

Automatic Tourniquet

Team Automatic Armor

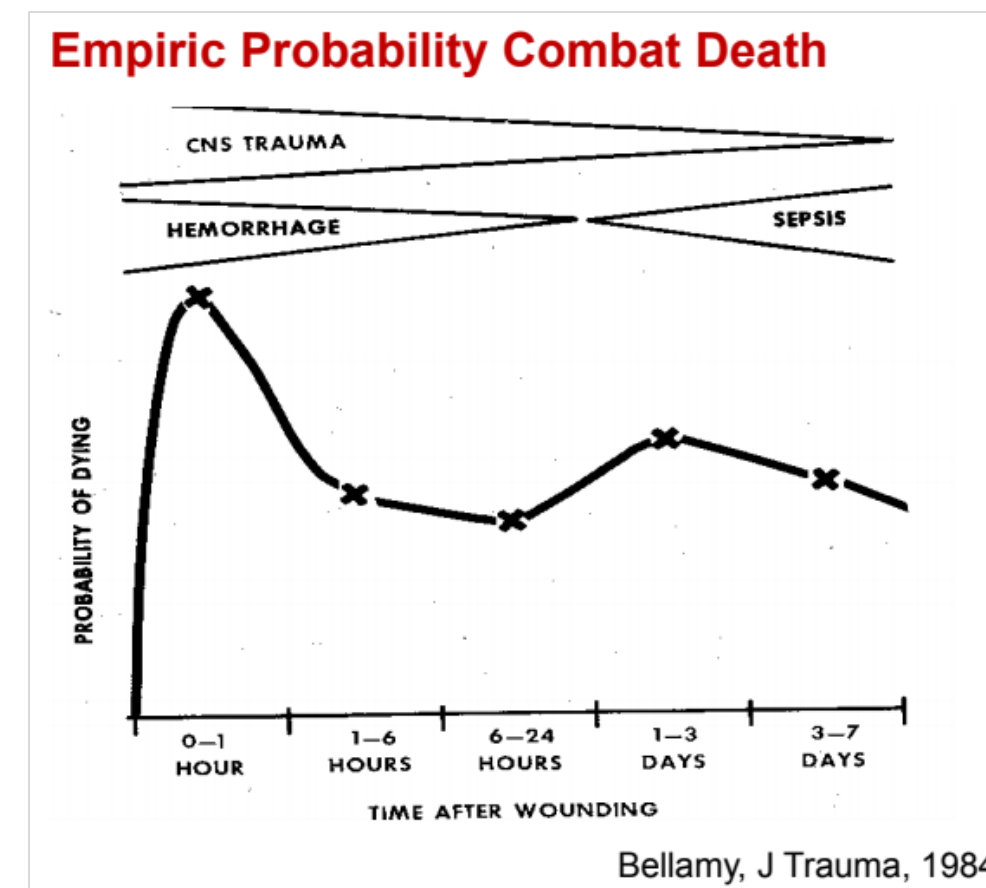
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Mission: Tourniquets, when used properly, are regarded as the most critical lifesaving device available to the military and police force. Automatic Armor aims to automate this device to make it even more impactful.

Impact:

- Potential for bleeding out is the maximum within the first hour after sustaining a wound. So timing is everything.
- 26.3% of combat deaths are considered potentially survivable. 14.1% of these preventable deaths are due to extremity hemorrhaging
- Estimated as much as 60% of potentially survivable police deaths are due to extremity hemorrhaging.
- According to a 2009 study found in Annals of Surgery “Tourniquet use when shock was absent was strongly associated with survival (90% vs. 10%; P 0.001)”.
- Causes:
 - A buddy or medic may not be close enough to reach an injured person in time
 - When under fire, soldiers or police officers are preoccupied with fighting the enemy
 - After being shot or taking shrapnel, soldiers or police officers may go unconscious or undergo shock which can prevent them from self application

