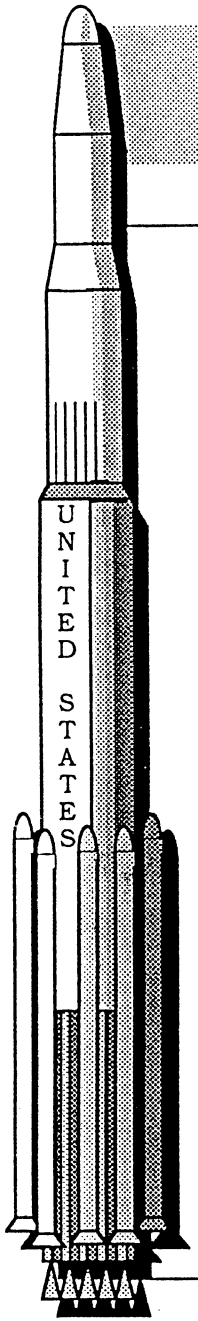


C A S P

Center for Advanced Space Propulsion

OVERVIEW

Of The

CENTER FOR ADVANCED SPACE PROPULSION

by

DR. GEORGE W. GARRISON

Presented at the

CASP TECHNICAL SYMPOSIUM

OCTOBER 26, 1989

THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE

Tullahoma, TN 37388

The University of Tennessee - Calspan
Center for Aerospace Research

UTSI Research Park, Bldg 1 (615) 454-9294
Box 1385, Tullahoma, TN 37388 FAX: (615) 455-6167

ATTACHMENT E
NAGW-1195
CSTAR-FINAL REPORT

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE OBJECTIVES

PROVIDE THE PATHWAY FOR U.S. INDUSTRY TO DEVELOP LEADERSHIP IN THE COMMERCIAL USE OF SPACE THROUGH PROGRAMS THAT

- FOSTER NEW TECHNOLOGY DEVELOPMENT
- LEAD TO NEW COMMERCIAL PRODUCTS
- LEAD TO COMMERCIAL USE OF THE SPACE ENVIRONMENT
- RESULT IN UNIVERSITY/INDUSTRY TEAMING ARRANGEMENTS ON COMMERCIALLY ORIENTED PROJECTS
- RESULT IN LONG-TERM INDUSTRIAL COMMITMENT TO THE CENTERS

NASA
OFFICE OF
COMMERCIAL
PROGRAMS

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE (CCDS)

TECHNICAL DISCIPLINE	# INVOLVED	CCDS'S
1. AUTOMATION AND ROBOTICS	2	• UNIV. OF WISCONSIN, MADISON, WI • ENVIRON. RESEARCH INST. OF MICHIGAN, ANN ARBOR, MI
2. LIFE SCIENCES	3	• UNIV. OF COLORADO, BOULDER, CO • PENN STATE UNIV., UNIVERSITY PARK, PA • UNIV. OF ALABAMA, BIRMINGHAM, AL
3. MATERIALS PROCESSING IN SPACE (MPS)	5	• BATTELLE, COLUMBUS, OH • UNIV. OF ALABAMA, HUNTSVILLE, AL • VANDERBILT UNIV., NASHVILLE, TN • CLARKSON UNIV., POTSDAM, NY • UNIV. OF HOUSTON, HOUSTON, TX
4. REMOTE SENSING	2	• INST. FOR TECH. DEVELOP., STENNIS SPACE CENTER, MS • OHIO STATE, COLUMBUS, OH
5. SPACE POWER	2	• AUBURN UNIV., AUBURN, AL • TEXAS A&M UNIV., COLLEGE STATION, TX
6. SPACE PROPULSION	1	• UNIV. OF TENNESSEE SPACE INSTITUTE, TULLAHOMA, TN
7. SPACE STRUCTURES AND MATERIALS	1	• CASE WESTERN RESERVE UNIV., CLEVELAND, OH

