Field Rocket Engine for Aircraft

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Abstract

The author suggests new aircraft with a new external, ion-field electric motor. The new ion-electric motor is described in detail by the author in other articles to which references are given. In this article, the author briefly talks only about the principle of its work. Three types (shapes) of the new aircraft are described: conventional supersonic, disk-shaped, and dipole. The proposed type of aircraft can fly and accelerate to cosmic speeds in any gas environment of any planet with low fuel consumption and maneuver in outer space.

Keywords: helicopter aircraft, hypersonic aircraft, vertical take-off and landing aircraft, comic apparatus, comic starter, fuel-free aircraft.

Introduction.

Humanity has always dreamed of flying both on Earth and in space. In the late 20th and early 21st century, this dream came true. Moreover, a person was able to visit the nearest space planet to us – the Moon. Humanity began to dream of fast flights on Earth, of wide exploration of outer space and remote planets of the Solar System. However, humanity is faced with a serious problem – the low speed and high cost of flights on Earth and the huge cost of flights and cargo delivery to space.

The author proposed an unusual solution to these problems – a fundamentally new engine that extracts energy from the environment and is able to accelerate the aircraft almost without fuel to cosmic speeds. The idea, operating principle, and calculations of this ion-field electric motor are described in the author's published articles [1]-[8-24]. Two main ideas are embedded in different versions of this engine. The first idea is to use an electric field to compress the air, heat it, and use the electric field to expand the air to generate electricity. In fact, this is the same air-jet engine, in which the heavy and expensive turbine compressor and gas turbine are thrown out and replaced with electric fields that weigh nothing. In addition, the main obstacle to the development of gas turbine engines – limiting the temperature of the turbine blades-disappears. Hot fixed engine walls and fixed parts in contact with the hot gas flow can always be cooled to a tolerable temperature. For example, the nozzle neck of a liquid rocket engine, where there are huge temperatures and pressures, is successfully cooled. In addition, the coefficient efficiency (CE) the proposed engine is higher than the efficiency of a conventional air-jet engine because there is no air friction against the numerous blades of compressor and working turbines and straightening blades.

The second idea is surprising in its unusual nature and, at first glance, seems crazy – it is the creation of traction at the expense of the flow itself, without fuel consumption. This crazy idea seems to contradict the laws of conservation of energy and momentum. And in General, how can you create traction and move something without spending fuel? I'll try to explain. We extract energy from the moving limited flow (moving mass 1). As usual, this is accompanied by a loss of speed and resistance of mass 1. Then we use this energy to create a force (thrust, push off from another larger mass 2). If mass 2 is significantly greater than mass 1, then the thrust from this repulsion will be greater than the resistance of mass 1. An Excess of this thrust can infinitely support the movement of the device and even accelerate it [1, 8-24]. In addition, the inhibited flow behind the energy extractor can be used to reduce the aerodynamic drag of the fuselage or other parts of the vehicle placed in it.

This phenomenon has been subconsciously partially used in aviation for 100 years. The engine thrust is only 6-20% of the aircraft's weight, and the entire weight is supported by the wing. The disadvantage of this method is that at zero speed, the thrust is zero. You need an accelerator at the start.

The third idea proposed and used by the author in this article is that the aircraft engine is located outside the aircraft and is not mechanically connected to it in any way. Communication is carried out only through an ELECTRIC

FIELD. This creates huge opportunities in manipulating the direction of thrust, control and artificial stabilization of the aircraft (L. a.). This is why the author considered three forms of L. a.: a conventional supersonic aircraft, a flying saucer, which is so loved by fans of unidentified flying objects, and a dipole. Below is a photo of the main, existing L. a.

British Airways Concorde G-BOAC. Length 61.66 m, wingspan 25.57 m, wing area 358.6 m^2, normal take-off weight 187.7 tons, 4×turbojet engines. Aerodynamic quality at M=0.94 K=11.47, at M=2.04 K = 7.14.

Tu-144 in the Museum in Sinsheim, Germany (No. 77112). Length 65.7 m, wingspan 28 m, wing area 503 m^2, normal take-off weight 180 tons, engine thrust 4×NK 144A at take-off 4×20 tons.

Mi-6 Helicopter. 924 helicopters were produced. Load 20 tons, screw diameter of 35 m, the GTE Engines 2 ×D-25B. The power of one engine is 250 kW.

