

Anti Riot Shield with Pepper Spray & Blinding LED

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Abstract: In contemporary society, riots have become an unfortunate aspect of civil unrest, often sparked by various factors such as political disagreements, religious intolerance, or provocative events. Effectively managing riots requires law enforcement to be prepared to disperse crowds without causing harm. To address this challenge, we propose the design of a smart anti-riot shield. This lightweight shield, crafted from aluminum, offers protection against projectiles like bullets and stones while incorporating non-injurious techniques to safely repel or arrest rioters. By prioritizing the safety of both law enforcement and civilians, this solution aims to provide a more peaceful resolution to riot situations..

I. INTRODUCTION:

Introducing our innovative solution, we present a smart anti-riot shield meticulously designed to empower law enforcement personnel in handling riot situations with utmost safety for both themselves and the rioters. This cutting-edge shield incorporates three non-injurious techniques alongside several other features to ensure effective crowd control:

Firstly, the shield is equipped with a pepper spray mechanism, strategically deployed to blind rioters who approach dangerously close to attack the police. Additionally, high-powered LED blinding lights serve as a deterrent against individuals attempting to hurl stones at law enforcement officers.

Constructed from lightweight polycarbonate material, the shield offers robust protection against projectiles while allowing for agile maneuverability. Its transparent design enables clear visibility of rioters, ensuring safe observation and assessment of the situation.

A unique feature of our shield is its single-arm configuration, providing unilateral protection while leaving the other arm free for additional tasks or maneuvers. Integrated push-button triggers facilitate the deployment of pepper spray and activation of LED blinding lights, enabling swift and decisive action in volatile situations.

Furthermore, an emergency trigger button is incorporated to swiftly communicate distress signals to the head office or control room, ensuring rapid response and assistance in critical scenarios.

In essence, our smart anti-riot shield represents a sophisticated amalgamation of innovative technologies and non-injurious techniques, poised to revolutionize riot control strategies and enhance the safety and efficiency of law enforcement operations

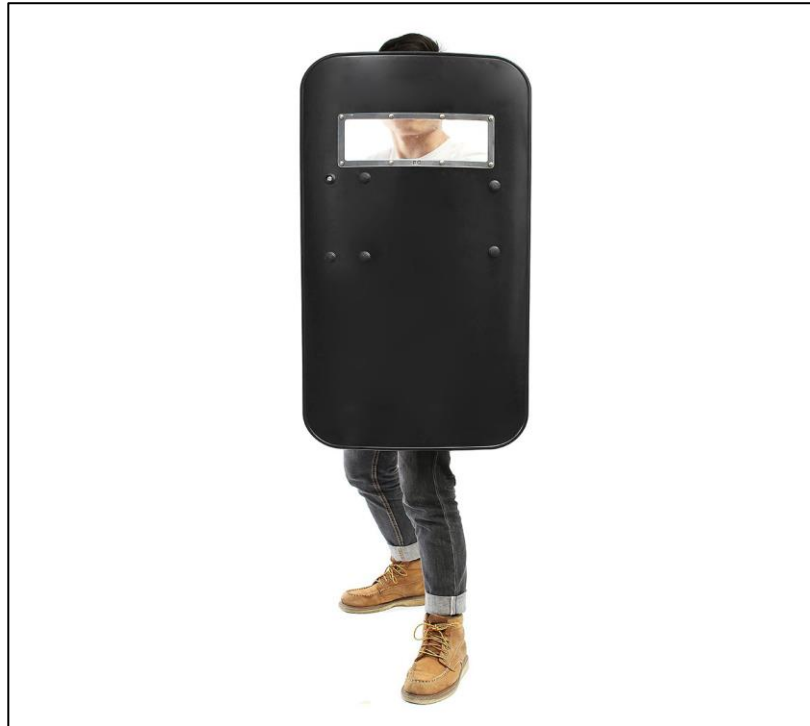


Figure No.1 – Riot Shield

II. Problem Statement:

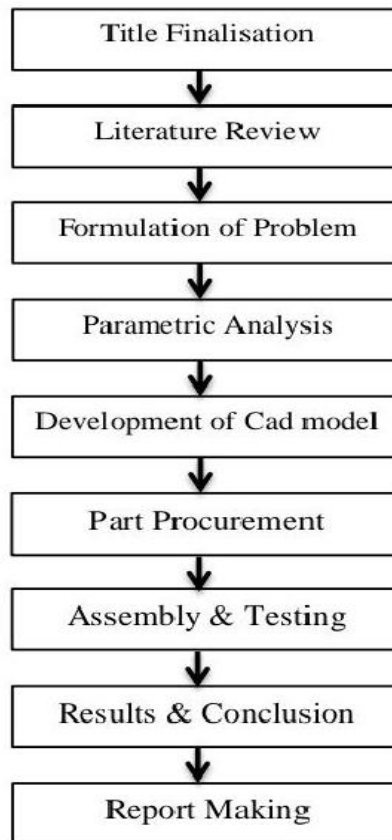
In today's society, riots have become a regrettable consequence of social unrest, often ignited by a variety of factors such as political discord, religious intolerance, or incendiary incidents. Effectively managing these situations requires law enforcement to possess the ability to disperse crowds without inflicting harm. In response to this challenge, we advocate for the development of a smart anti-riot shield. Constructed from lightweight polycarbonate, this shield offers protection against projectiles such as knives, sharp weapons and stones. Furthermore, it integrates non-injurious techniques to safely deter or apprehend rioters. By emphasizing the safety of both law enforcement personnel and civilians, this solution aims to facilitate a more peaceful resolution to riotous scenarios.

