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A High Fill Slope Failure in Panzhihua Airport of China [U+FF1A] Characteristics, Genesis and Lessons

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This paper presents the case history of a landslide at the Panzhihua Airport, Sichuan Province, China. The landslide consists of a fill slide, a reactivated old landslide, and a total of three major slide events. The first slide occurred on October 3rd, 2009. Immediately following this occurrence, a comprehensive reconnaissance study was conducted and emergency remediation measures were taken to maintain the airport operation. However, movements of the slide mass continued and accelerated during the rainy season of 2010, which triggered the second and third major slides on August 15 and September 20, 2010, respectively. By June of 2011, progressive failures of the back scarp in the fill body had progressed into the limit range of the airport runway, which forced the airport to be closed. A series of remediation measures were conducted to stabilize the slope and restore the operation of the airport.

In this paper, the geometric and geological features of the landslide are first described, followed by a detailed description of the progressive movements of the slide mass based on recorded data from ground survey markers and inclinometers. Limit equilibrium analyses are conducted to analyze the overall stability of the slide mass. The genesis and contributing factors of the landslide and important lessons learned for future constructions of high fill slopes in mountainous regions are discussed. The contributing factors of this landslide include: a weak layer of mudstone at the soil-bedrock interface which had been fully softened over time by the groundwater accumulated above this layer, the Panzhihua earthquake, excess groundwater due to the rainy season, and a two-day rainstorm prior to the landslide. Several lessons are learned from this case study. First, the potential long-term deterioration of the mechanical properties of any soft and weak strata, particularly under adverse conditions (e.g., saturation), should be adequately considered. These soft and weak strata should be excavated and removed off project site or adequately reinforced. Second, adequate drainage control should be constructed for large fill slopes. Third, optimized slope-stabilizing structures should be designed to resist progressive movement/failure of the slope.