hearing protection is painful and will damage your sense of hearing.
- **Do not cock the Urutau's hammer with the safety switch on, in the rear position.** Doing so may damage your fire control group components.
- Replace parts and components as they become significantly worn.
- While we never experienced any issues with the hammer spontaneously breaking loose, storing the Urutau loaded with a round in the chamber is not recommended.
- Keep your hands clear of the ejection port when charging or firing the Urutau.
- Inspect your ammunition before using it.
- Do not blindly use components and materials in your Urutau without first making sure their dimensions and properties fulfill the design specifications in this document.

- If you make experimental changes to the design, wear other protective equipment in case of unforeseeable malfunctions. Consider firing the weapon remotely by securely mounting it to a vise and pulling the trigger with a string.
- Check your barrel for obstructions before firing. To check safely, remove the rear cap and bolt carrier assembly, and then look down the barrel from the breech-end. If there is an obstruction, do not try to "shoot it out." Remove the barrel from the gun and then use a rod and hammer to tap the obstruction out of the barrel.
- If you notice a significant difference in sound or recoil after firing, stop. This may be a sign of a squib load, a primed cartridge without powder. If this happens, check your barrel for obstructions.
- To minimize lead exposure, if possible, only shoot your Urutau in well-ventilated areas.
- Keep your Urutau inaccessible to those too incompetent to handle it.
- While the safety switch should be utilized when possible, it should not be used as a replacement for any of these rules or guidelines.
- Do not shoot firearms into the air. The Urutau is not a noisemaker. The bullets have to go somewhere.
- If you are intoxicated, significantly tired, sick, or under emotional distress, do not handle any firearms or other weapons.

FOLLOW ALL THE INSTRUCTIONS IN THIS DOCUMENT CAREFULLY.

DO NOT ASSUME ANYTHING IS OPTIONAL UNLESS WE EXPLICITLY STATE SO.

EVERYTHING WE WROTE IS HERE FOR A REASON.

PLEASE DON'T BE AN IDIOT.

Got all of that? Good.

AMERICAN LEGAL WARNING

We are not lawyers, and no part of this document is to be construed as legal advice. Generally, the American federal government does not prohibit the private manufacture of firearms, but depending on the characteristics of a firearm, it may or may not require registration to make and own legally. The purpose of this section is to manage the risk of American Urutau builders inadvertently breaking the law.

SHORT-BARRELED RIFLE (SBR)

Depending on the configuration you choose for your Urutau, you may create a firearm that meets the definition of a short-barreled rifle (SBR). An SBR is defined as a firearm that is fired from the shoulder with a barrel length less than 16 inches or overall length less than 26 inches. (18 USC § 921(a)(8))

Without considering state and local restrictions, SBRs are legal to own provided that they are compliant with federal law. Compliance requires submitting and receiving approval on an ATF Form 1 and serializing your lower receiver in accordance with the National Firearms Act Handbook chapter 7. Please see the NFA/GCA section for more details.

If you prefer to to avoid manufacturing an SBR altogether, assemble your Urutau with the extended rear cap to keep its overall length over 26 inches, and ensure that your barrel is greater than or equal to 16 inches. **This is the easiest way to legally make the Urutau.**

To provide extra insight, it is possible to use a shorter rear cap in tandem with a longer barrel to keep the overall length over 26 inches, but the shorter length of pull may feel uncomfortable with a longer barrel. Unless you have access to an extra long barrel, this approach is probably not worth bothering with.

NATIONAL FIREARMS ACT (NFA) / GUN CONTROL ACT (GCA)

If you want to make an SBR, you are legally required to register your Urutau with the ATF. To do so, you will need to submit fingerprints, take a portrait of yourself, fill out an application, pay $200, and wait a period of time for your application to receive approval. Only once your application is approved, you can make your Urutau into an SBR.

To register your Urutau, fill out ATF Form 5320.1, also referred to as “Form 1.” The easiest and fastest way to do this is on the ATF eForms website. Electronic fingerprints, while not a requirement, have an extra upfront cost, but they are significantly more convenient and speed up approval times. You are also required to serialize your lower receiver. Please review the National Firearms Act Handbook chapter 7 for specific requirements.

For more information about the process, please do your own research. ATF requirements for your application can change with little to no notice at any time. With further questions, please consult with an attorney.

If this sounds like too much to handle, do not worry. As stated in the previous section, it is possible to build your Urutau in such a way that it does not require registration.

STATE AND LOCAL RESTRICTIONS / PROHIBITIONS

Different state and local jurisdictions may restrict or prohibit the weapons you can legally own and/or manufacture. Please familiarize yourself with your state and local laws before attempting to manufacture the Urutau.

OTHER LAWS

The risks of Americans ignorantly manufacturing SBRs and firearms prohibited by state and local laws are one of our biggest concerns in publishing the Urutau. However, those are far from the only laws to consider. Please familiarize yourself with

all applicable federal, state, and local weapon laws before manufacturing the Urutau or coming into possession of any firearm.

WHAT IF MY SBR LOWER RECEIVER WEARS OUT OR BREAKS?

You are required to completely destroy the serialized lower receiver and send a notice to the ATF that it is completely destroyed. To legally make a new one, you are required to file a new Form 1. Destroying your serialized part and then making a new one with the same serial number and tax stamp is illegal. Of course, you can probably infer that the efficacy of this law is questionable, but take that for what you will.

WHAT IF I DON'T CARE ABOUT ALL THIS LEGAL STUFF?

Please reconsider. Do not underestimate what a felony on your record will do to you. A felony conviction will keep you from voting, keep you from serving in the military, keep you from attaining or force you to forfeit professional licenses, complicate finding a job, cost you in fines and legal fees, send you to prison, and worst of all, keep you from legally owning a firearm.

WHAT IF I *STILL* DON'T CARE?

Well, shoot. I guess you don't. In that case, please avoid getting caught.

At the very least, watch "Don't Talk to the Police", a law lecture by Regent University Law Professor James Duane and "10 Rules for Dealing with Police", a video by Flex Your Rights, an American nonprofit organization. Also, please read OpSec & Obfuscation, the next section.

OPSEC & OBFUSCATION

The Urutau is designed for a global audience, and some of its builders will actively defy the laws in their jurisdictions. Manufacturing a firearm illegally is an inherently risky activity, and the purpose of this section is twofold. It intends to help you minimize the risk of coming under scrutiny and to help you control damage if an investigation against you occurs. The contents of this section consider both inward-facing and outward-facing evidence as well as managing interpersonal relationships and communication, or lack thereof, with authorities of the state.

Some of the information in this section may seem onerous to comply with. Whether or not you do depends on the potential penalties and your risk tolerance. The applicability of this information depends upon your jurisdiction's rules of evidence, right to remain silent, right to protection from unwarranted searches, and right to legal representation, which vary around the world.

No matter the difficulty or applicability, the purpose of this section is to help you avoid death before you have the chance to live free.

Special thanks to the West Midlands Police and the BBC's show "Forensics: The Real CSI" for inspiring or confirming the contents of this document! Watch Season 4, Episode 3 if you are curious.

This section is written to honor David Biddell-Portman, an English man who did absolutely nothing wrong!

RULE #1:

KEEP QUIET

"People can tame all kinds of animals, birds, reptiles, and fish, but no one can tame the tongue. It is restless and evil, full of deadly poison." (James 3:7-8)

The easiest way for the authorities to catch you manufacturing and/or possessing an illegal firearm is to tell other people about it. Even if you are talking with your best friend, let us caution you that the momentary dopamine rush you feel from telling them your secret is not worth the endless anxiety you will feel knowing that they are now a liability.

In case that is not clear, do not communicate your plan to manufacture or that you possess a firearm with *anyone*. Do not hint at it. Do not joke about it. Do not show it off. Do not brag about it on social media. Do not attempt to sell it. Absolutely do not do an interview with a journalist.

Do not commit more than one crime at a time. As silly as this may sound, the point is that manufacturing and/or possessing a clandestine, illegal firearm is a lot less likely to draw unwanted attention if you are not simultaneously engaging in organized crime, drug crime, violent crime, or other illegal shenanigans.

Most importantly, if you are ever accosted or arrested by the authorities for any reason, whether you know you are guilty or not, most developed countries afford you the right to protection from unwarranted searches, the right to remain silent, and the right to legal counsel. Please research your country's laws to determine if and how these rights apply to you, at your home, in public, or in the courtroom. Flexing your rights may make you "look guilty," but in many countries that afford people these rights, the courts cannot use your invocation as evidence against you.

RULE #2:

MINIMIZE EVIDENCE

For the purposes of this section, we will designate evidence as physical, inward-facing computer systems, and outward-facing computer systems. Physical evidence is any tangible material which would directly or indirectly incriminate you. Inward-facing computer systems include the digital contents of your computer, 3D printer, mobile phone, or any personal device of capable of retaining information. Outward-facing computer systems include the various websites and online services you interact with. Computer systems and physical evidence are serious liabilities to you. If not properly managed, they can provide evidence that is highly telling of your behavior, both before and after an investigation begins.

PHYSICAL EVIDENCE

If you are caught red-handed, you are more than likely going to find yourself in legal trouble. However, if a firearm and ammunition is not in your immediate possession, the laws in your jurisdiction may afford you protection if you have plausible deniability that a firearm is yours. Please investigate options to cache your weapon in as remote an area as possible. Beware that canines can be trained to sniff out firearms and ammunition, so keeping it stored in your home may be unwise.

Think carefully before throwing away gun parts or any 3D printer waste in the garbage. If a part you are throwing away is recognizable, or worse, functional, you may come under serious scrutiny. However, in some jurisdictions, something as simple as discarded support structures could become part of an investigation. Fortunately, with enough heat and air, PLA burns with little smoke, though it makes a goopy mess. Still, this is the cheapest method for 3D printed part and waste disposal.

Modern forensic sciences can correlate 3D printed parts to the printer that created them by examining toolmarks in the printed layers and imprints left by the build plate. Likewise, with these methods, 3D printed parts are correlatable to each other. If any of your potentially incriminating 3D printed parts are disposed of improperly, seized, go missing, or are lost, dispose of your 3D printer's nozzle and build plate and replace them with new ones. Also, dispose of other 3D printed parts in your possession with the method already described.

The courtroom admissibility of fingerprint and DNA evidence varies by jurisdiction, but it is useful to infer your possession or creation of an object. Manage fingerprints by wearing gloves when handling firearm components, especially metal and glass ones. DNA evidence is harder to control, but it is easier to obfuscate. Rub a cloth on a surface contacted by the public, like a hand railing for example, and then rub the cloth on the inside and outside of the weapon. While this is untested, it may confuse an investigation.

In some jurisdictions, it is harder to prosecute for possession of a firearm if the authorities cannot prove that the firearm is viable. If this is the case in your jurisdiction, consider removing the firing pin, fire control group components, or other parts to render the firearm inoperable on its own, and thoroughly hide the smaller pieces elsewhere.

Do not print any documents or create any handwritten notes related to the firearm you are manufacturing. If you already have, burn the documents or soak them in a container of water and use your hands to knead them to a pulp. Most conventional paper shredders are inadequate for destroying printed information, but these other methods are cheap and very effective.

INWARD-FACING COMPUTER SYSTEMS

In some particularly tyrannical jurisdictions, like Canada, Australia, or the state of New Jersey, the law may prohibit possession of firearm-related technical information outright. Even if this is not the case, the contents of your personal devices are highly telling of your behavior, and if you cannot legally manufacture a firearm, you should treat firearm-related digital files with serious caution. For this reason, prioritize securing or avoiding use of these devices when manufacturing a firearm.

Personal cybersecurity is a continually evolving issue, and this guide is not comprehensive, nor can we guarantee that it will protect your privacy. Instead, we intend to make some general recommendations to secure your personally owned devices to a point where it *may* prevent extraction of incriminating information by a law-enforcement agency.

1. Encrypt your computer's hard drive with a free tool like Veracrypt. Features of Veracrypt include full disk encryption with pre-boot authentication and the option of a decoy OS in case you are forced to give up the password. (By "forced," we mean that you are in a situation where you do not have the right to keep it to yourself. Mandatory key disclosure laws vary between jurisdictions, even those that supposedly afford you the right to remain silent.) LUKS encryption with a system running a GNU+Linux distribution is also a viable option, though it does not include the ability to create a decoy OS. In case the contents of this computer become inaccessible or are destroyed, we recommend backing up irreplaceable, innocuous personal files and/or utilizing a secondary computer. After encrypting your computer, shut it down while it is not in use. Pre-boot authentication is useless if your computer is apprehended while it is turned on. If you cannot encrypt your entire computer, at an absolute minimum, use a free tool like Cryptomator to encrypt anything incriminating.
2. When encrypting your computer, choose a strong password. A strong password is at least 20 characters, though ideally longer. It should contain uppercase and lowercase letters, numbers, and special characters (!@#). It should not contain unmodified words identifiable in a dictionary, names, dates, or other personally identifiable information. Most importantly, do not use a password you have already used on another system or website. If a reused password is intercepted in a breech of another website, your security will be compromised.
3. If you have digital files on an unencrypted computer or storage device that you need to destroy, use a free tool like BleachBit. Features of BleachBit include secure deletion of files and comprehensive overwriting of empty file storage space. This is important if you already tried to delete files without BleachBit, as recoverable copies may continue to exist on your hard drive. BleachBit is especially important to securely remove GCODE files from the SD card you use with your 3D printer.
4. Use a distribution of the GNU+Linux operating system like Debian or Fedora, for example. While many would argue over which distribution is "the best," we

recommend either of these two for their general respect of user privacy, aversion to proprietary software, and their ease of use. Use of these operating systems will minimize the risk of intentional backdoors related to proprietary software, and the operating system makes a less-lucrative target due to its relative obscurity. You are welcome to use any other GNU+Linux distribution, but be aware that it may contain undesired, proprietary software or other vulnerabilities. Most GNU+Linux distributions are compatible with slicers like Cura, Slic3r, and Bambu Studio, but you may need to utilize a Windows virtual machine if you want to run a proprietary CAD program.

5. Do not depend on any “cloud” file storage services, like Dropbox, Google Drive, Apple iCloud, or Microsoft OneDrive, for example. There is no such thing as “the cloud.” It is only someone else’s computer. The degree to which these services will respect your privacy in general is always in question, but these services absolutely will not protect your privacy if they are issued a subpoena from a law-enforcement agency. If you absolutely cannot avoid using one of these file storage services, use a tool like Cryptomator to encrypt your files before uploading them.

6. Isolate your computer from the internet. Do not open any firearm-related files or programs until it is offline. Obviously, you need internet access to download the files to make your firearm, but once you have all data and software downloaded to your system, keep it off the internet. If you need to download more files, using another computer, save them to an external drive, copy them to your isolated computer, and then use BleachBit to clean the external drive. You never know what might be running on your computer that could give you away, but isolating your computer from the internet is the most effective way to keep it from leaking information.

7. Do not involve your personal mobile phone. Those proprietary pieces of junk usually have backdoors left open for law enforcement use. Do not use it or take it with you in the pursuit of any firearm-related activities. If you are making a firearm for exclusively personal use, you should not need it anyway. If you will not follow this rule, buying a phone which you can install GrapheneOS to. As of writing, there is no evidence that up-to-date versions of GrapheneOS are compromisable by any organization specializing in mobile device data extraction. GrapheneOS also includes many security-oriented features. For example, in case you are under duress, you can set a secondary PIN or password which, when entered, wipes your device clean. Check out the GrapheneOS website for more information.

OUTWARD-FACING COMPUTER SYSTEMS

If you are in a legally precarious situation, please avoid using any public chatroom related to privately manufactured firearms. Considering Rule #1 implications, everything one writes on these platforms are likely monitored and logged in many different locations. We have no information on the backend security of these platforms, so please treat them with serious caution. However, we understand that this document cannot foresee every question or issue you may experience with the Urutau. We also understand and appreciate that you may want to innovate on the Urutau and share your creations with others.

If you have a question, issue, or innovation you would like to share with Zé Carioca and/or RSmith28, you can email them directly with the addresses included in the Preface section. When contacting us, please use our included PGP keys to encrypt your message, and include your public key in the first email you send us. **Unencrypted emails will be ignored**. If you are smart enough to make an Urutau, we trust that you can figure out how to utilize PGP encryption with a program like Kleopatra, a program for creating, managing, and utilizing PGP keys. Please read the PDF in the PGP Keys & Contact Info directory before attempting to contact us.

To contact us, we recommend accessing ProtonMail over Tor. Proton has given law enforcement user IP address in the past, but accessing their service exclusively over Tor should alleviate this concern. To access Tor, we recommend using TailsOS. TailsOS is a GNU+Linux distribution which is designed to connect you to The Onion Router (Tor) network with little other functionality, and it is generally the most secure way to access Tor. It runs off a USB drive, and it does not require that you overwrite the contents of your computer or configure dual-booting. TailsOS also includes a copy of Kleopatra preinstalled. If you want to access The Gatalog chatroom, knowing the risks involved, it is accessible over Tor & TailsOS as well. Do not share any personal details that the authorities can use to correlate your identity, and use extreme caution to strip metadata from any files that you share.

Articles of evidence from online actions, like online purchases for example, are unavoidable when manufacturing a firearm. Purchases of items like filament, nuts, and screws are unlikely to draw suspicion, but some items like ammunition components, hydraulic pipe, specialized springs, and other accessories may warrant

caution. These are purchases that, while not necessarily illegal, deniability of illegal use is less plausible. We call these "**potentially concerning purchases**." It only takes one potentially concerning purchase to trigger an investigation, but the more potentially concerning purchases one makes, the easier it is to correlate their intentions. For example, if one were to purchase thick-wall hydraulic "explosion-proof" tubing, magazine springs, an AR15 hammer spring, bullets, casings, primers, Hilti nailgun cartridges, a red-dot optic, a solvent trap, a sling, and a gun cleaning kit, can you guess what they are doing?

Before making a potentially concerning purchase, take time to exhaust all your homemade alternatives. As time goes on, what is feasible to manufacture at home will change, hopefully for the better. In cases where you must make a potentially concerning purchase, consider potential anonymous payment and shipping methods, which vary depending on where you are located. Refer to the story, John Smith Practices Good OpSec for a general example of purchasing and shipping a product without leaving a digital paper trail.

Use of a virtual private network (VPN) does not replace any of these precautions or recommendations. While VPNs have their uses, they do not magically conceal your identity on their own. For example, even with a VPN, you are still identifiable through your payment credentials, browser fingerprinting, or other accounts you are signed into. Likewise, those who peddle VPNs are often doing so for sponsorships or internet clout. They often don't fully understand the product or if the company is even interested in protecting you. If you blindly trust a VPN, you will end up caught.

RULE #3:

OBFUSCATE YOUR BEHAVIOR

When manufacturing a firearm, other people will observe your general behavior. The risks of other people and authorities becoming suspicious of you are manageable through obfuscation. Obfuscation is the act of obscuring your behavior. It includes acts which increase your plausible deniability that you are manufacturing a firearm, and it makes the subject less likely for other people to consider.

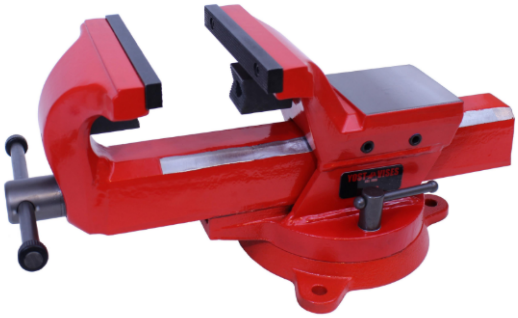
Some activities which may help obfuscate your behavior include:

- Find some DIY projects to do. Make home furniture. Make art. Make Christmas ornaments. Make windchimes. Build a table. Build a shed. It doesn't matter what it is. Just make some innocuous objects. Come up with a good cover story and stick to it.
- If it is allowed in your jurisdiction, participate in Airsoft or paintball sports. This activity will enable you to practice your marksmanship and combat skills. Also, it may help you justify purchases for firearm accessories, like optics and slings.
- If possible, pursue lawful firearm ownership. This may enable you to purchase ammunition, primers, and propellants, depending on how your jurisdiction regulates them. If this pursuit may result in unwarranted inspections of your domicile or bring you under significant scrutiny, please plan accordingly or disregard this idea.
- Don’t be a loner. Clean yourself up and go out. Attend a church, temple, mosque, or synagogue. Go to the gym. Go to the park. Go to the pub. Join in on athletic events. Volunteer in your community. It does not matter what you do, as long as it is healthy and legal. While doing what you decide to do, try to make some real friends. We know that it is emotionally challenging to have an interest in firearms that you cannot share with anyone, but you can find other channels of personal connection through genuine friendships and service to others. Loners live miserable lives. *You deserve better.*

MACHINES & TOOLS

3D Printer & A Thorough Understanding of How to Use It

Use of a 3D printer takes time and mastery. Please make sure your printer is well calibrated and that you understand how to effectively use it. If you need help choosing one, we recommend either a Creality Ender 3 or any Bambu CoreXY printer. If you choose a Bambu printer, for privacy, keep it off the internet.



Bench Vise Mounted to a Sturdy Surface

You will find this important to complete many of the instructions in this document.

Handheld Drill

You will need this when preparing your bolt carrier assembly if you do not have access to a drill press. You will also need this when preparing your hammer if you do not have access to a lathe.

Chop Saw, Miter Saw, or Other Tool(s) for Cutting and Squaring Steel

Chop saws and miter saws are ideal because they make square cuts a lot easier. However, they are an investment, and other, more tedious methods, like cutting with a hacksaw and squaring with a flat file, will work. If you use a chop saw or miter saw, make sure you use an appropriate cutting disc for steel.

Optional, but Strongly Recommended – Dremel Tool with Sanding Drums and Steel Cutting Discs

While you can achieve everything this would do with cheaper tools, it does make the heavy lifting on some processes more efficient. Avoid knockoff brands that make tools like these, as they are usually junk.

Optional – Drill Press

A handheld drill will work, but you may prefer to use a drill press when preparing the bolt core bars. It does not need to be big, and a benchtop drill press will work. If the arbor is bent on your drill press, do not use it. (The drill bit will “wobble” if the arbor is bent.)

Caliper

You will find this useful this to take measurements and verify the dimensions of objects. Quality ones are expensive, but a worthwhile investment.

Soldering Iron

You will need this to apply brass heatset inserts to 3D printed, plastic parts. Be careful when working with this tool, as the metal end gets dangerously hot. Do not contact it with your skin, and keep it away from flammable materials.

Needle Nose Pliers

You will need this to prepare your hammer and cut spring steel wire. You will also find this helpful for support structure removal. Get a quality pair, as cheaper ones are usually made from monkey metal.

Hacksaw

You will need this to prepare your bolt and other metal parts. As you will be cutting through steel, we recommend having extra sawblades on hand.

Hex Key Set

You will use these for tightening the Urutau‘s screws, though we recommend using a more dedicated tool for tightening the M3 screws. (There are a lot of them, so using a simple hex key can be tedious.)

Flat File Suited for Processing Steel

You will need this to process a few small, metal objects.

Drill Bits of the Following Diameters: 2.1mm, 3.5mm, 5mm, 6mm, and 10mm

All of these drill bits will drill through steel at some point in the process, so we recommend HSS-Co M35 or M42 bits. You may find a drill bit variety set more economical.

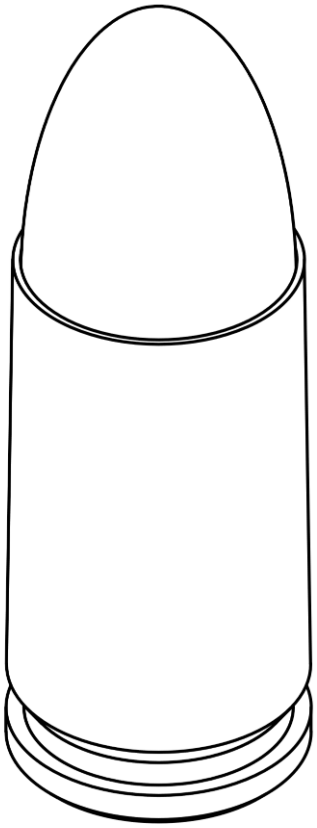
2.5mm Hex Screwdriver Tool

You can substitute this with a simple hex key or something more complicated, but will use it to tighten all the DIN 912 M3 screws that the Urutau requires. There are a lot of low quality tools out there, so choose wisely.

M6 Tap with a 1.0mm Pitch & Tap Driver

You will use these to process your bolt core bars. Avoid low quality tools.

AMMUNITION



Before manufacturing the Urutau, it is critical that you ensure you are able to make or purchase ammunition! Without ammunition, at best, you creating an Urutau is a waste of time, money, and effort. At worst, it is a major liability with no apparent benefit.

By design, the Urutau is intended to chamber 9X19mm Luger/Parabellum cartridges. There have not been any attempts at utilizing another cartridge yet, and be forewarned that any attempt you make at doing so is highly experimental.

FOR AMERICANS

In most American states, the sale of ammunition is generally unrestricted. If, for any reason, you are unable, unwilling, or too autistic to purchase ammunition at a retail location, online vendors generally do not require a signature or have the mailman check your identification. Websites like ammoseek.com are great aggregates for finding the best prices, but on ammoseek.com specifically, don't order from any vendors with a shipping score lower than seven.

If you live in a state, territory, or district that controls the sale of ammunition, the components necessary to load your own cartridges are generally unrestricted. This includes casings, primers, propellants, and bullets. A cursory internet search of "reloading 9mm" will provide you with a variety of tutorials on assembling the cartridges yourself.

FOR NON-AMERICANS

To begin, please be aware that all ammunition components, casings, bullets, primers, and propellant are potentially concerning purchases. Please find a way to acquire these without giving away who you are.

The Hilti loophole is still open in the European Union, and it may be applicable to other parts of the world. For more information, download ButWhatAbout: Ammo Volume 1 by IvanTheTroll from The Gatalog.

For those looking to cast lead bullets and electroplate them with copper, download ButWhatAbout: Ammo Volume 2 by Cathode from The Gatalog.

For those looking to concoct their own primers or those who cannot derive priming compounds from the Hilti loophole, download Homemade Primer Course by Dr. W. Marshall Thompson from Aardvark Reloading.

(The website, https://aardvarkreloading.com is accessible via Tor.)

For those looking to concoct their own propellant (powder) or cannot derive propellant from the Hilti loophole, Gatalog affiliates Albert9x19 and Optimus Synthesis are both creating separate guides. As of writing, neither of them are in beta yet. If you want more information, please contact them.

If you are in a country where you cannot find brass casings, vendors in other countries *may* be willing to export them to you. Please note that Americans cannot export ammunition or ammunition components under most circumstances.

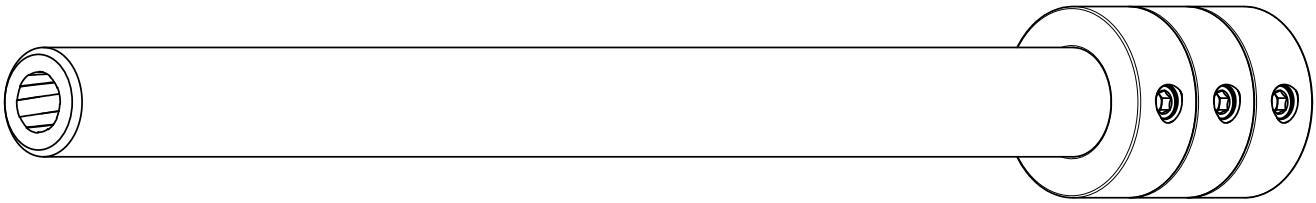
The feasibility of all the above recommendations will change as regulators catch up. But, if innovation continues to outpace regulation, we will have the upper hand. Keep an eye on The Gatalog and other GunCAD publishers for new innovations as the status quo shifts.

BARREL

Manufacturing a quality barrel is the most challenging part of manufacturing an Urutau, and **we recommend making sure you have one before making or printing any other Urutau components**. Similar to ammunition, an Urutau with no barrel is useless, and it will only be a liability to you if you cannot legally own a firearm.

The barrel of a firearm is a tube which casts a bullet in the direction it is pointed. The outside may just look simple, but the inside, ideally, has a helical pattern of grooves to impart spin onto the bullet. The reason for this is to stabilize it in flight.

To retain the barrel in the gun, we recommend using three DIN 705 shaft collars with appropriately-sized set screws. The instructions in the “ECM Barrel” guide explain how to apply them.



For Americans, we anticipate vendors will manufacture and sell barrels of varying lengths. However, these vendors will not sell to individuals outside of the USA.

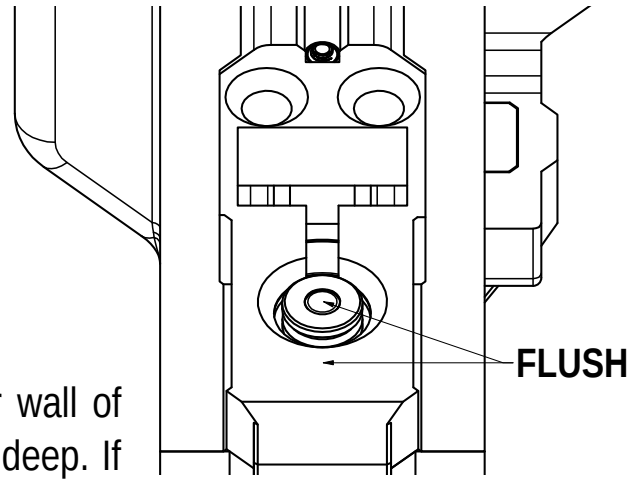
If you are able to safely acquire one, the Urutau is compatible with AR9 barrels. However, it is extremely important that if you use an AR9 barrel, **do not use a barrel with a super/enhanced/extended feed cone**. These barrels leave 5mm of the case head exposed, which is within SAAMI tolerances, but leaves absolutely no room for error when the gun goes into battery. In other words, using an AR9 barrel with a super/enhanced/extended feed cone significantly increases the risk of out-of-battery detonations. To test if your AR9 barrel is dangerous, drop a cartridge into the chamber and use a caliper to measure the exposed case head protrusion. If 5mm of the cartridge is exposed, you will need to choose a barrel that exposes less of the cartridge.

If you are not an American, or if you are, but you want the fun of making your own barrel, you have options:

1. **Create your own barrel with electrochemical machining (ECM). This is the recommended way to create your own barrel**, and all the instructions to do so are in the "ECM Barrel" directory of the Urutau's file package. When making a barrel this way, please make sure you follow all instructions carefully. The process is not hard if you can follow the instructions, but if you make a serious mistake, you will likely need to start the process over. By completing the ECM process, you will also test your ability to utilize your 3D printer, which you will need to print the rest of the Urutau components after you are finished making your barrel. **Note that as part of measuring the quality of your barrel, you will need to have at least one 9X19mm Luger/Parabellum cartridge on hand.**
2. For expediency, you can utilize a piece of hydraulic tubing, the same kind recommended in the ECM guide, but with an internal diameter of 9mm. Once it is in your possession, simply drill out the chamber with a 10mm drill bit. The barrel will be extremely inaccurate and reliability questionable, but at a minimum, it should work. For Americans, if you take this approach, be aware any firearm with an unrifled barrel is considered a shotgun, and any shotgun barrel less than 18 inches is considered a short-barreled shotgun (SBS). Like SBRs, SBSs require registration under the National Firearms Act. Note that the 18-inch requirement is 2 inches longer than the minimum for a rifle. Given the inaccuracy of such a weapon, manufacturing the Urutau as an SBS is probably not worth bothering with, but if you really want to, please review the American Legal Warning section.
3. If you have access to a quality lathe and are not concerned with potential OpSec issues, you may machine your barrel from a 9x19mm Luger barrel blank that you can purchase online. You may need to turn down its OD and chamber it with a 9x19mm Luger chamber reamer. Unless you trust the precision of your lathe, it is not recommended to replace the barrel-mounting shaft collars with uncut metal, as any inaccuracy may lead to headspacing issues. If you are in a legally precarious circumstance, be aware that a barrel blank and/or chamber reamer would be a potentially concerning purchase, and it may lead the authorities to investigate you. Treat this approach with serious caution.

HEADSPACING

Whether you are using a privately or professionally manufactured barrel, **it is critical that you verify that your barrel is headspaced properly**. Headspacing refers to the distance between the head of a fully chambered cartridge and the face of your bolt carrier assembly. If you do not understand what this means, don't worry. All you need to do is follow these instructions carefully. Though you are welcome to verify your headspacing at any time, we recommend doing so around step 6 of the upper assembly process if not soon after.



To verify your headspacing, insert a cartridge into your chamber. The tail-end of the casing, called the "case head," should feel flush with the inner wall of the upper receiver, as depicted.

If the case head sits deeper than the inner wall of the upper receiver, your headspacing is too deep. If the case head "sticks out" or protrudes above the inner wall of the upper receiver, your headspacing is too shallow. In either case, this will jeopardize the reliability of your Urutau and increase its risk of malfunctions, including out-of-battery detonations. Shallow headspacing may also lead to case head separations, which will jam your Urutau and are very tedious to clear. SAAMI specifications allow for shallow headspacing up to 0.5mm, but please try to get it as close as you can.

If your barrel comes with adjustable shaft collars, follow the headspacing section in the ECM documentation.

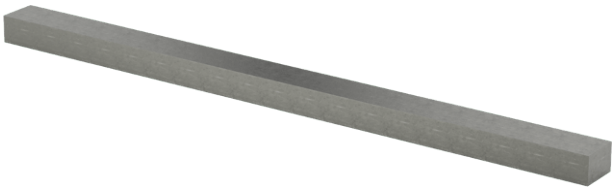
To work around a third-party barrel that does not have adjustable shaft collars and does not headspace properly, your safest and easiest option is to use a different one and, if possible, return the inadequate barrel to the person or organization that sold it to you. You may be able to make your barrel work by modifying the Urutau's design or modifying your barrel with the proper equipment. However, this would be experimental, and we don't recommend this approach unless you know what you are doing.

MATERIALS

At Least 2kg of eSun PLA+ or Polymaker PolyLite PLA Pro

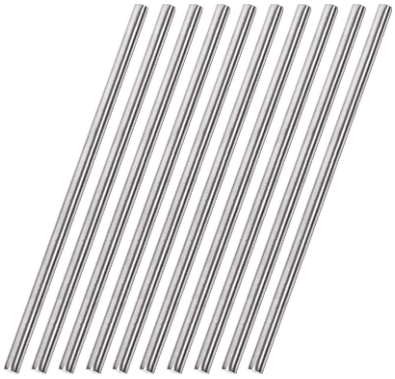
This is what we recommend printing the gun with. Attempts at using other filaments are experimental.

NOTE: For the best deal and quality, we recommend ordering eSun PLA+ from eSun's official online store. 10 packs of filament reels without a spool are the best deal, and reusable spools are cheap to print or purchase. Their website is also very generous with its coupon codes.



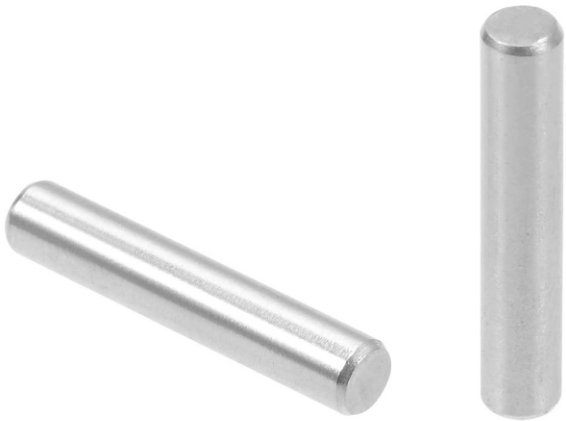
30cm or 1ft of 12mm X 20mm or ½" X ¾" Steel Bar Stock

You will make this into your bolt core bars. We recommend buying more than one in case the process takes you more than one try.



6mm Diameter, 250mm Long Stainless Steel Rods

Two of these rods will become your bolt guide rods.



3mm Diameter, 16mm Long Steel or Stainless Steel Pins

You will use a pin to add strength to your hammer. If you have 3mm steel round stock on hand, you can cut these from it. As we recommend replacing hammers relatively frequently, we recommend keeping many of these on hand.

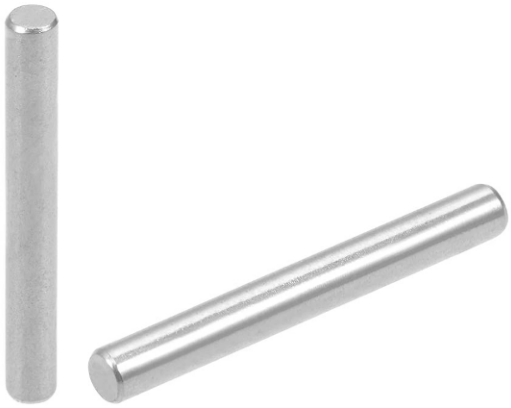
AR-15 Hammer Spring

CAUTION: THIS IS A POTENTIALLY CONCERNING PURCHASE. If you are unable to legally manufacture a firearm, your billing and shipping information could lead the authorities to investigate you. Please follow the instructions to make your own hammer springs if you cannot buy this without taking a serious risk.

If you can acquire one, this will become your hammer spring.

8mm Diameter, 100mm Long Steel or Stainless Steel Rod

If you cannot acquire an AR-15 hammer spring, this will become your winding mandrel for your DIY hammer springs.



