

# **THE BUCK .22**



**PRINTABLE**

**WEAPON**

**SYSTEM**

**PETE LARIC**

# DEDICATION



For my country!

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# SUMMARY

The Buck .22 is a 3D printed, semi-automatic, .22 caliber pistol first developed in 2014, and subsequently perfected over the course of five years. Constructed using a mixture of printed and factory made parts, if properly built, it is an extremely reliable, durable, and capable weapon.

In this book, you will learn how to properly print, assemble, maintain, and use a Buck .22 firearm. This book assumes only the most basic knowledge of 3D printing and home gunsmithing. The Buck is extremely easy to build, and could certainly be made in an afternoon by a person lacking experience in either field. If you've used a 3D printer before, and perhaps field stripped a handgun at some point in your life, you are more than adequately prepared to build a Buck .22!

# **DISCLAIMER**

The hobby of designing and building firearms is fraught with legal and physical perils. I DO NOT RECOMMEND THAT ANYONE ENGAGE IN THIS ACTIVITY! If you choose to participate in this hobby, you assume all liability for the consequences of your actions, including but not limited to injury or death of persons, destruction of property, arrest and prosecution, etc. YOU HAVE BEEN WARNED! I will not be held liable for your actions. By reading further, you signify acceptance of these terms.

If you are the sort of person who believes others are somehow responsible for your actions, please put this book down right now! Also, consider the fact that, by your very own logic, I am not responsible for my actions either.

# LEGALITY

In the United States, it is generally legal for a person to construct a firearm for their own personal use, so long as:

1) The builder is not a “prohibited person”, i.e. a person who is legally barred from possessing firearms.

2) The firearm in question has no prohibited characteristics, or characteristics requiring special registration prior to building.

3) There is no intent to sell the firearm at the time of its construction.

4) There are no state or local laws banning or regulating the home manufacture of firearms.

That said, making firearms is often frowned upon by the so-called authorities. While it isn't strictly speaking illegal, there are many pitfalls

that have been put in place with the express purpose of making it more difficult to legally enjoy this hobby. These include, but are not limited to:

- The Undetectable Firearms Act of 1988 (UFA), which requires all firearms to contain 3.7 ounces of stainless steel or equivalent, rendering them detectable by metal detectors of the type used at airports, courthouses, etc. The Buck .22 complies with the UFA because the bolt alone contains over 6 ounces of steel. Additional steel resides in the barrel, trigger assembly, recoil spring guide rod assembly, pins and screws, etc. So the Buck .22 will most certainly set off a metal detector, and most certainly complies with the UFA.
- The National Firearms Act of 1934 (NFA), which prohibits, among many other things, a pistol lacking a rifled barrel. If you assemble your Buck .22 using a factory-made barrel, the required rifling will already be in place, and you will therefore be in compliance with this law. However,

there are many other aspects of the NFA that must be considered. For example, mounting a rifle-type shoulder stock to a gun with a barrel less than 16” in length results in the creation of a short-barreled rifle (SBR), which is also illegal without special registration. I recommend familiarizing yourself thoroughly with gun laws, and contacting an attorney who specializes in them, prior to starting any project.

- The Gun Control Act of 1968 (GCA) regulates who may possess and transfer firearms. Generally, convicted felons, those who are mentally ill, drug addicts, and those convicted of certain violent crimes such as domestic violence cannot legally possess firearms. If you fall into any of these groups, you cannot legally build a Buck .22.
- Transferring firearms is not strictly regulated at the federal level, but selling them is. Any person who “engages in the business” of selling firearms must purchase a Federal Firearms License (FFL). Selling

firearms without an FFL isn't always illegal, but if the government arbitrarily determines that you are "engaged in the business" based on some subjective criteria, you could be found guilty of trafficking firearms without a license. Additionally, there are serial marking and record-keeping requirements for firearms commercially sold. So, the easiest way to comply with these laws is to abstain from selling homemade firearms entirely.

- The International Traffic in Arms Regulations (ITAR) are a series of rules that restrict both commerce in physical goods, and export of technical information of military significance. During the Obama administration, there was an attempt to use ITAR to ban the publication of computerized drawings of printable firearms. This stance was challenged on First Amendment grounds, and the government backed off. Under the current rule, technical information concerning semi-automatic firearms up to .50 caliber is not export-regulated and may be shared

freely. This may change at some point in the future, though, which is all the more reason to ensure that this information is made available now.

- Some states and municipalities have enacted laws that make it difficult or impossible for an ordinary citizen to legally build a firearm. Please research the laws in your area, and again: seek legal counsel prior to building anything.

It is also worth noting that the Buck .22 was inspired by a commercially available firearm (the Ruger Charger). Although it maintains excellent parts compatibility with the Charger, it is not endorsed by Sturm Ruger & Co. or its affiliates.

I am not an attorney! Please do not construe my words as legal advice. This is just a brief overview of the legal landscape, which is far more complex than I could ever hope to summarize. My goal is to make you aware of the basics so you're less likely to accidentally violate some law you didn't even know exists.

The law varies by location, time period, and who is interpreting it – in essence, it is arbitrary and capricious. This is why I recommend contacting an attorney prior to commencing any build.

Remember, though: you have a *right* to own a firearm! Never let anyone tell you otherwise. Unless you've been found, through due process of law, to be a danger to yourself or others, this right cannot be abridged. Owning a 3D printer is a great way to ensure that it never will be.

# HISTORY

In 2012 and 2013, the first 3D printable firearms were developed. By the latter year, the U.S. government had taken an unprecedented stance against them: it was contended that the mere publication of technical data (including drawings of printable firearms) was illegal!

Like many of my fellow Libertarians, I was outraged by this. This policy was a blatant violation of both the First and Second Amendments of the U.S. Constitution. I was a student of Electrical and Explosives Engineering at the time, so I vowed to use all the skills and equipment at my disposal to develop a printable weapon far more capable than others then in existence.

Early printable guns used plastic barrels that were prone to exploding, so I knew that a metal barrel would be needed. Early printable guns

were mostly of the single-shot variety, offering little firepower. I therefore resolved to build a semi-automatic. Others had built rifles and bulky AR-15 pistols around printed frames, so I decided instead to build a smaller pistol that could be kept on a nightstand or even carried in a holster.

This is what I came up with:



Using a 3D printed receiver (neon green) and a bunch of factory-made parts (everything else), I managed to cobble together a homemade pistol similar to the commercially available Ruger Charger!

I test fired the gun at the local shooting range. It cycled through several hundred rounds of ammo with no malfunctions! I was so impressed with its performance that I edited together an anonymized video, wherein I assumed the moniker “Buck O’Fama” (based, allegedly, out of Area 51), disguising my voice using the text-to-speech feature of my Apple MacBook. I uploaded the video to LiveLeak, where it received hundreds of thousands of plays, before eventually being removed by the social justice warriors. Dozens of news articles were published around the globe, alternately praising or decrying the technical achievement. I was well pleased!



Me in 2014 with the very first Buck .22!

From a technical standpoint, it wasn't a huge achievement, though. I had printed only the *receiver* of the pistol – essentially, a box containing the functional parts, which itself is not subject to any great stresses or extreme temperatures. However, as luck would have it, this is the only part of the pistol that the government actually cares about! If the pistol had been purchased at a gun store, this part would have been emblazoned with a serial number, which could then be used to trace the chain of lawful ownership. I also would have

been subject to an FBI background check, various fees, and in some states, a waiting period of 10 days or more! By printing this one part, I was able to circumvent this entire process. Much of the media buzz centered around this.

At the time, I was employed in the Optics and Photonics Applications Lab (OPAL) at New Mexico Tech, working on a research project for Los Alamos National Labs. Due to the sensitive nature of the work we were doing, I didn't want the publicity or the potential damage to my career, so I stayed in the shadows. I also did not want to commit what the Obama administration deemed to be a felony: namely, the publication of export-restricted technical information. So I abstained from publishing any CAD drawings.

Fast forward to 2019. Despite having graduated *summa cum laude* (highest honors) with a bachelor of science degree, I was nevertheless struggling to make ends meet, working seasonal jobs for low wages. My mind

drifted back toward the Buck .22... I had, after all, spent the intervening years developing and perfecting the pistol. It was no longer “partially printable” – it was now “mostly printable”. It no longer began to develop stress cracks after a few hundred rounds. Due to refinements in the design, material, and print orientation, it could now fire thousands of rounds with no signs of damage or fatigue of any kind. It was, in my assessment, a mature design of great commercial value. And my motivations, once driven purely by ideology and technical curiosity, had drifted eerily toward self-enrichment! I needed a powerful portfolio piece...

The time to share the fruit of five years of labor had finally arrived.

# OVERVIEW

The current iteration of the Buck .22 comprises a printable stock, printable grip panels, printable receiver with integrated combat sights, and several non-printable parts including the barrel, bolt, trigger assembly, recoil spring guide rod assembly, and magazine. Although it may be technically feasible to develop printable versions of some or all of these parts, they are freely available from many online sources and are unregulated by current U.S. federal law.

