

The SOLAR SYSTEM

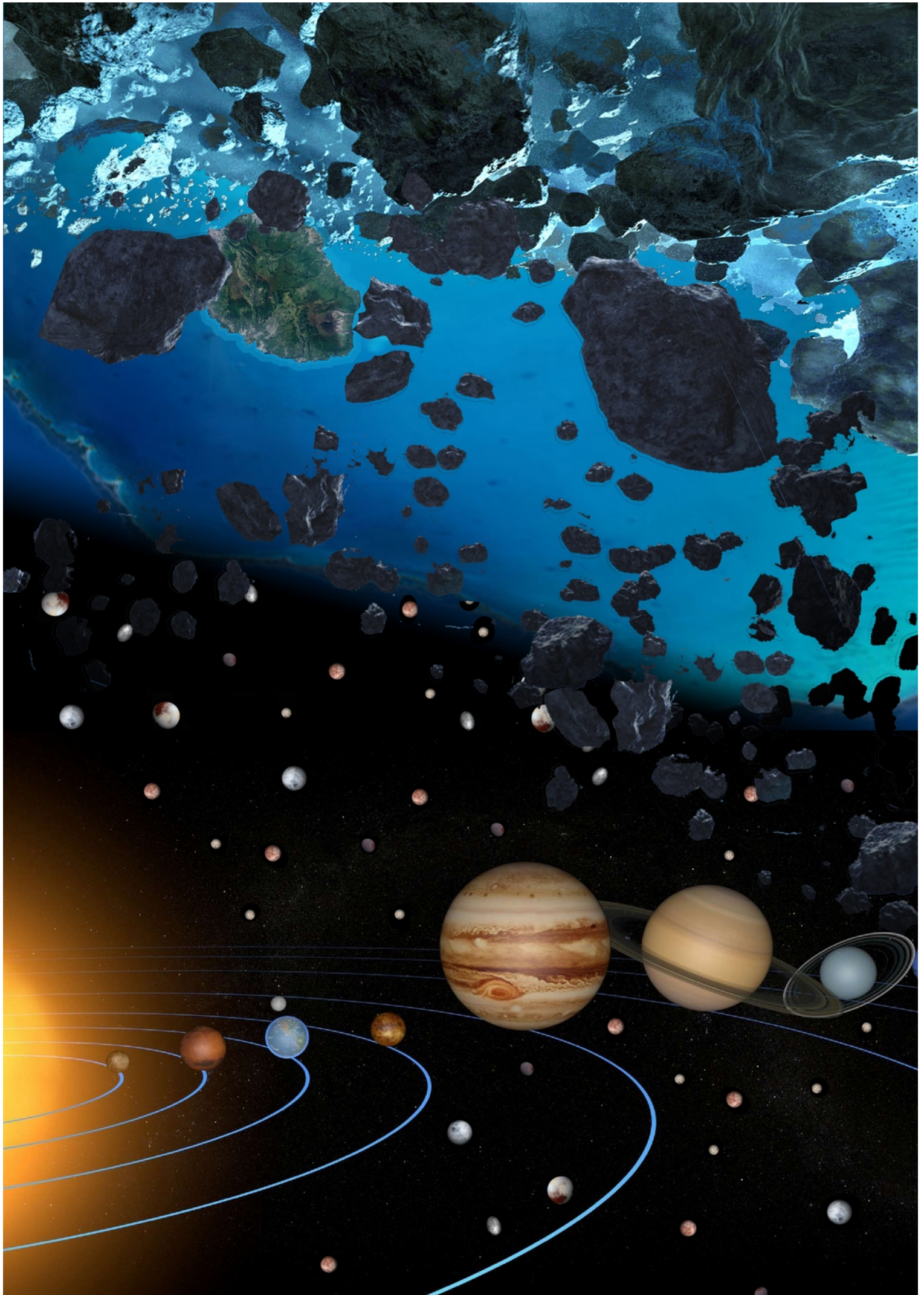
The Earth is the cradle of humanity and for four hundred generations of men and women, for the worse and for the better, as they say, it has seen the development of our particularly stirring species. Under the Sun and the Moon, we have developed agriculture and writing, villages and cities. We crossed the seas and oceans as the winds blew in the sails of increasingly efficient ships, until the very recent industrial era of engines and machines. And just half a century ago, since the times of Sputnik and Gagarin, we managed to get out of our home planet and discover with emotion its beautiful blue color.

With increasingly powerful and sophisticated instruments, probably thanks to the explosion of digital technology and the miniaturisation of equipment, we have discovered over the past forty years that the near extra-terrestrial world is much richer, much more varied than had been known by our ancestors from all the countries from which we came to become the people of Reunion Island.

Of course the Moon, which already made our elders dream, is still there, just four hundred thousand kilometres from Earth and Reunion. And with the naked eye or with telescopes, we can observe the other three rocky planets, Mercury, Venus and Mars, as well as the four gas giants, Jupiter, Saturn, Uranus and Neptune, but we discovered that beyond the dwarf planets that are Pluto-Charon and Ceres, there are also around the Sun more than one thousand five hundred other small planets, for which we created this new classification of dwarf planets.

