



Compact Pneumatic UAV Launcher



FAMU - FSU College of Engineering
Launch Team - Group 3

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Meet the Sponsor

Eglin Air Force Base

- Located in the western panhandle of Florida
- Serves as the primary focal point for all Air Force armament
- Uses advance technology and engineering to provide the most superior combat capability to warfighters
- Supports the 96th Air Base Wing, the largest single base mobility commitment in the USAF





Why?

Problem Statement

Eglin Air Force Base needs a safe, efficient, and effective method of launching their current UAV prototype into flight.

Needs Assessment

The objective of this design is to provide a means of propelling an Unmanned Aerial Vehicle (UAV) into flight, which will be provided by Eglin Air Force Base.



Launch Team - Group 3

Background

- Currently launching by hand or surgical tubing
- Methods do not meet the EAFB standards
- Better means of launch must be developed

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Design Specifications

Launcher

- 60 ft/sec min exit velocity
- Max 600Gs Instantaneous acc
- Launcher weight limit: 2.5 lbs, including stand etc.
- Estimated 30-45 deg launch angle
- No energetic methods or accelerants
- Must be repeatable a min of 5 times
- Customer prefers a tube design
- Max dim 36" L x 4.5"W x 4.5"H square or 36" x 5.5" diameter round

UAV

- Approx 3.5lb
- Approx 18" L x 4" W x 2.5" H collapsed





Concept Screening

Selection Criteria	Concepts					Manual Launch (Reference)
	Pneumatic	Spring	Electro-magnet	Compound Pulley	Linear Actuator	
Repeatable for min. 5 launches	+	+	+	+	+	0
Ease of field assembly	+	0	-	0	+	0
Ease of use	+	0	+	0	+	0
Safety	-	-	-	-	-	0
Maintenance	-	-	-	-	-	0
Durability	+	+	-	+	-	0
Reliability	+	+	+	+	+	0
Feasibility	+	+	-	+	-	0
Sum +'s	6	4	3	4	4	0
Sum -'s	2	2	5	2	4	0
Sum 0's	0	2	0	2	0	8
Net Score	4	2	-2	2	0	0
Rank	1	3	6	2	5	4
Continue?	Yes	Revise	No	Yes	No	No



