

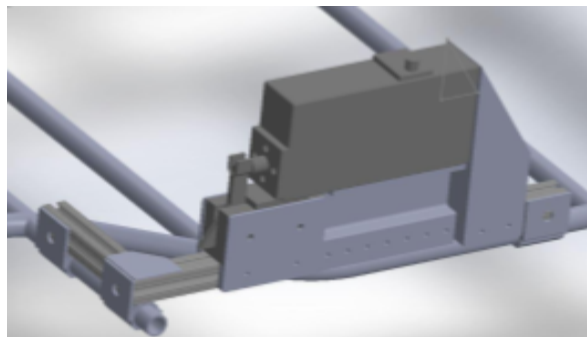
Executive Summary

Triton AI is a student organization led by Jack Silberman focusing on artificial intelligence application and robotic competition. For this project, Triton AI needs a hybrid mobile vehicle that has both autonomous and human control on an ev go kart platform. To achieve this, two primary subsystems' designs were requested by the sponsor: autonomous brake and steering systems with electric or mechanical disengagement mechanism switching to manual control.



**Fig.1: Project platform:
MSTEM3 from TOP KART**

Due to the limited space available on the go kart platform, the mounting position of each subsystem needs to be placed on the side or above the chassis because the human driver would occupy most of the middle space of the kart. The brake system was initially sitting under the driver's left knee, which restricted the room for placing a large size linear actuator. To improve this, the team decided to mount a rail platform on the left side of the driver seat where the whole autonomous braking system can have more vertical space without blocking the foot actuation.



**Fig.2 CAD of Brake system
mounting**

The decision of Kar-tech linear actuator was affected by several specifications: 1) 90 lbf dynamic force and 300 lbf static force providing more than enough the deceleration, 2) CAN bus communication enabled precise position control, 3) built-in contactless sensor for position record, and 4) built-in clutch mechanism allows the lever of master cylinder to operate without stroke blocking when the disengagement is activated.

The steering system consisted of a combination of servo motor and gearbox, external encoder, and external electromagnetic clutch. Since the go kart needed to bear over 460 lb weight, including human driver and all necessary components, the motor needed to perform 35 ft lb to suffice a proper steering, which determined that it is essential to possess a set of servo motor and gearbox. External encoder and torque sensor provided detailed information about steering functionality. External electromagnetic clutch enable the human driver to disengage from the autonomous steering and obtain the manual control.