THE CHALLENGES OF AN ORDINARY MAN TO HELP SPACE HEROES

I'm not a hero. I do not have special talents or abilities beyond what many other people have. I try to do my part, I fight for ethical conduct, I try to make a difference in my daily actions or in my professional activities.

I'm just an ordinary man, maybe with a quirky sensitivity and a life story outside the box, things that brought me here, with "weird" preferences, as my daughter Clara is often told about my strange, long songs Or my movies, books and other things. Dreaming about the future, going to the cosmos through my yard and always observing stars.

Things that have led me here and given me choices, such as my preferences for technology and science or the definition of my profession, which covers various areas of knowledge, technological, sociological and artistic, making it possible to create and materialize ideas, Industrial Design.

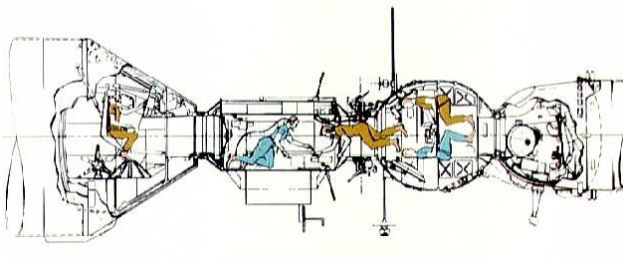
Life stories ... There is one that motivated me to these choices, besides having defined what my future as a person would be.

Like millions of people on the planet I was in my living room watching the landing of the first men on the moon with my family, at the age of seven, with blurry TV images and enormous excitement, as if it were Christmas Eve.

I have always followed everything about the Conquest of Space, I always liked science. Even in my childhood I received the encouragement of my parents and my two older brothers who always participated in my discoveries and mischief!

She lived in a wonderful home, where she valued good reading and rigid education under the traditional guidance of a veteran navy father and a former mother teacher. I have won books on astronautics and astronomy, encyclopedias and comics. I visited museums, I got models to ride.

Due to the lack of money, my brothers and I created many of our own "models" using paper tubes, bottle caps, plastic bottles, the remains of other toys. I discovered that I wanted this forever!
Still in that room in the suburbs of Rio de Janeiro, sitting on the rug and watching the indefinite images on TV, I heard my mother, a housewife beyond her time and in love with books, asking my father: "João is this really true, the man went to the moon?" My father replied looking at her -" It's Wilma, we made it! It's on TV. " At this time, even so small and accustomed to the science fiction series of the time, I realized how deep and symbolic it was, how much human effort had been invested, and the expression "we started" in my father's response showed me the How much I could do in the future ... I wanted to be an astronaut!
I kept reading my books, learning and discovering new things and at some point, I wanted to be a scientist...



Around my twelve years, browsing through a magazine of my father, I saw a technical drawing, the internal layout of the Apollo Soyuz set and I've been hooked ever since! I did not know yet what profession I was doing that work, I deduced over time that it was engineering. I wanted to be an aeronautical engineer!

The layout showed the interaction between the machine and its occupants, with details on the movements of the astronauts, reaches and other details and after years, I discovered that this was one of the functions of Industrial Design. So I wanted to be a designer. I became one!

PERSONAL CHALLENGES

I have always tried to focus on efficiency, objectivity and the desire to achieve good and remarkable results in all my professional actions. I have not always been able to and I'm still trying to get better and better!

Often I discovered that I was wrong, I failed many times ... I also lost a lot because of my self-confidence, arrogance and even naivety, believing that many of my "peers" shared my ideals and goals, but we had different Interests. I continue through my personal and professional experience, adding knowledge, researching and putting into practice to the maximum each concept and method that I believe to be promising in many areas, from the basic knowledge of the Pioneer Design Schools to the current concepts of Design Thinking and methodology Of DFX or Production Engineering and Psychology.

However, what has most helped in the development of my projects and also in my activity as a teacher, is a historical approach, are the methods of NASA, including those used during the Apollo Program. This reference is indeed a stimulus, an inspiration, a symbolism and an example of acceptance of challenges and objectives: "Not because they are easy, but because they are hard."

I worked in the private sector; I was researcher of Innovation in the area of Industrial Design of the National Institute of Technology - INT, organ of the Brazilian Government; I accepted the invitation to be a Design teacher; I founded a small R & D Design company, Clara Idea Design, where I created a line of assistive technology equipment to help the blind in education and work.

