Human spaceflight; Technology development and innovation

Presentation to ESF/ESA/ESPI Conference

Humans in Outer Space – Interdisciplinary Odysseys

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Scope of the Presentation

- What space offers to Humans
- What is offered to support human roles
- Space technology development and innovation
- The background and important issues for the future

What space offers to Humans

Considerations

- Removal of limits to growth
- Support for the Earth environment

- Industry should be involved in future plans for exploration
- The public should be encouraged to join in the experience

BUT

- Access to space complex and expensive, needs partnerships to succeed

Limits to Growth

- Resources on Earth are finite
- Population increasing
- Energy use is increasing
- Renewable sources not keeping up
- Lack of perspectives and cultural norms or institutions to deal with L2G
- Either remove growth or the limits

Link to the Environment

- Growth will continue for some time
- Removing the limits must not worsen but improve the Earth environment
- Just as space travel enables us to look down on our home – the EARTH – we must use this image to encourage global thinking & planning

The Industrial Scene

- Upstream and Downstream space sectors
- Commercial customers dominate turnover due to large downstream market
- Competition as well as collaboration Space Industry is clearly identifiable
- European & worldwide industry rationalisation continuing

Public Involvement

- Putting the experience within reach by good reporting
- Direct outreach by programme
- Use of services
  - Satellite TV
  - Weather forecasts
  - Communications
- Encourage an “I could” - attitude

Access to Space

- Transportation needs to be lower cost and more reliable – reusability will assist these aims
- Access needs to consider the range of infrastructure needs
- Optimisation for cargo and manned transportation; to Low Earth Orbit to Moon or beyond; Cargo return …

What is offered to support human roles

What is offered to support roles

- Planning for every day activities
  - Farming (EO data on growth, harvesting etc)
  - Travel (weather and navigation)
- General support
  - Communications
  - Broadcasting
- So space is helping to maximise our use of available resources

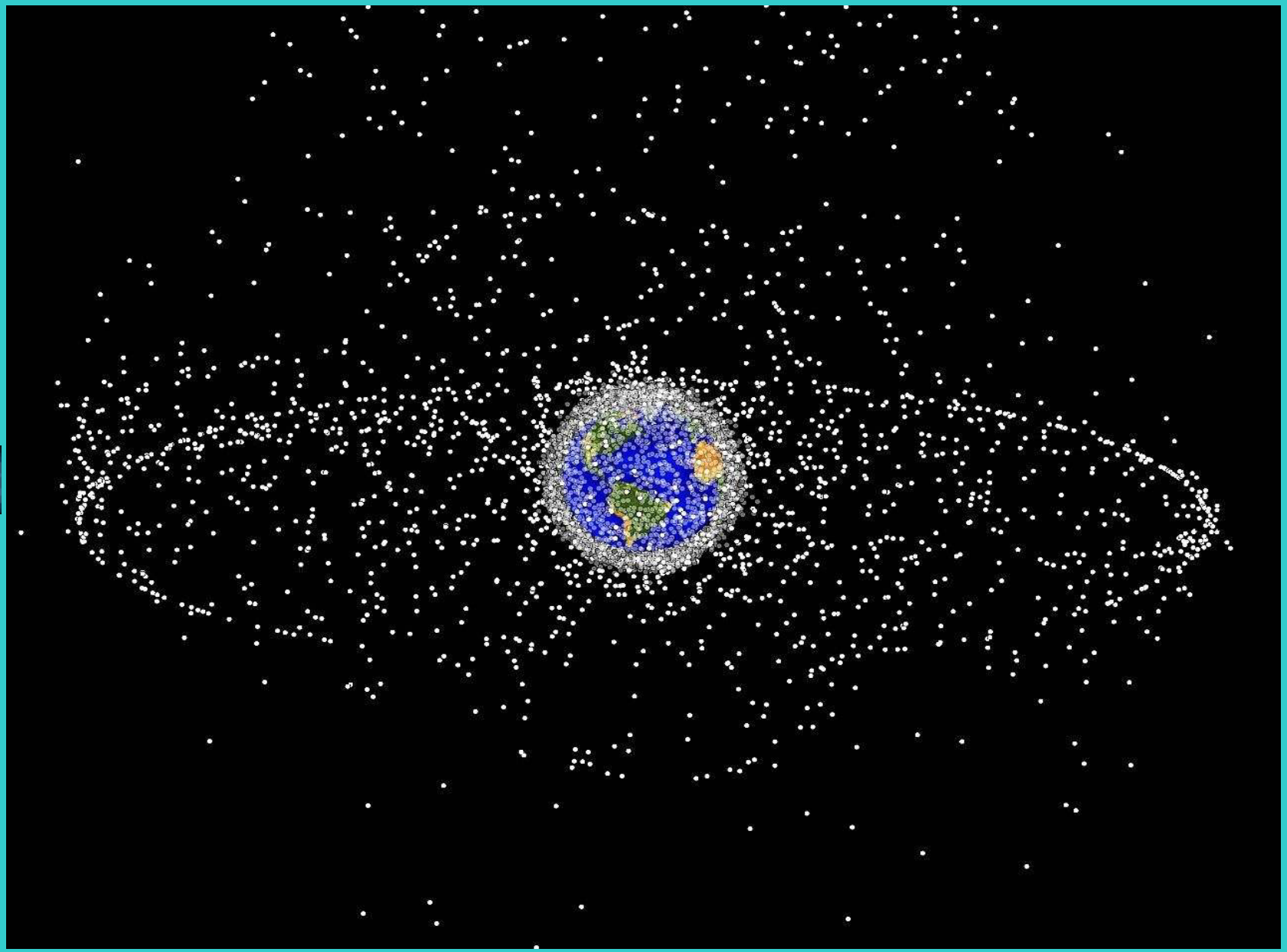
Space Technology Development and Innovation

