TO DESIGN HYDROCARBON GAS OPERATED AIR GUN

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ABSTRACT

The Air Gun is designed to operate with different Hydrocarbon Gases such as Methane, Butane, Propane etc. rather than the traditional CO2, Nitrogen and Compressed air. The objective is to increase the effective range and power of the traditional Air Rifles by modifying and using alternative fuel and make it function like a firearm without its deadly effects.

Keywords: Hydrocarbon Gases, Piezo-igniter, Ignition, Combustion Chamber, Explosion, Detonation, Gases, Air Rifle.

1. INTRODUCTION

There are mainly 5 types of Air guns available in the market; Spring Powered, Gas piston, Pre-charged Pneumatics, Nitrogen Powered, CO2 Powered. In the Pre-Charged Pneumatics rifles there is a small chamber which contains the pressurized air which is used and regulated by a valve. Meanwhile the CO2, N2 Powered works in the same way however the fuel is pressurized CO2, N2 tubes which can be contained in a much smaller capsule like structure.

The butane, propane, methane gas is stored in canisters which are generally available in the market. So the availability is plenty, and no special equipment is required to harness the gas. The research is conducted in order to check whether usage of hydrocarbons such as butane gas, propane gas is feasible to use in the air rifle segment of sports and how it performs compared to the other types of Air guns which are available in the market.

2. OBJECTIVE & METHODOLOGIES

Hydrocarbons such as Butane, Propane and Methane have low flash point and they are readily available in the market hence they can be used as a source of energy in substitution for CO2 and N2.

It is necessary for the mechanism to be portable, hence it has been formed in a shape of a Rifle. The idea here is to create an explosion in an enclosed space, leaving one end open from where the energy can travel and has the least resistance path. A pellet or ball bearing would be placed on the exit which would be propelled by the combustive force.

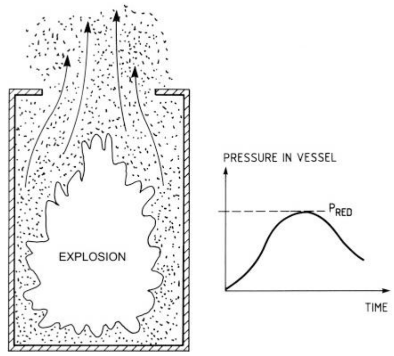

Fig. 1 Explosion direction [14]

There are other aspects of detonation phenomena which are only partially related to hydrodynamic processes and thus are out-side the scope of classical theory. These comprise transition from flame to detonation, limits of detonation, pulsation and spin of detonation waves. In addition, various problems arise from observations on the ignition of explosives by weak shocks. [1, 2].

2.1 Characteristics of Explosion Properties of the Gas

The major explosion parameters of gases are: [2]

1) Maximum pressure of explosion, max p
2) Maximum rate of explosion pressure rise, (see fig 2) or K factor: (dp/dt)max or K factor:
K=(dp/dt)max V1⁄3
3) Explosion limits
4) Detonation limits
5) Temperature of self-ignition
6) Minimum energy of ignition

Fig. 2 shows the record of the explosion pressure in a closed container. The maximum pressure of explosion Pmax is the highest pressure recorded during explosion in the closed container.

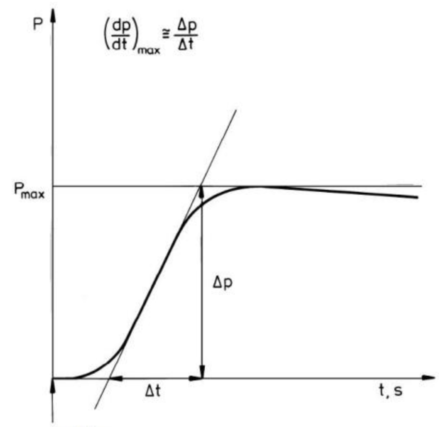

Fig. 2 Record of the explosion in a closed container [2]

2.2 Combustion properties of Gas – Air mixtures

The burning of a gas in air is a chemical reaction in which the fuel is oxidized releasing heat and often light. The chemical products of the complete combustion of hydrocarbon fuel are carbon dioxide and water vapor. Combustion of methane in air can be described by the reaction:

$$CH4 + 2(O2 + 3.762N2) \rightarrow CO2 + 2H2O + 2(3.762N2) + heat \quad \ldots (1)$$

The temperature of premixed flame can be calculated from the (lower) heat of combustion of gas and the specific heats of combustion products. The flame temperature is highest for a stoichiometric mixture. This temperature is called the adiabatic flame temperature since it is calculated assuming the combustion to be an adiabatic process (no heat losses to the environment). Table 1 presents the adiabatic flame temperatures of some hydrocarbon gases and hydrogen in air [2, 3].

The adiabatic flame temperature can be used to calculate the volume of stoichiometric mixture after the combustion has occurred. It follows from ideal gas law pV= NRT that:

$$\frac{V_f}{V_i} = \frac{N_f T_f}{N_i T_i} \quad \ldots (2)$$

Where,

- V_i is the initial volume in [m^3] V_f is the initial volume in [m^3]
- N_i is the number of moles in the unburned mixture in [mole]
- N_f if the number of moles in the combustion produce in [mole]
- T_i is the initial temperature in [K]

For methane, the number of moles is conserved i.e. $N_f = N_i = 10.52$

The ratio $E = {V_f}/{V_i}$ is called the expansion ratio of the gas. Values of the expansion factor E are given for hydrocarbon gases and hydrogen in table 1. For most hydrocarbon fuels, to a first approximation the mole number ratio ${N_f}/{N_i}$ can be taken as 1. The expansion factor can be equated to the ratio of the temperatures ${T_f}/{T_i}$.

