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Determine and Overcome the Astrophysics Challenges of Deep Space Journeys.

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Abstract: Because there are a biological sensors working in the human blood circulatory to organize the blood pressure coordinating with the heart`s pulses pressure via organizing the diameter of blood arteries explanations in each organ in order to organize the pressure in each organ (with the heart pulses pressure), may the functions of these biological sensors distort during a microgravity environment that may create unbalances in the blood pressure in the human blood circulatory but during a long time a space journeys, these distortions will stay a long time as long as the duration period of the long space journey, therefore heath deteriorations of the astronauts after the long space journey is due to the permanent distortions of the blood circulatory that been happened during the long space journey, therefore it could result a permanent physical distortions upon blood circulatory system that makes the astronauts keep suffering of a high liquid pressure in some specific organs and even have some effects upon eye health and the heath deteriorations generally. Therefore we should consider several concerns when we design a spacecraft able to generate a centrifugal force as an artificial gravity force, dock spacecraft safely, and learn from our previous mistakes may avoid spacecraft accidents, here are the main technical reasons behind the failure of the SpaceX, the operation temperature of all equipment and engines during the space journeys, the nuclear batteries, using multi-layers tissue composed of a high-density metals and ultra-high strength alloys for the external body of the spacecraft. Therefore astronaut's room in the spacecraft should be a spinning room to generate a centrifugal force[1] as an artificial gravity force to prevent astronauts from any sort of health deterioration due to the lack or losses of gravity force during the space journey in the meanwhile astronaut's room should be at a range of temperature 25 °C depending upon the central warming of the spacecraft also all the spacecraft should be able to guarantee the required heat for all equipment’s and engines to as an operating temperature at that circumstances of deep space journey to prevent any failure due to reducing the temperature extremely as much as the spacecraft’s travel away of Sun`s warming rays.

Key words: astrophysics challenges, deep space journeys, spacecraft.

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1.0 Introduction: The health deterioration of astronauts after long space journeys is due to the permanent distortions of the blood circulatory during the long space journey, the Zero gravity prevents astronauts from using their normal energies in their daily activities during their space journeys to do their jobs at their normal powers, therefore human blood cycle and also all human organs are in their lowest level of activities, therefore the natural human antibiotics system operation will be at the lowest level of capabilities. Therefore the spacecraft of long space journeys should be tested in environment stimulate the space circumstance before launching via storing at vacuum chamber to find capabilities of the duration of its task at -262 °C to be sure that all equipment's are ready to do their functions properly at the circumstances of a cold space environment to guarantee their functions successfully without any failure during the mission to the Moon, Mars and beyond, even the main engines of the spacecraft should also pass this test successfully at the extinguish case, then try to use in a specific zone for engines tests to observe the effects of the shrinkage of materials which may create cracks may guide the engine to the failure, to be sure that the main engine able to re-use during the return from the Moon or Mars mission, in order to find a suitable designs considering a required tolerances and also a suitable materials have a suitable expansion and shrinkage factors, satisfying the requirements in cold space environment.

1.1 Design a spacecraft able to generate a centrifugal force as an artificial gravity force.

To design a Spacecraft able to generate a centrifugal force as an artificial gravity we have two choices how to make a spacecraft guarantee [the centrifugal force as an artificial gravity force properly valued equal to Earth`s gravity force on the surface of the ground] at the highest efficiency and via the lowest level of cost of energy: When 1-kilogram weight 9.81 Newton on the surface of Earth therefore in a cylindrical room have 5 meters diameter we shall calculate a speed required to generate centrifugal force the same value.

$F= M \times V^2/R$

$9.81= 1 \times V^2/2.5$

$V^2= 3.924$

$V= 1.9$ m/s

We may use magnetic fields as a repulsion force between the spinning room (astronaut's room) and the main body of the spacecraft to reduce the friction between them and reduce the required energy for that system. It's important to develop Gravity Sensors to measure the value of a centrifugal force and transfer the data to the main computer to control the speed of spinning, to generate the required limits of the centrifugal force equal to the value of the Earth's gravity force at the Earth's surface.