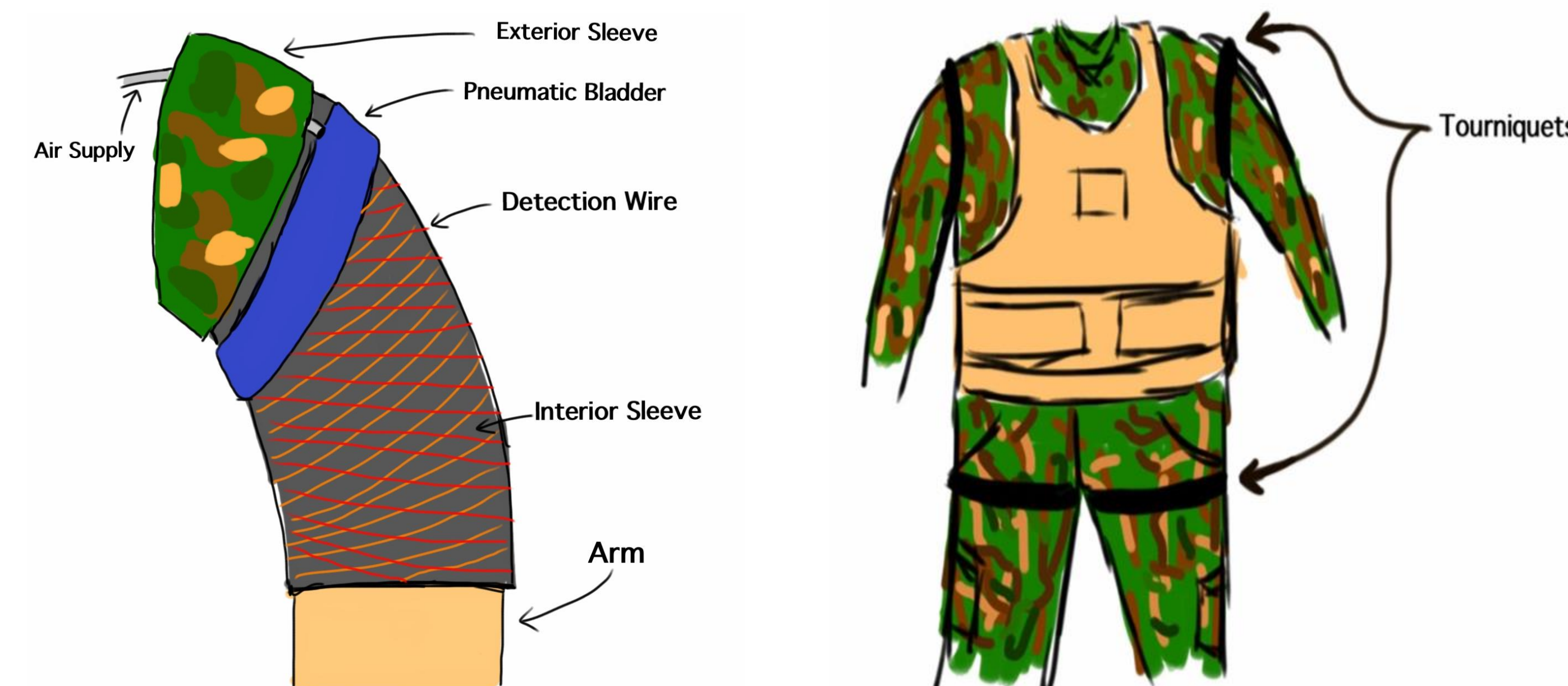


Engineering Requirements	Target Value	Achieved Value
Pressure	4 psi (inside the cuff)	7.51 psi (on the arm)
Weight	≤ 2 lbs	0.75 lbs
System Response Time	≤ 3 seconds	3.6 seconds
Time Pressure is Applied	2 hours	2 hours
Cost	\$25-100	\$74

