EXCEPTIONNALS ENGINEERING PROJECTS

TOME II

FIRST RED CATS EDITION
Monday, October 23, 2023

JOSEPH FELIX MAXIM THIBODEAU

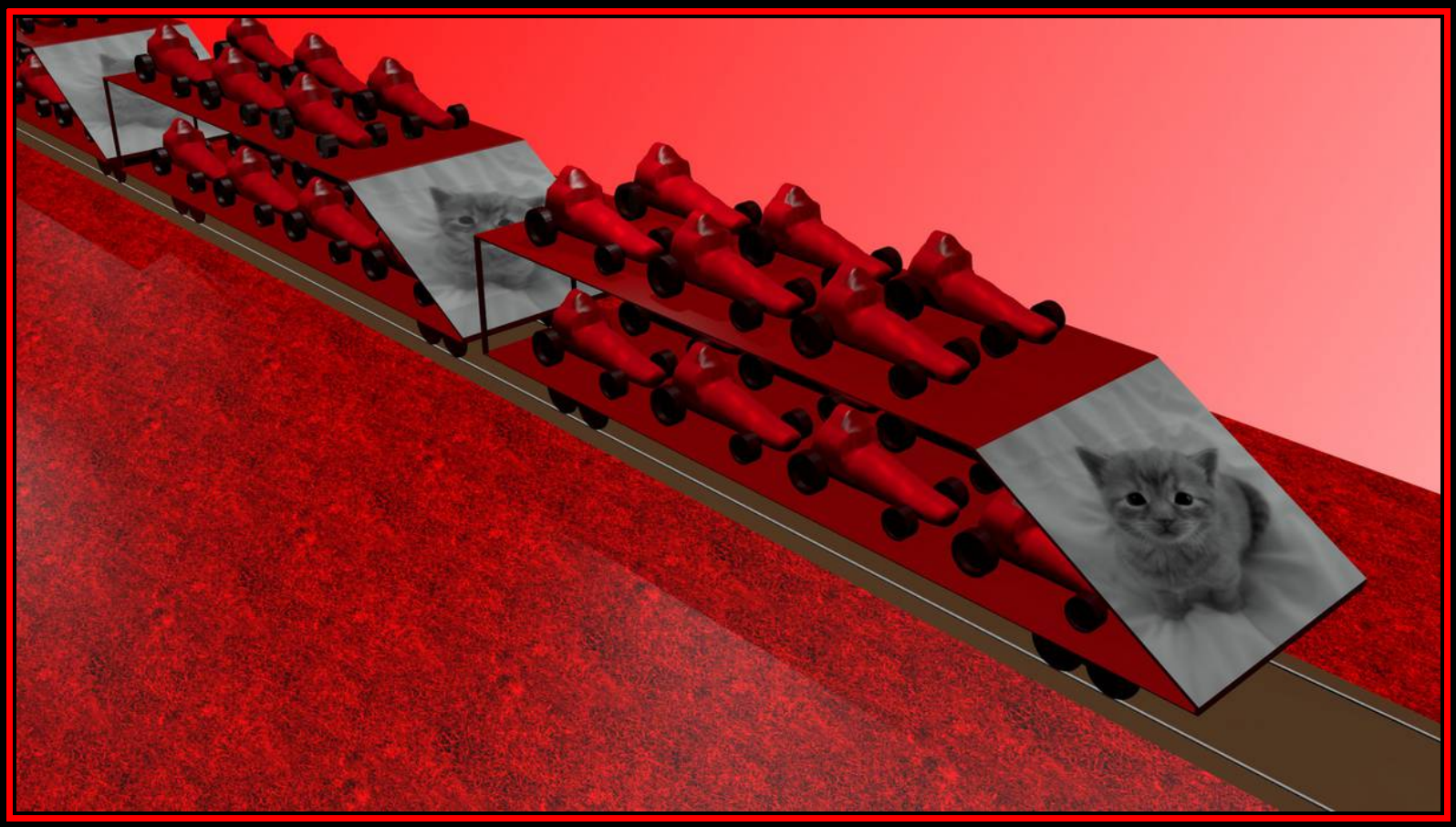
INDEX

PREFACE

The topics are so varied that I leave you the care to visit them, a real preface will follow in the next edition, because I am in a hurry to publish this ...

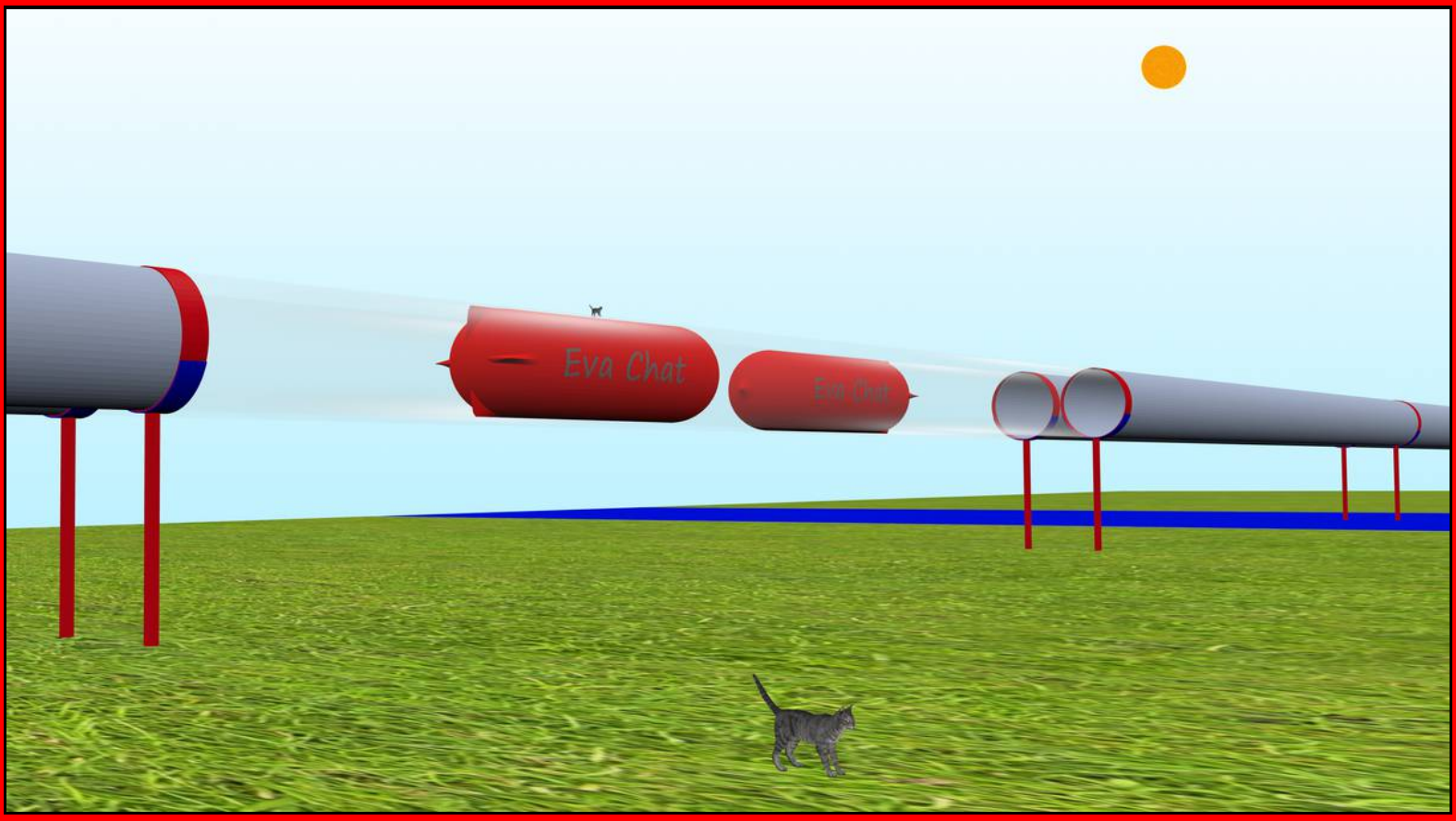
It can be noted that the red color is used in abundance, in my works, it is because I do not have workers to apply textures, and for various reasons of revolt.

INTERCITY TRANSPORT



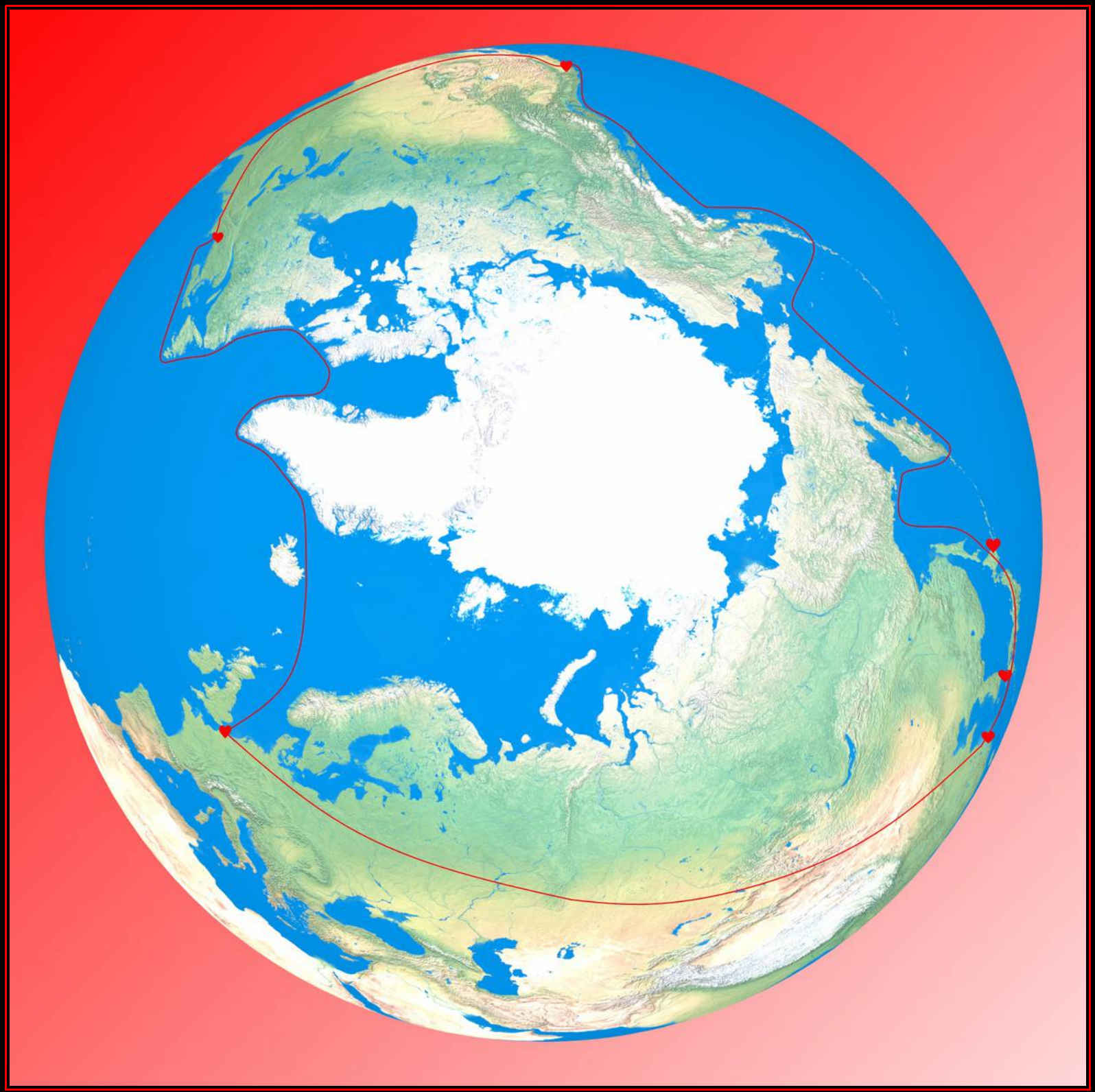
In most cases, because the railways are everywhere, it would be better to think of the inter-city transport of citizens by train, with economy concern of the civilizations of the future, that will be boundless, it is certain. What is the use of mobilizing all the energy of a nation, if it is to waste it in a small opening would be the generalized electric transport across a continent. Not to mention the cost of highways, which is huge, the rail is 100 times less energetic and much less expensive. From the point of view of pollution, it is incomparable.

SUPREME EVA CAT



Here is the extraordinary Eva cat, in honor of the great and wonderful supreme princess Eva, farmer and final ecologist, total and absolute, as well as her cat the very great and beautiful, marshal cat, head of all armies. The Eva cat-A system is 40,000 km long, at less than 1.25 trillion, see next page.

SUPREME EA CAT LOOP



It was the third traverses I envisioned. We will most probably need to remove the San Francisco – Japan link, for reason of tidal waves :(

PRELIMINAIRIES ASPECTS

This project, based on existing concepts and including small personal modifications, this time a dimension allowing its realization on such a scale. Compared to the American project, which is titanic and therefore limited to the New York-Washington route:

The hyper-loop one project is very advanced. Its design began several years ago and is based on existing technologies. However, the company managed to put together all the vectors necessary for the emergence of a real project. The main question is, what will happen if an overseas country succeeds in doing better with less? Because, the essences of transport are: the cost, the speed, the comfort and the various ecological aspects.

I. Cost: The Eva Chat project is optimized for cost and speed in the second place. The hyper-loop one project is based on optimizing comfort and perhaps profitability because only wealthy businessmen can borrow it. Regardless of the calculation, my project will be at least 8X cheaper in the conditions that can be observed on the previous image.

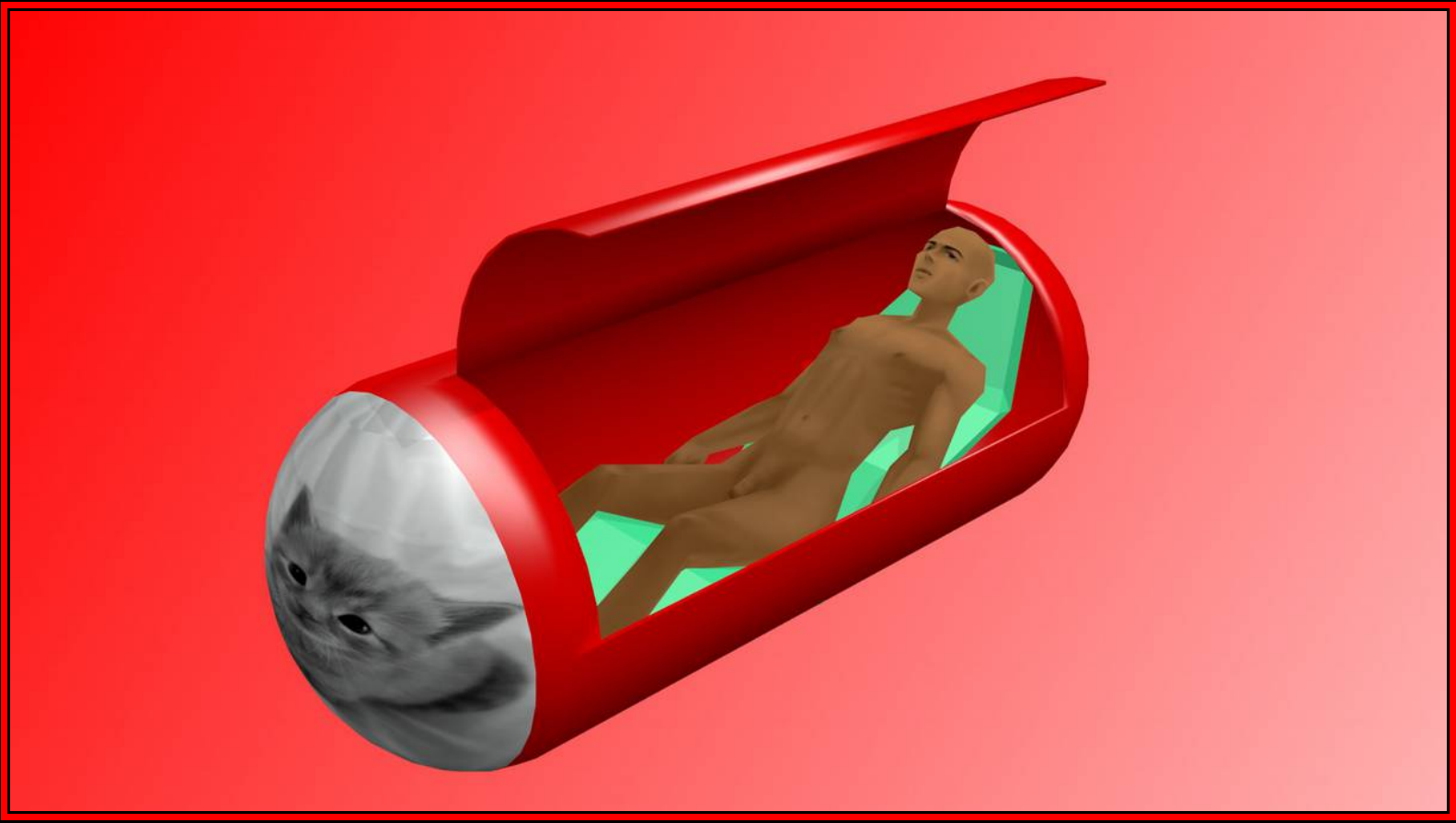
II. Speed: The hyper-loop project will be at least half as fast, and I am very conservative, as the project Eva Chat. Acceleration will be better, so times will be better on my project.

III. Comfort: The main flaw of my project, is the comfort, over long period, it would even be necessary to have a license. In the case of an ocean crossing, the times could be of the order of several hours. People of big sizes, 2.30 meters and more could be forced to stay in bed or on the side or even to be excluded. But, less than 1 in 100,000 people in the US are of this size ... In the competing project, the comfort of the business class is required, it will however be required to remain seated during the acceleration phases, if the

maximum speed is not just ridiculous or the travel time much longer.

IV. Ecological aspects: My project, the Eva cat, is at least 10X more ecological, because of the material that would be: lighter, easier to produce, easier to set up.

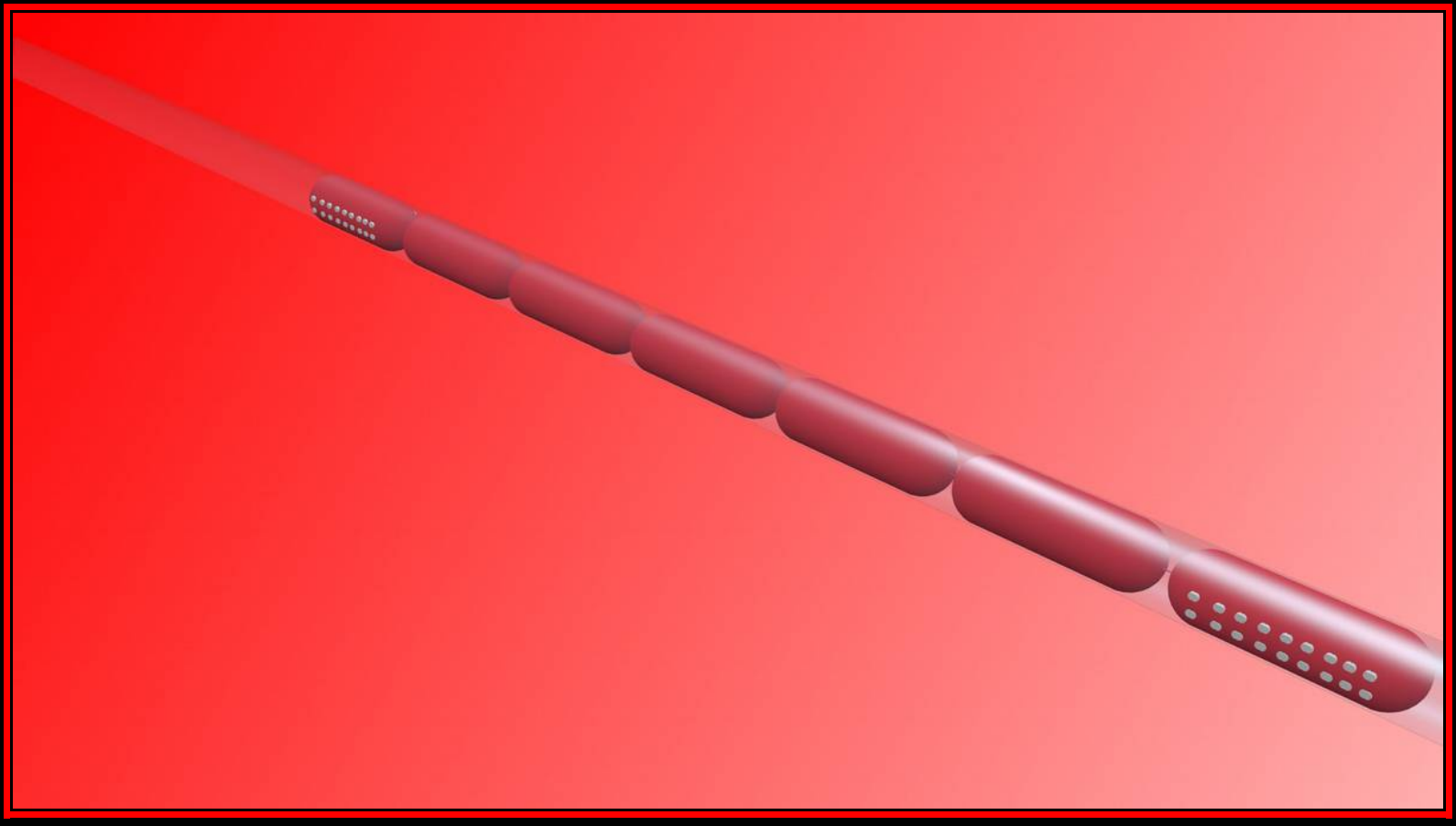
EVA CAT CAPSULE



Here is the standard capsule Eva Cat 2.0 and a large occupant: 2.20 m and 140 kg. It is certain that the real users will be dressed, but it is my standardized model of the Marsonauts :)

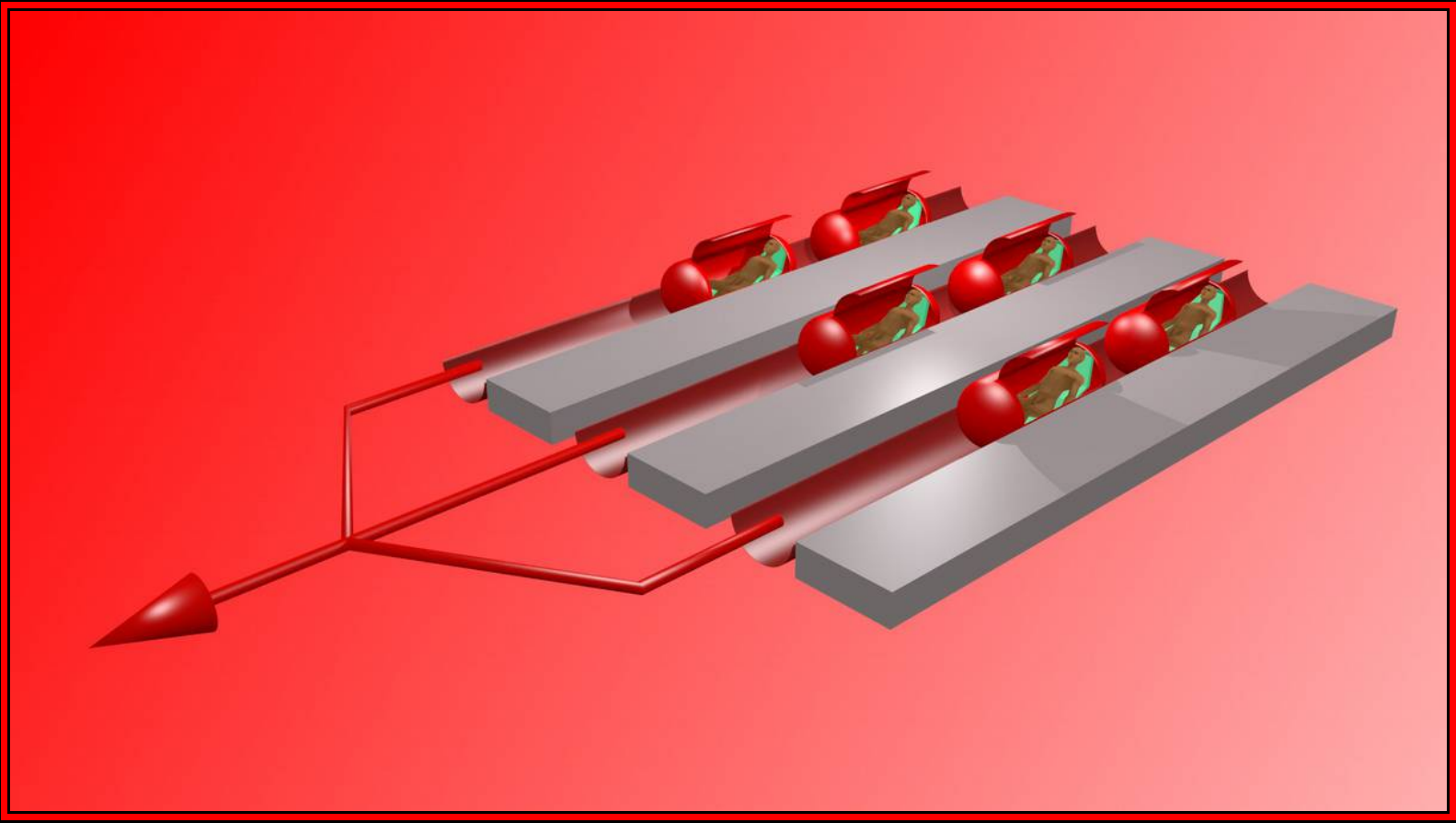
It is possible to think of a larger capsule, but the price of returning the trip by the mass to accelerate and decelerate will be greater as the number of curves will be, according to a calculation that I will elaborate later. Also, the cost of the tube, and therefore of the infrastructure, will be proportionally greater by a factor directly connected to the surface area of the cross-sectional plane of the capsule.

