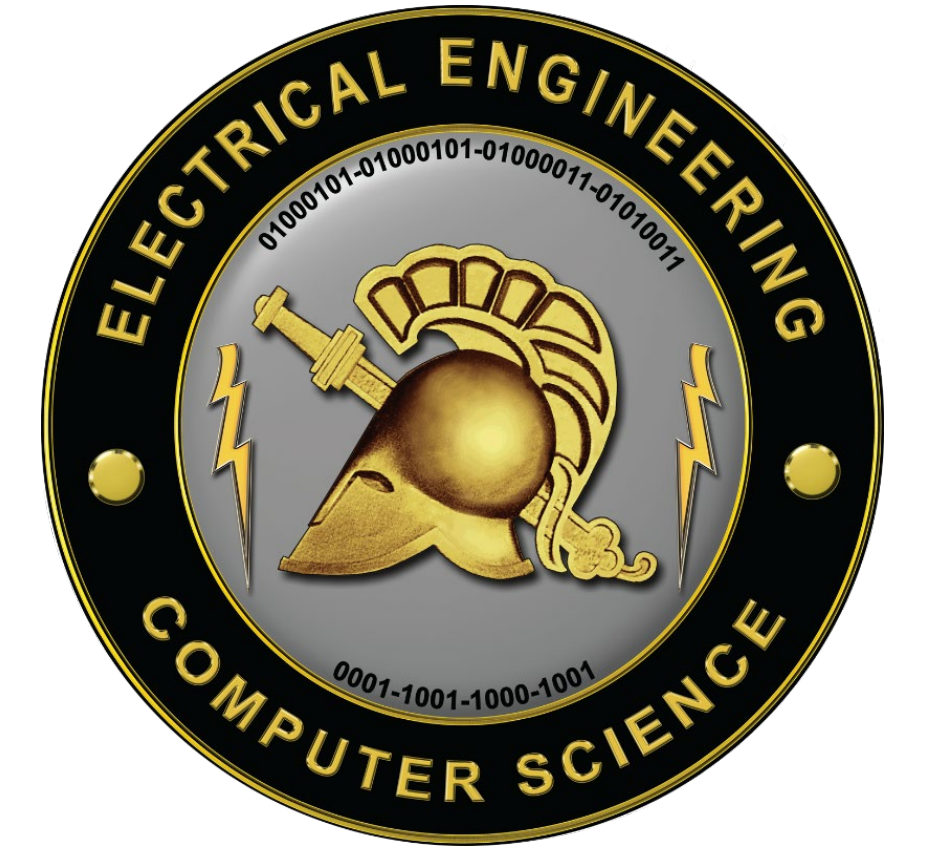




# EW MINEFIELD

UNITED STATES MILITARY ACADEMY WEST POINT  
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## PROBLEM

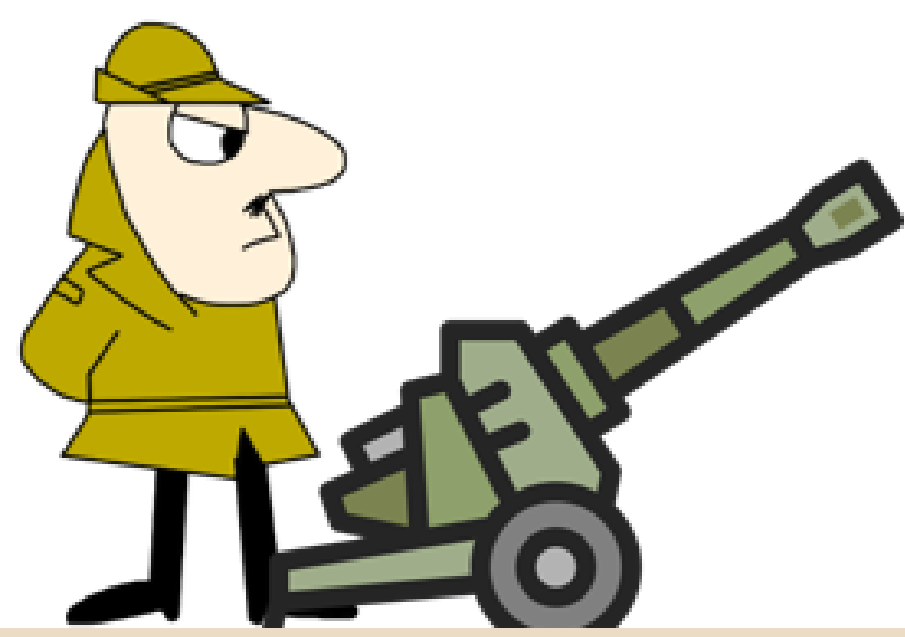


“An important tool in Ukraine’s arsenal, having been used for locating enemy positions and assisting artillery targeting”

Fig. 1: National Defense Article about EW in Ukraine Russia War



- Soldiers not safe on the battlefield.
- 101<sup>st</sup> ABN DIV (AA) requested a force-protection device to emulate tactical radios



## BACKGROUND & REQUIREMENTS



Figure 1. Stratomist Emulator (per unit cost: ~\$80,000)

