

**Prohászka Zoltán:**

**Preparing for the Kremer Marathon  
Competition**



# contents

**-The (recent) Kremer Prizes**

**-Introduction our team**

**-team members**

**-History (our 1st HPA)**

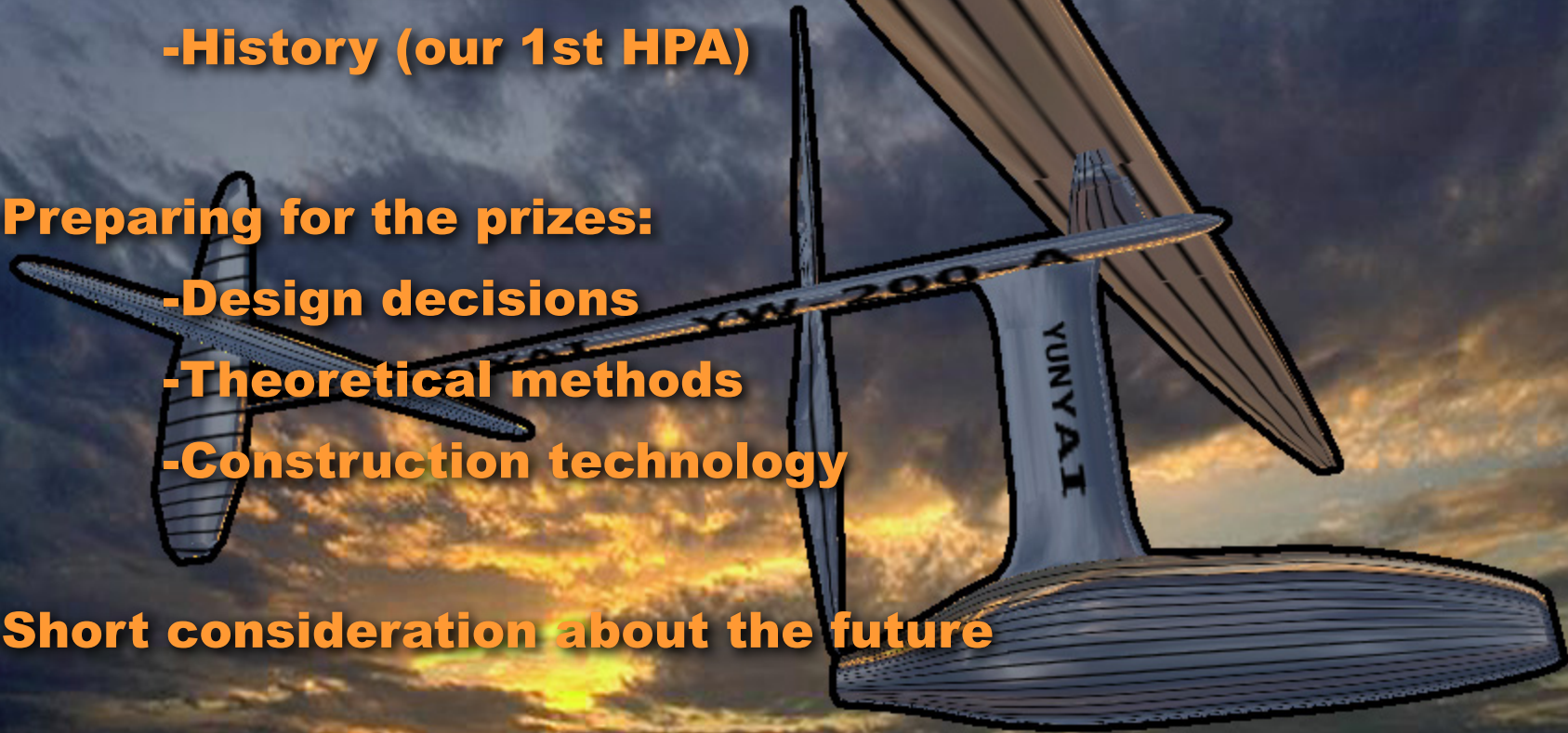
**-Preparing for the prizes:**

**-Design decisions**

**-Theoretical methods**

**-Construction technology**

**-Short consideration about the future**



## Already Awarded Kremer Prizes

**-The Kremer Human Powered Aircraft Competition, (1977, Gossamer Condor)**

- One mile long '8' shaped course.**
- requires:**
- Maintained level flight**
- Manouverability**



