Canadian Space Station Program

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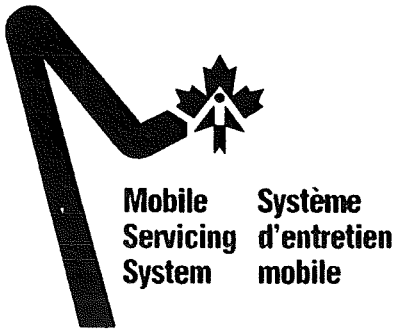
Director General
Canadian Space Station Program

August 6, 1991
League City, Texas



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The Canadian Space Station Program

- Mobile Servicing System
  - Development, use and operation
- Strategic Development
  - Space station utilization and operations
  - Evolution
  - Technology development
  - User development
  - Industrial development

Mobile Servicing System

- Canada's contribution provides essential facility for assembly, maintenance and servicing of Space Station
- Required to support several phases:
  - assembly
  - initial operations
  - mature operations
  - evolution

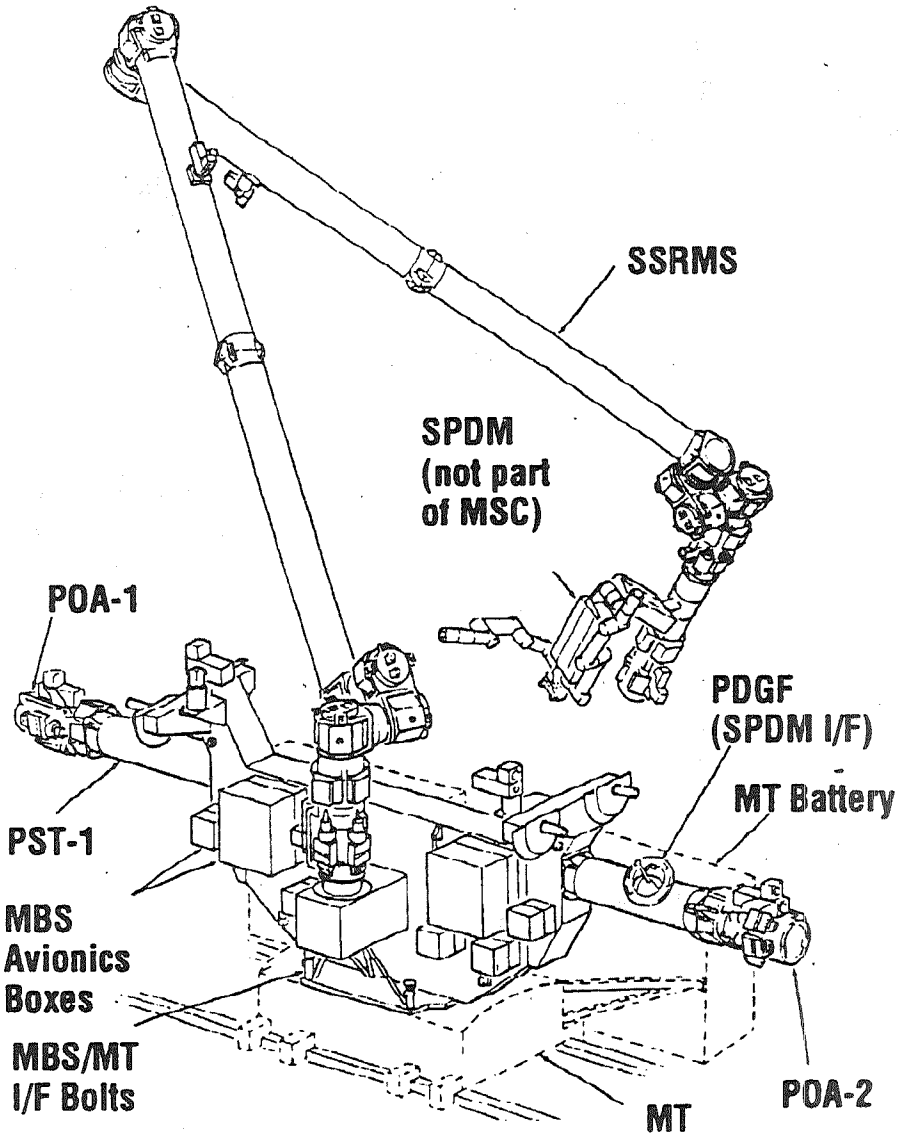
Major impacts of restructuring on Canadian Program

