SPACE 4.0 Intelligent Health
From Technology Development to Business Applications

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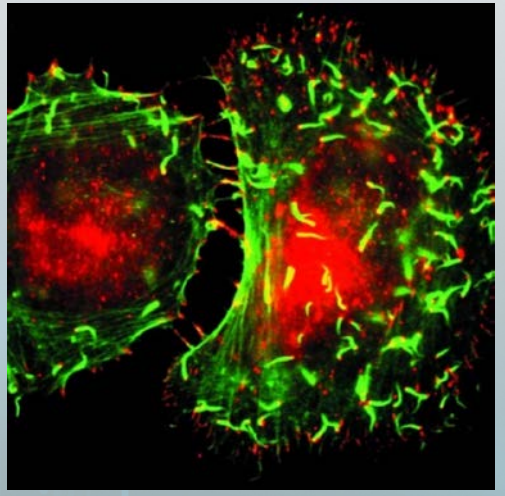
Health for Space & Space for Health

1) Health for Space: clinical care & life sciences research

- Space = most extreme case of “isolation”
- Avoid mission abortion in case of medical problems
- No Flight Surgeon as a default crewmember => autonomous crew
- Specific technological development for prevention & management of medical emergencies during manned space missions

- Micro/hypergravity: unique environments for research
- Research support by “new” technologies (smaller, faster, lighter)

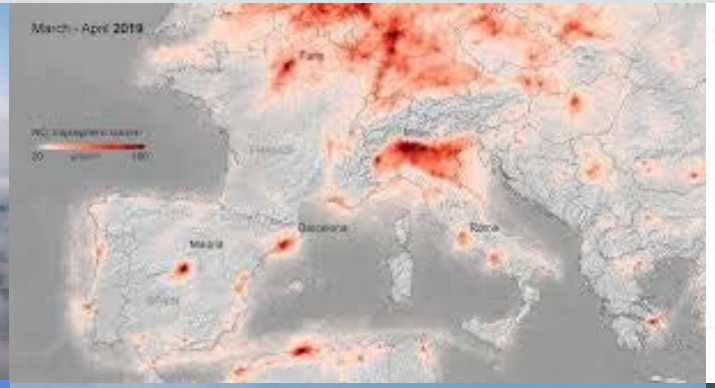


2) Space for Health: better clinical care on the ground

- Space technologies, expertise & know-how to support Health-related applications for European citizens
- Space health R&D targeting needs & products which are(sometimes) niche business opportunities (i.e.: not of primary interest for the non-space industry)
- Integration of non-space and space technologies & processes leading to new or enhanced products / services

Health at different scales

GLOBAL



LOCAL

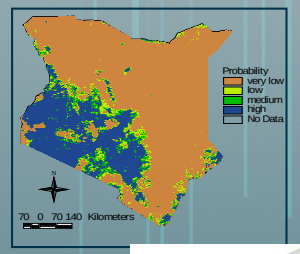
INDIVIDUAL

Health at different stages of the care chain

Prevention

Predictive risk maps
- pollution, communicable disease,…)
- EO Data
- Positioning in situ

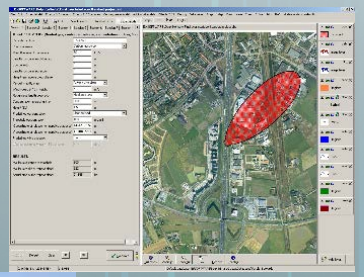
Primary prevention
- Breast cancer screening
- COPD
- Cardio Vascular Disease Apps with monitoring and tracking features
- Countermeasure systems
- Nutrition



Early Warning

BCRNE info maps
- EO Data
- Positioning
- Satcom in situ

Detection & Alerting Services
- Monitoring devices
- Sensors



Diagnosis

Instrumentation
- Multipurpose
- Compact

Remote diagnosis
- Via SATCOM
- Hybrid networks
- For crisis environments
- For medical deserts & isolated places