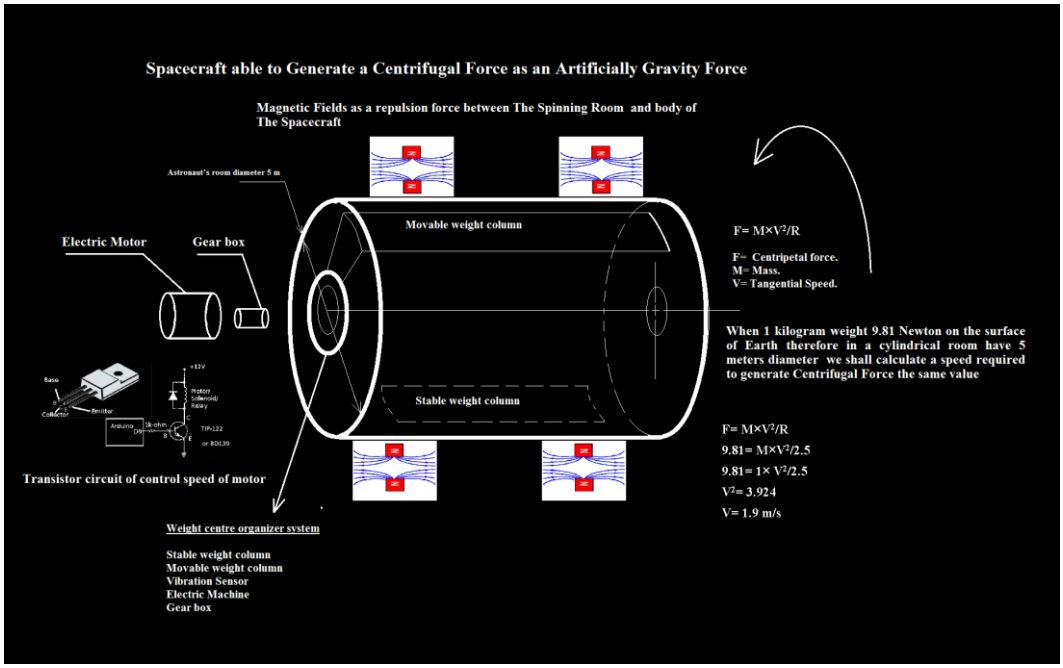

Figure -1- Astronauts spinning room generate a centrifugal force as an artificially gravity force.

In the meantime, magnetic fields may be used as a repulsion force between the spinning room and the body of the spacecraft:

$$F= M\times V^2/R$$

F= Centripetal force.

M= Mass.

V= Tangential Speed.

The weight centre organizer system prevents any vibration that may be generated due to moving astronauts inside the spinning room this system is composed of a stable weight column, movable weight column, vibration Sensor, electric machine, gearbox, and computer, note that we may design a spacecraft may rotate completely during the space journey, but the first choice is safer, to prevent any side effects of the centrifugal force upon spacecraft's machines, components, fuel system, etc.

1.2 Docking spacecraft safely.

Docking a spacecraft safely is the priority of our deep space missions therefore it is important to study the Falcon 9 electromechanical system that is used during the launch and ducking vertically.

1- During the lift-off:

A- The computer inside the rocket with a navigation system divides the surface of the Earth and the space of Earth zone 3D gradients, according to the navigation system and the rocket always appears as a point among these gradients.

B- Note that one of the main engine nozzles is movable to any direction to get the same effect of

changing the angles, but stabilizing the location of the centre weight is important to stabilize the rocket's angle and direction.

C- Note that one of the main engine nozzles is movable to any direction to get the same effect of changing the angles, but stabilizing the location of the centre weight is important to stabilize the rocket's angle and direction.

D- The gravity sensors transfer data to the computer to determine the angle of the rocket according to the Earth horizon line.

E- Note that a gravity sensor is merely a metallic ball inside another plastic or fiberglass spherical room that moves semi-freely among electronic switches, wherever it attaches transfers electronic signals to determine the direction of a gravity force as fundamental data to the central computer of the rocket.
F- Thus the computer will identify the angle of the rocket in space to make the required calculations to guide the rocket via changing the location of a centre weight to change or stable rocket angle to move towards the required direction.

G- Fuel injection increases gradually to increase the propulsion pressure and control injecting the required amounts of fuel and Oxygen to the burning chamber at each altitude to organize the lift-off procedures of the rocket vertically and softly to its destination according to the 3D gradients maps of the space around the Earth.

