Engineers use this process to create solutions to problems. The basic steps are:

DEFINE THE PROBLEM

Defining the problem may sound easy, but it may take time to think through the situation. It is necessary to have a clear understanding of what the problem is that you are trying to solve. Identify any barriers that may limit your ability to solve the problem. These may include availability of materials or financial resources. What challenges exist? For example, when designing any ROV, engineers need to consider the vehicle's ability to withstand pressure.

GATHER RELEVANT INFORMATION

Researching a problem is an important step before beginning to design a solution. What is already known about the problem? This may involve Internet searches, field observations or consulting with others who have experience with a similar problem.

BRAINSTORM POSSIBLE SOLUTIONS

Often, a productive way to generate ideas is for people to work together to brainstorm. There are no bad ideas. The most "out of the box" idea, which may sound unlikely at first, may be a great breakthrough!

ANALYZE POSSIBLE SOLUTIONS AND SELECT THE MOST PROMISING

Team members compare different proposals for solutions. How well does each one meet the criteria for success? How well does each solution find a way to eliminate the identified barriers? The team then chooses the most promising solution to prototype and test.

TEST THE SOLUTION

Testing the solution often involves building models of simplified designs. This allows the team to be sure an idea will work before investing a lot of time and money to construct something more elaborate. This step is sometimes called prototyping or "proof of concept." If the prototype works, the designers will continue to develop their solution with the same materials and techniques. If the prototype does not work, then designers must go back to a previous step and consider solutions that use other materials and techniques.

REPORT RESULTS

Team members communicate results of their trials to colleagues to report on their successes or failures. This helps other teams to repeat results, modify the design, and avoid costly mistakes.

REPEAT TO REFINE THE DESIGN SOLUTION

This entire process may be repeated several times. The team repeats trials to improve the solution until results are satisfactory. For complex projects, these steps may be done by teams that work on different parts of the problem. An ROV might have a design team working on the video system, another team working on propulsion, and another responsible for electronics.

DEFINE THE PROBLEM → GATHER RELEVANT INFORMATION → BRAINSTORM POSSIBLE SOLUTIONS → ANALYZE POSSIBLE SOLUTIONS AND SELECT THE MOST PROMISING → TEST THE SOLUTION → REPORT RESULTS → REPEAT TO REFINE THE SOLUTION