3S: Smart Air Suspension System

Sponsors: Matthew Swenson, UI Mechanical Eng. and **George Tanner**, UI Entrepreneurship

Background:

The sponsors have developed a novel trailer suspension system. The concept utilizes a first-class lever coupled with a pivoting axle to create a uniform suspension which balances each side of the trailer. This configuration negates the need for individual solid axles and independent leaf spring or Torflex™ suspension systems, offering several distinct advantages. The suspension springs on each side of the trailer work together, ensuring any response will not allow the trailer to lean on one side, resulting in greater load stability. To date, the team has designed single-axle and tandem-axle configurations using spring suspensions and built a prototype of the 2000 lb. capacity single axle design (Fig. 1).

Figure 1. Single axle trailer with 3S suspension system.

Objective:

Design a solution to replace the suspension springs with a controlled system, enabling the trailer to be raised or lowered via operator input and enabling the suspension system to smartly "adapt" to uneven loading.

Scope:

Create a "Proof-of-concept" design that includes the following:

1) Recommended components (air bags/cylinders, controllers, sensors, etc.)
2) Proposed system layout and assembly on a typical trailer configuration
3) Draft Drawings, BOM, and Manufacturing plan to build a prototype system.
4) Source components and assemble and test a prototype system on the pictured trailer

Notes:

The budget for the project will be ~$500 for prototyping purposes. More money can be available if the project can justify it. Pitch us a good idea!

One Possible Approach:

1) Source an air tank kit, similar to this: Amazon.com: Viair 10000 Onboard Air System : Automotive
2) Identify and source airbags/cylinders to replace the springs, possible like these this: Amazon.com: Vixen Air 1/2" NPT Single Air Port Suspension Air Spring/Air Bag Dual Pack VXD2500DP : Automotive
3) Identify an accelerometer that can sense any “lean” in the trailer
4) Use an Arduino (or similar) to “control” the system using feedback from the accelerometer(s) to fill one side and/or defill the opposite side airbag.

You may come up with a better idea, so please don’t feel restricted to this direction.