Automated People Movers and Automated Transit Systems 2020

Automated Transit for Smart Mobility

Proceedings of the 17th International Conference on Automated People Movers and Automated Transit Systems

Chicago, Illinois
June 29–July 2, 2020

ASCE

Edited by William J. Sproule, Ph.D., P.E.

T&DI ASCE TRANSPORTATION & DEVELOPMENT INSTITUTE

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Preface

The 17th International Conference on Automated People Movers and Automated Transit Systems was held at the Chicago Marriott Downtown Hotel on the Magnificent Mile, in the heart of downtown Chicago. The conference theme was *Automated Transit for Smart Mobility*.

Chicago has always been a global hub for transportation. From the earliest explorers who arrived by ship, through the development of the U.S. passenger and freight railroad network and public transit system, to the role that the Chicago O'Hare International Airport played in air travel, Chicago is a city built around transportation. It is difficult to say what the future of transportation will be, whether it is automated urban rail transit lines, autonomous transit vehicles, or other new technologies, it is safe to say Chicago will have a key role in future transportation. The decision to hold the conference in Chicago was partly based on the opportunity for attendees to learn about and visit the new modernized and expanded Airport Transit System (ATS) at Chicago O'Hare International Airport. Over the past few years several multi-billion dollar projects have been undertaken or are on-going to modernize and expand the airport to serve future needs. One the projects is the automated people mover which originally opened in 1993 as a 2.5 mile (4 km) long system that connected the four terminals with remote parking lots. The ATS project includes replacement of the original vehicles, upgrading the infrastructure, and extending the line to a new multi-modal facility for rental cars and connections to Metra, the Chicago regional commuter rail system.

The Conference Proceedings include 11 papers that were presented at the conference and all papers included in the Proceedings have been peer reviewed and accepted for publication. In addition to these papers over 50 presentations were made at the conference without a paper. The papers and presentations examined the current state and future of APMs, ATS, and autonomous transit systems, and covered a wide range of topics including history, applications, airport and other major activity centers projects, system improvements, facility planning and design, safety, security, standards, automated train control, and policy. Abstracts and presentation slides for all presentations made at the conference were reviewed by a technical committee. In addition to the technical sessions, opportunities were available in an exhibition area and at social events for attendees to meet and network with others. Technical tours of the Chicago Transit Authority's Central Control Center and the Airport Transit System (ATS) at Chicago O'Hare provided attendees with a behind the scenes look at these innovative systems.

This conference is the seventeenth of a series of successful Automated People Mover conferences that began in 1985 in Miami, Florida. Since that time subsequent conferences have bought together planners, inventors, designers, suppliers, builders, owners and operators of automated transit of all forms to share their experiences, reveal innovations, and discuss what they have learned. Past conferences have been held around the globe and have built an international collegial community and the Proceedings have become an invaluable reference source. In 2011, automated transit

systems were added to the automated people mover focus in recognition of exciting applications on line haul metro systems, and in 2018 the conference included several presentations and discussions on autonomous transit vehicles and systems.

1985	Miami, Florida	2005	Orlando, Florida
1989	Miami, Florida	2007	Vienna, AUSTRIA
1991	Yokohama, JAPAN	2009	Atlanta, Georgia
1993	Irving, Texas	2011	Paris, FRANCE
1996	Paris, FRANCE	2013	Phoenix, Arizona
1997	Las Vegas, Nevada	2016	Toronto, CANADA
1999	Copenhagen, DENMARK	2018	Tampa, Florida
2001	San Francisco, California	2020	Chicago, Illinois
2003	Singapore		

The organizing committee acknowledges the significant efforts of the many authors, presenters, moderators, and reviewers who through their efforts have created these Proceedings and contributed to the success of the conference.

Bill Sproule

Acknowledgments

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Contents

Mirage-TI Tram End of Life Overhaul

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ABSTRACT

The Mirage Hotel & Casino recently completed the end-of-life overhaul of several major subsystems for the mirage-TI automated people mover ('Tram') system in Las Vegas, Nevada. Jakes Associates Inc. was selected to manage this project, which included the replacement of the automated train control (ATC) system, key propulsion equipment (such as primary drive motor, brake control unit, and other), network and communications systems improvements, station improvements (including new platform screen door systems), and limited refurbishment activities of both vehicles, including new air conditioning systems, chassis components, air drier system, and train door controllers. JAI also provided management and oversight services for the replacement of drive bull wheel seals and bearings, and oversaw the design, construction, and installation of a new system return wheel. JAI also managed permitting activities required by Clark County ATS regulations. The improvements accomplished as part of this project has resulted in the extension of the system's life for decades to come.

INTRODUCTION

The Mirage-Treasure Island Tram system (Mirage/TI Tram) consists of a single electrically powered, cable drawn two-car train which shuttles automatically between two stations along approximately 1,000 feet of elevated, single lane guideway. The Tram system operates year-round transporting passengers between the Mirage Hotel and Casino (Mirage) and the Treasure Island Hotel and Casino (TI) in Las Vegas, Nevada (USA). The system was originally designed and installed by VSL and Lift Engineering in 1993. Table 1 identifies some basic system parameters.