Concept Scoring

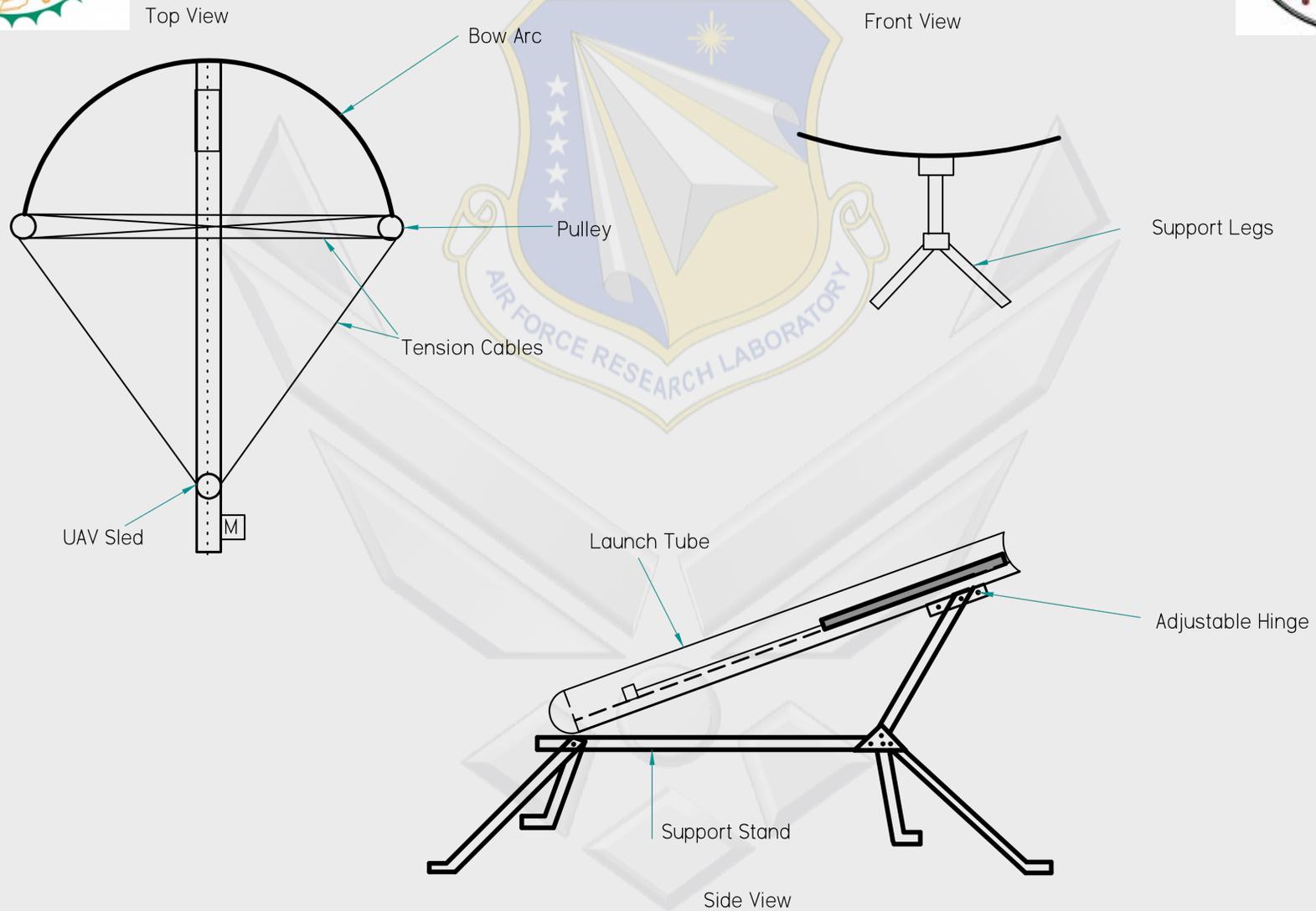


Concepts

Criteria	Weighting	Pneumatic	Spring+	Compound Pulley
Min. exit velocity of 60 ft/s	10	10	8	8
Max. Weight of 2.5 lbs	9	7	2	5
600g max. inst. Acceleration	10	9	7	7
repeatable for min. 5 launches	8	6	8	8
Cost	7	5	7	6
Ease of field assembly	7	5	3	4
Ease of use	7	5	3	4
Safety	10	3	4	4
Maintenance	7	5	7	6
Durability	8	4	6	5
Reliability	9	8	8	7
Feasibility	8	7	4	5
Total	100	74	67	69
Weighted Total		74%	67%	69%

