Chapter 5

Pressure Hulls and Canisters
Chapter 5: Pressure Hulls and Canisters

Stories From Real Life: Squalus and Thresher

Chapter Outline

1. Introduction
2. Pressure
   2.1. Atmospheric Pressure
   2.2. Pressure Differentials
   2.3. Gauge Pressure Versus Absolute Pressure
   2.4. Pressure Units
   2.5. Devices for Measuring Pressure (and Depth)
   2.6. Calculating Hydrostatic Pressures Under Water
   2.7. Calculating Hydrostatic Pressures on Other Worlds
3. Pressure-Related Forces on Submerged Objects
4. Basic Principles of Pressure Hull Design
   4.1. Size
   4.2. Shape
   4.3. Materials
   4.4. Using Pressure to Advantage
   4.5. Choosing Canister Size and Single or Multiple Cans
   4.6. Pressure Canister Options
5. Calculating Pressure-Related Forces on Spheres and Cylinders
6. Constructing Leak-Proof Openings
   6.1. O-Rings
   6.2. Pressure Hull Penetrators
   6.3. Pressure Can Access
7. Pressure-Compensation Techniques
   7.1. Oil Compensation
   7.2. Gas Compensation
8. Encapsulation (Potting)
9. Adding a Card Cage
10. Chapter Summary

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).