

A vertical garden with green plants growing on a wall. The plants are arranged in a dense, vertical pattern, with some plants having long, thin, trailing stems. The background is a light-colored wall.

Why space?  
Because Earth  
depends on it.

Cecilia Hertz, Founder and Managing Director, Umbilical Design  
Dream-on workshop, Riksteatern May 27, 2016

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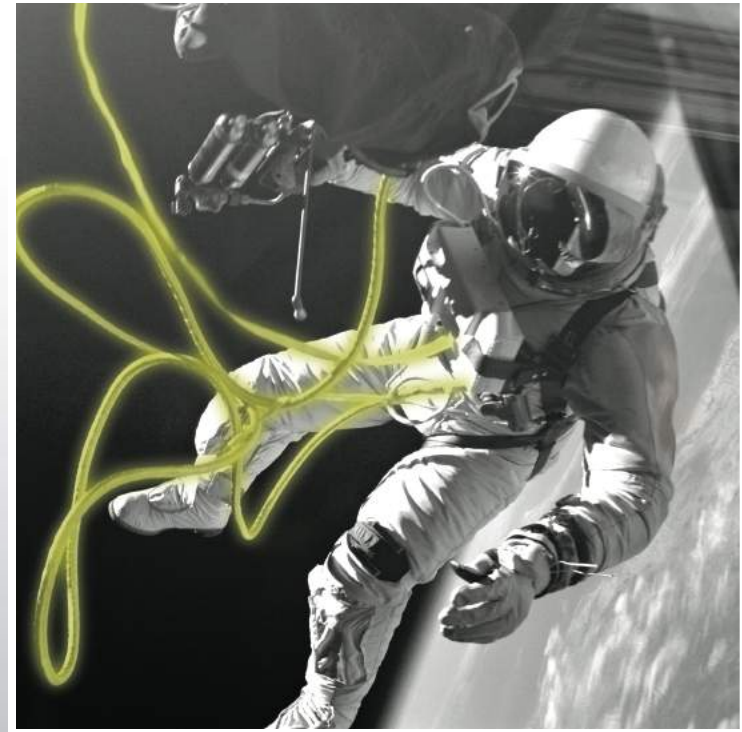
# Background



- Umbilical Design was founded 2001
- Focus on design and architecture for space and extreme environments.
- Ongoing cooperation with NASA and ESA.

## The Name

Umbilical is a term adopted by the space industry, where an *umbilical* implies the connecting line carrying power, air, water and oxygen between a launch pad gantry and a launch vehicle, or between an astronaut and his/her spacecraft, etc.



# Application Areas



Umbilical Design works in three application areas;

