# DESIGN OF SHIELD, FRICTION AND HYDRAULIC AIRIUMS TO PRODUCE POWERED MOTION OF OBJECTS USING AIR

BY

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## ABSTRACT

*Energy is derived from air when the air pushes and causes an object to move. During my eighteen years of research work, I developed three devices to derive energy from air in different ways. In the first case, a pivoted object exposed to air has part of its surface shielded from air pressure. This causes it to rotate steadily. In the second case, a shaft is immersed into a hollow cylinder through the open end. The friction force between the shaft and the cylinder is made slightly less than the force due to atmospheric pressure on the exposed face of the shaft. The cylinder moves steadily when exposed to air due to the force of air on its closed end. In the third case, a pipe containing a frictionless piston is filled with oil. Hydraulic principle is then used to make the oil exert force on the piston at regular time intervals, causing it to push a pivoted object at regular intervals. The pivoted object therefore rotates steadily. It is therefore concluded that energy can be derived from air using the above three methods.*

## INTRODUCTION

Energy is the capacity to do work (Hannah and Hillier 1970). Different forms of energy include chemical, nuclear, potential, kinetic electrical and heat energy. Heat for instance, is a transfer of energy due to temperature difference (Nelkon 2008).

One of the major problems in physics and engineering is how to produce powered motion of objects. Powered motion is used for doing work or deriving different forms of energy. To achieve this, scientists had worked hard in the past to invent different engines such as steam, petrol, diesel and jet types. Specifically, an engine is a device that converts energy into useful work (Hannah and Hillier, 1970). To develop technologically and enjoy a high standard of living, it is necessary to replace these heat engines with more convenient devices. This can be achieved using air at ordinary temperature. Atmospheric air has a high pressure of $101300N/m^2$ (Nelkon 2008) and as a result, exerts a considerable force on a given surface. Compressed air exerts a higher value of force on a given surface because it has a higher pressure. Air consists of a mixture of gases (Ababio 2007). Such gases include oxygen, nitrogen, carbon dioxide, the inert gases etc. Air is therefore, a fluid. A fluid is characterized by its ability to flow and occupy space (Hannah and Hillier 1970). The total thrust exerted on a plane surface immersed in a fluid act at a point on the surface known as the center of pressure, and the direction of the resultant pressure exerted by a fluid at a rest on a solid surface is always perpendicular (normal) to the surface (Hannah and Hillier, 1970). From the above statement, the direction of the resultant force on a plane surface due to a fluid at rest is therefore, perpendicular to the surface at the center of pressure of the surface. Depending on the area of a surface and the pressure of air, the force exerted by air on a given surface can move heavy objects such as cars, ships, trains and aeroplanes steadily at a high velocity. However, observation shows that air does not move objects exposed to it.

Using the knowledge of vector, this can only be explained by the fact that the force exerted by air on a given surface of an object is exactly opposed, in magnitude and direction, by the force it exerts on a directly opposite and equal surface of an object.

Equal surfaces have the same dimensions, and therefore, equal areas. This means that the forces acting on them due to air of a given pressure are equal in magnitude. The aim of my research is to achieve by manipulation, powered motion of objects using air, and in so doing, derive work directly from air.

Described later are the three devices which I developed for this purpose. They were generally named "airium", a word which I derived from the English word 'air'. Air is the invisible mixture of odourless, tasteless gases that surrounds the earth (Merriam Webster).

In heat engines, there is no perpetual motion, that is, they cannot do work continuously without external supply of energy. The chemical energy of the fuel released by igniting it is converted to heat energy. This causes a rise in the temperature of a gas which therefore, expands and does work by driving a piston or rotating a turbine wheel. The energy output or work done cannot be greater than the chemical energy of the fuel. Motion of the shaft or turbine wheel stops when the energy content of the fuel is exhausted if there is no further external supply of energy (fuel). Therefore, the total energy output in a heat engine is not a function of time but a function of initial energy content of the fuel. Unlike the heat engines, once the airiums start functioning, no external supply of energy is required. The motion continues as long as desired and the work done or energy output is therefore, a function of time. This is unusual as it contradicts the law of conservation of energy which states that energy can neither be created nor destroyed (Nelkon, 2008). However, energy is now created with time in the airiums. The energy output in the airiums therefore has unlimited value compared to the energy input.

