INNOVATION PROJECT

ELECTRIC PROPULSION

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2013

The Aim of the Project

- Product is new technology for aerospace.
- It is planned to produce prototypes, based on 1992-2011 experimental results made by Alexander V. Frolov (asymmetrical capacitors).
- It is planned to patent the technology and organize sales of licenses.

Product

- Product is electric propulsion technology.
- It is not ionization electric propulsion, it works without reactive effects.
- It is development of T.T. Brown' projects of 1927-1965
- Applications: aerospace.

Market

- Market size 300 Billion USD + 14% growth.
- Space Exploration Technologies Corp. (SpaceX) have NASA tender of 1.6 Billion USD.
- In 2014 Bigelow Aerospace planned to start space hotels project Sundancer. In 2017 it is planned to start visits to space hotel BA330.

Market problems

Cost of useful aerospace cargo:

- 30 tons cargo Shuttle cost 17,000 USD/kg.

- Satellite Hughes Communications «Jupiter», planned in 2012 by Ariane, EU will cost 110 mil. USD, i.e. about 18,300 USD/kg.

- SpaceX «Falcon Heavy» can work with 53 tons of cargo and this work cost 2,000 USD/kg.

- «PROTON» also cost 2,000 USD/kg.

- Conclusion: market need **low cost two-side space-orbit transport** to be developing for satellites and other customers, including space tourists.

Serious Market Problems

- 2010 year, 74 projects, 4 of them were failed.

- Risk lead to insurance fee about 20%, that increase cost of projects.

- 4 of 74 is too big risk for space tourism. Market ask more safe transport.

India, 50 mil. USD satellite was destroyed.

Solution

- Idea: Electric propulsion based on aether pressure gradient. The gradient can be provided by means of gradiental properties of dielectrical member of the capacitor.

- Propulsion in this case is result of asymmetrical electric interaction in electric capacitor.

- Fuel is not necessary here. Onboard source of electric power is necessary.

- Direction and value of propulsion force can be controlled and adjusted.

Technical idea

T. T. Brown patents of 1927
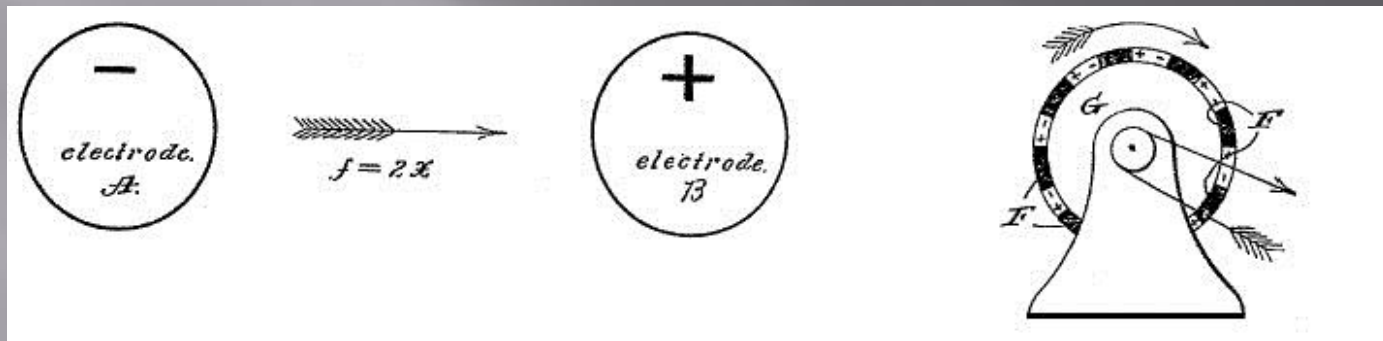
In 1927 Brown considered propulsion effect of his devices to be result of different forces between positive and negative electrodes. In his view, positive electrode is attracted to negative electrode with more powerful force than negative electrode is attracted to positive one. He offered "Electrokinetic Propulsion Unit" or "rotor of some machine" using this effect.