*Space Solutions, Extreme Environments and Everyday Life*

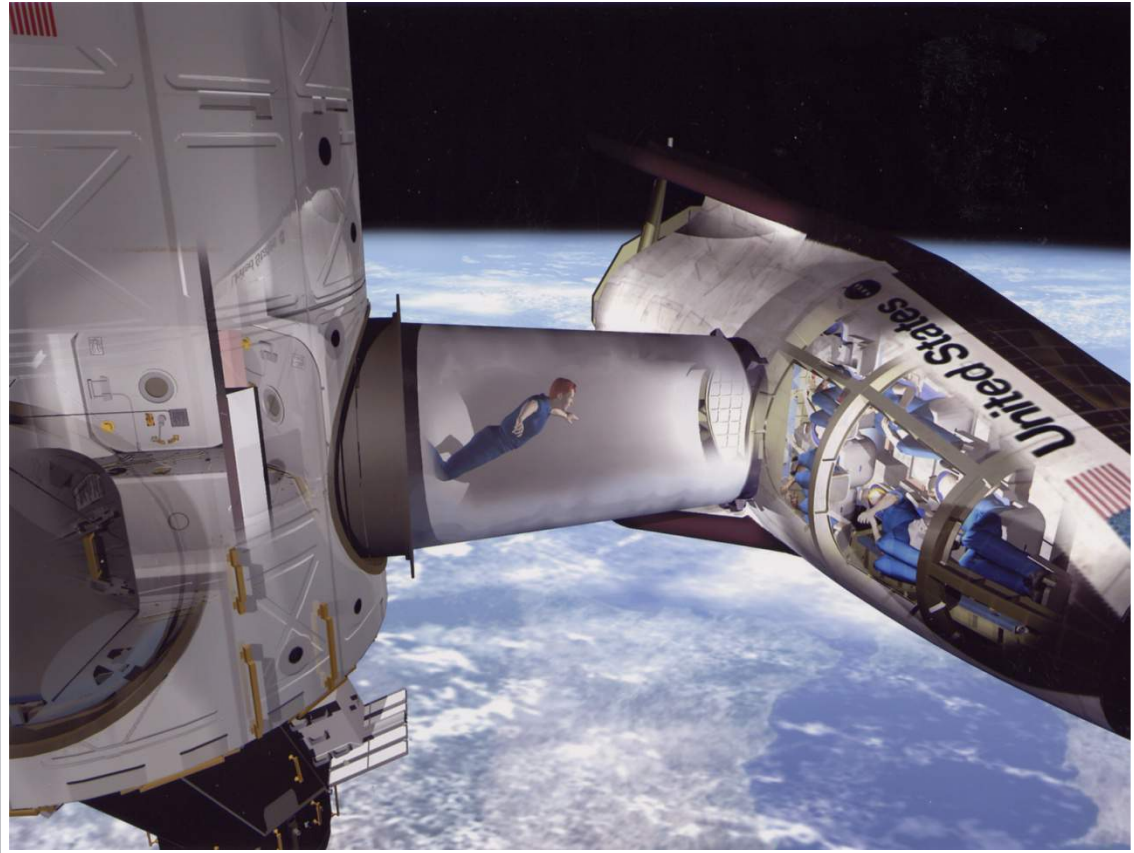


Crew Return Vehicle CRV  
In cooperation with NASA and ESA

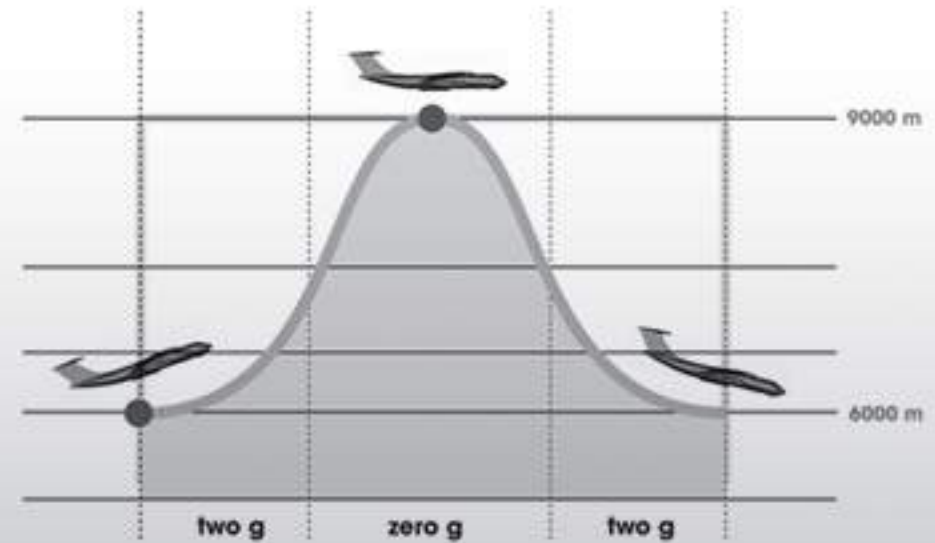


## Task

"To produce and visualize solutions for an interior layout of the CRV cabin, that support and ensure a psychologically and physically safe trip from the ISS back to earth."

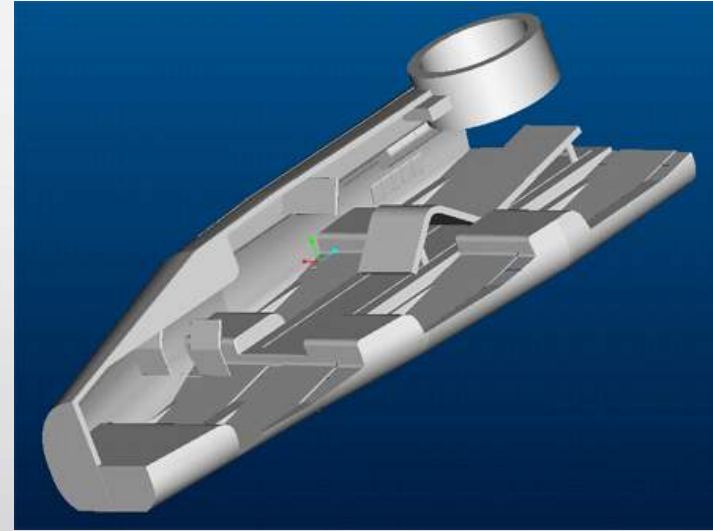


# Tests in weightlessness



The project was selected as one of 30 to participate in ESA:s Parabolic Flight Campaign in Bordeaux, France