The Buck .22 uses a straight blowback action that is inertially delayed by the 6-ounce bolt. This allows it to fire the 24,000 PSI .22 LR cartridge without the need for a locked breech. Despite having a small bore diameter, it is able to achieve a muzzle velocity of up to 1,200 feet per second from a 4.5" barrel. This gives it a ballistic trajectory similar to that of a 9mm. While it would not be as effective as a 9mm in

terms of its ability to incapacitate an attacker (due to its smaller bullet diameter and lower bullet mass), .22 LR is nevertheless a perfectly lethal cartridge that is not to be underestimated. In my humble opinion, I would rather have a reliable, accurate .22 than an unreliable or inaccurate 9mm. While a Buck .22 may not compare to something like a Glock 19 in terms of performance, it is extremely reliable and fairly accurate. More to the point: it is far easier to homebuild a Buck .22 than it would be to homebuild a Glock! The cost of the Buck is also much lower than that of a Glock – as of this moment, a Buck can be built for less than the price of an aftermarket Glock slide.

The standard magazine for the Buck .22 is a 10-round rotary magazine, developed by Ruger for their 10/22 and Charger firearms. In my experience, this is the most reliable type of magazine available. However, aftermarket magazines do exist that hold 30 rounds or more! In my experience, these magazines tend to be unreliable. Within the last few years,

Ruger started making 15 and 25-round box magazines, but I have yet to try these with the Buck.

# BILL OF MATERIALS

The following materials are needed to construct a Buck .22:

## PRINTABLE COMPONENTS

- Receiver (prints in two halves)
- Stock (prints in two halves)
- Grip
- Grip Panels x2 (L & R)

NOTE: The Buck .22 accepts standard Colt 1911 Government grips as well!

- V-block
- Front Sight (prints with Receiver)

## NON-PRINTABLE COMPONENTS

- Barrel
- Bolt Assembly
- Trigger Assembly
- Recoil Spring Guide Rod Assembly
- Magazine
- Barrel Retainer Screw x2
- Stock Screw

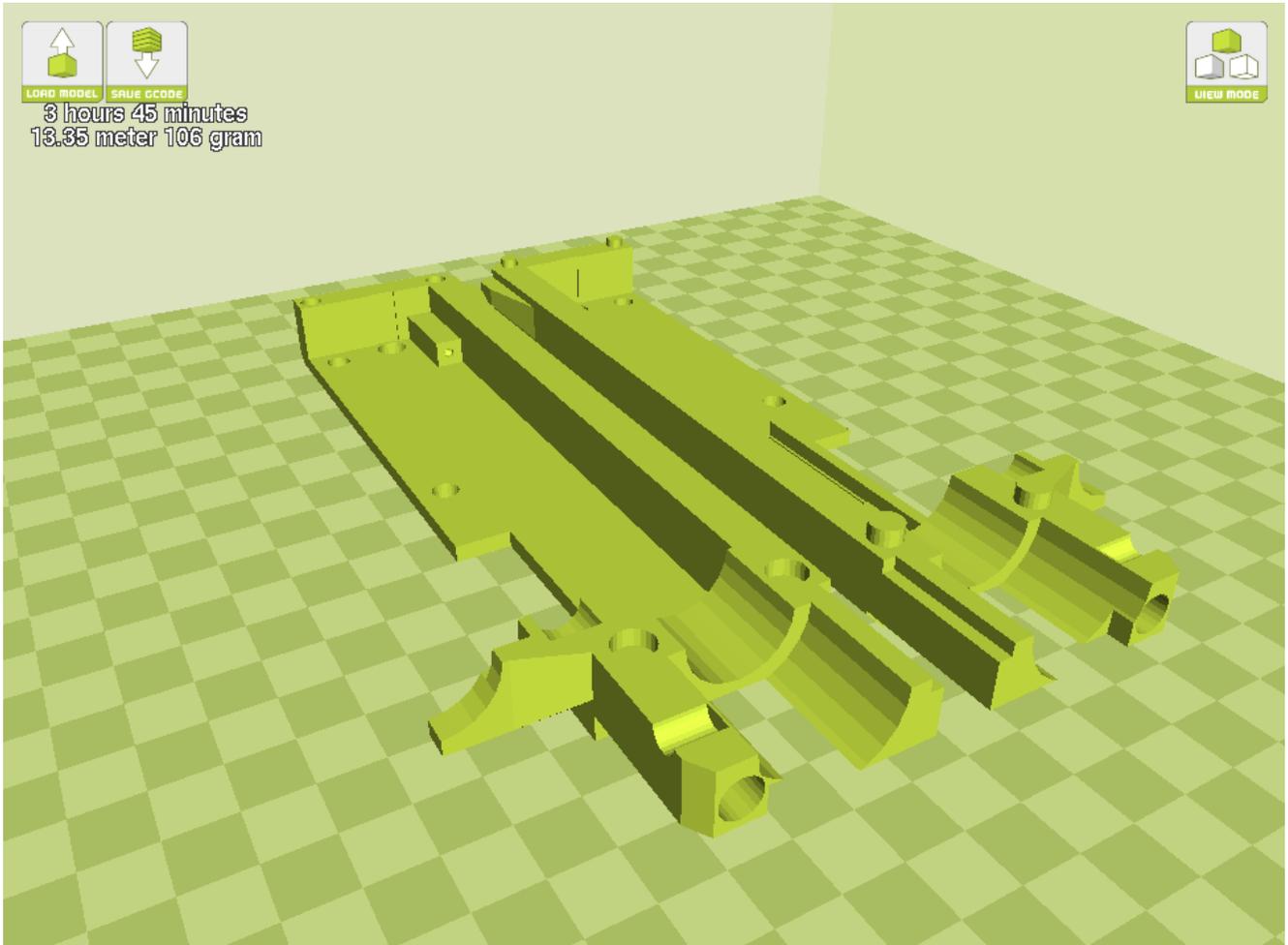
- Receiver Cross Pin x2
- Bolt Stop/Buffer Pin
- Grip Screw x2 (#4-40x1.25", brass)
- Nut for Grip Screw x2 (#4-40, brass)

## DRAWINGS

- CAD Drawings, available from:  
<http://www.PeteLaric.com/Buck22>

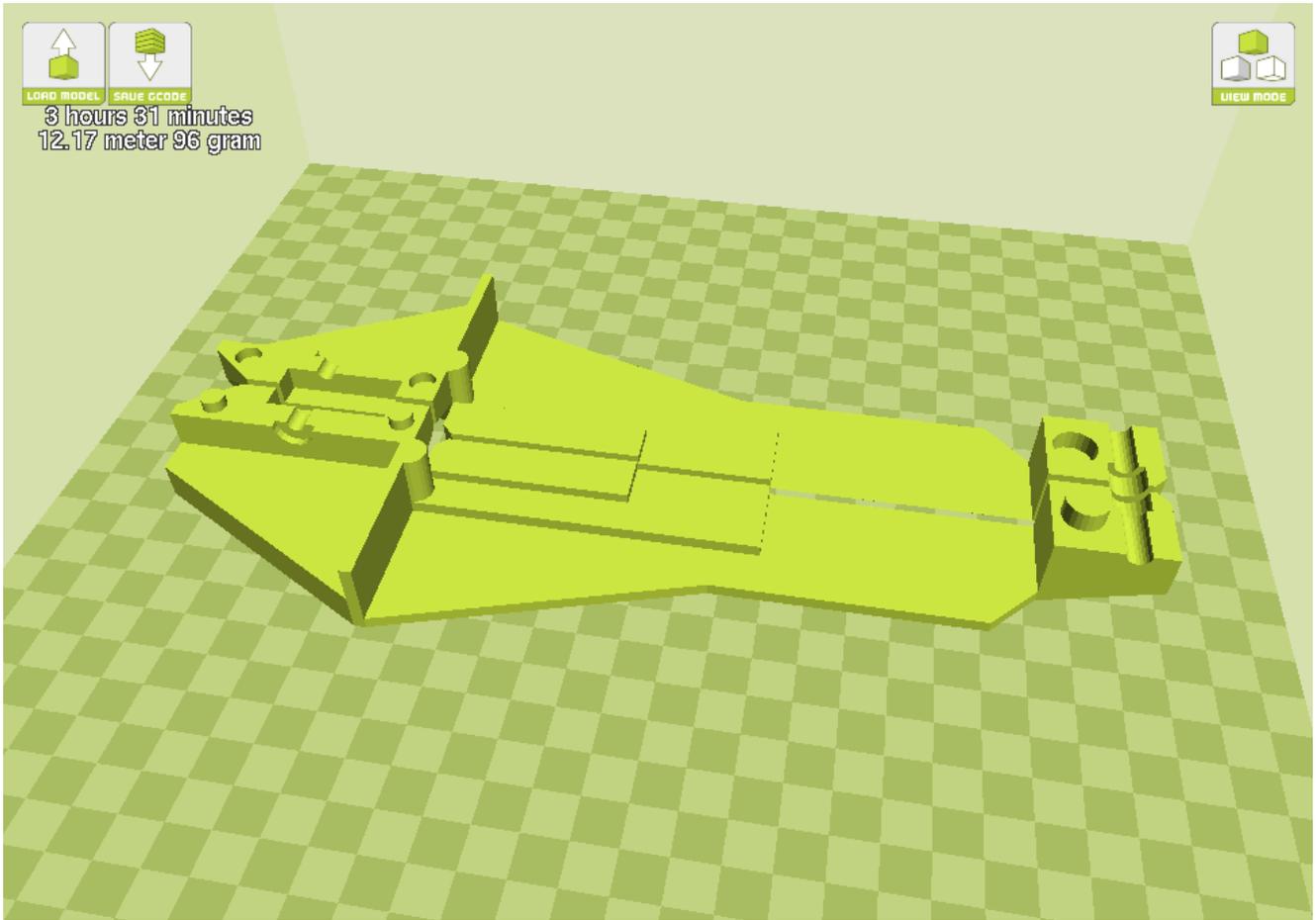
# PRINTING

I initially began printing Buck receivers oriented vertically, which seemed the easiest method at the time. However, I found that this resulted in cracking after a few hundred rounds. Those experienced in 3D printing know that printed parts always crack along the striation lines – the subtle but visible lines demarcating the layers used to form the printed object from the build platform up. When printed vertically, a Buck receiver will experience forces from the recoiling bolt that are perpendicular to the striation lines. This will tend to encourage the formation of cracks along these lines. So, I developed a method of printing the Buck receiver horizontally, by splitting it into two main components, which are then acetone-welded together. To ensure perfect alignment every time, I added LEGO-like pegs and corresponding recesses, so the receiver can actually snap together while being welded.

