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Abstract: Luge Track Safety

One day before the opening of the 2010 Winter Olympic Games in Vancouver, a tragic crash in the 6th and last training run claimed the life of Georgian luge slider Nodar Kumaritashvili. The accident cast a pall over the impending Olympics and called into question whether one of the centerpieces of the Games, the ice sliding track, was safe enough to proceed. Since then, three official reports detail investigations attempting to explain the accident and possible related track deficiencies. Simple geometric models of ice surface shape and equations of motion of objects on these surfaces can be used to explain ejection of sliders from ice tracks. Simulations using these can be used to explain why certain design features can be viewed as proximate causes of ejection from the track and hence design flaws. This talk studies the interaction of a particle model for the luge sled (or its right runner) with the ice fillet commonly connecting inside vertical walls and the flat track bottom. A numerical example analyzes the Olympic luge accident. It shows that this runner-fillet interaction, and specifically the fillet's positive curvature up the inside wall, can cause a vertical velocity more than sufficient to clear the outside exit wall. In addition its negative curvature along the track, together with large vertical velocity, explains loss of fillet or wall contact and slider ejection. This exposes the fillet along inside walls as a track design flaw. A more transparent design and review process could lead to safer future designs. A more inclusive and public process is needed with an element of verification scrutiny, a role that could be played by competent scientists and engineers without financial involvement or potential conflicts of interest.

Bio: Dr. Mont Hubbard

Dr. Mont Hubbard is a Professor in the Department of Mechanical and Aeronautical Engineering at University of California, Davis. He received a Bachelor of Science from the United States Military Academy in 1964, Master's in Mechanical Engineering from MIT in 1965, and Ph.D. in Aeronautics and Astronautics from Stanford University in 1975. He served as an officer in the U.S. Air Force for five years, and served as an instructor at the Air Force Academy for three of those years. His research interests include: Application of system theory, automatic control and parameter identification to various dynamic systems; mechanics, control, and optimization of human motion including locomotion and sport mechanics, especially ski jumping, bobsledding, javelin throwing, and high jumping.