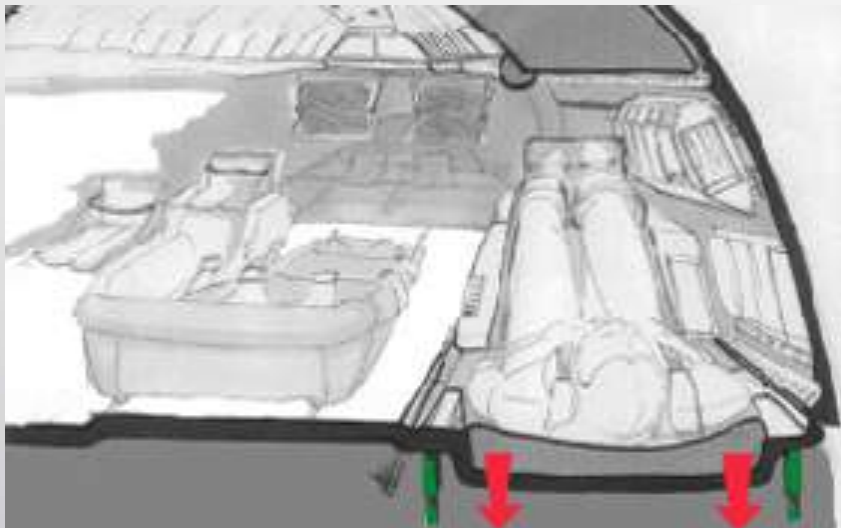
# Design Level #1



Concept and configuration of the CRV cabin



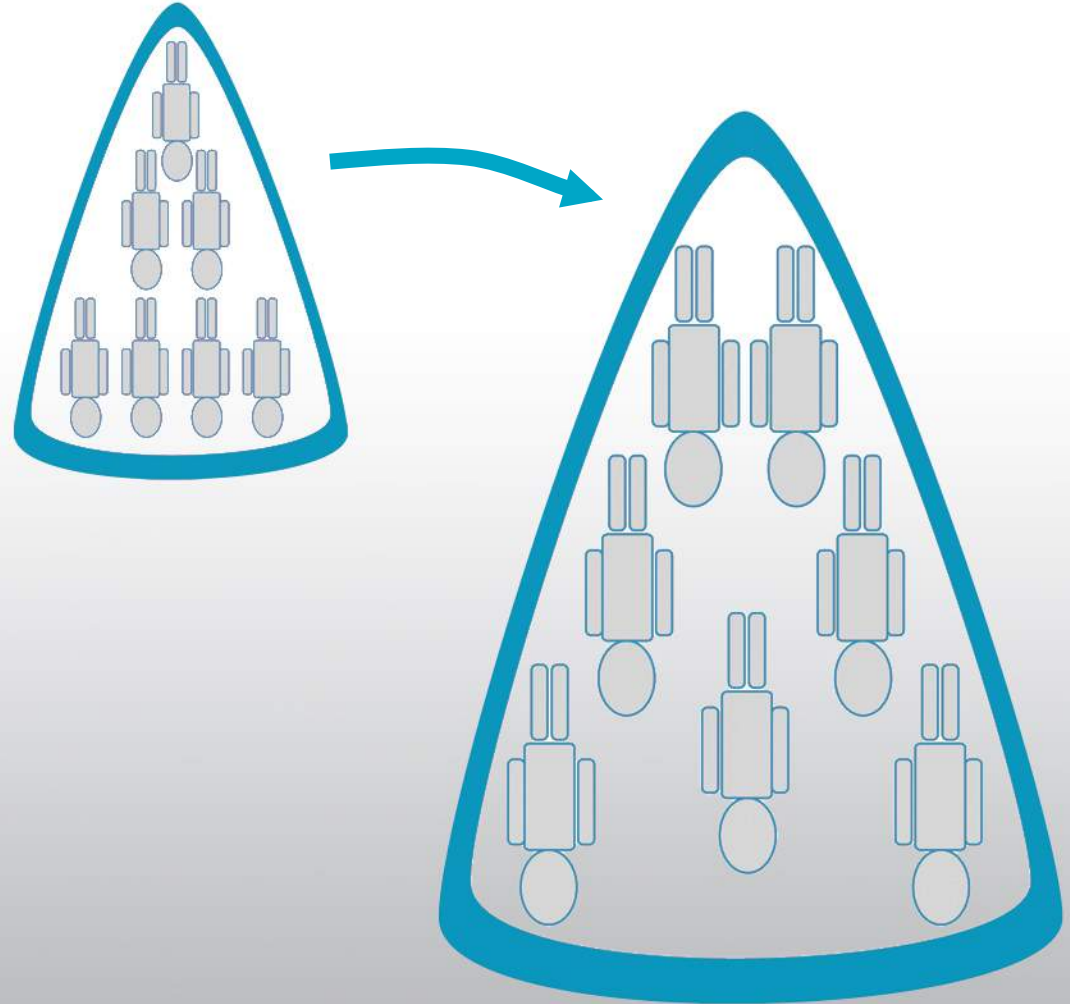
## Design Level #3



Functionality design of the products inside the CRV cabin

# Collaborations with astronauts

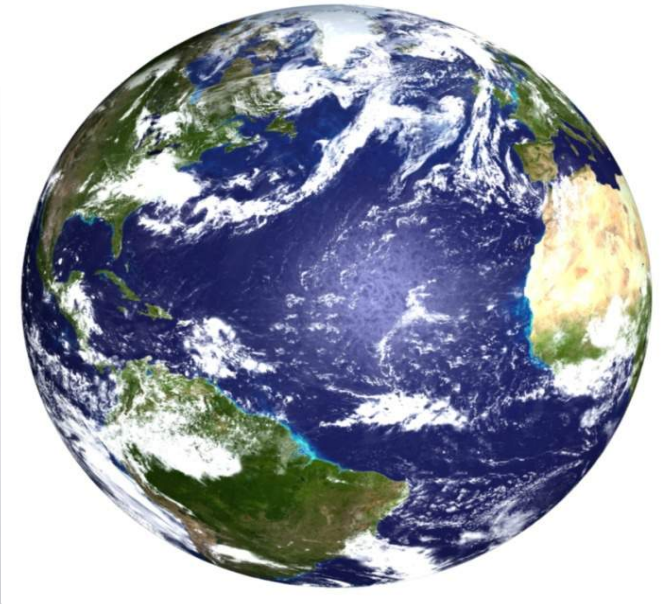




## Result

- Decreased weight
- Better volume management
- Easier to ingress & egress
- Increased comfort & safety