fuel	flamm. range %	stoich. mixt. %	T_f K	E	H_{st} MJ/m^3
hydrogen	4 - 75	30	2318	8.0	3.06
methane	5 - 15	9.5	2148	7.4	3.23
ethane	3 - 12.5	5.6	2168	7.5	3.39
propane	2.2 - 9.5	4.0	2198	7.6	3.46
butane	1.9 - 8.5	3.1	2168	7.5	3.48
pentane	1.5 - 7.8	2.6	2232	7.7	3.59
hexane	1.2 - 7.5	2.2	2221	7.7	3.62
heptane	1.2 - 6.7	1.9	2196	7.6	3.62
acetylene	2.5 - 80	7.7	2598	9.0	3.93
ethylene	3.1 - 32	6.5	2248	7.8	3.64
propylene	2.4 - 10.3	4.4	2208	7.7	3.59
butylene	1.7 - 9.5	3.4	2203	7.6	3.64
benzene	1.4 - 7.1	2.7	2287	7.9	3.62
cyclohexane	1.3 - 8.0	2.3	2232	7.8	3.85

Table 1: Combustion properties of some hydrocarbon and hydrogen in air [3].

A basic quantity of premixed gas flames is the burning velocity - S0. This is the velocity at which the flame front (thin reaction zone) travels in a laminar flow with respect to the unburned mixture immediately ahead of it.

The value of burning velocity is determined by the molecular transport processes, such as heat and mass transfer within the flame front. The burning velocity is a function of gas concentration, reaching a maximum just on the fuel rich side of the stoichiometric concentration. This maximum value and the corresponding concentration are given in table 2 for the gases in table 1. It is seen that the maximum laminar burning velocity of most hydrocarbon fuels is close to 0.5 m/s. Hydrogen has exceptionally large laminar burning velocity 3.5 m/s [3].

fuel	max S_0 at %	max S_0 m/s	max S_t m/s	AIT K	min. ign. energy mJ
hydrogen	54	3.5	28	847	0.02
methane	10	0.45	3.5	813	0.29
ethane	6.3	0.53	4.0	788	0.24
propane	4.5	0.52	4.0	723	0.25
butane	3.5	0.50	3.7	678	0.25
pentane	2.9	0.52	4.0	533	0.25
hexane	2.5	0.52	4.0	498	0.25
heptane	2.3	0.52	4.0	488	0.25
acetylene	9.3	1.58	14.2	578	0.02
ethylene	7.4	0.83	6.5	763	0.12
propylene	5.0	0.66	5.1	733	0.28
butylene	3.9	0.57	4.3	658	0.28
benzene	3.3	0.62	4.9	833	0.22
cyclohexane	2.7	0.52	4.1	518	0.24

Table 2: Combustion properties of some hydrocarbon and hydrogen in air [3]

3. COMPONENTS & DESIGN

The components are designed in simple and compact manner which can be manufactured without much complexities. Few parts can be found in the market which can be modified according to the need and few has to be manufactured.

The core component of the design is the combustion chamber which has been inspired by combustion engine. In a Petrol engine, sparks plugs are used to combustion the fuel inside, similarly, a combustion chamber has been designed which can hold Hydrocarbon gases as fuel and it would be ignited by Piezo igniter.

Different patents related to the different components have been studied in order to gain more knowledge on their functions and designs. The parts are inspired by the features in different patents.

3.1 Gas Torch Adaptor

One of the modified parts used for the design would be the Gas Torch Adaptor which gets attached to a butane canister of 222gram or 250gram. The canister is of the standard fitting, which is available in the market and the adaptor would fit like a glove even to a propane canister. This torch is universal and available almost everywhere, as they have a variety of application in many of the industries. [Fig. 3]

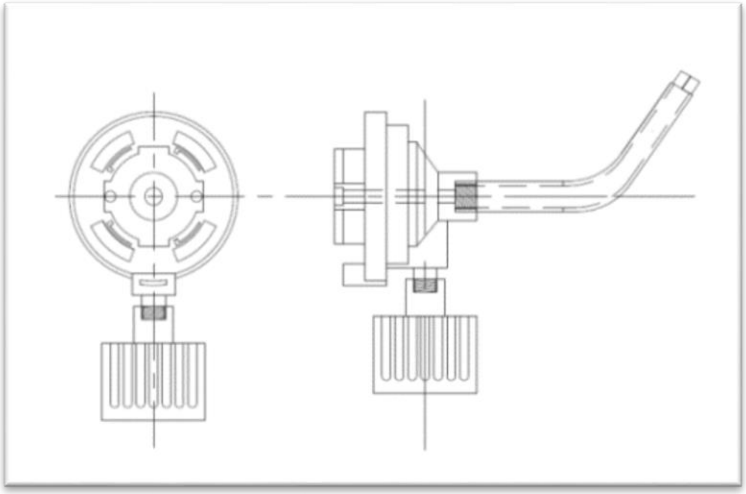

Fig. 3 Gas Torch Adapter

3.2 Check Valve / Non – Return Valve

The Check Valve is designed as well as modified for the system, a fuel check valve was available in the market but the size of it was bigger than anticipated, so to install it in the system it had to be modified using some brass nipples used in automobiles and fuel pipe. [Fig 4]

Inside the brass nipple, a 5.5MM ball bearing is inserted which sits loosely in the nipple but when back pressure is there it sits flush on the hole inside the nipple and makes it airlock. This system works as double security along with the Non-return valve as if the flames reach the canister it would be a disaster.