3mm Diameter, 20mm to 26.2mm Long Steel or Stainless Steel Pins

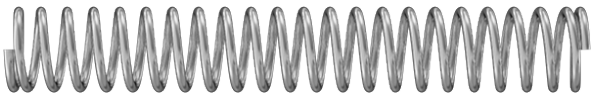
If you cannot acquire an AR-15 hammer spring, you will use these as part of the winding jig for your DIY hammer springs. (25mm ones work great!) If you have 3mm steel round stock on hand, you can cut these from it.

1.2mm / 0.045” or 0.047” Spring Steel Wire

If you cannot acquire an AR-15 hammer spring, this is the wire you will use to wind your own hammer springs.

Compression Springs – 8mm Outer Diameter, 65Mn Steel, At Least 220mm Long Uncompressed, of the Following Wire Diameters: 1mm and 0.8mm

You will use these springs for the recoil system and other parts of the gun. In case it is not clear, you will need two types of springs with the same specifications except for the wire diameter, one type 1mm and the other 0.8mm.



Compression Spring – 4.5mm Outer Diameter, 0.5mm Wire Diameter OR a Spring from a Retractable Pen

These springs are cheap and easy to cannibalize from retractable pens. This will become your firing pin spring when cut down to 15mm long, uncompressed.

M3 Brass Heatset Inserts

These will help you secure M3 screws to the Urutau. 5.7mm x 4.6mm inserts were the ones we tested with. These inserts are very useful in more than just the Urutau, so we recommend keeping many on hand.

When installing these inserts to plastic parts, make sure your soldering iron is hot enough! If your inserts are undersized, they *may* still work, but please proceed with serious caution. You may need to modify the Urutau's design to properly fit inserts with a smaller diameter.

DIN 912, M3 Screws of the Following Lengths: 10mm, 16mm, 20mm, 40mm

You will primarily use these to hold your gun together. When this document refers to M3X#mm screws, you can assume they are DIN 912. These screws are very useful in more than just the Urutau, so we recommend keeping many on hand.

A DIN 912, M6 Screw, 20mm Long

You will use this screw to secure the steel bolt core bars to the printed bolt carrier housing. Make sure the screw has a pitch of 1.0mm, which is typical for M6 threads.

A DIN 912, M6 Screw, 12mm Long

You will use this screw to attach the steel core bars of your bolt carrier assembly together. Make sure the screw has a pitch of 1.0mm, which is typical for M6 threads. Optionally, you may choose to make this by cutting down and deburring a 20mm long screw.

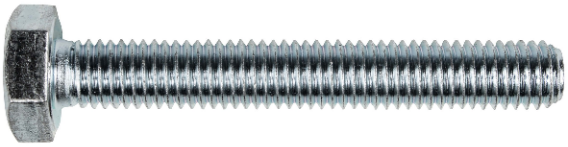
623ZZ Ball Bearings

You will use two of these on your charging handle assembly so that it does not seize up during use.

5mm Diameter, M3 Threaded Spacers of the Following Lengths: 10mm and 25mm, At Least 10 Each

You will use these primarily to assemble the fire control group.

While these have many plausible, legal uses, we are concerned that the only place to purchase these is AliExpress. If these ever become unavailable, or if you really want to cover your tracks, look in the alternative files section for a solution which replaces these with brass heatset inserts and 5mm diameter, 40mm long steel pins.



DIN 933, M5 Screws with a Length Greater Than or Equal to 11.6mm

You will use these to reinforce your hammer in the area where it contacts the tail-end of your firing pin. As we recommend replacing hammers relatively frequently, we recommend keeping many of these on hand.

JB-Weld

You will use this to bond metal parts to other metal or plastic parts.

Superglue (Cyanoacrylate)

You will use this to link the two safety bars together.

Oil for Drilling Steel

You will use this to keep your drill bits cool and prevent seizing when drilling steel parts.

Threadlocking Compound

You will use this to secure your bolt core bars to the printed bolt carrier housing. This is also helpful to troubleshoot issues involving walking screws.

DIN 705, 3mm ID, 7mm OD, 5mm Long Shaft Collar

You will use this to make your firing pin.

1.5mm RC Hex Driver Shaft

You will use this to make your firing pin.

While these have many plausible, legal uses, we are concerned that the gun's design is dependent on the particular shape of this item. Likewise, purchasing this item may leave you vulnerable to correlation attacks. If these ever become unavailable, or if you really want to cover your tracks, look in the alternative files section for a solution which replaces this item with an M4 screw.

Extended Glock Magazine Springs

CAUTION: THIS IS A POTENTIALLY CONCERNING PURCHASE. If you are unable to legally manufacture a firearm, your billing and shipping information could lead the authorities to investigate you. Solutions exist to wind your own, but they have not yet been tested to Gatalog standards.

You will use these to make your magazines.

Chemical(s) to Clean, Lubricate, and Prevent Rust

Ballistol is often a preferred choice due to its versatility. However, it and other firearm cleaning solutions *may* be a concerning purchase in serious conditions. As an alternative, WD-40 Corrosion Inhibitor is useful on your barrel and exposed metal parts of your bolt, and synthetic motor oil or graphite powder is useful as a lubricant for moving parts.

Optional – M3 T-Nuts

If you would like to use the M-LOK sling mount or other M-LOK accessories, you will need these to mount them to the barrel cover.

Optional – Firearm Sling

CAUTION: THIS IS A POTENTIALLY CONCERNING PURCHASE. If you are unable to legally manufacture a firearm, your billing and shipping information could lead the authorities to investigate you. As an alternative, you can substitute this with just about any “suitcase strap” for sale.

If you would like to carry your firearm, this will help you keep your hands free.

3D PRINTED PARTS

The purpose of this section is to provide generic guidance on the best way to print all of the Urutau's plastic pieces. Anything we do not specify is up to your best judgment. You know your 3D printer better than we do, so unless you are new to 3D printing, your intuition takes precedence.

Nozzle Temperature: 215-220°C

Bed Temperature: 60°C (35°C for Bambu Printers with a Cold Plate)

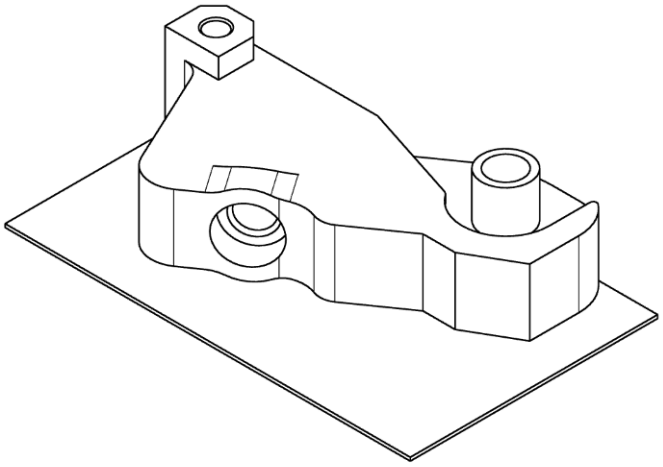
Layer Height: 0.16mm

Infill: 100% Rectilinear

Bambu Printers: Maximum Volumetric Speed should be less than or equal to 6mm³/s

Orientation: As depicted in the photograph

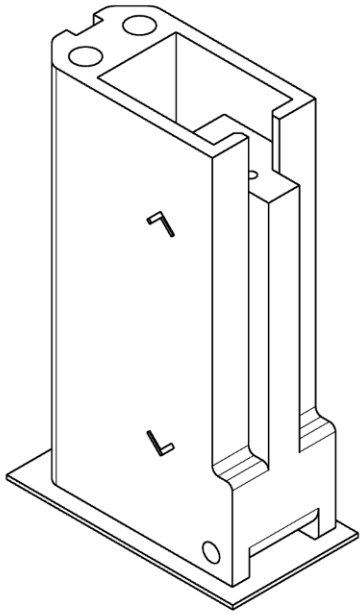
Brim, & Supports: As specified in the description for each part



Hammer

Use supports on the build plate only. This may cause some plastic to sag in the screw cavity, but this is expected.

We listed this piece first, as the hammer requires JB-Weld to finish.

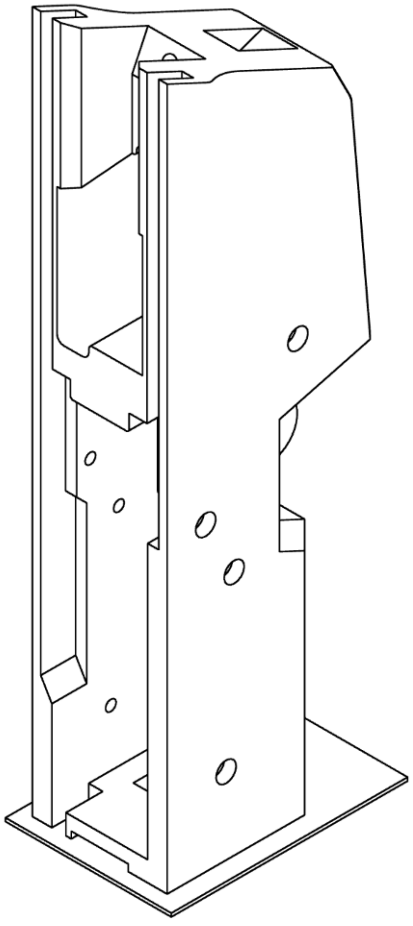


Bolt Carrier Housing

Use supports on the build plate only. Support cleanup will be a little tricky on this one. Use of a brim is recommended.

Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.

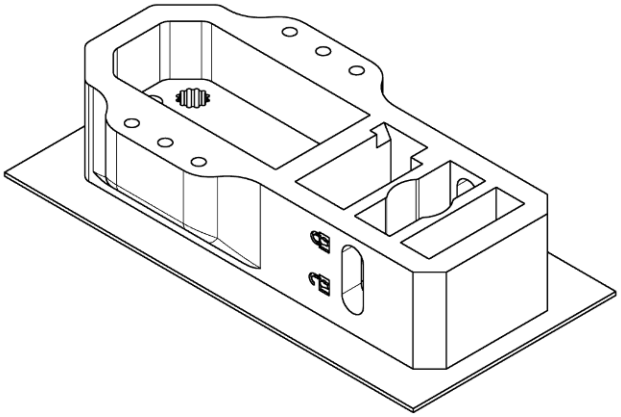
If you are using a Bambu printer, we recommend limiting the Maximum Volumetric Speed to 3mm³/s for this part.



Lower Receiver

If you are able to do support painting, apply supports only to the downward-facing, planar surfaces. If not, simply use supports everywhere. Use of a brim is recommended.

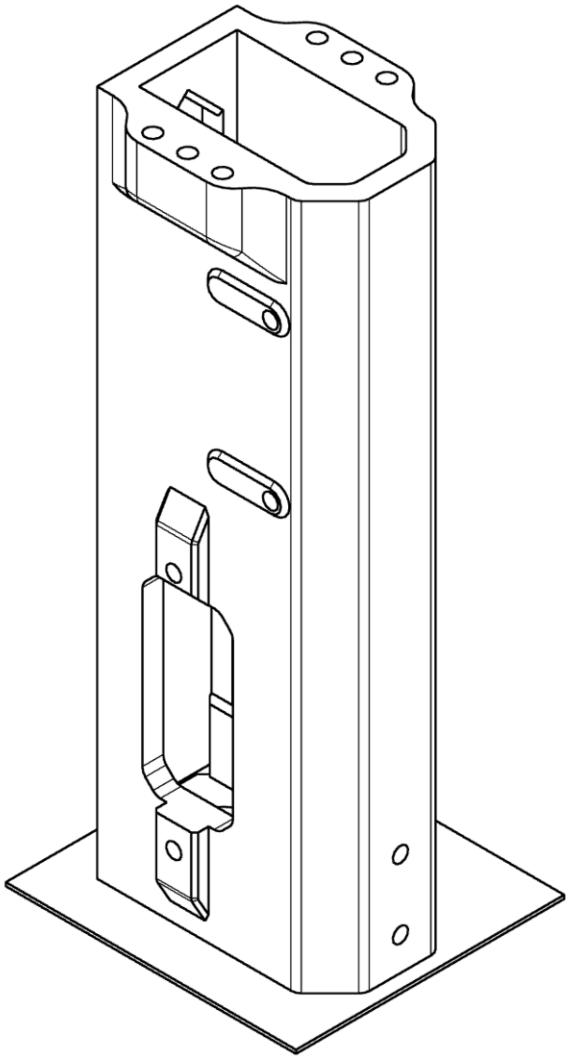
You are welcome to try lying this down so that the sling loop is pointing upward, but that orientation is vulnerable to warping.



Rear Cap

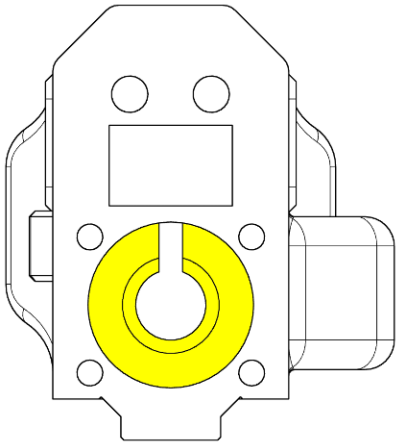
No need for supports. Printing with a brim is recommended to prevent warping.

If you are an American trying to avoid manufacturing a short-barreled rifle (SBR), please make sure you print the extended-length version to meet legal overall length requirements.

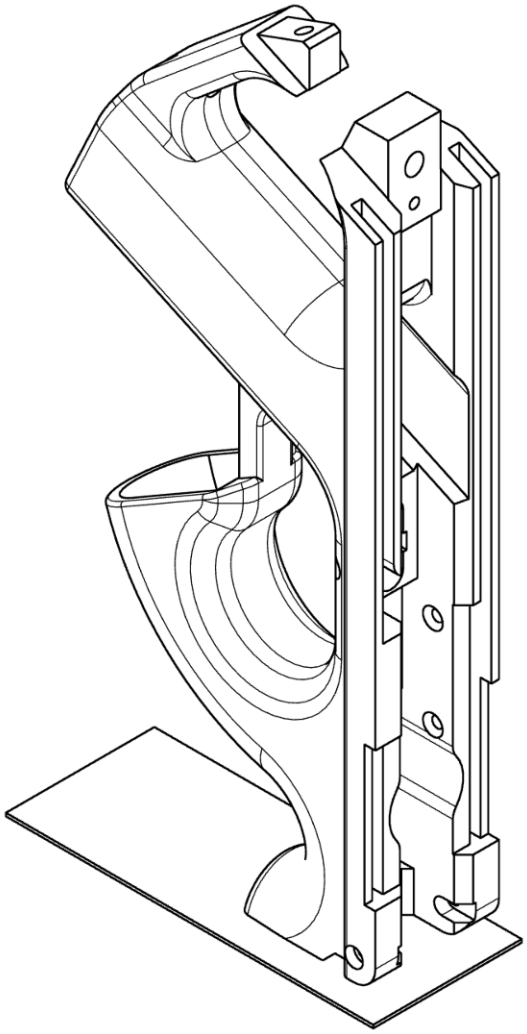


Upper Receiver

Supports are only required in the area that contacts the barrel, highlighted below.

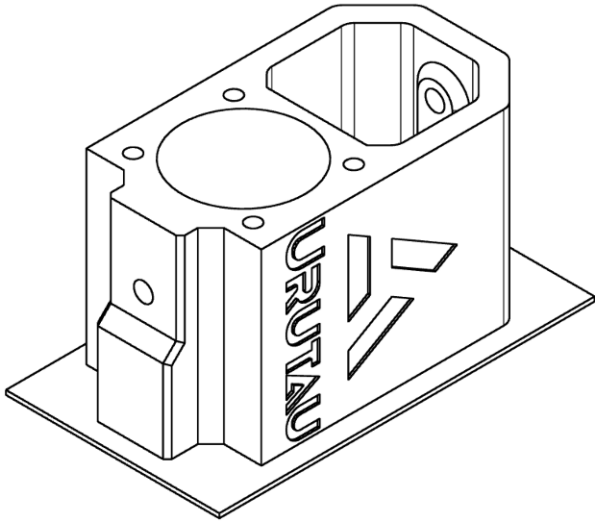


Supports in the ejection window may improve appearance, but are not required. They are not needed anywhere else. Use of a brim is recommended.



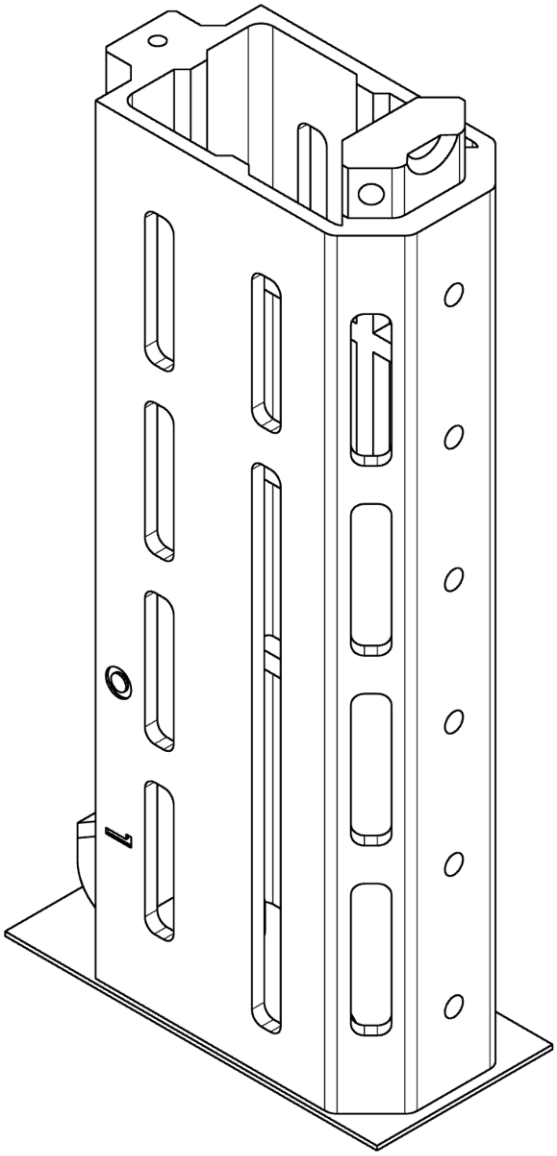
Grip

Tree supports are recommended to get the best surface finish, though normal support structures will work too. If you understand the limits and capabilities of your printer, you may use support painting to cover only the areas where need support the most. Use of a brim is recommended.



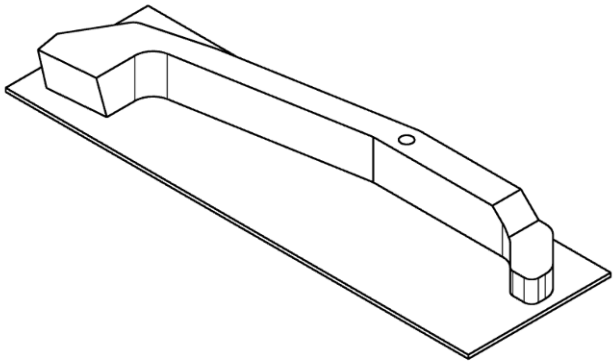
Barrel Retainer

No supports are necessary. Use of a brim is recommended.



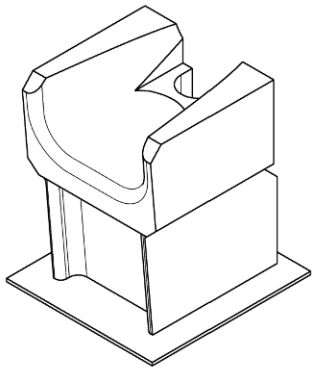
Barrel Cover

No supports are necessary. Use of a brim is recommended.



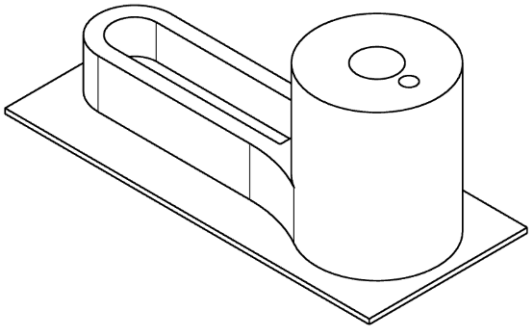
Ejector

No supports are necessary.



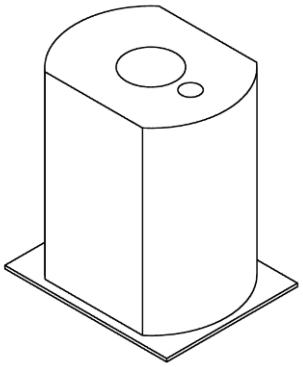
Feed Ramp

No supports are necessary.



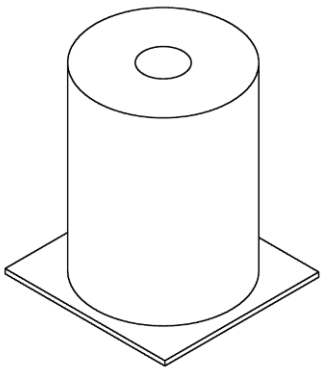
Hammer Spring Winder

Only print this part if you need to wind your own hammer springs. No supports are necessary.



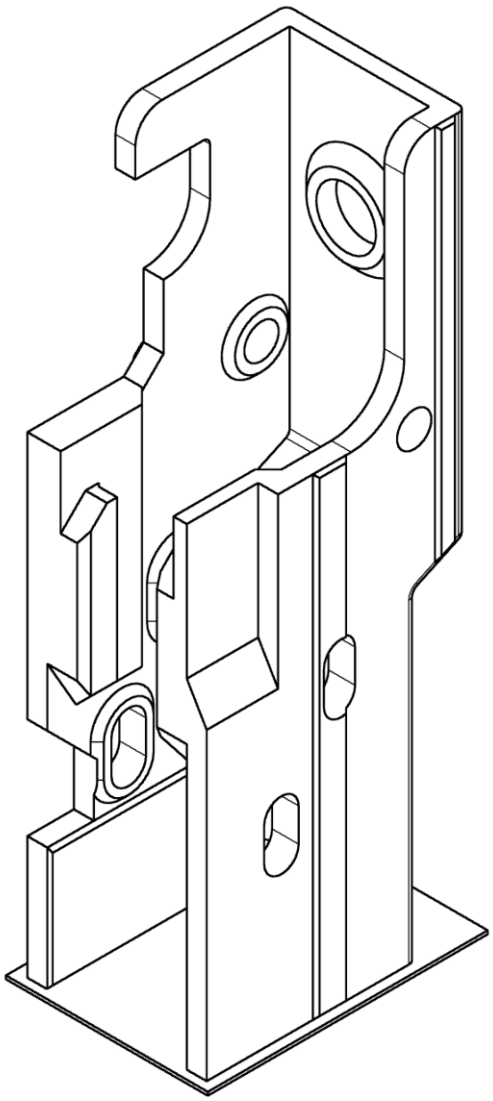
Hammer Spring Winder Vise Piece

Only print this part if you need to wind your own hammer springs. No supports are necessary.



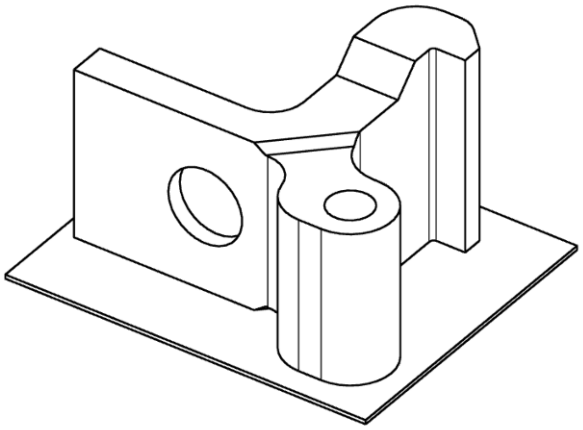
Hammer Spring Winder Knob

Only print this part if you need to wind your own hammer springs. No supports are necessary.



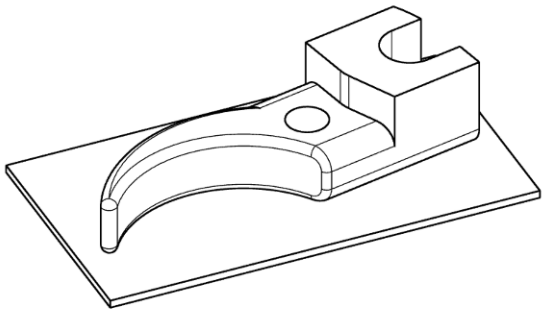
Fire Control Group Housing

Use supports everywhere applicable.



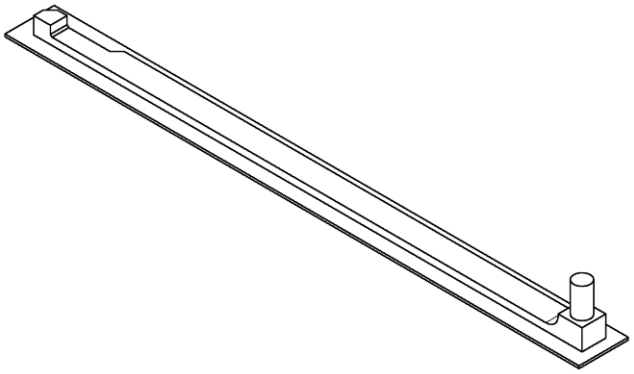
Disconnector

Use supports on build plate only.



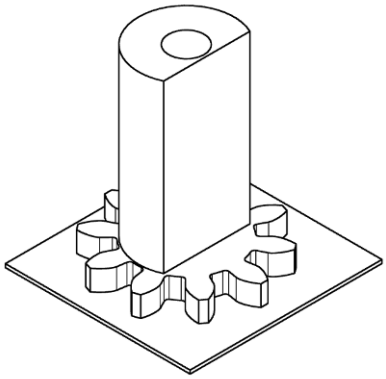
Trigger

No supports are necessary.



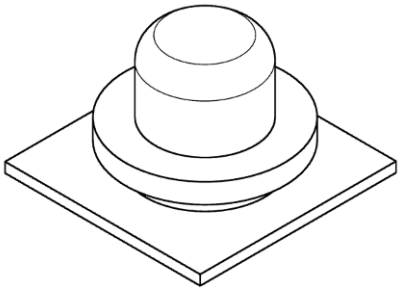
Trigger Bar

No supports are necessary. Use of a brim is potentially helpful if your prints are prone to warping.



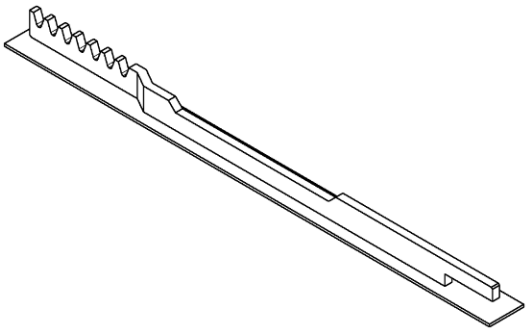
Safety Drum

No supports are necessary.



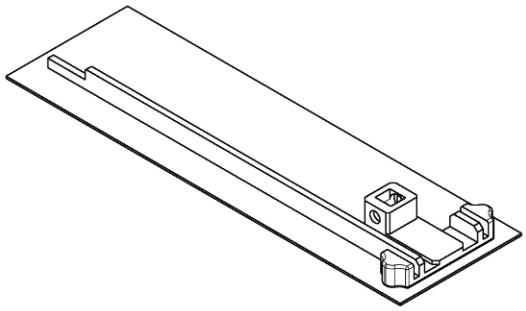
Safety Locking Peg

Print this twice. Supports may create a nicer finish, but given the small size of the cantilevered area, they may not be worth bothering with.



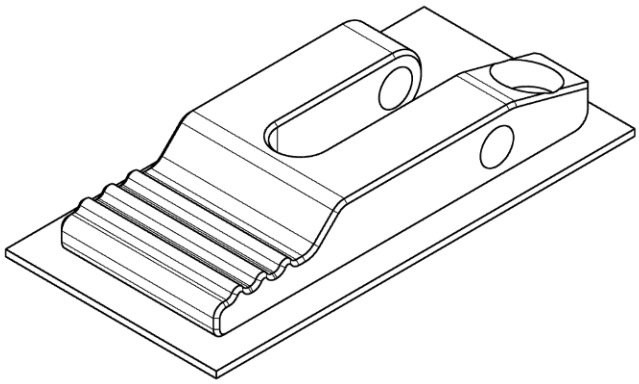
Rear Safety Bar

Use supports where applicable. They are only required in one small area. Use of a brim is potentially helpful if your prints are prone to warping.



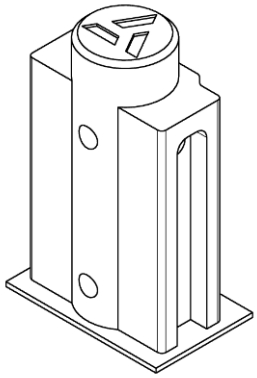
Front Safety Bar

No supports are necessary. Use of a brim is recommended.



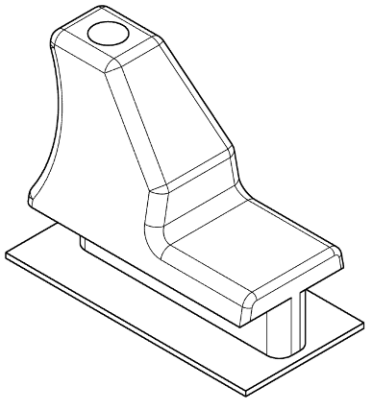
Magazine Release

No supports are necessary.



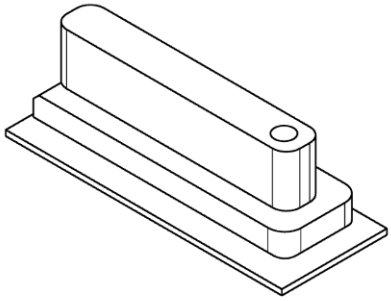
Charging Handle Adaptor

No supports are necessary. There is a little bridging on this piece, but most printers are able to handle it without supports.



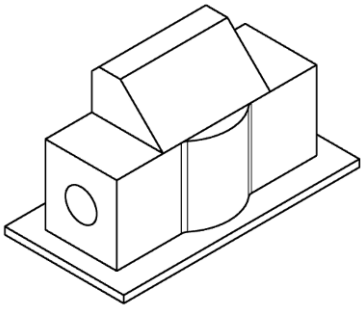
Charging Handle

Use supports on build plate only. Print this twice if you want to make an ambidextrous charging handle.



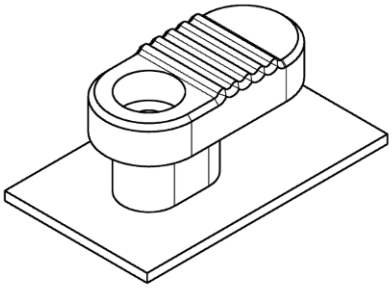
Charging Handle Cap

No supports are necessary. Do not print this if you want to make an ambidextrous charging handle.



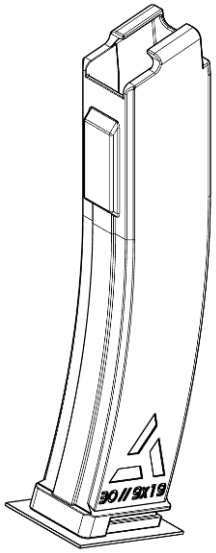
Locking Tab

No supports are necessary, unless you really care about the inside finish of the spring cavity.



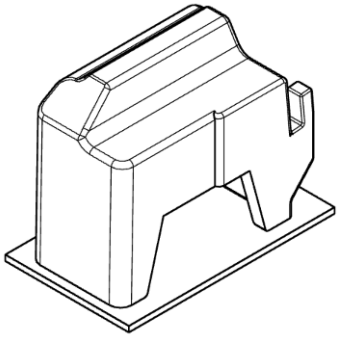
Locking Tab Knob

Use supports on build plate only. Print this twice.



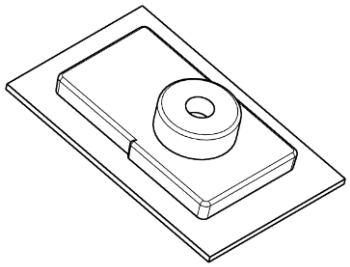
Magazine Body

No supports are necessary. Print one of these for as many magazines as you would like, though be aware of potential cumulative consequences if you are in a legally precarious circumstance.



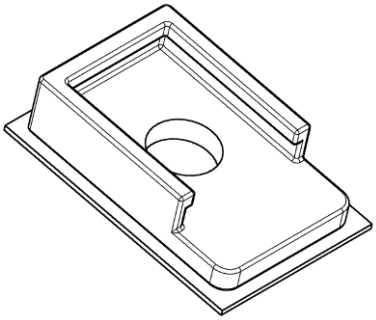
Magazine Follower

Use supports on build plate only. Print one of these for each magazine you want to make.



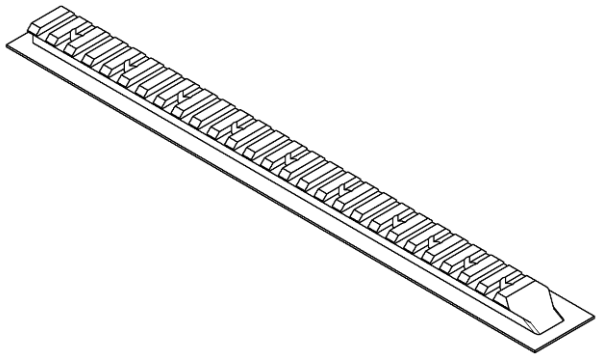
Magazine Lock Plate

No supports are necessary. Print one of these for each magazine you want to make.



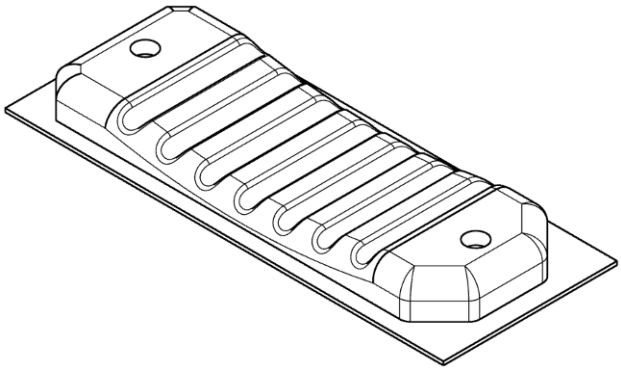
Magazine Base Plate

No supports are necessary. Print one of these for each magazine you want to make.



NATO Rail

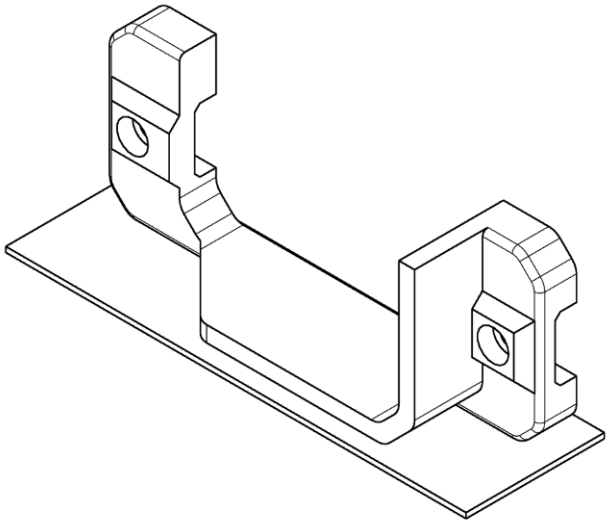
No supports are necessary. Use of a brim is recommended.



Butt Pad

No supports are necessary. If you have TPU on hand, you may use it for this part. If not, PLA works just fine. Use of a brim is recommended.

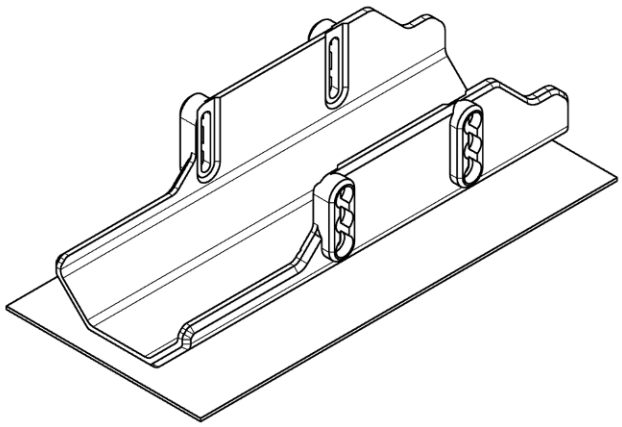
Your Urutau will function without this piece, but it will be more uncomfortable to shoulder.



Brass Deflector

Depending on your printer's bridging abilities, supports are optional.

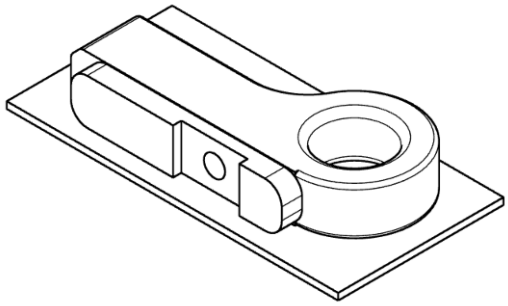
Your Urutau will function without this piece, but it is intended to keep discarded brass from hitting you in the face.