EVA CAT SUPREMUS



The Eva Cat Supremus, which consists of two locomotives, and in this case 5 transport capsules on a possibility of about 10. One locomotive for acceleration, and the other for braking and energy recovery.

MAXIME ADMIRABLE SUPER KITTENS BOARDING SYSTEM



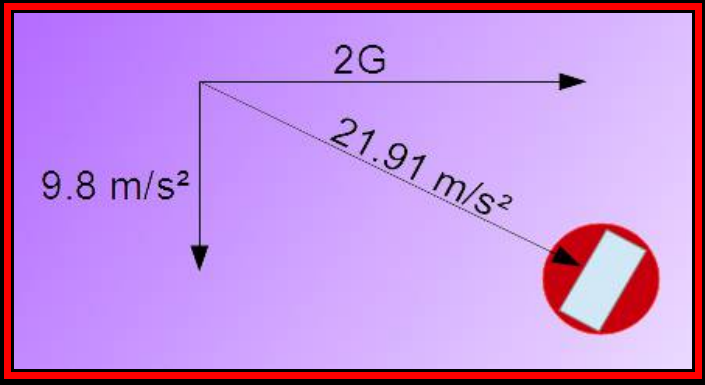
The boarding systems will have to be extremely well designed, so as not to become a network bottleneck. The relatively high cost of the transport tube imposes a loading rate of:

Insertion per minutes	Per year	Passengers per year(10/train)
1	525 600	5 256 000
10	2 628 000	26 280 000

In some calculations, I had fixed the capsular mass at nearly 300 kg, but I am now at almost 200 kg. This gives, for a train of 10 capsules Eva Chat, about 2 * 350 kg + 10 * 200kg = 2750 kg, about 20 kw * h (speed-max of Mach-1), at 80% efficiency, for each complete stop with a 67% energy return. So, if one travels, imposes, 4500 km * 1 stop / 25 km, the amount of energy required would be of the order of 3600 kw * h, ie 360 $ to 0.10 $ / kw * h. Without energy return, the consumption would be of the order of 18000 kw * h or 1800 $ for 10 passengers. If the passengers weigh only 50 kg, it would be a price of $ 14.40 ...

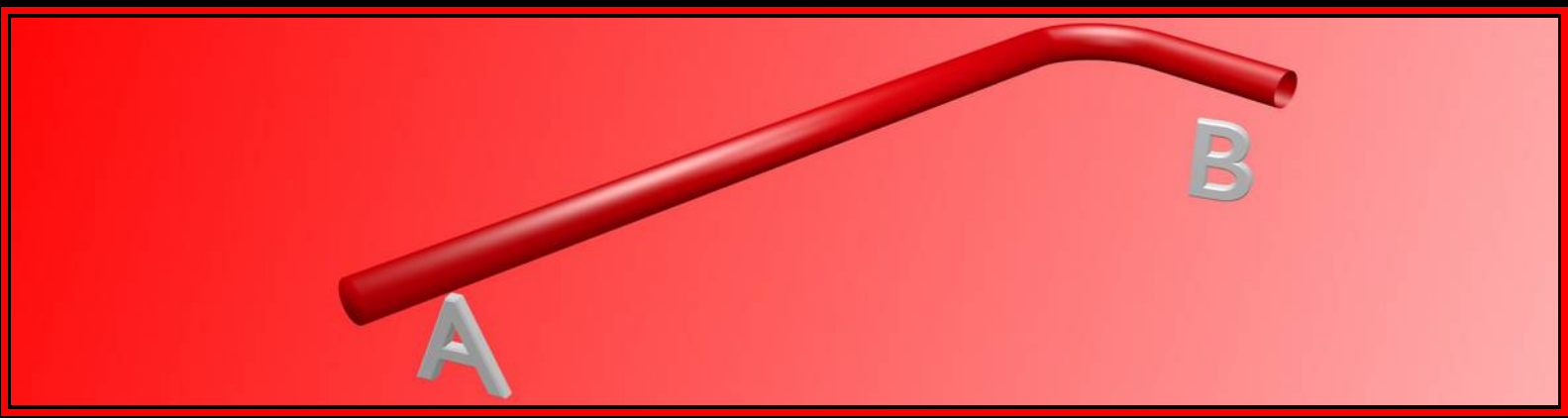
SPEED AND ACCELERATION

To please Eda and Eva and Maxime and Véronique, the acceleration must be maximum, but bearable. So the limit of Eva cat will be fixed at 2.236 G perpendicular, so at a speed of 4681 m / s, the minimum radius of a turn must be greater than that which generates the red circle (1000 km) on Africa image above. It should be noted, that it would take 1-1 / 4 turn of the red circle to reach the maximum speed of the circle in question. This also means that the maximum speed on Earth for a human being is probably close to 11,852 m / s or Mach-33 or 1/8500 of the speed of light, due mainly to the radius of curvature of the Earth. At this speed, we could go around the Earth in 9 minutes. Also, for a turn to a radius equivalent to the gray circle (50 km), the speed, to respect the limit acceleration, can not exceed 1047 m / s or Mach-3.



It is clear from this illustration that the position of the Eva cat capsule will be oriented perpendicular to the vector of acceleration. In the case of a deviation that would produce a vertical force, the vector would be larger in up than down. Therefore, the radius of curvature of the cat Eva will not be the same when climbing and descending, following the bypassing of an obstacle by the top or the bottom. The Coriolis force must also be considered, but it will be very small in the case of a north-south axis only.

It is very difficult to predict the average speed over a long course, as the number and intensity of the acceleration phases will only be known when the route is clearly established. For example, a turn at 90 ° would force us to stop completely, Eva cat, and restart: (here is an extreme example)



Radius curve = 2m ==> $\sqrt{2 * 9.8\ m/s^2 * 2\ m}$ = 6.26 m/s
Segment A = 1000 m/s at 6.26 m/s ==> (1000 – 6.26) / 18.6 = 50 s
Segment B = 6.26 m/s at 1000 m/s ==> (1000 – 6.26) / 4.9 = 202.8 s = 3 min 20 s

A+B = 272 seconds ==> 272 s * 1000 m/s = 272 km

let's neglected the turn speed :

A: 1000 m/s * 50 s + $\frac{1}{2}$ * -18.6 m/s² * (50 s)² = 26.75 km
B: 6.26 m/s * 202.8 s + $\frac{1}{2}$ * 4.9 m/s² * (202.8 s)² = 7.39 km

A+B = 34 km

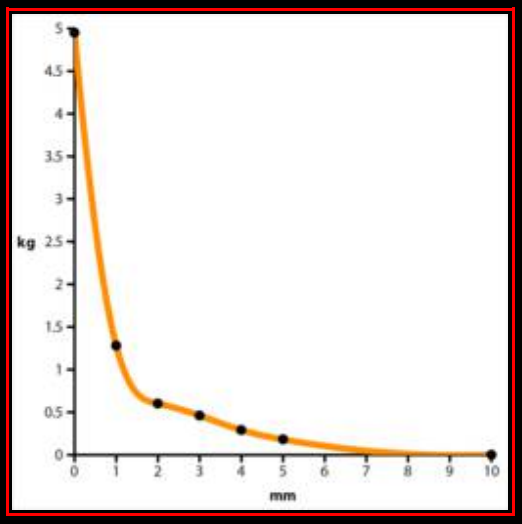
In conclusion of the calculation, without turning we would travel 238 km more, in the same amount of time, which means a loss of time of 4 minutes on the path in a straight line. This must be related to the theoretical time of a segment, for example East-West Coast of 5000 km, which in a straight line would have a travel time of 1 hour 25 minutes to the speed of 1000 m / s. All justified by the fact that Eva would not like to be held upside down for several minutes, so the limit of linear acceleration on one side will be 0.5G and the other 2G for the vector force parallel to movement.

BASICS CONCEPTS

Neodymium magnet: $Nd_2 Fe_{14} B$

retailer : 85g that could lift 33 kg = 7 Euro

2 * Nd = 288 g
14 * Fe = 781 g
1 * B = 11 g
Total = 1080 g/mole
% = 25% of neodymium (**rare earth**)

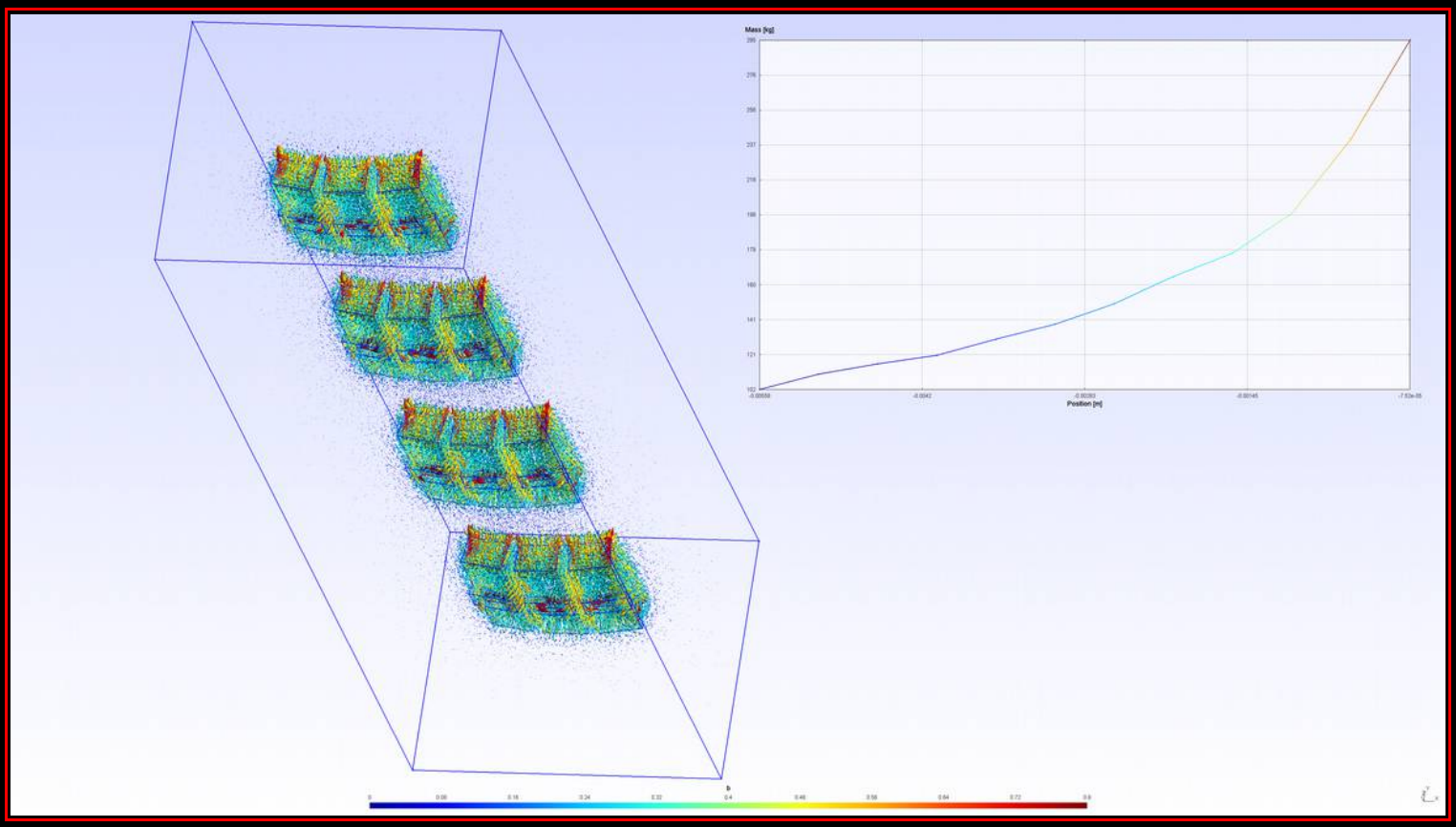


world production of Nd was about 7000 tons in 2004. 7 Millions tons at all.
the price 2017 of Nd was 60 USD / kg

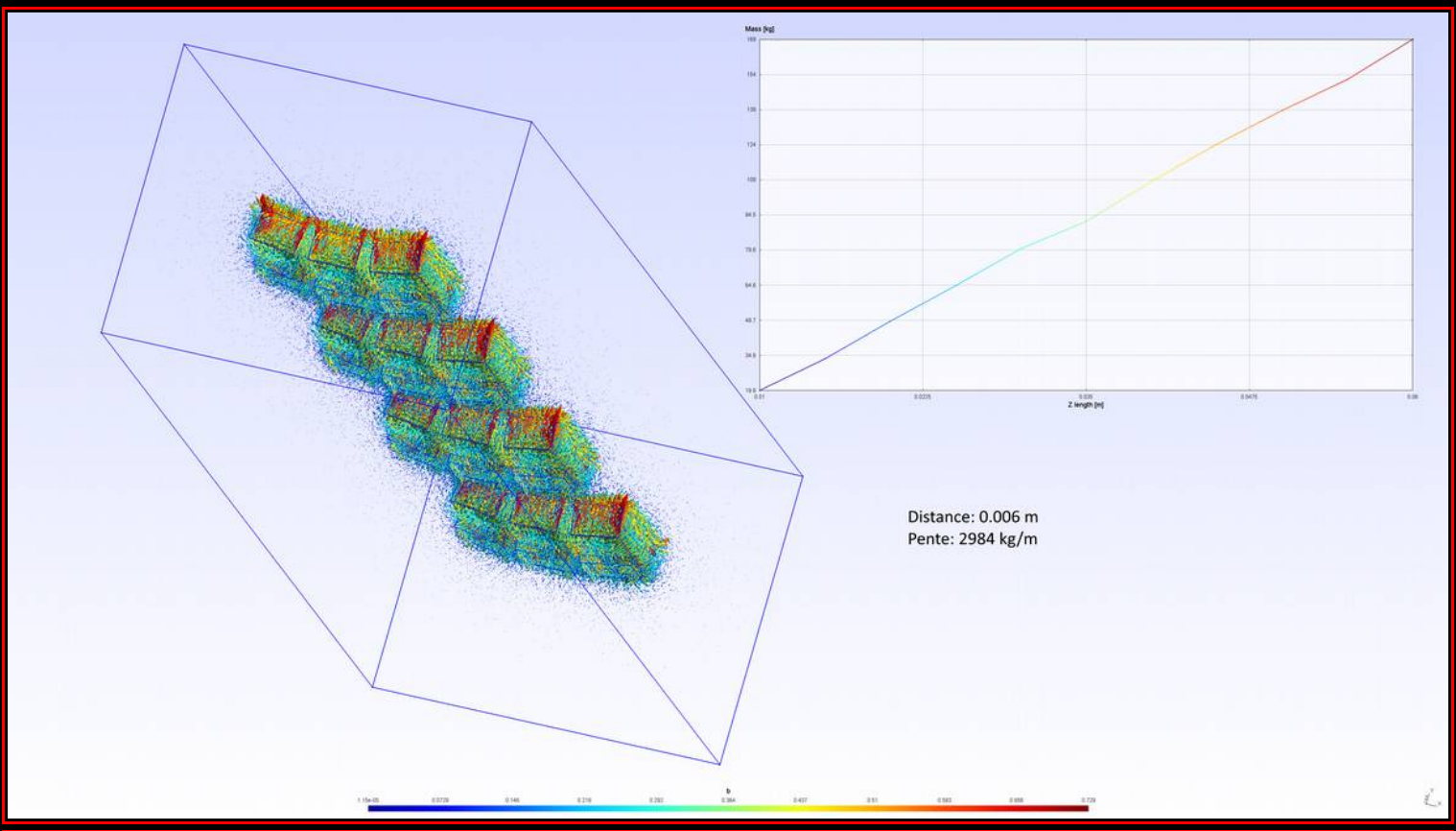
$$F = \frac{\mu q_{m1} q_{m2}}{4\pi r^2}$$

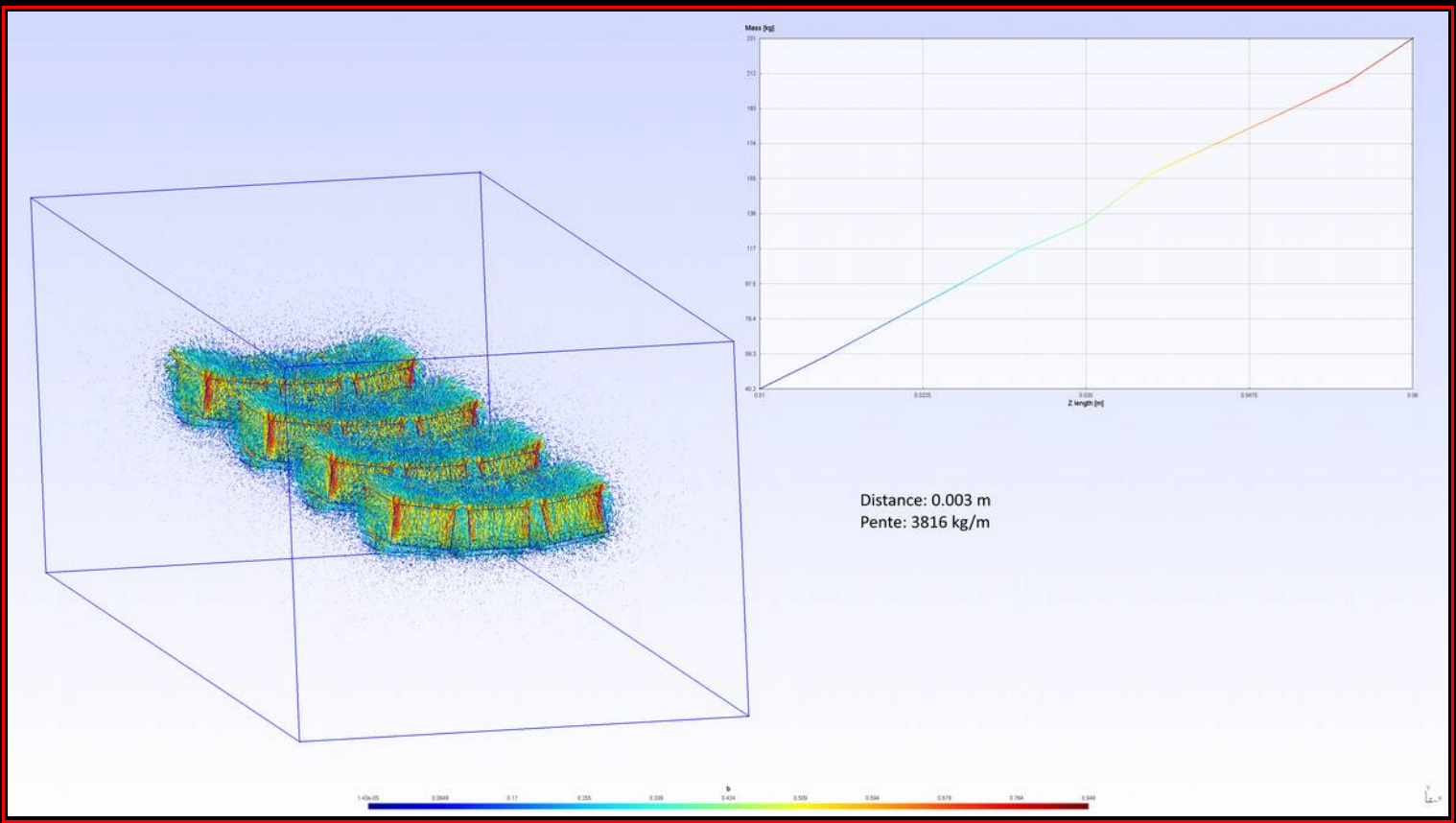
$$F = \frac{\mu_0 H^2 A}{2} = \frac{B^2 A}{2\mu_0}$$

*F = 4 * PI e-7 * 1e6 * (0.05 * 0.015) * 1e6 * (0.05 * 0.015) / (4 * PI * 0.015²) = 250 N = 25.5 kg*
F = (1.37 T)² * 0.05 * 0.015 / (2 * 4 * PI e-7) = 560 N = 57 kg



GMESH simulation gives, 22.75 cm³ X 12 magnets for achieving 170 kg at 2 mm distance. One magnet 20 X 20 X 10 mm weight 30g and has a value of 2.50 USD for 4 cm³.





For a variation of the width of the magnets on the tube side from 10 mm to 60 mm, the curve is more favorable for a large width when the inter-magnet distance is small. So in conclusion, it is not necessary to cover the tube, but it is necessary to keep a certain thickness for the magnets for a question of quality-cost ratio. In

addition, it is best to minimize the arc width to avoid too much lateral pressure on the capsule. The height of the magnets Capsule side can and will be larger than tube side for reasons of material saving. The height of the magnets for an inter-distance of 2 mm should be about 10 mm.

For the acceleration concept at any point :

Mass capsule and tripper = 200 kg (much too much)
3.5 m^2 effective area (under and sides of the capsule-1/3)
Take 2 mm distance, which gives 170 kg of force for 2048 g
200 kg / 170 kg = 2410 g every two meters and 30 cm
1000 m of Eva cat = 1000 / 2.3 * 2410 = 435 * 2410 = 1048 kg / km
0.25 * 1048 kg = 262 kg Nd / km
1179 tonnes of Nd and $ 100 million ($ 71m Nd) for 4,500km --> increase in costs to predict

Metal: Steel and sometimes Aluminum; 15m tube for transport by group of 4

USD steel cost: $ 800 / ton ==> 8 tonnes / m^3
USD aluminum cost: $ 2200 / ton ==> 2.7 tonnes / m^3
1m OD steel pipe: 200kg / m
Supports (rough estimate :)): 20 kg / m
Manufacturer of steel forming: 50%

$ 264 / m ==> 1.188 billion $ steel or 3.267 billion $ aluminum
For an aluminum 4,500 km Eva Chat duct: 1/10 of total Canadian annual production: 300e6 kg

Security, cameras and sensors:

Every 30 miles (48 km): -1 600 kits of 8 cameras -> 1600 * 200 $ = 320 000 $ / 8 years
-A shelter, with a vigil ==> $ 10,000 + $ 20,000 / year
-A car ==> $ 2,500 / year

Over 40 years: $ 63,000 / year

Over 4500 km: $ 5.9 million / year
For one mile (1.6 km): $ 2,100 / year

Propeller: Enamelled copper or aluminum

USD Copper Cost: $ 7,000 / ton

Construction: flat or excavated surface

example:
USF: 1,500,000 soldiers

Salaries and benefits: $ 100,000 / soldier / year
Containing money:

- Balance
- Housing allowance
- Food allowance
- Salary bonus and special balance
- Retirement pension

Social Security :

- Health care for the soldier and his family
- food Bank
- Consumer Goods Bank
- Child allowance
- Fitness center
- Removal allowance

The fact that the productive mass of the project is not exposed to the violence of the fighting, would allow us to reduce the payroll by 20%, this may seem insulting, because to die in combat is boring. But perhaps the situation of civil work will evolve in the future, because currently these benefits are demanded by the people who do not want to give anything.

