

Standing Committee on Critical Transportation Infrastructure Protection (ABR10)
Laurel J. Radow, Chair

TRB's Role in Transportation Infrastructure Protection and Resilience

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INTRODUCTION

As we celebrate 100 years of TRB, committees look back to recall and document the impetus of their creation for various reasons as TRB expanded its research scope and support advancing transportation practices. If the first years of TRB were focused on issues more germane to transportation or in the research of materials and safety, the more recently established committees may be better explained as looking at how transportation fit into society as a whole.

Infrastructure took on an expanded definition in the 1990s as computers began to find their way into how transportation and society in general worked. In addition, the 1990s saw terrorist attacks including the New York City World Trade Tower Bombings in 1993, Oklahoma City in 1995, Centennial Olympic Park Bombing in 1996, and the planned suicide bombing of the Brooklyn Bridge in 1997 that forced public agencies to begin to reassess how they protected their expensive investments which were in fact very valuable assets.

The history of how the definition of infrastructure shifted and expanded is appropriate for another venue though in fact, it can be seen through TRB's NCHRP and other research publications of the early 2000s as described later in this article. Rather, this article explores the establishment of the TRB Standing Committee on Critical Transportation Infrastructure Protection (originally ABE40 and as of 2014, ABR10).

CONTEXT FOR CREATION OF THE COMMITTEE

An abbreviated timeline of specific key external actions by both the National Academies of Sciences, Engineering, and Medicine (NASEM) and President William Clinton offers the context needed to understand why ABE40 was established first as a task force and later elevated to full standing committee status.

Based on the increase in terrorist attacks and activity, one of these key initial external actions was a report published in the mid-1990s. In 1995, the National Research Council published *Protecting Buildings From Bomb Damage: Transfer of Blast-Effects Mitigation Technologies from Military to Civilian Applications* (National Research Council, 1995).¹ The report included a recommendation that a program of applied research and technology transfer be undertaken to hasten the availability and utility of the techniques addressed within as applied to the civilian building community.

About a year later, on July 15, 1996, President Clinton signed Executive Order 13010, *Critical Infrastructure Protection*, establishing the President's Commission on Critical Infrastructure Protection (PCCIP).² This Executive Order (E.O.) defined "infrastructure" as "The framework of interdependent networks and systems comprising identifiable industries, institutions (including people and procedures), and distribution capabilities that provide a reliable

flow of products and services essential to the defense and economic security of the United States, the smooth functioning of government at all levels, and society as a whole.” E.O.13010 provided a context for the term “critical” as “certain national infrastructures are so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States.”³ The Commission’s final report to the President echoed the E.O.’s definition of vital infrastructure.⁴

The general concept of “vital” or “critical” infrastructure in E.O. 13010 was not entirely new, having appeared in some form in many of the policy debates in the 1980s. The E.O. did break new ground, however, in listing what it considered to be critical infrastructures. According to E.O. 13010, these critical infrastructures were:

- Telecommunications;
- Electrical power systems;
- Gas and oil storage and transportation;
- Banking and finance;
- Transportation;
- Water supply systems; and
- Emergency services (including medical, police, fire, and rescue).

The last external action that helped lay the groundwork for TRB’s decision was Presidential Decision Directive 63, *Critical Infrastructure Protection* (PPD-63). In response to the President’s Commission on Critical Infrastructure Protection final report, President Clinton signed PDD-63 on May 22, 1998.⁵ The Directive’s goal was to establish a national capability within five years to protect “critical” infrastructure from intentional disruption.” According to PDD-63, “critical” infrastructures were “those physical and cyber-based systems essential to the minimum operations of the economy and government.” This definition expanded little on that in E.O. 13010, but was noteworthy for its specific mention of “cyber” infrastructure.⁶ In the E.O. the distinction between cyber and physical aspects were as types of threats to our critical infrastructure. Cyber was not considered part of the critical infrastructures. The Commission report and PPD-63 rectified this omission.

The Directive, a Presidential memorandum instructing departments within the executive branch of the federal government, designed eight departments as Lead Agencies for Sector Liaison of which the U.S. Department of Transportation was one of those agencies. The Directive included specific instructions establishing infrastructure assurance and designation of a Sector Liaison Officer responsible for working with the private sector to reduce vulnerabilities and establish public private partnerships for national security.

