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AB self-pulling, no power Propeller

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Abstract

The author explores a seemingly absurd idea: getting free traction in a stream of air or liquid. This seems to contradict the laws of conservation of energy and momentum. In fact, these laws are fully enforced. The peculiarity is that these laws apply to DIFFERENT masses. Everyone knows that you can get energy from a stream (wind turbines) and everyone knows that you can get thrust from energy (airplanes). The author examines the conditions under which the propeller thrust will be **greater** than the wind turbine resistance, i.e. we will get a positive thrust. This useful thrust can reach the value of the engine thrust during cruising flight, i.e. such a propeller aircraft will practically not consume fuel, can fly forever and will have an unlimited range. This is shown by the example of three propeller-driven aircraft: An-24 (medium passenger), An-22 (Antey, cargo), Tu-95 (military bomber). All that is required for this: slightly (0.2 – 0.5 m) increase the radius of the propeller and replace the propeller with an AB-propeller.

Keywords: self-pulling propeller, non-power propeller, air propeller, aircraft propeller.

Introduction.

The entire history of aviation and cosmonautics is the history of the struggle for fuel economy, duration, flight range (in aviation) and the necessary specific thrust when launching rockets. While working in the development of aviation and rocket bureaus, I remember how the bureau employees were proud that their aircraft flies a hundred kilometers further, and their rocket engine is 1-2 units (out of 380) more economical than similar products at home or abroad. But everyone has always believed that you need to carry fuel with you and it is impossible to get energy from the environment.

The author shows that you can get energy not only from the wind, but also from your own movement. True, this is accompanied by resistance - braking of the vehicle, but if this energy is correctly converted back into thrust, then this thrust, under certain conditions, can be **greater** than the drag force and can support the movement of the aircraft. However, the device must be repelled from another (larger) mass and have a sufficiently high (but currently achievable) efficiency: 0.5 for a wind turbine (industrial windmill), 0.82 - 0.86 (aircraft propeller). The first efficiency is the usual efficiency of wind power plants; the second is the usual efficiency of aircraft propellers. The simplest way in aviation – to transfer the torque from the first (brake) screw to the second (pulling) screw – is to connect them in one blade. At the same time, both parts of the blade should be rotated, designed for optimal cruising flight mode. Another way is to make them coaxial and connect them through a variable gearbox, which will make their revolutions independent of each other. Both propellers have constant pitch rotary blades.

Description.

Two variants (a,b) of the proposed AB propeller for aviation are shown in Fig.1. In the first version, both screws are rigidly fastened into one complex screw and rotate with the same number of revolutions. But the angles of alignment (attack) are regulated independently of each other. The first screw 1 (Fig.1a) is wind power (R_1). It is used to extract energy from the flow radius R_1. The first screw slows down the flow and creates aerodynamic drag. This braking is useful because it reduces the aerodynamic drag of the engine nacelle that is in a blocked flow. The second screw 2 with a large radius R_2, power pulling. Its swept area is several times larger than that of the first screw, it, on the contrary, accelerates the OTHER part of the flow (more mass) and creates a thrust that is greater than the resistance of the first screw, although their powers are equal. At the same time, it is very important that the swept area of the second screw is significantly larger (several times) than that of the first brake screw.

Unfortunately, there is an important circumstance: the resulting thrust strongly depends on the flight speed (V^2) and at zero speed is zero. Therefore, to take off, climb (climb) and accelerate to a high cruising speed, you need the help of a conventional turboprop engine or starter. When the desired speed is reached, the turboprop or piston engine can be switched off by means of a clutch or fuel cut-off, and the aircraft can fly as long as desired for an unlimited range. Currently, the cost of fuel is almost half of the ticket price. And combat aircraft are very limited in the radius of impact. Unlimited stay in the air is very important for surveillance drones. If necessary, the engine can be switched on at any time.