Description of the proposed aircraft

The usual form of supersonic aircraft. Although the proposed aircraft looks like a supersonic aircraft (Fig.1A), it is fundamentally different from it. The motor operates on the principle of an electric field and uses a high - voltage current. The wing is a thin grid on which metal grids are stretched on both sides (Fig.1B), a high voltage is applied between the grids and injectors 6 inject charged ions. The ions accelerate and create a stream of air, which keeps the aircraft in the mode of motionless hovering in the air. To neutralize the charge, electrons are injected at the end of the local flow 7. A light electrostatic generator driven by a conventional motor generates the required amount of electricity. Due to the large wing area, the fuel consumption for hovering is approximately the same as that of a helicopter. By adjusting the thrust of individual sections of the wing, the aircraft can control its position and fly at low speed like a helicopter.

To create a significant horizontal speed, the end electrodes 6-7 are turned on, which create a powerful electric field 4 around the wing (Fig.1C). Ion injectors 6 located in the leading edge are turned on and the ions accelerate a huge flow of air 5, the thickness of which is approximately equal to the width of the wing chord at this point. Thanks to this, we get a very low fuel consumption compared to a conventional screw, and even more so an air-jet (especially a special supersonic) engine.

This scheme is appropriate for short-range aircraft. But it is also good for mass rapid long-range ballistic flights and mass or tourist flights into space.

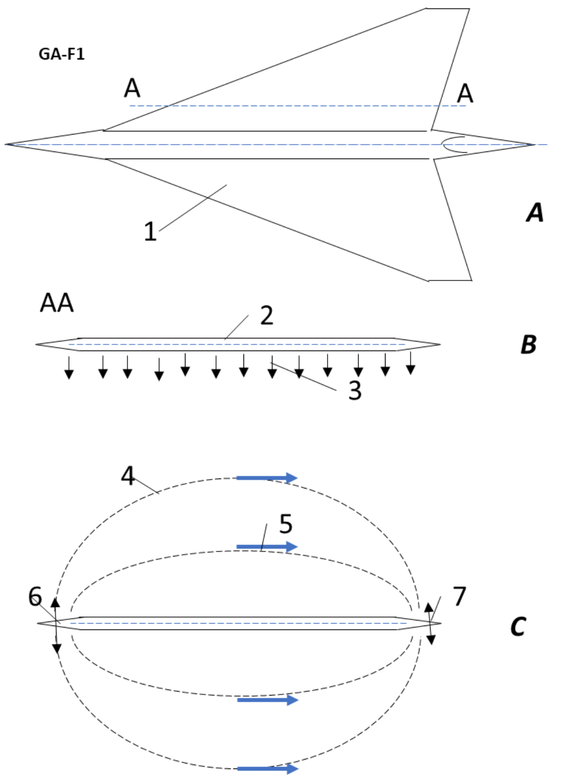

Fig.1. Hypersonic (space) ion-electric aircraft with vertical take-off and landing and with an ion-field engine. Notation: A - top view, B – cross – section of the lattice wing, C-electric field around the wing and the trajectory of the ions. 1 - top view of the device, 2 – section of the wing on AA, 3 – air flow through the lattice wing under the influence of an electric field in the mode of stationary hovering in the air (takeoff and landing), 4-5 – lines of the electric field and the movement of ions, 6 – ion injector, 7 – electron injector.

The disk shape (Fig.2) is more suitable for highly maneuverable and reconnaissance flights, for unmanned vehicles, drones and for devices with artificial intelligence, because it allows you to change speed and direction sharply and make a flight with large overloads, as Well as hang in one place for a long time.