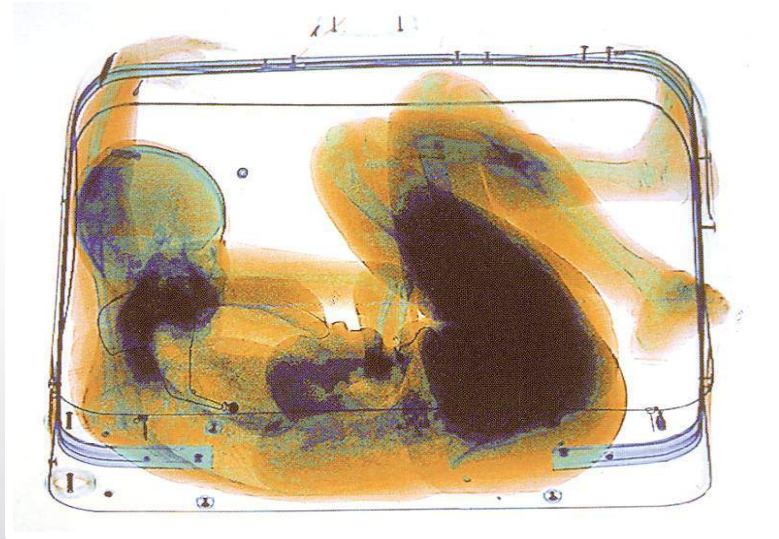




## Goal

To put Sweden on the international space design scene



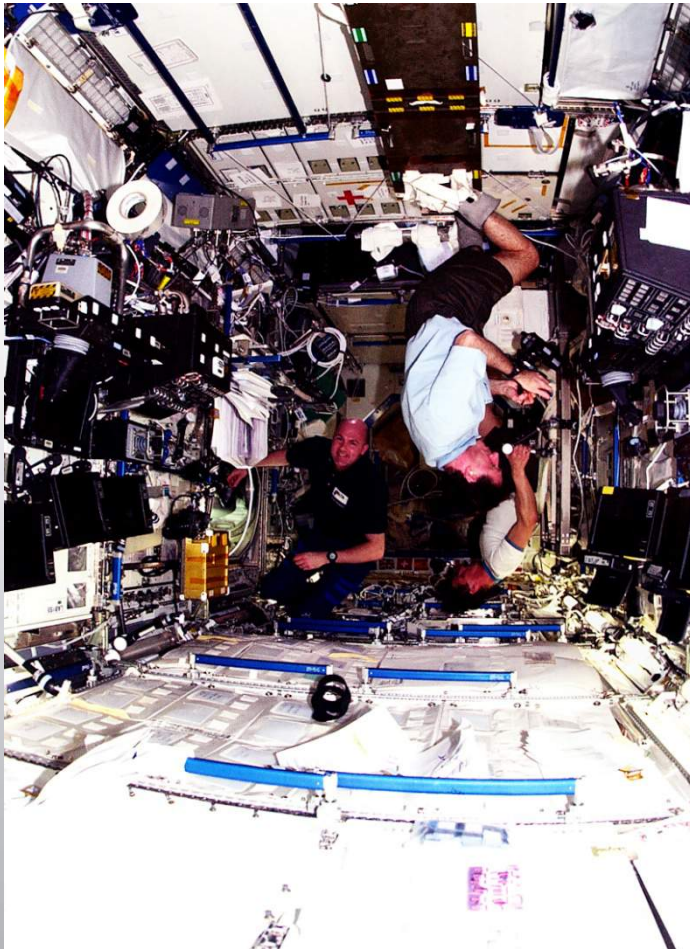


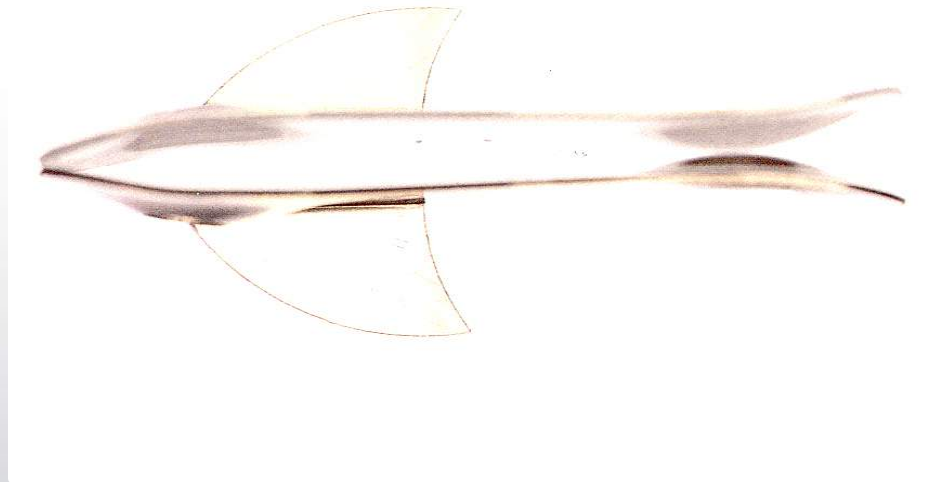
## Volume Management

Space Environments – Unique Solutions



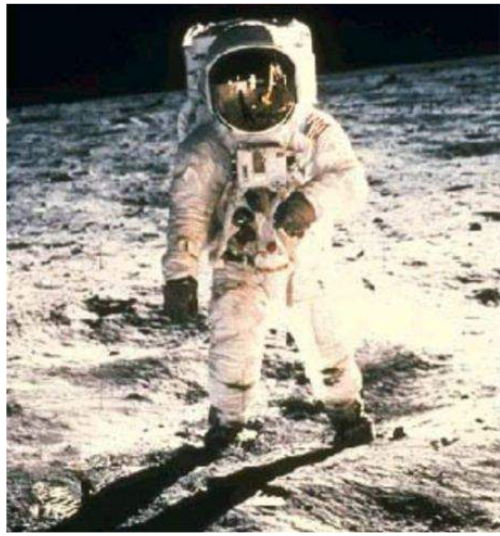
# Living and working in enclosed environments





## Weightless Thinking

Space Environments – Unique Solutions



Space suits

Our new homes?





## Terrestrial Applications

Umbilical Design's **major business area is Space Technology Transfer**, where we've been active since 2004 and represent Sweden in **ESA Technology Transfer Network**.

