PROPOSAL FOR THE LIFE SCIENCES ACCELERATOR PROGRAM – March 2009

Name: **Timothy Moutafis, CEO**

Organization: **Smart Surfaces, Inc.**

Address: **15 Ward Street, Somerville, MA 02143**

Contact Information: tmoutafis@smartsurfacesinc.com **Phone:** **781 799 9705**

I. Overview of Product

Smart Surfaces**,** Inc. (SSI) is a medical device company developing a Reactive Mattress for the control and prevention of pressure (decubitus) ulcers. Despite the wide variety of commercially available mattresses, none have solved this major problem, which represents a $1.5 billion and growing market.

Pressure ulcers result from the pressure of body protuberances against the mattress (interface pressure) caused by the patient's own weight while lying motionless in bed for extended periods. In principle, pressure ulcers are preventable; but the lack of effective, low-cost mattresses and the shortage of health care workers make it difficult to control this problem.

SSI's patent-pending technology for a therapeutic, air-powered mattress is designed to achieve the lowest interface pressure possible between mattress and patient. It will react and adjust to the patient's position and weight to maintain this equilibrium.

The chief design element of this system is an array of inflatable diaphragms that replace the spring elements of a conventional mattress. In a normal mattress, the support force increases as the mattress is compressed, resulting in an increase of interface pressure that makes bony and prominent areas vulnerable. SSI's diaphragms are designed to apply constant upward force as they are compressed. Figure 1 compares the typical behavior of spring and foam mattresses to that of the SSI's prototype. These charts demonstrate how SSI's technology is uniquely able to limit contact pressure and suggests the possibility that this product may prevent pressure the onset of decubitus ulcers by preventing pressures that exceed the critical 32 mm Hg contact pressure (Venous Pressure).

Each diaphragm is mounted to a post that protrudes above the base of the mattress and is configured to roll over itself as it is depressed to maintain uniform upward pressure (see Figure 2). These diaphragm modules act together to support the patient but are individually and automatically adjusted in response to patient position to minimize stress. (see Figure 3)

The mattress will be produced in several sections: each consisting of several hundred diaphragm modules individually mounted on posts that project them above the base. A manifold system integrated into the base establishes a pneumatic pathway between the diaphragms and the air source. An external controller is used to actuate individual pressure switches which open selected pathways to the diaphragms in response to patient movement, to maintain the equilibrium of pressure. Each section is surrounded by foam guards on the edges to contain the modules and maintain the shape.

This modular design will increase portability of the units, enable easier implementation of economical production processes and improve design flexibility to facilitate incorporation of future design features.

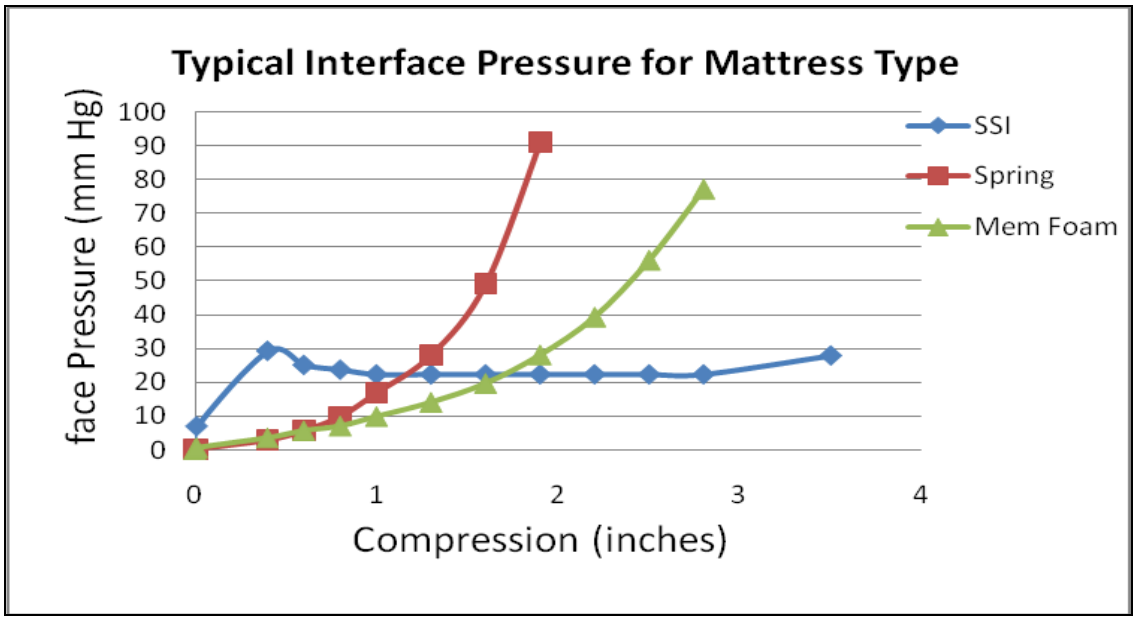

Figure 1: Pressure as a Function of Compression Curves for SSI's mattress versus Spring and Memory Foam