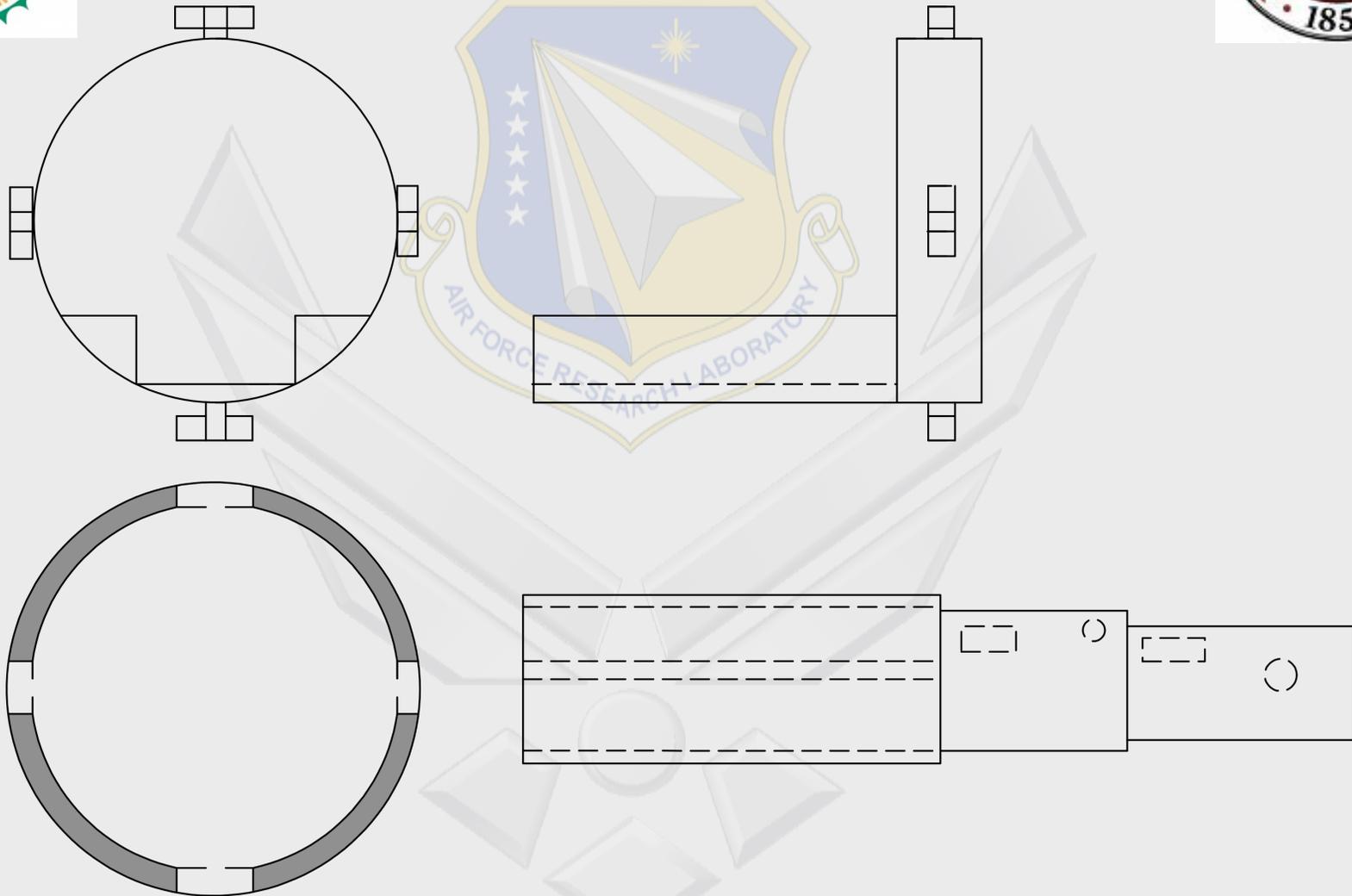


Compound Pulley





Single Chamber Tube

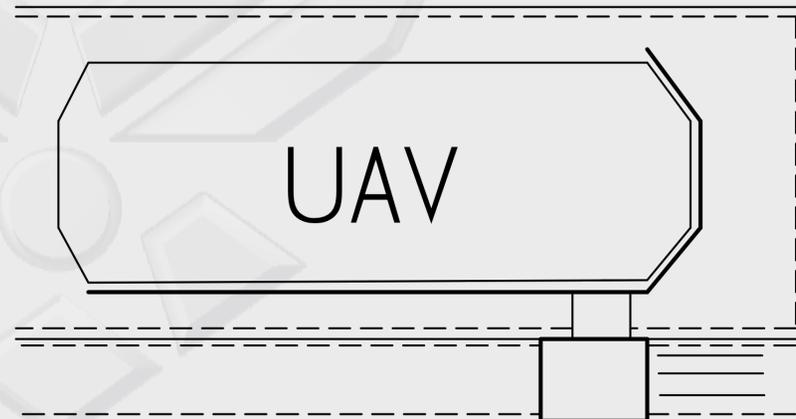
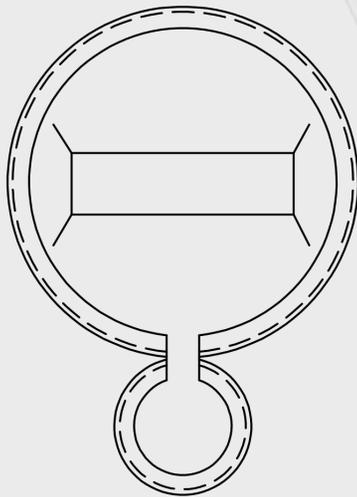
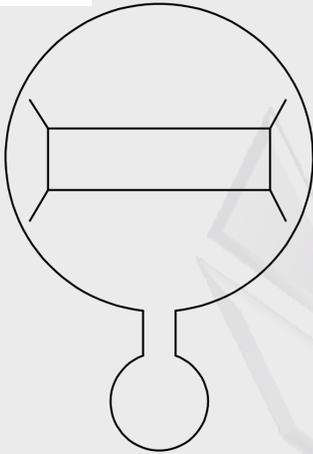