Cheek Raiser

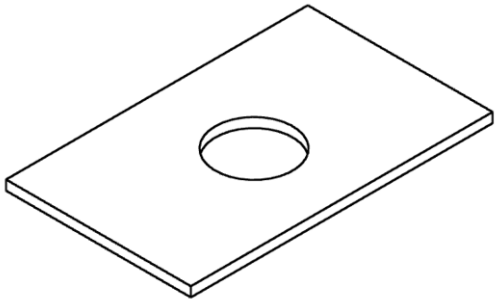
No supports are necessary, unless you want a slightly higher-quality finish.

Your Urutau will function without this piece, but it exists for your comfort.



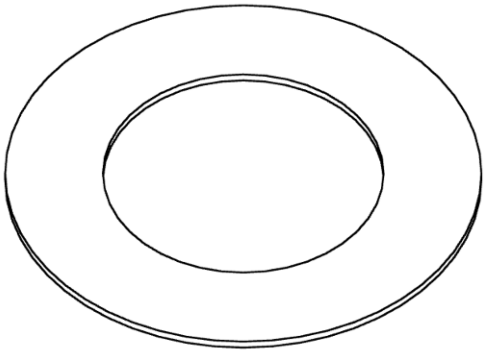
Sling Mount

No supports are necessary. Print this only if you want an external mount for a sling. Your Urutau will function without this piece.



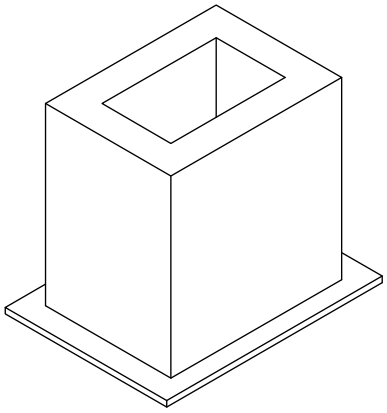
Grip – Lower Receiver Shim

You may need this if you have a higher end or well calibrated 3D printer, as the grip and lower receiver have a small gap to compensate for potential printing inaccuracies.



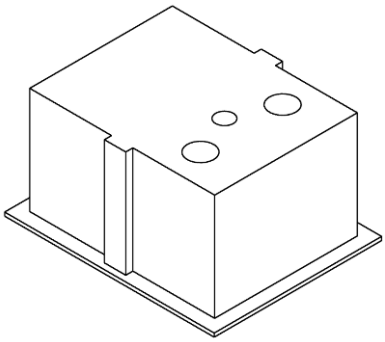
Barrel Retainer Shim

You may need this as the barrel retainer has a little extra room in case of slightly overlength shaft collars.



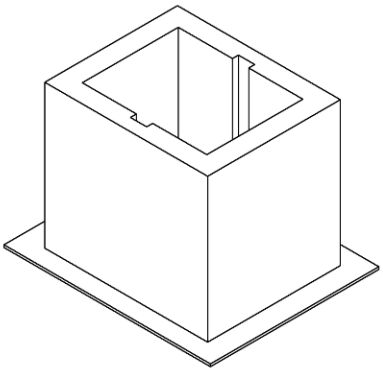
Lower Bolt Core Bar Cutting Jig

If you are using a hacksaw instead of a chop saw or miter saw, you will need this to cut your lower bolt core bar. No supports are necessary. You will want to make a new one for each set of bolt core bars you process. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.



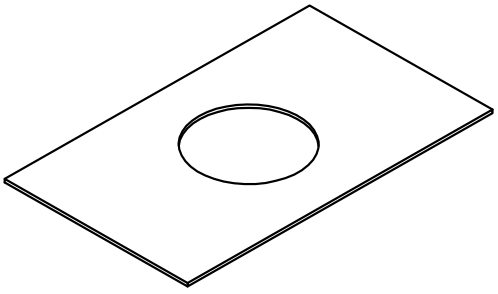
Bolt Face Drilling Jig – Channel Piece

No supports are necessary. You will want to make a new one for each bolt face you process. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.



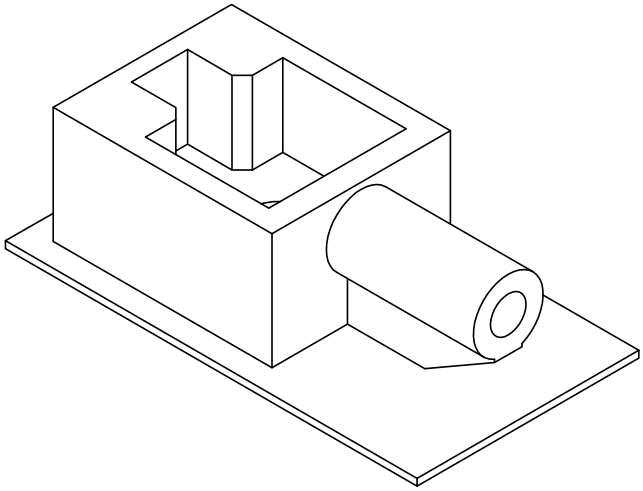
Bolt Face Drilling Jig – Retainer Piece

No supports are necessary. You will want to make a new one for each bolt face you process. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.



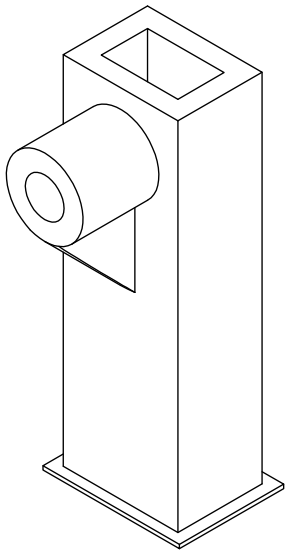
Bolt Core Bar Shim

You may need one or more of these to resolve dimensional inaccuracies with your lower bolt core bar. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.



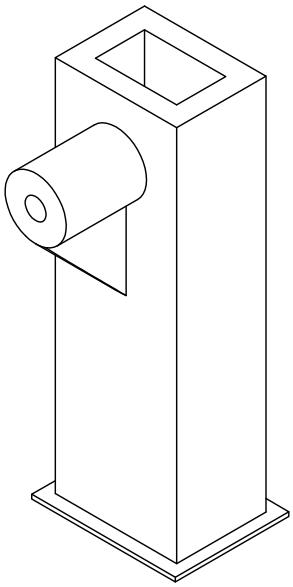
Lower Bolt Core Bar Drilling Jig

No supports are necessary. You will want to make a new one for each bolt you process. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.



M6 Bolt Head Recess Jig

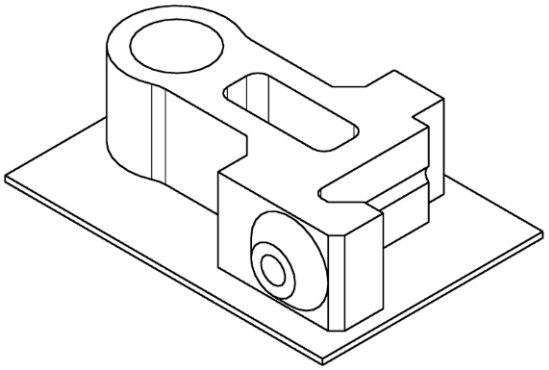
No supports are necessary. You will want to make a new one for each bolt you process. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.



M6 Bolt Drilling Jig

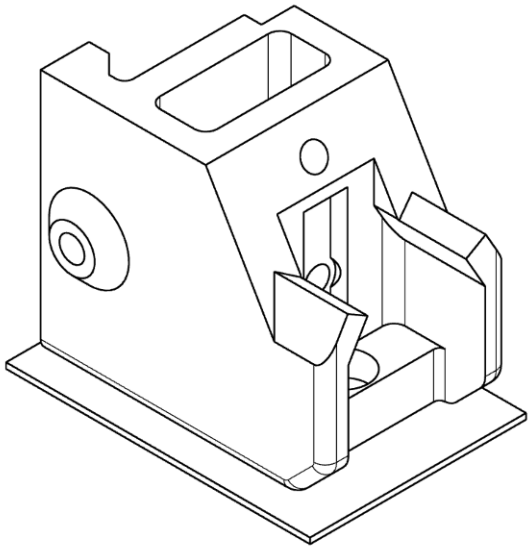
No supports are necessary. You will want to make a new one for each bolt you process. Based on whether your steel bar stock is 12mm X 20mm or ½" X ¾", print the metric or imperial version, respectively.

If you already have an optic or sight system that you would prefer to use, you can skip the rest of this section. If not, continue on.



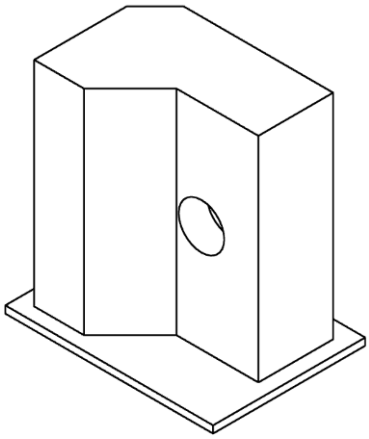
Front Sight Body

No supports are necessary.



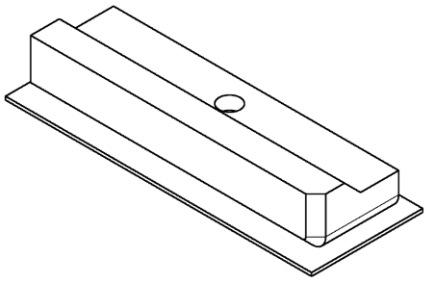
Rear Sight Body

No supports are necessary.



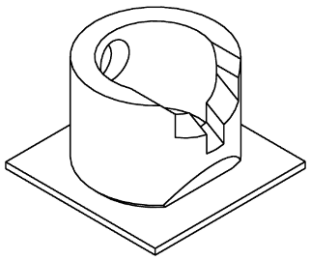
Front Sight Clamp

No supports are necessary. At your discretion, different orientations will work when printing this piece.



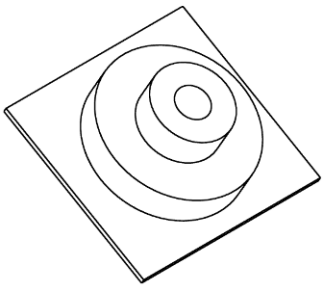
Rear Sight Clamp

No supports are necessary. At your discretion, different orientations will work when printing this piece.



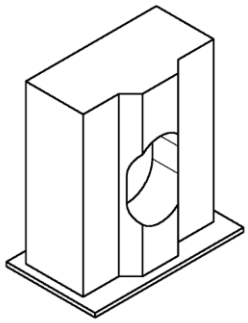
Sight Drum

No supports are necessary.



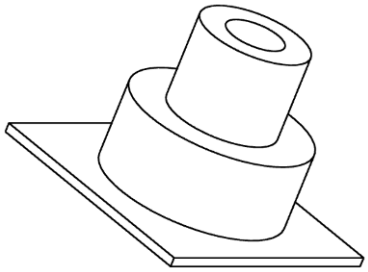
Drum Locking Piece

No supports are necessary.



Rear Sight Locking Tab

No supports are necessary.

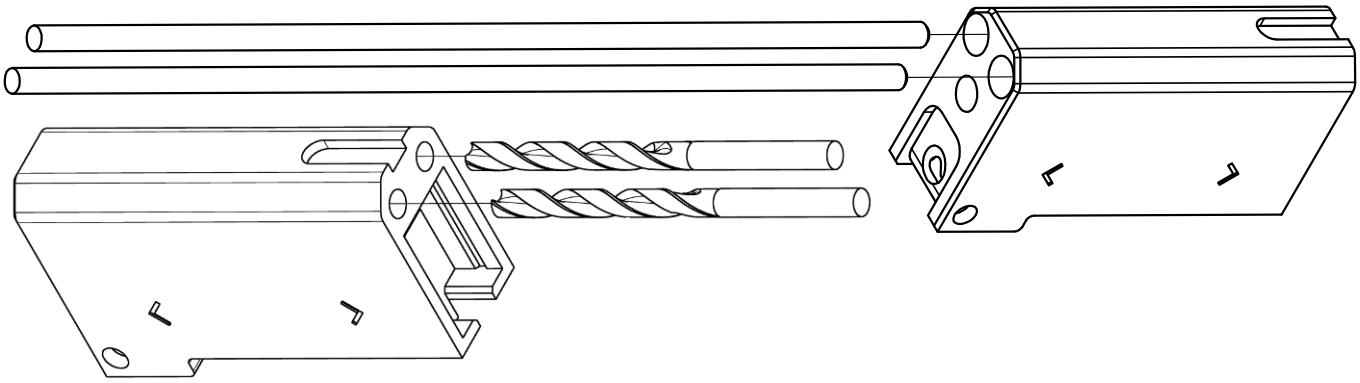


Locking Tab Locking Piece

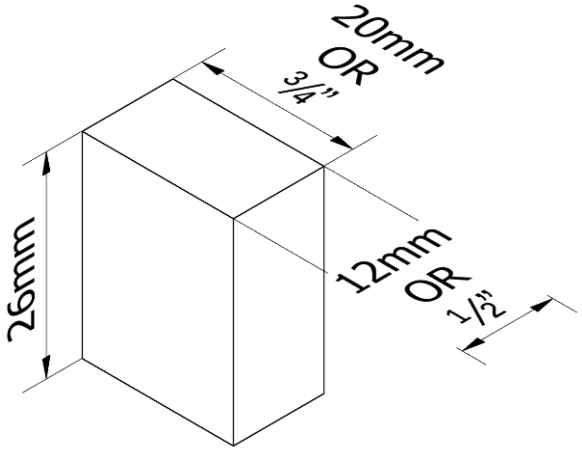
No supports are necessary.

BOLT CARRIER ASSEMBLY

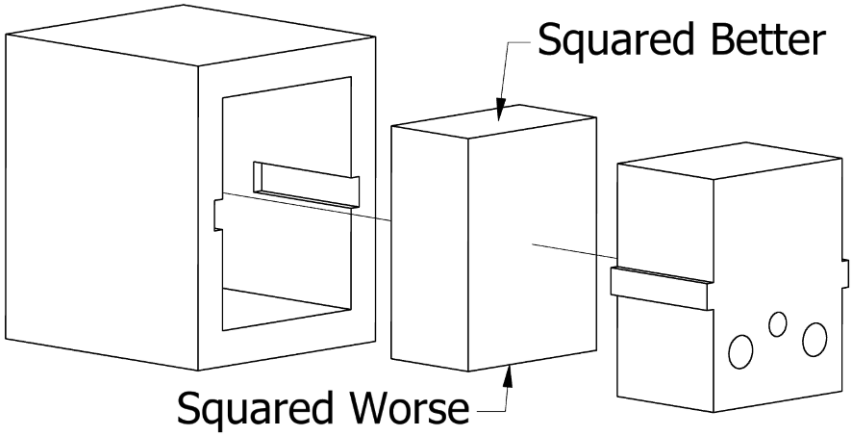
1. To begin, you should ensure that the guide rod channels on your bolt carrier housing are reamed and functioning as expected. It is possible to save this step for later, but it is more convenient to complete it now. Lubricate two separate, Ø6X250mm stainless steel rods and insert them into the guide rod channels on your bolt carrier. **They should glide in and through smoothly.** If they don't, hand-ream the channels with a 6mm drill bit or reamer and try again. Once the guide rods glide through smoothly, set them aside until it is time for the rear cap assembly.



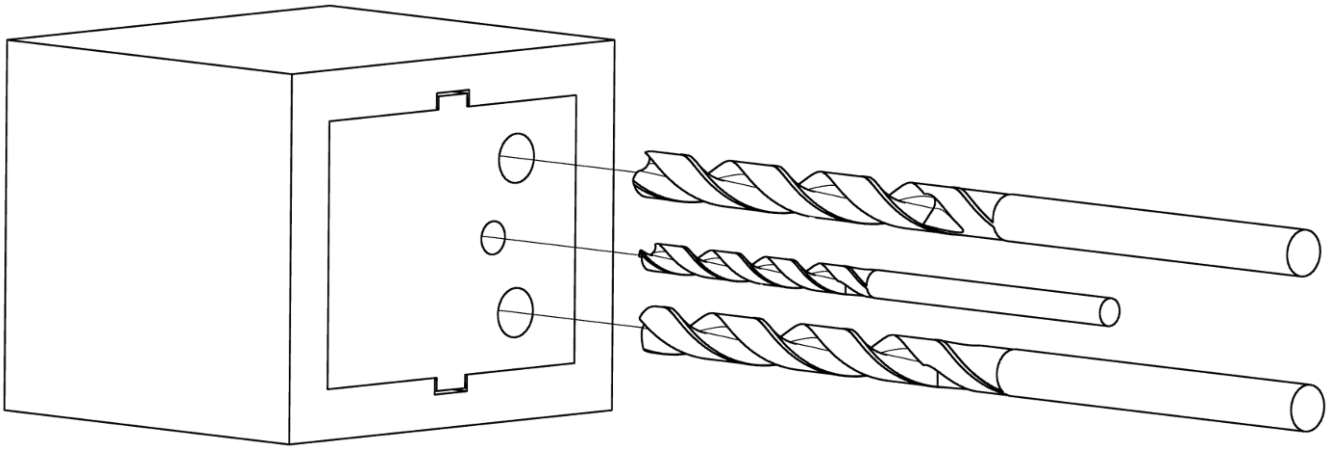
2. Cut a 26mm length of your 12mm X 20mm or ½" X ¾" steel bar stock. Yes, it will need to be 26mm long whether you are using metric or imperial steel bar. If you are using a hacksaw for this step, use the lower bolt core bar cutting jig. We don't have the time or resources to test a bunch of out-of-spec bolt pieces to tell you what will and won't work, but please make the cut as square as you can and length as precise as you can. This steel piece will become your lower bolt core bar.



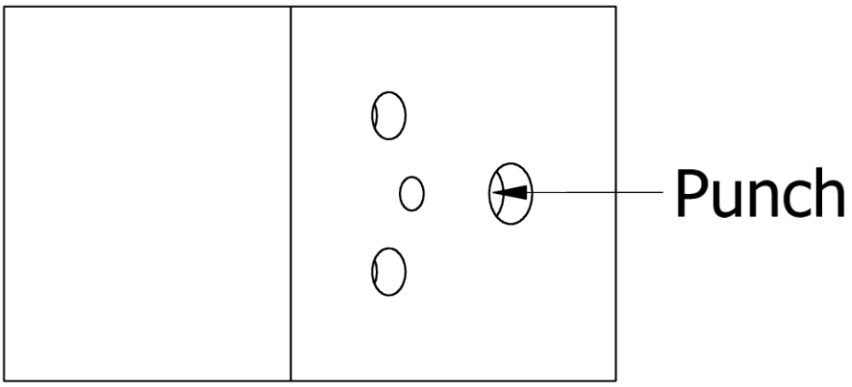
3. If one end of the steel bar you cut is not squared as well as the other, that is okay, and that is the end we want to drill into. (You will cut away most of that end to make the cartridge pickup anyway.) Insert the bar into the bolt face drilling jig. Then, fit the jig together with the holes oriented toward the end that isn't squared as well. The pieces are purposely designed to fit very tightly, and you may find a bench vise useful to press them together.

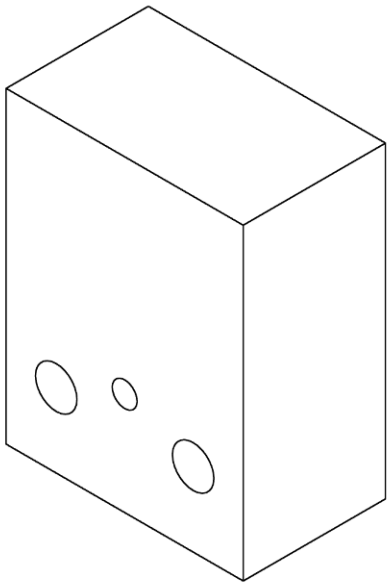


4. It is time to drill the firing pin channel and the corners of the cartridge pickup. We recommend drilling the smaller hole first, as it will become your firing pin channel, making precision more important. Heat generated when drilling the larger holes may warp the jig slightly, but that is expected. We also recommend applying a few drops of cutting oil into the channels before drilling. A drill press is helpful for this step, but if you do not have one, a handheld drill will work. Mount the jig to a vise, and when drilling, pause occasionally and remove the bit to clear chips out of the channel. Drill through the smaller hole with a 2.1mm drill bit and the larger holes with a 3.5mm drill bit.

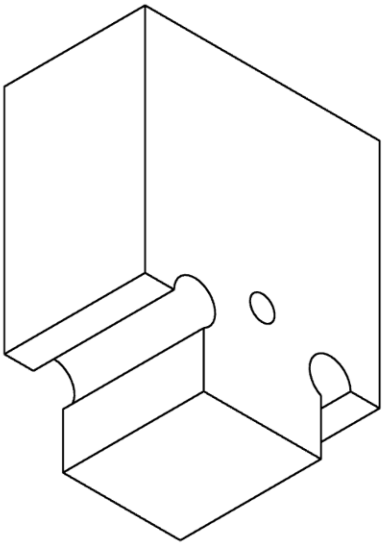


5. After you completely drilled through all three holes, mount the assembly to a vise, and use a punch, hex key, or other sturdy tool to remove the steel bar from the jig. Because of how tightly the jig is held together, removing the steel bar is tricky. As the jig is only usable once, it is okay to destroy it as part of this step.

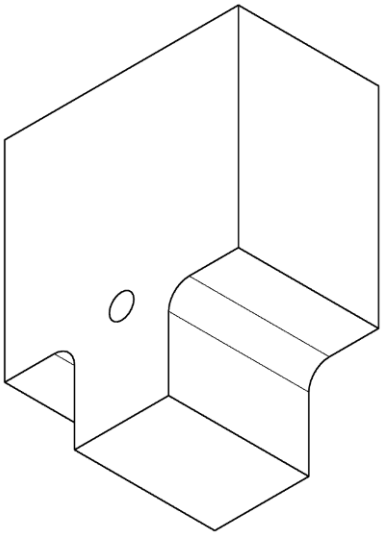




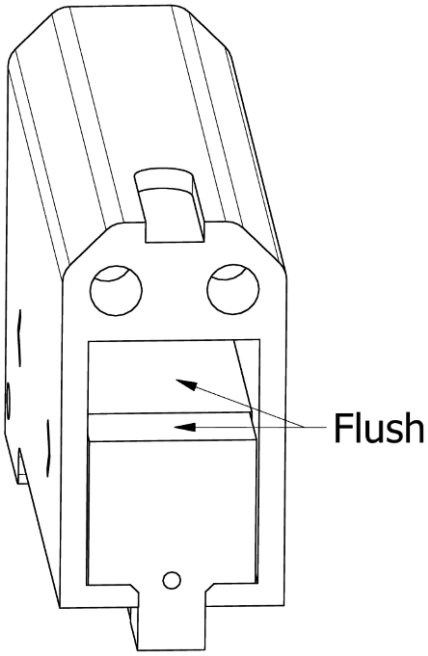
6. With a hacksaw, cut the metal as depicted. You are welcome to use a more powerful tool, but we believe a hacksaw is the easiest to control. It may come out jagged and ugly, but we will clean it up in the next step.



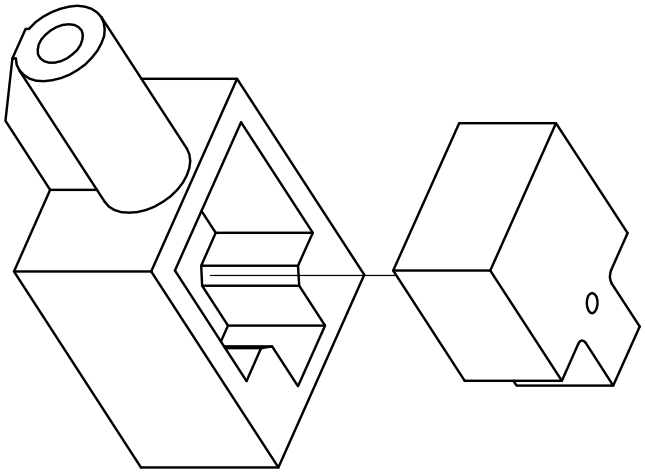
7. Use a Dremel tool with a sanding disc and a file to process the metal piece until it appears as depicted. Only use the Dremel tool for the heavy lifting. If you don't have a Dremel tool, you can complete this step of the process with only a file. To understand when you have filed away enough metal, use the lower bolt core bar drilling jig as a sizing gauge.



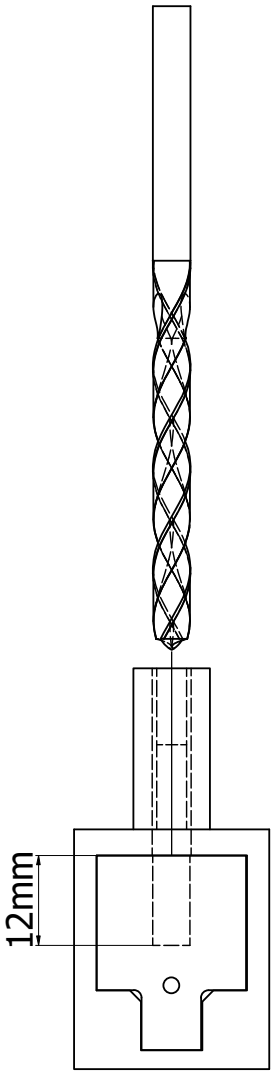
8. Test fit the bolt face you processed by fitting it in a bolt carrier housing. The depicted surfaces should be flush. If you insert the 1.5mm hex driver shaft that you will make into your firing pin, it should glide in and out with little to no resistance. If it does not, check the alignment of the firing pin channel. You may need to process the bolt face more or start over.



9. Insert your lower bolt core bar into the lower bolt core bar drilling jig. Make sure that it is fully inserted.



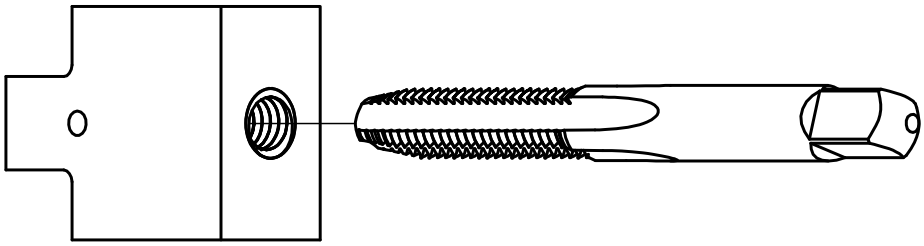
10. You will now drill part of the channel used to secure both bolt core bars together. This part of the channel is 12mm deep and 5mm in diameter. When drilling, you will need to pause occasionally and use the depth gauge on your caliper to take measurements. For reference, the jig's channel is 25mm deep. Drilling a little too deep is okay, but don't drill too shallow, and try to get it as close as you can. A drill press is helpful for this step, but if you do not have one, a handheld drill will work. Apply a few drops of cutting oil before drilling, and remove the bit occasionally to clear out chips. With a 5mm drill bit, drill 12mm into the lower steel core bar.



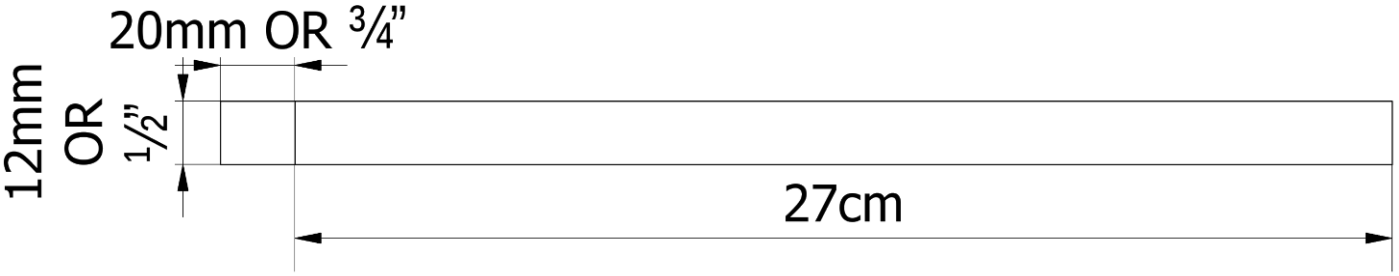
11. Remove the lower steel core bar from the jig. You will no longer need the jig, and it is only useful once, so it is okay to destroy it as part of this step.

12. You will now tap the channel used to secure both bolt core bars together. When tapping steel, use copious amounts of cutting oil, rotate your tap counterclockwise occasionally to break away chips, and clear out debris as it accumulates. Most importantly, **if your tap feels extremely stiff, stop rotating it clockwise, rotate it counterclockwise to remove it, and remove accumulated debris**. Your tap is not invincible, and it will break if too much force is applied while the channel is clogged. Likewise, it will break if too much force is applied while it is at the end of the channel. Broken taps are extremely difficult to remove and may require you to start your work over. You will not receive any sympathy if you break your tap. You have been warned.

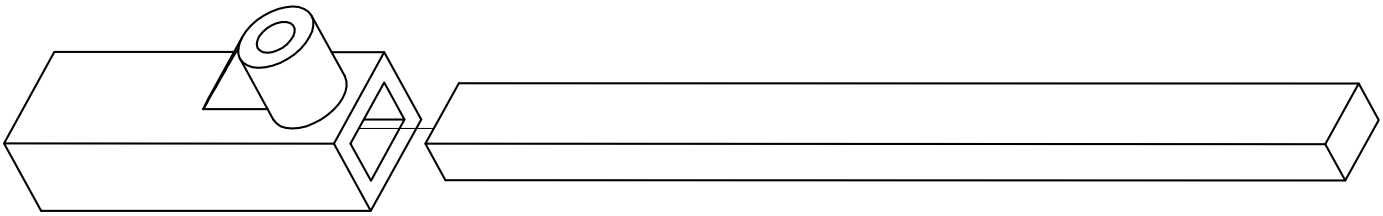
    With all of that said, mount your lower steel core bar to a vise and use an M6 tap with a 1.0mm pitch to tap its channel.



13. Cut a 27cm length of your 12mm X 20mm or ½" X ¾" steel bar stock. Yes, it will need to be 27cm long whether you are using metric or imperial steel bar. Please make the cut as square as you can and length as precise as you can. It is okay if you cut it a little short, but if it is too long, it will not work. This steel piece will become your upper bolt core bar.

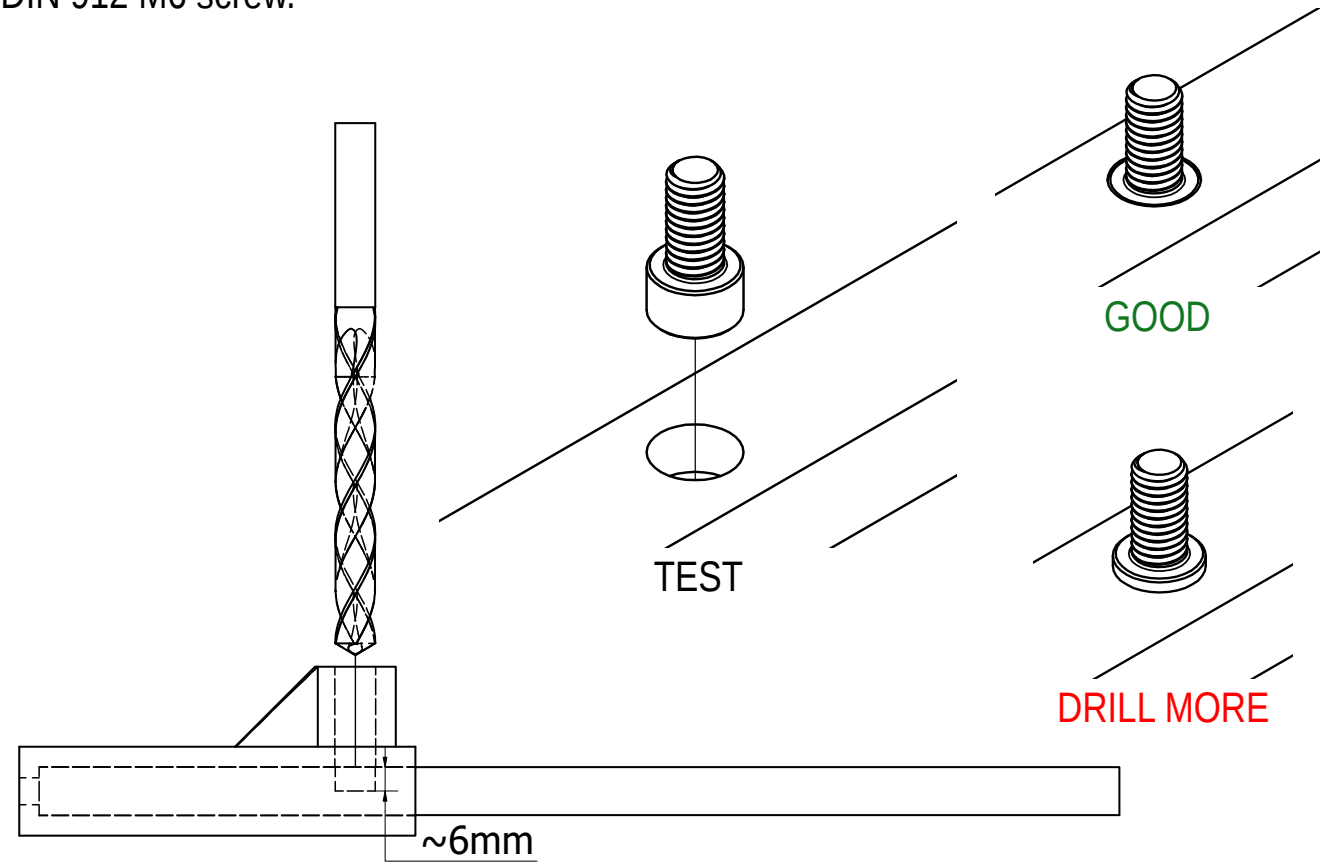


14. Insert your upper bolt core bar into the M6 Bolt Head Recess Jig. Make sure it is inserted all the way, and mount the jig to a sturdy surface.

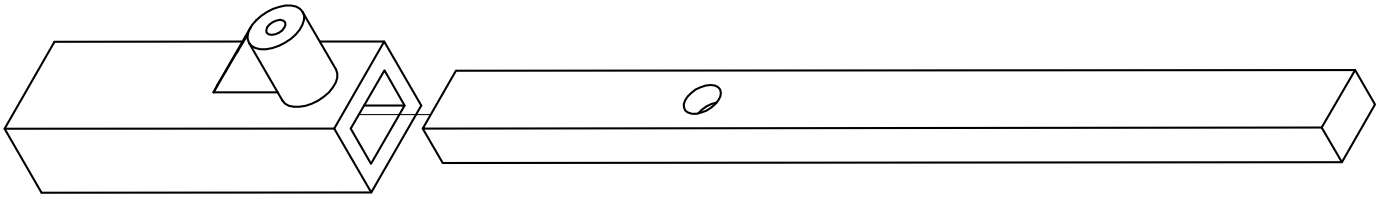


15. You will now drill out the cavity that contains the head of the M6 screw. During this step, **you will not drill all the way through the steel bar**. If you do, you will need to start the upper bolt core bar over. This cavity is about 6mm deep, but the best way to measure it is by inserting the head of a DIN 912 M6 screw into the cavity. If the screw head is fully submerged in the cavity, you have drilled enough. If it protrudes, even just a little bit, you will need to drill a little more until it does not. It is okay if it goes a little deeper than necessary, but again, do not drill all the way through the steel bar.

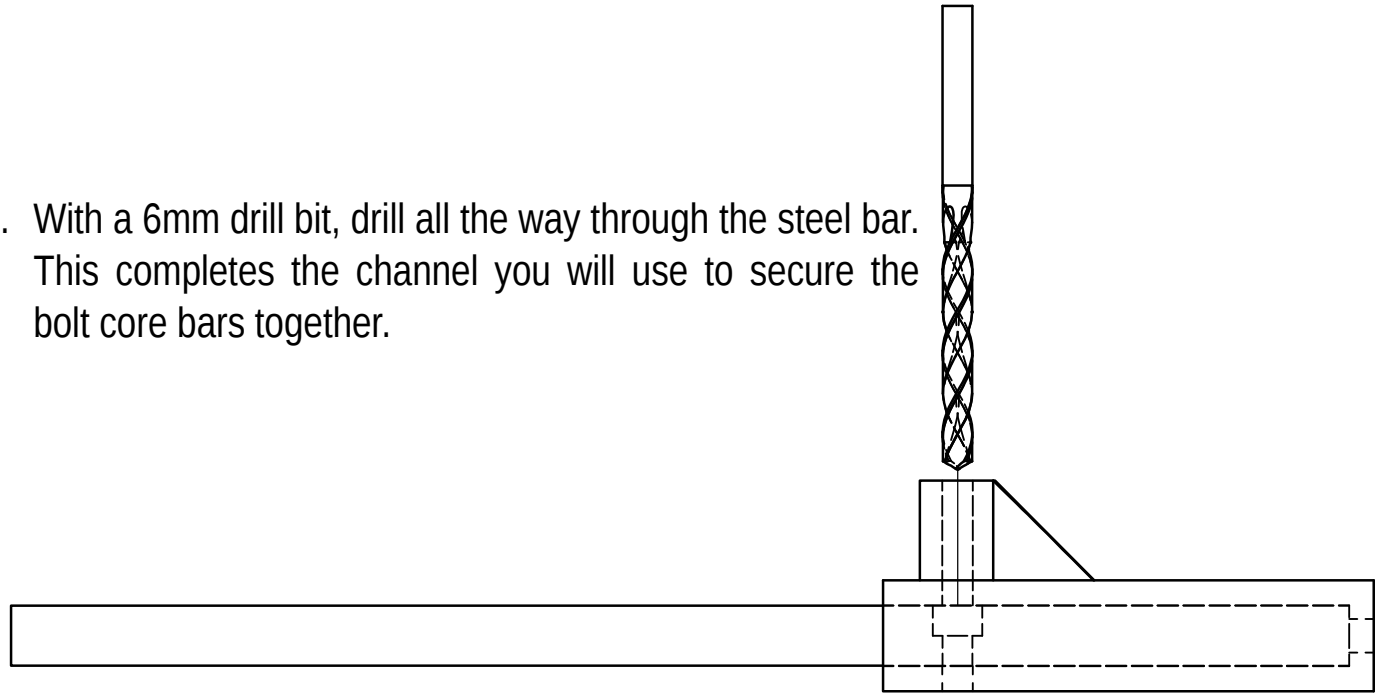
    Check one last time that the upper steel core bar is all the way in the jig. Drill about 6mm deep with a 10mm drill bit. Verify the drilling depth is sufficient with the head of a DIN 912 M6 screw.



