THE ALTERNATIVE DIMENSION IN ANGULAR MOMENTUM

(29TH Sun Jan 2012)

It is observed that the subject area under 'Angular Momentum', 'Conservation of Angular Momentum' and 'Direction of Angular Momentum' was not well defined in the 'Classical and Medieval Mechanics' and this technical paper is born to challenge the gloomy theorizations within the particular subject area.

01. What is Momentum?

Alternative Definition:

Momentum is the Degree of Directional Mass Mobility at any Instant of any Dynamic System

1.1 LINEAR MOMENTUM

1.11 Linear Momentum of a moving Rigid Body:

Product of the body's Mass and its Velocity at the Center of Gravity

$p = m_x v$.....[kg.m/s]-is a vector quantity

1.12 Linear Momentum of a moving closed system of non- rigidly packed particles:

The integrated product of Mass and Velocity of all the particles of the closed system resulted at the Center of Gravity

$p = \sum mv$.....[kg.m/s]-is a vector quantity

1.2 CONSEVATION OF MOMENTUM

Newton's law of conservation of momentum states that ***if no external force acts on a closed system of objects or particles, the momentum of the closed system remains constant***

(There could be no arguments upon this definition and the way how Newton defined the external force, if it could affect the momentum, is certainly interesting)

1.3 DIRECTION OF MOMENTUM

Alternative Definition:

Is the direction along which, the mass is capable of doing work due to its momentum

02.What is Angular Momentum?

Alternative Definition:

Angular Momentum is the Degree of Mass Moment Mobility at any Instant of any Dynamic Rotary System about the Axis of Rotation

2.1 ANGULAR MOMENTUM

Product of mass moment and angular velocity about the axis of rotation

$L_o = I\,\omega$ ..... ($kg{\cdot}m^2s^{-1}$) [I-moment of inertia about the axis, ω -angular velocity]

2.2 AXIS OF ROTATION

Axis of rotation is always perpendicular to the plane of mass motion and it should not necessarily be always at the center of the plane

2.3 DIRECTION OF ANGULAR MOMENTUM?

Lots of complicated definitions, different explanations and disagreements could be observed upon this subject area in the so far developed background science. Hand rules are also born because of the complexity in explaining the direction of angular momentum.

The right-hand rule was first introduced (1687) to explain the direction of angular momentum by **Sir Isaac Newton** and long after **John Fleming** has introduced both right and left hand rules (1892) to explain a phenomenon in Electromagnetism.

Hand rules were more over used in explaining ***the way how a phenomenon behaves,*** *where as the founder himself was not certain enough of the* ***mechanism behind the phenomenon****.*

But the Scientist of the 21st century has got to see ***the mechanism behind the phenomenon*** *rather than admitting of hand rules or otherwise the danger in it, scientific realities too may become myths for our children to believe.*

2.31 Direction of Angular Momentum in Classical Newtonian Mechanics:

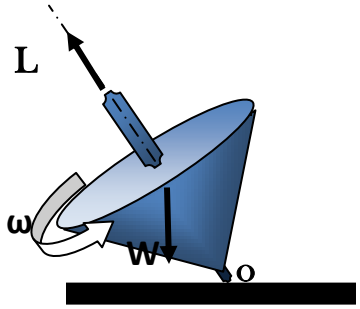


FIGURE-1

Whereas any object is rotated in screw driving direction, angular momentum, the vector quantity, is directed along the axis of rotation

However this theory doesn't explain well how the child's top is erected vertically. Even if any axial force is developed in the so called direction of angular momentum 'L', it cannot turn the top about 'o', in against of the weight 'W', which is acting vertically downwards at the center of gravity.

If the top is rotated other way round, then the direction of 'L' should be reversed according to the theory but no physical difference could be observed and the top is erected all as the same.

However the mystery of the child's top seems to have misguided the classical and modern Physicists as well, through centuries and as a result, much complicated subject area was formed related to ***Conservation of Angular Momentum****.*

2.32 Conservation of Angular Momentum?

Since, the principle of **Conservation of Energy** is more than adequate to explain whatever it is of a motion in **Applied Dynamics ($E_k = ½ mv^2$)** or in **Space Dynamics ($E=mc^2$),** It is difficult to understand why the concept of '***Conservation of Angular Momentum'*** is so highly recognized by the scientists.

Simply a child gives an angular momentum to a weight tighten to a string by rotating it around himself and once the string is broken, the weight starts moving along a straight line. Angular momentum is then converted in to linear momentum and in the simple logic 'was angular momentum conserved there? But very clearly the **kinetic energy** was conserved before and after the incident such that; $½ I \omega^2 = ½ mv^2$.

*However it is observed that, the Scientists in the Classical and Medieval period got used to interconnect any complicated motion, of which the mechanism was not very clear for them, with that false concept of '****Conservation of Angular Momentum****'.*

The direction of angular momentum, as defined in the Classical Mechanics, is also contradictory because the system is incapable of doing any work along the axis of rotation

2.33 The Alternative Dimension upon the Direction of Angular Momentum

Alternative Definition:

It is the same direction of the angular velocity on the plane of rotation upon which, the rotary system is capable of doing work due to its Directional Kinetic Energy.

(Phenomena of flux vortexes of charged particles in Electromagnetism or the phenomena of mass motion in conical, cylindrical or spherical vortexes in fluid dynamics should not be interconnected with angular momentum because the principles are quite different—Pl ref. 'Behavior of the Three Basic Space Matter'/Space Dynamics/V-1 /2009 and 'Star Mechanism'/Space Dynamics/V-3/2011)

2.4 ANGULAR MOMENTUM RELATED CASE STUDIES

Naturally the simplest cases draw the most complex definitions and the incidents of the child's top and the rolling wheel could draw much complicated definitions grown perhaps beyond galaxies.

