Life Vest Challenge

Student Resource:
What is a Life Vest or PFD?

A personal flotation device (abbreviated as PFD; also referred to as, lifejacket, life preserver, life vest, life saver, cork jacket, buoyancy aid, flotation suit, etc.) is a device designed to help keep a person or animal afloat -- whether they are conscious or not.

In most of the world, lifejackets or life vests are now mandatory on airplanes that travel over water. These usually consist of a pair of air cells or bladders that can be inflated by triggering the release of carbon dioxide gas from a canister -- or can be inflated by blowing into a tube with a one-way valve to seal in the air.

Lifejackets are also provided on both recreational and commercial seafaring vessels -- so all crew and passengers can wear one in an emergency. Not only people wear personal flotation devices; some are available for dogs and other animals to wear. Most people are familiar with the story of the Titanic, which struck an iceberg a century ago -- many know there were not enough lifeboats on board to rescue all the people, but interestingly, there were enough life-jackets (see example on the right) for all the people aboard, and most everyone was wearing one. Of course, in the frigid water of the North Atlantic, the life vests alone were not enough to save many people.

Simple flotation devices are used by many children learning to swim, and can be a vest or arm "bubbles."

◆ History and Inventors

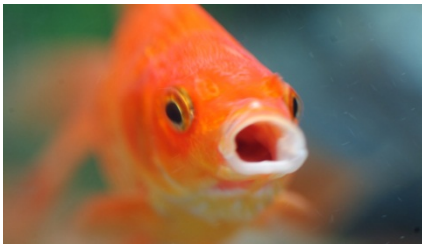
The most ancient examples of "primitive life jackets" can be traced back to inflated bladders of animal skins or hollow, sealed gourds, for support when crossing deeper streams and rivers.

Personal flotation devices were not part of the equipment issued to naval sailors up to the early 19th century, for example at the Napoleonic Battle of Trafalgar. Seamen who were press-ganged into naval service might have used such devices to jump ship and swim to freedom. It wasn't until lifesaving services were formed that personal safety of boat crews heading out in pulling boats generally in horrific sea conditions was addressed.

Purpose-designed buoyant safety devices consisting of simple blocks of wood or cork were used by Norwegian seamen. The modern lifejacket is generally credited to one Captain Ward, a Royal National Lifeboat Institution inspector in the United Kingdom, who, in 1854, created a cork vest to be worn by lifeboat crews for both weather protection and buoyancy.

The rigid cork material eventually came to be supplanted by pouches containing watertight cells filled with kapok, a vegetable material. These soft cells were much more flexible and more comfortable to wear compared with devices utilizing hard cork pieces. Kapok buoyancy was used in many navies fighting in the Second World War. Foam eventually supplanted kapok for "inherently buoyant" (vs. inflated and therefore not inherently buoyant) flotation.

◆ The Goldfish Club



In November, 1942, During World War II, C. A. Robertson was the Chief Draftsman at the United Kingdom's PB Cow & Co., one of the world's largest manufacturers of air-sea rescue equipment. He formed "The Goldfish Club" after hearing of the experiences of airmen who had survived a "ditching" at sea. The club was reserved for airmen who owed their lives to their life jacket, or flotation device! By the end of World War II, the club had 9,000 members from all branches of the Allied Forces. Find out more at www.thegoldfishclub.co.uk.

◆ Innovation in Life Jacket Design Competition

Each year, the U.S. Boat Association sponsors the "Innovation in Life Jacket Design Competition" to encourage and solicit innovative ideas to revolutionize the design of life jackets that the majority of average boaters might wear. In the most recent challenge, the first place winner was the "See-Tee," a design from Jeff Betz of the Troy, NY based Float-Tech Inc. This isn't Betz's first life jacket innovation - his company started as the result of a graduate school project that designed the firm's first non-traditional inflatable life jacket based on a foul weather coat. The Sea-Tee is a standard shirt that many water sports enthusiasts are used to wearing - but with a twist. It has a built-in inflatable bladder similar to most inflatable life jackets. Betz is careful not to call this a life jacket however, and simply refers to it as a buoyancy aid.

A team of high school students (Josh Jankowski and Nathan Karabon of St. Thomas More High School in Milwaukee, WI, USA) won third place! Their design, which marries traditional foam floatation in a modern inflatable configuration, is a result of their school's Pathway to Engineering curriculum that is part of the national "Project Lead the Way" program. Jankowski and Karabon's interest in designing a life jacket came from learning about the competition while doing research as part of their senior research project. As the youngest participants in the competition, the duo surveyed boaters and researched designs to come up with their prototype. Jankowski and Karabon took home a $500 prize awarded by the BoatUS Foundation. Find out more at BoatUS.com/foundation/winners. Plans for the next round of the design competition are already underway!