By naming the U.S. Department of Transportation (DOT) as one of the lead agencies and highlighting a need for the public and private sector to work together, TRB understood the need to ensure that the research component of this critical issue was included in the broader critical infrastructure discussion.

THREE ERAS IN THE EVOLUTION OF ABR10

Though a fairly new committee, ABR10’s twenty-year history can be organized into three specific eras. Its creation as a task force is tied directly in response to the Presidential Decision

Directive 63. TRB approved the formation of the Task Force on Critical Transportation Infrastructure Security in 1999 with Dr. William J. Harris, Jr. chairing it between 1999 and 2000. Soon after the task force was established, as a way to bring awareness to this topic, TRB published a special edition of *TR News* (211): *Transportation Security: Protecting the System from Attack and Theft*⁷ (November-December 2000). The edition compiled the latest works addressing risk and security of the transportation system and its modes.

In 2000, Brig. Gen. Lewis S. Roach, Deputy Commander for Mobilization, Transportation Engineering Agency, U.S. Army, became chair of the task force. The task force became ABE40, Standing Committee on Critical Transportation Infrastructure Protection in February 2002, at which time Lewis became the committee Vice Chair.

Dr. Daniel J. O'Neill, Director, CRADA International, Inc., served as the first committee chair of ABE40. He served three years (2002-2005), which is one term, as chair and remained a member until 2011. The [e-Circular](#), E-0065, *Transportation Security: Summaries of Presentations at TRB's 83rd Annual Meeting*, published under his leadership emphasized the reasons why TRB needed to pay attention to the ever increasing importance of critical infrastructure protection.

Should there have been any doubts about the need for such a committee, soon on the heels of the presidential directive came the preparation and triage for Y2K. Many computer systems and databases used two digit databases and code associated with the calendar date. This limited the number of years the software or technology to function to 12/31/1999. The question raised by many was, "what would happen on January 1, 2000?". Would computer-based systems and services create massive disruptions? As a result, the federal government's effort was to update code from two to four digit code prior to January 1, 2000, as the way to limit computer-based chaos at the start of the new millennium.

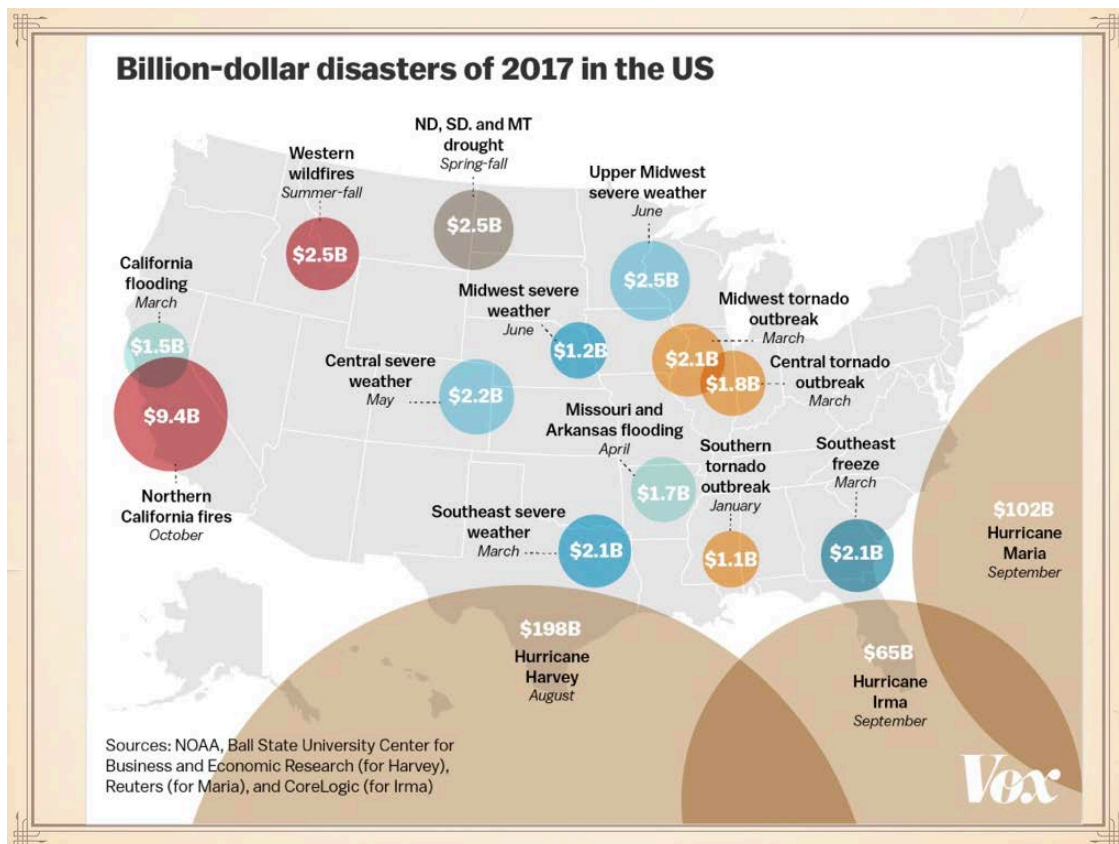
The committee's second era began as we as a nation began to understand what September 11, 2001, meant to the United States. If on September 10, 2001, TRB and its member agencies were primarily transportation agencies that ensured the safety and mobility for its users, on September 11, 2001, transportation's role changed almost overnight to include security and a range of other issues rarely previously considered. Whether it was the grounded air fleet across the United States for about a week or the heightened concerns for the nation's iconic transportation sites including the Golden Gate Bridge or the Hoover Dam or our nation's transit system which moves millions of people each and every day, the role of transportation agencies had suddenly shifted and expanded.

