

**Civilian Radioactive Waste
Management System**

Management & Operating
Contractor



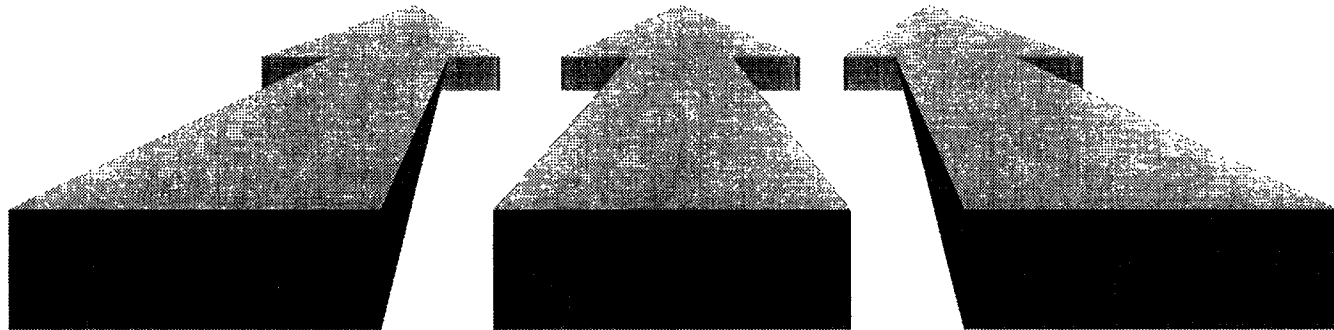
**TRW Environmental Safety
Systems Inc.**

Transportation Risk Management

**Presentation to the Nuclear Waste Technical Review Board
Arlington, Virginia**

**Alan Salton
June 14, 1995**

Risk = Probability x Consequences



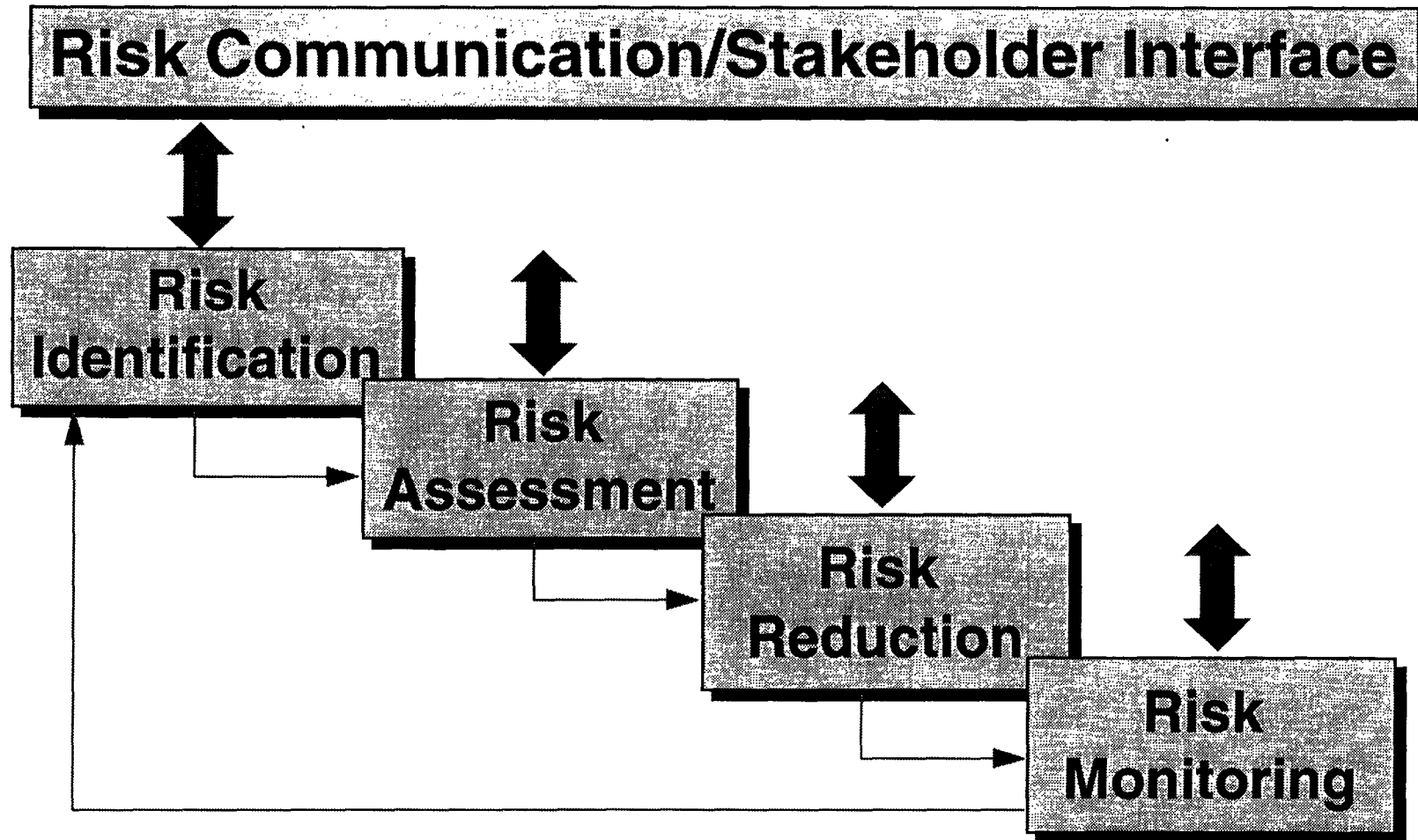
Risk Management Approach

- **Proactively plan, assess, and improve the risk management process**
- **Integrate past, current, and future risk management activities**

