

## European Study Group with Industry ESGI 73 Problem 5

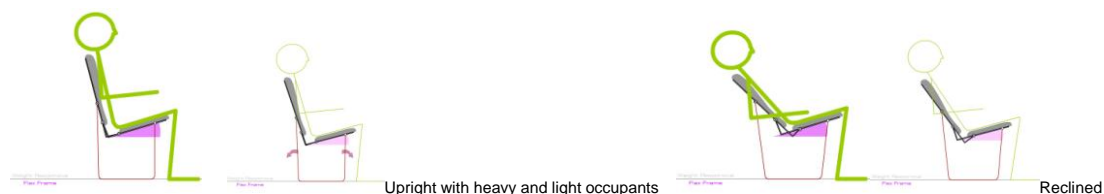
### A Neutrally Stable Virtually Pivoting Chair

#### Problem:

We all sit in 'Office Swivel' chairs, an 'intuitive' solution has been developed to make the experience more comfortable (using the occupant's mass rather than springs) but its effectiveness is difficult to quantify. That is, when sitting and leaning back the occupants mass balances with the force applied to the chair back by raising the seat, as opposed to the traditional approach of compression springs. In addition, the movement of the seat acts as if there was a virtual pivot, which represents the natural human hinge point, the hip, and ensures complete contact/support for the occupant during the reclining cycle with associated back support benefits.

Empirical data suggests that the mechanism achieving this works for a wide range of heights and masses, but a more rigorous analysis has not been performed. Can a model be developed to consider what 'Human' percentile will receive the same effect as they recline and return to neutral rest; is the current geometric 'setup' a true reflection of the forces in play, or could this geometry be altered to achieve a more efficient result?

There are also frictional forces in the mechanism to consider, their interaction with the process is again not fully understood, and can be altered during manufacture. Consequently, can controls be added to the chair to increase, or decrease, the effects experienced by the occupant in a desirable way i.e. by altering friction or the geometry of the mechanism? Note, 'Core Stability' can be improved by making the occupant 'work' to return to an upright position, so it is not necessarily true that the best chair is one where the least effort is required).



The mechanism has been in development since 2004, and there various references to help explore the problem. Physical examples of the chair and mechanism will also be available during the Study Group for investigation.

Please download the 'zip' file from the following URL/Ftp site (copies will also be provided on CD during the Study Group):

[www.61-54design.co.uk/downloads/VP-MT-Compact-2010.zip](http://www.61-54design.co.uk/downloads/VP-MT-Compact-2010.zip)

#### Contents:

- AVI shows the dimension changes during the 'recline' cycle-[VP-MT Compact Line Geometry](#)
- Anthropometric and mass data- [450883/HFDGCh14/Ergonomic\\_modelsof\\_anthropometry\\_human/antropometrija](#)
- Presentation of 'Hip Pivot' idea-'Motion Presentation'- [Motion Presentation](#) Use the flash player if you have not got it installed
- My conceptual brief to my 'Patent Lawyer'-[Mechanism to aid body support](#)
- Sales 'USP's' document-[Chair motion draft](#)
- First 'Patent' application-[Variable Configuration Seating](#)
- AVI of a chair using the mechanism-[VP - MT Compact - 6 2010](#)
- AVI of the latest mechanism-[VP-MT Compact 2010](#)
- AVI of the sample/prototype mechanism (available at the presentation) - [VP-MT Mk10-14-07-2009](#)
- General arrangement drawing of the 'Compact' option-[VP-MT Compact-2](#)