

# Chapter 5



## Pressure Hulls and Canisters

## Chapter 5: Pressure Hulls and Canisters

### Stories From Real Life: *Squalus* and *Thresher*

#### Chapter Outline

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| <ol style="list-style-type: none"> <li>1. <b>Introduction</b></li> <li>2. <b>Pressure</b> <ol style="list-style-type: none"> <li>2.1. Atmospheric Pressure</li> <li>2.2. Pressure Differentials</li> <li>2.3. Gauge Pressure Versus Absolute Pressure</li> <li>2.4. Pressure Units</li> <li>2.5. Devices for Measuring Pressure (and Depth)</li> <li>2.6. Calculating Hydrostatic Pressures Under Water</li> <li>2.7. Calculating Hydrostatic Pressures on Other Worlds</li> </ol> </li> <li>3. <b>Pressure-Related Forces on Submerged Objects</b></li> <li>4. <b>Basic Principles of Pressure Hull Design</b> <ol style="list-style-type: none"> <li>4.1. Size</li> <li>4.2. Shape</li> <li>4.3. Materials</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>4.4. Using Pressure to Advantage</li> <li>4.5. Choosing Canister Size and Single or Multiple Cans</li> <li>4.6. Pressure Canister Options</li> <li>5. <b>Calculating Pressure-Related Forces on Spheres and Cylinders</b></li> <li>6. <b>Constructing Leak-Proof Openings</b> <ol style="list-style-type: none"> <li>6.1. O-Rings</li> <li>6.2. Pressure Hull Penetrators</li> <li>6.3. Pressure Can Access</li> </ol> </li> <li>7. <b>Pressure-Compensation Techniques</b> <ol style="list-style-type: none"> <li>7.1. Oil Compensation</li> <li>7.2. Gas Compensation</li> </ol> </li> <li>8. <b>Encapsulation (Potting)</b></li> <li>9. <b>Adding a Card Cage</b></li> <li>10. <b>Chapter Summary</b></li> </ol> |
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#### Chapter Learning Outcomes

- Calculate the magnitude of the hydrostatic pressure-related forces acting on various parts of an underwater vehicle at any depth, in either freshwater or saltwater.
- Recommend effective shapes, sizes, and materials for pressure-resistant and leak-resistant hulls and canisters.
- Describe specific techniques for getting rotating propeller shafts, camera images, or wires through the walls of these containers.
- Describe relatively low-cost and easy-to-build yet effective designs for pressure canisters that can be used for small, unmanned vehicles diving to maximum depths of about 100 meters (approx. 325 ft).

**Figure 5.1.cover:**  
**Hydrostatic-Testing Deep Worker 2000**

*Southwest Research Institute prepares Deep Marine Technology's Deep Worker 2000 submersible for a hydrostatic pressure test. SwRI operates ocean simulation chambers with diameters up to 90 inches and pressures to 30,000 psi.*

Image courtesy Southwest Research Institute and Deep Marine Technology, Inc.