**-The Kremer Speed Competition (1984 MIT Monarch 10 m/s, Musclar I-II)**

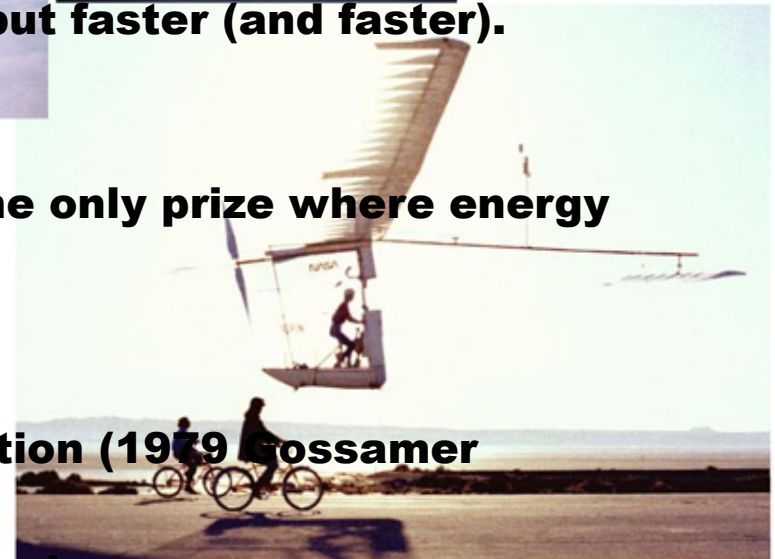
**Same course, but faster (and faster).**



**This is (was) the only prize where energy storage was allowed.**

**-The Kremer Channel Crossing Competition (1979 Gossamer Albatross, 5 m/s)**

**This was the only Kremer prize where**



## **Available Kremer Prizes:**

**-The Kremer Marathon Competition (1988): 40510 km (marathon distance) in 1 hour.**

**-Requires speed maintained for a longer duration. (High speed low power)**

**-Short calculation for 60 kg pilot: 30kg aircraft, 900N lift, 1/120 profile drag, 7.5 N 1/90 induced drag (30 AR), 10 N 1m<sup>2</sup> drag surface, 5N 22.5, 12.5 m/s: 280 W, 90% prop eff: 308W**

**Human power output: 300 W @ 1 hour**

**-The Kremer Seaplane Competition (1988):(complete the classic Kremer course taking off and landing to water.)**

**-This would enhance safe operation of such an airplane**

**-The Kremer HPA for Sport Competition (1995):**

**-(complete a different, but relatively short course in windy weather condition)**

**-It is dedicated to the aim of making HPA flying-riding a regular aeronautical activity.**

## Our Team:

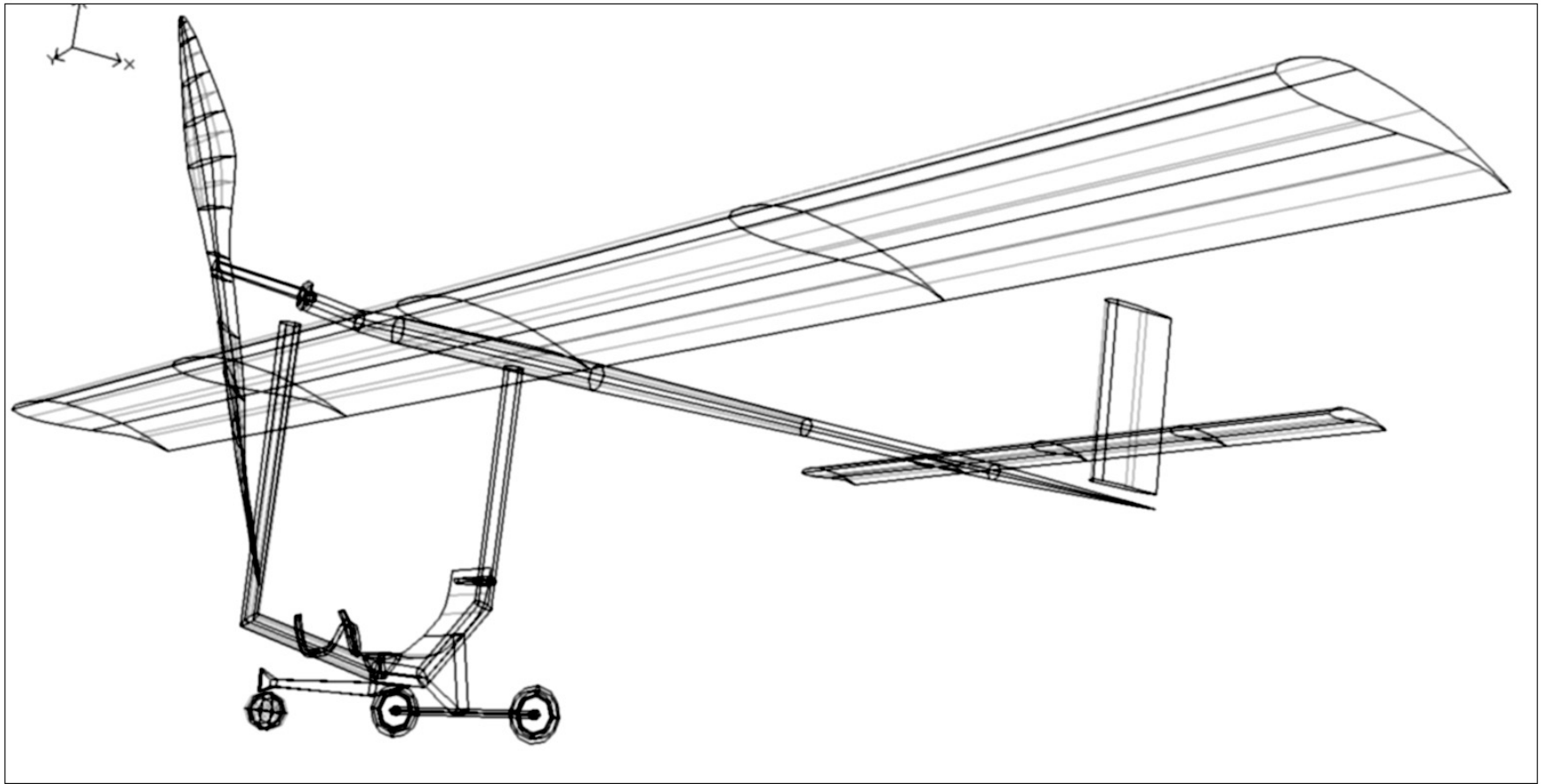
The basis of our team is a friendship group which formed around ten years ago in our high school dormitory.