Treatment

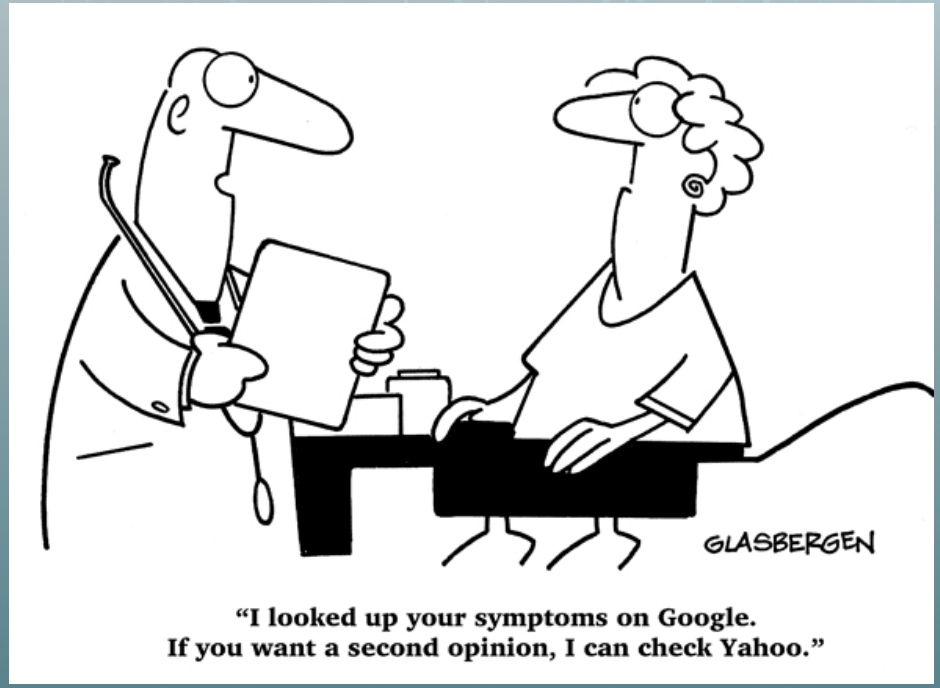
Assisted treatment
- Guidance
- Assistance
- Training

Towards “Intelligent” Health

What is “intelligent” Health?

- Use of disruptive technologies

- Use of new concepts, paradigms & workflows



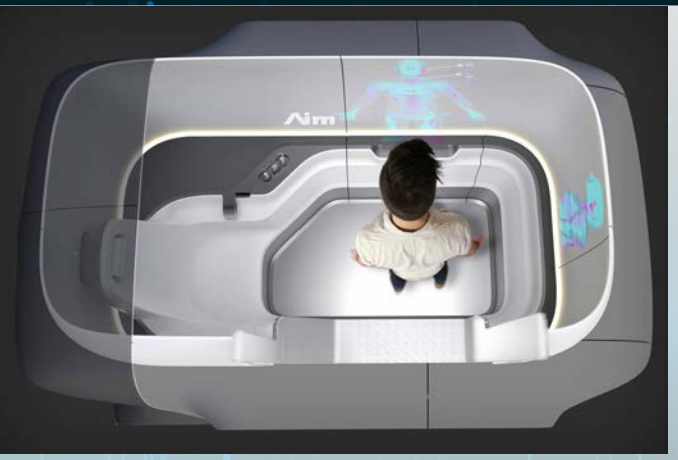
“Intelligent” Health - Disruptive Technologies

