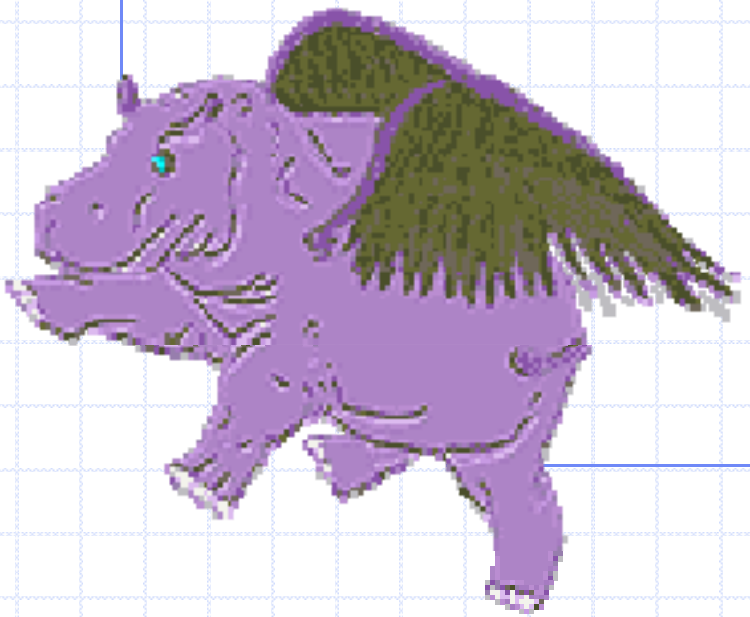
FLYING HIPPO:

