SECTION 11

Conceptual Gravitational Applications

A GRAVITATION DEFLECTOR SPACECRAFT DEEP SPACE DRIVE

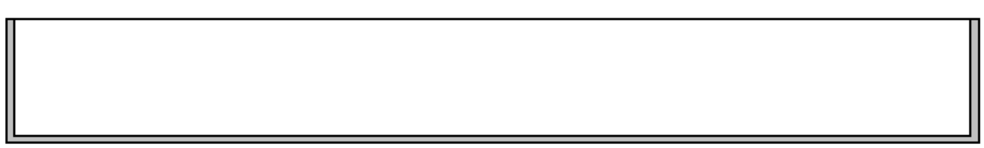
A spacecraft gravitation deflector drive would be a deflector in cup form, mounted on the "rear" of the spacecraft and extending the spacecraft's full length to its "nose". In the case of the invention of the automobile the motor was instinctively placed in front of the cab where the horses it replaced were located the cab being otherwise unchanged. That was done even though the motor's function was to drive the rear wheels because driving the front wheels with steering was too complex.

Likewise, the initial or instinctive concept of a gravitation deflection spacecraft places the deflector at the rear or bottom of the space capsule where the rocket engines it replaces were located The concept is of a rocket with its narrow aerodynamic rocket form but with different engines as in Figure 11-1, to the right.

Legend: Deflector Spacecraft

Figure 11-1

However, the nature of gravitation is such that the spacecraft can be as large as we may wish and there is no need for aerodynamic considerations for flying in atmosphere. The spacecraft will be a human habitation for a long time, even for years, and must be compatible with human needs. Thus the spacecraft should resemble the kind of environment that humans experience in every day life: office buildings and community residences. Those factors would appear to call for a spacecraft configuration more as that in Figure 11-2, below. Such a craft could be multi-level [multi-storey] with levels or "decks" for: residences, administration, laboratories, work shops and a garage for planet surface flying vehicles. The top level could offer a beautiful "sky view".



Legend: Deflector Spacecraft

Figure 11-2 – A Gravitation Deflector Driven Spacecraft

This configuration would satisfy a number of functions. The deflector would provide [all without use of fuel]:

- Launching of the spacecraft vertically upward at an upward acceleration of approximately one-half of local natural gravitation, for Earth an upward acceleration of about $16.1\ ft/s^2$;
- Landing and re-launching of the spacecraft at any gravitating body such as the Moon, Mars or Proxima Centauri b;
- Deep space transit propulsion between gravitating bodies;
- Partial protection from deep space radiation and cosmic ray particles by virtue of the ½ to almost 1 meter thickness of the Silicon deflector;
- A gravity environment within the spacecraft of zero natural gravitation plus an artificial gravitation due to the acceleration of the ship in whatever amount that it is at any particular time [taking "down" as toward the deflector end of the ship].

The engineered arrangements for varying the amount of deflection so as to vary the acceleration would be means of controlled changing of the orientation of selected portions of the Silicon cubic crystals. The engineered arrangements for varying the direction or orientation of the spacecraft would be a 3-axis system of angular momentum wheels

For a spaceship in free space the gravitational *Flow* environment is different from on Earth. In the case of only one gravitation source near enough to be of any important effect departing such a source after launch from it requires simply aiming the stern of the ship toward that source. Controlled landing on it requires simply aiming the stern of the ship toward that source and controlling the acceleration by varying the deflection.

In general, however, in deep inter-planetary space gravitation is present albeit fairly weekly because of inverse square reduction of intensity, and it is present in various amounts with attraction toward various differently located sources. As with the sailing navigation using the wind in earlier centuries, spaceship travel within the Solar System may require techniques analogous to: sail craft's tacking on various headings, "crabbing" into partial "cross wind" as aircraft do, and in general going "where the winds permit". In the spacecraft case the "winds" are the various direction gravitational *Flows* available from which to generate acceleration and to which the spacecraft is subject to attraction.

Solar System navigation is further complicated by the destination's continuous motion. The navigation must be toward where the destination will be upon spacecraft arrival at it as compared to where the destination currently is.

For inter-stellar navigation there is the possibility of near light speed travel. The deflector could provide continuous, fuel-less acceleration to the spacecraft throughout its trip. The continuous acceleration would accelerate the craft during the first part and, with the craft re-oriented using the 3-axis system of angular momentum wheels, decelerate the craft for approach to the destination.

Because the acceleration is independent of the mass of the spacecraft its mass could be quite large and able to carry everything needed for an extended trip and for survival at the destination. The spacecraft could therefore also have whatever large amount of shielding is needed against the radiation hazards of free space.

A DEEP SPACE TRIP FROM EARTH TO THE MOON

For launch from Earth the spacecraft starts from resting on its stern, a position to which it most recently arrived. The launch is propelled by anti-gravitational repulsing of the spacecraft relative to the Earth.