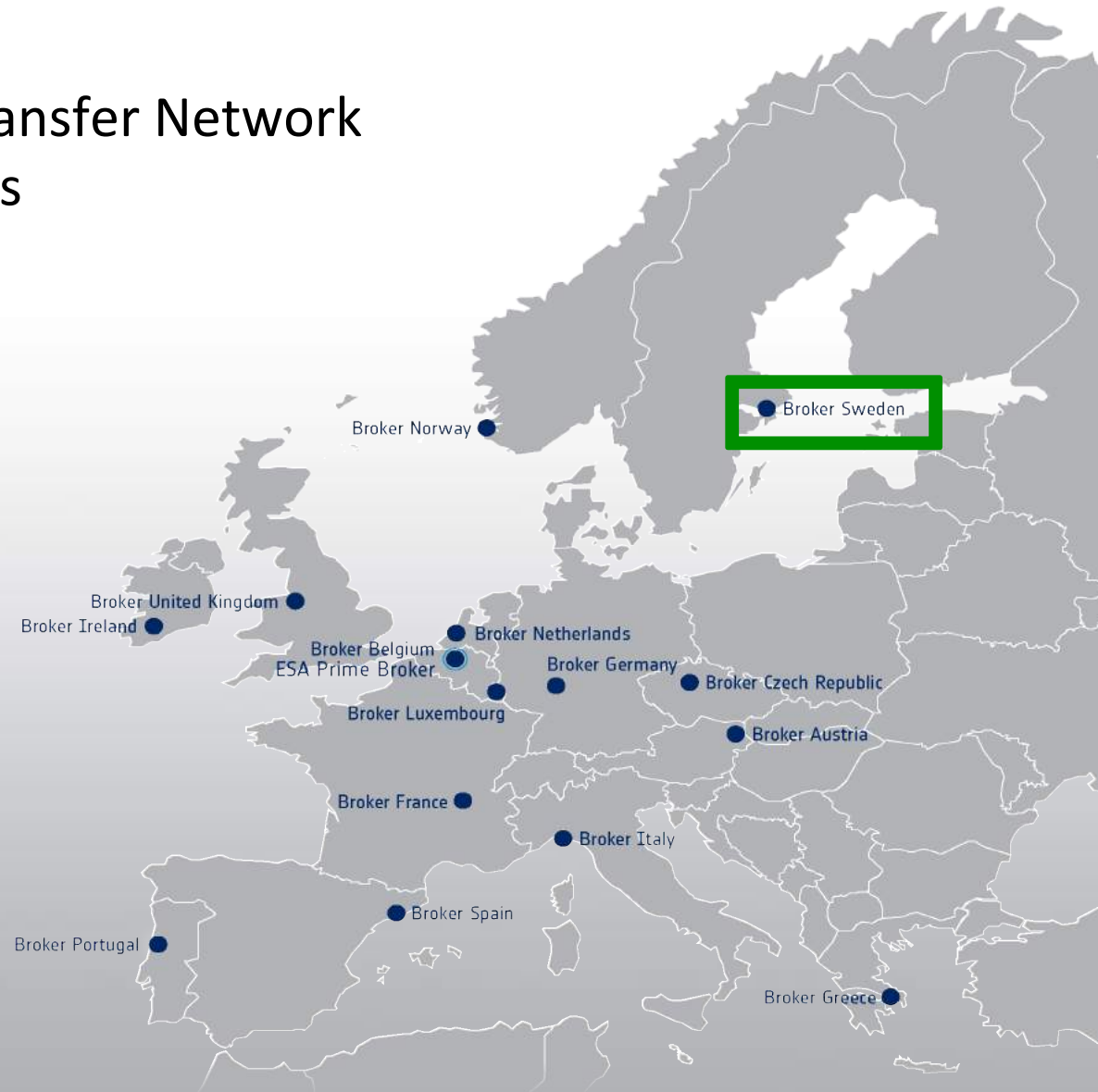
We are developing a national platform to transfer materials, technologies and concepts from the space industry to commercial and industrial applications.

In our major project – the Down to Earth project we focus on companies willing to **develop and launch sustainable products incorporating space technologies**, which can be used as competitive advantages on a global market

# ESA BROKER NETWORK

ESA Technology Transfer Network  
Across 15 Countries

**20** Transfers  
per year



# UMBILICAL DESIGN

ESA Broker, Stockholm, Sweden

## EXTREME SAILING SUIT

Materials from the Mars Rovers tires were transferred to a sailing suit for extreme sailing.



# Couture in Orbit – From spacewalk to catwalk

A project in cooperation between ESA and the Science Museum in London







Between 2014 and 2016, five ESA astronauts from the UK, France, Italy, Denmark and Germany are visiting the International Space Station

To mark the missions, the project: "Couture in Orbit" was initiated



## Material "Shape memory alloys" (SMAs)

that returns to its original shape at a pre-programmed temperature

# Colours of Earth - Fashion inspired by space

The Great Salt Lake seen from the International Space Station  
Artificial pools, where water is evaporated to extract minerals

