

TR NEWS

July–August 2022

NUMBER 340

New Technologies in Highway Construction

PLUS

**Cyberphysical Systems
Augmented Reality
From Paper to E-Ticketing**

NATIONAL
ACADEMIES *Sciences
Engineering
Medicine*

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* Membership as of May 2022.

3 New Technologies in Highway Construction

Hala Nassereddine

In this special issue, *TR News* looks at new technologies that support highway construction. Some concerns of the past, such as lagging productivity and aging infrastructure, continue to affect the industry. But, despite these and other challenges, new technology is driving industry reinvention and taking the future of highway construction in a positive direction.

5 Cyberphysical Systems: Innovative Applications for Highways

Nazila Roofigari-Esfahan

Cyberphysical systems—a combination of computerized and physical components—are a central part of many industries, including manufacturing, smart infrastructure, and transportation. However, limited educational and training programs are hindering its full-scale adoption. The author looks at the benefits and addresses the challenges of implementing this technological innovation.

11 Preparing for Digital Twins

Francesca Maier

As digital twins—virtual models of a physical object or system—gain popularity, their usefulness in aiding the transition from paper plans to 3-D models and organizing crucial asset information is becoming clear. The author presents compelling evidence that the pursuit of digital twins is time well spent.

16 Augmented Reality: Existing Capabilities and Future Opportunities

Fernando Moreu, Kaveh Malek, Elijah Wyckoff, and Ali Mohammadkhorasani

In the infrastructure industry, augmented reality is being applied to reality—such as an aging structure—to add virtual information, like a crack pattern on that structure from a prior inspection. The result is an annotated, mixed image projection right before the user's eyes via a special headset. The authors describe how this technology is revolutionizing inspections.



22 Digital Eyes in the Skies: Machine Learning for Uncrewed Aerial Missions

Paul Wheeler and Bharathwaj Sankaran

Agile and maneuverable, uncrewed aircraft systems can inspect transportation assets for signs of damage or wear without endangering road crews or impeding traffic. Machine learning allows these specialized drones to react better to repeated conditions or tasks, while potentially saving budget dollars and decreasing the time it takes to perform inspections.

26 Building Information Modeling for Infrastructure: Crafting a Smarter Transportation Future

Alexa Mitchell

The recent infusion of billions in infrastructure funds means an uptick of new transportation projects. It also means that industry professionals must work more efficiently. The author describes how 3-D digital technology—known as building information modeling—can help the industry achieve just that.

30 E-Ticketing: The Fast Lane in Highway Construction Technology

Roy Sturgill and Gabriel B. Dadi

Searching for ways to work faster, smarter, and with less frustration, the construction industry is picking up speed in its move from paper to electronic project management. The authors describe e-ticketing and how it is taking hold.



COVER Digital technology is the driving force behind highway construction innovations. The ability to see in 3-D via enhanced modeling technology is arming construction project designers with the means to produce more precise plans, manage materials, and track and organize data. Such technology is only part of the innovations in use now or just down the road in highway construction. (iStock)

Coming Next Issue

The September–October 2022 issue of *TR News* features a variety of perspectives on decarbonizing transportation. This theme issue is unique in that authors present thought-provoking discussions—some reflecting decidedly strong opinions—on a controversial subject. One author presents ideas on how growth in transportation electrification may increase energy to power grids while furthering decarbonization. Another author poses the challenge California faces in its efforts to reduce greenhouse gases by getting drivers off the roads. Other authors outline the research needed to support carbon reduction in aviation. All give readers a lot to consider as we move toward a zero-emissions future.

Plugged in and powering up, an electric vehicle will soon be back on the road. Such vehicles have a role to play in the quest to reduce the transportation industry's carbon footprint.



34 COVID-19 Changed Business-As-Usual for State DOTs: How Nebraska DOT Responded

Lorraine Legg

The COVID-19 pandemic hit just as Nebraska DOT's 2020 construction season was getting into gear. That meant moving quickly to adapt to directed health measures while pushing forward on projects. The author relates how the department successfully responded and the lessons learned in the process.

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TRB COVID-19 Resources

Agencies and organizations can use TRB publications and online resources for useful and timely information to help address issues related to the COVID-19 pandemic. To read about TRB's current research and activities, and for a list of relevant publications, visit www.nationalacademies.org/trb/blog/transportation-in-the-face-of-communicable-disease.

The *TR News* Editorial Board thanks Waseem Dekelbab, TRB, for his work assembling and developing this issue.

TR NEWS

features articles on innovative and timely research and development activities in all modes of transportation. Brief news items of interest to the transportation community are also included, along with profiles of transportation professionals, meeting announcements, summaries of new publications, and news of Transportation Research Board activities.

TR News is produced by the Transportation Research Board

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TR News (ISSN 0738-6826) is issued bimonthly by the Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001. Internet address: www.TRB.org.

Editorial Correspondence: By mail to the Publications Office, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001, by telephone 202-334-2278, by fax 202-334-3495, or by e-mail cfranklin-barbajosa@nas.edu.

Subscriptions: North America: 1 year \$75; single issue \$19. Overseas: 1 year \$100; single issue \$19 plus shipping. Inquiries or communications

concerning new subscriptions, subscription problems, or single-copy sales should be addressed to the Business Office at the following address, or by phone 202-334-3216, fax 202-334-2519. Periodicals postage paid at Washington, D.C.

Postmaster: Send changes of address to *TR News*, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001.

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Printed in the United States of America.

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