Dual Chamber Tube

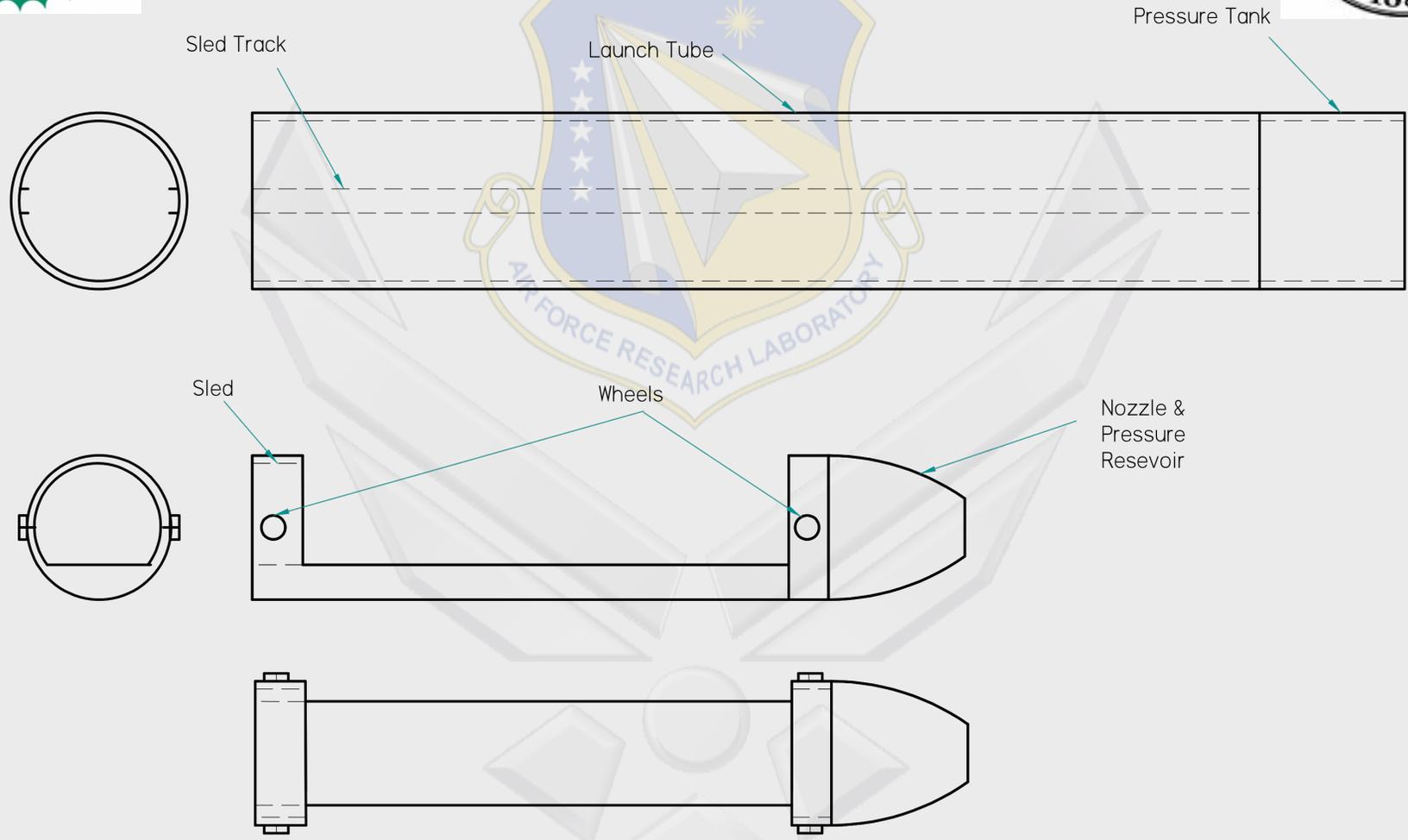
Front View

Side View





Pneumatic Nozzle





Propulsion Method

Pneumatic Concepts

Criteria	Weighting	Single Chamber	Dual Chamber	Nozzle Propulsion
Min. exit velocity of 60 ft/s	10	10	10	5
Max. Weight of 2.5 lbs	9	6	5	6
Cost	5	5	3	4
Safety	10	10	10	6
Maintenance	7	7	5	4
Durability	8	7	6	4
Reliability	9	8	7	7
Feasibility	6	6	4	3
Total	64	59	50	39
Weighted Total		92%	78%	61%