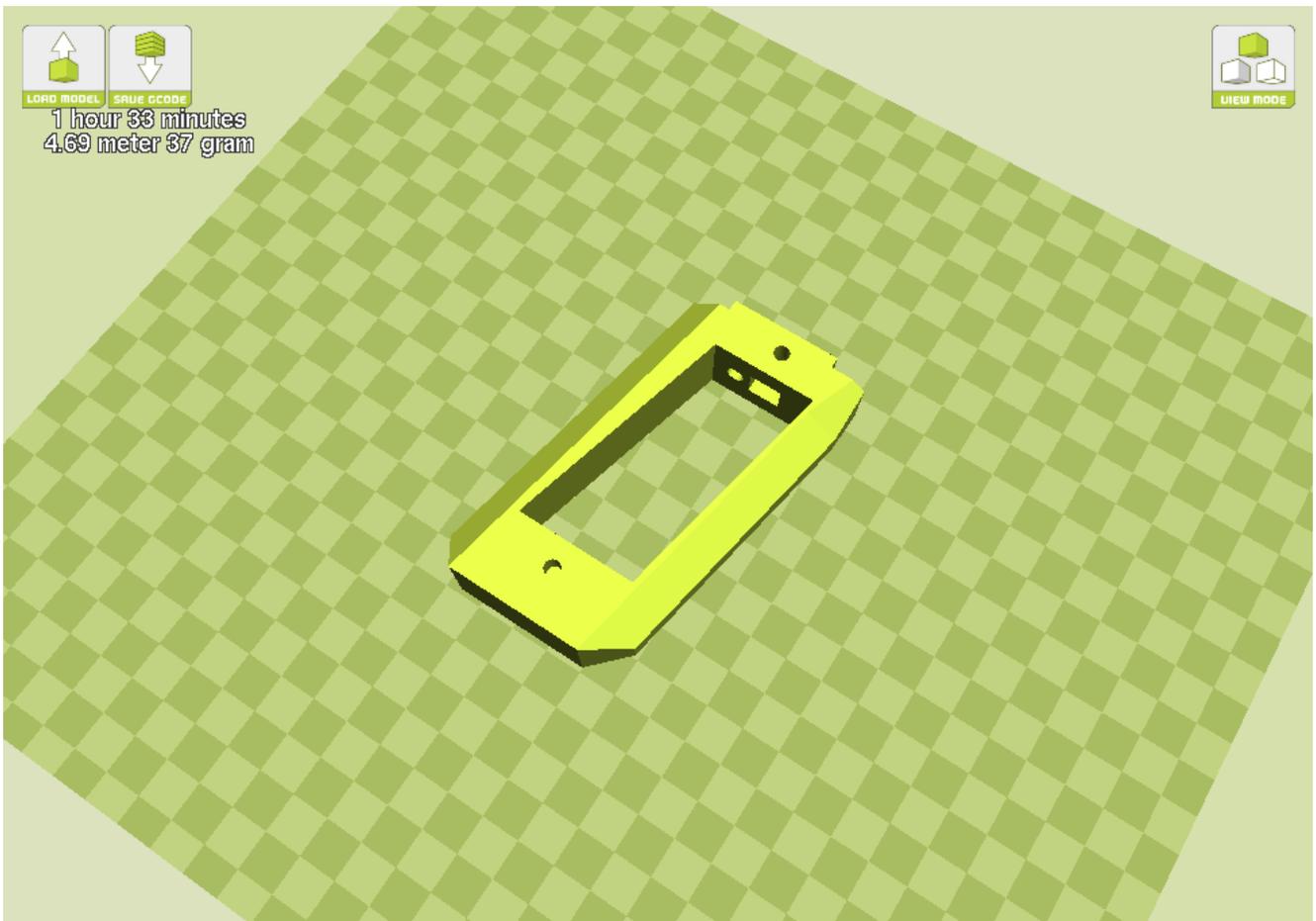


Receiver halves, ready to print.

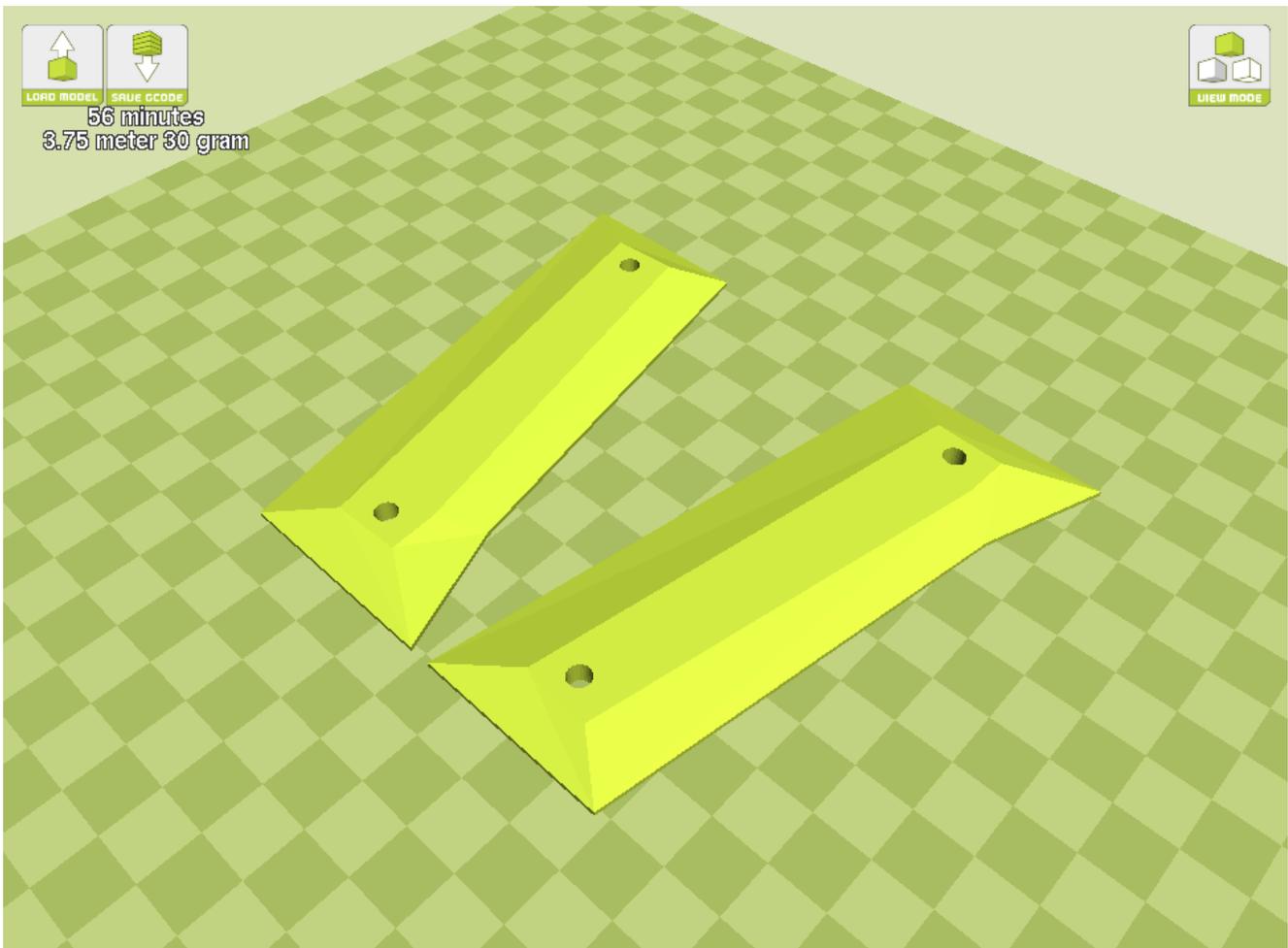
The same was done with the stock, which prints separate from the grip and grip panels.



Stock halves, ready to print.



Grip, ready to print.



Grip panels (L and R), ready to print.

Because each part is oriented to optimize strength when printed, the resulting pistol is actually quite strong. The receiver should be printed with 100% infill (solid), but the other parts may be printed at 40% infill or less.



The assembled pistol.

