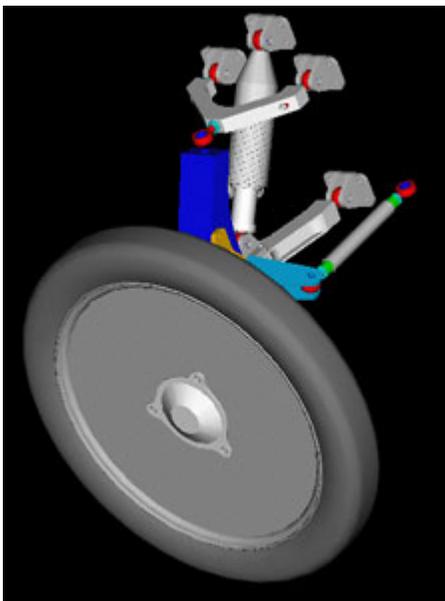
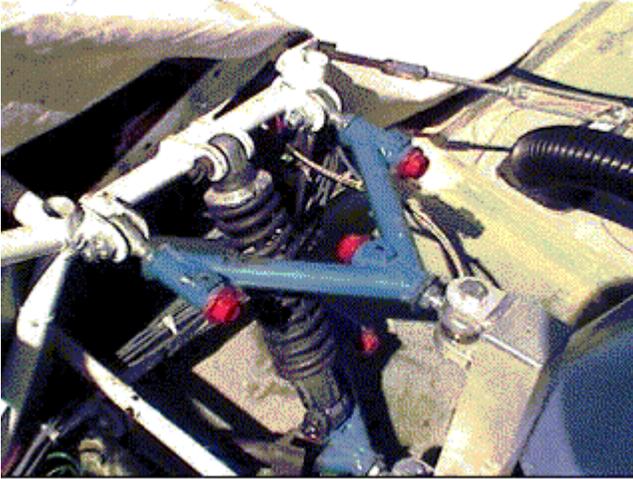


First is the conventional SLA (Short-Long Arm) suspension design in front, also known as an Unequal-length A-arm design. This design takes up a relatively large amount of space, but provides the most optimized wheel control, limiting tire scrub which can wear out tires quickly, and providing the maximum cornering grip. In comparison with a conventional SLA design, the solar car suspension uses very short arms, mostly because wheel travel is very limited with the stiff suspension setup. For the rear suspension, you can use the semi-trailing arm suspension. This semi-trailing arm design allows for an unprecedented degree of parts commonality with the front suspension for a trailing arm design, required a reduced number of designs, analyses and spare components, reducing design and manufacturing time. In fact, only three components of the rear suspension are not shared with the front suspension – primarily the bracket to mount the large hub motor. Despite this, this rear suspension incorporates the geometry improvements inherent in the front suspension design, reducing wasted energy due to "porpoising", diving and squatting due to motor power.



The various components of the suspension, including the braking system, can be seen more clearly with the wheel removed



This picture shows a double A-arm independent suspension, with a coil-over shock.

### Likes

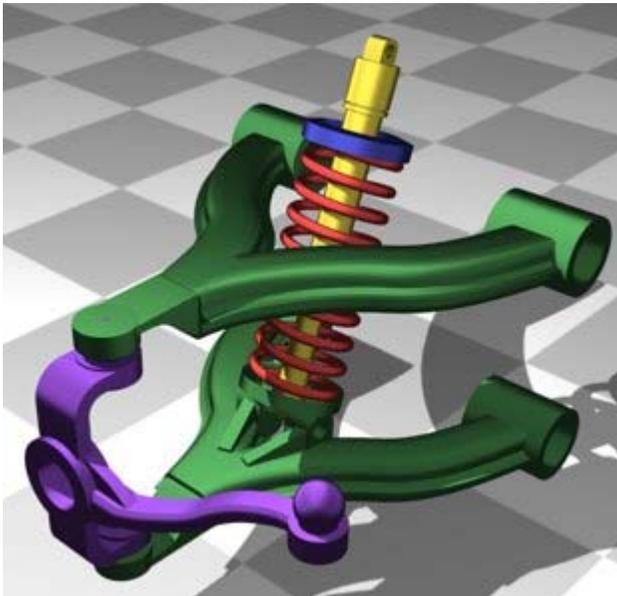
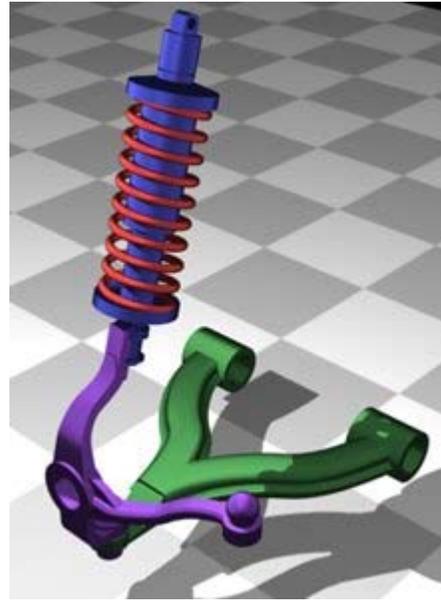
- caster adjustment
- caster adjustment
- toe/in toe out
- simplistic yet effective design