So, my condolences to the heroes given:

1000 m of tube = 66 single pieces of 15 m
Favorable geographical location of the steel production plant: 2250 km from each end
Cost of trucking on an average of 1125 km: $ 1.75 / km = $ 2000 / trip
assumption of 6 pipes per truck ==> $ 500 / pipe + base

Transportation: $ 3333 / km = $ 1,500,000

Hours of work per worker: 8 hours / day

Workers per tube: 30 minutes / tube
Crane operator
X tube directors 6
Against Master
Leveler
Concrete maker
Steel erector (structure up to 10 meters) X 2
Welder
Painter
Mascots: 3 X Cat + 1 X Dog + 1 X Peregrine Falcon

Number of workers: 14

Number of hours * workers / tube: 0.5 * 14 = 7

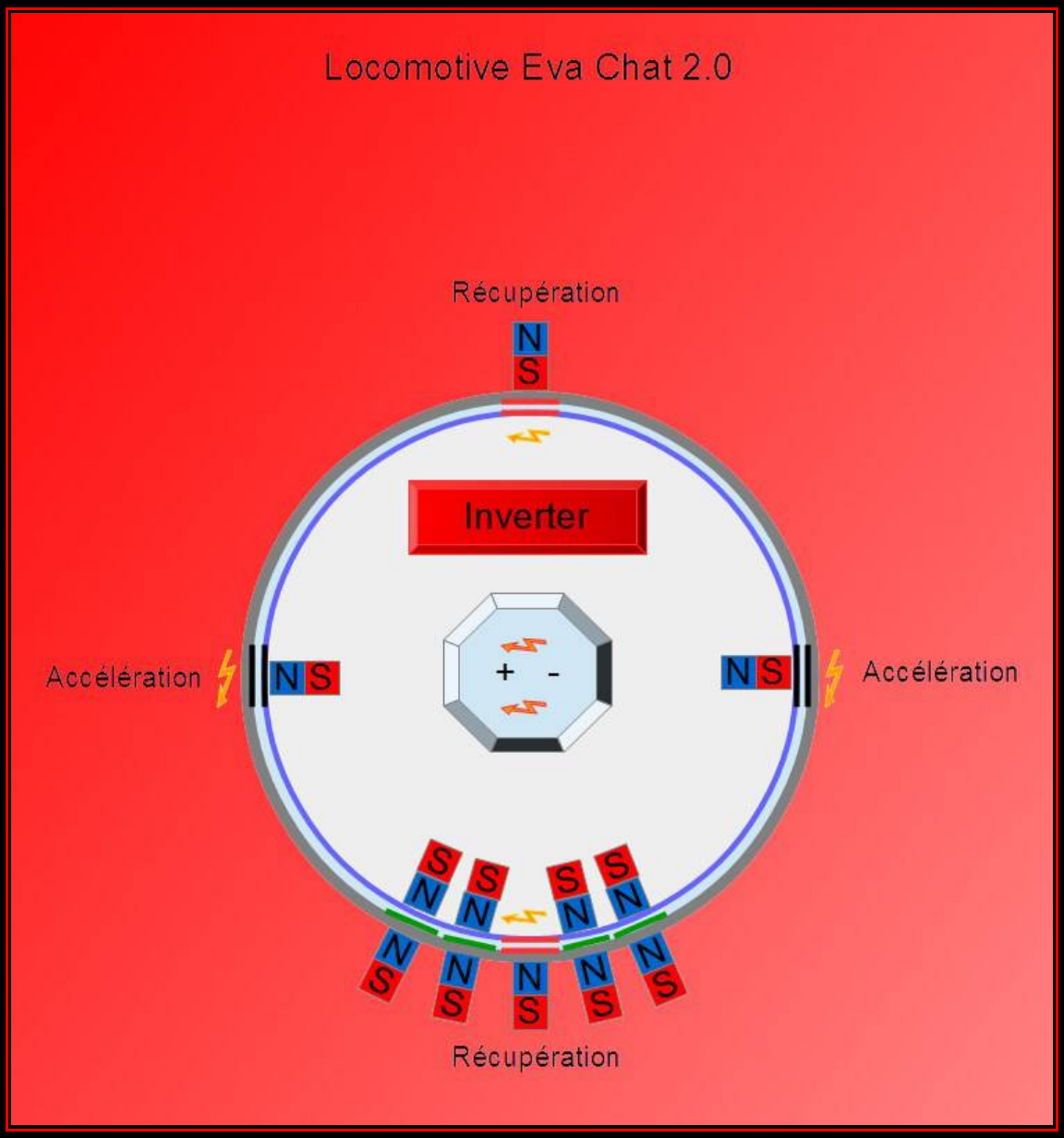
Total workforce: 4500 km * 66 * 7 = 2 million hours * workers
Temporal limitation: 180 days
Construction points: 50 knots
Number of workers required: 50 knots * 14 workers * 2 figures = 1400 assemblers

Building a 69kv high-voltage line costs $ 285,000 / miles ==> $ 178,000 / km. What should include cleaning and planting posts, at least :)

One million USD per km, average per single pipe 1.25 for two...

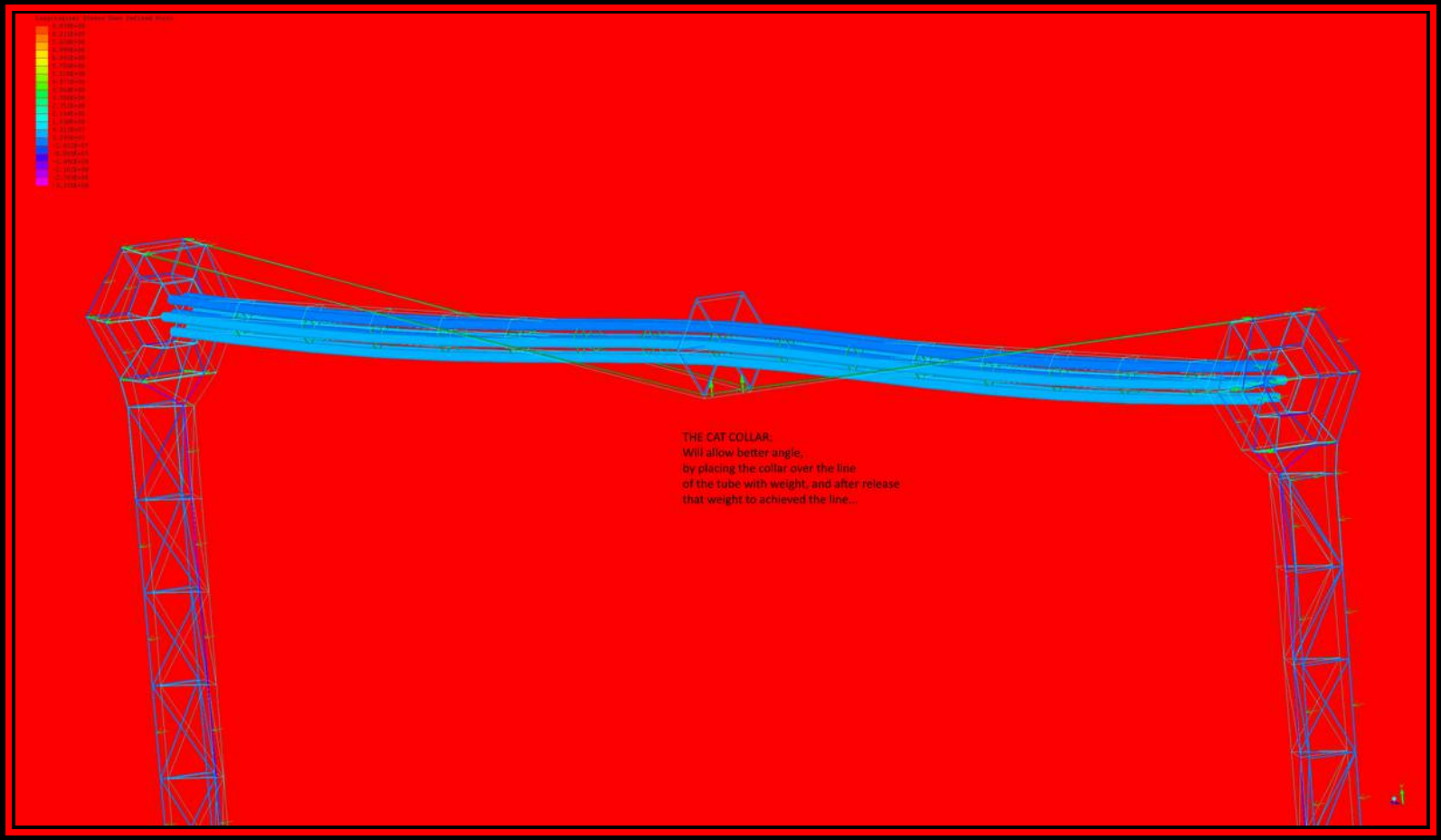
See more in the next edition ...

LOCOMOTIVE EVA CAT

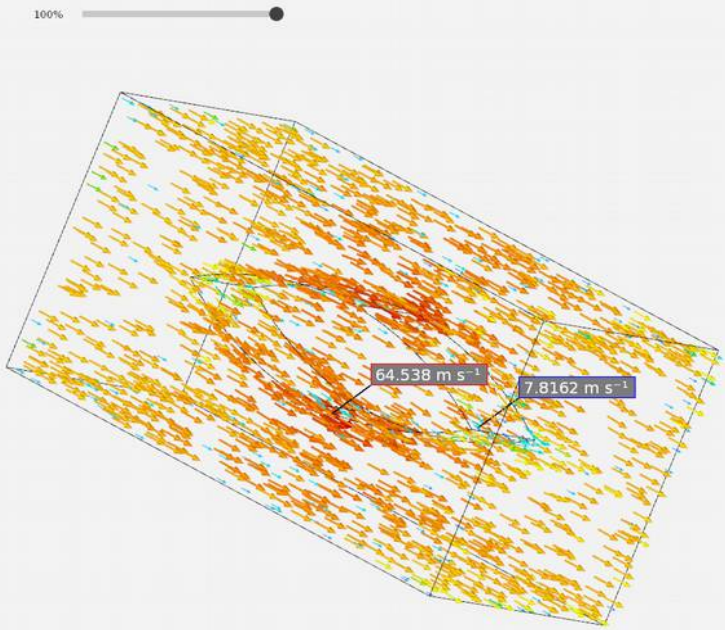


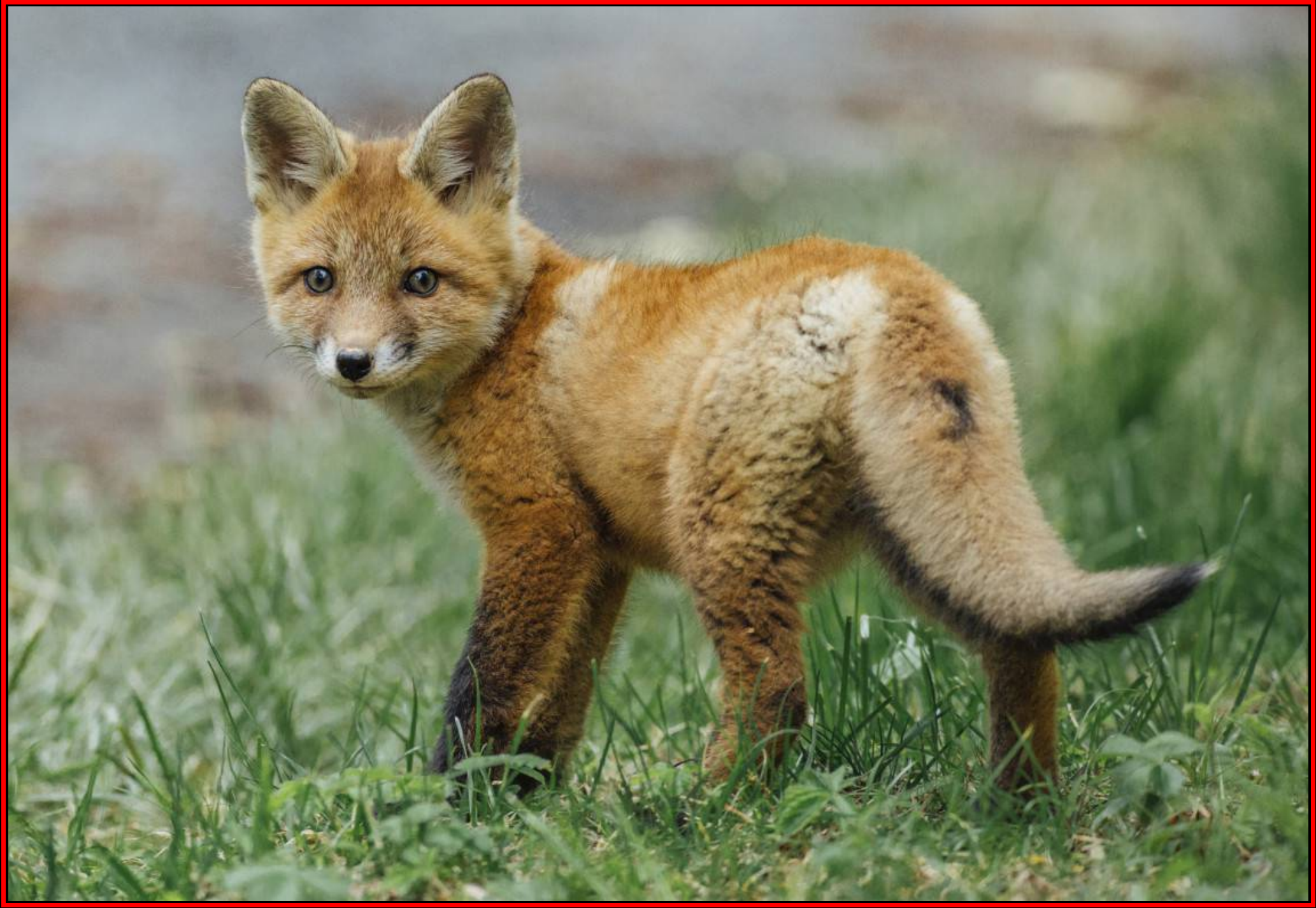
Despite the disturbing fact that I do not know any energy recovery system that is in place today (some University projects have), whatever some theoretical concept has, this design incorporates one. It may be enough to place the rotor side of the linear motor inside the capsule and extract kinetic energy in this way. This concept is valid only if the speed of the capsule is decreased enough to cause a deceleration of the order of 0.5g. For now, the recovery system will have a theoretical return of 67%, which would be very good. This system will be implemented only when exceeding the speed limit of 150-200 m / s because it requires more energy than currently used in magnetic levitation trains. The current system is similar to this one except that the stator is located between two rotors. However, if it can be shown that the system I propose does not consume more than the old one, it will not be necessary to coexist them. See EVA WHALE section for more...

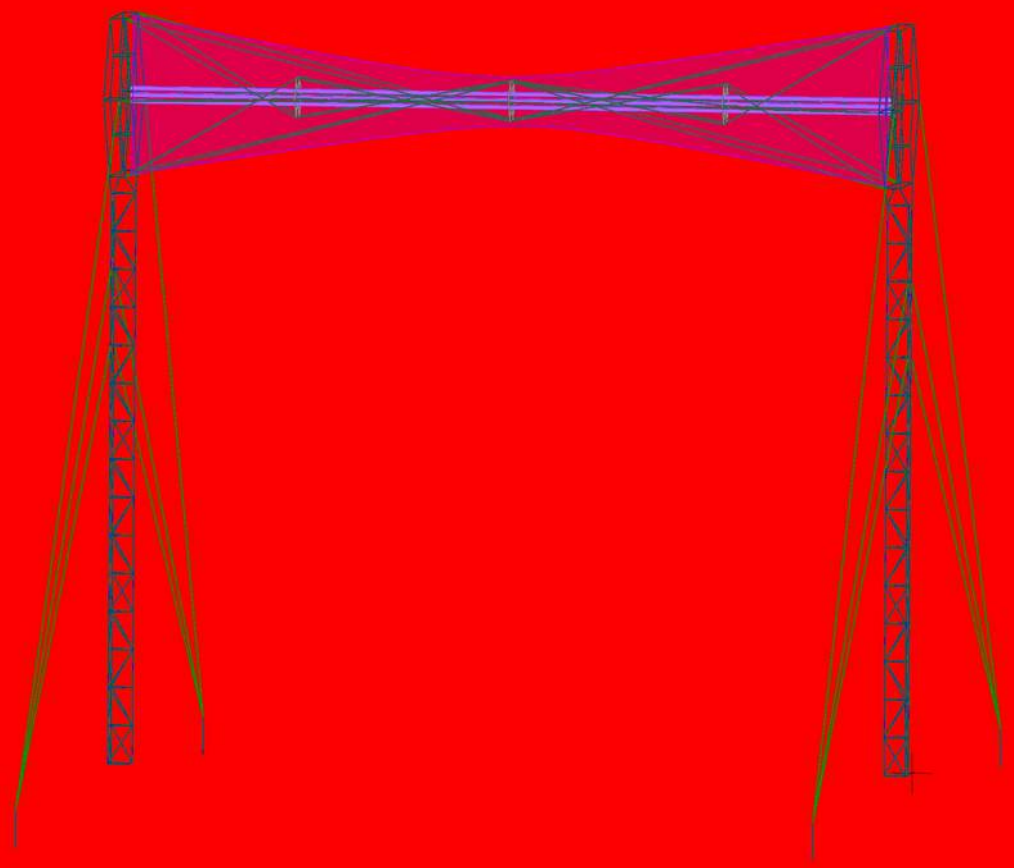
THE TOWERS


THE CAT COLLAR:
Will allow better angle,
by placing the collar over the line
of the tube with weight, and after release
that weight to achieved the line...

320 N/m²
50 m/s


100%
ANSYS
2019 R2
ACADEMIC
Velocity
64.538 m s⁻¹
7.8162 m s⁻¹
[m s⁻¹]
m

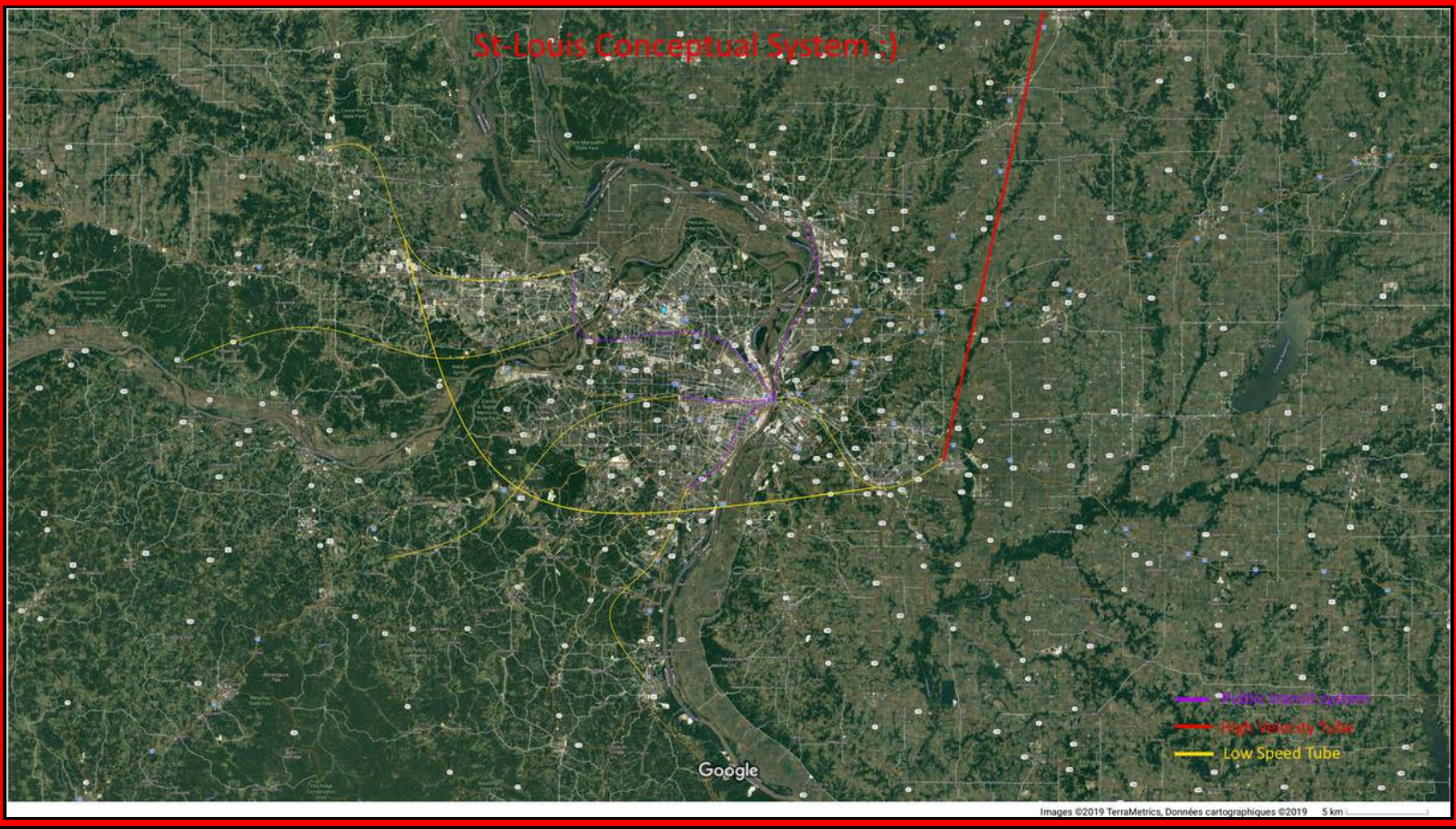




	volume	density	cost per kg	cost
DEER tube rectifier cables	0,0178	950	50	845,50 $
One Tower Super EVA KITTEN	1,456	7800	2	22 713,60 $
Shelve SUPER DUPER DUCK				15 000,00 $
Moose Steel Cables EA PRINCESS	2,723	7800	2	42 478,80 $
Tube shell RABBIT	2,42	7800	1	18 876,00 $
Man*Hours				25 000,00 $
Magnets CATS				10 000,00 $
Total				134 913,90 $
Grand Total per km				539 655,60 $
Servitude 50 years				1 000 000,00 $

