3. A Design Methodology for Underwater Vehicles

A **design methodology** is a time-proven sequence of stages and procedures followed to plan, define, design, build, test, and implement a specific type of system. The final segment of this chapter takes you, stage by stage, through a design methodology for underwater vehicles that will transform your ROV or AUV project from a nebulous idea in the back of your mind to a completed working vehicle that's in the water, doing the mission it was designed to do.

The methodology presented includes 10 stages:

Stage 1: Accepting the Mission

Stage 2: Crafting a Mission Statement

Stage 3: Identifying the Mission Tasks

Stage 4: Establishing Performance Requirements

Stage 5: Identifying Constraints

Stage 6: Listing Vehicle Systems

Stage 7: Generating the Concept Design

Stage 8: Fabricating the Vehicle

Stage 9: Conducting Sea Trials

Stage 10: Carrying out Operations

Stage 11: Evaluating Ops and Writing a Report

The first four stages are really about clarifying exactly what it is you are trying to accomplish with your design. Though many beginners are tempted to skip these stages because they don't sound like as much fun as drilling, sawing, and soldering, such clarification is absolutely essential. Without it, your design efforts will be unfocused and will result in an uncoordinated, poorly optimized design that may or may not be able to accomplish the tasks you want it to do.

Stage 5 helps you complete a realistic assessment of your available time, money, etc.

Stages 6 and 7 translate your project goals into a feasible design that is sufficiently detailed for you to evaluate whether or not it's consistent with your constraints. If not, this is where you decide whether to revise the design or abandon the project. (Most teams confronted with this decision simply revise the design, because they're having too much fun to abandon the project!)

Stages 8 and 9 are where all that preparation really pays off—the saws and drills start humming, sparks start flying, and a real-life ROV or AUV begins to materialize on the workbench. Sea trials confirm which parts of your design are effective and which ones need to go back to the shop for some design revisions or adjustments.

Stage 10 is where your completed vehicle finally goes to work, accomplishing the underwater mission(s) for which it was designed and built! Finally, after ops are complete, there's the important Stage 11 in which you evaluate the vehicle's performance, suggest improvements, and summarize everything in a glorious project report.