**Date: Fri, Jan 15, 2010 at 8:51 AM**

**Subject: Scholes cabin 5 (P): Splicing**

Dear Stirling,

Sandy showed me how to splice a new end onto the cord we trail the UCTD probe from. It is important to do it right, because if it breaks, R50 000 go down to the ocean floor! The cord is a thin braided rope made out of Kevlar. You don't tie a knot in it - you splice an 'eye' (a little loop) into the end and that makes a lark's head knot around a stainless steel ring on the probe. A splice is the rope woven back into itself. If it is properly done, it is even stronger than the rope alone - since the rope is effectively doubled at that spot. A splice is easy to do on a hollow braided cord. You thread a special crocheting hook down the middle of the rope, grab the loose end, and pull the rope back into itself. The harder you pull, the tighter it grips! In this smooth line the splice looks beautiful, just like a slinky scaly snake.

As you know, I have always loved ropes and knots. I enjoy watching the crew, who tie knots all day. Some of those knots are ancient, because no better way of tying things together has been found. There are special people called riggers, whose job it is to fasten the cargo in the hold, and the slings on the cranes and the ropes that hold things up. It seems simple (and it is, really) but you need to understand some rules that involve basic physics.

The first is vectors. I learned it the hard way, when a foofey-slide I built when I was your age broke on its first use. Luckily nobody got badly hurt. I could not understand why it snapped - I knew that rope was strong enough to take a person's weight! But when I stretched it nearly horizontally between two trees and then hung on it, it snapped immediately. What was going on? The answer was that the downward force of the boy hanging on the rope was being multiplied many times as it was translated into the near-horizontal force acting lengthways on the rope. My scoutmaster Sparks explained it to me.

Make a sketch to see how it works. Draw two tree trunks, which we will assume don't bend. Draw a rope stretched between them in a shallow V-shape, because there is a boy, weighing say 50 kg, hanging on the middle. The force on the rope is (50 kg) x (length of rope from boy to tree)/(distance rope is pulled down by boy)/(2). [The divide by 2 is because there are two bits of rope supporting the boy - one in one direction, and the second in the other direction]. So if my rope was 20 m long, and it sagged in the middle by 1 m, the equivalent pull on the rope was 50 x (20/2)/1/2, which work out as 250 kg. No wonder it broke! And the tighter I pulled the rope, the more likely it would be to break, because the sag would be less!

The second principle to remember is that the strength of a knot depends on how sharp a corner it has to bend around itself or the thing you are tying it to. All knots weaken ropes, rather than strengthen them like the splice, but by different amounts. The reef knot and the double fisherman's knot, which you know, have relatively gentle bends - that is why they are good knots. The weak point on my UCTD is not the splice, but the lark's head (a basic double loop - look it up in one of my books), because the steel ring is too small in diameter. They should really fix that.

We are moving back to the fuel pumping station on the ice shelf. That must mean that the tanks are back from SANAE IV. Another day and we could be out of here!

Love,

Dad