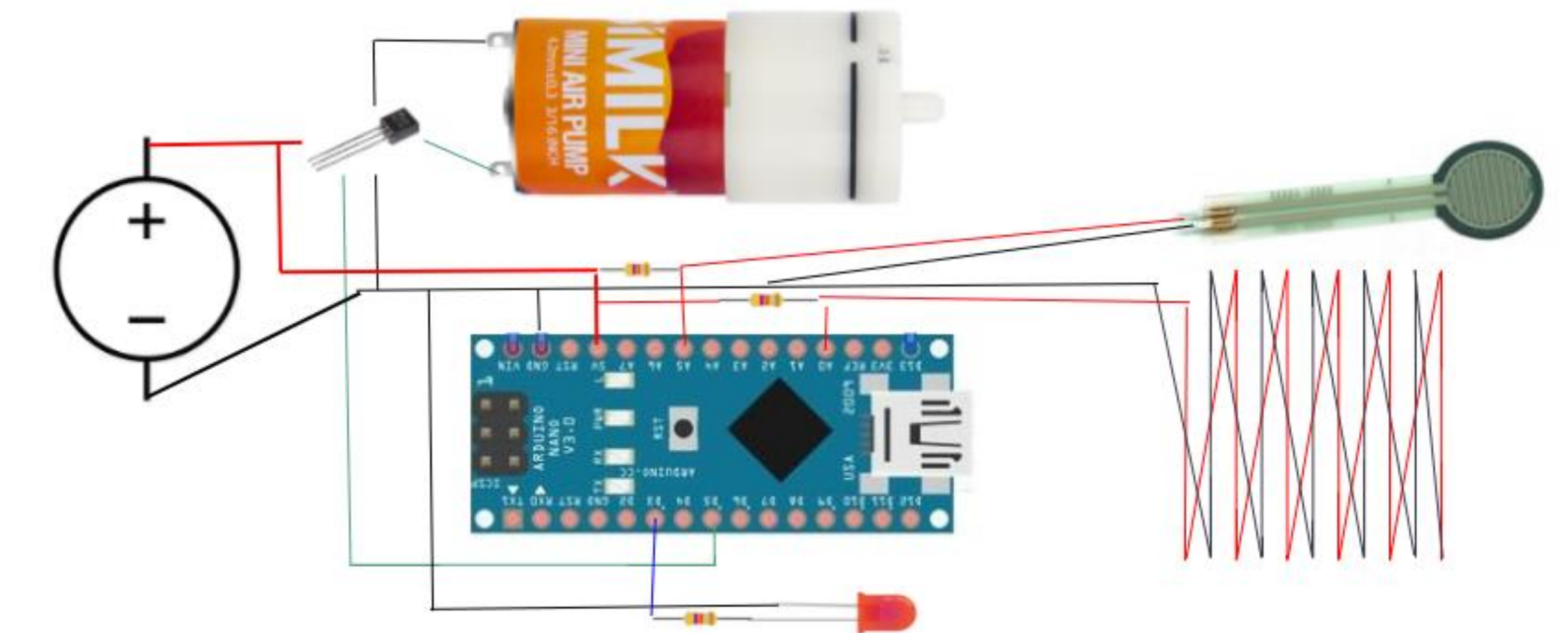
Final Design and Prototype

The prototype includes the following features

- 10psi (max) 5v dc pneumatic fixed displacement pump
- Force Sensitive Resistor - pressure sensor
- Magnetic wire penetration sensor
- LED light timer
- Researchable 3.3V battery
- MOSFETs control to protect the circuit from overdrawing current