Preliminary Design Review



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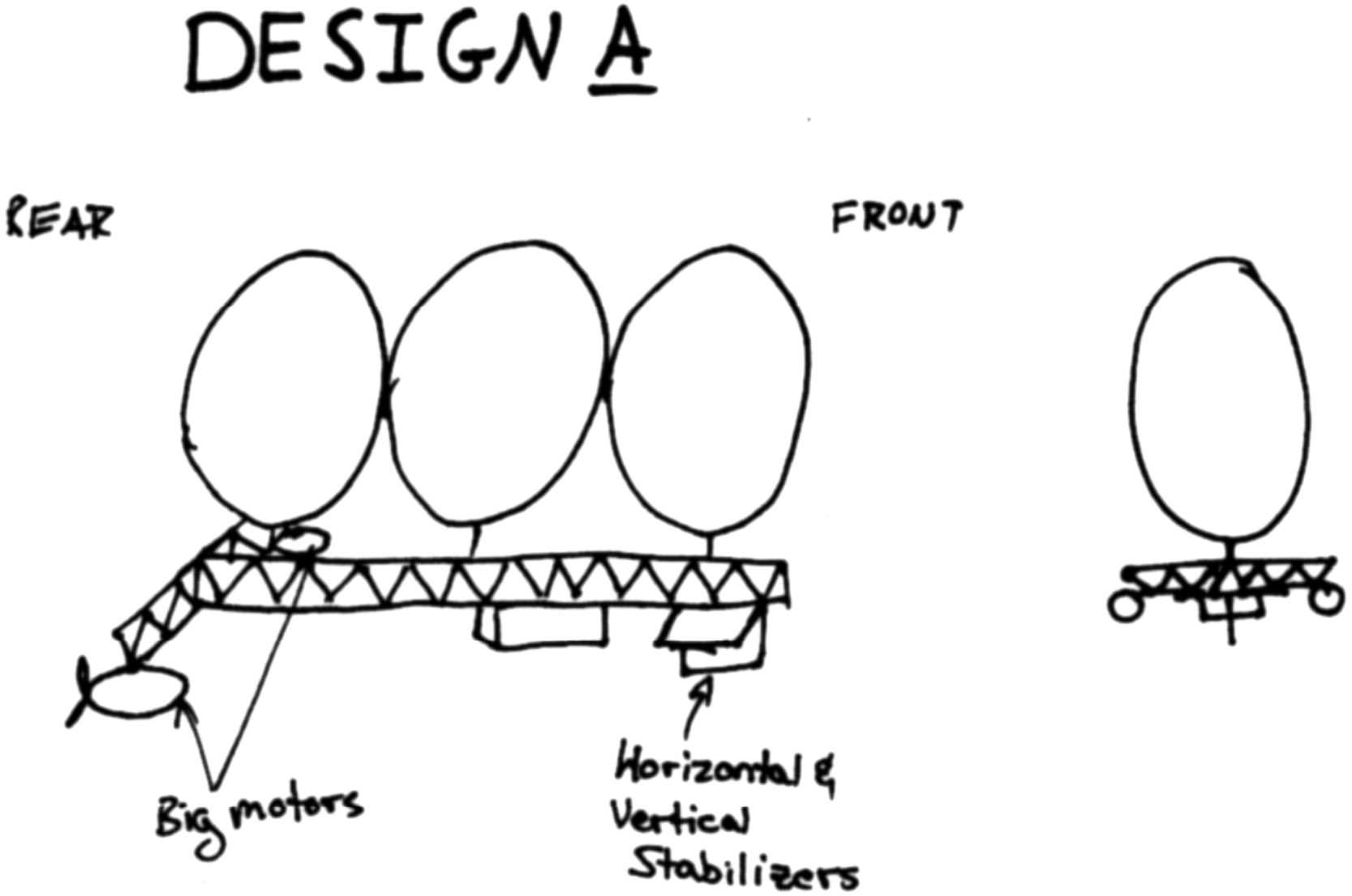
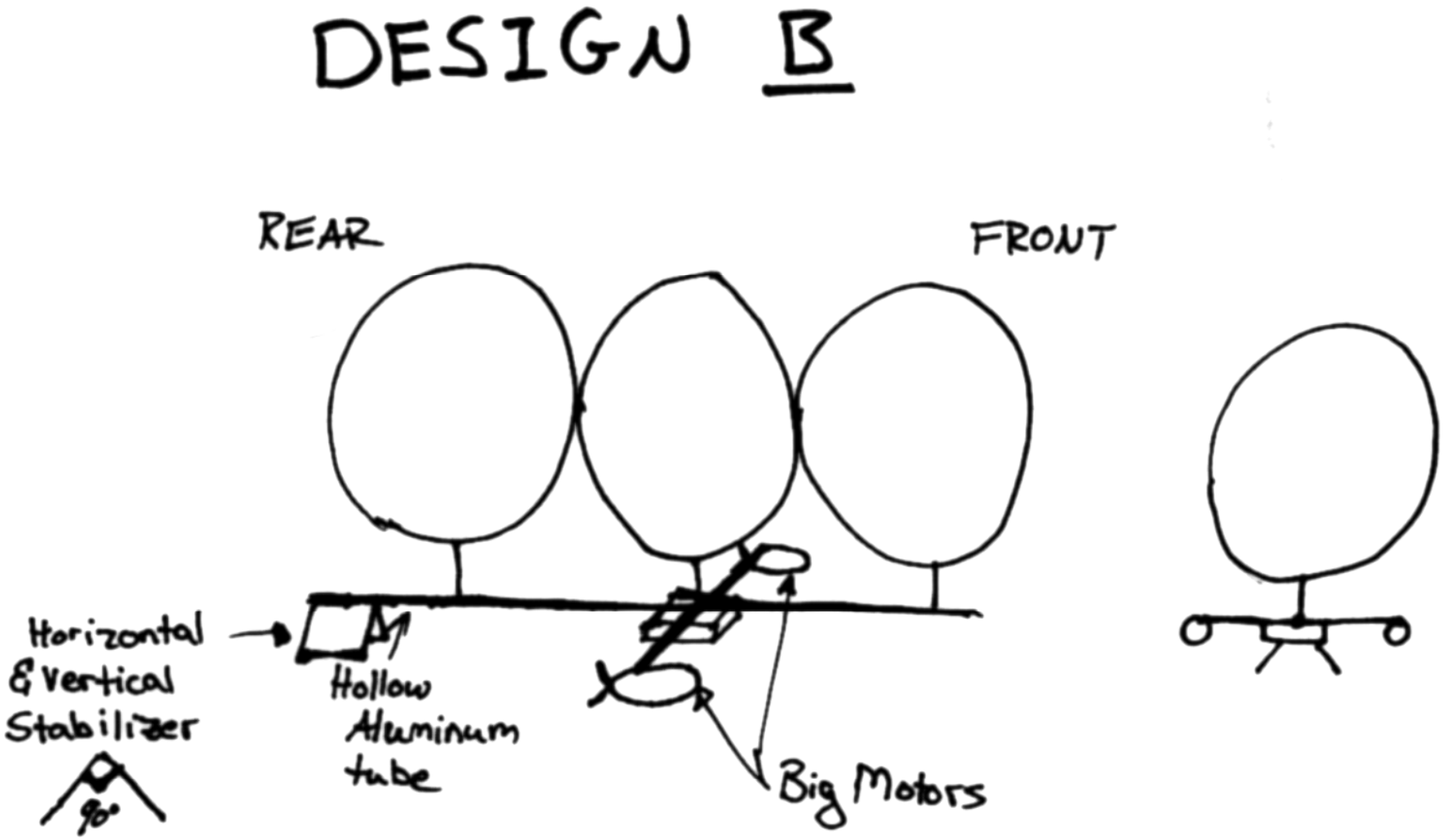
Objectives