The second type of fuel-free propellers is shown in Fig. 1b. It differs in that the screws 1 and 2 are separated from each other and can rotate at different speeds. They are connected via a gearbox and can transmit power from screw 1 to screw 2. This is done because different revolutions can help in achieving higher efficiency of the propellers.

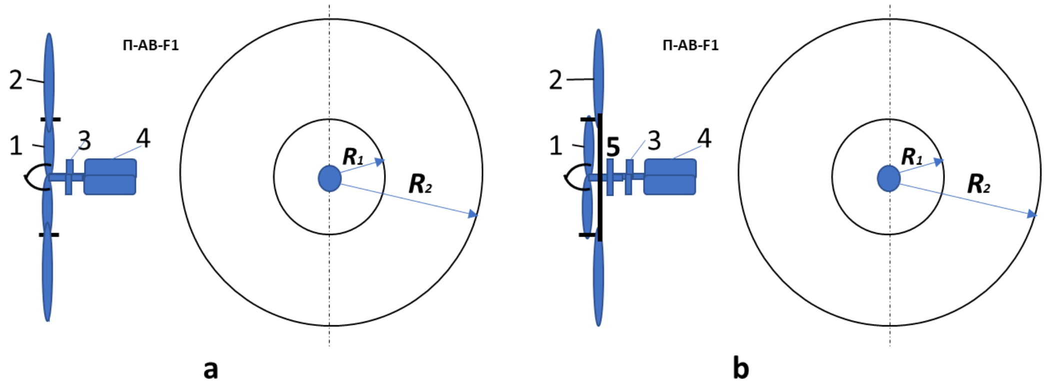

Fig.1. Without fuel and the pulling propeller of AB. *Designations:* **a** – version with connected propellers; **b** – version with separated propellers; 1 – propeller that takes energy from the flow; 2 – pulling propeller; 3 - coupling with the engine (the engine is used only during take – off); 4 – engine; 5 - gearbox for changing the number of revolutions between the propellers. R_1 is the radius of the screw 1, R_2 is the radius of the screw 2.

The proposed method requires only the replacement of the existing propeller on the plane on the screws AB. If we can accelerate the plane at the start (as is done on drones or using accelerators), then the engine of such an aircraft is not needed at all. This dramatically reduces the cost of the aircraft, increases its load capacity and simplifies operation.

Some difficulty (reduced efficiency) may cause the desire not to change the diameter of existing screws. This can be objected to, as calculations show, the desired increase in the radius of the propeller 2 by about 0.15 – 0.5 m and may be within the tolerance and the propeller 2 will not touch the ground. In extreme cases, it is necessary to raise the engine nacelle a little.

During the discussion, a wish was expressed: how to save tens of thousands of aircraft and engines operated in the world without significant alterations. To do this, the author suggests making a prefix to existing aircraft engines, shown in Fig. 2.

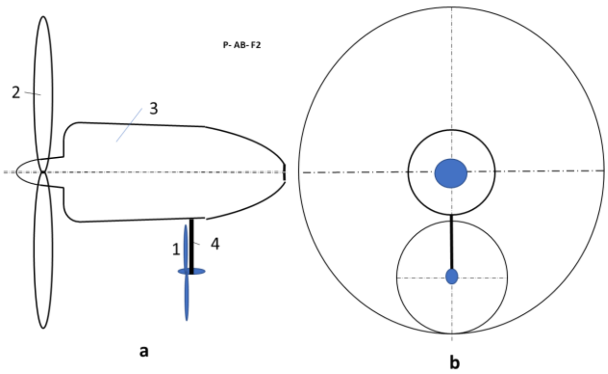

Fig.2. AB prefix to a conventional aircraft engine turns it into a fuel-free perpetual flight engine. *Designations*: **a** –

side view; **b** – front view; 1 – propeller that takes energy from the flow; 2 – conventional pulling propeller; 3 – conventional aircraft engine; 4 – power transmission shaft (rotation from propeller 1 to the engine).