One or more friction airium (F.3a) can be fixed to a vehicle and the resultant force ($P_B$-K) – (air resistance + ground friction) turns the wheel of the vehicle directly. Therefore, with adequate control, the airiums can be used to power or drive vehicles directly.

The airiums that produce rotational motion can also be used to power vehicles. If any of these types is fixed to a vehicle so that it blows air out of a pipe in one direction as rotation takes place, then, the vehicle moves in opposite direction.

The mechanical energy derived from the rotation of the discs in the rotating airium can be converted to electrical energy in a dynamo. The dynamo, which is a generator of electrical current, makes use of electromagnetic induction. A disc magnet will be spun round in front of a stationary coil by the rotating shaft of an airium so that there is a relative motion between the magnet and the coil. This relative motion is a condition for the flow of an induced current – current without cells and batteries (Nelkon 2008). The current causes an electric bulb to glow, for example. Thus electrical energy is obtained in this way using the airium.

The airiums, e.g. the friction type, can be used to support the weight of vehicles, ships, trains, aeroplanes, massive buildings and bridges. This is done by placing the airiums at appropriate positions on the object with the resultant force produced by the airiums pointing vertically upwards. For an aeroplane, when there is a landing problem, the airiums can be used to support its weight till appropriate steps are taken.

The rotating airiums can be used to power industrial machines such as water pump. Such a water pump can be used to rehabilitate desert lands and drought – affected areas. All that is needed is to install pipes from high seas to the deserts. Once the pump starts pumping water, the process continues indefinitely because the airiums produce perpetual motion. The disadvantage of the airiums is that they can fly and therefore can be used to convey missiles.

## OBJECTIVES OF THE RESEARCH

The existing heat engines are costly to afford, complex and not easy to maintain. In addition, they operate at very high temperatures and pollute the environment with noise and exhaust fumes. The objective of this research is to design devices that do not have the above mentioned disadvantages and which are relatively efficient. In addition, such devices should be more convenient to use.

### The Mechanism of the Shield Airium

The device is named Shield Airium (Fig. 1) because a surface of a pivoted object, positioned in such a way that a force acting on it (due to air pressure) supposed to have a turning effect (moment) about the center of the pivot, was shielded from exposure to air at regular time intervals. The resultant moment by the pivoted object HJK (Fig 1) becomes the sum of the moments of the forces acting on the other surfaces that were not shielded, considering their magnitudes and directions. Object HJK is a disc made of non-magnetic material but has a hole at the center through which the shaft passes. When the circuit is closed, N repels n (which is a north pole of another magnet), extending the springs so that the surface G presses the surface JK of the pivoted object, shielding it (JK) from air pressure so that the pivoted object rotates. When the circuit is open, N looses its magnetism and the springs return to their original positions, causing JK to be exposed to air pressure.

HJK therefore, rotates continuously about the pivot due to repeating closing and opening of the circuit. The net force rotating HJK when JK was shielded from air is the force of air on side HK (Fig. 1). This is because the direction of the force on HJ passes through the center of the pivot, so that its moment is zero.

