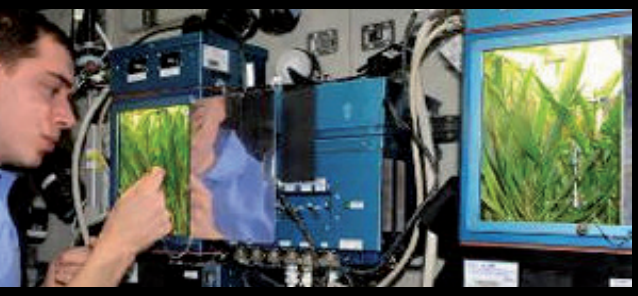
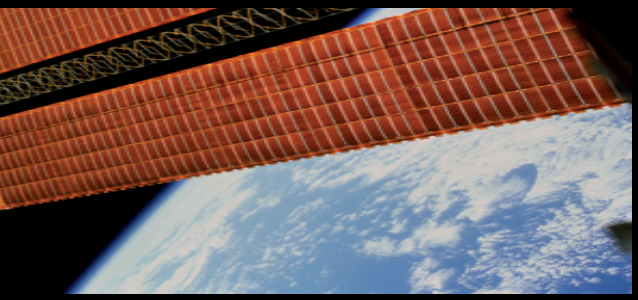
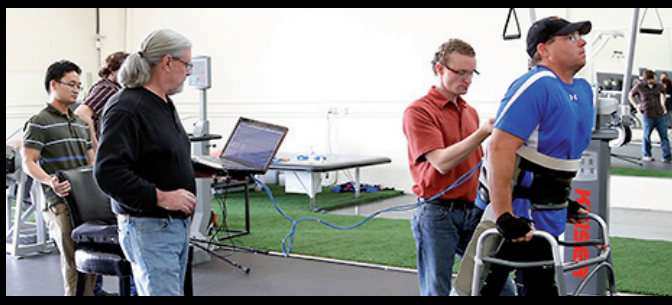
ESA - Space for Sustainability Award 2013





MARS 4 EARTH

Stimulate innovation and develop synergies for sustanainable applications through the prism of a Mars manned mission's requirements



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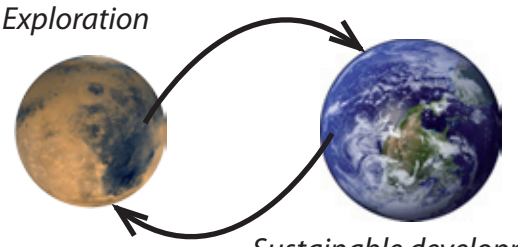
MARS 4 EARTH

• MISSION STATEMENT •

MARS 4 EARTH is a interdisciplinary project idea which intends to stimulate and develop innovation for sustanainable applications through the prism of a Mars manned exploration's requirements. Such initiative create per se synergies and public awarness that can be used for the benefits of both space exploration and sustainable developpment.

" No-one in Europe could live without satellites even if they don't realise it. Space is useful in our daily lives. So we're not really just star-gazing, exploring space improves our daily lives on earth."

Jean Jacques Dordain, ESA DG, Euronews 14.11.2012



Unlike in the U.S, space exploration and manned flight minds are not associated to New frontiers way of life in european citizen. European people are more focused on welfare improvement and welcome space solutions when it contributes to This goal. A Project like MARS 4 EARTH adresses both and strengthen each other.

• BACKGROUND •

The European space industry is highly qualified, on the edge, public benefit oriented, benefits of daily life like transportation, networks....
Already many spin off, ESA is leading position the effort of technology transfer to non space application for the benefits of citizenship, safer, easier, greener living conditions.

Sustainable development is a critical issue for Europe, the continent has high level living conditions objectives whereas it is facing a slow down from an economic point of view.
New challenges arose like climate change and environmental change which makes people understanding that spaceship earth is a closed system. Regarding these issues, space sector can highlight the similarities between its needs for manned exploration and the need of more Eco friendly, energy efficient systems on Earth.

• MARS 4 EARTH's RATIONALE •

Sustainable development challenges in Europe :

- Health : ageing population and healthcare system : There is a strong political will to maintain the system whereas economic rationale suggest to reduce it. ESA Member states are pushing for technologies relying on telemedecine, diagnosis, autonomous system which can reduce costs of their health care systems.

- Maintain water quality level and management among applications needs : Europe water supplies are likely to come under increasing pressure in the future as a result of population growth and climate change. On warmer season a lot of southern ESA member states face water stress which deeply affect their agriculture industries.

- Energy efficient systems / infrastructure and green oriented production solutions :
There is a pressing need in Europe for low carbon (i.e. renewable) energy sources to meet international agreements and to limit climate change in the longer term.

