



HUMANS IN SPACE: LIFE SUPPORT



PHYSICAL/CHEMICAL CLOSED-LOOP LIFE SUPPORT

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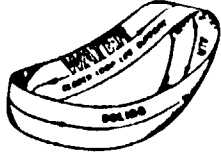
**CHIEF, ECOSYSTEM SCIENCE AND
TECHNOLOGY BRANCH**

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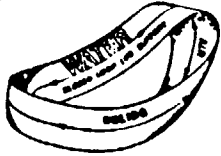


PROGRAM OBJECTIVES

- **PROVIDE A PHYSICAL/CHEMICAL LIFE SUPPORT TECHNOLOGY BASE TO ENABLE FUTURE LONG DURATION HUMAN SPACE MISSIONS**
- **PROVIDE AGENCY FOCUS FOR A MULTI-CENTER PHYSICAL/CHEMICAL LIFE SUPPORT R AND T PROGRAM**
- **ESTABLISH A PHYSICAL/CHEMICAL LIFE SUPPORT R AND T DEVELOPMENT INFRASTRUCTURE AMONG NASA, INDUSTRY AND UNIVERSITIES**

JUSTIFICATION

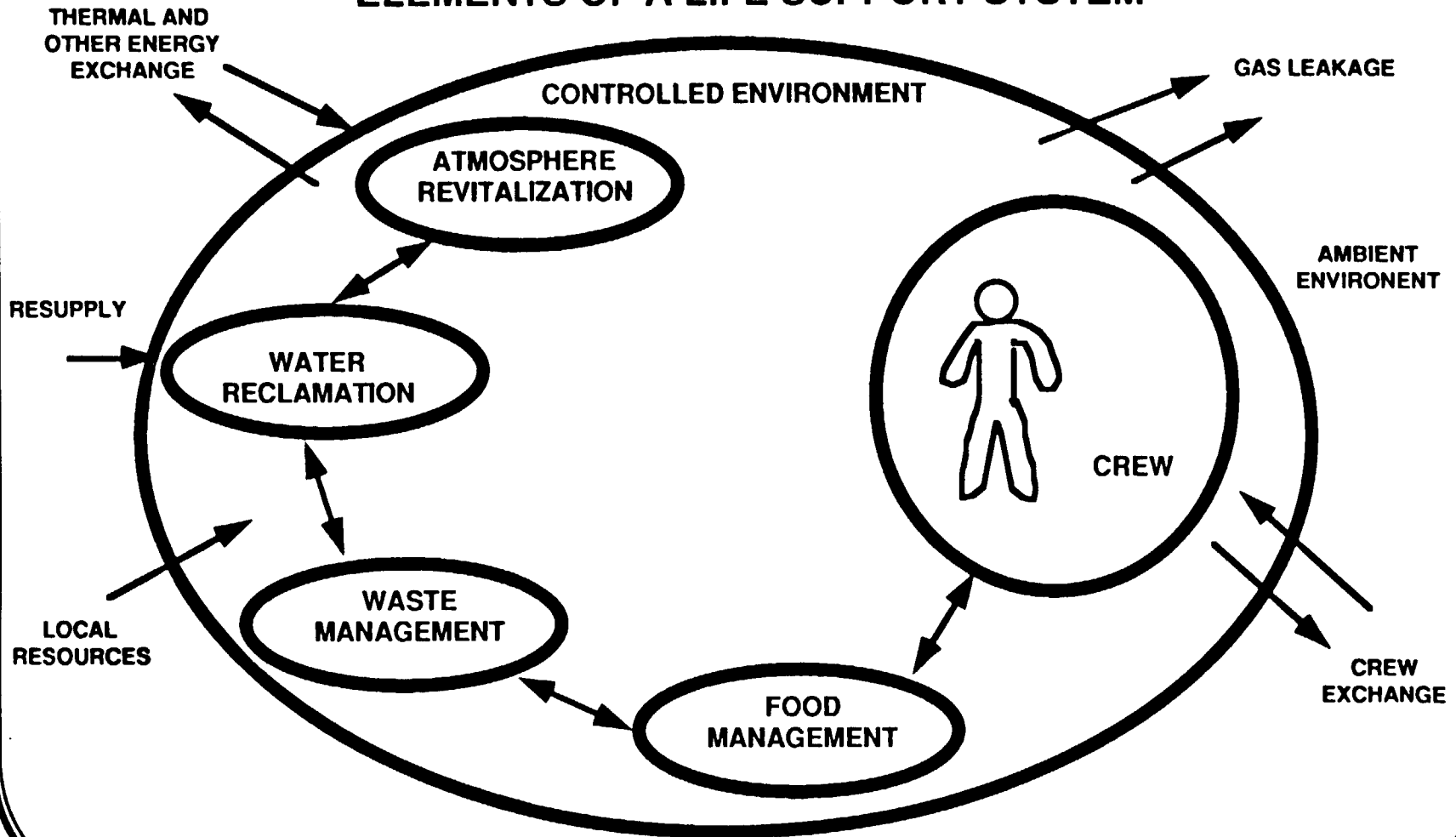
CLOSURE OF AIR & WATER LOOPS HAS THE POTENTIAL FOR AN ORDER OF MAGNITUDE REDUCTION IN THE MASS OF LIFE SUPPORT EXPENDABLES AND ASSOCIATED TRANSPORTATION REQUIREMENTS

