NASA
National Aeronautics and
Space Administration

FREEDOM

SPACE STATION FREEDOM OVERVIEW

Presentation to

SPACE STATION EVOLUTION

BEYOND THE BASELINE

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Space Station Freedom

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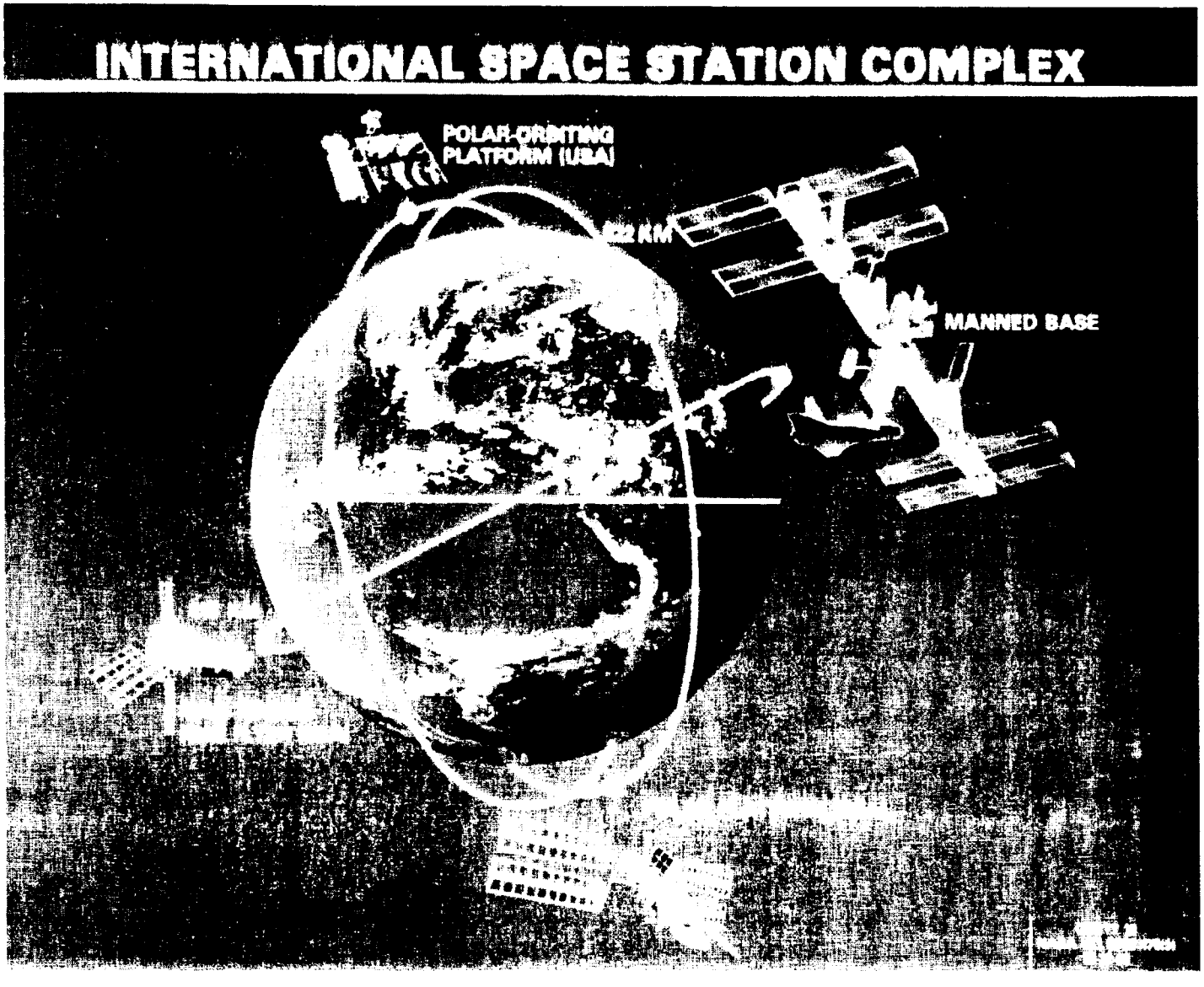
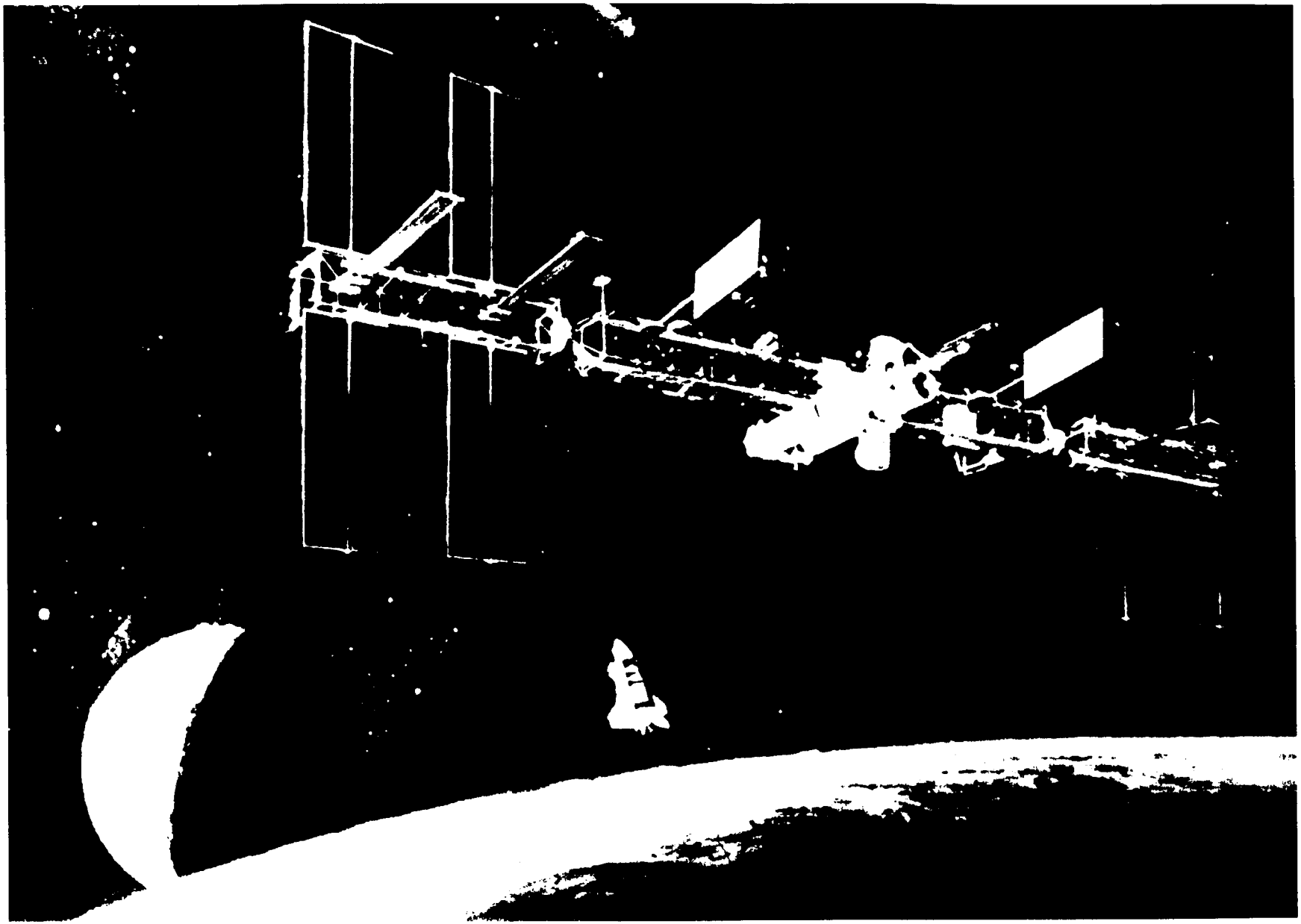

