

Presentation for Nuclear Waste Technical Review Board

RADTRAN: A Risk Assessment Tool

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TRANSPORTATION RISK ASSESSMENT TEAM

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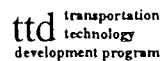
-Fran Kanipe, TRANSNET Manager, Web Master

-Jim McClure, Ph.D., data bases

-Scott Mills, Ph.D., GIS and LHS analysis

-Ruth Weiner, Ph.D., atmospheric dispersion

-Jerry Sprung, Ph.D. event trees, SeaRAM



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HISTORY OF RADTRAN

- RADTRAN 1, 1977 For NUREG-0170, "Final Environmental Statement on the Transportation of Radioactive Materials by Air and Other Modes"
- RADTRAN II, 1982 Generalized version of R 1
- RADTRAN III, 1985 Model updates
- RADTRAN 4, 1992 Route-specific analysis
- RADTRAN 5, 1997 Embedded values removed, model updates, more individual doses



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RADTRAN 5 COMPUTER CODE for TRANSPORTATION RISK ASSESSMENT

- Carriage of RAM by all commercial modes
- No embedded data
- Risks, Consequences, and Probabilities:
 - Incident-Free Population Doses
 - Accident Dose-Risks
 - Individual Doses
 - Consequences printed in output
 - Probabilities printed in output



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RADTRAN 5 COMPUTER CODE for TRANSPORTATION RISK ASSESSMENT

Incident-Free Dose Calculations

- Basic point-source and line-source models; integration over uniform population distributions within each route segment and at each stop location
- Population Subgroups: Off-Link; On-Link; Crew and Escorts; Stops; Handlings; Inspections; Storage
- Individual Doses: Maximum In-Transit Individual plus individual crew members etc. by use of selected input values



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RADTRAN 5 COMPUTER CODE for TRANSPORTATION RISK ASSESSMENT

Accident Dose-Risk Calculations

- Loss of Shielding (LOS) and Six Dispersion Exposure Pathways
 - Clean-up and Interdiction levels independent
 - New Ingestion Model (COMIDA2)
- Calculated Separately for each Route Segment (up to 60 per run)
- Library of radionuclide data (plus DEFINE)
- Package Response (*Severity Categories, Aerosol Fractions, Respirable Fractions, etc.*) from event trees
- Accident Environment Probabilities (*Accident Rates & Severity Fractions*) from event trees
- User-Defined or Pre-calculated Dispersion Parameters; Individual Downwind Doses calculated for all isopleths



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RADTRAN 5 COMPUTER CODE for TRANSPORTATION RISK ASSESSMENT

Other Features

- New Economic Model; now a separate code
- Code Documentation and other reports available at RADTRAN Web Site

<http://ttd.sandia.gov/Radtran/radtran.htm>

- Codes accessible via Internet (TRANSNET system); user-friendly GUI for RADTRAN; over 100 users with passwords; available at no charge - Contact Fran Kanipe for an account
- Software QA Plan; Code Verification Methodology published; & Independent Validation by SAIC (for RADTRAN 4)



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RADTRAN 5 COMPUTER CODE for TRANSPORTATION RISK ASSESSMENT

Probabilistic Analysis with Latin Hypercube Sampling (LHS) Method

- LHS Code used as a "shell" around RADTRAN
- Samples from distributions rather than using fixed-point estimates; same technique is used in repository performance assessment
- Probabilistic risk analysis; sensitivity analysis; uncertainty analysis



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TRANSPORTATION RISK ASSESSMENT

SUMMARY

- RADTRAN is a highly flexible, powerful tool capable performing of high-accuracy, high-resolution risk and consequence assessments
- As realistic representation increases, conservatism decreases
- Accuracy of results depends more than ever on quality of the input data
- Current initiatives: to obtain distributions for LHS applications



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CURRENT DATA INITIATIVES

- Accident Data - e.g., Lloyd's Data for 15 years
- Event-Tree Construction - e.g., DOE SeaRAM program; NRC revalidation of NUREG-0170
- GIS-Based Route Data - ArcView Census Block Data plus detailed 911 data for two separate U.S. locales
- Data Elicitation (First Responders contacted by phone) - Evacuation Time, Response Time, Decision Time
- Time & Motion Studies - Inspections, Stops, Intermodal Transfers
- Package Response (Doug Ammerman, Joe Koski)



