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Computer Code Abstracts

CCA—108

1. Name of Code: AIROS
2. Computer for Which Code is Designed and Others Upon Which It is Operable: IBM-7094
3. Nature of Physical Problem Solved: AIROS solves the space-independent reactor-kinetics equations and provides for the determination of reactivity by solving in addition the discretized equations that represent the spatial heat and mass transfer model for several fuel channels. In addition, variation of the film coefficient with flow is accounted for along with the provision for flow decay and afterglow heating. Scrams can be initiated by delayed signals from instruments that sense any quantity calculated, e.g., power, inverse period or temperature. Generalized feedback equations are used to provide flexibility in the models that represent multichannel heat transfer including conduction and convection, energy, pressure and other phenomenon. The reactivity equation is also generalized. The reactivity feedback coefficients can be constand or vary as the square root or reciprocal of temperature. Furthermore any feedback variable can be used to initiate a reactivity scram, each with a unique delay time.
4. Method of Solution: The numerical technique used to integrate the neutron and feedback differential equations is that developed by E. R. Cohen as previously used in the AIREK codes. An improved interval-switching technique allows rapid calculations with predetermined accuracy.
5. Restrictions on the Complexity of the Problem: 15 delayed-neutron-precursor groups; 100 feedback variables with any variable "connected to" no more than 8 others. Printout of no more than 39 feedback variables.
6. Typical Running Time: One to two minutes for a problem with six delayed-neutron-precursor groups and fifty feedback variables (including CRT).
7. Unusual Features of the Code:

   a) Special provision is made for reactor startup problems resulting in large reduction in running time.

   b) Much of the required input data is preset but can be changed if desired.

   c) Addressable input data is used so that on multiple cases, only changes need be specified.

   d) A restart feature is provided wherein re-restart cards are punched upon abnormal problem termination and/or on an input option.

   e) Extensive printed and graphical displays are provided as follows: power, inverse period, reactivity and any 39 feedback variables. Printing and display of feedback variables is under the user's control, and the latter can be grouped on CRT frames as desired.

8. Related and Auxiliary Programs: None.
9. Status: In production.
10. *References:*

[1]R. A. Blaine and R. F. Berland, "AIROS—A Digital Simulator for Power Reactor Dynamics," NNA-SR-9943 (August, 1964).

[2]R. A. Blaine, "Modifications to AIROS," Atomics International Internal Letter, dated October 1, 1964.

[3]M. Hoffman and W. A. Rhoades, "AICRT 3, A General Code for Display of Digital Data," NAA-SR-MEMO-9069 (10/63).

11. Machine Requirements: 32 K; IBM 7094; SC-4200 graphical display device.
12. Programing Languages Used: FORTRAN IV (95%); MAP (5%).
13. Operating System or Monitor Under Which Program is Executed: IBSYS
14. Any Other Programing or Operating Information or Restrictions: If an SC-4020 graphical display device is not available, the AICRT-3 display routine can be rewritten; otherwise link 2 can be deleted and AIROS can be run as a non-overlay job without CRT.

    The NAA SC-4020 (IBSYS) subroutine package is available through:

    UAIDE Librarian
    c/o Stromberg-Carlson
    P. O. Box 2449
    San Diego, California
15. Material Available:
    a) AIROS source deck (2000 cards);
    b) sample data decks;
    c) reference documents;
    d) abstract.

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CCA—109

1. Name of Code: GRAVE
2. Computer for Which Code is Designed and Others Upon Which It is Operable: IBM 7094
3. Nature of Physical Problem Solved: GRAVE is the program to form group-averaged cross sections using the neutron cross-section master tape developed under the Atomics International automated cross-section program. Nineteen group-averaged parameters are obtainable as follows: σ_T, σ_{EL}, $\sigma_{N,\gamma}$, σ_F, $\bar{\nu}$, $\bar{\mu}$, $\bar{\xi}$, σ_{IN}, $\sigma_{N,\alpha}$