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Research Article

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Determine and Overcome the Astrophysics Challenges of Deep Space Journeys

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Abstract
Because biological sensors work in the human blood circulatory system to coordinate the blood pressure with the heart`s pulse pressure via organizing the diameter of blood arteries that exist in each organ to organize the pressure in each organ (with the heart pulse pressure), the functions of these biological sensors distort during a microgravity environment that may create imbalances in the blood pressure in the human blood circulatory system, but during a long space journey, these distortions will last a long time, as long as the duration of the long space journey. Therefore, the health deteriorations of the astronauts after the long space journey are due to permanent distortions of the blood circulatory system that happened during the long space journey; therefore, it could result in permanent physical distortions of the blood circulatory system that make the astronauts suffer from high liquid pressure in some specific organs and even have some effects on eye health and causes health deteriorations generally. Therefore astronaut's room in the spacecraft should be a spinning room to generate the centrifugal force as an artificial gravity force to prevent astronauts from any sort of health deterioration due to the lack or absence of gravity force during the space journey. In the meantime, it should be in a temperature range of 25 °C, depending on the central heating of the spacecraft. Therefore, we should consider several concerns when designing a spacecraft that can generate a centrifugal force as an artificial gravity force, docking spacecraft safely, and learning from our previous mistakes to avoid spacecraft accidents. Where the operation temperature was the main technical reason behind the failures of SpaceX spacecraft. Therefore, all spacecraft should be able to guarantee the required heat for all equipment and engines within the limits of their operating temperature during space journeys, using multi-layer tissue composed of high-density metals and ultra-high-strength alloys for the external body of the spacecraft to prevent any failure due to reducing the temperature as much as the spacecraft's travel away from the sun`s heating rays.

Keywords: Astrophysics Challenges, Deep Space Journeys, Spacecraft

1. Introduction
The health deterioration of astronauts after long space journeys is due to the permanent distortions of blood circulation 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 the human blood cycle and all human organs are at their lowest level of activity, therefore the natural human antibiotic system operation will be at the lowest level of capabilities [1]. Therefore, spacecraft for long space journeys should be tested in an environment stimulated by the space circumstances before launching via a vacuum chamber to find the capabilities of the duration of their task at -262 °C to be sure that all types of equipment are ready to do their functions properly in 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, to find a suitable design considering the required tolerances and also suitable materials that have suitable expansion and shrinkage factors, satisfying the requirements in the cold space environment.

1.1 Design a Spacecraft able to Generate a Centrifugal Force as an Artificial Gravity Force [2]
To design a spacecraft able to generate a centrifugal force as an artificial gravity force, we have two choices: how to make a spacecraft guarantee the centrifugal force as an artificial gravity force equal to Earth`s gravity force on the surface of the Earth at the highest efficiency and via the lowest level of cost of

energy: When a 1-kilogram weighs 9.81 newton on the surface of the earth, therefore, in a cylindrical room with a diameter of 5 meters, we shall calculate the speed required to generate centrifugal force of the same value.

$F= M\times V^2/R$
$9.81= 1\times V^2/2.5$
$V2= 3.924$
$V= 1.9$ m/s

We may use magnetic fields as a repulsion force between the spinning room (the 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, and generate the required limits of the centrifugal force equal to the value of the Earth's gravity force at the Earth's surface.