- To engineer a lighter-than-air vehicle, incorporating
  - Stability and Control
  - Maximum mass/time ratio
  - Durability
  - Elegance of design
- Design approach: simplicity

Preliminary Proposed Designs



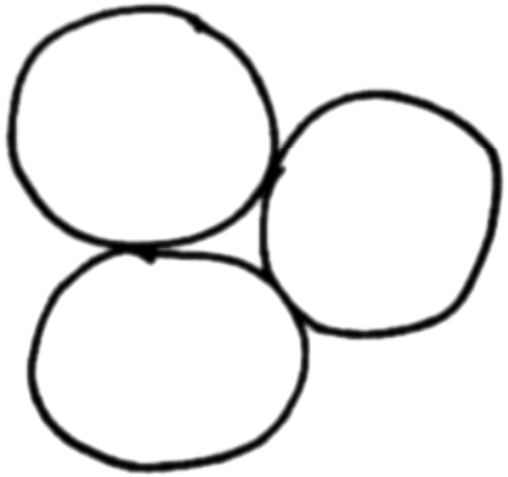
Preliminary Proposed Designs



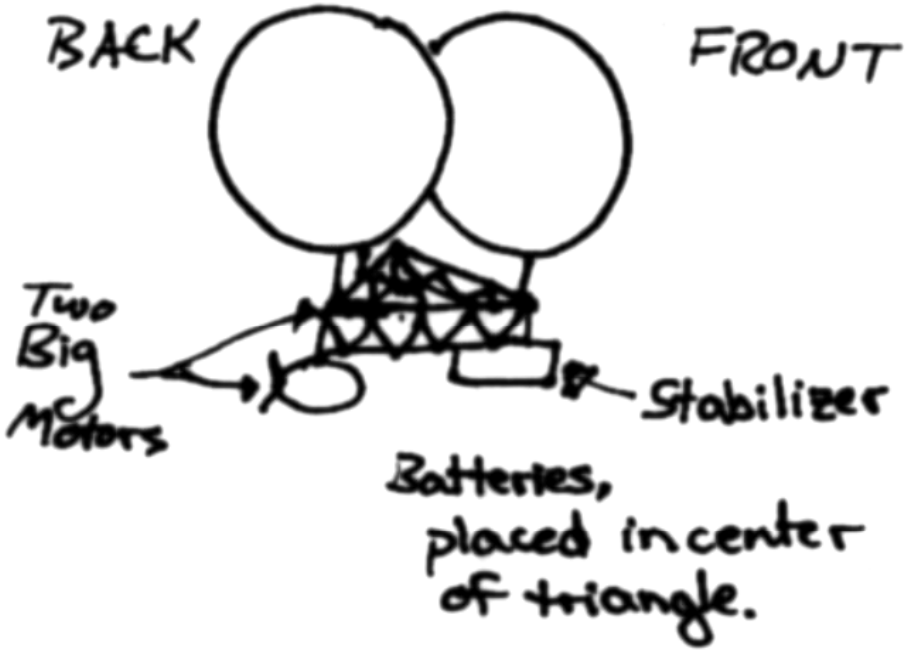
Preliminary Proposed Designs

DESIGN C

TOP VIEW



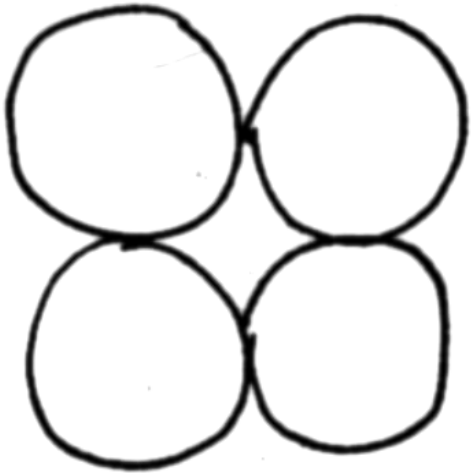
SIDE VIEW



Preliminary Proposed Designs

DESIGN D

TOP VIEW



SIDE VIEW

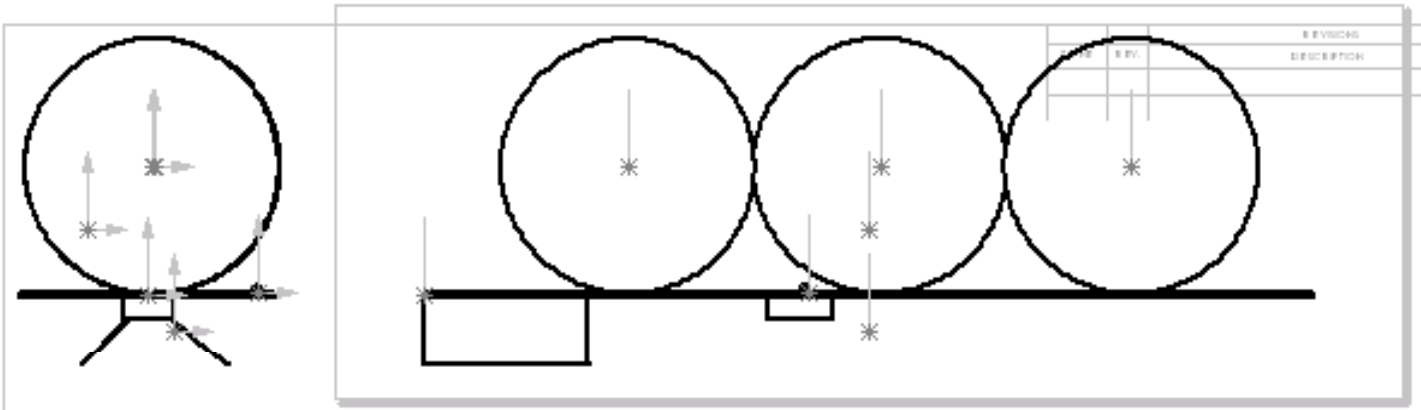
Product Design Matrix

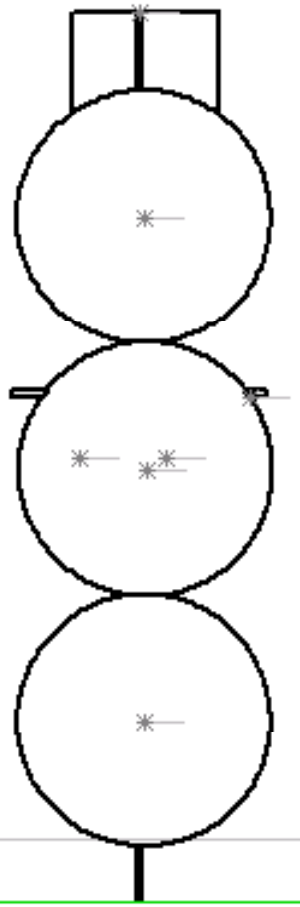
Requirement	Importance	A	B	C	D
		Linear, Rear Propulsion	Linear, Center Propulsion	Triangle	Square
speed	8	0	0	0	-
weight	10	0	0	-	-
stability	7	0	0	+	+
control	7	0	+	+	0
endurance	4	0	0	-	-
strength	6	0	+	+	+
simplicity	6	0	0	0	0
aestetic	2	0	+	+	-
total		**0**	**15**	**8**	**-11**

