AB Rocket Propulsion

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Abstract

The author suggests a unique method of movement using the energy of the medium of motion. The fact that the braking force (resistance) when extracting energy from the flow and thrust of the propulsion unit depend on the mass of the medium, which is involved in the inhibition (with energy recovery) and deadlift. If it is the same (or the same) mass, then the drag and thrust forces are equal. But if these masses are different (or the medium is different), then the forces are also different. This difference has long been widely used by mankind when the environment is different (wind-earth) (wind generators) or when the energy source is separated from the environment (all modern engines, rockets).

The peculiarity of the author's new engine is that its engine extracts energy and creates thrust in the same medium by redistributing energy (speeds) within the medium, using DIFFERENT masses of this medium. The difference in forces can be used to move (decelerate or accelerate) the aircraft.

In this case, the laws of conservation of energy and momentum of the system as a whole (apparatus-medium) are fulfilled.

For us, the important thing is that we can fly and launch into space for free, without the need for massive quantities of expensive fuel. This may seem like a fantastic, unprincipled far-out dream, but simple experiments can confirm or disprove thi presented theory.

Keywords: AB propulsion, aviation engine, space launch engine.

Introduction

Humanity long ago intuited that energy can be gotten from a visibly moving Earthly medium. Windmills have been known since ancient times, and modern wind generators already produce ~11.4% of electricity demand in the EU (2015). Not so many years ago, people widely used fleet sail-hoisting ships and even experimentally established that a sailing vessel can move at a speed greater than the wind speed, a special zigzag move opposed to the oncoming wind.

I remember fierce discussions between scientists about whether a windmill could move a ship against the wind. One group said that theoretically this is impossible, because the ship itself will create wind-energy to the windmill and it will be a perpetual motion machine, which is impossible. Another group said that, theoretically, a ship with a wind-engine can move strictly against the wind. Let me remind you that a sailing vessel cannot sail strictly against the wind at an angle of approximately ±45 degrees. These arguments would go on forever, until one craftsman took an ordinary board, attached a screw from a fan to it, connected it with a small screw located in the water, and showed that his ship was moving strictly against the wind.

Another example. Everyone probably remembers from physics or saw in warehouses that thanks to the block, we can lift heavy loads with a small force and move them over considerable distances. Or a wedge to break strong connections that require huge effort.

Here is another example closer to the topic under consideration in this essay – the wing of an airplane. We make a relatively small effort to move the wing (literally, a plane) in Earth’s air. To do this, a propeller or jet engine throws a relatively small stream (jet) of air (gases) at a high speed. The wing, when moving, deflects downwards a huge mass of air (approximately an ellipse with a large axis equal to the wingspan), but at a LOW speed (down) and supports the heavier than air large weight of the aircraft.

The ratio of the lift-force (weight) aircraft to the force of thrust (resistance) is called in aircraft engineering aerodynamic quality of the aircraft. In a good subsonic passenger aircraft, the aerodynamic quality reaches 18-19. Most subsonic aircraft have 10-14, and record gliders have up to 40. Supersonic and hypersonic aircraft 3-7. This means that the difference in force (due to the discarded mass) can be very significant.

The main idea proposed herein is to use this difference of forces to accelerate the aircraft and transfer energy from the medium to the vehicle. Note that the absence of wind at a given point does not mean that there is no energy in the given environment. Our environment is the whole Earth. The earth moves relative to the Sun, the Sun moves in the Galaxy, the Galaxy moves relative to other Galaxies, and so on.

The author additional idea is the use of electric fields that allow an effective energy extraction from motion and effectively use the environment (or rather its mass) to repel this environment with low energy.

Description of the Innovation. Plant fundamental.

The main innovation is that the author uses two different devices to extract energy from the flow and invest this energy in the traction electric field. This allows achievement of a high efficiency of energy extraction and investment (<100%), a large difference in the braking and discarded (accelerated) mass (difference in forces), and change the direction of the second force against the flow.