## AIR AS AN ALTERNATIVE SOURCE OF ENERGY (DIAGRAMS)

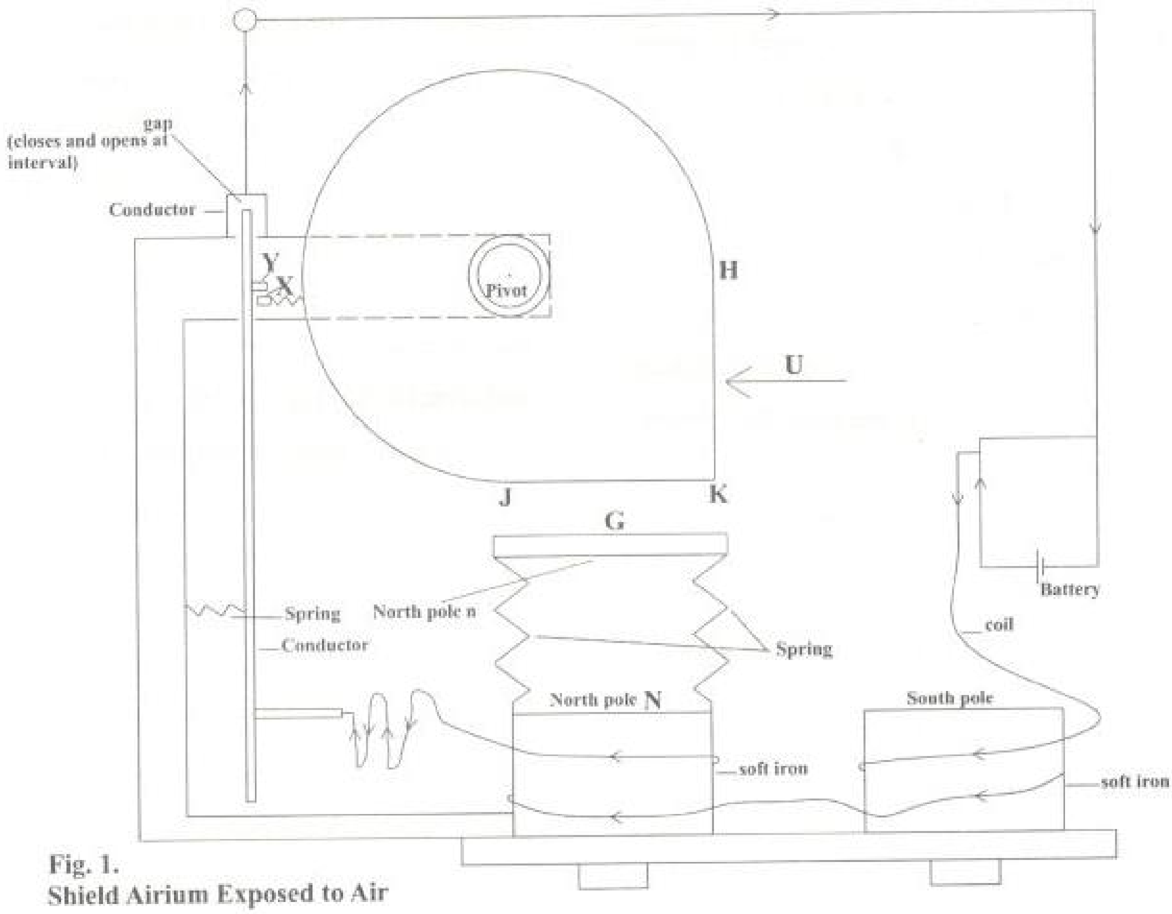


Fig. 1.
Shield Airium Exposed to Air

## The Design of the Airium

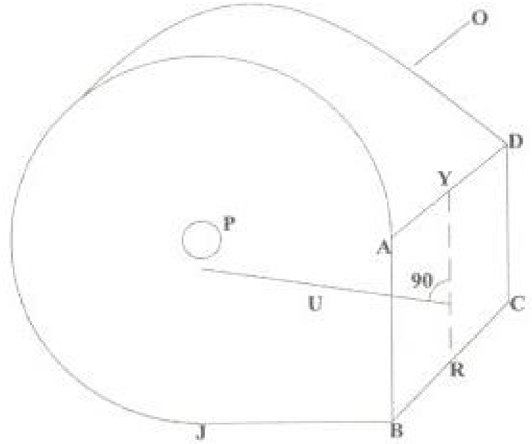


Fig 2. pivoted object O representing HJK in fig 1

Three dimensional drawing (Fig.2) in which HJK is represented by the pivoted object O. Also in Fig. 2, YR̂ is represented by HK (Fig. 1). YR is taken to be a vertical line parallel to HK and passing through the center of pressure of ABCD. AD is the length of object. If AB or YR is 0.2m and AD is 0.05m, then, the area of ABCD = 0.2m x 0.05m = $0.01m^2$.

Force on ABCD = pressure x area = $10^5 N/m^2$ x $0.01m^2$ = 1000N (atmospheric pressure = $10^5 N/m^2$).

The pivot is positioned in such a way that it is vertically above line U which is perpendicular to YR. Line U is the line of action of the 1000N force on ABCD. It is therefore, perpendicular to ABCD and passes through the center of pressure of ABCD.

**Theoretical Consideration**

The moment of a force about a point or axis P = force x perpendicular distance from P to the line of action of force (Nelkon 2008). Therefore, if the perpendicular distance from the center of the pivot to line U is Am, the moment of the force about P = 1000N x Am = 1000A Nm. This is the moment which causes O to rotate and represents the energy derived from air.