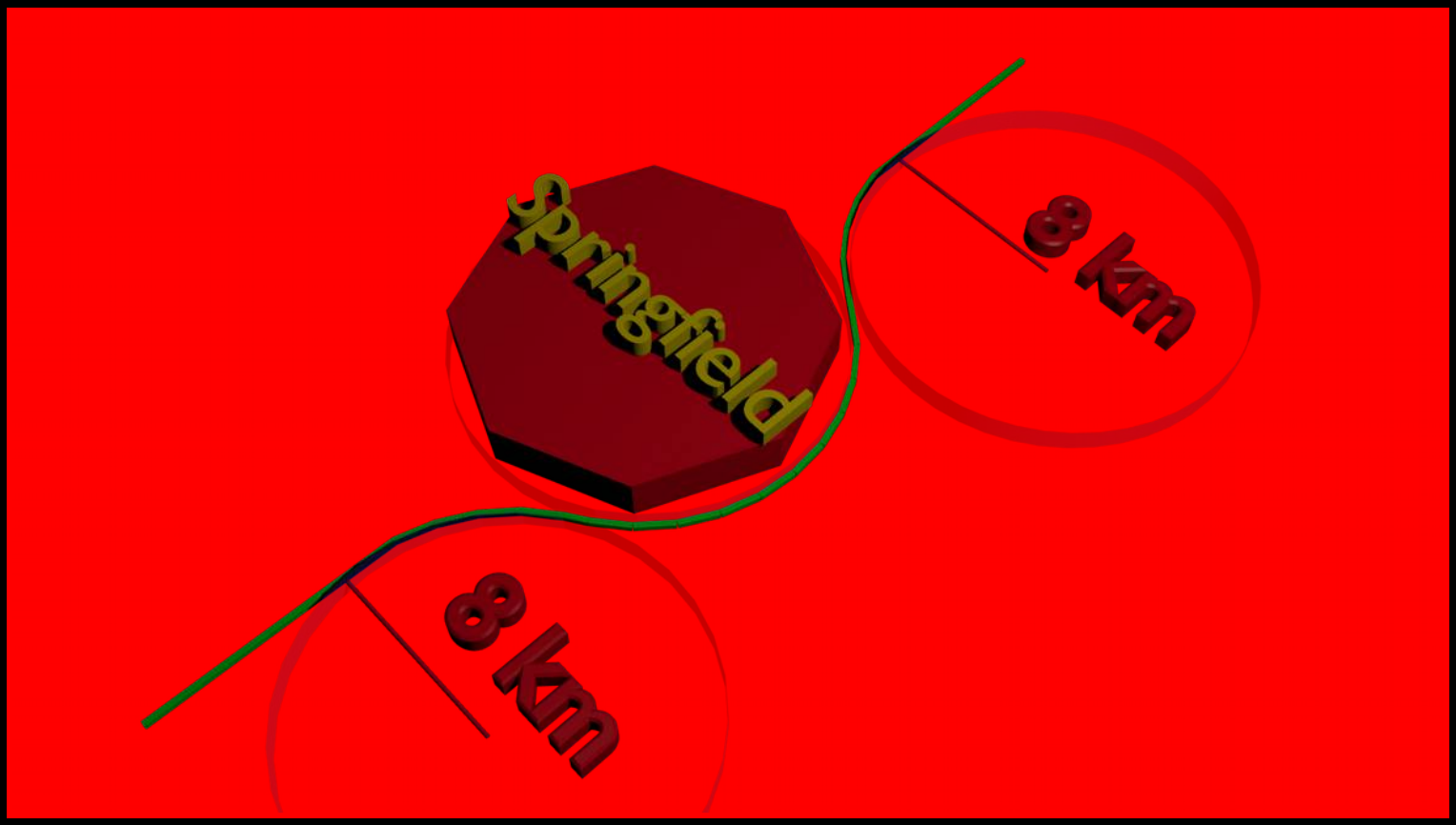
TYPICAL PROJECT : USA CAT

	New York-Newark, NY-NJ-CT-PA Combined Statistical Area	23 632 722
	Los Angeles-Long Beach, CA Combined Statistical Area	18 550 288
	Chicago-Naperville, IL-IN-WI Combined Statistical Area	9 928 312
	Washington-Baltimore-Arlington, DC-MD-VA-WV-PA Combined Statistical Area	9 546 579
	San Jose-San Francisco-Oakland, CA Combined Statistical Area	8 607 423
	Boston-Worcester-Providence, MA-RI-NH-CT Combined Statistical Area	8 099 575
	Dallas-Fort Worth, TX-OK Combined Statistical Area	7 352 613
	Philadelphia-Reading-Camden, PA-NJ-DE-MD Combined Statistical Area	7 164 790
	Miami-Fort Lauderdale-Port St. Lucie, FL Combined Statistical Area	6 723 472
	Houston-The Woodlands, TX Combined Statistical Area	6 686 318
	Atlanta--Athens-Clarke County--Sandy Springs, GA Combined Statistical Area	6 258 875
	Detroit-Warren-Ann Arbor, MI Combined Statistical Area	5 315 251
	Seattle-Tacoma, WA Combined Statistical Area	4 526 991
	Phoenix-Mesa-Scottsdale, AZ Metropolitan Statistical Area	4 489 109
	Minneapolis-St. Paul, MN-WI Combined Statistical Area	3 835 050
	Cleveland-Akron-Canton, OH Combined Statistical Area	3 497 851
	Denver-Aurora, CO Combined Statistical Area	3 345 261
	San Diego-Carlsbad, CA Metropolitan Statistical Area	3 263 431
	Portland-Vancouver-Salem, OR-WA Combined Statistical Area	3 160 488
	Orlando-Deltona-Daytona Beach, FL Combined Statistical Area	3 045 707
	Tampa-St. Petersburg-Clearwater, FL Metropolitan Statistical Area	2 915 582
	St. Louis-St. Charles-Farmington, MO-IL Combined Statistical Area	2 910 738
	Pittsburgh-New Castle-Weirton, PA-OH-WV Combined Statistical Area	2 653 781
	Charlotte-Concord, NC-SC Combined Statistical Area	2 537 990
	Sacramento-Roseville, CA Combined Statistical Area	2 513 103
	Salt Lake City-Provo-Orem, UT Combined Statistical Area	2 423 912
	Kansas City-Overland Park-Kansas City, MO-KS Combined Statistical Area	2 411 635
	Columbus-Marion-Zanesville, OH Combined Statistical Area	2 398 297
	Indianapolis-Carmel-Muncie, IN Combined Statistical Area	2 353 935
	San Antonio-New Braunfels, TX Metropolitan Statistical Area	2 328 652
	Las Vegas-Henderson, NV-AZ Combined Statistical Area	2 315 324
	Cincinnati-Wilmington-Maysville, OH-KY-IN Combined Statistical Area	2 208 450
	Raleigh-Durham-Chapel Hill, NC Combined Statistical Area	2 075 126
	Milwaukee-Racine-Waukesha, WI Combined Statistical Area	2 043 904
	Austin-Round Rock, TX Metropolitan Statistical Area	1 943 299
	Nashville-Davidson--Murfreesboro, TN Combined Statistical Area	1 912 819
	Virginia Beach-Norfolk, VA-NC Combined Statistical Area	1 819 427
	Greensboro--Winston-Salem--High Point, NC Combined Statistical Area	1 630 368
	Jacksonville-St. Marys-Palatka, FL-GA Combined Statistical Area	1 543 297
	Louisville/Jefferson County--Elizabethtown--Madison, KY-IN Combined Statistical Area	1 498 593
	Hartford-West Hartford, CT Combined Statistical Area	1 487 971
	New Orleans-Metairie-Hammond, LA-MS Combined Statistical Area	1 480 408
	Grand Rapids-Wyoming-Muskegon, MI Combined Statistical Area	1 421 374
	Greenville-Spartanburg-Anderson, SC Combined Statistical Area	1 409 582
	Oklahoma City-Shawnee, OK Combined Statistical Area	1 408 578
	Memphis-Forrest City, TN-MS-AR Combined Statistical Area	1 370 129
	Birmingham-Hoover-Talladega, AL Combined Statistical Area	1 317 269
	Richmond, VA Metropolitan Statistical Area	1 260 029
	Harrisburg-York-Lebanon, PA Combined Statistical Area	1 239 677
	Buffalo-Cheektowaga, NY Combined Statistical Area	1 214 960
		205 078 315


St-Louis Conceptual System :)
Public transit system
High Velocity Tube
Low Speed Tube
Google
Images ©2019 TerraMetrics, Données cartographiques ©2019 5 km

If the total length of the pipe is actually 18,300 miles, and it can be divided into 75 segments, and each segment is used at a height of 5,000,000 passengers per year, or a train of 10 passengers per minute , the usage revenue could be calculated as follows: (number of passengers clearly underestimated)

St. Louis to Chicago: (Flat terrain and pipe: 20 X 90 ° over 281 miles including 3 limiting to 100%)



This trajectory counts for two 90 ° non-limiting at 400 m / s

A train of 10 passengers = 2750 kg * 22.2 m / s^2 * 2816 m / (3600 s * 1000) = 47.75 kw * h
At 80% efficiency and 67% return ==> 20kw * h by 90 ° ==> 400kw * h for speed = mach-1
At $ 0.10 / kw * h ==> $ 3.60 / person in electricity, a journey of 22 minutes
At mach-3 ==> 421 kw * h * 20 X 90 ° ==> 8,422 kw * h for 11 minutes ==> 84.22 $ / passenger
At 100 m / s (300 km / h, 190 mph) ==> 0.76 $ / passenger for 1 hour 15 minutes

5,000,000 * $ 2 / person = $ 10,000,000 / year ==> 40 years * $ 10,000,000 / year = $ 400,000,000
$ 400,000,000 / 281 miles = $ 1,425,000 / mile or about 3X too much ...

400 kw * h * 5,000,000 * 75 = 17 Mw or 0.004% of so-called electrical production
At $ 6 / w, this would give $ 102 million to be multiplied by 4 ==> 408 million USD of solar panels

It would take $ 33 fuel to make the same trip by car, and 4 hours 8 min.
So, with only $ 2.92 / person per section, it would be possible to generate:

$ 14,640,000 / year * 75 segments = $ 1,098,000,000 / year

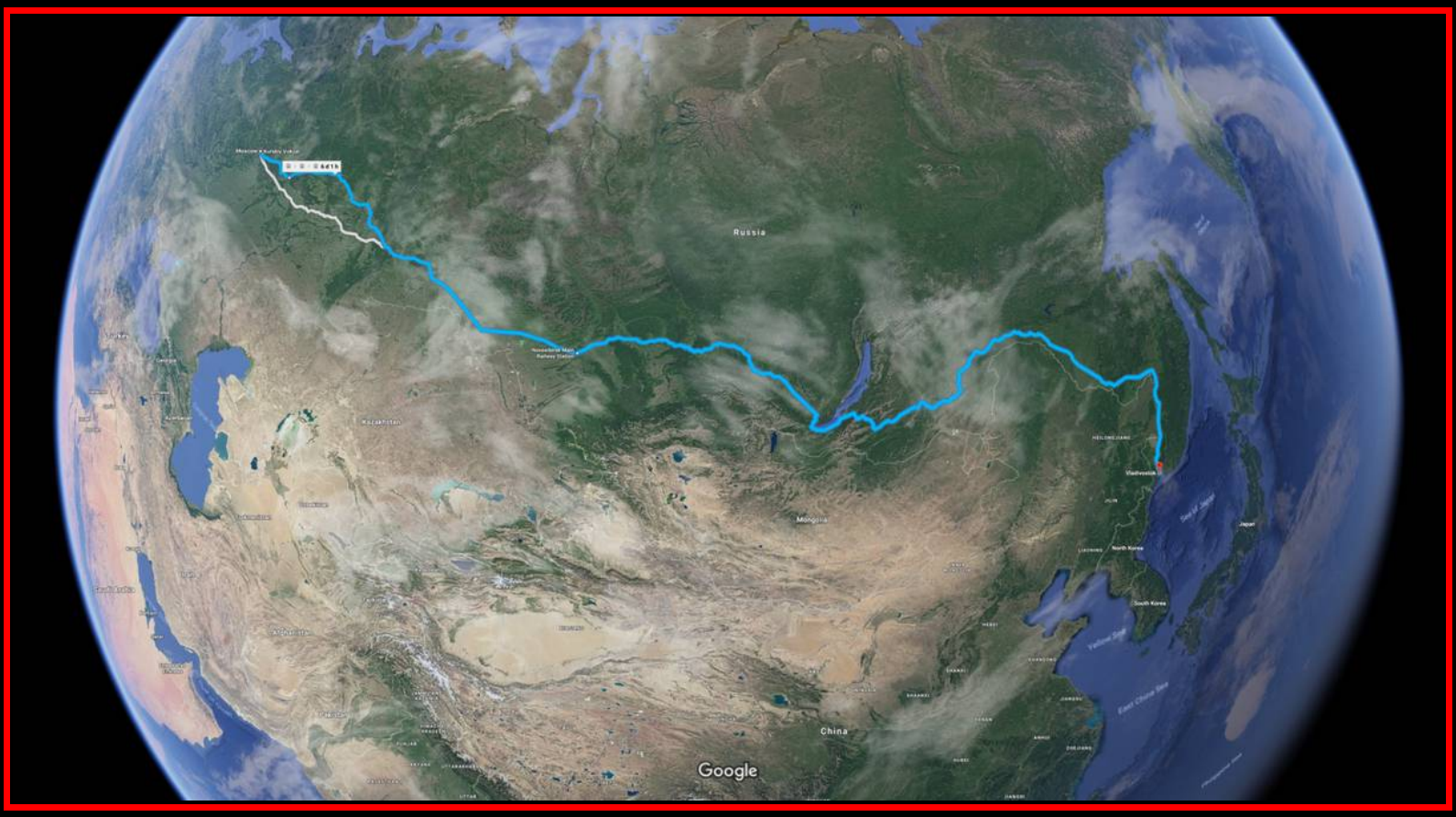
Cost of the current rough estimation of the USA project: 22 billion USD

- 32.947 billion dollars with interest over 30 years
- 32.947 / 30 = 1.098 billion USD, so project paid over 30 years

In conclusion, for a complete mapping of the USA:

- Two East-West lines, Two North-South lines, three North-South inter-lines: 18,300 km
- 25-35 billion US dollars (rough estimate minimalist)
- Time required (construction only): as little as 12 to 16 months
- Plans and specifications: As much as possible, from 1 to 10 years
- Cost per trip 4500 km = less than $ 50
- Annihilation of civil aviation to predict
- Increase of neodymium prices to predict
- Political acceptance to be confirmed
- Populist project, therefore supports the people to provide
- Very ugly project from a landscape point of view: is not buried like a pipeline
- Very environmentally friendly project -15% on current total CO2 emissions

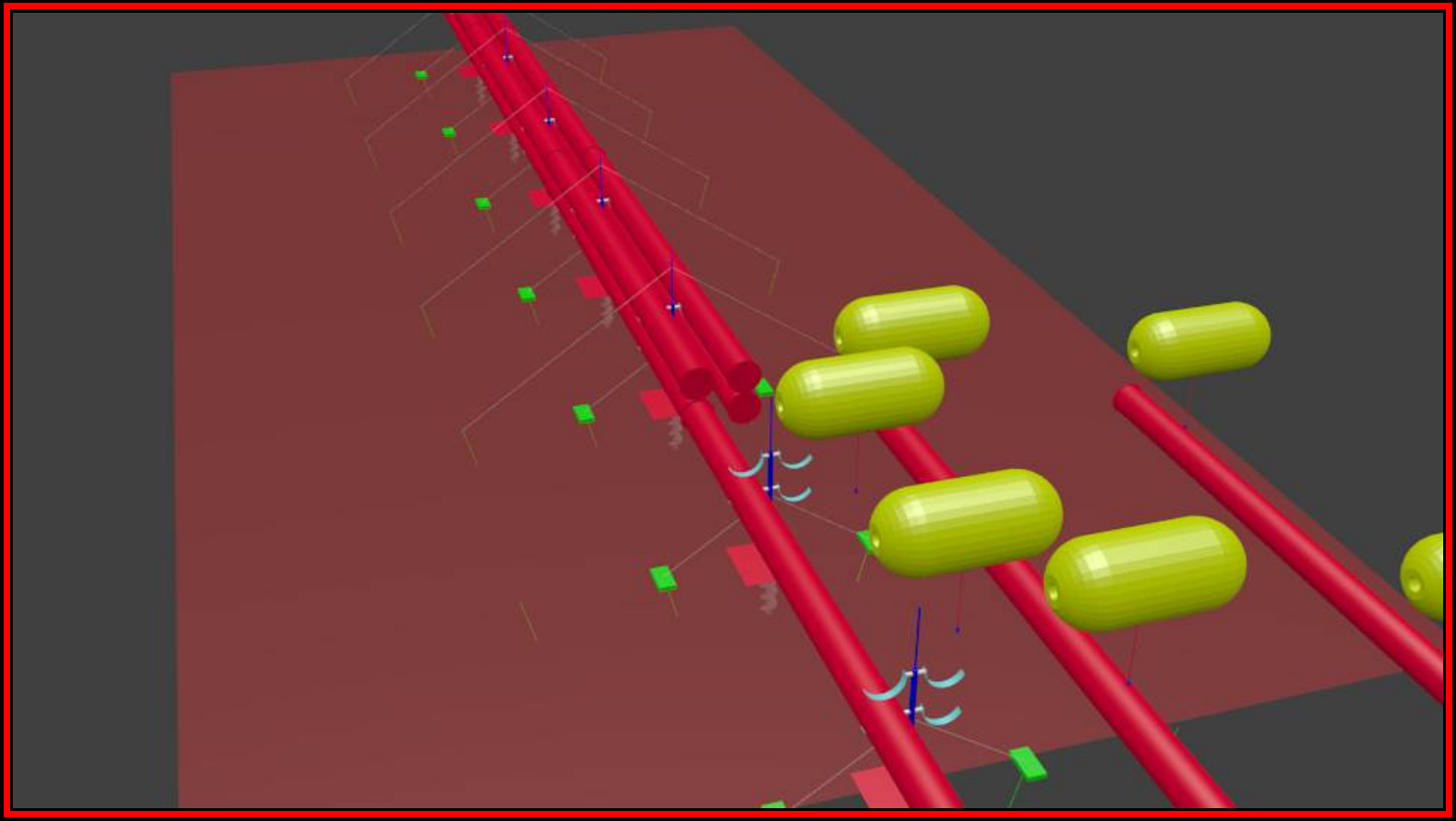
THE MOSCOW-VLADIVOSTOK LINE



Here you could see the huge distance that need to be covered, 9 134 km

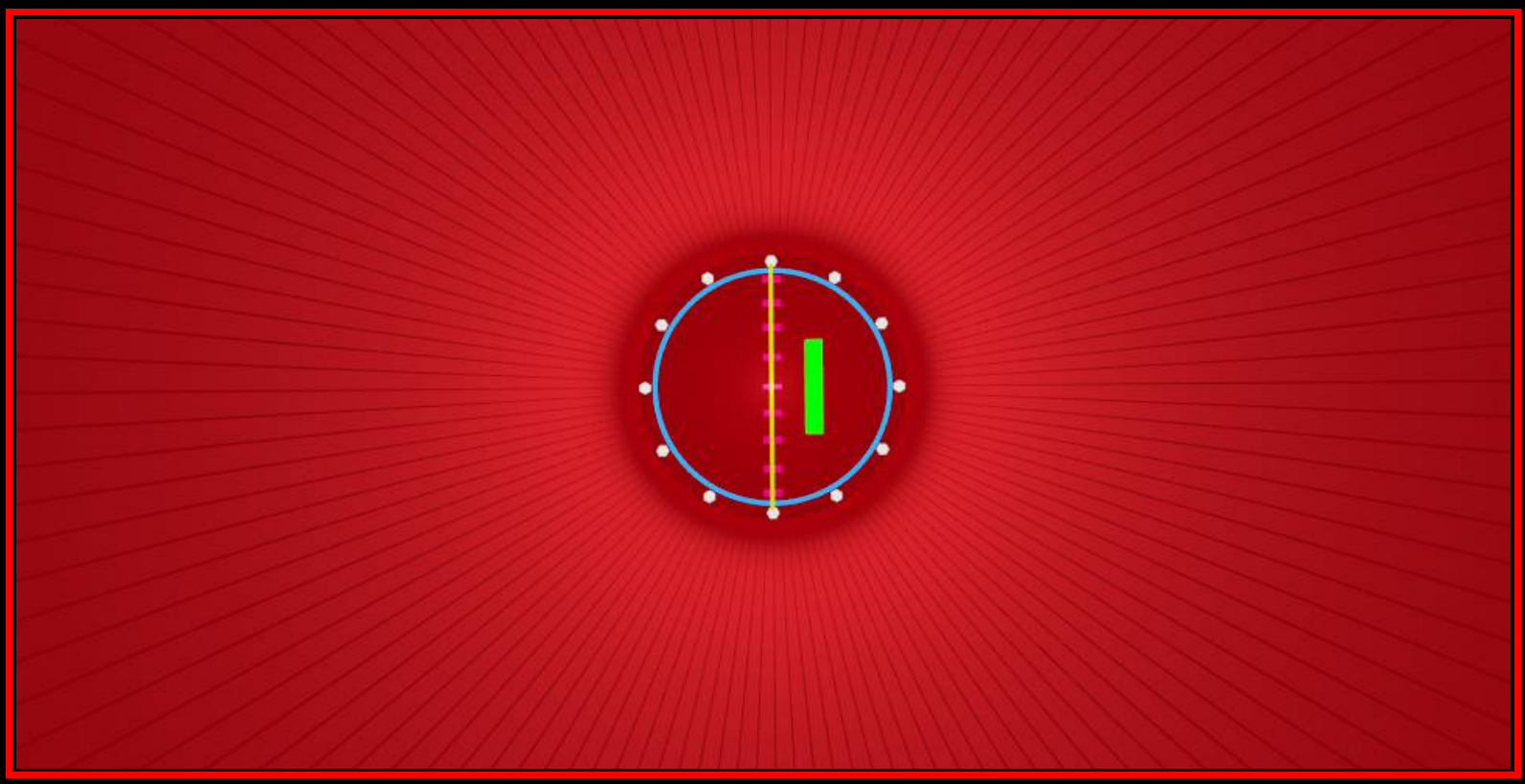
EVA WHALE

The submarine part of the Eva Cat, named Eva Whale, a titanic project that bears good name. At first glance, it will not be possible to build at less than 25 million USD per kilometer. However, it is possible that some tricks are found by the beginning of the construction :)

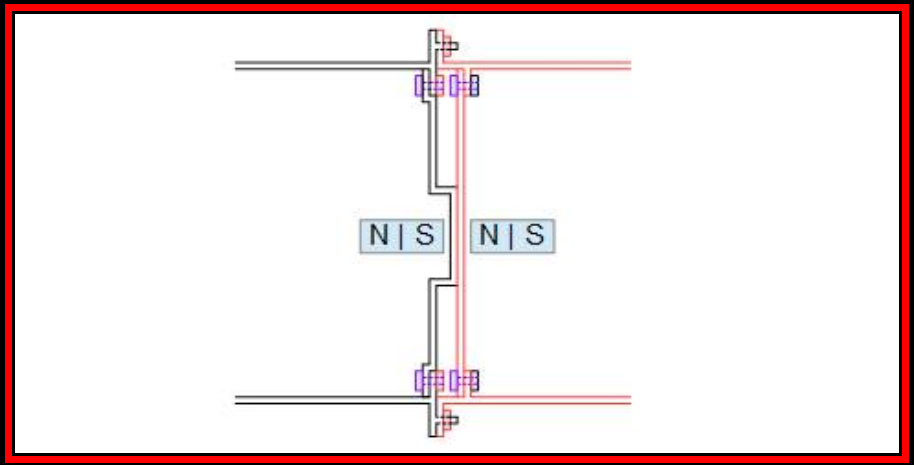


For example, if the tube assembly process takes one hour for four 20-meter tubes, the 8900 km of the 6-node network will take a total of four years.