With 9/11 as its backdrop, ABE40 established immediate and close working relationships with AASHTO. In particular, relationships were formed with the AASHTO Special Committee on Transportation Security (SCOTS), and later with the Special Committee on Transportation Security and Emergency Management (SCOTSEM). The Committee, expanding beyond the relationships with transportation agencies, formed liaison roles with the agencies within the U.S. Department of Homeland Security (DHS) such as the Office of Infrastructure Protection, Transportation Security Administration, Coast Guard, and Federal Emergency Management Agency. It also established collaborative relationships with professional organizations including American Society of Civil Engineers, Institute of Transportation Engineers, and others to close the gap in research and knowledge concerning security issues. In addition, because of the cross-cutting nature of its scope, the Committee also established and maintained formal liaisons with several TRB Sections and Committees including the Special Task Force for Climate Change

(A0020T), the Data and Information Systems Section (ABJ00), the Design and Construction Group (AF000), and the Transportation Education and Training Committee (ABG20) as well as informal liaisons with more than 15 other TRB Standing Committees.

As the Committee matured, its scope evolved and by the end of the decade the Security and Infrastructure Protection portfolio was augmented with topics such as climate change, sustainability, system resilience, risk management and assessment, multi- and intermodal security, institutional and organizational resilience, and infrastructure interdependency issues. Each committee chair since 2011 had been recognized for advancing an aspect of security and resilience. Mr. Jeffrey L. Western (chair 2005-2011) introduced the concepts of disaster resilience to ABE40, which led to the formation of the Transportation Systems Resilience Section. Dr. Yuko J. Nakanishi (chair 2011-2014) institutionalized the practitioner agencies and companies with the research institutions to solidify committee functions and responsibilities. Mr. John M. Contestabile (chair 2014-2017) advanced resilience concepts to practical policy with a viable business case (Illustration 1: Billion-dollar disasters of 2017 in the US⁸). Ms. Laurel J. Radow (chair 2017-present), through a series of webinars and the largest transportation resilience conference, initiated the mainstreaming of resilience from research to practice. These expansions paralleled the gradual absorption of security, related intelligence, and law enforcement responsibilities into DHS and the Department of Justice at about the same time.

Illustration 1: Incident Scale



TRANSPORTATION SYSTEM SECURITY AND RESILIENCE: ABR10 IN ITS CURRENT STATE

The committee's third era in its twenty years of existence may once again be tied to external actions. In 2012, The Committee on Science, Engineering, and Public Policy, part of the National Academies' Division on Policy and Global Affairs (PGA), released the report "*Disaster Resilience: A National Imperative*" that defined "national resilience," described the state of knowledge about resilience to hazards and disasters, and framed the main issues related to increasing resilience in the United States.