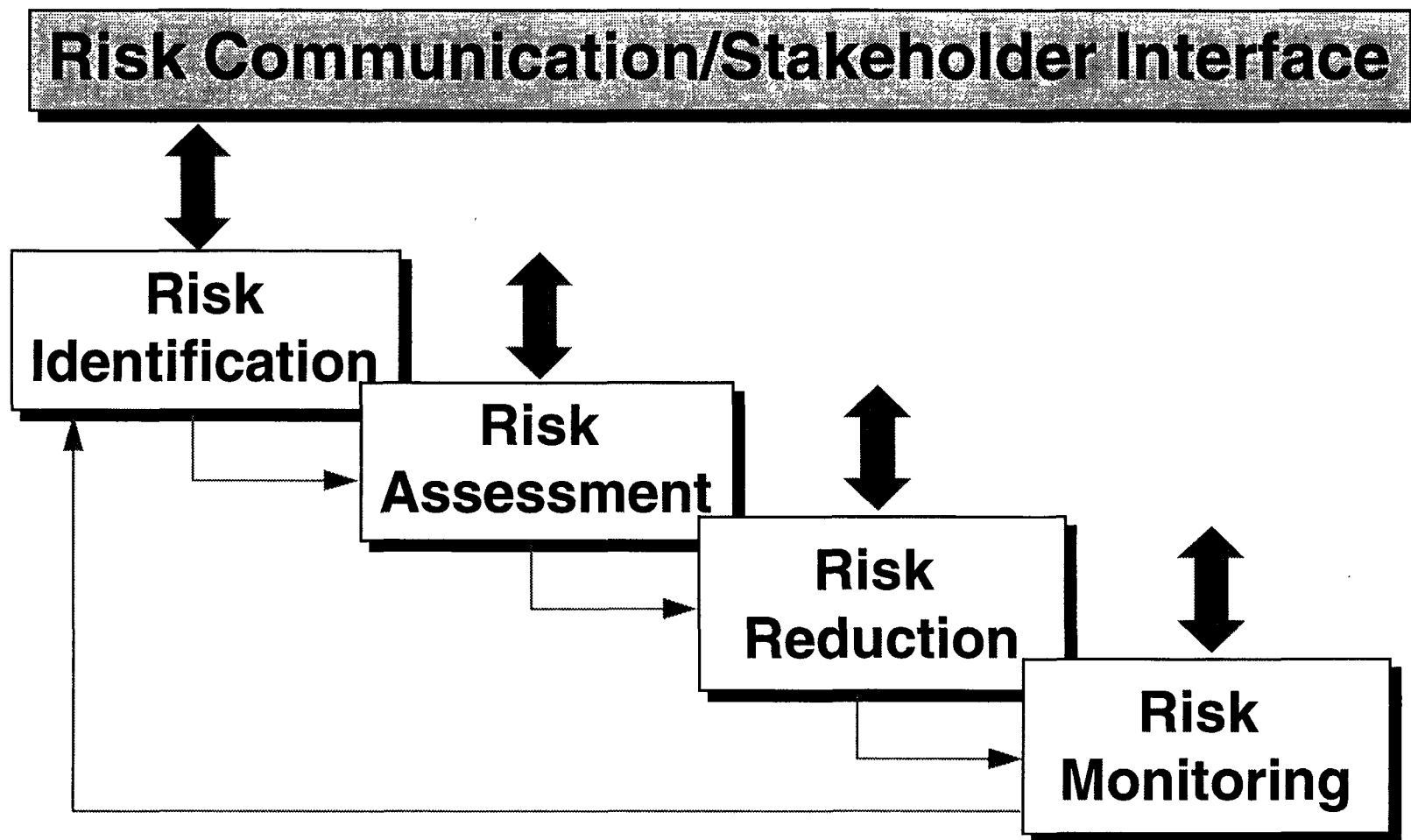
Transportation Risk Management Mission

***“To enhance public safety
by reducing or mitigating
risks
to health and the
environment”***

