ESA Activities in Health in support of the Sustainable Development Goals and WHO Leadership Priorities

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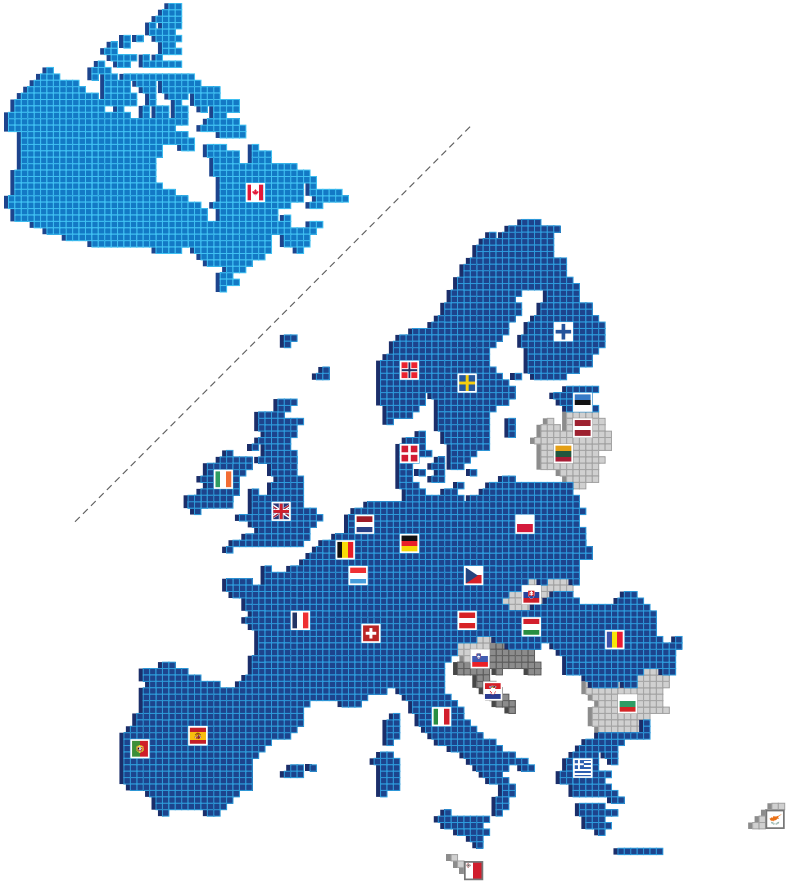
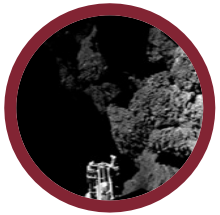
Activities & **M**ember **S**tates





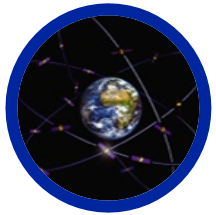
space science

human spaceflight

exploration

earth observation

launchers



navigation

operations

technology

telecommunications

ESA Health Related Activities in 2016

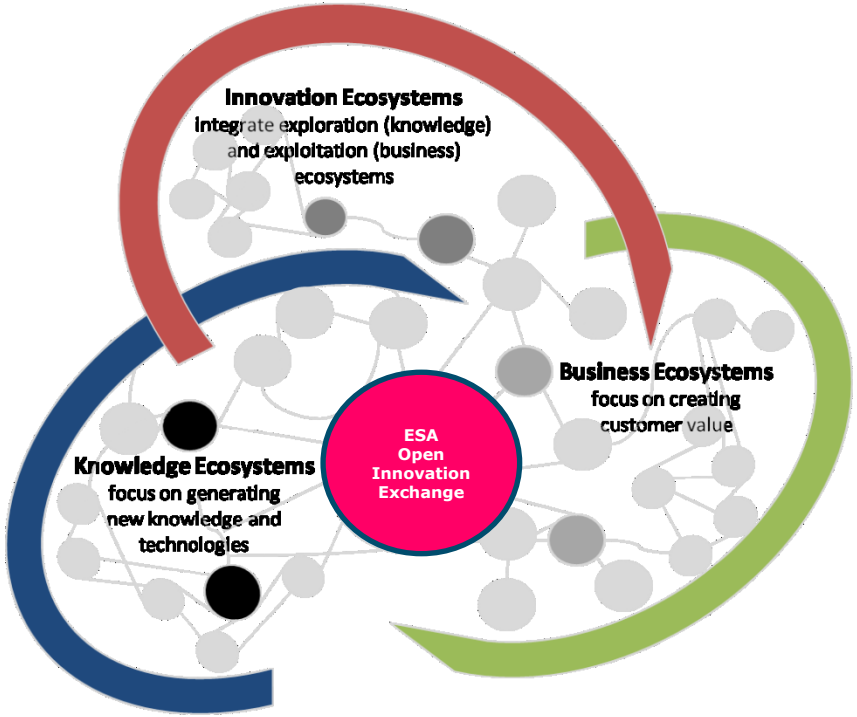
- **Excellent Progress in Coordination of Health Activities**
  - Good coordination between Directorates
    - Space meets Health Workshop (7Nov2016)
  - Engagement with User Community
  - Coordination with World Health Organisation
- **Council at Ministerial Level (C/Min) – Dec 2016**
  - ESA Programmes agreed with Member States
    - Programme content & workplan
    - Level of subscription
  - Sustainable Development Goals addressed in a number of programmes and identified in Space 4.0 overall Goal of maximise integration of space into European Society and Economy