III. OBJECTIVES

- 1.To replace the wooden riot shields
- 2.To ensure safety to the officer or person who is handling the crowd
- 3.To develop technologies in defense

IV. METHODOLOGY:

Procedure of working cycle:



V. CONSTRUCTION & WORKING:

The smart anti-riot shield is constructed primarily from lightweight polycarbonate material, ensuring ease of handling and protection from projectiles such as stones and bullets. Its transparent design allows law enforcement personnel to safely view rioters through the shield, aiding in observation and assessment of the situation.

The shield features a single-arm configuration, providing unilateral protection while leaving the other arm free for additional tasks or maneuvers. Integrated push-button triggers are strategically placed on the shield, allowing for quick deployment of non-injurious techniques.

When rioters approach dangerously close, the pepper spray mechanism is activated via the push-button trigger, dispersing pepper spray towards the assailants. This pepper spray induces temporary blindness, incapacitating rioters and allowing for their arrest without causing harm.

Simultaneously, high-powered LED blinding lights are activated, further disorienting and incapacitating attackers who attempt to throw stones at law enforcement officers. These blinding lights are specifically designed to blind rioters for a couple of minutes, providing a window of opportunity for officers to safely escape or make arrests.

In emergency situations, the shield is equipped with an emergency trigger button, allowing personnel to quickly convey distress signals to the head office or control room for rapid response and assistance.

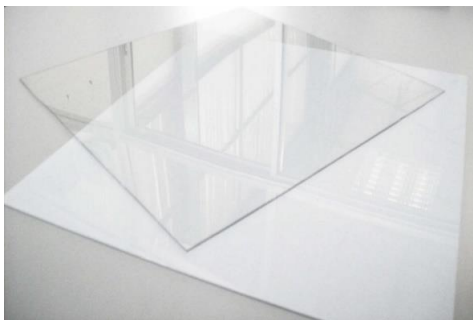
In summary, the smart anti-riot shield utilizes innovative construction and non-injurious techniques, such as pepper spraying and LED blinding lights, to empower law enforcement personnel in safely repelling and arresting rioters without causing harm to themselves or the rioters.

VI. Component specification:

1) Polycarbonate Sheet

Polycarbonate sheet is a thermoplastic that comes in a transparent sheet and offers unique durability and is resistant to water and impact damage with its tough quality and minimal moisture absorbance.

They also have excellent heat resistance, stability and are flame-retardant and chemical resistant. After all Material Selection process we have chosen this material with below specifications



:

▪ Technical Specifications

- i.Shape=Rectangular
- ii.Length = 900mm
- iii.Breadth = 600mm
- iv.Thickness = 3mm

2) High Power LED

Light Emitting Diodes(LED) are fixed at the top of the shield to give poor eye sight to the crowd who is creating problems. LED is fixed at the top of the shield, when the trigger button for led is turned on the

light emitting diode burns pink color which prevents the crowd from moving forward and attacking the persons who is handling the crowd & that's why we have chosen this LED with below specifications



▪ Specifications

- i. Shape=Hexagonal
- ii. Dimensions LxWxH = 50 x 50 x 90 Millimeters
- iii. Wattage=20 Watts
- iv. Weight=291 Grams
- v. Average Life=20000 Hours

3)Controller Arduino Nano

Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

You can tell your board what to do by sending a set of instructions to the microcontroller on the board



▪ Specifications

- i. Dimensions = 4 x 3 x 3 cm
- ii. Item Weight = 40 Grams
- iii. Operating Voltage = 5 V
- iv. Power Consumption = 19 Ma
- v.

4) GSM 900 Module

The GSM-900 Module is a readily available module, which provides the network connectivity to your project. It does all the work regarding our mobile phone, it would do like making a call, receive a call, send a message, connect to the internet using GPRS.



▪ Specifications

- i. Dimensions = 13.3 x 9.4 x 3.2 cm
- ii. Weight = 81.6 g
- iii. Voltage = 12V
- iv. Power Supply = 1 To 2 amps

5) Battery

In general, a lithium-ion battery pack like this should be charged to a maximum voltage of 4.2 volts per cell, which gives a total charge voltage of 12.6 volts for a 3S pack. The battery gives power supply to both led's and 12v motor which is used to spray pepper spray from the pepper spray tank. Power connections are supplied through wires to the led and motor from the battery



▪ Specifications

- i. Dimensions=6.8 x 5.5 x 2 cm
- ii. Weight=160 Grams
- iii. Voltage=12 Volts
- iv. Battery Description=lithium-ion
- v. Battery Capacity=2200 Milliamp Hours
- vi. Lithium-ion battery dedicated charger to charge up to 8.4v

6) Pepper Spray

A pepper spray tank is fixed at the right bottom corner of the shield which stores pepper spray for dispersing the crowd .when the valve at the bottom of the pepper spray Tank is turned on and the diaphragm motor is triggered using the trigger buttons the pepper spray moves out through the half inch tubes to the nozzles which is fixed outside the outside the shield it disables the crowd from moving forward and makes their eye irritating for some minute so that the crowd controller can move towards a safer position



▪ Specifications

Personal pepper sprays can range from a low of 0.18% to a high of 3%. Most law enforcement pepper sprays use between 1.3% and 2%. The federal government of the United States has determined that bear attack deterrent sprays must contain at least 1.0% and not more than 2% CRC (CRC is the pain-producing component of the OC that produces the burning sensation). There is no permanent injury that's why using this product with below specifications:

- i. Dimensions = 12 x 4 x 12 Centimetres
- ii. Weight = 35 gms (55ml)
- iii. Range = 4 feet
- iv. Effect = 45 min

7) Trigger buttons

Three push and pull trigger buttons are used to control the on and off of led and motor. The trigger buttons are attached to the led and motor through wires.

