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ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD

[Docket No. ATBCB-2019-0002]

Advisory Guidelines for Aircraft Onboard Wheelchairs

AGENCY: Architectural and Transportation Barriers Compliance Board.

ACTION: Invitation for public comment on proposed advisory guidelines for aircraft onboard wheelchairs.

SUMMARY: The Architectural and Transportation Barriers Compliance Board (hereafter, "Access Board," "Board," or "we") invites public comment on proposed non-binding advisory guidelines for wheelchairs used within aircraft cabins primarily to transport individuals with disabilities between seat and lavatory, which we refer to as "onboard wheelchairs." The Access Board is developing these advisory guidelines as technical assistance to air carriers by providing one example of how they might satisfy performance standards for onboard wheelchairs on covered aircraft, which the Department of Transportation (DOT) expects to establish in a forthcoming rulemaking under the Air Carrier Access Act. Even if adopted by the Access Board, these guidelines will not be legally binding on any regulated entity. Whether, or to what extent, DOT subsequently references, incorporates, or adopts these guidelines falls under the department's exclusive authority.

DATES: Submit comments by **[INSERT DATE 60 DAYS FROM DATE PUBLISHED IN FEDERAL REGISTER]**.

Public hearing: September 12, 2019, 9:30 a.m. to 4:00 p.m.

Public testimony: Send requests to present oral testimony by September 5, 2019.

ADDRESSES: *Public hearing:* The public hearing location is 1331 F Street NW, Suite 800, Washington DC 20004.

Witnesses can testify in person or by telephone. Call-in information and a communication access real-time translation (CART) web streaming link will be posted on the Access Board's web site at http://www.access-board.gov/onboard. The hearing will be accessible to persons with disabilities. An assistive listening system, communication access real-time translation, and sign language interpreters will be provided. Persons attending the hearing are requested to refrain from using perfume, cologne, and other fragrances for the comfort of other participants (see www.access-board.gov/about/policies/fragrance.htm for more information).

Comments: Submit comments identified by docket number ATBCB-2019-0002, by any of the following methods:

- Federal eRulemaking Portal: http://www.regulations.gov. Follow the instructions for submitting comments.
- Email: docket@access-board.gov. Include docket number ATBCB-2019-0002 in the subject line of the message.
- Fax: 202-272-0081.
- Mail/Hand Delivery/Courier: Office of Technical and Information Services, Access Board, 1331 F Street NW, Suite 1000, Washington, DC 20004-1111.

Instructions: All submissions received must include the agency name and docket number for this notice. All comments received will be posted without change to http://www.regulations.gov, including any personal information provided.

Docket: For access to the docket to read background documents or comments received, go to http://www.regulations.gov.

Public testimony: Send requests to present oral testimony to Rose Marie Bunales at (202) 272-0006 (voice) or bunales@access-board.gov.

FOR FURTHER INFORMATION CONTACT: Wendy Marshall, Access Board, 1331 F Street, NW, Suite 1000, Washington, DC 20004-1111; Telephone: (202) 272-0043 (voice); E-mail: marshall@access-board.gov; or Mario Damiani, Access Board, 1331 F Street, NW, Suite 1000, Washington, DC 20004-1111; Telephone: (202) 272-0050 (voice); E-mail: damiani@access-board.gov.

SUPPLEMENTARY INFORMATION:

I. Purpose

The purpose of these advisory guidelines for onboard wheelchairs is to provide air carriers and onboard wheelchair manufacturers with technical assistance in meeting their obligations under the Air Carrier Access Act. 49 U.S.C. 41705. The Department of Transportation has indicated an intent to issue regulations under the Air Carrier Access Act that seek to implement the final resolution of a negotiated rulemaking, described in more detail below. See Resolution of the Department of Transportation Access Committee, Annex A (Nov. 22, 2016), available at https://www.transportation.gov/sites/dot.gov/files/docs/ACCESS Committee Final Resolution.11.21.16.pdf. The agreed-upon terms include a requirement for an onboard wheelchair of enhanced functionality on specified commercial aircraft of more than 125 passenger seats. The Department of Transportation has sought technical assistance from

the Access Board in providing specifications that would meet a future mandatory performance standard, issued by the Department, for such onboard wheelchairs.