Lipka Balazs Pilot, co-designer,  
constructor

Toth Andras Aircraft co-designer and  
constructor

Prohaszka Zoltan Designer, constructor

And many other people, who contributed  
more or less work to the project.



I. Red Bull röpnap, 2002. augusztus 11.  
Velencei-tó









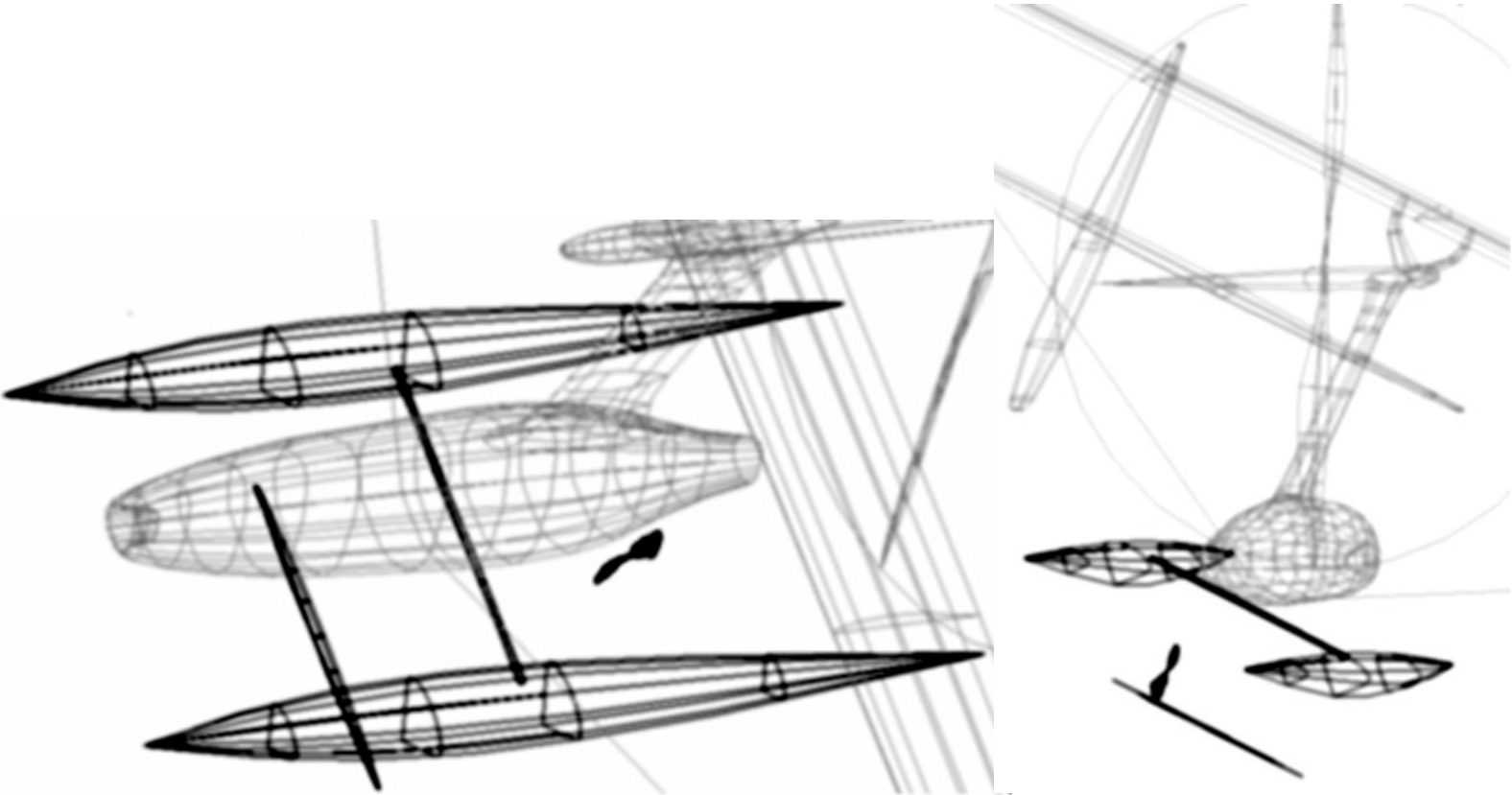


