

**SAE- WHEELCHAIR RESTRAINT
TASK GROUP
Unconfirmed Meeting Minutes, February 5, 1995
John Ascuaga's Nugget
Reno/Sparks, Nevada**

1. Roll Call, Acceptance of Minutes, Document Identification

The Chairman welcomed everyone to Reno. Penny Brown was introduced to the group as the new SAE administrative support person. Thirteen members and guests were in attendance as shown by the attached roll call. The following documents were identified for the meeting:

WR114-Minutes of Aug. 1994 meeting, Tampa, Fla.

WR115-Feb. 5, 1995 Meeting Agenda

WR116a-SAE J2249 Jan, 1995 WTORS document – distributed for voting

WR116b-Surrogate Wheelchair Drawing Package (available upon request)

WR117-Univ of Pgh; WTORS Standards comparison

WR118- Myers, McLaurin and Shaw–UVA Universal WTORS

WR119-J. Takacs comments on ISO 10542, Jan. 1995

WR120- Jan 16, 1995 CSA Z605 MASORS Standard

WR121- Results and comments of SAE J2249 WTORS voting

Review of Aug. 1994 Tampa, Fla. minutes: Further clarification was requested regarding the intent of Pg 4, Appendix C6.7 " .75+/_ Hz". *Follow-up: Item should be modified to read; "Change frequency to between .5 and .75 Hz."* Otherwise, minutes were accepted as distributed.

2. Finalize Agenda/Meeting Highlights (Hobson)

Doug Hobson added the "Status of the Simms–Stevens/NHTSA Case" as an agenda item. The draft agenda was otherwise accepted. The Chairman emphasized that during this meeting he would like to review the results of the Adaptive Devices Standards Committee voting on the WTORS document, as well as address comments made as a part of this voting. Responses to the comments should be formulated as a part of this meeting. Through the voting process, the WTORS document has been assigned the numerical designation of SAE J2249. The next step in the Standards adoption process will be voting by the SAE Motor Council.

Also as a part of this meeting, a review of compatibility between pending WTORS standards and ADA regulations regarding WTORS, will be reviewed by Gina Bertocci. The Chairman also suggested that in the interests of harmonization, we may choose to adopt some pertinent items from the CSA Z605 MASORS document for inclusion in our standards document. It was also pointed out that comments on the CSA Z605 are due Feb 20, 1995.

The Chairman suggested that the group use this meeting to consider future issues that should be addressed by the Task Group. With regards to possible future work, presentations on the Cleveland Clinic, UVA and Oregon State docking systems will be provided at this meeting for information and discussion.

3. Update on CSA Activities

WR120: The final draft of the CSA Z605 MASORS standard is currently under review in preparation for voting. The group should take this opportunity to provide our input on this document. Joe Takacs, Steve McKay and Gil Haury of this group will officially submit their comments to CSA. However, it was agreed that all participants will review CSA Z605 and will forward comments to Larry Schnieder by the end of Feb. Additionally, any items from this document, which should be included in our document, must also be commented on following the same procedure. An editorial committee will review these comments for inclusion at the March SOWHAT meeting. A brief overview of differences between CSA Z605 and SAE J2249 was also provided.

4. Update on Pittsburgh ISO

¹ Meeting

The Nov, 1994 version of ISO 10542 was distributed to the group for their review. This document was distributed for ISO voting last week. One difference between the SAE and ISO WTORS standard is that ISO addresses only public transportation, whereas SAE includes both, private and public transportation. The Nov, 1994 meeting held in Pittsburgh also resulted in considerable progress on ISO 7176/19, the Transportable Wheelchair standard. Upon request, this document is available from Doug Hobson for review. A computer crash simulation workshop was also presented by Ken Digges as a part of the Pittsburgh meeting.

5. Update on SOWHAT

The SOWHAT research program has obtained necessary first year funding. Initial efforts will include combining the CSA Z604 and ISO 7176/19 documents to prepare a draft Transportable Wheelchair Standard for the March 12th meeting in Mesa, Arizona. Development of a surrogate WTORS is also underway for the standard's testing procedures. A Wheelchair Classification System, based upon wheelchair geometric and inertial properties, is also under development to better understand the various structures to which securement systems must attach..

