

**UTILISATION OF ISS BY THE  
DEVELOPING COUNTRIES – A Viewpoint**

**by**

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# OUTLINE

- **Introduction – The ISS Success story**
- **ISS research Laboratory and facilities**
- **Research focus of ISS**
- **Benefits to DC member States with ISS experience**
- **Why do the DCs want to participate in ISS/HSTI?**
- **How do the DCs want to participate in ISS/HSTI?**
- **Available facilities on ISS**
- **Suggested guidelines for participation in ISS**
- **Defining the ISS research**
- **Gauging national readiness to participate in ISS**
- **Conclusion**

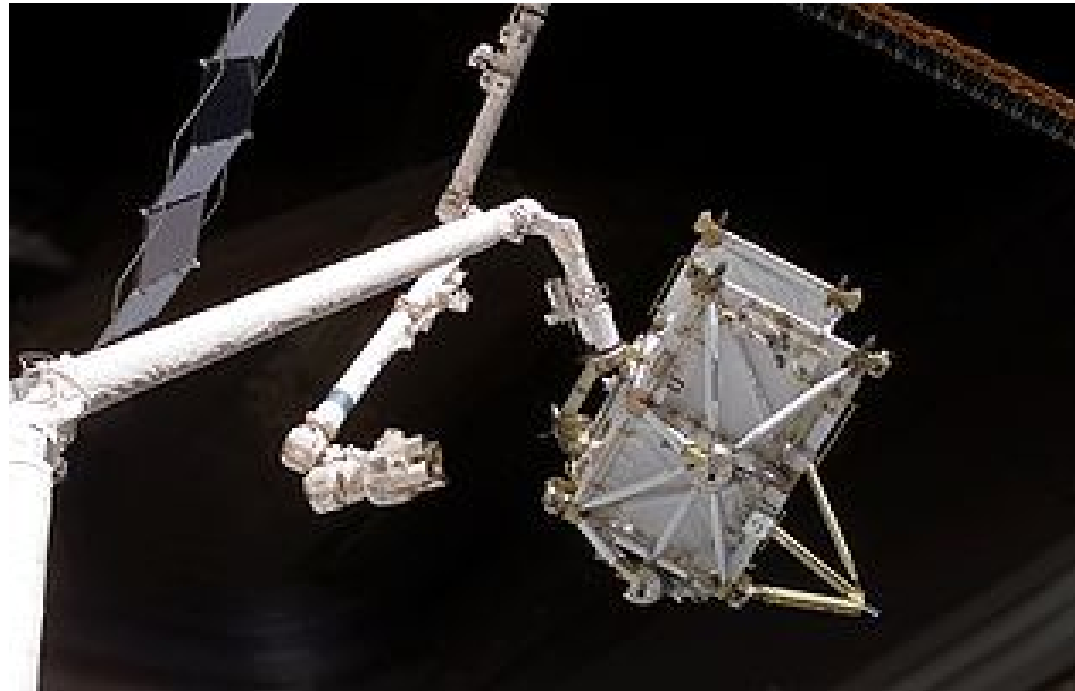
# **Introduction - The ISS Success Story**

- **Committed fundamental research at each national level**
- **Resulting in knowledge generation and skill development**
- **Cooperation in an era of space enterprise instead of a space race**
- **Emphasis on knowledge and skill sharing by drawing on the scientific and technological resources of 16 nations**
- **Result – Today's ISS architecture and facilities while attaining individual national goals.**

# ISS Research laboratory



# Canadarm-2



**The Canadarm2 moves toward a P5 truss section, being held by Discovery's Canadarm, in preparation for a hand-off during [STS-116](#)**

## **ISS Research Focus**

- **Microgravity Science**
- **Life Science**
- **Space Science**
- **Earth Science**
- **Engineering Research and Technology**
- **Space Product Development**

# **Using the facilities of ISS**

- **The research facilities of ISS are being used by ISS-partners (Canada, ESA, Japan, Russia and USA)**
- **Non-ISS partners - Brasil, Malaysia and South Korea already experienced the opportunity**
- **Could similar opportunities for the developing countries?**

## **What did Brasil and Malaysia achieve?**

- **Brasil** - Experiments on Seed Germination, DNA Repair, Effects of Micro-gravity on Fermentative Kinetics, Interacting Protein Clusters, Capillary Desiccators' Functioning, Miniature Wire Heat Transfer Tube, Brazilian seeds *Pharsalus vulgaris*, and Chlorophyll Chromatography;
- **Malaysia** – Experiments on Characteristics and growth of liver cancer and leukemia cells; Crystallisation of various proteins (**lipases**) and microbes in space - **Lipases** is a type of protein enzyme used in the manufacturing of a diverse range of products, from textiles to cosmetics; The opportunity to grow these in space will mean a possibility for Malaysian scientists to take a crack at an industry worth about US\$2.2 billion worldwide by producing these locally.