INTERNATIONAL SPACE STATION COMPLEX
POLAR-ORBITING PLATFORM (USA)
MANNED BASE



SPACE STATION FREEDOM PROGRAM OBJECTIVES

- Provide a permanently manned presence in space
- Enhance capabilities for space science and applications
- Stimulate advanced technologies
- Promote international cooperation
- Encourage private sector participation and utilization
- Provide options for future endeavors in space

SPACE STATION FREEDOM

ESA

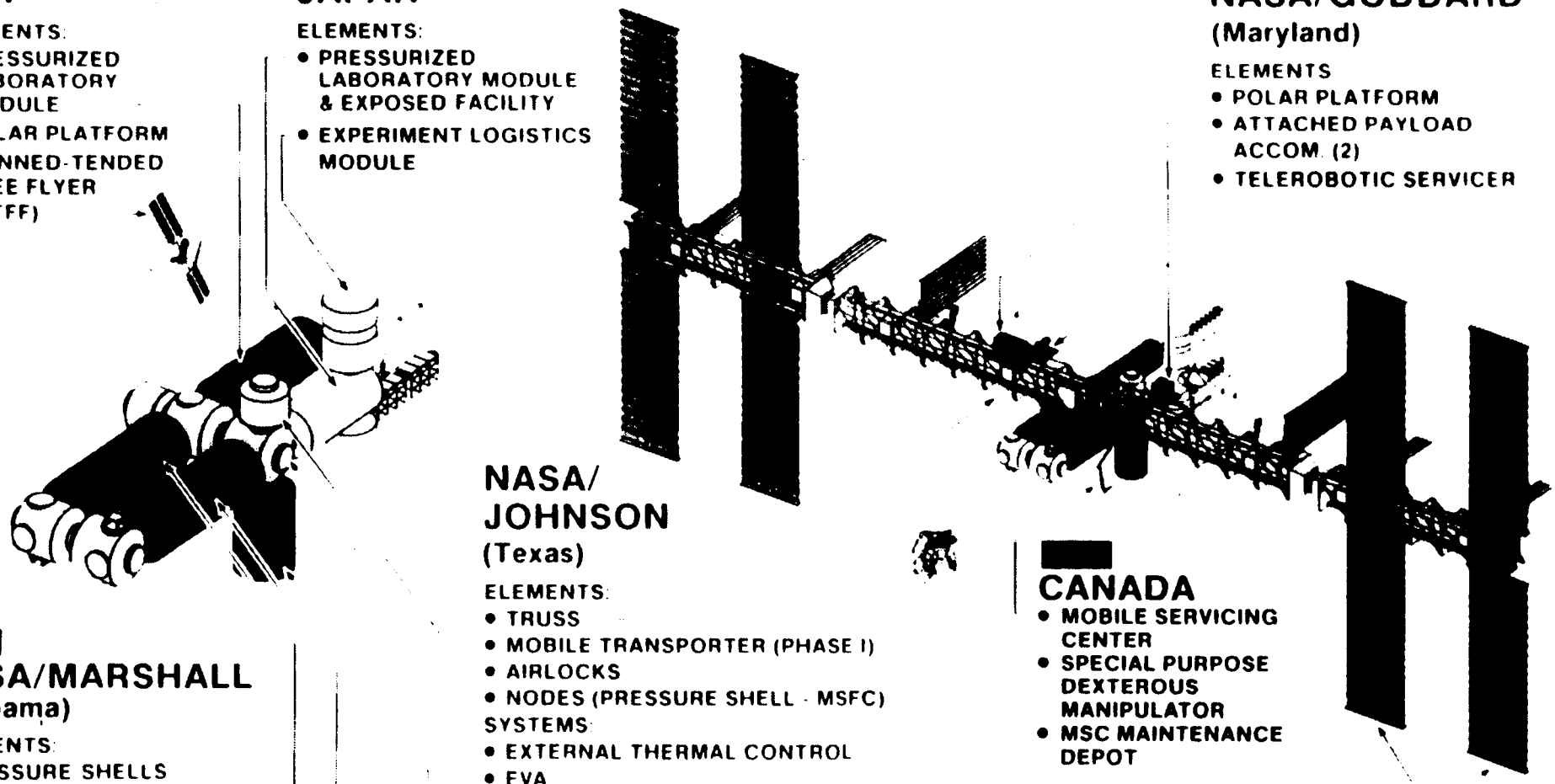
ELEMENTS:
- PRESSURIZED LABORATORY MODULE
- POLAR PLATFORM
- MANNED-TENDED FREE FLYER (MTFF)

JAPAN

ELEMENTS:
- PRESSURIZED LABORATORY MODULE & EXPOSED FACILITY
- EXPERIMENT LOGISTICS MODULE

NASA/GODDARD (Maryland)

ELEMENTS
- POLAR PLATFORM
- ATTACHED PAYLOAD ACCOM. (2)
- TELEROBOTIC SERVICER



NASA/ JOHNSON (Texas)

ELEMENTS:
- TRUSS
- MOBILE TRANSPORTER (PHASE I)
- AIRLOCKS
- NODES (PRESSURE SHELL - MSFC)

SYSTEMS:
- EXTERNAL THERMAL CONTROL
- EVA
- DATA MANAGEMENT
- COMMUNICATIONS & TRACKING
- GUIDANCE, NAVIGATION & CONTROL
- PROPULSION (THRUSTER TD BY MSFC)
- NSTS SS ATTACHMENT SYSTEMS