The choice of filament is important. The first Bucks were made out of polylactic acid (PLA), but I quickly discovered that this material becomes brittle over time, and will deform if left in a hot car. Additionally, PLA can carbonize, clogging print nozzles. I switched to acrylonitrile butadiene styrene (ABS) in 2014 and never looked back! Not only is ABS very strong, but it also won't carbonize in your

nozzle. The best part is, it dissolves in acetone, creating a goo that can be used as glue to join printed parts together. This is known as acetone welding, and it is an extremely useful technique! Once two parts have been acetone welded together, the resulting part will be as strong as if it had been printed as a single piece, if not more so.

Several acetone welds are used to create a Buck .22, including:

- Joining the two halves of the receiver.
- Affixing the front sight to the receiver.
- Joining the two halves of the stock.
- Affixing the grip to the stock.

Alternatively, the grip may be affixed to the stock by a single bolt or screw if desired.

# ACETONE WELDING

Acetone welding is a very simple procedure, requiring no great skill or training whatsoever.

First, thoroughly clean and dry a used glass jar. It could be from raspberry jam, salsa, mayonnaise – whatever. Glass is preferable because acetone dissolves some polymers. You don't want the jar itself dissolving on you.

Fill the jar about  $\frac{3}{4}$  of the way with acetone. You can buy it in a metal can in quantities up to one gallon. They usually have it at Walmart. Don't use nail polish remover, as that's diluted with water, colorants, and various fragrances.

Drop scraps of ABS into the acetone and shake it up. It may take a matter of hours to fully dissolve, but rest assured that the acetone will dissolve the ABS. Once dissolved, you have a sticky substance that can be used like glue to join ABS parts.

The best tool I've found for applying the goo is a Q-Tip. I usually apply it liberally to both surfaces, clamp the parts together with a machinist's clamp, then wipe off the excess. Wiping off the excess is important, because any leftover globs will harden into solid ABS.



I don't know for sure how long it takes to fully "set"... As with most things, it's best to err on the side of caution. I would give it a few hours at least, prior to attempting further assembly.

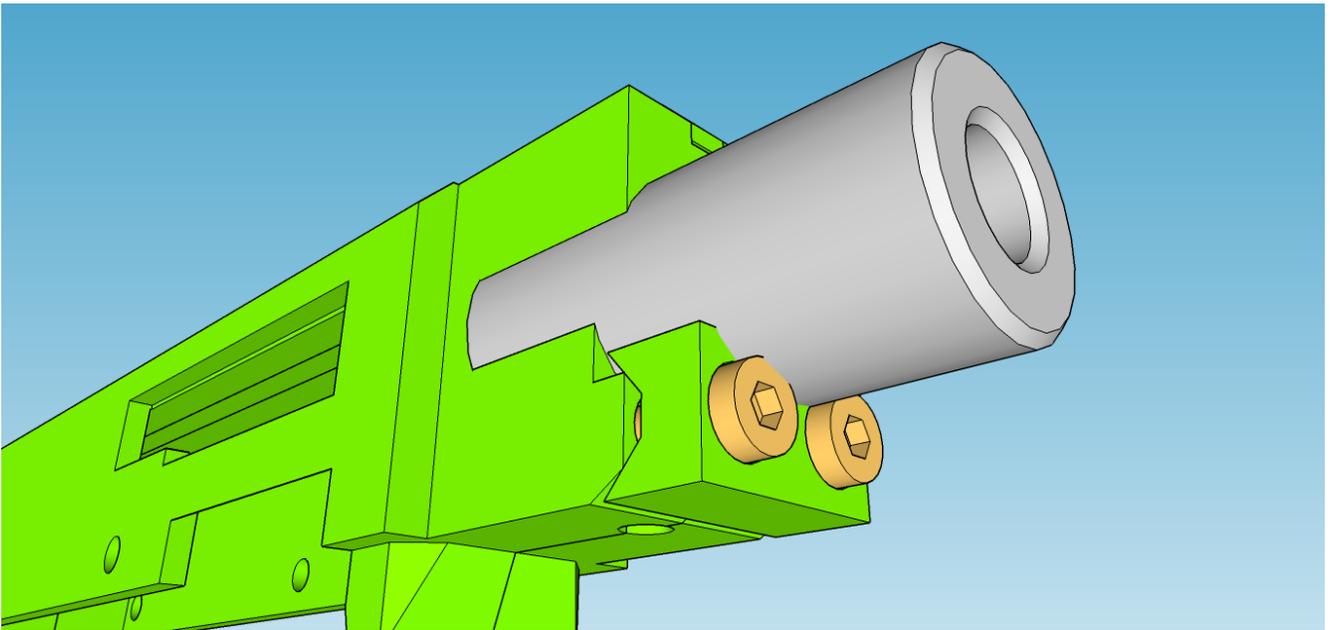
Waiting 24 hours is probably excessive, but would certainly be sufficient. I often allow the acetone welds to set overnight.



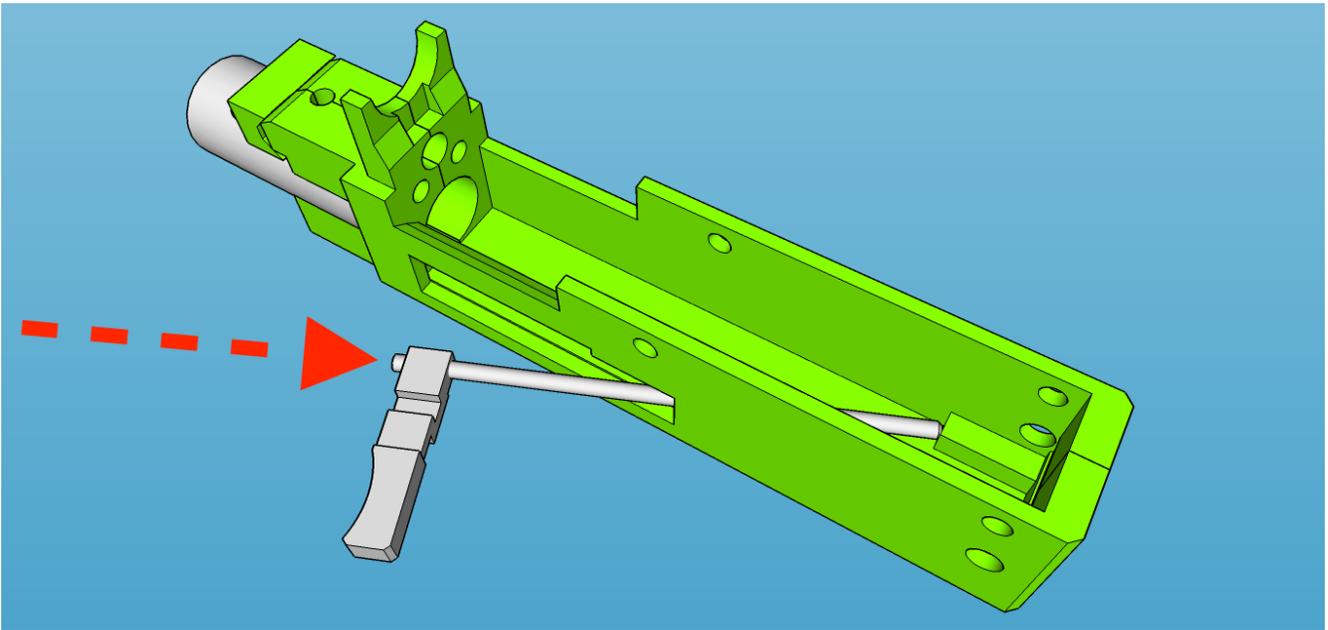
# ASSEMBLY

Assembling the Buck .22 is very easy. Once all printable parts have been printed and welded, and all non-printable parts have been acquired, the process of assembling the pistol can be completed within five to ten minutes.

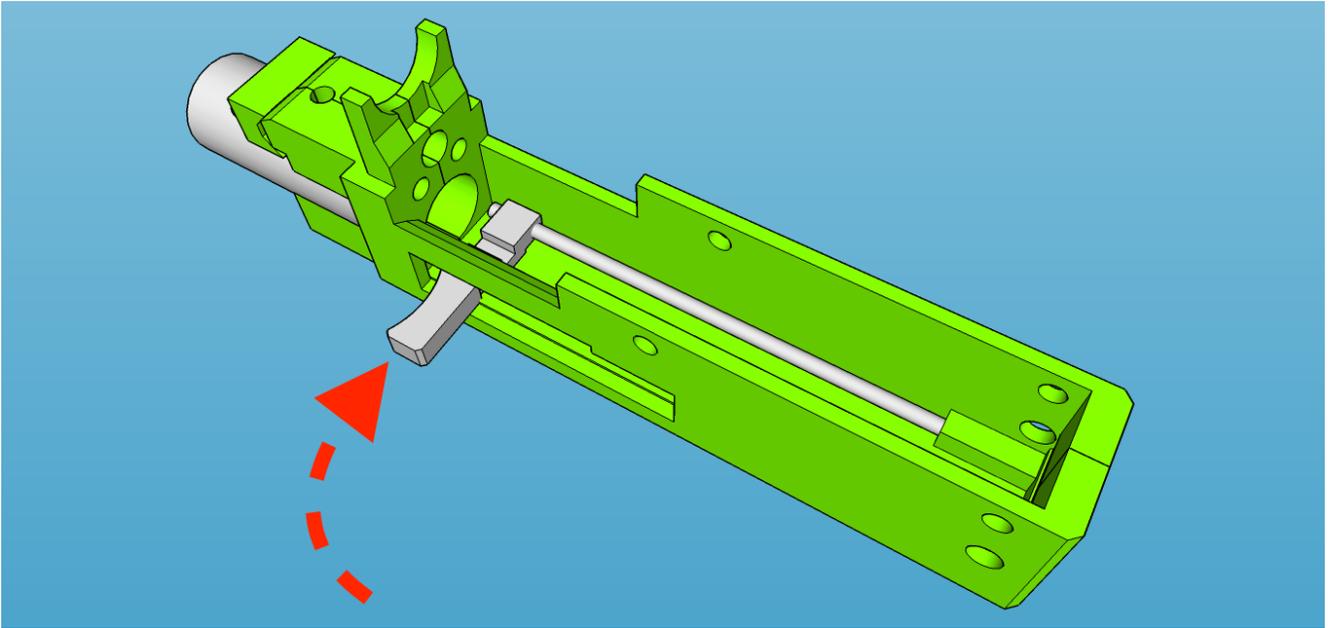
The first step is to install the barrel. Insert the barrel into the receiver from the front. Secure it in place with the v-block. Secure the v-block in place with the two hex head bolts as shown.