Approximately this surprising method of obtaining thrust is proposed by the author in an Ion-Air Rocket Engine [1]. The fundamental difference is that in [1] the energy generated by an electric generator is spent on air compression and the incoming and outgoing mass is the same. Such an engine can only generate thrust if energy is injected into it. This energy is injected into it by injecting conventional fuel into a conventional combustion chamber. Its huge advantage is simplicity, lightness, and most importantly, the absence of a gas turbine with blades, which allows you to sharply raise the temperature in the combustion chamber (efficiency). In addition, the simple replacement of the mechanical compressor and turbine with an electric field allows the preservation of the important advantage of an Air Rocket Engine - the thrust in place at zero,

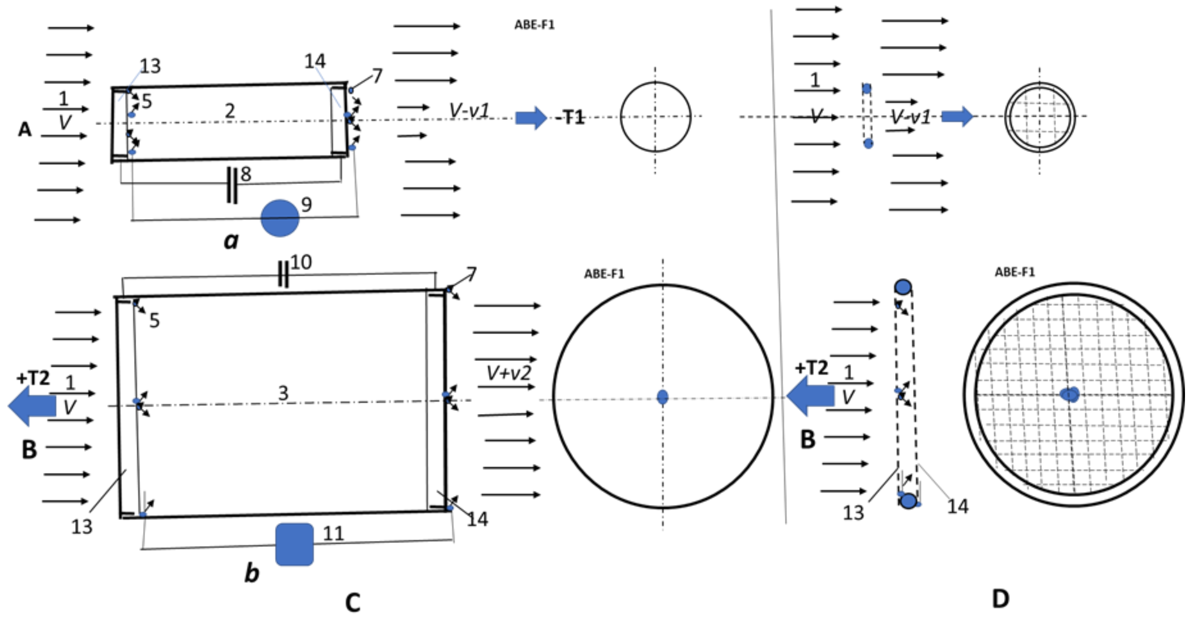

Fig.1C.(left). Ion-Air Rocket Engine, using the moving. **A** - Ion-Air Electric Generator; **B** – Ion-Air Electric Engine. *Notations*: 1 - air; 2 – electric rocket generator; 3 – electric rocket engine; 5 – ion injector; 7 – electron injector; 8 – condenser for creating the electrostatic field of Ion-Air Electric Generator; 9 - consumer of electricity; 10 - condenser for creating the electrostatic field of electric generator; 11 - issue of electricity; 13-14 – electrodes of high voltage. *V* – air speed, *v*1 is the reduction of the flow by the generator (braking), *v*2 – decreasing speed of the thread motor (with flow booster), -T1 – resistance of the power generator (tube 1), +T2 thrust of the tube 2.
Fig.1B.(lower, left). Ion-Air Rocket Engine, using the electricity. *Notations*: 1 - air; 5 – ion injector; 7 – electron injector; 10 – condenser for creating the electrostatic field into engine; 11 - issue of electricity (11≈9); 13-14 – electrodes of high voltage.

