DIGITAL BILLBOARDS: Lessons Learned from AASHTO 20-7 (256)

Presented to the Annual NAHBA Conference
Chateau on the Lake, Branson, Missouri
August 10, 2009

Jerry Wachtel, President
The Veridian Group, Inc.

Purpose of the Study

- AASHTO – SCOTE requested this study to provide guidance for States and local governments who were faced daily with requests for new or replacement DBBs.
- FHWA guidance was not yet available, and States were under pressure from industry.
- Different jurisdictions had enacted different regulations, and there was little consensus.
- SCOTE considered this issue to be high priority.

The Veridian Group, Inc.

Task Assignment

- Perform a critical review recent research literature and guidelines/regulations.
- Review industry research separately.
- Identify human factors and safety issues related to the operation of such signs.
- Review experiences in other countries.
- Prepare final, peer reviewed report, to include recommendations for guidelines.

The Veridian Group, Inc.

The Literature Review

- More than 150 studies found and reviewed.
- Technology still leads research; relatively few studies addressed digital/video signs.
- Research methods much improved since earlier FHWA reviews (1980, 2001).
- Found research in 9 countries and U.S.

The Veridian Group, Inc.

Wide Variety of Research Methods Used

- Theoretical studies of driver attention and distraction as well as physiological responses.
- Epidemiological studies.
- On-road testing with instrumented vehicles.
- Laboratory studies using projected images.
- Laboratory studies using simulators.
- Road User Surveys, Interviews

The Veridian Group, Inc.

Conclusions from the Literature

- Strong theoretical basis to understand why DBBs can capture and hold a driver's attention, even at the expense of performance on the primary task.
- Most studies suffer from some weakness or limitations that may affect its validity or generalizability.
- Industry sponsored research consistently reports no adverse impacts (even when such adverse impacts are found).
- Research sponsored by government, insurance, auto safety organizations typically show some adverse impact on driver attention and distraction.
- Recommendations from research, and guidelines/regulations are quite consistent in what they recommend.

What Type of Guidelines or Regulations may be Helpful – The Big Picture

- Two key concerns are unique to DBBs -
  - Brightness, especially at night
  - Length of time each message is visible
- If these two display features were controlled, and if the industry truly self-regulated in accordance with the research, much of the safety concern would disappear.

The Veridian Group, Inc.

This DBB is Shown from a Distance of Six Miles

What Constraints Make Sense?

- Decades of research shows how to design a sign for quick, easy, unambiguous communication with drivers.
- The industry turns this knowledge on its head.
- Limiting the amount of information per display, and designing displays with greater legibility would reduce eyes-off-road time.
- These concerns are not unique to DBBs, but the problems are magnified because of the attention getting properties of the sign and the brief period that any given message remains visible.
  - (Even official signs, such as Amber Alerts, have been criticized by safety experts for containing too much information).

CHILD ABDUCTION
GRY 2000 TOY P/U
CA LIC 6E70253
Ninth Street ¼
Cesar Chavez St 2

What do International Guidelines say?

- International guidelines are far more prescriptive than in the U.S.
- Based on research and good human factors practice
- Requirements differ by road volume, speed, access control
- They specifically address
  - "Longitudinal exclusion zones" (e.g. interchanges, ramps, merges, diverges)
  - Sign brightness limits appropriate for the sign's local environment
  - A validated, prescribed method o be used for brightness measurement
  - Minimum display time and changeover time
  - Prohibitions of sequential messages across displays or signs
  - Amount and complexity of information that can be used
  - Minimum spacing from important official road signs
  - And more

Cited U.S. Regulations Generally Address:

- Minimum message duration
- Message transition time
- Maximum brightness
- Message Sequencing
- Fail safe design (default display in event of failure)

The Veridian Group, Inc.

Special Features of some of the cited U.S. Regulations Include:

- Signs on moving vehicles are prohibited
  - With certain exceptions
- Signs that emit sound or odor are prohibited
- Sign permits must be renewed annually
  - To address new concerns or evidence,
  - To keep current with new technologies that may arise

Where are Guidelines Being Developed?

