Model-based Development of Software-based Systems:

A Research Agenda

May 1994

NASA-Langley

Michael Holloway

ORA

Doug Hoover
Zwei Chen
David Guaspari

Honeywell

Lance Sherry
Dave Youssefi
Matt Michaels
Christine Mixon
Jack Janelle (and team)
Dave Cirulli
Joel Thornton (and team)
Jon Ward
John Krueger . . .

Table Of Contents

I Overview: Integrated Cockpit Avionics

II Documentation-based Process

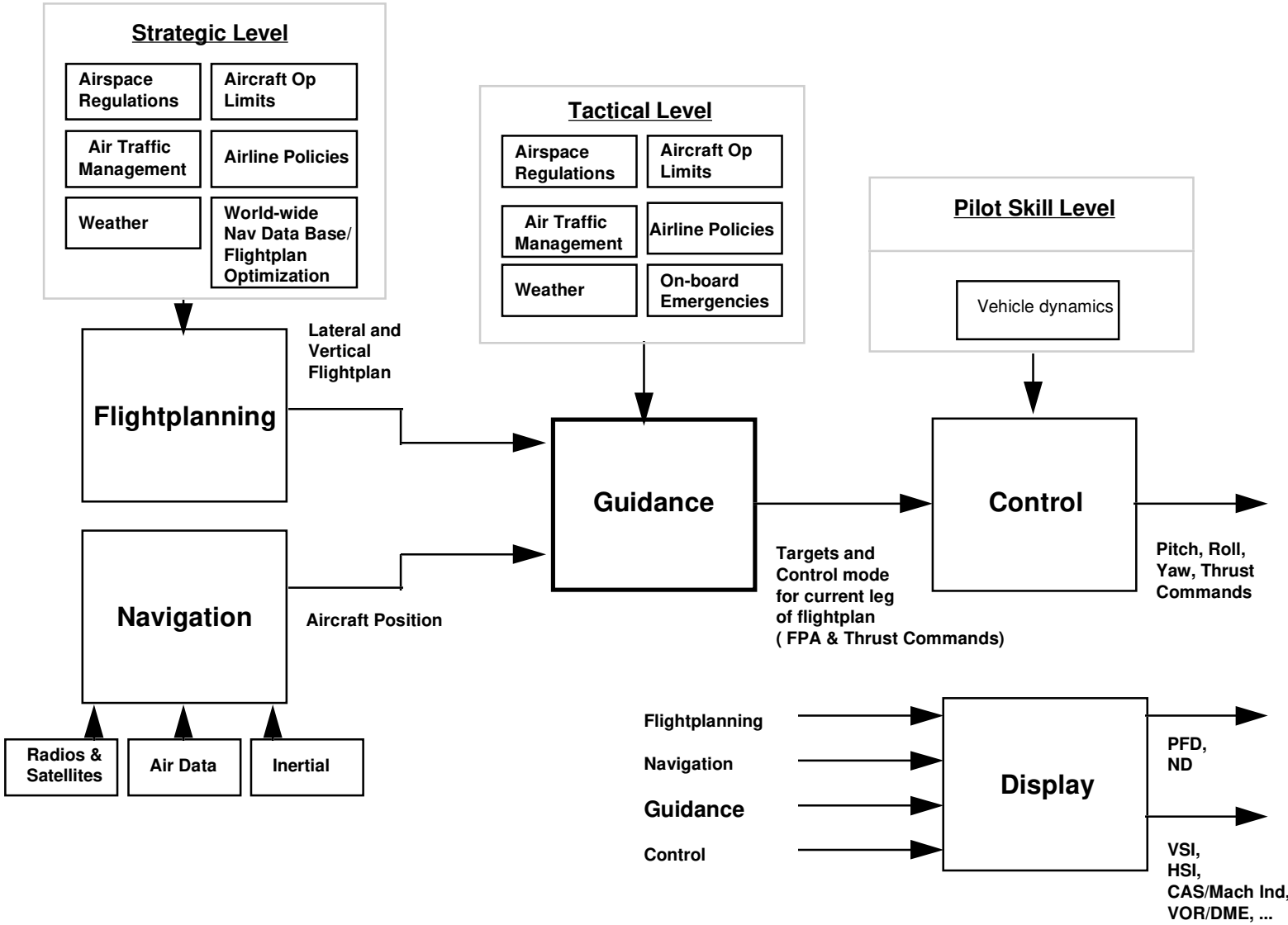
III Model-based Process

IV Characteristics Of The Avionics Information-Model

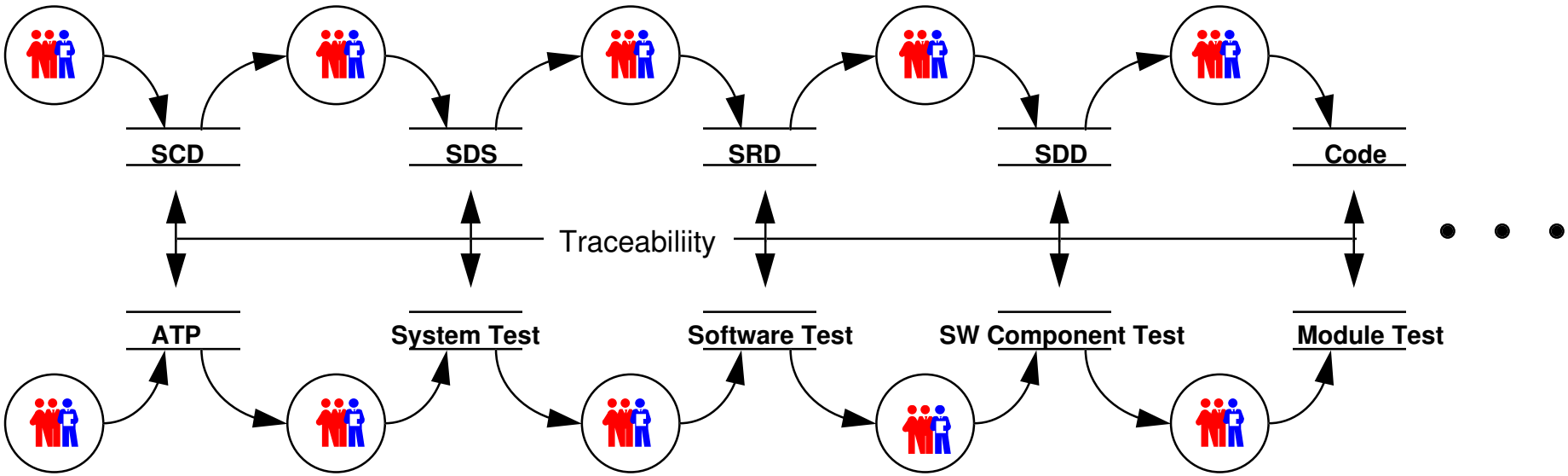
V Current Research

VI Summary/Roadmap