Fig.1D (right). Plat Ion-Air Rocket Engine. Electric Generator and Electric Engine has two nets.

Description of the proposed engine. (see also citation #1).

The proposed engine is shown in Fig. 1A, 1B (left). Figure 1A shows an ion electric generator, and Figure 1B shows an independent ion-electric ramjet engine that uses electricity generated by this generator.

An ion-electric rocket engine consists of an electric generator (tube 1) that serves to generate electricity (Fig.1A) and a ramjet engine 3 - a tube 2 for creating rocket thrust (Fig.1B). Their ratio depends on the purpose for which this installation will be used: such as an electric generator, or like a rocket engine, or both at the same time.

The ion electric generator 2 consists of a tube at the ends of which are located ring electrodes 13-14, connected to a capacitor 8, which creates a high-voltage braking electric field in the generator. In addition, in the front of the generator there are injectors of positive ions 5, and at the end of the generator there are injectors of electrons 7, which create an electric potential difference and a current through the consumer 9, 11 (Fig. 1C).

The pipe-ramjet engine (Fig.1B) accelerates the air flow passing through it by an electric field and creates thrust. Inside the tube-motor has a strong electric field created by the capacitor 10. There is a positive ion injector 5 at the inlet. The output is an electron injector 7. The injectors are connected to source 11 (in this case, 9).

Plant operation. The manner in which the proposed installation works.

The Generator receives air 1 through the inlet at a speed of *V*. The air enters a strong electric field and positive ions 5 are injected into it. Under the influence of a strong electric field, these ions are inhibited and colliding with air molecules transmit their kinetic energy to them, creating a counter-pressure that slows down the air. But the air, due to its high pressure and speed, overcomes this resistance and creates a high electrical voltage. This stress (energy) accelerates a large air flow mass in the lower tube (engine) and creates a significant useful thrust, which (if properly designed) propels the entire installation and aircraft. The exhaust air jet leaves the installation, where electronic injectors 7 inject electrons into it. The electrical circuit closes and the entire installation is neutralized.

From the thermodynamic point of view, the proposed installation is completely identical to a conventional air-using jet engine with an independent power source or an electric turbo generator [1]. But it has important fundamental differences: instead of a mechanical compressor, turbo generator and dynamo, a strong electric field is used. This immediately saves us from complex, expensive, massive turbines and magnetic dynamos, restrictions on the temperature and strength of the turbine blades. This also greatly simplifies, reduces the cost of construction, reduces the weight of the engine. This is shown in Fig. 1. The design has only pipes, high-voltage capacitors (which create electric fields, but do not consume energy!), ion and electronic injectors, the energy and mass expenditure of which is negligible (about 0.5

kg/day). The most surprising feature is that the proposed AB engine does not consume fuel, but extracts (redistributes) energy and momentum from the flow between the flow and the aircraft so that the total energy and momentum of the system (flow-aircraft) remain unchanged. The disadvantage of the proposed engine is that it cannot work in place and becomes effective (in terms of thrust) at high (especially hypersonic) speeds.

Note once again that the energy of capacitors 8, 10 is not consumed when the unit is running.

Good quality industrial capacitors can stay charged for days, weeks and months. Their charging energy is low. Recharging is possible during flight.

The resulting electricity can be easily converted into traction. Such a Converter (engine) is shown in Fig.1. It consists of a tube at the ends of which are reinforced electrodes 13-14 and injectors of ions 5 and electrons 7. The engine works as a compressor-accelerator of air molecules. It consumes electricity from a source 9. Unlike conventional ramjet engines, the proposed engine can generate thrust at any high speed. And in an airless space, it throws off only ions into the hard vacuum, turning into an effective powerful ion rocket engine.

Advantages of the proposed engine and generator.

