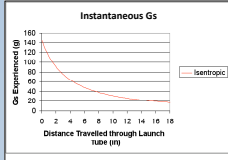
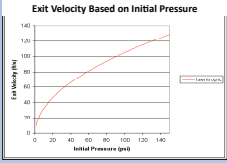


Theoretical Calculations



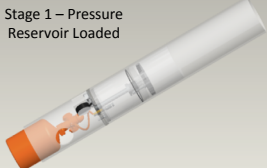
Assumptions

- Polytropic $PV^n=C$ where $n=7$
- Isentropic expansion $PV^\lambda=C$ where $\lambda=1.4$
 - 45 Degree launch angle
- Neglecting vibration and friction

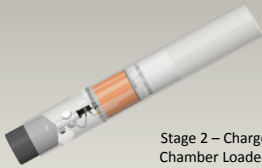
Testing Prototype



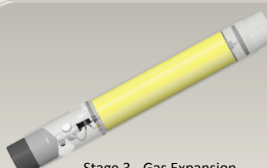
Stage 1 – Pressure Reservoir Loaded



Stage 2 – Charge Chamber Loaded



Stage 3 - Gas Expansion

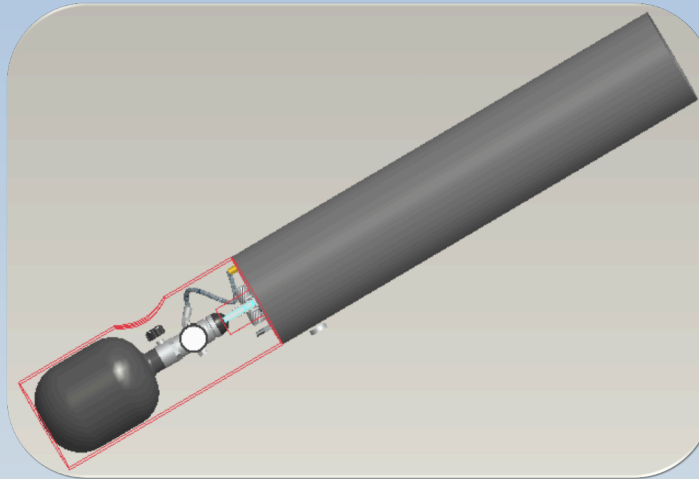


Compact Pneumatic UAV Launcher Eglin Air Force Base



Group 3

Adewale Adalakin Enye' Blocker Tim Bartlett Jared Rodriguez



Background

Eglin Air Force currently designs and tests Unmanned Aerial Vehicles. Their current methods of launching prototypes by hand, using surgical tubing, or via a larger UAV are insufficient.

Objective

To provide a means of propelling an UAV into flight, which will be provided by Eglin Air Force Base.

Specifications

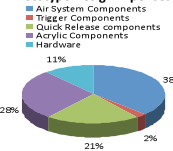
Launcher

- 60 ft/sec min exit velocity
- Max 600Gs of instantaneous acc
- Launcher weight limit: 2.5 lbs -> 10 lbs (after written approval)
 - Estimated 30-45 deg launch angle
 - No energetic methods or accelerants
 - Repeatable a min of 5x
- Customer prefers a tubular design for safety & convenience
- Max dim 36" L x 4.5"W x 4.5"H square or 36" L x 5.5" OD
- Functional on various surface conditions

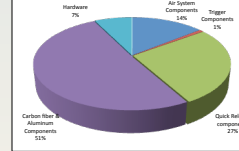
UAV

- Approx 3.5lb fully equipped
- Estimated 18" L x 4" W x 2.5" H in launch position

Prototype Design Expenses

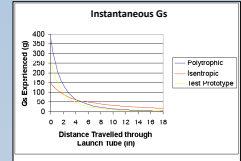
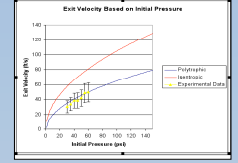


Final Design Expenses



Made On A MAC

Testing Results

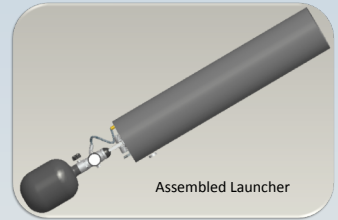


Testing Conclusions

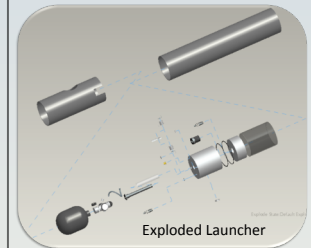
- Found the "n" variable of the polytropic process
- Polytropic process with $n=3$ is closer to experimental data, therefore, can be used to accurately predict a pressure of 85psi to reach 60ft/sec exit velocity
- Developed optimal design capable of using 85psi
- Max acceleration the UAV will experience will occur at the very beginning of the launch
- Modeling raises the max acceleration from 147 to 387Gs
- Theoretically, the prototype experienced only 270Gs.

Optimized Final Design

- 1/8" Thick carbon fiber tubing
 - Aluminum backing
- 4130 Steel 4 button quick release pin
- Duplicated air delivery system from testing prototype



Assembled Launcher



Exploded Launcher

Gas Delivery System