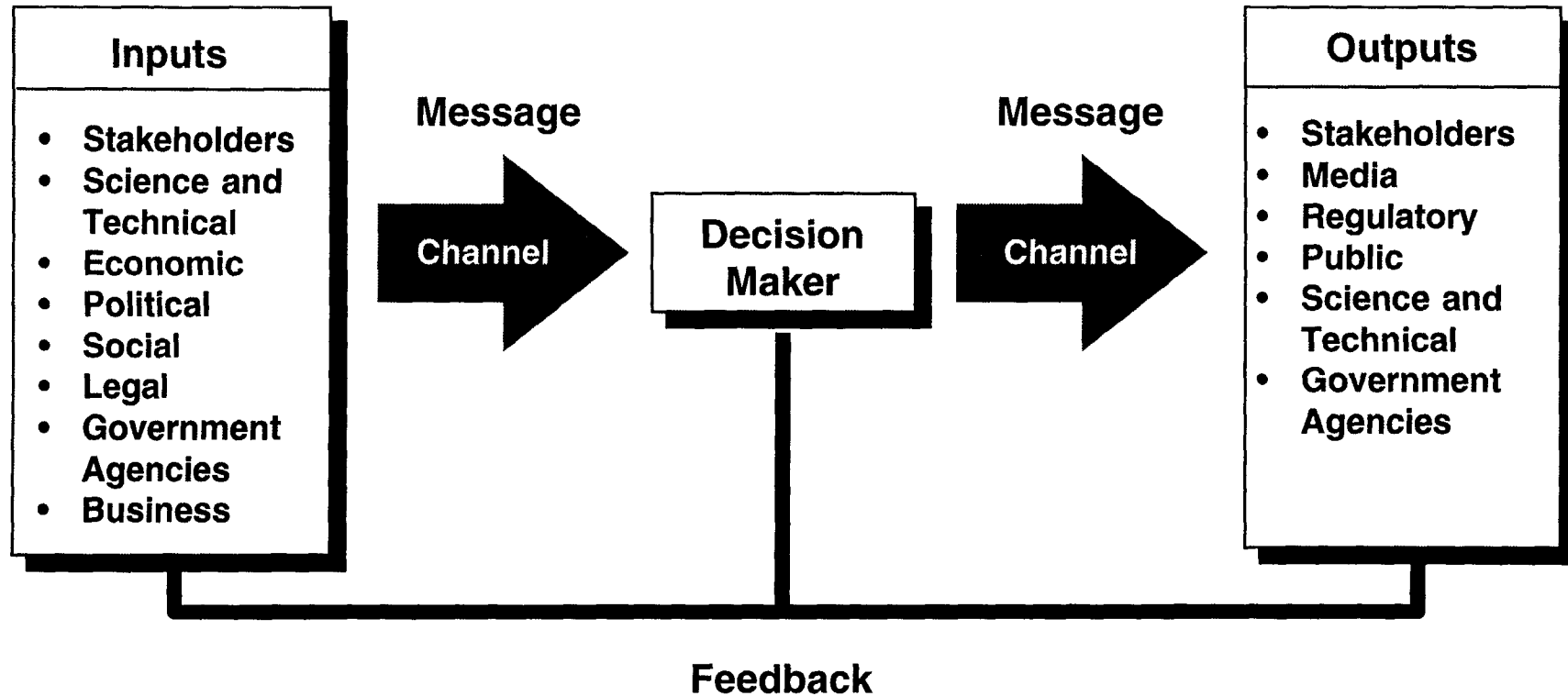
Transportation Risk Management Process



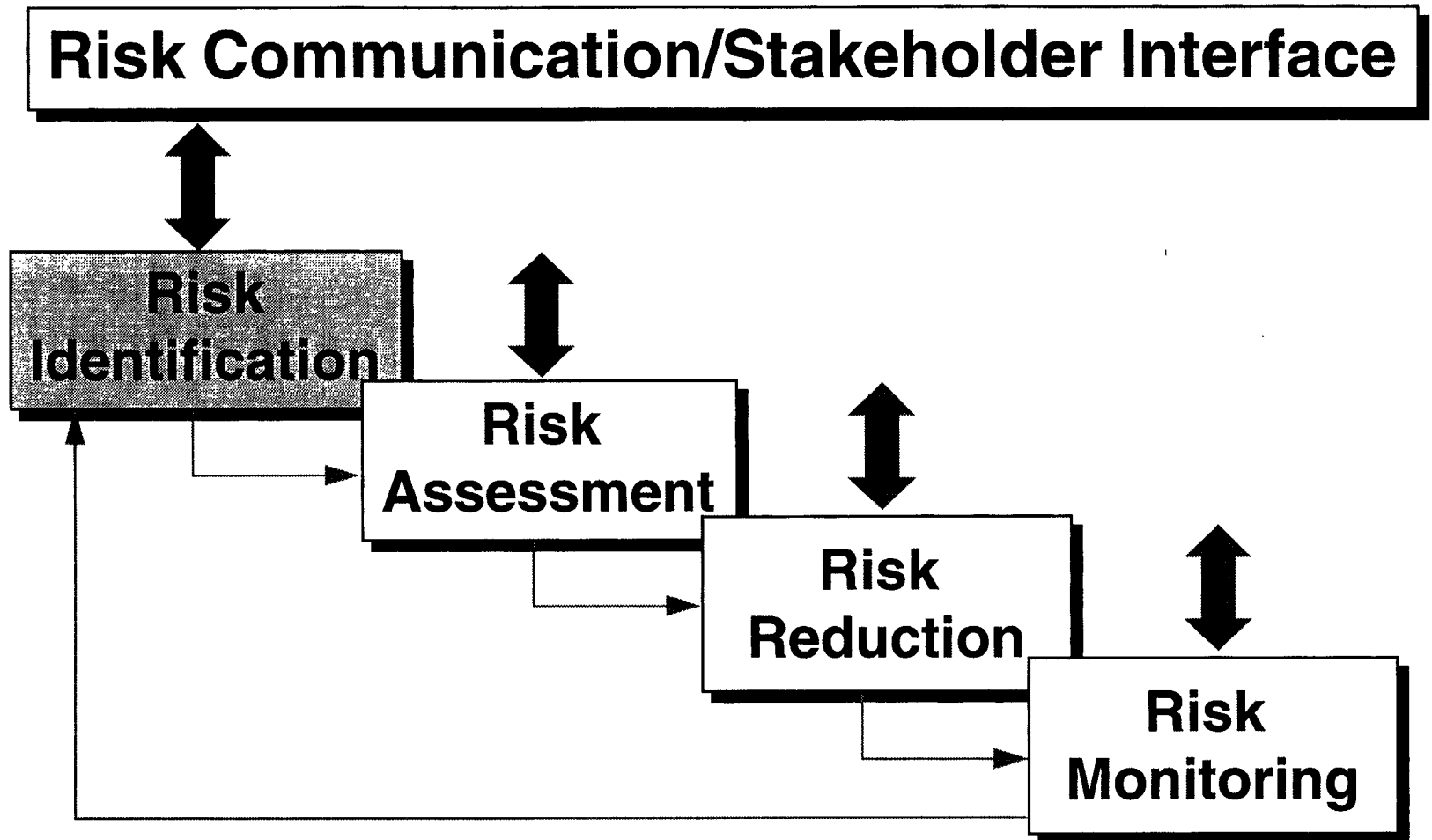
Risk Communication/Stakeholder Interface