T.T. Brown 1965

- Patent of 1965 let us new idea of the E-field gradient

Linear field   **Gradient of E-field**
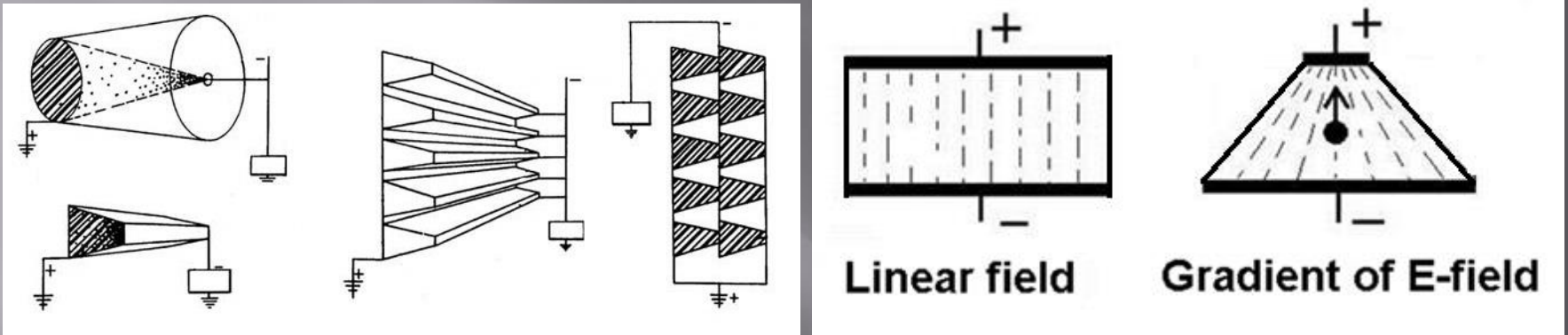
Here is special form of dielectric member of capacitor.
In this case E-field is gradiental field (gradE).
Active force act onto all particles of matter of the dielectrical member are placed in area of this gradiental field.
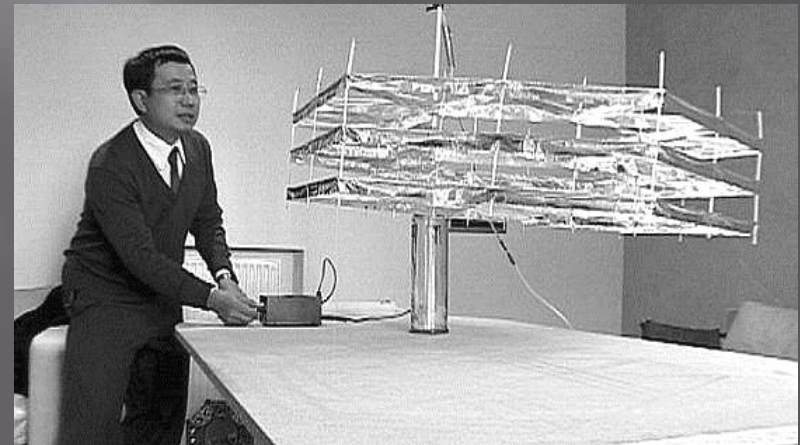There is non-zero vector sum of forces in this device.
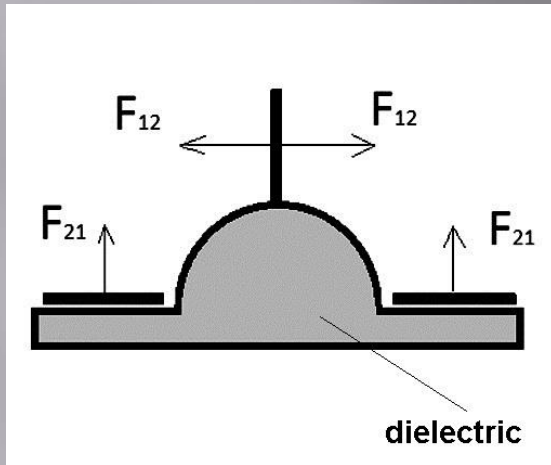
Modern experiments
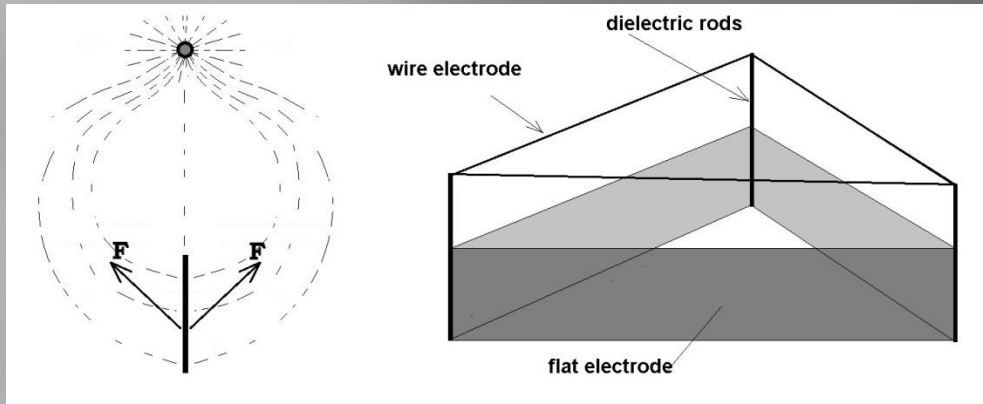
- Asymmetry of E-field provide propulsion.
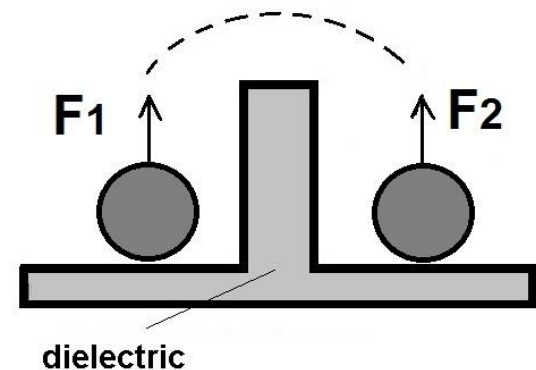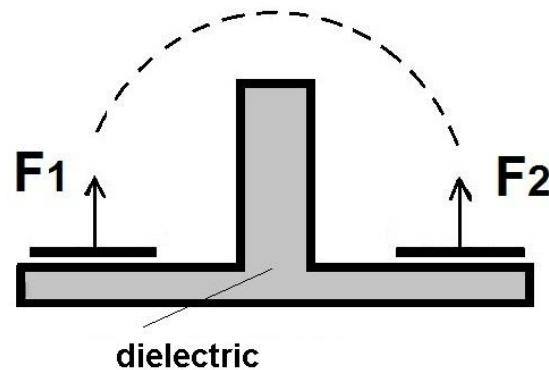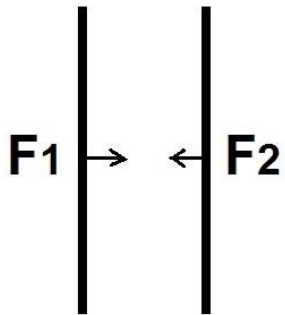- Here is also ionization effects