Justification of Selected Design

- Selected Design B

- Most durable
- Most controllable
- Least weight
- Legacy of success





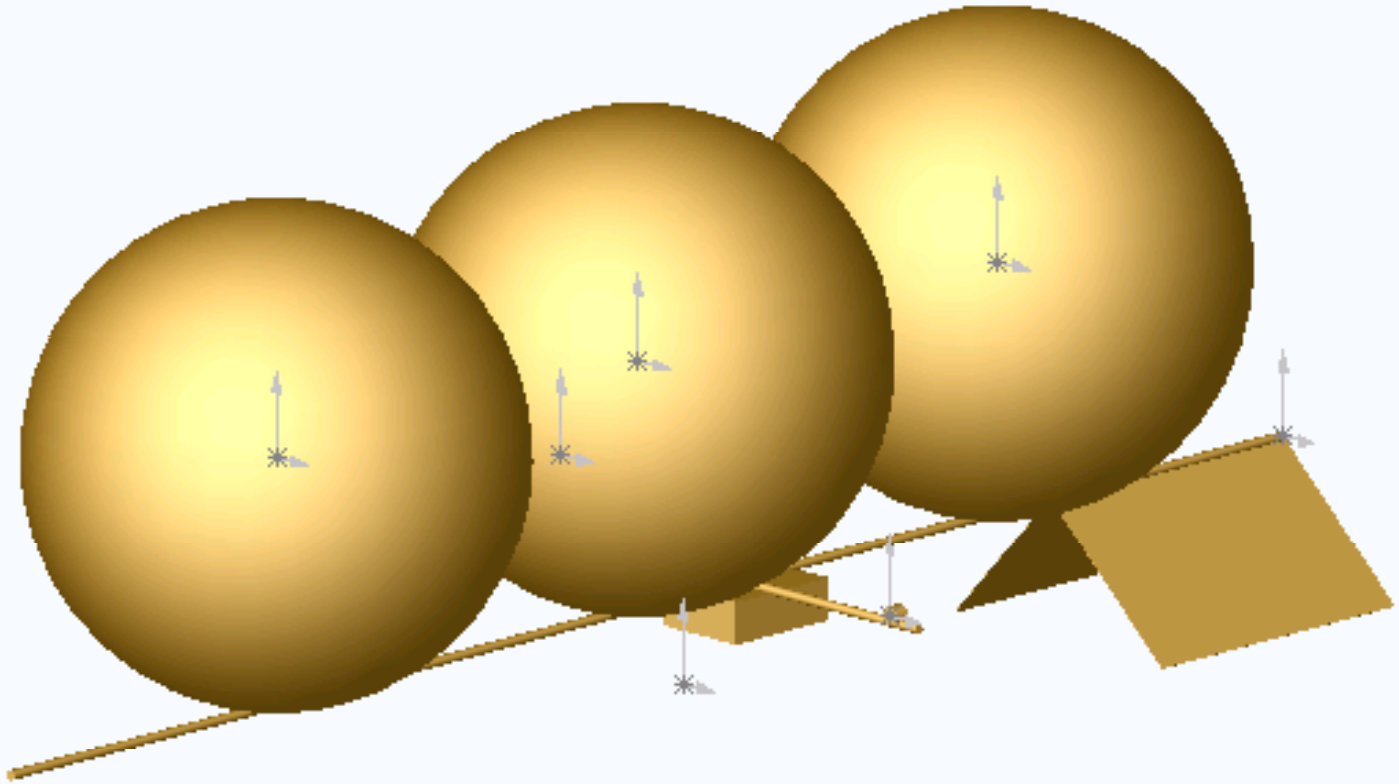
Schematic of Selected Design

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

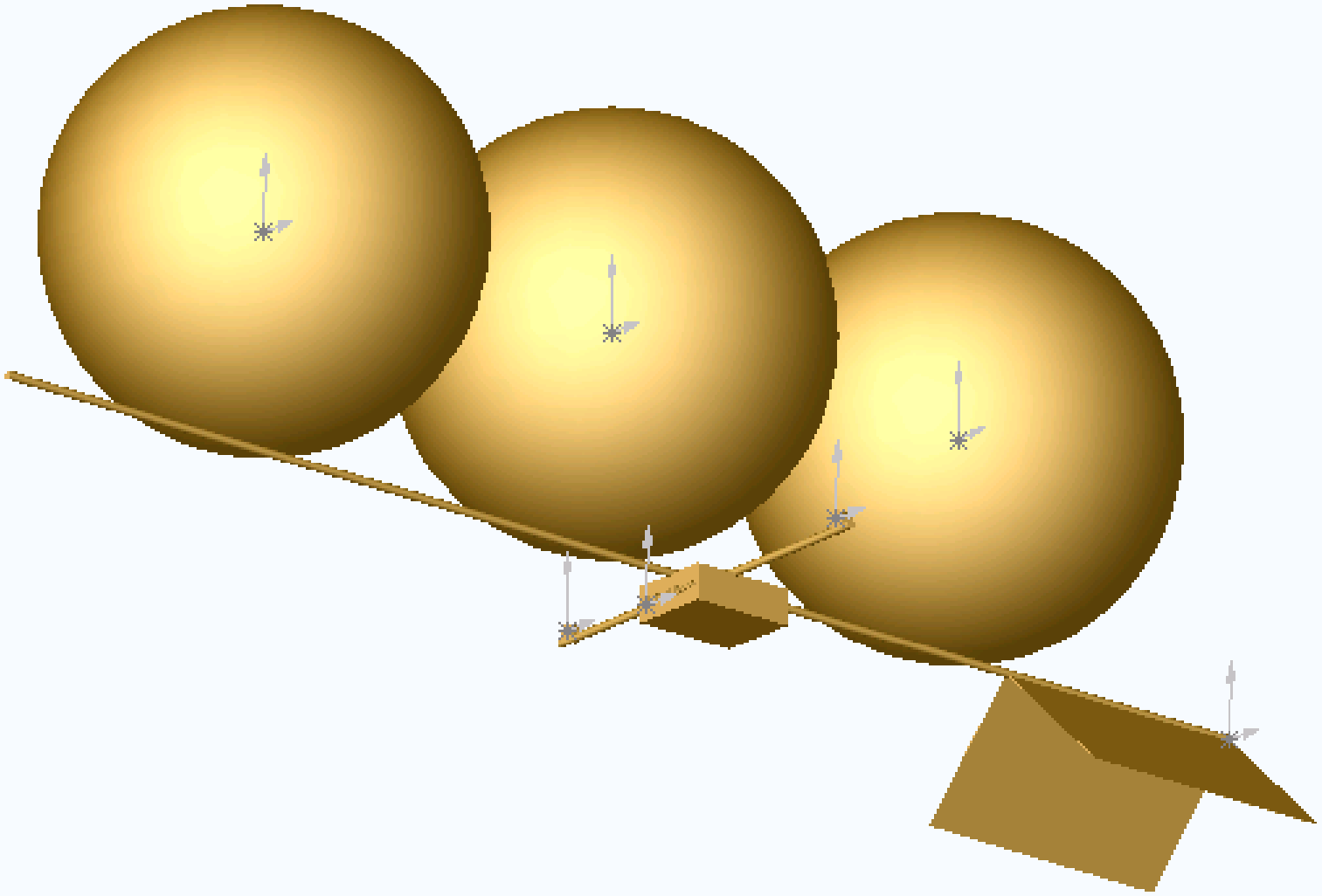
NEXT ASSY | USED ON
APPLICATION | DO NOT SCALE DRAWING

<COMPANY NAME>

Solid Model of Selected Design



Solid Model of Selected Design



Technical Analysis – Lift

- Three Balloons = 1.6 m^3 of helium (fixed)

- Maximum Mass
  = Lift/g = $(\rho_{air}-\rho_{helium}) * V$
  = **1600 g**

Technical Analysis – Steady State

- Thrust from two large engines =
  2 * 1.80 N = **3.60 N**
  [Assuming batteries run for 5 sec.]

- $T = D = 0.5 * \rho_{air} * v^2 * S * C_D$
  Let $C_D = 0.9$,
  Then $v = [\ 2*T / (\rho_{air} * S * C_D)\ ]^{1/2}$
  = **2.9 m/s**

Technical Analysis – Vehicle Mass

Batteries (8 cell)	160 g
Engines (two)	420 g
Propellers (two)	10. g
Balloons (three)	210 g
Electronics (total)	290 g
Structures (estimate)	320 g
Total Estimate	**1410 g**
Payload Estimate	<**190 g**

Requested Additional Materials

Aluminum rod (for main cross structure):

- 3/8 in. diameter, hollow, 1 mm thickness
- Lighter
  - Estimated weight of balsa wood structure: **490 g**
  - Estimated weight of aluminum rod: **320 g**
- Strength
  - Balsa wood yield strength: **20 MPa**
  - Aluminum yield strength: **410 MPa**
- Durability
- Price: **$2.11**

Proposed Schedule