There is another design [Fig. 5] that was made after careful examination and analysis of the above-outsourced fuel check valve. The new design hasn't been incorporated into the system, but it certainly can be done as it reduces the number of components. The new design has been made such that two components have been combined into one component hence saving space and making the system as compact as possible. [7]

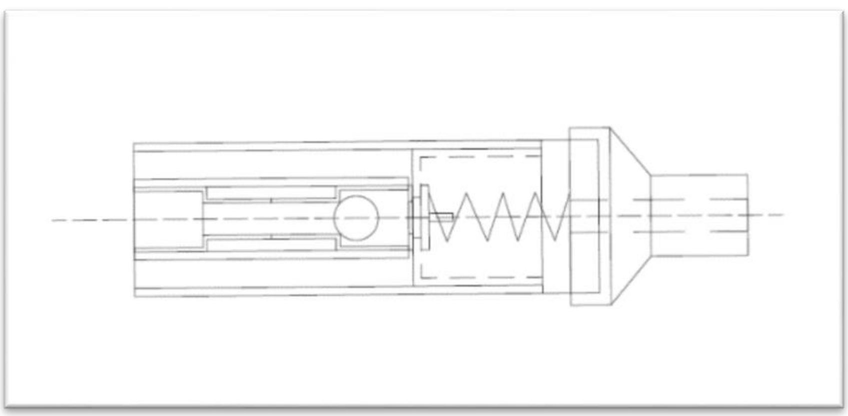

Fig. 4 Non-Return Valve

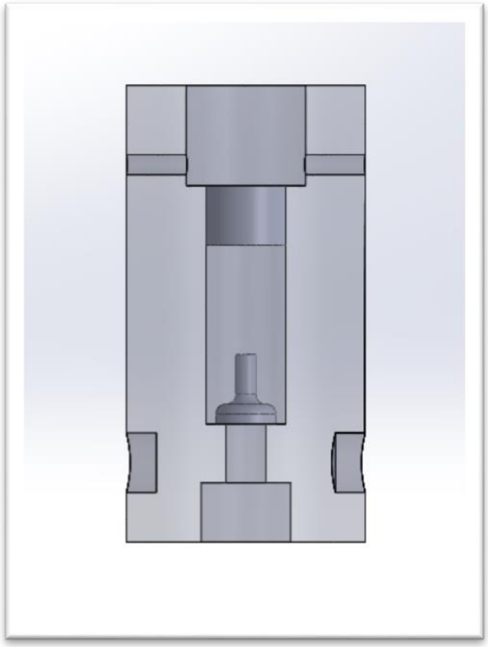

Fig. 5 Non Return Valve [New Designed]

The volume inside the Non-Return Valve would be around 4,448.49 mm^3 approximate. This is the volume of gas inside the valve when in a loaded condition.

3.3 Gas Torch & Non – Return Valve Assembly

The tip of the gas torch sits flush to the Non-Return Valve fitting due to the brass nipple assembly inside it and makes it a single component upon installation of both the components. [Fig. 6]

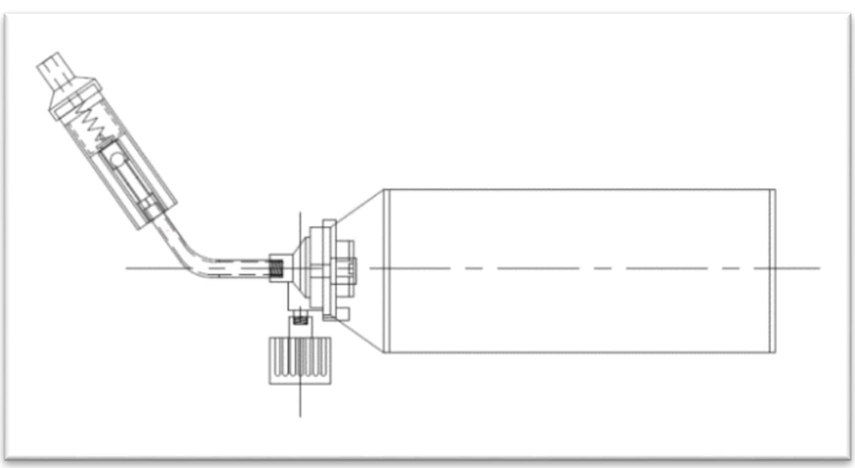

Fig. 6 Gas Torch & Non Return Valve Assembly

3.4 Piezo – Igniter

When the button on a Piezo-electric igniter is pressed, a spring-loaded hammer strikes quartz in order to create a spark. This is the typical process used in such lighters. This creates the necessary amount of voltage to generate a spark. [Fig. 7][5, 6]

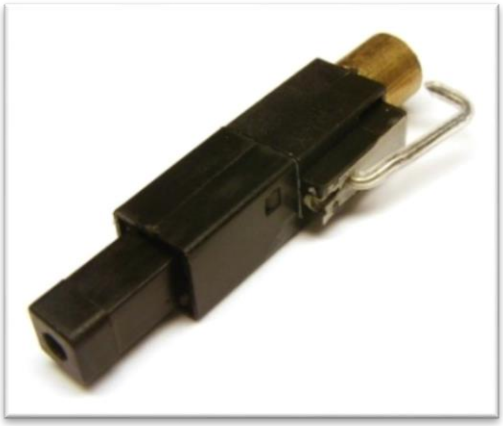

Fig. 7 Gas Torch & Non Return Valve Assembly

3.5 Main Body

This is one of the main component of the model which also functions as a juncture where the entire small components are assembled on. The body is made of Aluminum (Aluminum alloy 6063) to keep it lightweight and effective. The main body hosts many parts such as Adapter, Barrel, Magazine, Ignition Module, and Stopper. [Fig. 8][17]

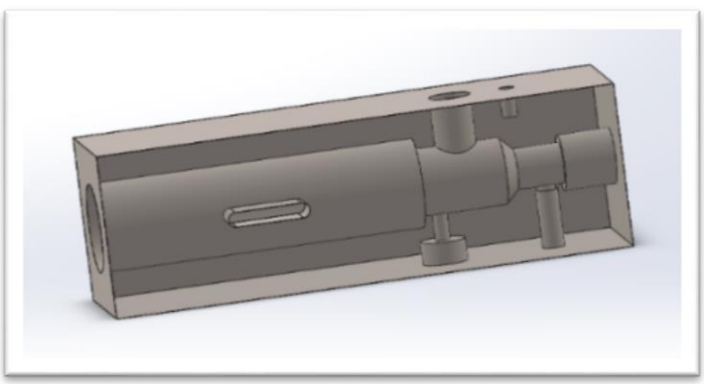

Fig. 8 Main Body 3D

3.6 Ignition Module (Ignition Chamber)

This component has two functions to serve, firstly it slides under the hole given in the Main body where it is screwed and aligned, think of this as a single bolt action gun mechanism, where a bolt is used to guide the mechanism. This guide is used for semi-automatic loading of the bullet into the chamber.