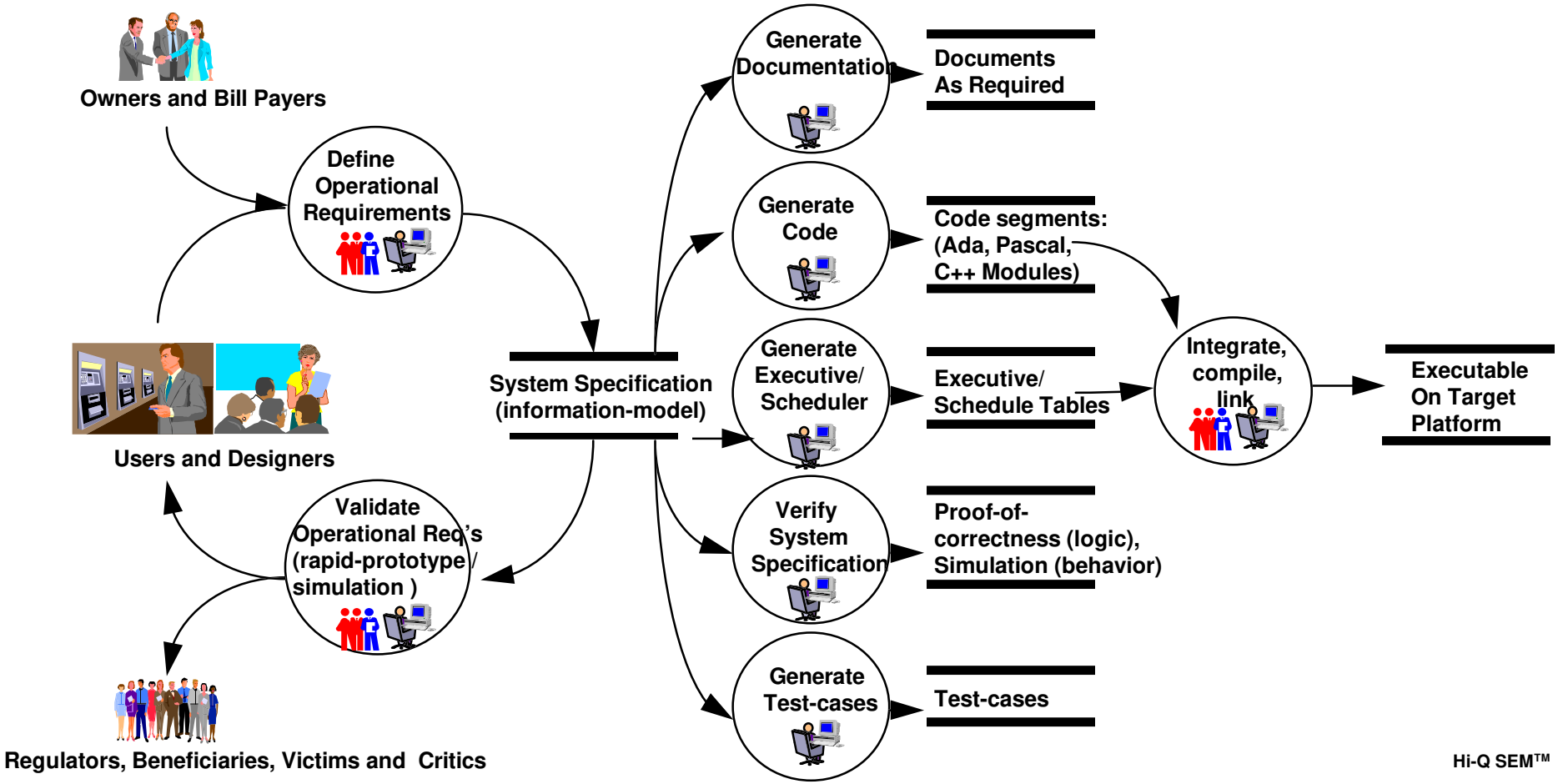
I Overview: Integrated Cockpit Avionics



II Documentation-Based System Development



III Model-Based System Development

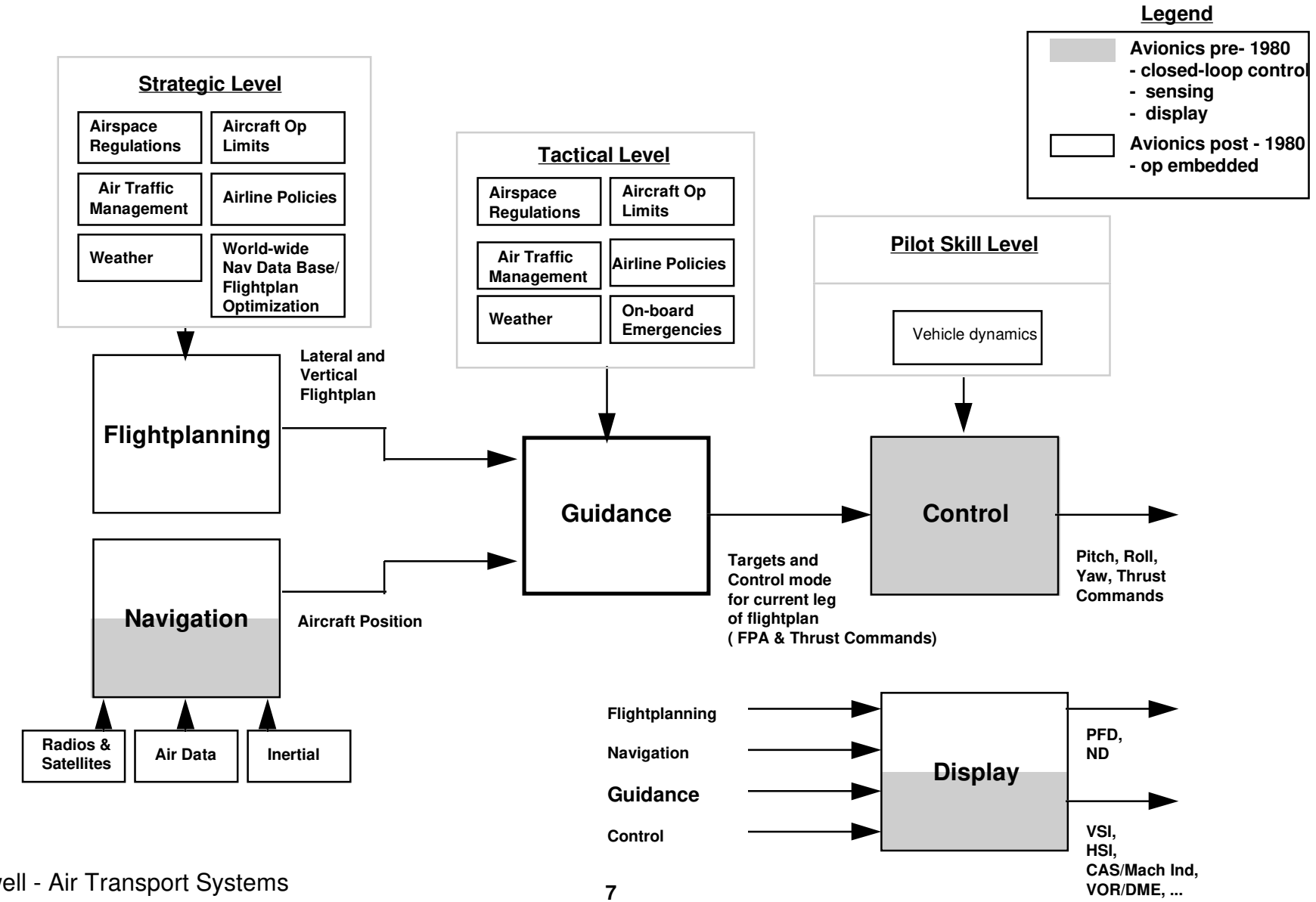


IV Characteristics Of The Avionics Information-Model

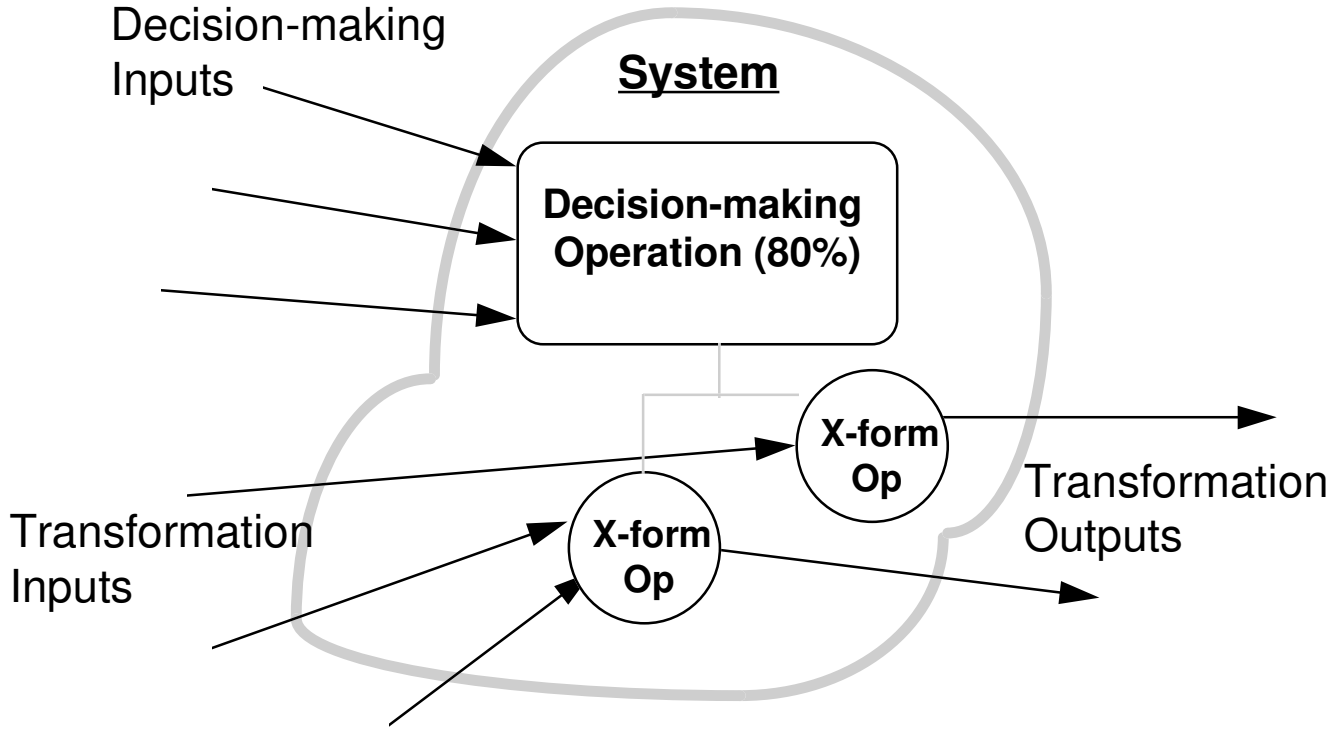
- **Capture *operationally embedded* nature of systems**
- **Capture *reactive* nature of systems**
- **Provide means for rapid formulation and adaptation of "*mental-models*" of the system**
- **Provide means for rapid formulation and adaptation of "*implementation-models*" of the system**