### Dislikes

- weight
- bulky coil over shock
- difficult to adjust
- wheel scrub

## MacPherson strut

This is currently, without doubt, the most widely used front suspension system in solar cars. It is due to its simplicity. The system basically comprises of a strut-type spring and shock absorber combo, which pivots on a ball joint on the single, lower arm. At the top end there is a needle roller bearing on some more sophisticated systems. The strut itself is the load-bearing member in this assembly, with the spring and shock absorber merely performing their duty as oppose to actually holding the car up. The steering gear is either connected directly to the lower shock absorber housing or to an arm from the front or back of the spindle (in this case). When you steer, it physically twists the shock absorber housing (and consequently the spring) to turn the wheel. Very simple. The spring is seated in a special plate at the top of the assembly which allows this twisting to take place. If the spring or plate is worn, you'll get a loud 'clonk' on full lock as the spring frees up and jumps into place.



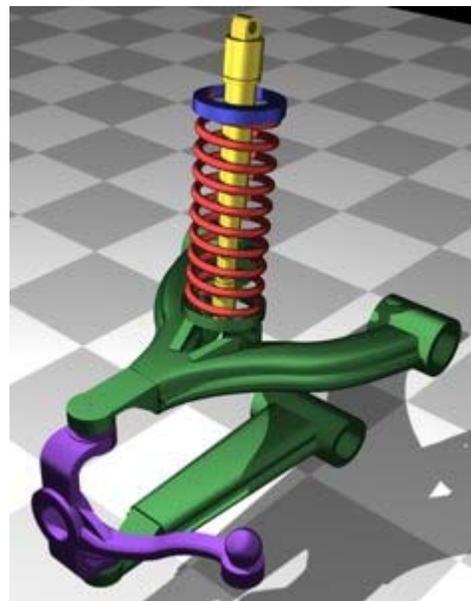
## Coil Spring type 1

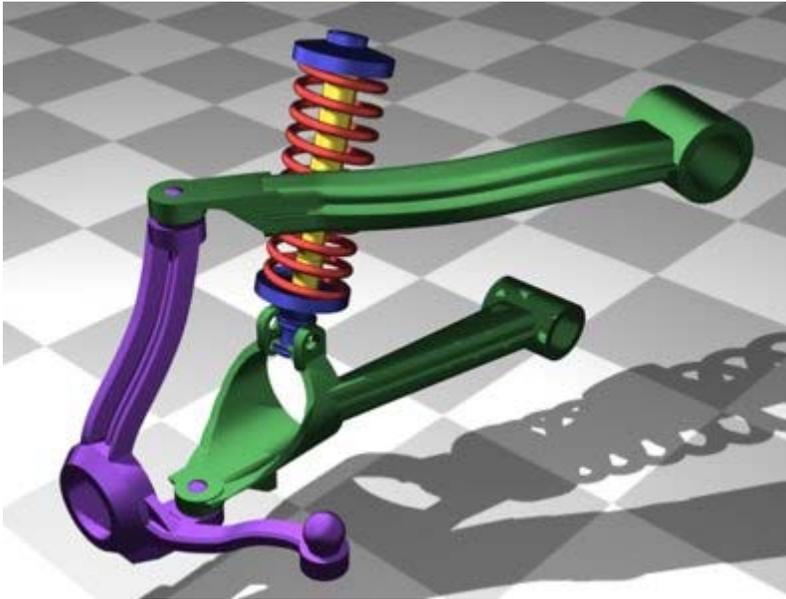
This is a type of *double-A arm* suspension. The wheel spindles (purple) are supported by an upper and lower 'A' shaped arms (green). If you look head-on at this type of system, what you'll find is that it's a very basic lever system that allows the spindles to travel vertically up and down. When they do this, they also have a slight side-to-side motion caused by the arc which the levers scribe around their pivot point. This side-to-side motion is known as scrub. Unless the links are infinitely long the scrub motion is always present. There are two other

types of motion of the wheel relative to the body when the suspension articulates. The first and most important is a toe angle (steer angle). The second and least important, but the one which produces most pub talk is the camber angle, or lean angle. Steer and camber are the ones which wear tires. **Also** note that the springs/shocks in this example are in a so-called 'coil over oil' arrangement whereby the shock absorbers (yellow) sit inside the springs (red).