- MSC delivery to orbit phased, MB 3 and MB 6
- MT operates only along one face of truss
  - Routine orbiter/station logistics tasks no longer possible from MT as base
  - Direct operations viewing by operator impeded
- MSC control from aft node and STS

Assembly Sequence Launch Manifest

Date	Flight		Assembly elements
11/95	1 FEL	MB-1	Truss section (S3/4) with stbd indb PV system, alpha joint, propulsion module platforms, passive dampers, MT, unpressurized berthing adapter
12/95	2	MB-2	Truss section (S2) with CMGs, C&T (S-band), two propulsion modules, S-2 avionics
3/96	3	MB-3	Truss section (S1) with stbd TCS, UHF and KU-band antennas, SSRMs
6/96	4	MB-4	Truss section (M1) with IUD, MTS, GCS , cryo berthing mechanisms (2), node 1&2 umbilicals, CETA cart (2), MT batteries
9/96	5	MB-5	Aft port node, Pressurized Docking Adapter (PDA), cupola
12/96	6 MTC	MB-6	U.S. lab module core - A, system racks, 4 user payload racks, MBS (ASRMs required)
3/97	7	MB-7	Airlock, pressurized docking adapter, SPDM/MMD
5/97		UF-1	Mini PLM, Cryo O2/N2
6/97	8	MB-8	Truss section (P1) with port TCS, C&T (UHF ant.)
9/97	9	MB-9	Truss section (P2) with dry cargo berthing mechanisms (3), 2 propulsion modules

