

Apollo “Moon Boxes” made at Y-12, part 2 — Y-12’s moon mission, use of Teflon

Before I continue, I must correct a mistake in last week’s article. The name of the BIG program was *Blood in Gemini*. Carolyn Gooch and Walker Smith, both of whom worked on the BIG project, have since pointed out that mistake. The display at the Y-12 History Center uses “Gravity” for Gemini. I will certainly correct that error!

Last week we noted that the 40th anniversary of landing astronauts on the moon was July 20. We also pointed out that Y-12 played a role in that tremendous achievement by supplying the moon boxes for the mission and for other Apollo missions as well. Y-12 also provided the Lunar Receiving Laboratory and managed its operation.

The report, compiled by F. D. Mundt, J. M. Schreyer and W. E. Wampler issued February 16, 1973, was quoted in last week’s article. That report described the Apollo Lunar Sample Return Container (moon box) and the rationale behind its design, development and fabrication. Here are some additional details.

The report continues, “Major considerations in the design of the Lunar Geological Equipment program were: (1) the work-capability restraints imposed on the astronauts by their spacesuits, and (2) lunar gravity. Human-factor testing and astronaut training caused many changes to be made and guided the designers in much of the development of the hand tools and the Apollo Lunar Sample Return Container, especially the latching and sealing hardware design.”

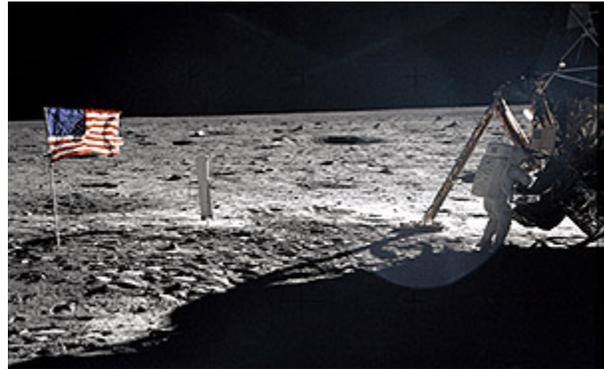


Fig. 1. Photo of Neil Armstrong, Apollo 11, Mission Commander at the Modular Equipment Storage Assembly’s moon box (made at Y-12) of the Lunar Module “Eagle.”

“In addition to the design requirements, there was also a requirement that all the hardware be cleaned to such a degree that residual organic contamination from earth could not interfere with the parts-per-billion analysis of the lunar samples. “

“The contractual agreements implementing the development, design, test, and manufacture of the Apollo Lunar Sample Return Container were entirely based on interagency agreements between the National Aeronautics and Space Administration and the United States Atomic Energy Commission. Union Carbide Corporation’s Nuclear Division as a prime contractor to the USAEC, accepted the work defined in the interagency agreement under the related-services clause of their prime contract with no change in the contractual fee (one dollar per year at the time ... unlike Award Fee Contracts of today!). All work was performed in facilities owned by the USAEC.”

The choice of the Oak Ridge Y-12 Plant to perform the design, development, testing, and manufacturing functions of the ALSRC and associated hardware programs resulted from the consideration of several factors, including the following:

1. Complete capabilities were available at the Oak Ridge Y-12 Plant. These capabilities included development in the requisite disciplines, available engineering, applicable testing facilities and

experience, extensive manufacturing facilities, and extensive quality control and quality assurance organizations at both the contractor and government level.

2. Extensive experience and expertise had been acquired in the design, development, testing, and manufacture of unusual components for other USAEC facilities.
3. Scientific support in a large number of fields was readily available from the Oak Ridge National Laboratory.
4. There was a ready integration of the ALSRC and associated hardware with the vacuum system in the Lunar Receiving Laboratory (LRL) since that system was also designed and built by the Oak Ridge Y-12 Plant.

A Quality Assurance Program was implemented specifically for the project. The program was based on NASA's quality requirements but was also in accordance with UCC-ND Y-12 Plant quality doctrine which was understood to be among the very best in the world. The extensive quality program included all aspects of the project and related hardware to include both the moon box and the receiving laboratory, both of which had to be capable of maintain the lunar material in isolation from earth's environment.

Some 223 individual documents were written and issued that covered the requirements for the project and were provided to NASA for the project. The above quotes come from the completion report that covered all phases of Y-12's participation in the NASA Apollo program.

A major design consideration for the moon box was the retention of vacuum prior to and during the trans-lunar portion of the mission and the retention of vacuum after the container was resealed on the lunar surface. This was accomplished by a triple seal between the container body and lid. The body was fabricated from a single piece of aluminum, thus there were no welds or seams of any kind. The same seamless approach was taken with the lid, therefore, the only potential leak was the lid to body seal.

Y-12's metal working expertise was well known and obviously a primary reason for NASA's selection of the site for the work. There were many people who worked on the project and there were facilities created, such as dry rooms and other special purpose equipment items. The Lunar Receiving Laboratory was also an important part of the project. Y-12 personnel were engaged with most all aspects of the moon boxes and analytical laboratory.

There were two boxes on each flight. So there were many boxes fabricated, maybe as many as 16 or more. There is at least one in the Smithsonian Institute, maybe more. I am sure there are some still with NASA in their Apollo displays around the country. There is a moon box at the American Museum of Science and Energy and, of course, there is a display at the Y-12 New Hope Center's Y-12 History Center that shows many of the specialty items. The display has a moon box that is open showing much of the contents. We also have a photo of the box on the moon.

The Y-12 History Center is open to the public from 8:00 AM – 5:00 PM Monday through Thursday and at other times by special request. There are several NASA sponsored events and online web pages that are commemorating the 40th anniversary of the moon landing.

The tremendous achievement of landing astronauts on the moon and returning them and their cargo of moon rocks and soil safely has resulted in a large number of technological advances. One such advance at Y-12 was the introduction of Teflon. The moon box was the first project at Y-12 where that product was used.