2.41 Case of a Moving Wheel:

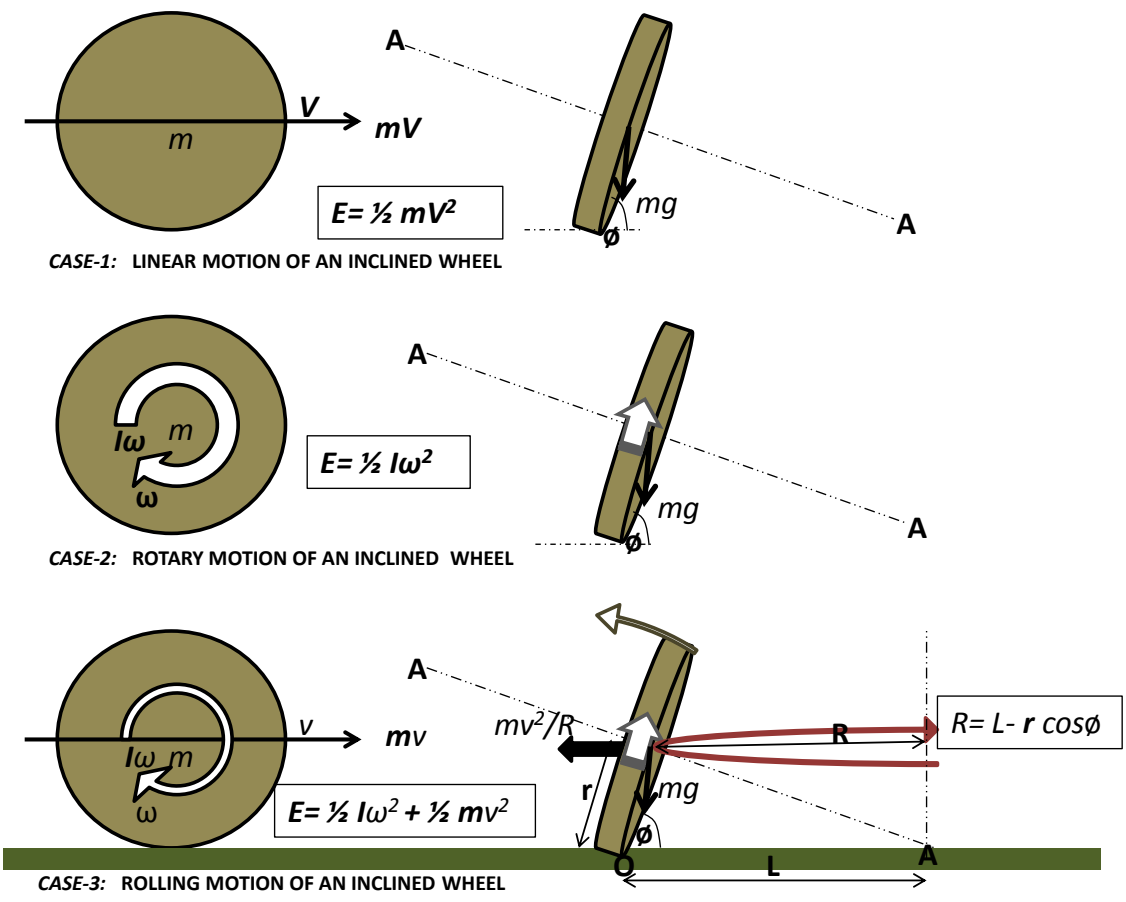


FIGURE-2

Case-1 of the figure-2:

The wheel of mass '**m**' is moving at a velocity of '**V**'. The wheel can turn to any direction while moving because it is not rotating. The axis through the center of gravity, perpendicular to the plane of the wheel, '**AA**' is not conserved at all by the linear momentum '**mV**'. Also, the moving body is capable of doing work, due to its momentum, only in the direction of its motion.

It proves that only the moving direction is conserved by the 'Directional Kinetic Energy' (*or by* ***linear momentum*** *according to the classical explanation****) and it is capable of doing work only along the direction of its motion***

Case-2 of the figure-2:

The wheel is not moving but just rotating at an angular velocity of 'ω' and it possesses an angular momentum of '$I\omega$'.

The axis of rotation '**AA**' is conserved by the '***Directional Kinetic Energy'*** *of the rotating system.(or* by **angular momentum** according to the classical explanation)

Any rotating system conserves the axis of rotation and it is capable of doing work, only in the direction of angular velocity upon the plane of rotation.

Case-3 of the figure-2:

i. As shown in the figure, the inclined rotating wheel touches the ground or any **frictional plane**

ii. The initial ***Angular Momentum*** of the rotating wheel is **converted** in to a ***Linear Momentum*** + a ***Rolling Momentum*****,** as soon as it touches the ground due to **frictional force** applied upon the plane of rotation

iii. If the ground is frictionless, the inclined rotating wheel will just fall upon the ground while rotating

iv. But as the ground is frictional, the rotating wheel starts rolling on the ground

v. The initial Angular Momentum becomes a rolling moment um + a linear momentum. But **Directional Kinetic Energy** is well conserved there such as; $\frac{1}{2} I\omega^2 = \frac{1}{2} I\omega^2 + \frac{1}{2} mv^2 + \Delta E$ where 'ΔE' represents the frictional loss of energy during the transition

vi. The inclined wheel is erected vertically due to the centrifugal force 'mv^2/R' where '**v**' is the velocity of the rolling wheel and '**R**' is the radius of turning about the vertical axis at which the axis of the wheel cuts the ground. With gradual erection of the wheel the radius 'R' grows bigger and then the force of erection 'mv^2/R' is reduced proportionately.