## What did South Korea achieve?

- 🌍 **South Korea** - she also took with her 1,000 **fruit flies** in a special air-conditioned container box (a **Konkuk University experiment**). She monitored the way the changes in gravity and other environmental conditions alter the behaviour of the flies, or their genome. Her other experiments included the growth of plants in space, the study of the behaviour of her own heart, and the effects of gravity change on the pressure in her own eye and on the shape of her own face.


# Why do the developing countries want to participate in ISS?

- Use of ISS's enhanced and unique facilities will drive advance science and technology
- The consequent research will deliver significant benefits to humanity in:
  - Healthcare - The physiological and biological processes that will affect the development of drugs and vaccines for a variety of human ailments (e.g. New antibiotics and antibodies and other treatments for Cancer, AIDS, Malaria, Sickle Cell, etc., etc.)
  - Advanced high-performance materials for automotive, medical and industrial applications.
  - More efficient processes in industry
  - Agricultural experiments with a focus on production of food and shelter for the teeming global population
  - Variety of experiments focusing on astronomy, biology, meteorology (climate change) and physics; and
  - Experiments on reduced deforestation.
- The partnership experience will advance integrated international operations and research and subsequently enhance collaboration on future international missions.

# **How do the developing countries want to participate in ISS?**

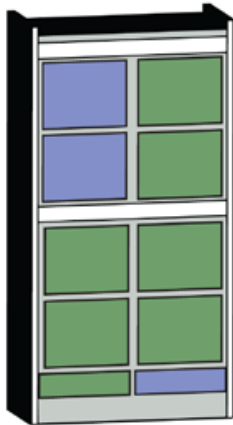
**Key areas of ISS activities:**

- (i) Scientific,**
- (ii) Engineering**
- (iii) Utilisation, and**
- (iv) Education potential.**

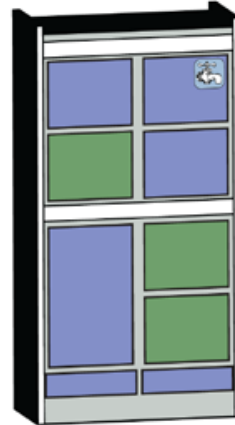
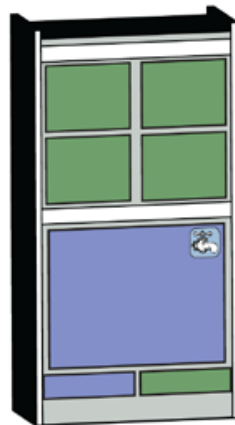
** What are the priority needs and where do the DCs want to make their mark and make a difference in the international community?**

# Are their facilities for participation in the ISS

Express 4 - Kibo

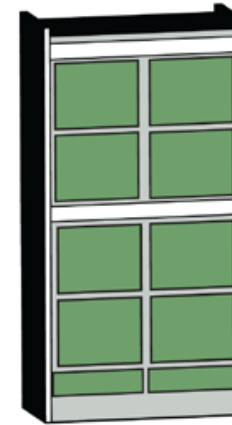


Express 2 - Destiny



Express 2A - Destiny

Express 7 - Destiny





Express 3A - Columbus

Over 50% of the capabilities of EXPRESS Racks are available for new research equipment. EXPRESS Racks are the most flexible modular research facility available on ISS and are used for NASA and international cooperative research.

## **Suggested guidelines for participation in ISS?**

### **Organize local seminars and symposia**

-  Each country should generate a Request for Information (RI) and distribute the RI to its science and engineering citizens, community, and institutions (**using all available and new communication channels**) to identify and express, individually and collectively, areas of interest.**
-  UN-OOSA should also brainstorm and suggest areas of interest and should provide a guideline to help the contributors in formulating their research problems and proposals.**

**The answers to the questions in the next slide should help in identifying the research activities that are worthy of investigation.**

# Defining the research

- **What is the research problem?**
- **How significant is the proposed research work?**
  - **What are some expected outcomes?**
  - **What are the social and economic impacts?**
  - **What is the relationship of this research to other studies?**
  - **How does this research or study advance the theoretical/practical knowledge?**
  - **What might be the policy implications?**
  - **How does this study lead to new research areas?**
  - **What are the risks and how might they be mitigated?**

# **Gauge national readiness to participate in ISS**

- **Assess local human and institutional capacities and capabilities that will support participation in ISS research? Are we ready?**
- **Will these capacities and capabilities support and sustaining fundamental and applied knowledge development and sharing?**
- **Funding? Is the national commitment there and guaranteed?**



# Submission and compliance

- **Prepare and submit on schedule to UN-OOSA sound proposals on realistic experiments that reflect the aspiration of your country; and**
- **Adhere to the guidelines and specifications provided by UN-OOSA for the preparation and design of ISS-bound experiments.**



# Closing Remarks



END