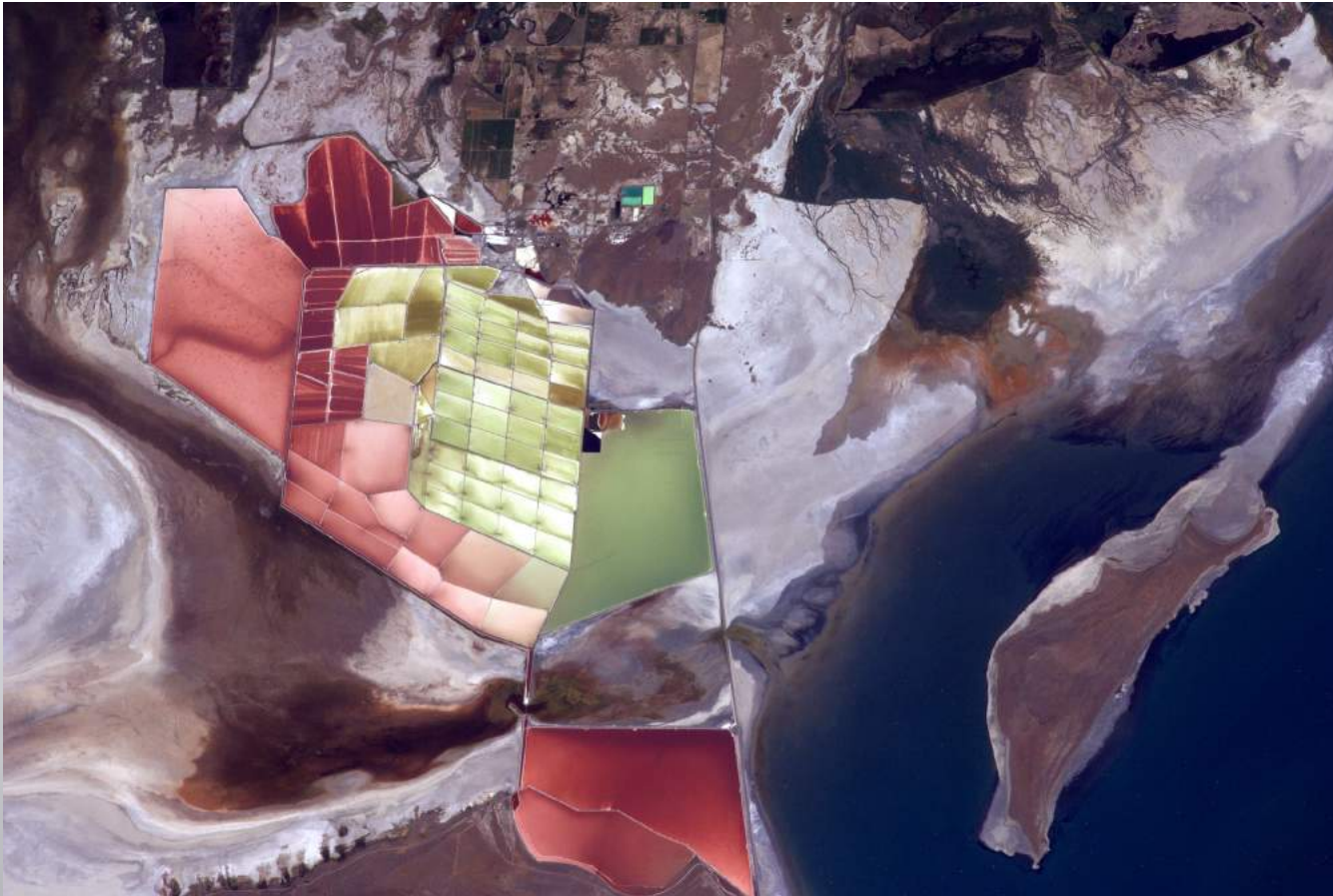


Photo taken by ESA astronaut Alexander Gerst during mission 2014



# CONTROL ROOM - FIELDVISIT – STEEL INDUSTRY





# UMBILICAL DESIGN

ESA Broker, Stockholm, Sweden



## THUNDERWEAR

### SPACE TECHNOLOGY

Space fabric used in astronaut clothing, which can resist heat up to 350C.