http://esamultimedia.esa.int/multimedia/publications/Towards_Space_4.0/

http://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/Sustainable_development_with_a_little_help_from_space

http://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/ESA_and_the_Sustainable_Development_Goals

ESA Open Innovation Exchange: Goals



- **I**ncrease awareness among stakeholders
  Disrupt barriers to unlock resources
  Explore opportunities for partnerships
  Address strategy for humankind's benefits
  Strengthen European collaborations to serve Global Challenges

- ESA Closed Habitats Forum, 9-10 –June 2016
- Space for Inspiration, 14-15 September 2016
- **ESA Space meets Health Workshop, 8 Nov 2016**
- ESA - ROBEX, 15 November 2016

- …A pillar of the engagement strategy

Open Innovation Exchange: Space Meets Health Workshop

- **Overall Goal:** Engage with a broad range of stakeholders in health research, development and industry to eliciting ideas for potential partnerships moving forward, and for reinforcing cross-synergies space/terrestrial healthcare R&D and the transfer of medical know-how and technologies for the benefit of both space exploration and society on Earth
- **5 Thematic Areas (Splinter Groups)**
  - Remote and autonomous healthcare monitoring and intervention
  - Advanced medical diagnostics and therapies, imaging, point-of-care and e-health technologies
  - Health issues associated with ageing and sedentary population
  - Genetics and personalised medicine
  - Environmental risk assessment models, surveillance, protection and countermeasures
- Meeting attended by over 90 external participants representing a broad cross section of health research, development and healthcare community
- **Follow on actions**
  - WebEx virtual meetings with 5 thematic splinter groups to further elaborate focus areas and an action plan
  - Follow up with all participants for feedback / recommendations
  - Dedicated B2B with individual stakeholders where appropriate

Partners

World Health Organization · CHARITÉ UNIVERSITÄTSMEDIZIN BERLIN · medical delta · eit Health

ESA – WHO Cooperation

- ESA / WHO Cooperation discussions initiated in late 2016
  - Follow on and complimentary to UNOOSA Space and Global Health coordination; Space and Global Health Expert Group, ISS Health Benefits (2014), UNOOSA/WHO/World Space Agencies meeting (2015)
- **Three Focus Areas Identified by WHO**
  - Space science and technology for epidemic intelligence
  - Space science and technology Health Emergencies
  - Shaping the research agenda on Benefits of space science and technology to public health
- **WHO Focus areas mapping with ESA programmes and activities**
- Proposed technical side meeting at World Health Assembly in May 2017
- ESA / WHO Cooperation Agreement to be elaborated
- **Next steps for elaboration of joint activities and projects with stakeholders?**
  - Joint ESA/WHO/Partners Workshop in late 2017 with stakeholders