Similar to the existing onboard wheelchair regulations at 14 CFR 382.65(c), it is expected that the new standards the Department of Transportation intends to issue as a result of the negotiated rulemaking will be performance standards. This means that the contemplated regulations would require onboard wheelchairs to have certain features and meet established functional criteria but would not specify technical requirements such as dimensions for specific features. The Access Board's advisory guidelines would serve as technical assistance for covered air carriers, providing one example of how covered air carriers might satisfy the performance standard for onboard wheelchairs established by DOT in its forthcoming rulemaking. These advisory guidelines contain recommended dimensions and other technical specifications that would help manufacturers optimize the design of a comfortable and functional chair and assist air carriers in the selection of onboard wheelchair models that best serve passengers with disabilities. Even if adopted by the Access Board, these guidelines will not be legally binding on any regulated entity. Whether or to what extent DOT subsequently references, incorporates, or adopts these guidelines falls under the department's exclusive authority. Nonetheless, it is the Access Board's understanding that DOT does not intend to issue any regulatory standards that would make non-conformance with these advisory guidelines a separate basis for affirmative enforcement action or imposition of administrative penalties.

II. Background

In 2016, the Department of Transportation established an Advisory Committee on Accessible Air Transportation (hereafter, "ACCESS Advisory Committee" or "Committee") to negotiate and develop a proposed rule concerning various accommodations for air travelers with disabilities, including the accessibility of lavatories on new single-aisle aircraft. See Nondiscrimination on the Basis of Disability in Air Travel; Establishment of a Negotiated Rulemaking Committee, 81 FR 20265 (Apr. 7, 2016). The Committee consisted of airline representatives, aircraft manufacturing representatives, representatives from disability rights advocacy organizations, and other stakeholders.[1]

The Committee agreed to specific incremental accessibility solutions with respect to aircraft lavatories. The accessibility solutions culminate in the requirement for installation on certain single-aisle aircraft of a lavatory of sufficient size to allow individuals with mobility disabilities to transfer from an onboard wheelchair to the toilet (and vice versa). However, by the terms of the Committee's agreement, it will be at least twenty years before these lavatories are installed in single-aisle aircraft. See Resolution of the Department of Transportation Access Committee, Annex A (Nov. 22, 2016), available at https://www.transportation.gov/sites/dot.gov/files/docs/ACCESS Committee Final Resolution.11.21.16.pdf.

[1] Full membership of the Committee can be viewed at DOT's Notice of Negotiated Rulemaking (Reg-Neg) Committee Membership and Public Meeting, 81 FR 26178 (May 2, 2016).

In the interim, the Committee agreed to pursue improvements to the onboard wheelchairs that individuals with certain types of mobility disabilities must use to move between the aircraft seat and the lavatory. See Id. DOT currently requires air carriers to provide onboard wheelchairs on most aircraft with more than sixty passenger seats that have an accessible lavatory and when requested by a passenger with a disability even if the aircraft does not have an accessible lavatory. 14 CFR 382.65(b). DOT specifies certain features that onboard wheelchairs must have and performance criteria that they must meet. 14 CFR 382.65(c). Because of the general nature of these performance criteria, there is little standardization across manufacturers with respect to the design of onboard wheelchairs. The Committee agreed to pursue an onboard wheelchair design that, if feasible, could be positioned over a closed toilet to allow for better use of the other features of a lavatory, including the privacy afforded by a closed door. The Committee also acknowledged the existence of safety and usability challenges with traditional onboard wheelchair models. The Committee thus agreed that DOT should develop new standards for onboard wheelchairs, and that, in the future, certain aircraft[2] would be required to provide an onboard wheelchair that meets those standards.