3.0 Phenomenon of Action and Perpendicular Reaction in Rotary Systems

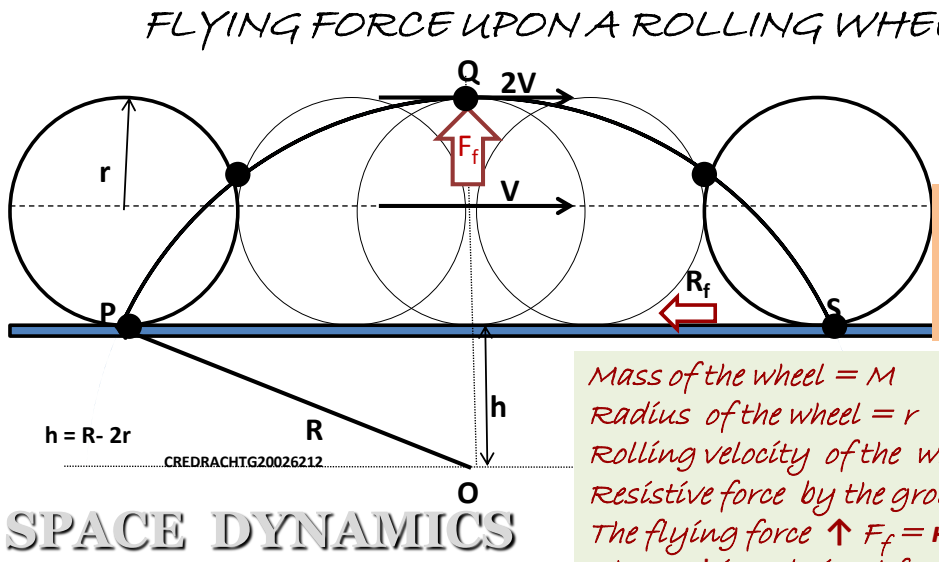
'Action- Reaction' the first law of Newtonian Mechanics explains that; ***The mutual forces of action and reaction between two bodies are equal, opposite and collinear.***

The law is quite clear and the phenomenon was very well explained in the classical mechanics. But in addition to that, there is another phenomenon which seemed to have overlooked in the classical mechanics to explain and that is 'Action-Perpendicular Reaction' in rotary systems.

3.1 THE PRINCIPLE OF 'ACTION- PERPENDICULAR REACTION' IN DYNAMIC ROTARY SYSTEMS:

Definition:-

Whence a dynamic rotary system is disturbed by any Action(an external force applied in the plane of rotation), a Perpendicular Reaction (an internal force)is developed to move the system away from the Obstacle.



A ring wheel of mass 'M' is rolling on the plane at a velocity of 'V' and the motion of any unit mass 'm' in the ring exhibits an orbital motion abut the center 'O' at any instant , as shown in the figure.
The unit mass develops a Centrifugal Force- $m(2V)^2/R$, due to its highest velocity '2V' at 'Q'. But only a certain percentage of the total ring mass is participating to develop the flying force 'F_f' ,at any instant of the rolling.

Therefore the Flying Force upon the ring wheel = $f\ M(2V)^2/3.46r$ ↑ (N), where 'f' is a factor to be deduced practically or mathematically. If 'κ' is nominated to represent all the constants in the expression;
The flying force ↑ $F_f = \kappa\ MV^2/r$

FIGURE-3

3.11 Energy based deduction of the Flying Force:

Work done by the resistive force-R_f per one cycle of rolling ***$=2\pi r.R_f$***

Work done by the flying force –F_f by lifting the mass against gravity, up to a height of 2r during one cycle of rolling ***$=2r.F_f$***

Both work done must be equal ***$2r.F_f=2\pi r.R_f$***

The flying force $F_f = \pi R_f$

Notes:

- ***Rf in above deduction depends on the frictional coefficient at the contact on the resistive plane and the perpendicular load at the contact. The frictional coefficient reaches its ultimate value with the growing speed of rolling. For an instant, a slow vehicle passes a mud, without slipping but a fast vehicle skids.***
- ***Rolling radius-r is the other important factor because rolling speed becomes higher when it decreases. When rolling speed (RPM) grows, proportionately the action-Rf too grows up.***
- ***Mass of the flying wheel is the other factor which is important in developing the flying force***
- ***However the above expressions are just deductions and it is up to Mathematicians to work out the exact relation for the flying force***

3.12 Reminiscence of the observation:

One day when I was a child of grade-2 , I observed a car moving fast on the road in front of our house in the countryside. Suddenly a wheel cover of the car released and flew off just like a flying saucer towards me. That incident never flew off from my mind and after some decades, it struck my mind again and again to think back 'how could that wheel cover fly in against of the mighty influence of Gravity?'

3.13 The phenomenon behind:

Where there is a disturbance in the rotating plane of any dynamic rotary system, it starts rolling about the obstacle and then, a perpendicular force is developed to move the system away from the obstacle.

3.14 How does it explain the incident?

The car wheel with the fixed wheel cover was rolling on the road surface. Though a flying force is developed in the wheel, it cannot fly because of heavy weight of the car. But once the wheel cover was released from the lock, it flew off due to the internally developed Flying Force.

3.15 The 1st Principle of Flying Saucer:

Once, a set of fast rotating wheels is disturbed by a clutch operated resistive plane, the wheels start rolling on the plane creating an internal force to fly.