The step between the launch and the aimed direction toward the Moon is an orbit of the Earth. Once initially in that orbit the orbit can then be shifted to the correct orientation for the spacecraft to leave the orbit headed toward the Moon.

The spacecraft remains in Earth-repulsing mode [its stern toward the Earth] for approximately half of the trip to the Moon, that is to the point where the Moon's attraction for the spacecraft takes over from the Earth's attraction for the spacecraft.

At that point the spacecraft changes its orientation so that its stern is toward the Moon. The spacecraft is then in the mode of repulsing the Moon toward which the spacecraft has a velocity accrued from its Earth-repulsing stage of the trip.

The magnitude of the Moon repulsing action is varied so as to guide the spacecraft to a soft landing on the moon.

A capability is required for selecting a location in which to land on a space travel destination and for translating the spacecraft so as to land at that destination. Those problems are treated in the following.

A GRAVITATION DEFLECTOR PLANET SURFACE FLYING VEHICLE

A gravitation deflector flying vehicle would have a deflector in cup form, underneath the payload compartment of the vehicle. That "elevation deflector" is for the purpose of providing vertical acceleration and maintaining travel levitation as in Figure 11-3 below.

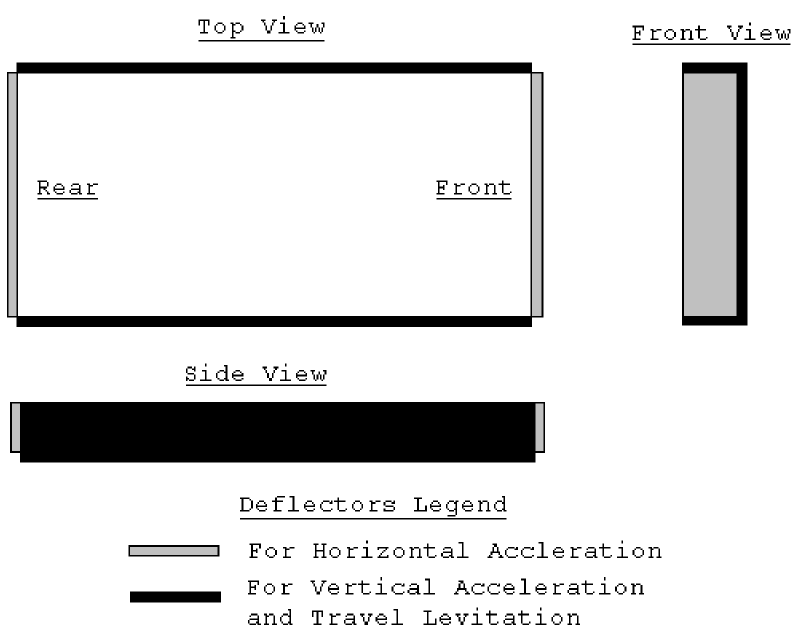


Figure 11-3 –A Gravitation Deflector Flying Vehicle

In addition to that elevation deflector the vehicle would have a front and a rear deflector for the purpose of providing horizontal acceleration and braking by acting on the horizontal components of the ambient gravitational field. The flying vehicle differs from the form for a spacecraft in:

- needing only modest acceleration capability vertically upward beyond sufficient to maintain its constant altitude levitation,
- employing means to generate horizontal acceleration while maintaining vertical levitation.

The vehicle requires a 3-axis system of angular momentum wheels for controlling its horizontal direction and maintaining its positional attitude in space.

This deflector configuration [all without use of fuel] will:

- Provide controlled vehicle levitation for take-off, landing, and travel,
- Provide controlled horizontal propulsive acceleration and "braking",
- But there is the problem of sufficient gravity for the passengers.

The vertical acting deflectors cannot provide artificial gravity by the action of vertical acceleration because the vertical acceleration is controlled to only maintain levitation at a given altitude except for take-off and landing. However, maintaining levitation requires significantly less than 100% vertical deflection. If, for example, levitation required only 50% vertical deflection then the gravitation within the vehicle would be the remaining undeflected 50% of natural gravitation.

A MOON LANDING AFTER TRAVEL TO THE MOON

Upon arrival at the Moon the first action is to reconnoiter and select a suitable landing cite, one that:

- Is convenient for the planned purpose and actions after landing, and
- Is suitable for the size and structure of the spacecraft in terms of the site's geography.

For that purpose the spacecraft launches one or more of its Gravitation Deflection Flying Vehicles to conduct a survey.

Upon selection of the site the spacecraft must be located so that it can land there by a vertical descent. That requires essentially the inverse of the orbit process employed at the beginning of the trip. Upon arrival at the Moon the spacecraft is entered into a lunar orbit. The orbit is then shifted until so aligned that exit from the orbit will result in arrival at the selected landing site.

In spite of that action the spacecraft will still be imperfectly aligned and located for the landing. To adjust that requires controlled horizontal translation of the spacecraft. As is the case with large ocean vessels, the spacecraft is too massive, has too much inertia, to maneuver itself into exactly the intended location and configuration.

