

INTERTRAN2
Transportation Risk Assessment Package
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The INTERTRAN2 programme is developed by AMC Konsult AB under contract with the Swedish Nuclear Power Inspectorate.

INTERTRAN2 was developed within the IAEA Coordinated Research Program on “The Probabilistic Safety Techniques Related to the Safe Transport of Radioactive Material”, it was rewritten for Windows within the Coordinated Research Programme on “Development of Relevant Accident Data for Quantifying Risks Associated with the Transport of Radioactive Materials”.

The Authors would like to thank all the participants of these Coordinated Research Programmes for their help with testing and commenting on the INTERTRAN2 package during the development.

We also would like to thank Mr. S. Ludwig from the Oak Ridge National Laboratories for his valuable help with the final testing of the programme and his valuable comments on the User Guide.

INTRODUCTION

The INTERTRAN2 Transportation Risk Assessment Package represents the culmination of efforts begun in 1989 to improve the INTERTRAN package (first available in 1983), under The Coordinated Research Programme on Probabilistic Safety Techniques Related to The Safe Transport of Radioactive Materials. INTERTRAN2 handler was originally developed for the DOS operating system on PC's, but has now been changed for use with Windows 95/98/2000 and Windows NT.

The INTERTRAN2 package is a computer code system for the assessment of radiological consequences and risks for the transport of radioactive material. It allows to study incident-free and accident conditions of transport separately. It is applicable to all modes of transport, in particular to multi modal shipments, and it can deal with nuclear material and industrial material as well as radiopharmaceuticals.

Under normal conditions of transport (incident-free case) the expected dose to workers and to different members of the public along the transport route can be calculated as collective dose, taking into account also handling operations. This incident-free case exposure of persons results from the external radiation originating from the radioactive material within the package during shipment. In addition to the collective dose of different subgroups the code also computes a hypothetical maximum dose to an individual member of the public who lives beside a highway or a railroad track. Under accident conditions the INTERTRAN2 package can be used to estimate the resulting external and internal individual and population doses as the consequence of an accident to be analysed and the corresponding risk.

The INTERTRAN2 package provides a tool, e.g. for

- specific shipment studies
- national assessments
- comparison of shipment options
- supporting decision making processes and optimisation of transport concepts and

technologies from the viewpoint of radioactive protection safety.

The computer code system allows the user to adjust the analysis to the specific problem being analysed, but the resolution of an analysis may be limited by the quality of available data. Taking this into account the scope of the INTERTRAN2 package and the accuracy of the results are mainly limited by the availability and quality of the data that are necessary to represent the specific transport situation to be analysed.

The INTERTRAN2 Package includes:

- INTERTRAN2, a handling program to assemble and manage input databases, construct input files for INTERTRAN2-RT4, and execute INTERTRAN2-RT4 cases.
- INTERTRAN2-RT4, based on RADTRAN4.019IOSI (date January 20, 2000), an SI-unit version of RADTRAN4.019. In the INTERTRAN2-RT4, the RADTRAN4.019IOSI has been modified and compiled for PC use.
- TRANSAT, An Atmospheric dispersion model.
- TICLD, Individual Dose calculation Program.
- LHS, Latin Hypercube sampling Program.

TICLD and LHS are not included in the standard version of INTERTRAN2, but may be downloaded separately or submitted by request.

TICLD and LHS are not required for general transportation risk assessments, but are useful for more detailed analyses by experienced analysts.

Documentation supporting the INTERTRAN2 package:

- INTERTRAN2 Transportation User's Guide
- Advisory Material for the INTERTRAN2 computer program
- RADTRAN4, Technical Manual and User's Guide
- TRANSAT User's Guide

The INTERTRAN2, permits the user to construct and manage input databases and prepare input files for INTERTRAN2-RT4, and execute INTERTRAN2-RT4 cases.

The first version of the handler, at that time a DOS programme, was introduced at the Coordinated Research meeting in Paris 1991. Since then the software has been rewritten for Windows. INTERTRAN2 was developed to enable IAEA Member States ability to perform transportation risk assessments, in a stand-alone, PC based environment. The INTERTRAN2 Windows version represents a significant upgrade to the previous INTERTRAN2, both by use of the Windows operating environment for input management and program execution as well as providing the ability for users to assemble risk assessment inputs as a collection of previously developed databases.

THE INTERTRAN2

The INTERTRAN2 handler is developed using CA-Visual Objects, a 32-bit fully object oriented language for Windows 95/98/2000 and NT. The INTERTRAN2 handler contains a database handling system where the user can input and store data for different package types, package contents, Pasquill data, accident data, link data etc. INTERTRAN2 is a menu driven program and the INTERTRAN2-

RT4 input file is created interactively. It is possible to combine available data sets in any way to produce an INTERTRAN2-RT4 input file.