(Then what is the 2nd principle of Flying Saucer? It is just to support the mechanism of the 1st principle, by reducing the mighty force of gravity and a vague clue is given in my 2nd publication – 'Gravity/Space Dynamics-V2 /2009)

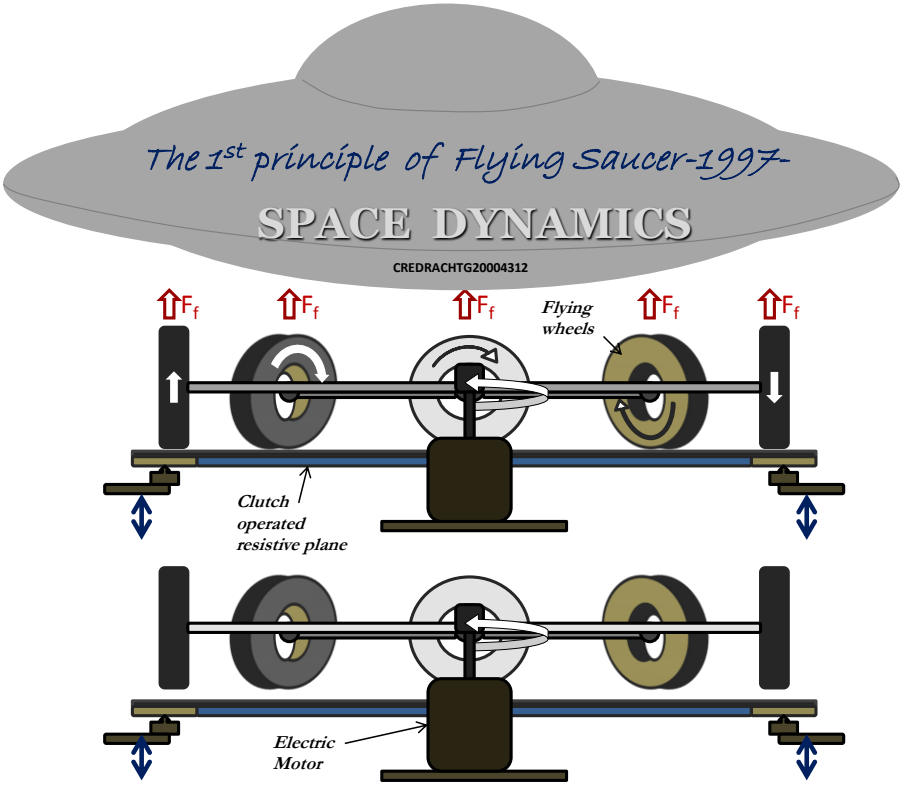


FIGURE-4

3.15 Flying Saucer must be the best expeditor among all other spacecrafts:

i. It doesn't need a medium to travel
ii. It doesn't need a runaway to takeoff or for landing
iii. It doesn't make any sound if the motor is driven by a solar/nuclear energizer
iv. Smaller sets of '***Flying Turbines'***, of the same principle, can be used to generate driving forces for moving forward, turning around, lateral movements and for application of brakes too.

3.2 CASE STUDY OF THE BOOM RANG:

There are lots of much complicated explanations regarding the motion of a Boom Rang in the background science but it is so simple to explain by the new principle of '***Action-Perpendicular Reaction***' of dynamic rotary systems.

3.21 What is the importance of the medium?

If you throw a boom rang in the space, in absence of air, the thing would not return at all because no resistive plane is created there for it to roll upon. Without rolling, no ***perpendicular reaction*** is developed and therefore, the thing will disappear along a straight line while rotating.

When it is thrown in a resistive media, only a single side of the rotating plane, undergoes a bigger resistance 'R' due to its motion while rotating. Then the rotating thing starts rolling upon the more resistive air strip. Where there is a rolling in any rotary system a ***perpendicular reaction 'F'*** is developed to move the system away from the obstacle and by this way the boom rang tends to turn gradually resulting a completion of an orbit.

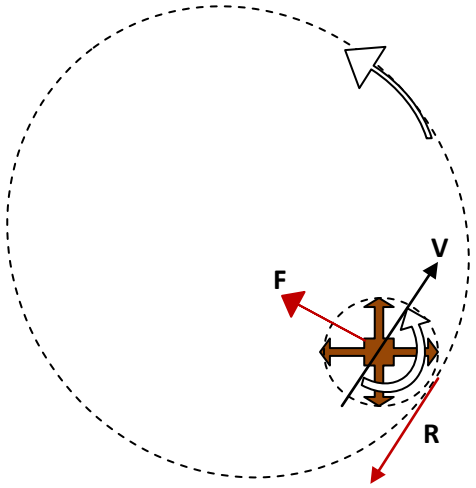


FIGURE-5

3.3 CASE STUDY OF THE CHILD'S TOP

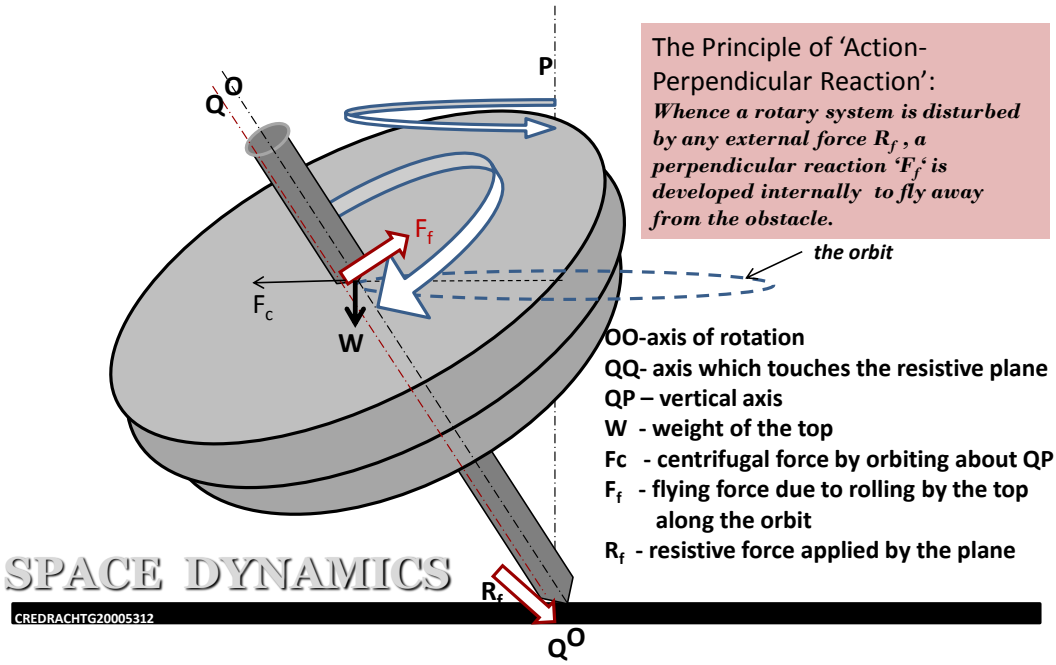
Just imagine how the most bewildering secrets of the nature were hidden in toys for children. The principle of '*Action-Perpendicular Reaction in Rotary Systems* 'can explain the secret of the child's top without any reference to the gloomy theorizations in '***Conservation of Angular Momentum***'.