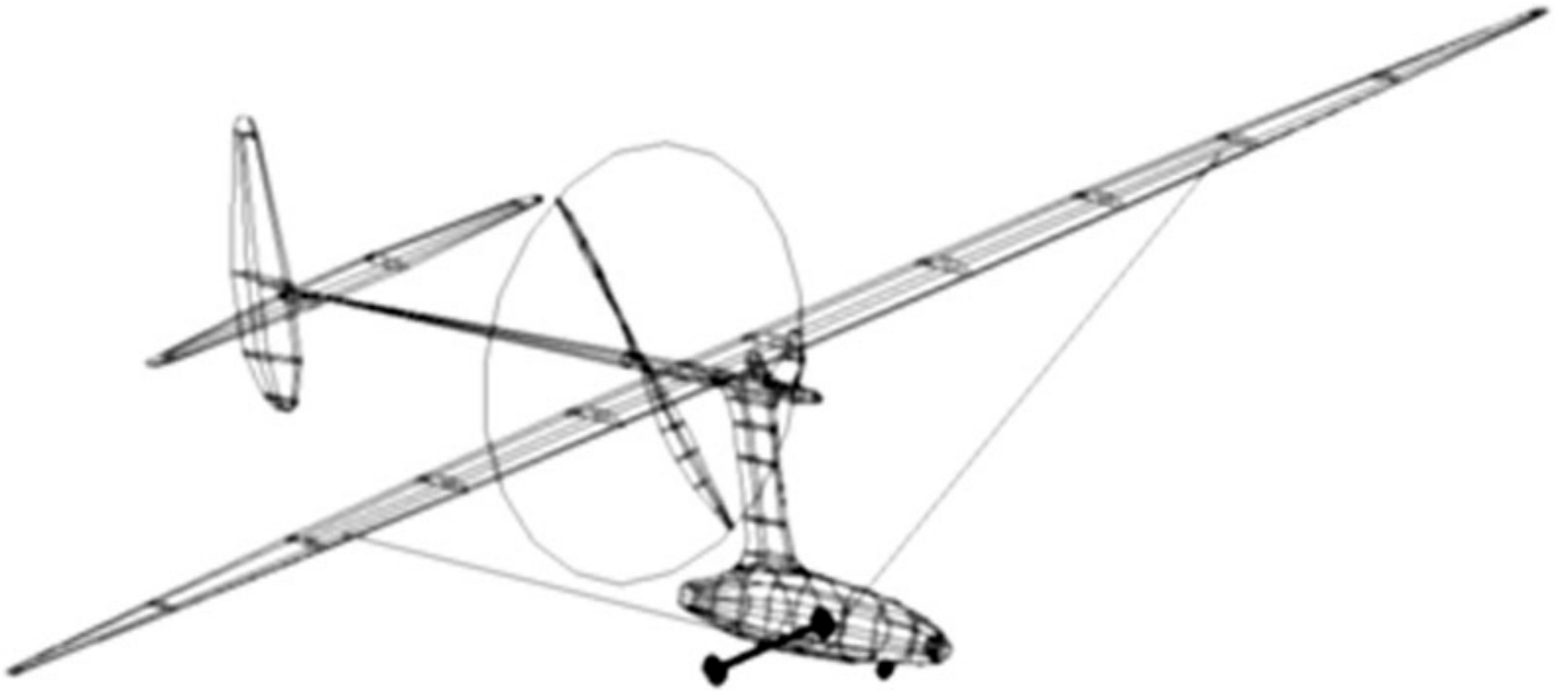


# For the Marathon Competition:



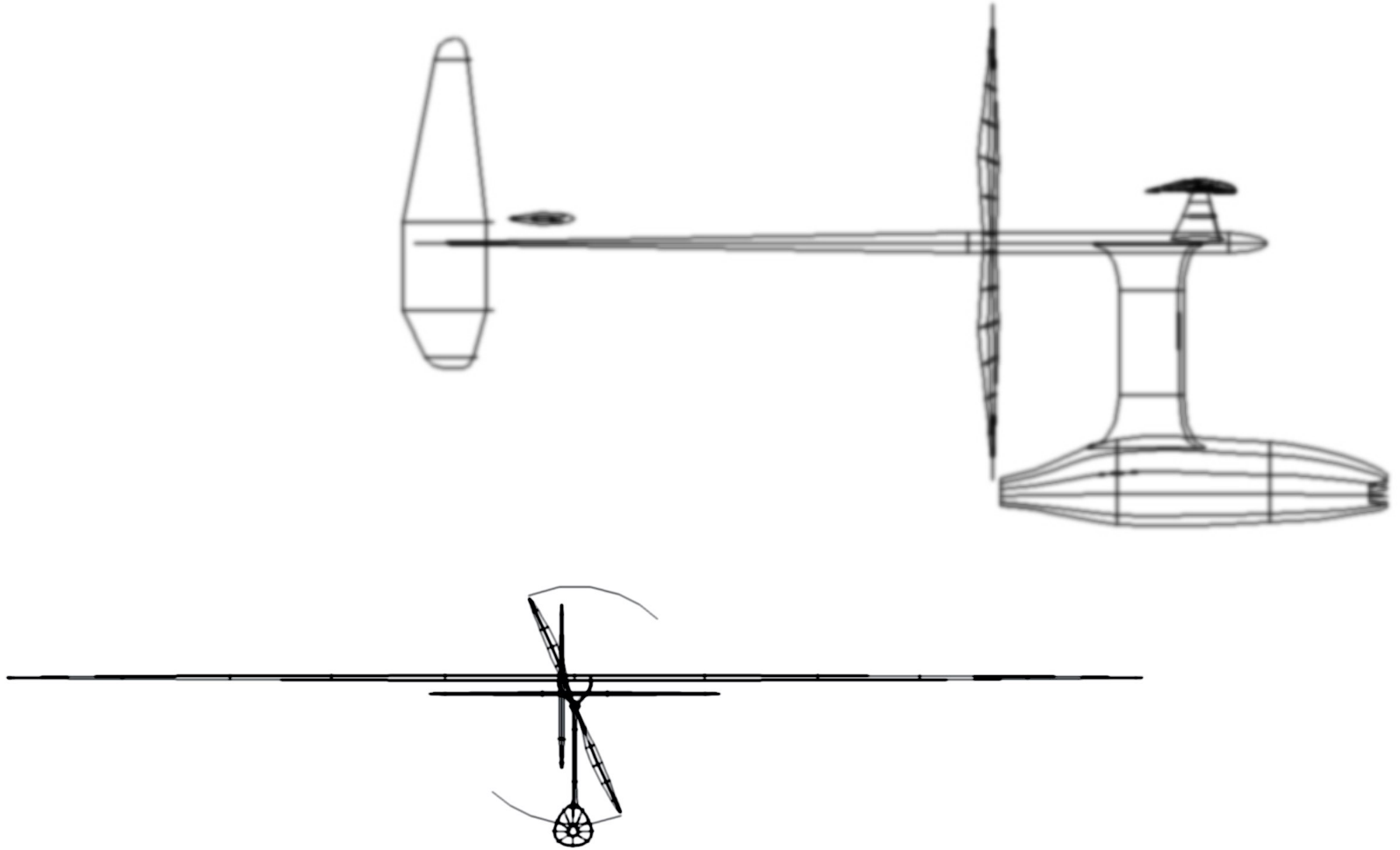
# Hydroplane Version:

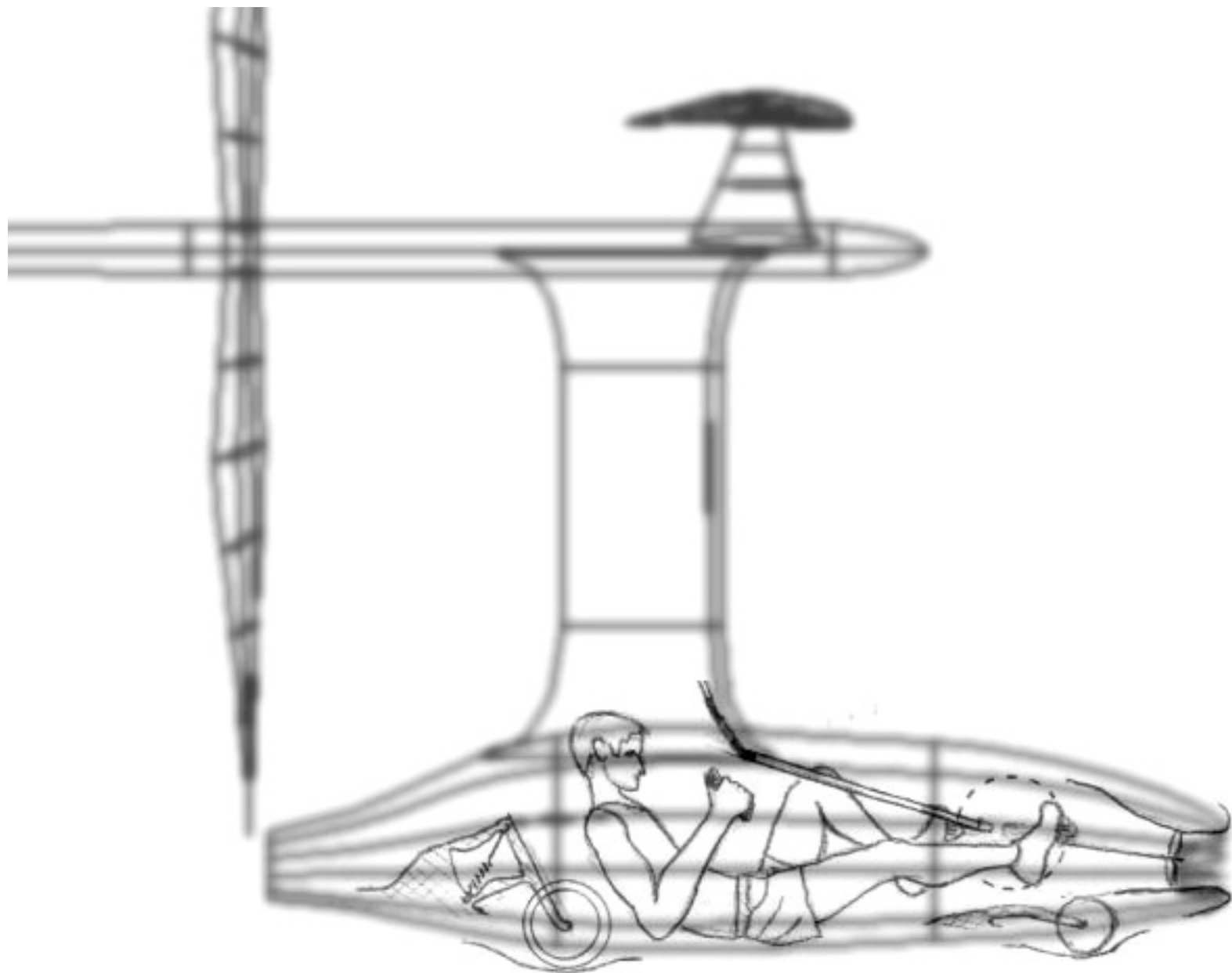




**HPA for Sport:**

# Configuration:







## Optimisation of the airplane:

- to be optimised:

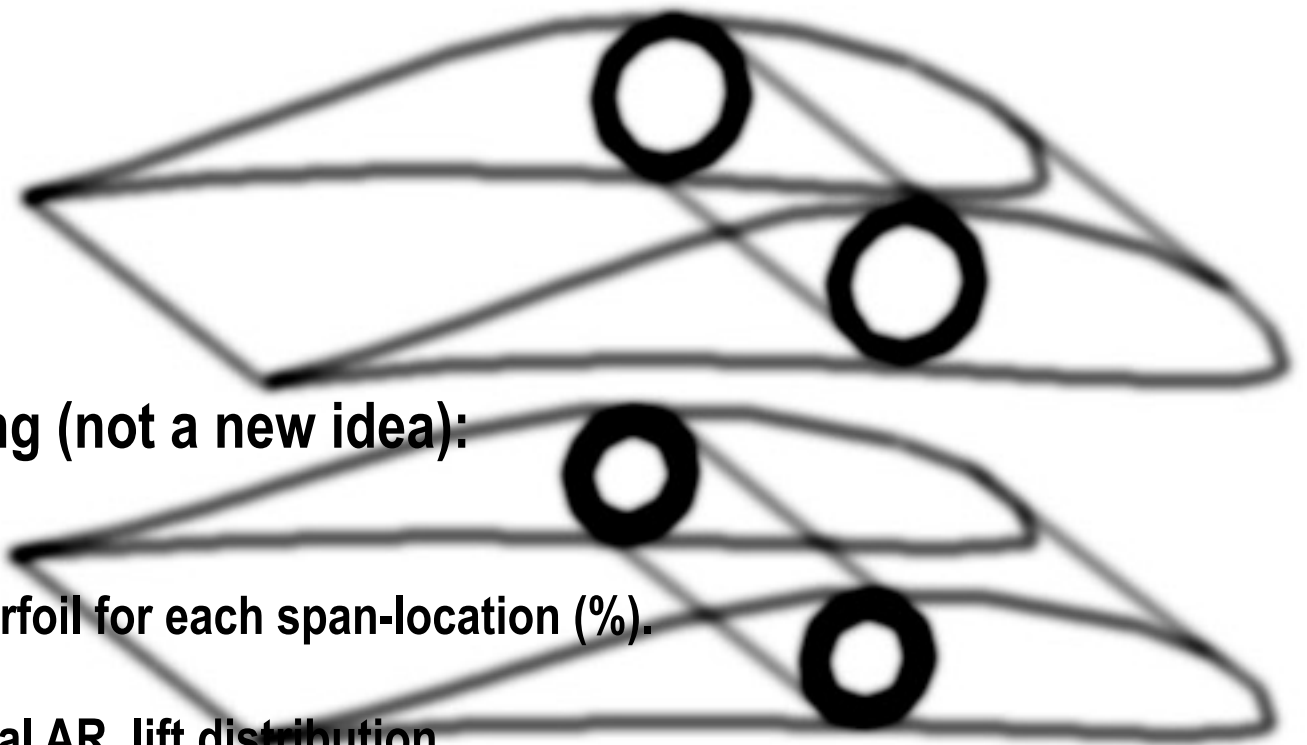
**POWER weight = power**

- to be searched:

**m,b,ch(0..b/2),bending(0..b/2),spar sizing (0..b/2),optimal airfoils,  
r\_prop,prop rpm,tail length,b\_elev,b\_rudder**

-to be satisfied:

**n,SF,v\_c/v\_s,v\_ne/v\_s, ...**



## **Determining ideal wing (not a new idea):**

- 1. Select initial airfoil for each span-location (%).**
- 2. Determine ideal AR, lift distribution.**
- 3. For each spanwise location try to use different airfoils,  
which:      -would decrease weight more than increase drag  
or            would increase weight less than decreasing drag.**
- 4. Go to 2 and repeat with the recently selected airfoils.**

**This iteration can be modified to run much faster than this simple version would.**

## Our Ergonometer & Simulator:



**The following, very important things can be tested and measured in our simulator:**

- The power output of our pilot candidates (1% accurate, in SI W)**
- The comfortability of the recumbant seat position, and it's effect to the pilot's power**
- The comfort of the controls and the space required by the pilot's arm during full steering**
- The shape of the smallest cockpit coverage**
- The required ventillation inside the cockpit**
- The effeetct of pilot's exhaust to concentration**
- The difference of the instant flight state to the ideal flight situation.**