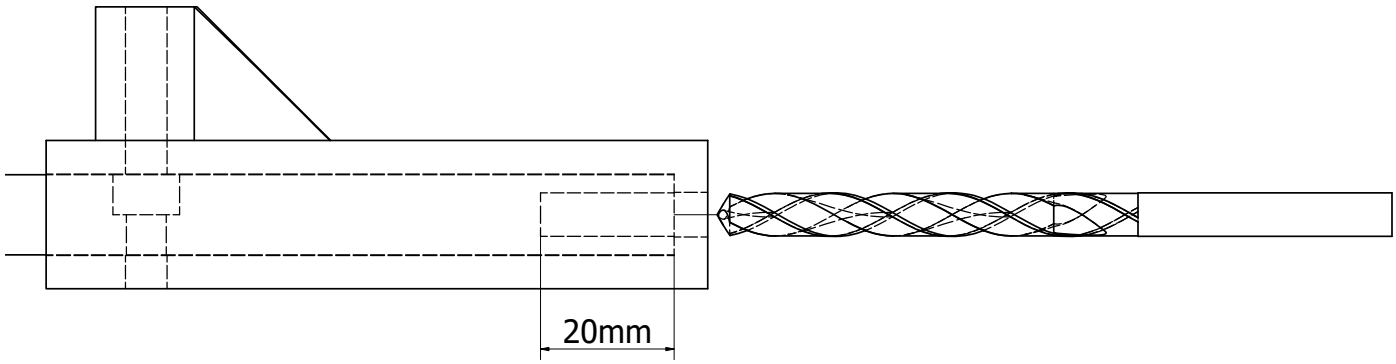
16. Insert your upper steel core bar into the M6 Bolt Drilling Jig. Make sure it is inserted all the way, and mount the jig to a sturdy surface.



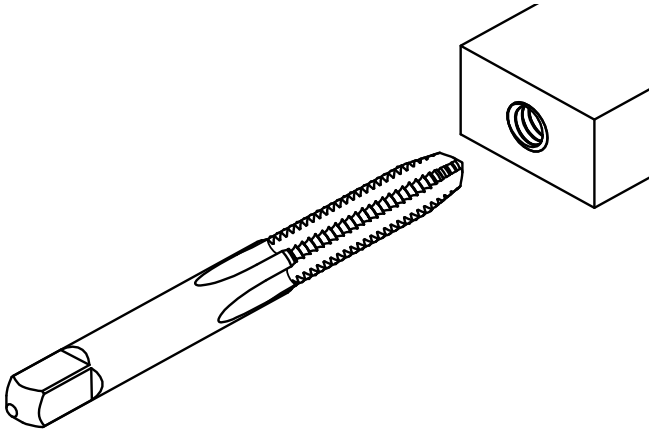
17. With a 6mm drill bit, drill all the way through the steel bar. This completes the channel you will use to secure the bolt core bars together.



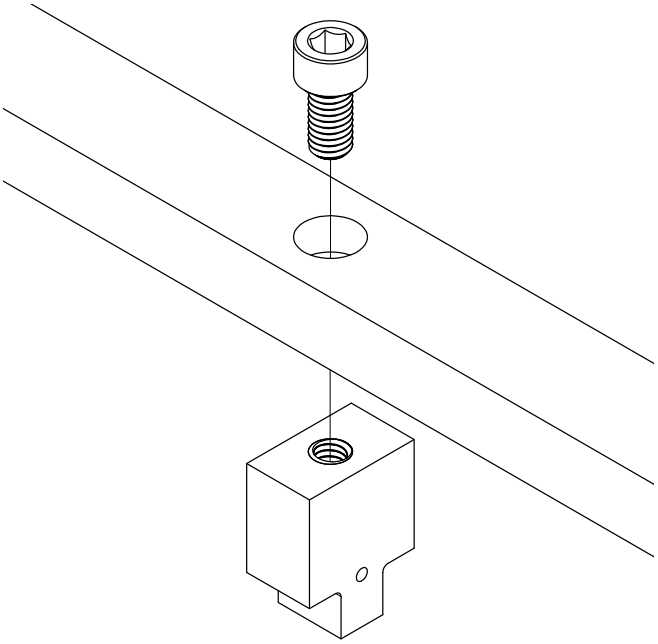
18. You will now drill the channel we need to secure the bolt core bars to the plastic bolt carrier housing. Reposition your bar and jig if you need to, but ensure they are still mounted securely. With a 5mm drill bit, drill 20mm deep through the channel on the tail end of the drilling jig. It is okay if the hole is canted slightly, but try to keep it reasonably straight.



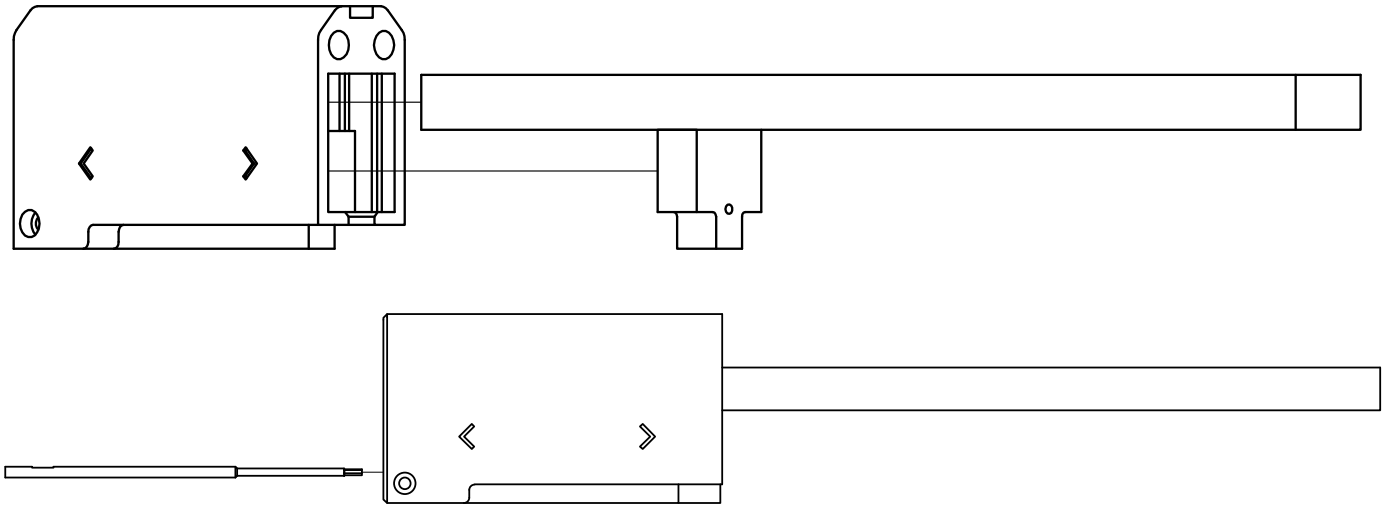
19. You will now tap the channel you just drilled. **Follow the same precautions listed in step 12**. Reread them if you need a refresher. Mount your upper steel core bar to a vise and use an M6 tap with a 1.0mm pitch to tap its channel.



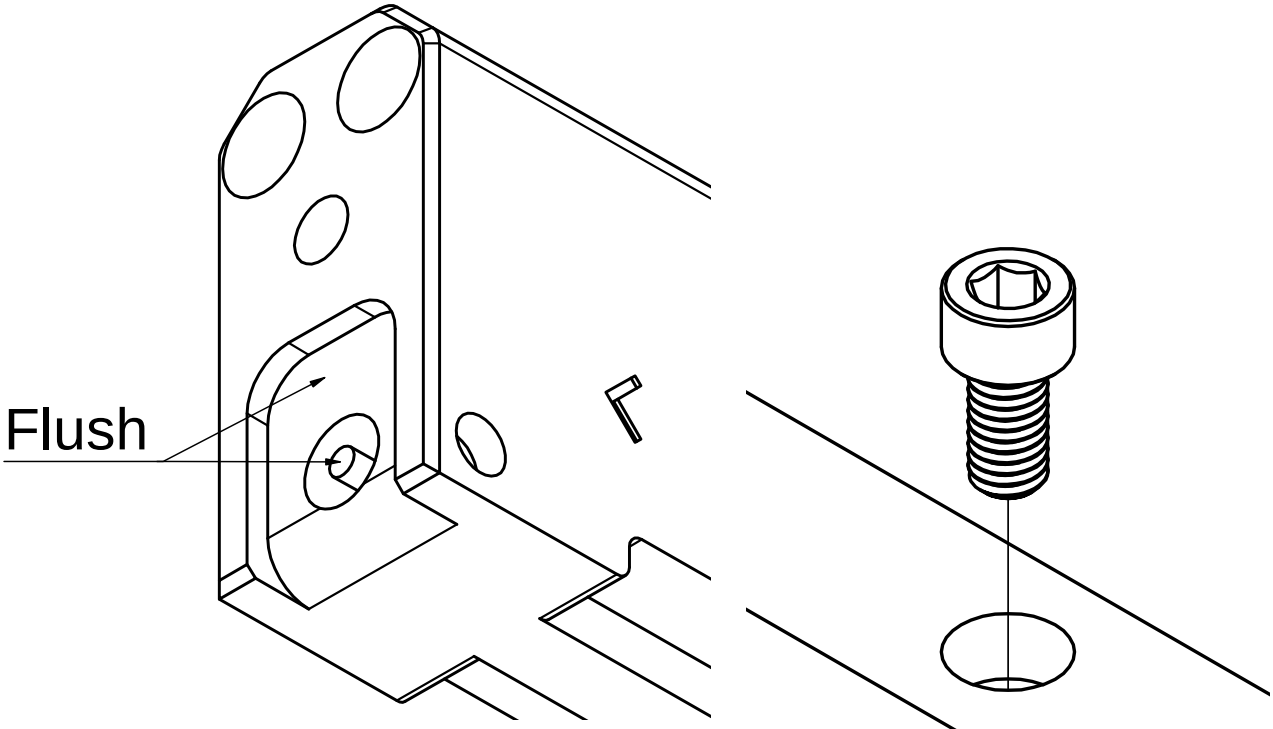
20. Before you finish the bolt carrier assembly, you will want to test the firing pin channel one more time. Tightly secure both bolt core bars together with a M6X12mm screw. Align your lower bolt core bar so that its firing pin channel is parallel to the upper bolt core bar.



21. Insert the bolt core bars into the bolt carrier housing. Then insert a 1.5mm hex driver shaft as far as you can.

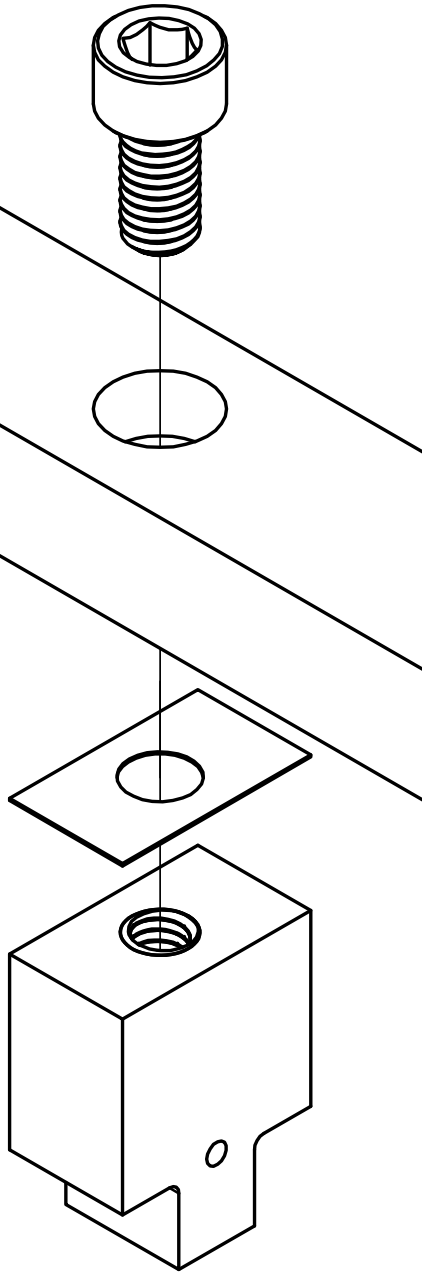


22. The tail-end of the hex driver shaft should come to a hard stop flush with the rear surface of the bolt carrier housing. If it does, continue to the next step.

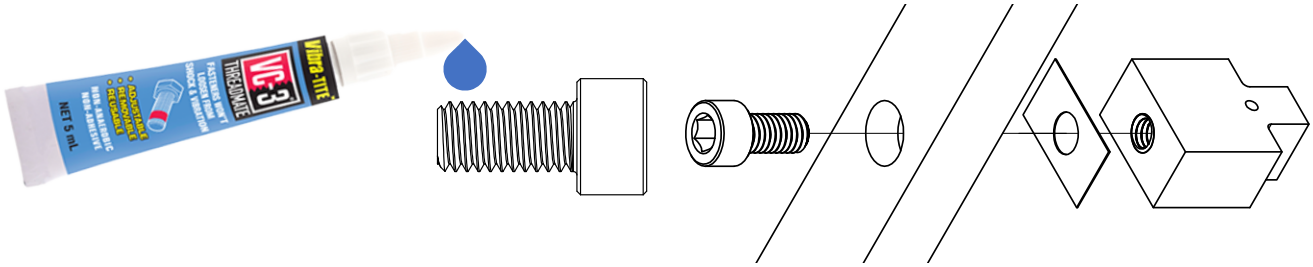


GOOD (if minimal force is required)

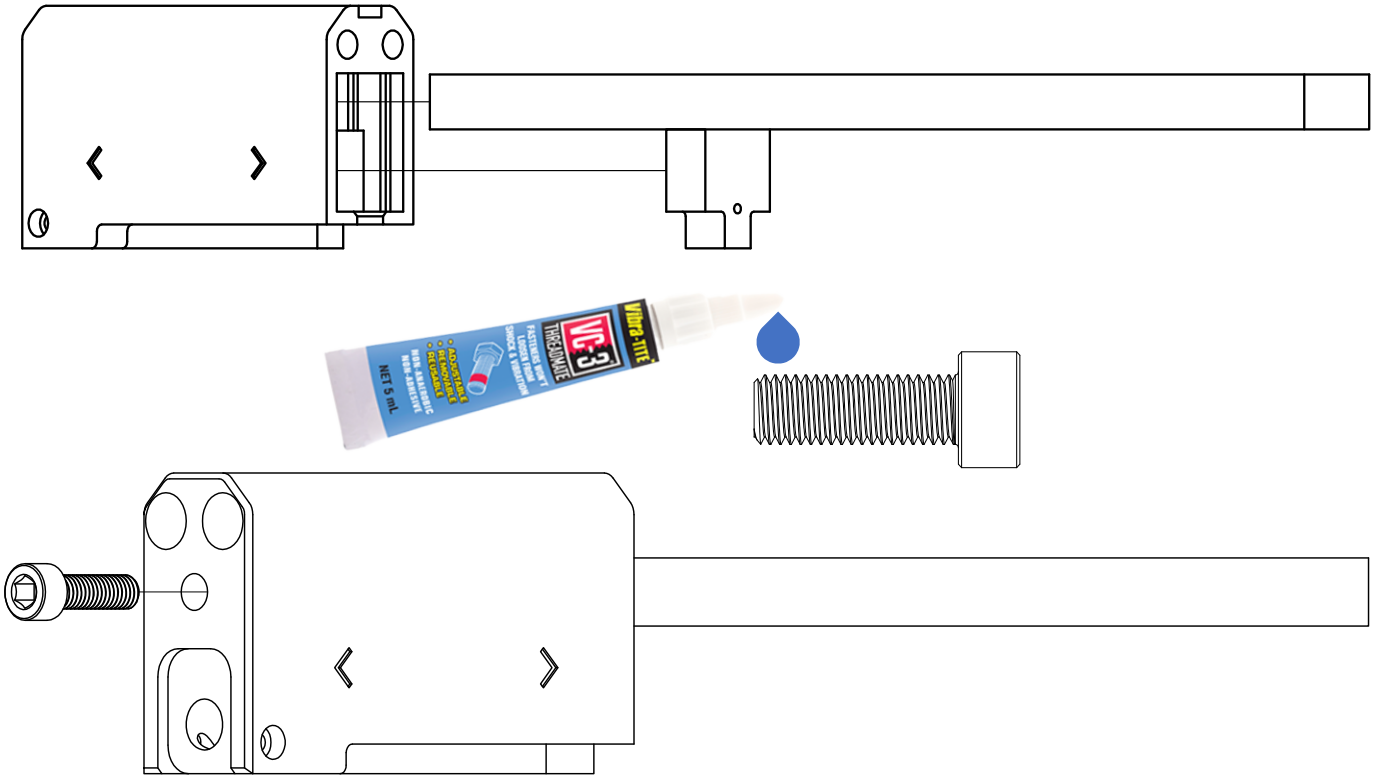
If it seizes up or comes to a hard stop before then, **your firing pin channel is misaligned and your bolt carrier assembly will not work**. Assuming your lower bolt core bar passed the test on step 8, this may be due to a slight dimensional inaccuracy in your lower bolt core bar. Try loosening the M6X12mm screw slightly and test the firing pin channel again. If the test then succeeds, you will need to add one or more bolt core bar shims to your assembly. Apply the shim(s), tighten the screw hard, and try the test again.



23. Now that you confirmed your bolt core bars are aligned properly, it is time to finalize the assembly. Remove the M6X12mm screw one last time, apply a few drops of threadlocker to its threads, and then put it back, tightening it down hard.

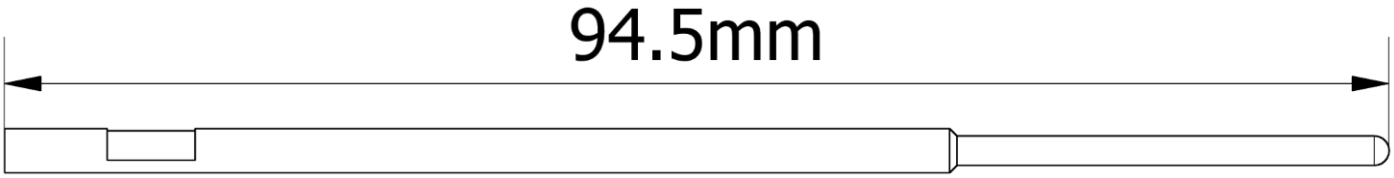


24. Insert your bolt core bars into the bolt carrier housing. Apply a few drops of threadlocker to the M6X20mm screw, and secure the bolt core bars to the housing through the channel in the rear of the bolt carrier assembly.

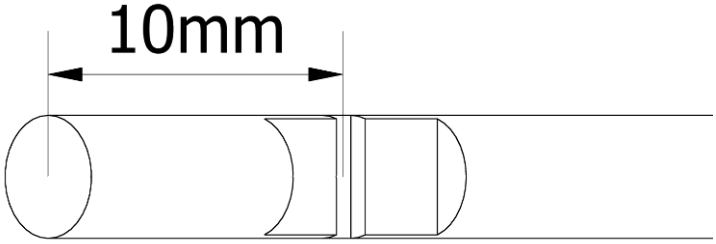


25. You may continue with the assembly process, but please do not charge or fire the Urutau until the threadlocker cures, usually 24 hours.

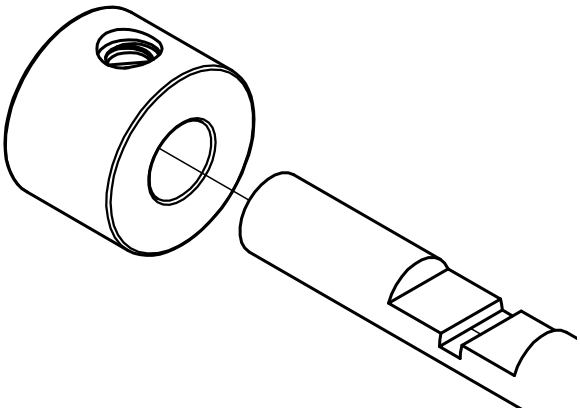
26. While waiting on the bolt carrier assembly, you can prepare your firing pin. Take a 1.5mm RC hex driver and cut the tip down to make it 94.5mm long. **It is important that you get the length as close to 94.5mm as possible. An overlength firing pin may lead to out-of-battery detonations.** A Dremel tool with a cutting disc is ideal for this, but any cutting tool will work. Using a file or a Dremel tool with a sanding disc, cut a conic or dome shape into the tip of the firing pin. It does not have to be perfect, but we want to minimize any sharp edges.

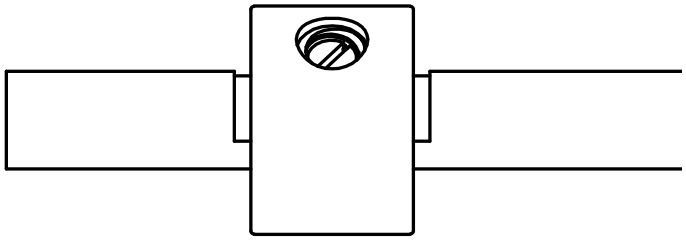


27. Using a Dremel tool with a cutting disc or other appropriate tool, 10mm from the tail end of the firing pin, cut a notch or divot into the flat surface. This may or may not be the exact middle of the flat surface, depending on the manufacturer of the driver shaft.

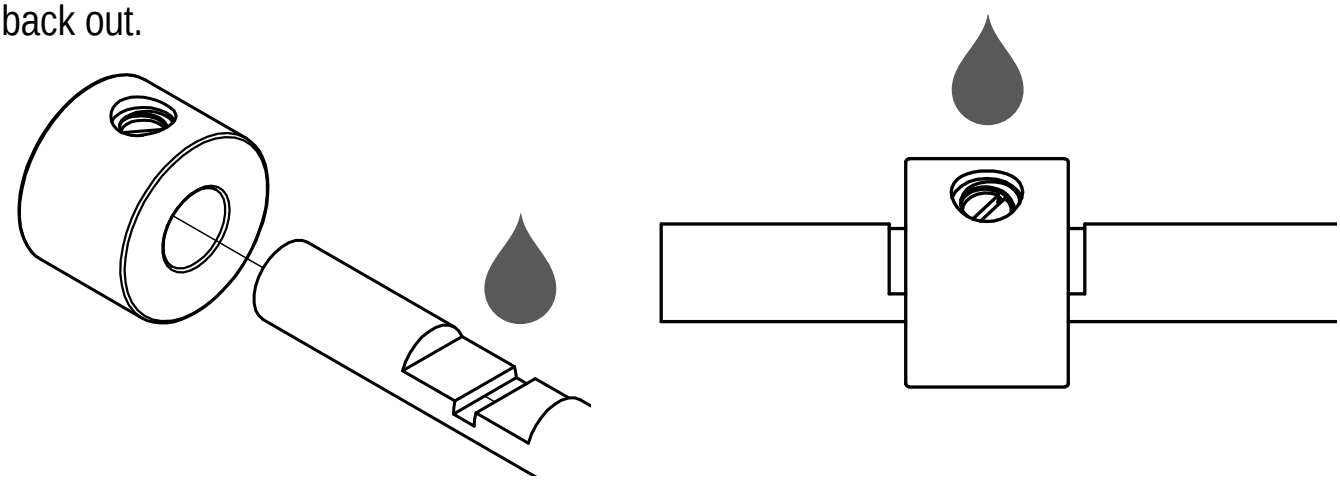


28. Apply a DIN 705 3mm ID shaft collar and slide it so the grub screw is over the notch. You may need to loosen the grub screw to do this, but be careful not to lose it. Once the grub screw is positioned over the notch, tighten it hard, and then pull the shaft collar both directions to make sure that it does not move. If it moves, reposition the shaft collar and try again.



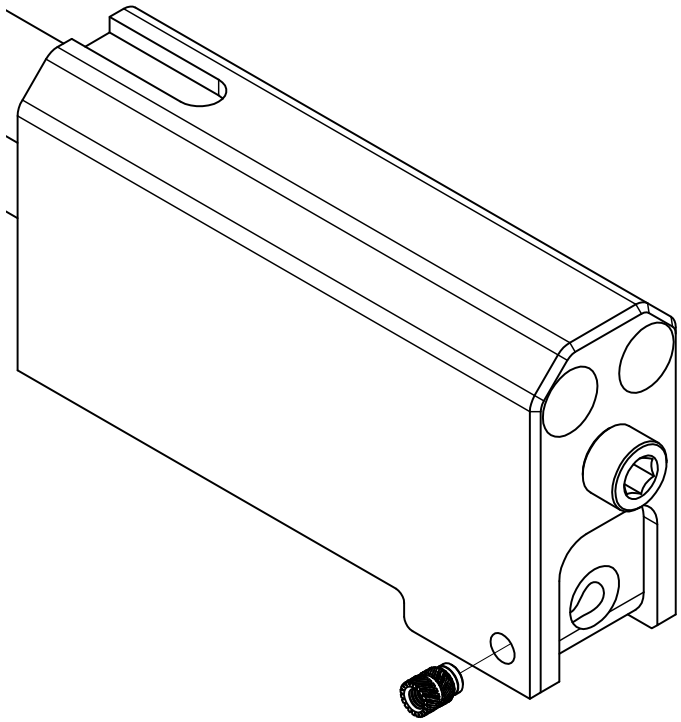


29. Remove the shaft collar. Mix a drop of JB-Weld and apply it to the notch or divot you cut. Reposition the shaft collar over the location where it is secure and tighten its grub screw. Test it one more time by pulling it in both directions. If it continues not to move, apply another drop of JB-Weld to the outside of the grub screw channel so it will not back out.

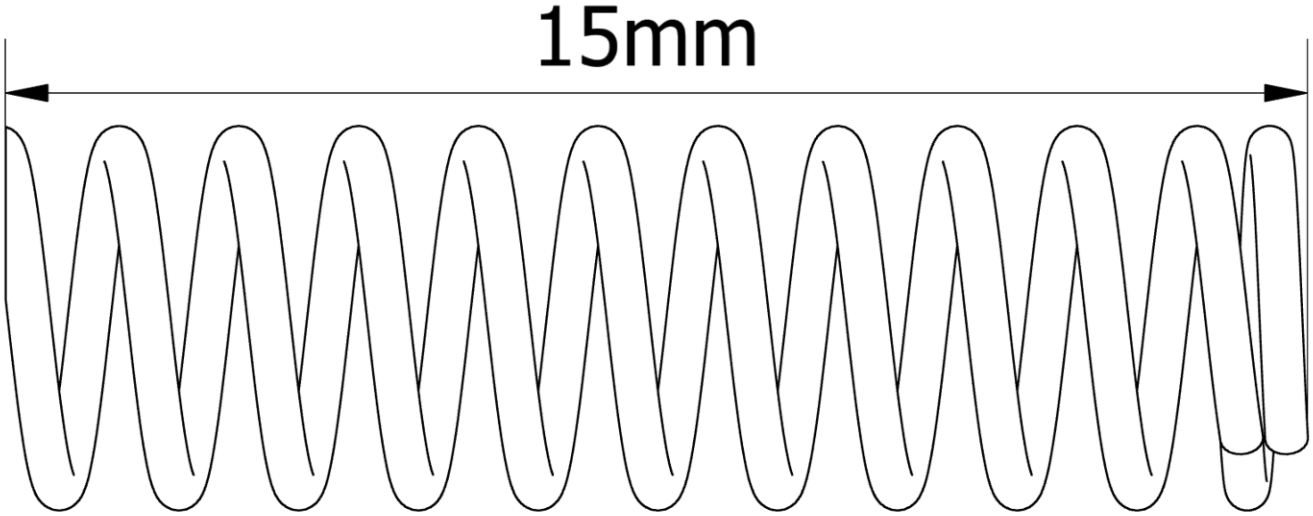


30. The JB-Weld will fully cure after 24 hours. It should be dry to the touch after 8 hours, and you can continue with the bolt carrier assembly process after then. However, do not dry-fire or live-fire the Urutau until after 24 hours passed.

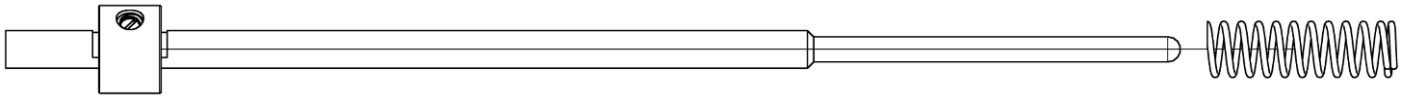
31. With a soldering iron, apply an M3 brass insert as depicted.



32. Cut a 15mm (uncompressed) piece from your 4.5mm OD, 0.5mm wire spring. (This is the retractable pen spring.) This will become your firing pin spring.

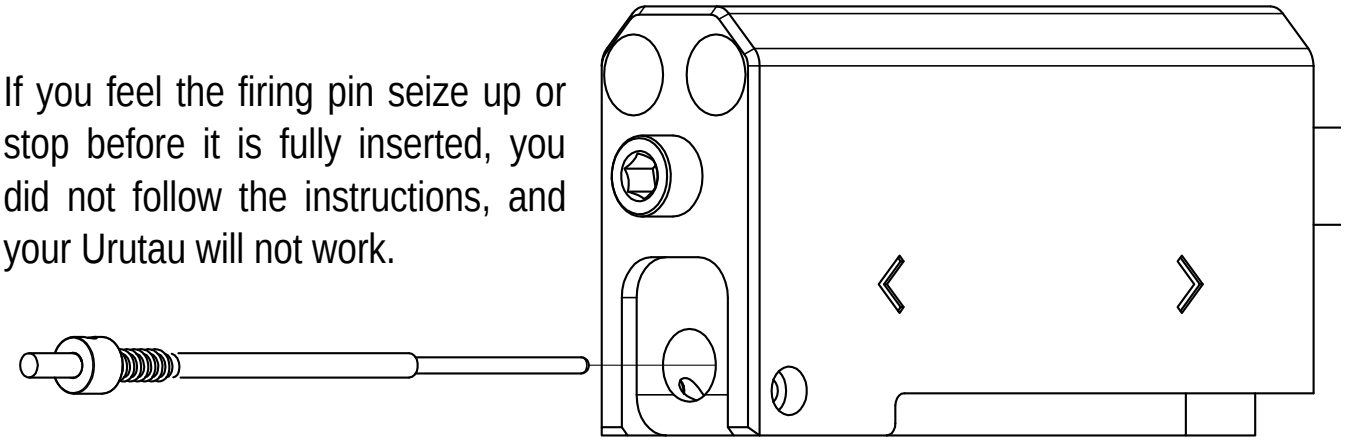


33. The JB-Weld should be dry to the touch before competing this step and continuing on. Apply the firing pin spring spring to your firing pin assembly.

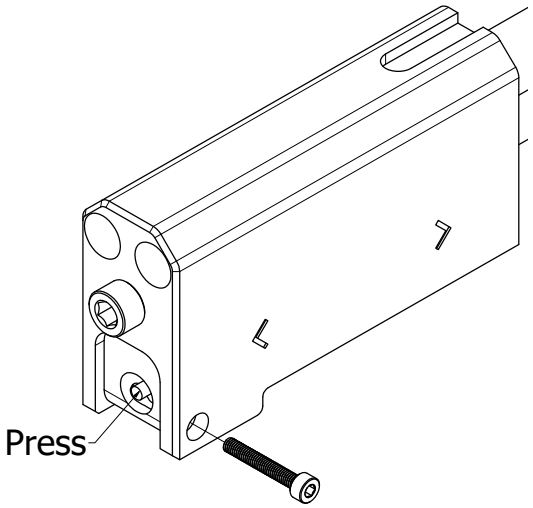


34. Insert your firing pin assembly into the bolt carrier assembly. It should enter smoothly with little to no resistance.

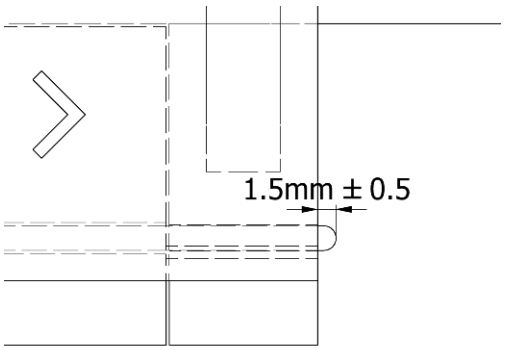
If you feel the firing pin seize up or stop before it is fully inserted, you did not follow the instructions, and your Urutau will not work.



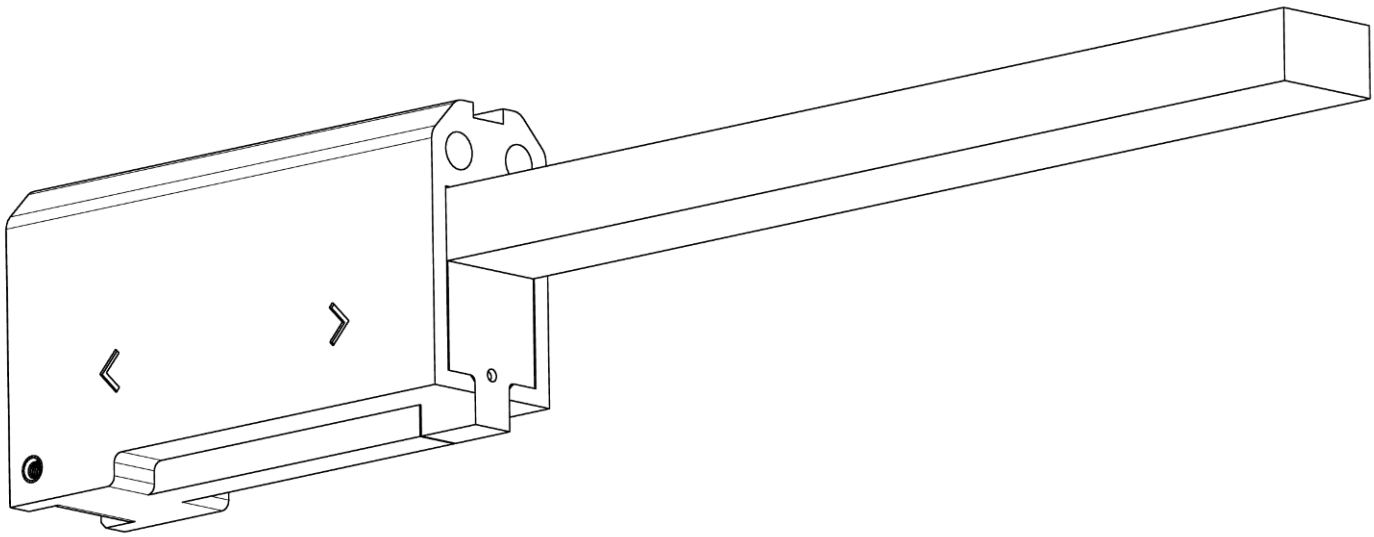
35. While pressing the firing pin into place, apply an M3X20mm screw as depicted. Note that the screw will not occupy the entire width of the bolt carrier housing, but as long as it retains the firing pin, that is okay. (If you would prefer to use a slightly longer screw, that is also okay as long as it does not protrude out the side of the housing.)



36. Check the protrusion of your firing pin by pressing it down completely like you did in the last step. It should protrude between 1mm to 2mm. If it is longer, trim it down slightly, as this creates a risk of out-of-battery detonations and pierced primers. If it is shorter, you will need to create a new one, as the gun may not detonate the cartridges reliably.



The creation of your bolt carrier assembly is complete! Set it aside until it comes time for the final assembly of the Urutau.

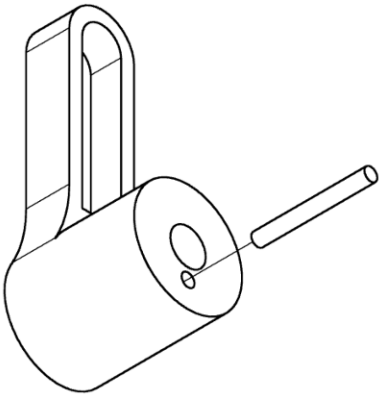


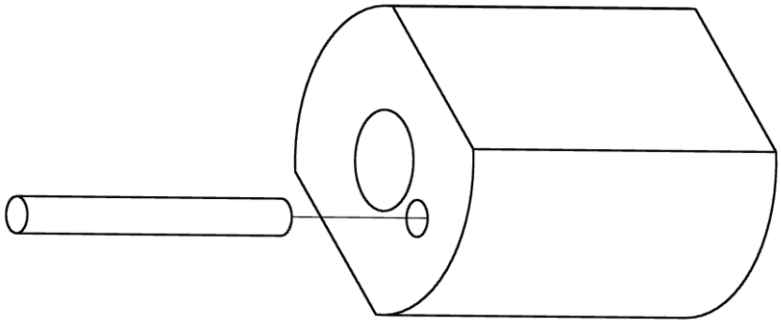
HAMMER SPRING WINDING

If you already own or are able to safely acquire an AR-15 hammer spring, skip this section. If not, the following steps will guide you through winding hammer springs.