r1

Space technology development and innovation

- Harsh environment
- Need for new ways of thinking
- Planning essential
- Current ability should lead to new capability
- Space Exploration – removing limited horizons and inspiring a new era

r1 examples of micro-gravity
x-ray cristalography, bone densiometry,
rjtremay; 13.03.2007



BNSC

space for science, enterprise and environment

Risks of collision in-orbit

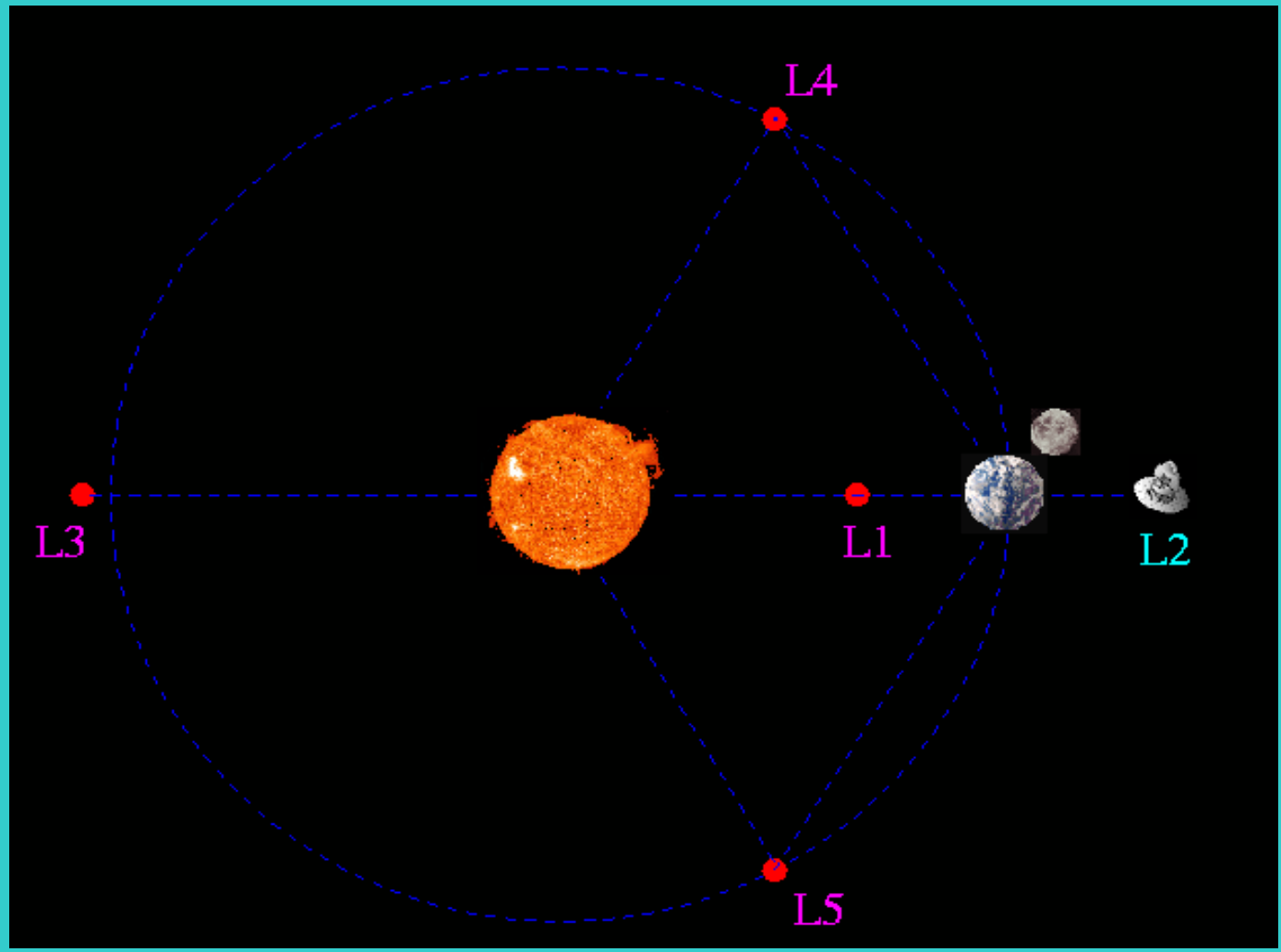
- modelling suggests that risks of collision in LEO, GTO & GEO should not be discounted
- greatest risk has typically been at launch/into orbit; and at de-orbit
- call for a special regime for space station orbits