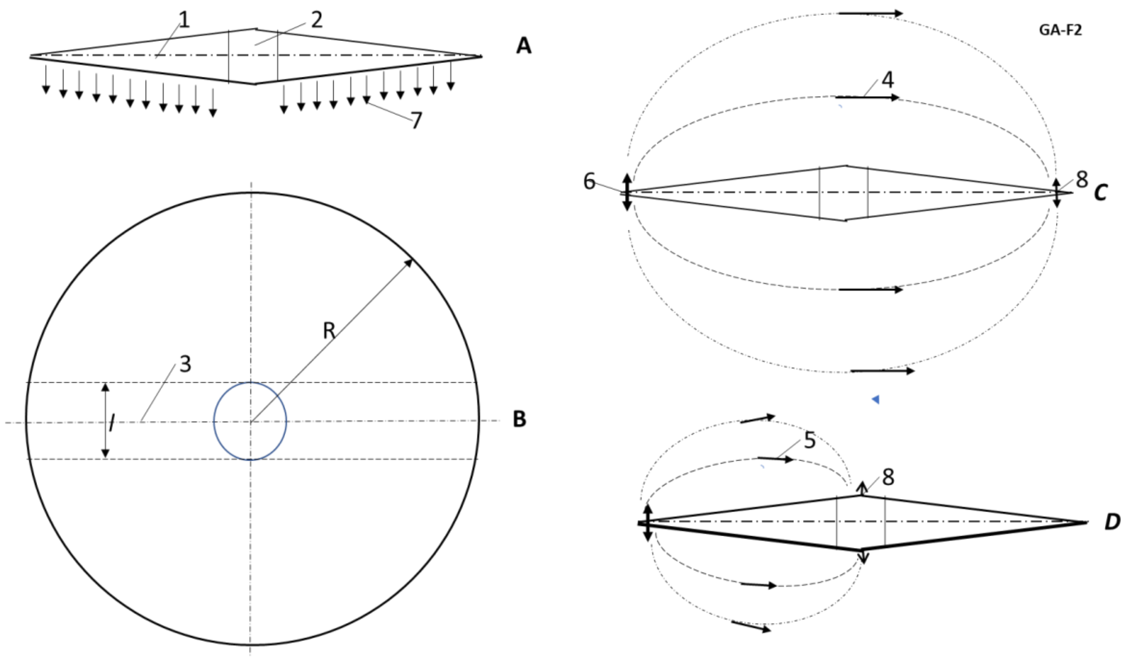

Fig.2. A Disk-shaped air-electric spacecraft with vertical take-off and landing and an ion-field engine. *Notation:* ***A*** - side view of the wing, ***B*** – top view of the wing, ***C*** – electric field around the wing and the trajectory of the ions. ***D*** – high voltage generator; 1 - disc apparatus, 2 – cabin equipment, 3 – part (bar) of the disk used as an electricity generator, 4 – pine electric control and motion of the ions of the main part of disc, 5 – line electric fields and ion movement electrical generator, 6 – the ion injector, 7 -

air flow through a slatted wing under the influence of an electric field on mode, still hovering in the air (takeoff and landing), 8 – injector of electrons.

It is also well suited for space flights. The principle of the device and operation of the disk is similar to the described aircraft. Like an airplane wing, the disk consists of a grid piecewise covered on both sides with a metal grid with a controlled high voltage between the grids to control the position of the disk. The peculiarity is that it can form a band 3 of an electric current generator in any direction, which generates electricity at high flight speeds. One diagram of such a generator is shown in Fig.2D. At the front of the wedge, where the flow accelerates, a braking electric field is activated, which generates electricity to accelerate another large flow. As shown in a number of the author's works, in this case, there is an excess thrust that accelerates and maintains the speed of the aircraft.

Dipole aircraft.

The simplest version of a dipole field ion aircraft is shown in Fig. 3.

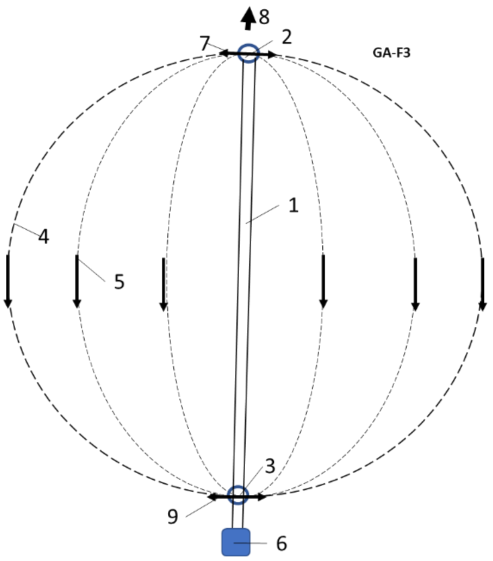

Fig. 3. A Dipole ion aircraft. Notation: 1 – Dipole. Two dissimilar electric charges held by a light insulation tube, 2 – negative charge, 3 – positive charge, 4 – charge trajectories (ions), 5 – ions, 6 – payload and control, 7 – ion injection, 8 – thrust force, 9 – electron injection.

Advantages of the proposed method.

These advantages, compared to existing aircraft and rocket space launch, are due to the new ion-field engine:

1. The ability to accelerate to comic speeds without fuel consumption.
2. The ability of vertical takeoff, landing and hovering like a helicopter.
3. High subsonic and supersonic flight speeds with low fuel consumption at launch.
4. The increase in payload due to the smaller amount of required fuel and the small weight of ion - field motors. Efficiency.
5. The versatility of the aircraft. The same device can be used for short -, medium -, long-distance flight and for space flights.
6. Able to fly at great height (20-40 km).

