

**OSSA SPACE STATION FREEDOM SCIENCE  
UTILIZATION PLANS**

Presented by Dr. Philip J. Cressy  
Office of Space Science and Applications  
NASA Headquarters

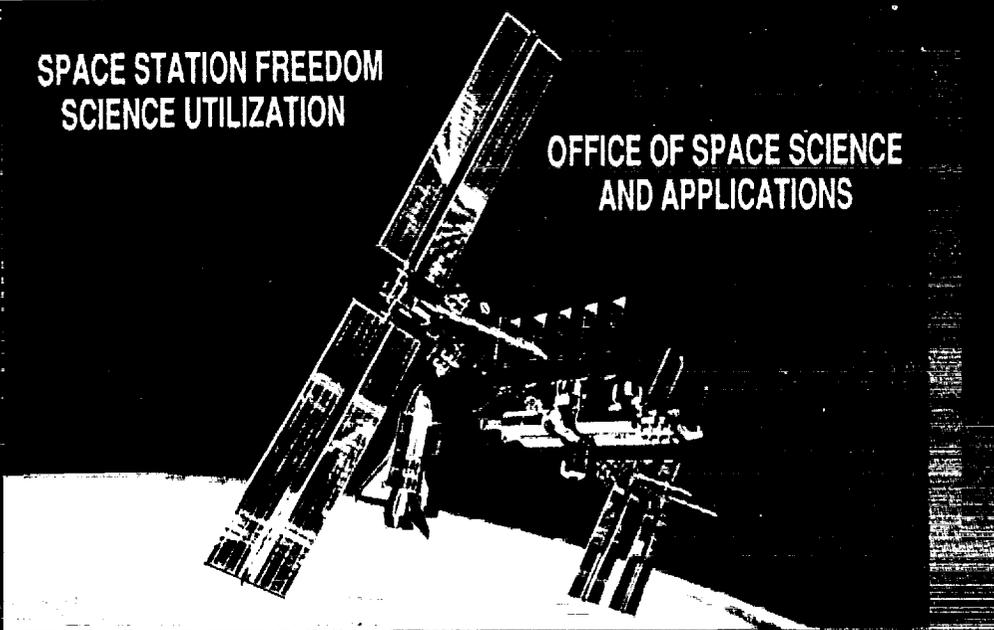
**ABSTRACT**

Long duration exposure to an essentially zero-gravity environment is a phenomenon exclusive to the Space Station Freedom that cannot be duplicated on Earth. The Freedom Station will offer periods of time on orbit extending to weeks and months rather than hours or days, allowing for in-depth space-based research and analysis to a degree never before achieved. OSSA remains committed to exploiting the unique capabilities provided by the Space Station as well as other space-based facilities to study the nature of physical, chemical, and biological processes in a low-gravity environment and to apply these studies to advance science and applications in such fields as biomedical research, plant and animal physiology, exobiology, biotechnology, materials science, fluid physics, and combustion science. The OSSA focus is on progressive science investigations, many requiring hands-on scientist involvement using sophisticated experiment hardware. OSSA science utilization planning for the Freedom Station is firmly established. For this presentation, this planning is discussed in three general areas: OSSA goals and overall approach, the current and on-going program, and plans for space station utilization. In the first area, OSSA addresses its overall approach to space science research, its commitment to transition to Space Station Freedom, and its top-level strategy for the utilization of Freedom. The current and on-going program is next discussed, focusing on the various Spacelab series of missions which are providing the stepping-stones to Space Station Freedom. Selected science results from SLS-1 and USML-1 are cited which underline the value of properly outfitted laboratories in space in which crew-intensive experiment interactions are possible. The presentation is concluded with a discussion of top-level goals and strategies for utilizing the Freedom Station by OSSA's Life Sciences Division and its Microgravity Science and Applications Division.