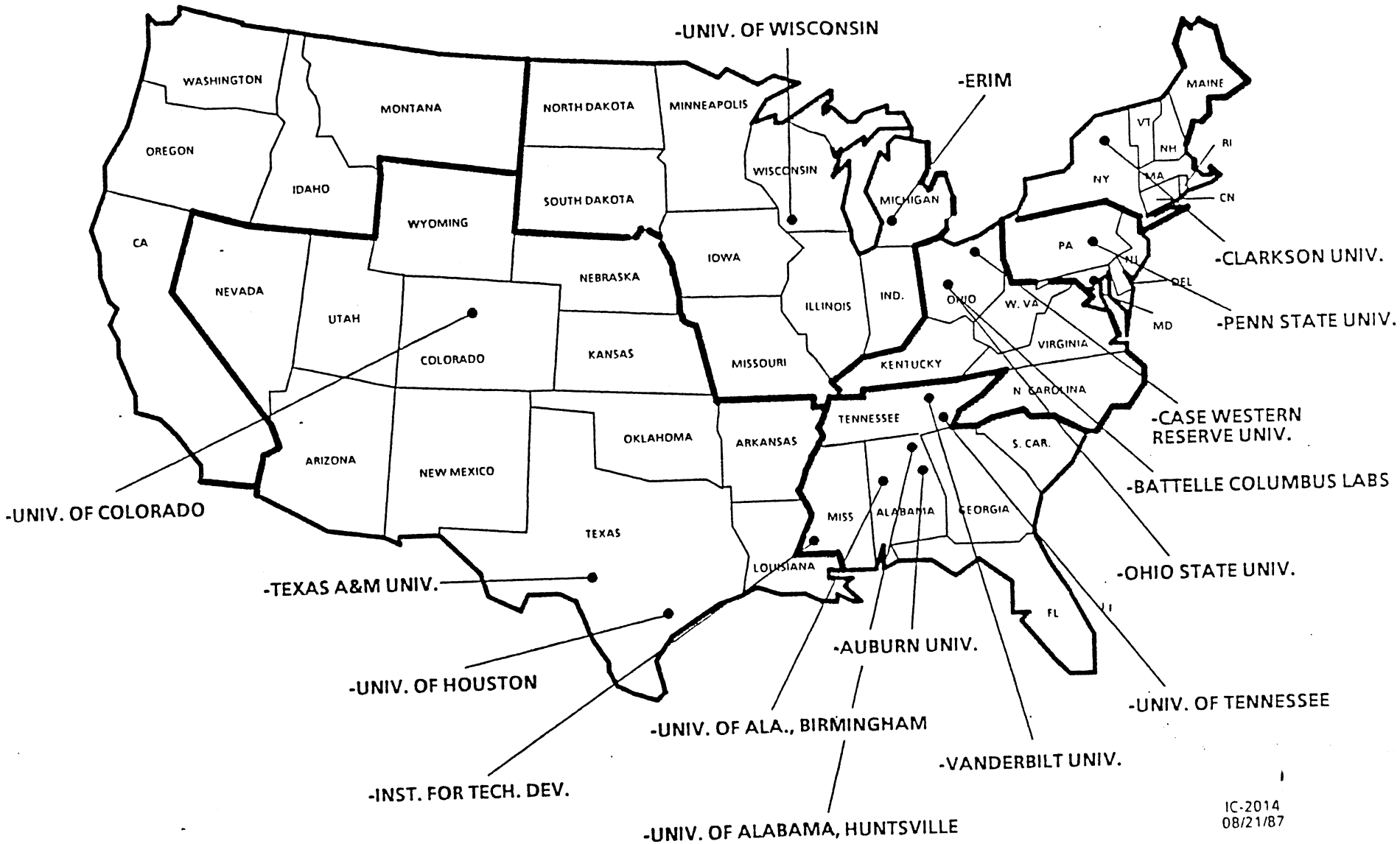
SUMMARY: THERE ARE CURRENTLY SEVEN TECHNOLOGY DISCIPLINES REPRESENTED IN THE CCDS PROGRAM. THE MAJORITY OF THE CCDS'S ARE CONDUCTING RESEARCH IN MPS.