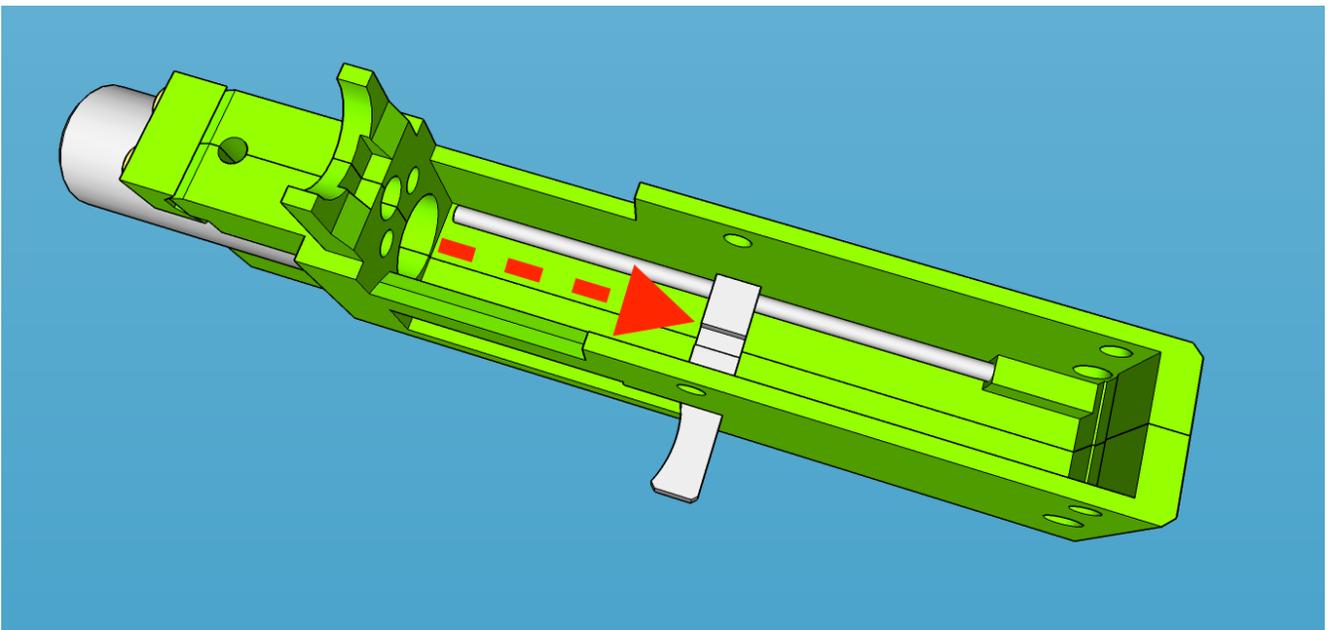
Next, install the recoil spring guide rod assembly by inserting the rod through the ejection port, leaving the charging handle protruding therefrom.



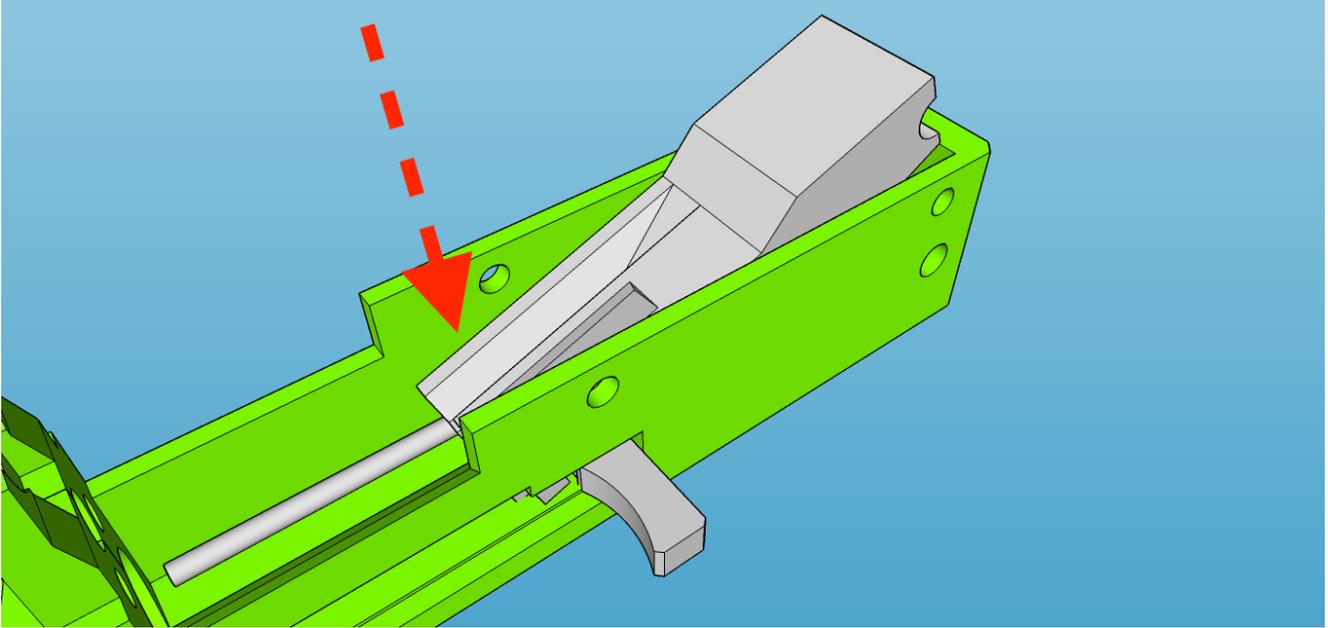
Rotate the recoil spring guide rod into the receiver as shown.



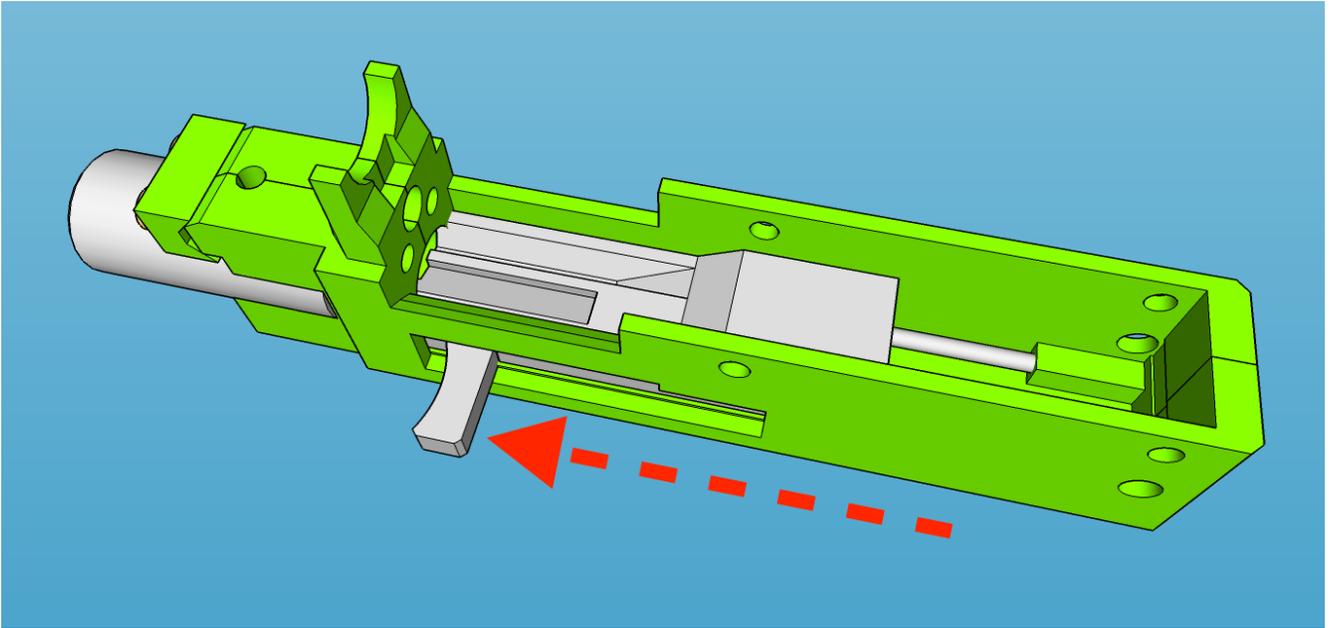
Next, pull the charging handle rearward from the inside of the receiver using your thumb. Pull it back as far as possible.