ESA and Sustainable Development Goals

1 NO POVERTY
- Earth observation (EO)
- Tele-learning

2 NO HUNGER
- Global monitoring, food security
- Nutrition
- Life support

3 GOOD HEALTH
- ***Space for Health***
- ***Human & biology Research***
- ***Telemedicine, Tele-epidemiology***

4 QUALITY EDUCATION
- Education and inspiration
- Tele-education
- STEM

5 GENDER EQUALITY
- Education and inspiration
- STEM

6 CLEAN WATER AND SANITATION
- Life Support
- Water recycling
- ESA TIGER Project
- EO Data

7 AFFORDABLE AND CLEAN ENERGY
- Applications Research
- Combustion
- Heat Management
- Battery

8 DECENT WORK AND ECONOMIC GROWTH
- Applications Research
- Start-ups
- Tech Transfer
- Patents

9 INNOVATION AND INFRASTRUCTURE
- Industry 4.0
- Materials
- Technology Transfer

10 REDUCED INEQUALITIES
- Applications and Services for developing countries

11 SUSTAINABLE CITIES AND COMMUNITIES
- ISS and Concordia
- Smart cities
- Integrated Applications
- EO: Mapping, Air quality

12 RESPONSIBLE CONSUMPTION AND PRODUCTION
- Life support
- Compact, low power systems
- ISS, Concordia

13 CLIMATE ACTION
- ESA EO Programmes
- Copernicus
- Polar region monitoring

14 LIFE BELOW WATER
- ESA EO Programmes
- Copernicus marine projec

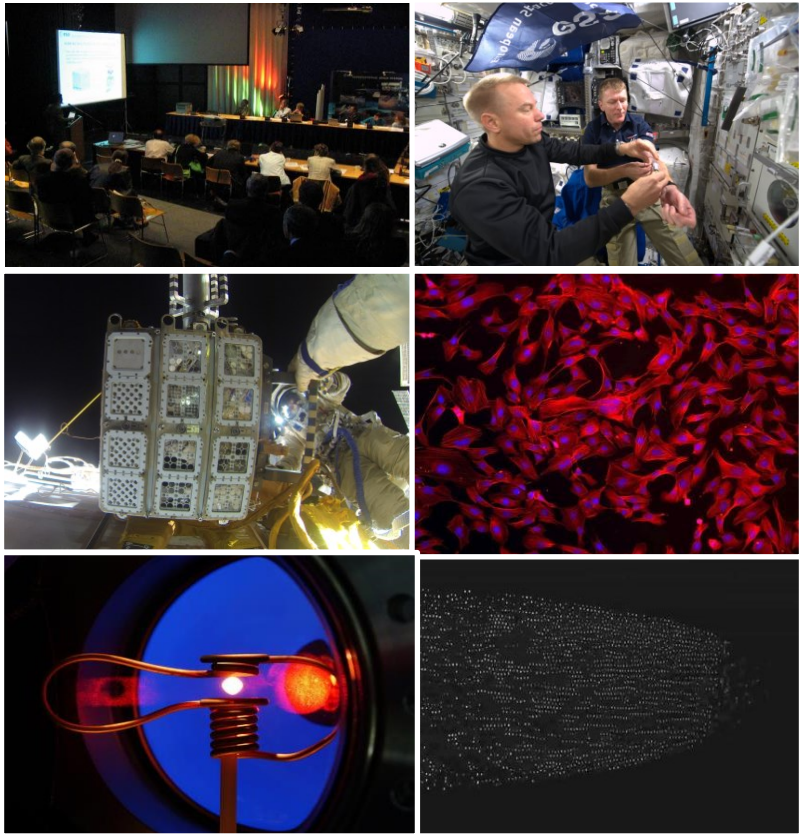
15 LIFE ON LAND
- ESA EO Programmes
- Copernicus

16 PEACE AND JUSTICE
- Integrated Applications
- Copernicus
- Inspiration

17 PARTNERSHIPS FOR THE GOALS
- Broad partnerships across programmes with other agencies, industry and institutions

Human Spaceflight and Robotic Exploration: SciSpacE - Science, Applications and Exploration

- Science and Applications programme uses a variety of ground and space platforms for research
- 1500 scientists from across the world and Europe involved in 200 projects. 60 industrial partners involved in project
- Support networks and interdisciplinary research
- Microgravity Applications Programme to foster applied research
- Research objectives until 2024 defined in **science roadmaps** elaborated with science community relevant to both Exploration and Terrestrial needs, several of which address Health topics