The second and the most crucial function it performs is that this component includes the combustion chamber inside itself. By doing so we don't require to make a separate chamber for butane gas to be ignited and this makes the gun compact and simple in design. [Fig. 9][17]

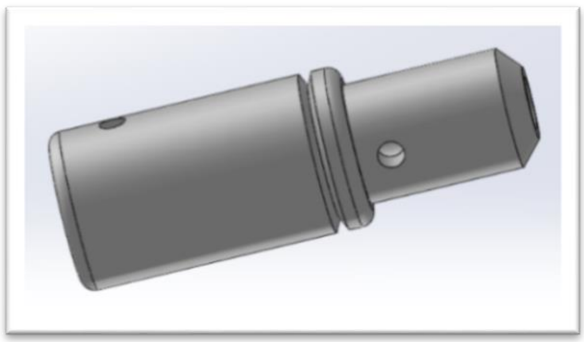

Fig. 9 Ignition Module 3D

Material [10]	**AISI 4140 Steel Bar**
Density	7.85 g/cm^3
Hardness, Brinell	197 HB
Tensile Strength, Ultimate	655 MPa
Tensile Strength, Yield	415 MPa
Elongation at Break	25.70%
Thermal Conductivity	42.6 W/m-K
Modulus of Elasticity	210 GPa
Workability	Cold: Good
Machinability	Good

Table 3: Material Details

For the calculation we are going to assume the combustion fuel as petrol whose approximate pressure inside the engine is about 120 bars and diesel has 180 bars.

DATA;

Pi = 12 n/mm^2	E = 210Gpa
Do = 9 mm	E = 210000n/mm^2
Di = 5 mm	FOS = 2
R = 2.5 mm	μ = 0.30
L = 35mm	welding factor (e) – 1.0

Yield Strength – 415 n/mm^2
Allowable stress – 14 N/MM^2

Minimum thickness requirement (UG-16)

The minimum thickness requirement of any pressure retaining component (excluding corrosion allowance) is 1.5 mm in accordance with the provisions of UG-16 i.e. [13, 15]

$$tu = 1.5mm$$

The thickness required (t_c) to handle circumferential stress arising due to internal pressure (Pi) is given as:

$$0.385 \text{ SE} = 0.39 \qquad \dots (3)$$

$$\text{Pi} = 12$$

If $P_i > 0.385\, SE$, using Appendix 1-2: [14]

$$t_c = R\left(e^{\frac{Pi}{SE}} - 1\right) \qquad \dots (4)$$

$$tc = 3.39\, mm \approx \mathbf{3.5\, mm}$$

The thickness required (t_l) to handle Longitudinal stress arising due to internal pressure (Pi) is given as:

$$1.25\text{SE} = 17.5$$

If $P_i > 1.25\, SE$, using appendix 1-2: [14]

$$tl = R\,(\sqrt{Z} - 1) \qquad \dots (5)$$

$$\text{Where, } Z = \left(\frac{Pi}{SE} + 1\right) \qquad \dots (6)$$

$$\therefore Z = 1.85$$

$$t_l = 0.900\, mm \approx \mathbf{1.0\, mm}$$

<u>The shell thickness excluding corrosion allowance (t) is the highest of the thickness amongst tc, tl, tu:</u>

$$\underline{tc = 3.39 \approx \mathbf{3.5\, mm}}$$

Maximum Allowable Working Pressure

$\frac{R}{2} = \frac{2.5}{2} = 1.25\, mm$, t = 3.5 mm

The MAWP for the available thickness is determined for circumferential stress (MAWPc) as:

If $t > \frac{R}{2}$, using appendix 1-2: [14]

$$\text{MAWP}_c = \log e\left(\frac{R+t}{R}\right) \qquad \dots (7)$$

$$\text{MAWP}_c = \mathbf{14.5\ n/mm^2}$$

The MAWP for the available thickness is determined for circumferential stress (MAWP_l) as:

If $t > \frac{R}{2}$, using appendix 1-2: [14]

$$\text{MAWP}_l = SE\ (z-1) \qquad \ldots (8)$$

$$\text{where, } z = \left(\frac{R+t}{R}\right)^2 \qquad \ldots (9)$$

MAWP_l = **66.64 n/mm²**

The shell MAWP which is the lowest of the MAWP amongst MAWPc and MAWPl:

MAWP_c = **14.5 n/mm²**

The Area inside the ignition module and valve portion would be **524.58 mm² &** Volume is **628.32 mm³**

Mass = Density of Butane gas × Volume of the cylinder

= 573 × 628.32 = **0.00036002736 kilogram**

Therefore, the mass of gas in the portion would be 0.36002736 grams. Given its gas and considering the leakages (If any) it is safe to assume that the usage of gas per shot would be 0.50 grams.

The heat of combustion of butane is -2870 kJ/mol. means, 2870 kJ energy is released when butane is burnt in the presence of oxygen.