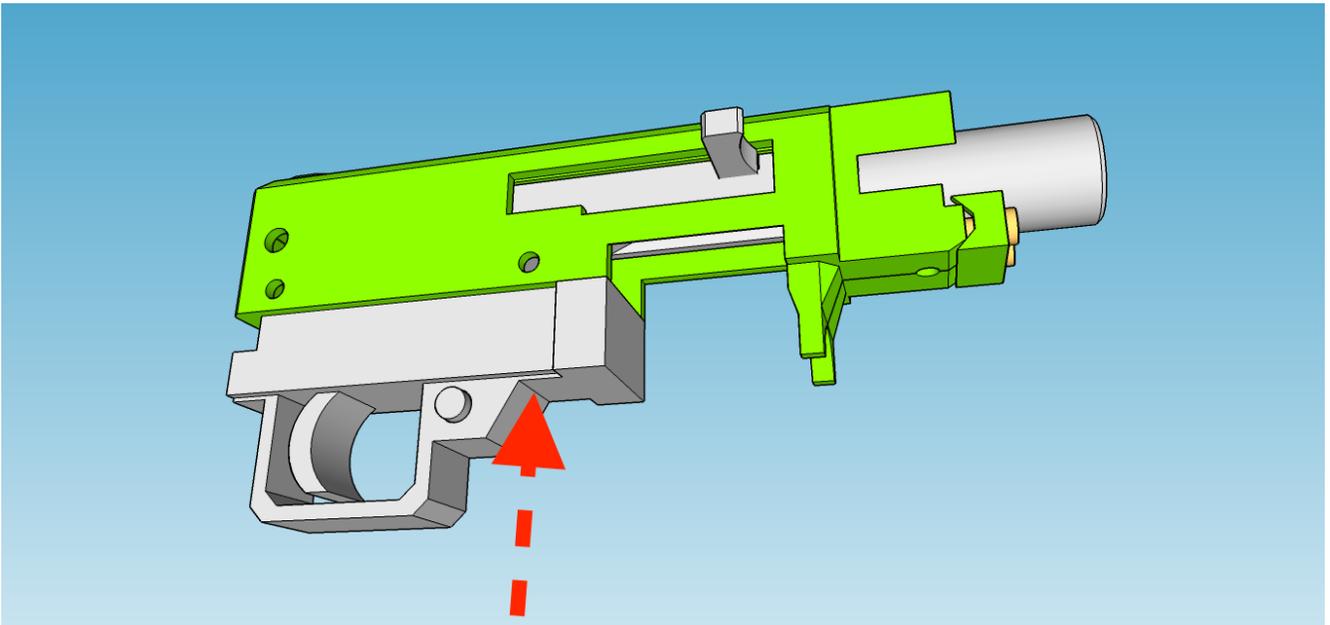
With the charging handle retracted to its maximum travel, insert the bolt as shown.



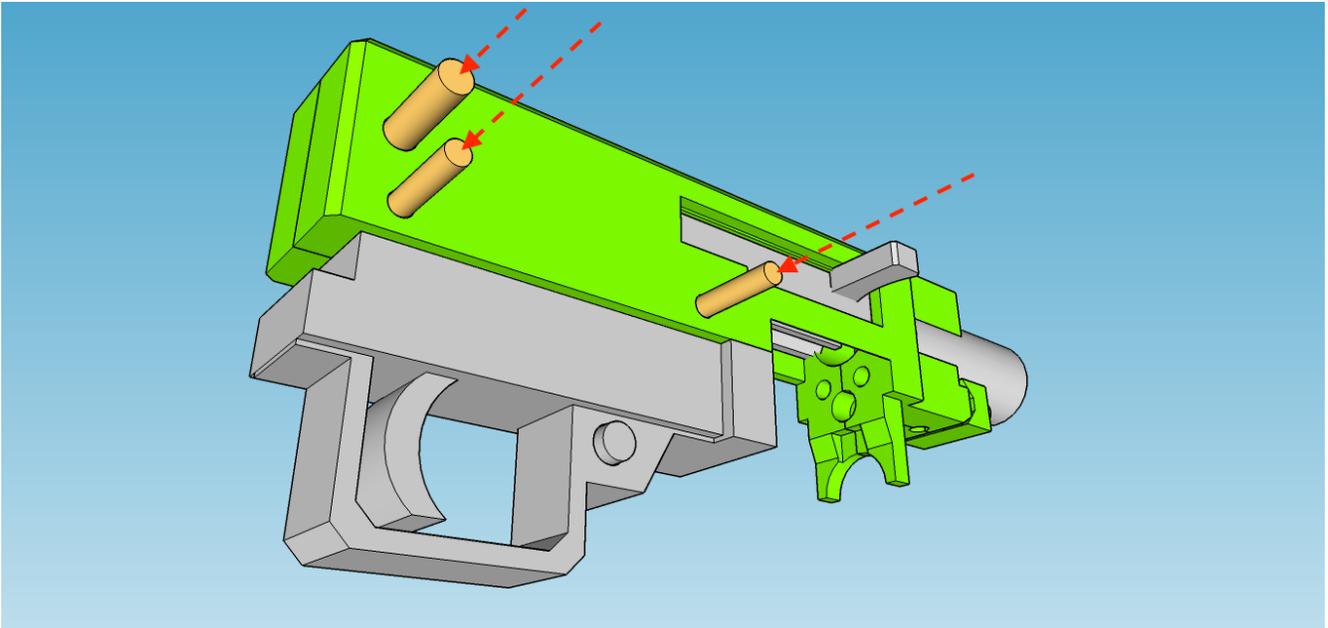
Release the charging handle while pressing gently down on the front of the bolt with your thumb. The recoil spring will carry the bolt forward as the bolt pivots to align with its track of travel.



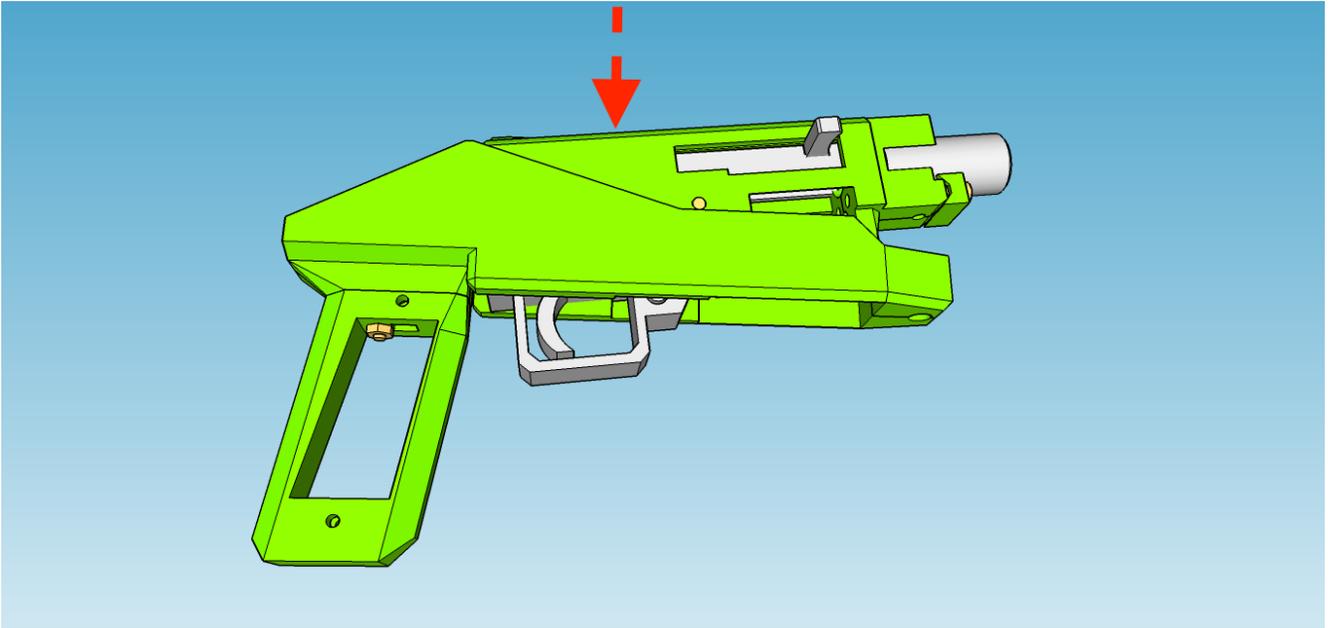
You are now ready to mate the receiver to the trigger assembly. Insert the trigger assembly into the receiver from below. Ensure that the pin holes align.