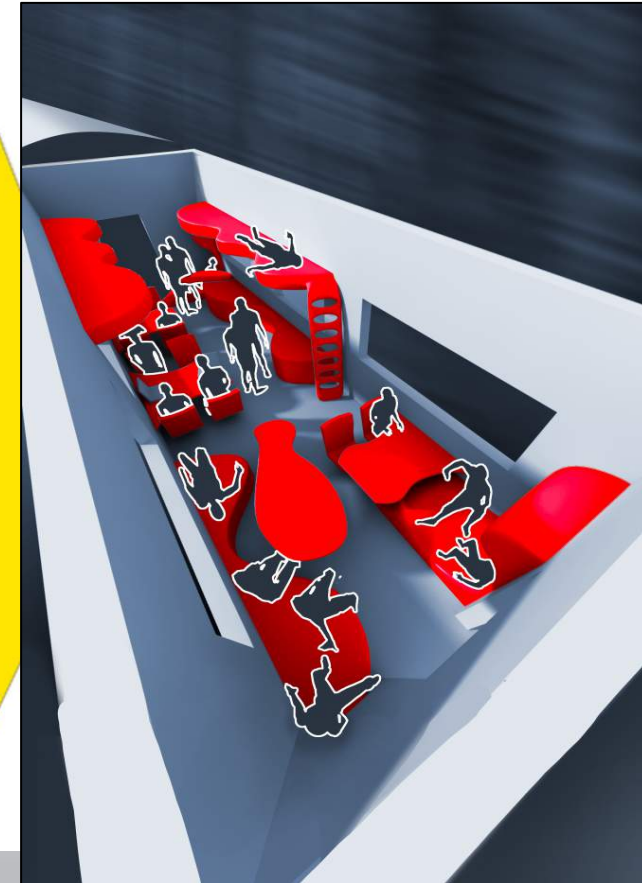
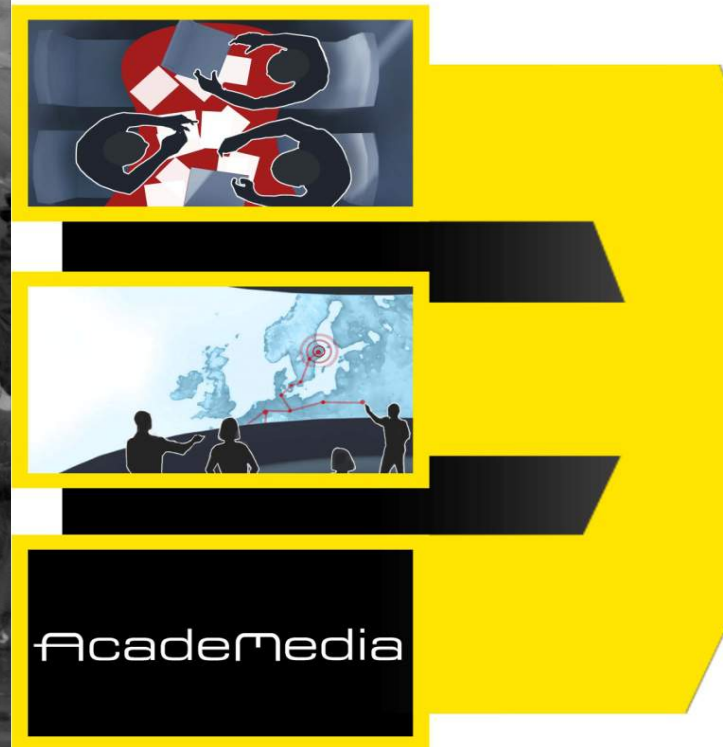
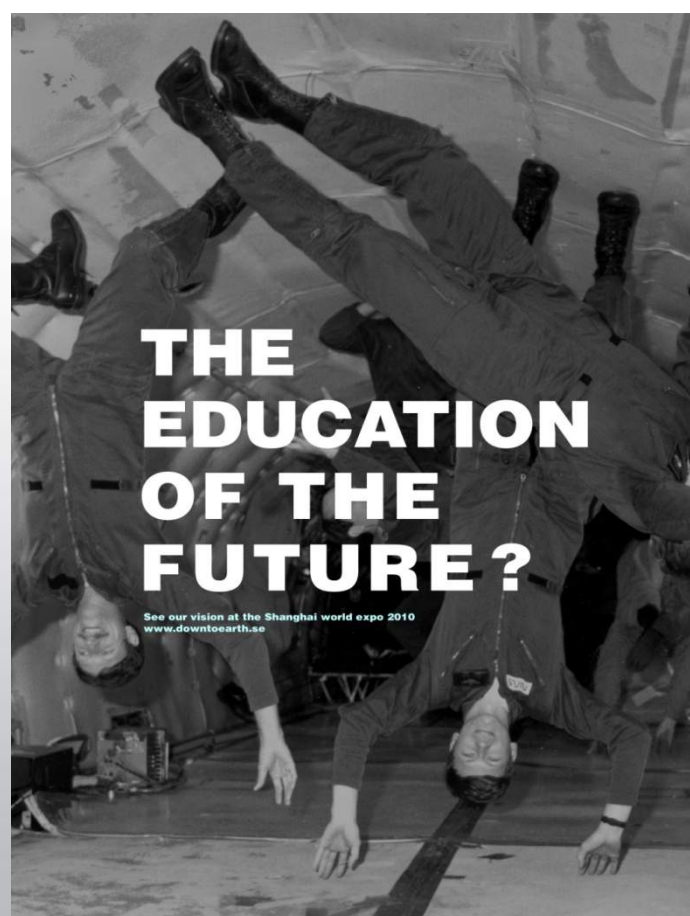
### BENEFIT FOR PLANET EARTH

- Protects steel workers from burns and scars;
- No coating, the fiber of the material is resisting heat in itself;
- Biodegradable



# Client case: TRAINing for Academedia

**Challenge:** “The education of the future”, **Concept:** TRAINing, **Client:** Academedia



“New learning environments are needed and as TRAINing uses the train, journey as a basis for learning, the concept helps us explore what a school can be in the future”