H- These synchronous functions work according to the data coming from sensors of the infrared ray and the rest of electromagnetic wave sensors around the rocket and gravity sensors to change the direction of rushing the rocket to the required zone.

I- The program of the computer controlling the functions of the hydraulic or mechanic system inside the rocket to change a weight centre of the rocket to stabilize a required angle.

2- During the docking:

A- The infrared ray pulses radiate from the LD lamp in high intensity toward the ground at a specific frequency.

B- The receiver circuit sensor of the infrared ray has received the reflected ray from the ground.

C- Electronic frequency filters determine the rays that the rocket deals with (among many infrared rays radiate via a burning chamber).

D- Computer measuring the electronic amperes and voltage in the output of the receivers of the infrared ray to identify the altitude of the rocket because the value of electric output of the receivers changes according to the altitude from the surface due to changes in the rates of scattering of infrared radiation according to its traveling distance.

E- Magnifying signals of the electric output of the receivers to a high electronic storm to run the electric motors to stand of the rocket and also motors of the fuel injection to the specific rates of fuel injecting according to the altitude and the speed of docking.

F- Fuel injection reduces injecting the amount of fuel and Oxygen gradually to reduce the propulsion pressure and control injecting the required amount of fuel and Oxygen to the combustion chamber at each altitude to make the value of the propulsion pressure equal or a little less than the value of the gravity force to the total mass of the rocket to organize the docking procedures of the rocket vertically and softly.

G- Note that choosing the long wave limit of the infrared ray is important in this application to prevent any distortions with the heat ray of the burning chamber which radiates a short wave limit of the infrared ray.

H- These synchronous functions work according to data coming from sensors of the infrared ray or any other electromagnetic wave sensors around the rocket to change the direction movements of the rocket to the required gradients during the docking.

I- The program of the computer controls the functions of [the hydraulic or mechanic system inside the rocket which can change the weight centre location of the rocket to stabilize the required angle, the sub-engine around the rocket which makes a small explosion to create the required reactions and the essential proposition engine] to guide the rocket to the required destination.

J- The sub-engine around the rocket makes small explosions to create the required reactions of the essential engines.

K- The computer calculates the changes in the altitude per second to find the speed of the docking.

L- Injecting the required amounts of fuel and Oxygen into the combustion chamber to create the required propulsion pressure equally or less than Earth's gravity force for the soft docking of the rocket vertically.

M- The docking is vertical because the computer returns the location of the centre weight to its original location at the downside of the rocket.

N- Note that the centre weight system may be composed of more than two heavy metallic parts able to move under computer control in three dimensions inside the rocket via a specific hydraulic or mechanical system.

Figure - 2 - Shows docking a spacecraft safely.

Important to know that vertical docking is a good developments have been achieved concerning a rocket design of docks vertically, but it seems like this rocket Falcon9 after its first docking could be used only as a recycle materials to produce the same style of rockets because rockets suffer from extremely hard circumstances more than any another equipment. Otherwise, it will reduce the safety in its next missions, due to creating many styles of stains in all parts as cracks in the microstructure of rocket body material which may fail the mechanical characteristics of these important parts and may result in disaster, especially in the parts which sufferers of extreme heat or extreme cold, impact, vibration, pressure, etc. but it's a great idea and better than extract these precious elements of raw materials or to buy it, each space agency around the world have their private and different designs of rockets which satisfied the safety of their missions.

1.3 Learning from our previous mistakes may avoid spacecraft accidents, and here are the main technical reasons behind the failure of NASA and the SpaceX Starship SN4 prototype the reusable rocket.

1. A NASA mission (Peregrine mission of moon landing attempt failed due to a critical fuel leaking after launch), when we check the data of the rockets used in this mission we find that it`s of the new generation rockets used by NASA are a huge masses that use large engines that consume large amounts of fuel to transport large payloads towards the moon, therefore this happens because of the great amount of fuel burned in the combustion chambers, that caused to the generate great rates of heat, in this case an extra accessories should be installed in the thermal insulator to be consist of several layers interspersed with a network of pipes (heat absorber) representing a part of a cooling system passes water driven by the compressor, absorbs the heat in that area extremely hot zone to transfer it to the heat radiator that should be installed under coolest cover such as the top of rocket to be cooled and returned back again to the same hot region to complete cooling cycle to maintain the original properties of the materials of the thermal insulator, because the traditional thermal insulators are unable to withstand the accumulated heats that radiated of huge engines for a long time, to prevent any failure in the pressure vessels and their accessories that may cause critical fuel leaking well as the in failure cargo, that may expose the space missions to the high risks.