CC - 2039
07/07/88 -- TEM

SPACE COMMERCIALIZATION EFFORTS

- Communications (COMSAT, 1962)
- Remote Sensing (LANDSAT, 1981)
  RCA & Hughes (EOSAT)
- Tracking and Data Relay Satellite
  (TDRSS, 1976, Privatization Failed)
- Leasecraft (Fairchild proposal for modular spacecraft)
- Commercially Developed Space Facility (CDSF)
- Expendable Launch Vehicles (ELV)

CENTERS FOR COMMERCIAL DEVELOPMENT OF SPACE NATIONWIDE



IC-2014
08/21/87

INDUSTRIAL PARTICIPATION REQUIRES

- Government Incentives
  (Taxes, Patent Rights, IR&D, Loan Guarantees)
- Consistent Government Policy
- Access To Space at Reasonable Cost
  (JEA's)
- Acceptable Risk Environment
- Attractive Return on Investment
- "Short" Payback

CASP MISSION

- Strengthen U.S. Competitiveness in Space Technology
- Foster Cooperative Research with Industry & Government
  - Ground Research
  - Space-Based Research
- Assist Industry in Developing Commercial Products & Services
- Perform Research in Advanced Space Propulsion
  - Chemical
  - Electric
  - A.I. Applications
  - Microgravity Fluid Management
  - Rocket Engine Materials Processing

CASP PARTNERSHIPS

- INDUSTRY
  - BOEING AEROSPACE COMPANY
  - CALSPAN CORPORATION
  - EPL, INC.
  - ROCKETDYNE DIV., ROCKWELL
  - SATURN CORPORATION
  - SUNDSTRAND CORPORATION
  - SYMBOLICS, INC.
  - TECHNION, INC.
  - TRW, INC.
- UNIVERSITY
  - AUBURN UNIVERSITY
  - UNIVERSITY OF ALABAMA - HUNTSVILLE
  - UNIVERSITY OF TENNESSEE
  - VANDERBILT UNIVERSITY
- GOVERNMENT
  - ARNOLD ENGINEERING DEVELOPMENT CENTER
  - NASA AMES RESEARCH CENTER
  - NASA LEWIS RESEARCH CENTER
  - NASA MARSHALL SPACE FLIGHT CENTER