8) MG955 Servomotor

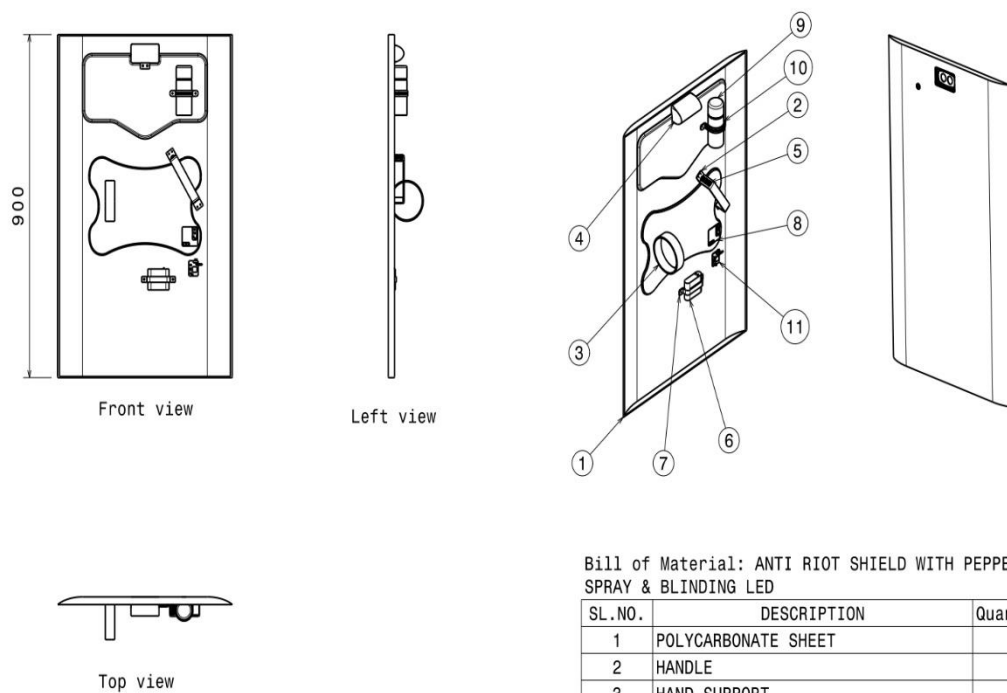
When the trigger button is pressed, Arduino got the input & it sends the output to servo meter. In such way the pepper is sprayed from bottle

▪ Specifications

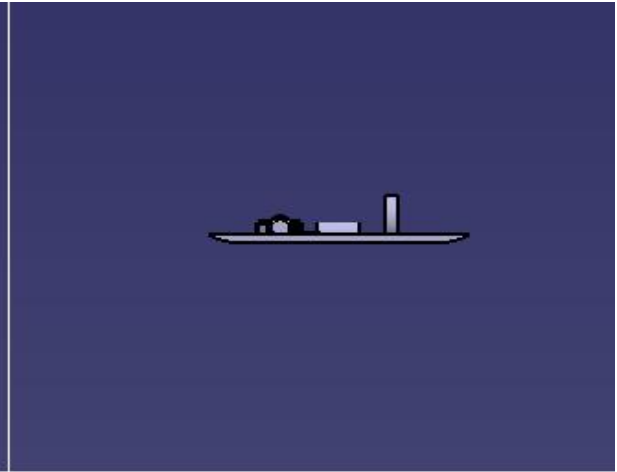
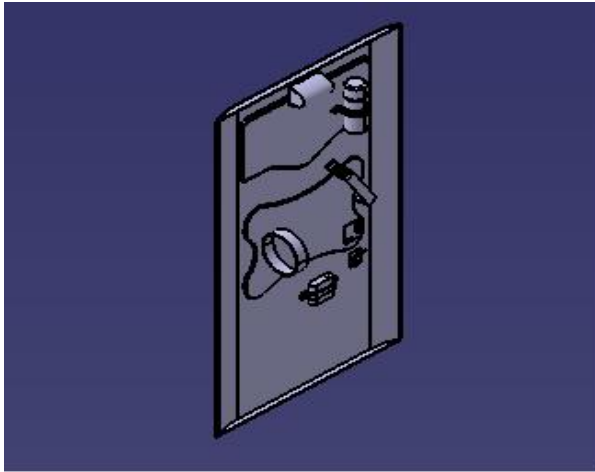
- i. Model: MG995
- ii. Weight: 55 gm
- iii. Operating voltage: 4.8V ~ 7.2V
- iv. Shipping Dimensions : 9 × 8 × 3 cm
- v. Rotational Degree: 90°