## Coil Spring type 2

This is also a type of double-A arm suspension although the lower arm in these systems can sometimes be replaced with single solid arms. The only real difference between this and the type 1 system mentioned above is that the spring/shock combo is moved from between the arms to above the upper arm. This transfers the load-bearing capability of the suspension almost entirely to the upper arm and the spring mounts. The lower arm in this instance becomes a control arm. It is less popular because it takes up more room.



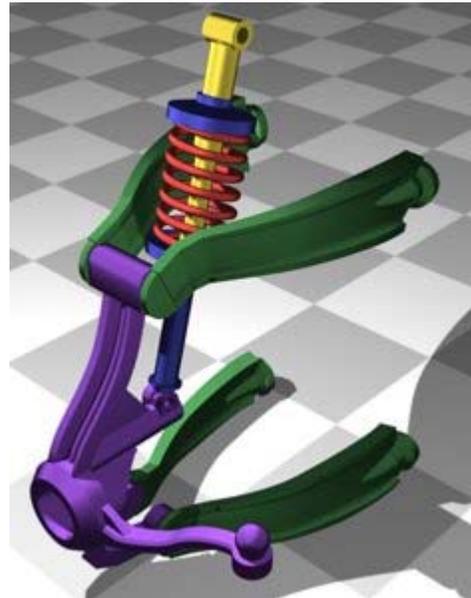


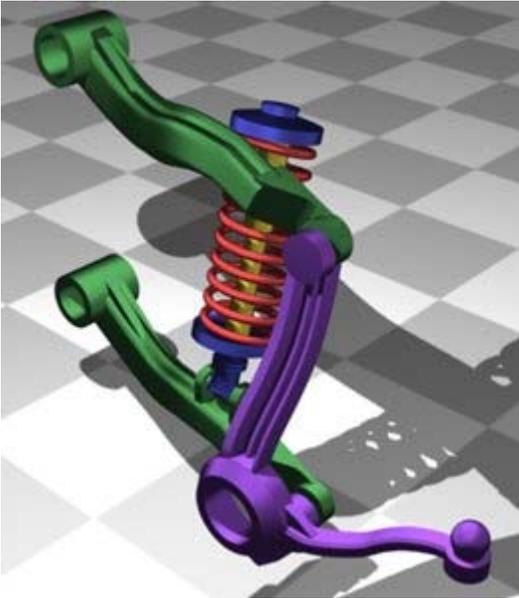
## Double Wishbone

This rapidly becoming one of the most favored suspension types for solar cars as it gives excellent road holding capabilities whilst taking up very little room under the solar car. This allows for smoother lines on the bodywork, and less intrusion in the engine area.

## Multi-link suspension

This is the latest incarnation of the double wishbone system described above. The basic principle of it is the same, but instead of solid upper and lower wishbones, each arm of the wishbone is a separate item. These are joined at the top and bottom of the spindle thus forming the wishbone shape. The weird thing about this is that as the spindle turns for steering, it alters the geometry of the suspension by torquing all four suspension arms. They have complex pivot systems designed to allow this to happen. Many people say this is better because the steering system is now infinitely adjustable. There are a few variations on this theme appearing at the moment, with differences in the numbers of joints, numbers of arms, positioning of the parts etc. But they are all fundamentally the same.





## Trailing-arm suspension

The trailing arm system is literally that - a shaped suspension arm is joined at the front to the chassis, allowing the rear to swing up and down. Pairs of these become twin-trailing-arm systems and work on exactly the same principle as the arms in the coil spring type systems described above. The difference is that instead of the arms sticking out from the side of the chassis, they travel back along it. If you want to know what I mean, find a VW beetle and stick your head in the front wheel arch - that's a double-trailing-arm suspension setup. It is very simple.

## Moulton rubber suspension

This suspension system is based on the compression of a solid mass of rubber - red in both these images. The two types are essentially derivatives of the same design. This system is known by a few different names including cone and trumpet suspension (due to the shape of the rubber bung shown in the lower image). The rear suspension system on the original Mini used Moulton's rubber suspension system, but laid out horizontally rather than vertically, to save space again. Ultimately, Moulton rubber suspension is now used in a lot of bicycles - racing and mountain bikes. Due to the compact design and the simplicity of its operation and maintenance, it's an ideal solution.

