

# **Future Truck Position Paper: 2019-1**

## *Recommendations Regarding Future Seating Positions*

Developed by the Technology & Maintenance Council's (TMC)  
Future Cab & Driver Interface Task Force

### **ABSTRACT**

Having studied issues with driver seating and control packages for all known driver population profiles, TMC's Future Cab & Driver Interface Task Force proposes in this paper that equipment manufacturers and suppliers develop seating systems that accommodate at least 95 percent of truck driving populations with adjustments for seat cushion width, seat cushion depth (each leg separate), lower seat back width, upper back width, lumbar vertical, lumbar in/out, and arm rest up/down.

### **INTRODUCTION**

Current SAE International driver interface packaging related standards use various mixes of male and female anthropometric models, but are all based on outdated truck driver anthropometric data. An SAE Cooperative Research Project in conjunction with the U.S. Department of Health and Human Services, National Institute of Occupational Safety & Health (NIOSH) has completed a survey\* of 1779 male and 171 female truck drivers, recording 33 anthropometric measurements plus shoe length and width. While the industry is to be complimented for combining forces with

NIOSH to complete this significant task, there is work to be done to incorporate this data into vehicle design – especially seats – using this updated anthropometric database.

Updating the design standards is very important for all driver interface packaging issues and critical for seating. The driver interacts with the seat at all times while driving the vehicle and lack of accommodation has many negative effects.

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*\*Anthropometric Study of U.S. Truck Drivers: Methods, Summary Statistics, and Multivariate Accommodation Models (Publication Number 2015-116)*

## DISCUSSION

There are several basic requirements for all heavy truck seating systems including:

- Basic Adjustments
- Stability
- Comfort
- Safety
- Durability
- Repairability

### A. Basic Adjustments

Over the years, increases in seat track adjustment (fore and aft), back angle tilt (back and upright) and vertical seat height adjustment (up and down) have increased the number of drivers being able to reach an acceptable seating position relative to operating controls. However, as TMC's *Future Driver Accommodations* position paper declared, more changes are needed to accommodate the current driving population (especially the smaller stature driver).

### B. Stability

To ensure safe driving, the seat must be stable. The vehicle cab underbody structure must be robust enough to assure the seat base is extremely rigid. The seat mechanism design must maintain stability for the driver interface with the vehicle controls while simultaneously providing isolation from road vibrations (high and low frequency).

### C. Comfort

Clearly one of the most important elements of the seat is driver comfort. Manufacturers must develop testing procedures that objectively measure comfort. Since truck drivers spent so much time in the seat, the evaluation procedure must include this factor in the product development process.

Considering that the cab is the workspace for the driver, manufacturers should develop and provide a "business class" level seat similar to an upgraded office seat for someone with back problems.

### D. Safety

Integral restraint systems are judged to be highly desired. In addition to improving the comfort of the shoulder belt by reducing the relative motion, these systems would improve safety by increasing the usage rate.

### E. Durability

The seating system should last the life of the vehicle. TMC's current durability targets are 1,000,000 miles and at least 10 years of service without failure.

### F. Repairability

In recognition of diverse and sometimes conflicting objectives, some components of the seating system may not be able to achieve the higher priority requirements and still achieve the durability objectives. Therefore, TMC recommends that manufacturers identify components that will require replacement and provide reasonably priced repair kits.

### G. Additional Adjustments

In addition to these basic requirements, significant modifications are required in future seating regarding:

- adjustments necessary to accommodate the full driving population,
- ease of use in obtaining optimum position of these adjustments, and;
- automatic return to these optimum settings for each individual driver.

The goal is to accommodate 95 percent of the truck driving population (2.5 percentile to 97.5 percentile) of a selected male/female mix. These adjustment range changes must be made without any regression of the other attributes.

Specifically, the full ranges (2.5 percentile to 97.5 percentile or 95 percent of the driving population) of following anthropometric dimensions must be incorporated in future seating systems:

- Hip Breadth (NIOSH Study Dimension # 1) i.e., butt width
- Bideloid Breadth (Dimension #8) i.e.,

#### Upper Body Width

- Abdominal Breadth (Dimension #1) i.e., Waist Width
- Buttock to Popliteal (Dimension #10) i.e., Seat back to back of knee
- Popliteal Height (Dimension #23) i.e., Floor to back of knee
- Elbow Rest Height (Dimension #15) i.e., Seat base to elbow
- Weight (Dimension #35)

Significant changes to seating system design will be necessary to accommodate these ranges but are essential to achieving comfort and safety for 95 percent of the driving population. Something similar to the seating systems that are available in some passenger cars (e.g., 30-way adjustments) will be required but with heavy truck level of durability.

Increasing the adjustments needed is the first step because with added adjustability comes the increase risk of maladjustments. Therefore, a comprehensive procedure must be established to instruct the individual driver on how to achieve their optimum seating position. Even with today's limited adjustability, studies have shown that training is necessary to avoid maladjustments and the resulting health issues

(mainly back problems).

Finally, once the optimum seating position has been established for the individual driver, a method must be devised to automatically reset the various adjustments for the specific driver. There are multiple technologies that can be utilized to achieve automatic resets. A couple of examples are:

- NFC chips in the driver's company identification card
- A smartphone app that communicates the driver's ID to the vehicle.

### **RECOMMENDATIONS**

In summary, TMC's Future Truck Cab & Driver Interface Task Force recommends the following actions:

- Seating systems must provide adjustments that accommodate at least 95 percent of the truck driving population.
- Procedures and training must be developed to teach drivers how to achieve their optimum seating adjustment position.
- Seating systems must feature an automatic return to the optimum position for each driver. 