Detailed Design Options

Concepts

Piston

Compression Chamber

Pros

Easier to solve the airtight issue

Use less air to propel object

Adds possible length to propulsion distance

Easier and less complex

Cons

Cuts possible length of propulsion in half

High stress part due to smaller cross-section

Heavier and more complex due to moving parts

Possibly less efficient at transferring energy

Difficult to make airtight seal



Air Release Method

Concepts

Release Valve

Airtight Seal

Pros

Safer field use

Less air needed to propel

No airtight seal needed

Simple

Releases entire charge instantly

Cons

More expensive

More complex

Safer field use

May require more pressure

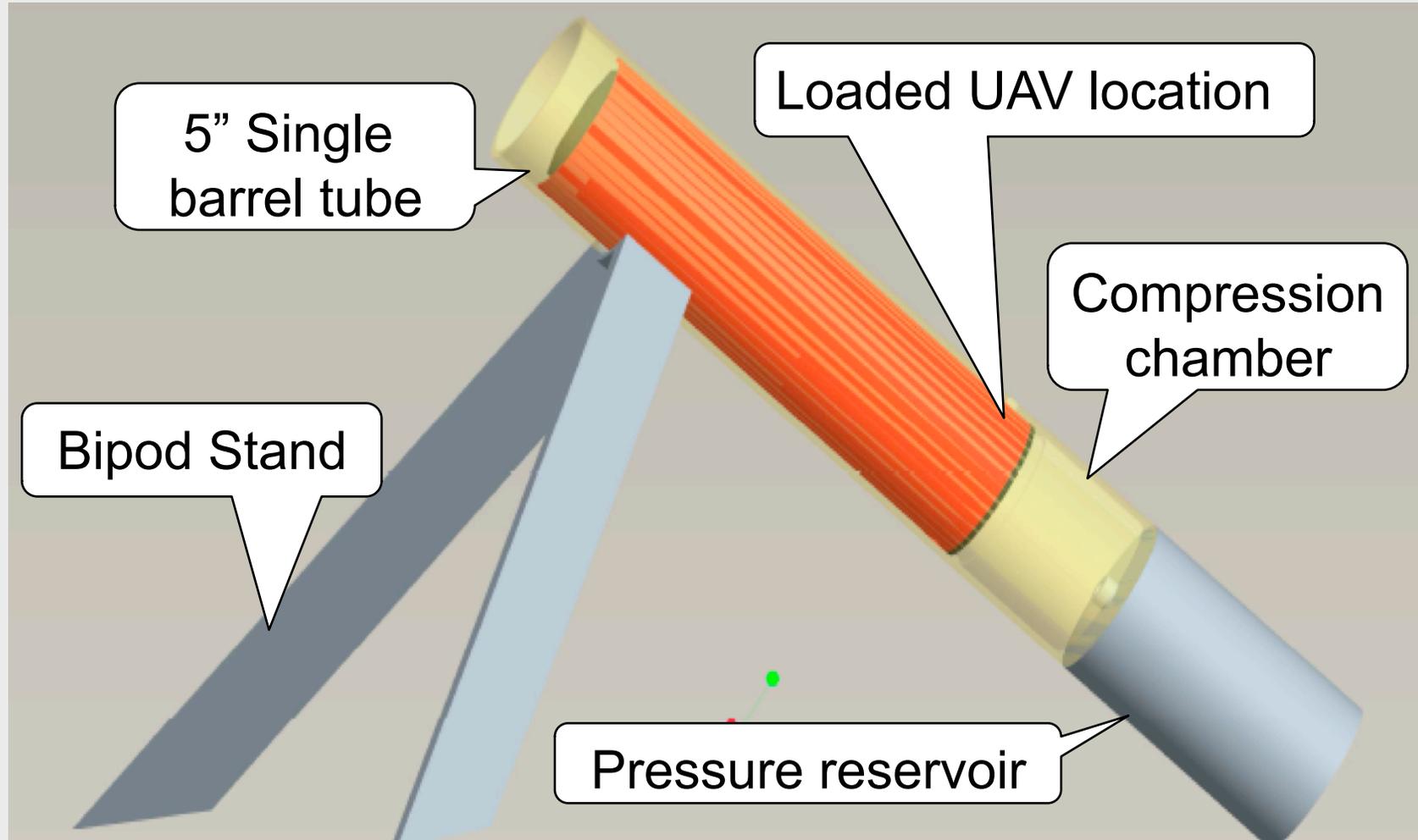
Difficult to design

Less safe

High stress part



Conceptual Design





Status

24hr Plan:

- Suspend meetings, relax and apply attention to other classes

72hr Plan:

- Simulate and test the theory behind the design
- Update and revise tentative schedule based on project status and new information

7 Day Plan:

- Brainstorm on possible prototype methods



For further info see geocities.com/jrod23dhs/group3.html