

Canada on the International Space Station

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Presentation to UN Office for Outer
Space Affairs (UNOOSA) Proposal

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“...to promote the peaceful use and development of space,... social and economic benefits for Canadians and humanity.”

Mandate, Canadian Space Agency Act, SC
1990, c. 13

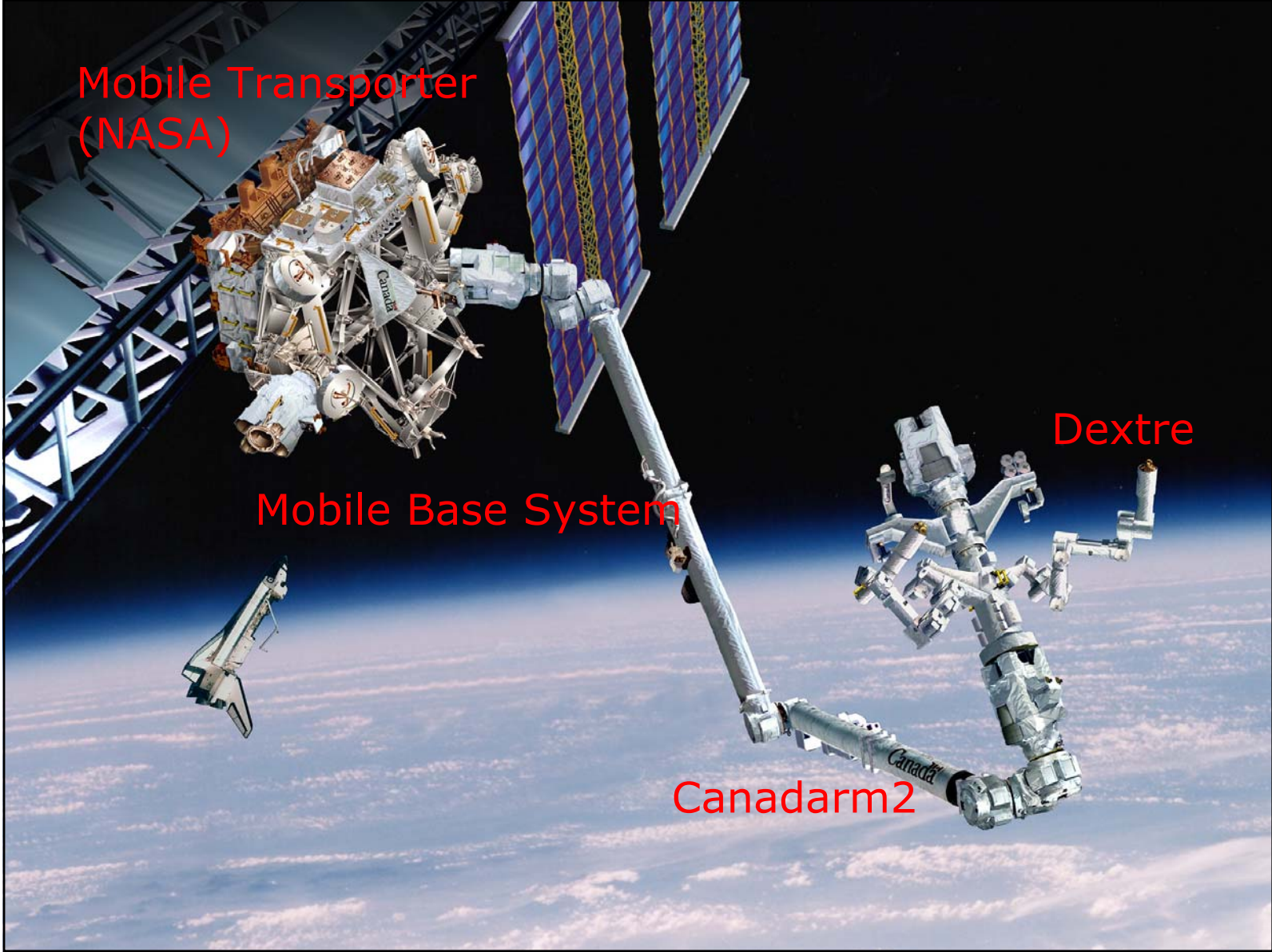


The International Space Station: Canadian technology gives Canada access to a unique research platform