Molecular Mass of butane is 58.12 g/mol

$$\text{Formulae - } N = \frac{mass}{Molecular\ Mass} \qquad \ldots (10)$$

Therefore, number of moles in 0.5 gram of butane is 8.602×10^{-3} mol

If 8.602×10^{-3} moles of Butane is burned in the combustion the energy produced would be;

$$\frac{8.602\ x\ 10^{-3}\ mol\ CH4}{1}\ X\ \frac{2870}{1\ mol\ CH4} \qquad \ldots (11)$$

Energy produced = **24.68 KJ**

According to newton's second law of motion, the acceleration of an object equals the net forces acting on it divided by its mass

M = 0.6786 g (Steel ball bearing)

F = 24680 N

Velocity (V) = **9030.52 m/s or 29627.7 ft/s**

3.6.1. Muzzle Energy

Muzzle energy is the kinetic energy of the bullet when expelled out from the muzzle to the target. Muzzle energy will be higher when bullet is heavier and moves out faster from the muzzle.

$$\boldsymbol{E_k = \frac{1}{2}Mv^2} \qquad \ldots (12)$$

The velocity of the bullet is a more important determinant of muzzle energy. Muzzle Energy with Butane as gas would be **1619.74 J**

3.6.2. Estimating Explosive Energy Release in a Confined Explosion

One typical explosion in an enclosure is caused by flammable gas leaking, which mixes with air in the enclosure and subsequently ignites to cause an explosion. The energy released by expansion of compressed gas upon rupture of a pressurized enclosure may be estimated using the following equation [2]:

$$E = \propto \Delta H_C \, m_F \qquad \ldots (13)$$

Where,

E – Explosive energy released in [kj]

$\propto$ - Yield

ΔH_C – Theoretical net heat of combustion [kj/kj]

m_F – Mass of flammable vapor release [kg]

The yield,$\propto$ is typically in the range of 1-percent (0.01) for unconfined mass releases, to 100 percent (1.0) for confined vapor releases [31].

Heat of Combustion, Ignition Temperature; and Adiabatic Flame Temperature* of Flammable Gases			
Flammable Gas	Heat of Combustion ΔH_C (kj/kg)	Ignition Temperature T_{ig} °C (°F)	Adiabatic Flame Temperature T_{ad} °C (°F)
Acetylene	48,220	755 (1,391)	2,637 (4,779)
Carbon monoxide (commercial)	10,100	765 (409)	2,387 (4,329)
Ethane	47,490	945 (1,733)	1,129 (2,064)
Ethylene	47,170	875 (1.607)	2,289 (4,152)
Hydrogen	130,800	670 (1,238)	2,252 (4,085)
Methane	50,030	1190 (2,174)	1,173 (2,143)
n-Butane	45,720	1025 (1,877)	1,339 (2,442)
n-Heptane	44,560	-	1,419 (2,586)
n-Octane	44,440	-	1,359 (2,478)
n-Pentane	44,980	-	1,291 (2,356)
Propane	46,360	1;010 (1,850)	1,281 (2,338)
Propylene	45,790	1,060 (1,940)	2,232 (4,050)
*Adiabatic flame temperature of lower limiting fuel/air mixture			

Table 4: Theoretical Heat Of Combustion for Several Flammable Gases [30]

3.7 Stopper System

A system was required to stop the metal sphere from falling off the barrel and also to create a pressure seal such that the gas in the combustion chamber doesn't leak outside the system. To do so a simple stopper has been designing; this works with a plug and spring.

3.8 Sear Mechanism

In a firearm, the sear is the part of the trigger mechanism that holds the hammer, striker, or bolt back until the correct amount of pressure has been applied to the trigger, at which point the hammer, striker, or bolt is released to discharge the weapon. Since here, there is a hammer and striker but it is concealed within the Piezo Igniter so design only the push mechanism which would help exert a force on the Piezo Igniter. [Fig. 10][4, 8, 26, 27]

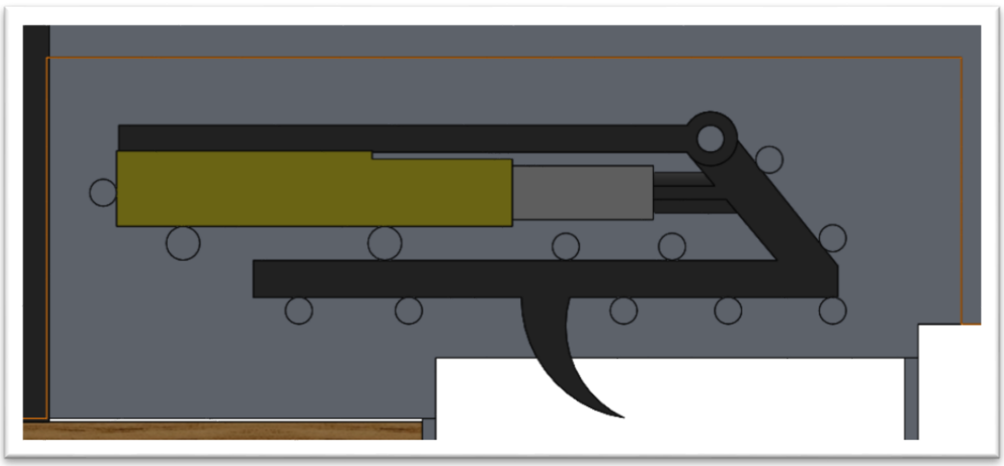

Fig. 10 Ignition Module 3D

3.9 Horizontal Fore-Grip

The Fore-grip is attached to the gun in order to provide support on the front end so it doesn't tip and can be controlled much better. Another reason to add a Fore-grip to this system is that it helps to counter the weight concentration on the front end due to the combustion chamber. Knurling is being done on the material to increase the surface roughness which would be beneficial to provide a better grip.