# TRAINing

– A new learning environment using existing infrastructure

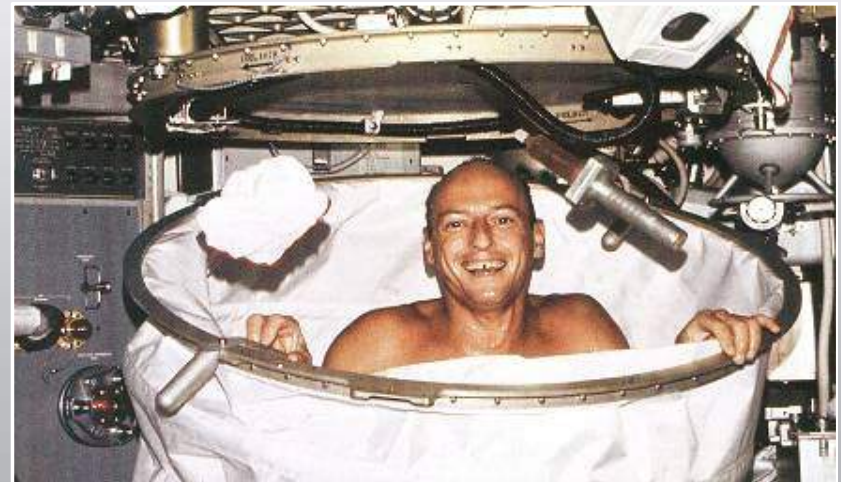
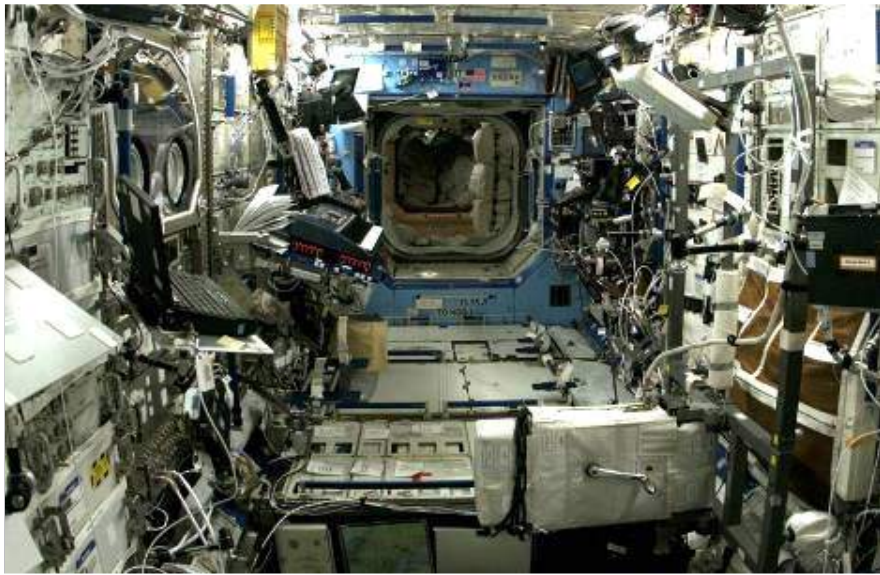
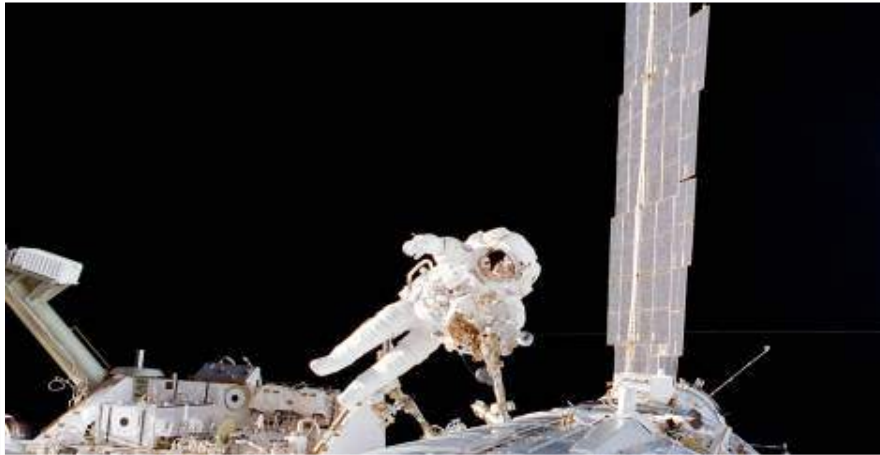
80 students travelling from Shanghai to Helsinki,  
project values: exploration, knowledge, innovation

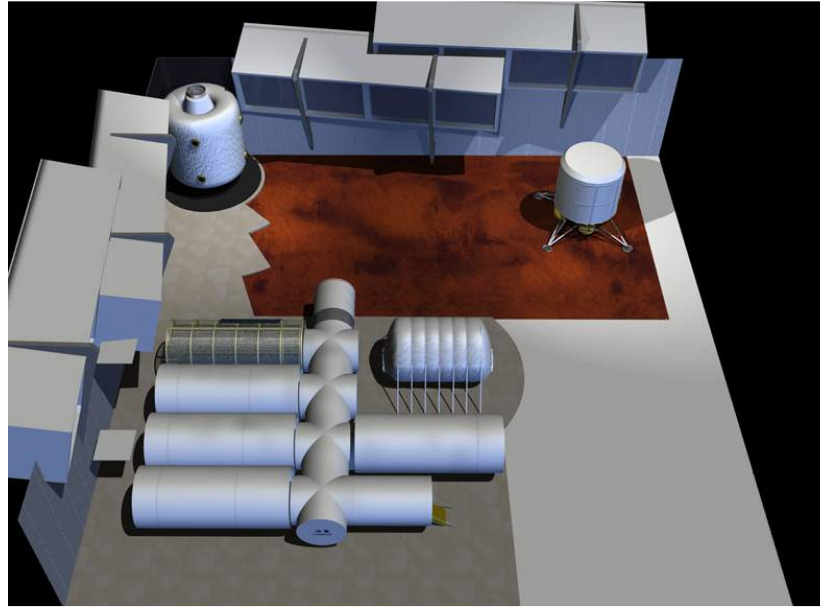




## Space Realism







*AIM Advanced Integration Matrix*











# Mega cities











Sustainability Base, NASA Ames



# Space material Aerogel

Environmentally harmless and recyclable



# ESA Moon Village by 2030 - an international lunar base

3D printing on the Moon

Turn lunar soil into construction blocks



© ESA/Foster and Partners

# Reflections







## Cross-fertilization and team work

Why not



Thank you!

Swedish astronaut **Christer Fuglesang** during EVA on STS-128



A photograph of an astronaut in a white spacesuit floating in space. The astronaut's helmet is in the foreground, reflecting the Earth. The Earth's curved horizon is visible in the background, with a bright sun creating a starburst effect in the upper right. The astronaut's arm, with an American flag patch, is visible. A small camera or light fixture is attached to the suit.

umbilical design

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