Propulsion Technologies for Space Missions

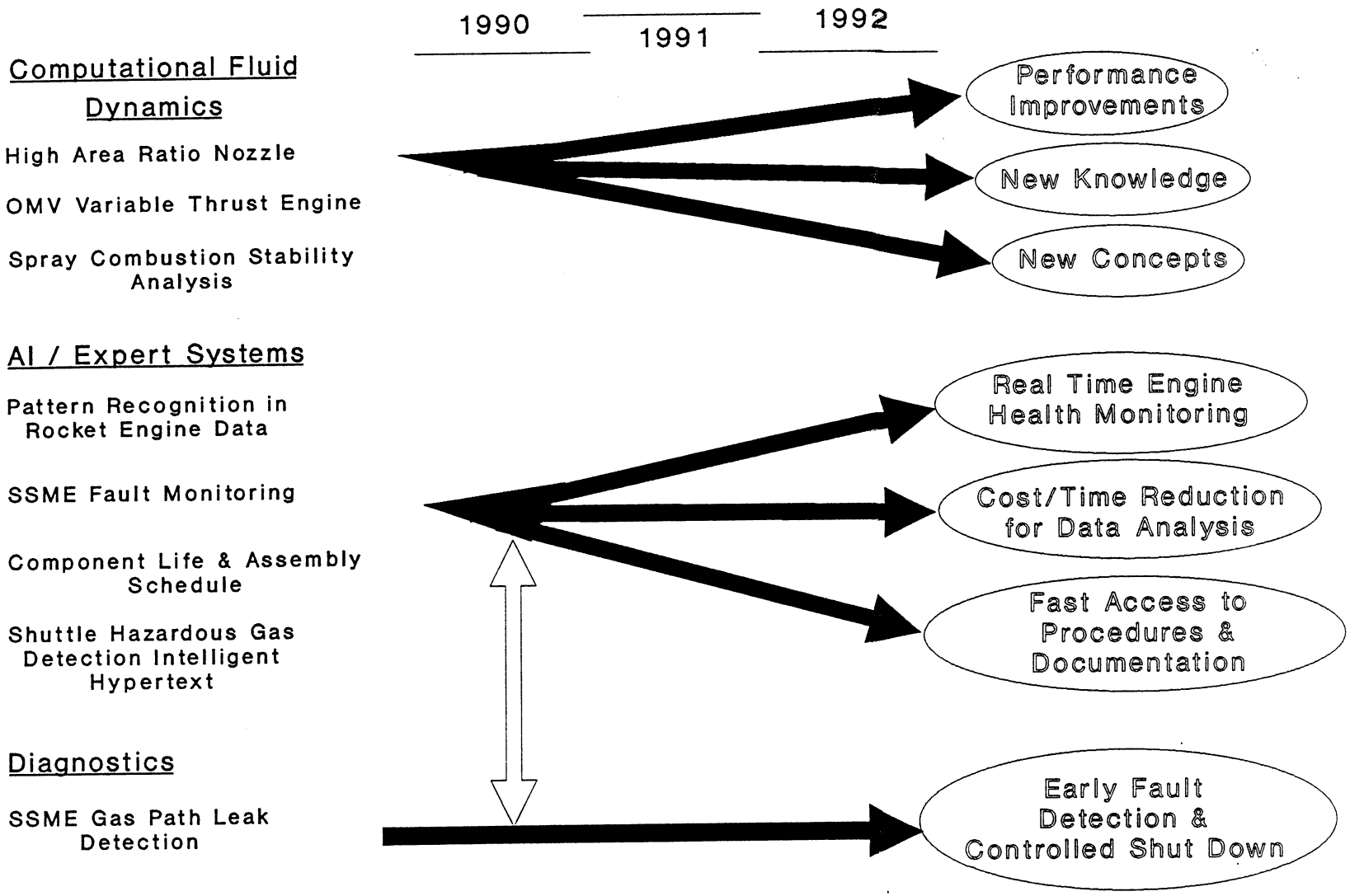
Technology \ Mission	Economic Access to Space	Orbital Transfers	Lunar & Inter-Planetary
High Performance Thruster		●	●
Adv. Combustion Technology	●	●	●
In-Space Propellant Supply Systems		●	●
Low-Cost Booster Propulsion Systems	●		
Expert Operating Systems	●	●	●
Low Contamination Thruster		●	●