- Worldwide:
  - Australia
    - Esp. Queensland, Victoria, New South Wales
  - South Africa
  - The Netherlands
- Within the U.S.:
  - Cities
    - Flowery Branch, GA; Oakdale, MN; Tucson, AZ
  - Counties
    - St. Croix, WI; St. Johns, FL

New Applications of DBB Technology

- Our research identified several new or growing applications of DBB technology for use in roadside advertising
- Some of these lead to new concerns
- Few have been addressed in regulations
  - On-premise signs
  - DBBs within the Right-of-Way
  - DBBs on moving vehicles in traffic
  - Personalized DBBs that interact with drivers

On-Premise Signs

- Not new, but of new concern, because:
  - On premise signs may be larger than DBBs
  - They may be much closer to the road
  - They may display full-motion video
  - With costs dropping, they will become more common
- Virginia Tech study sponsored by OAAA found on-premise DBBs just as bad as off-premise signs for driver distraction.
- TRB Subcommittee will be submitting a research problem statement on this topic.

The largest DBB in the world – an on-premise sign 90 x 65 ft in size, on a 165 ft post on the roof of a building next to an interstate highway.

DBBs Within the Highway Right-of-Way

Private road/tollway authorities are actively reviewing proposals

- Two State proposals submitted to FHWA
- New source of revenue is appealing
- But such signs directly violate several major requirements of the MUTCD
  - (Manual of Uniform Traffic Control Devices)

The Veridian Group, Inc.

The MUTCD is "the bible" for traffic control (signs, signals, and markings) in the U.S.

- The very first standard in the MUTCD reads:
  - Std. 1A.01: "Traffic control devices or their supports *shall not* bear any advertising message or any other message that is not related to traffic control."
- Many other standards include similar wording

NORTH
24
35
Des Moines
EXIT 2V
14th St
Downtown
EXIT 2U
WEST
670
70
Topeka
EXIT 2U
70
EAST
St Louis
EXIT 2U
Broadway
EXIT ONLY
WEST
670
70
Topeka
70
EAST
St Louis
WB I-70
EXIT
CLOSED
2U
EXIT

NORTH
678
Van Wyck Expwy
Belt Pkwy WEST
Verrazano Br
EXIT 1A
EAST
878
Nassau Expwy
Belt Pkwy EAST
Eastern LI
EXIT ONLY
NYC LAW
NO
TURN
ON RED

US Airways
Parking Lot 4
Parking Lot 3
Airport Exit
Parkway West
Manhattan
Rental Cars
SAMSUNG
NEW YORK

GRIDLOCK ALERT TODAY
AVOID MIDTOWN 8AM - 10PM
iPod

The proposed DBB-CMS location in the opposite direction

A Recent Study of Official CMS Uses Found that:

- Traffic agencies received complaints when official CMS displayed messages unrelated to traffic control – even public safety messages.
- Drivers lost confidence in CMS when they were also used to display such messages.
- "Change blindness" might prevent drivers from attending to an important message on a CMS if that sign often displays irrelevant information
- Safety experts are concerned that MUTCD will become moot if its basic safety principles are subverted by commercial uses.

DBBs on Moving Vehicles

- DBBs are now appearing on vehicles moving within the traffic stream.
- One company builds a large LCD display into the side of a big-rig truck.
  - These trucks display video messages while in traffic, then…
  - When they reach their destination the screen rises above the crowd for concerts, sporting events, parades, etc.

The Veridian Group, Inc.

A Truck Mounted DBB

ELEVATING "LED" SIGN TRUCK

Video of Elevating LED Sign Truck 1.avi

A 40 ft trailer with an integral LED video screen measuring 9x16 ft. The screen shows full motion video in traffic, and rises 25 ft. when the truck is parked at its venue destination.

Personalized DBBs that interact with the Driver

- DBBs can convey personalized messages to approaching drivers.
- Some DBBs interact with drivers, requiring them to text a message to the sign.
- Some DBBs gather data from oncoming vehicles to tailor specialized messages.
- One company claims that its DBB-mounted cameras can record the faces and eye movements of approaching drivers.