CONSTRUCTION

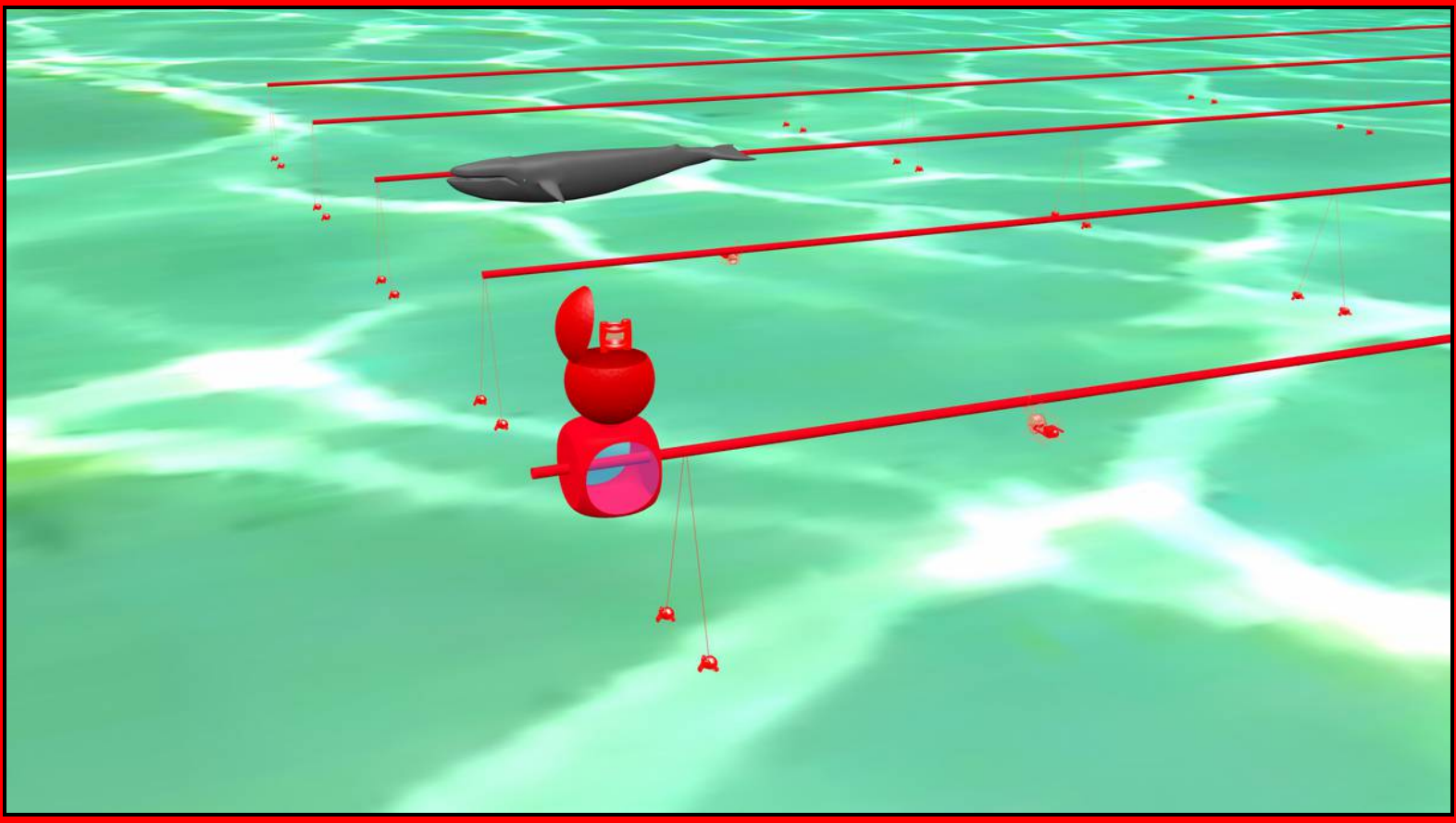


This extraordinary image may seem to carry no information, but it is the very foundation of the construction principle of Eva Whale. That is to say the installation of each pipe that put end to end, will form the highway of the future. We can see, in the drawing, a view of the inside of a pipe, in green a very powerful magnet that will be used to place and hold the two pipes to connect. Once the outer fasteners are tight, we can unscrew the two contact surfaces to release the anti-pressure reinforcement thickness. To be able to extract the reinforcement from the network, we will divide it in two by the pink screws. Thus, the water will never penetrate, in theory, in the circuit :() It will be possible to send robots to perform this task, because even a small human would have a lot of difficulties to achieve it.



It should be noted that the scale is not respected in this drawing, and that the diameter of the removable wall is smaller than that of the tube. Also, do not forget that the reinforcement splits in two.

THE EVA SHELTER OF CATS SUPREME GALACTIC



We must think

THE INCREDIBLE BELUGA ANTI-WHALE GIRDLE

THE BLUE WHALE

The origin of this name is the gigantic tube of the version of the EVA WHALE, but I don't know yet witch version will be more profitable, most probably it will be the BELUGA WHALE, but let's compute some data about both :)

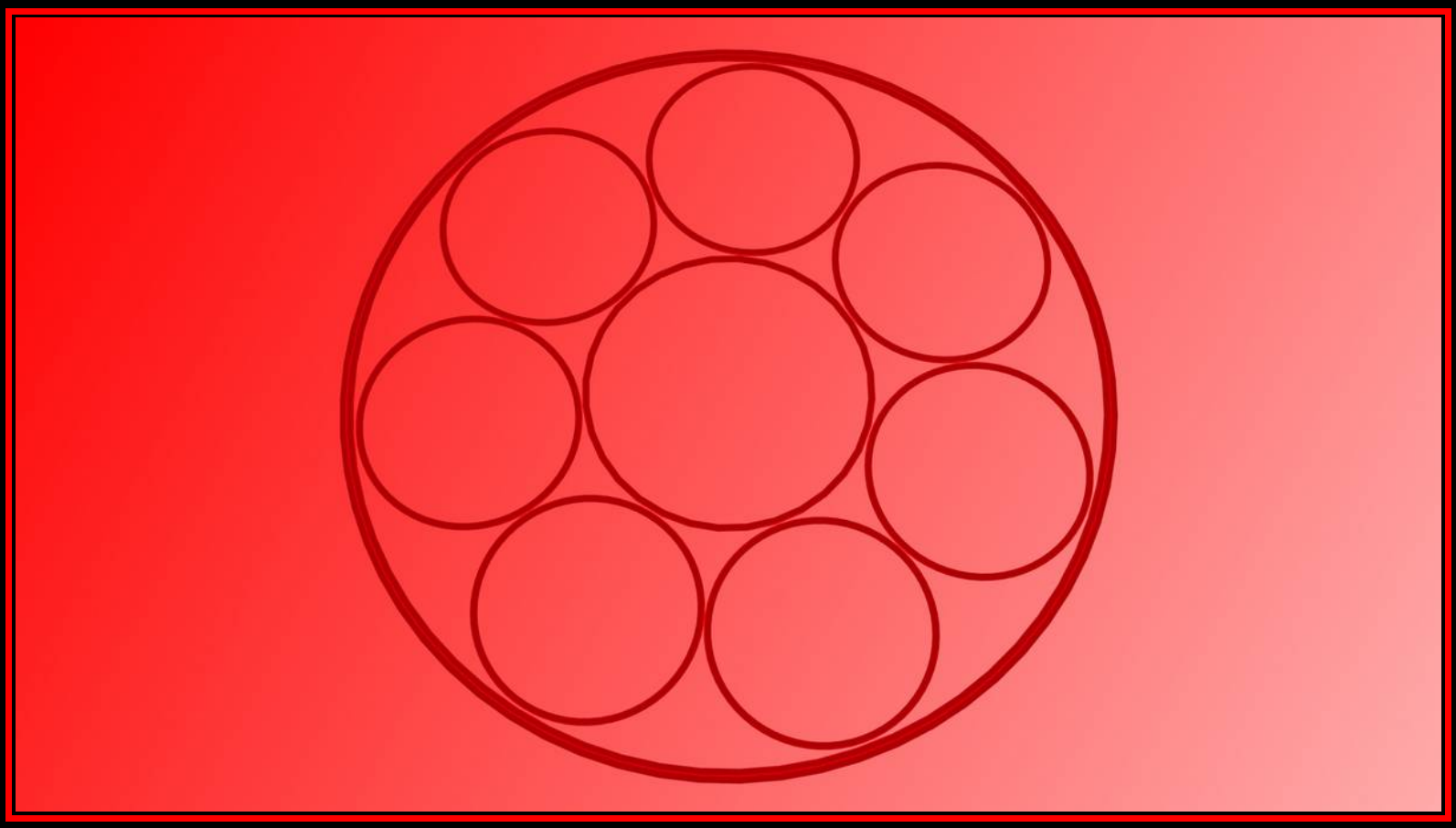
MAIN TUBE DATA

	Pressure (100 m)	PVC (175 m)	Steel (175 m)	Pressure (900 m)	
pression	1,00E+006	2,50E+004	1,75E+006	9,00E+006	pa
diameter	3,7	3,7	3,7	3,7	m
tensile strenght	4,00E+008	5,00E+007	4,00E+008	4,00E+008	pa
safety factor	1,5	1,5	1,5	1,5	
corrosion	0,001	0,001	0,0005	0,001	m
wall thickness	0,00791	0,00239	0,01256	0,06137	m
outside area	10,75209	10,75209	10,75209	10,75209	m
inside area	10,66037	10,72438	10,60661	10,05061	m
volume per meter	0,09172	0,02771	0,14548	0,70148	m³/m
weight per meter	697,1	24,9	1105,6	5331,3	kg/m
length of pipe	7200	7200	7200	7200	km
# of pipes	3	3	3	3	
total pipe weight	15 057 316	538 747	23 881 952	115 155 773	tonnes
cost of material	0,6	1	0,6	0,6	$/kg
casting cost	0,005	0,005	0,005	0,005	$/kg
total pipe cost	9 109 676 116	541 441 096	14 448 581 038	69 669 242 474	$
total world production	1 800 000 000	53 810 000	1 800 000 000	1 800 000 000	tonnes/year
total pipe %	0,84%	1,00%	1,33%	6,40%	world production
Archimède force	10660		10607	10051	kg/m
masse force	697		1106	5331	kg/m
Masse réel 1 tubes	-9963,3		-9501,0	-4719,3	kg/m
Sur 15 mètres	-149449		-142514	-70790	kg

Base on old configuration, about the ocean floor:

- Up to 200 meters: 4,900 kilometers
- up to 600 meters: 3,800 km
- up to 900 meters: 300 km

Now we are able to build at the same depth, 175-225 meters under the sea level...



SUB TUBES	
Number of Lines	3
Number of small tubes	7
Length of journey	7200000
Diameter	1,05
Thickness (+reinforcement)	0,002
Diameter large tube	1,34
Volume per meter	0,02728
Length of tube	15
One tube mass (kg)	1104,649
Total mass	530 231 528
% world production	2,71%
Total Aluminum cost	1 060 463 057 $

A rough estimate, based solely on pipe costs, gives us $ 16.6 billion. However, the material used is steel at 0,6 $ per kg, there is also an envelop of PVC for corrosion (1$/kg), and sub tubes in Aluminum at 2$ per kg.

ELECTRICAL

~~Facing numerous difficulties, I achieved a strategy to get the most valuable system. We will need to compare the increase in High voltage, to the benefit of increasing the diameter of the wire. Without calculation we could expect a value of about 1000-2000 mm^2 of cable, and a Voltage of 11-18 kV. All this to be able to supply the theoretical 25 millions capsules per tubes, so 1.5 GW of continuous power to be delivered to the system for a speed close to 900-1000 m/s, on a distance of 40 km at 1-2 G. This incredible fact, is the result of the cost over time of electricity that will match the construction cost in some days with smaller diameter.~~

THE BELUGA WHALE

With single tubes, we could save money on the material and certainly the man labor, because of the complexity of the BLUE WHALE, but the electrical system is now a big problem...

MAIN TUBE DATA

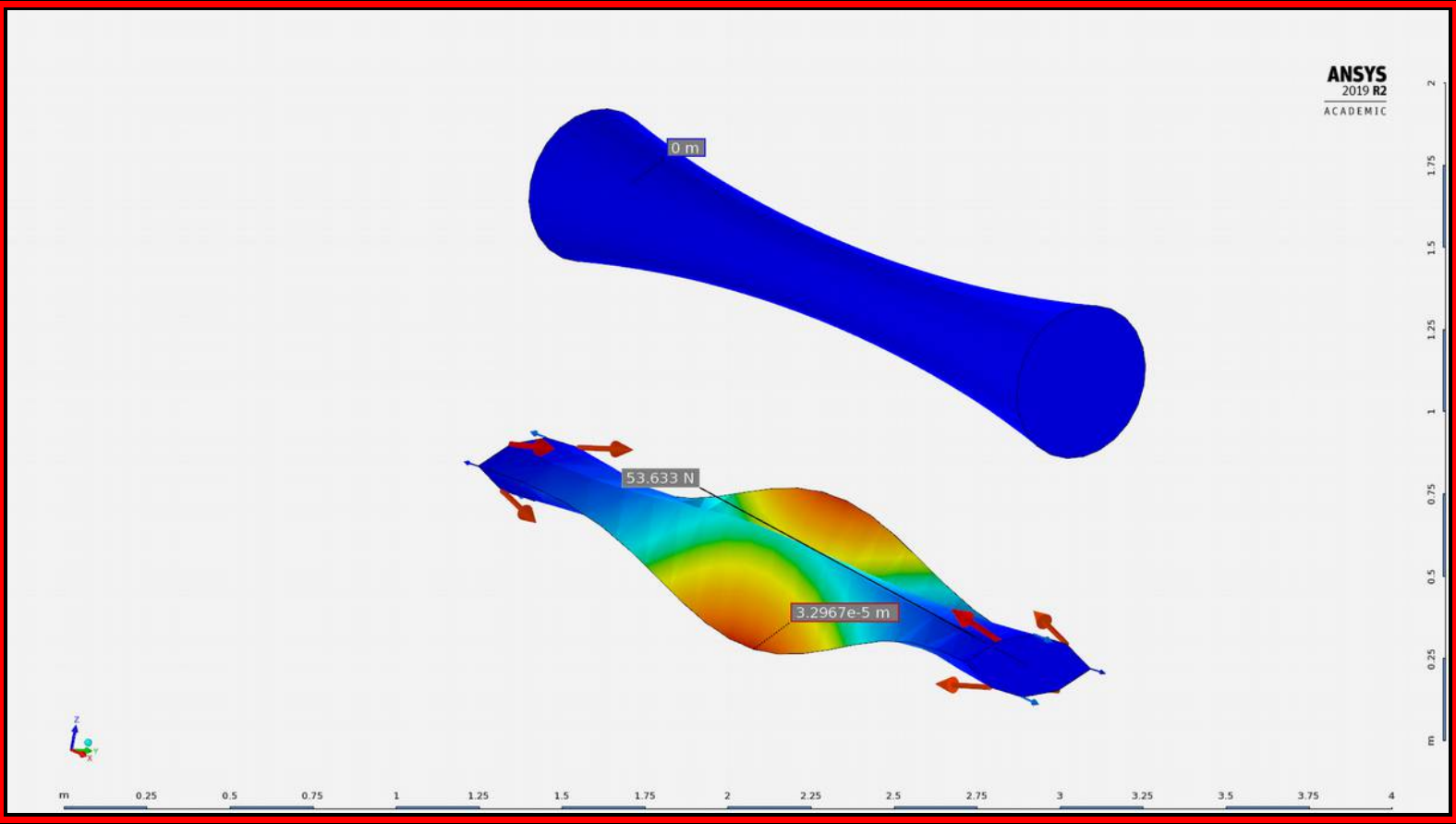
	Pressure (100 m)	PVC (175 m)	Steel (275 m)	Pressure (900 m)	
pression	1,00E+006	1,00E+000	2,00E+006	9,00E+006	pa
diameter	1,1	1,1	1,1	1,1	m
tensile strenght	4,00E+008	5,00E+007	4,00E+008	4,00E+008	pa
safety factor	1,5	1,5	2,5	1,5	
corrosion	0,001	0,002	0,002	0,001	m
wall thickness	0,00305	0,00200	0,00877	0,01892	m
outside area	0,95033	0,95033	0,95033	0,95033	m
inside area	0,93982	0,94343	0,92028	0,88606	m
volume per meter	0,01051	0,00690	0,03005	0,06427	m³/m
weight per meter	79,9	6,2	234,4	488,5	kg/m
length of pipe	7200	7200	20000	7200	km
# of pipes	3	24	4	3	
total pipe weight	1 726 052	1 072 931	18 751 048	10 550 717	tonnes
cost of material	0,6	1	4	0,6	$/kg
casting cost	0,005	0,005	0,5	0,005	$/kg
total pipe cost	1 044 261 283	1 078 295 305	84 379 715 000	6 383 183 864	$
total world production	1 800 000 000	53 810 000	1 800 000 000	1 800 000 000	tonnes/year
total pipe %	0,10%	1,99%	1,04%	0,59%	world production
Archimède force	940		920	886	kg/m
masse force	80		234	488	kg/m
Masse réel tubes	-859,9		-685,9	-397,6	kg/m
Sur 15 mètres	-12899		-10288	-5964	kg

With a cost of 12,25 Billions USD for the tubes materials only, it is cheaper by 4,35 Billions USD for the entire path of 7,200 km, from Portland to England. And it's close to 5X lighter.

PONT DES CHATS GRIS

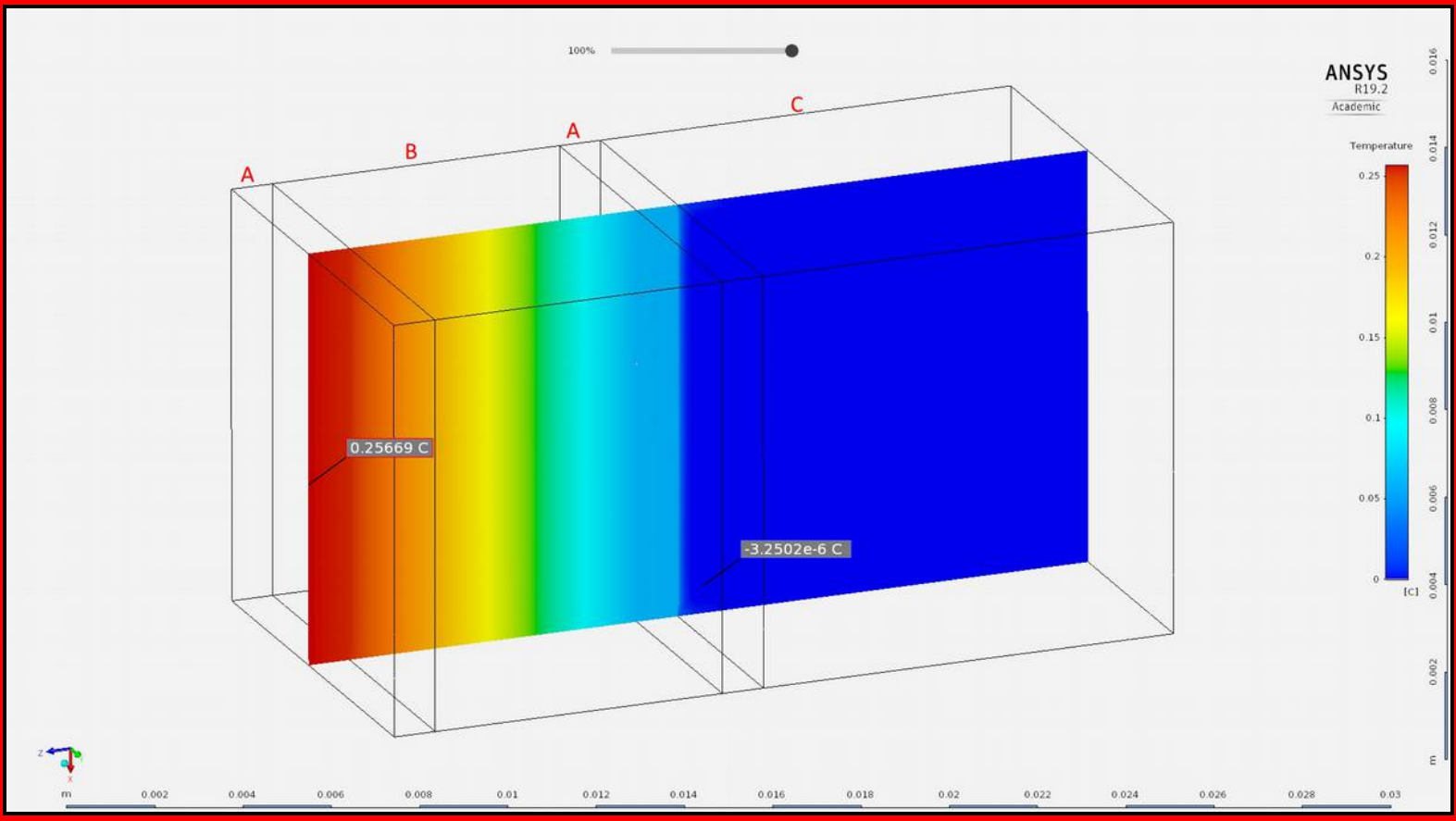
Eda Budget First Trial: (500 m span)				
Items (X1 Line)	Cost/m (USD)	Distance(m)	Total	notes
Steel PVC pipe main	$71,00	7 200 000	$511 200 000	
Aluminum sub tubes	$0,00	7 200 000	$0	
Titanium screw	$5,00	7 200 000	$36 000 000	
Dyneema (Bridge)	$0,37	7 200 000	$2 664 000	
Nylon (Holder)	$0,25	7 200 000	$1 800 000	
Anchor	$0,80	7 200 000	$5 760 000	Scrap cars cube + pikes
The gas	$12,50	7 200 000	$90 000 000	
The Cats Shelters	$30,00	7 200 000	$216 000 000	
Total:	$119,92		$863 424 000	

This very preliminary data set gives for the 24 Tubes: 20.7 Billions USD



On this image, we could see a Water flow of 1 m/s that gives 27 N/m of tube resistance to the flow.

HEAT TRANSFER



A: Silicon

B: Steel

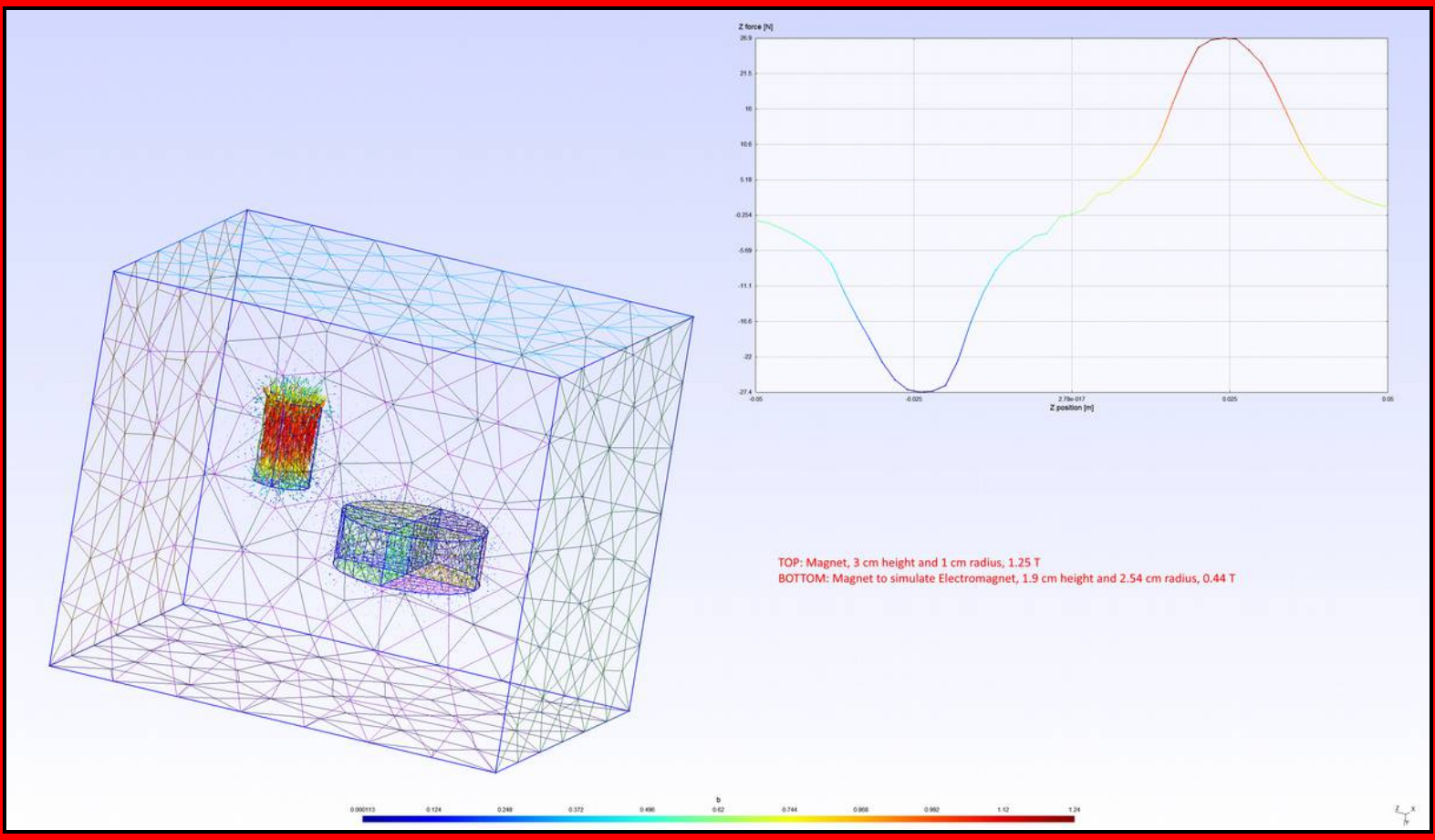
C: 0,6 m/s flow of water

The power is 450 W/m², I expect, with an insulation of the rectifier in silicon, some need for insulation to increase temperature in the shelter. This shelter has 600 m², and the power come from: 20% of the 125 MW of one tube, divide by 100 shelters on the acceleration line. The maximum achievable efficiency for a rectifier bridge is 81.2%, and the power ratio of the electromagnets should be close to 50%, the theoretical energy calculated by kinetic energy law, will be around 50 MW per tube. So, for the maximum thinkable speed of 1000 m/s:

0,5 * 225 kg * 1000² = 112 MJ, that gives us the possibility to send 2,24 capsules per second, that mean for a train of 5 capsules, 0.448 train per second, over a year gives us: 70 Millions passengers per year per tube. But all this is flexible, we could say a lot about those calculation.

