# ABSTRACT

*Downhill sport is one type of competitive sport that is calculated based on the fastest time using a kind of Mountain Bike (MTB) bicycle specifically designed to be able to pass extreme tracks. One example of the type of extreme track that will be traveled by this bike is a zigzag track on flat terrain. When traversing the track at high speed, the rider will tilt the bike up to 30° and position the body as best as possible to make good turning maneuvers. This can affect the load distribution at specific load points on the bike frame, impacting its ability to withstand the load. In addition to these two factors, bicycle geometry, such as head tube angle (HTA), can also affect the handling and body position of the rider, which impacts the load distribution on the frame. Damage to certain parts will occur if the load is not well distributed. Therefore, the selection of HTA in the downhill MTB bicycle frame design must be appropriate. This Final Project aims to analyze the geometry of the bicycle to determine the effect of HTA on the strength of the downhill MTB bicycle frame. To determine this effect, the HTA will be changed by +4° and -4° from the existing angle of 70° so that the HTA that will be observed is 66°, 70°, and 74°. In this Final Project, a static analysis will be carried out using the Finite Element Method with Autodesk Inventor software tools to perform frame design and simulation. After the simulation is carried out, all bicycle frame designs can accept forces without failure (fracture) or plastic deformation because the maximum value of von Mises stress obtained is less than the yield strength value. The simulation results are displayed through a comparison graph of the maximum value of von Mises stress, deformation, and safety factor. The comparison graph of von Mises stress and deformation values has the same trend of decreasing, with the highest value occurring in the downhill MTB bicycle frame design with HTA 66°. The highest maximum von Mises stress value occurs at the rear end part of 40.56 〖MP〗_a, and the highest maximum deformation value occurs at the chain stay of 0.0266mm. Based on this graph, the more upright the HTA, the value of von Mises stress and deformation will decrease, but there will be an increase in the safety factor value. So, the bicycle frame design with HTA 74° has a high safety factor value of 10.01ul with a von Mises stress value of 34.94 〖MP〗_a and a deformation value of 0.0258mm. Thus, it can be concluded that changing the angle* *of the head tube of a downhill MTB bike frame can affect the frame's strength when turning maneuvers, but not significantly.In contrast, the critical point of the stopping value occurs in observation area 6 (part seat stay) in the MTB downhill bicycle frame design with HTA 66˚. It can be concluded that changes in HTA on downhill MTB bicycle frames can affect the strength of bicycle frames because the distribution values of von Mises stress and termination in each observation area show differences, although not significant, as shown in the comparison graph. Steep (upright) HTA has a maximum value of mises stress higher at the critical point than designs with other HTA angles. This condition can endanger riders if they use a more upright HTA because it has the potential to cause fractures, accidents, and upright HTA, which is not recommended for crossing steep tracks.*

***Keywords:* *Finite Element Method, Mountain Bike (MTB), downhill, Chnges head tube angle, strength of bicycle frame, Zigzag Tracks.***