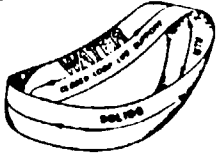


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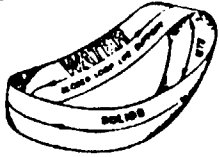
ELEMENTS OF A LIFE SUPPORT SYSTEM





IMPLEMENTATION

- **BASE R & T**
- **PATHFINDER**



R & T BASE PROGRAM

- **AIR, WATER, WASTE PROCESSING RESEARCH**
- **PROCESS SIMULATION TECHNIQUES**
- **MONITORING AND CONTROL INSTRUMENTATION
FOR AIR, WATER QUALITY, AND CONTAMINATION**



PATHFINDER PROGRAM ELEMENTS

MODELING AND ANALYSIS

**BIOREGENERATIVE
SCIENCE AND
TECHNOLOGY
(OSSA)**

**WATER
RECLAMATION
SYSTEMS**

**SOLID WASTE
MANAGEMENT
SYSTEMS**

**AIR REVITALIZATION
SYSTEMS**

**THERMAL CONTROL
SYSTEMS**

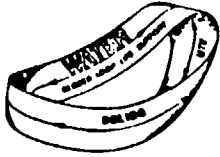
**FOOD MANAGEMENT
SYSTEMS**

**PHYSICAL/CHEMICAL
PROCESSING
TECHNOLOGIES**

**PORTABLE LIFE
SUPPORT
TECHNOLOGY**

INTEGRATED SYSTEMS

MISSION SCENARIOS



HUMANS IN SPACE: LIFE SUPPORT



MAJOR THRUSTS

WATER RECLAMATION

- Processing technology
- Contaminant control
- Subsystem analytical modeling & validation

WASTE MANAGEMENT

- Composition and definition
- Handling & processing
- Subsystem analytical modeling & validation

AIR REVITALIZATION

- CO₂ removal
- Oxygen generation
- Trace contaminant control
- Subsystem analytical modeling & validation