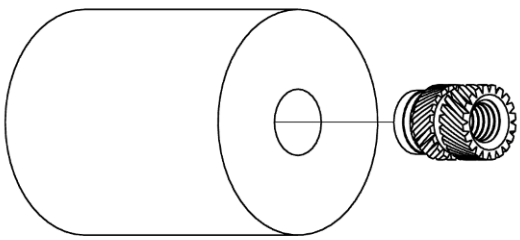
Special thanks to ImmortalRevolt for sharing his winding jig prototype with us!

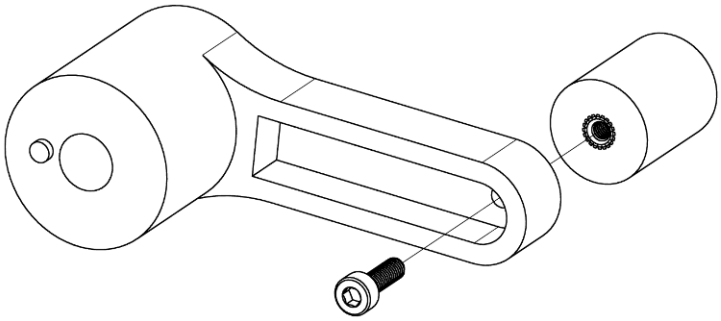
1. Make sure you have two 3mm diameter steel pins that are between 20mm and 26.2mm long. Insert them into the winder and vise piece so that 1.2mm of the pin protrudes from the channel. It doesn't have to be perfect, but you may find a caliper helpful for this step.



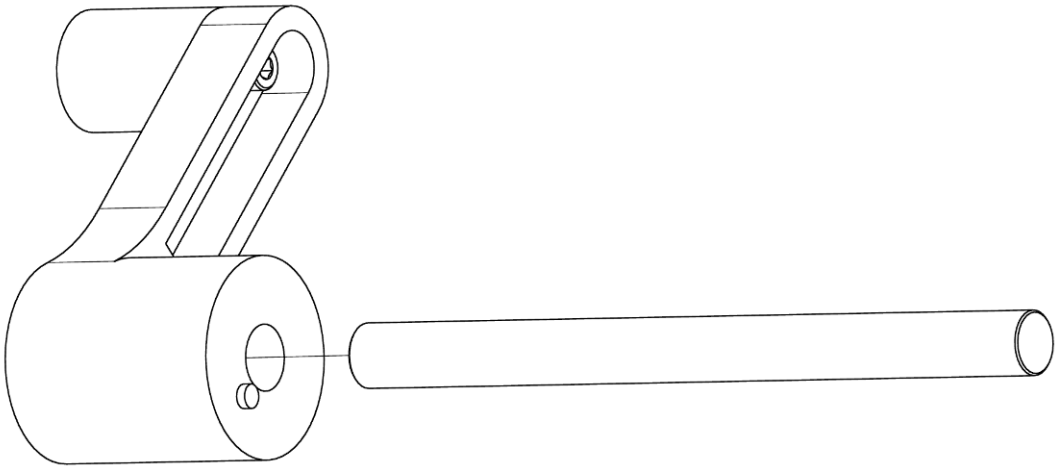


2. Optionally, use a soldering iron to apply an M3 brass insert into the winder knob, and then use an M3X10mm screw to attach it to the winder. This is a matter of personal preference, and the winding jig will function just fine without it.

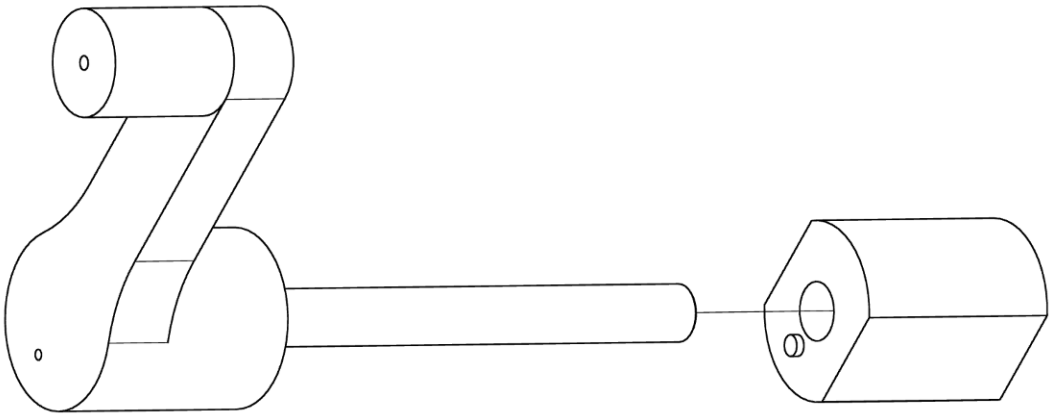




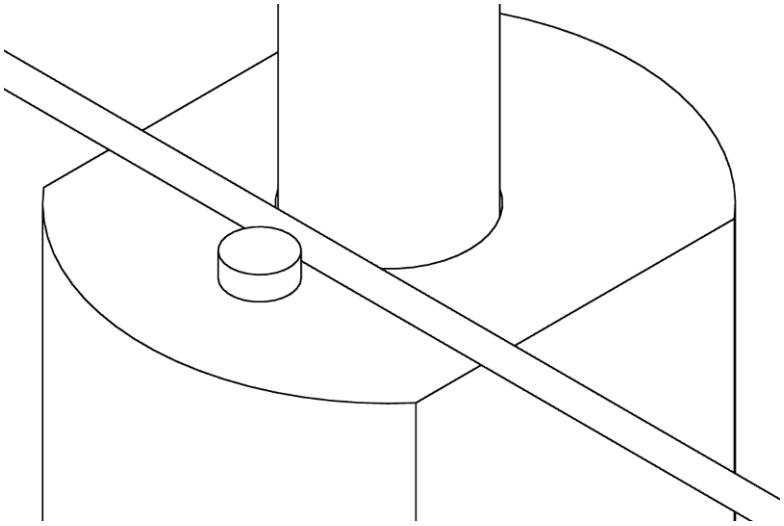
3. Insert your 8mm diameter stainless steel rod, the winding mandrel, into the mandrel channel in the winder.



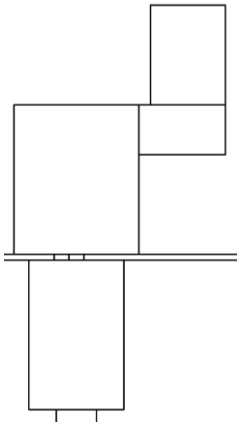
4. Mount the vise piece in a bench vise (not pictured) and insert the other end of the winding mandrel into its channel.



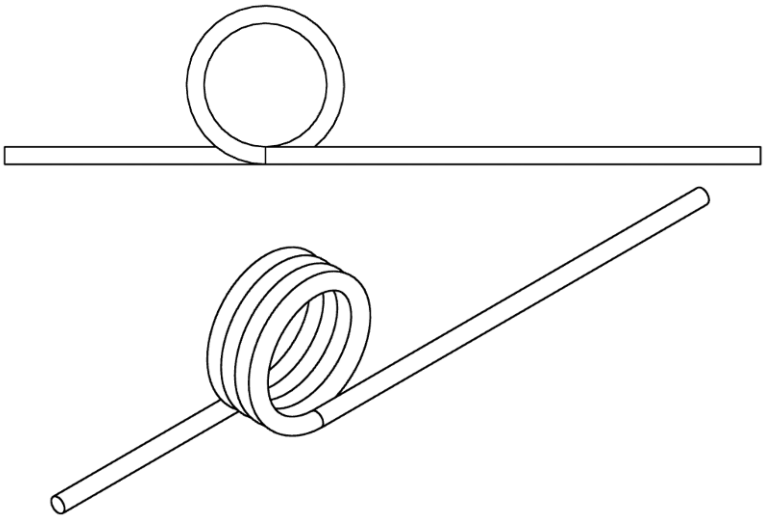
5. Insert your 1.2mm / 0.045”-0.047” spring steel wire between the winding mandrel and 3mm wire catch pin in the vise piece.



6. Press the winder and mandrel downward so its protruding wire catch pin presses the wire against the mandrel. You may need to bend the wire slightly to do this, and that is okay.



7. Your goal is to wind the wire into four loops, one on top of the other, with each of the legs a 180° angle to each other, as depicted. With the wire fixed in place, press down on the winder and slowly rotate it. The wire will uncoil slightly when you release the winder, so you will need to rotate the winder a little more than four times to create a 180° angle.



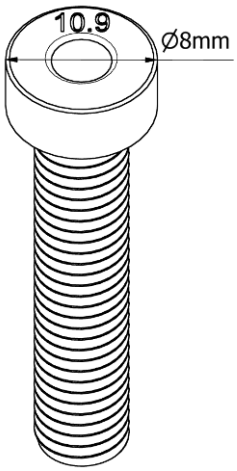
8. When the coils are wound, cut the spring. You will want one leg around 33mm long and the other around 17.5mm long. It doesn't have to be perfect, but it is easier to cut a little more later than it is to start over.

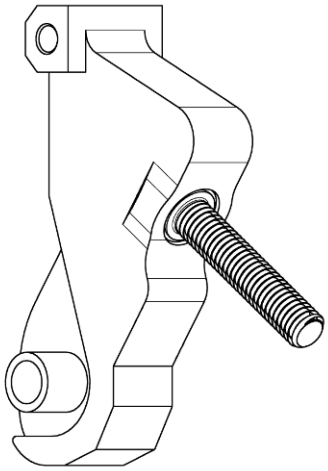
9. Repeat this process from step 5 onward to create your other hammer spring. You will need to wind it in the opposite direction of the spring you just made. You may find reversing the direction of your vise piece in your bench vise helpful in doing so.

The creation of your hammer springs is complete! Set them aside until reaching step 10 of the lower assembly process.

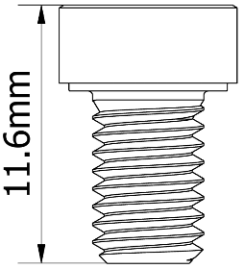
LOWER ASSEMBLY

1. Chuck a DIN 933 M5 hex-head screw into a drill. Spin the drill and use a file to round-off the hex shape. Generally, you want the diameter of the rounded head of the screw around 8mm, but a good way to test this is to insert the head of the screw into the cavity in the hammer. If it feels stiff going in, file a bit longer and try again. If not, remove it and continue on.

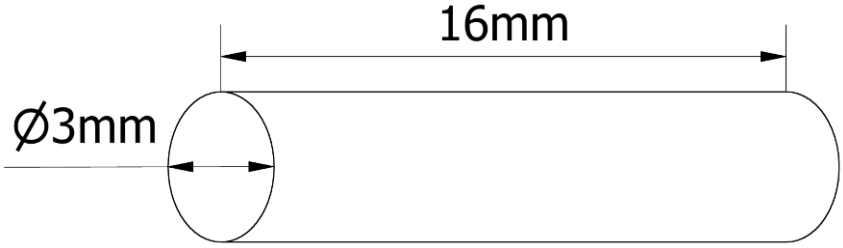




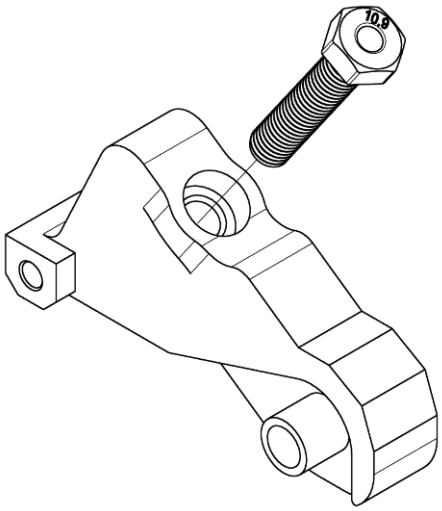
2. Cut the screw down to no longer than an 11.6mm overall length. If it is a little under, that is okay, but it cannot be longer than 11.6mm. Deburr any rough edges with your file.



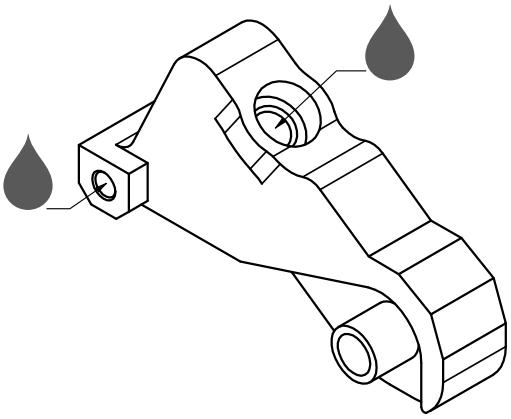
3. Make sure you have a 3mm diameter, 16mm long steel dowel pin on hand. If it is a little shorter than 16mm, that is okay, but if it is longer, please cut and/or file it down.



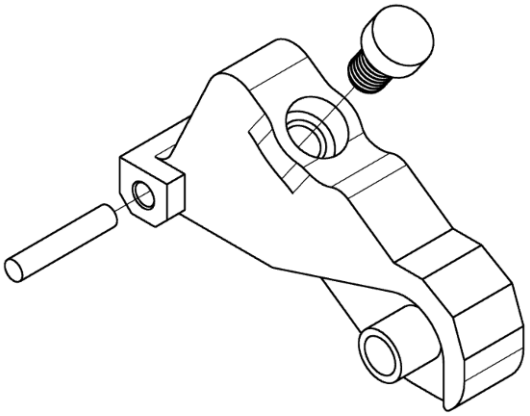
4. Using an uncut M5 screw, insert the threaded end into the channel and rotate it out again. This is optional, but it will make the next few steps easier. Do not overtighten, as that will strip the channel of its ability to catch the screw.



5. Apply drops of JB-Weld into the hammer's screw cavity and the channel inside the hammer's wings.

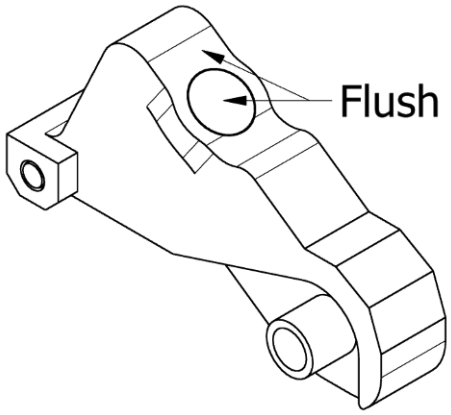


6. Insert the 16mm long steel dowel pin as depicted. You may find a hammer or bench vise useful for tapping or pressing it into place. Also insert the cut and rounded M5 screw as depicted. You will find a pair of pliers useful for this step. You will not be able to get it all the way in, but try to get it as deep as you can. Wipe away any excess JB-Weld that oozes out.



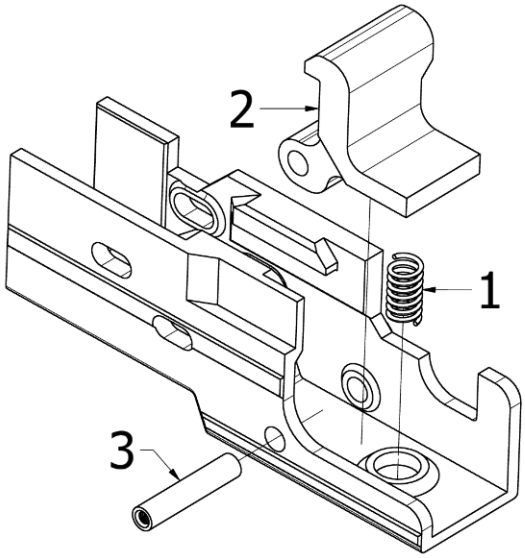
7. Assuming you are working at room temperature, give the JB-Weld 24 hours to cure. It should be dry to the touch after 8 hours, so you may continue the assembly process past that point, but do not dry fire or live fire the Urutau until 24 hours are passed.

8. Use a file to grind the face of the screw flush with the hammer. Though it is unavoidable, try to avoid damaging the plastic as best you can.

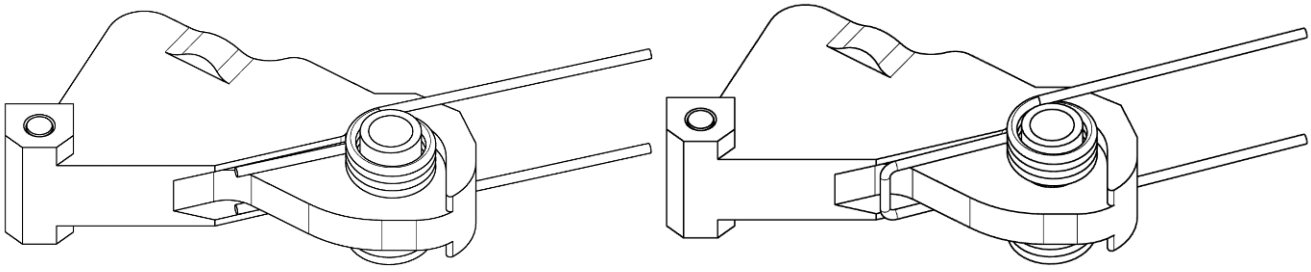


Whereas the hammer takes more than 24 hours to prepare and requires occasional replacement, we recommend making more than one, provided that you have a good hiding location if you are in a legally precarious situation.

9. Place 7.5 coils of your 8mm OD, 0.8mm wire compression spring stock into its cavity on the fire control group housing floor. Place the disconnector on top of it. Insert a Ø5X25mm M3 threaded spacer. You will need to resist the disconnector spring pressure to insert the spacer, but it should not take too much physical effort. If you have difficulty inserting the spacer, ream the disconnector's channel with a 5mm drill bit.

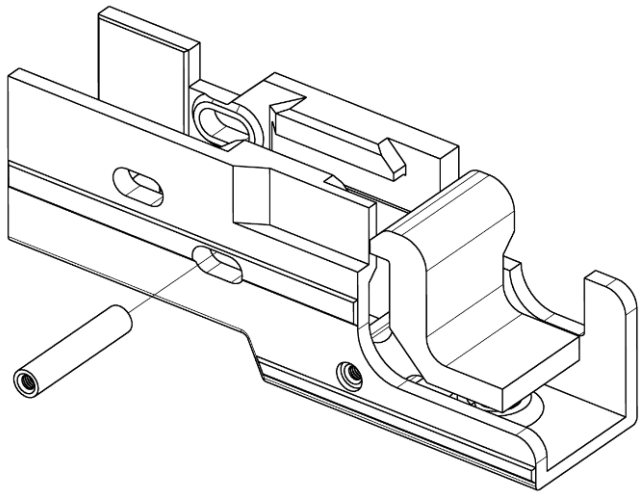


10. Apply your hammer spring(s) to the hammer as depicted. If you get this wrong, your Urutau will not fire reliably.

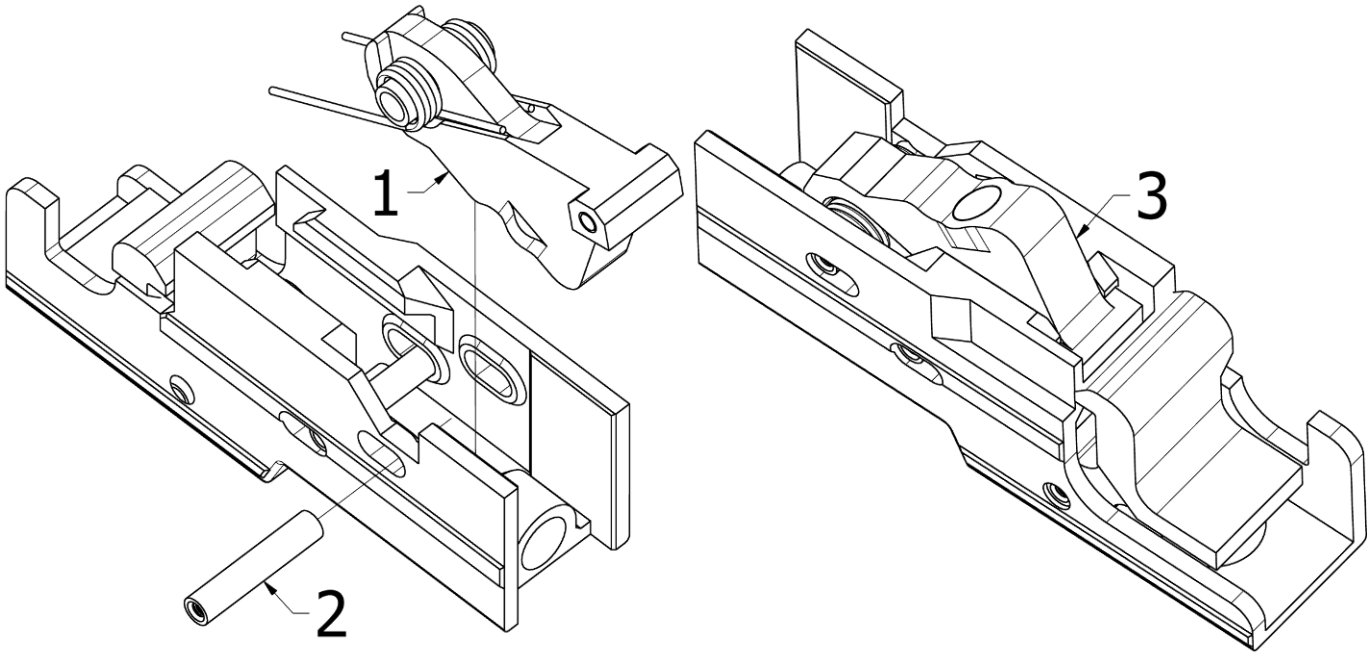


DIY AR-15

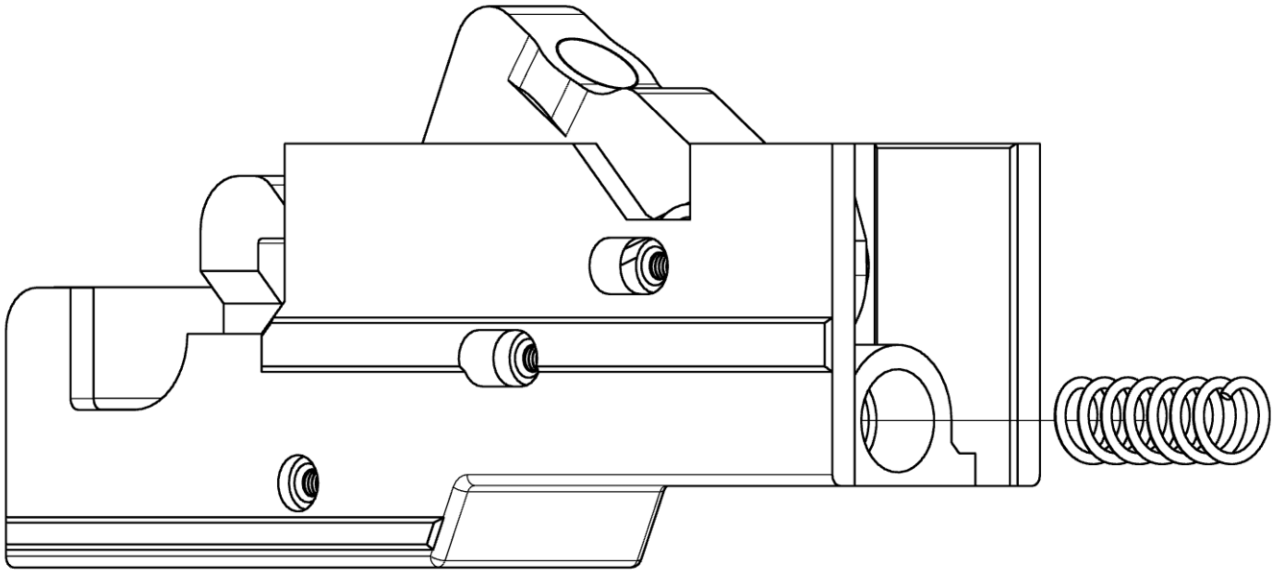
11. Insert a Ø5X25mm M3 threaded spacer as depicted. Be aware that it will want to fall out until the completion of the next step.



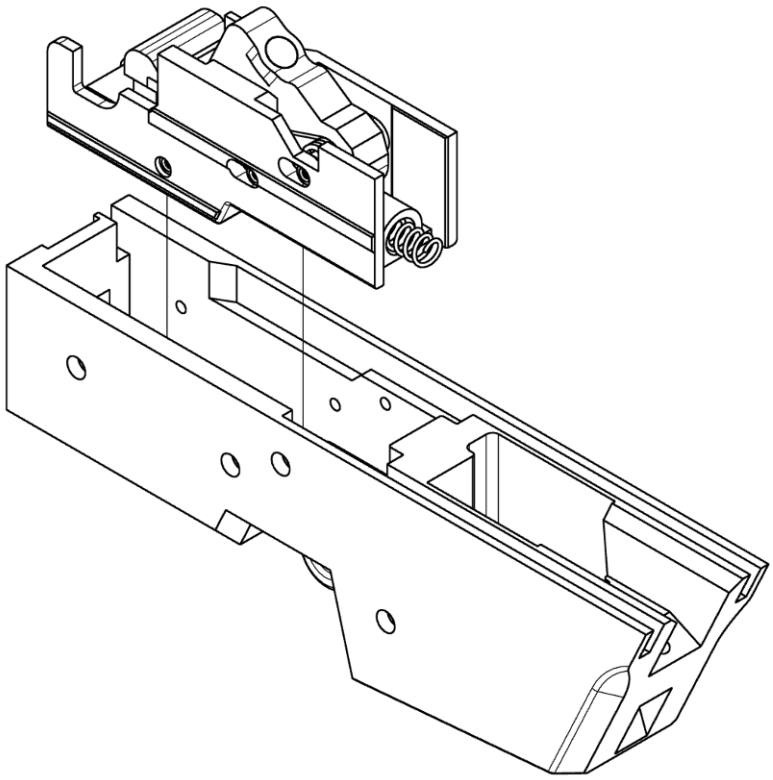
12. Place the legs of the hammer spring(s) onto the spacer you just inserted. Then, press the hammer down until its channel aligns with the opening in the fire control group housing. Insert another Ø5X25mm M3 threaded spacer as depicted when it is aligned. Cock the hammer once the spacer is in place. If you have difficulty inserting the spacer, ream the hammer's channel with a 5mm drill bit.



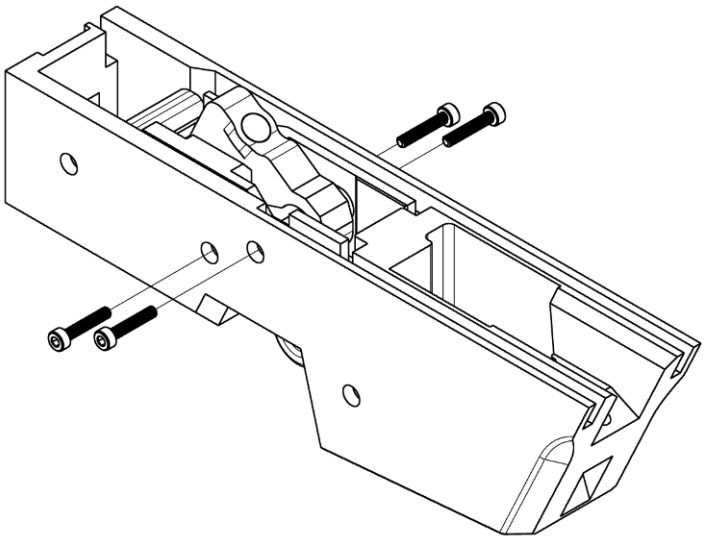
13. Insert 5.5 coils of your 8mm OD, 1mm wire compression spring stock into the cavity in the fire control group housing. Be aware that it will want to fall out until the completion of the next step.



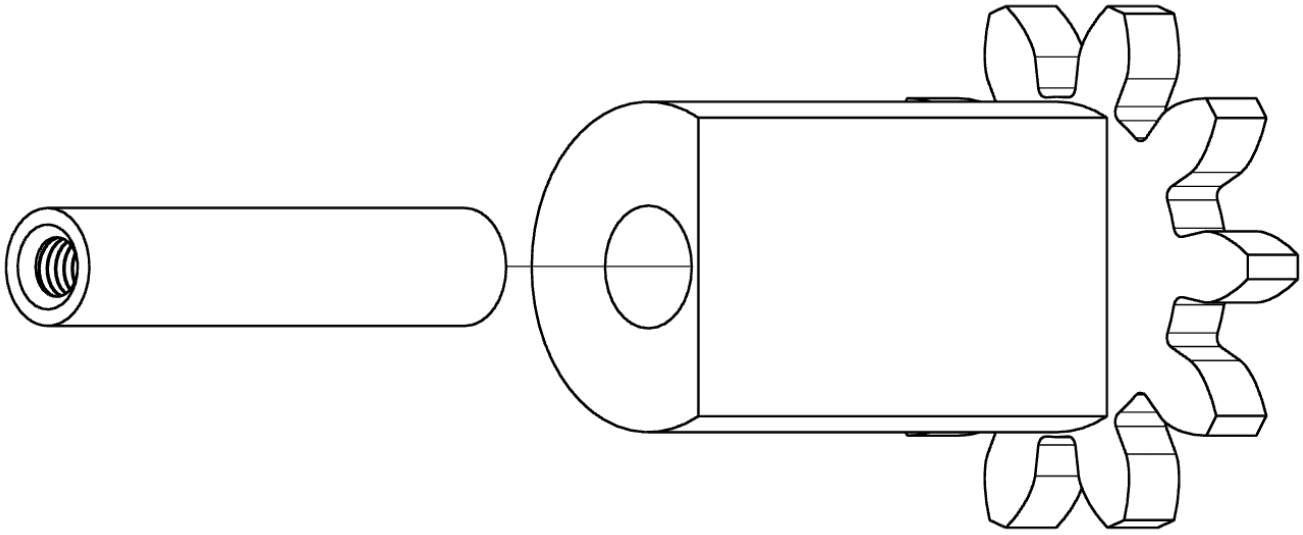
14. Insert the assembled fire control group cassette into the lower receiver. This step will be a little tricky, as you will need to fight the fire control group housing spring, and the sharp end will want to catch the plastic. Make sure that it does not get bent out of shape.



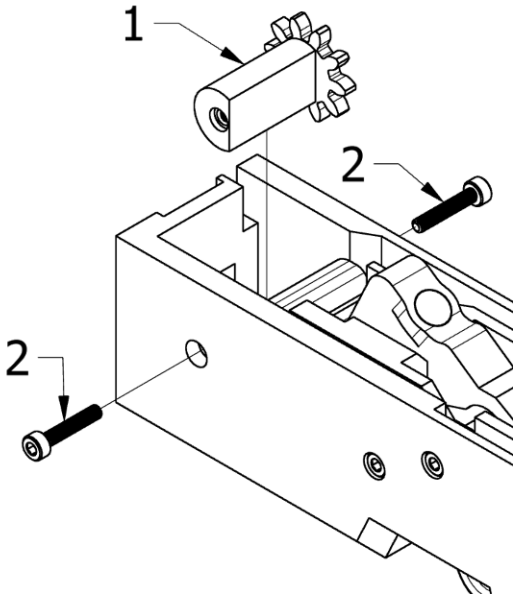
15. Apply M3X16mm screws into the holes as depicted. **Do not overtighten**, as doing so may warp the lower receiver and hinder the function of the fire control group. If you need to push the fire control group components around, be ready to catch the hammer in case you accidentally release it. (Getting unexpectedly smacked by it hurts.)



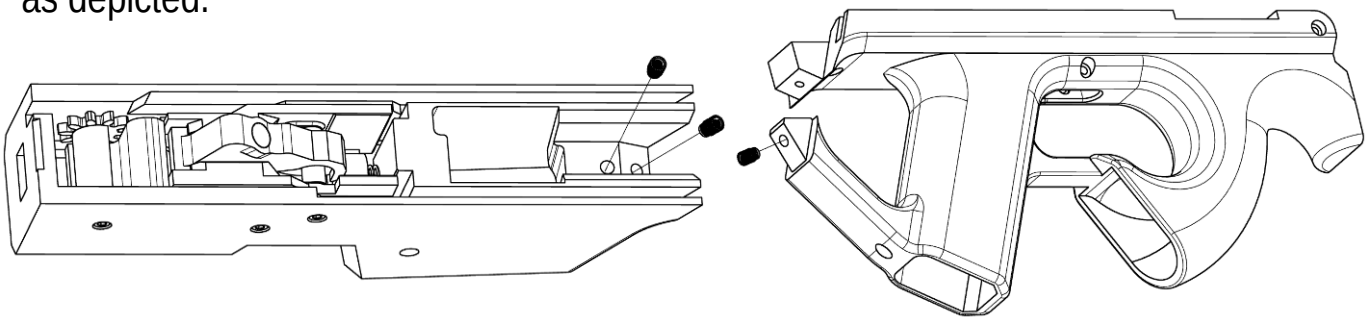
16. Insert a Ø5X25mm M3 threaded spacer into your safety drum. If you have difficulty inserting the spacer, ream the safety drum's channel with a 5mm drill bit.



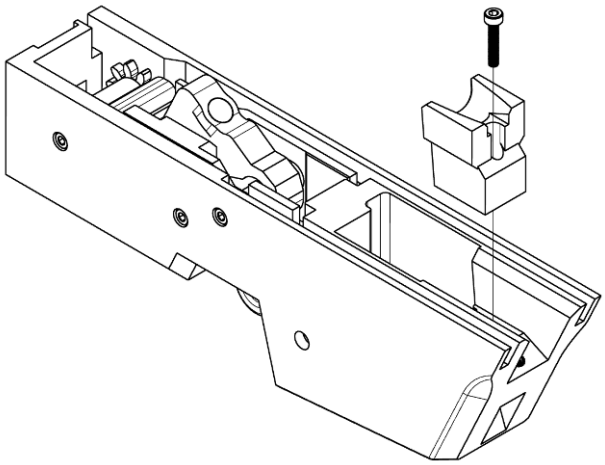
17. Insert your drum into the lower receiver, and then apply two M3X16mm screws into the holes as depicted. Again, do not overtighten. Do not worry about the orientation of the drum just yet.



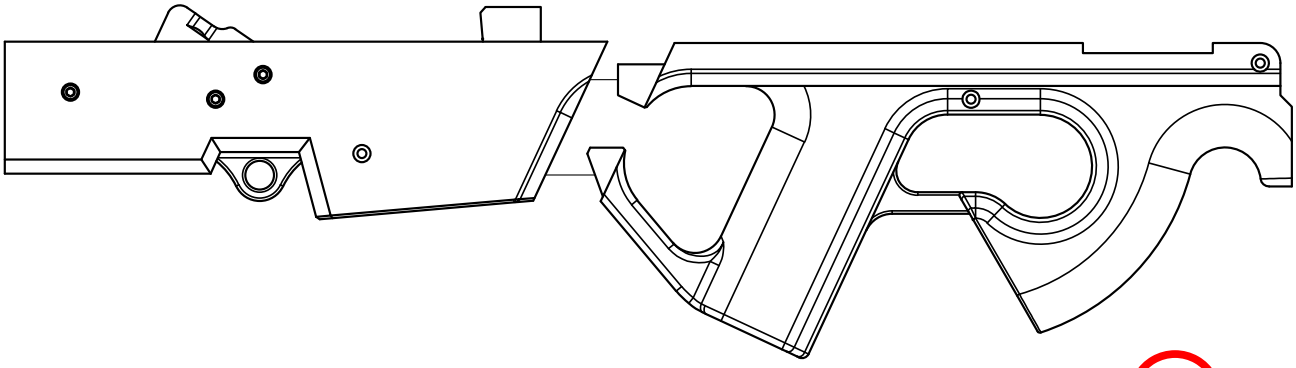
18. With a soldering iron, apply M3 brass heatset inserts into the lower receiver and grip as depicted.



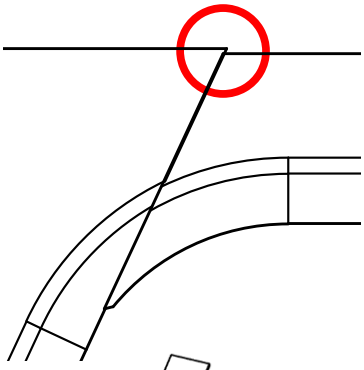
19. Install the feed ramp into the lower receiver with an M3X16mm screw.



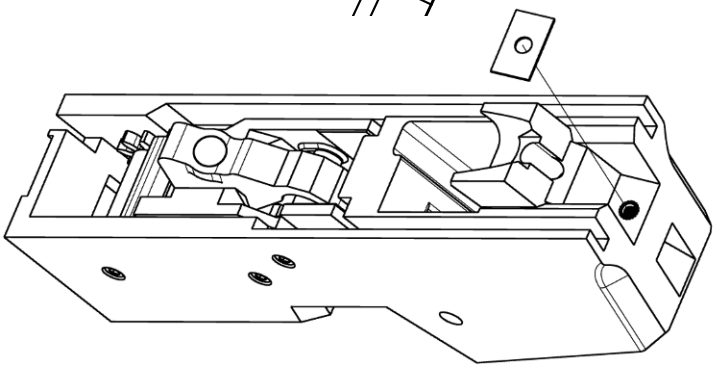
20. Test the fit of your grip on the lower receiver by placing the two parts together.