Risk Management Communications Model

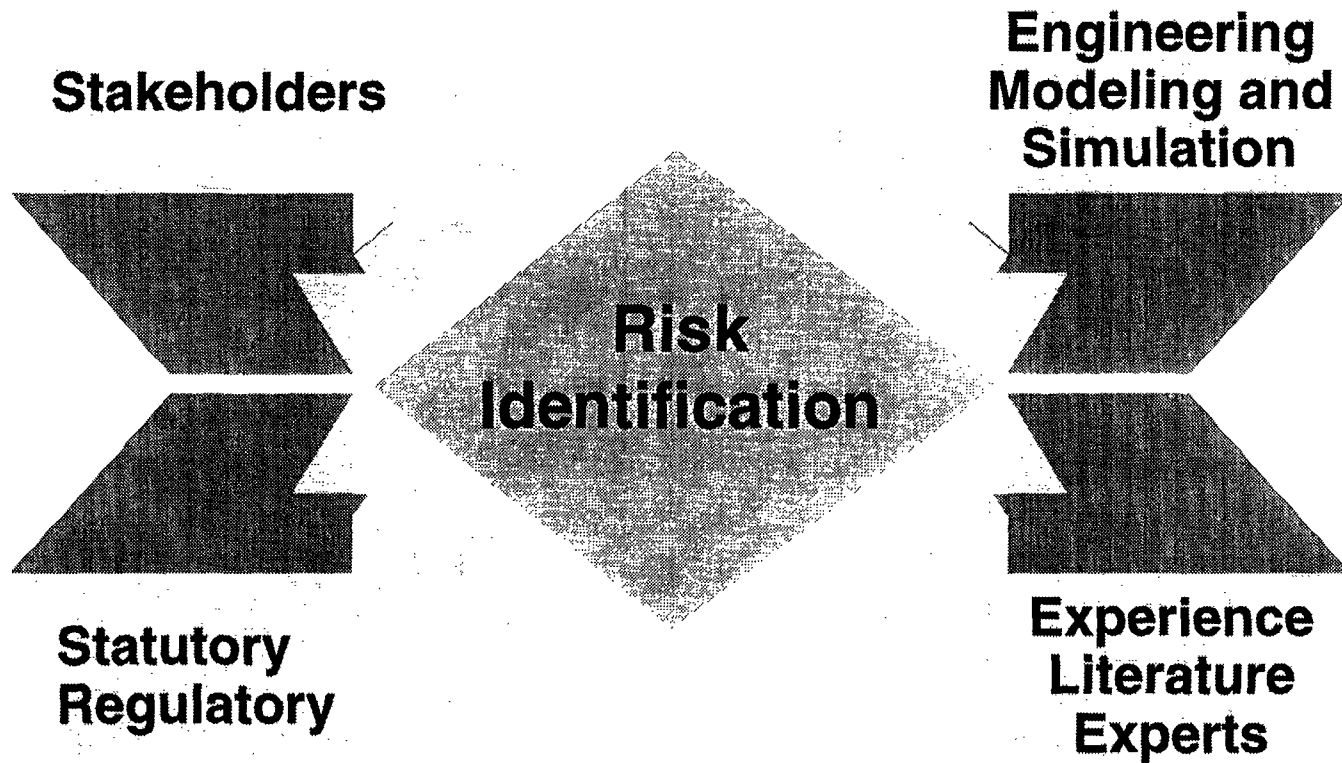


Risk Identification

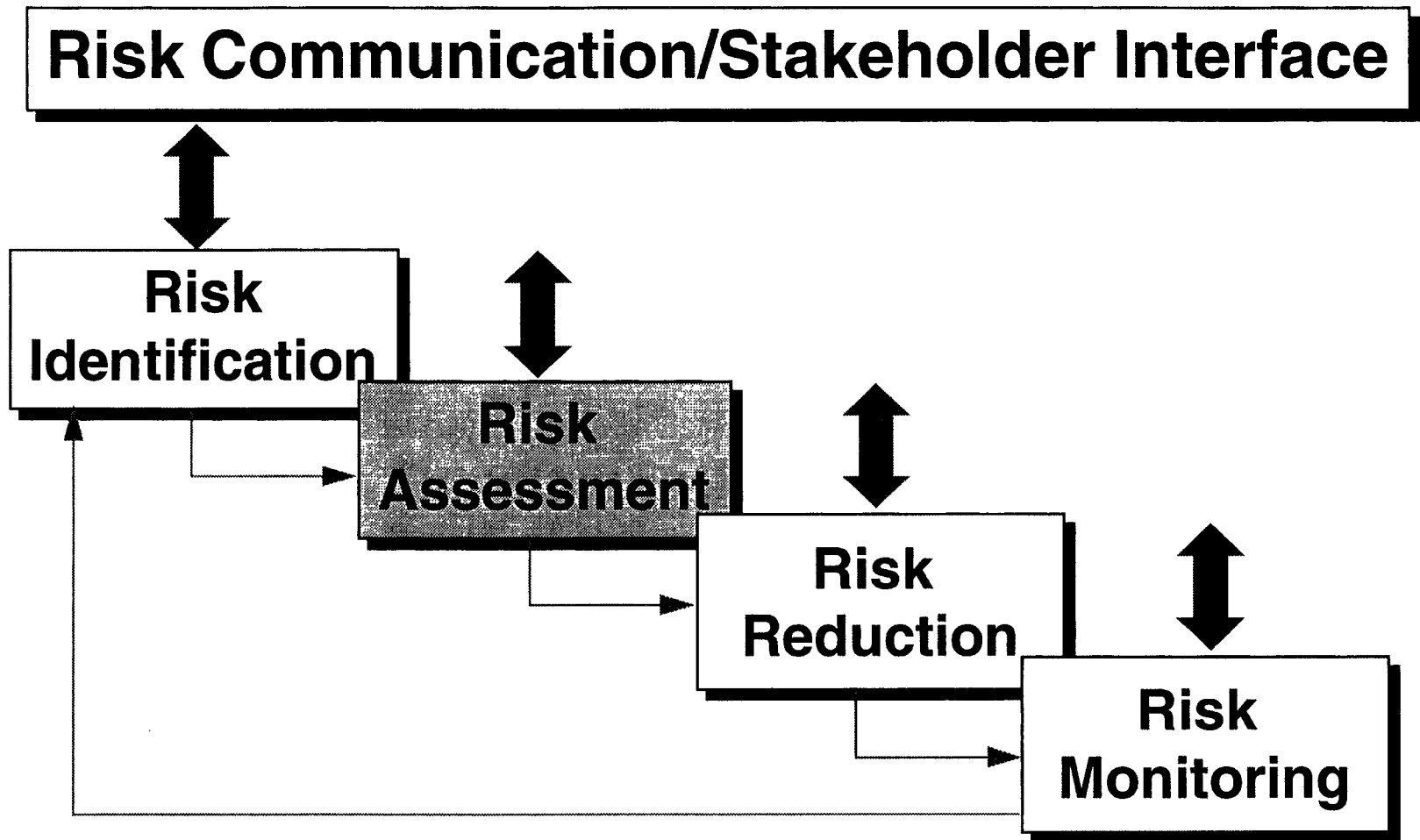


Risk Identification

“Incorporating scientific knowledge and societal values”



Risk Assessment



Risk Assessment

Data Acquisition

Seismic Assessments	Cask Studies	Human Factors Analysis	Radiological Assessments
Systems Safety	Accident Rates	Routing Models	RISKIND RADTRAN
Infrastructure Analysis	Railway Data	Motor Carrier Safety	MPC Risk Assessments

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Risk Analysis Methodologies

Hazard and Operability Analysis	Systems Reliability Analysis
Event Tree Analysis	Fault Tree Analysis
Life-Cycle Cost Analysis	Network Analysis
Cost-Effectiveness Analysis	Risk-Benefit Analysis
Benefit-Cost Analysis	Socio-Economic Analysis

