National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 21, 2003

In reply refer to: R-03-20

Dr. Mark W. Hurwitz
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The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The Safety Board is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

The recommendation is derived from the Safety Board's investigation of the collision of the two cars of the Angels Flight funicular railway in Los Angeles, California, on February 1, 2001, and is consistent with the evidence we found and the analysis we performed.[1] As a result of this investigation, the Safety Board has issued seven safety recommendations, one of which is addressed to the American National Standards Institute (ANSI). Information supporting this recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

About 12:17 p.m. on February 1, 2001, the two cars of the Angels Flight funicular railway (Angels Flight) collided in downtown Los Angeles, California. The accident resulted in 7 injuries and 1 fatality among the 20 passengers aboard the two cars and injuries to a pedestrian. The Angels Flight Operating Company estimated monetary damage to the cars at $370,000 with an additional $1.2 million to replace the funicular haul system.

The National Transportation Safety Board determined that the probable cause of this accident was the Yantrak Company's (Lift Engineering's) improper design and construction of the Angels Flight funicular drive and the failure of the City of Los Angeles Community Redevelopment Agency, its contractors (Pueblo Contracting Services, Yantrak, and Harris and Associates), and the California Public Utilities Commission to ensure that the railway system conformed to initial safety design specifications and known funicular safety standards.

[1] For additional information, see National Transportation Safety Board, *Uncontrolled Movement, Collision, and Passenger Fatality on the Angels Flight Railway in Los Angeles, California, February 1, 2001,* Railroad Accident Report NTSB/RAR-03/03 (Washington, D.C.: NTSB, 2003).

Postaccident inspection of the Angels Flight drive mechanism revealed that the *Sinai* car stopped ascending and began its uncontrolled descent when the drive axle for the car's cable drum became disengaged from its driving planetary gear. When the Angels Flight operator saw the car begin to descend the grade, he pushed the stop button on the operator's console, which should have simultaneously activated the service and emergency brakes. But the service brakes, which operated on the drive train, had no effect on the freewheeling cable drum that was no longer connected to the drive train mechanism. The emergency brake would have stopped, or at least slowed, the rotation of the cable drum had it applied, but it was found to be inoperative. The cars themselves were not equipped with track brakes that could have operated independently to significantly slow the car or bring it to a stop before the collision. End gates on the cars may have prevented the passenger from being ejected from the end of the *Olivet* car when it was struck by the *Sinai* car. Finally, rescue efforts were hampered by the absence of emergency walkways that would have facilitated evacuation of injured passengers.

At the time Angels Flight was redesigned and renovated, California had no standards or regulations for the design, construction, and operation of funiculars. Also at that time, ANSI had no explicit standard covering funiculars, although sections of Standard B77.1, *Aerial Tramways, Aerial Lifts, Surface Lifts, and Tows Safety Requirements*, contained guidance that could apply to portions of the Angels Flight system. Since 1984, Colorado has had regulations that cover design, construction, and maintenance of funiculars in the Colorado Passenger Tramway Safety Board's *Passenger Tramway Rules and Regulations*. The Colorado regulations include the ANSI B77.1 standards, revisions to ANSI rules by the Colorado Board, and additional technical rules. The California Public Utilities Commission did not reference any particular set of standards that was to be followed in the reconstruction of Angels Flight.

By February 2001, ANSI began internal circulation of a draft Standard B77.2, *Funicular Safety Requirements,* specifically for funiculars. The B77 Accredited Standards Committee has approved a draft, but it has not been adopted as final by ANSI. Such a standard would inform and guide organizations such as the Public Utilities Commission in their safety oversight of operations like the Angels Flight railway. Therefore, as a result of its investigation of the February 1, 2001, collision of the two Angels Flight Railway cars in Los Angeles, California, the National Transportation Safety Board makes the following safety recommendation to the American National Standards Institute:

> Establish an accelerated schedule for adoption of the draft American National Standards Institute Standard B77.2 for funicular safety requirements. (R-03-20)

The Safety Board also issued safety recommendations to the California Public Utilities Commission and the City of Los Angeles Community Redevelopment Agency. In your response to the recommendation in this letter, please refer to Safety Recommendation R-03-20. If you need additional information, you may call (202) 314-6177.

Chairman ENGLEMAN, Vice Chairman ROSENKER, and Members GOGLIA, CARMODY, and HEALING concurred in this recommendation.

Original Signed

By: Ellen G. Engleman
Chairman