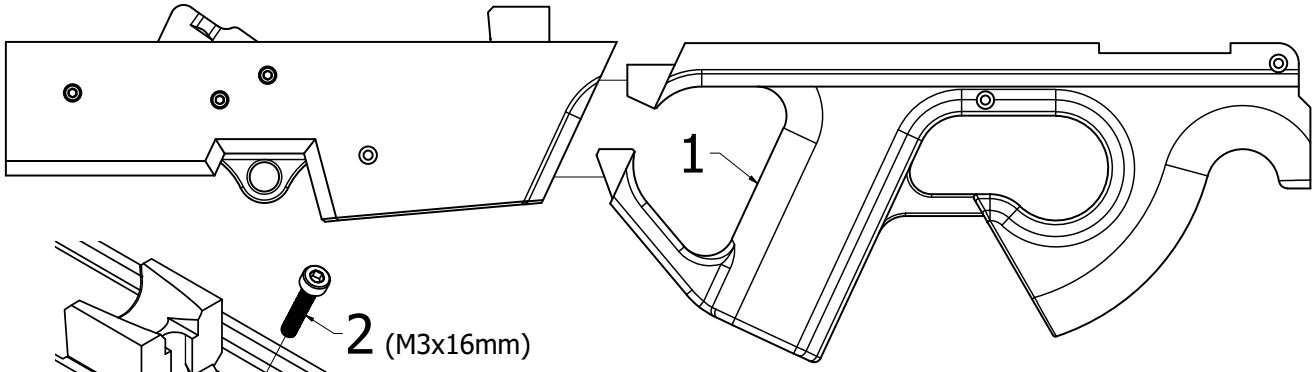


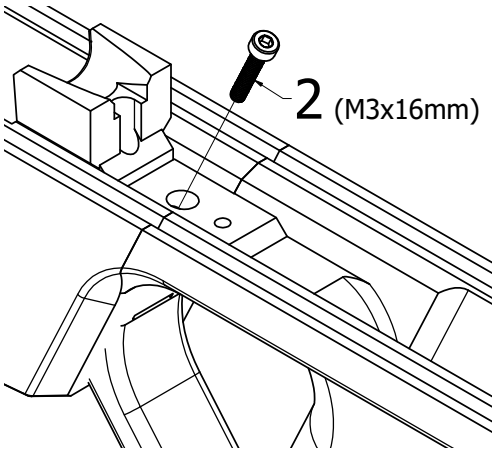
If you see a discrepancy as depicted in the image, you will need to use the grip-lower shim. This is probably because you are using a higher end or well-calibrated 3D printer.

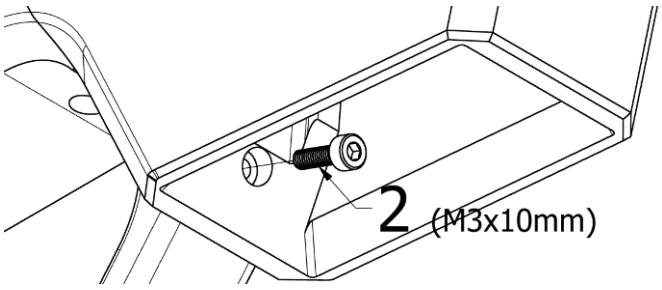


21. If you need to use the grip-lower shim, drop it into place. Fit the grip into the lower receiver and secure it in place with an M3X10mm and M3X16mm screw.

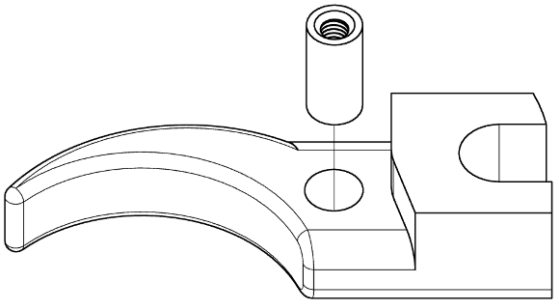




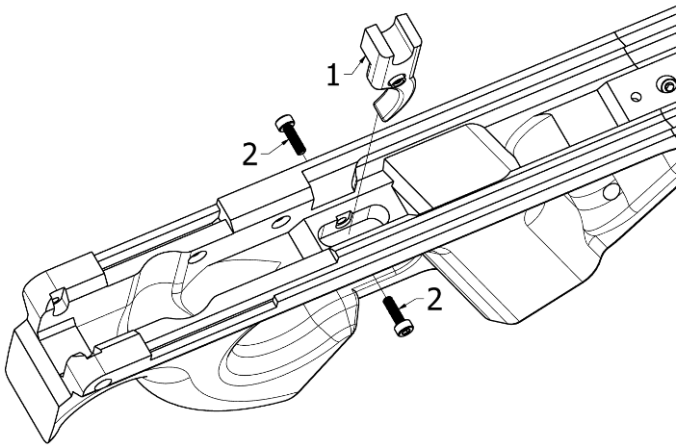




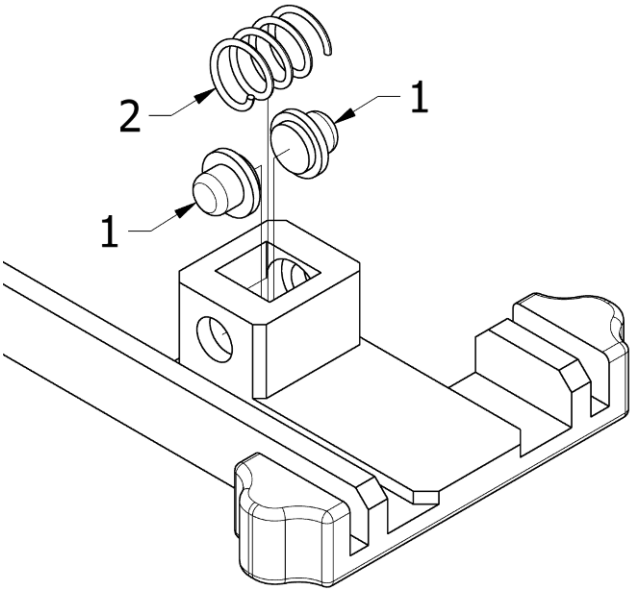
22. Insert a Ø5X10mm M3 threaded spacer into the channel on the trigger. If you have difficulty inserting the spacer, ream the trigger's channel with a 5mm drill bit.



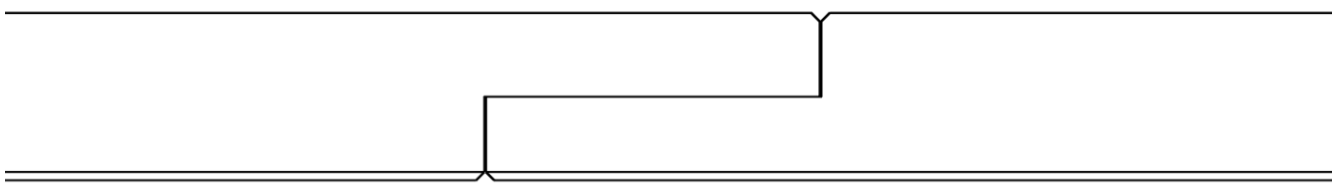
23. Insert the trigger into the grip as depicted, and then use two M3X10mm screws to secure it in place.



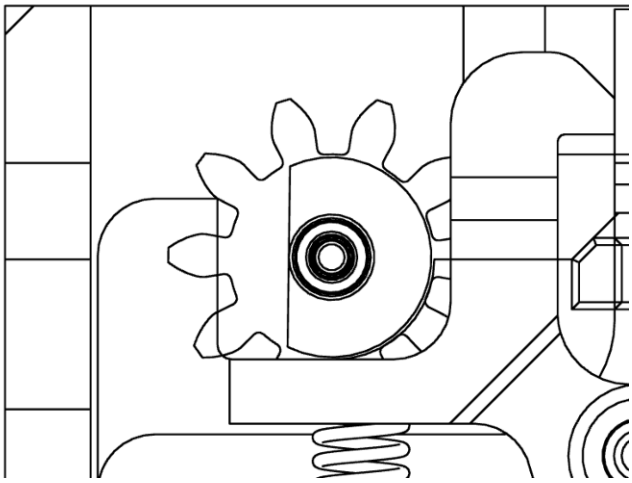
24. Cut 4 coils of your 8mm OD, 0.8mm wire spring. Insert the safety locking pegs into the front safety bar so they protrude out their channels. Then, insert the cut spring to pin them into position.



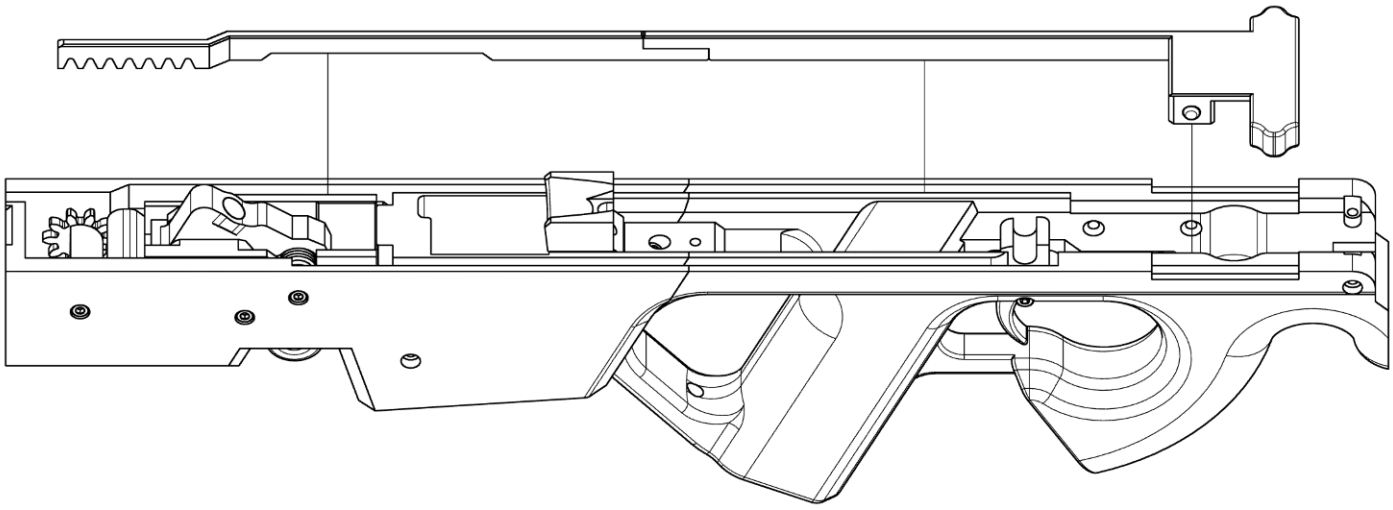
25. Use a drop of superglue to attach the two safety bars together. Once it is cured, use sandpaper to clean up any glue that oozed out.



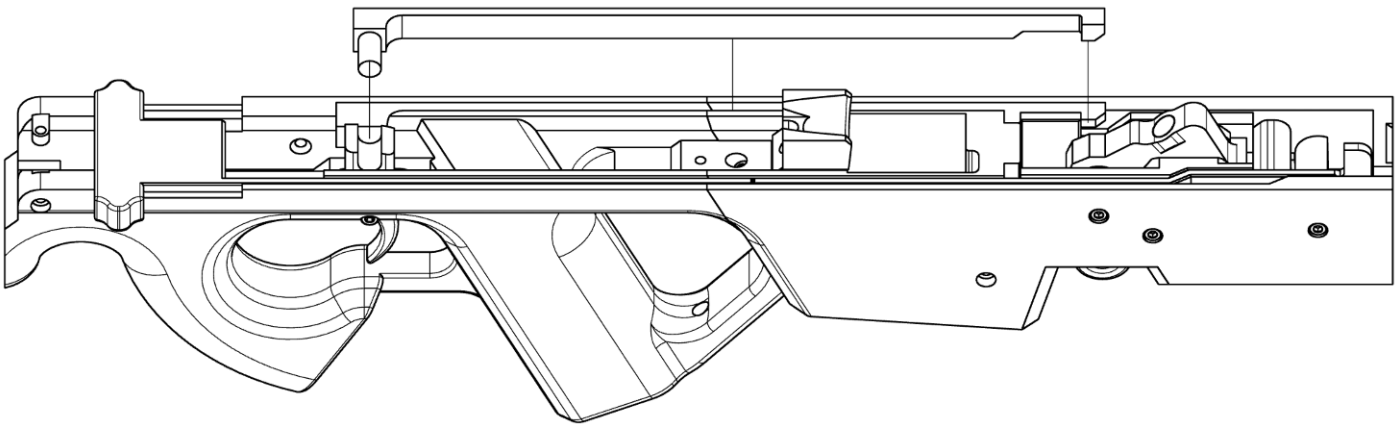
26. Orient your safety drum so the flat face is facing away from the grip, toward the rear of your lower receiver. This is the position we what the drum to be when the safety switch is in the forward (1 / fire) position.



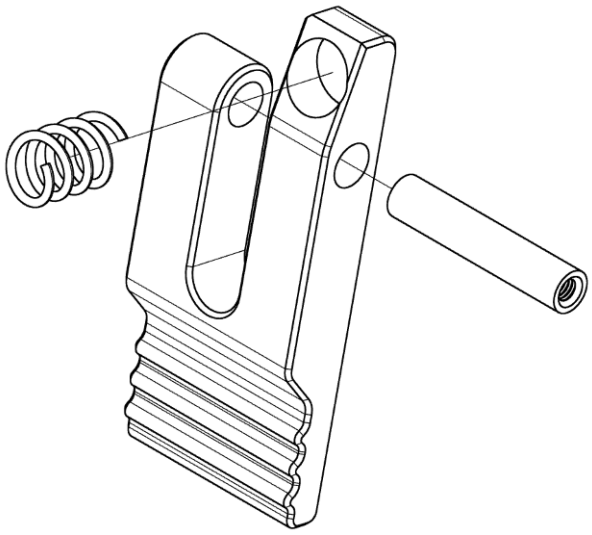
27. Without rotating the safety drum, drop the safety bar into the forward position.



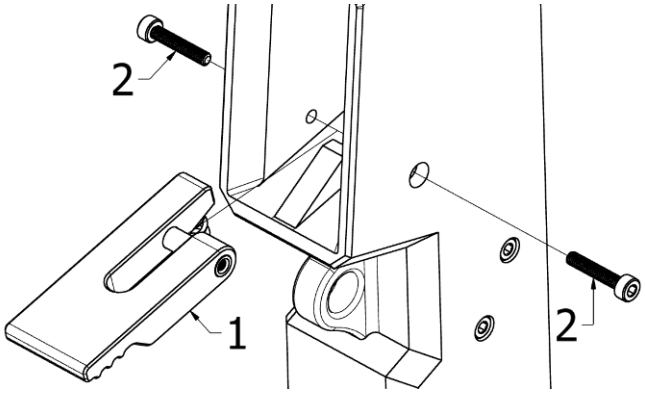
28. Drop the trigger bar into place. Be aware that from this point forward, pulling the trigger will release the hammer. Feel free to test the fire control group, but please catch the hammer with your hand so that it does not damage the lower receiver.



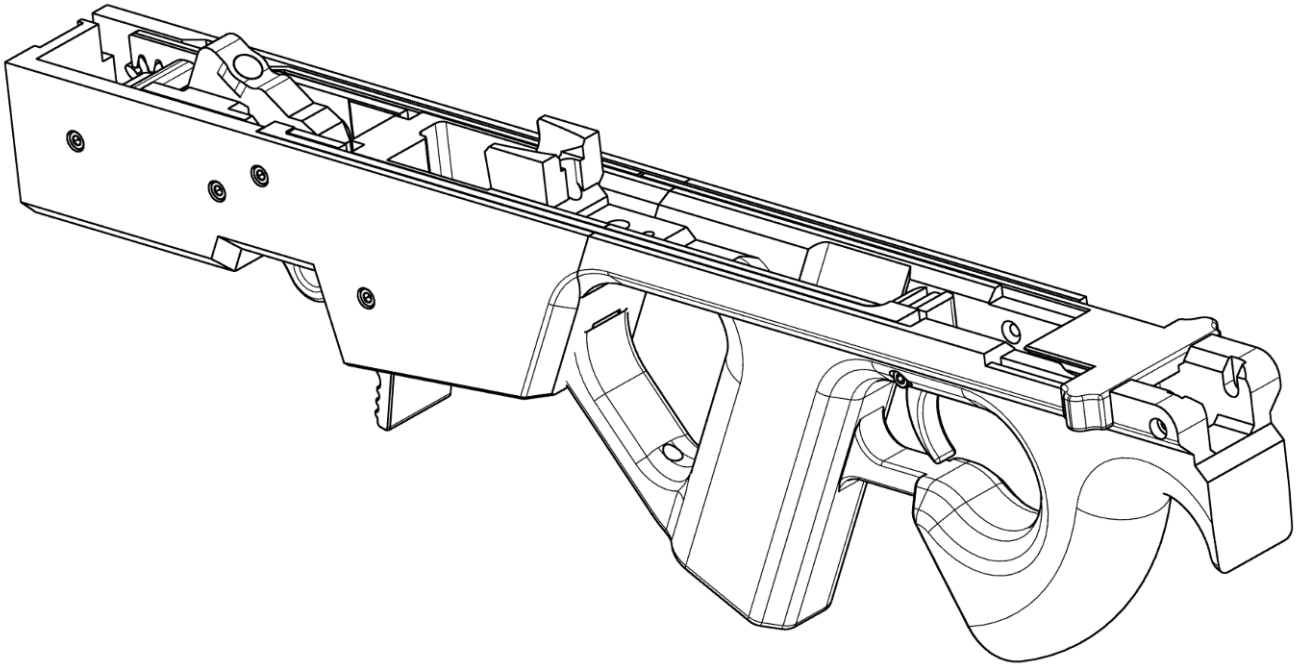
29. Cut 4 coils from your 8mm OD, 1mm wire spring. Insert a Ø5X25mm M3 threaded spacer into the channel in the magazine release, and apply the cut spring to the cavity as depicted. If you have difficulty inserting the spacer, ream the magazine release's channel with a 5mm drill bit.



30. Insert the magazine release into the lower receiver and align the spacer with the screw channels. Secure it into place with two M3X16mm screws. You will need to fight the spring pressure until the screws are at least partially installed.

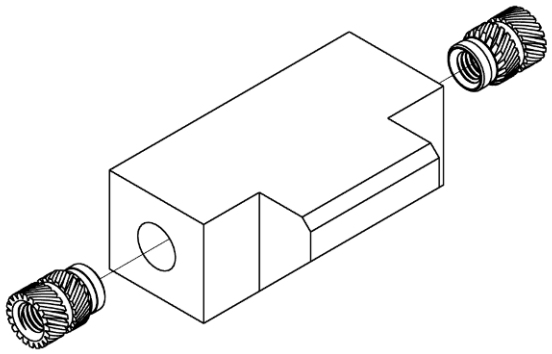


The assembly of your Urutau lower is now complete! Set it aside until it comes time for the final assembly.

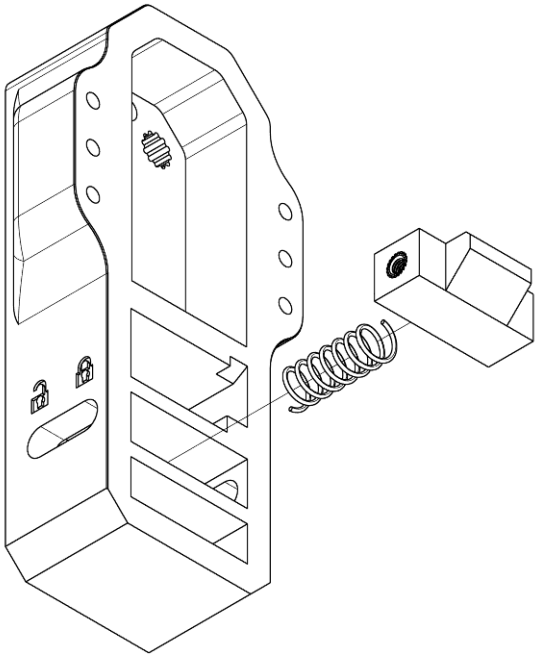


REAR CAP ASSEMBLY

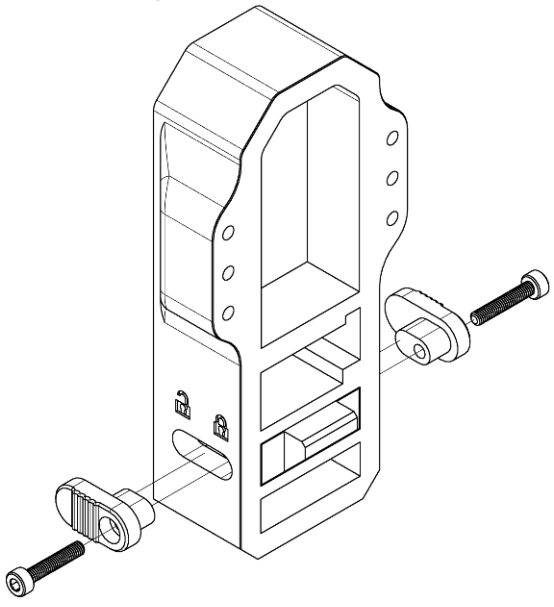
1. With a soldering iron, apply M3 brass inserts to the locking tab as depicted.



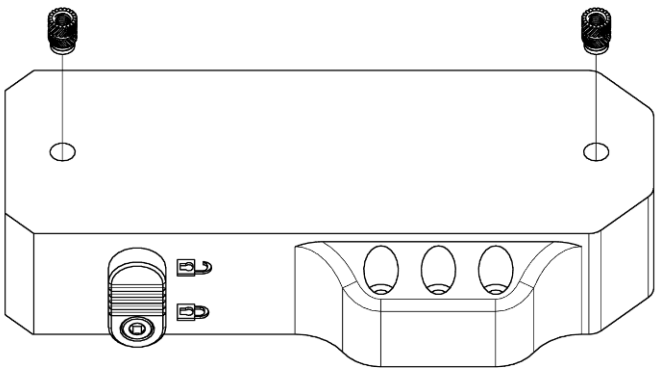
2. Cut 7.5 coils of your 8mm OD, 0.8mm wire spring. Line up the spring with the cavity on the locking tab, and insert them both into the rear cap. You will need to hold the tab down until the completion of the next step.



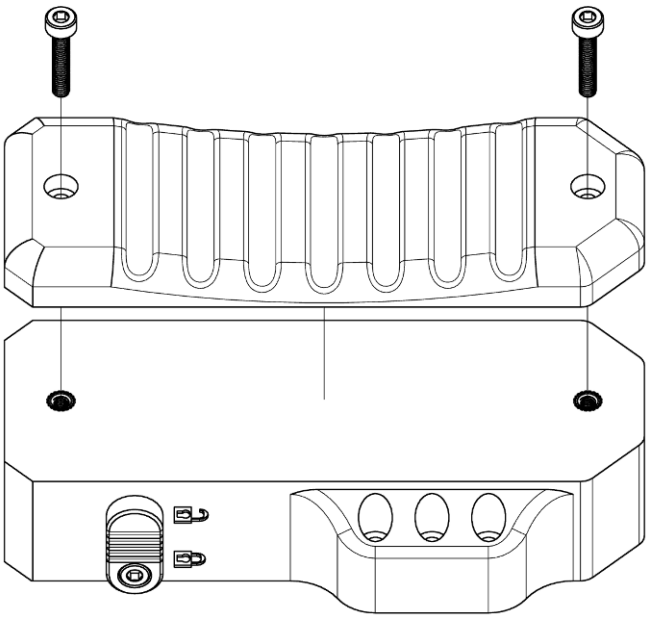
3. Secure the locking tab knobs to the locking tab through the rear cap with two M3X16mm screws.



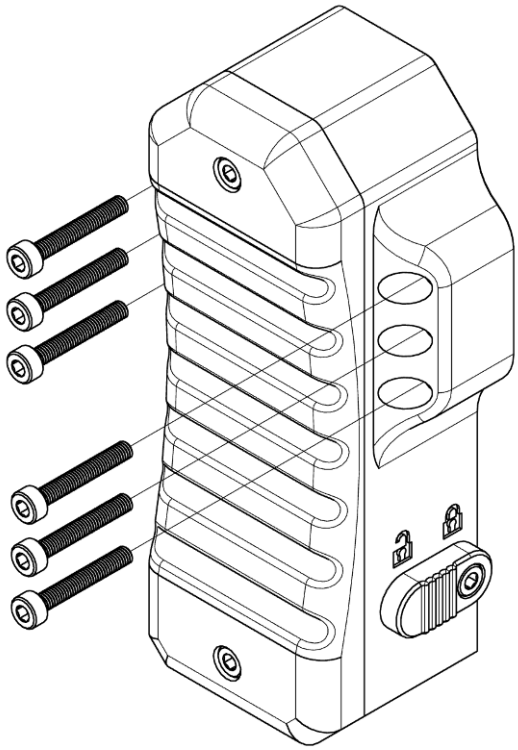
4. To create a functional firearm, this step and step 5 are recommended, but technically optional. (Skipping them will make shouldering your weapon more uncomfortable.) With a soldering iron, apply M3 brass inserts to the rear cap as depicted.



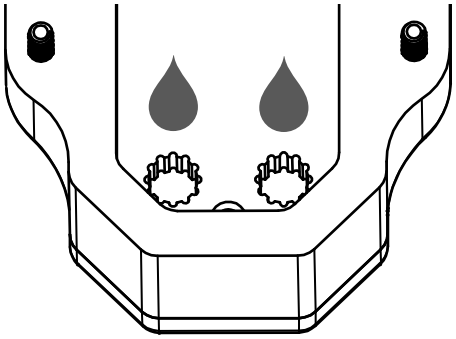
5. Secure the butt pad to the rear cap with two M3X16mm screws.

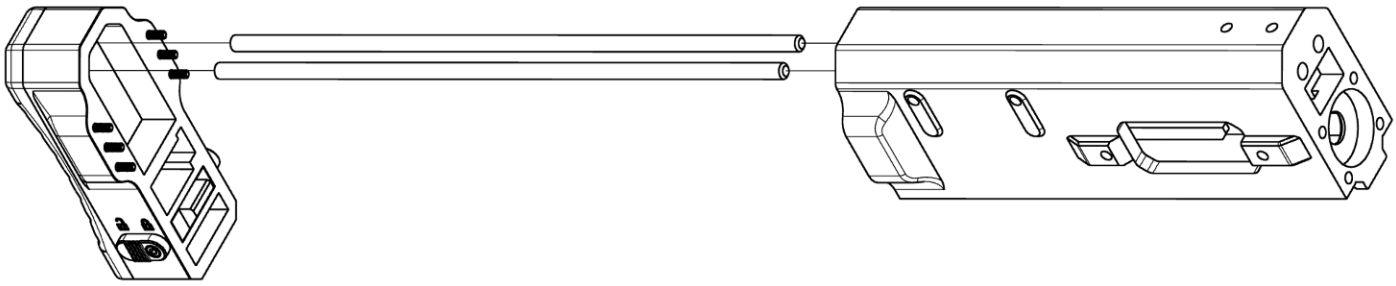


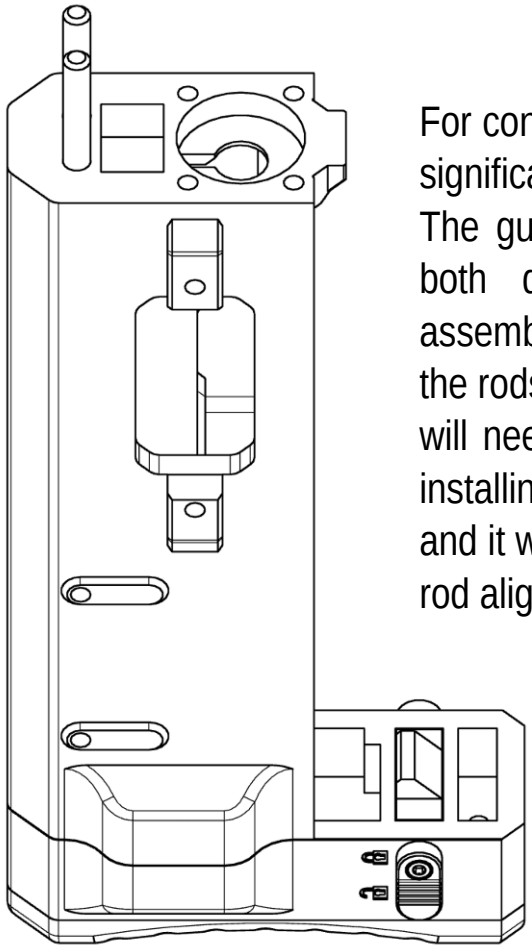
6. Insert six M3X20mm screws into their respective holes on the rear cap, making sure they are clear of print debris. This may seem unimportant, but you will need to fight a lot of spring pressure when you install the rear cap to the upper receiver later in these instructions, and you will find having the screws in position helpful.



7. Make sure you have an upper receiver on hand. (It does not need to have had any post-processing done on it yet.) Apply drops of JB-Weld into the guide rod cavities in the rear cap. Then, insert your guide rods into the upper receiver and align the upper receiver with the rear cap. (Screwing anything down is not necessary.) With a mallet or blunt object, tap the guide rods into the cavities. Lie the rear cap down so the guide rods and upper receiver point up. Make sure the upper receiver is aligned one last time, and then give the JB-Weld 24 hours to cure.

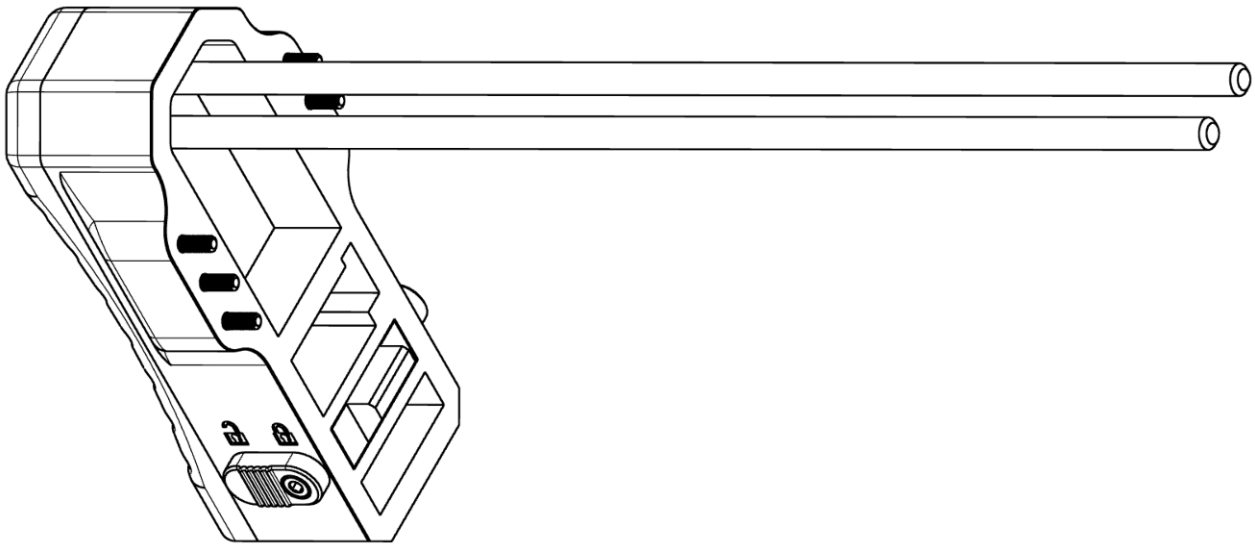






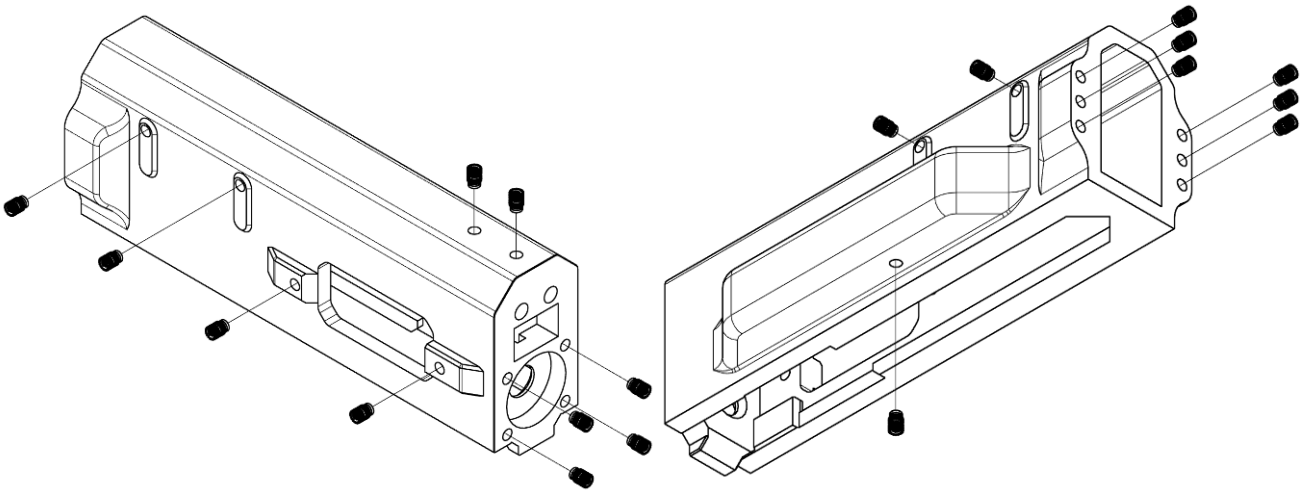
For context, the reason we require this step is to significantly simplify the final assembly process. The guide rods will have a hard stop going in both directions when the firearm is fully assembled, so the JB-Weld will not need to hold the rods in place for the long term. However, you will need to fight a lot of spring pressure when installing the rear cap to the upper assembly, and it will be easier to not have to fight the guide rod alignment as well.

The assembly of your rear cap is complete! Set it aside until it comes time for the final assembly.

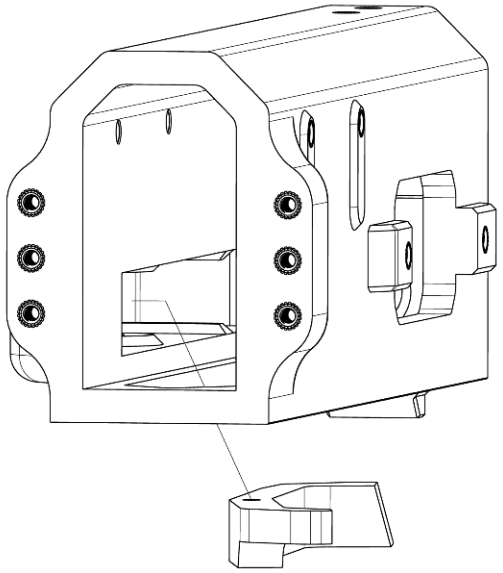


UPPER ASSEMBLY

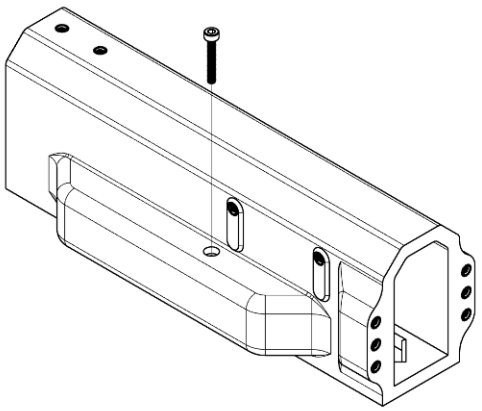
1. With a soldering iron, apply M3 brass inserts to the upper receiver as depicted.



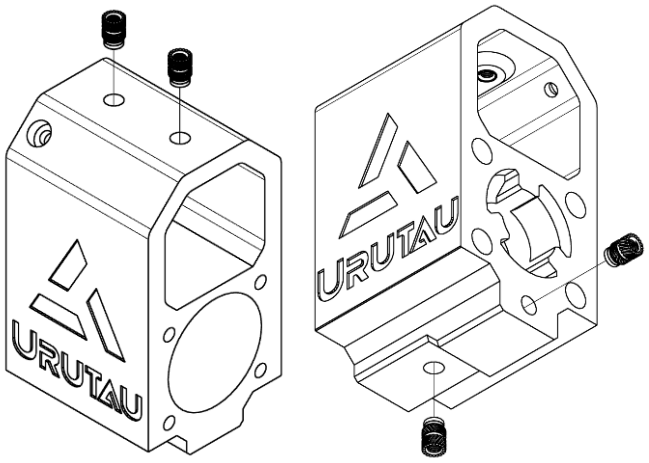
2. Insert the ejector into the upper receiver.