NB: Disc HJK in Fig. 1 is a plane representing objects O in Fig. 2, and lying between the ends of object O. The position of this plane depends on the position of line ABCD through which objects YR passes. For a given surface area of HK, in order to obtain a higher force and therefore, a higher turning effect, it is necessary to use compressed air at a high pressure. This is achieved by putting the airium in a sealed container (not shown), with the rotating shaft projecting out of the container and then compressing air into the container at the required pressure.

**FRICTION AIRIUM**

The device is named Friction Airium because friction force, by opposing motion of part of a system, causes motion of the entire system in its (friction) direction. For a load lying on a plane surface, if the surfaces are pressed together with a normal force (due to the weight of the load, for example), then, in order to move the load on the plane, a force tangential to the two surfaces has to be overcome. This force is known as friction force and the maximum friction force just before the load moves is called limiting friction (Hannah and Hillier, 1970).

## DESCRIPTION OF FRICTION AIRIUM

Figure 3a shows the diagram of Friction Airium. A cylinder C with a shaft D fitting tightly inside it at one end is exposed to atmospheric air. A is the face of the shaft exposed to air and B, directly opposite it, is the face of the cylinder exposed to air. A vacuum V exists in the cylinder between B and D. A spring S is used to connect B and D. The directions of the resultant air pressure on A and B are perpendicular to them (A and B) at their respective centers of pressure, and correspond to the directions of the resultant forces (due to air on A and B).

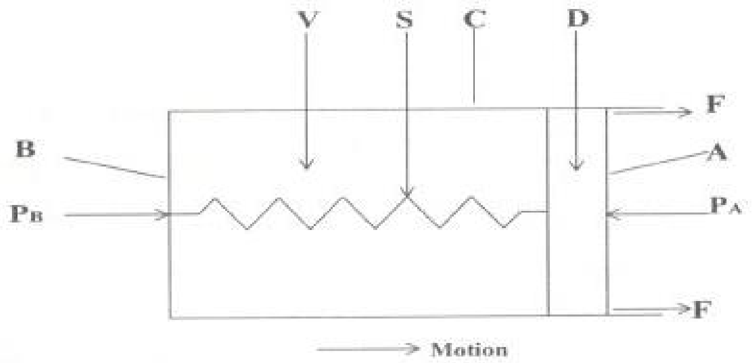


**Fig .3a**
**Friction Airium (Linear Motion )**

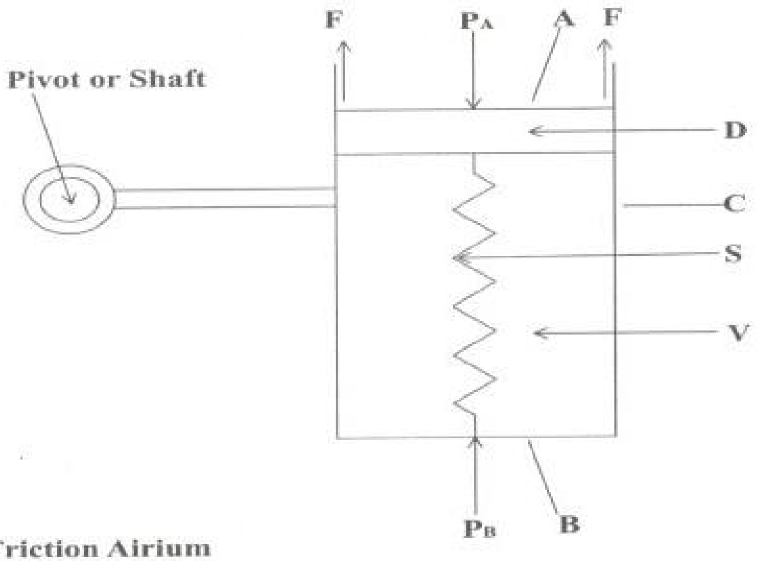


**Fig .3b Friction Airium (Rotation )Exposed to Air**

**Theoretical Considerations**

The resultant forces due to air on shaft A and cylinder face B are respectively $P_A$ and $P_B$. These forces are equal and opposite since the cross-sectional areas of shaft A and cylinder B are approximately equal.

Let the cross-sectional area of shaft A or cylinder B be $0.12m^2$.