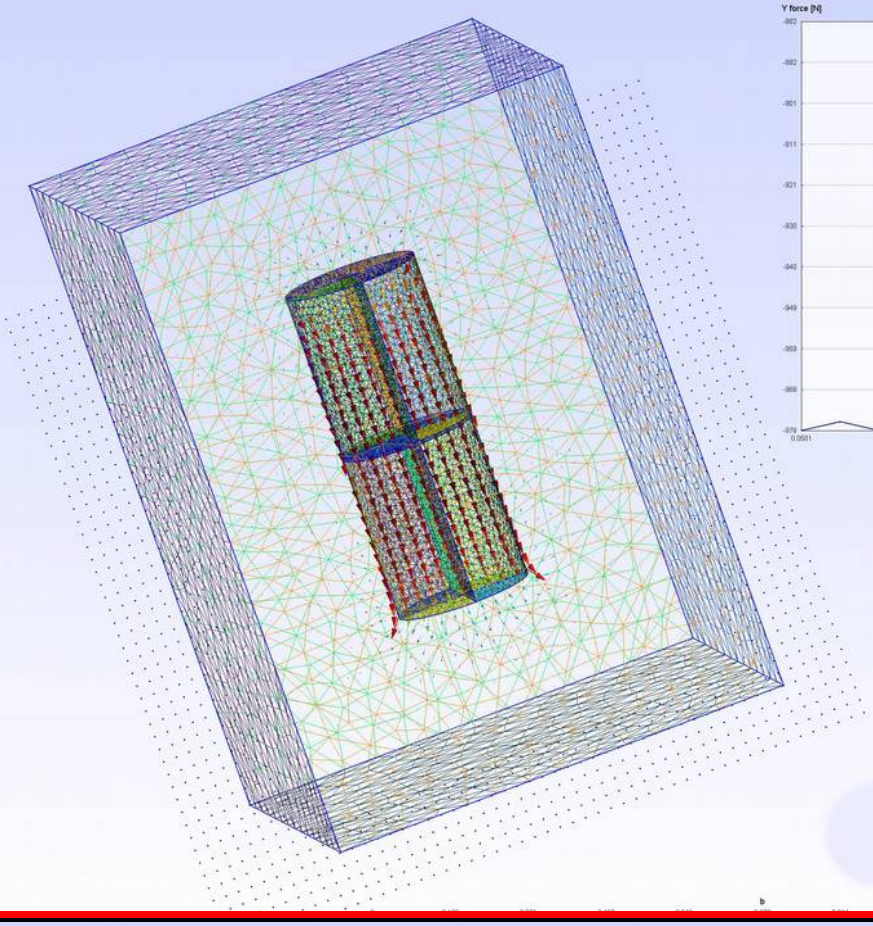
First, you must not forget that this line won't be straight, and our capacity to recover that energy is unknown to me, for now :)

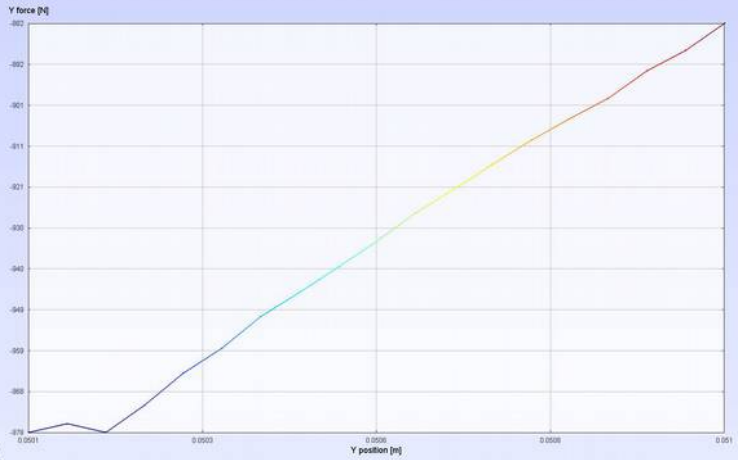
FORCE FIELDS ACCELARATED CAPSULE OF TYPE "ESCARGOT"



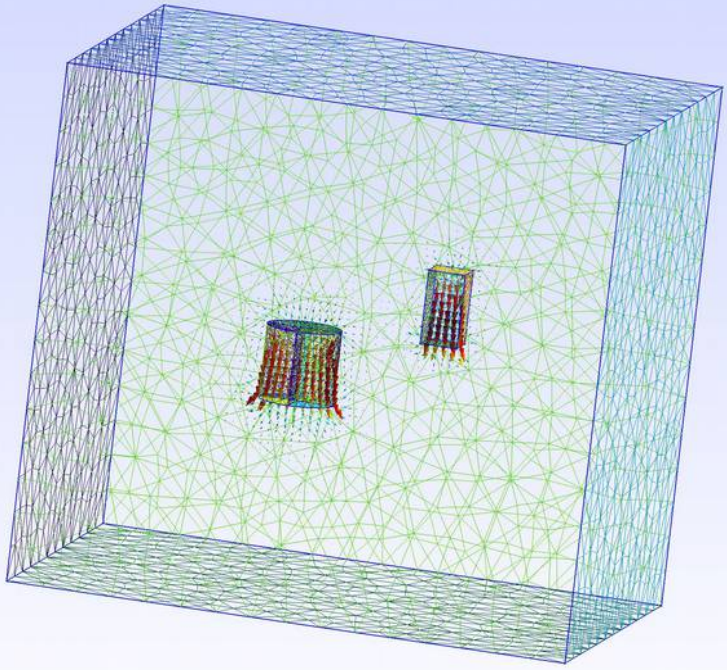
Onelab simulation using GMESH and getDP. This is the fundamentals of the propulsion system to be put in place. By cutting the currant to the electromagnets, at the right time, we will create a push and pull response on the capsule, that will created a propulsive force forward. For the breaking, it is going to be complex, but I hope to create a counter force by allowing electromagnets to create currant, and with a rectifier, storing that power into capacitors, that will discharge them self into a bigger storage system, for further use.

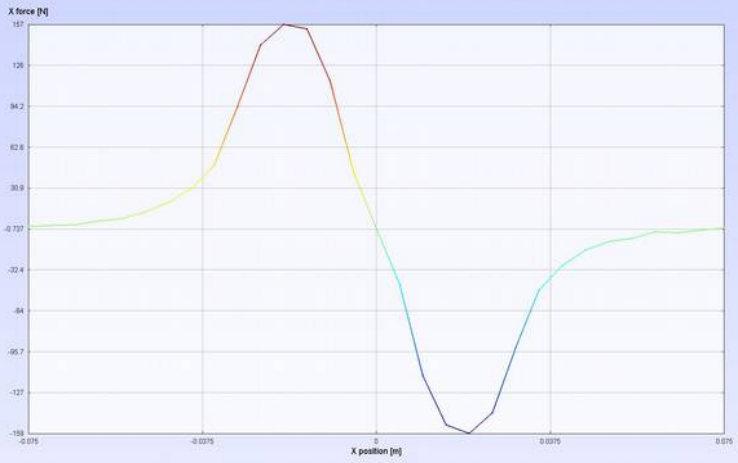
One of the problematic of the recuperation system, is the continuous currant that will be produced, will need to be modulated to be use with fresh energy, on the other side. There are few options, we could certainly use only DC for the fresh and reuse the recuperated energy, using the same system.



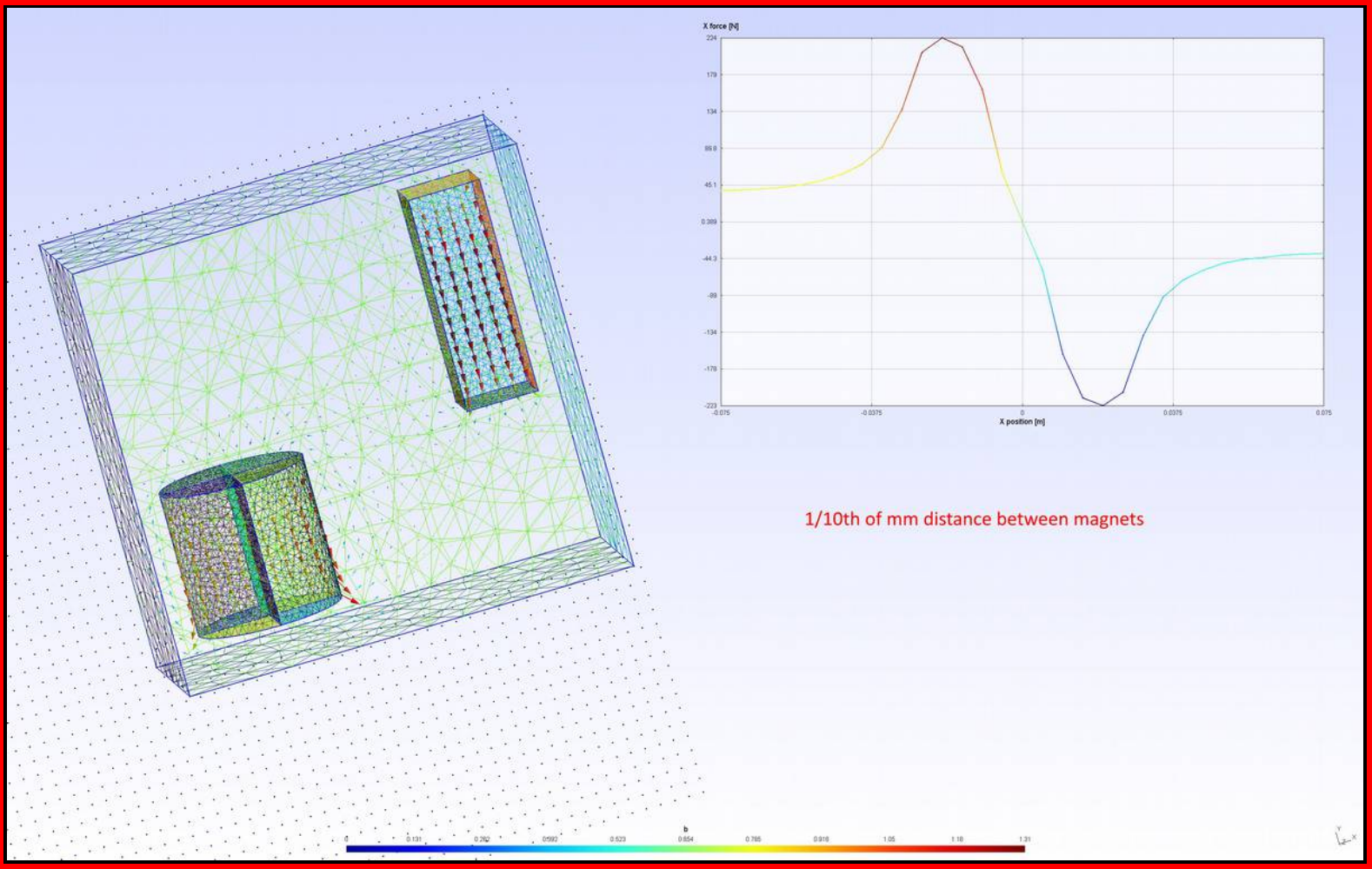


F = k*x(t), and F = m * 9.8
V = a * t => V = t * (m*9.8 - k*x(t))/m
x when V = 0 => t * (m*9.8 - k*0.5*9.8*t²)/m
0 = (m*9.8 - k*0.5*9.8*t²) => with k = 100/0.001 = 100,000
m = 100,000*0.5*t² => t = Sqrt(m/(50,000))
x = 1/2 * 9.8 * t² => 4.9 * m / 50,000, with 0.5 kg per magnet
0.05 mm, so with some terrorist, it could be twice the weight,
with linearity of the fonction: 1/10 th of a mm.





2 mm Gap



1.5 Tesla on each magnet, clearly not the reality of electromagnets, but it will do anyway...

THE SUBMARINES

This submarine model is sold at the price of 2.5 Millions USD, and could go up to 300 meters (Triton 1000). The next beauty could achieved 11 000 meters depth :)

The deep ocean is no place for compromise.

Triton submersibles are designed, tested and certified to the most rigorous safety standards. They are built from the finest materials and our clients enjoy after-sales service and technical support from the world's most experienced operations team.

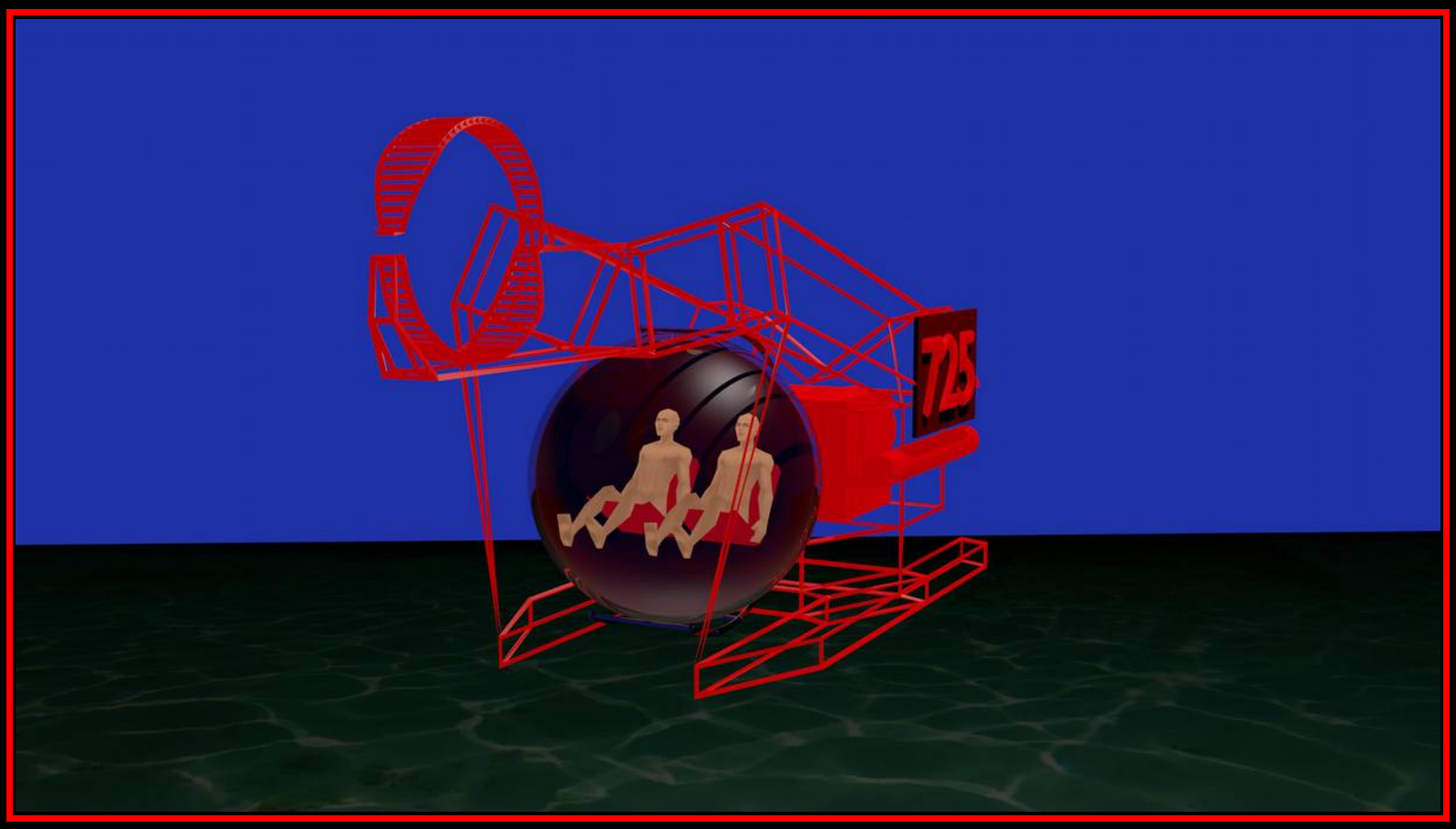
Triton is committed to producing the best deep-diving submersibles on the planet.

That submarine could achieved the depth region of the ocean anywhere on the globe, almost :) It won't be required but 2 500 – 3 000 meters could be of great help to place the Suzanne anchors carefully on the oceanic floor. It can't carry one ton of steel, but with a balloon, the job will be done correctly. To set the inside pressure of the said balloon, we will need to have a descent speed correlated with the evaporation rate of the gas inside it, but if it is need, we will find a way. Normally, we only need to drop those old cars cube, but if the slope of the undersea mountain doesn't allow us to use this method, it will be done with the said balloons and rope of Dyneema or nylon. Unfortunately, some region of the globe, like the part between Africa and south America, will be more difficult, but in a century, why not... With a perfectly mapped oceanic floor. The amount of submarine mountains larger and higher than Everest, will certainly represent a huge challenge, but with all those techniques updated to perfection :()

THE SUPER DUPER EVA SUBMARINE

My first draft of this kind of submarine, will be allowed up to 250 meters depth with a poly-carbonate sphere of 5.5 cm thick.

pression	2.50E+006
diameter	2
tensile strenght	6.50E+007
safety factor	1.5
corrosion	0.0001
wall thickness	0.05464
Weight	3,443
Archimede	4,189



They look great in this submarine :)

2D OPTIC CATS COMMUNICATIONS

By using camera and screen, we could increase the data rate by x %, where x are your need :) , by using cubic array of 3D 10 meters step... I'm hoping of 10 M Bytes/s, with the help of 2D code bar.

THE CHATPLACE TECHNICS

In honor of Laplace, I'm building this imaginary space that will be a complete screen of symbol to be read and encode by the two end computer that will transfer the images. In the imaginary space of 4K, there is the place for all characters of this planet in 20X20 format pixels, of about 20,736 completed characters. All the screen possibility will be encoded materially into a memory read only device, that will trig the data stored into by the call of the transfer screen number. In the case of Mars, that should be a 7 X 7 low dispersion laser array.

This system is now improved, by the use of single pixel (bit) in different screen space (memory available), for the different use.

THE BANDWITH RATIO: IMAGINARY / REAL

For a memory size of 2^m, where in the case of a cellular phone, "m" should be 32, the bus width addressable memory, so the size of the packets, will be 2^{16} bit. This fact, because the number of packets to be compare with the data for matching them, to achieved a 32 bit number (integer:"m"), will be 2^{16} too, to maximize the bandwidth, that itself is achieved by multiplication of those both number that are related by addition of exponent, about the memory size :)

The number of operation per second is given by the switching speed of the transistorized system, built to perform that screening test. Operation per second = 2^{32} * 25E-11 s = 0,931 Hz

In conclusion, the imaginary bandwidth (bit/s) is equal to the bus width addressable(2^{16}) * Operation per second. And the real bandwidth is equal to the memory width(32) * (operation per second). The quotient of both, gives the final ratio, the CATS-RABBITS ratio, of the effective compression rate of the communication...

That ratio is from 1 to 186 361 for huge device :)

PARENTHESIS ON THE POWER GENERATED BY THE CHATPLACE TECHNICS

The list of device that follow doesn't include the CHATPLACE device, because it does not exist actually :)

- SDRAM:
  - 4 G bytes / 10 ns : 1,5 W
- EEPROM:
  - 512 k bytes / 70 ns : 0,1 W
  - 1 M bytes / 70 ns : 0,1 W
  - 1 M bytes / 200 ns : 0,05 W
- LPDDR4:
  - 32 G bytes / 0,25 ns : 1 W N.B.: This 0,25 ns could theoretically be increase by burst data to 0,032 ns by adding a memory complex to compare with the packet within a 4096 Bus width, all that modifiable :)

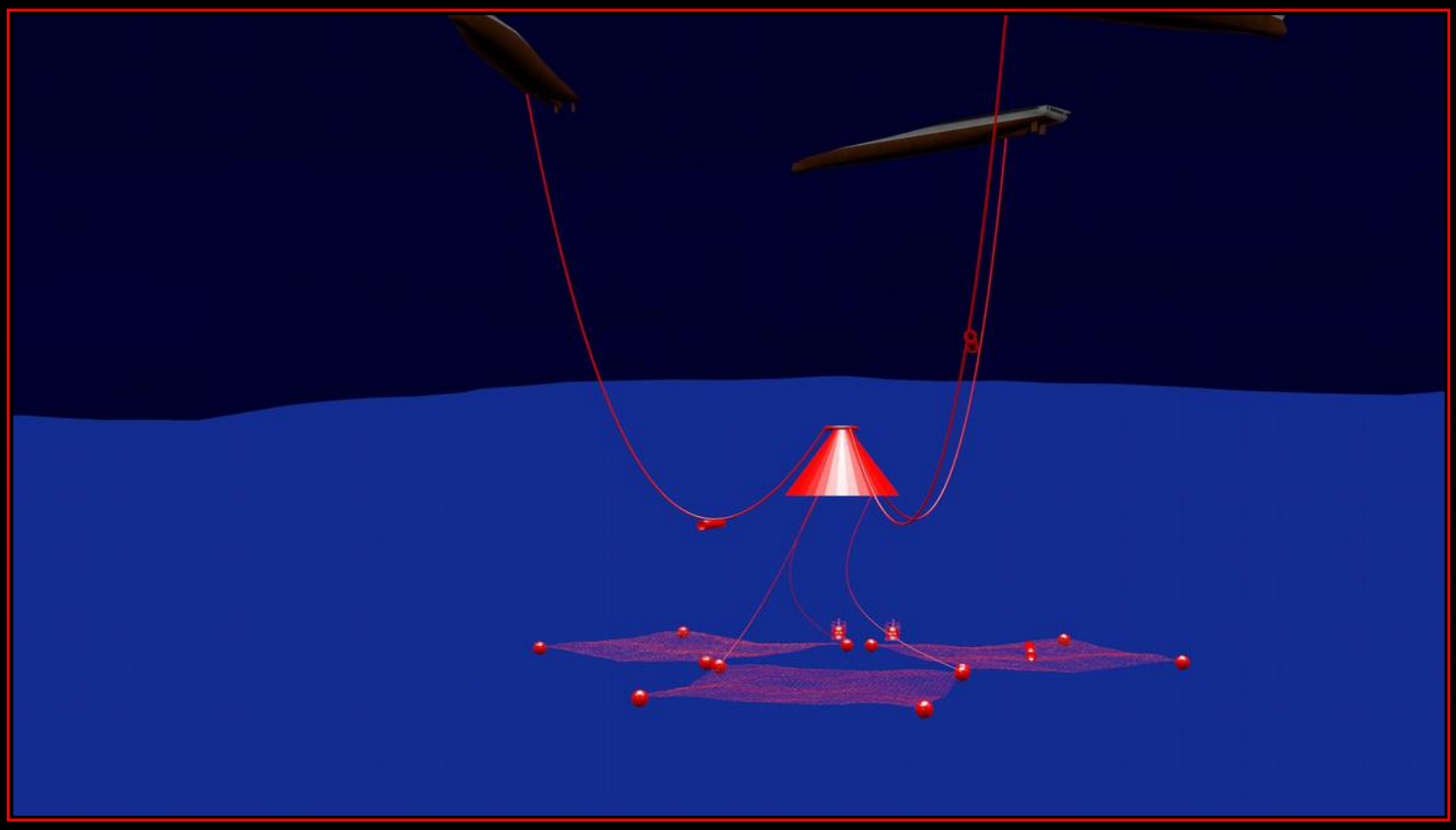
My approximate evaluation for the power consumption, will include the others parts of the device, that will be estimated by doubling the power consumption of the memory. For a cell phone, with a factor CHATS-LAPINS of 2048X, it should be about 2 W, for a 4 G bytes memory, remembering the reader that the ratio shall be calculated with bits values...