Theory and examples of evaluations of flight data.

The theory of the field high-speed electric motor proposed by the author was described by the author in many of his works [1, 8-24]. The main advantage of the proposed engine: at high speeds, the engine itself receives energy from part of the flow 1 and uses it to repel the device from another (larger) part of the flow 2. That is, the engine produces thrust at high speeds without fuel consumption. Conclusions based on the laws of conservation of energy and momentum are given in previous works [1, 8-24]. Here we produce final formulas for estimates.

$$P_1 = \frac{1}{2}\eta\rho S_1 V^3,\ \ T_2 = \left(\frac{P_1}{\Delta V_2}\right) = \left(\frac{1}{2}\rho S_2 P_1^2\right)^{\frac{1}{3}},\ \ D = \frac{P_1}{V} = \frac{1}{2}\eta\rho S_1 V^2,$$

$$T = T_2 - D - \frac{Mg}{K},\ \ \Delta V_1 = \left(\frac{2P_1}{\rho S_1}\right)^{\frac{1}{3}},\ \Delta V_2 = \left(\frac{2P_2}{\rho S_2}\right)^{\frac{1}{3}},\ \ P_2 = P_1\,. \qquad (1\text{-}2)$$

Here P_1 – power getting from air flow 1, W; $\eta \approx 0.5$ wind coefficient efficiency; ρ – air density, kg/m^3; S_1- cross section braking flow 1, m^2; S_2 -cross section accelerated flow 2, m^2; V -speed of flight, m/s; T_2 – trust from flow 2, N; T -additional, useful trust, N; ΔV_1- change speed of breaking flow 1, m/s; ΔV_2- change speed of accelerated flow 2, m/s; D – drag of flow 1, N (Flow 1 is a breaking flow, flow 2 is an accelerating flow); M – mass of flight apparatus, kg; g = 9.81 m/s^2 – Earth gravity; K – aerodynamic coefficient of flight apparatus.

From equations (1-2) and T = 0, we can get the maximum start mass of aircraft, which started vertical and having the ion lift wing, for given power or need the engine power for given mass.

$$M = \frac{1}{g}\left(\frac{1}{2}\rho S P^2\right)^{\frac{1}{3}} \text{ or } P = \left(\frac{(Mg)^3}{\frac{1}{2}\rho S}\right)^{0.5}, \qquad (3)$$

where S – area of the ion lift wing, m^2; P – power of the lift ion engine, W.

In flight equation M (3) and maximum V are next (for T = 0):

$$M = \frac{K}{g}[T_2 - D] = \frac{K}{g}\left[\left(\frac{1}{2}\rho S_2 P_1^2\right)^{\frac{1}{3}} - \frac{P_1}{V}\right],\ \ V = \frac{P_1}{\left(\frac{1}{2}\rho S_2 P_1^2\right)^{\frac{1}{3}} - \frac{Mg}{K}},\ or\ V = \frac{P_1}{\left(\frac{1}{2}\rho S_2 P_1^2\right)^{\frac{1}{3}} - X},\ X = C_d\frac{\rho a V}{2}S\,. \qquad (4)$$

Where X is dragging the flight apparatus, N; a is speed of sound, m/s; $C_d \approx 0.1 \div 1.$ – coefficient of wave drags.

Evaluation of the basic data of some aircraft.

Supersonic aircraft such as the Tu-144 or Concord. Fig.1.

For estimation, we take the following initial data: the length of the average wing chord is 40 m, S_1 = 400 m^2, S_2 = 1200 m^2, K = 7-10, M = 180 tons, p = 1 kg/m^3 (height H = 1600 m), .

Then at subsonic speed V = 266 m/s, aerodynamic quality K = 10, and altitude H = 1600 m (p = 1 kg/m^3), the traction data will be

$$P_1 = \frac{1}{2}\eta\rho S_1 V^3 = \frac{1}{2}0.5\cdot 1\cdot 400\cdot 266^3 = 1.88\cdot 10^9 \text{ W},\ \ D = \frac{P_1}{V} = 707\ ton,\ ,\ T_2 = \left(\frac{1}{2}\rho S_2 P_1^2\right)^{\frac{1}{3}} = 1280\ ton. \quad (5\text{-}6)$$

$$X = \frac{Mg}{K} = \frac{180\ ton}{10} = 18\ ton, \qquad T = T_2 - D - X = 1280 - 707 - 18 = 555\ ton.$$