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PACKAGE RESPONSE

- PACKAGE RESPONSE IN SHIPBOARD ENVIRONMENTS
 - STRUCTURAL (Ammerman)
 - THERMAL (Koski)
- STRUCTURAL EVALUATION TEST UNIT (SETU)
 - EXTRAREGULATORY IMPACT TESTING TO 60 MPH ON AN UNYIELDING TARGET (Ammerman)
- CONTENTS RESPONSE (E.G., VHLW) (Department-wide)



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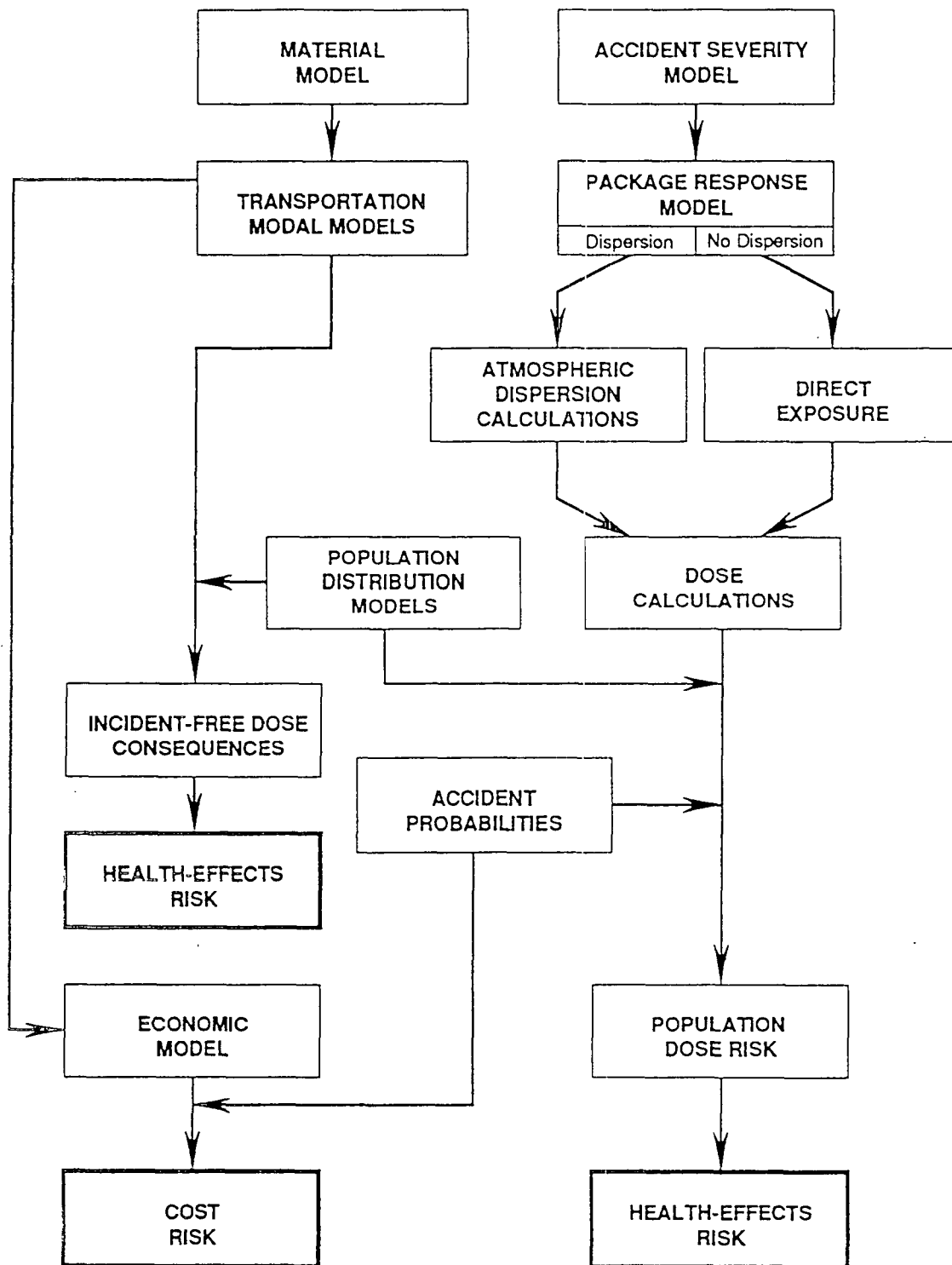


Figure 2-3. Flow Chart of the Interactions of the Component Models and the Population Dose Calculations