Alabama
the Beautiful
The Alabama Pilot Project

Will answer national questions

Today is the release of the results of a three year project
“Alabama is to be commended for adding much needed, common sense information to the body of knowledge...”

“This, along with crash tests and data analysis, is critical and long overdue to help put to rest the question of whether school buses should have lap-shoulder belts.”

Presentation Outline

• School buses in Alabama

• Major research initiatives
  o Stakeholder attitudes
  o Literature review
  o School bus crash characteristics
  o Seat belt use rates
  o Safety effectiveness of seat belts
  o Seat belt effects on capacity
  o Cost effectiveness

• Summary and Recommendations
Governor’s Task Group on School Bus Seat Belts

- Thoughtful approach, no useful previous studies
- Federal agencies did not know answers
- They decided:
  - Do no harm
  - Get own data
  - Fund a pilot study
Seat Belt Pilot Study

• Overall goal: Assess impact of installation of lap/shoulder seatbelts on a limited number of Alabama school buses

• 10 school systems (Autauga County, Boaz City, Calhoun County, Conecuh County, Decatur City, Dothan City, Madison City, Perry County and Tuscaloosa County)

  12 buses (3 manufacturers, 3 seat types, 3 digital camera systems, 6 buses with aides)

• Well designed study
Current Situation
Alabama School Bus Facts

- 7,341 route buses (97% < 10 years old)
- 457,258 daily route miles (82 million/yr)
- 376,650 pupils transported (51% of pupils)
- $4.00 per mile to operate ($4.41/pupil/day)

- Alabama: fatalities to pupils inside buses
  5 since 1977 (major upgrade of school buses)
Sample Safety Statistics

- School buses are the safest vehicles on the road
- They are 6 – 8 times saver than parents’ cars
- Nationally, about 20 pupils are killed annually in school bus crashes. Two-thirds are outside the bus, in the loading/unloading zone
- Safety is due to their weight, height, rugged construction, and compartmentalization
Stakeholder Attitudes
Pre- and post-project surveys

Parents & children
Drivers and aides
Transportation supervisors
Principals
General Findings

*Positive* – all groups think buses are now safe and will be safer with seat belts

*Parents* – more concerned with bullying than safety

*Drivers and aides* – buses are safe, but concerned with poor visibility of pupils (possible discipline problems)

*Transportation supervisors* – concerned about loss of fleet capacity, expenses, etc.

*Principals* – most positive group
Expectations For Seat Belt Use

Who is responsible for pupils’ use of belts on bus?

Importance

- State Board
- Principal
- Teacher
- Driver/Aide
- Parents
- Older Children

Principal's response
Driver's response
Transp. Supervisor

UTCA
Sample of Principal’s written comments

• If belts are used, discipline should improve. Parents are the ones to instill this habit in children.

• I whole-heartedly believe lap/shoulder belts would have a major (positive) impact on student safety.
Safety Effectiveness

Predicting Lives Saved by Seat Belts
Procedure to Estimate Reductions of Fatalities

• Most recent 10 years of data (5 fatalities in Alabama, \textit{too few to use statistics})

• Estimate future Alabama fatalities using national data \textit{(National Highway Transportation Safety Administration)}

• Apply school bus seat belt safety effectiveness factor

<table>
<thead>
<tr>
<th>Point of Impact</th>
<th>Fatalities Reduced</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td>44% ±</td>
<td>Crash tests</td>
</tr>
<tr>
<td>Side</td>
<td>21%</td>
<td>Proxy (auto)</td>
</tr>
<tr>
<td>Rollover</td>
<td>74 %</td>
<td>Proxy (auto)</td>
</tr>
<tr>
<td>Rear/Other</td>
<td>0 %</td>
<td>Compartmentalized</td>
</tr>
<tr>
<td>Composite</td>
<td>39%</td>
<td></td>
</tr>
</tbody>
</table>
Capacity Loss with Seat Belts

• Important factors
• UA study of seat/row configurations
• Additional buses needed
Capacity of 39” bench – based on human seat width

Assumed Seat Width
- 13” = 10 year old
- 15” = 14 year old male
- 18” = 18 year old male

But what this ignores the trend in pupil body size over the last 25 years

SOURCE - ChildAnthropometry for Restraint System Design. June 1985 University of Michigan, Ann Arbor
Capacity Loss – Belt Buckles at 15”

Now: 3/3 seats (39” wide), 12 rows = 72 elementary pupils

With Belts: 3/2 seats (45”/30”), 12 rows = 60 elementary pupils

Capacity Loss - Thicker Seat Backs
Backs of seats will be 2” to 4” thicker = lose one row?