3.31 What happen if the plane is frictionless?

If the plane is too smooth, the top will fall upon the surface because no action 'R_f' could be generated in its plane of rotation.

3.32 What will happen if the pin bottom is too sharp just like a needle?

The top will fall upon the plane because the eccentricity of the 'action-R_f' in the plane of rotation is not adequate to generate a considerable 'reaction- F_f'. (pl see the distance between axis OO and QQ in figure-6)



Due to the inclination of the top, the resistive force by the plane is applied only at where it touches the plane. Due to this obstacle, the top starts rolling upon the plane by orbiting about the vertical axis 'QP'. To overcome this obstacle, the rotating system develops a 'Perpendicular Reaction – F_f' which is quite capable of erecting the top against all other forces.

FIGURE-6

3.34 What will happen if edge of the body (rotating plane)touches the ground?

The 'action- R_f' will be shifted to the new contact point and the 'reaction- F_f' will become quite incapable of lifting the body without having an adequate lever arm. Then rolling and orbiting will start. If the centrifugal force-Fc is big enough, then the rotating plane will become vertical and the top will be rolling straight without orbiting any more.

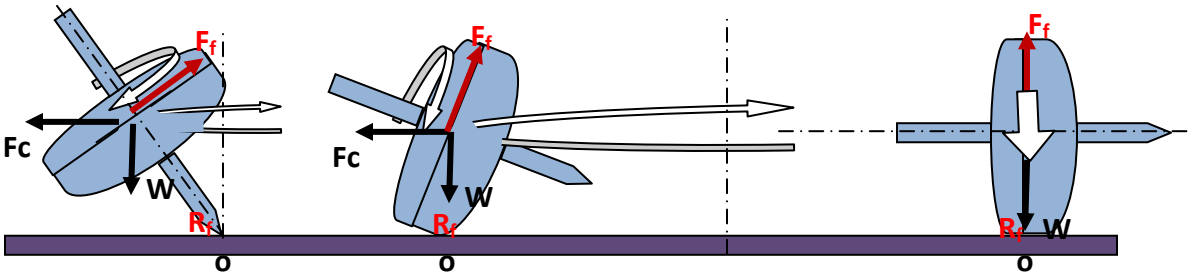
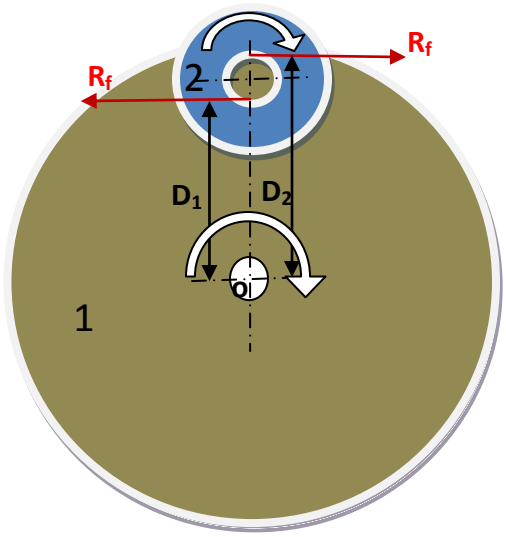


FIGURE-7

3.4 THE CASE OF ROTATING WHEEL AND THE DENTIST'S CHAIR

The rotary motion induced upon the person who is sitting in the dentist's chair with a rotating wheel in hand can also be explained without any reference to the theory of '*conservation of angular momentum*'



When the wheel-2 is rotating, a frictional force 'R_f' is applied upon the center axle and it creates a moment about 'o', the center of the wheel-1, to rotate it too, in the same angular direction.

Moment = R_f (D_2-D_1)

FIGURE-8

3.41 Does it happen in a frictionless world?

When the wheel-2 of the figure-8 is rotating, a frictional moment is created upon the axle and let's consider only the critical resistive force- R_f for simplicity of our deduction.

Then the resultant frictional moment about the center of the chair-$R_f(D_2-D_1)$ makes the wheel-1 (the chair)too, rotate very gently as shown in the figure-8.

Rotation of the wheel-2, could not be transferred at all in to the wheel-1, in a friction less world. Therefore it is just a work of friction but not because of any gloomy influence of conservation of angular momentum.