Within months, on February 12, 2013, President Barack Obama released Presidential Policy Directive 21, *Critical Infrastructure Security and Resilience* (PPD-21). PPD-21, the Directive coordinating stovepipe preparedness, security, and risk management programs, was developed to advance a multijurisdictional (international, national, state, regional, local, tribal, and territorial) unity of effort to strengthen and maintain secure, functioning, and resilient critical infrastructure.

During the years just prior to the release of the NASEM report and update federal doctrine, although the occurrence of transportation security incidents remained low, the nation continued to experience multiple multi-billion dollar natural disasters leading TRB cooperative research conducted during this era to highlight the importance of a more holistic "all-hazards" approach to infrastructure protection. With the release of the report and the presidential directive, the Committee had adopted new vision, mission, and scope statements incorporating this perspective. The new vision was one of both a "secure and resilient transportation system;" the revised mission was "to advance research, knowledge, and collaboration in transportation infrastructure protection from an all-hazards, all-modes, and whole of community perspective," and the expanded scope encompassed "all threats and hazards to the transportation infrastructure."

This scope was refined further in 2015 and currently includes the consideration of "all threats and hazards to transportation infrastructure not within the normal scope of daily operations." ABE40's particular focus area is on manmade threats, accidents, and natural hazards that have the potential to cause significant damage to transportation infrastructure and loss of life.

Move to the Transportation Systems Resilience Section (ABR00)

In 2014, TRB established the Transportation Systems Resilience Section and ABE40 moved under its auspices and was re-designated as ABR10. This reorganization included an explicit and additional charge to encourage the incorporation of resilience into the missions of other TRB committees not part of the Resilience Section. In this third era of the committee and in support of this objective, ABR10 has accomplished the following:

- Developed and distributed fact sheets and Section briefings at the 2015-2019 TRB Annual Meetings describing the Resilience Section and its three committees' and the Special Task Force on Climate Change mission and goals.
- Developed and produced two publications focused in resiliency:
 - TR News: *Transportation Systems Resilience* (September-October 2017)
<http://www.trb.org/Publications/Blurbs/176812.aspx>

- TRB E-Circular 226 *Transportation System Resilience: Preparation, Recovery, and Adaptation* (2017). <http://www.trb.org/Publications/Blurbs/176885.aspx>

This circular presents research issues related to implementing transportation systems resilience, and explores themes of a whole-system approach to resilience, weather and advances in forecasting, an integrated approach to cyber-physical security for transportation, and a European perspective on research for resilient roads.

Guiding Principles

ABR10 also adopted a set of guiding principles consistent with its new mission and scope intended to shape its strategic and business planning activities as it moved forward. Some of the key principles include:

- Resilience Measures: enhance resilience by improving capabilities to withstand various hazards, to respond, and to recover.
- Diversity: include stakeholders from federal, state, local governments, NGOs, academia, and the private sector, and relevant external domestic and international organizations to participate in committee activities.
- Methods: systems approaches will be taken where appropriate.

Accomplishments of the Committee

Beginning in its second phase and through its partnership with AASHTO's SCOTSEM, ABR10 served as the principal TRB committee through which the bulk of the NCHRP 59 series of research on transportation security and emergency management was funneled. From about 2003 through 2017, 219 research efforts were undertaken and completed. State and local departments of transportation have made use of the results of these research products. The total dollar amount for this research was \$32 million (based on the January 2019 NCHRP summary)

<http://onlinepubs.trb.org/onlinepubs/dva/CRP-SecurityResearch.pdf>

As the committee became more familiar with what critical infrastructure means and the role transportation plays, various subcommittees were created and dissolved. The three subcommittees that exist in 2019 are Cyber Security, Physical Security and the one shared with ABR20, Supply Chain Resilience. The areas of focus of each of these three subcommittees are essential to the *economic well-being* of the United States. If failure or disruption occurs with any one of these areas of economic well-being, the faith of the nation will be greatly impaired. It is for that reason that the committee supports these areas through this heightened emphasis.