Possible solution: Manufacturers can lengthen bus bodies (about two feet); move rear axles backward
But this makes it harder to control the bus
One Possible Solution
Flexible Seating

Seat fits 3 elementary or 2 middle/high school

(minimum of 40 pounds and four years of age)

(maximum of 70 pounds in center position)
### Previous Studies

Estimates of Cost and Capacity Reduction

<table>
<thead>
<tr>
<th>Study</th>
<th>Cost per Bus</th>
<th>Capacity Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHTSA Report to Congress ’02</td>
<td>$2,440 to $3,550</td>
<td>17%</td>
</tr>
<tr>
<td>Indiana School Bus Study ’05</td>
<td>-</td>
<td>0 to 33%</td>
</tr>
<tr>
<td>NC School Bus Study ’07</td>
<td>$7,700</td>
<td>8 to 17%</td>
</tr>
<tr>
<td>CRS Report to Congress ’07</td>
<td>$8,000 to $15,000</td>
<td>16 to 33%</td>
</tr>
<tr>
<td>Texas Leg. Budget Study ’09</td>
<td>$9,300 to $14,000</td>
<td>-</td>
</tr>
</tbody>
</table>
Alabama Capacity Investigation
28% of fleet, actual pupil loads

<table>
<thead>
<tr>
<th>Seat/Row Configuration</th>
<th>Buses Not Meeting Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/3 - 12 rows</td>
<td>68 (3%)</td>
</tr>
<tr>
<td>3/3 - 11 rows</td>
<td>365 (16%)</td>
</tr>
<tr>
<td>3/2 - 12 rows</td>
<td>145 (7%)</td>
</tr>
<tr>
<td>3/2 - 11 rows</td>
<td>445 (20%)</td>
</tr>
</tbody>
</table>

Analysis of max estimated error = 2% or Less
Reduce estimate to 1%, 14%, 5% and 18%
Seat Belt Use Rates

• Use overhead cameras to determine belt use on a periodic basis.
• 170,000 observations of individual pupils
• Could not see about 1/3 of pupils on a bus
• Identified important factors in belt use
• Average seat belt use over 2 years = $61.5\%$
<table>
<thead>
<tr>
<th>Bus</th>
<th>Pupils Observed</th>
<th>Proper Use</th>
<th>Improper Use</th>
<th>Not used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus A</td>
<td>24,851</td>
<td>88%</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Bus B (Aide)</td>
<td>6,705</td>
<td>71%</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>Bus C (Aide)</td>
<td>2,093</td>
<td>59%</td>
<td>2%</td>
<td>39%</td>
</tr>
<tr>
<td>Bus D (Aide)</td>
<td>838</td>
<td><strong>95%</strong></td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Bus E (Aide)</td>
<td>1,353</td>
<td>16%</td>
<td>3%</td>
<td>81%</td>
</tr>
<tr>
<td>Bus F</td>
<td>12,984</td>
<td>39%</td>
<td>3%</td>
<td>58%</td>
</tr>
<tr>
<td>Bus G</td>
<td>81</td>
<td>9%</td>
<td>3%</td>
<td>89%</td>
</tr>
<tr>
<td>Bus H (Aide)</td>
<td>1,742</td>
<td>79%</td>
<td>5%</td>
<td>16%</td>
</tr>
<tr>
<td>Bus I</td>
<td>5,438</td>
<td>5%</td>
<td>2%</td>
<td><strong>93%</strong></td>
</tr>
<tr>
<td>Bus J (Aide)</td>
<td>3,588</td>
<td>59%</td>
<td><strong>20%</strong></td>
<td>22%</td>
</tr>
<tr>
<td>Bus K</td>
<td>3617</td>
<td>73%</td>
<td>24%</td>
<td>2%</td>
</tr>
<tr>
<td>Bus L</td>
<td>952</td>
<td>21%</td>
<td>6%</td>
<td>74%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>64,242</strong></td>
<td><strong>40,351</strong></td>
<td><strong>5,023</strong></td>
<td><strong>18,870</strong></td>
</tr>
</tbody>
</table>
Variability in Seat Belt Use, Bus to Bus, Year to Year