In response to the Committee's agreement, DOT requested technical assistance from the Access Board in developing advisory guidelines that would address the Committee's concerns. The Access Board proposes the below advisory guidelines in response to this request.

[2] By the terms of the ACCESS Committee's final resolution, the new requirements for onboard wheelchairs would apply to "New covered single aisle aircraft with 125 FAA maximum certified passenger seats entering service 3 years after the effective date of the Final Rule." Resolution of the U.S. Department of Transportation Access Committee, Annex A (Nov. 22, 2016), available at https://www.transportation.gov/sites/dot.gov/files/docs/ACCESS Committee Final Resolution.11.21.16.pdf.

III. Legal Authority

The Air Carrier Access Act permits the Department of Transportation to seek assistance from the Access Board for the provision of "technical assistance to air carriers and individuals with disabilities in understanding the rights and responsibilities" under the Act. 49 U.S.C. 41705.

In addition, Section 502 of the Rehabilitation Act of 1973, as amended, tasks the Access Board with statutory authorities relating to transportation barriers confronting persons with disabilities. See 29 U.S.C. 792. Specifically, the Board is directed to "investigate and examine alternative approaches to the architectural, transportation, communication, and attitudinal barriers confronting individuals with disabilities, particularly with respect to telecommunications devices, public buildings and monuments, parks and parklands, public transportation (including air, water, and surface transportation, whether interstate, foreign, intrastate, or local), and residential and institutional housing," and to "ensure that public conveyances, including rolling stock, are readily accessible to, and usable by, individuals with physical disabilities." Id. at 792(b)(5) and (b)(10). Further, the Access Board is charged with promoting accessibility throughout all segments of society. Id. at (b)(4).

IV. Discussion of Proposed Guidelines

A. Design Considerations

1. Over-Toilet Position

In these advisory guidelines, the Access Board proposes that the onboard wheelchair be designed such that it can fully enter the aircraft lavatory in a backward orientation, where the seat of the onboard wheelchair slides over the closed toilet allowing the lavatory door to be completely closed with the occupied onboard wheelchair inside. The purpose of allowing the onboard wheelchair to be positioned over the toilet is to provide both privacy and sufficient space for movement so that the occupant can accomplish non-toileting personal hygiene and medically needed tasks in private. In this use, the occupant is not using the toilet. In order to use the toilet, the onboard wheelchair occupant would need to transfer from the onboard wheelchair to the toilet, typically by standing and pivoting 180 degrees. Owing to the small size of lavatories on single-aisle aircraft, such a transfer is typically accomplished with the door to the lavatory open, and the onboard wheelchair partially or fully outside the lavatory. However, many people are unable to perform a stand-and-pivot transfer; the proposed over-toilet positioning would allow these individuals the opportunity to use the lavatory for non-toileting personal hygiene or medically needed tasks that require the privacy afforded by a closed lavatory door.

Over-toilet positioning of the onboard wheelchair was of interest to the members of DOT's ACCESS Advisory Committee and was included in the Committee's final

agreement to the extent that such a design is feasible. The Board seeks comment on whether such a design is feasible. The Board is not aware of any commercially available onboard wheelchair that can be positioned over a toilet; however, researchers from Hamburg University of Applied Sciences (Germany) have been developing a prototype with a cantilever design that could be positioned over the toilet.[3] The Board notes that any such design is "feasible" in this context only if it meets all other technical requirements (including collapsibility for storage) and does not involve modification of the aircraft lavatory.

Question 1. Is it feasible to design an onboard wheelchair that can be positioned over a toilet without modification to the aircraft lavatory? Please explain the design and engineering considerations that would impact the ability of the onboard wheelchair to maneuver over the toilet.

Question 2. If feasible, would this onboard wheelchair also be capable of folding and being stored in an FAA-certified stowage space?

Question 3. What are the cost implications associated with the design and manufacture of an onboard wheelchair that can be positioned over a toilet without modification to the aircraft lavatory?