CANADA

- MOBILE SERVICING CENTER
- SPECIAL PURPOSE DEXTEROUS MANIPULATOR
- MSC MAINTENANCE DEPOT

NASA/MARSHALL (Alabama)

ELEMENTS:
- PRESSURE SHELLS FOR NODES
- LABORATORY MODULE
- HABITATION MODULE (OUTFITTING TD BY JSC)
- LOGISTICS MODULE (PRESS & UNPRESS)

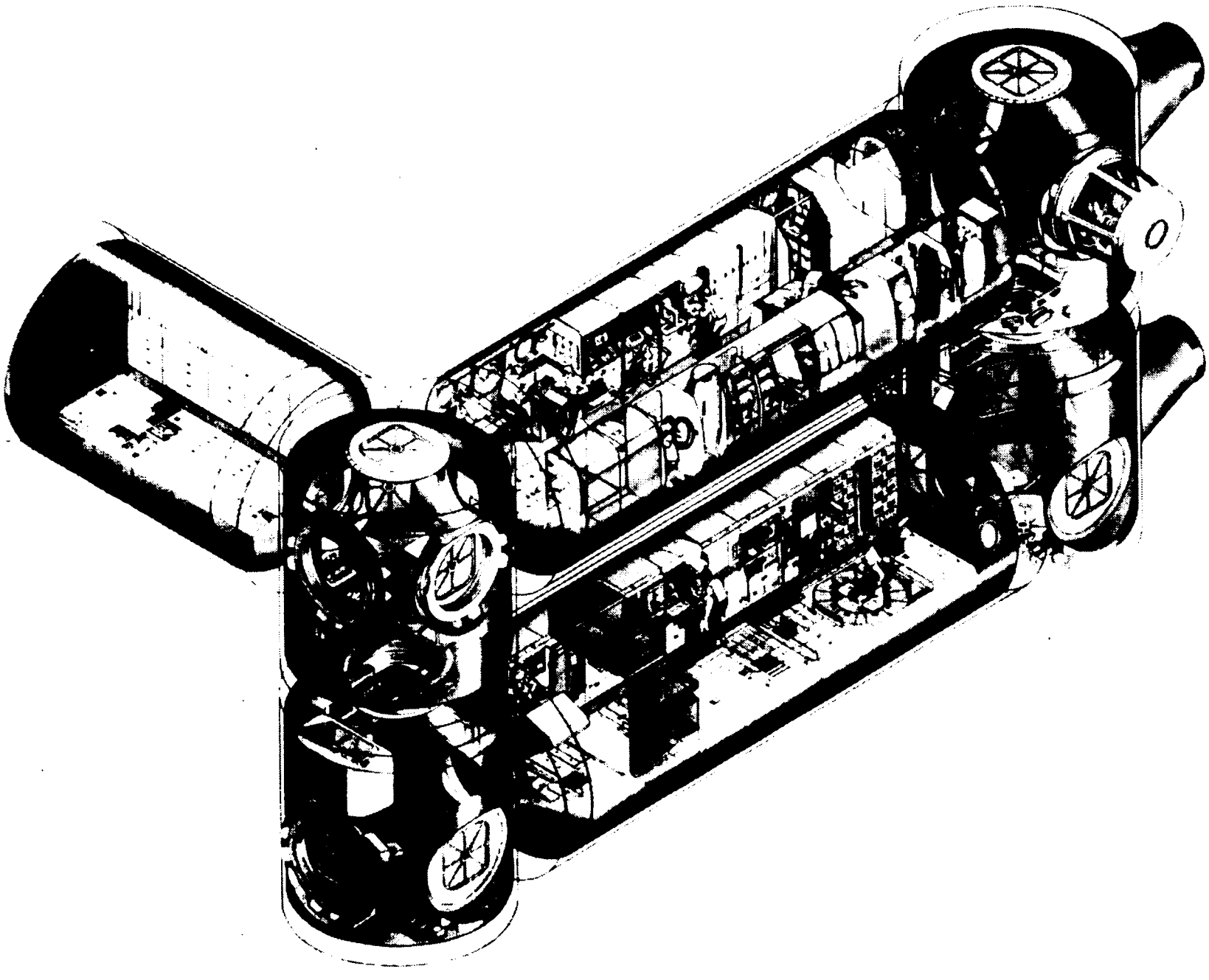
SYSTEMS
- ECLSS
- INTERNAL THERMAL CONTROL
- INTERNAL AUDIO & VIDEO

NASA/LEWIS (Ohio)