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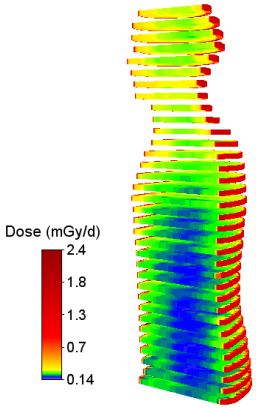
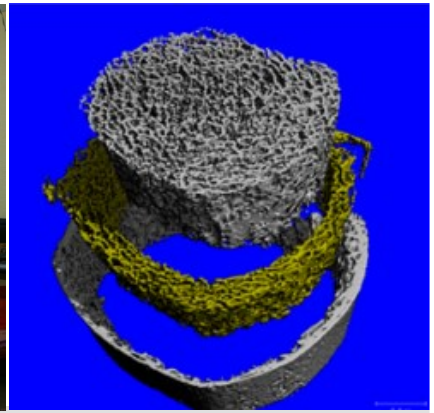
Human Spaceflight and Robotic Exploration

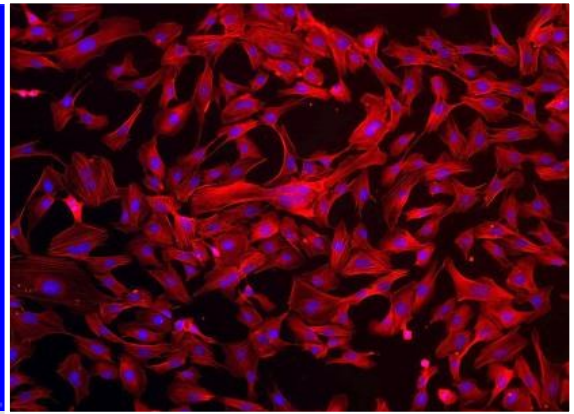
Health Issues

Terrestrial & Space Exploration:

- Cardiovascular, Bone Muscle, Immune system
- Radiation biology and protection
- Countermeasures
- Diagnostic techniques, medical monitoring, technology







Human Spaceflight and Robotic Exploration

Regenerative Life Support Systems

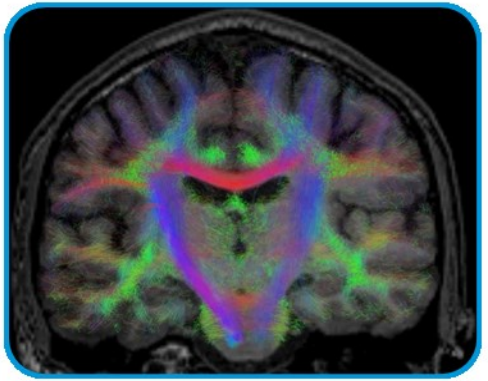
Terrestrial:

- Food production in confined environment
- Water Purification / treatment techniques

Space Exploration:

- Life Support Elements for Deep Space Habitat

Human Spaceflight and Robotic Exploration
Space Medicine Office

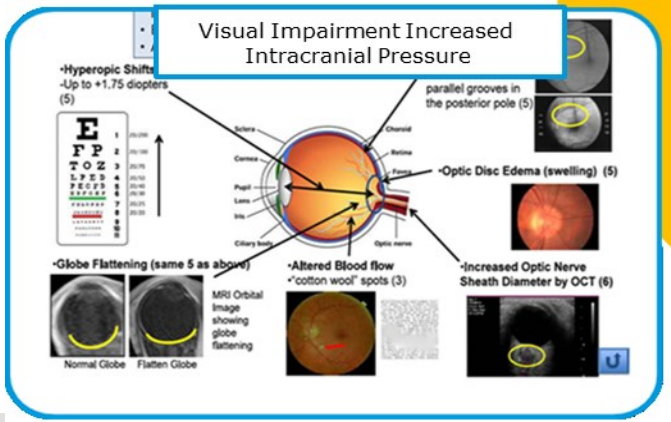


New Approaches

New Results

New Questions

New Application



Technical & Quality Management

- **Transversal activities – Pivotal role** in ESA's health-related activities

Health in Space (for Astronauts) via technological development

- To prevent & manage medical emergencies during manned missions (Needs provided by **MED**ical **OP**eration**S** team)
- To preserve & protect astronaut's psychological, physiological & physical capabilities (musculoskeletal, cardiovascular, neurovestibular…) via countermeasures and physiological monitoring systems
- To provide instruments / critical technologies for supporting scientific experiments and research