AP

sim\_v:04.29 m/s

sim\_F:11.43 N

sim\_P:82.44 W

csapas:80.321281 1/min  
konnyito\_szorzo:1.350000

SLIP: 0.00%  
OLDK 0.67%

V: 4.74

MAGK 3.64%

CSUR31.80%

poz:-100.71  
fazis:0  
fH:-0.03

DIST:-9.76%  
TIME: 0.00%

vrec0:11.00 m/s  
Pd : -86.26 W  
vrec :14.02 m/s  
Pout:127.39 W

Lift:00.17 G

99.545 ms 11 FPS

E:-7.24 En

AP

sim\_v:08.34 m/s

sim\_F:09.31 N

sim\_P:83.12 W

csapas:76.530609 1/min  
konnyito\_szorzo:2.749999

SLIP:-2.23%

OLDK-3.61%**OLDK36.39%**

**MAGK-20.42%**

H: 6.28

V:12.15

MAGK 2.64%

E: 5.45

poz:2040.51

fazis:2

fail:2

Lift:01.02 G

101.500 ms 10 FPS

**CSUR-32**CSUR-4.00%

DIST: 5.16%

TIME: 8.40%

vrec0:12.37 m/s

vrec :13.22 m/s

Pd :-211.30 W

Pout:329.21 W

En

AP

sim\_v:09.19 m/s

sim\_F:14.66 N

sim\_P:142.72 W

csapas:87.209305 1/min  
konnyito\_szorzo:1.600000

SLIP: 0.06%  
OLDK 1.53%

+H: 6.03

+V:13.19

MAGK-2.65%

MAGK 8.91%

E: 6.55

poz:-13.53  
fazis:9  
fail:2

CSUR-8.06%

DIST:79.97%  
TIME:80.62%

Lift:01.00 G

vrec0:13.20 m/s    vrec :13.20 m/s  
Pd :-229.19 W    Pout:244.04 W

102.500 ms 10 FPS

En



sim\_v:09.22 m/s

sim\_F:14.19 N

sim\_P:135.84 W

csapas:84.865631 1/min

konnyito\_szorzo:1.600000

AP

SLIP: 0.47%  
OLDK-31.1 OLDK 1.77%

MAGK 0.37%  
V:12.16 MAGK-4.55%  
+H: 5.89

E: 5.08

poz:-2033.74  
fazis:11  
fail:2

CSUR-3.46%19.54%

DIST:95.17%  
TIME:95.37%

Lift:01.00 G

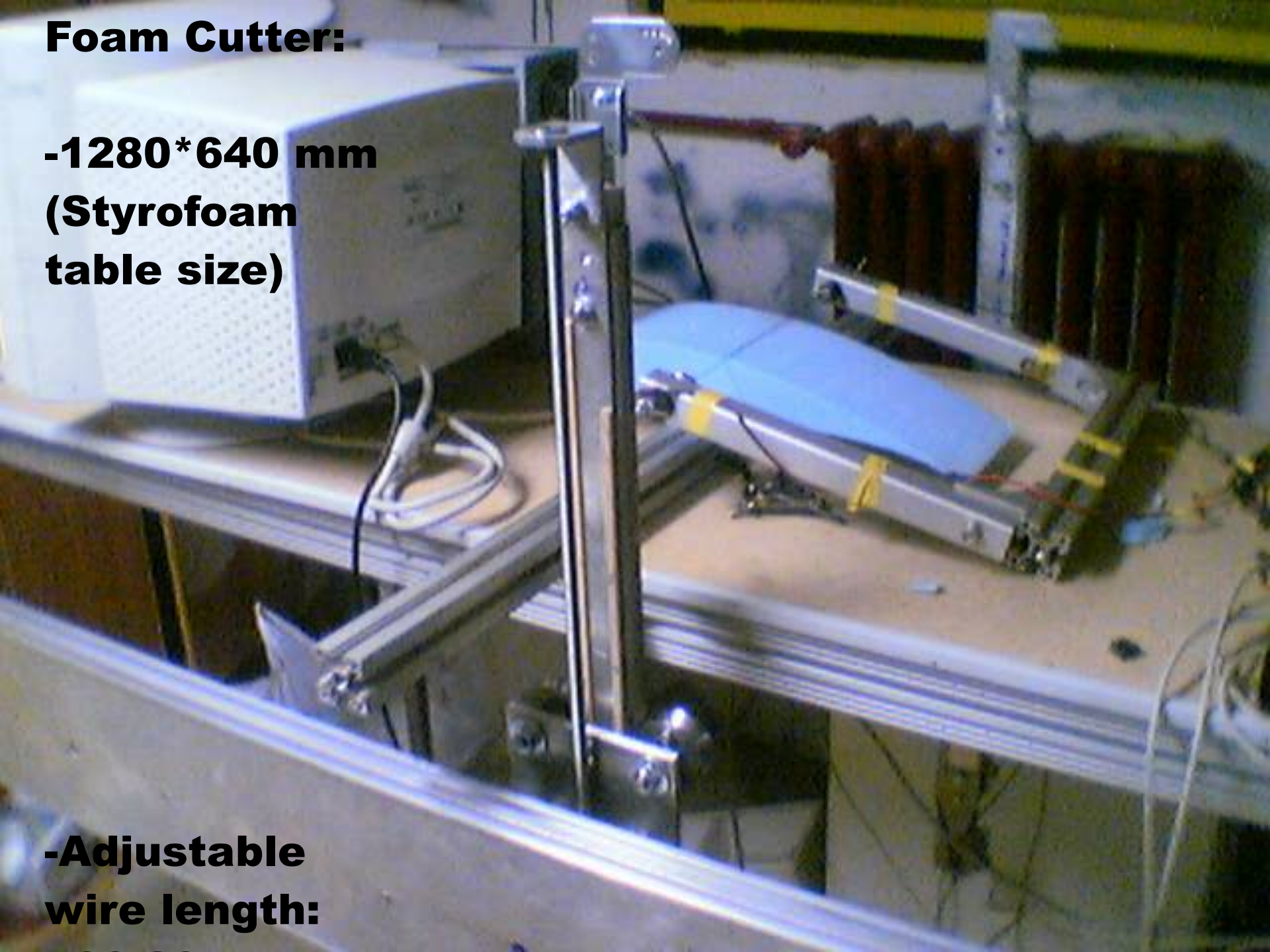
vrec0:12.08 m/s vrec :13.30 m/s  
Pd :-214.33 W Pout:224.28 W

103.400 ms 10 FPS

En

**Foam Cutter:**

**-1280\*640 mm  
(Styrofoam  
table size)**



**-Adjustable  
wire length:**

**Thanks for your attention!**