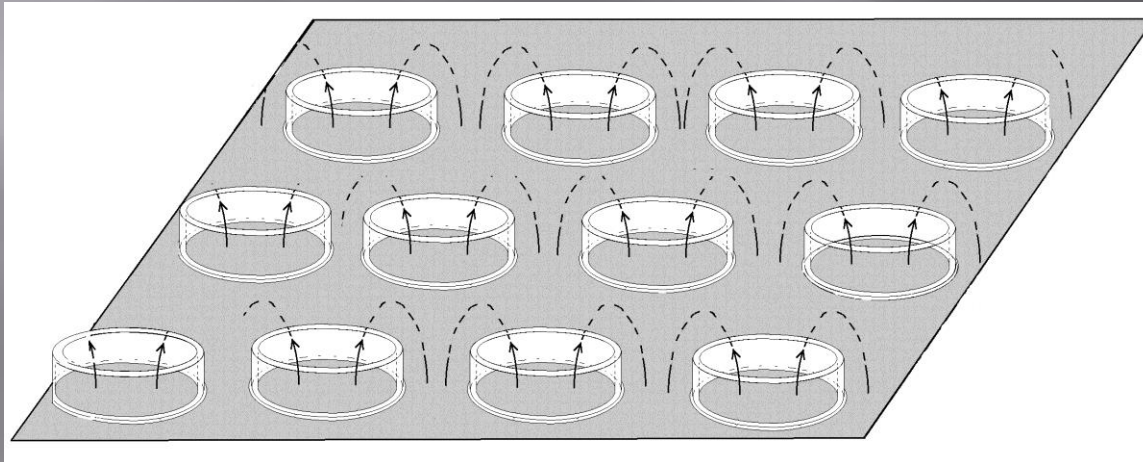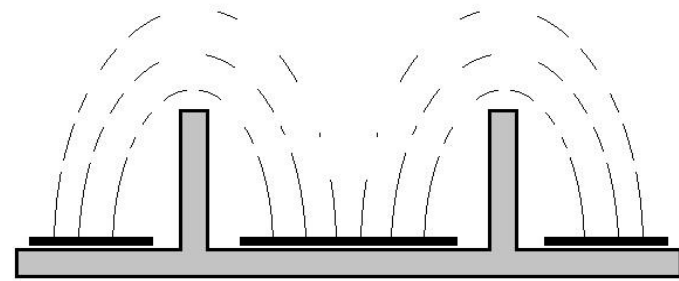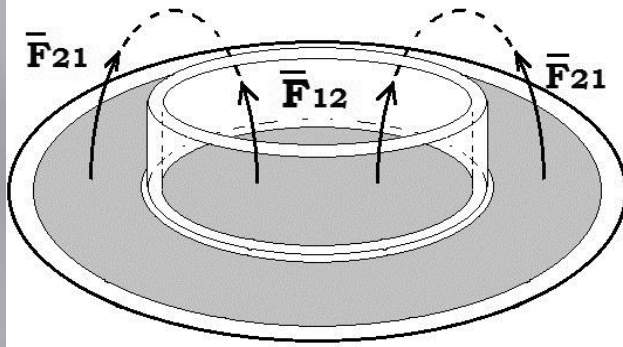Flying device named "Lifter" by Jean Louis Naudin