- Ensure access to farther and farther non renewable ernergies : In order to facilitate the energy transition ESA member states committed to reduce their carbon emission and reduce their dependenc. For

the remaining part, existing reserves are rapidly being depleted and the remaining unexploited oil and gas fields are in difficult to access locations and/or harsh environment which requires new tools and safer process.

Technologies synergies between European needs in SD and space exploration :

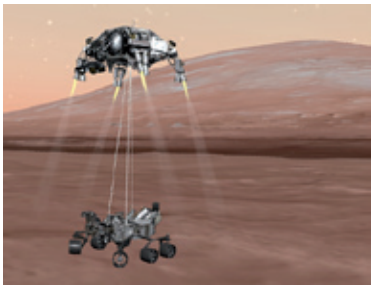
Space activities cover a wide scope of activities including exploration which main purpose is to increase mankind aware of the solar system and extend human presence. Unlike other space applications that offer direct benefits to mankind welfare, space exploration May be seen as an unaffordable expense.

ESA achieved many on the edge exploration missions (either manned or not) with the first landing an foreign body beyond the asteroid belt with Huygens, first automatic docking to the ISS with the ATV, mapping of the universe with Hershel and Planck and coming missions to asteroid with Rosetta and Mars with ExoMars.

It is generally admitted that a human being putting a foot on the surface of the red planet is the final objective of manned exploration no space agencies committed formerly to do achieve this objective in a foreseeable future. Through Aurora program ESA is developping step by step exploration missions at long term. Even the US realised that they cannot afford the Moon yet. In the current, space budget is hardly maintained and manned space flight rationale is questioned. It is in ESA best interset to foster synergies with Earth applications in order to answer sustainable development challenges.

It is in ESA's best interest to anchor its farthest ship en route to the farthest shore with earth related matters i.e :

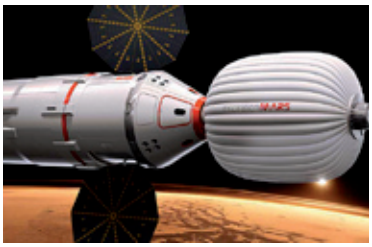
- Management and maintenance of crew heath on long distance spaceflights inluding point-of-care delivery of healthcare by intelligent and autonomous systems. Development of counter measure of physiological effects and accelerated ageing.
- Space exploration requires capabilities for efficient, reliable and compact energy generation and storage on-board spacecraft and on the planetary surface were cells, batteries, photovoltaics, and nuclear power development can be used on Earth
- Launch costs and weight restrictions limit the amount of water and other 'consumables'. The limited access to water supplies requires efficiently managed with a re-cycling/ re-use factor approaching 100% which can improve those on Earth.
- Space exploration also has significant requirements for robotics, automation and safe operations – not only for robotic precursor missions to the Moon and/or Mars but also in support of human missions that could be used for tele reach applications.



These pictures illustrate current or future space exploration related projects which aroused strong public opinion curiosity in 2012

European public opinion enthusiasm for space exploration :

As a mankind achievement any child or teenagers do remember where he was and what he was doing on the night of July 1969 the 21th. One could object that strong and powerful enthusiasm what limited to this golden space decade. However the public enthusiasm for Chris Hadfield flight mission on board the ISS and the 78.000 individuals who applied for a one way mission to MarsOne reality show underline that this enthusiasm is a long and a diffused tail effect which remains intact as of today.



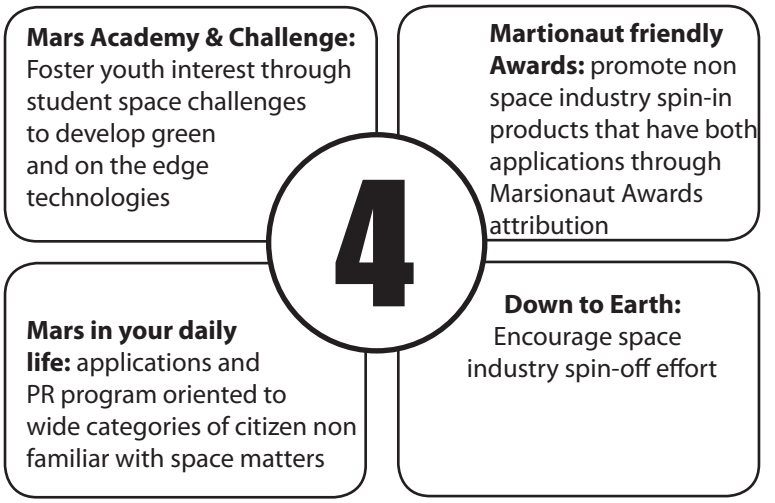
A public interest for space exploration can be use to promote sustainable development

Unlike other space applications, space exploration benefits are more scientific, prestige and socio economic. Public opinion and tax payers do not see direct benefit of space exploration. Given the enthusiasm from people for latest initiative like Curiosity Rover, MarsOne, Inspiration Mars from Denis Tito and Chris Hadfield flight on board the ISS, ESA shinitiative should take the opportunity of highlighting space technologies' contribution to sustainable development since both are rulled under the same rationale of innovation, efficiency, eco friendly.