[3] The prototype developed by Hamburg University features a hole in the seat of the onboard wheelchair so that an occupant could remain in the onboard wheelchair while using the toilet. These guidelines do not contemplate such a use for the onboard wheelchair, as these guidelines call for the onboard wheelchair to be positioned over a closed toilet. We reference the Hamburg University design for its over-toilet positioning capability.

2. Loads

The loads that commercially available onboard wheelchairs support vary widely. For example, the overall weight capacity of currently available models varies from approximately 200 to 800 pounds. In the Access Board's 1987 publication *Guidelines for Aircraft Boarding Chairs*,[4] we recommended that seats support at least 723 pounds (weight of a 99th percentile male with a 3.0 safety factor). See https://www.access-board.gov/research/completed-research/guidelines-for-aircraft-boarding-chairs. Using updated anthropometrics, the weight of a 99th percentile male with a 3.0 safety factor would be 826 pounds. See Department of Health and Human Service Centers for Disease Control and Prevention's Anthropometric Reference Data for Children and Adults: United States, 2011-2014, Table 6, Line 1 (Aug. 2016). SAE International, in its standard Foldable On-Board Wheelchairs for Passengers with Disabilities, ARP 4120C (Stabilized 2013), requires a different overall load. In the proposed guidelines, the Board reserves provisions for loads related to the seat, arm supports, foot support, casters, and assist handles, pending further information as to what loads are appropriate for an onboard wheelchair design that accomplishes the proposed functions. Specifically, the Board is unaware of any existing industry standards for onboard wheelchairs that are designed to allow over-the-toilet positioning, and therefore does not propose

[4] After receiving reports of accidents and near accidents involving the use of aircraft boarding chairs, the Access Board sought public comment on the development of voluntary standards for boarding chairs. 49 FR 36210 (Sep. 14, 1984). Based on public comments and various other research, the Board published a proposed advisory standard in 1986 that contained technical specifications for chairs used to board and deplane individuals with mobility disabilities. 51 FR 17762 (May 15, 1986). The Board published the final technical paper, *Guidelines for Aircraft Boarding Chairs* in 1987. The FAA subsequently adopted portions of the guidelines in its Advisory Circular on Aircraft Boarding Equipment, AC No: 150/5220-21C (6/29/2012).

incorporation by reference of the loads of any existing standard, including the loads from the Board's 1987 *Guidelines for Aircraft Boarding Chairs*, absent further engineering information.

Question 4. If the over-the-toilet positioning is feasible, what should the respective loads be for the seat, arm supports, foot support, casters, and assist handles?

Question 5. If the over-the-toilet positioning is not feasible, what should the respective loads be for the seat, arm supports, foot support, casters, and assist handles?

B. Section 1: Application and Administration

In the proposed guidelines, Section 1 establishes the purpose and the general requirements for application of the onboard wheelchair guidelines.

101.1 Purpose

The purpose of these technical specifications is to provide technical assistance for the design of an onboard wheelchair with enhanced safety and stability, and that improves the ability of persons with mobility disabilities to have access to and use of the lavatory for toileting and non-toileting privacy needs, such as administering medication or conducting hygiene related tasks in a safe manner.

101.2 Voluntary Application

These Advisory Guidelines for Aircraft Onboard Wheelchairs establish voluntary, non-binding technical guidance for use by airlines and manufacturers of onboard wheelchairs.

101.3 Dimensions

These technical specifications take into consideration adult anthropometrics. For anthropometrics, the Board consulted data from the Department of Transportation Federal Aviation Administration Human Factors Design Standard, HF-STD-001B (Dec. 30, 2016), and the Department of Health and Human Services Centers for Disease Control and Prevention's Anthropometric Reference Data for Children and Adults: United States, 2011-2014 (Aug. 2016). In addition, due to the lack of available updated anthropometrics on feet and seated hip breadth, the Board used data from our 1987 *Guidelines for Aircraft Boarding Chairs* (which references Wesley Woodson's 1981 Human Factors Design Handbook).