Frolov's capacitors

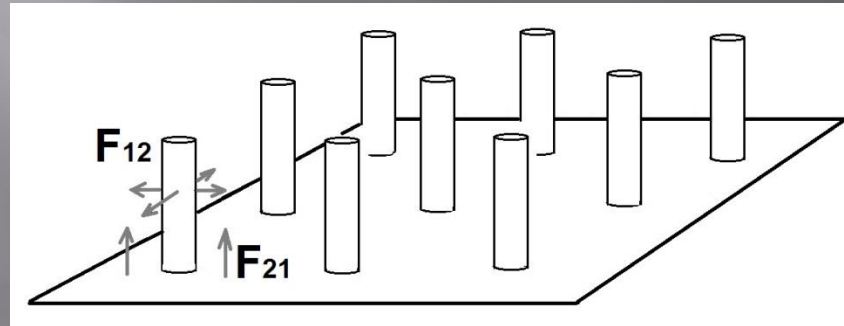- Propulsion force can be detected in the case of special geometry of capacitor.

Cylinder form
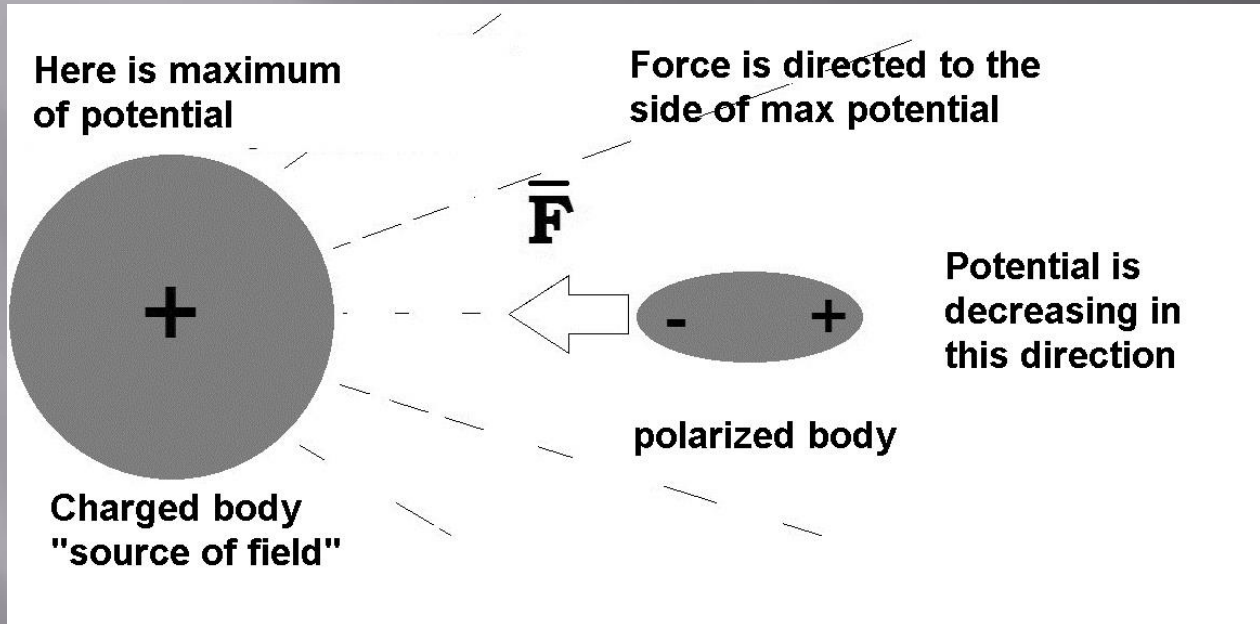

▫ Many small caps

Charged non-metal elements

- Frolov's idea of 1994
- Net force F12 is equal to zero.
- Net force F21 is not equal to zero.
- We can estimate here total net propulsion force.