Better still, we have counted more than a million asteroids around the Sun, more than a kilometre in diameter, where we find all the elements of Mendeleev's table, from oxygen to carbon and all the metals, without forgetting the water we discovered very recently that it is omnipresent throughout the solar system! Asteroids are easily accessible with electric thrusters a thousand times more efficient than chemical rockets for interplanetary navigation. The Sun, at the distance of the Earth, provides on each square kilometre as much energy as a nuclear power plant. The economic future is in Space.

At Reunion Island, our small planet that arrived on the great just two million years ago by the effects of a particularly active volcano, we are the precursors of an extension of humanity and life into the entire solar system, where we will find the resources to forget the crises and make the Earth a beautiful paradise. Today we can get out of our cradle, open ourselves to a wider world, and play with the diversity that is our main asset to open up a solarian world to the greatest happiness of Earthlings and Reunionese. The Earth-Moon Sailing Challenge is a great local and global realistic dream, a real dream project in a world where you have to understand that the jobs of Space are on Earth!



The EARTH-MOON Challenge

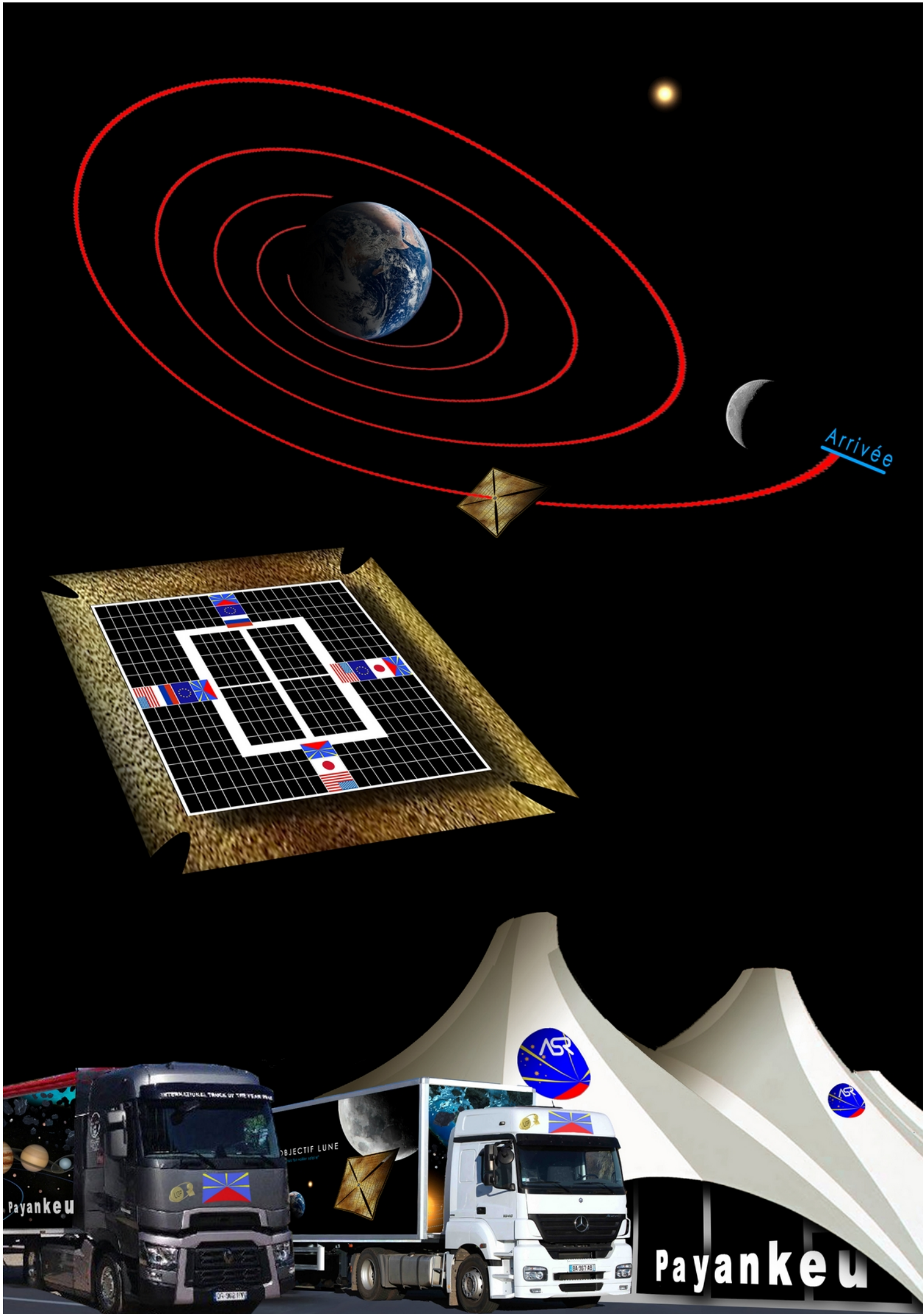
In a manner similar to sailing with a sailboat on the seas and oceans by the combined effects of the shock of the air molecules on the sail and the hydrodynamic forces on the keel or centerboard, it is possible to navigate in interplanetary space using the combined effects of the pressure of the photons of the Sun's light and gravitational forces. The photonic pressure is low, equivalent to the effect of a two-euro coin pressing on a surface as large as a sports field, but it is exercised continuously hour after hour, day after day, while the tanks of a chemical rocket are empty after a few minutes of operation. As in the interplanetary void there is no resistance to advance, sailing spacecraft can navigate anywhere in the solar system, for exploration missions, such as the IKAROS mission in 2010 between the Earth and Venus, or for regattas and races.