The proposed fuel-free jet engine has important advantages over existing turbine-powered air-jet engines and liquid-propellant rocket engines. This is a giant leap in aviation and space. These advantages are as follows:

Compared to the Air Rocket Engine (ARD) and Ramjet Rocket Engine:

1. Operates without fuel, redistributing energy between the flow and the aircraft apparatus.
2. Extreme simplicity and cheapness. It's just a tube with an ionic and an electronic injector. It is simpler than a World War II German V-1 Buzz-bomb.
3. Low specific gravity. 3-4 times less than that of the ARD.
4. Unlimited maximum flight speed (up to 20-30 M).
5. Ability to work at high altitudes (up to 30-70 km).
6. Can create more thrust at hypersonic speeds.
7. It can work as a powerful starter during takeoff, using a ground-based electrical source and sliding contacts, i.e. it can work as a hypersonic gun.
8. Can be used as a shortened grid motor (Fig. 1, section D on the right).

Estimation and calculation of electricity.

Estimation of parameters of an electric generator and engine.

The proposed engine has two pipes (Fig. 1). The first pipe (top) is an electric generator, the second pipe (below) is an electric motor. The first pipe slows down the flow of air and generates electrical energy due to its braking. The second pipe, using the electrical energy obtained in the first pipe, accelerates the flow of air and creates traction. It would seem that in such a scheme we can only lose, since part of the energy is lost to friction, electrical resistance, and the total value equal to the thrust minus the resistance will always be negative. But the simplest estimates show that with the right design, this may not be the case. The fact is that the accelerated mass of air in the second pipe can be **many times greater** than the mass of air in the first pipe. And as a result, despite the small acceleration of the flow in the second pipe, the total force will become positive and will move the aircraft - Flight Apparatus In this case, the flow + engine + aircraft system does not violate either the Law of Conservation of Energy or the Law of Conservation of Momentum, taking into account the signs of energy and momentum. In this case, the system works the more efficiently, the greater the difference in the mass of the slowed and accelerated flows and the higher the speed of the Flight Apparatus (FA).

Simplified estimation formulas are provided below to estimate the thrust of the proposed new engine.

In our estimates, we neglect the consumption of positive ions and energy for their ionization, because these costs are small (see below). In addition, we neglect the energy consumption for air friction on cylindrical pipes. All expenses you can include in normal resistance of F A. Note that the normal resistance of F A can be reduced significantly, if you place the first pipe ahead of the aircraft, for the trumpet will reduce the speed of the airflow F A 2/3 of the speed of flight (Fig. 2).

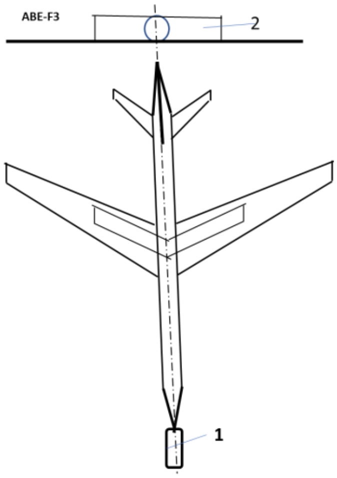

Fig.2. Subsonic aircraft, having the offered rocket engine. *Notation*: 1 - tube 1, 2 – tube 2.

Electric generator (tube 1).

Power of electric generator. Take the coordinate system associated with F A. Let's estimate the electrical power that we can get from a wind-driven electric generator. In our case, the flow is slowed down by an electric field [1].

The power generated by an electric generator can be estimated using the usual wind generator formula

$$P = 0.5\eta\rho S_1 V^3 , \qquad (1)$$

where P is power of wind generator, W; η is coefficient of efficiency. For a wind propeller it equals $\eta \approx 0.5$. Theoretical maximum is $\eta \approx 0.6$. Generator uses about 2/3 speed of flow; ρ is air density (for altitude $H = 0$, $\rho = 1.225$ kg/m^3; for altitude $H = 10$ km, $\rho = 0.414$ kg/m^3); S_1 is enter area of tube 1, m^2; V is flight speed, m/s.