AB Prefix is a wind screw 1 (engine), which transmits rotation through the shaft 4 to the launch complex (shaft) or end of the air aircraft engine (turboprop or piston), and thereby to the pulling screw of the aircraft engine. In cruising mode, you can stop the fuel supply to the engine and it will work as a simple transmission shaft.

Advantages of the proposed screw.

Advantages of AB propeller:

1. Creates free thrust and thus flight for unlimited time and range. (a similar idea when launching rockets provides a free launch into space and cheap, fast long-distance space flights).
2. Increases the useful or paid load by 25-50% (from the weight of the aircraft) due to the lack of fuel.
3. Can increase by another 10-15% (of the weight of the aircraft) the useful or paid load by removing the engines, if the aircraft starts using a ground starter or special accelerators.
4. Reduces almost twice the cost of tickets of passenger aircraft at the expense of fuel economy.
5. In the case of complete abandonment of aircraft engines, it halves the cost of the aircraft and its maintenance costs.
6. Reduces almost twice the resistance of the body (engine nacelle or fuselage) located immediately in the flow behind the propeller 1, because the propeller 1 reduces the speed in its flow.

Theory of AB propeller.

Energy (power), which the propeller can get from an air flow is:

$$P_1 = 0.5\eta_1\rho S_1 V^3, \qquad (1)$$

where P_1 is power from propeller 1, W; η_1 is coefficient efficiency of the wind propeller, (conventionally it is 0.5); ρ is air density, kg/m^3; S_1 is area swept by an air screw 1 (propeller 1), m/s.
Air drag D (N) of propeller 1 is

$$D = P_1/V = 0.5\eta_1\rho S_1 V^2, \qquad (2)$$

Power (a rust of propeller 2) we can receive from Laws of Energy and Momentum conservation:

$$P_2 = 0.5 m_s \Delta V^2, \quad T_2 = P_2/\Delta V, \quad m_s = \rho S_2 \Delta V, \ \Delta V = (2P_2/\rho S_2)^{1/3}, \ T_2 = (0.5\rho S_2 P_2^2)^{1/3}, \quad P_2 = \eta_2 P_1 . \ (3)$$

Here P_2 is a power produced propeller 2, W; m_s is an air second mass expense of the propeller 2, kg/s; ΔV is an increase the air speed after propeller2, m/s; ρ is air density, kg/m^3; S_2 is area swept by an air screw 2 (propeller 2), m^2; η_2 is an efficiency coefficient of the propeller 2 (conventionally it is 0.82 – 086).
The trust of the propeller 2 must be more, then the drag of the energy propeller 1:

$$T_2 > D . \qquad (4)$$

From condition (4)-(1) we get the condition of a positive trust

$$(\eta_2^2 S_2/\eta_1 S_1) > 1 . \qquad (5)$$

Than more this inequality, then better.
Radius of propellers 1 and 2 (Fig.1) are computed by equations:

$$R_1 = (S_1/\pi)^{1/2}, \quad R_2 = [(S_2/\pi)+R_1^2]^{1/2}.$$

Examples of propeller AB ratings for aircrafts An-24, An-22 (Antey), and Tu-95 aircrafts.

1**. An-24** *medium passenger aircraft*. Data: Take-off weight 21 tons, two AI-20 turboprop engines, power 2x1815 kV, AB - 72 series 2 propeller, screw diameter 3.9 m, cruising speed 480 km/h = 133 m/s. The number of aircraft produced is 1986. Many of them are still in operation. The cost is 3 ÷ 7 M$.

Let's take the following data for calculating the AB of the propeller: S_1 = 4 m^2, S_2 =16 m^2, η_1 = 0.5, η_2 = 0.84, ρ = 1 kg/m^3. Then: The power and resistance of the propeller 1 are equal:

$P_1 = 0.5\eta_1\rho S_1 V^3 = 0.5 \cdot 0.5 \cdot 1 \cdot 4 \cdot (133)^3$ = 2352000 W, $D = P_1/V$ = 2352000/133 = 17684 N ≈ 1.77 tons

The power and thrust of the propeller 2, and the useful thrust of the propeller AB are equal to:

$P_2 = \eta_2 P_1 = 0.84 \cdot 2352000 = 1.97 \cdot 10^6$ W, $T_2 = (0.5\rho S_2 P_2^2)^{1/3} = [0.5 \cdot 1 \cdot 16 \cdot (1.97 \cdot 10^6)^2]^{1/3} = 3.14$ ton,
$T = T_2 - D = 3.14 - 1.77 = 1.37$ ton for one engine.

