ERGO-LINK SEAT REFERENCE POINT SET UP TIPS:

- The Seat Reference Point (SRP) is used on the ergo-link mannequin as an alternative to the "H Point" used for designing seats and interiors for automobiles and other vehicles. The rationale for using the SRP and not the "H Point" is that the digital mannequins are intended to set up the workstation human fixed hip position, and not to design the seat. Seat selections vary significantly dependent on the workstation requirements including for vibration, erect or reclined seating, long seating sessions, etc., and therefore the "H Point" location without specific seat data is a variable.

- The SRP is defined as the intersection of the seat back and seat pan intersection and human interface (including body weight, and seat pan and back compression factors on seats that have cushioning or padding). Locating the SRP in space locks essentially "fixes" the mannequin to a 0.00 position, or to an "anchor point" in space, in a vehicle or workstation from which the hip and all connected body parts can be adjusted or articulated.

- In an existing vehicle or workstation which includes a foot control such as an accelerator, brake, or a foot switch, the heel point should be initially "fixed" to that position. Subsequently the SRP can then be "fixed" with the accommodation of a comfortable foot, leg, thigh, and hip angles in the X, Y, and Z planes dependent on the workstation, and applicable seat type/height/configuration. The foot to calf angle should be 100 degrees (relaxed/normal position). In the top view, the foot has a normal angle of approximately 10 degrees outward at the ankle. The thigh and leg angle is variable dependent on stature, the seat contour, back angle, fore-aft location and height requirement for applicable vision access, and normal reach to primary or essential controls. Use the normal & extended reach envelopes in "Transparent Mode" which move with the torso for reach evaluation. Once anchored, the Ergo-link Mannequin articulation to accommodate "standard" accelerator positions, footbrake, and other controls is simple and intuitive to complete.

- Seats are often designed for specific workstations that require greater vertical travel than an automobile. An example of a seat that must allow for thighs to rotate to negative angles from the SRP is a motorcycle configuration. The leading edge of the seat is narrow, and the seat is a generally a triangular shape. This allows the user to lower his/her feet to the ground while seated to support balance when stationary.

- Another example is a military turret seat which must travel vertically from a range of an "open hatch" mode (semi-standing), or significantly down in the "closed hatch" periscope position (and "detented" to several positions in between). A triangular shape allows the commander or gunner to stand while stable and supported in the buttock area without upward knee or leg interference with controls such as a joystick or yoke to rotate the turret which are can be utilized in either position. This is similar to the design of the adjustable desk which is for selective seated or standing user interface.

Setting up the SRP on a mannequin:

- The torso SRP is parallel to the frontal torso plane, and tangential to the back of the torso. The X plane (side view) SRP is at the base of the hip. The intersection of these two angles is the SRP at the Z plane centerline. This is where a sphere is formed using the revolve command.

Setting up the SRP on the seat:

- SRP location on seats without pads are simple to determine, but padded or seats with cushions require testing or estimated compression due to weight & dynamic factors. Allowance for weight is necessary for seats that are padded or cushioned due to SRP downward and rearward.
- Stature and the mean can be used as the baseline for weight (i.e. NATICK percentile averages).
- For cushioned vehicle seating (45 lb. density foam cushion) with a 95th male, allow approximately 3/4 inches on the pan, and ½" on the back…not an absolute, but a reasonable assumption for locating the SRP on an anthropometric concept layout.
- A 5F is approximately one half that of the 95M.
- Per NATICK Labs, the 95M weight is 244.05 lbs. (110.7 kg), and the 5F weight is 113.10 lbs. (49.9 kg). CG is generally at mid lumbar torso area.
- Remember, you are designing the workstation, not the seat which can be significantly varied. Studies on seating are complex, dependent on workstation function, cushion density, each layer density, and are designed to the specific criteria including predicted time in seat, and dependent on the type of vehicle/aircraft or static workstation.
- If you have the seat, test the density using cursory weight evaluation methods for evaluation. Maximum weight compression is at the buttocks toward the SRP.