1988: a commitment from Canada

2001: Canadarm2 arrives at ISS

2007: Dextre arrives



Mobile Transporter
(NASA)

Mobile Base System

Canadarm2

Dextre

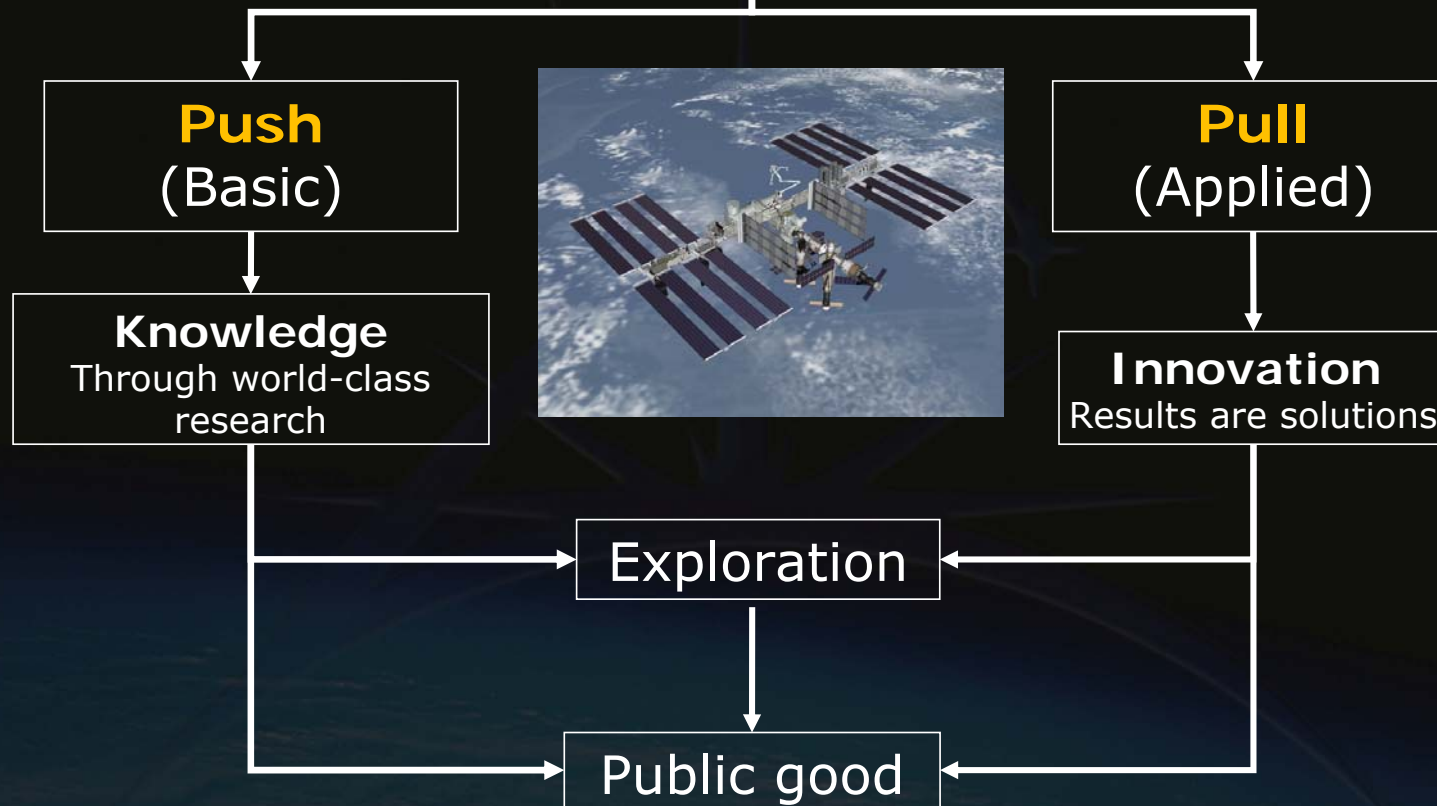
Canada can make use of ISS

- Access to transport
- Access to stowage
- Access to crew-time
- Access to facilities (subject to agreements)

CSA and the ISS

- ISS is not a *future* destination
- Since 2001, CSA has used it for research
- CSA has an active program for utilization
 - Solicit new ideas
 - Develop ISS activities
 - Implement on ISS
- CSA has solid experience on ISS
- CSA is a trusted partner and active member of relevant working groups

