

**SAE- WHEELCHAIR RESTRAINT
TASK GROUP**

Draft Minutes

Meeting, February 1, 2000

Reno, Nevada

Chair: Douglas Hobson

1. Roll Call, acceptance of Minutes (1/97), document identification

The chairman welcomed the attendees, conducted a roll call, briefly reviewed the Minutes of the last meeting (1/97) and identified and numbered the documents distributed by the attendees.

1.1 The Minutes (1/97) were accepted as distributed.

1.2 The distributed documents were identified and numbered as follows:

- WR154 – Minutes of ADSC Restraints Task Group from January 28, 1997 meeting in Orlando, Fla.
- WR155 – Preliminary agenda for Reno meeting on February 1, 2000
- WR156 – Part 3 of 10542 for docking systems; draft 2000-01-25
- WR157 – current SAE J2249
- WR158a – xerox photo of SWC built by Kinedyne
- WR158b – Kinedyne SWC assembly drawings
- WR159a – SWC side-view drawing from ISO 10542-1 Annex A
- WR159b – SWC top-view and securement-point drawing from ISO 10542-1 Annex A
- WR 160 – Letter dated 10/20/99 from Carmella Strano to Doug Hobson re Terminology

1.3 Attendees: Jean-Marc Girardin, Gil Haury, Ray Lee, Larry Schneider, Joe Takacs, Gary Talbot, Stephen Sundarrao, Robert Joseph, Patricia Christian, and Douglas Hobson-Chair

2. Finalize Agenda

The distributed agenda was reviewed, additions made, and then accepted as the work plan for the meeting.

3. Update on CSA activities

Larry S. provided an update on the status of CSA activities and indicated that CSA is working on making Z604 and Z605 compatible with J2249a and ANSI/RESNA WC/19, respectively. Larry has sent all the drawings, including updates based on ISO and WC/19 work. Jean Marc indicated that he thinks there was a recent meeting at CSA on these documents and that the modified drafts will be mailed out to the committees for comment in the next couple of months. Larry indicated that it is likely that there will still be a few problems and inconsistencies, based on what was in the previous drafts and the fact that CSA has not asked for further assistance.

4. Update on ISO standards

Doug H. discussed the USA's efforts to maintain world-wide harmonization through active participation in ISO meetings. He indicated that CEN has agreed to accept ISO standards. CEN sets and governs industry standards for the European Common Market.

He described recent meetings in Valencia, including witnessing of a barrier crash of a van with two crash dummies seated in wheelchairs.

Larry S. described how, in spite of three more years of work in ISO since completion of SAE J2249, there are really no differences of any substance in the equivalent ISO standard, 10542 -Parts 1&2. SAE J2249 is a much more concise and consistent document that contains, in one document, most of the provisions of ISO 10542-1&2. It also includes allowance for testing with a specific wheelchair (systems test), allowing for WTORS for children 6 years of ages and older, special requirements for docking and powered systems, special design and setup requirements for four-point, strap-type tiedowns, etc. These later inclusions are only now being worked on in Parts 3, 4 and 5 of 10542.

Doug reviewed the range of ISO activities occurring within WG6 including the formation of a new sub task group on "Seating devices for use in motor vehicles", headed up by Gina Bertocci. He also indicated that the University of Pittsburgh-RERC's website at: <http://www.rerc.upmc.edu/STDsDev/> contains copies of all the SAE, SOWHAT and ISO draft standards, minutes and meeting announcements.

5. Update on SOWHAT activities

Larry S. presented a brief update of activities within the ANSI/RESNA SOWHAT-Working Group. The ASNI/RESNA-WC-19 standard on transport wheelchairs has now passed through a lengthy review process within RESNA and is almost ready for final voting by ANSI. It is anticipated that WC-19 will be finalized by mid year, 2000. He also indicated that wheelchair companies are actively testing to the new standards, and that more and more products that comply with the standard are appearing in the market place. Copies of the final working draft will be posted on the above RERC website, as a replacement to the current posted draft.

6. Review of Phase II work priorities

Future leading priorities for future items agreed to at the last meeting include:

- The potential need for a surrogate wheelchair in excess of 87 kg
- Testing of wheelchair securement systems for exclusive use in low-g environments
- docking systems performance in normal driving maneuvers
- performance in side and rear impacts
- driver restraints

Although many of these items remain as priorities for the Task group, several had to be deferred at this meeting in order to address more pressing issues.