The solution to that is analogous to the seaport operations for large vessels – tug boats maneuver the large vessels into position. In the case of landing on the Moon or any planetary body the tug boats are the same Gravitation Deflector Planet Surface Flying Vehicles that performed the earlier reconnaissance.

GRAVITO – ELECTRIC POWER GENERATION

Electric power for the controls, lights, instruments and temperature control in the Gravitation Deflector Planet Surface Flying Vehicles can be supplied by re-chargeable batteries, the batteries being on charge whenever the vehicle is parked in the vehicle garage on the main spacecraft. But the electric power for that charging and for all of the electric needs of the main spacecraft must be generated on board that spacecraft. The means for that is gravito-electric power generation.

Gravito-electric power generation is similar to hydro-electric power generation in which the energy of water falling in Earth's gravitational field powers water-turbines that drive electric generators.

In gravito-electric power, depicted schematically in the figure below, a gravitation deflector repulses the water in the central region of the mechanism. That water is effectively lighter than that in the outer region, which is acted on by whatever is the local gravitation for the benefit of the humans on the craft. The lighter water floats up on the in-flow under it of the heavier natural gravitation water. The result is continuous circulation of the water, like a continuous waterfall.

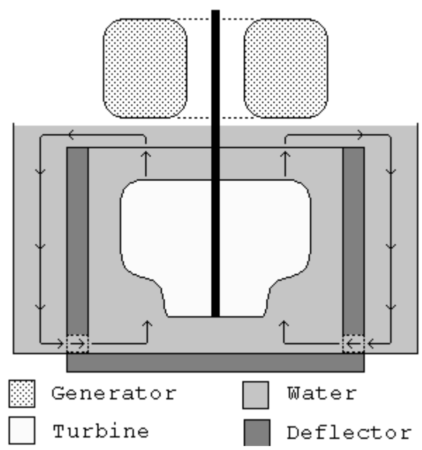


Figure 6-1 – A Gravito-Electric Generator

Water turbines like those used in hydro-electric plants can be placed in the gravito-electric continuous water flow to drive electric generators as in hydro-electric plants.

Gravito-Electric power plants could replace all Earth-based fossil fuel power plants for a major contribution toward relieving the problems of global warming.

SPACE NAVIGATION

[The content of this discussion of space navigation is based on a large variety of materials that will be found on Wikipedia by searching on "space navigation".]

While it might seem that navigation within the Solar System and between stars should be quite simple because one can "see" both the source and the destination the problem is actually much more complicated. Within the Solar System the motions of the various destinations are very significant and travel among them requires going to where the destination will be at the time of the travel arrival there. While that factor is less significant for interstellar travel, interstellar travel involves accelerating for the first "half" of the trip and decelerating for the remainder so that it is essential to know exactly where one is located relative to the source and the destination so that the acceleration phase and the deceleration phase can both be properly managed.

With men having been placed in space in the International Space Station and the advent of on-going planning for future human travel to Mars, interest in the problem of space navigation has developed. In 2003 the European Space Agency studied the feasibility of pulsar navigation and in 2012 two different pulsar navigation studies were conducted, one by GMV Aerospace and Defence (Spain) and one by the National Physical Laboratory (United Kingdom).

In 2016 the People's Republic of China launched an experimental pulsar navigation satellite for the purpose of characterizing 26 nearby pulsars for their pulse frequency and intensity to create a database for navigation for future operational missions.

Then, in 2018 NASA conducted a pulsar navigation experiment called SEXTANT (Station Explorer for X-ray Timing and Navigation Technology) using the International Space Station. That pulsar navigation system demonstrated an accuracy of within 7 kilometers in defining the position of the space station. While in terms of the space station orbit that accuracy may seem poor, accuracy within 7 kilometers is essentially spot on for interstellar travel.

A pulsar is a rotating star that emits a narrow beam of radiation. That radiation can be observed only when the beam of emission is pointing toward Earth. The rapid rotation of the star, from milliseconds to seconds per cycle of rotation, is responsible for the corresponding pulsed appearance of its emission.

The periods of pulsars make them very useful tools for astronomers. Each pulsar's rate of rotation and corresponding pulse rate are very stable. Certain types of pulsars rival atomic clocks in their accuracy in keeping time.

Pulsar navigation is a technique where the periodic X-ray signals emitted from pulsars are used to determine the location of a spacecraft, such as a spacecraft in deep space. The spacecraft would compare received pulsar X-ray signals with a database of known pulsar frequencies and locations. Similar to GPS, that comparison allows the spacecraft to triangulate its position accurately.

Just as sailors look to the stars to navigate and determine their position, interstellar travelers may use pulsars to navigate the universe.

And

Just as the sail-driven ships of past centuries explored the world with fuel-free travel by controlled use of the wind;
The new gravitation technology will enable fuel-free exploration of space by control of the ubiquitous gravitational field.