I must remember the reader, that this ratio is applied on the real bandwidth, so, without parallelism of some devices, you won't achieved any increase in effective data rate in the phone, but only reduced the cost of the transmission by 2048 :)

With a 5 M bytes transmission rate device, the cost of decreasing the rate and maintaining the total phone data rate, should be:

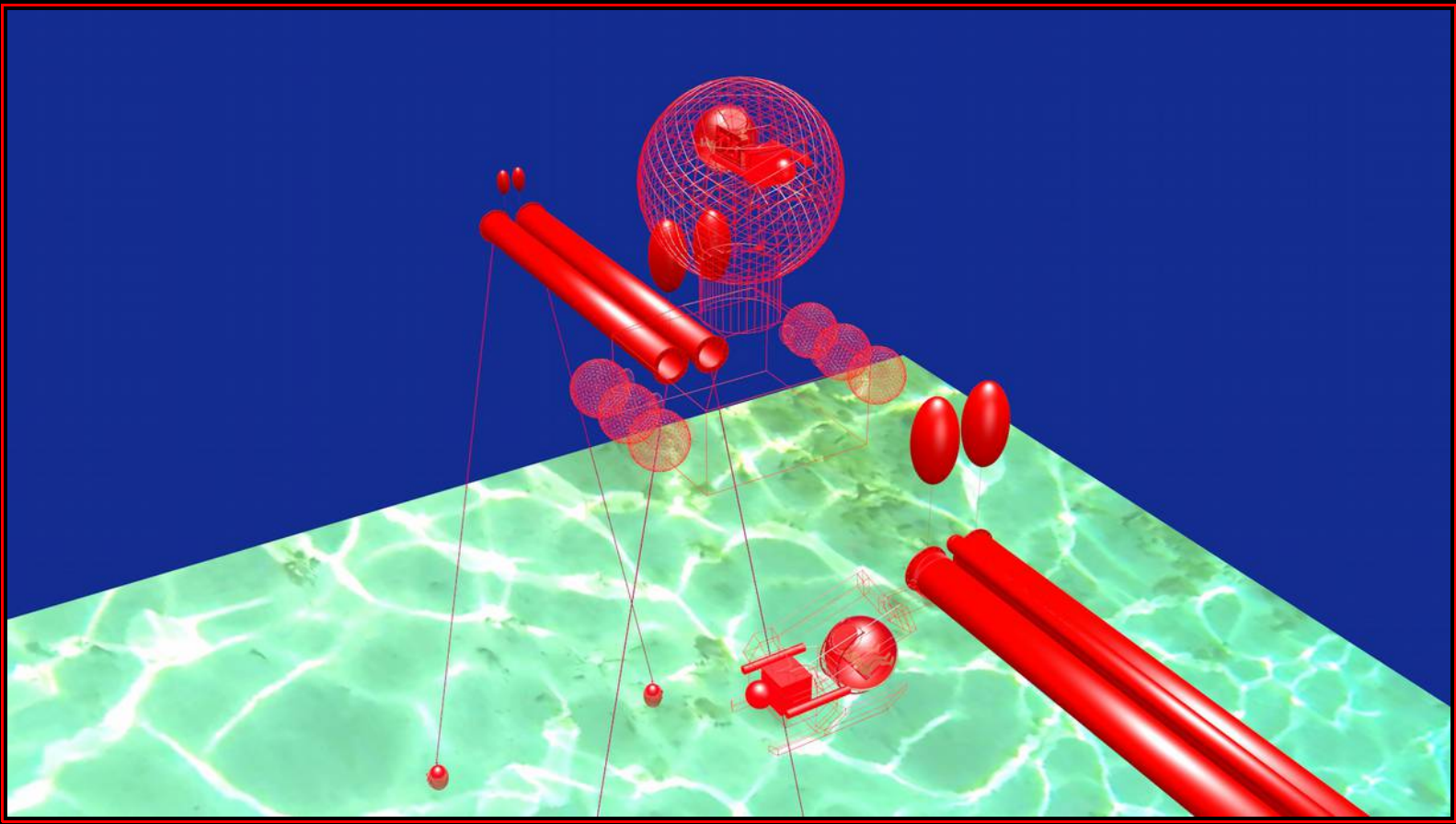
- With a 32 G bytes memory unit
  - A ratio of 2048, that mean 64 CHATPLACE unit parallel
  - 64/44 of the data: 1,6X
- With 4 X 32 G bytes memory unit
  - A ratio of 2048, that mean 256 CHATPLACE unit parallel
  - 256/40 of the data: 6,4X = 32 M bytes / second :) At the cost of 8 W and 4 mm X (10 X 10) mm, that will be restore to the phone by lowering the WiFi bandwidth by 320X, even more :) :) :)
- With a 32 G bytes memory unit
  - A ratio of 1092, 256 parallel
  - 256/21: 12,2X, but this time 160X on the WiFi, and 2 W, and 1 mm X (10 X 10) mm

INFERNAL CATS MACHINE



This machine aim the goal to reduced the amount of movement caused by ocean wave, to provide more time of construction when the situation will be almost calm. It is almost cheap to build...

CATS SHELTER NEST

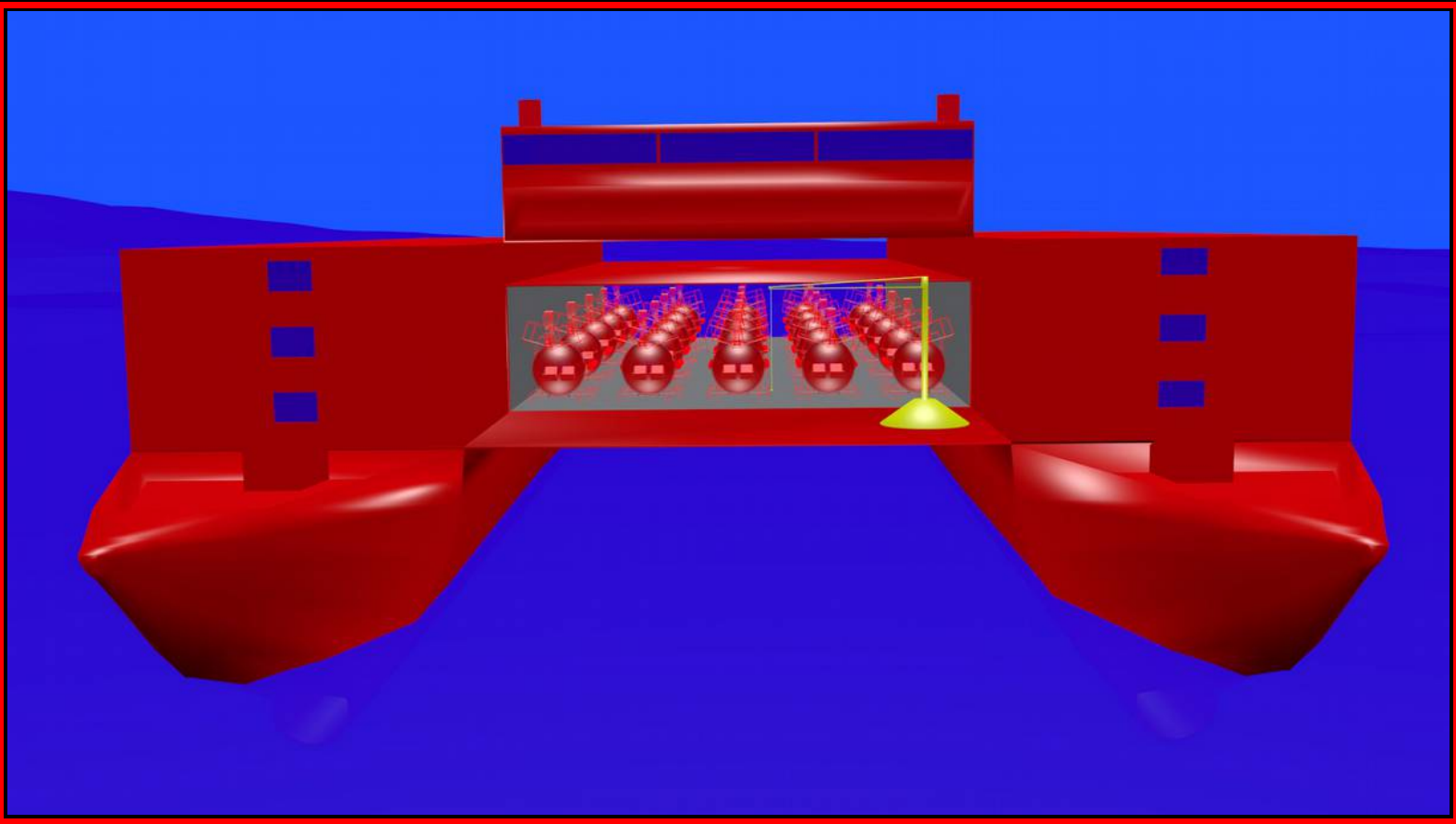


Those shelter will have many use:

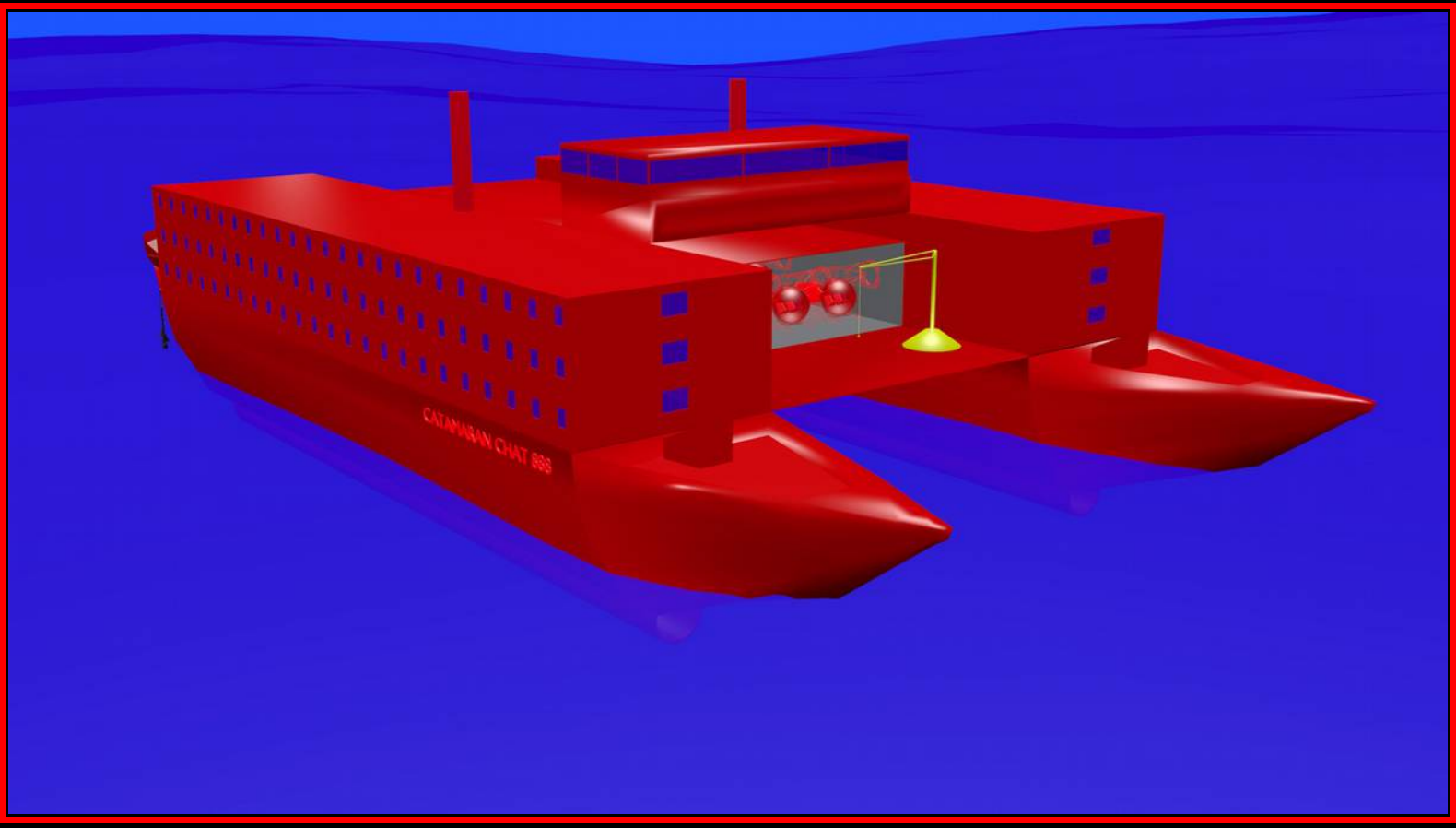
- Retrieved the magnets, used during construction, if this method is retained.
- Electrical portal for the acceleration phase of the capsules
- Data portal for the communication system
- Escape way, in case of emergency
- Pumping station for the residual gas (humidity that may leak)
- Shunt device for a major leaking incident
- Maintenance of the magnets or the tube itself

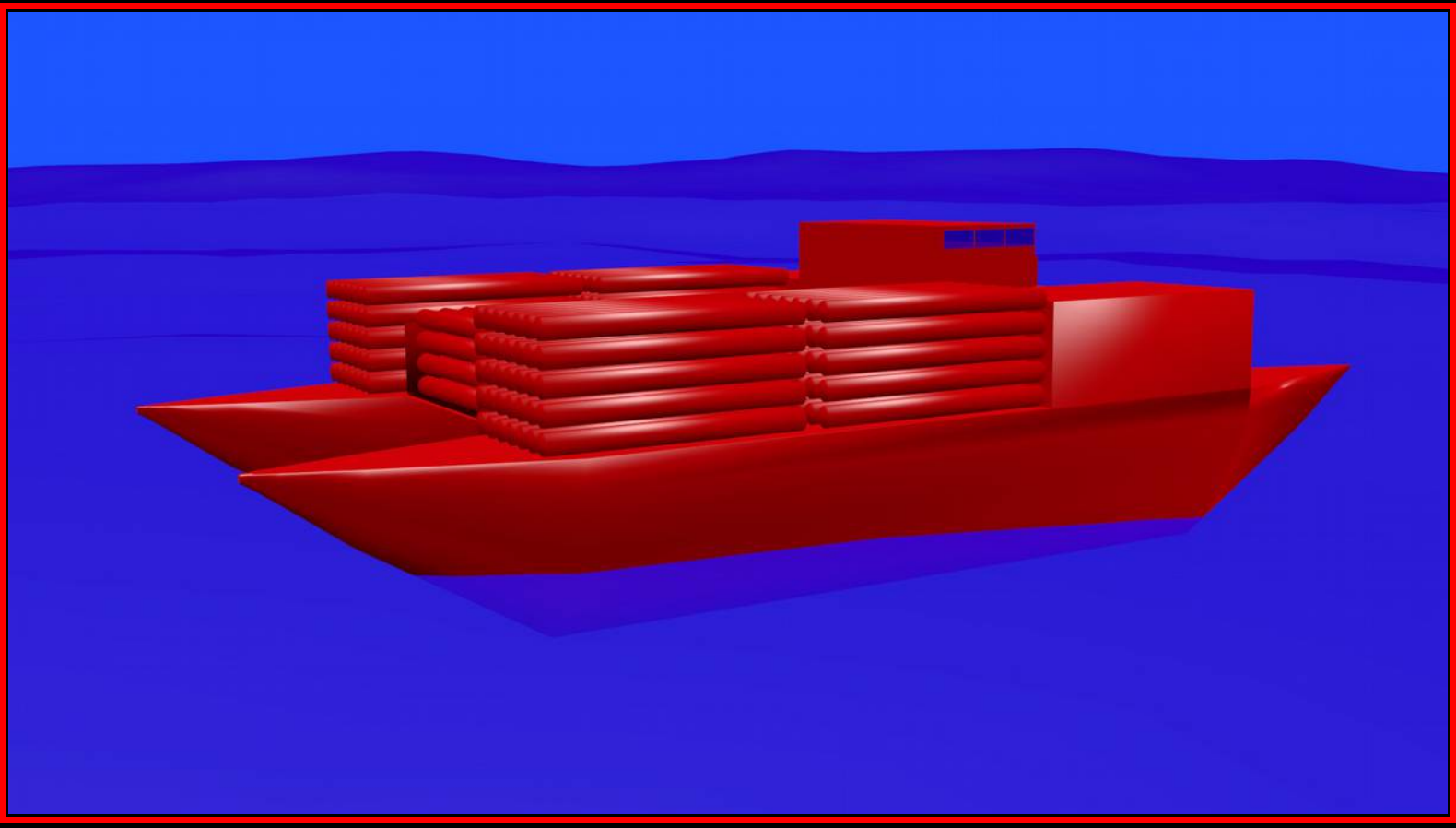
The final shape won't be like that, but I had to draw something :(

CATAMARAN OF THE CATS



This boat, with a mass of 2 500 tons, may cost about 35 Millions USD, base on actual cruise ship of the same size. It can carry 25 submarines, and the crew of about 200 tube-nautes. With a speed of 50 km/h, we will only need one per node. We won't work out here if the meteorology is bad, depending of the site we may achieved 50% of the time, maybe ?


CATAMARAN CHAT 888

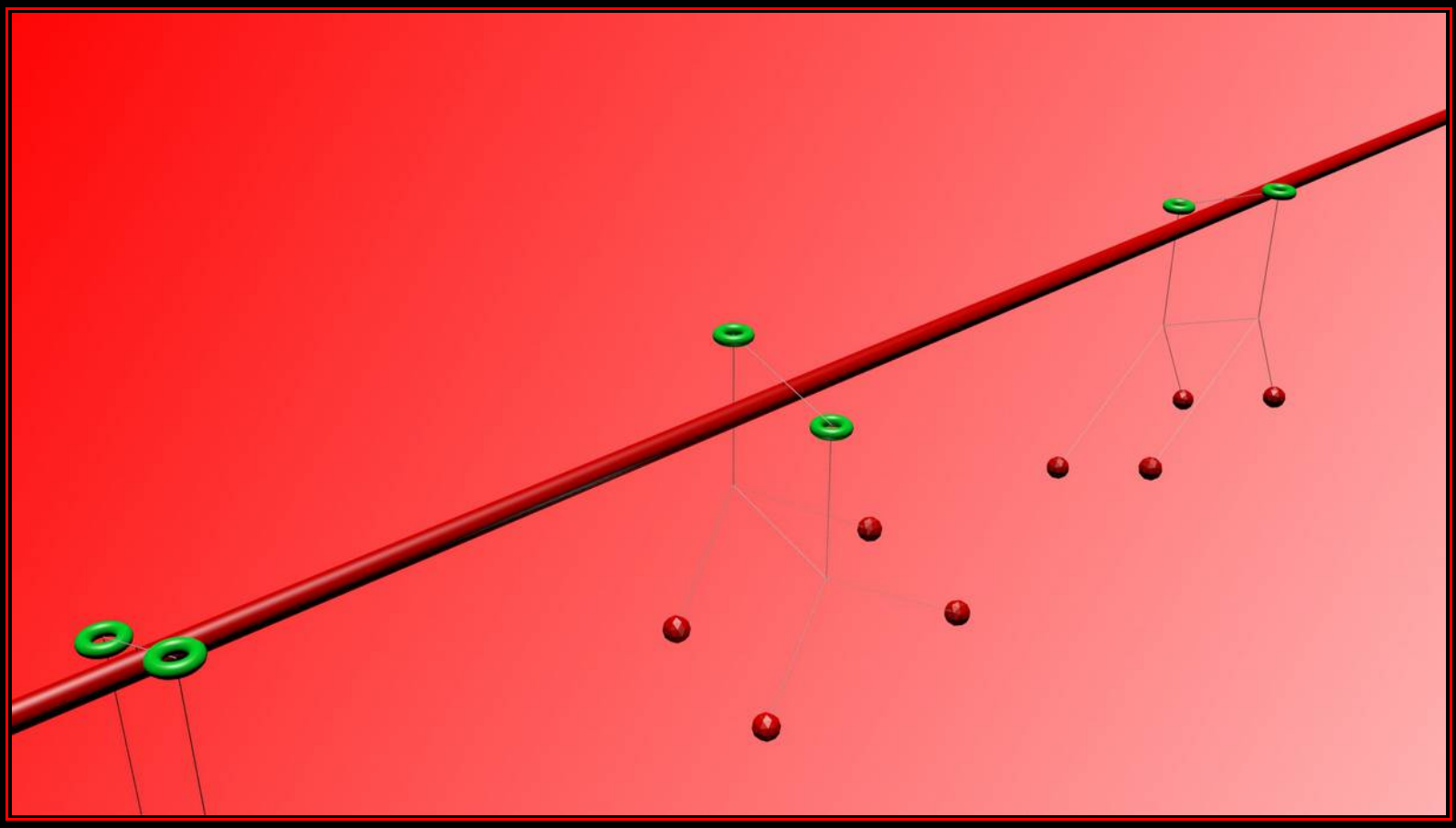


This is about the same ship, but to carry the tubes itself, I drew it to show the possibilities. It can hold 250 tubes, about 48 hours of work. With a speed of 30 km/h, we will need one more that the cats infernal machine will required. (6 500 km / 4) / 30 km/h = 54 hours :)

All those data will need to be verified in a great emotional test:

- Sicily to main Italy
- England to Ireland
- Helsinki to Tallinn
- Others...

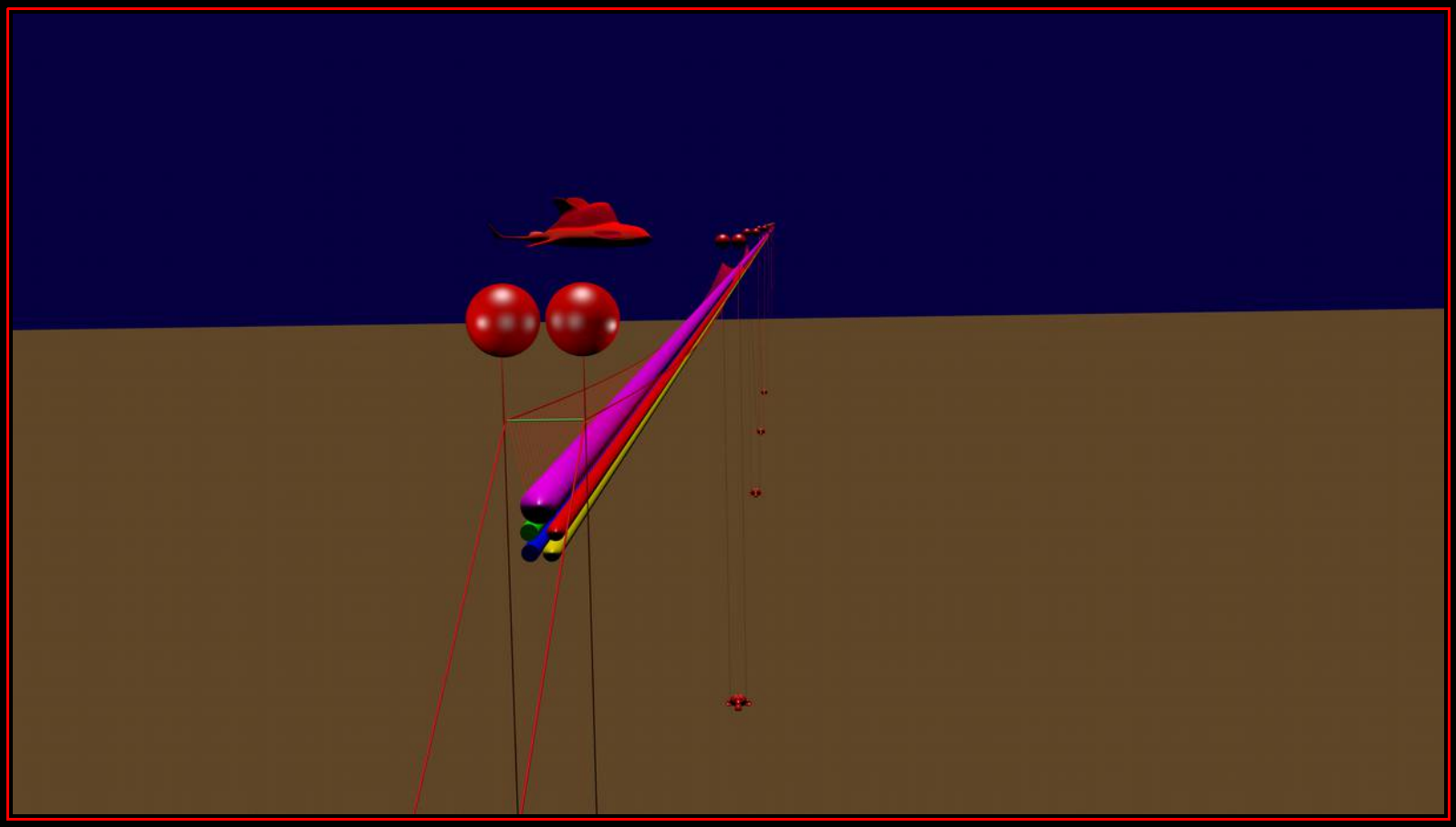
LE PONT DES CHATS GRIS SUPRÊMES



This method could be used, for distances less than 10 km, to serve as a bridge, to bypass various obstacles. In green the buoys, in red, the anchors, the tube and the Dyneema …

To measure the tension in the cable, we could squeeze the cable within two pair of rounded bars, assemble with a beam (solid enough bar), and add a little bit force to know where we are on the tension graphics related to Young modulus elasticity...