Supporting ESA projects where Space is used for Health on the ground (for Citizens)

- Provision of knowledge and experience on medical technologies and processes for health-related activities sponsored by other ESA programmes (e.g. HRE, TIA)
- Expertise covering the whole medical chain (prevention, monitoring, diagnosis & treatment)

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Telecommunications & Integrated Applications

ESA's Telecommunications & Integrated Applications programmes have a dual purpose:

- To enhance the competitiveness of Industry by means of Research Development and Innovation of Satcom products, services and applications
- To contribute to the resolution of problems that affect the European Institutions and the European society at large

ARTES - **A**dvanced **R**esearch on **TE**lecommunication Satellite **S**ystems (Optional programmes)

- **ARTES IAP**: user driven + 2 space assets
- **ARTES C&G**: industry driven + satcom based

Telemedicine represents more than 50% of ESA's 180 health projects

Telecommunications & Integrated Applications

In close partnership with **end users** …

market pull

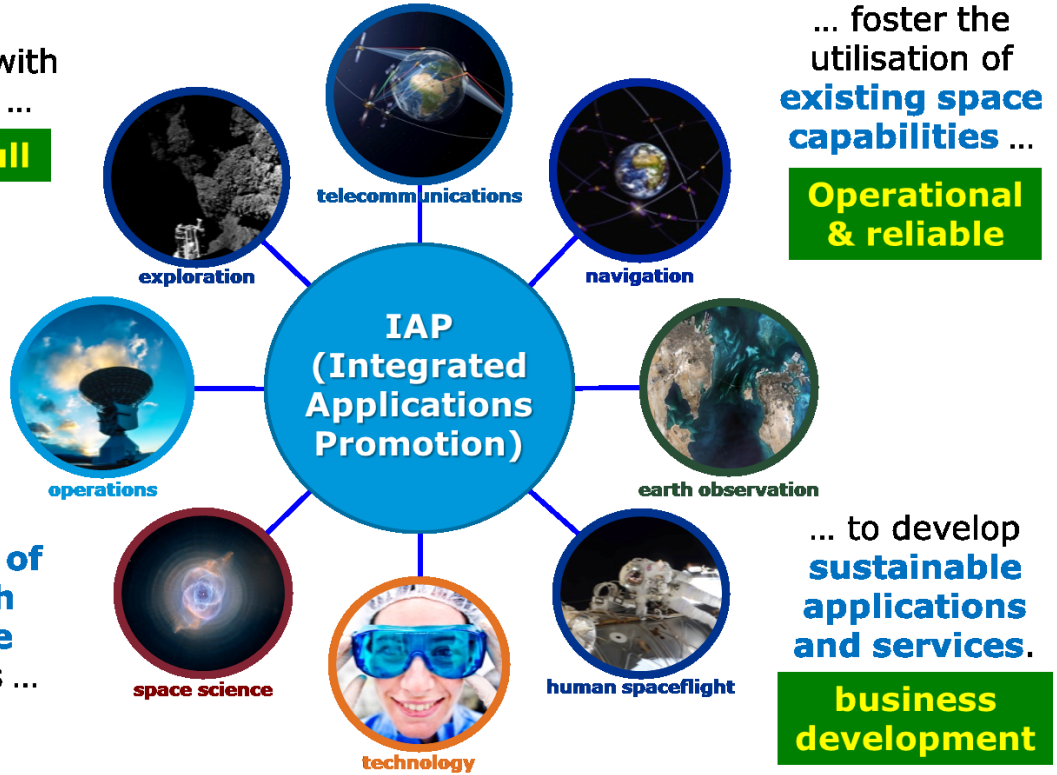
… through **integration of space with non-space** technologies …

… foster the utilisation of **existing space capabilities** …

Operational & reliable

… to develop **sustainable applications and services**.