2. The failure during the vertical docking is due to the high speed rushing of the rocket during the vertical docking is often occurs, because the electro-mechanic system of the rocket as any another electro-mechanic systems needs to suitable time to organize all operations accurately, therefore it is a very important to determine suitable altitude to halt the rocket completely in the space or merely reduce the speed of the rushing extremely before preparing for the vertical docking, consider the momentum of the material of the rocket which prevent the rocket to reduce its speed quickly when the distance is very close to the surface of the ground, reduce the speed of the rocket via control the fuel injection which should inject the required value of fuel to the combustion chambers to generate required the value of propulsion pressure which is equal to the gravity force of the Earth to the total mass of the rocket, while the computer should also estimate the speed of docking to make the injection to inject the required fuel and Oxygen to the combustion chambers to prevent very high speed docking, because control the required propulsion pressure in each altitude and speed of the rocket will guide to the softly docking without any accident, note that if the rocket is in the high speed of rushing and get too close to the ground during the docking, even injecting big value of fuel inside the combustion chambers and generating greater value of propulsion pressure will not prevent the severe impact with the ground, due to the great value of momentum of the rocket which comes of big mass and speeds of the rocket, therefore the rocket should reduce the speed in the high altitude before it gets to the gradient of docking in order to prevent any severe impact with the ground which will damage the rocket.

3- The explosion of SpaceX Star ship SN4 prototype exploded after an engine test in Texas doesn't mean the engine exploded but perhaps the pressure vessels of fuel or Oxygen, because when the engine is running and consuming fuel and Oxygen, the temperature is reduced extremely in these pressure

vessels (due to the phase transferring of the big amounts the liquid phase Oxygen and Hydrogen in their vessels to the gas phase, for a long time), which will change the mechanical characteristics of the materials of vessel, to be brittle and will be unable to carry the pressures of the pressure gases of the fuel or the Oxygen and finally may guide to the failure of the vessels, where using several spherical vessels linked with each other with tubes may increase the total surface of the pressure vessels to reduce the stresses in the meantime the spherical shape is most safely designed to avoid any sudden changes of the dimensions and reduce stress points and choosing a small grain microstructure of the used alloys for these pressure vessels may also increase the toughness of the materials planned to be used at low rates of temperature.

4- The pressure vessels of the fuel and Oxygen should be thermally isolated from the heat of the engines, to prevent any heat transfer otherwise if any heat transfers to the pressure vessels, will distort the value of the shrinkage of the vessels during the reduction of the temperature in some places to be different than the rates of shrinkage at the rest of places of the pressure vessels, which will create cracks among the places (which have a different rates of shrinkage) and this may guide the pressure vessels to the failure.

5- Developments of the design of rockets shouldn't ignore the basic scientific principles during the design and development of engines and pressure vessels and the rest of the parts of the rockets.

6- Choosing lighter materials such as Carbon fibres or fiberglass for the main construction of the rockets is important, for the reduction of the total weight of the rockets and the value of the required used fuel during the launch, but those materials may not be suitable to be used for the pressure vessels, therefore the pressure vessels of the rockets should keep using the same strength dependable materials and not to be replaced with the Carbon fibre or fiberglass, during our plan to reduce the total weight of the rockets, to avoid any accidents either during the test or during the space missions, because the priority is to achieve the space missions safely and successfully.

7- Failure of one or more of the main engines especially during the docking comes due to the extreme heat of the combustion chambers which arrive for injection or the rest of the accessories components of the engine, causing failure due to extreme expansion or distortions or burning of its parts which lock the components completely, therefore it's important to add a cooling system between the combustion chambers and the parts behind or even adding a specific cooling system to each injection and each accessories components of the engine that may be affected by the heat of the combustion chambers, to reduce the transferred temperature to the installed accessories of the components of the engine, to guarantee the operation temperature of these components and guarantee these components to do their functions properly.

2.0 The operation temperature of equipment’s and engines during the space journeys.

System of the heat distribution from the radiator of the nuclear reactor to Supply the required heat for all equipment and engines and astronaut’s room as well as the external crust of the space craft to guarantee the operating temperature at cold space circumstances to prevent any failure due to reduction the temperature extremely during the space journey.