Then, force P on each face is calculated as

P = atmospheric pressure x area of the face

$= 10^5 N/m^2 \times 0.12m^2$

$= 10^5 N/m^2 \times 12 \times 10^{-2} m^2$

$= 12 \times 10^3 N$

atmospheric pressure = $10^5 N/m^2$

The value of the limiting friction between D and C should not be greater than this force ($12 \times 10^3 N$) otherwise D will not slide inside C. In fact, the limiting friction F can be taken to be say $11.7 \times 10^3 N$ and it is the maximum value of the friction force when D is just about to slide.

Now, since F is equal to $11.7 \times 10^3 N$ and $P_A$ is equal to $12 \times 10^3 N$, it can be seen that $P_A$ is more than what is required to overcome friction force, or to cause sliding of D in C in its ($P_A$) direction. When sliding has started, the force K with which D is pushing the spring against the inner face of B is K = P-F = $(12 \times 10^3 - 11.7 \times 10^3)N = 0.3 \times 10^3 N$ = 300N. K has the same direction as $P_A$.

Initially, the connection of S to D and B is such that no tension existed in S or else, it would increase the value of liming friction. Now, $P_B$ is $12 \times 10^3 N$ or 12000N. This is greater than K by the amount $P_B - K$ = (12000-300) N = 11700N.

Again, if the friction force between the cylinder and the ground, added to air resistance is say, 100N, then, net force acting on the entire object in the direction of $P_B$ is (11700-100) N = 11600N.

The object therefore, moves with a net force of 11600N. The cylinder C can be pivoted so that a net force $(P_B\text{-}K) - y$ (y is air resistance) rotates it continuously about the center of the pivot (Fig. 3b) with a constant moment.

**DERIVING ENERGY FROM AIR**

Referring to Fig. 2a, if the total mass of C, D and S is 20kg then, from the relation, force = mass x acceleration (Nelkon 2008)

11600 = 20kg x acceleration

$\therefore$ Acceleration = $\dfrac{11600N}{20kg}$

$= 580N/Kg = 580m/s^2$

For an object starting from rest,

$S = ½ at^2$ (Nelkon 2008)

Where

S = distance moved by the object in the direction of force

a = acceleration of the object

t = time (s)

Therefore, at the end of 100s, the total distance traveled by the object is

$S = ½ \times 580m/s^2 \times (100s)^2$

$= 29 \times 10^5m.$

This, off course, is the actual distance the object traveled in 100s provided it does not reach its terminal velocity within the time.

An accelerating object starts to travel with constant velocity after an initial acceleration. This maximum velocity of the object is called its terminal velocity (Nelkon 2008).

We therefore assumed that the object (Fig. 2a) is accelerating before the end of 100s.

The velocity reached at the end of 100s is calculated as

$v^2= u^2 + 2as$ (Nelkon 2008)

v = final velocity

u= initial velocity

a = acceleration

s= distance traveled

The initial velocity u = 0, since the object started from rest

$V^2 = 0^2 + 2 \times 580m/s^2 \times (29 \times 10^5)$

$:. V = \sqrt{33640000\, m^2/s^2}$

= 5800m/s

The kinetic energy K.E. of the object is given by

$K.E ½ mv^2$ (Nelkon 2008)

m = mass

v = velocity

$:. K.E. = ½ \times 20kg \times (5800m/s)^2$

$= 3.364 \times 10^{10}Nm$

$= 3.364 \times 10^{10}J$

$= 3.364 \times 10^7KJ$

This is the energy derived from air in 100s.

## HYDRAULIC AIRIUM

The device is named Hydraulic Airium because it uses the hydraulic principle to function. Hydraulic principle implies that the pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and the walls of the container (Okeke and Anyakoha 2006).

Figure 4 shows the diagram of hydraulic airium. The cylinder Y is connected to pipes X and M. They are filled with suitable oil. The lower end of X is immersed in a container V containing compressed air. Also immersed in V is a thin rod U fixed to a plate W. A hole Z exists in the lower end of X. When W covers Z, it (W) prevents the oil from being exposed to the compressed air. A rod Q on disc L is fixed to a spring $S_2$ bearing a small object T. Another rod G is fixed to L and bears a curved object D. The shaft B of the piston has a tapered end which is fixed to another curved object C.