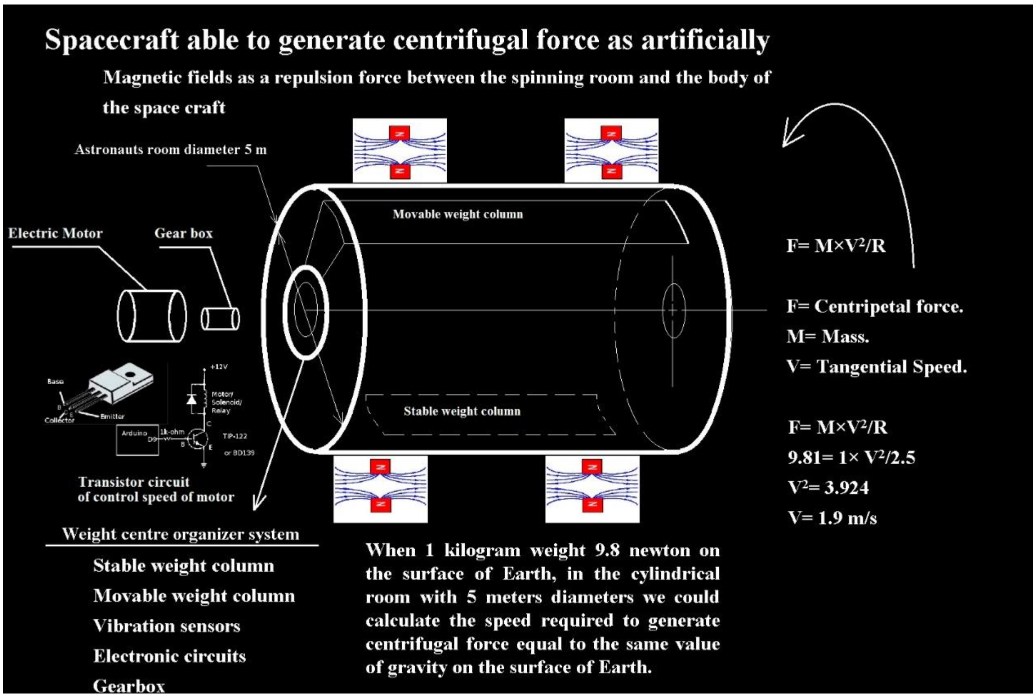

Figure 1: Astronauts Spinning Room Generate a Centrifugal Force as an Artificial Gravity Force

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, a movable weight column, a vibration sensor, an electric machine, a gearbox, and a computer. Note that we may design a spacecraft to rotate completely during the space journey, but the first choice is safer to prevent any side effects of the centrifugal force on the 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 docking vertically.

1.2.1 During the Lift-Off

a. The computer inside the rocket with a navigation system divides the surface of the Earth and the space of the Earth into 3D gradients according to the navigation system, and the rocket always appears as a point among these gradients [3].
b. Where one of the main engine nozzles is movable in any direction to get the same effect as changing the angles, but stabilizing the location of the centre weight is important to stabilize the rocket's angle and direction [4].
c. The gravity sensors transfer data to the computer to determine the angle of the rocket according to the Earth's horizon line [5].
d. The gravity sensor is merely a metallic ball inside another plastic or fiberglass spherical room that moves semi-freely among electronic switches, wherever it attaches any side, transfers electronic signals to determine the direction of a gravity force as fundamental data to the central computer of the rocket.
e. 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 a stable rocket angle to move in the required direction.
f. Fuel injection increases gradually to increase the propulsion pressure and control injecting the required amounts of fuel and Oxygen into 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 gradient maps of the space around the Earth [6].
g. These synchronous functions work according to the data

coming from the sensors of the infrared ray and the rest of the electromagnetic wave sensors around the rocket and gravity sensors to change the direction of rushing the rocket to the required zone.

h. The program of the computer controlling the functions of the hydraulic or mechanical system inside the rocket changes the weight centre of the rocket to stabilize the required angle.

1.2.2 During the Docking

a. The infrared ray pulses radiate from the LED lamp in high intensity toward the ground at a specific frequency [7].

b. When the sensors of the infrared ray circuits receive the reflected ray from the ground.

c. Electronic frequency filters determine the rays that the rocket deals with that are emitted from the LED of the spacecraft (among many infrared rays radiated from the heat of the burning chamber).

d. Computers measure 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 the 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 the signals of the output of the receivers creates high-ampere electric current to run the electric motors of the stands of the spacecraft and also the motors of the fuel injection to run them at specific rates, injecting fuel according to the altitude and speed of docking, to generate the appropriate propulsion pressure for the engines to secure the softly docking [8].

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 into the combustion chamber at each altitude to make the value of the propulsion pressure equal to 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. 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 [9].

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 stabilize the angle of the rocket and its direction to guide it to the required destination.

j. The sub-engine around the rocket makes small explosions to create the required reactions to reduce the speed of the rocket.

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, either equally or less than Earth's gravity force, for the soft docking of the rocket vertically [10].

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 hydraulic or mechanical system.

Figure 2: Shows Falcon 9 Rocket Touches Down at Sea in Successful Landing (SpaceX) [11].