From its inception, ABR10 has been a champion of outreach and collaboration. In addition, it has had a highly visible role within TRB, sponsoring presentation sessions, poster sessions, committee meetings, and workshops at every Annual Meeting from 2005 to the present. The Committee was a co-sponsor and participant in the TRB Transportation Hazards and Security Summit held annually from 2006 through 2013 and held its mid-year meeting in conjunction during those years with the SCOTSEM Annual Meetings. Additionally, the committee had accomplished the following:

- Provided leadership to the Planning Committee for the 2018 Transportation Resilience

Innovations Summit and Exchange (TRISE) meeting that was held in October 2018 in Denver, Colorado. This first time event had 350 attendees with 91 state DOT employees representing 43 states.

- Co-sponsored both the first and the second International Symposium on Disaster Prevention and Mitigation of Highway Infrastructure organized by the China Highway and Transportation Society (CHTS) held in China in 2014 and 2016. The Committee's vice chair gave the opening remarks in June 2016 on behalf of TRB and a technical presentation on current TRB resiliency activities. One of the Committee's international members also presented at this event.
- Co-sponsored the TRB First International Conference on Surface Transportation System Resilience to Climate Change and Extreme Weather Events held in Washington, D.C. from September 16-18, 2015.
- Adopted the committee's session theme for the 2020 TRB Annual Meeting: "Mainstreaming Resiliency." This theme will help frame the Committee's sessions, workshops, and call for papers. Mainstreaming, in this context, means incorporating the principles and effective practices of resiliency throughout all functions of transportation agencies including Asset Management, Performance Management, Project Design, Traffic Operations and Emergency Management.
- Approved as the 2020 Workshops Topic: The 6 "Cs" of Success. These success factors include community, communication, cooperation, collaboration, connectivity, and culture. The workshop will also address the role of social networks and social capital in resilience activities.

FUTURE OUTLOOK AND OPPORTUNITIES FOR THE COMMITTEE

The days and years after 9/11 allowed some to set transportation security off to the side to "let others solve the problem." By doing so, transportation agencies could, for the most part, continue to do business as usual. In the intervening years, and as we faced fewer and fewer terrorist attacks on US interests and assets, and as the committee endorsed an all-hazards approach, the committee also paid attention to natural disasters. The increased severity and frequency of these natural disasters (see attached slide to be included the article) remains a key concern.

Whether the cause is terrorist attacks or natural disasters, the lesson learned throughout the committee's twenty years is that the need to incorporate resiliency into the overall structure of state and local departments of transportation is evident. The committee sees its role in the next five to ten years is to encourage and support research that supports mainstreaming resiliency.

¹ *The Bridge* (USPS 551-240) is published quarterly by the National Academy of Engineering, 2101 Constitution Avenue, N.W., Washington, DC 20418. Second-class postage paid at Washington, D.C. Vol. 28, No. 3, Fall 1998)

² Executive Order 13010—*Critical Infrastructure Protection*. Federal Register, July 17, 1996. Vol. 61, No. 138. pp 37347-37350. Reference is on page 37347.

³ Executive Order 13010

⁴ Executive Order 13010. p 3734

⁵ President's Commission on Critical Infrastructure Protection, *Critical Foundations: Protecting America's Infrastructure*, October 1997. *The Clinton Administration's Policy on Critical Infrastructure Protection: Presidential Decision Directive No. 63*, White Paper, May 22, 1998. <https://fas.org/irp/offdocs/paper598.htm>

⁶ The distinction between physical security and cyber-security is almost inextricable and not clearly articulated. For example, physical assets in electric power include the generation plant, transformers, and power lines. The computer hardware and communication links that control the generation and flow of electricity could be considered physical or cyber typically means protecting assets (including computers) from damage caused by physical forces such as explosion, impact, and fire. Cyber-security typically means protecting both physical and cyber assets from operational failure or manipulation due to unauthorized access to operating software or data. Securing critical infrastructures may require a broad combination of both physical and cyber measures (from installing fences to installing firewall software).

⁷ *TR News* (211): *Transportation Security: Protecting the System from Attack and Theft* (November-December 2000) <http://onlinepubs.trb.org/onlinepubs/trnews/trnews211.pdf>

⁸ National Oceanic and Atmosphere Administration, Ball State University, Center for Business and Economic Research (for Hurricane Harvey), Reuters (for Hurricane Maria), and CoreLogic (for Hurricane Irma), Vox, March 26, 2018 <https://www.vox.com/energy-and-environment/2017/12/28/16795490/natural-disasters-2017-hurricanes-wildfires-heat-climate-change-cost-deaths>

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