**SPACE STATION FREEDOM  
SCIENCE UTILIZATION**

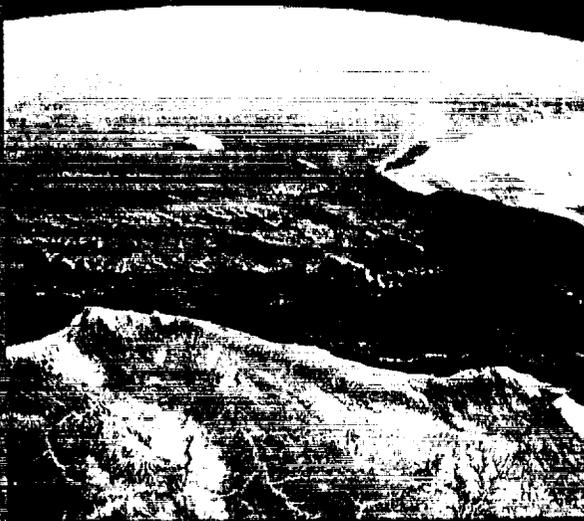
**OFFICE OF SPACE SCIENCE  
AND APPLICATIONS**



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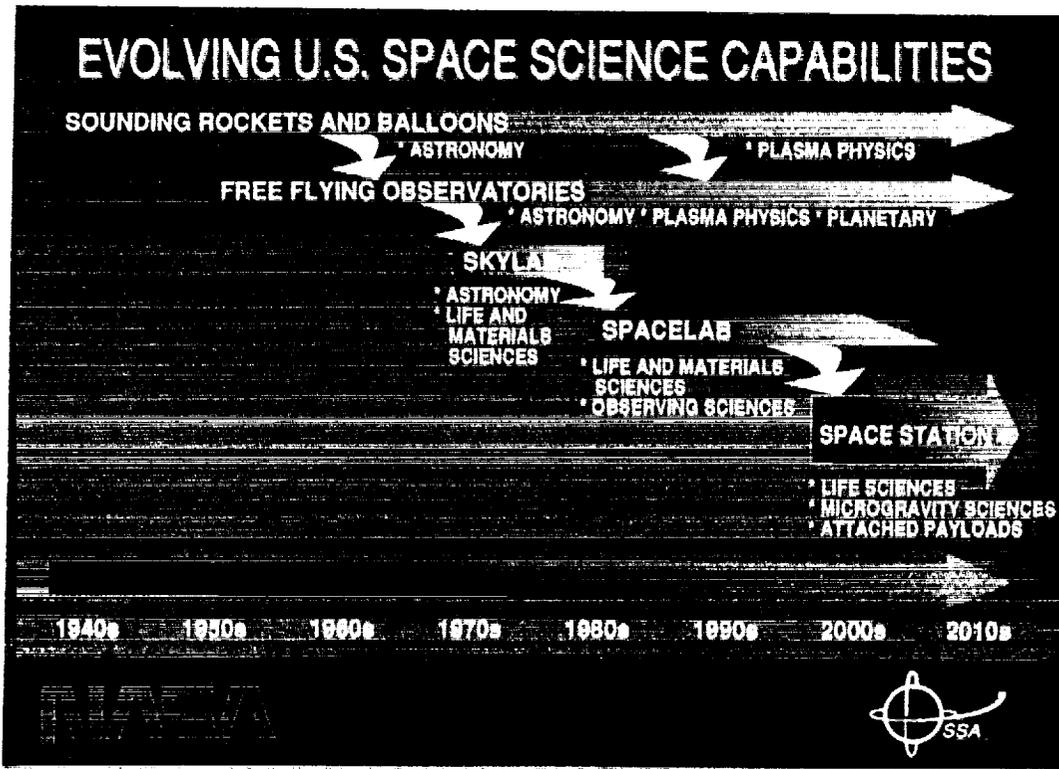
**OFFICE OF SPACE SCIENCE AND APPLICATIONS GOALS**

- TO ADVANCE SCIENTIFIC KNOWLEDGE OF THE PLANET EARTH, THE SOLAR SYSTEM AND THE UNIVERSE
- TO USE THE UNIQUE VANTAGE POINT AND ENVIRONMENT OF SPACE TO STUDY THE UNIVERSE, TO UNDERSTAND THE FACTORS THAT INFLUENCE OUR PLANET'S ENVIRONMENT, AND TO SOLVE PRACTICAL PROBLEMS ON EARTH
- TO EXPAND THE HUMAN PRESENCE BEYOND THE EARTH INTO THE SOLAR SYSTEM