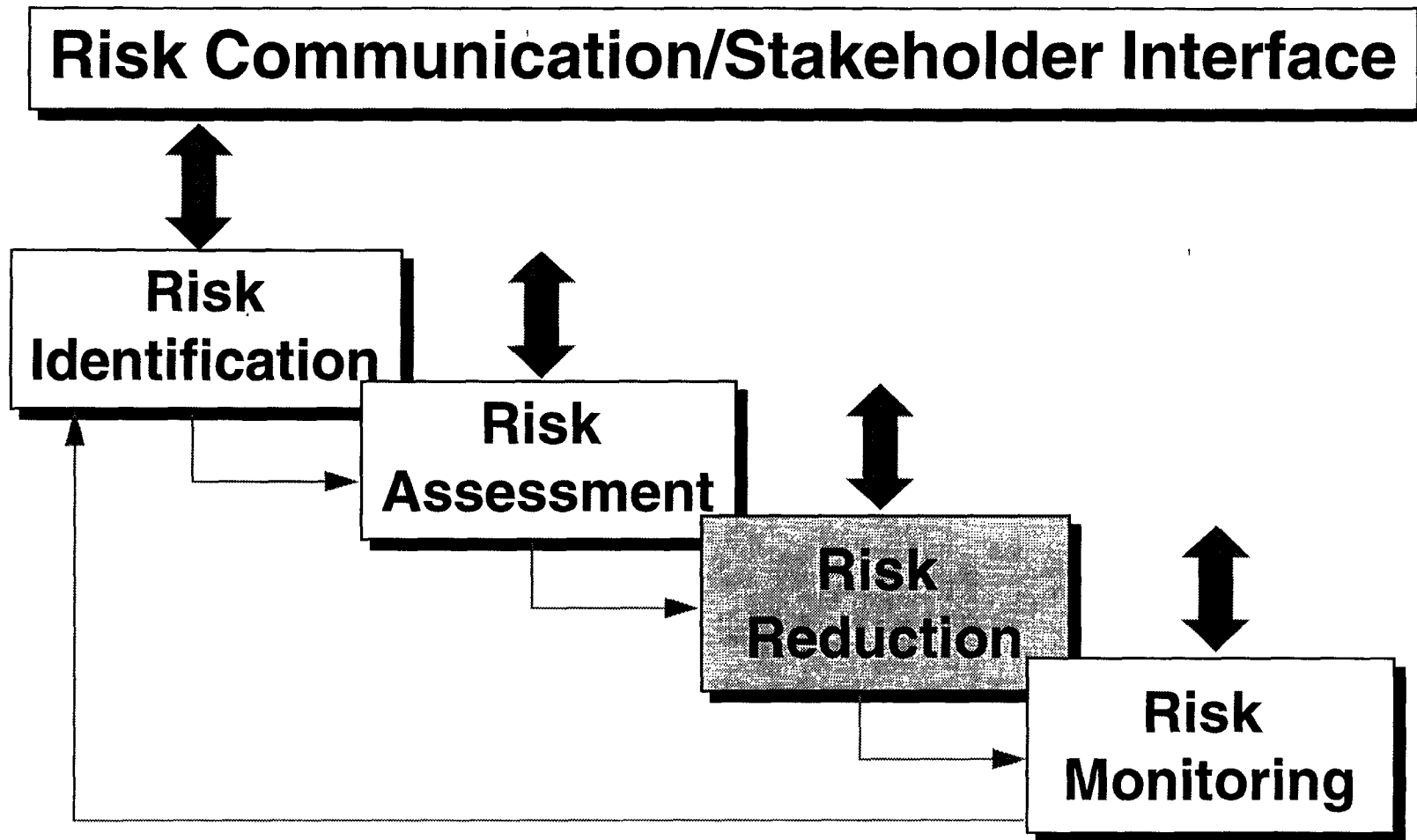


Risk Assessment

Risk Assessment Activities

- **Environmental reports**
- **Technical activities**
- **Computer modeling and data acquisition**
- **System benchmarking**

Risk Reduction



Risk Reduction

- **Design recommendations**
- **Policies and procedures**
- **Training, inspections, and certification**
- **Performance standards**
- **Maintenance protocols**

Risk Reduction Through Human Factors Engineering

Current Activities:

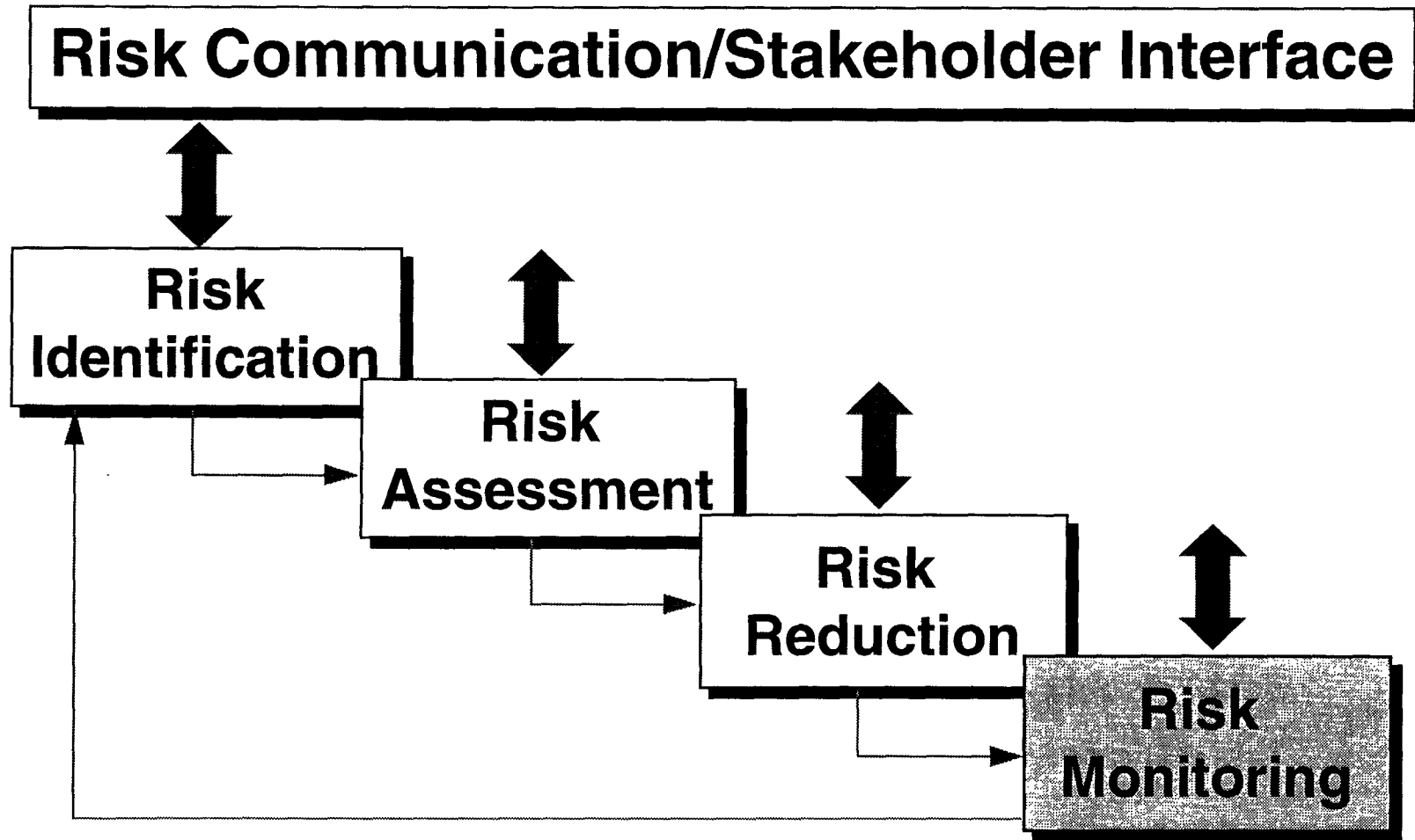
- **Ongoing research of existing studies and reports on human factors engineering (HFE) and transportation through database searches and a literature review**
- **Analysis of those reports that are applicable to CRWMS and examination of design and operational recommendations**

Risk Reduction Through Human Factors Engineering

Current Activities:

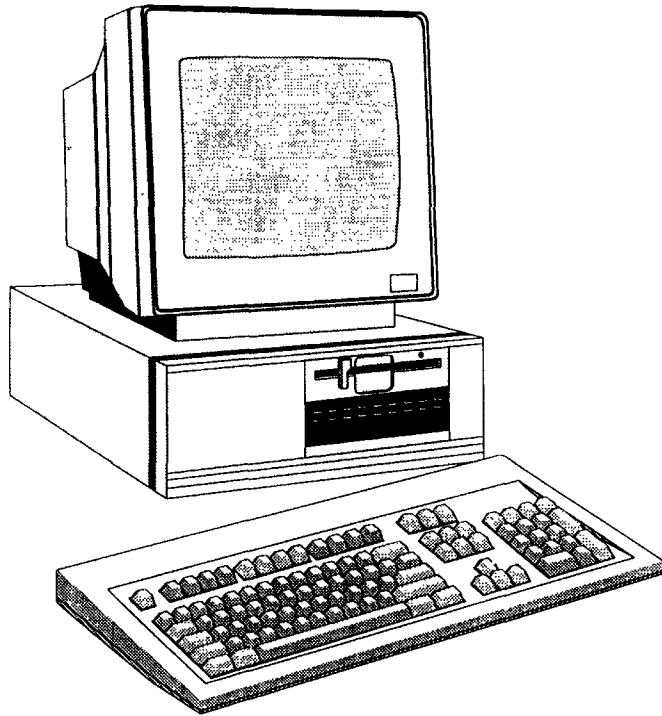
- **HFE design requirement in multi-purpose canister (MPC) statement of work**
- **HFE review in GA-4/9 cask design**
- **Driver performance evaluation of light weight truck cab configuration**