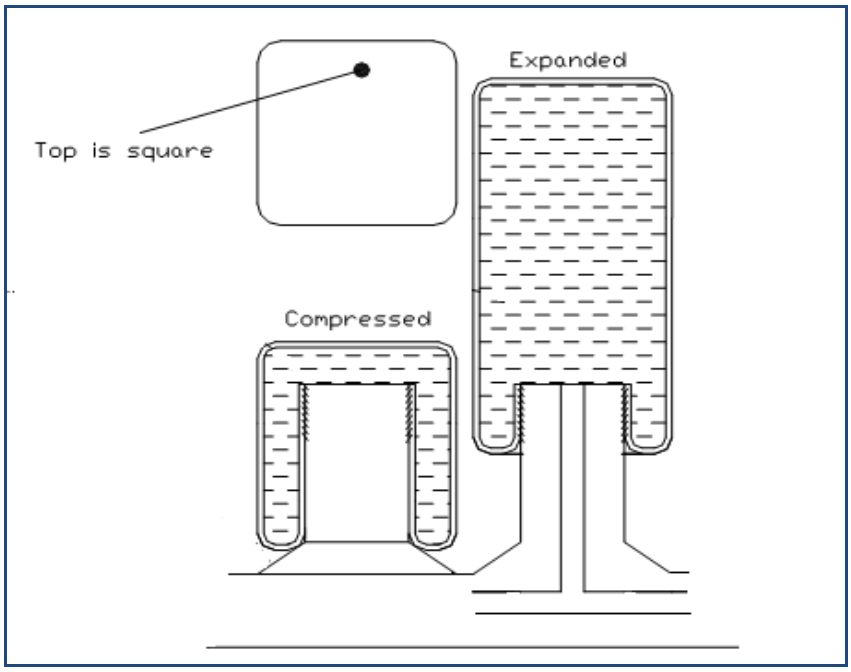

Figure 2: The Rolling Diaphragm

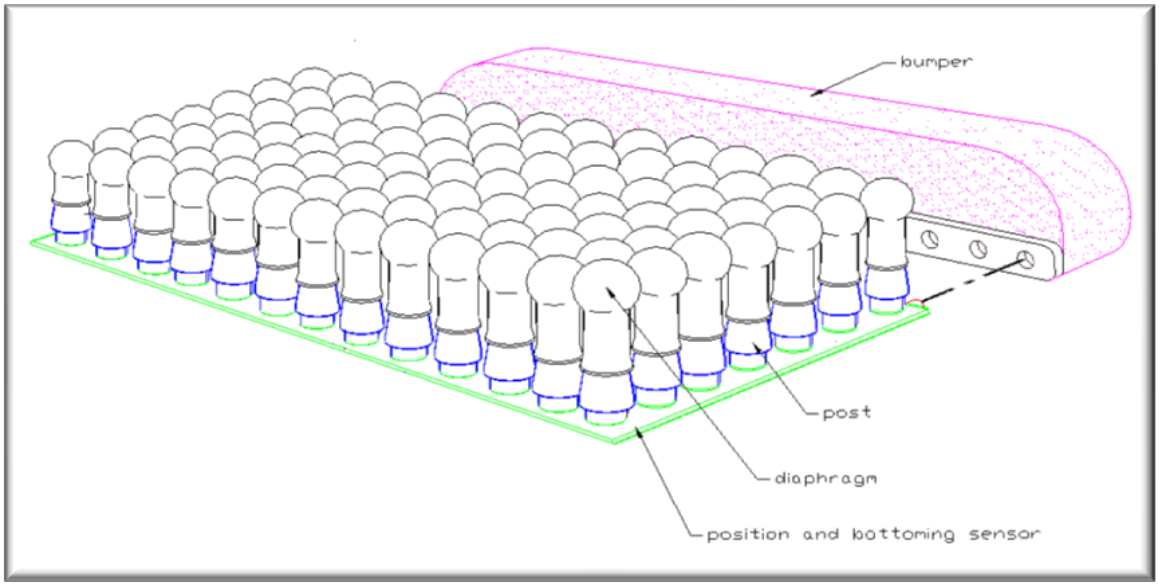

Figure 3: Schematic of SSI's Array of Patent-Pending Air Modules

II. Medical Significance

Pressure ulcers are a major healthcare problem: occurring in about 15% of the hospitalized population. About one million people are affected each year in the US alone. Direct and indirect costs, including liability, are estimated to be $50 billion per year in the US.

The mechanism that causes pressure ulcers is well understood. In elderly patients or those with existing vascular disease, localized pressure for periods as short as several hours may lead to localized necrosis. This tissue is particularly fragile and tears as a result of the shear forces exerted by most mattresses. These injuries heal very slowly once they occur and it is an ideal environment for infections. When ulcers progress, they are particularly difficult to treat and many patients who are immobilized for extended periods face a greater threat from pressure ulcers than their underlying disease .

Although widely considered preventable, the healthcare system as a whole is stressed by the chronic shortage of healthcare workers to address preventative care and the availability of an economical, yet effective, low pressure surfaces. This problem will continue to mount as the population ages and pressures on cost containment increase. Although there are a number of high-performance specialty beds, they evolved during an era when hospitals were paid incrementally for treating complications so they are prohibitively expensive to implement in large quantities.

To make matters worse for providers, last year CMS ceased reimbursement for costs associated with treatment of pressure ulcers that occur in the hospital setting.

SSI's solution will address these problems by providing a mattress replacement that will compete with expensive specialty beds in performance but at a price that compares with current mattress replacements.