The RFP has framed the solution space as a handlebar system for bicycles that enhances the safety and comfort of users who suffer from arthritis, specifically rheumatoid and osteoarthritis. The solution is meant to prioritize steering and braking while either implementing a new mechanism for gear shifting, or allowing existing gear shifting solutions to be used.

The solution presented by this design addresses steering by using an upright handlebar shape with grips that can freely rotate on their own axis. This allows the user to make turns without the need to turn their wrists. This is because the rotation of the handlebar grip accommodates for the turning that is required to rotate the handlebar. This design also implements a brake lever that is specifically tailored to fit the needs of those with weaker grip strength, while still allowing them to use a system that is familiar, and allowing them to get a therapeutic amount of exercise. The length of the acting lever arm is increased relative to the internal arm that acts on the brake cable to a ratio of 10:1. This reduces the amount of force that must be applied to the lever to engage the brakes.

This design takes into account the need to address the swelling and inflammation in the joints of those with arthritis, specifically the inability to grip small or thin objects as well as healthy hands, resulting in difficulty grasping standard bicycle diameters. This is addressed by increasing the grip diameter from the standard of around 22.2 mm to 34 mm, the maximum diameter that those with arthritis in the hands can comfortably grasp [1].

By implementing materials that promote shock absorption, this design is able to further maximize comfort to the user by minimizing the transmission of vibrations from the terrain to the hands. This design draws elements from the patent for “Increased Diameter Arthritic Gold Club Grips” by M. Kachlik, and is adapted to fit the design space of a bicycle handling system. The design is composed of layers of polyurethane, natural fibre mat, and synthetic rubber. With this composition, the polyurethane layer also provides a comfortable and firm gripping surface. The aluminum grade 6061-T6 is selected for the material used in the frame, anodized to enhance corrosion resistance. The frame is light weight and as a result, also assists the reduction of shock and vibration transmission.

Another consideration made for this design is the inclusion of adjustable lever lengths. This is done by taking advantage of the existing clamp system that bicycle brake levers already use. The lever is able to be clamped at any point on the rotational axis, which allows the user to comfortably grip any part of the lever. As previously discussed, the length of the acting lever arm of the brakes is increased to 10:1, reducing the grip force required to engage the brakes. The element of adjustable clamp location is due to the understanding that there are varying intensities of arthritis, and some users will prefer to have less mechanical assistance. When brakes are fully engaged too fast or too easily, it poses an extra element of danger or discomfort that is almost entirely mitigated by allowing users to apply their gripping force comfortably to a variety of locations on the lever.

The RFP mentions the consideration of gear shifting, either by implementing a new mechanism or by allowing existing mechanisms to be applied. This design uses standard size frames to allow the modular gear shifters to be mounted on any point that is comfortable for the user, lowering the cost and improving general compatibility for this design.