Composed of:

1. Astronaut’s room.

2. The central warming radiator.

3. The external crust of the spacecraft.

4. Electric pump.

5. Cool liquid.

6. Nuclear reactor.

7. Hot liquid.

8. The pressure vessel of nuclear reactor`s radiator.

We should take the advantage of any heat in the space craft such the heat of the nuclear reactor`s radiator to use it as a close cycle liquid (such a heavy water D2O) to distribute it from the radiator of the nuclear reactor to supply the required heat for all equipment and engines and astronaut's room as well as the external crust of the space craft to guarantee the operating temperature at cold space circumstances to prevent any failure due to reduction the temperature extremely during the space journey.

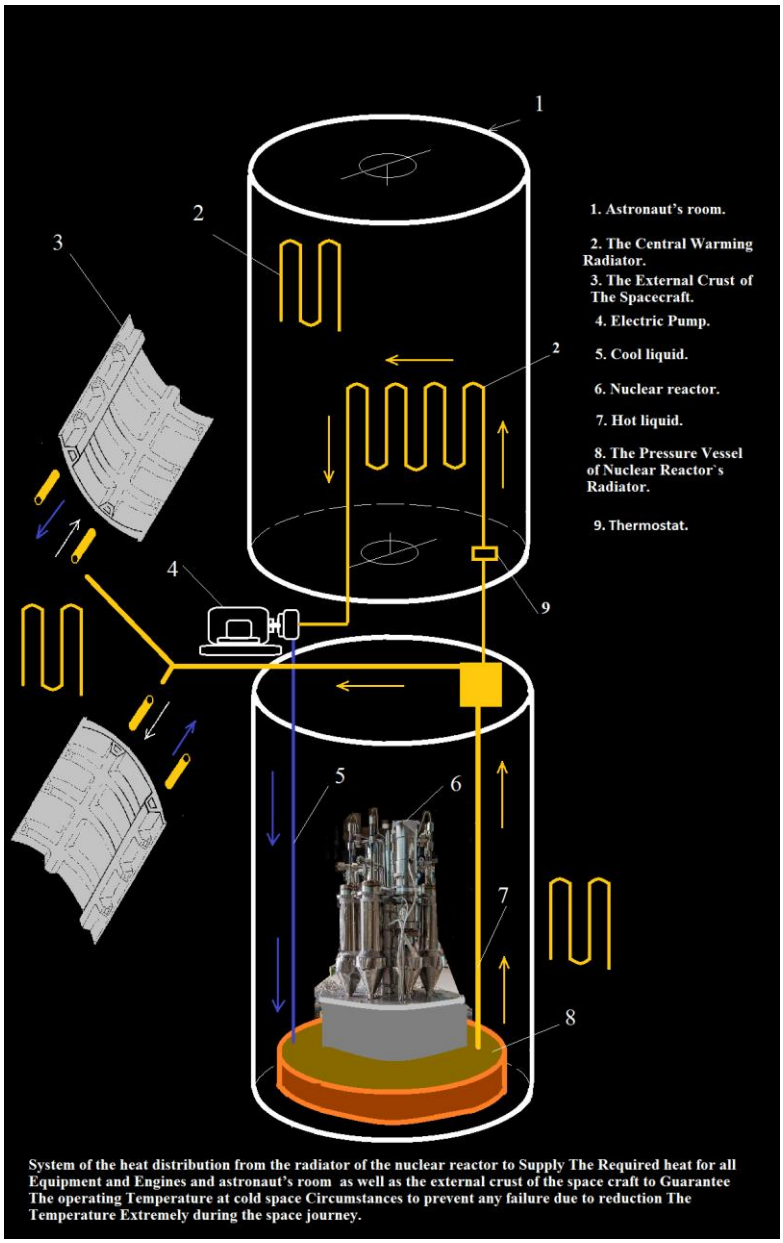

Figure - 3 - System of the heat distribution.