Aide Removed

Changed Driver

2008-09

2009-10
Effect of Driver/Aide on Seat Belt Use Rates

Rating was based on degree of encouraging seat belt use, Fall 2009

Clear Effect of Driver – seatbelt use rate is almost always close to the driver’s rating.

Effect of Aide – mixed, seatbelt rate is often close, but 2/3 of aide ratings < belt rate.
Cost Effectiveness Study

• Most difficult and technical study
• Data is limited or missing
• Patterned after NHTSA (2008)
  ○ Cost to save an Equivalent Life
  ○ Net Benefits
• Best use of limited funding
Costs

ALSDE files and vendor quotes (2010 dollars)

• Bus purchase - $79,860
• Annual fuel/maintenance/other - $7,973
• Driver salary/wages - $26,271
• Aide salary/wages - $21,443
• Cost of seats (above cost of normal seats) $11,000 to $15,000
• Extend passenger compartment $1,000

Determined max/min additional costs for a 10 year phase in, by bus configuration
**Costs: 10 year phase in 2010 dollars**

- **Most expensive**: 3/2-11 configuration with aides
  - $1.4 B during phase in
  - $237 M annually after that

- **Least expensive**: flex seats with extended passenger compartment, without aides
  - $117 M during phase in
  - $12 M annually after that
Benefits

• Annual reduction of fatalities: 0.13
  (average saving one life in 8 years)
• Annual reduction of injuries: 7.60

• NHTSA converts fatalities + injuries to cost values using the “Value of a Statistical Life”
  ($ approx 6.4 $million)

• NHTSA uses “Equivalent Lives Saved per Year” = economic value of all lives + all injuries saved
  ( 0.427 for Alabama)
Benefits

NHTSA uses 2 benefit/cost measures

1) Cost of an equivalent life saved
   • $32 M to $38 M for Alabama

2) Net benefits (benefits – cost)
   • - $104 M to - $125 M for Alabama

• Cost per benefit is the dominant consideration
• Can funding be better spent elsewhere?
Alternate Safety Measures

• Literature indicates that up to 75% of pupil fatalities occur outside of bus in loading/unloading zones.
• Alabama follows national pattern:
  • 6 pupil fatalities outside bus in 10 years.
  • 1633 reported vehicles passing buses in loading/unloading zones in 2009-10.
• Alternative treatments for this type of crash are lower cost and higher cost effectiveness.
Sample Alternative Treatments

• Safety technology on new school buses
• Additional training to drivers, teachers, students
• Upgraded traffic control at school crossings;
• Public education about passing a school bus that is loading/unloading pupils;
• Enforcement efforts by the Dept of Public Safety, local police agencies, and school districts
• Others appropriate to local situations
Concluding Recommendation
School Bus Seat Belt Pilot Project

If funding is to be spent on school bus safety, it appears more lives could be saved by investing in alternative safety measures in loading/unloading zones rather than in installation of seat belts. The alternative treatments in the previous slide are less expensive and more cost-effective than seat belts.

We recommend that alternative treatments be investigated and that plans be prepared for their implementation, pending availability of funding.
Reports are Available
School Bus Seat Belt Pilot Project

Eleven UTCA reports were prepared to document study methodologies and research results.

They may be found on the ALSDE website at www.ALSDE.edu

Look at the bottom of the home page for “Special Links” and “Hot Topics”
Acknowledgements

The Governor’s Study Group
Alabama State Department of Education
10 local school Systems
UTCA and CAPS
5 faculty members, 5 staff members
and 19 students
Have a safe trip home!