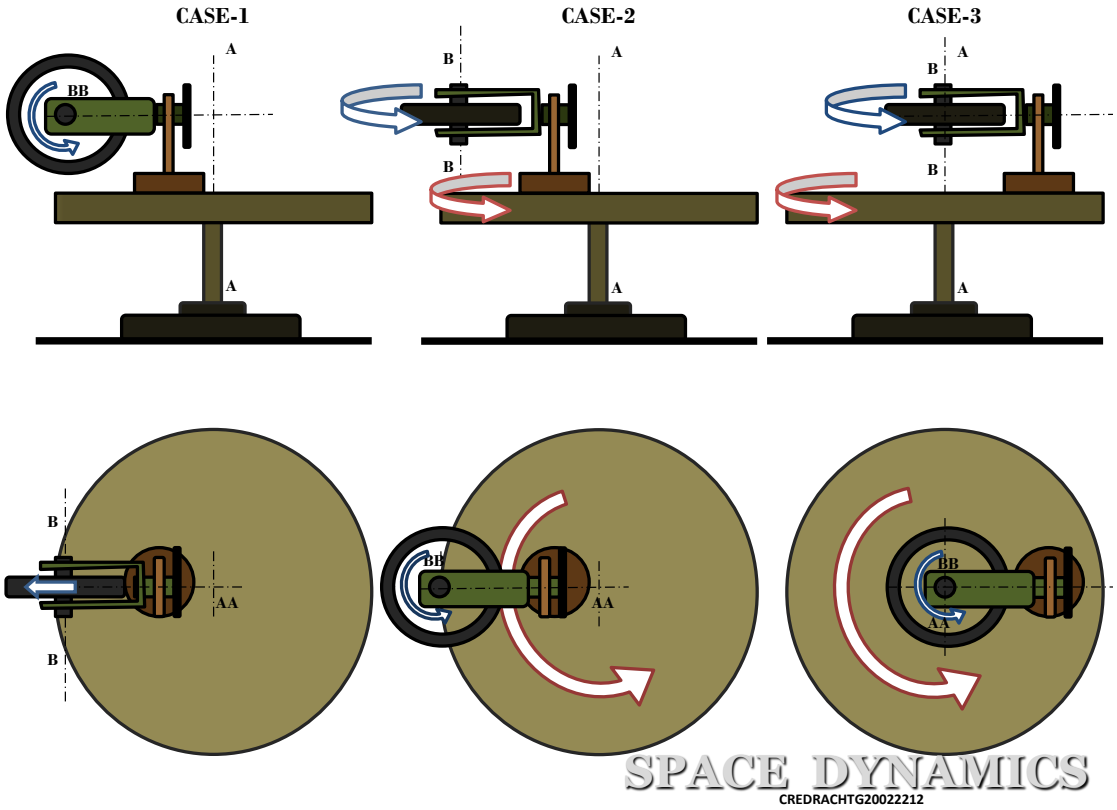


FIGURE-9

3.42 Motion due to different handling of the rotating wheel:

Case-1 in the figure-8 exhibits that, neither frictional moment nor rotation is transferred to the chair wheel when the two rotating axis are perpendicular to each other

Cases 2 &3 in the figure-8, explains that there is no change of the direction of induced rotation in the chair wheel, if the distance between the two parallel rotating axis 'AA' and 'BB' is changed

But the rotation of the chair wheel is completely in the other way round, if the Dentist himself tries to speed up the rotation of the wheel in his hand, because a bigger opposite moment is created upon the chair by his attempt to do that. That is for no other reason but simply due to the phenomenon explained by Newton's 1st law- 'Action-Reaction'

But to be frank, the things become a bit complicated when it comes to explain the happening when the Dentist attempts to **turn the axis 'BB'** of the rotating wheel in his hand.

(That is for no other reason but, due to lack of a realistic explanation in the background science, to describe the 'energy requirement to divert the mass flow direction of any rotary system, by turning of the rotating axis)

4.0 DIVERSION OF A MASS FLOW

4.1 DIVERSION OF A LINEAR MASS FLOW :

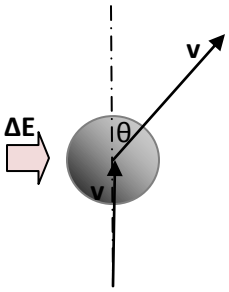
Energy is consumed to divert a 'Mass Flow' and the 'System Kinetic Energy Stock' remains unchanged, if the diversion is gentle and smooth.

4.11 What is a Mass Flow?:

Mass mobility in directional motion is recognized as a 'Mass Flow' and the grain particles should not necessarily be cemented together, as in a solid body.

4.12 A Packet of Extra Energy for Diversion:

In linear mass motion it is very easy to observe the direction where it comes from and where it goes. Let's calculate how much extra energy is required to divert the direction of the dynamic system by an angle of 'θ'.



System Energy Gain in the new direction→ΔE = ½ m[v sinθ]^2
= ½ mv ^{2} [sin^{2}θ]

System Energy Loss in the old direction↑ΔE = ½ mv^2 - ½ m[v cosθ]^2
= ½ mv^2 [1-cos^{2}θ]
= ½ mv ^{2} [sin^{2}θ]

FIGURE-10

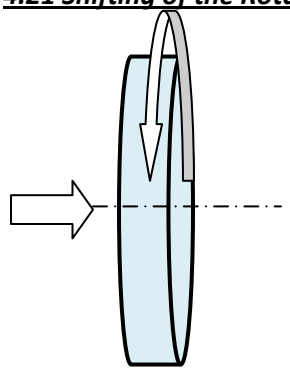
In the above exercise neither velocity nor the kinetic energy of the system is changed if the diversion is gentle and smooth. The packet of extra energy pumped in to the system, (the vector quantity →ΔE), is used only to divert the mass flow. Also the 'Conservation of Energy' is well exhibited there because the gain was equal to the loss and ultimately the 'Stock of System Kinetic Energy- ½ mv $^{2'}$ remained unchanged in spite of the directional change.

The above exercise is very much similar to the pipe flow of water or any liquid and the system energy is not consumed by the diversion if the bend is gentle and frictionless.

4.2 DIVERSION OF A ROTARY MASS FLOW:

Any rotating system can be considered as a 'Rotary Mass Flow' and the grain particles should not necessarily be cemented together as in a solid body. Extra energy is required to divert the 'Rotary Mass Flow' and the force or couple has to be applied upon the Rotating Plane of the system.

4.21 Shifting of the Rotating Plane:

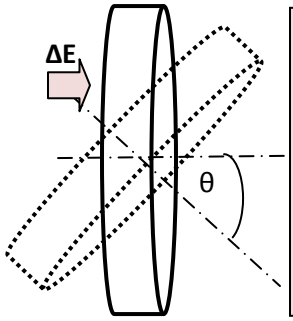


No extra energy is consumed in shifting of the rotating plane of any rotary system as far as the medium remains non-resistive. But extra energy is consumed for any acceleration or any deceleration in shifting of the system.
Shifting is not a Diversion at all.