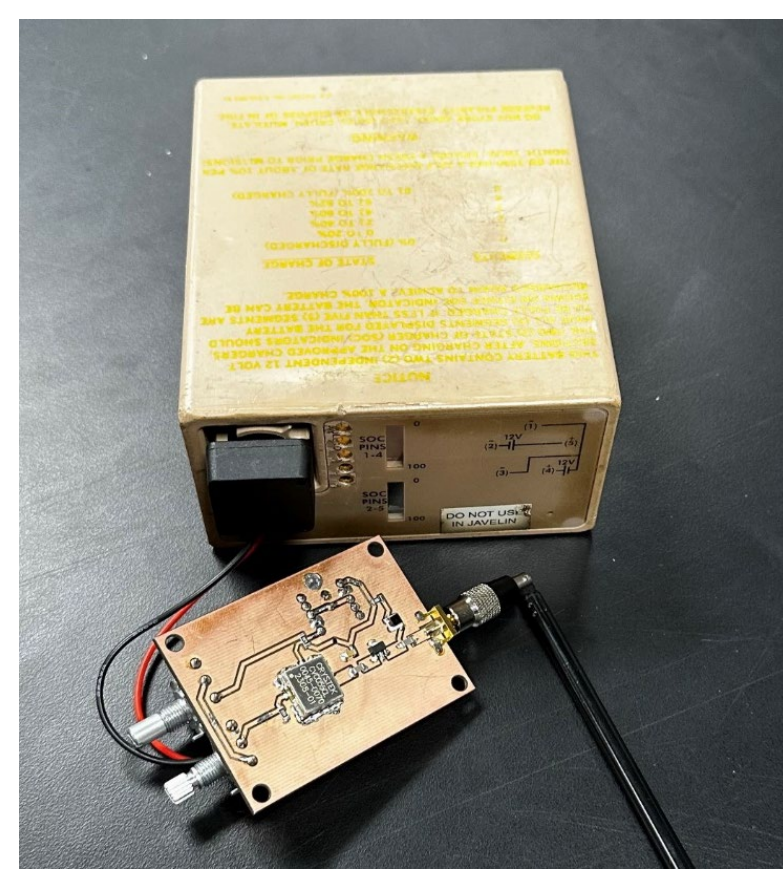


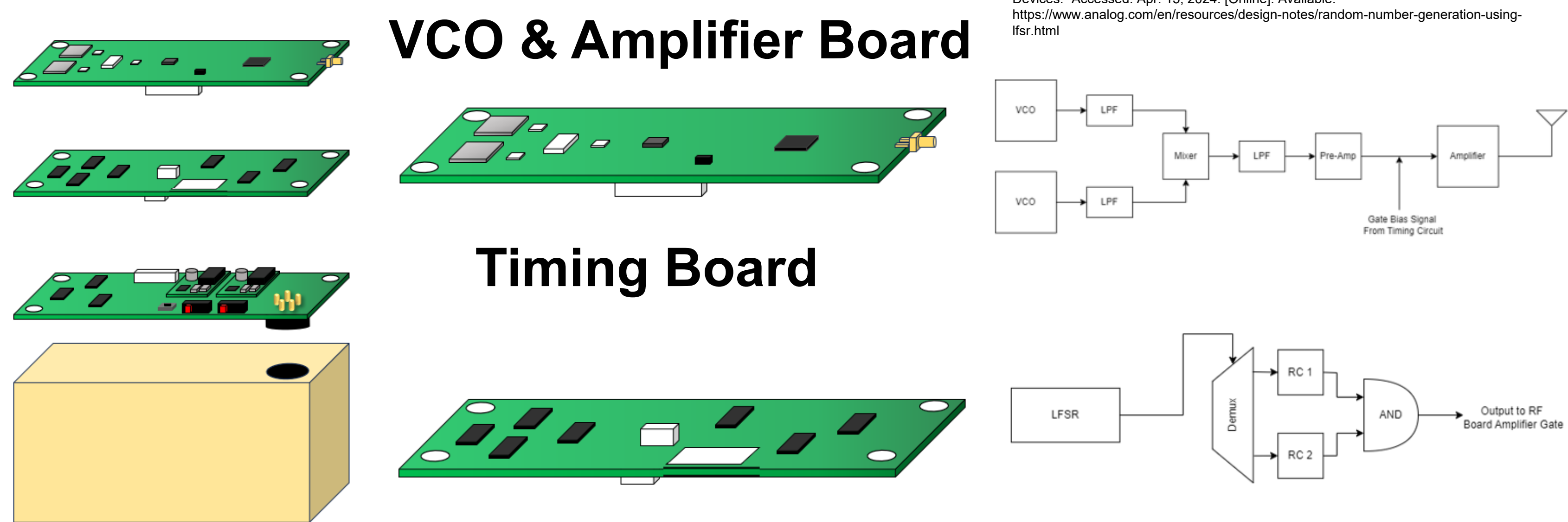
Figure 2. Version 1 Prototype

An accurate squad-level radio emulator:

- Low-cost and reproducible
- Device that operates on full VHF range (30-300 MHz)
- Realistic signal on spectrum (no harmonics)
- Random transmission times and lengths
- Operator friendly

## INNOVATION

1. Purely hardware (< \$150)
2. Wider Frequency Range
  - 2 VCOs w/ Mixer
3. Increased Power Output
  - Preamp w/ Amp
4. Attenuating Harmonics
  - Low Pass Filter
5. Pseudo random bit sequence generator [1]
  - Temporal variations & Frequency hopping