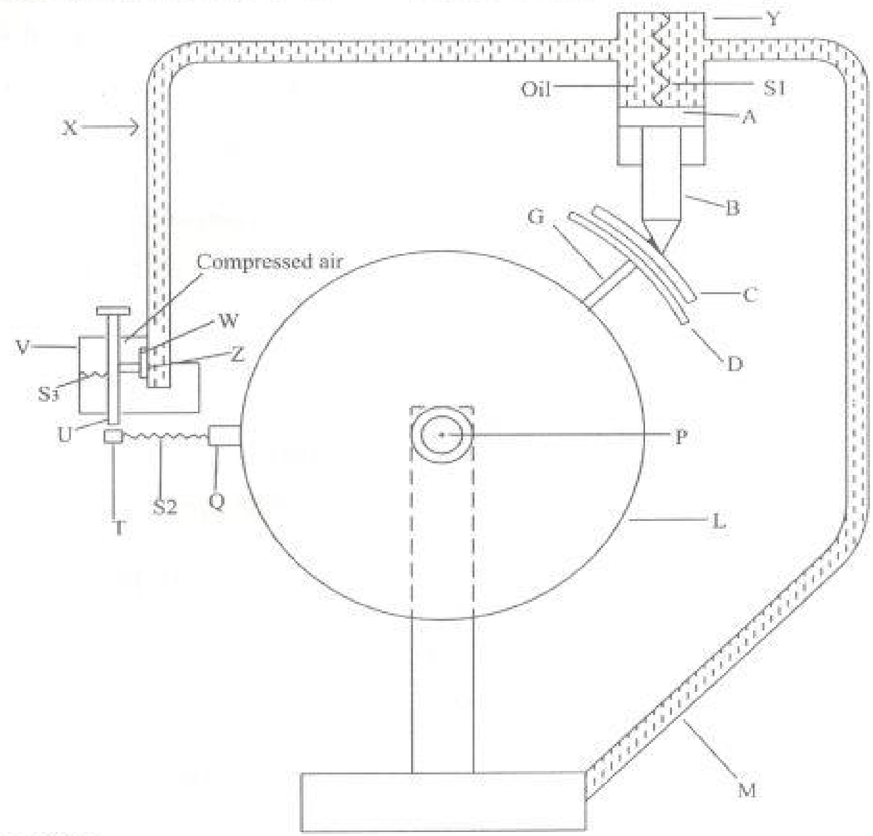


**Fig.4 hydraulic Airium**

Both D and C are parts of a cylindrical object with center P. Whenever C and D are in the positions shown T and U are in contact with each other. To operate the device, U is pulled up from its upper end (with a hand, for example). As a result, W moves up, uncovering Z and exposing the oil to the pressure of compressed air.

The pressure of oil on piston A, then causes a force proportional to its cross-sectional area to act on it.

Now, A with the tapered end of its shaft welded to C, pushes D as it moved down in response to the force. This causes L to rotate. At the same time, spring $S_2$ and T pass out of the base and side of V with ease even though they make contact with them. This is because $S_2$ though stiff, is flexible and can easily bend to make the movement possible.

It was mentioned earlier that U was pulled up with a hand. As it (U) is connected to V by a spring $S_3$, it falls back to its position due to the pull of $S_3$. Consequently W moves down, covering Z so that the pressure of the compressed air is no longer transmitted to the oil at the moment.

As the force on A due to the pressure of compressed air transmitted to the oil no longer exists, A moves up due to the pull of spring $S_1$ and the oil returns to its original level, filling X, Y and M to the brim again. When D comes to the position shown in the diagram (Fig. 4) as L rotates, T strikes U with a great force, causing it (U) to move up together with W. The oil is again exposed to the compressed air, force is exerted on D and the process continues indefinitely, repeating itself at regular intervals of time.

If the force exerted on the surface of A and perpendicular to the surface is say, $10^5$N, then, the moment of this force about A is calculated as Moment = force x perpendicular distance from P to the line of action of the force.

If this perpendicular distance is 0.3m, then

Moment = $10^5$N x 0.3m = $10^5$N x 3 x $10^{-1}$m

= 3 x $10^4$Nm

= 3 x $10^4$ joules.

This is the mechanical energy derived from air each time a force acts on A.

## CONCLUSION

The successful design of shield, friction and hydraulic airiums makes it possible for energy to be derived from air.

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