U-SIT And Think News Letter - 30

Updates and Commentary

Unified **S**tructured **I**nventive **T**hinking is a problem-solving methodology for creating unconventional perspectives of a problem, and discovering innovative solution concepts, when conventional methodology has waned.

Dear Readers:

- Diversions in the last two mini-lectures took us away from the drinking vessel problem. In this issue, we return to the drinking vessel problem and address Professor Nakagawa's fourth query.

1. USIT – How to Invent: the USIT textbook.	$44.50
2. USIT – an Overview	FREE

3. Mini USIT Lecture – 30

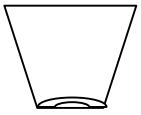
"USIT – an Alternative Method for Solving Engineering-Design Problems"

Continuation of **How to Invent** …

Recap of Mini USIT Lecture 27
In mini-lecture 27 the center-of-gravity attribute was addressed and three solution concepts found.

> [CAF6]: Center of gravity above half height is characteristic of a truncated-cone design and increases probability of tipping.

Mini USIT Lecture 30
In this lecture I'll examine the "oilcan" bottom attribute.

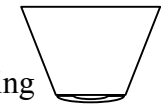


> [CAF7]: An "oilcan" bottom (concave shape) attribute has the apparent function to eliminate a convex bottom that could increase probability of tipping and spillage when resting on a flat surface.

Oilcans are noted for concave/convex bottoms that have two stable states, fully convex and fully concave. Children's toys have used a concave/convex-shaped thin, metal disk to create an entertaining sound when the button is pressed and caused to "pop" to the other state. Another toy is a simple metal disk that is first buckled into one state and then dropped on the floor causing it to revert to the other state as it leaps from the floor converting its strain energy into kinetic energy.

A contrarian view looms: This two-state buckling phenomenon brings to mind a vessel that could be

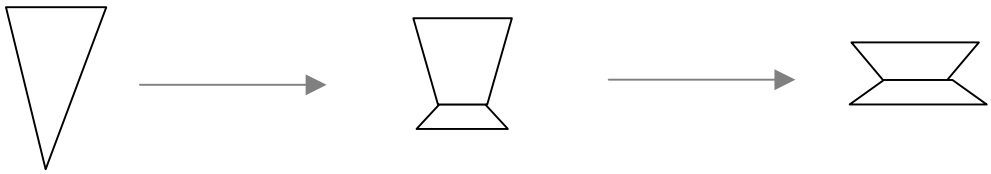
"clamped" to any smooth surface by taking advantage of an unwanted convex bottom.



SC17 Form a vessel with an elastomeric rim around its base and a convex bottom. On pressing the vessel's convex bottom against a smooth surface, the oilcan bottom will instantly invert to a concave shape and the vessel will become "clamped" to the smooth surface – as with a "suction cup". Clamping occurs as air is excluded and the entrapped cavity's pressure drops by its sudden expansion.

SC18 This suggests a two-part system of vessel and saucer. The saucer would serve as a portable base that gives the vessel stability when not being used, as when resting in a moving automobile. A capped, drinking vessel with its convex bottom could then be brought to the awaiting base, clamped into place on buckling of the convex bottom into its concave state. When used for drinking, the base would travel with the vessel to the drinker's mouth and back to its resting place.

Now I wonder if convex-to-concave shape change could be simplified; say, by eliminating the buckling phenomenon. This leaves shape change without two specific states of strain – perhaps, a continuum of shape change. A cup made of telescoping segments comes to mind – a known concept. One easily visualizes a continuum of shapes from a cone to a squat, truncated, double-ended cone. That generates an idea.



SC19 A cone for serving children's dessert, such as ice cream, when empty could be pressed into the shape of a toy, a yoyo. Given the degree of freedom of reshaping a vessel, children would find multiple shapes and entertaining applications.

****** To Be Continued in the next USIT Newsletter ******

4. Classroom Commentary

Nakagawa Query #4 (In reference to the "messy newspaper ink" problem.)

> Your way of thinking and explaining the problem is often very abstract. Especially, you sketch the system as the three layers with straight-line interfaces. [See NL_05] The other extreme would be a picture taken by an electron microscope. What do you think considering (or more or less speculating) the details of the inner structures of paper and ink? Consideration of such a concrete image affects the process? Should we avoid such kind of concrete image, so as not to be restricted to the current specific case?

This, as usual for Professor Nakagawa, is an interesting question. It goes to the heart of any metaphor for representing the contact of two objects. I'll begin by answering the question in the last sentence above.

No!

Why? …

Always begin problem description with a comprehensive view of the problem situation that satisfies your technical ability and your intellectual curiosity. Then begin the process of simplification with a goal of discovering a single, unwanted effect. Key to this process is the reduction of the number of objects, preferably to two objects. When this state of problem description is reached, you will have established a single, unwanted effect between two objects, two causal attributes and one affected attribute with, possibly, a third object. Now follows what I find to be the most interesting, challenging, and insightful step in problem solving *a la* USIT. We are challenged to describe the points of "contact" or interaction of two objects in terms of causal attributes that effectively rationalize (make comfortable to reason) one's understanding of the unwanted effect. (*)

In the case of the messy newsprint ink there are several points of contact between the same two objects. For example, an area of contact between ink and paper may incorporate tiny pockets of air. Where there is no air, and ink is in direct contact with paper, we can consider the inhomogeneity of both ink and paper. Ink, consisting at least of color particles and a fluid carrier, and paper, consisting of several kinds of particulate, allow different properties at each point of contact. Where air pockets exist there are two interfaces that can be described as "points of contact": air-to-ink and air-to-paper. Each point of contact can be represented metaphorically using a straight line between two rectangles. This done, we now focus on describing the role of causal attributes deemed to be relevant to the unwanted effect at each point of contact.

Of course, depending on the interest and ability of the analyst, points of contact can be carried to the atomic level. This is conducive to considering physical and chemical bonding effects and their dynamics.

The greater is the depth of analysis, the greater is one's understanding, and the greater is the relevance of the analysis and expected value of solution concepts.

(*) The theory underlying this process of creating metaphors is discussed in my new book, "Heuristics for Solving Technical Problems – Theory, Derivation, Application".

8. Other Interests

I expect to have the new book, "Heuristics for Solving Technical Problems – Theory, Derivation, Application", available for free on the USIT website within days. A little bit of PHP script needs completion and testing to support automated mailing.

Regarding inquiries about ordering the book, "Unified Structured Inventive Thinking – How to Invent", details may be found at the Ntelleck website: www.u-sit.net. The cost of the book is US$44.50 plus shipping and handling. See the website for S/H charges. Send a check made out to **Ntelleck, LLC** for the proper amount, drawn on a US bank, to

Ntelleck, LLC, P.O. Box 193, Grosse Ile, MI 48138 USA

Please send your feedback and suggestions to Ntelleck@u-sit.net and visit www.u-sit.net

To be creative, U-SIT and think.