VII. DESIGN OF Anti-Riot Shield:

2D Of Anti-Riot Shield

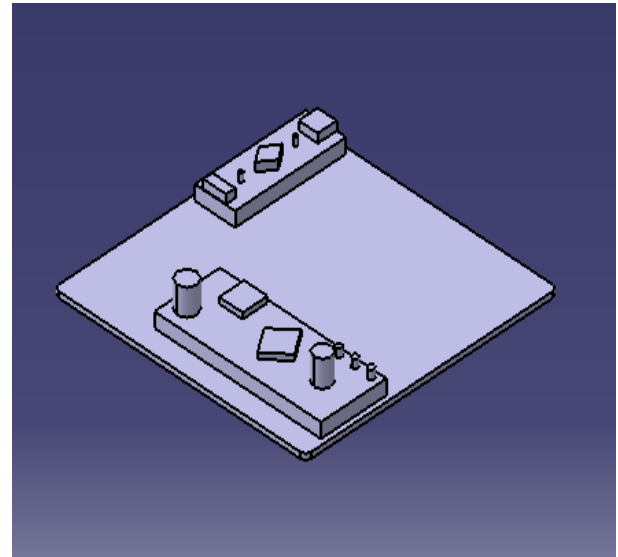
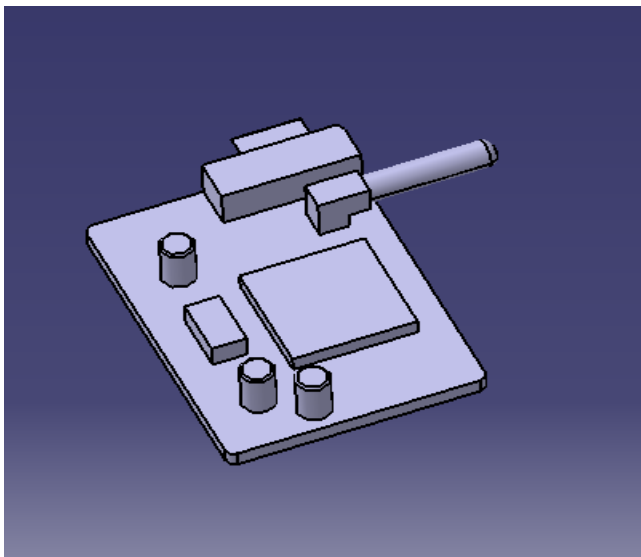