With an aerodynamic quality of 15 and a flight weight of 20 tons, the aircraft needs 20/15=1.33 tons of thrust. That is, it can fly even if one engine fails. This is required by the rules of multi-engine aircraft.

The radii of the first and second propellers are equal:

$R_1 = (S_1/\pi)^{1/2} = (4/3.14)^{1/2} = 1.27$ m, $R_2 = [(S_2/\pi)+R_1^2]^{1/2} = [(16/\pi)+1.27^2]^{1/2} = 2.25$ m.

The existing conventional screw has a radius of $R = 1.95$ m.

2. *Powerful transport aircraft* **An-22** (Antey). Data: Take-off weight 227 tons, four NK-12 turboprop engines, power 4x11227 kW, AB-90 coaxial propeller, screw diameter 6.2 m, cruising speed 560 km/h = 155 m/s. The number of aircraft produced is 69. Many of them are still in operation. The cost is about 35 M$.

Let's take the following data for calculating the AB of the propeller: $S_1 = 9$ м^2, $S_2 = 36$ м^2, $\eta_1 = 0.5$, $\eta_2 = 0.84$, $\rho = 1$ kg/m^3. Then: The power and resistance of the propeller 1 are equal to:

$P_1 = 0.5\eta_1\rho S_1 V^3 = 0.5 \cdot 0.5 \cdot 1 \cdot 9 \cdot (155)^3 = 8.46 \cdot 10^6$ Вт, $D = P_1/V = 8.46 \cdot 10^6/155 \approx 5.46$ tons. Power $P_2 = \eta_2 P_1 = 0.84 \cdot 8.46 \cdot 10^6 = 7.11 \cdot 10^6$ W, $T_2 = (0.5\rho S_2 P_2^2)^{1/3} = [0.5 \cdot 1 \cdot 36 \cdot (7.11 \cdot 10^6)^2]^{1/3} = 9.66$ tons. Useful thrust is
$T = T_2 - D = 9.66 - 5.46 = 4.2$ tons per engine or 12.6 tons per 3 engines.

With an aerodynamic quality of 16 and a flight weight of aircraft is 200 tons, the aircraft needs 200/16 = 12.5 tons of thrust. That is, it can fly even if one engine fails. This is required by the rules for multi-engine aircraft.

The radius of the first and second propellers are equal:

$R_1 = (S_1/\pi)^{1/2} = (9/3.14)^{1/2} = 1.69$ m, $R_2 = [(S_2/\pi)+R_1^2]^{1/2} = [(16/\pi)+1.27^2]^{1/2} = 3.58$ m.

The existing conventional screw has a radius of $R = 3.1$ m.

3. *Strategic long-range bomber* **Tu-95**. Data: Take-off weight of 182 tons, four NK-12 turboprop engines, power 4x11227 kW, coaxial screw, screw diameter about 6.2 m, cruising speed of 750 km/h = 208 m/s. The number of aircraft produced is 212. Many of them are still in service.

Let's take the following data for calculating the AB of the propeller: $S_1 = 9$ м^2, $S_2 = 36$ м^2, $\eta_1 = 0.5$, $\eta_2 = 0.84$, $\rho = 1$ kg/m^3. Then: The power and resistance of the propeller 1 are equal:

$P_1 = 0.5\eta_1\rho S_1 V^3 = 0.5 \cdot 0.5 \cdot 1 \cdot 9 \cdot (208)^3 = 20.2 \cdot 10^6$ W, $D = P_1/V = 20.2 \cdot 10^6/208 \approx 9.71$ tons.