At the same time, I work in the Public Service as Professor of Technology in Naval Construction at the Science and Technology Secretariat of Rio de Janeiro - SECT, ministering in a Technical School, always conducting my activities as a Space Project with dedication, precision and Pleasure, Using values And concepts absorbed throughout my history, trying to ensure the best possible results. My work gives me pleasure and I can help people!

SPACE CHALLENGES

I get newsletters from NASA and JPL and read them regularly, or at least when possible. For various reasons, however, including the testing schedule where I teach, I lost information about the Space Poop Challenge at the time of disclosure, only to be aware of it on December 3, 2016 when I read a weekly magazine!

I felt again like on Christmas Eve and I loved the design proposal and the theme, I saw the deadline, it seemed short ... and it was. I took a deep breath and accepted to take part in the challenge. I worked hard on concepts and researched references in various areas, made more complex sketches and designs, gotten intimate absorbents for simulation and absorption and capillary testing, discovered new things, and reviewed my files with data from technological references and my favorite documents in a folder called NASA with over 3500 items! I have applied technologies from different sectors to the solutions I have developed. Finally I could design for NASA, including even the insignia of my project!

I did not expect to be a winner in this challenge; It stands to reason that the cash prize is a great stimulus and even needed now! But because of the reduced time, among other things, I knew my chances would be minimal and something could go wrong on the way and gave. From problems with the financial crisis in Rio de Janeiro that eroded my economies; Or the cancellation of new projects for my company due to lack of money from clients; Or my anxiety and stress that worsened, added to my father's recent loss; Or the unexpected and almost fatal illness of my little dog, Espoleta, who needed urgent hospitalization; Or even the serious defect in my computer and loss of CAD software that failed, forcing me to install a new one on my wife's notebook.

Several interferences crossed the course of my challenge. I did not give up ... In the end everything was fine, even in a serious financial crisis!

I completed the concept and sent, in a hurry and still adjusting topics in the electronic questionnaire, literally missing about four minutes for the deadline! I'd rather take the risk and get into the challenge anyway.

The cash prize is very stimulating and important, especially given the difficult financial picture we face, but the biggest stimulus is the project itself as pure Industrial Design activity and how it could really generate solutions for a need so real and at the same time always Seen with some taboo or with secondary importance and adapted and "rushed" solutions. I also do not know if any of the concept items developed can be used as an unfolding or reference to other problems, but, they are now available and I hope they serve.

NEEDS AND CHALLENGES: THE SPACE POOP CHALLENGE.

There are no human needs that are less noble or deserve attention and care. From comfort and physical and emotional well-being to the maintenance of life, all are essential and in certain circumstances are fundamental.

In a controlled, well-known and secure environment the simplest needs are solved with the facilities and infrastructures available, in a less comfortable or adapted way, and in conditions of extreme urgency are overcome in an improvised way. However, this holds true for situations on Earth, and only on Earth! Or in rare and memorable situations outside of it ...

To meet the call of going higher in space we are adapting ourselves, creating resources that allow us to go further, in a more secure, efficient and better way to withstand the adverse, inhospitable and unpredictable conditions of this environment, all challenging conditions, and In this context the explorers of women and men, the heroes of space, form the most important component and their most basic needs become special requiring effective and comfortable solutions.

RESPONSE TO THE CHALLENGE

The Autonomous Waste Management System

In response to the Space Poop Challenge, a conceptual solution was developed with minimal impact on MACES Space Suit systems, employing principles of biomechanics, fluid mechanics and capillary transport and liquid absorption, intelligent material technology and electronic systems. This solution was called the Autonomous Organic Waste Management System - AWMS.

The AWMS concept was thought from the physiology, as if the whole device were an extension of the natural excretory systems, amplifying their capacities and reproducing their transport mechanisms. This idea came from the principles of Bionics.

WHAT IS AWMS?

The concept covers all the needs presented in the Space Poop Challenge and the end result achieved aesthetically pleasing form, with the appearance of light clothing.

