

NEPA—a grand new idea

As nuclear energy became more widely known after its initial use to end World War II, Oak Ridge was the source of expansion into unknown fields of study in hopes of capitalizing on this new source of abundant energy. One such example was the NEPA project.

The Nuclear Energy for Propulsion of Aircraft project began in May, 1946. In February, 1947, a nuclear physics seminar with special emphasis on the application of nuclear energy to aircraft was held in Oak Ridge as part of the bold new program.

The project was a joint industry-government program for research and development directed by a special staff group in Oak Ridge. Known as “NEPA,” the project was a combined operation of ten aviation companies and the National Advisory Committee on Aeronautics working with the Fairchild Engine and Airplane Corporation as prime contractor under the Army Air Forces. This name changed when the U.S. Air Force was formed as a separate branch of the military on September 18, 1947. The Atomic Energy Commission was seen as the source of nuclear technology by the military and industry alike.

NEPA brought several activities to Oak Ridge at all three sites. At K-25, the area where S-50, the Thermal Diffusion Plant had been, was used to house the first part of the program in Oak Ridge. The Oak Ridge National Laboratory, primarily those parts of the laboratory located at Y-12, eventually became involved in supporting this mission also.

Yet, the Army Air Forces and later the U. S. Air Force never really were able to make adequate progress on the concept to actually build an aircraft. The technical problems of placing a nuclear reactor in close proximity to the aircraft pilot and crew was insurmountable with the existing shielding technology.

The potential for radiation exposure even made some aircraft designers recommend that only elderly men be considered as aircraft crew members. Sound ridiculous? The thought process was that older men would have already fathered any children they intended to have and thus any radiation exposure would not keep them from having children.

When the NEPA project began to lose momentum, in 1949 the Aircraft Nuclear Propulsion (ANP) project was established at the Oak Ridge National Laboratory. This project expanded the initial idea and included funding for research into radiation shielding, compact reactor design and basic materials research.

All these areas were where the scientists of ORNL desired to expand anyway and they wanted the laboratory to be the nation’s leading research center for nuclear reactor design. The first large-scale non-destructive testing of materials was done at Oak Ridge as part of ANP.

The ANP was cancelled in 1963 without ever having succeeded in designing or building any nuclear powered aircraft, however, between 1949 and 1963, the experience and knowledge gained in the effort would pay dividends in the coming decades. The project helped propel ORNL toward basic materials research and gained tremendous recognition for Oak Ridge and the laboratory in reactor technology.

The Tower Shielding Reactor was one of the main research tools for the program. Built in 1953, it was used initially to investigate radiation from a nuclear reactor overhead. It was also used for other experiments in support of the nuclear aircraft project.

Experiments indicated that by using a divided shield rather than a single large shield the weight could be reduced. One section of the shielding would be placed around the aircraft’s reactor and another around its crew. Researchers, however, could still never devise a reactor and shielding design light enough to ensure safe flight. In an attempt to overcome this problem, a most unusual “tug-tow” arrangement was considered in which the crew and controls would be in a towed glider, separated from, yet tied to, the reactor by a long umbilical cable. Imagine taking off and landing such a contraption!

The Tower Shielding Reactor was a workhorse for a number of programs well after the idea of a nuclear aircraft was abandoned. It was later used for research into breeder reactor technology in the early 1990s and was eventually defueled in 2003 and is now awaiting demolition scheduled in 2009.

Another significant outcome from the NEPA and ANP projects was research into nuclear powered rockets. The first such programs began at Los Alamos as early as 1953 and continued on into the 1970s with significant involvement in many Atomic Energy Commission/Energy Research and Development Association/Department of Energy sites. The efforts were aimed at deep space exploration in support of the National Aeronautics and Space Administration's far-reaching ideas of venturing into outer space.

So, the early expansion at Oak Ridge into nuclear energy for propulsion of aircraft led to many years of experimentation with various nuclear power related engines. Other applications of nuclear energy and basic research on how to protect from radiation also grew out of the research related to the projects.

Next we will examine the new missions coming to Y-12 after the Cold War heats up with a nuclear explosion by the Soviet Union.