### Power & Frequency Board

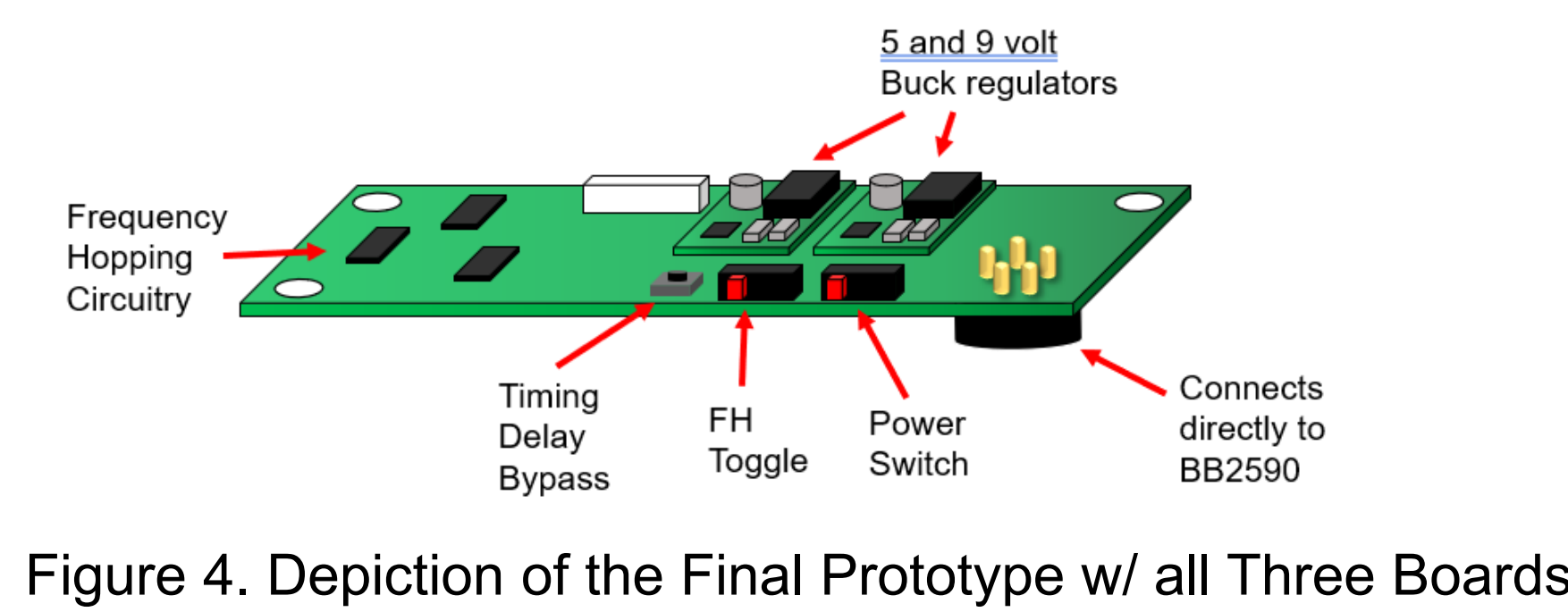


Figure 4. Depiction of the Final Prototype w/ all Three Boards

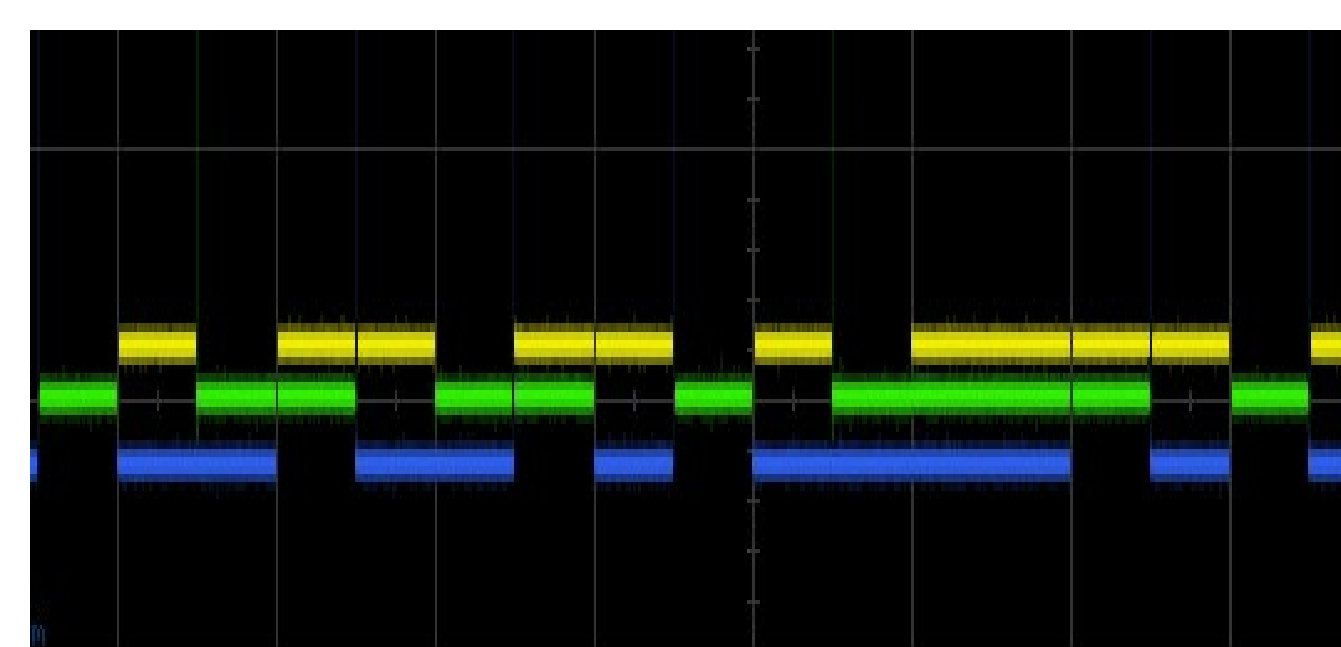


Figure 5. Screen Capture of Pseudorandom Bit Stream on Timing Board

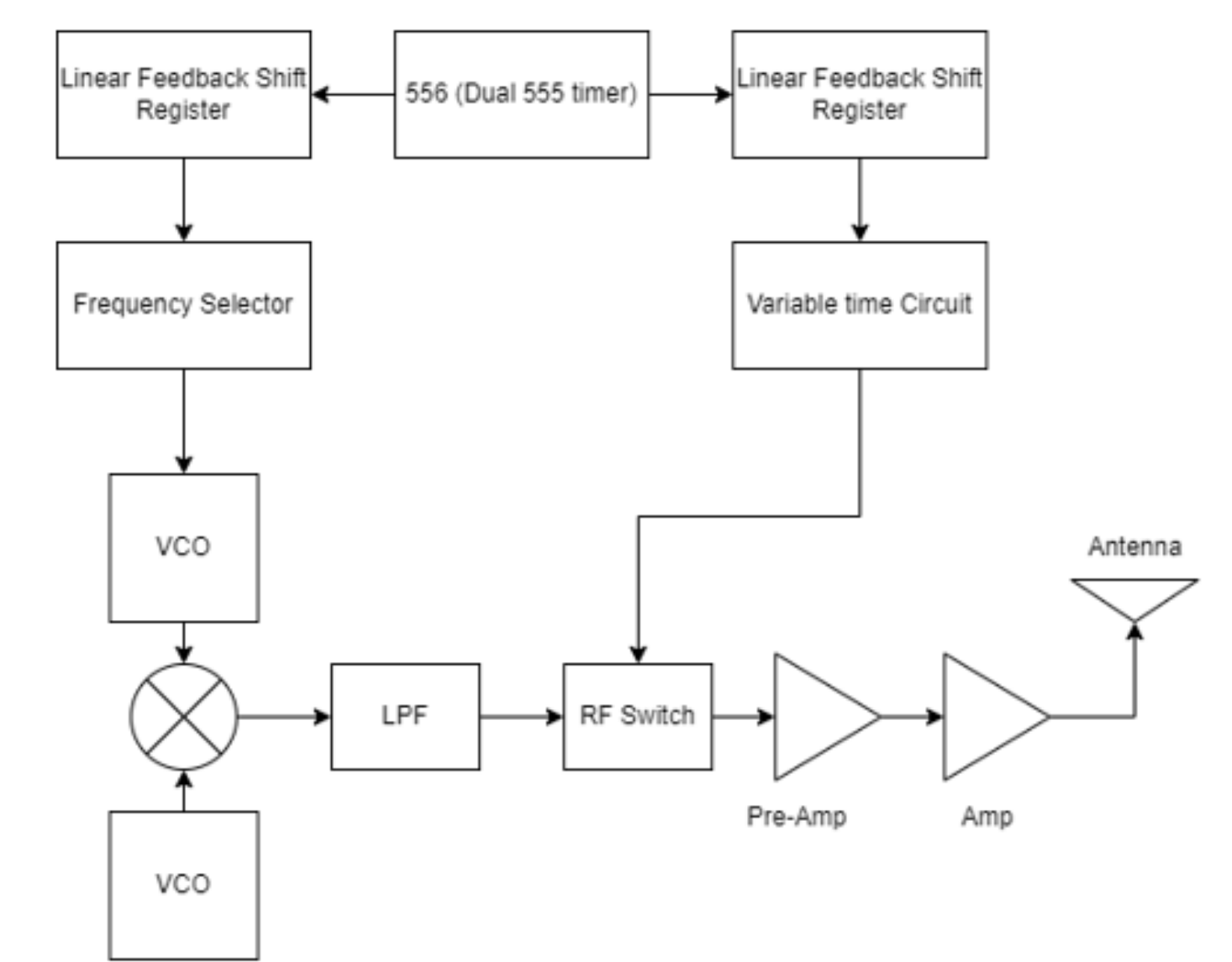