ELEMENTS:
- POWER MODULES - PV

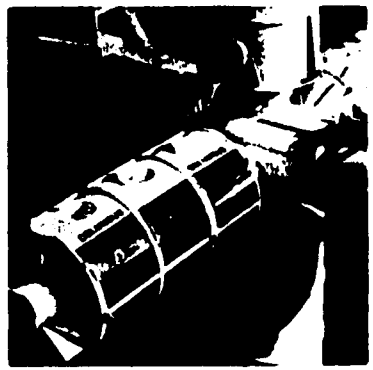
SYSTEM:
- ELECTRICAL POWER DISTRIBUTION

U.S. SPACE STATION PRESSURIZED MODULES



INTERNATIONAL PARTICIPANTS IN THE SPACE STATION FREEDOM PROGRAM

WHO	WHAT
EUROPEAN SPACE AGENCY (ESA) BELGIUM, DENMARK, FRANCE, GERMANY, ITALY, THE NETHERLANDS, NORWAY, SPAIN, SWEDEN, UNITED KINGDOM	ATTACHED PRESSURIZED MODULE POLAR PLATFORM MAN-TENDED FREE FLYER
JAPAN SCIENCE AND TECHNOLOGY AGENCY OF JAPAN	JAPANESE EXPERIMENT MODULE
CANADA CANADIAN SPACE AGENCY	MOBILE SERVICING CENTER SPECIAL PURPOSE DEXTEROUS MANIPULATOR MSC MAINTENANCE DEPOT



COLUMBUS

MOBILE SERVICE CENTRE

JAPANESE EXPERIMENT MODULE

SPACE STATION FREEDOM BASELINE

FREEDOM

Changes

- All direct current power system
- Shuttle suits exclusively
- Hydrazine propulsion
- One airlock (Hyperbaric)
- Passive cooling of external payloads
- Lab support equipment
- Solar dynamic power generated system test deleted
- Polar Platform unique hardware

SPACE STATION FREEDOM BASELINE (Continued)

FREEDOM

Deferrals

- Full 75 kilowatt power from Feb 97 to Nov 97
- Crew habitability
- Closed loop oxygen and carbon dioxide
- Washer, dryer, freezer, etc; until 75 kW power available
- User ultra-pure water
- KSC 8 flight/year processing from March 95 to Jan 97
- Three 0-100 MBPS lines to single bus increased to 300 MBPS dual bus system at Assembly Complete
- Global Position System deferred until required to support ESA man-tended free flyer

SCHEDULE

FREEDOM

	Rephased Baseline	Prior
First Element Launch	March 95	(March 95)
Manned Tended Capability	April 96	(Nov 95)
Permanent Manned	July 97	(Dec 96)
Δ 37.5 kW	Sept 97	(March 97)
Japanese Experimental Module (JEM)	Feb 98	(June 97)
ESA Module	July 98	(Aug 97)
Assembly Complete	Aug 99	(Feb 98)

SPACE STATION FREEDOM EVOLUTION

- Freedom is a permanent facility
  - -- Upgrades and configuration changes will take place on-orbit
- During the operational life of the Space Station
  - -- National priorities will change
  - -- User needs and mission requirements will change
  - -- Technology will evolve and components will become obsolete

SPACE STATION FREEDOM EVOLUTION (Continued)

- Evolution is a key design consideration
  - -- To meet anticipated user needs and advanced mission requirements
  - -- To improve the productivity and efficiency of flight/ ground systems
  - -- To avoid component and system obsolescence
- A Space Station evolution program is in place
  - -- Transition Definition Program managed by the Strategic Plans and Programs Division at Level I
  - -- This Symposium will review the results of FY 88 - 89 tasks

SPACE STATION FREEDOM EVOLUTION (Continued)

- Good progress is being made
  - -- User needs and resource requirements have been identified for a range of advanced mission scenarios
  - -- Primary evolution design accommodations (hooks & scars) have been identified
  - -- Preliminary reference configurations for evolution have been established
  - -- Advanced Development Program tasks have transitioned OAST-developed technology to the baseline station
  - -- Direct participation in the Human Exploration Initiative Tiger Team established preliminary Transportation Node requirements

SPACE STATION FREEDOM EVOLUTION (Continued)

- Future efforts will focus on definitizing
  - -- Assembly Complete evolution design accommodations
  - -- Phase II configuration and phasing
  - -- Lunar/Mars Transportation Node configuration, technology requirements, and phasing
  - -- Advanced Development tasks in enabling technology for station evolution