Sailing between the Earth and the Moon by gradually widening a spiral-shaped trajectory is a very sporting challenge because the near-daily changes in the relative position of the Earth, the Moon and the Sun in relation to each other require complex maneuvers. Official rules exist for the Earth-Moon Challenge, with a starting sphere 50,000 km from the center of the Earth, and an arrival marked by the sending of a photograph of the center of the hidden face of the Moon, to prove that the sailboat has exceeded the distance of the Moon.

The sailcraft must be launched to the starting orbit by a conventional rocket. Then the sail is deployed, and the sailcraft begins to maneuver by playing with the pressure of the light photons. It needs on board steering systems, communication with a control center on Earth, energy management provided by solar panels, and to coordinate the whole thing, an onboard computer. The miniaturisation of the equipment over the past 25 years has allowed to go from projects of sailcraft from 100 to 150 kilograms to sailcraft like the Payankeu project whose mass is only three kilograms for a sail of 50 square meters and a central core of 20x20x10 centimeters only.

The navigation between the Earth and the Moon can take about a year and a half for the sailcraft's orbits to be enlarged enough to pass behind the Moon. The economic model adapted to manage the race is that of the Tour de France, with a circus top and a caravan that go from city to city week after week, to do conferences, concerts, with an exhibition, a control center, and professional meetings with the educational community and chambers of commerce.

The other model of operation is that of Cirque du Soleil, which can make five large representations on the same day in five capitals of the world. The Earth-Moon Challenge has gone from an international competition to a global cooperation, and the same Payankeu sailcraft, «made in Reunion» will be presented under different flags in different parts of the world.



Arrivée

OBJECTIF LUNE

Payankeu

Planet REUNION

By the grace of a great volcano, Reunion Island is on Planet Earth like a small rainbow planet set on the big blue planet. It was at Reunion Island that in 1979, following conversations with engineers of the French Space Agency working at the Toulouse Space Center, emerged first the concrete idea of making solar sails for a race of sailcrafts between the Earth and the Moon, as the famous science fiction writer Arthur C. Clarke had imagined in his book *The Wind from the Sun* published in 1964.

Two years later, after meetings at a world congress of astronautics, the French-speaking association U3P, the Union pour la Promotion de la Propulsion Photonique, was founded in Toulouse with the dual objective of outreaching information on this extraordinary means of navigation in the solar system without using fuel, and of organizing regattas of solar sailcrafts between the Earth and the Moon in the image of the most famous sailing challenge on the seas and oceans.

In the mid-1980s, an organization called *Transpace*, set up by a French Region for the organisation of an Earth-Moon race, was quickly shattered under the devastating effect of political struggles. In 1992, on the occasion of the 500th anniversary of Christopher Columbus, three large sailcraft, American, Japanese and European, were about to embark on an Ariane-4 rocket till the starting sphere, but this great momentum was once again broken by the outbreak of the Gulf War. Later, the U3P has devoted most of its activities to supporting dozens of student academic work on solar sails.

After the year 2000s, the progressive miniaturization of equipment and the rising of cubesats standards allowed a resumption of technical projects, with the concept of a small solar sailcraft project called Demoiselle, another name given to dragonflies. It became later the Papang project, after a return of the idea to Reunion Island where it was fully within the manufacturing capabilities of the industrialists of our island. Then, with the emergence of major problems facing the planet, the spirit has changed from international competition to global cooperation. The Earth-Moon Challenge has become the goal of the global Payankeu project, made by teams from all over the world to be integrated at Reunion Island, which had demonstrated its space capability by producing in 1997 the world's first high school satellite for the 40th anniversary of Sputnik.

To implement the technological project, the Earth-Moon Challenge has two major proven business models, the Tour de France and the Cirque du Soleil. A video presentation on the Payankeu project was nominated in the top 12 presentations at the GLEX-2021 World Congress, and since the 2021 academic year, the Energy Lab laboratory of the University of La Réunion has adopted Payankeu as one of its experimental projects. Payankeu is a key educational scheme in all areas of activity for local as well as global futures, an exceptional tool for the regional development of space culture, a banner for the visibility and outreach of Reunion Island in the whole World.