Mobile Servicing Centre



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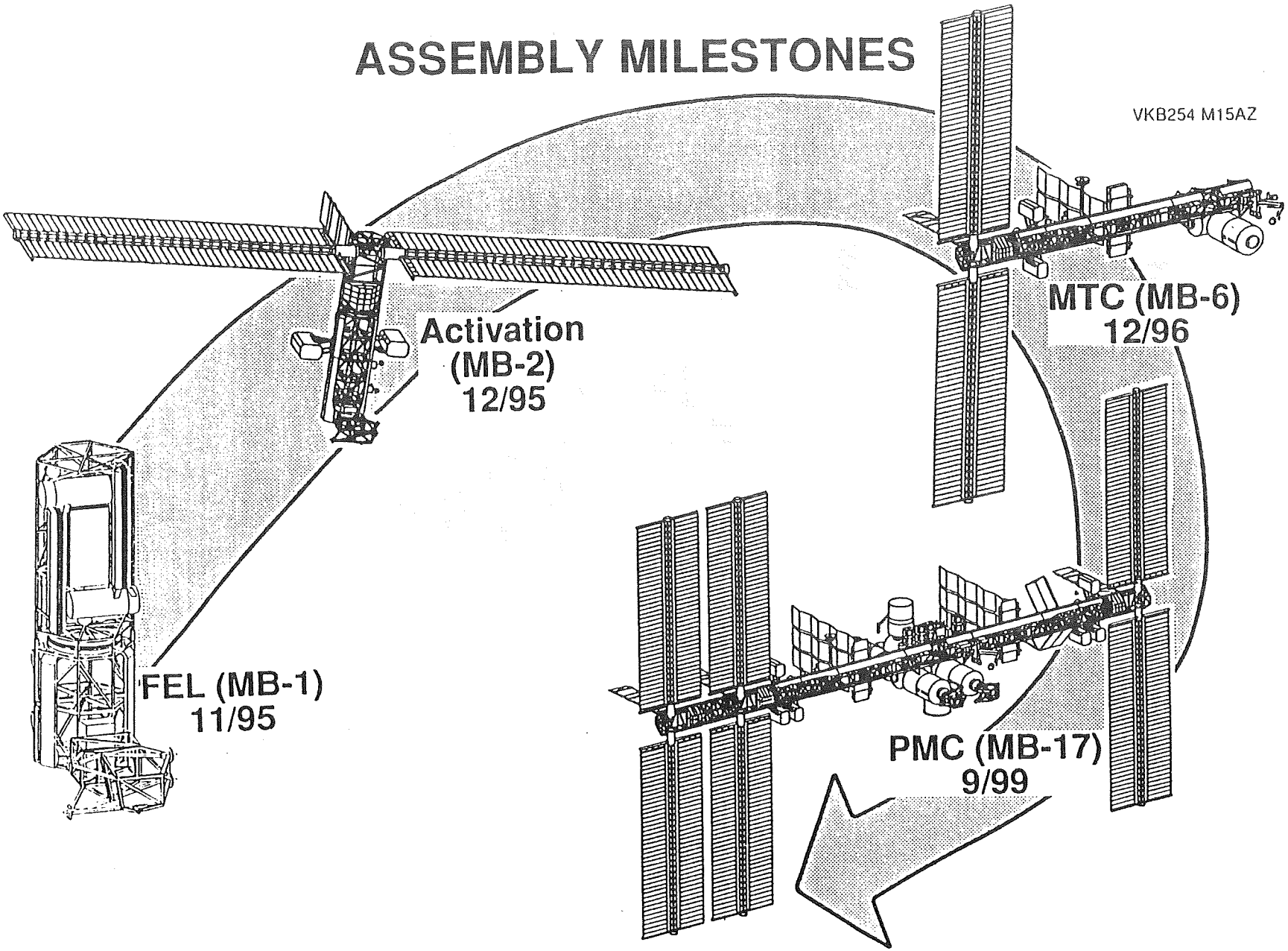
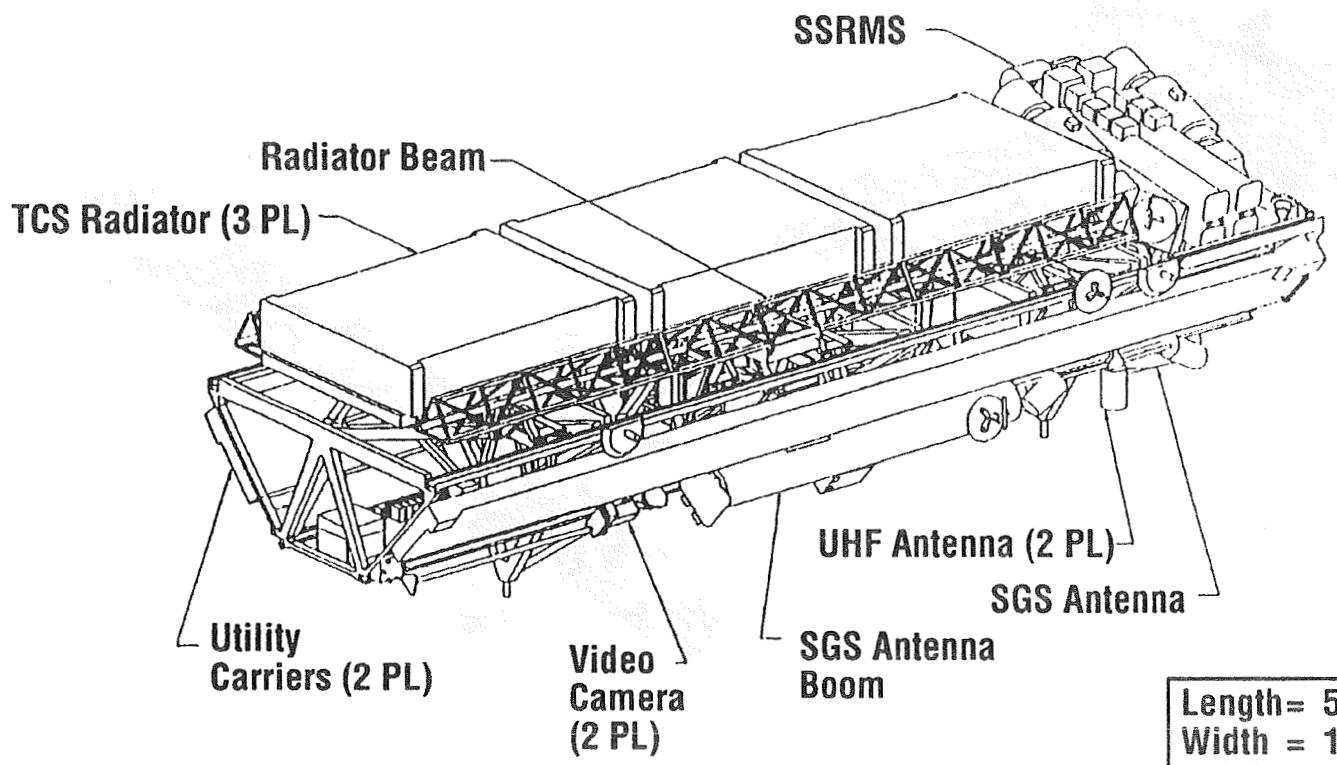
ASSEMBLY MILESTONES