Figure 6. Block Diagram of Final Prototype

## EVOLUTION OF DESIGN

Version 1	Version 2	Final Version
<ul style="list-style-type: none"> <li>• Adjustable single-frequency</li> <li>• 45 – 71 MHz</li> <li>• 66 mW transmit power</li> <li>• ~\$60</li> </ul>	<ul style="list-style-type: none"> <li>• Adjustable single frequency</li> <li>• 39 – 240 MHz</li> <li>• 120 mW transmit power</li> <li>• ~\$80</li> </ul>	<ul style="list-style-type: none"> <li>• Adjustable frequency hopping</li> <li>• Variable intermittent time transmissions</li> <li>• 30 - 300 MHz</li> <li>• 5 Watt transmit power</li> <li>• ~\$150</li> <li>• In production (testing 25APR FTCKY)</li> </ul>

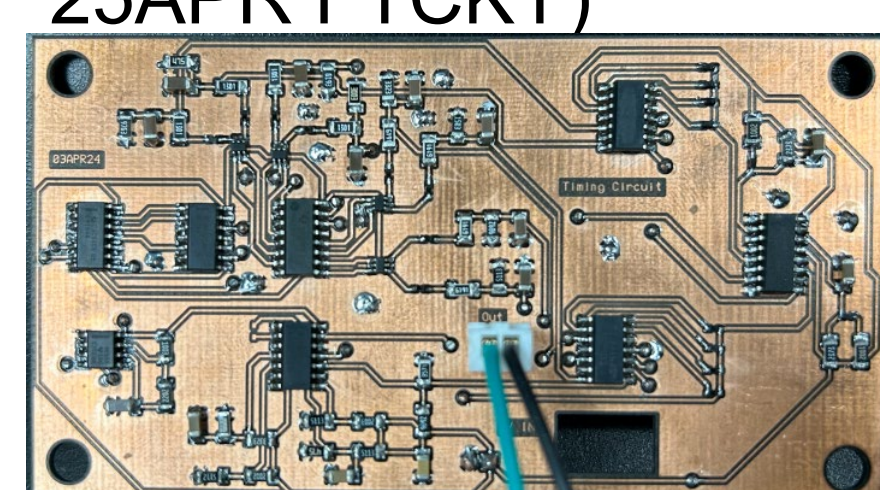
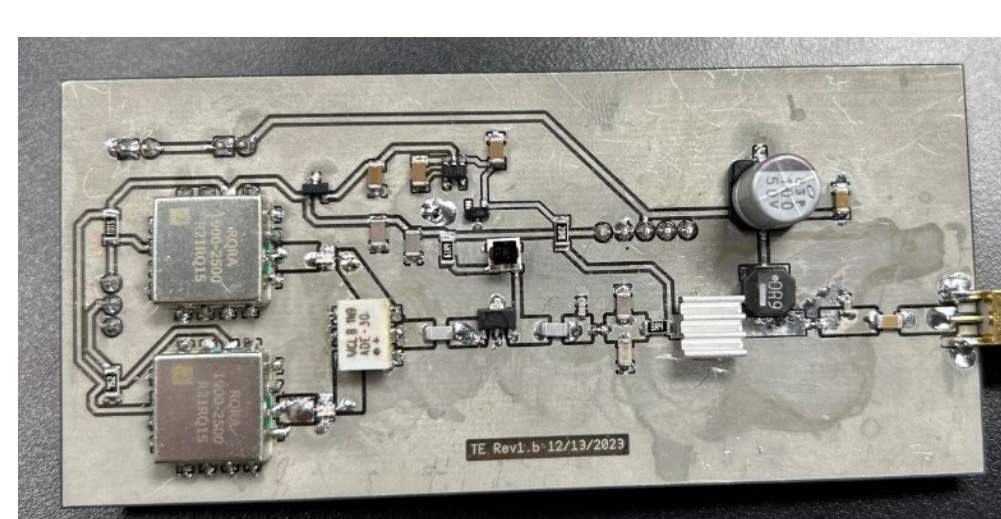
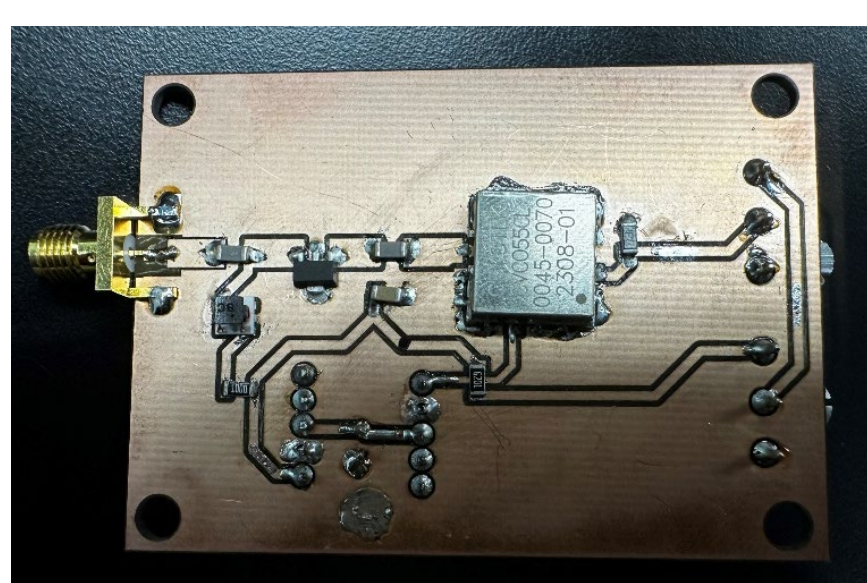