ISS Strategic Approach

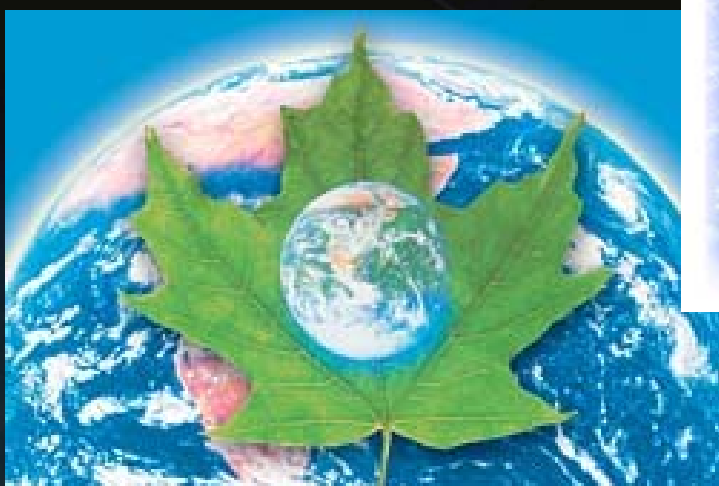


CSA ISS Activities

- Space Robotics: Canadian industry specialization
 - Canadarm2 and Dextre: Canadian contributions to ISS
- Technology Development
 - Reduce risks
 - Enable human exploration of space
 - Enable research
- Scientific Research
 - Contribute to and make use of facilities
 - Basic and applied research
- Outreach and Education
 - Unique facility and opportunity

Our Interests

- Science
- Technology



CSA Health Interest

- Make space safer for humans
 - Identify risks
 - Mitigate risks
 - Develop countermeasures
 - Science and technology
 - Remote care medicine
- Improve health on Earth
 - Complement knowledge acquired on Earth
 - Accelerate Earth applications

Space is ICE:

- Isolated
- Confined
- Extreme



- Bioanalysis
- Biodiagnostics
- Remote care medicine
- Textiles



Canadian micro flow-cytometer for space applications



Needs

- Operational Space Medicine
- Space Life Science research



Technology

- Institut national d'optique
- fibre optics
- blood cell function and number
- cell bound or soluble molecules: hormones, viral molecules, bone markers...



ISS utilization

- Health monitoring
- Environment monitoring
- Space Life Science studies



Earth application S

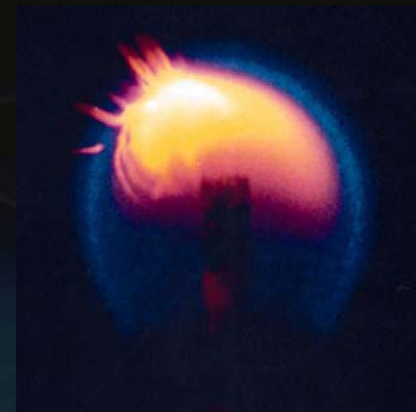
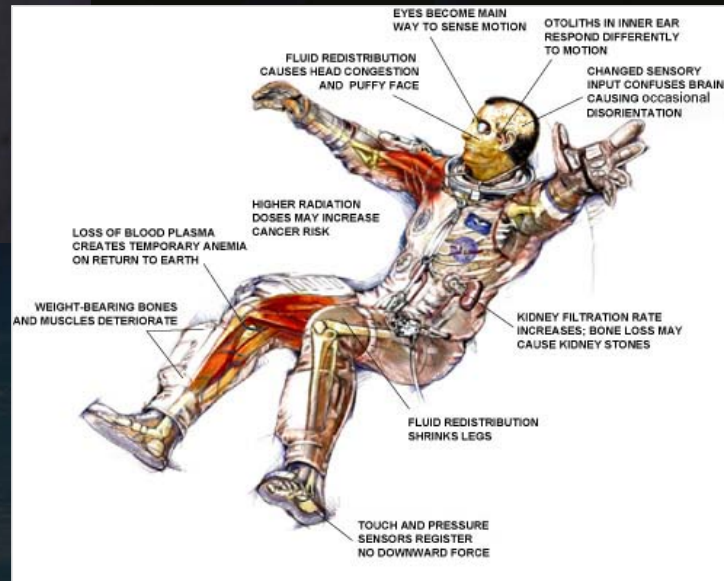
- Health care (stress, HIV, cancer, cardiovascular)
- Agriculture (cattle health, resource management)