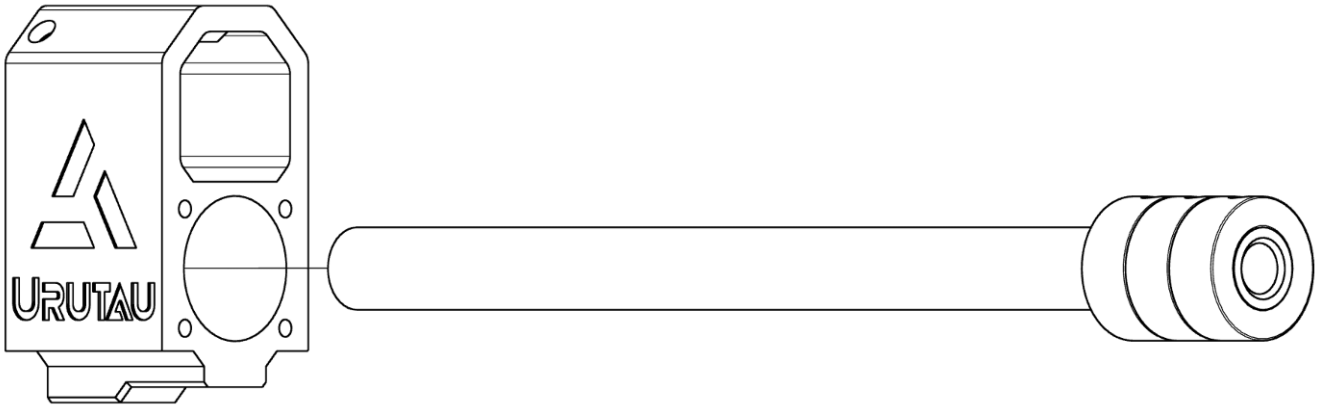
3. Apply an M3X20mm screw into the upper receiver through the ejector. You will need to carefully position the ejector so the screw slides through its channel.



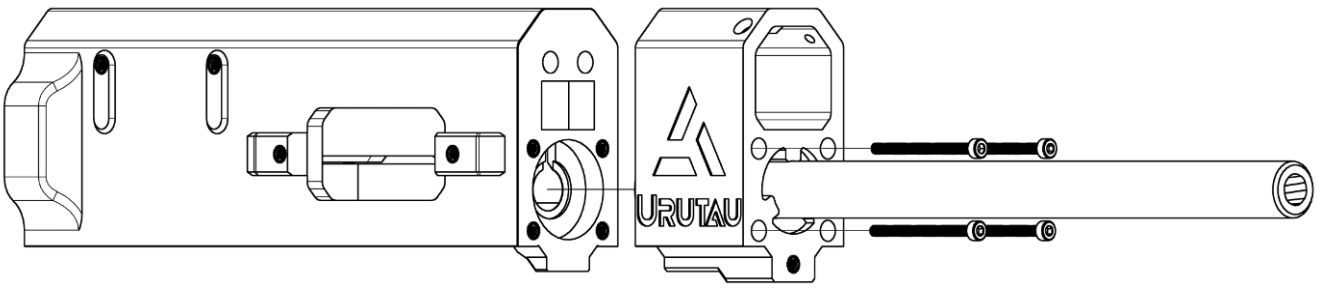
4. With a soldering iron, apply M3 brass inserts to the barrel retainer as depicted.



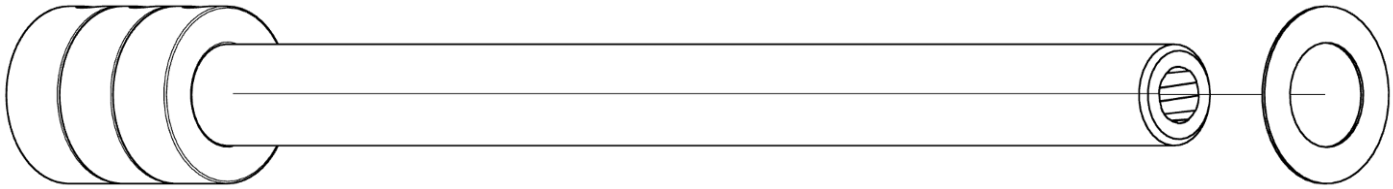
5. Insert your barrel and its shaft collars into the barrel retainer. The instructions to apply the shaft collars are in the ECM guide if you have not already.



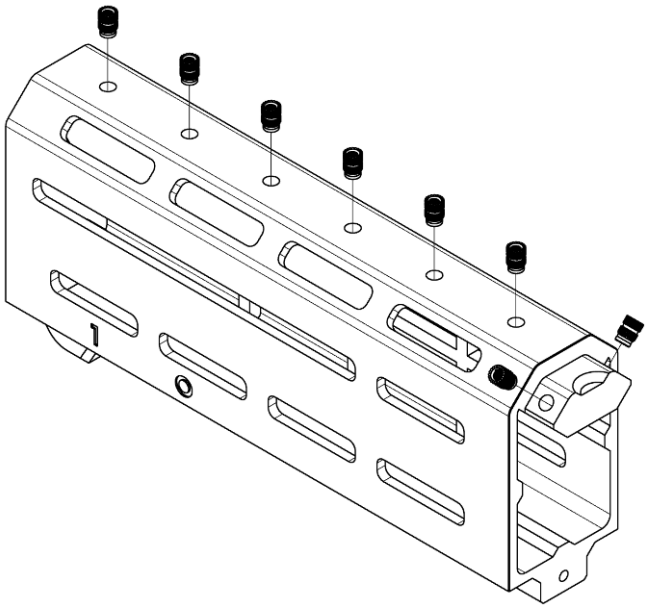
6. Secure the barrel retainer and barrel to the upper receiver with four M3X40mm screws. (This is a good opportunity to test your barrel headspacing if you have not already. Please see the headspacing section for more information.)



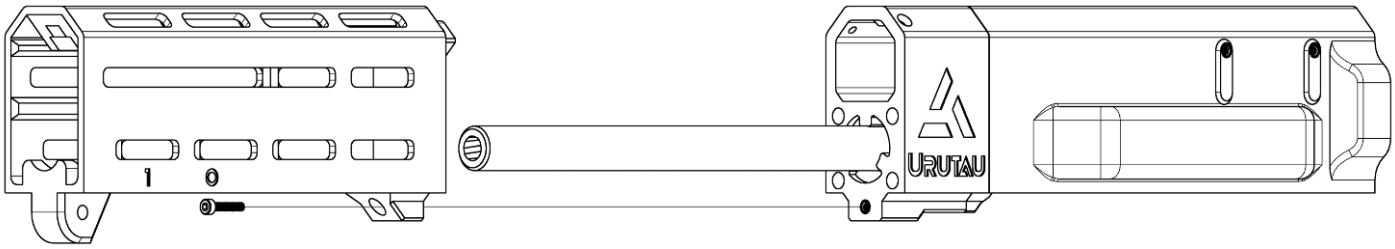
7. Try twisting and pulling your barrel as it is installed in the upper receiver and barrel retainer. If it feels sturdy, continue on to step 8. If you feel it move around, you will need to apply a shim to the inside of your barrel retainer to keep it held tightly in place. Remove the M3X40mm screws and barrel retainer from the upper receiver, and then remove the barrel from the barrel retainer. Apply the barrel retainer shim onto the barrel as depicted, and then continue from step 5.



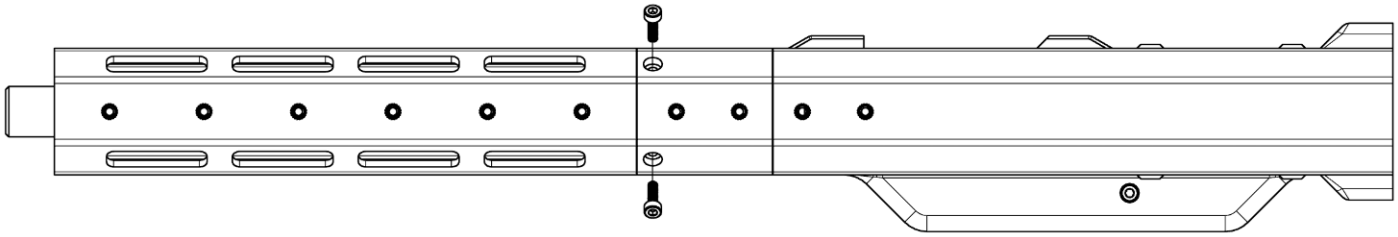
8. With a soldering iron, apply M3 brass inserts to the barrel cover as depicted.



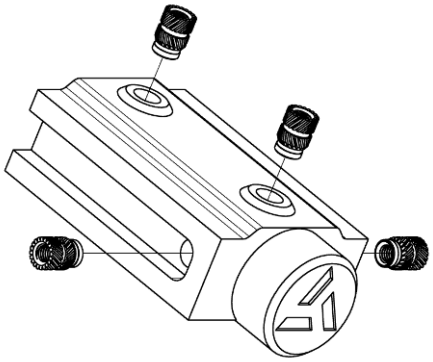
9. Attach the barrel cover to the barrel retainer with an M3X16mm screw as depicted.



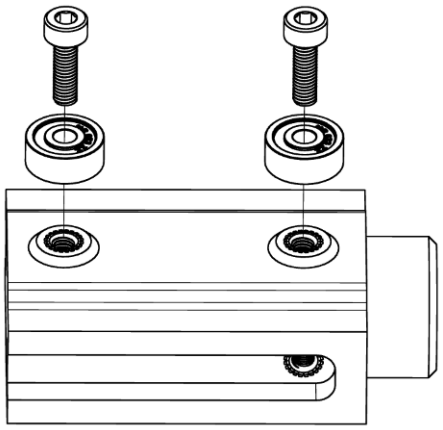
10. With the barrel cover fully inserted, insert two M3X10mm screws as depicted.



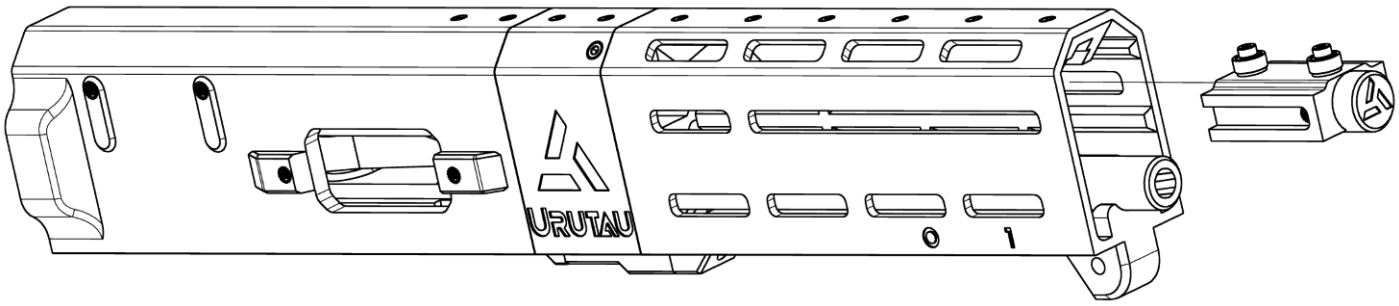
11. With a soldering iron, apply M3 brass inserts to the charging handle adaptor as depicted.



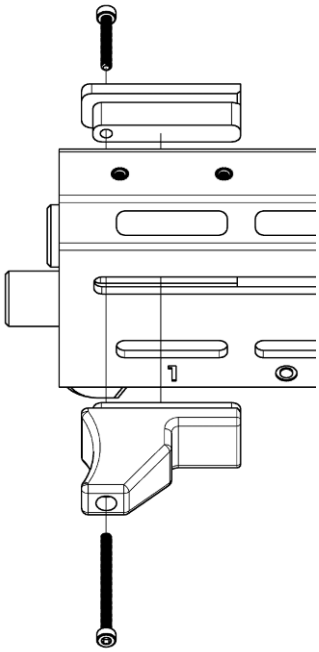
12. Use two M3X10mm screws to secure two 623ZZ ball bearings to the charging handle adaptor as depicted. They should be snug, but do not overtighten. After securing the screws down, make sure the ball bearings rotate freely.



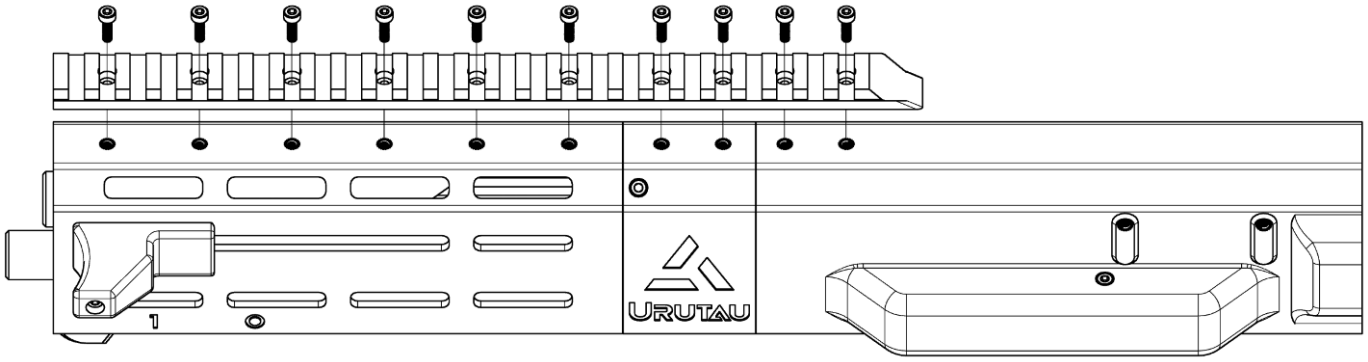
13. Insert the charging handle adaptor into the barrel cover.



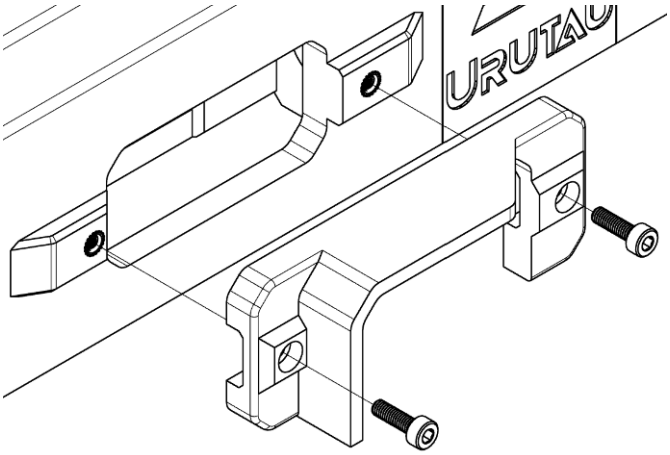
14. While making sure your charging handle adaptor is aligned properly, use an M3X40mm screw to secure your charging handle to the charging handle adaptor through the slot in your barrel cover. If you want a charging handle on both sides, do the same on the other side. If not, use an M3X20mm screw to secure the charging handle cap to the other side.



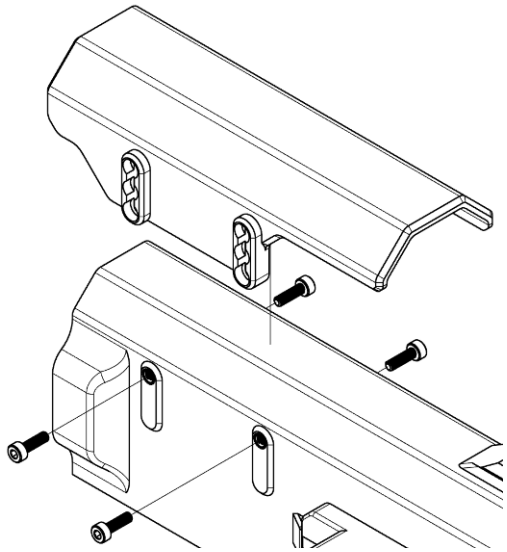
15. Secure the NATO rail to the upper assembly with ten M3X10mm screws.



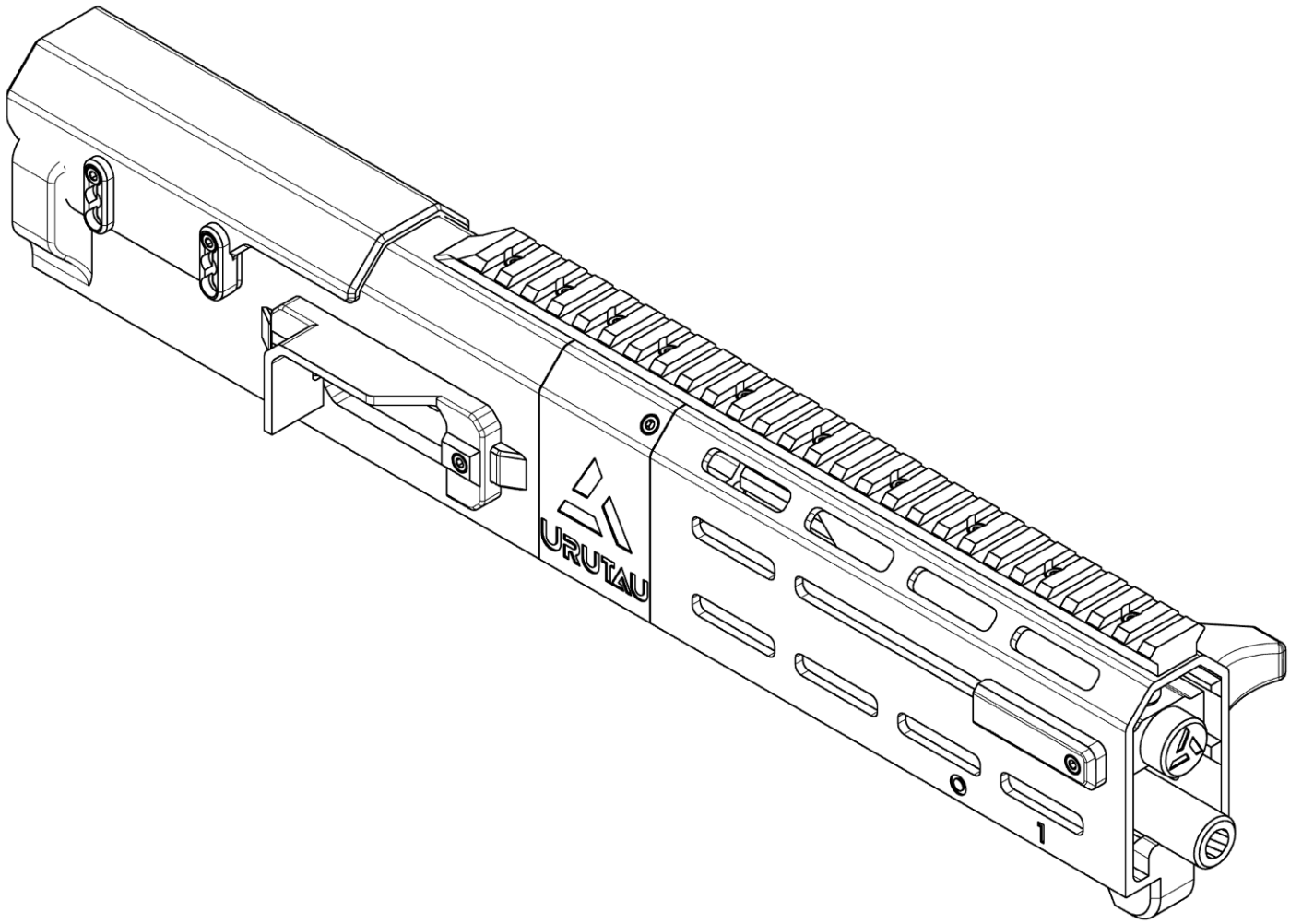
16. Secure the brass deflector to the upper receiver with two M3X10mm screws. This is optional, but it will minimize the chances of brass hitting you in the face.



17. Secure the cheek raiser to the upper receiver with four M3X10mm screws. This is optional, but it will add comfort when aiming the gun. You can adjust its height as needed at any point in the future.



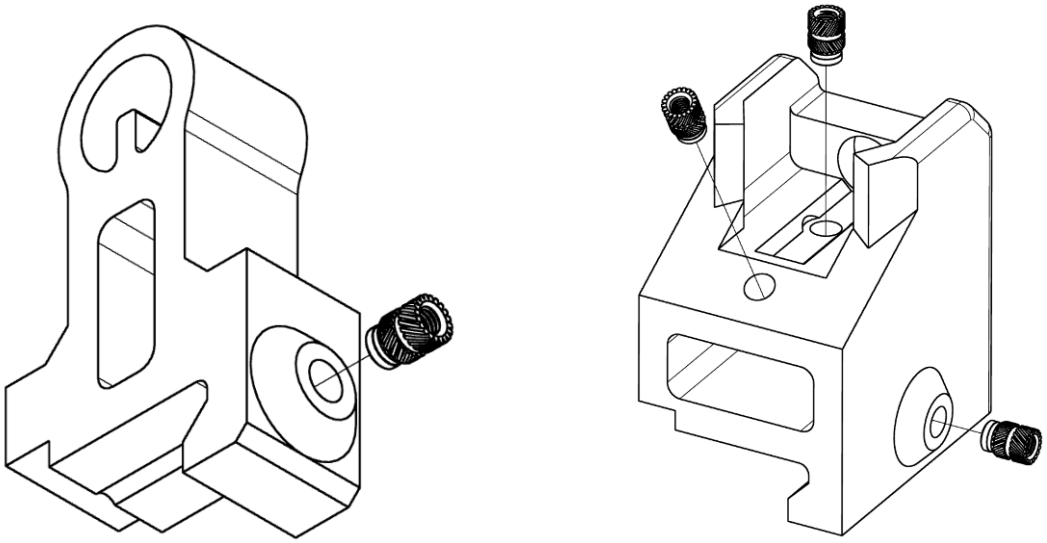
The assembly of your Urutau upper is now complete! Set it aside until it comes time for the final assembly.



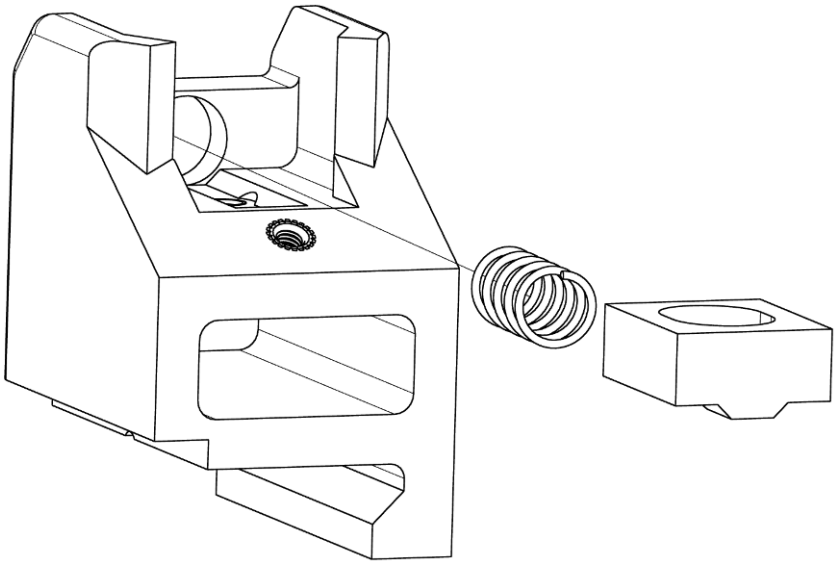
IRON SIGHTS

If you already have an optic or sight system that you would prefer to use, skip this section. If not, we strongly recommend following the instructions in this section to make sure that you are able to aim your Urutau effectively.

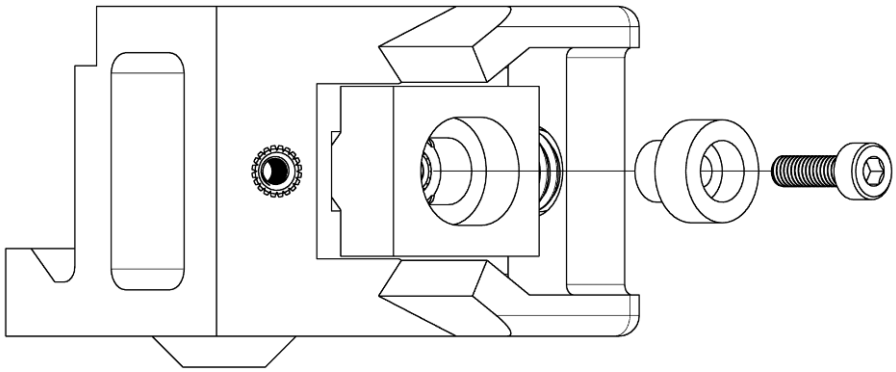
1. With a soldering iron, apply M3 brass inserts to the sight bodies as depicted.



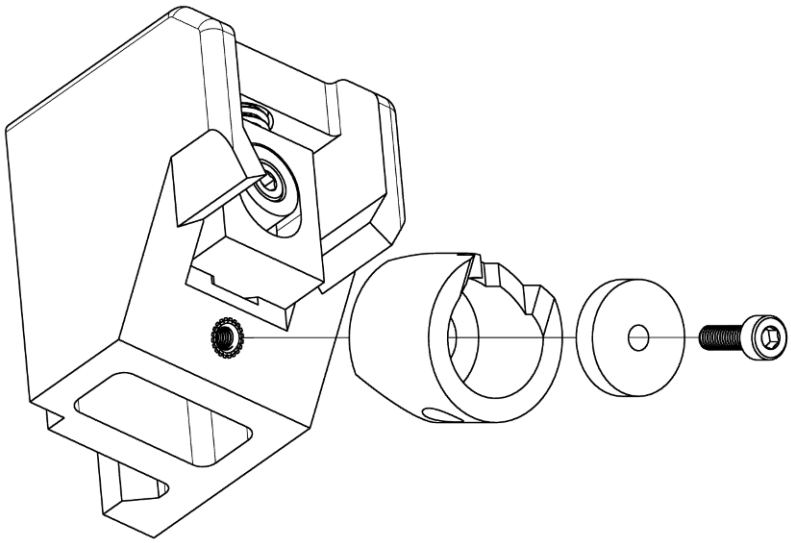
2. Cut 5.5 coils from your 8mm OD, 0.8mm wire spring. Insert the spring into its cavity in the rear sight body and press it down with the rear sight locking tab. Hold it down until you finish step 3.



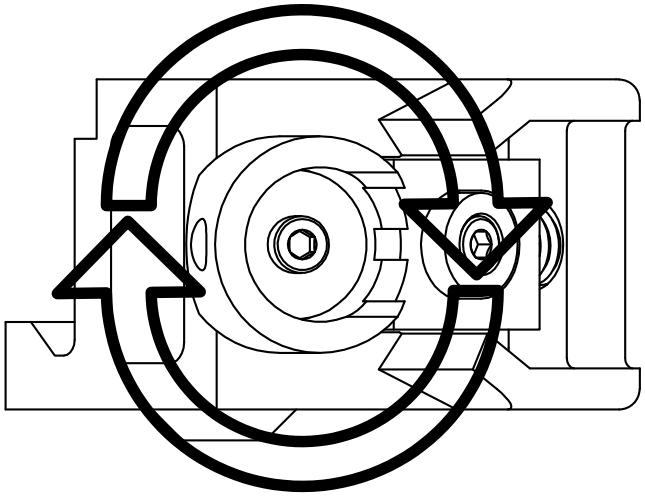
3. Secure the locking tab locking piece into place with an M3X10mm screw. This should keep the locking tab and its spring from falling out.



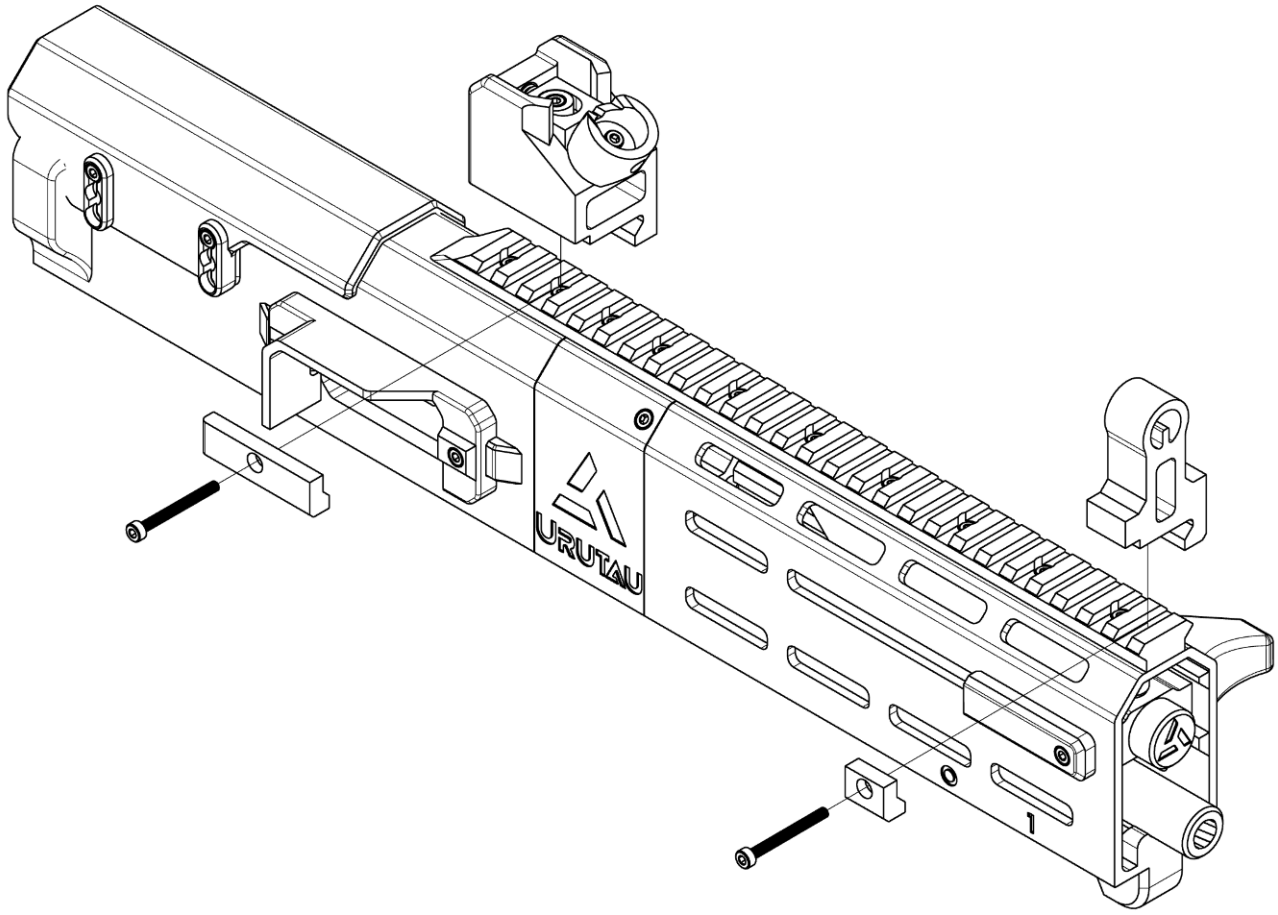
4. Use an M3X10mm screw and your drum locking piece to secure the rear drum into place.



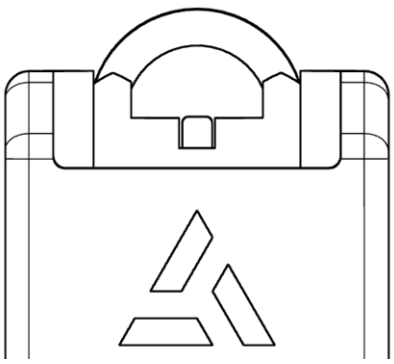
5. Test the drum by rotating it. It should lock into place in two positions.



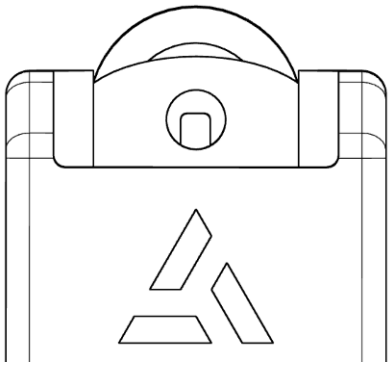
6. Apply the sights to the NATO rail with their sight clamps and M3X40mm screws. If you need to disassemble the upper receiver at any point in the future, you will need to remove at least some of the screws that attach the NATO rail to the rest of the upper, so you may choose to delay the completion of this step to any point between now and firing the Urutau for the first time.



When using the open side of the rear drum, it should be accurate to 50 meters. When using the circular side, it should be accurate to 25 and 95 meters.



50 Meters

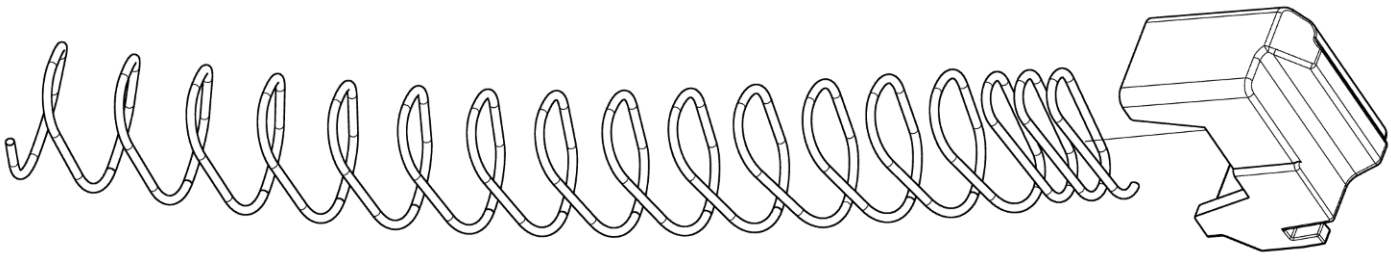


25 & 95 Meters

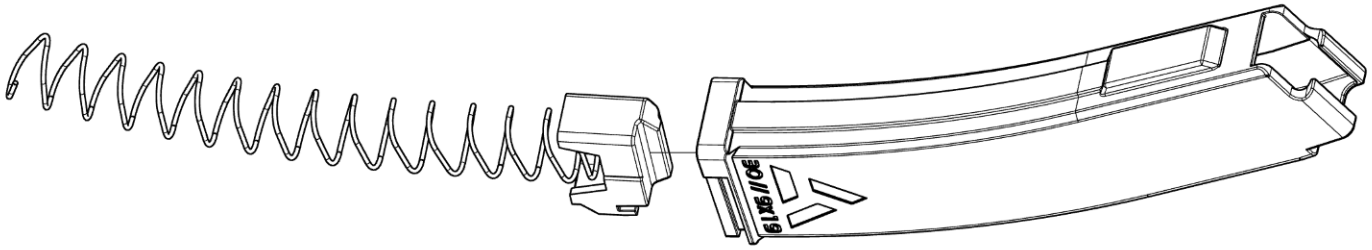
MAGAZINE ASSEMBLY

The following steps will walk you through the assembly of the Urutau's magazine. If you live in an area where 30-round magazines are prohibited, we recommend saving this step for last as it is quick, easy, and has a low likelihood of failure.

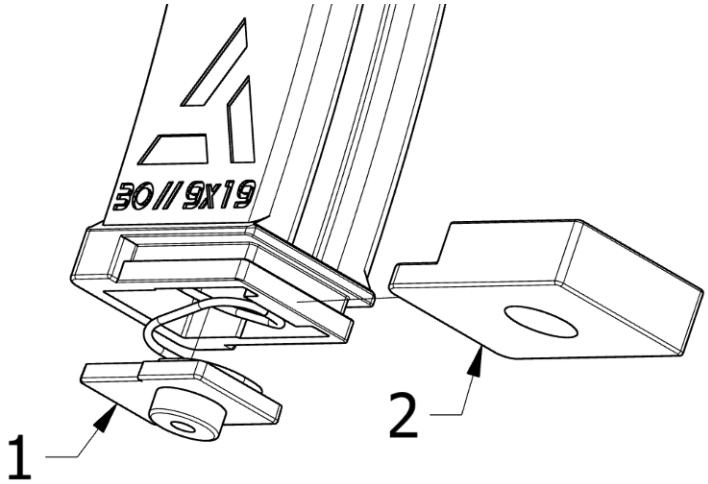
1. Apply the follower to the smaller coils of the magazine spring. There isn't much to hold it in place, so make sure it does not fall off before completing step 2.



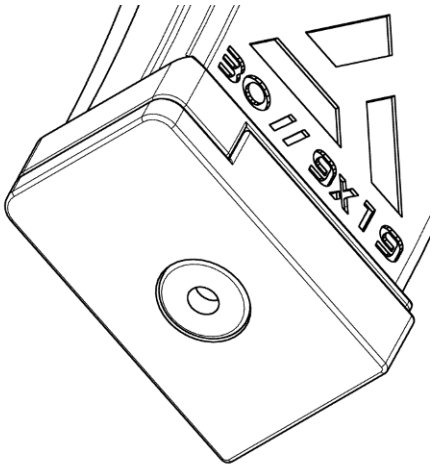
2. Insert the spring and follower into the magazine body as far as it will go.