Risk Monitoring

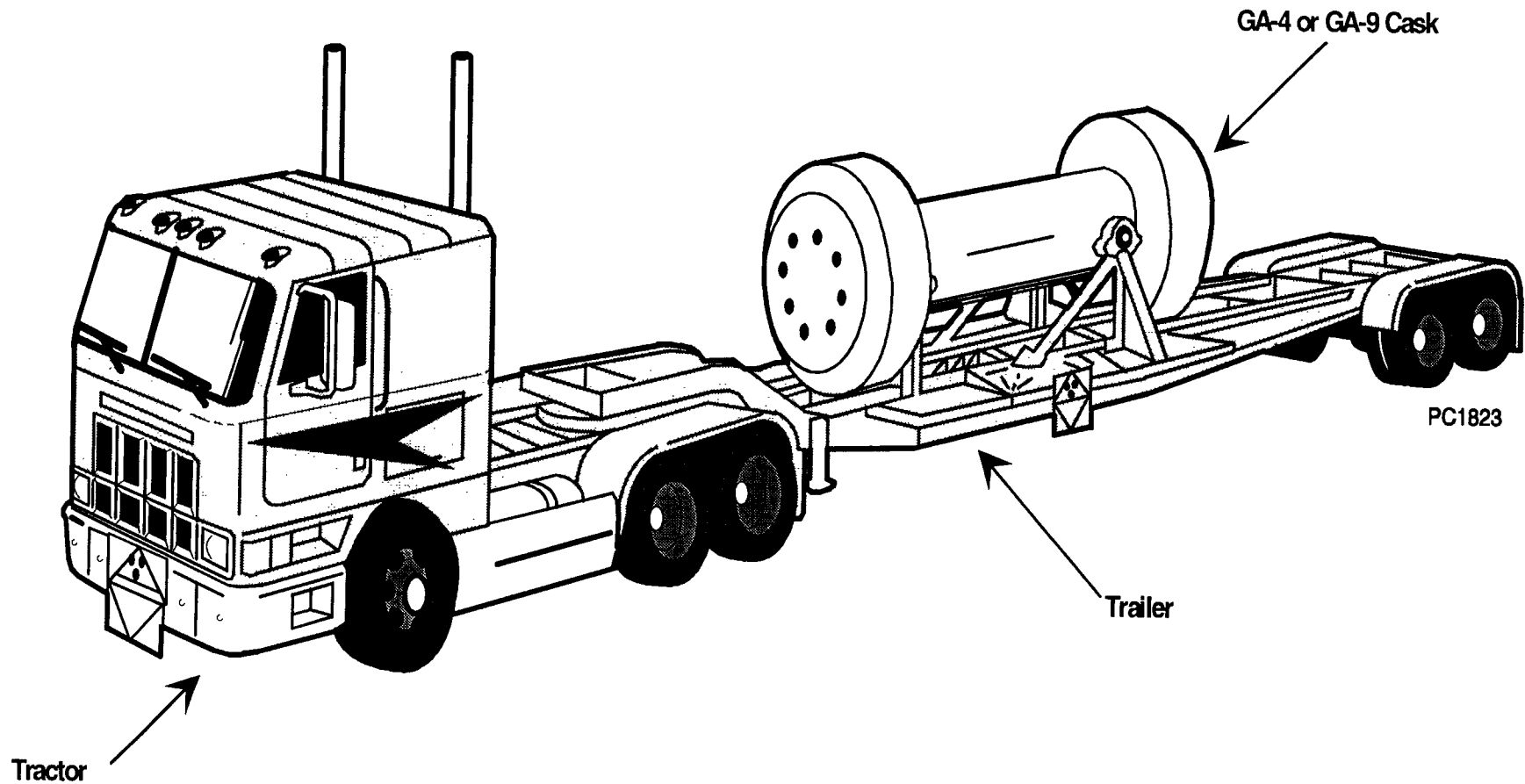


Risk Monitoring

- **Transportation risk management database**
 - **Follow-up reviews**
 - **Inspections**
 - **Performance assessments**



Transportation Risk Management and the GA-4/9 Tractor Trailer



Transportation Risk Management and the GA-4/9 Tractor Trailer

Risk Communication:

- **Open forum for risk identification**
- **Open access to data and assumptions**
- **Open access to assessment methodologies**

Transportation Risk Management and the GA-4/9 Tractor Trailer

Risk Identification:

- **Historical precedence**
- **Engineering standards**
- **Stakeholder concerns**
- **Professional society interactions**

Transportation Risk Management and the GA-4/9 Tractor Trailer

Risk Assessment:

- ANSYS design modeling
- durability demonstration
- Performance testing
- Track assessment
- Human performance evaluation
- Over-the-road testing

Transportation Risk Management and the GA-4/9 Tractor Trailer

Risk Reduction:

- **Design standards (ANSI N14.30)**
- **Design recommendations**
- **Policies and procedures**
- **Driver training, certification, and qualification**
- **Inspection standards**

Transportation Risk Management and the GA-4/9 Tractor Trailer

Risk Monitoring:

- Ongoing evaluation of driver performance
- Regular follow-up assessments
- Routine inspections