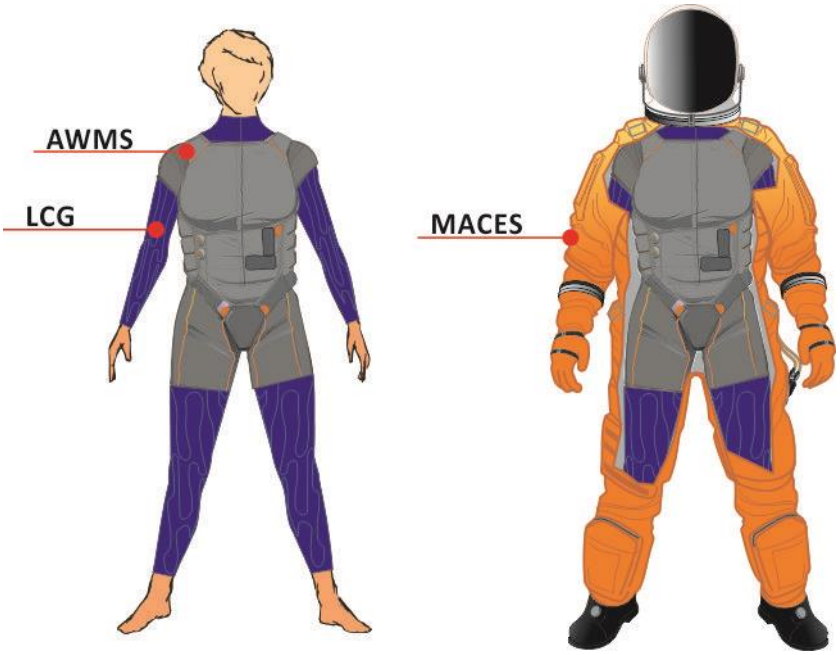
I believe the result was good, and for a better understanding of what was created, I present some details, without the depths complex, but what is necessary for an overview.

The AWMS is a system composed of flexible and elastic clothing that supports the components. The articles are arranged in accessible housings for the maintenance of the devices and for the disposal of containers and tubes. The support tissue is elastic and adaptable to the various anthropometric characteristics on a S, M, L and XL scale, covering the largest range of percentiles contained in **Airforce ANSUR anthropometric data table**.

AWMS is molded to allow full mobility and the skin contact collectors and connectors are anatomical and non-invasive, designed to enable movements and seating position. The system is a closed circuit, with the devices grouped into independent modules and the general layout aims to keep the legs free and allows adjustment of the components at waist height to avoid interference in the anti-G device of the space suit.

The integration of AWMS with the MACES space suit

The term "Autonomous" in the acronym AWMS refers to the autonomy of the whole system, and in this aspect with emphasis on the maximum independence of the space suit devices,

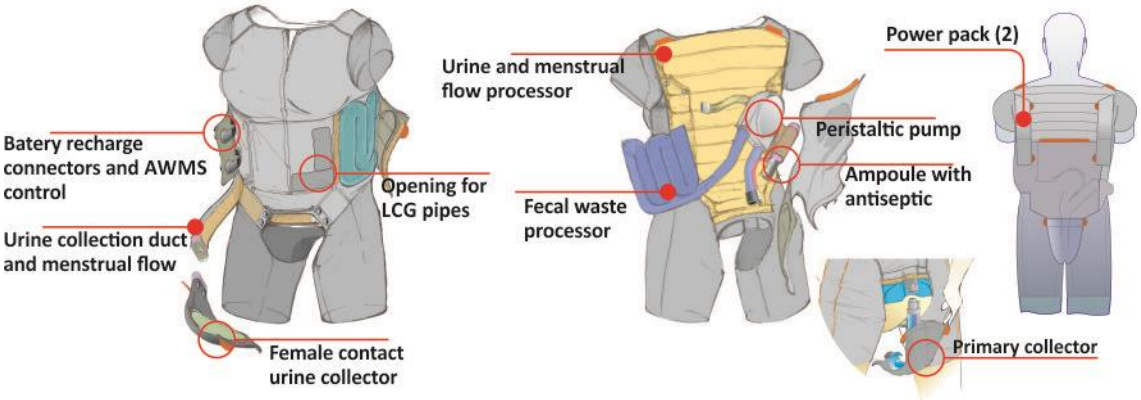


being the only interaction being power sources and controls, thermal control suit and biomedical sensor wires. (Connector through openings in AWMS). It is designed not to use pressurizing systems, subsystems, air circulation or thermal control fluids. The AWMS is worn after the thermal control garment - LCG.