3D Of Anti-Riot Shield



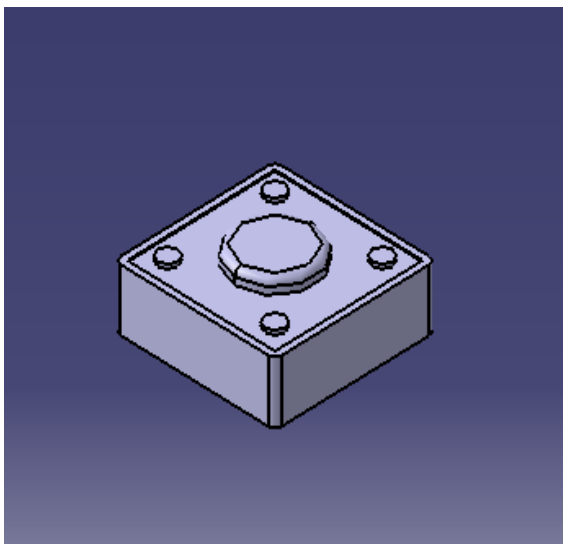
Arduino

GSM 900 Module

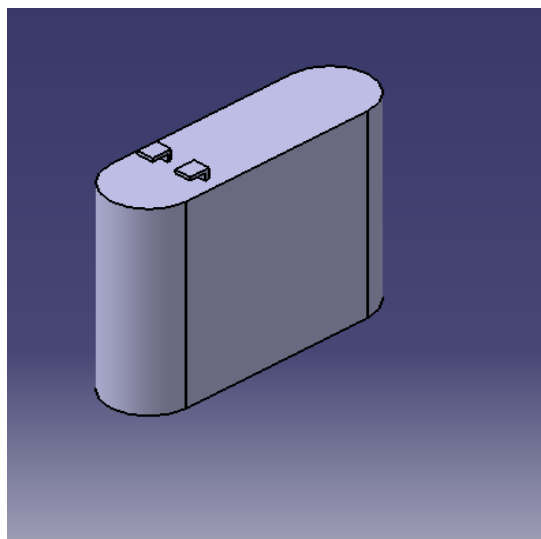


Trigger button

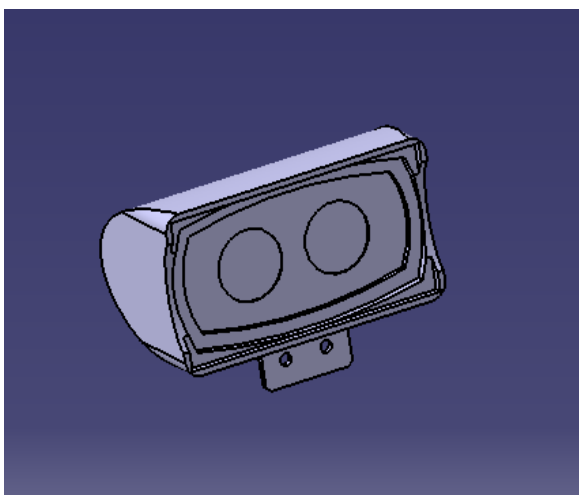
Battery



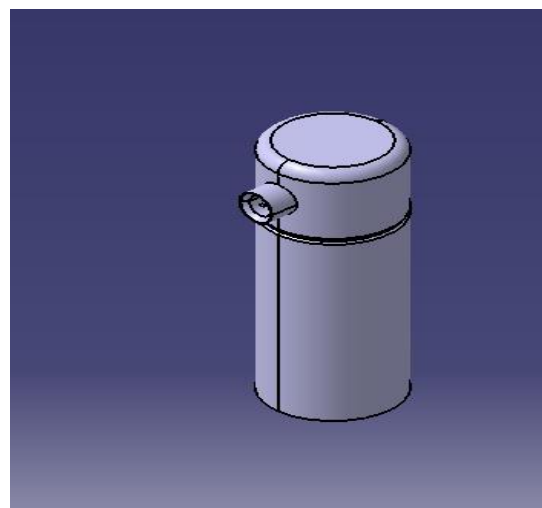
High Power Led



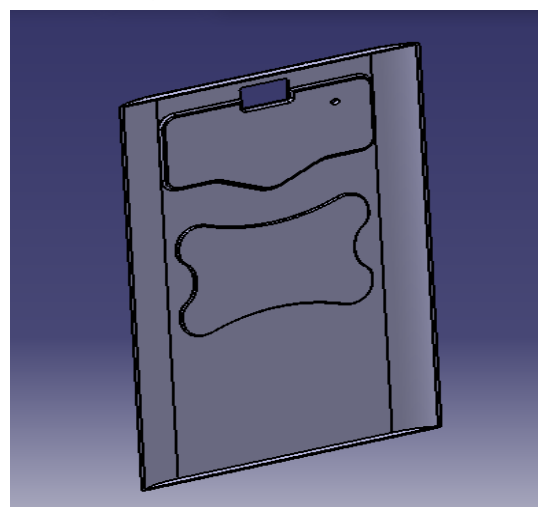
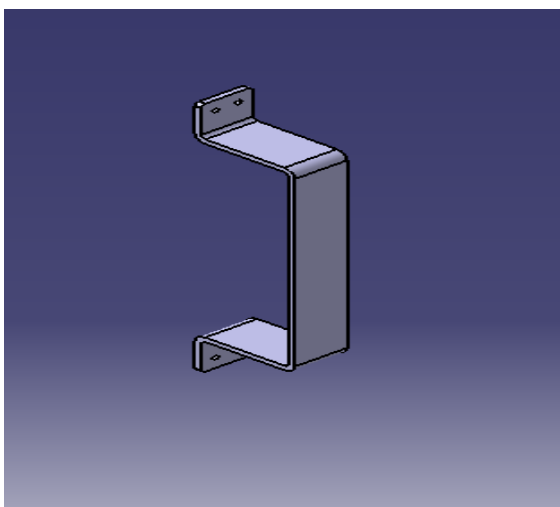
Pepper Spray Bottle