The manned mission requirements to Mars can embody public opinion interest without needing a formal committment of ESA to carry such mission in in a short term period.

• MARS 4 EARTH's CONTENT•

The four pillars of action



The Green Martian Challenges :

Goal : Stimulate students to martian mission requirements with student competition with work packages on technologies that have both benefits for sustainable development and Mars Mission.
Level of action : College and Universtities
Implementation within ESA policy : Esa Education programs

Previous initiative :
- European Student Orbiter, design a moon orbiter
- ACE Student Aerospace Challenge, suborbital competition
- NASA Lunarobotics, robotics
- Space droids programming challenge, programming of robots on board ISS
- Exploration Design Challenge, student design of MPCV radiation shielding

SWOT :
Strengths : Strong interest from Student
Weaknesses : Design workpackage to address both SD & space matters
Opportunities : Affordable technologies like 3D printers, ExoMars background
Threats : Committment of Schools to participate
Applicability : Now

The Green Mars Academy :

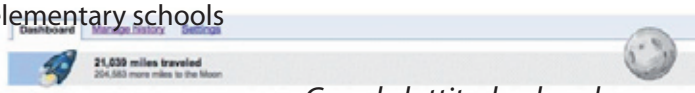
Goal : Gather space students enthusiast through Summer schools program held at ESA centers
Level of action : College and Universtities
Implementation within ESA policy : Esa Education programs
Lesson learned from similar / previous initiative : European Center for Space Law Summer Course, ISU Space Studies Program

SWOT :
Strengths : Met students needs to get intouch with professionals on real projects
Weaknesses : Limitation engineering scope of current space related competition.
Opportunities : ESA facilities availabilities,
Threats : Costs, logistics
Applicability : Short term

MARS IN YOUR DAILY LIFE :

Goal : Foster public opinion awarness of SD& Space exploration synergies by providing direct connection to space matters.
Level of action : Wide categories of citizen non familiar with space matters.
Development of partnerships to with sport brands to develop smart health monitoring app that collects datas. Sport event planners cooperation to Create a Marsathon where the addition of all km ran would be compared with Earth Mars distance.
Synergies studies and data collection on osteoporosis. Staying fit exercizes campain to elderly people to increase awarness of similarities with ageing population and spaceflight.
Name ExoMars competition.

Implementation within ESA policy : ESA Public Relations Bureau
Previous initiative :
- MissionX astronaut training program to elementary schools
- MagISStra Greenhouse
- Smartphone space apps, ESA astrodrone



Google lattitude already offers the possibility to know how much a user walked in year and compare it to the Earth Moon distance

SWOT :
Strengths : Huge potential of applications
Weaknesses : Get people interest for the program.
Opportunities :
Threats : Targeting many different categories of citizen.
Applicability : Now

MARTIONAUT FRIENDLY AWARDS, A TECHNOLOGY SPIN-IN EFFORT :

Goal : promote non space industry spin-in products that have both applications through Marsionaut Awards attribution
Level of action : Reward products from companies which do not develop space products but from which sprecifications are close or met space exploration requirements in term of design, efficiency.

Implementation within ESA policy : ESA Technology Transfert C
Similar initiative :
- ESA Space Spin-off Award
- FSC Label, Max Haavelar
- Energy Star

SWOT :
Strengths : Consumers interest for on the edge products
Weaknesses : Unmatching specifications and design
Opportunities : Wide potential of products
Threats : Targeting many different categories of citizen.
Applicability : Now / Short term

For consummers, labels make a difference during shopping decision

DOWN TO EARTH, A TECHNOLOGY SPIN-OFF EFFORT :

Goal : promote space industry technologies spin-off products which have been designed for space use but which have a Earth based applications.
Level of action : Improve current practice within ESA, develop partnerships
Implementation within ESA policy : ESA Technology Transfert Office
Similar initiative :
- ESA Space Spin-off Policy
- ESA spin-off Award

SWOT :
Strengths : On the edge technologies
Weaknesses : Intellectual property issues, interest / awarness for spin off
Opportunities : European space technologies portfolio
Threats : Competition with other industries like IT on infrastructure and networks
Applicability : Short term / Long term