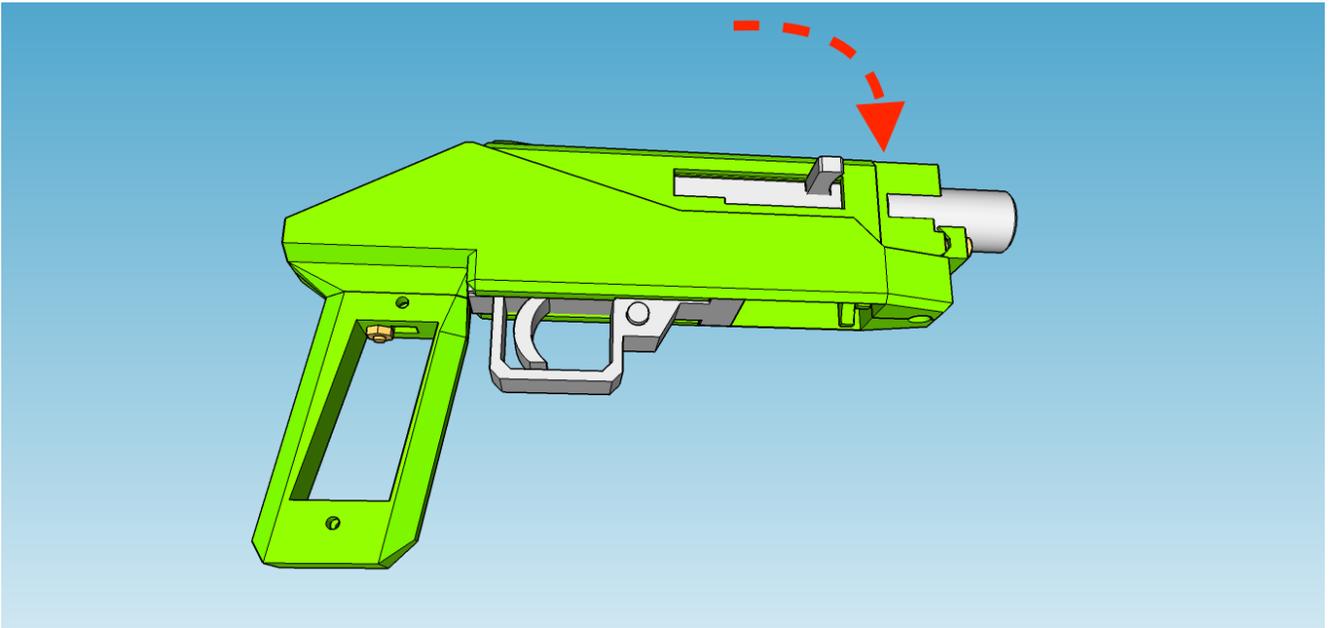
Insert the two receiver cross pins (smaller diameter) and the single bolt stop/buffer pin (larger diameter). Strike gently with a rawhide mallet if necessary.



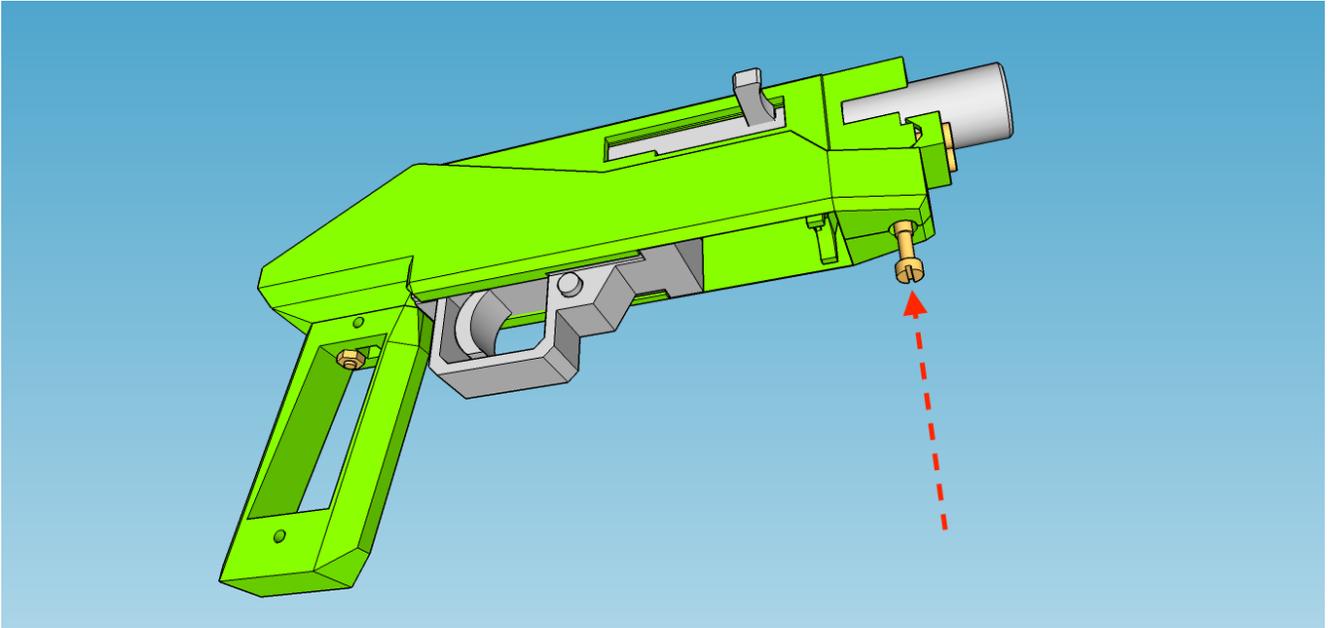
The assembled receiver may now be installed in the stock. Insert the receiver into the stock from above, as shown.



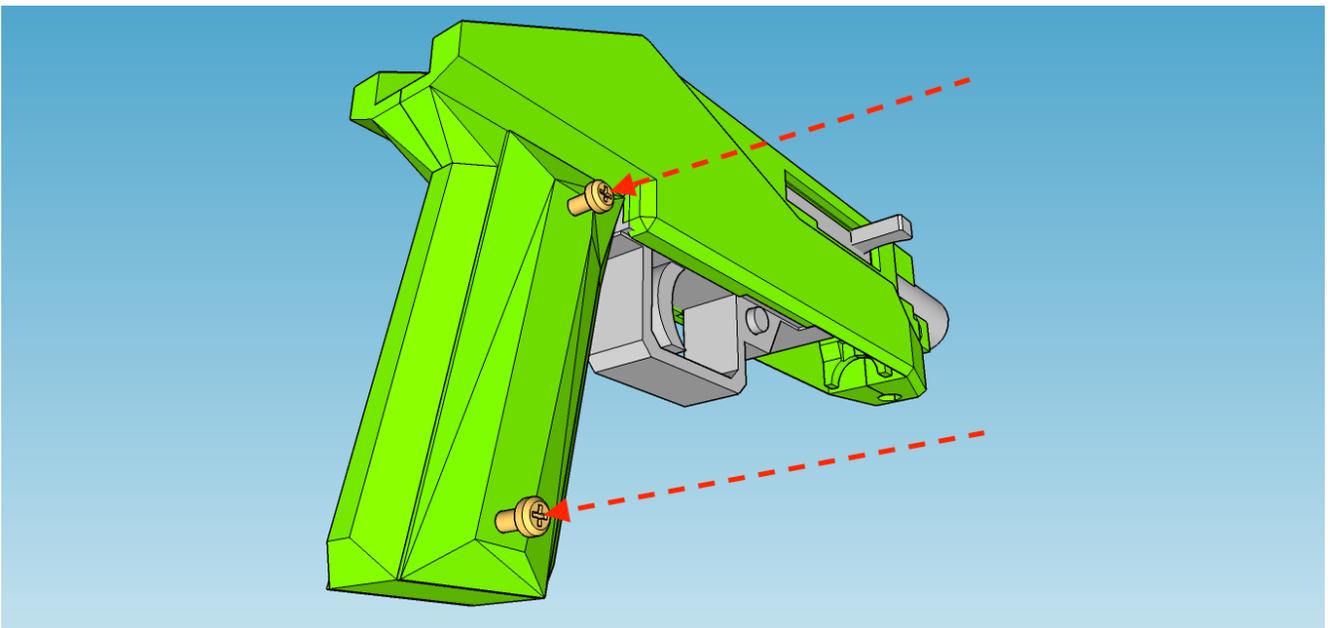
Rotate the receiver into place.