The power and thrust of the propeller 2, and the useful thrust of the propeller AB are equal to:

$P_2 = \eta_2 P_1 = 0.84 \cdot 20.2 \cdot 10^6 = 17 \cdot 10^6$ W, $T_2 = (0.5\rho S_2 P_2^2)^{1/3} = [0.5 \cdot 1 \cdot 36 \cdot (17 \cdot 10^6)^2]^{1/3} = 13.7$ ton,

$T = T_2 - D = 13.7 - 9.7 = 4$ ton for one engine or 12 tons for 3 engines.

With an aerodynamic quality of 15 and a flight weight of 182 tons, the aircraft needs 182/15 = 12.1 tons of thrust. That is, it can fly even if one engine fails. This is required by the rules for multi-engine aircraft.

The radii of the first and second propellers are equal:

$R_1 = (S_1/\pi)^{1/2} = (9/3.14)^{1/2} = 1.69$ m, $R_2 = [(S_2/\pi)+R_1^2]^{1/2} = [(16/\pi)+1.27^2]^{1/2} = 3.58$ m.

The existing conventional screw has a radius of R = 3.1 m.

Discussion.

For any sane reader and specialist, the idea of free (without fuel) flight is associated with the idea of a perpetual motion machine and is rejected without consideration on the basis of the Law of conservation of Energy. The author himself, at one time, exposed a lot of very clever ideas of the perpetual motion machine. Although the nuclear engine is essentially a practical version of the "perpetual motion" engine. Isotope decay (energy release) can last for centuries or millennia.

In the proposed idea of an AB propeller, there is no violation of the Law of Conservation of Energy, because energy is extracted from the driving (relative to the apparatus) flow and converted into thrust. The question here is different: is this thrust enough to compensate for the resistance of the energy recipient, i.e. is the law of Conservation of Momentum observed? The Law of Conservation of Momentum is closely related to the Law of Conservation of Energy and is formulated for the case when we are dealing with the **same** mass. Then any manipulation of energy within this mass will either result in conservation of momentum (in the case of 100% energy conversion), or loss of energy and momentum. As shown above, we fulfill the Law of Conservation of Energy, because we use only the energy that we receive. The Law of Conservation of Momentum is also fulfilled, since we use another, **larger mass** to create thrust, the excess of which compensates for the loss of thrust on the resistance and the efficiency of the propeller 2 is less than 100%.

In the folding economy, blocks are widely used, which allow a small force to lift heavy goods.

Here is an example from aviation. Engine thrust in horizontal flight is equal to the weight of the aircraft divided by the aerodynamic quality (M/K), and is equal to approximately 7% – 10% of the weight of the aircraft. The full weight of the aircraft is supported by the wing, which throws down a huge mass of air and creates a force equal to the weight of the aircraft, i.e. a force of K = 10 -18 times more thrust. In this case, the wing works as a huge blade AB propeller 2 with a diameter equal to the wingspan.

As an example, we can point out such a well-known strange fact that a sailing ship with a side wind can develop a speed several times greater than the wind speed [5]. But here the repulsion comes from another (water) environment.

The scientific intuition of the author protests against the possibility of flight in a homogeneous environment to get more thrust from the resistance of the resistance, but allows to get less a thrust then resistance, i.e. reducing fuel consumption. A thrust equal to the resistance is possible with efficiency coefficients equal to one. Only in this case, the device will not lose speed and can move almost indefinitely. For example, celestial bodies, electrons in molecules, or nucleons in stable nuclei move.

The AB propeller theory was developed above in the Theory section. It shows that long-term movement is possible. There are also estimates made for 3 widely used aircraft at the present time. The proposed method promises a revolution in aviation and cosmonautics. The theory is easy to test on a simple desktop model of the AB propeller. You only need a good fan to create air flow, a craftsman to create a high-quality AB propeller and a sensitive thrust meter. I hope that such a craftsman will be found.

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