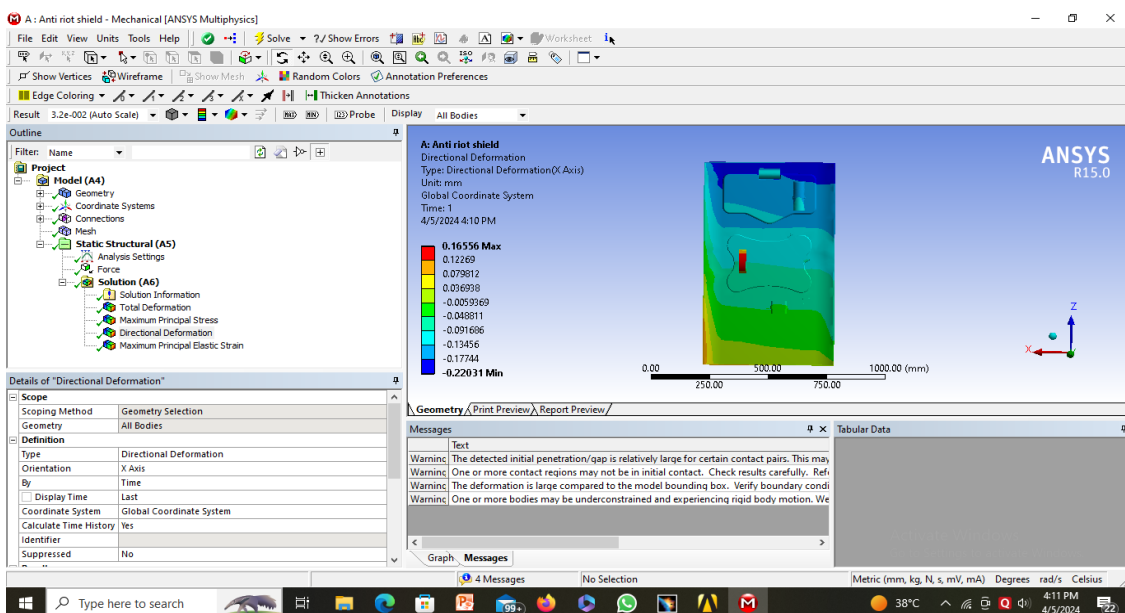
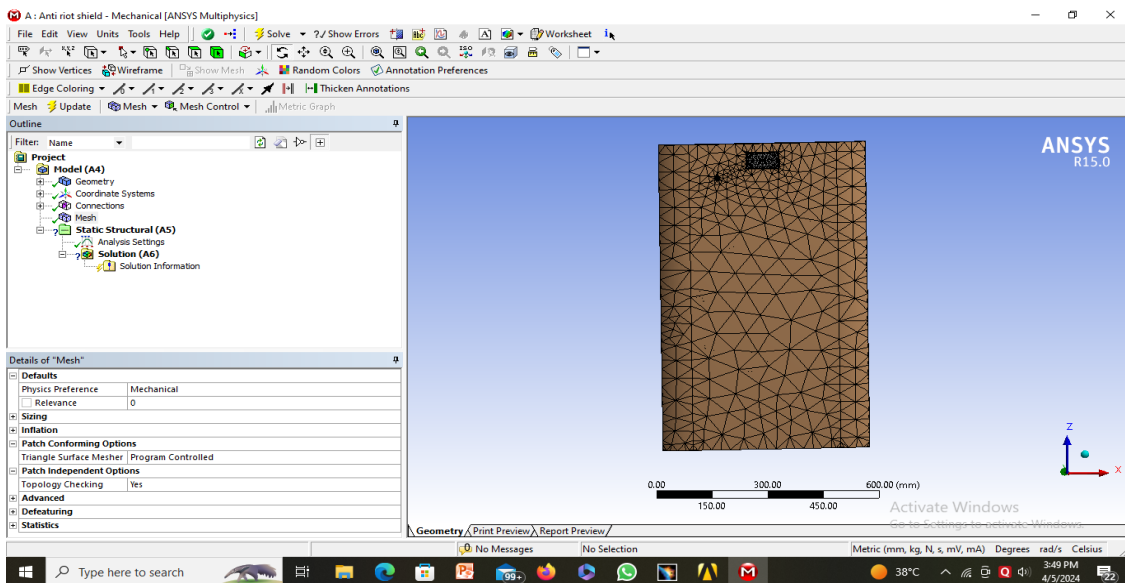
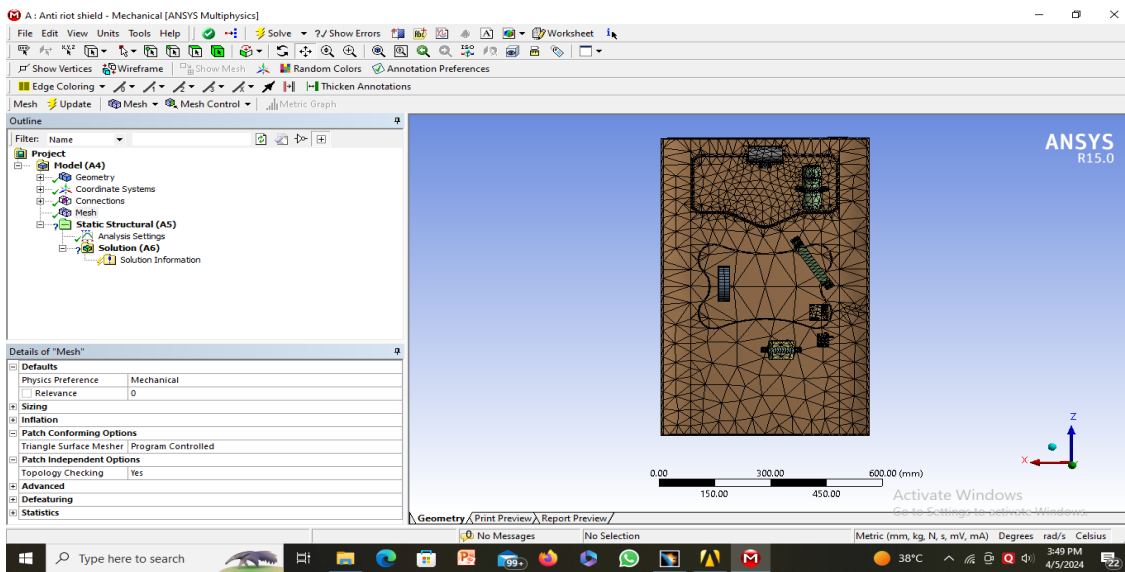
Handle

