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## CANADIAN SPACE AGENCY SPACE STATION FREEDOM UTILIZATION PLANS

Presented by James Faulkner and Ron Wilkinson  
Canadian Space Agency

### ABSTRACT

Under the terms of the NASA/CSA Memorandum of Understanding, Canada will contribute the Mobile Servicing System and be entitled to use 3% of all Space Station utilization resources and user accommodations over the 30 year life of the Station. Equally importantly Canada, like NASA, can begin to exploit these benefits as soon as the Man-Tended Capability (MTC) phase begins, in early 1997.

Canada has been preparing its scientific community to fully utilize the Space Station for the past five years; most specifically by encouraging, and providing funding, in the area of Materials Science and Applications, and in the area of Space Life Sciences. The goal has been to develop potential applications and an experienced and proficient Canadian community able to effectively utilize microgravity environment facilities such as Space Station Freedom. In addition, CSA is currently supporting four facilities; a Laser Test System, a Large Motion Isolation Mount, a Canadian Float Zone Furnace, and a Canadian Protein Crystallization Apparatus.

In late April of this year CSA sent out a Solicitation of Interest (SOI) to potential Canadian user from universities, industry, and government. The intent of the SOI was to determine who was interested, and the type of payloads which the community at large intended to propose.

The SOI will be followed by the release of an Announcement of Opportunity (AO) following governmental approval of the Long Term Space plan later this year, or early next year. Responses to the AO will be evaluated and prioritized in a fair and impartial payload selection process, within the guidelines set by our international partners and the Canadian Government.

Payload selection is relatively simple compared to the development and qualification process. An end-to-end user support program is therefore also being defined. Much of this support will be provided at the new headquarters currently being built in St. Hubert, Quebec.

It is recognized that utilizing the Space Station could be expensive for users; costing in many cases millions of dollars to get a payload from conception to retrieval. It is also recognized that some of the potential users cannot or will not invest a lot of money or effort into Space Station utilization, unless there is a perceived significant commercial potential. How best to fund Space Station payloads is under study.

Space Station Freedom will provide the first opportunity for Canada to conduct experiments in a long-duration microgravity environment. CSA have been developing and funding potential users for some time, and considerable interest has been shown by the response to our SOI earlier this year. Canada can be one of the two earliest users for the Space Station, along with NASA. We hope to take full advantage of this opportunity.



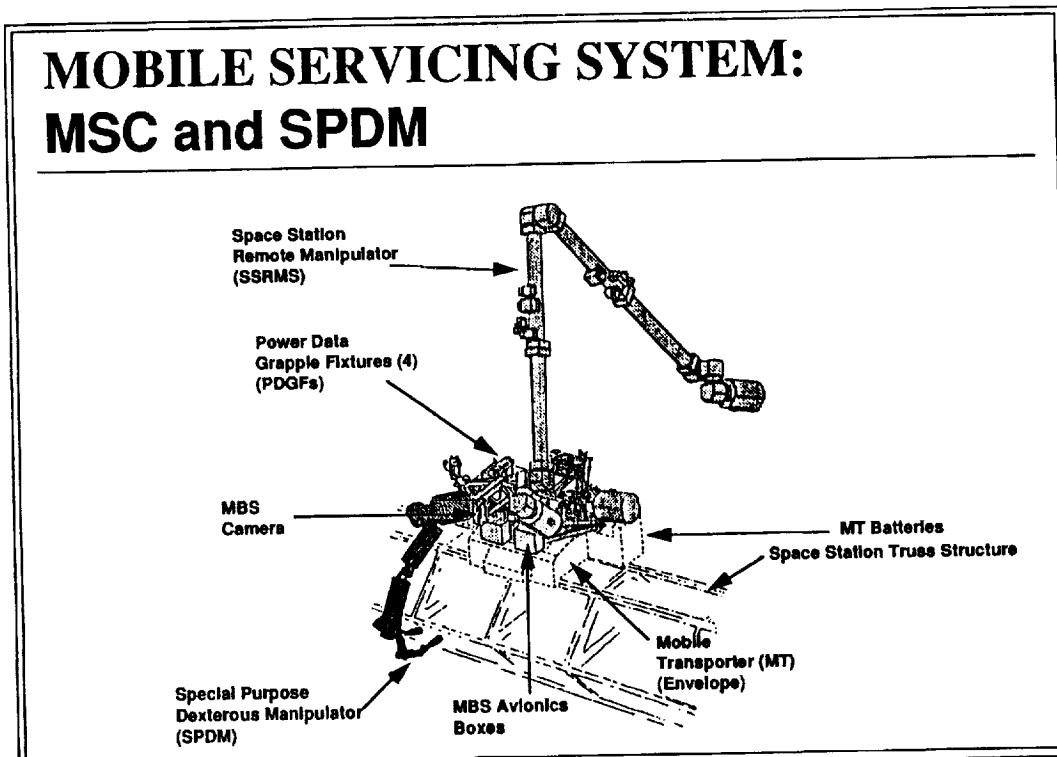
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**SPACE STATION FREEDOM UTILIZATION PLANS**

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## SPACE STATION ALLOCATIONS

|   | CSA | ESA   | Japan | NASA  |
|---|-----|-------|-------|-------|
| 1. Utilization Resources<br>(power, crew time, etc) | 3%  | 12.8% | 12.8% | 71.4% |
| 2. User Accommodations                              |     |       |       |       |
| a. NASA Lab Module                                  | 3%  |       |       | 97%   |
| b. NASA Truss Attach Points                         | 3%  |       |       | 97%   |
| c. ESA Attached Pressurized<br>Module               | 3%  | 51%   |       | 46%   |
| d. Japanese Experimental<br>Module                  | 3%  |       | 51%   | 46%   |
| e. NASA Polar Platform                              | 3%  |       |       | 97%   |
| f. ESA Polar Platform                               | 3%  | 97%   |       |       |
| 3. Supporting Services                              |     |       |       |       |
| a. Space Shuttle launch and<br>return services      | 3%  | 12.8% | 12.8% | 71.4% |
| b. TDRSS data transmission<br>capacity              | 3%  | 12.8% | 12.8% | 71.4% |