CG - 0632

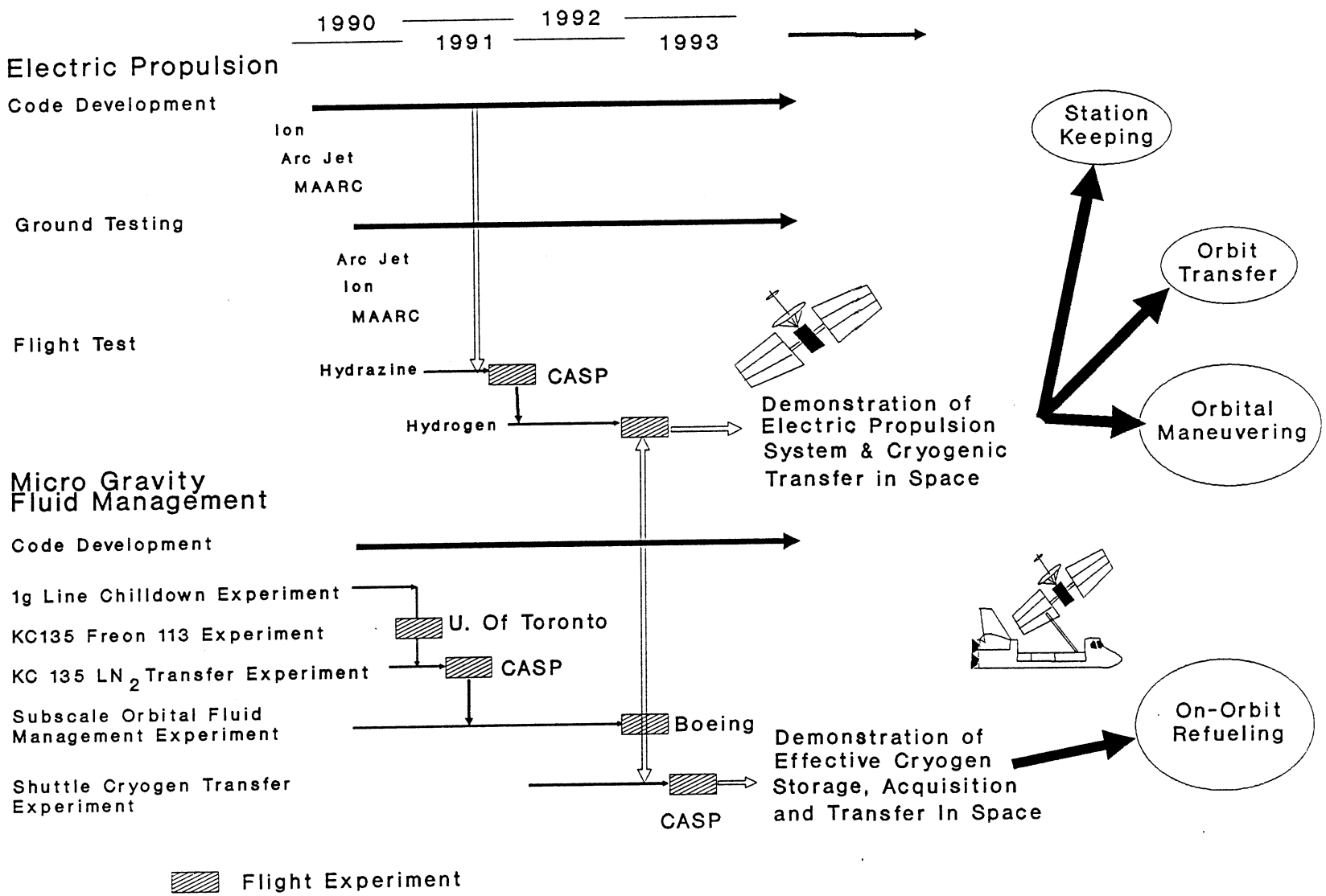
CASP FOCUS AREAS

- ADVANCED CHEMICAL PROPULSION
  - High Area Ratio Nozzle Performance
  - Variable Thrust Engine Performance
  - Spray Combustion Stability
- A.I. PROPULSION APPLICATIONS
  - Health Monitoring of Rocket Engines
  - Fault Pattern Detection & Diagnosis
  - Intelligent Hypertext Applications
- MICROGRAVITY FLUID MANAGEMENT
  - Liquid Storage and Transfer
  - Subscale Orbital Fluid Transfer Experiment
  - Helical, Two Phase Flow
- ELECTRIC PROPULSION
  - Magnetic Annular Arc Thruster
  - Ion Thruster
  - Electrostatic Plasma Accelerator
- LASER MATERIALS PROCESSING

Chemical Propulsion Technology Development



CASP Multi Year Flight Experiment Plan



SUMMARY

- CASP ORGANIZATION/STRATEGY ESTABLISHED
- CASP HAS DOUBLED THE NUMBER OF INDUSTRIAL PARTNERS
- CASP HAS TRIPLED THE NUMBER OF TECHNICAL PROJECTS
- CASP IS ACTIVELY WORKING THREE FLIGHT EXPERIMENTS
- IMPLEMENTED MAJOR FACILITY PROGRAM
- CASP BUILDING GROUND-BREAKING SCHEDULED FOR NOVEMBER