The AWMS arrangement is as follows:

1 - Clothing Stand

Composed of modules and submodules for the collection and processing of organic waste and power system and control devices.



2 - Fecal waste processor

The device is based on the Peristalsis - where wave movements of the smooth muscle of the digestive tract throughout its length enable swallowing to excretion, regardless of gravitational action or position of the individual. The transport dynamics of the flow to the container is obtained by means of a Peristaltic Pump.

Description of submodules

2 A - Cutaneous Adhesive Base - It forms the contact between the skin in the anal region and the mouth of the Primary Collector. It is hypoallergenic, bactericidal and water repellent. It has anatomical and flexible shape allowing the movements. It isolates the region of the urethra preventing transfer contamination. It enables the quick coupling of the Collector Duct by means of a magnetic flexible ring strip in the back of the base. The references for this solution are adhesive connectors for colostomy bags.

2 B - Primary Collector - It is a molded and resilient plastic tube. The inlet, from the anus, contains the contact tip with the Skin Adhesive Base, fixed magnetically. The outlet to the pump contains quick-connect connectors for connection to the Peristaltic Pump Duct and a Pressurized Ampoule with sanitizing solution.

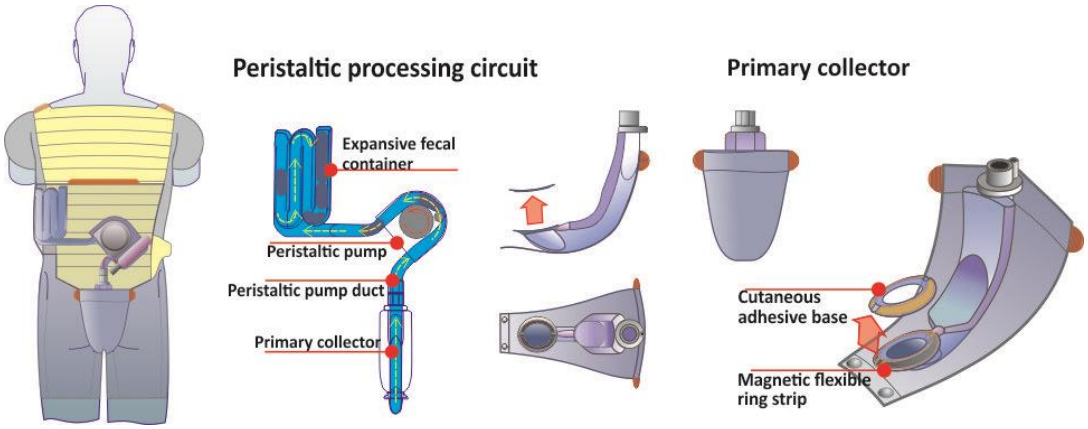
2 C - Peristaltic Pump Duct - It is a flexible tube with caliber, elasticity and resistance ideal for peristaltic pumping. It is a unique piece, connected to the Expansive Fecal Container. There is no contact between the pump and the transported fluids that remain confined inside the duct.

2 D - Peristaltic pump - Not a design item, however, depending on the characteristics of the concept, a specific design with a better arrangement for space utilization would be ideal. In the peristaltic pumping cycle there is no need for return valves, the flow retention occurs by the rotating shoe itself.