Table 1. Evolution of Design from Version 1 to the Final Version 1. On the far left, the photo depicts the Version 1 board. In the middle, the photo depicts the Version 2 board. On the far right, the photo depicts of one out of three of the final boards.

## CONCLUSION AND FUTURE WORK

Project EW Minefield designed and built a force-protection device that emulates friendly radio traffic.

Future Work:

- Weatherproofing
- Mass Production
- More Transmit Power
- Improving Ease-of-Use
  - Selectors for specific radio types

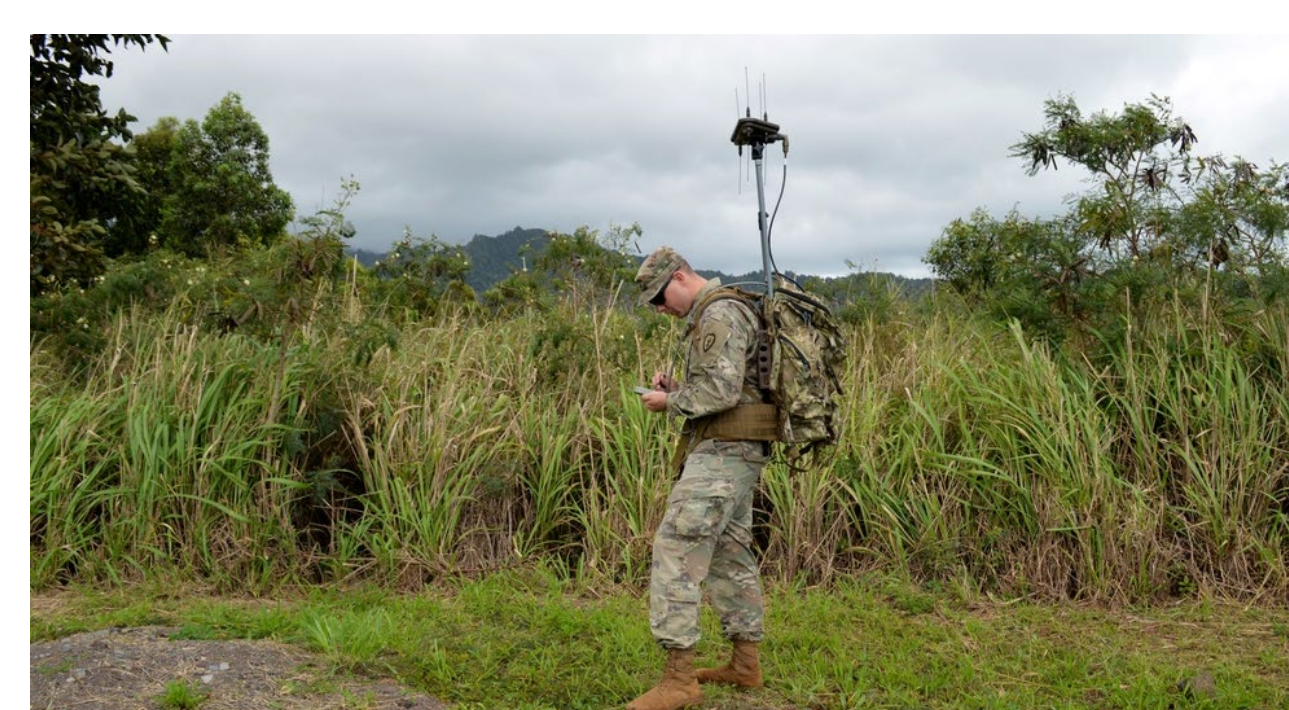


Figure 7. Soldier Training Radio Direction Finding

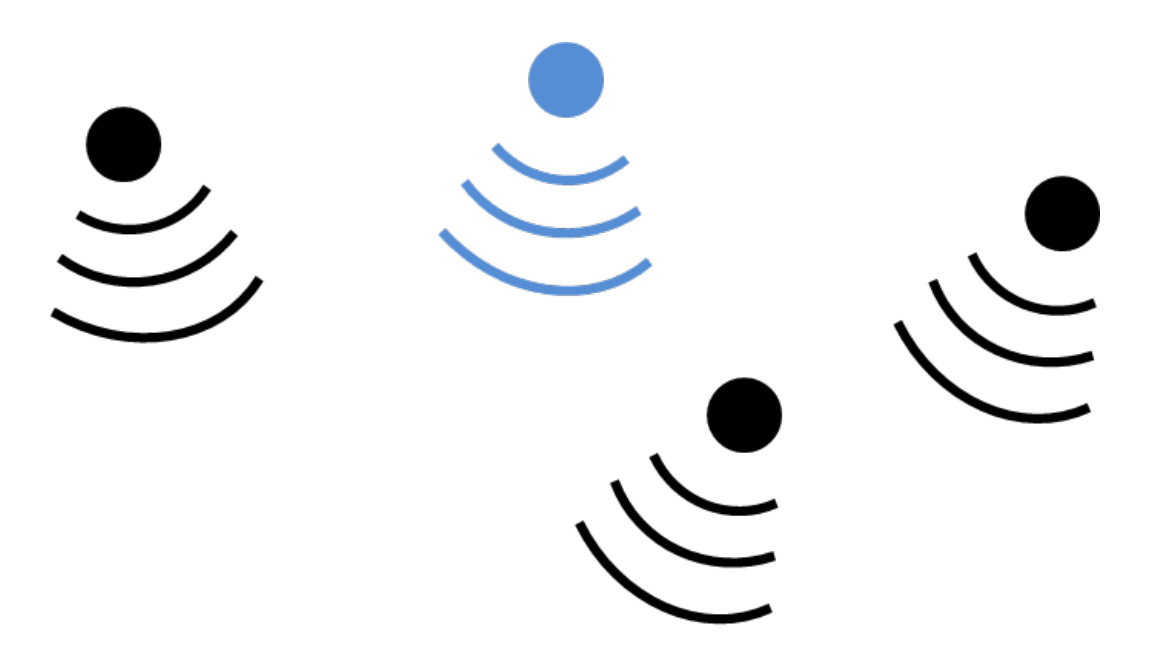


Figure 8. EW Minefield Cluster