At supersonic speed V = 590 m/s, (Mach number M=2), aerodynamic quality K = 7, and altitude H = 10,000 m (p = 0.414 kg/m^3), the traction data will be

$$P_1 = \frac{1}{2}\eta\rho S_1 V^3 = \frac{1}{2}0.5\cdot 0.414\cdot 400\cdot 590^3 = 8.2\cdot 10^9 \text{ W},\ \ D = \frac{P_1}{V} = 1390\ ton,\ ,\ T_2 = \left(\frac{1}{2}\rho S_2 P_1^2\right)^{\frac{1}{3}} = 2520\ ton. \quad (7\text{-}8)$$

$$X = \frac{Mg}{K} = \frac{180\ ton}{7} = 25.7\ ton, \qquad T = T_2 - D - X = 2520 - 1390 - 25.7 \approx 1104\ ton.$$

The minimum power of conventional engines required for hovering at vertical launch with a wing area of S = 500 m^2 and a take-off weight of M = 180 tons is:

$$P = \left(\frac{(Mg)^3}{\frac{1}{2}\rho S}\right)^{0.5} = 11.38\cdot 10^5 \text{ kW}. \qquad (9)$$

These are 4.5 D-25 gas turbine engines with a total weight of about 6 tons (1 D-25 weighs 1,325 kg).

Disk space drone. Fig.2. Data: The disk diameter is 10 m, S = 78.5 m^2, M =100 kg.

Power required for "hovering" in the Earth's atmosphere:

$$P = \left(\frac{(Mg)^3}{\frac{1}{2}\rho S}\right)^{0.5} = 4.57 \text{ kW}. \qquad (10)$$

Excess thrust when flying in the Earth's atmosphere with V= 100 m/s near the surface is approximately T = 5 tons. This gives a huge opportunity for maneuvering.

Dipole micro-apparatus. Fig.3. Data: dipole length 10 cm, S = 0.785·10^{-2} m^2, M =10^{-2} kg, (10 grams).

The energy required to "hang" in the Earth's atmosphere:

$$P = \left(\frac{(Mg)^3}{\frac{1}{2}\rho S}\right)^{0.5} = 0.457 \text{ W}. \qquad (11)$$

Discussion.

As these estimates show, the proposed engine, if successful, means a huge breakthrough in aviation, space, rocket technology, transport and energy. This reduces the cost of delivering cargo and people to space by tens or hundreds of times, reduces the cost of long-distance flights, and opens up new opportunities for launching aircraft and spacecraft. The study and verification of the theoretical foundations of the proposed method is not difficult and can be carried out on desktop models and in existing wind tunnels. The system only needs small sources of ions. The disadvantage of the proposed engine is the lack of traction at the start—that is, at zero speed. However, if the airfields are equipped with sliding contacts for power supply or accelerators during launch, the bodies can be accelerated to high speed and launched from the usual existing airfields (see [1, 8-24]).

Reference:

1. Bolonkin A.A., **Ion Air Rocket Propulsion**. General Science Journal. 26 June 2020. English. https://www.gsjournal.net/Science-Journals/Research%20Papers-Engineering%20(Applied)/Download/8296
2. Габович М.Д., Пучки ионов и атомов для управляемого термоядерного синтеза и технологических целей. М. Мир, 1992, 354 с. (Russian).
3. Forrester T.A., Large Ion Beam. Fundamental of Generation and Propagation. Wiley. 1990. Форрестор Т.А., Интенсивные ионные пучки. М., Мир,1992, 354 с. (Translation in Russian).
4. Kikoin I.K., Table of Physics Values. Moscow, Atomizdat, 1976. (Russian).
5. Нащекин В.В., Техническая термодинамика и теплопередача. М. Высшая школа, 1969. (Russian). Naschekin V. V., Technical thermodynamics and heat transfer. (Russian).
6. Гришин С.Д., Лесков Л.В., Электрические ракетные двигатели летательных аппаратов. М. Машиностроение. 1989, 216 стр. (Russian). Grishin S. D., Leskov L. V., Electric rocket engines of aircraft.
7. Wikipedia. Wind energy. Ionization energy.