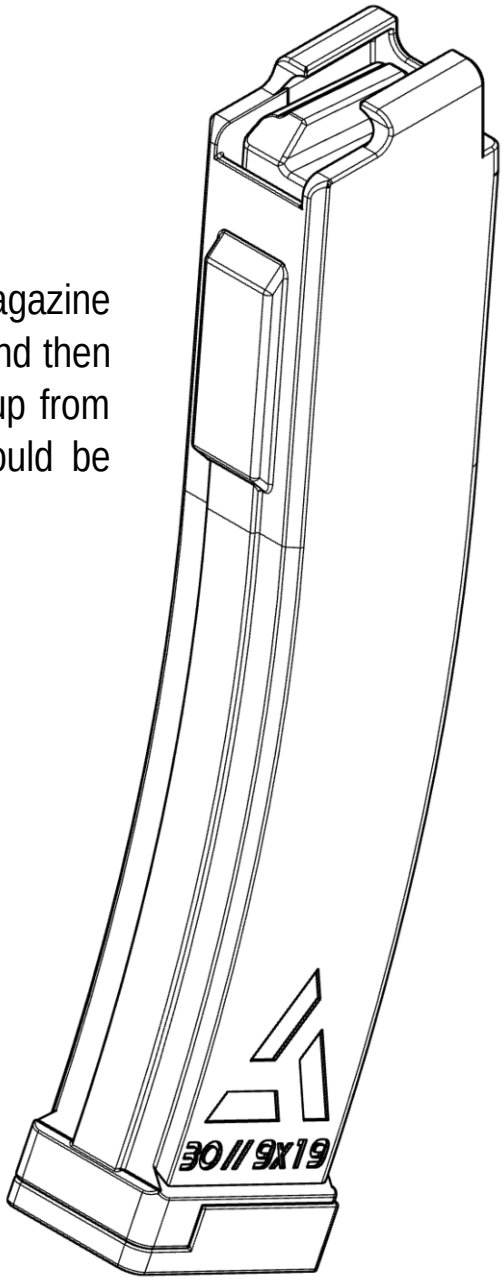
3. Press the magazine lock plate into the protruding spring and into the magazine. Then, slide the magazine base plate into place. It should fit tight, and you may need a hammer to tap it into place.



4. Make sure the peg on the magazine lock plate fell into the hole in the magazine base plate. If not, use a pointy tool to push it around until it does.



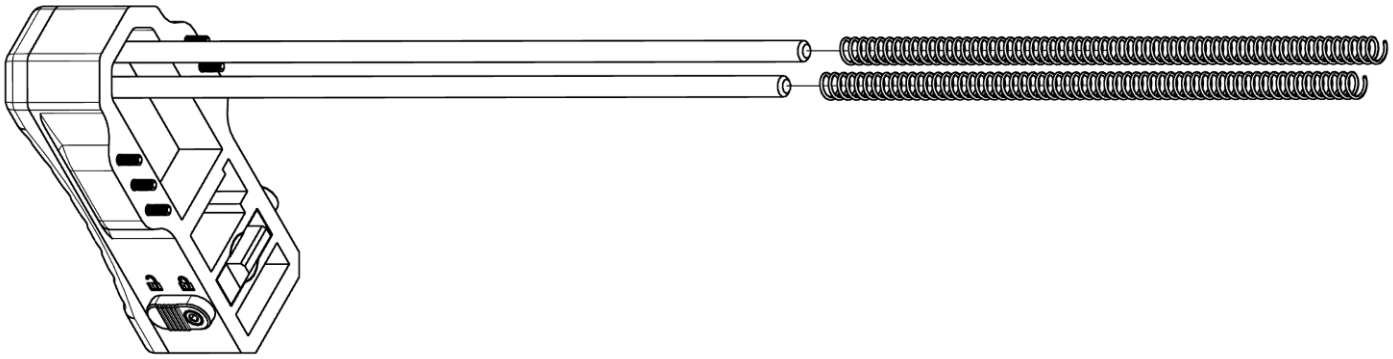
5. This step is optional, but ensures the quality of your magazine by dry-cycling it. Insert 30 rounds into the magazine and then push them all out with your thumb. If they all come up from the magazine without hesitation, your magazine should be good to go!



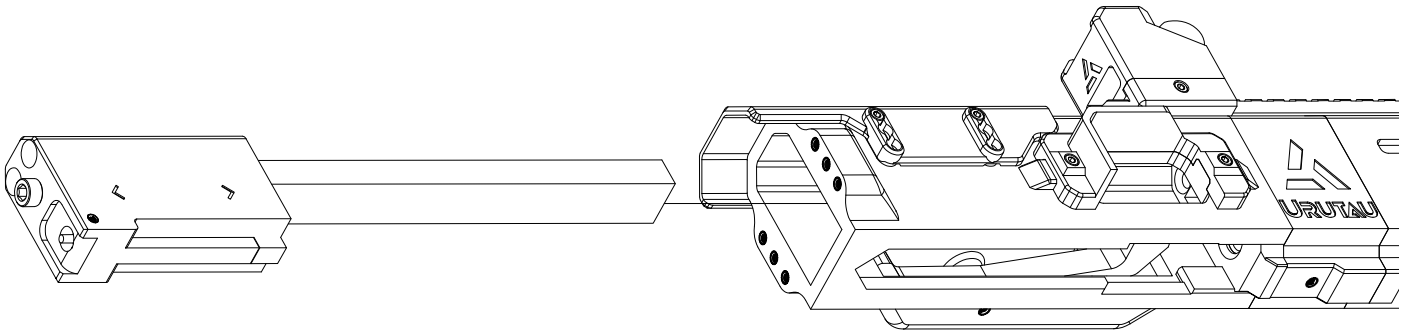
Repeat this process for as many magazines as you would like, though, again, be aware of potential cumulative consequences if you are in a legally precarious circumstance.

FINAL ASSEMBLY

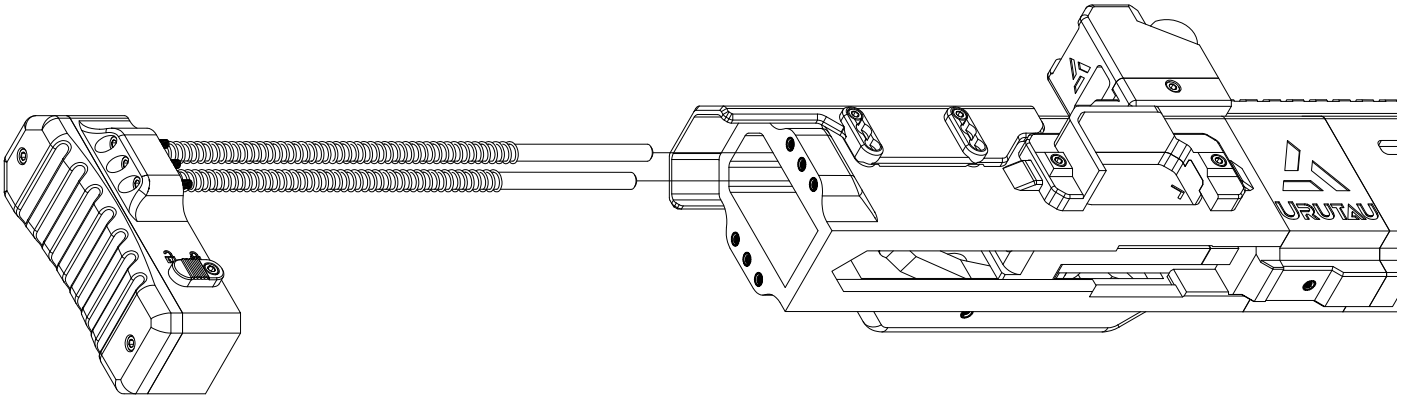
1. Cut two separate 220mm (uncompressed) lengths of your 65mn, 8mm OD, 1mm wire spring. Apply the springs to the guide rods.



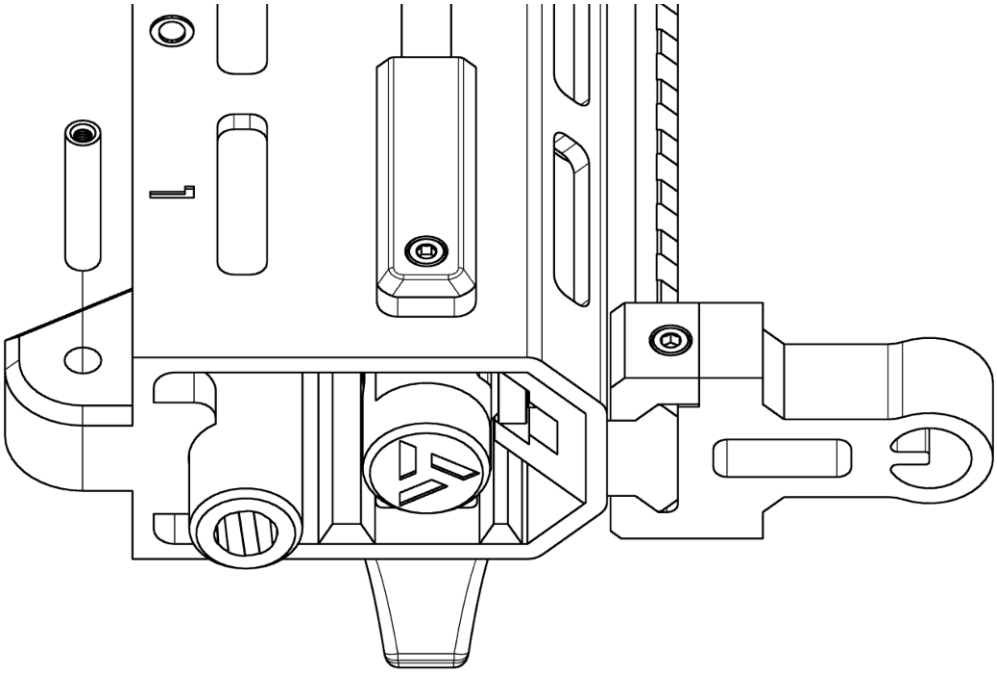
2. Drop the bolt carrier assembly into the upper receiver. You will need to make sure the tail-end of the ejector is out of the way when doing so.



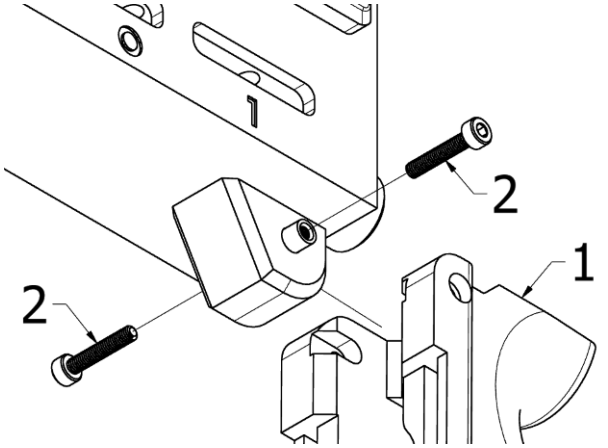
3. This step will be tricky. Insert your guide rods into the channels in the bolt carrier assembly. Push down on the rear cap with one hand so that the rods go through the channels in the bolt carrier assembly and upper receiver. With the rear cap flat against the surface of the upper receiver, screw at least one of the M3X20mm screws into place. Past this point, you don't need to hold the rear cap assembly in place, but please screw the remaining M3X20mm screws tightly. From testing, the Urutau only needs two screws in place for it to function, but for safety reasons, we recommend utilizing all six.



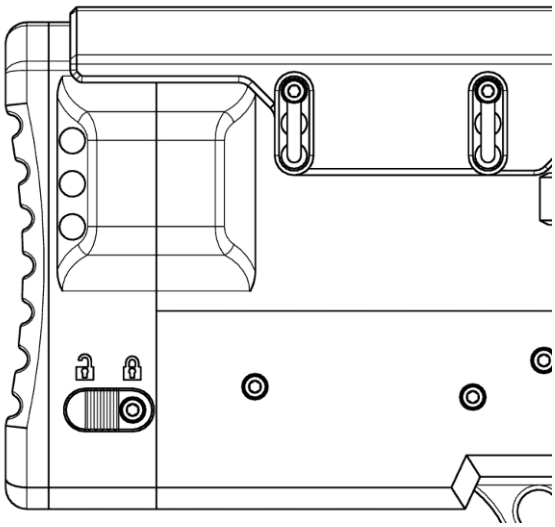
4. Insert a Ø5X25mm M3 threaded spacer into the barrel cover as depicted. Use a 5mm drill bit to ream out the hole if the spacer is too difficult to insert.



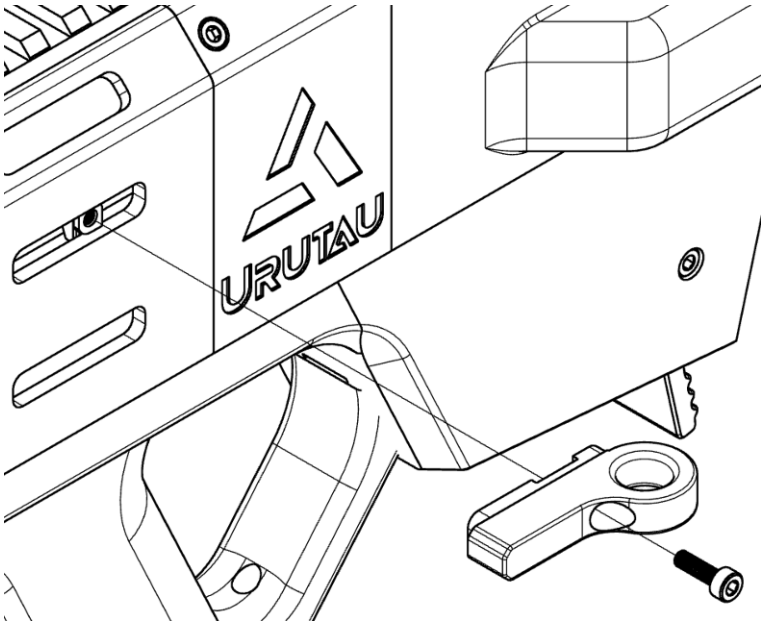
5. With the spacer inserted into the barrel cover, insert that spacer into its position in the grip. Use two M3X16mm screws to attach the grip to the barrel cover.



6. Pivot the gun closed. The locking tab should click into place.

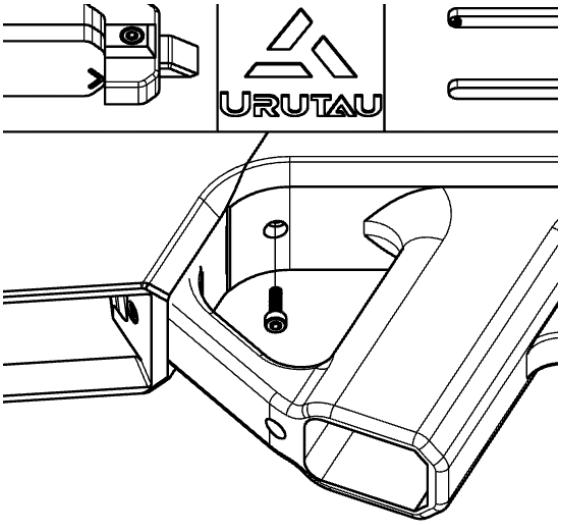


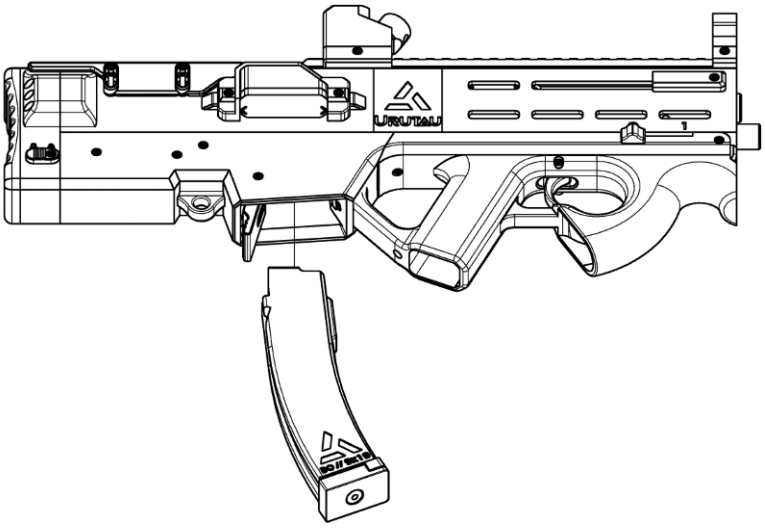
7. Optionally, if you would like to attach a sling, use an M3 T-Nut and M3X10mm screw to attach the sling mount.



8. Inside the thumbhole, apply an M3X10mm screw to hold the gun together. This is optional but recommended.

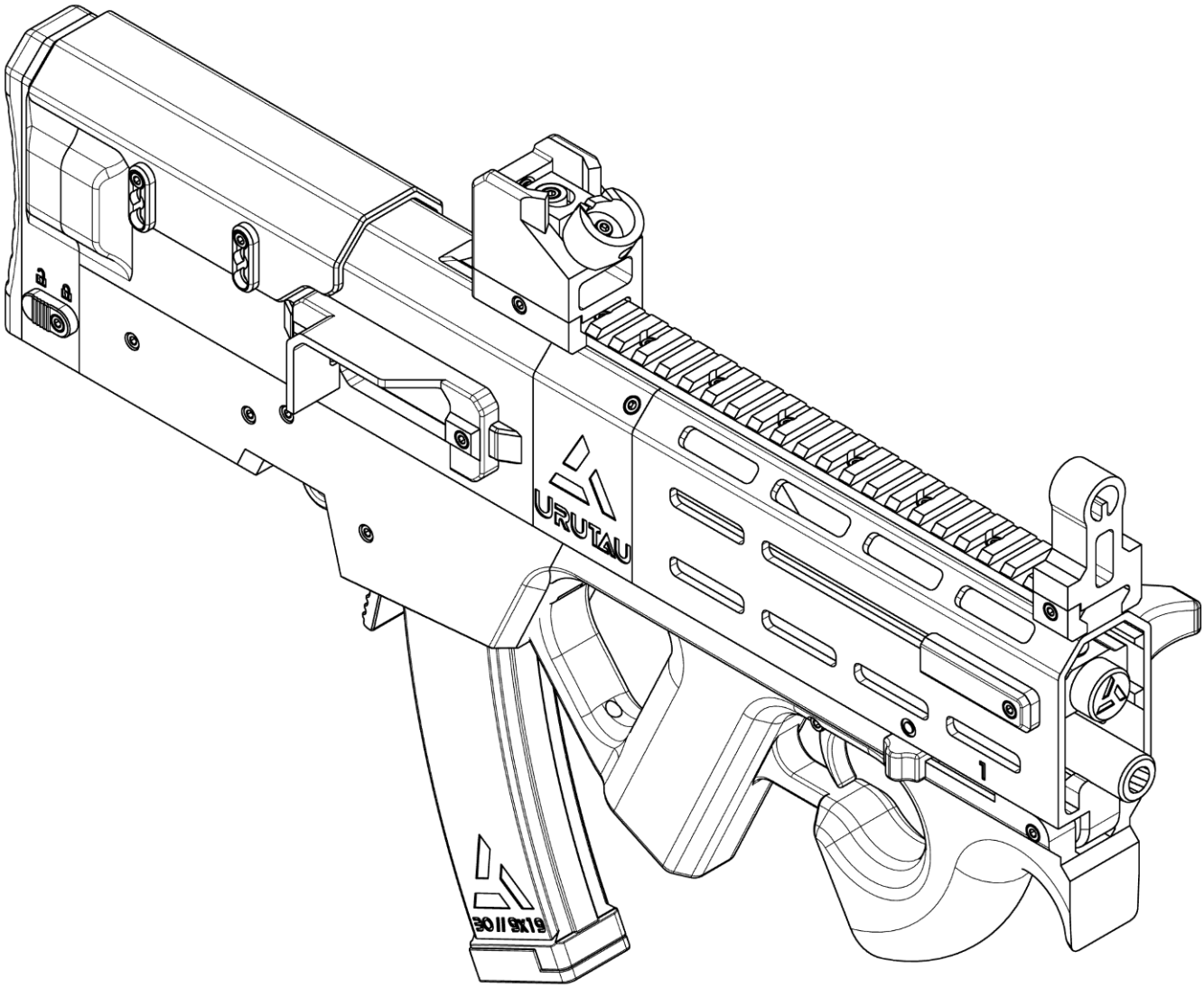
   The reason we recommend inserting this screw is that the upper and lower will split when a loaded magazine is inserted, possibly resulting in feeding issues. If your gun feeds okay without it, then it shouldn't be necessary.





9. Optionally, insert a magazine and admire your hard work!

The assembly of your Urutau is now complete!



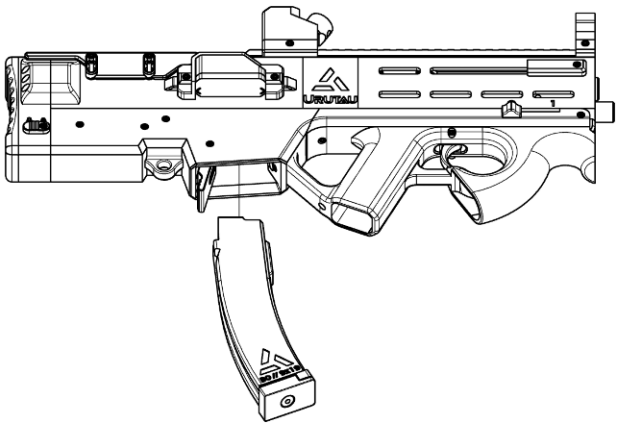
FUNCTION TESTING

DRY FIRING

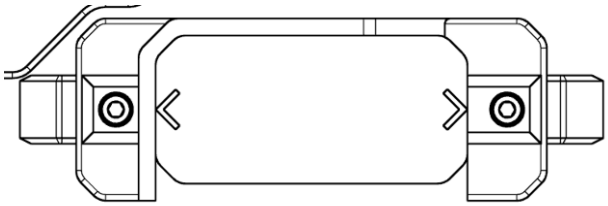
1. Make sure there is no magazine in the gun. Pull the charging handle back as far as it will go, and look inside the chamber to make sure it is empty. Release the charging handle. The bolt should come forward quickly and make a loud “smack” sound. If it does not, your gun will not cycle. In such a case, please check your recoil springs and guide rods that they are clean, lubricated, and gliding properly.
2. Insert a magazine into the magazine well. The magazine release should make a “click” sound when the magazine is locked into place. When the magazine is locked into place, pull down on the magazine. It should not come out. If it comes out, it was not inserted completely or there is something wrong with the magazine release. Push the magazine release forward and pull down on the magazine. The magazine should come out of the gun. It may feel a little stiff coming in and out, but it will become easier as the magazine breaks in. If this test fails, make sure your magazine release is installed correctly and that nothing is obstructing the magazine.
3. Make sure the chamber is empty. Move your safety switch to the rear position (0 / safe) if it is not there already. Try pulling the trigger. The trigger should feel stiff, and nothing should happen. If the hammer is released, check that your safety drum is clocked appropriately. The flat face should point toward the front of the gun when the safety switch is in the rear position. If it is not, adjust it accordingly.
4. Move your safety switch to the forward position (1 / fire). Try pulling the trigger. The hammer should release, making an audible “click” sound. If it does not, make sure that your fire control group housing spring is aligned properly, and check that the flat face on your safety drum is pointing toward the rear of the gun when the safety is in the forward position. If the hammer successfully released when pulling the trigger, hold the trigger down, pull the charging handle back as far as it will go, release the charging handle, and then release the trigger. When you release the trigger, the trigger should spring forward, and you should hear another audible “click” sound. If no sound is audible, check the inside of the gun to see if the hammer is still attached to the disconnector. If it is, you may need a stronger fire control group housing spring.

LIVE FIRING

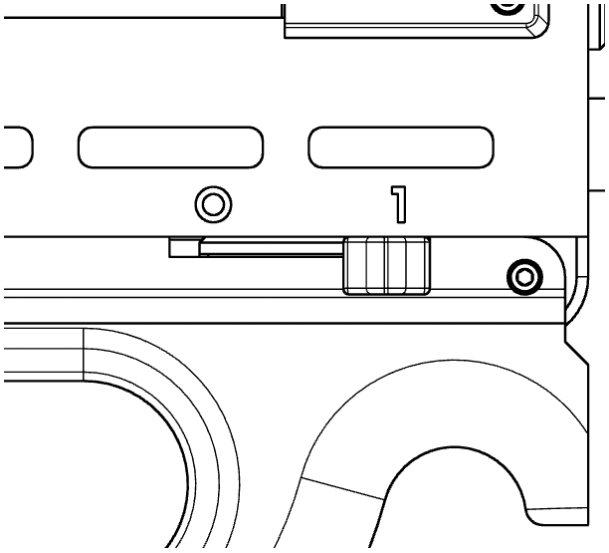
1. Load a magazine with as many cartridges as you want, up to 30. Insert the magazine into the magazine well.



2. Pull the charging handle back as far as it will go and release it. Check that the bolt went into battery by making sure that the arrows appear in the ejection window as depicted.



3. Move your safety switch to the forward position (1 / fire).



4. Pull the trigger. The gun should go off with each trigger pull. Repeat this process until you are satisfied.

MAINTENANCE

Like all firearms, the Urutau will need maintenance after use or long-term storage. While its beta testers fired a collective couple thousand rounds through the gun, we do not have the time or resources to test it further. For this reason, this section is intended to provide shorter-term maintenance advice, some from experience, and some speculative. Common sense should take precedence.

1. Inspect your magazine feed lips for cracking when loading them. Cracked feed lips may result in double feeding from the magazine. From experience, it is difficult to tell how much use a magazine can take before this happens, but replace the magazine body if its lips appear cracked or significantly damaged.
2. Inspect your fire control group components, your hammer especially, every 300 rounds. The surface of your hammer that contacts the bolt carrier housing when cycling will wear out the fastest. From testing, the fire control group components will likely survive much more than 300 rounds if printed correctly, possibly thousands. However, if reliability is critical and you have the resources to do so, replace the printed fire control group components, or at minimum, the hammer, every 300 rounds.
3. Clean and lubricate your firing pin after shooting or after leaving your Urutau in storage for a while. Debris will coat your firing pin after shooting. If too much debris accumulates, your firing pin may seize up. It is not clear from testing how much it takes for this to happen, but we recommend cleaning and lubricating your firing pin after shooting when possible.
4. Clean and lubricate your guide rods every 300 rounds or after leaving your Urutau in storage for a while. Debris accumulation occurs more slowly on the guide rods than the firing pin, but poorly lubricated guide rods will cause feeding issues.
5. Periodically inspect the bottom of your bolt carrier housing where it contacts the hammer. This area will also wear out more quickly due to the friction it has to endure. We don’t know at what point it may start to cause issues, but replace the bolt carrier housing if it appears significantly worn.

TROUBLESHOOTING

Hammer does not release on trigger pull.

1. Make sure the fire control group housing spring is not bent up.
2. Make sure the fire control group screws are installed.
3. Make sure the fire control group screws are not overtightened.

Hammer does not reset when releasing the trigger.

1. Remove the fire control group and clean any debris in the lower receiver's floor.
2. Make sure the fire control group screws are not overtightened.
3. Experiment with a stronger fire control group spring.

Cartridges fail to feed.

1. Ensure the screw between your grip and barrel retainer is reasonably tight and still in place.
2. Make sure that the guide rod channels in your plastic bolt carrier housing were reamed as specified in step 1 of the bolt carrier assembly process.
3. Make sure your guide rods are clean and lubricated.
4. Dry cycle your magazine to ensure that it is cycling properly. This is especially important if you are using a DIY magazine spring.
5. Experiment with stronger recoil springs.

Casings fail to eject.

1. Ensure the ejector is not significantly worn or damaged.
2. Ensure there is nothing blocking the ejection port.

The gun melted when I tried shooting it quickly.

1. Starting at room temperature, the gun should handle up to 60 rounds without having to pause and let it cool down, but anything beyond that is testing limits.
2. Experiment with more temperature-tolerant filaments.

The case head is separating, leaving part of the casing in the chamber.

1. Your headspacing is probably too shallow, meaning that your bolt is slamming the cartridge deeper into the chamber than it can go. If you are using an ECM barrel, check the barrel with the headspacing gauge in the ECM directory.
2. The ammunition may have been made by sloppy reloading or with low-quality brass.

The screws are walking in certain areas.

1. Apply a drop of threadlocking compound on the screws and set them back in place. Do not overtighten them where the instructions caution you not to.

The firing pin strikes the primer too lightly for it to detonate.

1. Make sure the gun is loaded. (Yes, I have made this mistake.)
2. Make sure your firing pin is clean and lubricated. Too much debris accumulation on the firing pin will cause it to seize up.
3. Your headspacing may be too deep, meaning that your cartridge has excessive wiggle room when the gun is in battery. If you are using an ECM barrel, check the barrel with the headspacing gauge in the ECM directory.
4. The ammunition may have been made with low-quality or stubborn primers.

Trigger pull feels crunchy.

1. If the gun has been fired, remove the fire control group and clean any debris in the lower receiver's floor.
2. If the gun is relatively new, break it in by dry-firing.

Trigger pull is too heavy.

1. You may experiment with a lighter fire control group housing spring, but that may result in hammer reset failures.
2. Grow some muscles, weakling!

TECHNICAL ASPECTS & DESIGN CHOICES

The purpose of this section is to provide contextual information that explains the rationale behind the Urutau's design choices. While understanding this information is not essential to manufacture the Urutau, we believe that readers will find it enlightening and beneficial for future advancements.

In the design of the Urutau, we aimed to establish new standards for privately manufacturable firearm designs or to uphold established, successful standards. Guidance from George Dmitrieff's Submachinegun Designer's Handbook significantly influenced the design choices for the Urutau, and we recommend reading his book if this section interests you.

CARTRIDGE CHOICE

The Urutau, like many privately manufactured firearms, operates on a straight-blowback mechanism. While this mechanism is relatively simple to implement, it restricts our options for compatible cartridges. Fortunately, the Urutau is optimized for the widely available and versatile 9x19mm Luger/Parabellum cartridge. Regarded as the most common pistol and submachinegun cartridge worldwide, the 9x19mm Luger cartridge offers an optimal combination of performance, availability, and compatibility with blowback-operated firearms like the Urutau. This standardized cartridge offers accessibility for builders across many developed and semi-developed countries and maximizes the firearm's usability across various operational situations.

BARREL LENGTH AND OVERALL LENGTH

Based on data from Ballistics by the Inch, the optimal barrel length for the 9x19mm Luger cartridge is around 10 inches (254mm). The Urutau is designed with a default barrel length of 250mm, providing adequate hand-clearance from the muzzle blast while also most efficiently utilizing energy from the 9x19mm cartridge. In case the user desires to comply with American firearm restrictions without needing to register their Urutau, the included ECM guide accommodates 16-inch (407mm) barrels. Compared to a shorter, 4.5-inch (114mm) barrel, the Urutau's longer barrel length

enables it to utilize approximately 22% more energy from the cartridge. The bullpup configuration of the firearm contributes to its compact overall length (OAL), allowing for a shorter firearm while maintaining a barrel length that efficiently utilizes the energy of the 9x19mm Luger cartridge. This design optimization balances both maneuverability and ballistic performance when compared to other firearm designs.

PRICE

Improving upon the current state of the art presents a challenge. The cost to build an FGC-9, including the printer, hardware, and materials for the first gun, amounts to around $600, with subsequent builds totaling approximately $200 each. The Urutau features a bolt designed to eliminate any welding requirements, eliminating the need for welding hardware and reducing the initial price by roughly $100, depending upon the builder's location. The estimated minimum cost to construct a Urutau stands at around $500 for the initial gun, including printer and hardware, and around $200 for each subsequent gun.

MATERIAL SOURCING

One of the concerning weaknesses of the FGC-9 and Partisan 9 is that, although minimally, they still rely on the acquisition of less-regulated gun parts for the build. For example, they require AR-15 fire control group springs. Of Dmitrieff's design objectives, this was the biggest challenge we experienced when designing the Urutau. The temptation to utilize parts which are difficult to standardize, privately manufacture, or substitute was a constant distraction. However, our choices to utilize easily accessible, less-firearm-related components improve supply chain resilience and enhance the builder's operational security when sourcing materials. The only areas of significant vulnerability remain the thick-wall hydraulic pipe used to manufacture the barrel and ammunition or ammunition components. Future development in either of these areas is highly encouraged and appreciated.

SCALABILITY

This is a non-issue for most Urutau builders, however with all necessary machines, tools, and materials on hand and the time to treat the project like a full-time job, the Urutau is manufacturable in less than a week. With extra printers, multiple competent

volunteers or employees, and a healthy supply chain, the Urutau's manufacturing process is easily scalable.

BOLT CORE BARS

The FGC-9 posed a challenge to its builders when processing bolt core bars, particularly due to the round bars being a challenge to weld in the correct orientation. Additionally, cylindrical cores are less efficient in filling the space inside the upper receiver. The Partisan 9 and Urutau address this issue, the Urutau by utilizing square rectangular bars as the bolt core, being 20x12mm or ½"x¾" rectangular steel bar stock. This standardized selection offers worldwide compatibility, accommodating both imperial and metric standards and simplifying material sourcing for builders.

WELDLESS CONSTRUCTION

Unlike the FGC-9 and Partisan 9, which rely on welded bolt cores, the Urutau utilizes a bolt that is screwed together, significantly reducing both build costs and the required skill of the builder. This innovation removes the necessity of a welding machine from the construction process, making it simpler and more cost-efficient.

SHORTENED METAL FIRING PIN CHANNEL

One of the most frustrating manufacturing steps to make an FGC-9 or Partisan 9 is the process of drilling the firing pin channel out of a bar of metal. Though this is possible with or without a drill press, it is still very tedious, and if the drill bit is canted slightly or if the drill bit breaks, it could render the work useless. The Urutau addresses this issue by significantly reducing the length of the steel bolt core piece containing the firing pin channel. By predominantly housing the channel within printed plastic, the metal drilling depth for the firing pin channel is reduced to 12mm or ½". Additionally, shortening the lower bolt core piece allowed for the cartridge pickup to be made of solid metal, eliminating the necessity for welding or other workarounds to construct a sturdy cartridge pickup.

GUIDE RODS

An additional enhancement we introduced in the Urutau is the implementation of two steel guide rods. Inside the FGC-9, the bolt made direct contact with the upper

receiver, leading to wear on the bolt carrier housing and the internal walls of the upper receiver. Although the Partisan 9 employs a single rod, an improvement over the FGC-9, there remains the possibility for the bolt to contact the upper receiver walls. On the other hand, the Urutau's bolt rides along two guide rods, minimizing contact with the upper receiver's walls. This design improvement not only reduces wear but also eliminates the necessity for a buffer tube. This innovation enhances the durability and longevity of the Urutau while simplifying its construction and maintenance processes.

TELESCOPING BOLT

The Urutau features a telescoping bolt, a design commonly found in modern blowback-operated firearms. With approximately 75% of the bolt mass positioned over the barrel, this configuration increases bolt stroke and weight. As a result, felt recoil is minimized, enhancing controllability during firing. This design improvement enhances shooting comfort and accuracy, making the Urutau a more manageable firearm to use.

PRINTED FIRE CONTROL GROUP

While 3D printed Fire Control Groups (FCGs) are not a new idea for 3D printed firearms, the Urutau breaks new ground by introducing an FCG designed from the ground up, drawing inspiration from the Steyr Aug FCG. This innovation compensates for its plastic composition with small metal components, enhancing its durability to withstand hundreds, or possibly thousands of rounds. The hammer also experiences far less leverage on its sear surfaces when compared to other fire control group designs. By pushing the envelope in FCG design, the Urutau establishes a new standard for reliability and longevity in privately manufacturable firearms, ensuring consistent, reliable performance with extended use.

MAGAZINE

We chose the CZ Scorpion magazine for several reasons, primarily due to its long-term reliability, ease of manufacturing, and user-friendly design. Despite its popularity, and as a running joke, we did not consider Glock magazines, as Scorpion magazines excel in these aspects. During testing, we experimented with printed STEN

magazines in an attempt to address feeding issues. However, after much experimentation and resolving the feeding issues, we still found Scorpion magazines ideal. It is worth noting that magazines with a double stack double feed configuration, such as the Scorpion's, generally experience less internal stress. Double feed magazines are also significantly easier to load in cold weather.

USABILITY

The Urutau is easy to use for any person of average physical capabilities. Aside from the ejection port, the entire gun is ambidextrous. The controls are all extremely basic so that non-English speakers with little firearm experience may intuitively understand how to use them.

SAFETY FEATURES

In addition to the manual safety mechanism, the Urutau incorporates safety features to manage the risk of an out-of-battery detonation. The hammer's geometry is designed to ensure that it cannot make contact with the firing pin unless the bolt is in battery. In the unlikely event of an out-of-battery detonation, a specially engineered channel redirects gasses upwards and away from the user, enhancing safety and minimizing the risk of injury.

FORM FACTOR

The form factor is inseparably linked to usability. The focus of the Urutau, aside from recreational shooting, is urban combat and guerrilla warfare. With this in mind, we can set some goals for the form factor: easy to conceal and use inside vehicles, easy handling inside buildings and close-quarters environments, and an effective range of 25 to 100 meters.

THE NEW SECOND AMENDMENT

The New Second Amendment, a document we authored and included with the Urutau, opens with the claim that the ideal privately manufacturable firearm has three design objectives:

1. Practicality of Manufacturing Processes
2. Invulnerability to State Intervention
3. Competitiveness with Modern Standards

These three objectives often form a triple constraint, where most privately manufacturable firearm designs pay little regard to one of the three. This is a trend that the Urutau seeks to disrupt. Granted, these design objectives are idealistic; achieving any one of them perfectly is impossible, and the degree to which an objective is achieved is a matter of opinion.

We believe the Urutau makes significant advancements in all three design objectives, however, it still has some significant hurdles to overcome. The manufacturing and assembly processes, the ECM process especially, are challenging, and they have significant pitfalls that may require the builder to start over. The thick-wall hydraulic tubing we use to make the barrel and ammunition components remain vulnerable to state intervention. As a pistol-caliber carbine, the Urutau is of little use beyond 100 meters and struggles to pierce soft body armor.

These are a few examples of challenges we need to confront, but this is why we authored The New Second Amendment. We will not let innovation end here. We are only getting started, and we would love for you to join us.

THE BEST HAS YET TO COME.

-RSmith28

-Zé Carioca