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## TRANSITION TO SPACE STATION



BEGINNING WITH SPACELAB AND OTHER IN-SPACE FACILITIES, WE ARE MOVING AGGRESSIVELY, BUT SENSIBLY, TO DEVELOP THE PRINCIPAL AREAS OF SPACE SCIENCE AND APPLICATIONS THAT WILL TAKE ADVANTAGE OF UNIQUE FREEDOM STATION OPPORTUNITIES. FOR MICROGRAVITY SCIENCE AND LIFE SCIENCES RESEARCH IN PRESSURIZED LABORATORIES

OSSA STRATEGIC PLAN 1991

SSA

## OSSA STRATEGY

- PLAN UTILIZATION TO SUPPORT PREPARATION FOR HUMAN EXPLORATION
- EMPHASIZE PRESSURIZED VOLUME UTILIZATION
  - Life Sciences
  - Microgravity Science and Applications
- TRANSITION SENSIBLY FROM SPACELAB TO SPACE STATION
- ENSURE A RANGE OF UTILIZATION OPTIONS
  - Facility-Class Payloads
  - Middeck and Drawer-Class Payloads
  - Small and Rapid Response Payloads
  - Attached (Observational) Payloads
- SOLICIT FIRST-CLASS SCIENCE
  - Planned AOs and NRAs
  - International Collaborations
- INTEGRATE THE INTERESTS OF THE U.S. SCIENCE COMMUNITY



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## THE CURRENT PROGRAM

OSSA IS LAYING THE FOUNDATION FOR SPACE STATION FREEDOM WITH ITS SPACELAB SERIES OF MISSIONS

SLS - Spacelab Life Sciences missions dedicated to human, animal, plant, and cell research

USML - US Microgravity Laboratory missions dedicated to materials, fluids, and combustion research

IML - International Microgravity Laboratory missions which emphasize international cooperation in microgravity research



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# SOME RECENT SCIENCE RESULTS

## SLS-1

- RAPID TRANSITION IN MUSCLE ACTIVITY AWAY FROM MUSCLES THAT CONTROL WALKING AND POSTURE
- SHIFTS IN MUSCLE NUTRIENT USAGE TO MORE CARBOHYDRATES AND LESS FAT
- IMPAIRMENT OF BLOOD PRESSURE REGULATORY MECHANISMS
- UNEXPLAINED RETENTION OF 1-g LUNG CHARACTERISTICS IN 0-g
- UNEXPECTED INCREASED BLOOD FLOW TO THE KIDNEYS