7. Priority Items for discussion at this meeting

7.1 SAE-J2249—Experiences to date/need for revisions

Larry led a discussion on the need for updates in SAE J2249. He proposed changing the document to allow testing with the surrogate wheelchair of WTORS with integrated restraints that transfer occupant restraint loads to the wheelchair. He also indicated that several drawings needed to be updated and maybe some text.

Joe Takacs suggested that we add a stronger warning against mixing and matching WTORS components from different manufacturers. This needs to be

done primarily in instructions to users of equipment – warnings to users. Joe will draft suggested stronger wording that will include the words “attendant” or “operator.” Larry suggested that we also should add something more to 5.5 (replacement parts) as well.

Larry agreed to review all references and update them as appropriate based on new documents, such as ANSI/RESNA WC/19, that have been developed.

Joe asked that the fore/aft distance between anchor points used in setting up a test by reducing it by 100 mm (i.e., from 1300 to about 1200). He thought this would create an angle closer to 45 degrees for the rear tiedown straps using the surrogate wheelchair, but it won't. Larry explained that the rear tiedown length is specified to be near minimum achievable, and this results in about a 30 degree rear tiedown angle. This is dictated by the height of SWC securement points. Reducing anchor point distance by 100 mm would only shorten front tiedown strap lengths that are already quite short using a 1300 mm spread because of the relatively long fore/aft distance between securement points on the SWC.

ACTION Plan: Larry will make the proposed changes to SAE J2249 using underline and italics text and strike-throughs, and will send out a draft to the editorial committee consisting of: Joe Takacs, Doug H., Ray Lee, and Jean Marc G. by the end of March.

7.2 SAE-J2252- Update Surrogate W/c drawings

Larry S. and Joe T. discussed their recent efforts to build a surrogate wheelchair using the GESAC drawing package. Both agreed that the GESAC drawings were overly complicated and made building a SWC very expensive. Joe presented a new drawing package that Kinedyne developed in the process of building a simpler surrogate wheelchair that meets the SWC specifications. He indicated that it cost about \$3500 to build their surrogate which has been successfully tested.

Larry indicated that UMTRI has recently built an SWC using the GESAC drawing package and it cost a lot more than \$3500. He also noted that there are a few problems with the drawings, including unnecessary hardware at the back of the wheelchair to support the battery/ballast box. The box is in the direct path of rear tiedown straps. Also, pelvic anchor blocks on the sides of the wheelchair are too wide and interfere with vehicle-anchored pelvic restraints. The need for a

battery/ballast box was discussed and it was agreed that it is probably not needed., and therefore will be removed from the drawings.

ACTION Plan: Larry and Joe will work together to agree on acceptable changes, including:

- removal of large ballast box
- adding ± 25 mm tolerance to height of foot rest from floor
- the need for gussets to strengthen frame of the SWC built by Kinedyne
- determining a suitable and available pressure rating for tires
- providing for freedom in design of the SWC for compatibility within docking systems
- providing for incorporation of a universal adaptor device (UAD) for testing docking devices
- durability for 50 kph/20 dynamic testing
- review/update of the sources list for the surrogate wheels

7.3 Universal Adapter Device (UAD) for Docking Systems

Doug reviewed University of Pittsburgh' efforts to develop a Universal Adaptor Device (UAD). He indicated that the primary purpose the UAD is to facilitate the universal optional use of docking systems in public transit. Once an acceptable design specification for the UAD has been agreed upon it would then proposed as a universal adaptor device standard. He referred to WR156 – 10542-Part 3 Docking systems, and specifically Annex C, that contains the detailed specifications of a proposed UAD resulting form the Pitt studies. In basic terms in order for a UAD standard to be universally applicable to all types of wheelchairs and docking devices seeking compatibility in engagement, the standard must specify the required:

- Geometry
- Location in space
- Strength
- Surrounding clearance zones for access of the docking mechanism to the wheelchair

UPitt has developed, tested, and demonstrated a UAD that offers these elements. It consists of one horizontal and two vertical sections of tubing as documented in Annex C of WR156.

This document can be viewed and downloaded from the above website: Click to ISO-WG-6, 10542-Part 3-Docking Systems

- Much discussion on the UAD concept followed, including the following questions:
- Why not include a second horizontal bar across the bottom? – i.e., present a rectangular structure
- Should it be easily removable from the wheelchair?
- Does the Oregon State patent preclude the use of any concept for a UAD that provides for a resisting torque on the wheelchair?
- Should the UAD concept be initially targeted for low-G (i.e., large vehicle) environments?
- What are the clear spaces around the UAD that still need to be developed?