It is important to know that vertical docking is a good development concerning a rocket design that docks vertically, but it seems like this rocket Falcon 9, after its first docking, could be used only as a recycle material to produce the same style of rockets because rockets suffer from extremely hard circumstances more than any other equipment. Otherwise, it will reduce the safety of its next missions due to creating many styles of stains in all parts as cracks in the microstructure of the rocket body material, which may fail the mechanical characteristics of these important parts and may cause a space incident during the mission., especially in the parts that suffer from extreme heat or cold, impact, vibration, pressure, etc., but it's a great idea, and better than extracting these precious elements from raw materials or buying them, each space agency around the world has its own private and different designs of rockets that satisfy the safety of their missions.

1.3 Learning from our Previous Mistakes may help Avoid Spacecraft Accidents, and here are the Main Technical Reasons behind the Failure of NASA and the SpaceX Starship SN4 Prototype of the Reusable Rocket

a. Mission of NASA (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 [12].

b. 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 [13].

c. 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, in the meantime 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. 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, it 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 the places of the pressure vessels, which will create cracks among the places (which have different rates of shrinkage), and this may guide the pressure vessels to failure [14]. Developments of the design of rockets shouldn't ignore the basic scientific principles during the design and development of engines, pressure vessels, and the rest of the parts of the rockets. Choosing lighter materials such as Carbon fibbers 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 for be used for the pressure vessels, therefore the pressure vessels of the rockets should keep using the same strength and dependable materials and not be replaced with 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. 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. The Operation Temperature of Equipment and Engines during the Space Journeys [15]

System of the heat distribution from the radiator of the nuclear reactor to supply the required heat for all equipment and engines and the astronaut's room, as well as the external crust of the spacecraft to guarantee the operating temperature in cold space circumstances to prevent any failure due to a 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. Space nuclear reactor.
7. Coolant.
8. The pressure vessel of space nuclear reactor radiator [16].

We should take advantage of any heat in the spacecraft, such as the heat of the nuclear reactor`s radiator, and use it as a close-cycle liquid (such as heavy water, D2O)[17] to distribute it from the radiator of the nuclear reactor to supply the required heat for all equipment and engines and the astronaut's room, as well as the external crust of the spacecraft, to guarantee the operating temperature in cold space circumstances and prevent any failure due to a reduction in temperature during the space journey.