FIGURE-11

4.22 Turning of the Rotating Plane:

'Turning of the plane of rotation' means the 'Diversion of the Rotary Mass Flow' of the system and it requires extra energy to do that. Only a half of the rotary mass flow is diverted when you turn the plane and the other half is just shifted without changing the direction as a whole. Therefore your energy requirement for a diversion is just a half because shifting of the other half consumes no energy.



System Energy Gain in the new direction↔ΔE $= \frac{1}{2}\{\frac{1}{2} I[\omega \sin\theta]^2\}$
$= \underline{\frac{1}{4} I\omega^2 [\sin^2\theta]}$

(ω-angular velocity, I –moment of inertia, θ- angle of turning)

System Energy Loss in the old direction ↕ΔE $= \frac{1}{2}\{\frac{1}{2} I\omega^2 - \frac{1}{2} I [\omega \cos\theta]^2\}$
$= \frac{1}{4}\{ I\omega^2 [1-\cos^2\theta]\}$
$= \underline{\frac{1}{4} I\omega^2 [\sin^2\theta]}$

FIGURE-12

4.23 Opposite Rotation of the Dentist's Chair:

By now the reader must be capable of explaining the famous opposite rotation of the Dentist's chair when he tries to turn the rotating wheel.

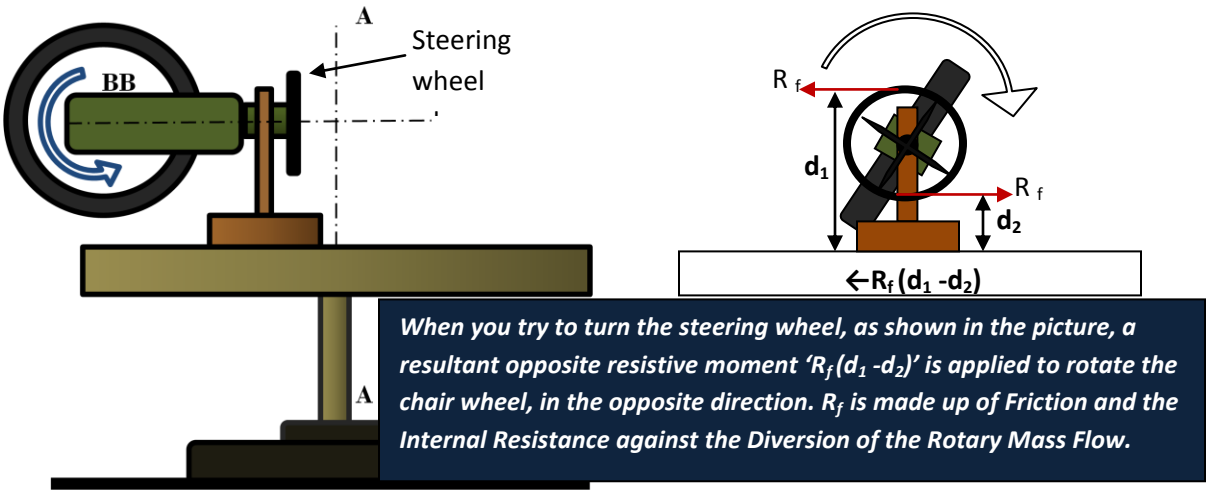


FIGURE-13

It must be your own experience with the steering wheel of your car and when you try to turn it you will be pushed a bit to the opposite direction in the seat due to frictional resistance. The same thing happens in the Dentist's chair but in this case, not only the friction but also, you have to consume your energy for diversion of the rotating system in your hand. In that attempt an opposite torque is applied on your body to rotate you with the chair in the opposite direction. That torque is ended once you stop the turning attempt. Rotating direction of the small wheel is immaterial in this experience.

4.26 Floating Up Thrust on Rotating Planes:

Horizontal planes in rotation don't obey the laws of free gravitational falling due to the floating up thrust created by the medium.

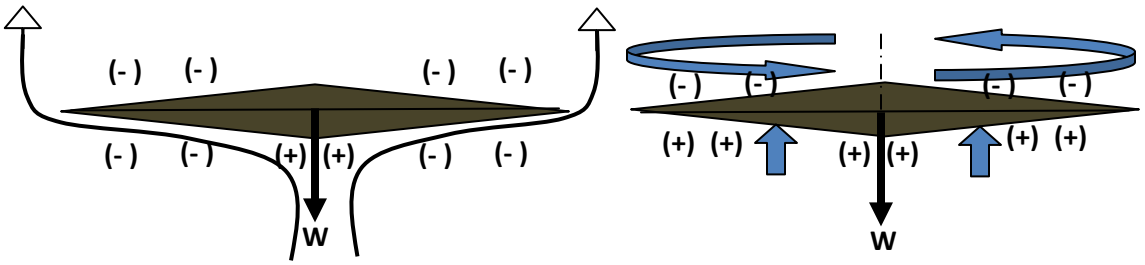


FIGURE-14

There are two objects falling under gravity as shown in the figure-14. Naturally the pressure under the plane is bigger than that of above the plane due to weight of the object. But the

aerodynamics upon the non rotating object is formed in such a manner that pressure under the plane is released by upward air circulation as shown in the picture. That air circulation is disturbed in case of the rotating plane and therefore, a small uplifting force is created by the pressure deference between top and bottom of the plane. Therefore the rotating object falls a little bit later than the falling of a non rotating object under gravity.

