

# TR NEWS

July–August 2021

NUMBER 334

## INNOVATIONS ON THE HORIZON

### Research Needs for the Marine Transportation System of the Future

*The National Academies of*  
SCIENCES • ENGINEERING • MEDICINE

**TRB**

TRANSPORTATION RESEARCH BOARD

The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

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The **Transportation Research Board** is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to provide leadership in transportation improvements and innovation through trusted, timely, impartial, and evidence-based information exchange, research, and advice regarding all modes of transportation. The Board's varied activities annually engage about 8,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state departments of transportation, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

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\* Membership as of July 2021.

### 3 Innovations on the Horizon: Research Needs for the Marine Transportation System of the Future

*Mary R. Brooks, Scott Brotemarkle, Edward Comstock, and Jim Kruse*

The articles in this special issue of *TR News* address the marine transportation system, a network of interconnected systems working together toward prosperity, sustainability, resilience, safety, and security. Authors examine high-priority areas for research that will help achieve emissions reduction, integration of automation and big data, and resiliency by 2050.

### 5 Transforming Ocean Shipping: Alternative Energy Sources and Practical Issues

*Lee Kindberg and Jim Corbett*

Dramatic change is under way in the maritime industry to meet climate and supply chain demands. Innovations are decreasing greenhouse gas emissions and increasing complexity in operations, fuel production, and infrastructure. New metrics and standards are needed. The transportation research community can help innovate this 21st-century shift in maritime energy systems.

### 12 Importance of the Marine Transportation System to the United States

*Paul Bingham*

### 14 Autonomous Vessels in U.S. Shipping: Following the Northern European Lead

*Sean T. Pribyl*

The author discusses emerging and innovative technologies that affect traditional methods of transport and human performance in the maritime industry, including advanced autonomy aboard vessels, vehicles, and in systems within the maritime domain. This article outlines the prevalent legal and policy concerns raised by uses of advanced autonomy with a systemwide perspective on northern Europe as early adopters.

### 20 Automation in Container Port Systems and Management

*Jean-Paul Rodrigue and Theo Notteboom*

Although a small number of terminals worldwide have been automated, the technology in equipment and processes has advanced to a point that it is being considered for a large range of terminals. The authors discuss major automation challenges faced by American container ports.

### 26 Capital Intensiveness Risks of Automation

*Jean-Paul Rodrigue and Theo Notteboom*



### 27 Big Data: Current and Future Use of Automatic Identification System Data in Maritime Transportation

*Brian Tetreault and Ned Mitchell*

The automatic identification system (AIS) offers a wealth of information about vessel activity and the operation of the marine transportation system. In this article, authors share information on current and future uses of AIS big data to support maritime and intermodal transportation.

### 33 Innovations That Increase Maritime Resilience

*Rear Admiral Richard V. Timme*

The marine transportation system faces numerous challenges ranging from natural disasters to ensuring that required capacity is met during a pandemic to remain competitive among global markets. The author identifies strategies that the U.S. Coast Guard (USCG) has employed to meet current challenges as well as to plan for those that lie ahead, including autonomy and commercial space operations. Methods and requirements of maritime resiliency are explored.

### 39 CONSENSUS REPORT Leveraging Unmanned Systems for U.S. Coast Guard Missions

*Heidi Perry and Monica Starnes*

Although the Coast Guard has explored integrating unmanned systems (UxS) into its operations, these systems have not been adopted in a comprehensive manner. This article outlines a National Academies of Sciences, Engineering, and Medicine study that evaluates opportunities for USCG to deploy aerial, surface, and underwater UxS, expanding and supporting its capabilities.



**COVER** Waltershofer Hafen affords a clear view of container ships, like CSCL *Venus*, in harbor at the Port of Hamburg in Germany. The global marine transportation system is the subject of this *TR News* theme issue. (Photo © Port of Hamburg, Peter Glaubitt)

## Coming Next Issue

Since the terrorist attacks of September 11, 2001 (9/11), transportation has broadened its role to include response and operations—from traffic incident management as a multiagency function to aviation security. But in the 20 years since 9/11, natural disasters, technology changes, and pandemics have presented new challenges. In the September–October 2021 issue of *TR News*, authors address these challenges, as well as how transportation agencies can incorporate resilience to respond quickly and effectively to an ever-shifting landscape.

*A Transportation Security Administration (TSA) worker screens airline passengers before their flights. Created two months after 9/11, TSA quickly became integrated into many transportation modes, particularly aviation.*



Photo: TSA

### Also in This Issue

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*Susan J. Binder and Vice Admiral James C. Card*

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*Jhony Habbouche*

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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 novel coronavirus 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](http://www.nationalacademies.org/trb/blog/transportation-in-the-face-of-communicable-disease).

## 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.

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