



Suit Up for Takeoff!

BACKGROUND

Woven fabrics made from different polymers—chemical compounds that consist of repeating structural units—are used in a variety of clothing products. These fabrics are also used for special environments such as jet flights and space exploration. Fabrics used for a special application need to exhibit specific properties that make the fabrics safe and appropriate for use in that application.

BACKGROUND

Today, you will be evaluating several samples of polymer-based materials for their suitability as a flight suit! First, in your team, you will prepare samples for testing by simulating specific environments and processes (freezing/thawing, heavy rain, and sand abrasion) on three different polymers. Run your tests for 20 minutes, and then share your samples with the other teams. Each team will then test each of the three samples in a tensile strength test unit and write down the results for each of the samples.

After the final tensile strength test, share your tensile strength data with the other teams. As a class, decide which material would be the best choice for a flight suit. You can choose to use more than one material. For example, one material might be fine as an inner layer but not an outer layer. One material might be more comfortable than another. These are all things that you should consider when choosing the material for the flight suit.

MATERIALS

- Two 20-gallon glass aquariums with lids
- Ten each of 8"-square samples of high-grade woven DACRON®, Kevlar®, and polypropylene fabric
- Scissors
- Hole punch
- Six feet of heavy gauge wire to suspend samples
- Epoxy to "fix" the wire in the aquarium
- One 20-lb bag of light-grit sand
- Two small high-speed fans
- Small freezer
- Empty plastic gallon jugs with perforated lids to hold water
- Tensile strength tester
- Safety glasses for all students

1. Set up each sample one at a time in the tensile strength device. Run the test according to the instructions provided by your teacher.
2. Write the results of the test for each test fabric in the table below. Include any observations of the fabric.

Freeze/Thaw

Fabric	Tensile Strength	Observations
DACRON®		
Kevlar®		
Polypropylene		

Hard Rain

Fabric	Tensile Strength	Observations
DACRON®		
Kevlar®		
Polypropylene		

Abrasion

Fabric	Tensile Strength	Observations
DACRON®		
Kevlar®		
Polypropylene		

3. Which fabric would you recommend for use in a flight suit? Use your data to explain why.