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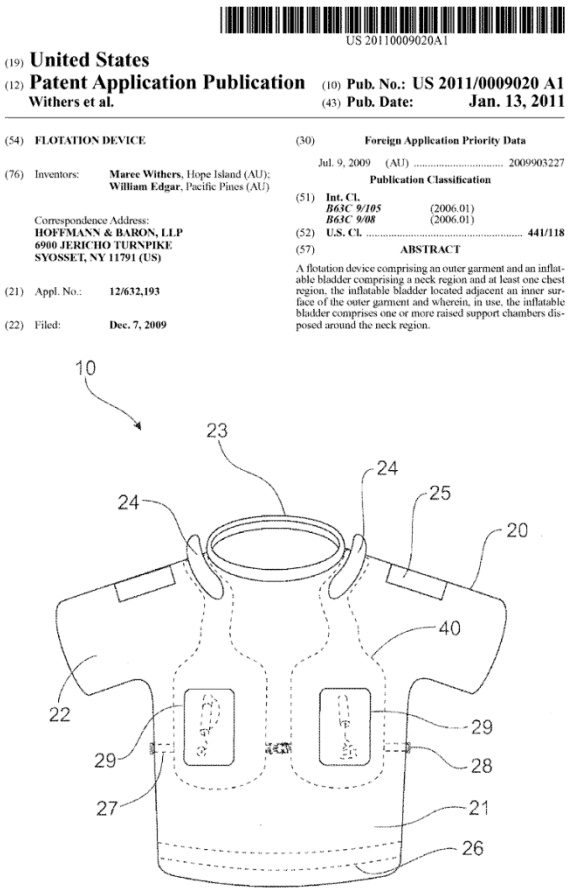
Student Resource:
Intellectual Property and Patents

A patent is a form of intellectual property. It consists of a set of exclusive rights granted by a sovereign state to an inventor for a limited period of time in exchange for the public disclosure of an invention. The procedure for granting patents, the requirements placed on the patentee, and the extent of the exclusive rights vary widely between countries according to national laws and international agreements. Typically, however, a patent application must include one or more claims defining the invention which must meet the requirements such as uniqueness. The exclusive right granted to a patentee in most countries is the right to prevent others from making, using, selling, or distributing the patented invention without permission.



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(54) **FLOTATION DEVICE**

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(57) **ABSTRACT**

A flotation device comprising an outer garment and an inflatable bladder comprising a neck region and at least one chest region, the inflatable bladder located adjacent an inner surface of the outer garment and wherein, in use, the inflatable bladder comprises one or more raised support chambers disposed around the neck region.

The image to the right shows a current patent for a personal floatation device that really looks like a shirt and contains air bladders which can be blown up in an emergency. One of the reasons some people don't wear PFDs when they should is because they don't like how the safety devices look -- or they consider them too bulky or uncomfortable. The inventors of this PFD designed it to look like a regular shirt on the outside, and then adapt to a safety device when needed -- so boaters, for example, wouldn't mind wearing it.

The inventors described their PFD as "A flotation device comprising an outer garment and an inflatable bladder comprising a neck region and at least one chest region, the inflatable bladder located adjacent an inner surface of the outer garment and wherein, in use, the inflatable bladder comprises one or more raised support chambers disposed around the neck region." By having a patent, the inventors are assured that they will be protected should someone steal their idea and try to manufacture and sell the new PFD design.

Because a patent requires public disclosure of an invention, more information about this patent can be viewed online at the US Patent Office website (http://patft.uspto.gov/) by searching for Patent # 20110009020.

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Student Worksheet:

◆ Engineering Teamwork and Planning

You are part of a team of engineers given the challenge of developing a personal floatation device (PFD) or life vest out of everyday materials that can provide enough support to float an unopened can of soup or vegetables for at least one minute. There are some rules:

1. The device must be in one attached piece and able to be affixed to the can within a 20 second period
2. Some part of the can itself must be touching the water.

◆ Research Phase

Read the materials provided to you by your teacher. If you have a life jacket or vest at home take a look at the design and consider the materials used in manufacture. Also consider all the materials provided by your teacher and how they might be used to create a system that can be quickly attached to the can -- in 20 seconds.

◆ Planning and Design Phase

Draw a diagram of the PFD you will build for the can…be sure to make a list of all the materials you will need for the construction phase.

Materials you will need:

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Student Worksheet (continued):

◆ **Presentation Phase**

Present your plan and drawing to the class, and consider the plans of other teams. You may wish to fine tune your own design.

◆ **Build it!**

Next build your PFD. You can practice putting it on and taking it off the can so you are within the 20 second limit, but you'll only have one chance to test it -- under the supervision of your teacher. During the building phase, you may share unused building materials with other teams -- and trade materials too. Be sure to watch what other teams are doing and consider the aspects of different designs that might be an improvement on your team's plan.

◆ **Test it!**

You'll test your PFD along with other student teams and earn points in the grid below.

PFD on can within 20 seconds? Yes 30 points No 0 points	Float time: 1 minute: 70 points 45 seconds: 45 points 30 seconds: 30 points 15 seconds: 15 points Never floats: 0 points	Total Score?

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Student Worksheet (continued):

◆ **Reflection**

Complete the reflection questions below:

1. Were you able to design a PFD for the can that you could put on the can in 45 seconds? Was this part of the challenge harder than you thought? Why or why not?

2. Did you redesign your PFD after presenting your drawing to the class? Why or why not?

3. How similar was your final drawing to the actual PFD your team built to support the can?

4. If your team found it needed to make changes during the construction phase, describe why the group decided to make revisions.

5. Which PFD in your class worked best? What was it about that design that made it superior?

6. Do you think that this activity was more rewarding to do as a team, or would you have preferred to work alone on it? Why?

7. If you could have used one additional material (tape, glue, wood sticks, foil -- as examples) which would you choose and why?

8. Do you think your design is scalable? Would it work efficiently if it had to float a brick or a bicycle? Why or why not?