INTEGRATED SYSTEMS

- System requirements
- Systems analysis & assessment
- System test & validation



Pathfinder P/C Closed Loop Life Support Technology Development

Simulation Modeling

Focused Research & Modeling

Prototype Systems Development

Phase A/B Project Commitment

Phase C/D Project Development

OPERATIONS

RESEARCH CENTERS - PRIMARY

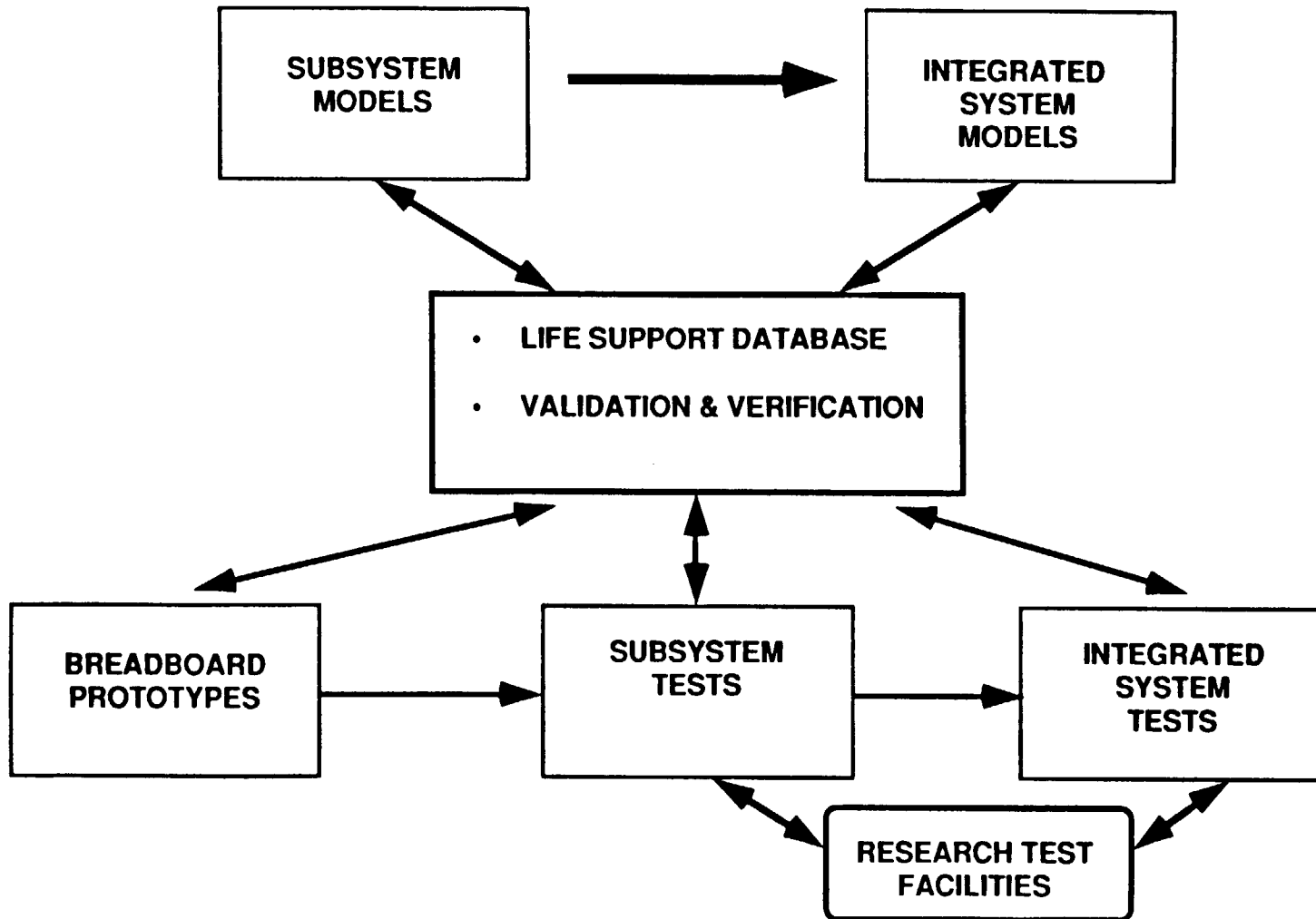
DEVELOPMENT CENTERS - SUPPORT

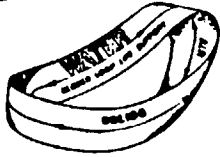
DEVELOPMENT CENTERS - PRIMARY

RESEARCH CENTERS - SUPPORT