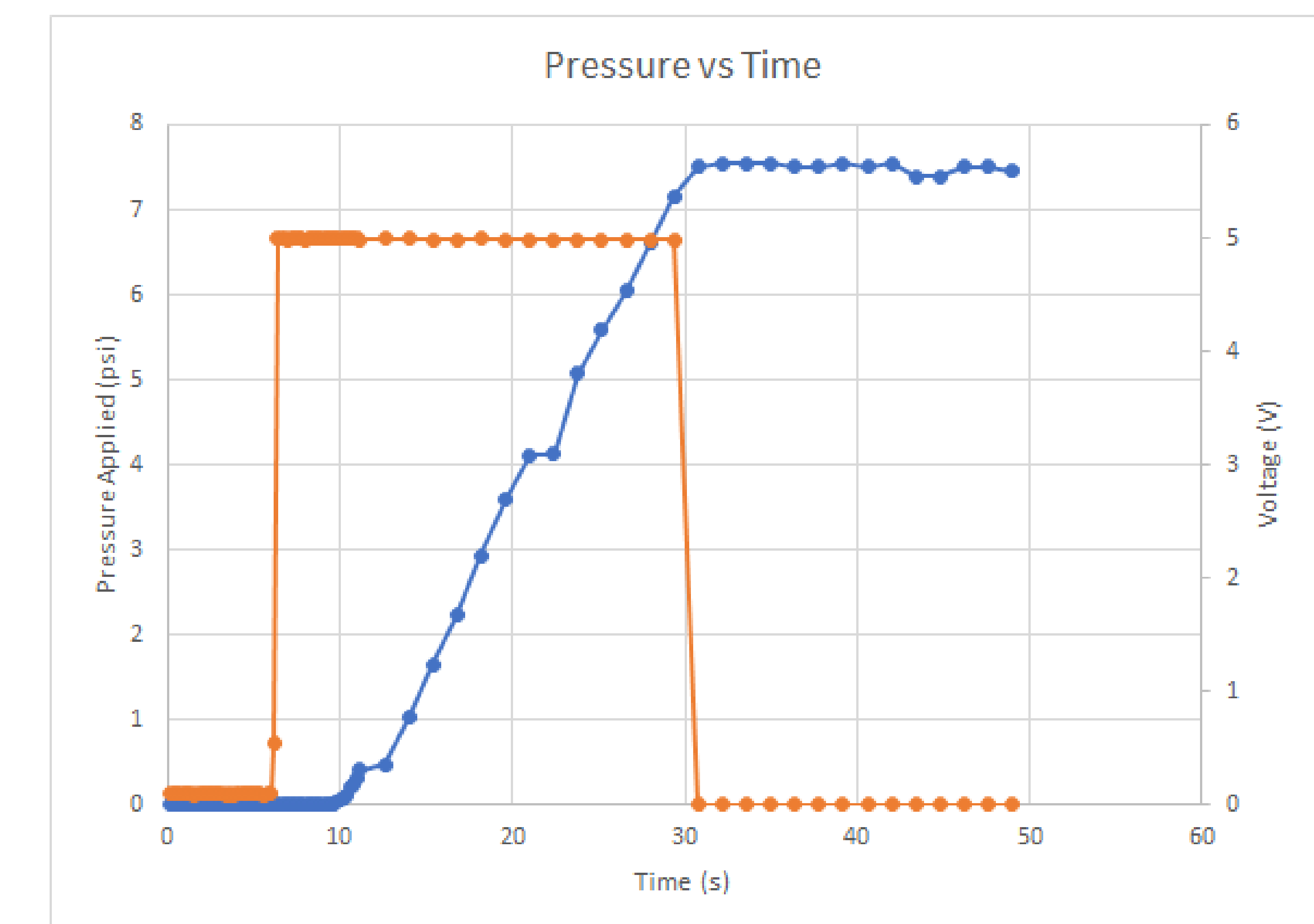


Kragh, J. (2009). Survival With Emergency Tourniquet Use to Stop Bleeding in Major Limb Trauma*.



Testing and Validation

- A prosthetic arm made of silicone was made to demonstrate the tourniquet worked
- **Pressure vs. Time** was used to figure out how much pressure was required to stop blood flow
- It was determined that **7psi** was the correct pressure to stop blood flow



Marketability – Benchmarks and Customers

- Benchmarks: Combat Applications Tourniquet (Not automatic) , ZIMMER ATS (Not Portable)
- Customers: First Responders and Military