2.1 The nuclear batteries.

Nuclear batteries[2] should also depend upon a cosmic rays during a deep space journeys to achieve long space journeys successfully and make it depends upon a cosmic rays, (because the both rays - cosmic rays and a radioactive materials rays) have the same particles, may challenge represent as how to pass over the technical difficulty's (because the cosmic rays are in a low intensity compering with the intensity of the radiation of a radioactive materials) such adding an external accessories to the nuclear battery such (a magnetic belt around the spacecraft or the robotic machines), to attract the magnetic proton particles from the space and move them into insides the nuclear battery and use it as a fuel in these nuclear battery, thus we could have another energy sources in the deep space and renewable during our long space journeys. There is a possibility of changing the used LD in the classical nuclear batteries types to the high sensitivity LD to make it able to react with a low intensity of radiation were it may represent the unique energy source in the space. The electronic technology has been developed and now it works through a nano-technology and beyond, also we may see how the solar panels have been developed to be a thinner and in a higher efficiency generations, therefore we should be optimist in respect to the ability of achieving a developments in the field of the cosmic rays batteries to achieve future's long space journeys successfully.

2.2 Using a multi-layers tissues compose of a high density metals and ultra-high strength alloys for the external body of the spacecraft.

Using a multi- layers tissues and alloys for the external construction of the spacecraft's may grant us the ability to make unique construction make the spacecraft do their functions at a severe physics circumstances of the cold space environment in the meantime protect astronauts of a cosmic rays and particles that may threatens their health during space long journeys.

Figure - 4 - Shows a multi-layers tissues and alloys for the external construction that should be used of the spacecraft's.

1. The external crust the ultra-high strength alloys that have perfect mechanical characteristics to grant the spacecraft to resist extremely hard circumstances such as vibrations, impact, physical corrosion, etc., In the meantime, the external crust should have a matrix of supporting columns able to increase the required mechanical characteristic and impiety of microstructure stains or design stains such as sudden changes of dimensions of gapes provided via a Copper tube to exchange temperature with the radiator of the nuclear reactor to guarantee the operation temperature.

2. The second layer composes high-density metals that have resistors of cosmic rays and particles this layer has a low mechanical characteristic and therefore should be supported via the ironic grid.

3. The third layer is represented as a thermal insulation material with a suitable thickness able to protect astronauts, components, machines, and everything inside the space craft from the extreme cold or heat in space.

4. The fourth layer is the last layer which grants the thermal insulation materials suitable mechanical characteristics and protection and should be soft because it may be even in the astronauts' working or living zone.

All these layers should have a connection with the thermal system to transfer heat either from the burning chamber or the radiators of the nuclear reactor of the spacecraft because even the external crust (the ultra-high strength alloys) should be protected from extremely cold temperatures that may result in a brittleness and reduce the mechanical characteristics for the ultra-high strength alloys) in the extreme low temperatures.

