General Characteristics		
1	**Abstract of Model Capabilities**	The AIRISK program was developed to facilitate comprehensive analyses of health consequences and ground contamination/cleanup associated with possible energetic chemical reactions in HLW tanks at Hanford. It is a radiological assessment code designed to estimate individual doses to humans from the environmental transport of radionuclides in the environment. It is a versatile radiological assessment code capable of handling a variety of postulated accident scenarios common to the DOE complex.
2	**Sponsor and/or Developing Organization**	Yu Chien Yuan (Square Y Consultants) and Don MacFarlane (formerly LANL - retired), DOE
3	**Last Custodian/ Point of Contact**	Pat McClure, LANL MS K557 Los Alamos, NM 87545 505-667-9534 Yu Chien Yuan Square Y Consultants Orchard Park, NY 716-662-6972
4	**Life-Cycle**	Developed from RISKIND code (used for transportation risk). The sister code (APRISK) is being updated to make it more probabilistic (monte carlo sampling of weather), to make the source term time dependent, and other changes.
5	**Model Description Summary**	AIRISK is a radiological assessment computer code developed by Los Alamos National Laboratories that estimates individual doses to humans from the environmental transport of radionuclides in the atmosphere and through the ingestion of water and food products (i.e., vegetation, milk, meat). The code also provides estimates of acute health effects that may occur due to initial exposure to an accidental release of radioactive materials, and latent health effects from initial and long-term exposure to the released radioactive materials. Contamination levels are also predicted up to 5 particle size groups.
6	**Application Limitation**	The source term is limited to 40 nuclides, and the code further reduces the number tracked using a process to screening out any nuclide contributing less than 0.1% to a dose pathway.
7	**Strengths/ Limitations**	**Strengths:** AIRISK is a versatile radiological assessment code capable of handling a variety of postulated accident scenarios common to the DOE complex. It includes multiple particle-size atmospheric transport and pathway analysis models. **Limitations:** The AIRISK code does not have widespread use outside of LANL. AIRISK uses only a single set of Dose Conversion Factors (DCF's). Therefore, if a radionuclide exists in two chemical forms that have different deposition velocities, or solubility classes, AIRISK can not model both species in a single computer run. Although 211 radionuclides are included in the data library, the user is limited to a release containing 40 radionuclides.
8	**Model References**	• Mac Farlane, Don, and Yu Chien Yuan, July, 1992, "AIRISK: A Computer Program for Calculating Doses and Health Risks from Accidental Release of Radioactive Materials", Los Alamos National Laboratory, Los Alamos, NM, LA-UR-92-2636.
9	**Input Data/Parameter Requirements**	The meteorological data required consists of joint frequency distributions of wind speed, and atmospheric stability class for each of the 16 compass directions. Alternatively, the user may supply directionally independent joint frequency data of wind speed and stability class. The user also has the option of specifying a single set of meteorological conditions.
10	**Output Summary**	Calculates individual receptor health effects. It models all exposure pathways of interest (inhalation, cloudshine, groundshine, resuspension inhalation, ingestion).
11	**Applications**	Handles up to 20 receptor locations. Using joint frequency data, AIRISK provides results for annual average, as well as 50% and 95% directionally independent meteorological conditions. Contains a terrain-effects adjustment model with stability depended cloud path factors.
12	**User-Friendliness**	Average documentation for atmospheric transport and dispersion models. Light documentation for dose calculations and description of hard-wired data libraries.
13	**Hardware-Software Interface Constraints/ Requirements**	Executable provided. Source code is unavailable for modification. Very simple to run although the user's manual contains no information on running the code. Runs on any IBM-PC AT or equivalent computer with a 80287 math coprocessor.

14	**Operational Parameters**	**Identify whether the code has any error diagnostic messages to assist the user in troubleshooting operational problems:** Approximately a third of the RSAC-5 program is devoted to error diagnostics. RSAC+ checks all fields to assure that data is in range for the given variable and that consistency in an input series is maintained. **Set up time for:** Setup up times are dependent on the complexity of the run being made. **Typical times are:** ***first-time user:*** .30-60 minutes ***experienced user:*** 5-10 min
15	**Surety Considerations**	No verification and validation documentation available. Documentation describing dose calculations and hard-wired data libraries is light. Some benchmarking performed, but not documented.

Specific Characteristics

Part A: Source Term Submodel Type		
A1	**Source Term Algorithm?**	✔ YES ✔ NO
Part B: Dispersion Submodel Type		
B1	**Gaussian**	✔ **Straight-line plume** **Segmented plume** **Statistical plume** **Statistical puff**
Part C: Transport Submodel Type		
C2	**Deterministic**	Yes
C4	**Frame of Reference**	✔ **Eulerian** **Lagrangian** **Hybrid** **Eulerian-Lagrangian**
Part D: Fire Submodel Type (Not Applicable)		
Part E: Energetic Events Submodel Type (Not Applicable)		
Part F: Health Consequence Submodel Type		
F2	**For Radiological Consequence Assessment Models**	**Cloudshine:** **finite cloud** ✔ **semi-finite cloud** **other** **Groundshine:** ✔ **short-term** **long-term** **Inhalation:** ✔ **short-term** **long-term** ✔ **Total effective dose equivalent** **Uptake of respirable fraction of particle spectra** **Resuspension:** **short-term** **long-term** ✔ **Anspaugh** **Food/Water Ingestion:** **dynamic** ✔ **static** **Skin dose:** ✔ **absorption** **other** **Dose assessment:** ✔ **ICRP-60 criteria** ✔ **organs** ✔ **pathways** **Health effects:** ✔ **early** **latent**
Part G: Effects and Countermeasures Submodel Type (No Information Provided.)		
Part H: Physical Features of Model		
H2	**Release Elevation**	✔ **ground** ✔ **roof**
H3	**Aerodynamic Effects from Buildings and Obstacles**	✔ **building wake** **cavity** **K-factors** Virtual source distance using building dimensions.

Part I: Model Input Requirements		
I1	**Radio(chemical) and Weapon Release Parameters**	**Release rate: _✔_ Continuous __ Time dependent __ Instantaneous** **Release container characteristics: __ vapor temperature __ tank diameter** **__ tank height __ tank temperature __ tank pressure __ nozzle diameter** **__ pipe length** **Jet release: ___ initial size __ shape** **__ concentration profile at end of jet affected zone** **Release dimensions: _✔_ point ___ line _✔_ area** **Release elevation: _✔_ ground ___ roof ___ stack**
I2	**Meteorological Parameters**	**Wind speed and wind direction: _✔_single point __ single tower/multiple point** **__ multiple towers** **Temperature: __ single point __ single tower/multiple point __ multiple towers** **Dew point temperature: __ single point __ single tower/multiple point** **__ multiple towers** **Precipitation: __ single point __ single tower/multiple point ___ multiple towers** **Turbulence typing parameters: __ temperature difference ___ sigma theta** **__ sigma phi __ Monin-Obukhov length __ roughness length** **___ cloud cover __ incoming solar radiation _✔_ user-specified** **Four dimensional meteorological fields from prognostic model:** See above.
Part J: Model Output Capabilities (See Item 10)		
Part K: Model Usage Considerations (No Information Provided.)		