Table 1. Mirage/TI Tram Characteristics.

Vehicle Speed	12 MPH
System Length	1,000 Feet
System Ridership	3,000 PPHPD
Fare	Free to Ride

Figures 1 through 5 show existing conditions and alignment prior to the project's execution. Photos of both station platforms after completion of project activities are included later in this paper, below.

Figure 1. Mirage/TI Tram Vehicle.

Figure 2. Mirage/TI Tram Guideway.

PROJECT SCOPE

To counteract system obsolescence and prolong system life, Mirage approved the refurbishment/replacement of several Tram elements/subsystems in July, 2017. Major system elements included the following:

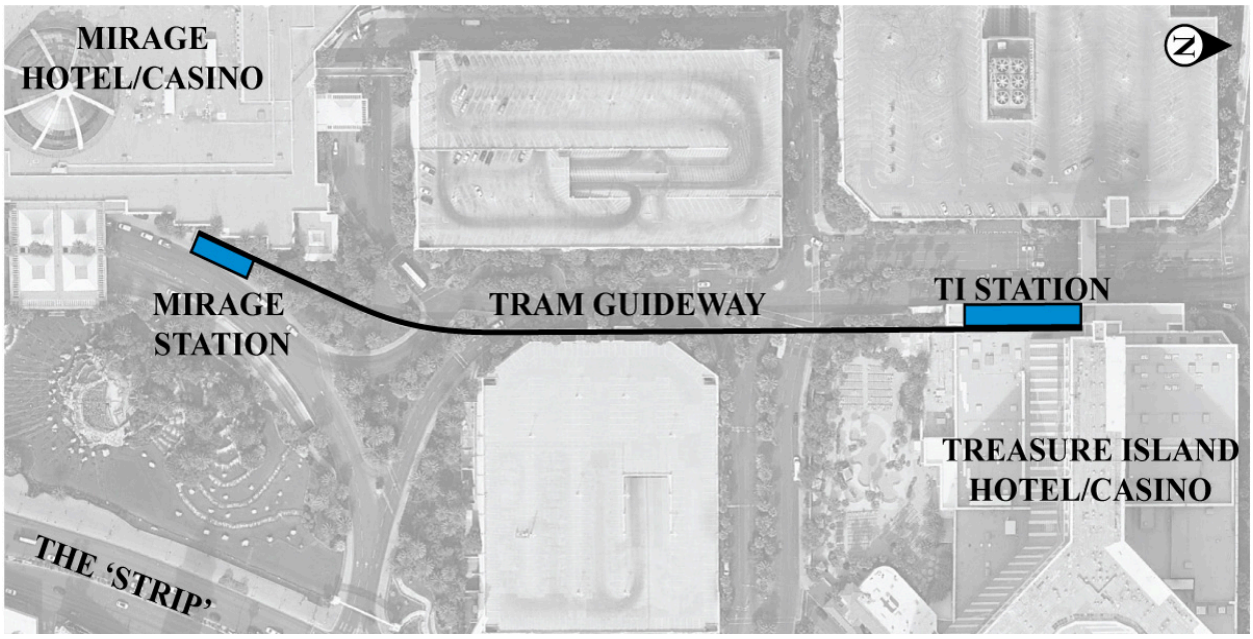

Figure 3. Mirage/TI Tram System Alignment.

Figure 4. Old Mirage Station Platform.

- Control system and communications system replacement
- Vehicle modifications, including:
    a. Replacement of door drives/operators for the on-board door vehicle sets.
    b. Bogie component refurbishment
    c. HVAC system upgrade

- Station enhancements, including:
    a. Elimination of Mirage Station queuing gates
    b. New platform screen doors at Mirage Station
    c. Replacement of platform screen doors at Treasure Island Station
- Replacement of braking system power control unit
- Replacement of drive wheel bearings and seals
- Replacement of return wheel
- Other.

Figure 5. Old Treasure Island Station Platform.

CONTROL SYSTEM REPLACEMENT & NEW COMMUNICATION SYSTEM

The original system controls were based upon switched relay logic design and construction from the early 1990's. Over the last two decades, system reliability has remained stable resulting from technical support provided by Frey AG while replacement parts have become obsolete. JAI recommended this system be replaced by a modern, PLC (Programmable Logic Control) based unit. After a technology review and assessment relative to other modern systems, Mirage chose to maintain a similar control system operating process relative to the original system.

The new ATC and associated train-wayside communication system was supplied by Frey AG Stans (Doppelmayr) included three primary subsystems including Automatic Train Protection (ATP), Automatic Train Operation (ATO) and Automatic Train Supervision (ATS) and their means of communication on-board the Tram and along the wayside. The ATC was designed in accordance with ASCE 21-05 Section 3.2: "Safety Principles" and Section 3.3: "Automatic Train Control System Fail-Safe Design" as applicable to meet adopted Clark County ATS regulations and to enhance system safety and reliability.