6. Review of SAE J2249 WTORS Voting Results

WR121: The results of the Adaptive Devices Standards Committee voting on SAE J2249 WTORS are contained in document WR121. SAE policy requires 75% approval from submitted votes for further consideration and adoption of a standard. Of the twenty five (25) committee members, 14 submitted votes, with 11 approving and 3 disapproving the WTORS standard. Since these results reflect an approval of 78%, SAE J2249 is eligible for advancement to the next step of Motor Council voting. The following reflects the committee's review of the comments submitted as a part of the voting.

A. Dale Carpenter:

i) Concern was raised regarding the disabled driver's inability to properly position occupant restraints such that the belts not pass over the wheelchair structure. Dale Carpenter suggested that a drawing indicating that this condition is not acceptable be added to the standard. The committee agreed that a statement and/or drawing warning that the operator not place the lap belt over the wheelchair arm rests will be added to the installation instructions which are to be present in the vehicle. Section 4.3.5 will also be reviewed to assure clarity. An item will also be added that addresses anchoring lap belts to wheelchairs, and that such a system should be tested with the specific wheelchair in lieu of the surrogate. Lou Molino and Larry Schneider will add appropriate wording addressing this issue for the committee's review. Dale indicated that based upon this agreement, he will change his vote to "approved."

B. William Evans:

i) Comments are editorial in nature and will be addressed by an editorial committee.

C. Rodger Koppa:

i) Concern was expressed that airbags, which are referred to in the Foreword and item 5.2.17, are out of the scope since WTORS manufacturers cannot control vehicle equipment and airbags are not part of the WTORS. Larry Schneider indicated that the statement in item 5.2.17 is part of the Instructions for Installation section to be indicated by the WTORS manufacturer in their product literature and does not require any action on the part of the WTORS manufacturer. Rodger indicated that this clarification satisfied his concern.

ii) Item 4.1.4; Language may be interpreted as allowing drilling or minor cutting of the wheelchair frame for hardware installation. The committee agreed that a statement which indicates that "drilling" is prohibited will be added in item 4.1.4.

iii) Item 4.2; Add statement indicating that tiedowns do not involve or depend on the use of wheelchair brakes. The committee agreed that WTORS design should not rely upon wheelchair brakes and will modify the design requirements accordingly.

iv) Add statement indicating that attachment hardware shall not limit ground clearance. A statement addressing this issue will be added to informative Appendix E. Rodger indicated that he will change his vote to "approved" based upon the implementation of items discussed above.

D. Roger Levy:

- i) Electronics which warn of incomplete engagement of docking systems should be added to the standard. This issue will be addressed following the presentations on docking systems.
- ii) See comments above by Roger Koppa, prepared in conjunction with Roger Levy.
Roger will change his vote to “approved” based upon meeting resolutions.

E. Phil Doolittle:

- i) *Add SAE Document # of Surrogate Wheelchair Drawing Package to the Surrogate Wheelchair definition.* Reference to Appendix D and assigned SAE Surrogate Wheelchair Drawing Package # will be added.
- ii) *Item 5.4; Is illustrate an appropriate term in referring to the instruction sheet? "Illustrate" will be removed.*
- iii) *Item A.8.12; Suggest adding the words "based upon calculation in item 6.2.4."* This phrase will be added to item A.8.12.
- iv) *Item B.5.2; Add photographic requirement to aid in describing method used to apply separating force in the test report.* Item B.5.2 will be modified to include the use of demonstrating photographs.