Why it is moving?

Analogy: Two-layers dielectric

electrodes of capacitor
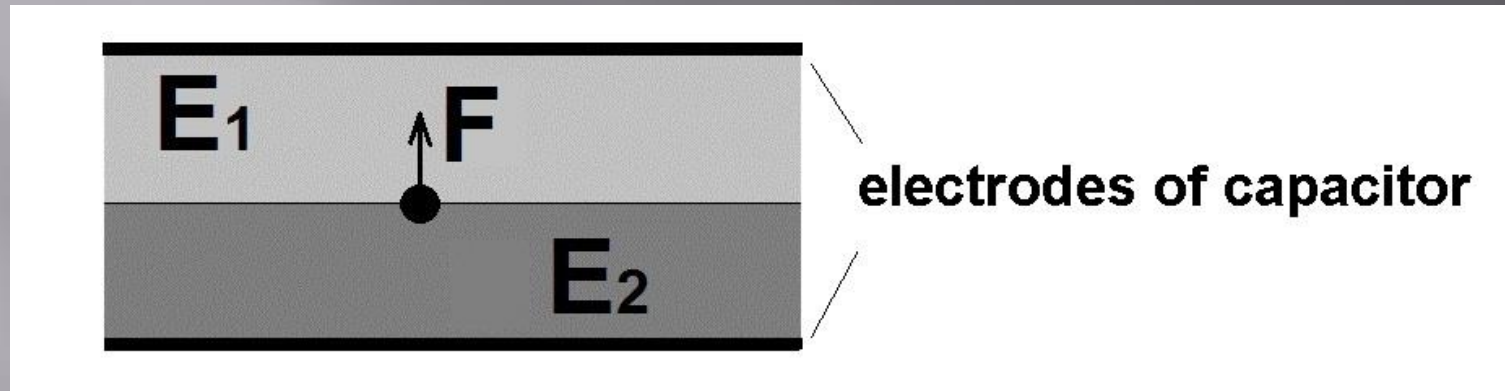
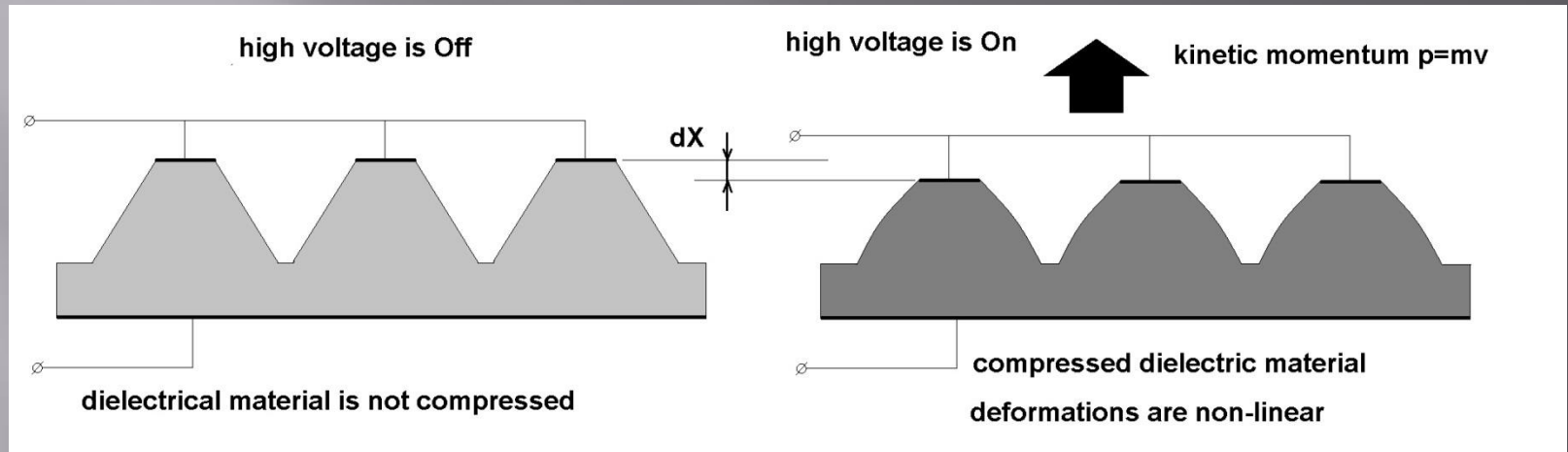- There is classical notion about force acting onto particles of dielectric placed between two layers of different permittivity dielectrics.
- The force is directed to area of max intensity of the E- field.

