Four Uses of the SOT:

1. As a pedagogical instrument in a university tribology course.

- It introduces the aspects of driven rolling motion that are present in an angular contact ball bearing.
- The elementary behavior of solid lubricants graphite and MoS2 in terms of their response to humidity can be demonstrated.
- The independence of CoF on load -Amontons law – can be demonstrated.

2. As an object of research in contact mechanics.

- To understand the velocity deficit in orbital speed discovered in the original Pepper, Kingsbury and Ebihara NASA Technical Paper 3629.
- To complete the understanding of *all* the forces on all the triboelements in the scrub - present understanding is incomplete.
- To go beyond the original KL Johnson analysis from 1958 & 1959 and obtain an explicit expression for the spiral's pitch as a function of the load, CoF, diameter of the ball and elastic constants of the ball and plates.

3. As an engineering instrument that provides credible simulation of lubricant behavior in angular contact ball bearings used in space mechanisms and thus to rank organic lubricant lifetimes as a function of material chemistry and environment.

4. As a research instrument for fundamental tribochemistry studies of organic lubricants as a function of material chemistry and environment.

The use of the SOT in 1 & 2 does not require the strict environmental control necessary for 3 & 4. To this end, a version of the SOT can be constructed without vacuum capability, but whose tribological elements can be operated in a purged environment that offers some simple control of the humidity and oxygen concentrations. The other operational aspects of this bench type version are all the same as those of the full vacuum version.