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REACTOR INSTALLATION AND MAINTENANCE FOR THE ADVANCED NEUTRON SOURCE

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DISCLAIMER

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Executive Summary

The Advanced Neutron Source (ANS), will be the world's leading neutron scattering research facility producing the world's highest flux of cold, thermal, and hot neutrons. ANS will also be used for isotope production and the study of material irradiation effects. The source of these neutrons is a 330 MW (fission) heavy-water cooled and moderated research reactor. The project, which is scheduled for a Title I design start in 1994, is a nationwide effort with Oak Ridge National Laboratory as the lead. IGRIP is being used as a multifunctional tool during ANS design to identify design flaws and simulate installation and maintenance processes.

Problem Statement

The production of an extremely high neutron flux requires a very compact reactor core design. Neutron beam transport and irradiation components must be located close to the core in order to use the high flux. Consequently, these components must be designed for frequent replacement because of radiation damage. Replacement operations will require remote maintenance because of neutron activation of the materials. A three-dimensional tool will be needed to visualize the assembly and to develop installation and maintenance procedures. IGRIP has been chosen for this purpose.

Solution

ANS reactor assembly components have been modeled in great detail in IGRIP in order to realistically simulate preliminary installation and maintenance processes. Animation of these processes has been captured in a 15-minute video with narration.

Approximately 90% of the parts were initially translated from CADAM (a two-dimensional drawing package) to IGRIP and then revolved or extruded. IGRIP's IGES translator greatly reduced the time required to perform this operation.

The interfacing of devices in the work cell has identified numerous design inconsistencies.

Most of the modeled reactor components are devices with a single degree of freedom (DOF) however, some of the slanted experiments required 6 DOF so that they could be removed at an angle in order to clear the reflector vessel flanges. IGRIP's collision detection feature proved to be extremely helpful in determining interferences when removing the

experiments.

The combination of three-dimensional visualization and collision detection allows engineers to clearly and easily visualize potential design problems beforethe construction phase of the project.

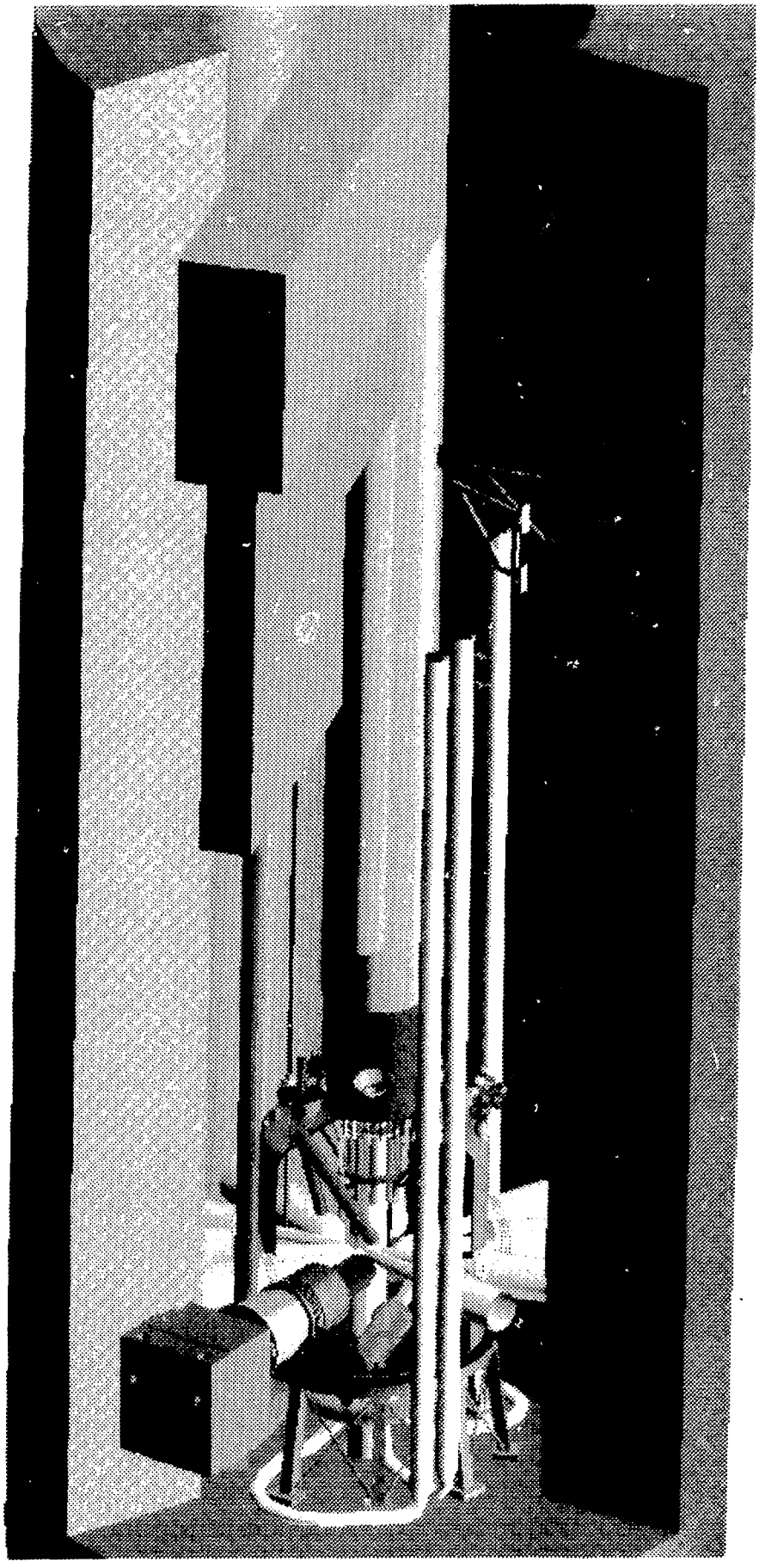
IGRIP Benefits

IGRIP reduces the cost and time involved in conceptual design by eliminating design flaws prior to construction. Animation of system operation easily communicates current design trends thus facilitating timely elimination of design inconsistencies. Lastly, IGRIP has proven to be an invaluable medium for exposing the project to the public.

Biographical Statement

Barbara R. Smith

Ms. Smith was born in Orlando, Florida, where she lived until 1991, when she joined Martin Marietta Energy Systems, Inc., in Oak Ridge, Tennessee. In 1991, Barbara graduated from the University of Central Florida with a bachelor's degree in mechanical engineering. Her professional experience ranges from the use of coordinate measuring machines in product certification to mechanical design for the Advanced Neutron Source project. She has specialized in structural and fluid analyses and the three-dimensional visualization of ANS reactor assembly components and processes.



ANS Reactor Assembly