Drag of Tube 1 is

$$D = P/V, \qquad (2)$$

where D is air drag, N.

Thrust of engine (tube 2). Thrust of engine (tube 2) may be getting from formulas energy and impulse in coordinate system of flight apparatus:

$$\Delta E = m\cdot\Delta V^2/2, \quad \Delta V = (2\Delta E/m)^{0.5} = (2P/m_s)^{0.5}, \quad m_s = \rho S_2 V, \quad \Delta V = (2P/\rho S_2 V)^{0.5},$$

where: ΔE is increment of the generator energy, *J; m is air flow mass, kg;* ΔV is the increment of the air speed into tube 2, m/s; m_s is mass of air flowing through tube 2 in 1 sec.; S_2 enters the area of tube 2, m^2.

From equations above we get the equation for thrust tube 2:

$$T_2 \approx P/\Delta V \approx (0.5\,\rho S_2 V P)^{0.5} , \qquad (3)$$

From (2)-(3) we get the equation for thrust the offered engine

$$T = T_2 - D . \qquad (4)$$

We will be used the equations (1) – (4) for estimation of the thrust of the offered engine.

From condition $T_2 > D$ we can get an inequality (condition), which that the proposed engine must satisfy:

$$(\eta S_1/S_2) < 1 , \qquad (5)$$

Estimation the engine quality is

$$k = S_2/\eta S_1 \,, \tag{6}$$

Do not think that the less η then all the better. For $\eta \to 0$ *, the* $P \to 0$.

From the equations (1)-(4) we can get the thrust of the offered engine at different sizes, at different speed and altitudes. Result of computation in Table 1.

Table 1. Thrust of AB engines for different speeds (Left-initial data, Right-computed data, efficiency η = 0.5).

#, Closed Type of Flight Apparatus or Sea ship	V- m/s speed of flight	H - km altitude	ρ-kg/m^3 density of air(w)	S_1 m^2 Enter (Tube 1)	S_2 m^2 Enter (Tube2)	P MW Power (Tube 1)	T_2 ton Thrust (Tube 2)	D ton Drag (Tube 1)	T ton Thrust of F.A.
1. Tu-154	250	5	0.736	2	20	5.74	10.3	2.3	8
2. Tu-144, Concord	600	5	0.736	2	10	79.5	41.9	13.2	28.6
3. Ballistic aircraft	6000	10	0.414	1	4	22300	1050	370	680
4. Satellite	8000	10	0.414	1	4	53000	1879	662	1208
5. Mars	12000	10	0.414	1	4	179000	4217	1490	2727
6. Solar system	17000	20	0.0889	0.25	1	27300	454	160	284
7. Sea ship, Baikal	10	0	1000	1	10	0.25	3.54	2.5	1.04

Notes:

1. Subsonic aircraft Tu-154 (having the conventional air rocket engine) has next data: mass 100 tons, fuel 40 tons, passengers 160-180, mass of empty 55 tons, flight speed 900 km/hour (250 m/s), range of flight 3900 km, aerodynamic quality ≈ 12.
2. Supersonic Tu-144, Concord: Start mass is 180-185 tons, Useful mass is 12-13 tons, Flight speed 2300-2150 km/hour (639-592 m/s, M=2), Aerodynamic quality ≈ 7.
3. High speed, long distance, ballistic flight.
4. Launcher of satellites.
5. Launcher to Mars and Venera.
6. Launcher to the far planets of the Solar System.
7. Application to water and sea ships. River-Sea ship "Baikal" has next data: displacement 1000 tons, engine 2×294 kW, speed 25.6 km/hour (7.1 m/s), passengers 355, team 40.

Estimation of flow of mass and energy of the ionizer.