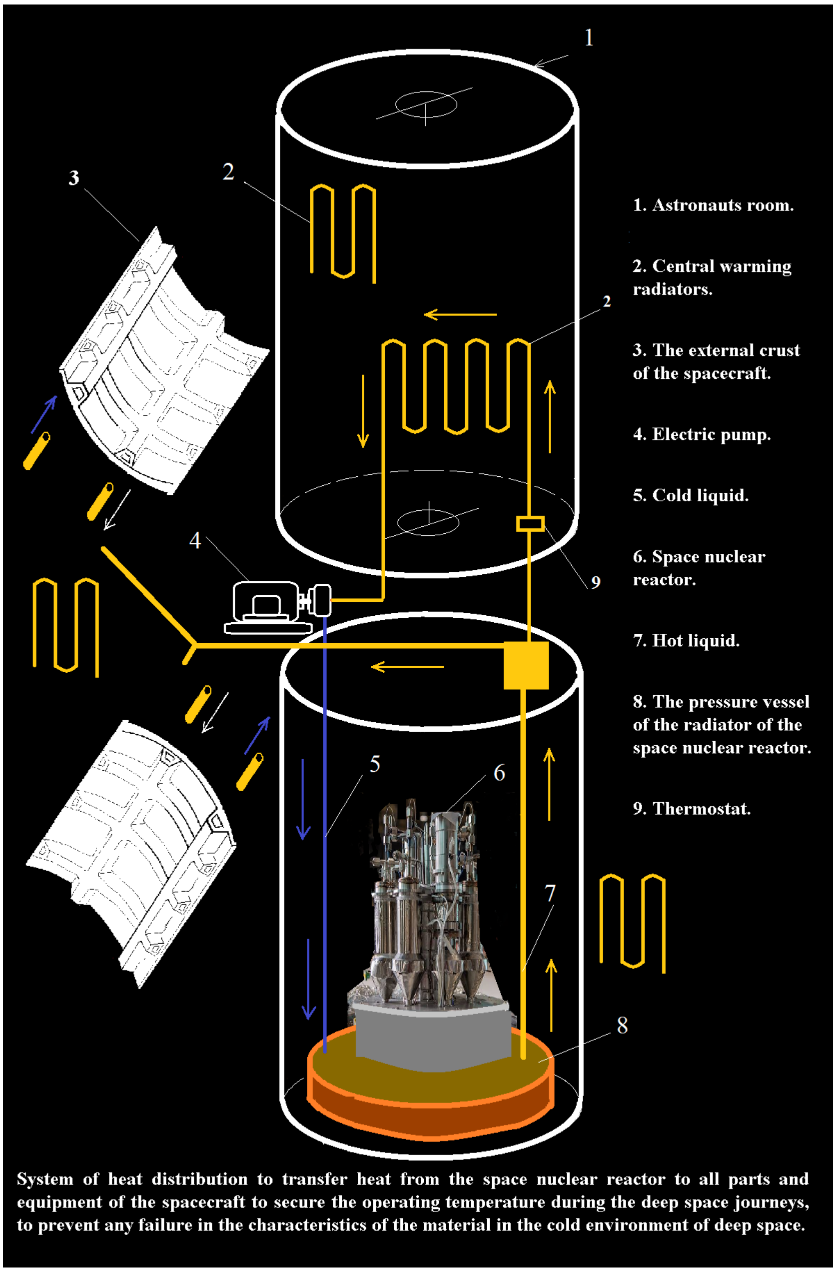

Figure 3: System of the Heat Distribution of the Spacecraft

2.1 The Nuclear Batteries of the Spacecraft [18]

Nuclear batteries should also depend upon a cosmic ray during a deep space journey to achieve long space journeys successfully and make it depends upon a cosmic ray, (because both rays - cosmic rays and radioactive materials rays) have the same particles, which 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 radioactive materials) such adding 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 this nuclear battery, thus we could have another energy sources in the deep space and renewable during our long space journeys. It is possible to change the used LD in the classical nuclear battery types to the high-sensitivity LEDs to make it react with a low intensity of radiation, where it may represent the unique energy source in space. The electronic technology has been developed, and now it works through nanotechnology and beyond. Also, we may see how solar panels have been developed to be thinner and in higher efficiency generations. Therefore, we should be optimists concerning the ability to achieve developments in cosmic ray batteries to successfully achieve the future's long space journeys.

2.2 Using Multi-Layer Tissues Composed of High-Density Metals and Ultra-High-Strength Alloys for the External Body of the Spacecraft

Using multi-layer tissues and alloys for the external construction of the spacecraft may grant us the ability to make unique constructions that make the spacecraft do their functions in the severe physics circumstances of the cold space environment and, in the meantime, protect astronauts from cosmic rays and particles that may threaten their health during long space journeys, as shown in figure - 4 – the multi-layer tissues and alloys for the external construction that should be used of the spacecraft.

a. The external crust is made of ultra-high strength alloys that have perfect mechanical characteristics to allow the spacecraft to resist extremely hard circumstances such as vibrations, impacts, physical and chemical corrosion, etc., in the meantime, the external crust should have a matrix of supporting columns able to increase the required mechanical characteristics and empty of microstructure stains or design stains, such as sudden changes in the dimensions of the gapes provided via Copper tubes to exchange temperature with the radiator of the space nuclear reactor to guarantee the operation temperature of the used alloy [19].

b. The second layer consists of high-density metals that have resistors for cosmic rays and particles [20]. This layer has a low mechanical characteristic and therefore should be supported via the Ironic grid.

c. The third layer is represented as a thermal insulation material with a suitable thickness able to protect astronauts, components, machines, and everything inside the spacecraft from the extreme cold or heat in space [21].

d. 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 brittleness and reduce the mechanical characteristics of the ultra-high-strength alloys in the extreme low temperatures in the deep space [22].