VKB254 M15AZ

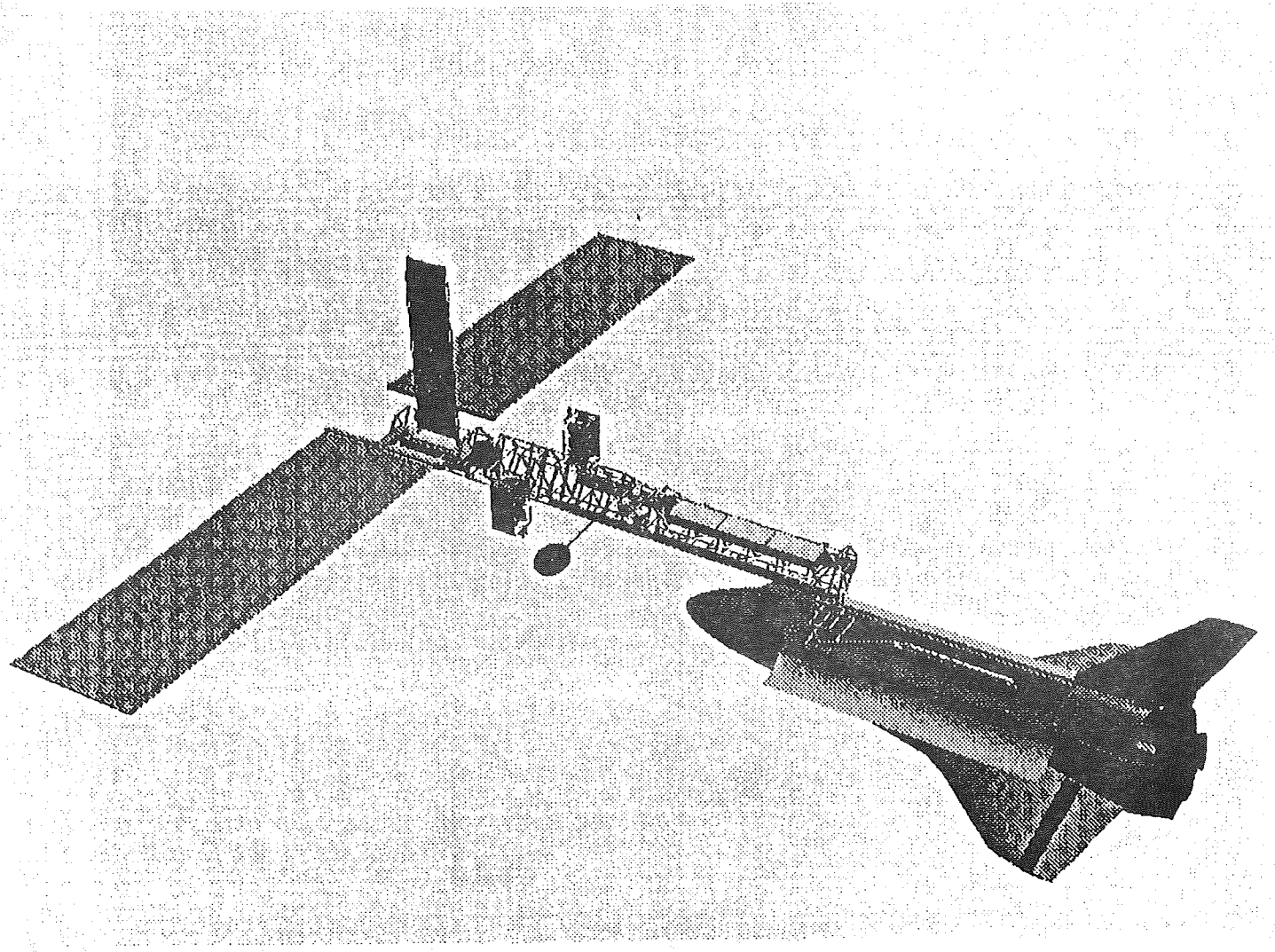


—Space Station Freedom—

MB-3 Launch Configuration

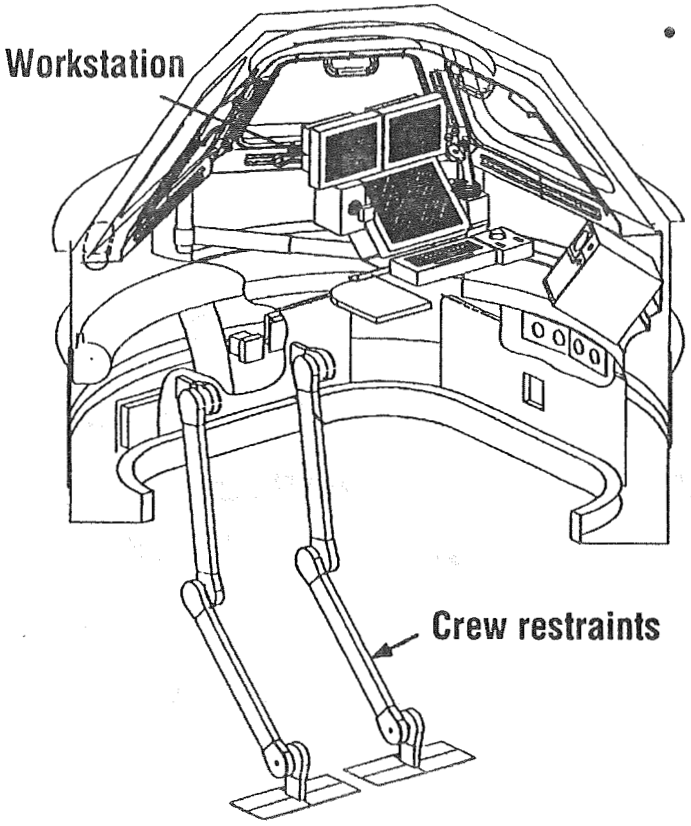


MB-3



Space Station Freedom

Cupola



- One Workstation
  - New workstation configuration
    - PDR: 2-14", 5-10" displays
    - 2x6 DOF hand controllers
    - Programmable display
    - Pushbuttons,
    - master alarm lights
    - DPDR: 1-14", 2-10" displays
    - 2x3 DOF handcontrollers
    - no programmable display
    - pushbuttons,
    - no master alarm lights

MSS Development Status

- Engineering model hardware manufacturing 70% complete
- Detailed flight system design for MB 3 deliverables 35% complete
- Engineering development facilities in operation
  - Simulation facility (MDSF)
  - SPDM test rig
  - Full-scale mockups

Canadian Program Status

Program is fully funded at $1.2B until year 2000

Mobile servicing system development

Phase A	Program definition (completed)	1984-85
Phase B	Concept development (completed)	1985-87
Phase C1	Preliminary design (completed)	1987-90
Phase C2	Detailed design (in progress)	1990-92
Phase D	Manufacture and test	1992-95
Phase E	Launch of 1st Canadian element (MB-3)	1996
	Operations Phase	1996-2025

User development

- Ongoing program

Technology development

- Ongoing program

CAL Corporation
Power System
(Ottawa)
SPAR Aerospace
(S&CS Division)
Avionics,
Arm Joints
and effectors
(Montreal)
CAE Electronics
Simulators and Human/
Machine Interface
(Montreal)
SED Systems
Ground Segment
(Saskatoon)
IMP
Electrical
Harnesses
(Halifax)
MacDonald
Dettwiler
Software
(Vancouver)
SPAR Aerospace
(MSS Division)
Prime Contractor
(Toronto)

Strategic Development

- Development of strategic technologies and industry for MSS
- Space station operations and utilization
- Space station user development
- Space station evolution