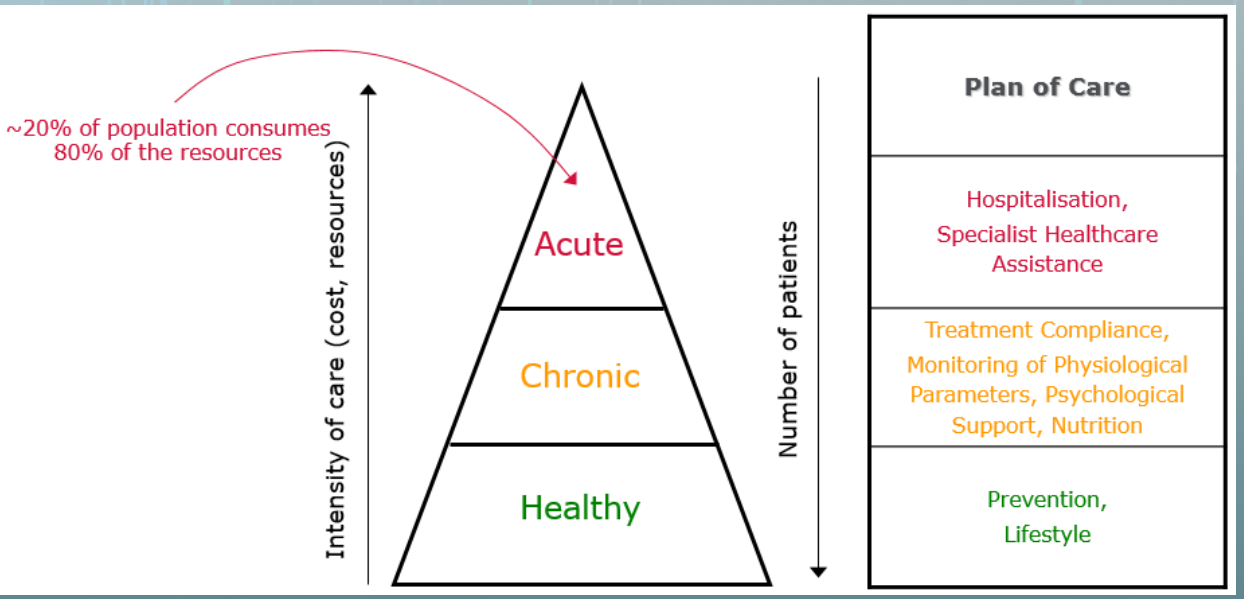





- AI, IoT, Blockchain
- Cybersecurity Technologies
- Advanced Robotics
- AR / VR & other Immersive Technology
- Uncrewed Aerial / Ground Vehicles

“Intelligent” Health - New Paradigms



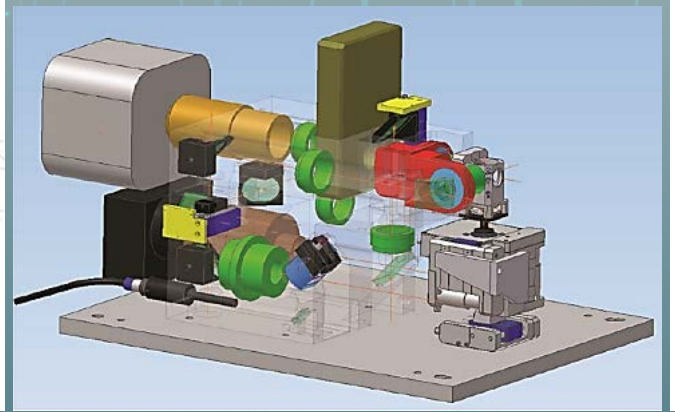


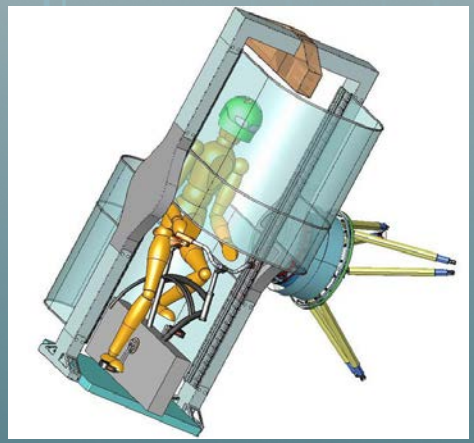
- **Shifting paradigms:**
  - From hospital to patient-centred health
  - From disease management to health management
  - From treatment to prevention
  - Inverting the pyramid of care
  - Moving data instead of people
  - Towards more autonomous care