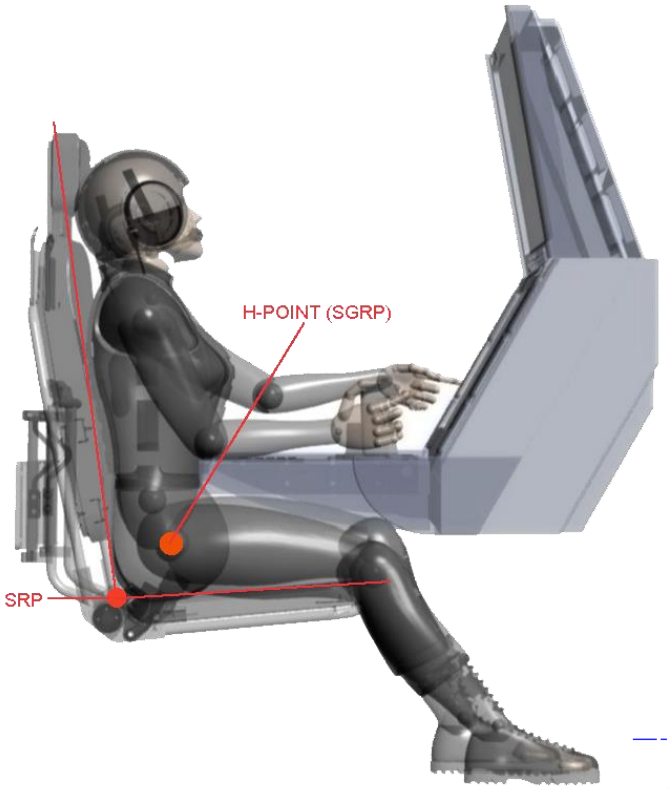
Mating the mannequin to the SRP: (Use mouse right click "Fix" and "Float" to adjust all body parts to desired position)