The INTERTRAN2 transportation risk assessment package has been assembled to provide a calculation tool for estimating the risks from both the incident-free transportation of radioactive materials as well as the risks associated with conceivable incidents and accidents that may occur during the shipment. Transportation risk assessment involves the quantification of both the potential for, and radiological consequences of, transportation operations in the public domain, under both incident-free and accident conditions. Due to the changing conditions associated with the transportation activity (e.g., variations in population density over specific routes or inability to predict the location (and therefore the specific characteristics) of an accident), transportation risks are calculated over a spectrum of accidents environments and associated consequences. Thus, such evaluations are termed “probabilistic transportation risk assessment”.

The accuracy of risk assessment calculations is completely dependent on the validity of the input data provided by the user. INTERTRAN2 has only limited capabilities to verify the accuracy of the input variables provided. INTERTRAN2 input handler does not contain a complete quality control of all the input data. The INTERTRAN2, however, checks the consistency of the selected input data files. Input errors are checked by INTERTRAN2-RT4 during its execution, the user is provided feedback in the output file identifying the erroneous data.

The INTERTRAN2 handler can also be a valuable tool to an expert user. Previously developed databases containing information on different routes, link segments, modes and packages, can easily be combined by the user to analyse many different problems, just by selecting different combinations of database records.

Although the INTERTRAN2 handler has received extensive testing, it was not developed under a rigorous Quality Assurance regime. It is important that, whatever method is used to construct the INTERTRAN2-RT4 input file, the user verifies the input separately either before running INTERTRAN2-RT4 or by reference to the INTERTRAN2-RT4 output file, which contains an echo of the input data.

The INTERTRAN2 Package is provided on either CD-ROM, 3.5” diskettes, or available by download from the internet address <http://www.amckonsult.se>.

System requirements: Windows 95/98, Windows NT, or Windows 2000. Approximately 15 MB of disk space is required for the initial installation. Additional space is required as the user adds information to the INTERTRAN2 databases. The system must allow “long” filenames, (more than 8 characters), eg. 32-bit file handling.

Three different options exist for installation of the INTERTRAN2 package – CD-ROM, 3.5” diskettes, or downloading from internet. In all cases, the package is provided in compressed format, which must be installed to properly configure the package for operation.

From CD-ROM

To install INTERTRAN2 from CD-ROM, insert the INTERTRAN2 CD into the CD drive. Automatically (using the AUTORUN.INF file), the following screen should be presented:



The user should then use their mouse to click the INSTALL INTERTRAN2 button. The user will be presented with options for installation drive and directory (using the defaults presented is recommended).

From 3.5" diskettes

To install the INTERTRAN2 package for 3.5" diskette, insert Diskette 1 into the appropriate drive (typically Drive A:). Using Windows Explorer, double click SETUP.EXE. The user will be prompted to insert successive diskettes. The user will be prompted for selection of installation drive and directory.

From download

Using your web browser (Netscape or Internet Explorer), download the INTERTRAN2 package from:

<http://www.amckonsult.se>

The user should download the file to a temporary folder on their hard disk. Using Explorer, locate the downloaded self-installing EXE-file called INTERTRAN2.EXE and double-click to initiate the unzipping process. Locate the file SETUP.EXE and double-click to initiate the installation process. The user will be prompted for selection of installation drive and directory.

TICLD and LHS

TICLD and LHS are not provided with the standard installation package of INTERTRAN2. Both these programs are intended for use by experienced risk analysts to perform more complicated assessments. TICLD and LHS may be downloaded from <http://www.amckonsult.se>. Both software packages are provided in compressed (ZIP-file) format, and must be uncompressed using the WinZIP or PKZIP utility, which is available free over the internet.

The INTERTAN2 system is menu driven, using pull down menus selected from the main menu. Selecting an option will then open a data window.

All data windows are scalable and respond to the options Cascade and Tile. At the top of a data window there is a set of buttons, these correspond to the functions available under the Menu item - Edit. Functions not available are inactive (i.e. "greyed" out).

The functions are the following:

New	Add a new record/case
Open	Edit the record/case highlighted

Copy Record	Copy the highlighted record to a new record
Save Input file	Save the present case to a INTERTRAN2-RT4 input file
Delete	Delete the highlighted record
Cut	Cut to clipboard
Copy	Copy to clipboard
Paste	Paste from clipboard
Go Top	Go to the top of the table
Previous	Go to the previous record
Next	Go to the next record
Go Bottom	Go to the end of the table

The primary function of INTERTRAN2 is to serve as the input processor and database manager for assembling risk assessment data that is needed to perform transport risk assessments.

INTERTRAN2 uses a series of “database” files that when edited by the user, store information about the shipment, and assumptions (probabilities and severities) of the shipment experiencing an accident. The user then creates risk assessment “cases”, “generates” input files, and performs “calculations” using the INTERTRAN2-RT4 programme.

More experienced risk analysts may use the TRANSAT programme to model complicated atmospheric dispersion conditions, which could then be utilized automatically within the risk assessment calculation. However, less experienced users may wish to use typical Pasquill data included with the code as default data.

It is very important that the data sets in the databases are correct and adjusted to be consistent with data in other data sets if these are to be combined to make an input file (i.e. case).

A detailed demonstration of the INTERTRAN2 package is given during the poster session.