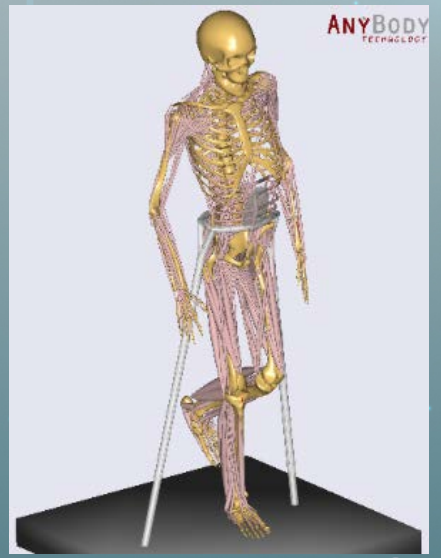
Instrumentation for Life Sciences & Life Support (TEC)

New technology: starting point for everything ESA does.

- Crew health
- Science / Research Instrumentation
- Planetary Exploration instrumentation
- Planetary Protection
- Support to Downstream Applications activities



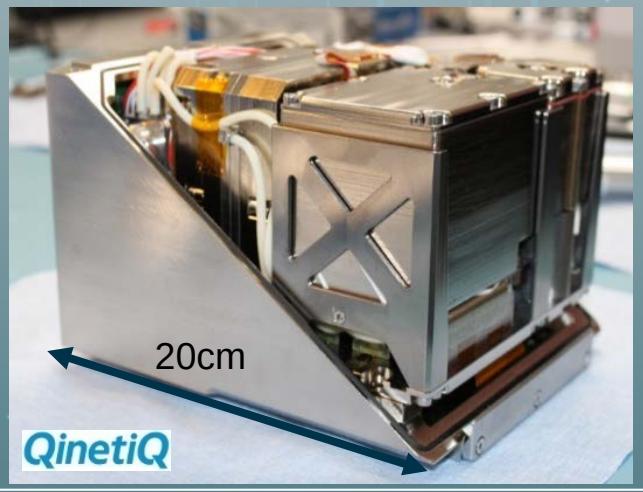




Health & Life Support Technologies

Health requires a “sustainable” environment

- Air, water, food (prep & prod) and waste management
- Closed loop systems (MELiSSA, system tools)
- Nutrition (effects on perfos, psycho, CM)
- Microbial safety (ISS and beyond)
- Chemical and biological monitoring instrumentation
- Habitability aspects (incl. contamination modelling)



Main Programme and Mechanisms

- **DPTD Programme (Discovery, Preparation, Technology Development)**

Discovery

- Early “blue sky” research, potential break-through, implementation in 10 years
- For paradigm shifts and game changers
- Ideas collected via the Open Space Innovation Platform (OSIP)

Technology Development Element (TDE)

- developments of technologies with low TRL (1-4), basic R&D
- Mandatory programme – Refunded at each CMin
- Activities implemented mainly through competitive tenders

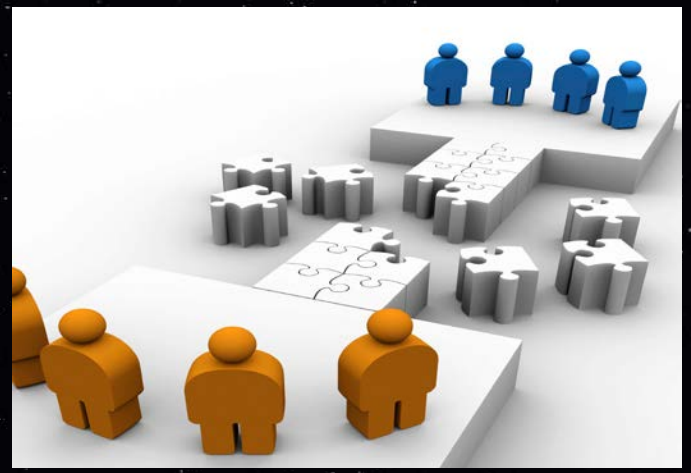
Technology Readiness Level (TRL)