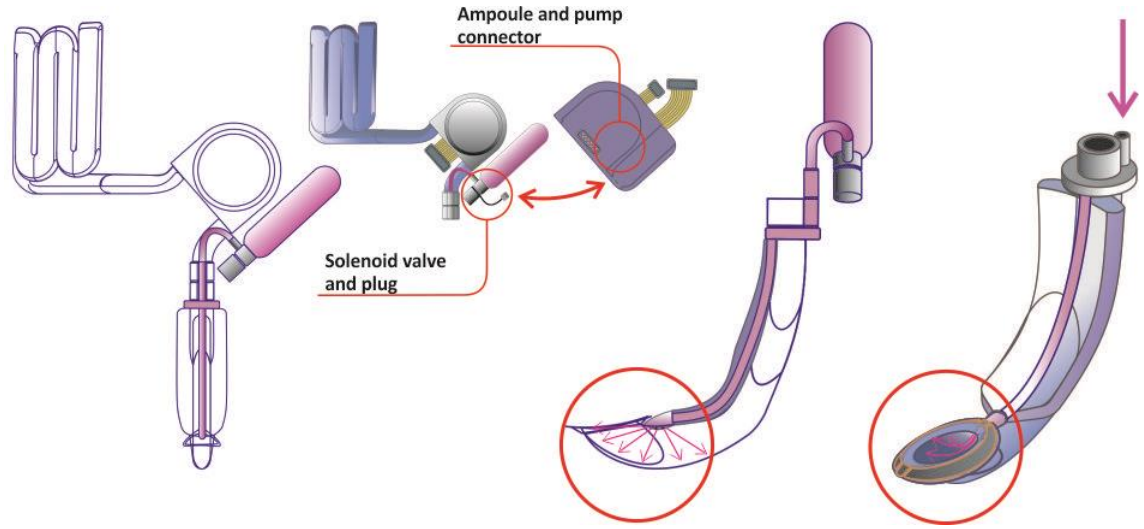
2 E - Expansive Fecal Container - A tubular bag that processes and stores fecal volume. It is molded in a flexible linear serpentine polymer with expansive elastic walls. Its interior has a partial vacuum and is impregnated with an antiseptic and absorbent compound. Approximate total storage: 720g and above, distributed over the entire length of the bag.

Super smooth surfaces

The entire fecal transport circuit is super slippery, ensuring greater efficiency. The ducts may be composed of special polymers or surface treatment ***(LiquiGlide - MIT)***.



2 F - Pressurized Ampoule - It is a capsule containing antiseptic hygienic and volatile physiological solution ***(similar to the 3M Cavilon)***, with the timed and electronically controlled actuation, synchronized with the peristaltic pump. The jet is potent enough for skin hygiene and the Primary Ducting Duct. The waste is removed by the peristaltic pump.



3 - Urine and Menstrual Flow Processor.

This device is based on the transport of fluids by capillarity of microtubes, absorption and capture of liquids by means of fibers, superabsorbent polymers ***(sodium polyacrylate)*** and auxiliary suction.

The System consists of the following elements:

3 A- Enclosure - The device consists of a flexible plastic enclosure, filled with composite absorbent materials. It has integral and anatomical mold positioned in the dorsal region, allowing maximum retention capacity. It is equipped with a low-power piezoelectric auxiliary

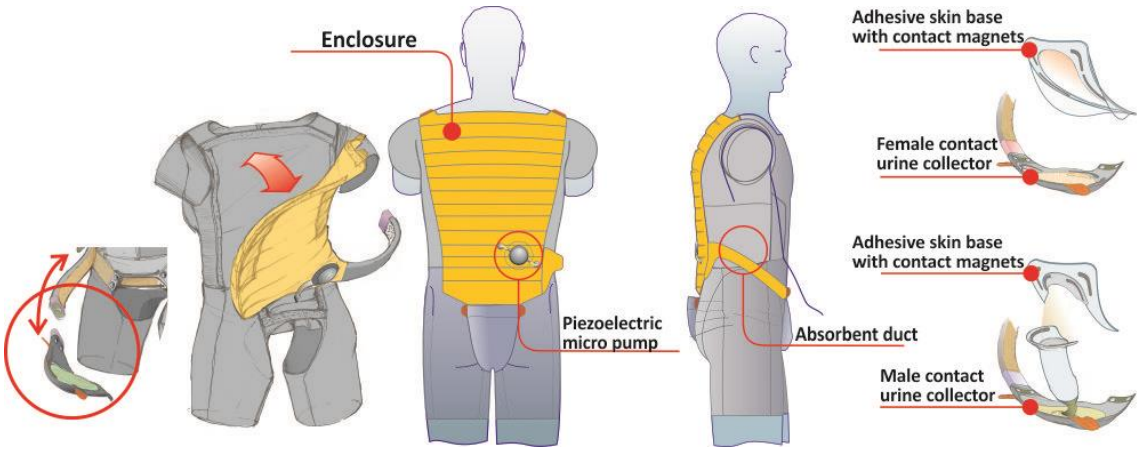
micro pump. The pump has a microprocessor for timed drive cycles. For size XL the approximate capacity of the casing is 9.5L of fluids and for size S is 7.0L

The capture of the liquids occurs through the duct composed of absorbent multilayers, integrated directly to the enclosure and a system of microtubes for the suction of the dispersed liquids in the Contact Collector with the aid of the piezoelectric pump.