Strategic Technology Development

- Areas of technology
  - Automation of operations
  - Automated power management
  - Autonomous robotics
  - Enhanced space vision systems
  - Trajectory planning and collision avoidance
  - Protection of materials in space
  - Tactile sensors

User Development Program

- **Objective: To develop potential users of the microgravity environment on Space Station, with emphasis on potential commercial applications and the necessary underlying science, especially in materials science and biotechnology**

User Development Program

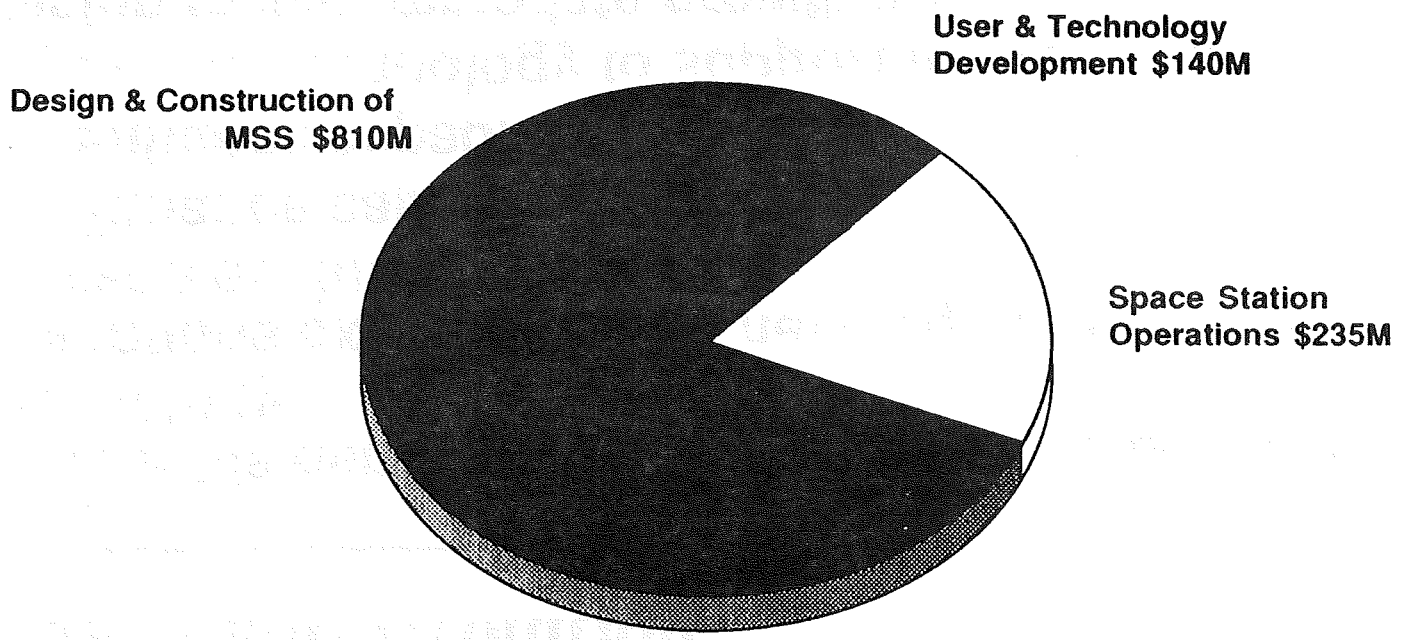
- Areas of current interest
  - Fluid dynamics
  - Chemistry
  - Crystal growth
  - Metals and alloys
  - Glasses and ceramics
  - Biotechnology
  - Combustion

Growth and Evolution

- 30 year life demands incorporation of advances in technology
- Operations experience and new requirements will demand evolution
  - Enhance capacity
  - Enhance capability
  - Evolve technology to support future missions
- Design to accommodate growth and evolution
- Pursue restructured space station development
- Achieve on-orbit operational experience as soon as possible

Space Station Program Budget

1.185 billion 15 year total (1985-2000)



Canada's Future Space Activity

- Long term space plan is being developed for spring 1992 to provide options for Canada's future space participation
- International participation is a key factor in major programs
- Space station remains as a test case for future large scale projects and international cooperation

CSA Approved Budget $2.7B

1988/89-2000/01