- **General Support Technology Programme (GSTP)**
  - developments of technologies with higher TRL (>4), technology maturation
  - Optional programme – Refunded at each Cmin + possible enroute additional subscriptions
  - Activities implemented through competitive tenders or direct negotiation

ESA Space Solutions - Downstream Applications (TIA)

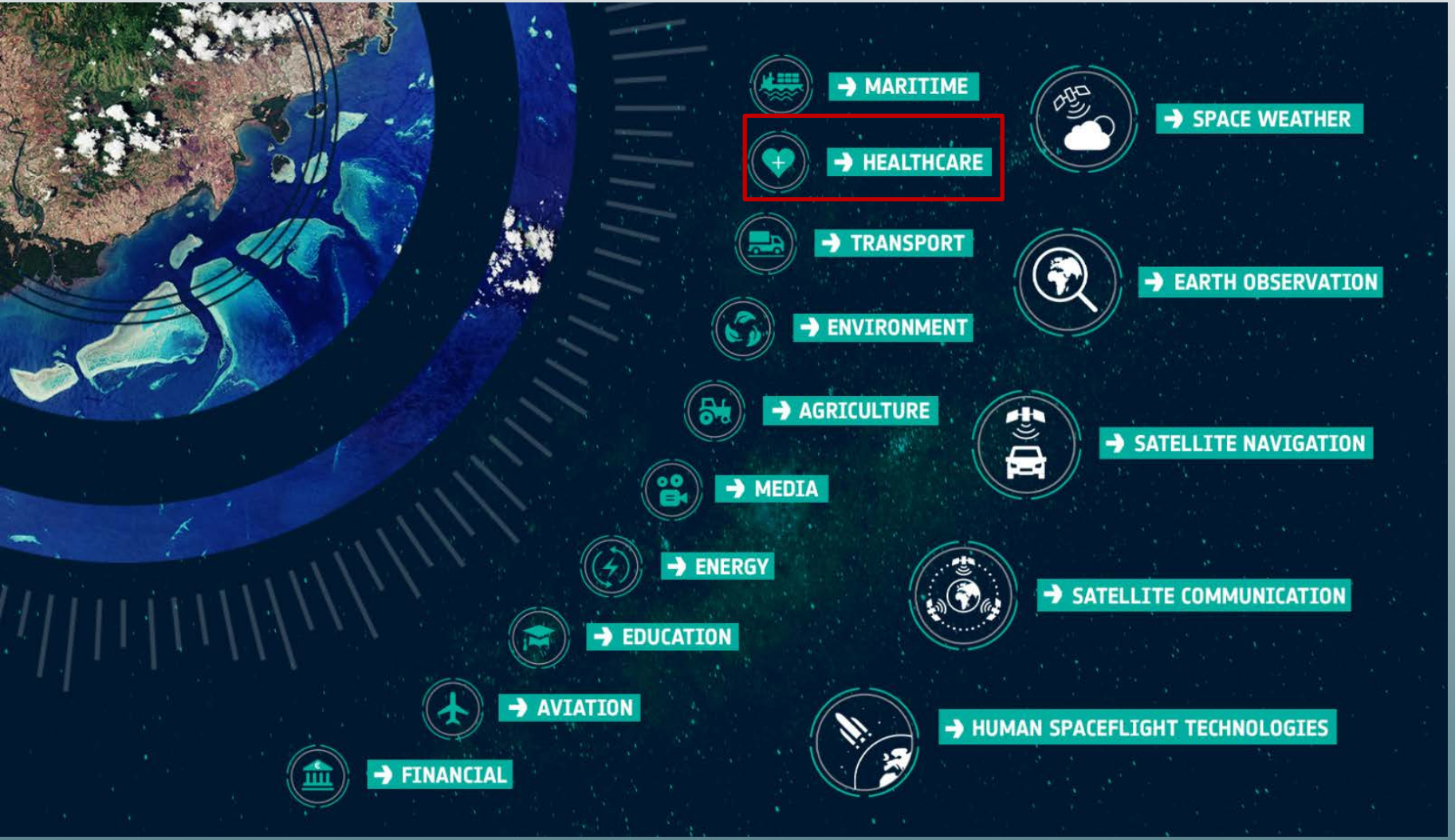
Funding & promoting development of space-based downstream applications, services and solutions for the needs of European citizens and society.