We can also just slide a rubber gripping pad on the handle if one doesn't have access to knurling. Or we make use strings or rope to give it a grip [Fig. 11] [9, 24]

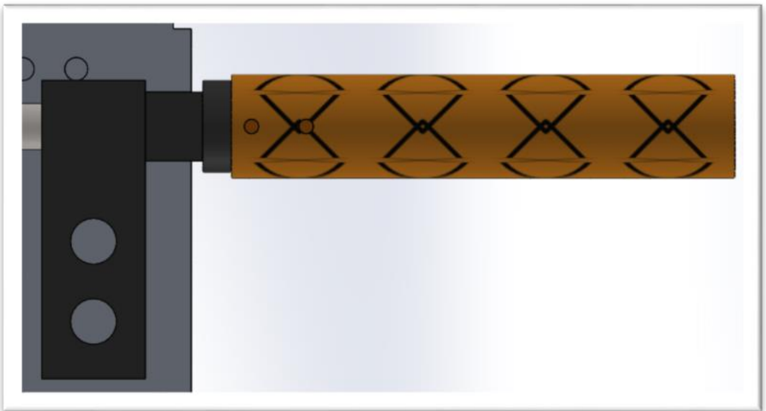

Fig. 11 Horizontal Fore-Grip

3.10 Safety Explosive Shield Cover (SESC)

The Safety Cover is a component [Red Crosses] that is used to shield the combustion chamber and the joint which is connected with valve from which the Gas enters the chamber. The Explosive Shield as the name suggests is a safety measure that is installed on the combustion chamber, this is done due to the fact that the user hand would be near the supply fuel and if the leakage takes place we need a method of safety.

It is a Stainless steel hollow pipe with 0.5 mm thickness which would be screwed into the Non-Return Valve systematically. So if there is a blast leakage then the extra protection should be able to deflect the explosion downwards which is away from the Fore-grip. [Fig. 12]

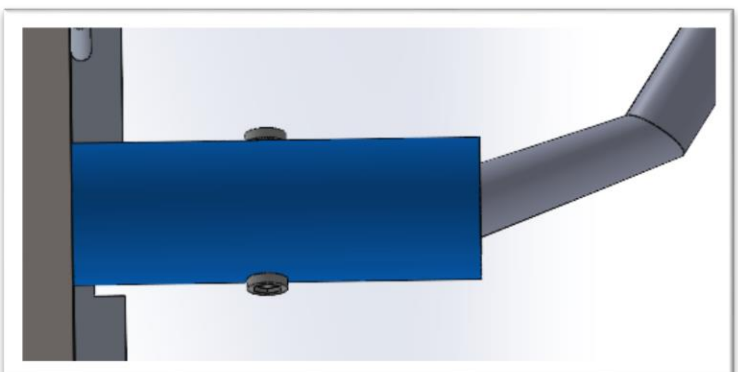

Fig. 12 Safety Explosive Shield Cover

3.11 Canister Holding Arm

All the canister weight would get concentrated on the bottom of the Non-Return Valve where it would thread. Due to this, it makes the fuel supply unstable, and chances of breakage increase. To counter this weight support element is directly attached to the frame of the system which distributes the loads from the threaded area to the support area, by doing so we can freely use the system without worry of breakage and the imbalance in the gun. [Fig. 13]

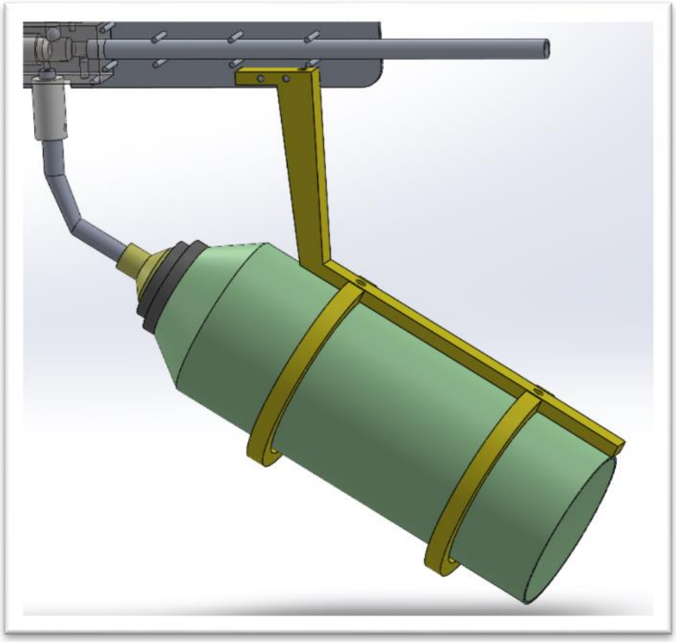

Fig. 13 Canister Holding Arm

3.12 Magazine and Feed System

As seen in figure 13, this is a single fed system in which one sphere enters the chamber, and once the combustion takes place the explosive energy pushes the module in backward motion creating an empty space which is taken over by another sphere which is fed through the magazine powered by a spring mechanism. The magazine can take up to 10 metal spheres, before loading it like a shotgun reloading mechanism. [Fig 14][18]