(see definitions next three pages)

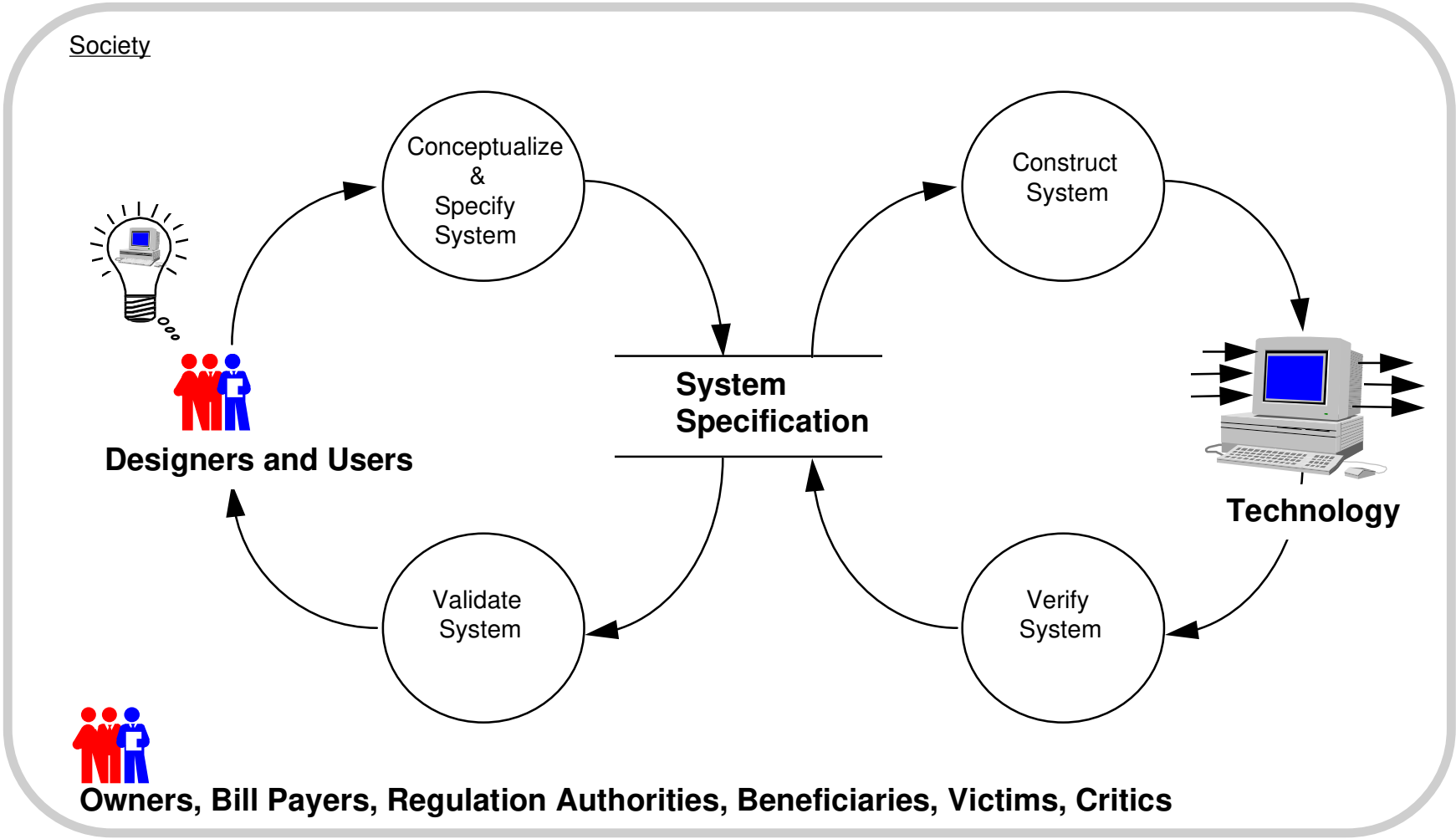
IV Avionics Info-Models: Operationally Embedded Systems