ADAMS Components

- New medical Concepts of Operation (CONOPS)
- Remote patient monitoring capabilities - ability to monitor and manage a sick or injured crewmember remotely
- Intelligent diagnostic systems
 - Smart, non-invasive physiological sensors
 - Computer-based medical decision support systems
- In-situ laboratory capabilities to allow point-of-care biological tissues and fluids analysis
- Remote Health Care Provider training program
- Medical simulation technologies, with space-based physiological models
 - Remote acquisition and maintenance of CMO medical skills

Microgravity



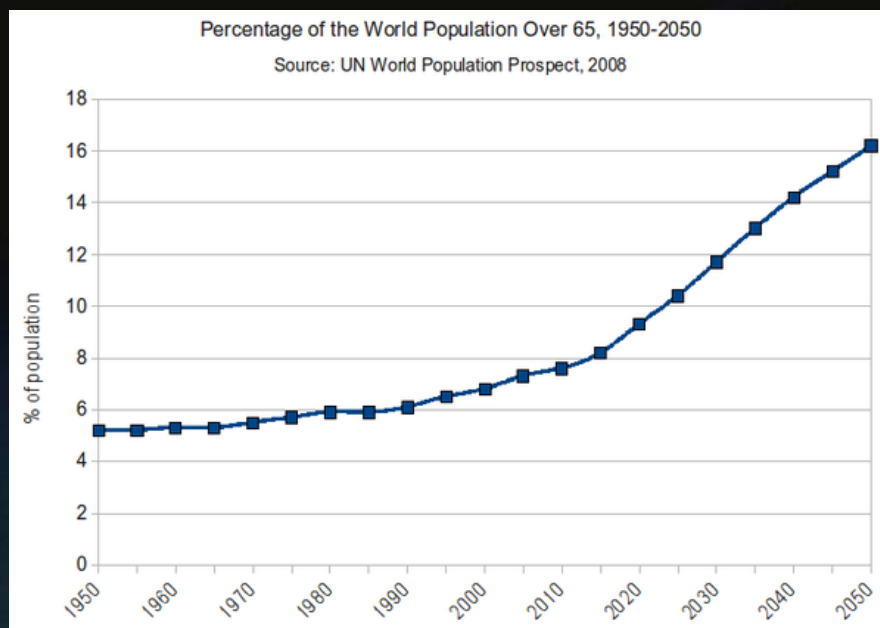
Similarities?



- Heart deconditioning
- Muscle atrophy
- Bone demineralization
- Degradation in motor skills/neural system
- Increased cancer risk

Aging Population

- Number of people older than age 65 expected to double between 1990 and 2020



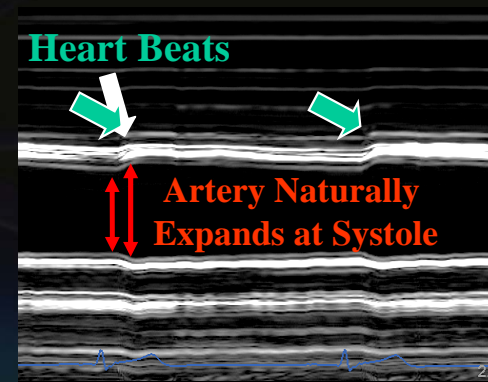
Vascular

Cardiovascular health consequences of long-duration spaceflight (VASCULAR)

Overall hypothesis: physical inactivity accelerates the “aging” of the cardiovascular system

Benefits:

- Understanding role of physical activity in daily life and the necessity for it
- Role of specific exercise programs in the maintenance of cardiovascular health
- Identification of markers of sedentary lifestyle on Earth, or of physical activity program



BISE



Body in space experiment

CSA sponsored, with use of ESA hardware (COGNI tunnel)

Objective: to better understand influence of gravity on perception of up/down

Benefits:

- Perception of up/down serious problem for astronauts.
- Tools developed can help people on prone to falling, including seniors and people with conditions like Parkinson's disease.