business development



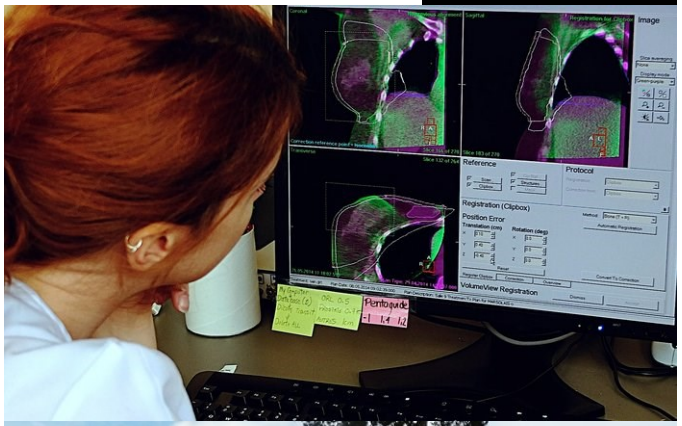
IAP MISSION: ***Space for Daily Life incl. Space for Health***

Telecommunications & Integrated Applications

Fighting Ebola with a transportable connected biological laboratory – B-LiFE (ARTES IAP)

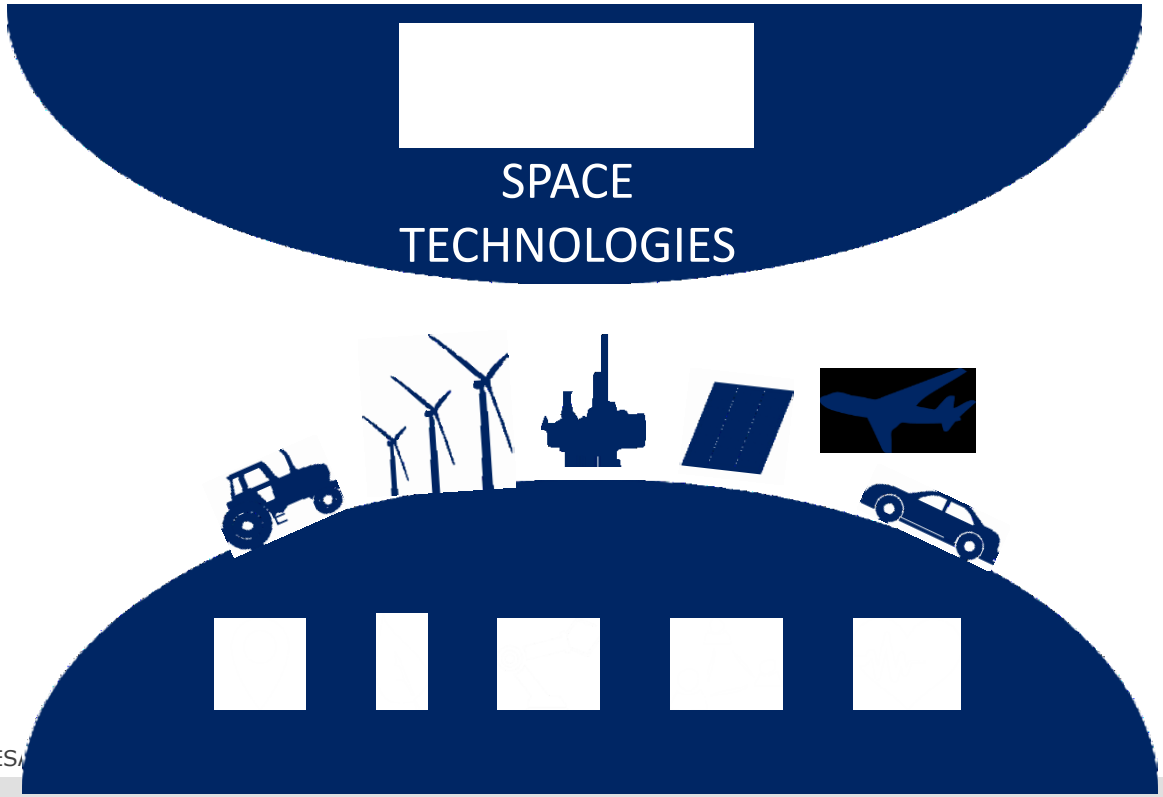
Remote monitoring - AMAZON (ARTES IAP)

Connected ambulances - SATCARE (ARTES C&G)



Improved Breast Cancer Screening Process – MERCURY (ARTES IAP)