The auxiliary suction serves especially for the deeper removal of residual menstrual flow in suspension in the vaginal cavity.

3 B - Female Contact Collector - It is an element with anatomical mold of the urogenital region, with more contact with the vulvar vestibule. In the region of the vaginal opening there is a small protuberance with a higher concentration of suction microtubes.

3 C - Male Contact Collector - Anatomically shaped, the collector accommodates the penis preventing potential leaks and allowing full capture of urine and moisture. At the end of contact with the urethra there is greater concentration of absorbent material and aspiration microtubes.



Both Contact Pickups have the same positioning solution, with Skin adhesive base and magnetic pickup adjusting contact.

The positioning of the Cutaneous Adhesive Bases should be made in the Earth for the best possible adjustment, being retracted only in the return of the space flight.

WHAT DID I BELIEVE WAS IMPORTANT?

Participation in the Space Poop Challenge was another rewarding, fun and, above all provocative, experience in many ways. Provocative of my potentialities, my ability to synthesize and organize, and to solve problems under pressure, as to the valuation of solutions to basic needs, seen by some as of lesser importance, but above all to the difficulties of materializing an idea and Makes it plausible, valid and important.

The AWMS was thought of as a specific item in the preparation for space flight, not as an auxiliary garment, its efficiency being experienced in space by the simplicity of use and quickness of placement in emergency situations. The AWMS is a specific device, without the complexity of a space suit, but no less important than it.

Everything we do is important and impacts us or others.

This reasoning, this way of perceiving and addressing issues and problems, both within a project and in life itself, opens up greater perspectives and meanings. Once, a friend and university classmate told me a sentence after a Project Methodology class:

"If we look more deeply, the processes we use in our projects can also be used in our lives! And, maybe we would suffer less from poor decisions and lack of awareness of good choices. "

The Space Poop Challenge was a good choice for valuing things that often go unnoticed or are seen with secondary value.

This challenge was important to HeroX, to NASA, to the staff, to the thousands of people who engaged in it and accepted the challenge, including me! And, above all, for the Astronauts, the true heroes of space who, in one way or another, will benefit from the results achieved, either by the project made by a "common man" or by a high technology solution developed by a company.

Yes, what we created was important.

If I'm a hero? No. Heroes do extraordinary things, expose their own lives to risk situations for others or for noble causes, engage in fantastic deeds whose ideals are just! They go into fires to save dogs...

But if we look closely every ordinary person is a hero yes! Assuming your personal risks striving for a better life every day, or fulfilling your obligations as citizens, reaching out to someone less favored or questioning reprehensible and inappropriate actions of people in positions where ethics, justice, and responsibility should be the central axis.

Ordinary people, anonymous heroes of everyday life.

I'm George Guerra, from Rio de Janeiro. I am the proud father of Clara, 18, the daughter of my first marriage and is preparing to be a biomedical. I am married to Ana Cristina, a psychologist and lawyer who shares my ideals and struggles.

I have developed projects in the areas of medical-hospital equipment, products for special needs, Urban Design and consumer products;

I created the DIGBRAILLE line for the visually impaired in education, leisure and work. I'm still trying to get funding to implement the series products with low cost and greater distribution;

I recently conducted research with universities and partner companies (Pontifícia Universidade Católica do Rio de Janeiro - PUC-NEXT and FMC Technologies - Projeto Gota) to create equipment for oil and gas exploration in deep waters with safety, low environmental impact and low cost. A new concept emerged;

I help people by teaching them a profession and ways to survive in the world around them.

I'm struggling every day for something better for the maximum of people, trying to make a difference.

The financial crisis hit us. We feel the impact, we are still in the middle of the storm ... I lost the students because they could not afford their studies, and friends are being laid off ... But, come on, dribbling the crisis as in a football Game and create alternative means To continue the game! Discovering promising challenges that can help many lives.

There is a saying in my country that says the following:

"I'm Brazilian and I never give up!"