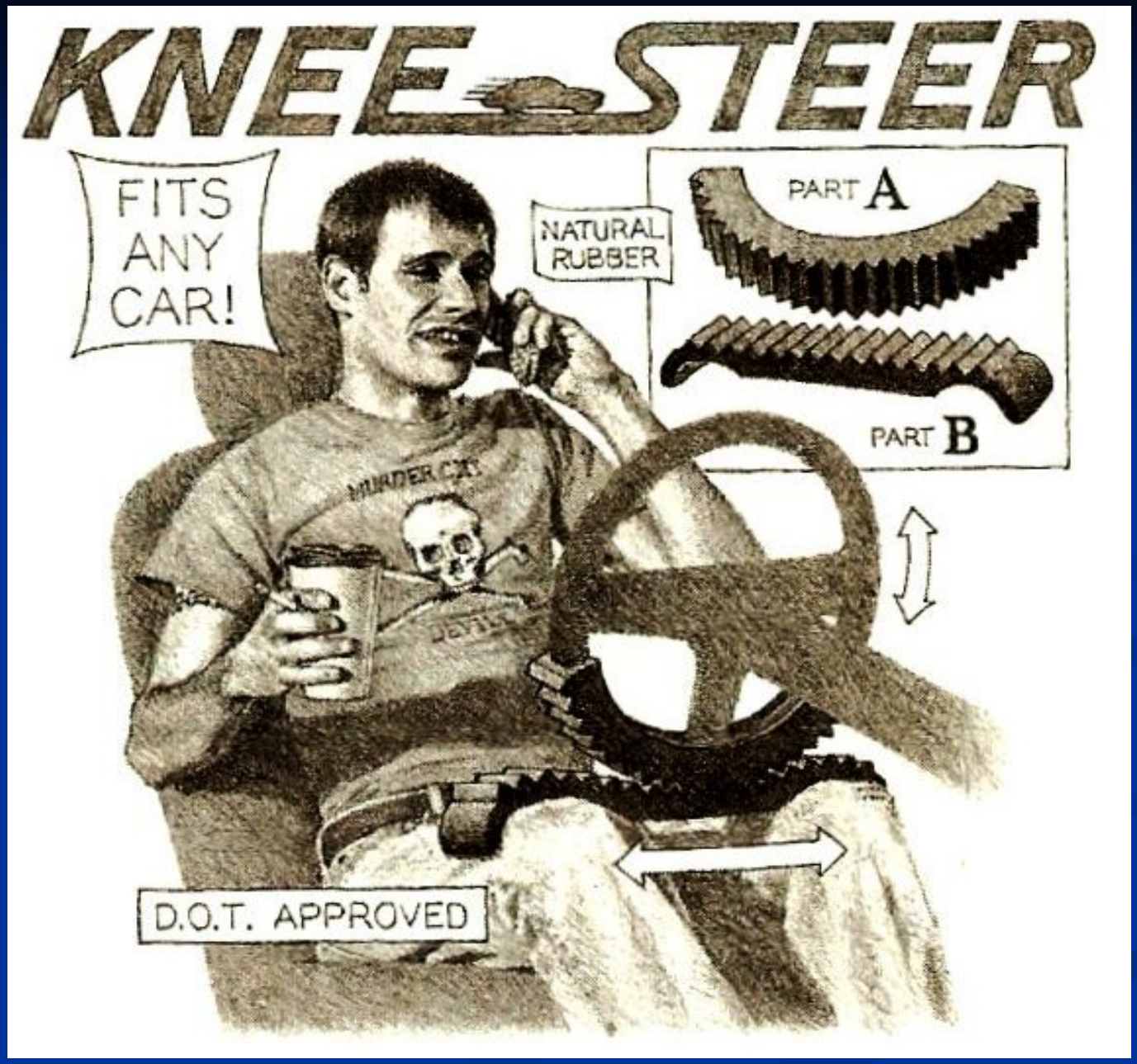
MOTOR ON JIM!

An Interactive DBB in Belgium

1. Driver sees sign, sends text message to "code" shown on sign.
2. Sign responds with a question.
3. Driver texts answer to question.
4. Right answer gets entered into contest to win car.
5. Wrong answer causes sign to light up and "tilt".

There is a renewed interest in the topic of driver distraction

- Several high profile accidents have been reported involving cell phone use and texting.
- The Secretary of Transportation is about to convene a high level "summit" on the problem.
- State and local governments are paying more attention to in-vehicle distractors – not always well thought out.
- But entrepreneurs are finding newer and newer technologies to add to such distraction.


KNEE STEER
FITS ANY CAR!
NATURAL RUBBER
PART A
PART B
D.O.T. APPROVED

The near future, in the eyes of some..

A few words about the OAC International Scan

- Gerry Solomon provided a great update earlier
- The desk scan is complete
- The leading countries recommended for site visits include:
  - England (Scotland)
  - The Netherlands
  - Finland (Norway, Sweden)
  - Australia
- Under consideration: Brazil, Spain, South Africa