The mass of the Ion. Let's assume that the engine power is 5 MW. Let's take Lithium-7 as an ionizer. Consumption of N_1 ions per 1 kg of air

$$N_1 = Q/q = 5.74/1.6 \cdot 10^{-19} = 3.59 \cdot 10^{19}, \quad 1/s\,,$$

here Q is the charge of 1 kg of air, C; q = 1.6.10^{-19}C the charge of ion 1, C.

Mass of ions in 1 kg of air

$$M_1 = N_1 n m_p = 3.59 \cdot 10^{19} \cdot 7 \cdot 1.67 \cdot 10^{-27} = 4.19 \cdot 10^{-7} \text{ kg/kg, air.}\,,$$

where n is number of neurons the Lithium-7; m_p is mass of 1 neuron, kg.

Therefore, the power of the 5 MW ionizer consumption will be

$$G_i = G_a M_1 = 7.62 \cdot 4.19 \cdot 10^{-7} = 3.15 \cdot 10^{-6} \text{ kg/s} = 11.4 \text{ gr/hour}\,.$$

Here G_a = 7,62 kg/sec is the air consumption of an engine 5 MW.

The fuel consumption of an aircraft engine with a power of 5 MV is equal to

$$G_f = P/q = 5 \cdot 10^6/40 \cdot 10^6 = 0.125 \text{ kg/s} = 450 \text{ kg/hour.}$$

where q is the calorific value of kerosene MJ/kg.

Energy of ionization. The ionization energy is v = 5 eV. For an engine with a power of 5MV, i.e. current i = 43.74 A the energy of ionization is

$$P_i = iv = 43.74 \cdot 5 = 219 \text{ W.}$$

Therefore, the influence of the mass and energy consumption of the ionizer on the flight characteristics of the engine can be ignored. Many elements can be ionizers.

Note that to launch 1 metric ton of cargo, you need at least 16 – 20 tons of expensive, toxic and explosive fuel.

The cost of launching 1 ton of cargo into space is 10 -15 million USA dollars. Even if Elon Musk reduces the cost of a normal launch by 2-3 times – this is not the solution to the financial expense problem, because the old method to drastically reduce the cost of launching, for example, by 100 times is simply impossible.

In addition, the proposed method would allow launches and operations of a spacecraft for years, like durable commercial and military airplanes.

The flight of one rich human tourist (100 kg) cost 30-40 million USA dollars a decade ago. So far, only about even tourists have actually visited space. By now, the price has risen to $ 100 million, but the queue is still growing. Companies are developing new services: flying around the moon, going into space, relaxing in an inflatable space hotel, flying around the Earth, etc.

High-speed cheap flights from continent to continent. The proposed engine can be used for flights to any long distances near the Earth, for example, New York – London, Paris, Moscow, Beijing, travel around the Earth, etc. The flight is performed in the same way as the spacewalk. The aircraft accelerates in the atmosphere to a high speed (for example, up to 6 km/s). In the final section the trajectory due to the wings and thrust is deflected up to 30^o and the device goes on a ballistic trajectory.

Other applications of the proposed engine. The engine (more precisely, its tubes Fig. 1D) can be made in the form of a large thin ring of a large diameter comparable to the diameter of the helicopter, with a double grid. Then the device can land and take off like a helicopter. The advantage over the helicopter will be that the device can develop high speeds. In addition, the advantage is in the simplicity and cheapness of the screw installation.

The engine can be used as a water transport engine {see [1]-[19] and #7 in Table 1}.

It could foster a true revolution in hypersonic missiles.

Discussion

The proposed engine, if successful, means a huge breakthrough in aviation, space, rocket technology, transport and energy. It reduces the cost of delivering cargo and people to space by tens or hundreds of times, reduces the cost of long-distance flights, and provides new opportunities for aircraft and spacecraft launches. The study and verification of the theoretical foundations of the proposed method is not difficult and can be carried out on desktop computer models and in available wind tunnels. The system only needs small ion sources. The disadvantage of the proposed engine is the lack of thrust at the standing start—that is, at zero speed. But if airfields are equipped with sliding contacts to supply electricity during the start, the F A can be accelerated to sound speed and run from conventional extant airfields.

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