



A29.01 – Constructing a XPS foam Structure

Summary:

This activity is designed to provide the students with the basic knowledge and skills necessary to construct simple payload bodies and structures from extruded polystyrene foam (XPS) material. Each student will construct a simple cube payload box with a removable lid and then modify the cube to provide an inner instrument container, reinforcing and mounting structures.

Materials:

Each student should have the following materials and tools:

1. One 1.5cm thick section of XPS foam material (700 cm²)
2. One “razor” or Xacto knife and supply of replacement blades (~10 blades)
3. One roll of masking tape
4. One machinist’s or try square
5. One 12” metal ruler
6. One bottle of Polyurethane glue
7. One 2 ½’ by 2 ½’ hardboard cutting surface

The laboratory should also be equipped with the following:

1. Flat work tables sufficient to seat all students with plenty of work space
2. An assortment of metal straightedges of lengths from 18” to 36”
3. An assortment of clamps for holding a straightedge in place
4. (Optional) An assortment of DB connector, switches, power jacks for practice in mounting these components on the XPS foam.

In an alternating arrangement, students could work in groups of two. This would minimize the number of independent setups.

Procedure:

1. Students should review and know the contents of the “Payload Construction Considerations & Techniques” and “Constructing a Standard LaACES Payload Box” lectures prior to this activity.
2. Using the techniques described in the lectures the students should construct a single-walled cube of outer dimensions 11 cm x 11 cm x 11 cm with a removable lid.
 - a. Side walls should all measure the same dimensions (8cm x 9.5cm) and be assembled as the outer walls are in the “Constructing a Standard LaACES Payload Box” lecture
 - b. The base and removable lid should be constructed as they are in “Constructing a Standard LaACES Payload Box” and cover the entire top/bottom and include an internal lip to assure a tight fit. (Inner dimensions: 8cm x 8 cm, Outer dimensions: 11cm x 11 cm)



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3. Design, construct and install structural and component support members for the box. These structural members might include some of the following:
 - a. Triangular corner braces for the box
 - b. Stand offs to locate and hold components within the box.
 - c. Foam component shelving and/or dividers

Expected Outcomes:

1. Develop the technical skills necessary to fabricate the MegaSat payload structure.
2. Provide a basis for estimating the level of effort necessary to fabricate the MegaSat payload structure.
3. Identify the team members best suited for payload structure fabrication.

Issues:

1. Emphasize safety when handling the “razor” knives. In particular, everyone’s fingers (or other body parts) should be completely out of the way of the trajectory of a knife that slips. Clamps should be used to hold the XPS foam and the straightedge when cutting.
2. Emphasize precision. “Measure twice, cut once”
3. Examine and correct technique. Cuts should be done “lightly” in three passes with the knife blade against the straightedge as described in the lectures.