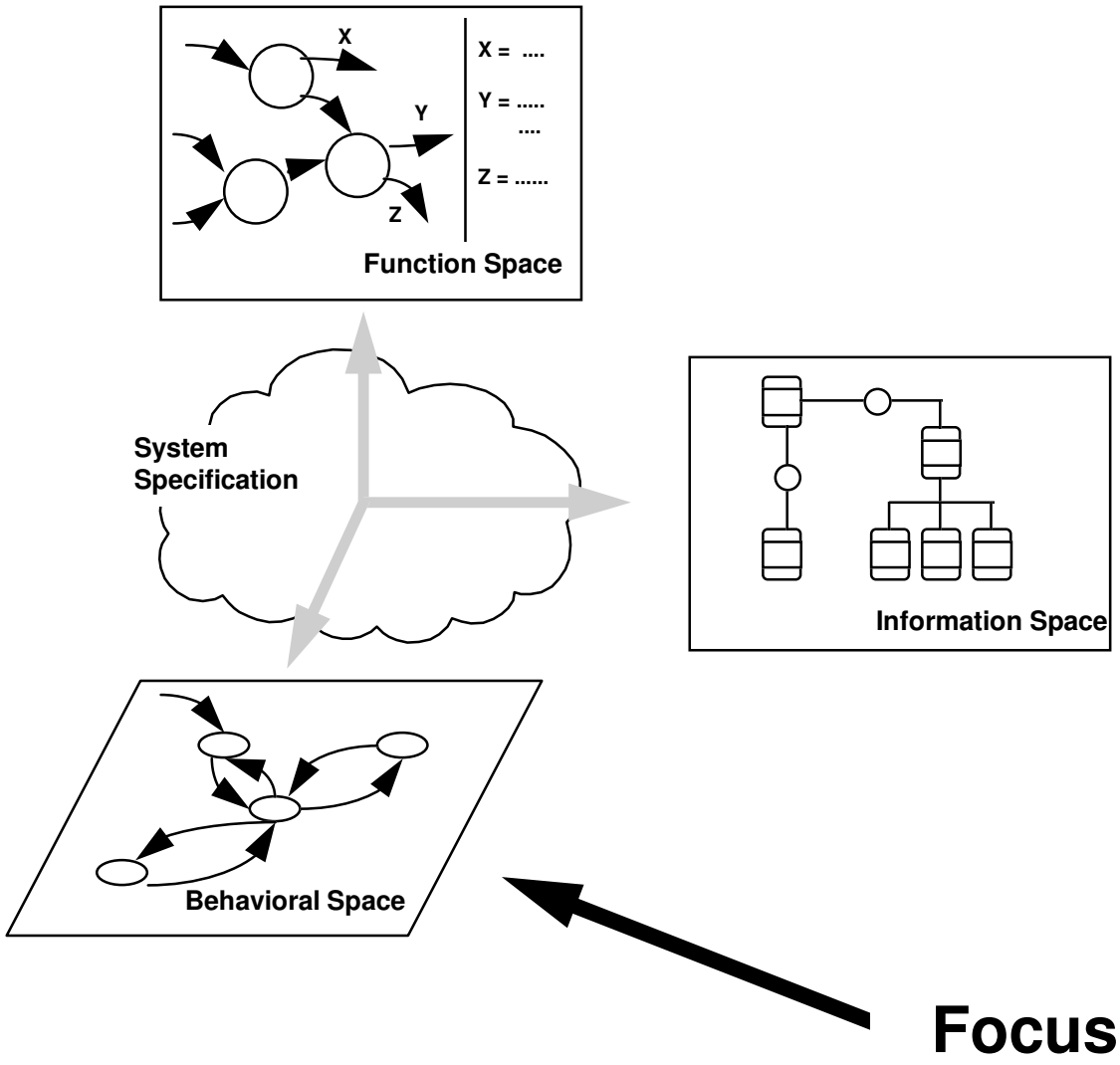
IV Avionics Info-Models: Reactive Systems