Development of the idea
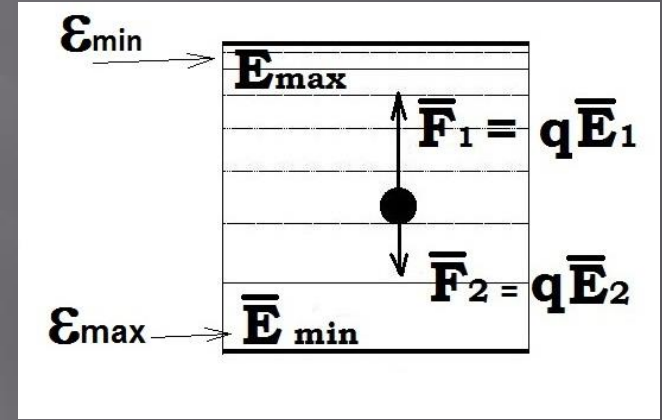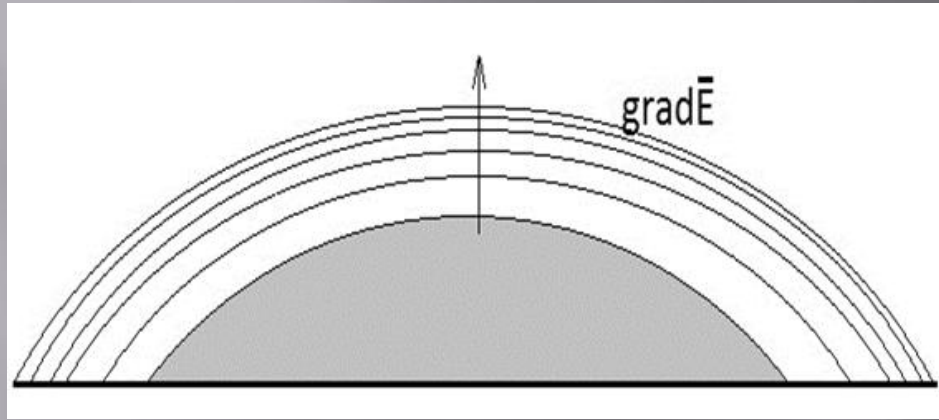
- We can increase effect with many layers.
- Special many-layer dielectric can be made of different layers of materials of different dielectrical properties (permittivity).