Joe Takacs proposed, and the group agreed, that we form a working group to work on the UAD. This group consists of Joe Takacs, Gina Bertocci, Bob Joseph (Kinedyne), Larry S., Doug H, Gil Haury, Jean Marc G. Doug H. will chair the working group.

ACTION Plan: By April 15, members of the group should review and forward comments on ISO 10542-Part 3 (WR-156) draft to the chair. These comments will be assimilated and presented at the ISO meeting in May, at which time WG-6 will be formally discussing the Part 3 draft.

7.4 J2249 Guidelines document-update

The J2249 Applications Guidelines document has been prepared by Schneider, Hobson and Bertocci and posted to the SAE Restraint Task Group website, as planned. This is an extensive 60 plus page document that contains much of the rationale behind the J2249 document. It also provides detailed explanations of each section in J2249 for use by test labs, followed by less specific guidelines for users/operators, installers, designers and transit administrators. The participants present were encouraged to review the document and make it available to all appropriate persons within their circle of contacts.

ACTION Plan: Suggestions for any improvements should be forwarded to the Chair by March 1, in preparation for the forthcoming update to the document.

7.5 Other topics

7.5.1 Letter form Carmella Starno

Doug reviewed Carmella's letter re terminology changes (WR160). The group agreed to change "in" to "during" in the definition of postural support. The group agreed that the current definition of "wheelchair" is not good and that we need to find a better definition. Doug will check options from existing ISO and ANSI/RESNA standards. The group agreed to not accept Carmella's suggestion to modify definition of WTORS by adding the words "hardware and" between anchorage and fasteners after specifications.

ACTION Plan: Once the details of the wording changes are finalized this information will be sent to Carmella by Doug.

7.5.2 WTORS for Low-G Environments

Larry indicated that he believes there is a need for testing WTORS intended only for use on large vehicles using something less than 48 kph/20-g. Basically, there is a need to establish the vehicle mass criteria for which a Low G standard will apply, and the specific crash pulse corridors. There is also need to specify how such a low-G WTORS will be identified.

ACTION Plan: Larry agreed to prepare and distribute a draft Low G proposal for addition to J2249 document by June 30, 2000.

7.5.3 Presentation of a Rear-World Crash

Larry made a presentation on a 20-mph frontal crash of a Ford E-150 van involving a wheelchair-seated C6-C7 quadriplegia passenger. The occupant was seated in a 300-lb power-based wheelchair that was provided with four securement points as specified in the new ANSI/RESNA WC/19 standard. The wheelchair was effectively secured by a four-point strap tiedown that complies with SAE J2249. The passenger was not using the available vehicle-anchored three point belt, but was wearing a Velcro chest belt and a buckled lap belt that were fastened to the wheelchair by fasteners placed through the webbing. These belts offered enough restraint to prevent the passenger from flying out of the wheelchair and through the windshield, which would have likely produced serious

or fatal injuries. The wheelchair occupant slid out of the wheelchair feet first when the lap belt webbing on the right side and chest belt webbing on the left side failed and pulled out of the fasteners. He sustained a laceration to the back of his head and brief loss of consciousness, probably from head contact with the wheelchair seatback that deflected forward due to chest-belt loading. He also sustained a contusion to the spleen, probably from belt loading, and a fracture to a finger on his right hand from contact with an unknown object. While this passenger would have been offered more effective protection in this frontal crash had he been wearing the three-point restraint, his life was probably saved by the proper use of a J2249 four-point strap-type strap and securement points on the wheelchair that prevented him and the wheelchair from moving forward into the front of the vehicle. In addition, if this had been a 30-mph frontal impact, the wheelchair-anchored postural belts would have been insufficient to offer a sufficient level of protection to prevent serious injury.

ACTION Plan: Larry offered to make this case study, done with Powerpoint, available for reviewing by others via the Task Group's website. He will work with the chairman to make this happen. Other participants were urged to report similar actual crash events. Larry offered the possibility of providing a crash investigation team from UMTRI, if so warranted by the reported circumstances of the crash event.

8. Meeting Plans

- 8.1 Next ISO-WG-6 meeting-May, 7-8 Stockholm
- 8.2 Next SOWHAT meeting-Vancouver, Canada, 2/27/00
- 8.3 Next SAE Restraints Group meeting, Oct. 8th 2000, Pray, Montana, immediately following the ISO WG-6 meeting. Details to follow.

9. Adjournment

The chairman thanked the participants for their most positive contributions and adjourned the meeting at 4:30 PM