IV Avionics Info-Models: Rapid Formulation and Adaptation of Mental-models and Implementation-models

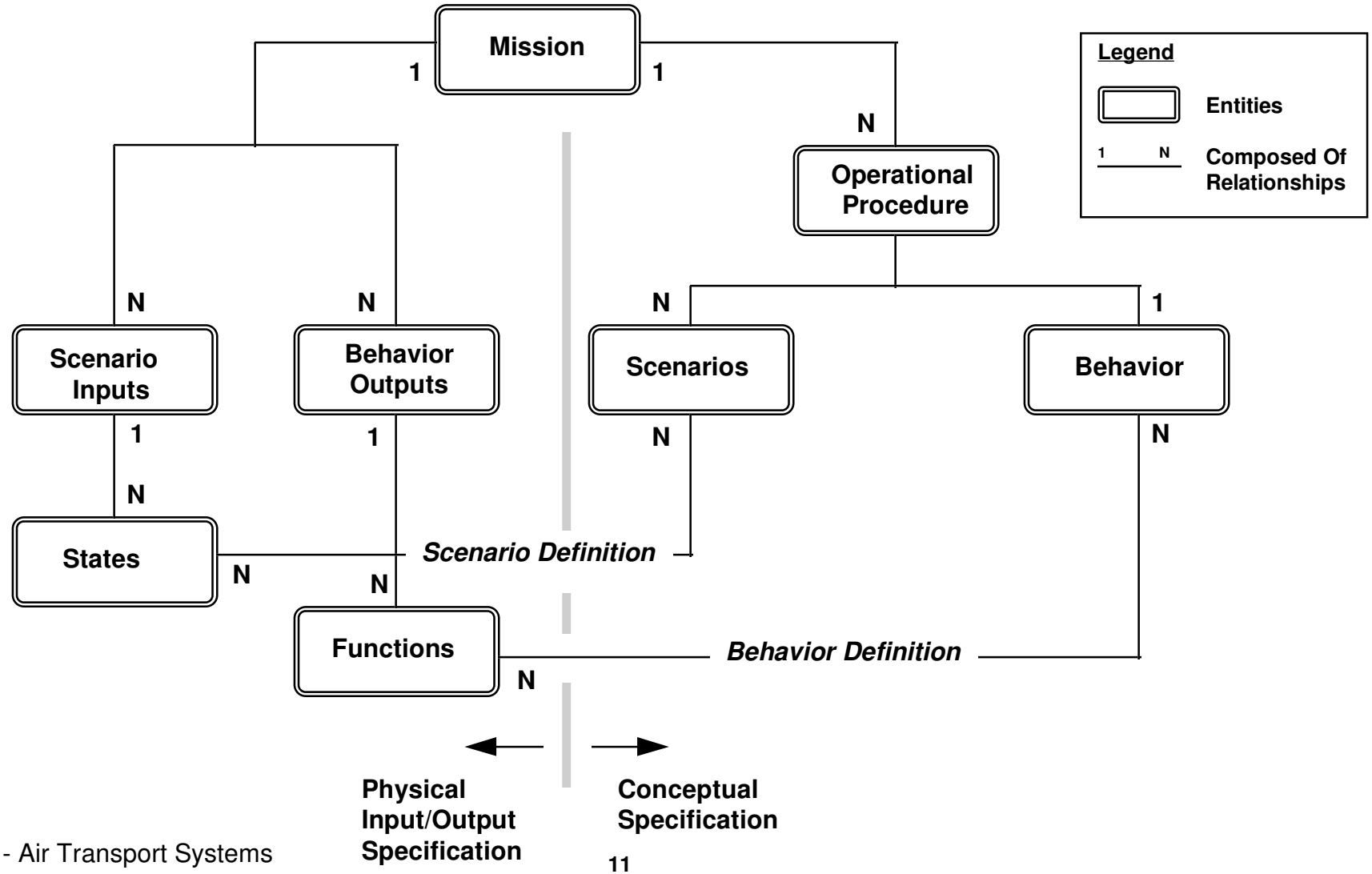


V Current Research



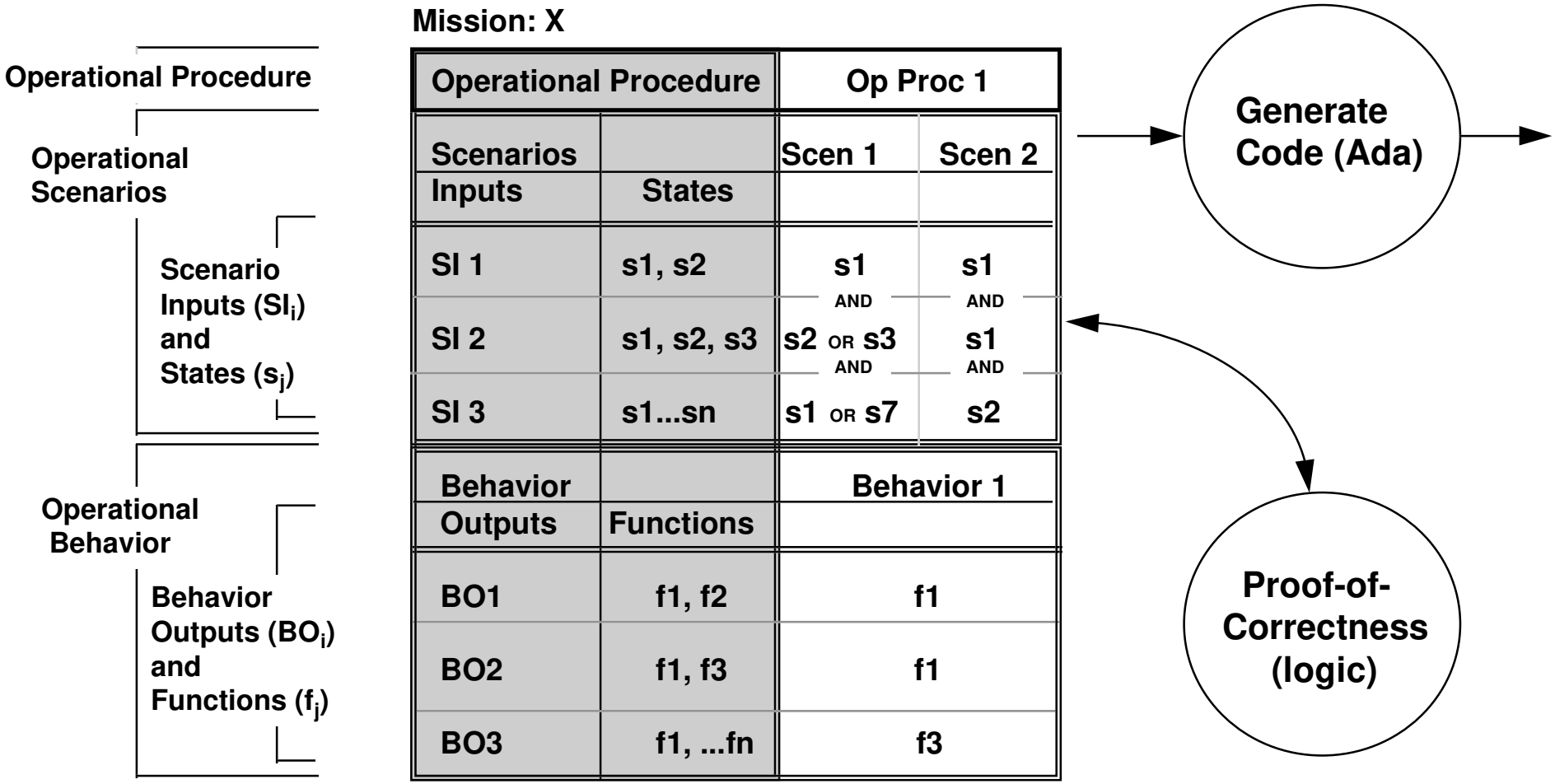
V Current Research

Operational Procedure Information Model



V Current Research

Visualization Of Info-Model and Automation



VI Summary

- **Economic pressures driving change in industry (reduce cost, reduce cycle-time, improve quality)**
- **Paradigm shift from documentation-based to model-based development process**
- **Model-based development process requires definition of "Information-model"**
- **Characteristics Of Avionics Info-model:**
  - ***operationally embedded***
  - ***reactive***
  - **easy-to-read for "*mental-modelling*"**
  - **easy-to-code for "*implementation-modelling*"**

VI Roadmap

1995 Model-based development (single user)

1996 Model-based development (multi-user)
- **shared specification, dictionaries, Config Management**

1997 Model-based development (multi-user)

1998 Model-based development (multi-user)
- **includes customers and vendors**

1999 Certification credit for automated analysis/verification