Technology Transfer Programme Office



Mission

Inspire & Facilitate

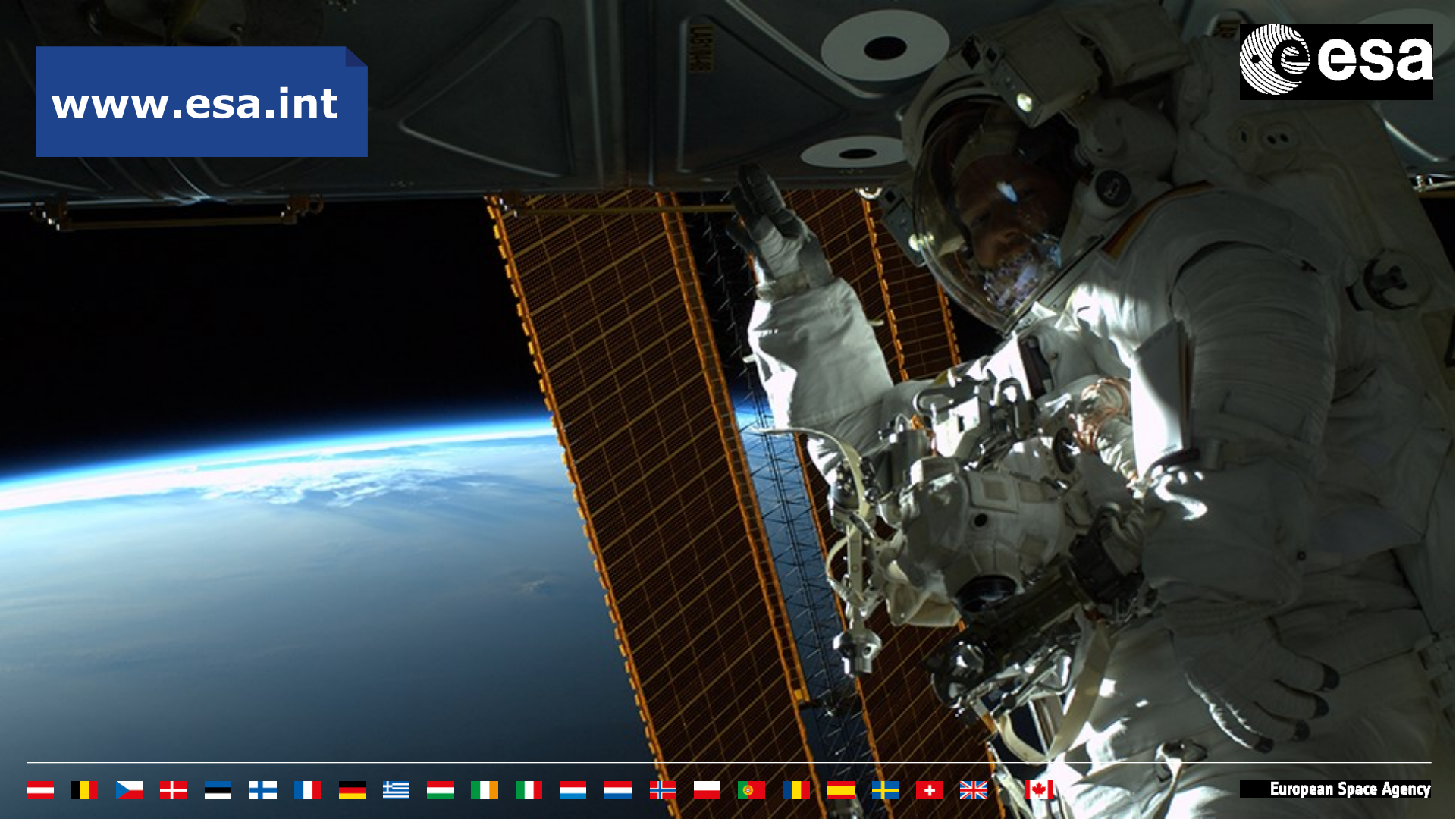
the use of space technology, systems and know-how for non-space applications

Strengthen European Capabilities

by identifying new business opportunities for providers of space technology and systems as well as enhancing its know-how and competitiveness

Boost Local Economy

by creating jobs, investing in start-ups and supporting sustainable innovation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