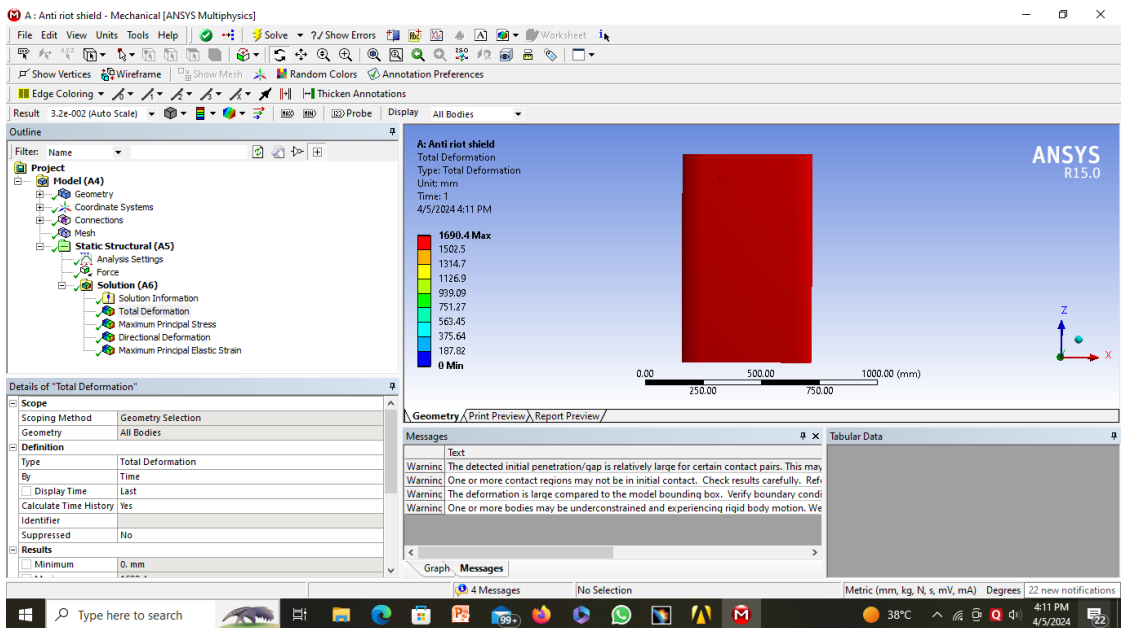
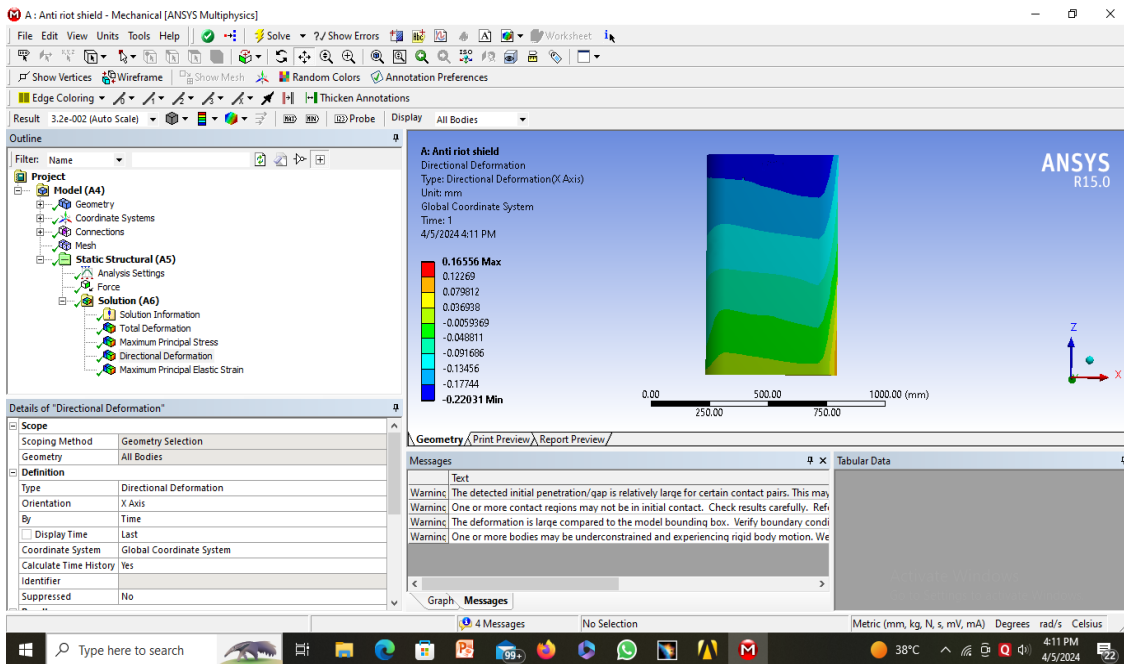