Kinetic momentum

high voltage is Off

high voltage is On

kinetic momentum p=mv

dX

dielectrical material is not compressed

compressed dielectric material

deformations are non-linear

- Important aspects:
  - Elastic properties of dielectric material.
  - Pulsed mode of charging-discharging of the capacitor.
- Net vector sum of displacement of all particles will correspond to macro-effect of propulsion force. It is law of conservation of momentum.

Estimated results

In this technology we can estimate 80 tons lifting force acting on 100 sq.m. capacitor, charged up to 10kV. Ionization is not reason of this effect.

Theoretically, ionization losses can be minimized up to 1A current. In this case power input 10kW is necessary to lift 80 tons and fly.

This design (propulsion unit) can be made of 100 units of 1 square meter packed in box of 1 cubic meter volume.

# Stages of the project

- Project is in development, 1992-2011.
- Simple experiments are proof of the principle.
- Next step is joint team with technological partner to produce special dielectric material.
- Keynote: the material must have some elastic properties to get maximum of the propulsion force. It is sufficient addition to T.T. Brown's ideas. It is the novelty.

Planned experiments
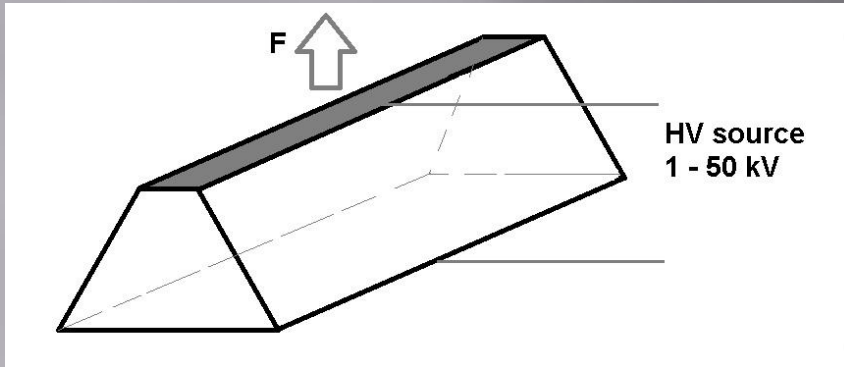
- We can investigate effects in gradient form dielectric (small electrode and large electrode).
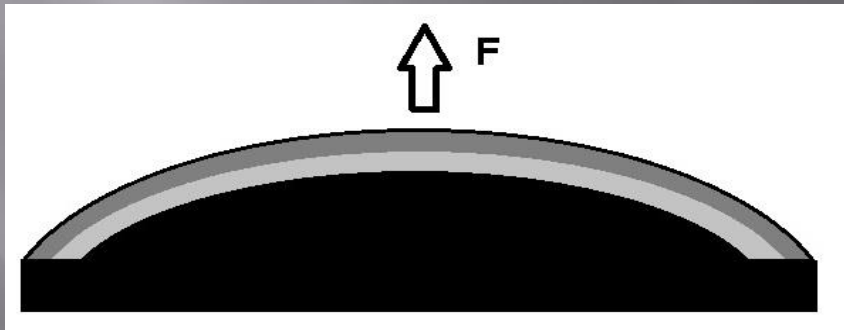
- We can produce simple two layers and multi-layers dielectrics, to organize research with new materials (gradient of dielectrical permittivity).

Application

Electric propulsion units can be used instead reactive fuel propulsion units.
Cost of space transport will be decreased in 1000 times **up to 1 USD/kg.**

Stages and financial

		Period	Investments
1	Production of samples and experiments	6 months	100,000 Euro
2	Patent	3 months	50,000 Euro
3	Marketing and sales of licenses	3 months	50,000 Euro
4	Profitable stage	12 months after start	

Period	2012	2013	2014
Expenses	200,000	1,000,000	3,000,000
Income	0	3,000,000	15,000,000
Profit	-200,000	2,000,000	12,000,000

- Investments 200,000 Euro.
- ExitValue = 30 Mil.Euro,
- R=50%, StartValue = 8,9 Mil. Euro.
- 51% Investor, ROI = 2180% after 3 year.

Proposal for Investor

- Funds required 200,000 USD.
- Team: Founder 39%, Investor 51%, management 10%
- Exit strategy: Sale of company to aerospace corporation Roscosmos, EADS, SpaceX, Bigelow.

Founder

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