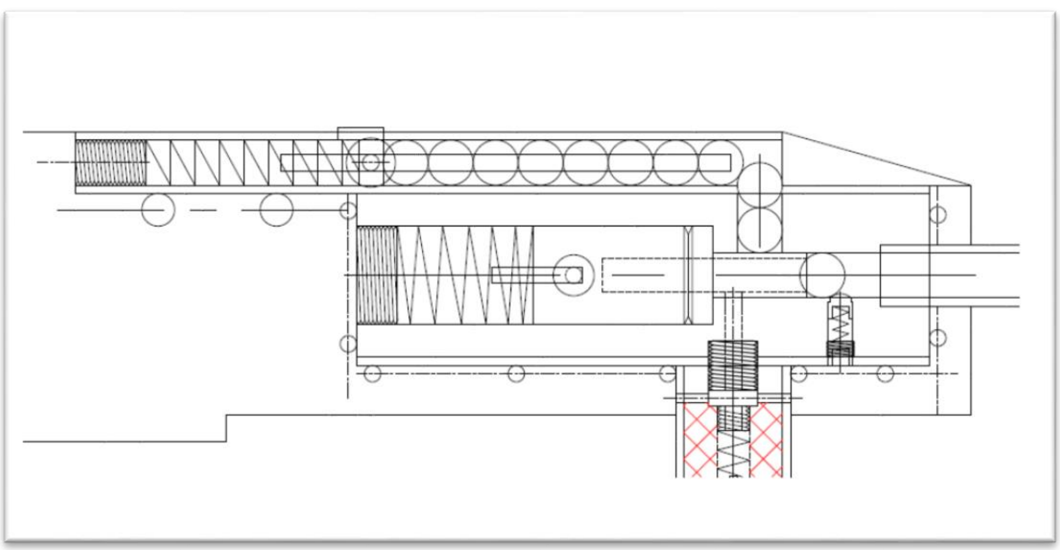

Fig. 14 Magazine and Feeding System

3.13 Foldable Buttstock or Stock

Stocks are a critical part of the rifles as the stock provides a means for the shooter to firmly brace the gun and easily aim with stability by being held against the user's shoulder when shooting the gun, and helps to counter muzzle rise by transmitting recoil straight into the shooter's body. The shoulder rest in this system is design to rotate on the left side of the gun and it can be locked using neodymium magnets in place so no complicated locking system is required. The length of the shoulder rest is kept almost equal to the length of the gun which when fold it can create a compact system that is portable. [Fig. 15][25]

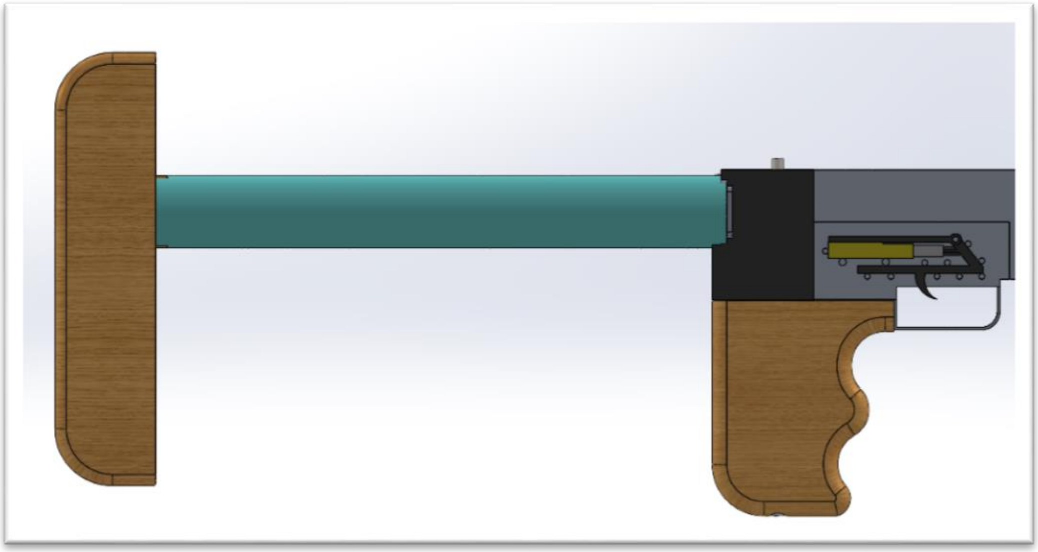

Fig. 15 Stock

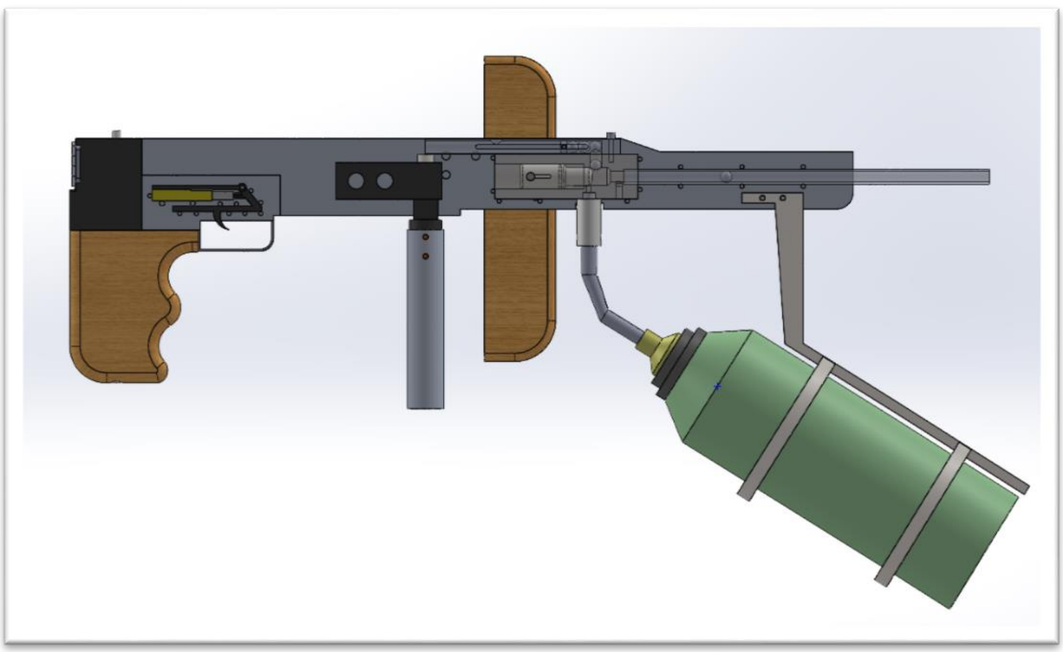

Fig. 15 Stock (Folded)

3.14 Assembly

The final product should look like this after the manufacturing and assembling all the parts together in the proper fashion and order. The above views showcase the parts in their designated place and a final cover is not attached for the internal view purpose. Aluminum is mostly used in most of the part to control the weight of the product; the critical components of the product are made of stainless steel as internal combustion is going to take place. From the given data it is estimated that the final weight of the product should be somewhere between 3.5 Kg to 4.0 KG.