4.27 Problem of the 'hanged cycle wheel':

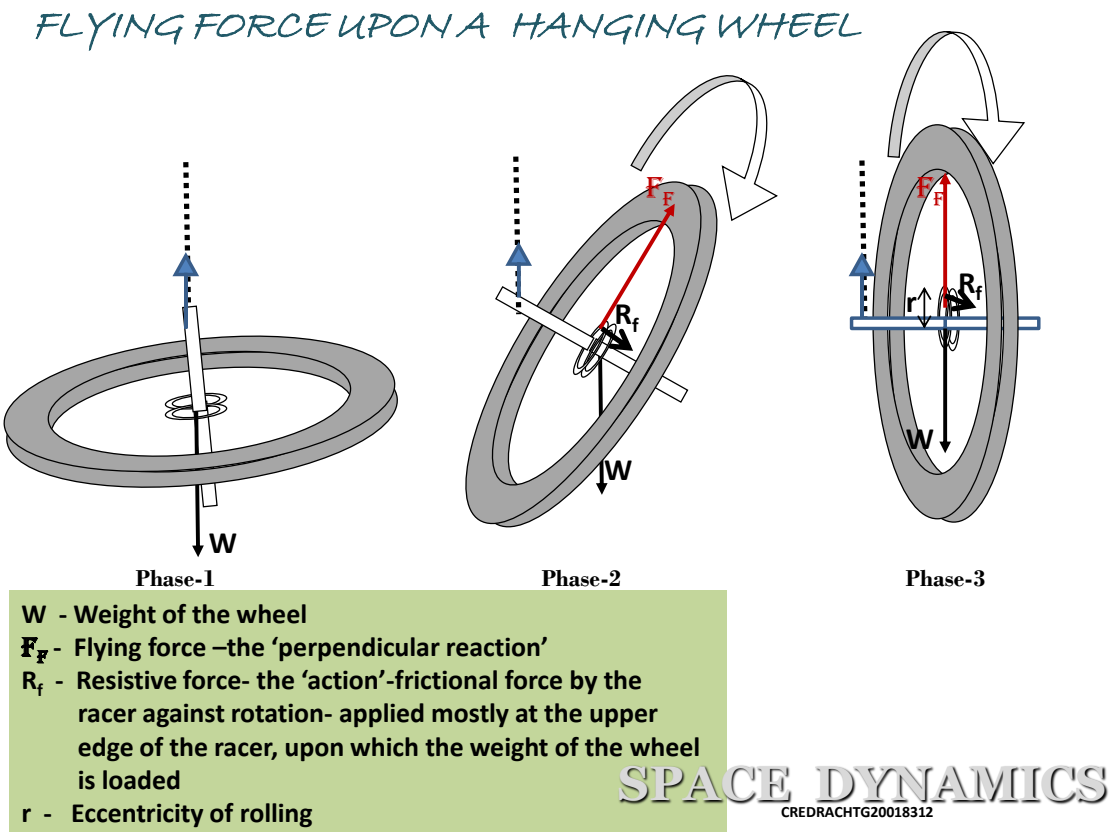


FIGURE-15

Phase-1: What is the importance of the slight inclination?

When the wheel is not rotated, it is held by the string as shown in the figure-15 and the slight inclination of the wheel axis is essential to initiate the flying force when the wheel is rotated. Unless the wheel plane is inclined to the horizon the racer is uniformly loaded and then there could be no rolling rather than rotating. Where there is no rolling, the flying force is not created.

Phase-2: Upon which the wheel is rolling?

The upper edge of the racer or bearing is heavily loaded by the weight of the wheel due to the inclination and therefore the biggest resistive force is applied at the top marginal area of the racer. Then the wheel starts rolling upon that upper racer point, a flying force too is created due to the eccentricity-r of the rotation. When the eccentricity is small, a human eye cannot notice the rolling from rotation.

Phase-3: Why not use a spring balance?

It is wonderful why people didn't use this flying force as yet, in a proper mechanism to create the '***Flying Turbine Expeditor Craft'*** , when a spring balance exhibits the weight reduction with the growing speed of rotation.

(Rolling of a rotating wheel starts upon which the maximum resistance is applied and eccentricity between the two axis decides the velocity of rolling and also the magnitude of the flying force)

5.0 Conclusion

The law of 'Conservation of Angular Momentum', the definition for 'Direction of Angular Momentum' and the gloomy way of explaining the rotary motion in some famous case studies are challenged by this technical paper by introduction of two alternative principles such as;

5.1 The Principle of 'Action and Perpendicular Reaction' in rotary systems

'Flying Force' upon a rolling wheel and the mechanism of 'Flying Turbines', which shows the possibility to create a 'Space Expeditor Craft' was introduced under this paper. Besides that the secret of the child's top, problem of the hanging wheel, rotation of the Dentist's chair and the orbital motion of boom rang were explained herein.

5.2 The Principle of 'Diversion of a Mass flow'

Under this principle it is explained that 'Diversion of a Mass Flow' requires external energy but shifting of a mass flow requires no extra energy if the external medium is non-resistive. Besides that the famous case of the 'Dentist's chair' was explained without any reference to 'Conservation of Angular Momentum' of the classical mechanics.

5.3 The Mystery of 'Mass Flow' at the Extreme Ends?

Without knowledge of the '4th Dimension' and the theory of 'Spherical Vortex of Charged Particles' the rotary mass flow at the extreme ends of the space matter cannot be observed by Man.

Theory of Spherical Vortex: ***The space matter is either contracted in to almost nothing or expanded in to galaxies by the vortex named as 'Spherical Vortex of Charged Particles ' (pl. ref. 'Earth Mechanism/ Space Dynamics-V3/2010)***

The 4th Dimension: *Mystery is born whereas Man cannot observe where the space matter in a* ***'Dynamic Rotary Mass Flow'*** *comes from and where it disappears in to? Therefore mysteries will be solved whenever the* ***'Space Dynamics along the Axis of 4th Dimension'*** *is observed by Man.*

END

If anything novel to the world is introduced herein by this technical paper, all that is exposed for the world community to be used freely on good will of experiments, researches and practices on behalf of Coexistence of the Global Ecosystem and Human Civilization.

- Cyril H Thalpe Gamage -(18th Sun March, 2012)-

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