Hypersole

Objective:

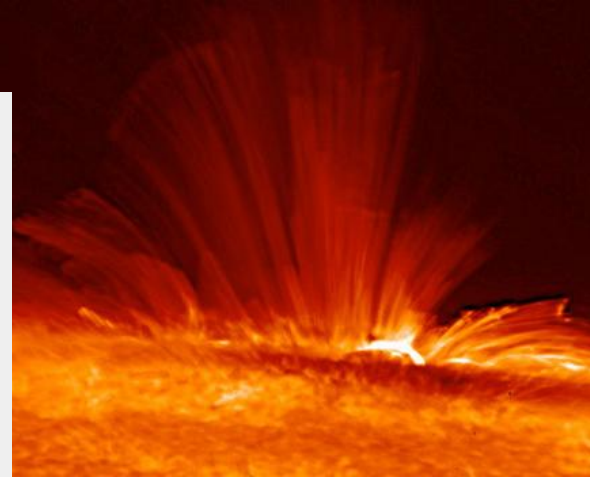
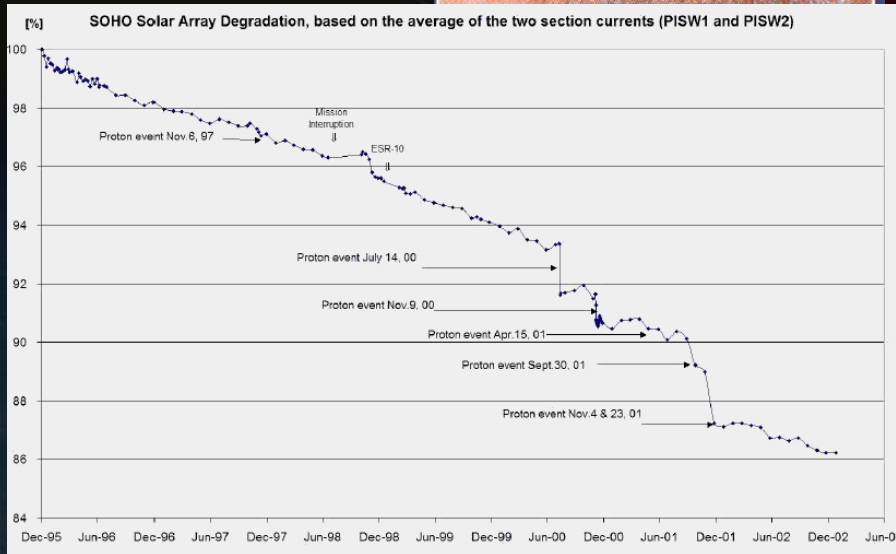
To identify skin receptors influenced by weightlessness and measure the contribution of foot sole skin sensitivity to balance control.

Skin sensitivity actually increases in correlation with balance deficiencies related to vestibular information.

Benefits:

- add significantly to existing studies of the aging process
- reductions in information relayed by skin sensors lead to a loss of balance control and, among the elderly especially, a greater incidence of falls

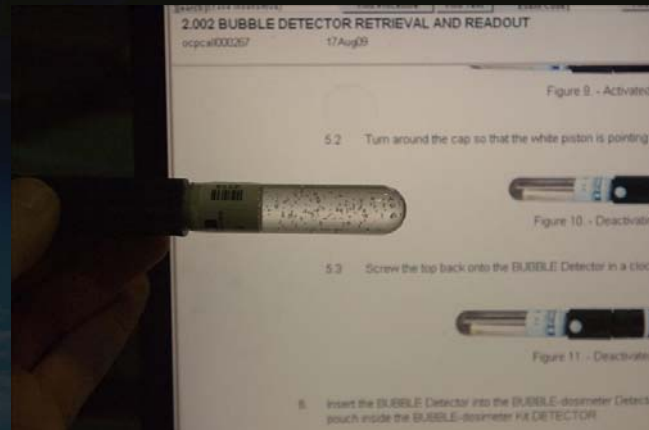
Space Radiation



Radi-N

The RaDI-N Neutron Field Study is a collaboration between the CSA and RSC-Energia

Measures incidence and energy range of neutrons on ISS





<http://www.enjoyspace.com/en/news/the-station-to-avoid-a-traffic-jam>



Canadian Space Agency
Agence spatiale
canadienne



Thank you!

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Canada