F. Lou Molino:

- i) *“Anchorage” should be deleted from the definition list since definitions are also provided for Anchor Point, Occupant Restraint Anchor and Wheelchair Tiedown Anchor.* “Anchorage” will be deleted.
- ii) *Item 5.2.6.1; Concern was raised regarding adequacy of the anchor point structure when one anchor point is used for both the occupant restraint system and wheelchair tiedown. Upper torso anchorage points should also require the same structural integrity.* FMVSS 210, which is referenced by the WTORS document, provides requirements for strength of upper torso restraint anchor points. A resolution was not reached by the committee, therefore, a breakout group led by Lou Molino will further address this issue.
- iii) *Item 4.3.1 requires an occupant restraint to consist of a pelvic and upper torso restraint, while item 5.2.14 defines a clear zone for the case where only a pelvic restraint is utilized.* It was explained that item 4.3.1 is a design requirement for WTORS manufacturers, while item 5.2.14 provides instructions to the installer. However, to further clarify the intent, wording will be added to Figure 10 indicating that a pelvic restraint alone is not recommended.
- iv) *Item 5.2.15 states that Figure 10 shows a clear zone with head excursion referenced from the WTORS anchorage points, while it actually shows excursion relative to the head’s initial position.* Wording will be modified to reflect that excursion is relative to the occupant’s head position.
- v) *Item 5.2.15 should indicate that energy absorbing padding added to the vehicle must comply with FMVSS 302, Flammability of Interior Materials.* A statement will be added indicating that all materials must comply with FMVSS 302 which will be added to the listing of Applicable Documents.
- vi) *Figures 4-6; Clarify intended reference planes.* A note will be added indicating the relationship between securement reference planes and the wheelchair reference planes.
- vii) *Items A.6.4a & b; Change “longitudinal axis” to “wheelchair reference plane.”* Items will be modified accordingly.
- viii) *Item A.6.4a; Angles in the horizontal plane are not specified for the test setup.* Appropriate angles will be specified for front tiedowns. Rear tiedown horizontal plane angles will be specified as 0 degrees, i.e. straight back from wheelchair attachment points.
- ix) *Item A.6.9; Provide additional guidance regarding pelvic belt angle and upper torso belt anchor point location.* This issue was unresolved and will be discussed at a future meeting.
- x) *Item A.8.3; Require pre-test measurements to record tiedown and occupant restraint belt angles relative to vertical and horizontal reference planes.* Requirement will be added to item A.8.3.

F. Greg Shaw:

- i) *Appendix D should be rewritten to*

³ *specify the use of the surrogate wheelchair*

defined by J2252, Surrogate Wheelchair Preparation, Fabrication and Assembly Manual. Compatibility with the ISO 10542 document, which provides outline specifications for the construction of a surrogate wheelchair as a part of the document, is deemed to necessary. Therefore, Appendix D will remain as written.

G. Joe Takacs: Comments on ISO 10542 (for informational purposes)

- i) *Page 1 & 2; Anchor Point: What is a "vehicle seatbase?"* Seatbase will be changed to two words.
- ii) *Page 4; Change "Pelvic Belt" to "Pelvic Restraint."* This change will be made.
- iii) *Item 4.2.1; Add to sentence "without intentional operation of a release mechanism."* Phrase will be added.
- iv) *Item 4.3.2; Move paragraph to Instructions section.* It is already contained within the Instructions section.
- v) *Item 5.1.4; Remove entire paragraph and require only month and year to be specified instead of batch.* Item 5.1.4 will be deleted, and "and/or unique identification to enable recall" will be added to item 5.1.2. ISO 9000, GMP, Good Manufacturing Practices, was also suggested as a guide for identification. The editorial group will review ISO GMP content to determine it's relevance to this standard.
- vi) *SAE J2249; Kinedyne will review Table 1 in section 6.1 regarding Applicable Subsections of FMVSS 209 for completeness.*

Final Revisions to J2249

Since there will be minor technical changes to the document based upon today's meeting, an editorial committee formed by Larry Schneider, Doug Hobson, Lou Molino and Joe Takacs will finalize the decisions of this meeting and will resubmit the document to SAE-Adaptive Devices Committee for second voting. Steve McKay requested a copy of the document prior to submission to SAE for voting, otherwise, all agreed that no further review is necessary.