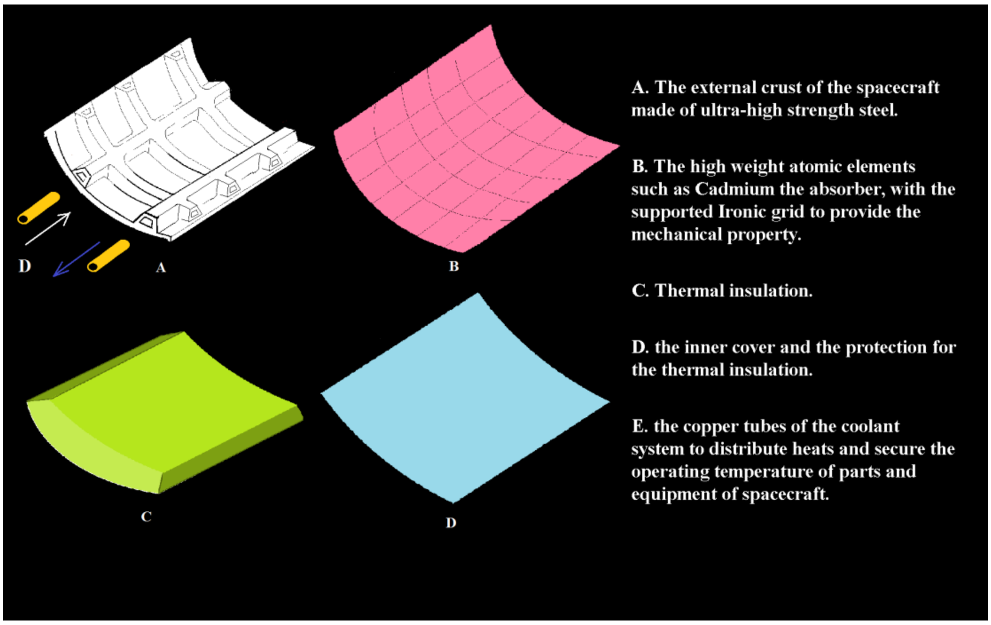

Figure 4: Shows Multi-Layer Tissues and Alloys for the External Construction of the Spacecraft's

Finding the best metallic alloys [multi-layer tissues composed of 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 to cosmic rays. Therefore, when we design spacecraft's for long space journeys, astronauts should avoid using many sorts of drugs, particularly during their space journeys, because those drugs have always unexpected side effects that result in several types of health deteriorations for astronauts either during or even after space journey.

A. The External Crust of the Spacecraft (Ultra-High-Strength Steel)
B. High-density metals, which have a resistor for cosmic rays and particles
C. Thermal insulation materials such as fiberglass have a suitable thickness.
D. Protection of the thermal insulation materials.
E. Copper tubes of the hydraulic system supply heat from the nuclear reactor to guarantee the operation temperature.

3. Conclusions

In order to achieve deep space missions, either human or robotic, it is very necessary to understand the circumstances on those planets and design spacecraft, equipment, and space suits that may satisfy the requirements to achieve space missions successfully. Here we find an extraordinary phenomenon on the planet Mars, and we try to explain that through explanations. This may help us estimate the reality of the physics circumstances over there, which may also help us design suitable equipment for our missions. Before we achieve our journeys to the planet Mars, we should consider a different environment and climate on that planet, which has different physical astronomy circumstances than physical astronomy circumstances on the planet Earth, because it results in many differences in the climate on that planet, not only an extreme reduction in temperature, but also the vortexes of winds and storms may have different mechanical characteristics due to the different values of atmosphere pressure, gravity force, as well as the direction spinning of the planet to its orbital direction rotation. This description of the extra additional systems that are required to be added to the spacecraft is merely a general view, while there is a much greater need to talk about it, either how the centre weight system works 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, the radio connection remote control from the astronauts room to change or stop the spinning of the astronauts room, or the vibration absorber system that should also be added to prevent the effect of vibrations generated during the sipping of the astronauts room upon the spacecraft. Computers and all electronic components stop completely at this extremely low temperature due to increasing the electrical conductivity of the integrated circuits as well as all the rest of the used metals. Observation should be done for each part of that equipment's during this test and record data to find the best designs for the equipment to be able to do their functions properly in the circumstances of the space-cold environment. Even the main engines of the spacecraft should pass this test successfully in the extinguishing case, then try to use it in a specific zone for engine tests to observe the effects of the shrinkage of materials which create cracks that may guide the engine to failure, to be sure that the main engines are reusable during the return from Mars mission, to find a suitable design considering required tolerances and also suitable materials have a suitable expansion and shrinkage factors, satisfying the requirements in the cold space environment, also we may see how the solar panels have been developed to be a thinner and in a higher efficiency generation, therefore we should be an optimist in respect to the ability to achieve development in the field of the cosmic rays batteries to achieve future's long space journeys successfully.

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