LE PONT DES CHATS GRIS SUPRÊME II



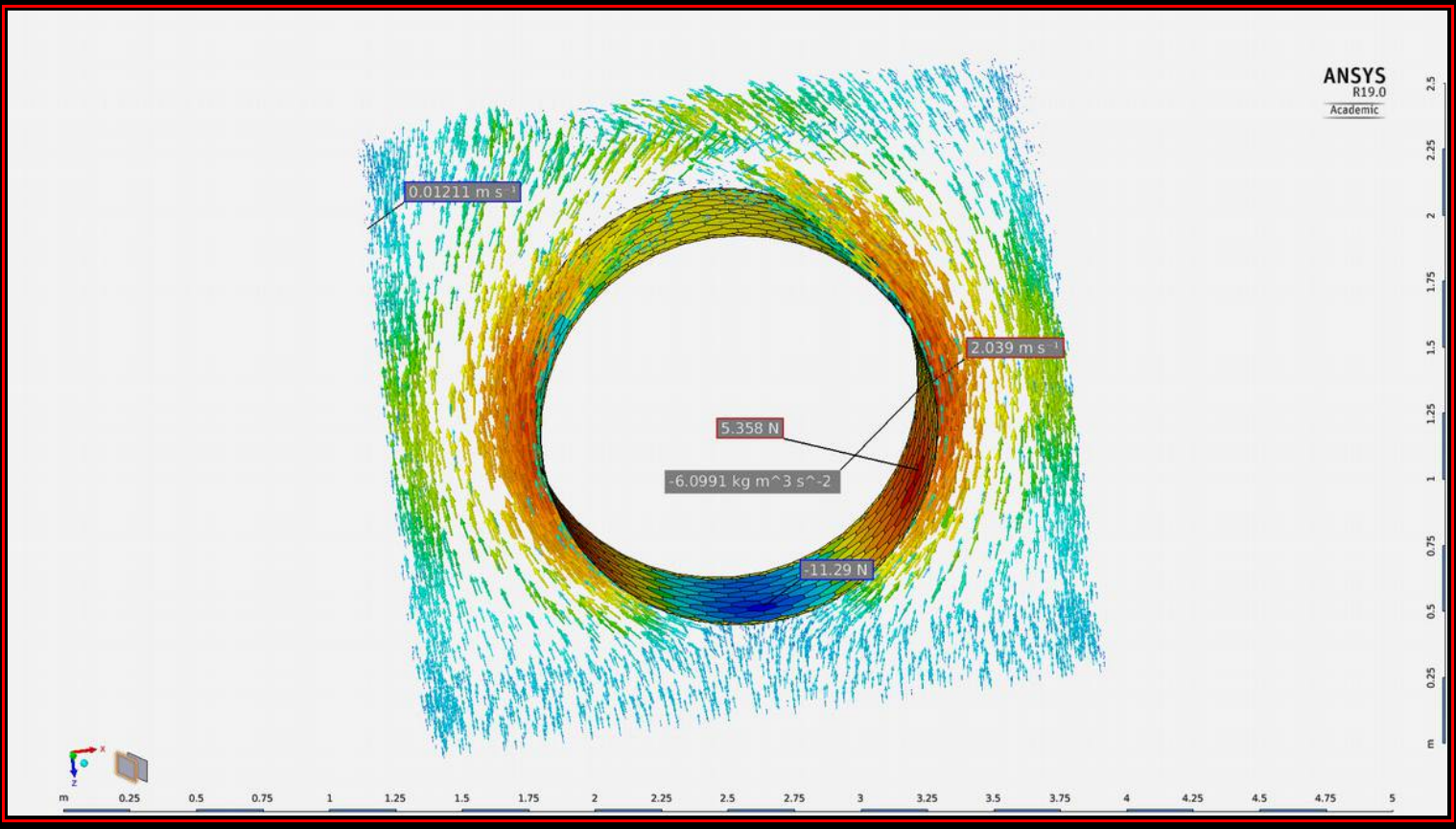
I am now at this version which could certainly include the previous one, with adjustable attachments, since it would be difficult to place the Susanne-Anchors in the ocean floor. One should also think of lateral forces that could be more powerful and require additional string triangles.

We can now think of a single depth 175-225 meters below the surface, for the entire length of Eva Whale. The distance between each pair of balloons, in this case is 500 meters, and could easily be changed ...

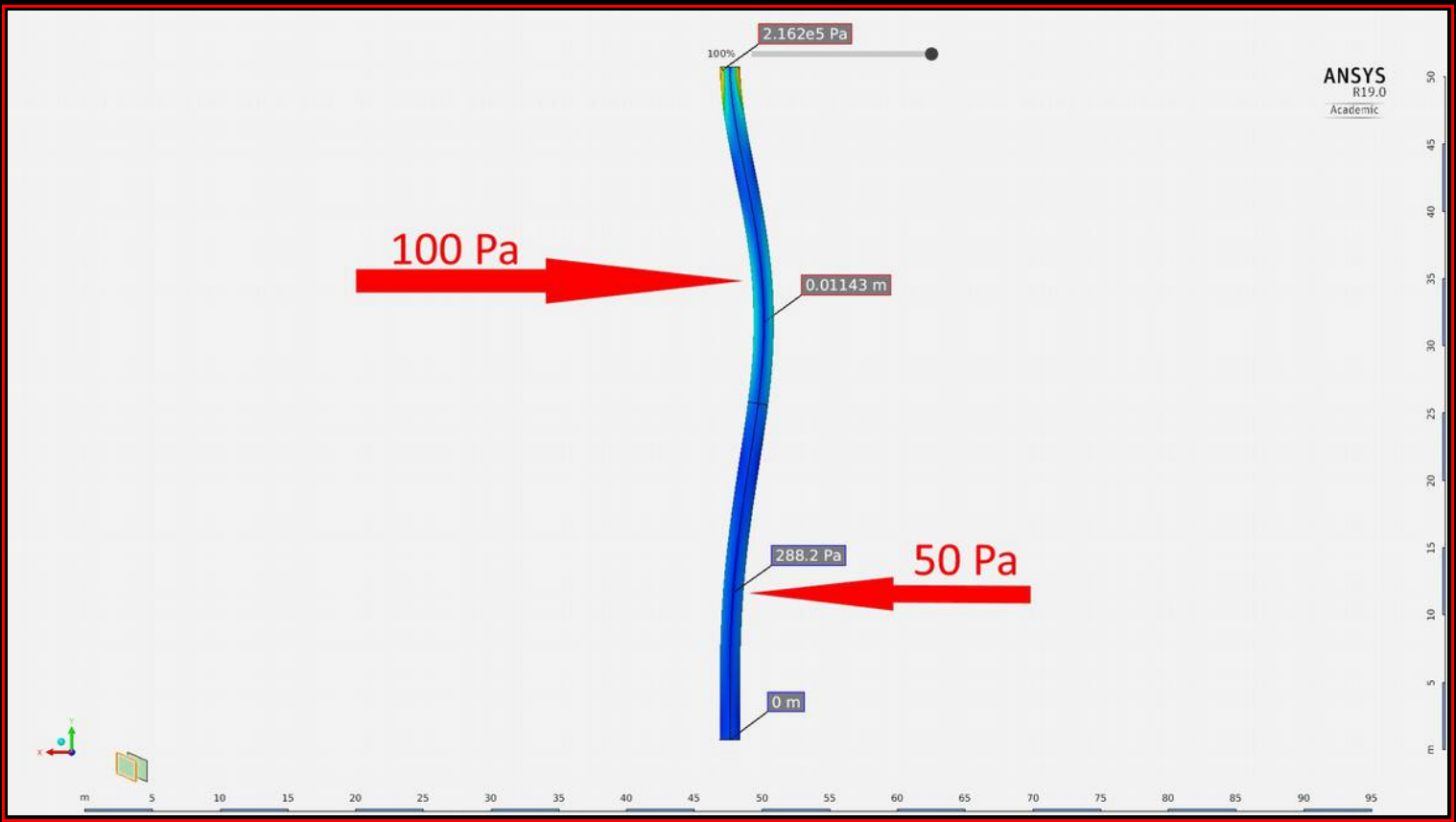
Contacts between marine animals and the system will certainly pose significant problems. It is imperative to provide a whale-tube collision, a valve system at regular intervals, as well as a system such as this one:

- 300 m resistant capsule
- Sufficient air supply
- Sections of tube that separates from the network and lets escape the capsules
- Inflatable boat and survival kit on each stretch
- Several security ships off

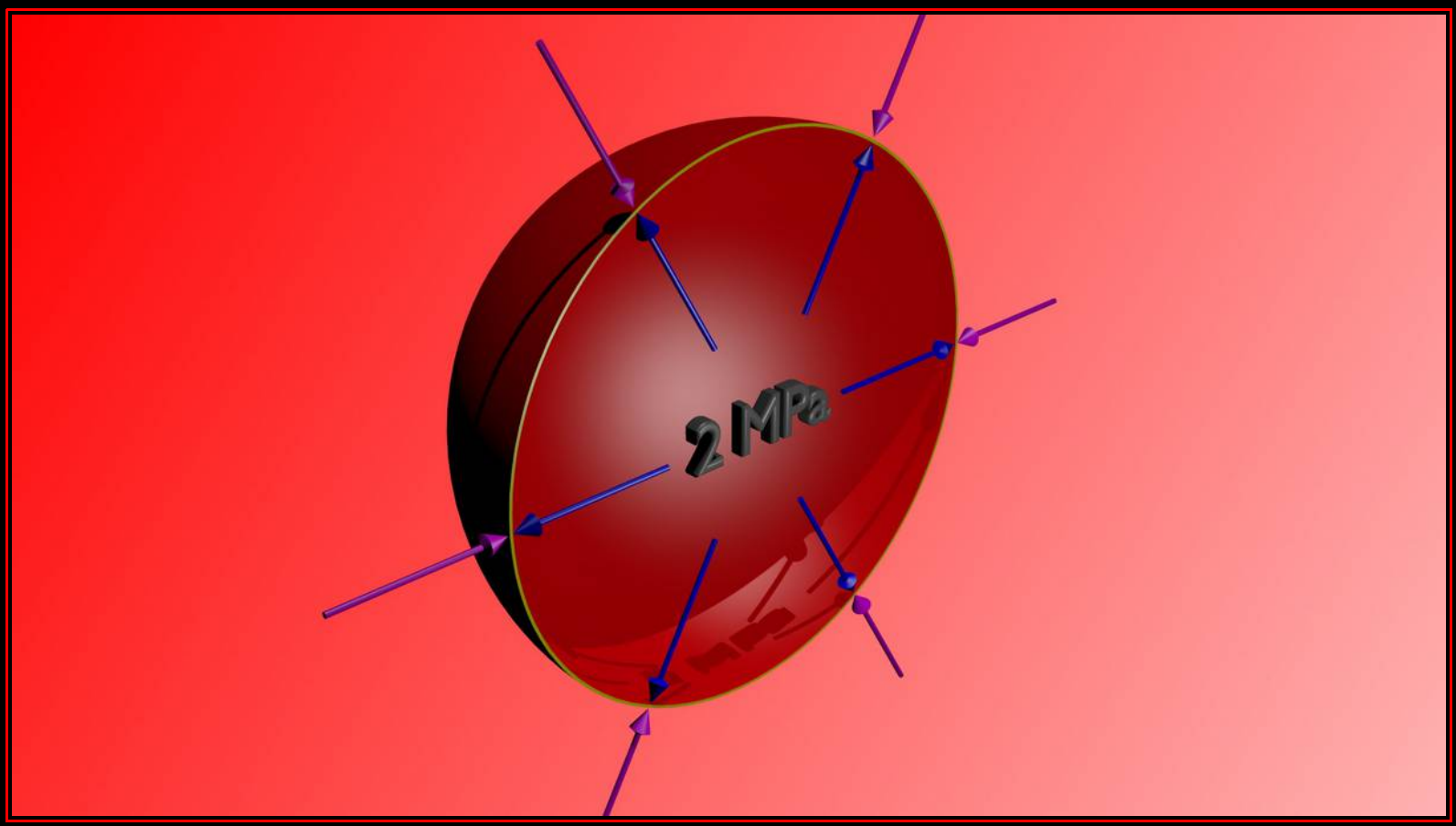
With all this, it is not likely to lose more than 10 lives (a train-a collision) per year. As far as the safety of the road itself is concerned, two parallel systems are needed, as the drawing above describes one.



In this image we see a 0.6 m / s marine current striking a single tube. The force that emerges is of the order of 60 N / m of tube. Which on a 500-meter inter-balloon distance, could give an angle of ~~15 ° with the ground, in the case of a 10 kN balloon force~~. In the case of a sudden change of direction of a marine current longitudinally, the bending force seems negligible (the drawing is amplified ...).



EA HEAD CAT

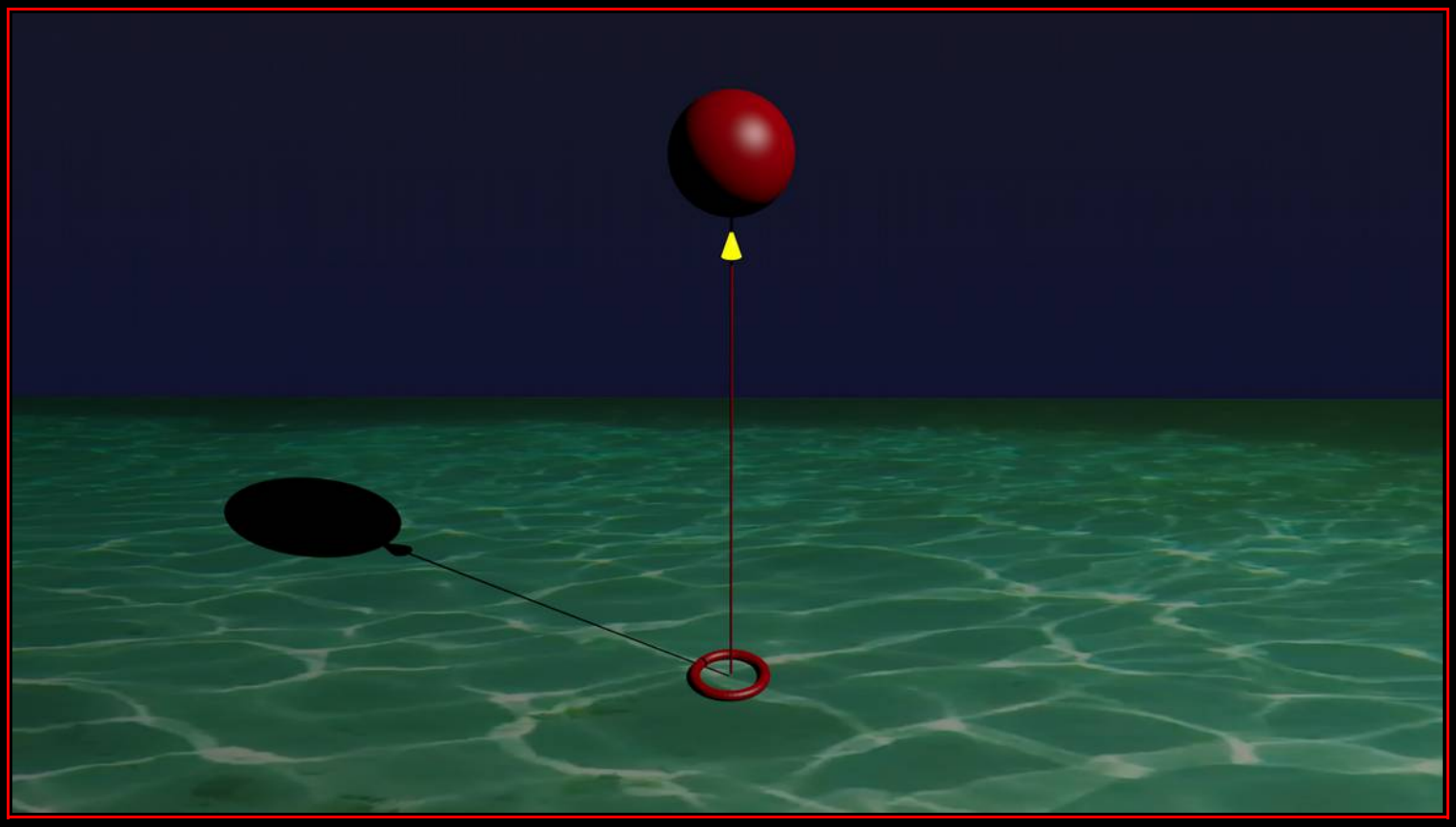


It is not easy to fill these balloons on the surface because the required pressure is too high. But, we could bring down small containers of liquid nitrogen, which once evaporated, would fill the said balloons to the required pressure. Example among many others: 5 m^3 ==> PV = nRT: n = 2 E6 Pa * 5 m^3 / (8.31 * 280 ° K) = 4 298 mol, which means: 120 000g / 0.808 g / cm^3 = 148 515 cm^3 = sphere of 32.9 cm radius = transport problem, but the cost is not bad: 1.50 Euro per liter = 225 Euro. Perhaps Oxygen: 1.429 g / cm^3 = 28.4 cm radius, but more difficult to liquefy. So, in summary 50 USD / m^3 of balloons, multiplied by 2 225 000 m^3 = ± 111 Millions US dollars for the Portland-Europe link, only in liquefied gas for two lines. We will take measures, not to lose too much gas in the water each year :)

CAT SCREWER SUBMARINE

This submarine, with the right specification, could reach 1200 meters to screw some piles, however, at the speed of 5 cm/s of descent, it could be a bit long. 72 hours of autonomy and two crew members (they breathe less ...). But, fortunately, the slopes where it would be required to screw piles will be relatively rare, probably those of more than 40 °. It is much more preferable to make bridges than to follow a specific width for the "span" of the Eva Whale of the Supreme EA Princesses.

CAT EAR DETECTOR

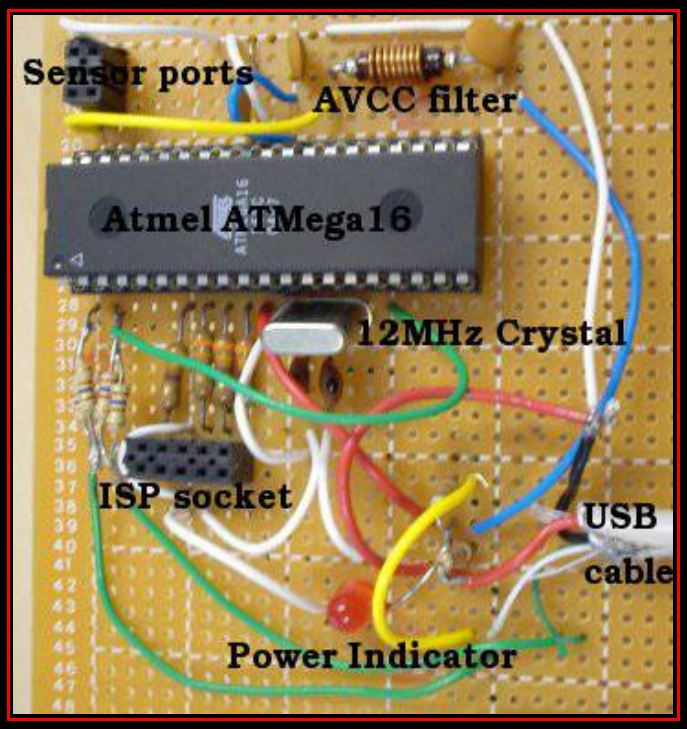


The following system should be deployed before the start of construction for a period of at least two years. Probably the deployment could do this at an average interval of 1 km, but for reasons easy to understand it will have to be closer to the areas where the sea current changes direction :)

For the US (Portland) route, up to the France-England Channel, by Greenland, or 8900 km, it would therefore 10,000 detectors. In a first estimate, see the following pages, the electronic circuit will not cost more than 25 USD, and this if we manufacture it in America. The balloon could cost around $ 10, the 50-700m nylon rope about $ 0.30 / sqm averaging $ 50, and the anchor in anything that comes to hand, about $ 5. For a grand total of less than $ 100 per tag we will need to ask and recover for data analysis. Once again: $ 1,000,000 of detectors + $ 500,000 / boat + 3 months of operations at $ 100,000 / month = less than 2 million USD. For recovery, it's more complicated:

- rope cut, under the effect of a signal
- pick it up with nets

Anyway, sailors, we will be a great help in this matter. But even if it would be more expensive, it is required... The current data, gives us the values of the order of 0.6 m / s max, but it is the conjunctions of currents which pose problem and their directional variation.



Part	Part No.	Quantity	Unit Price (America)	Total
ATMega16	16PC-ND	1	8.56	8.56
Connector	787780-1-ND	1	1.5	1.5
Crystal	CTX058-ND	1	1.24	1.24
ISP Header	A19341-ND	1	0.5	0.5
socket	ND	1	1.88	1.88
Red LED	67-1068-ND	1	0.43	0.43
15pF Capacitor	1303PH-ND	2	0.1	0.2
Capacitor	ND	3	0.06	0.18
Resistor	330QBK-ND	5	0.074	0.37
Resistor	62EBK-ND	5	0.074	0.37
Resistor	2.2KEBK-ND	5	0.074	0.37
Total				16.61

This circuit gives us a good idea of the small size of the situation. Only a few changes will be necessary.

Programming interface

accelerometer

In addition, it may be necessary to include a small communication system, to cut the cable when we are ready for pickup.

THE EMOTIONAL TEST SAMPLE (ITALY)

On the red path, the maximum depth is about 195 meters, but it looks optimal for them. For us, it will be preferable to think of depth of 225 meters, to be able to test every aspect of the possibilities. There is such a path southern of this map, but the width, so the prices will be increased. We must also consider, than this link will have to be integrated in the network. Alone, it's great, but being allowed to travel up to Rome without any stop is greater :)

BIBLIOGRAPHY

- WIKIPEDIA
- BLENDER
- AUTOCAD
- OPEN OFFICE
- ET AUTRES SI LA QUESTION SE POSE :)

C'est ça qui arrive quand on ne sait pas prendre de photo : Lumière venant du coté droit :)
Peut-être une autre fois :)