7. Compatibility of WTORS Standards and ADA Regulations (Bertocci)

In an effort to promote standard and regulation compatibility, a comparison of the SAE, CSA and ISO WTORS standards, and ADA regulations was provided. Points addressed by the review include document status, transportation modes, wheelchair/occupant orientation, securement station space requirements vs. space consumed following preferred tiedown angles, occupant restraint requirements, and allowable excursions vs. the ADA space envelope. It was concluded that differences do exist, and should be addressed in any document revisions or addendum's.

8. Docking Devices Presentations

Presentations were delivered by Tom Adams of the Cleveland Clinic on their prototype docking system, and Tom Stowes of CCI. Doug Hobson also presented the details of UVA's docking system and the Mobile Tech-ILS docking system developed by Oregon State University. A major problem in the use of docking systems is the requirement for a variety of wheelchair interface brackets.

Doug expressed the view that there is a unique opportunity in the transportable wheelchair standards group (SOWHAT) to move toward a universal interface similar to what has been developed in the tractor trailer industry. He suggested that the issue of a universal interface standard be added to the future goals of this group. The question was posed as to whether the SAE WTORS document adequately addresses, and does not restrict the use of docking systems. Phil Doolittle pointed out that systems requiring the occupant to back into the docking station cannot be used by a driver, who is otherwise within the scope of our standard. Including the document changes discussed in this meeting, it appears that the standard does exclude docking systems. Manual Override/Release and Interlock Warning controls for docking systems will be addressed as future issues for the standard. It is recognized that additional refinement of the standard will be required as docking system development advances.

9 Charting the Course of Future Work

Future issues to be addressed by this committee, and hence the standard will be explored through position papers on the following topics. Presentations on these issues will be given at future SAE-WTORS meetings by those indicated below.

Rearward Impact - Ken Digges

Design of Docking Systems - Joe Takacs/Rich Jacobson

Rear Facing Orientation in Frontal Impact - Larry Schneider

Dimensional Improvement of SWC to Better Reflect Production WCs - Gina Bertocci

Air Cushions/Bags - Ken Digges

Occupant Rebound - John Thacker

Side Impact - Ken Digges

Differences in Physical Impairment - Mike Shipp

Occupant Restraint Fit: 6yrs old to adult - Doug Hobson/Gina Bertocci

Stability in Normal Driving Maneuvers - Tom Adams

Universal Interface - Doug Hobson

The group agreed that future priorities should be established based upon a combination of the needs of people with disabilities, the needs of the industry, and the areas where research funding is available.

10. Stevens/NHTSA resolution: Jan 19, 1995

On Jan 19th, the Sixth Circuit Court of Appeals dismissed the appeal by Simms and Stephens who charged that NHTSA violated section 504 of the Rehabilitation Act of 1973 since it did not establish provisions in FMVSS 222 to ensure that disabled students received protection equivalent to that of students able to use standard seats. Specifically, the plaintiffs charged that NHTSA acted illegally by using static rather than dynamic tests for wheelchair securement systems. Furthermore, Simms and Stephens charged that NHTSA should have developed standards for crashworthiness of wheelchairs transported on school buses. On both counts, the court sided with NHTSA, supporting the agency's contention that technical problems made it impracticable to perform dynamic tests of wheelchair tiedowns, and develop crashworthiness standards for transportable wheelchairs without extensive delays. Further, the agency has indicated that it is actively involved in the development of the SOWHAT group's transportable wheelchair standard, via funding to the UVA for crash testing of wheelchairs.

11 Future meetings

11.1 Next ISO meeting

The ISO Transportable Wheelchair and WTORS Committees will meet in Oslo, Norway on May 21/22, 1995.

11.2 Next SOWHAT meeting

The ANSI/RESNA Transportable Wheelchair Standard Committee will meet on March 12, 1995 in Mesa, Arizona. Minutes from this meeting will be available from Larry Schneider.

11.3 Next SAE meeting

The next SAE meeting will likely be held in conjunction with the ADED Conference in Dearborn, Michigan. The conference will take place on Aug 24,25,26 1995. Further details as to the exact date of the SAE meeting will follow.

12.Adjournment

The agenda items were completed and the meeting was adjourned at 5:00 pm. The Chairman thanked those present for a very productive effort.