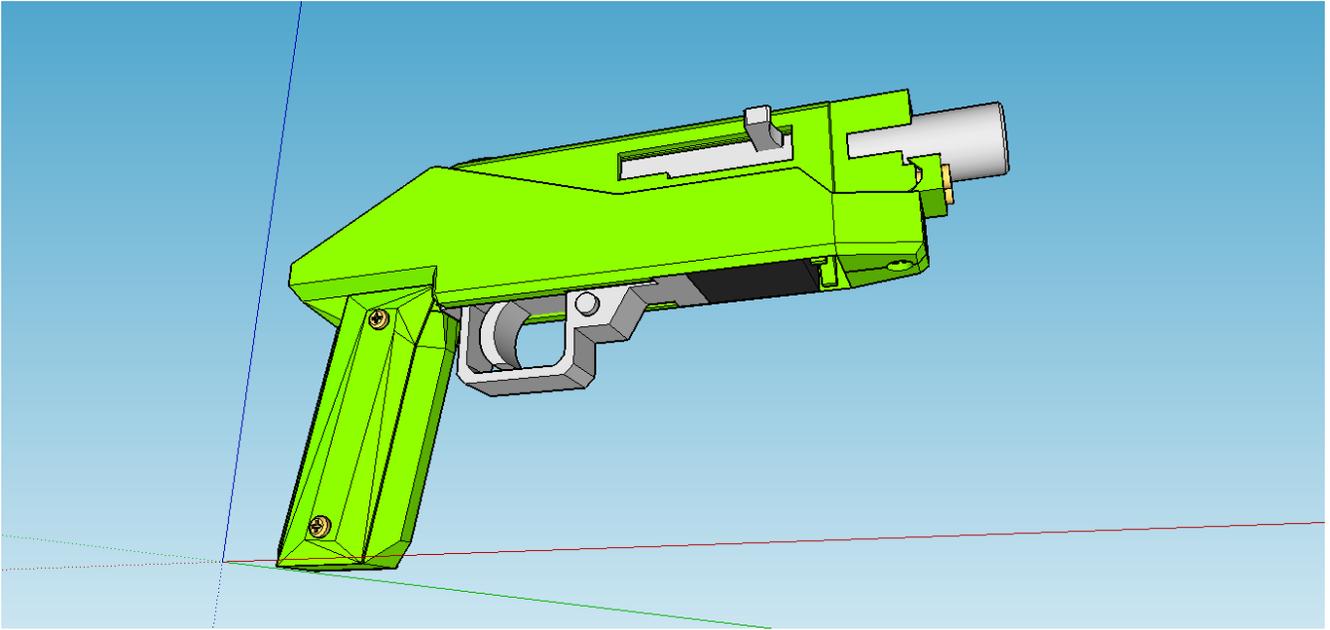


Secure the receiver to the stock using the stock screw.



Now, install the grip panels using brass #4-40x1.25" screws and nuts.





Your pistol is now complete!

Please use it responsibly. Belying its status as a homemade plastic conversation piece, your Buck .22 is in fact a deadly weapon comparable in lethality to anything sold at a gun store. It is most certainly not a toy!

As of this writing, there has been no recorded case of a person being shot by a 3D printed firearm. Unless it is absolutely necessary to defend innocent life, I do not recommend brandishing a printed gun for any reason.

# CARE & USE

Your Buck .22 requires little in the way of maintenance to remain reliable, but it requires some. Like all .22 caliber guns, there is a tendency for lead fouling and powder residue to build up. This is caused by .22 ammo being notoriously “dirty”, and by many .22 bullets being unjacketed lead. If the fouling is allowed to get too bad, it can cause your gun to jam. To maximize reliability, clean the bore frequently, with particular emphasis on the chamber. A metal wire chamber brush is recommended to remove fouling. **DO NOT USE CAUSTIC SOLVENTS LIKE GUN SCRUBBER!!!** They may dissolve the plastic receiver. If such solvents must be used, remove the barrel and clean it far away from the printed plastic parts. A Q-Tip cotton swab is the perfect size to clean a .22 caliber pistol bore, once the chamber brush has been used. Gentle solvents like CLP are recommended.

In addition to regular cleaning, your gun should be lightly oiled to ensure that the metal parts are protected against rust and corrosion, and that everything slides smoothly. Any type of gun oil may be used. CLP is convenient because it both cleans and lubricates at the same time. It works well in my experience. It comes in a pressurized spray can.

# PARTING SHOT

The ironic thing is that this gun wouldn't exist if it weren't for certain attempts by the anti-gun crowd to unfairly restrict firearm ownership and censor information about firearms. Several specific acts really drew my ire, including the Obama administration's contention that uploading a CAD drawing of a printable gun is tantamount to exporting controlled military technology (a felony).

These abridgements of my constitutional rights galvanized me into action, to push back against what I perceived as a threat to the country my father quite literally bled for in Vietnam.

America was not chartered in furtherance of socialism or communism, but for individualism! I was raised to believe that this is "the land of the free, and the home of the brave". The related concepts of individual rights and individual responsibility are indeed being eroded by a brainwashed generation of puppet children, indoctrinated by public

schools and the media to believe that capitalism and Western culture represent all that's wrong with the world. In point of fact, capitalism and Western culture have proven thoroughly superior by every objective metric, from technological progress, to life expectancy, to personal freedom, to standard of living. I am by no means "proud to be an American", as nobody chooses where they are born! But I am certainly lucky to have been born in America, where even an average Joe like me has access to game-changing technology, combined with the freedom to actually use it! And I am proud to have played a small part in advancing one particular technology, which is inherently more conducive to freedom than to servitude.

All of that being said, my views on private gun ownership have evolved somewhat. As a scientifically-minded person, I consciously strive to avoid being ruled by cognitive biases, but instead to evaluate the available evidence as objectively as possible. Here is a table I compiled a few years ago for a college class:

HOMICIDE RATES BY COUNTRY			
RANK	COUNTRY	RATE	NUMBER
1	Honduras	90.4	7,172
2	Venezuela	53.7	16,072
6	Guatemala	39.9	6,025
11	South Africa	31	16,259
12	Colombia	30.8	14,670
22	Mexico	21.5	26,037
25	Nigeria	20	33,817
26	Greenland (Denmark)	19.4	11
45	Ethiopia	12	11,048
66	Russia	9.2	13,120
77	Somalia	8	819
79	Iraq	8	2,628
103	North Korea	5.2	1,293
106	Thailand	5	3,307
111	<b>United States</b>	<b>4.7</b>	<b>14,827</b>
165	Israel	1.8	134
187	Australia	1.1	254
188	China	1	13,410
190	United Kingdom	1	653
191	France	1	665
195	Austria	0.9	77
197	New Zealand	0.9	41
201	Germany	0.8	662
214	Japan	0.3	442
217	Liechtenstein	0	0
218	Monaco	0	0

RATES ARE PER 100,000 POPULATION PER YEAR.

[https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_intentional\\_homicide\\_rate](https://en.wikipedia.org/wiki/List_of_countries_by_intentional_homicide_rate)

From it, I observed that many countries with stricter gun laws than the U.S. (e.g. Germany, Japan, Australia) indeed have lower homicide rates than we do. However, I also observed that several countries with strict gun laws (e.g. Russia, Mexico, Greenland) have far higher homicide rates than ours – Mexico, for instance, has over 4.5 times our homicide rate! Russia is perhaps an even more relevant example, as this country has endured the grand experiment of communism so often

extolled by those who seek state regulation of gun ownership. Despite severe restrictions on gun ownership in Russia, their homicide rate is twice as bad as ours! On the other end of both spectra, we have countries like Austria, where gun ownership is virtually unrestricted, but which enjoys a homicide rate one fifth of that observed here in the U.S.

From this data, I draw three conclusions:

1) Availability of firearms does appear to correlate with homicide rate at the national level.

2) This correlation is far from strictly causal, as there are counterexamples of both varieties (strict gun laws + high homicide rate; lax gun laws + low homicide rate). This is also evident at the local level, with gun control utopias like Chicago and Washington D.C. consistently topping the murder rate charts.

3) Socioeconomic factors appear to be the dominant forces at work, as the worst

countries (Honduras, Venezuela, Guatemala, South Africa) are all plagued by poverty, whereas the best countries (Monaco, Liechtenstein, Japan, Germany) all have thriving economies and a high standard of living for the average citizen.

So it begs the question: now that I have come to believe that the availability of firearms contributes to the homicide rate, how can I advocate for the availability of firearms?

My answer is simple: the Second Amendment was not written to protect sporting guns used by hunters, or even to protect self-defense guns used by ordinary citizens. It was written to protect military-type firearms in private hands, for the somber day when a hypothetical future tyrannical government needs to be opposed with force. The world saw what happened when, in the early 1930s, a socialist became the democratically elected chancellor of Germany, and immediately implemented a national firearms registry. This registry allowed entire ethnicities to be disarmed and

systematically exterminated, resulting in a war that cost over 60 million human lives! At the current homicide rate, it would take American private citizens over 4,000 years to murder that many people. So it is clear that, in terms of body count, it is governments – not citizens – that pose the greater threat to human life.

Do I trust my fellow citizens with guns? Not really. But I trust governments even less. For me, it comes down to a question of self-determination. With a Buck .22 in your hand, you are nobody's victim.

“You see, in this world, there's two kinds of people, my friend. Those with loaded guns, and those who dig.”

– Clint Eastwood  
The Good, the Bad and the Ugly (1966)

“...and he that hath no sword, let him sell his garment, and buy one.”

– Luke 22:36

# ABOUT THE AUTHOR



Pete Laric is an amateur musician and tinkerer. Notable inventions include the AirHarp<sup>®</sup> digital autoharp, and the MuzzleSafe proximity gun safety.

All of his original music is available online, for free: <http://www.PeteLaric.com>

As of 2019, Pete's YouTube channel has garnered over 6.2 thousand subscribers and over 2.4 million views.

Pete is a grandson of the noted author Frank Laric, whose celebrated works include *Poems for the Common Man*, *Black Cola*, and *The American Vigilante*.