Institutions, users, customers



Entrepreneurs, service providers, industry

Downstream Business Applications

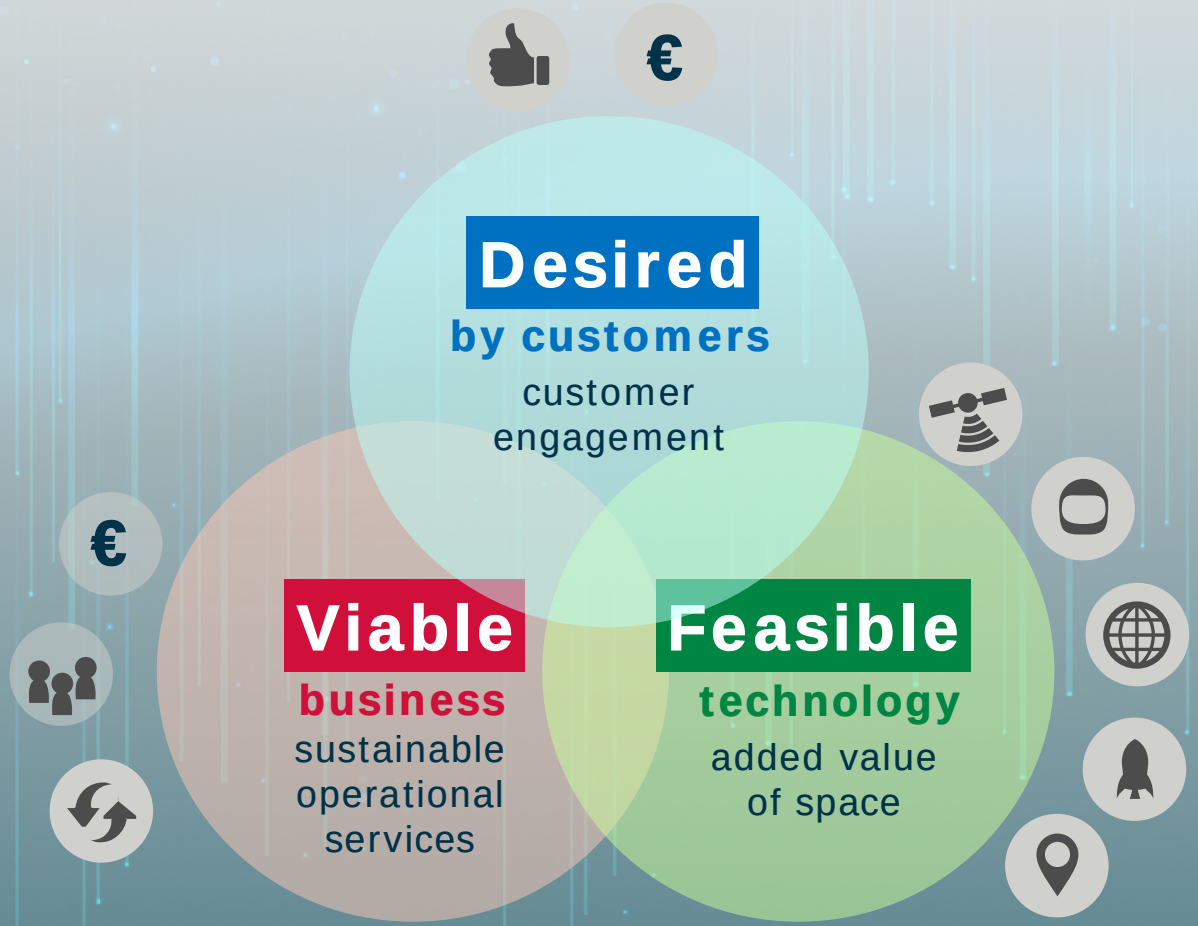


Leveraging Space technology and data for the benefit of life on Earth

Cross-fertilization to foster innovation

ESA is an ENABLER, allowing others to DO

Looking for promising sustainable services



Different mechanisms:

- Kick Start
- Feasibility Studies (DN or OC)
- Demonstration projects

Intelligent Processes

(e.g. fast track call for CV19)

Specific themes vs fully open opportunities

DIGITAL HEALTH FOR DEVELOPING ECONOMIES

ARTIFICIAL INTELLIGENCE KICKSTART

Value of Space for Health

Satellite Communications

- Provide connectivity where terrestrial communications is insufficient
- Enable remote monitoring through transmission of sensor data