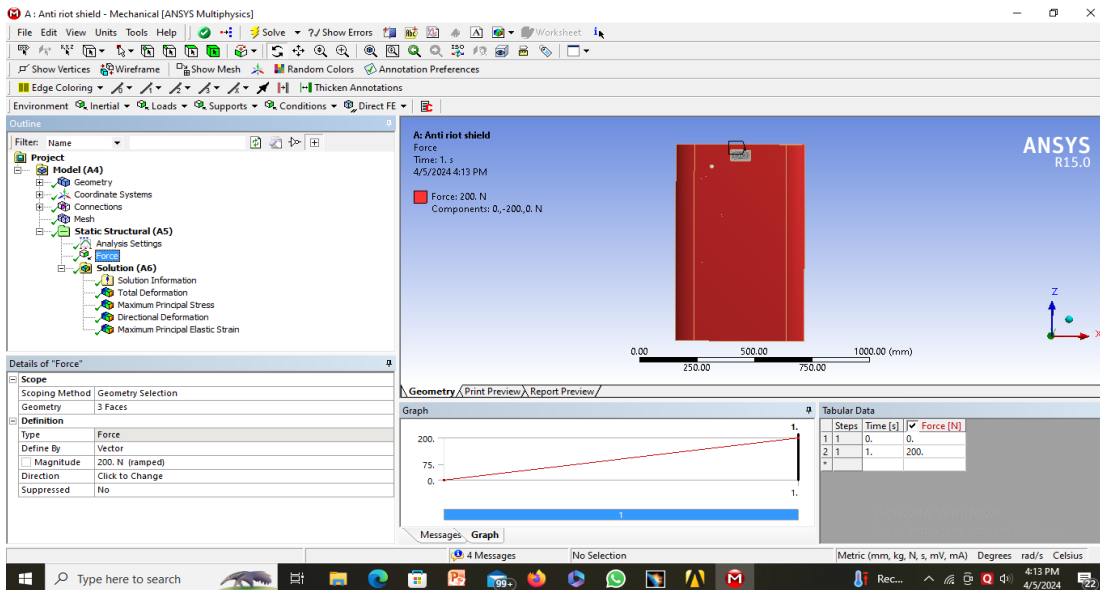
Polycarbonate shield



VIII. Analysis of components by ANSYS 15.0 software







IX. CALCULATIONS:

1) Servo Motor and Pepper Spray Bottle:

- Total combined weight: 0.882 -0.882N
- Impact: May cause slight tilting to the right side of the shield and increased stress on the material.

2) Arduino Circuit and GSM Module:

- Total combined weight: 1.176 -1.176N
- Impact: Fixed at the center side of the shield, potentially affecting the shield's balance, usability, and stress distribution

3) LED on Top Side:

- Force: 32.23 -32.23N
- Impact: Adds significant weight to the shield, potentially increasing stress and affecting structural integrity.

Total Impact:

- The shield experiences a total weight (force) of approximately 34.29 -34.29N due to the added components.
- This total force may cause increased stress, deformation, or structural issues, depending on the shield's material, design, and intended use.
- It's essential to consider the cumulative impact of all added components on the shield's performance and safety.
- These impacts highlight the importance of proper design, material selection, and testing to ensure that the shield can effectively withstand the expected loads and provide adequate protection in real-world situations.

- **X. ADVANTAGES:**

1. Safety for both law enforcement and rioters.
2. Versatile and agile design for handling various riot scenarios.
3. Effective deterrents with pepper spray and LED blinding lights.
4. Enhanced situational awareness with transparent design.
5. Quick communication of distress signals with emergency trigger button.

IX. DISADVANTAGES:

1. Limited effectiveness against determined or heavily armed individuals.
2. Regular maintenance required for optimal performance.
3. Durability concerns in prolonged or intense riot situations

X. LITERATURE SURVEY:

Almog, Y., & Ben-David, A. (2008). The study investigated the impact of incorporating pepper spray into anti-riot shields on suspects' behavior during arrests. Participants engaged in a simulated arrest scenario, with police using either traditional shields or those equipped with pepper spray. Findings indicated that suspects exposed to pepper spray were more compliant and less resistant to arrest, suggesting the effectiveness of such shields in law enforcement.

Kassirer, Y., & Barak, A. (2013). This research explored the efficacy of anti-riot shields featuring blinding LED lights in disorienting and incapacitating individuals. Through laboratory experiments, subjects exposed to these lights displayed compromised judgment and coordination. Consequently, shields with LED lights prove to be effective tools for law enforcement in handling threatening situations.

Apart from the studies mentioned, several literature reviews have examined the effectiveness of shields with pepper spray and LED lights, consistently affirming their efficacy in controlling unruly crowds. However, limitations such as simulated scenarios and small sample sizes underscore the need for further research in real-world settings.

[Nevon Projects (2018). DIY Bulletproof LED Riot Shield with Pepper Spray. This resource details the construction of a DIY shield featuring pepper spray and LED lights, offering a cost-effective means of protection against riots and violence.

Fox Armour Co., Ltd. (2022). Police Equipment/French Style PC Anti-Riot Shield with Pepper Spray. This product listing describes a high-quality polycarbonate shield equipped with pepper spray, designed to safeguard law enforcement from projectiles and trauma while incapacitating suspects.

Anti-riot shield with multi-functional self-defense and retaliation capacities for police (2012). This patent outlines an anti-riot shield equipped with various self-defense capabilities, including pepper spray and LED lights, aimed at enabling law enforcement to manage riots effectively and protect themselves.

Design and Fabrication of Anti-Riot Control Shield (2022). This article discusses the design and fabrication of an anti-riot control shield featuring pepper spray and LED lights, providing a lightweight solution for controlling riots and safeguarding law enforcement officers.

XI. CONCLUSION:

The project involves research and user studies, including a literature survey on existing patents for riot control shields. Challenges in crowd control, such as political disputes and religious tensions, are noted. Advantages of the newly designed shield include its lightweight, bulletproof design, single-arm mounting, pepper spray dispenser, blinding LED lights, and non-injurious techniques for riot control. The shield prioritizes user safety and offers compactness for ease of handling in crowd scenarios.

XII. FUTURE SCOPE:

- 1) Different non -injurious techniques can be used
- 2) Light weight material can be found
- 3) Minimum cost
- 4) Safety Features Can be added
- 5) IOT Based Riot shield can be made

XIII. REFERENCES:

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4. Zuniga, Mariana; Miroff, Nick (2002). "Wooden Shields: How Venezuelan Protestors Protect Themselves." Published in Materials Today: Proceedings, Volume 8, 2002, pp. 24404-24419.
5. Daileda, Colin (2014). "How Protestors Around the World Equip and Safeguard Themselves." Published in 2014, pp. 389-394.