Additional articles:

8) Bolonkin A.A., **Electron Air Hypersonic Propulsion**. International Journal of Advanced Engineering Applications, Vol.1, Iss.6, pp.42-47 (2012). http://viXra.org/abs/1306.0003,
9) Bolonkin A.A., **Electronic Wind Generator**. Electrical and Power Engineering Frontier Sep. 2013, Vol. 2 Iss. 3, pp. 64-71. http://www.academicpub.org/epef/Issue.aspx?Volume=2&Number=3&Abstr=false http://viXra.org/abs/1306.0046.
10) Bolonkin A.A., **Electron Hydro Electric Generator.** International Journal of Advanced Engineering Applications. ISSN: 2321-7723 (Online), Special Issue I, 2013. http://fragrancejournals.com/?page_id=18, http://viXra.org/abs/1306.0196, http://www.scribd.com/doc/149489902/Electron-Hydro-Electric-Generator , http://archive.org/details/ElectronHydroElectricGenerator_532, http://intellectualarchive.com. #1089. Search: “Bolonkin”.
11) Bolonkin A.A., **Electron Super Speed Hydro Propulsion.** International Journal of Advanced Engineering Applications, Special Issue 1, pp.15-19 (2013), http://viXra.org/abs/1306.0195, http://archive.org/details/ElectronSuperSpeedHydroPropulsion.
12) Bolonkin A.A., **Electric Hypersonic Space Aircraft.** http://intellectualarchive.com, #1288;

http://vixra.org/abs/1407.0011 , 1 July 2014; http://www.scibd/doc/232209230, http://archive.org/details/ElectricHypersonicaircraft, http://gsjournal.net/Science-Journals-Papers/Author/1481/Alexander,%20Bolonkin .

13) Bolonkin A.A., **Electrostatic Generator and Electric Transformer,** http://Vixra.org/abs/1407.0016, http://GSJournal.net, 2 July 2014; http://intellectualarchive.com, #1289.

14) Bolonkin A.A., **Jet generator.** http://Vixra.org/abs/1407.0180 , https://archive.org/details/, http://gsjournal.net/Science-Journals-Papers/Author/1481/Alexander,%20Bolonkin

15) Bolonkin A.A., Electrostatic Gunnon. http://www.gsjournal.net , sent 11 13 19. https://archive.org/details/articleelectrostaticguneng101219 , www.IntellectualArchive.com#2217, http://viXra.org/abs/1911.0232 .

16) Bolonkin A.A., **Electric Ion Wind Generator.** 6 9 20. http://viXra.org/abs/2006.0067 Archive: https://archive.org/details/article-after-r-electro-ione-wind-generator-6-6-20. GSJournal, 6 8 20. https://www.gsjournal.net/Science-Journals/Research%20Papers/View/8276 .

17) Bolonkin A.A., **Thermonuclear Micro-Projectile and Methods for its Use in Defensive Protection from Space Rockets, Peaceful Energy and Transport. 9 22 19.** https://archive.org/details/articleafterrcstrategicdefthermonuclearmicro-projectileandmethodsforitsuseindefe , www.IntellectualArchive.com #2192, http://viXra.org/abs/1909.0475, http://www.gsjournal.net

18) Bolonkin A.A., **Cheap, Small Electric Space Propulsion (Launcher).** https://archive.org/details/articleelectriceng3spacelauncher111819 .

19) Bolonkin A.A., **Wind Energy – Electron Jet Generators and Propulsions**. USA, Lulu, ISBN 978-1-386-84732-5, 142 p. Book.

20) Bolonkin A.A., **AB Rocket Propulsion**. 7 18 20. GSJournal, https://www.gsjournal.net/Science-Journals/Research%20Papers/View/8317. https://www.gsjournal.net/Science-Journals/Research%20Papers-Miscellaneous/Download/8416 , http://viXra.org/abs/2007.0149 , https://archive.org/details/article-ab-propulsion-after-rbc-2-7-15-20

21) Bolonkin A.A., **AB self-pulling, no power Propeller.** GSJournal, https://www.gsjournal.net/Science-Journals/Research%20Papers-Engineering%20(Applied)/Download/8436, https://vixra.org/abs/2010.0058 .

22) Bolonkin A.A., **АБ само тянущий, без-энергетический Пропеллер. Russian.** Sent 10 9 20. GSJournal, https://www.gsjournal.net/Science-Journals/Research%20Papers-Engineering%20(Applied)/Download/8435.

23) Bolonkin A.A., **Wind engines for land transport.** GSJournal, https://www.gsjournal.net/Science-Journals/Research%20Papers-Engineering%20(Applied)/Download/8435

24) Bolonkin A.A., **Ветродвигатели для наземного транспорта. Russian.** GSJournal, https://www.gsjournal.net/Science-Journals/Research%20Papers/View/8438