- Backup communications for drones

Earth Observation

- Provide contextual situational awareness
- Provide collection of data for production of images and maps environment

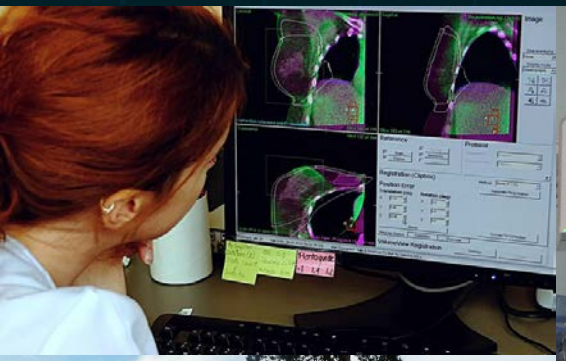
Satellite Navigation

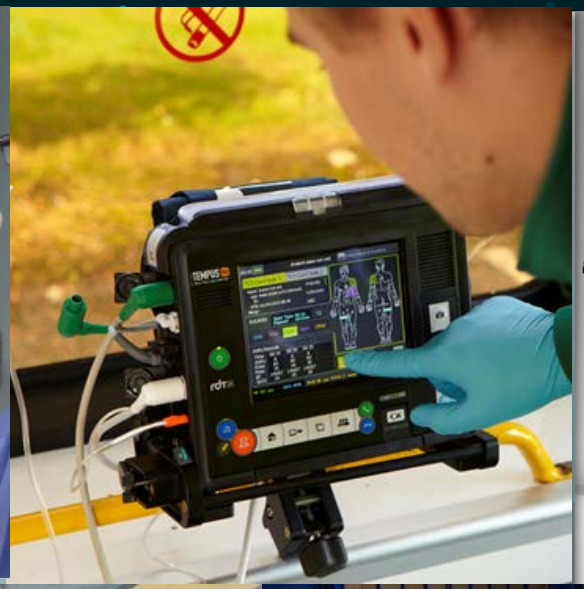
- Provide location data for epidemiological analysis
- Support cross-certification of patient data
- Track and route emergency vehicles/ambulances
- Enable applications in the VR/AR sector
- Definition of waypoints for drones

Human Spaceflight technologies

- Provide support to sanification/decontamination
- AI algorithms used for spacecraft
- Support monitoring (e.g. COVID-19 patients)

Health can lead to successful (business) projects





esa
space solutions

Thank you for your attention