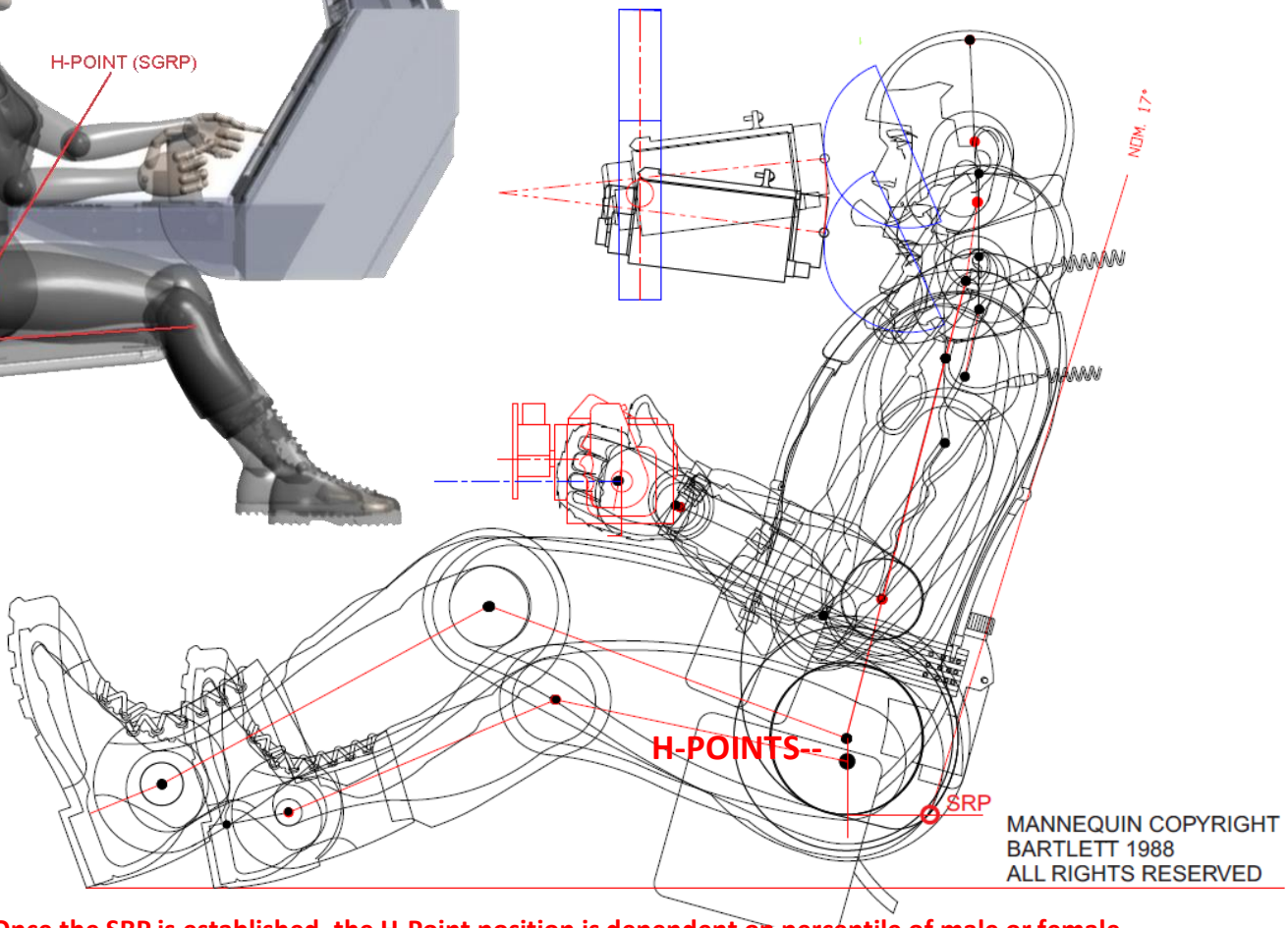
- Mate the SRP spheres (mannequin and seat).
- Once mated, you can still rotate the hips in all directions from the sphere "anchor".
- When hips are "fixed" you can then float and rotate the other limbs, torso, head, etc.
- Determine torso angle, and then "fix" the torso.
- Set or "Fix" all other body parts as desired.

IMPORTANT NOTE: The SRP and SGRP are not the same.

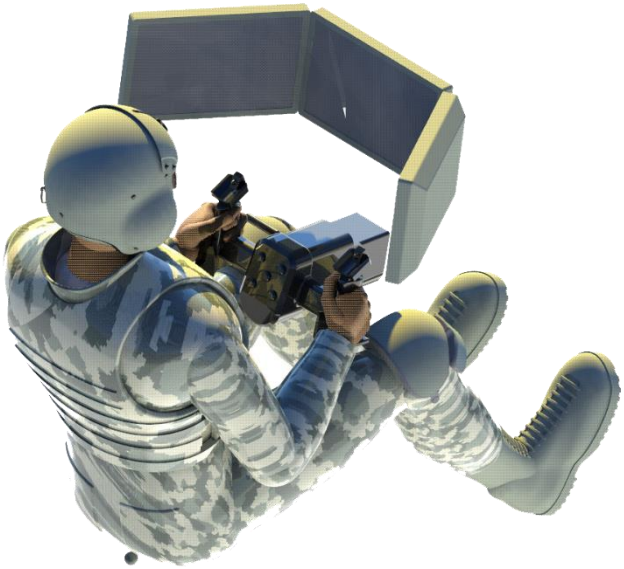
- The **SGRP is the H-POINT**. The H-Point is the point of rotation of the leg which on the Ergo-link mannequins is the sphere location of the thigh and hip in side view, but centered on the hip in the front view.

- The SRP is the intersection of the seat back angle and the seat pan angle which is referenced on the mannequin as stated above. See image below.





Once the SRP is established, the H-Point position is dependent on percentile of male or female.



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