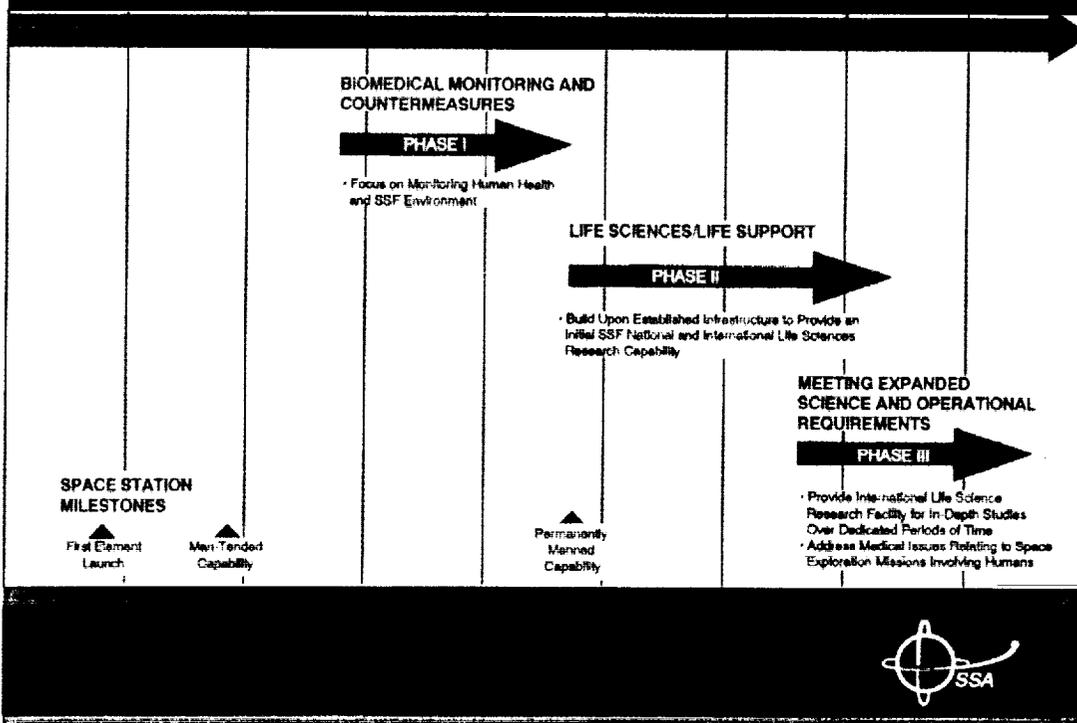
## USML-1

- SEVERAL INORGANIC CRYSTALS APPEAR TO BE LARGEST AND HIGHEST QUALITY GROWN TO DATE
- OVER 700 CREW MANIPULATIONS OF PROTEIN CRYSTAL SAMPLES INCREASED QUALITY AND YIELD
- MANY CRYSTALS WERE OBSERVED TO BEGIN GROWING ONLY LATE IN THE FLIGHT
- MANY UNPLANNED/UNEXPECTED RESULTS WERE OBTAINED

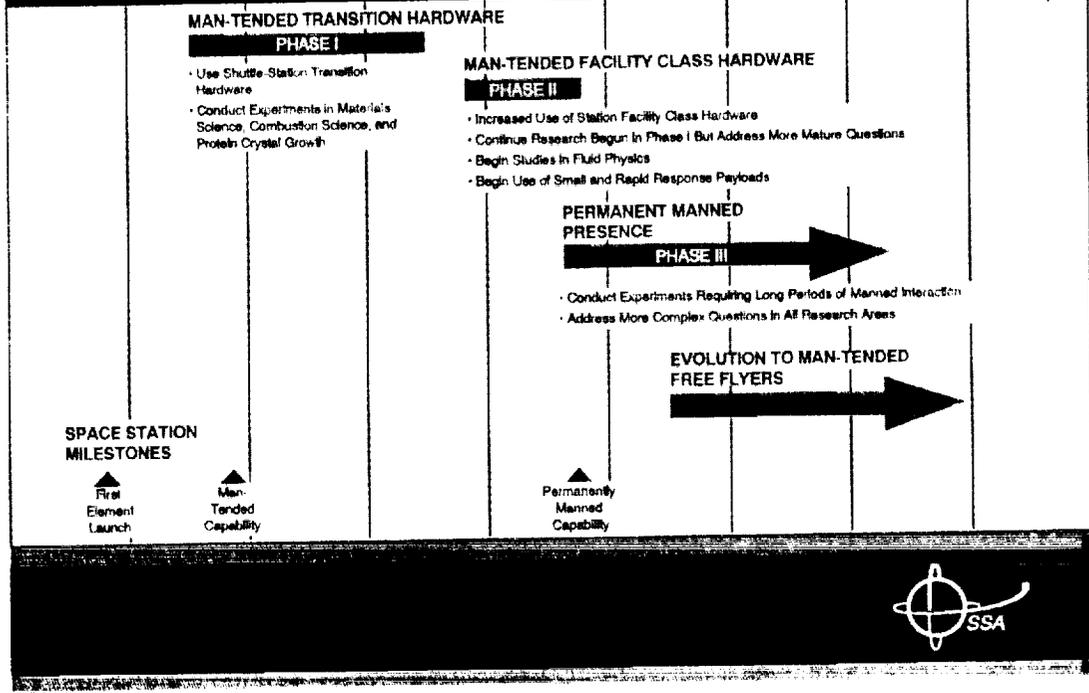


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# LIFE SCIENCES STRATEGY



# MICROGRAVITY SCIENCE AND APPLICATIONS STRATEGY



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