Fig. 16 Assembled

4. CONCLUSION

The system works in harmony and the combustion in the module push itself behind up to 11 mm and then all the energy is redirected towards the direction in which the barrel is open. This pushes the bearing with the given velocity out of the barrel. This is a cyclic process; however, with further research, it can be made automatic. For now, we have to open and close the Gas valve in order to fill the combustion chamber.

The calculation for the other hydrocarbons can be found in the below table;

Gases	Heat of Combustion (KJ / mol)	Molecular Mass (g/mol)	No. of Moles in 0.5 gram
METHANE CH_4	890	16.04	0.0311
ETHANE C_2H_6	1560	30.07	0.0166
PROPANE $C3H_8$	2220	44.1	0.0113
BUTANE c_4H_{10}	2870	58.12	8.602
OCTANE $C8H_{18}$	5460	114.23	23.89

Table 5: Properties of different gases

Gas	Energy Produced (KJ)	Mass (grams)	Velocity (ft./s)	Muzzle Energy (J)
CH_4	27.67	0.6786	29627.7	1815.97
C_2H_6	25.89	0.6786	28658.9	1699.15
$C3H_8$	25.08	0.6786	28.207	1645.99
C_4H_{10}	24.68	0.6786	27981	1619.74

Table 6: Energy Table

The above table [Table 6] represents the Kinetic Energy and the Muzzle Energy calculated for different Hydrocarbons gases. Out of which it seems that given the current design **Methane** would be the optimum choice of fuel as it produces the highest Energy out of all of them.

The Muzzle velocity of a CO2 rifle is 120 m/s to 180 m/s and a good Pre-Charged Rifle is capable of muzzle velocity of 240–270 m/s. The data received through the calculations suggests that for the same volume of gas (0.5 gram) **Methane CH_4** would be the best choice to be used as fuel due to its higher output off energy.

The other gases can also be used according to the availability and requirement of the design. From the calculation it is also suggested that the Maximum Allowable Working Pressure should not exceed 14.5 N/mm^2.

The Ignition module has been tested for failure on SOLIDWORKS Simulation with the following

DATA;

Fixture Type – Fixed
Load Applied – Pressure (Internal)
Mesh Type – Solid Mesh
Material – AISI Alloy 4140 Steel
Yield Strength – 4.150e+08

Pressure (N/mm^2)	Total Nodes	Total Element	Deformation Scale	Result
12	28928	18596	1505.37	Safe
14.5	28928	18596	1.245.82	Safe
24	28928	18596	752.683	Unsafe

Table 7: SolidWorks Simulation Analysis Results

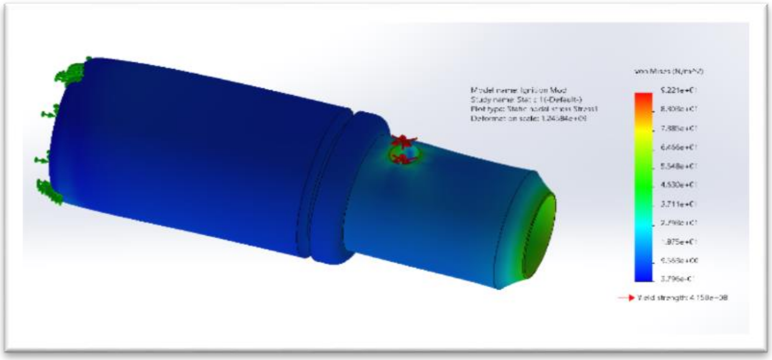

Fig. 18 Deformation at 14.5 N/mm2 Pressure

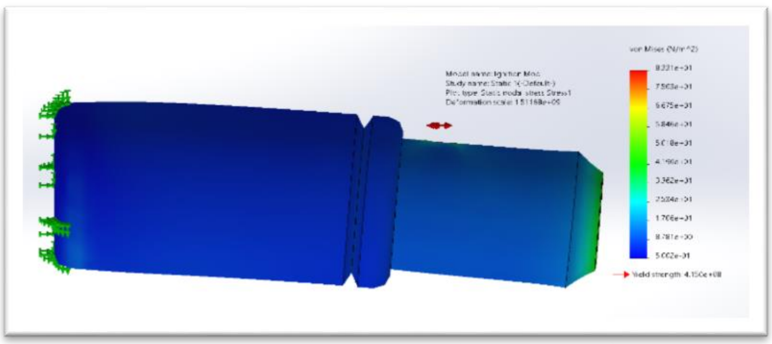

Fig. 19 Deformation at 12 N/mm2 Pressure

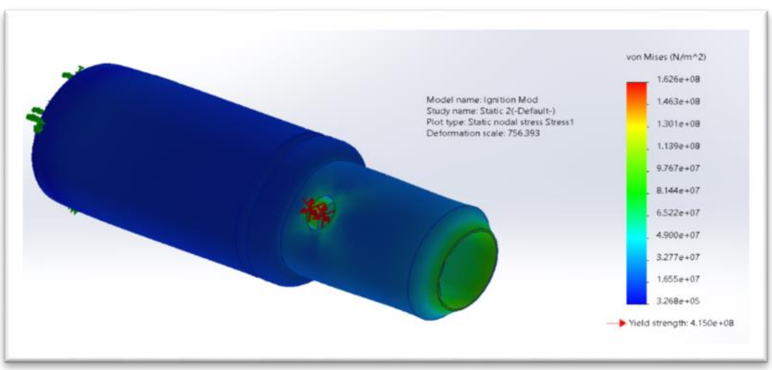

Fig. 19 Deformation at 24 N/mm2 Pressure

At 24 n/mm^2 the component starts to deform so from the data it can be said that the component is safe to use. The valve is designed to act as a non-returnable check valve hence the combustion doesn't go into that area however for safety of the user a metal cover is used to protect the main line, so even in worst case scenario the user is not met with any damaged.

So to conclude it can be said that there is a significant increase in power with the use of Methane gas as an alternative to the traditional fuel sources. If a person wants to increase the range and power even more then they have to modify the Combustion chamber to accompany more Gas intake and then the power would automatically.

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