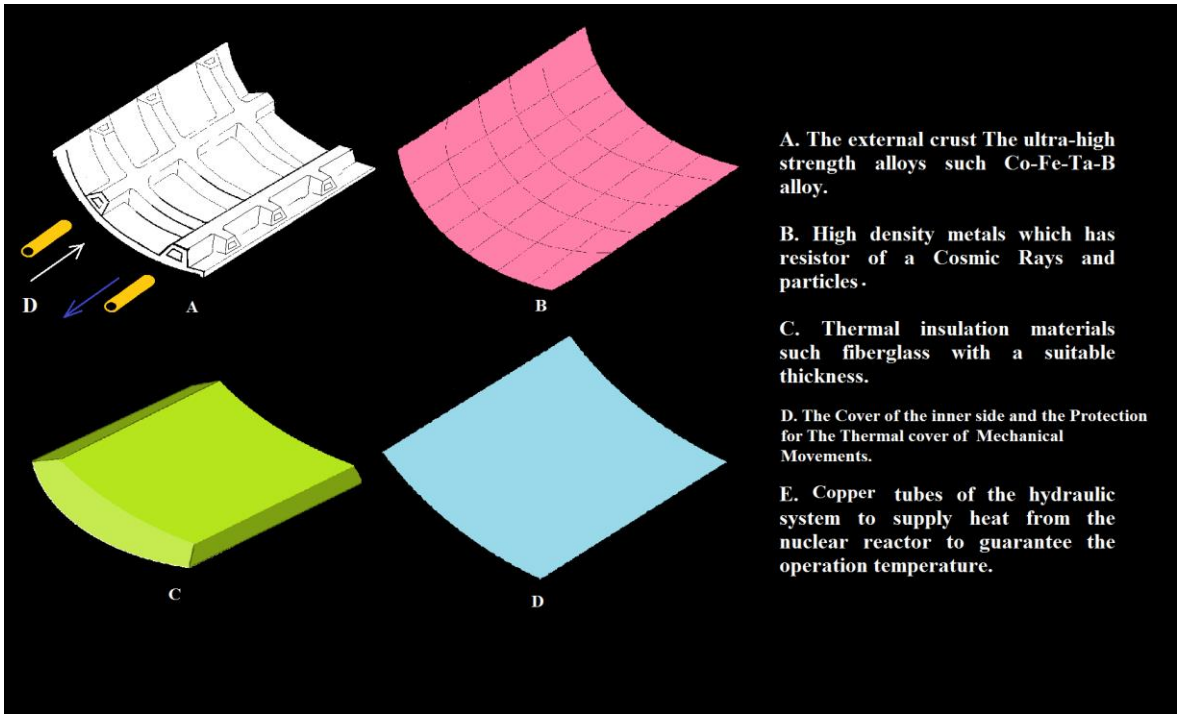

Figure - 4 - Shows a multi- layers tissues and alloys for the external construction of the spacecraft's.

Finding the best metallic alloys [multi- layers tissues compose of a high density metals] may resist and reduce passing cosmic rays through the spacecraft's when we build spacecraft's in order to prevent any health deteriorations due a cosmic rays, therefore when we design spacecraft's of a long space journeys because astronauts should avoid using many sorts of drugs, particularly during their space journeys, because those drugs have always unexpected side effects which always result a several types of health deteriorations for astronauts either during the space journeys or even after space

A. The external crust of the spacecraft (ultra-high strength steel)[3]

B. High density metals which has resistor of a cosmic rays and particles

C. Thermal insulation materials such fiberglass with a suitable thickness.

D. Protection of the thermal insulation materials [4].

E. Cooper tubes of the hydraulic system to supply heat from the nuclear reactor to guarantee the operation temperature.

2.3 Conclusions

In order to achieve a deep space missions either a human or a robotic missions it is a very necessary to understand the circumstances on those planets and design spacecraft, equipment, space suits may satisfy the requirements to achieve space missions successfully, here we find one of an extraordinary phenomenon on the planet Mars and we try to explain that through a explanations this may help us to estimate the reality of a physics circumstances over there that may also help us to design a suitable equipment for our missions. Before we achieve our journeys to the planet Mars we should regard in our consider a different environment and climate on that planet which has a different physical astronomy circumstances than physical astronomy circumstances on the planet Earth, because it results a many different in the climate on that planet not only an extreme reducing in temperature, but also the vortexes

of winds and storms may have a different mechanical characteristics due to the different values of atmosphere pressure, gravity force as well as the direction of the Mars axial rotation to its orbital direction rotation. This description of the extra additional systems that required to be add to the spacecraft is a merely general views, while there are a much more need to talk about it either how the centre weight system work to move the single or two moveable weight columns to return the centre weight of the astronauts room to their original point when any vibration occurs or the radio connection remote control from the astronauts room to change or stop the spinning of astronauts room or vibration absorber system that should also been added to prevent and effects upon the spacecraft. Computers and all electronic components stops completely in the extremely low temperature due to increasing the electrical conductivity of the integrate circuits as well as all rest of used metals, the observation should be done for each part of those equipment's during this test and record data, to find the best designs for the equipment to be able to do their functions properly at that circumstances of the space cold environment properly even the main engines of the spacecraft should pass this test successfully at (the extinguish case), then try to use it in a specific zone for engines tests to observe the effects of the shrinkage of materials which create cracks may guide the engine to the failure, to be sure that the main engines are reusable during the return from Mars mission, in order to find a suitable designs considering a required tolerances and also a suitable materials have a suitable expansion and shrinkage factors, satisfying the requirements in cold space environment, also we may see how the solar panels have been developed to be a thinner and in a higher efficiency generations, therefore we should be optimist in respect to the ability of achieving a developments in the field of the cosmic rays batteries to achieve future's long space journeys successfully.

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Research Area:	Physics, Materials Sciences and Engineering.
Number of Published papers:	**7**
Special Award (If any):	
Any other remarkable point(s)	