Y-12's missions grow more diverse

Continuing to draw heavily on Bill Wilcox's *An Overview of the History of Y-12 1942–1992, we* find Y-12 developing relationships with the National Aeronautics and Space Institute (NASA) and other branches of the government for work using Y-12's specialized capabilities. Chief among the relationships over the years has been the relationship with NASA.

Beginning with a small project (Blood in Gemini) to determine any adverse effects of the weightlessness in space on human blood, this project successfully proved there were no damage to a person's blood when venturing into space. Walker Smith recalled for me his trips to the launch pad where he personally placed the small metal box containing the blood samples onto the spaceship just prior to liftoff.

Another experiment, which was eventually abandoned (this one from the Army Air Force), was the Nuclear Energy for the Propulsion of Aircraft (NEPA). However, the NEPA project provided a huge source of funding for much scientific exploration for years, eventually spending approximately $7 billion on the overall project.

Another similar project was an air-breathing nuclear-powered rocket (PLUTO). These type experiments were also pushing nuclear technology to the limit. Y-12 did research and development work for both. NEPA lasted longer than PLUTO, but both eventually proved to not be feasible.

While both these farfetched concepts were unworkable in the long run, each of them produced increased knowledge and technical achievements beneficial to Y-12's nuclear weapons program. As an example, techniques developed for processing beryllium first came from these experiments.

In November 1958 a major labor dispute occurred when the machinists refused to recognize a contract settlement made by the Atomic Trades and Labor Council. An unauthorized strike by the machinists resulted in many of them being discharged but later reinstated with disciplinary action. While labor disputes have been rare over the years, on occasion they did occur.

In 1960 the first numerically controlled machine tool was operated in Building 9212, A-2 Wing. This was a huge step forward in making practical use of the emerging computer technology. Uranium machining made advances and became automated to meet the more sophisticated weapons designs. Dry rooms had to be fabricated to house lithium assembly operations.

ROVER, a nuclear-powered rocket that NASA envisioned for a flight to the moon, required Y-12 to set up pilot facilities and eventually a production plant for fuel elements. However, ROVER also did not prove successful, even though the tests conducted at the Nevada Test Site in 1962 proved the concept would fire successfully.

A follow-on program called NERVA (Nuclear Engine for Rocket Vehicle Application) also eventually failed to meet the need for rockets powered by nuclear energy. Finally fuel elements were fabricated for PEWEE, yet another rocket which did work well; however, NASA had by then moved to the present day design of rockets that no longer relied on nuclear energy to power rockets.

Among the many useful things to come from all this was increased knowledge about carbon foams. This technology proved very beneficial later when NASA had to design re-entry vehicles such as the Space Shuttle.

The “42 Games Experiment” succeeded in making Y-12 the acknowledged leader in the Nuclear Weapons Complex. It was a competition between Los Alamos National Laboratory, Lawrence Livermore Laboratory, Bendix–Kansas City Plant and Y-12. Each machining facility was given 50 blanks. The precision required was 0.0002 inches (two ten thousandths of an inch). Jack Case selected the Y-12 team led by Bill Nelms with Ken Sommerfeld as engineer and Bob McMillan as statistician.

The Y-12 team began by picking out the best tape-controlled template grinders Y-12 had and making a thousand templates. From this huge number of templates, the best 200 were selected for use in cutting the parts.

The contest ran for four months. Y-12 was declared the clear winner and thus firmly established a leadership role in precision machining that exists to this day. Another important lesson learned was the value of statisticians working closely with the machining process. Y-12 was practicing statistical quality control well before it became the industry standard.

The success of the “42 Games Experiment” led to a new philosophy being introduced in Y-12 production processes. It consisted of an approach to instill quality into the product at the source instead of using inspection to weed out the low-quality production parts. This was a major breakthrough in production management thinking and resulted in assigning process statisticians to the production shops.

This new approach to production management brought with it an increased awareness of the need for quality to be an integral part of the manufacturing process and brought a heightened sense of quality consciousness. The resulting decrease in the number of “killed” parts proved the effectiveness of the approach. Y-12 continues to operate in this manner today and has even expanded the thinking of building quality into all processes, not just the production processes.

Another thing that solidified Y-12’s “Can-Do” reputation and its lead in precision manufacturing and fast turnaround was the “18-Day Turn-Around Program.” This contest required that production of a weapons part from blank preparation, programming and machining through inspection to be completed in 18 days. Again, Y-12 won the competition easily and consistently produced the required products.

One reason for the need for fast turnaround was the much increased and diversified nuclear testing activity at the Nevada Test Site in the early 1960’s. At the height of the nation’s nuclear testing program, the variety and complexity of test assemblies grew almost exponentially. Design changes were routine, and refinements resulted from every test. It was a time of rapid change in nuclear weapons design.

By 1963 there were well over 1,000 machine tools in a wide variety of over 50 diversified shops across the site at Y-12, mostly located in Manhattan Project buildings that had been converted to meet the changing mission needs. The capability for handling various toxic, hazardous or reactive materials in enclosed and closely controlled conditions existed throughout Y-12.

Special handling procedures and unique enclosure equipment existed in a number of specialty shops designed for highly specialized materials used in nuclear weapons component manufacturing. During the 1960’s and 1970’s Y-12 was reaching new peaks of production unheard of just a few years before.