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## CANADIAN SHARE OF RESOURCES AND ACCOMMODATIONS

|                            | <u>1997</u> | <u>1998</u> | <u>1999 (1)</u> |
|----------------------------|-------------|-------------|-----------------|
| Pressurized Upmass (kg)    | 385         | 334         | 210             |
| Up-Volume (racks)          | 0.8         | 0.6         | 0.5             |
| On-board Racks             | 0.5         | 0.8         | 1.5             |
| Unpressurized Upmass (kg)  | 372         | 372         | 248             |
| External Attachment Points | 0.1         | 0.1         | 0.4             |
| Average Power (Kw)         | 0.26        | 0.46        | 0.72            |
| Total Crew Time (hrs)      | 39          | 39          | 26              |
| On-board Data Storage (MB) | 8           | 8           | 8               |
| Average Down Link (Mbps)   | 0.93        | 0.93        | 0.93            |

(1) The 1999 figures include allocations up to Sep 1999 (i.e. PMC)



## **USER DEVELOPMENT PROGRAM**

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- MATERIALS SCIENCES AND APPLICATIONS
- SPACE LIFE SCIENCES
- GOAL: TO DEVELOP A CANADIAN COMMUNITY  
ABLE TO EFFECTIVELY UTILIZE  
MICROGRAVITY ENVIRONMENT  
FACILITIES SUCH AS SPACE STATION



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## **MATERIALS SCIENCES AND APPLICATIONS**

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- EXPLORATION
  - UNIQUE PHENOMENA
- FUNDAMENTAL SCIENCES
  - FLUID PHYSICS
  - TRANSPORT PHENOMENA
  - CONDENSED MATTER PHYSICS
  - COMBUSTION SCIENCE
  - NUCLEATION
  - CRYSTAL GROWTH
- APPLIED SCIENCE
  - MATERIAL SCIENCE
  - PROTEIN CRYSTALLIZATION
  - LASER MATERIAL PROCESSING
- TECHNOLOGY
  - DEMONSTRATE HARDWARE



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## **SPACE LIFE SCIENCE**

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- HUMAN PHYSIOLOGY
- GRAVITATIONAL BIOLOGY
- BIOTECHNOLOGY
- THREE COMPONENTS:
  - INVESTIGATOR DEVELOPMENT
  - SPACE STATION PREPARATORY SCIENCE
  - SPACE STATION



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## **USER DEVELOPMENT PROGRAM FACILITIES**

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- LASER TEST SYSTEM
- LARGE MOTION ISOLATION MOUNT
- CANADIAN FLOAT ZONE FURNACE
- CANADIAN PROTEIN CRYSTALLIZATION APPARATUS



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## SOLICITATION OF INTEREST

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- |  |     |
|--|-----|
| • MATERIALS RESEARCH                         | 52% |
| • BIOLOGY, LIFE SCIENCES,<br>BIOTECHNOLOGY   | 17% |
| • ROBOTICS, SPACE STRUCTURES,<br>DEVICES     | 12% |
| • EARTH OBSERVATION,<br>ATMOSPHERIC RESEARCH | 8%  |
| • HARDWARE DEVELOPMENT                       | 7%  |
| • COMMUNICATIONS, ENERGY                     | 4%  |



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## REVIEW PANELS

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- REPRESENTATIVES FROM UNIVERSITY,  
INDUSTRY, GOVERNMENT
- FOUR PANELS TO START:
  - SCIENCE (including related technology);
  - SPACE TECHNOLOGY  
(e.g. structures, devices, robotics);
  - EARTH OBSERVATION; and
  - COMMUNICATIONS.



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## **REVIEW PANEL EVALUATION CRITERIA**

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- SCIENTIFIC MERIT
- ORIGINALITY
- VALUE TO CANADA
- STATION RESOURCES REQUIRED
- COMMERCIAL POTENTIAL
- COST



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## **CANADIAN SPACE STATION PROGRAM ALLOCATION BOARD (CSSPAB)**

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- CSA VICE PRESIDENT OPERATIONS (Chairman)
  - CSA VICE PRESIDENT RESEARCH & APPLICATIONS
  - DIRECTOR GENERAL  
CANADIAN SPACE STATION PROGRAM
  - DIRECTOR GENERAL SPACE SCIENCE
  - CSA USER OPERATIONS PANEL MEMBER
- plus
- CHAIRMEN OF REVIEW PANELS (to relevant meetings)



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## USER SUPPORT PROGRAM

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- ASSISTANCE TO PI'S
- TECHNICAL SUPPORT CENTERS
- SPECIALIZED EQUIPMENT
- ARRANGE LAUNCH AND COMMUNICATIONS SERVICES
- PAYLOAD INTEGRATION CENTER
- PAYLOAD OPERATIONS CENTER
- PAYLOAD SUPPORT CENTER



## FUNDING POLICIES

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- TO BE DETERMINED
- INITIAL THOUGHTS:
  - CSA would subsidize the costs associated with integrating, qualifying, launching, controlling, and recovering payloads;
  - PI's absorb some of the payload development costs by contributing in-kind support, or by obtaining funding from other sources; and
  - where there are future commercial returns, the federal government would apply user fees to recover some portion of the costs.