Delta 2 - 2nd stage

The background – and important issues for the future

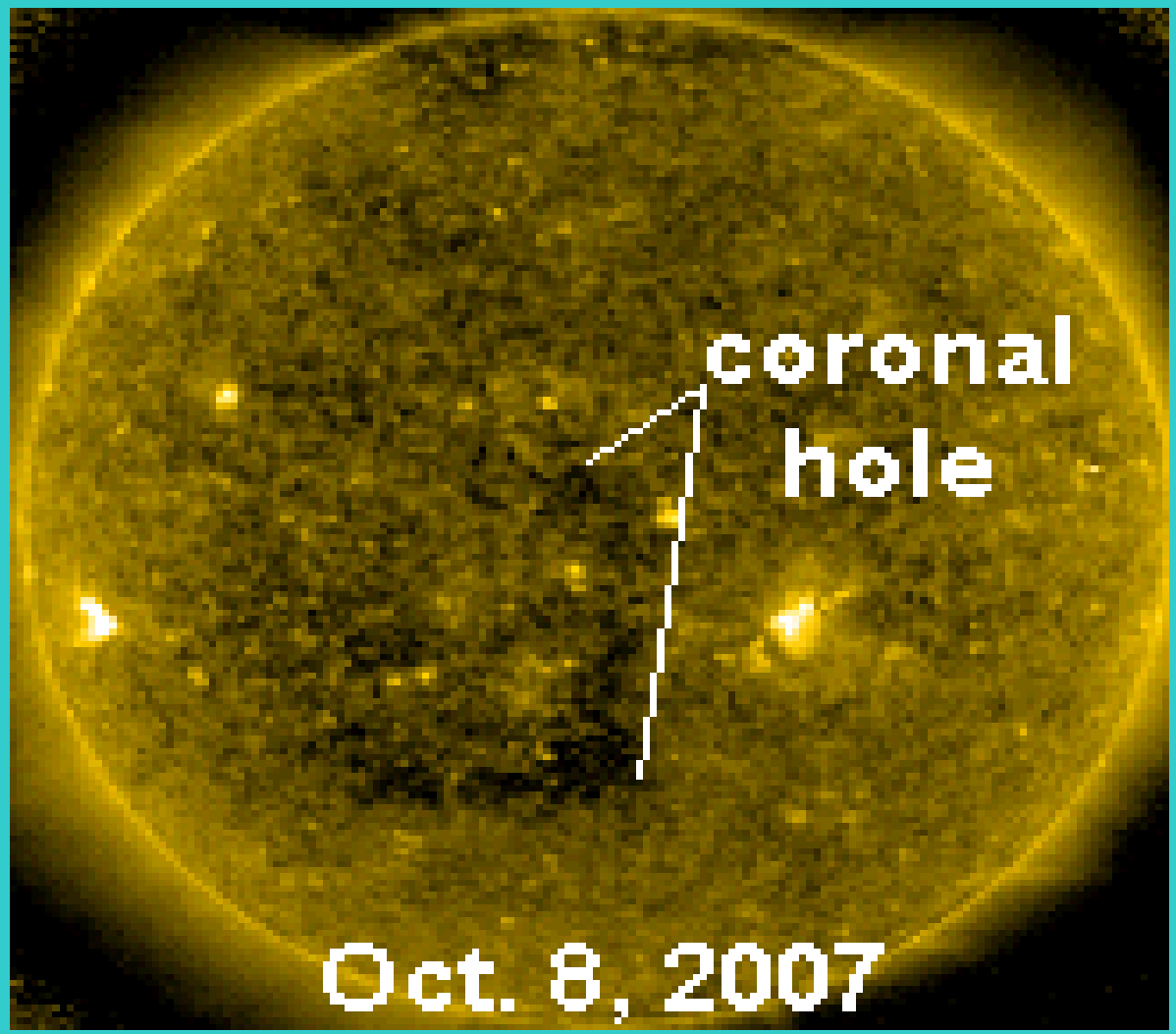
- Science fiction
  - As a driver for technology ideas (what if!)
  - Scenarios for future possibilities
- Space agreements & rules
  - Treaties - limiting or inspiring
  - National laws – closed or enabling
  - Expectations (enabling & inspiring)
- Plan to mange the new environment before we loose its support to Earth
- The space environment-beyond Earth orbit

Lagrange Points



L1
Soho
L2
NGST
L4
&L5
stable

Space Weather



- solar wind stream flowing from the indicated coronal hole should reach Earth on or about Oct. 11th

Other international collaboration in space to inspire, inform and lead to innovation

Space science collaborations worldwide

Operational meteorology (to include Sp. Weather)

Earth Observation CEOS, GEO (& Euro GMES)

Space Environment: Debris, Near Earth Objects and Space Weather / Radiation

United Nations via the COPUOS

The way forward

Space technology and science capability must be optimally transitioned from the research to the operational area as a matter of course

- Communications and Earth weather forecasting has been revolutionised by space capability
- Space weather is still predominantly a science issue
- Astronomy and military surveillance resources support NEO and space debris activities
- Space traffic management will need even more resources as we start to take control of the human presence in space – being there managing the risk