Neutral Buoyancy Tanks

Nicholas Kim

Evan Seliner

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Ethan Willis & August Longhurst

Dr. Friedman

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Skylab and its Importance to Human Settlement in Space

Skylab was the first US Space Station but not the first ever space station. That honor would go to the Soviet Salyut 1, which was launched in 1971, two years before Skylab, which was launched in 1973. Skylab had many goals, most of which are similar to what we have today on the International Space Station (ISS). These goals include studying the earth and sun through satellite imaging, performing all sorts of experiments in zero gravity or 0g (both on humans and not), and most importantly studying how humans can live and operate in 0g for long periods of time. Ultimately, the main purpose of Skylab was to establish how humans could spend long periods of time in space without being negatively affected.

The mission profile of Skylab was fairly straightforward. From its launch in 1973, three different manned missions would visit Skylab with a total crew of three each. These missions would last 28 days, 56 days, and 84 days respectively. The crews are pictured in Fig.1 and include Charles Conrad, Paul Weitz, and Joseph Kerwin for Mission 1. Next are Alan Bean, Jack Lousma, and Owen Garriott for Mission 2. Finally, there are Gerald Carr, William Pogue, and Edwad Gibson for Mission 3.
Skylab’s Main Purpose

Skylab had many goals, but the most important was to establish how humans can live and operate in 0g over long periods of time. Skylab was America's guinea pig in this respect as we had never done anything like this before. It was intended to find what systems would be needed to maintain humans in space, how 0g would physically affect the human body, and what problems could occur in space. These would take form through experiments which included analyzing motor skills in 0g, the effects of 0g on sleep, and the cardiovascular system in 0g. The results from Skylab would be used to inform future, long-term missions such as the ISS and the Lunar Gateway.
Problems & Solutions

Fig. 2. A view of the Solar Parasol

There were a lot of problems the crew and the engineers ran into, but there were two main ones that stuck out. The first was the problem of the internal temperature. During the ascent of Skylab, aerodynamic forces tore off the micrometeor shield, exposing the station to solar radiation. This would heat the inside of the Saturn Workshop to over 135 degrees Fahrenheit, way past livable conditions. To solve this issue, NASA developed the Solar Parasol Shield (see Fig. 2.), a thermal blanket which reflected incoming rays. A full mockup was tested in NASA’s neutral buoyancy tank before being sent up on the sun-facing side of the Saturn Workshop with the first crew. This would lower the internal temperatures to sustainable living temperatures. However, there was still a second issue which was caused by the elevated internal temperatures. There was an insulating foam, lining the interior of the station. This foam was used to regulate the internal temperature, however, due to the micro meteor shield unexpectedly falling off due to aerodynamic forces, the internal temperature of the station reached temperatures that were enough to melt this insulating foam and decompose it. This not only caused problems with the
first crew with regards to creating optimal living conditions but also released toxic gas due to the foam, which required repressurization of the Saturn Workshop. The crew would also enter the workshop with gas masks to ensure their safety.

Fig.3. A drawn concept of Skylab with internals

In this diagram of the main components of Skylab (see Fig.3.), we can see both the interior and exterior of the station, most notably the Saturn Workshop, where most of the experiments conducted by the Skylab crews would take place. Be sure to note the comparison of this concept drawing (Fig.3.) to the actual pictures of the lab (Fig.2.). We can see the toll that the launch and unexpected problems had on the station, for in this concept diagram, both solar panels are attached.

Impact of Skylab

Skylab was the first time the United States attempted to stay for long periods of time in space. As stated before, the crews, as well as the engineers really, were learning as they went.
They faced a lot of problems and challenges, specifically with the insulating foam and heating issues. Despite this, they were able to push through, establish essential precedents, and collect important information about staying in space for long periods of time. Not only that, but it helped us learn how to solve problems in space, particularly regarding human health. We knew that there were specific issues that the human body would have to face, like the effects on the human cardiovascular and muscular systems, but we had no real clue what we were getting into. In the end, with the Skylab command now knowing that humans have the capability to stay in space for a long time (as we saw with the time progression with each crew), it has now allowed us today to carry out future missions beyond Earth with both confidence and experience. Skylab has set the foundation for these missions, like we see today with the ISS, and soon The Lunar Gateway.
Works Cited