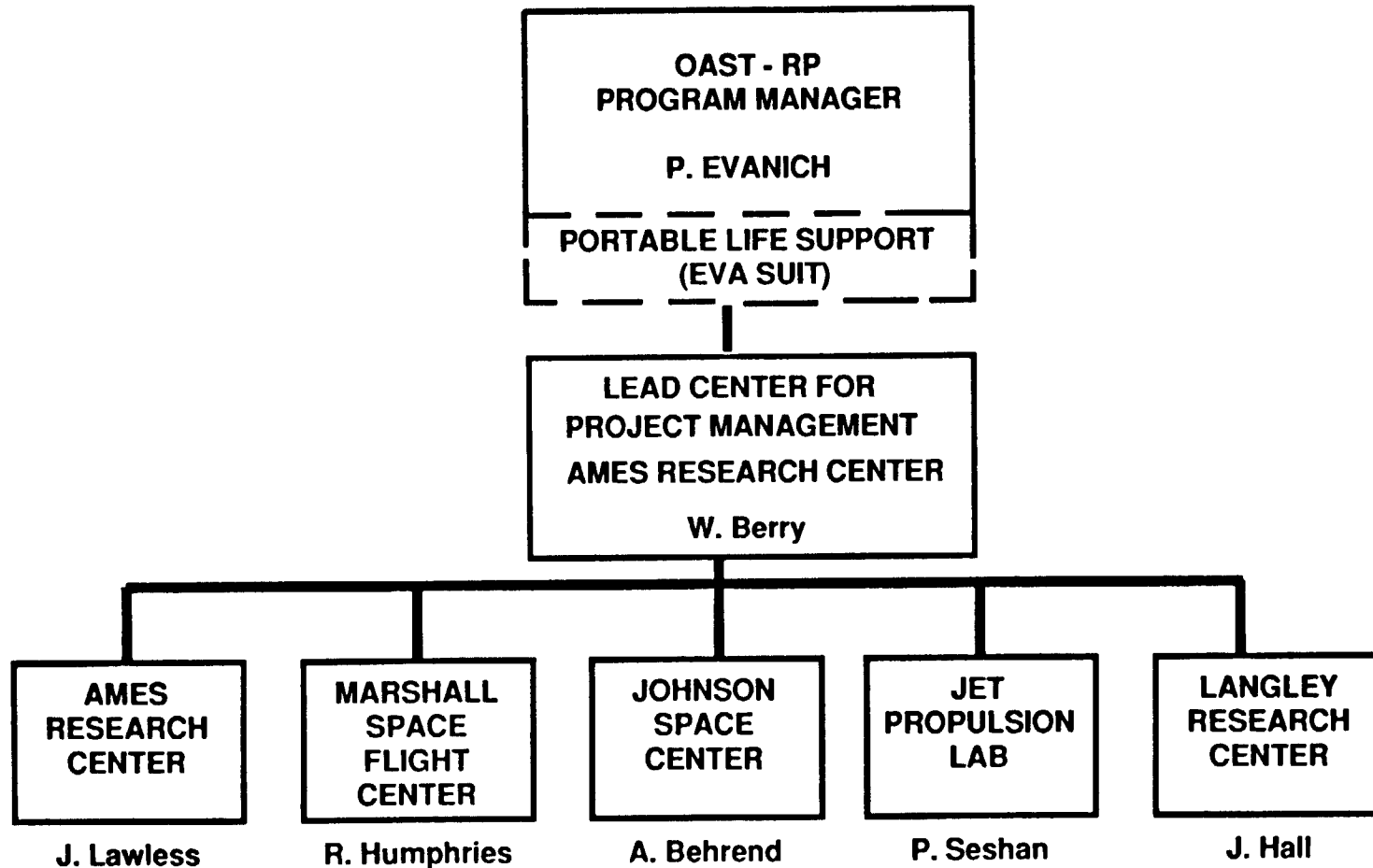


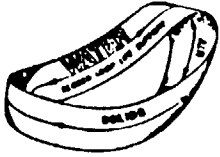
TECHNICAL APPROACH





P/C CLOSED LOOP LIFE SUPPORT PROGRAM





PATHFINDER P/C CLOSED LOOP LIFE SUPPORT

MAJOR DELIVERABLES

	89	90	91	92
WATER RECLAMATION	△ Assessment		Validated Process	Technologies △
WASTE MANAGEMENT	Subsystem Selection △			Model Development △ Analysis
AIR REVITALIZATION		Subsystem Selection △		Initiate Integrat. Analysis △
INTEGRATED SYSTEMS	System Requirements △			Subsystem Prototype △ Design Packages