The dimensions of the onboard wheelchair must also account for the aircraft dimensions necessary to ensure that the onboard wheelchair fits through the aisle of the aircraft, into the lavatory, and over the toilet. We therefore seek information on the relevant aircraft measurements necessary to determine the appropriate dimensions of an onboard wheelchair that can fully enter an aircraft lavatory and be positioned over the toilet.

Question 6. Is there recent anthropometric data on adult male feet and seated hip breadth that the Access Board should consider?

Question 7. Please provide information on aisle width for single-aisle aircraft with more than 125 passenger seats.

Question 8. Please provide dimensions for lavatories on single-aisle aircraft with more than 125 passenger seats, including: width of the doorway opening, height of the lavatory doorway threshold, interior width and depth of the lavatory, clear floor space aside the toilet, and available clearances below the toilet bowl.

101.4 Dimensional Tolerances

Dimensions are subject to conventional industry tolerances for manufacturing processes, material properties, and field conditions.

Question 9. What information or resources are available concerning conventional industry tolerances for manufactured equipment such as onboard wheelchairs?

102 Definitions.

The following terms are defined in the advisory guidelines: attendant, caster, and onboard wheelchair. These advisory guidelines rely on the definition of other terms as defined by

regulations issued by the Department of Transportation under the Air Carrier Access Act. All other terms should be given their ordinary accepted meaning as implied by the context in which the term is used.

Question 10. What other terms, if any, should be defined in this section?

C. Section 2 Technical Specifications

201.1 Occupied Movement

The technical criteria in 201.1 address the required functionality of an onboard wheelchair while occupied by a passenger. The onboard wheelchair must be designed such that it can move both forward and backward through the aisle of the aircraft. The purpose of requiring movement in both directions is to ensure that a forward entry into a lavatory for transfer, as well as a backward entry into the lavatory if the occupant intends to remain in the onboard wheelchair while inside the lavatory, is possible.

Question 11. What concerns are there, if any, about a design that allows for the onboard wheelchair to be maneuvered in both a forward approach and a backward approach to the lavatory?

201.1.1 Lavatory Transfer

The purpose of this provision is to ensure that the onboard wheelchair can be maneuvered close enough to the lavatory toilet in a forward orientation such that an occupant who is capable of a stand-and-pivot transfer is able to transfer to the toilet.

In a forward approach to the lavatory, the attendant would push the onboard wheelchair partially into the lavatory using the rear assist handles. Once close enough to the toilet for transfer, the attendant or occupant would apply the wheel locks, and the occupant would then stand and pivot to transfer to the toilet.[5]

201.1.2 Over-Toilet Positioning

The purpose of this requirement is to ensure that the onboard wheelchair can successfully maneuver into the lavatory and over the closed toilet in a manner that permits the lavatory door to close completely, providing the occupant with privacy. In this use, the attendant would push the onboard wheelchair backward into the lavatory using the assist handles on the front of the chair. The attendant would push the onboard wheelchair over the closed toilet, which would permit the lavatory door to close completely.

Question 12. What space constraints exist within aircraft lavatories that would prevent the onboard wheelchair from completely entering the lavatory?

[5] The ACCESS Advisory Committee's agreement indicates that specified aircraft would be required to provide a visual barrier to be used where the door to the lavatory must remain open during transfer. See Resolution of the Department of Transportation Access Committee, Annex A (Nov. 22, 2016), available at https://www.transportation.gov/sites/dot.gov/files/docs/ACCESS Committee Final Resolution.11.21.16.pdf.

Question 13. Are there any protruding objects inside aircraft lavatories that would impede over-toilet positioning? If so, please describe the protruding objects.

201.2 Unoccupied Movement

When folded, the onboard wheelchair must be maneuverable on its wheels to allow an attendant to transport and stow an unoccupied onboard wheelchair without having to carry it.

Question 14. The Access Board is aware that, in practice, unoccupied onboard wheelchairs are sometimes carried by an attendant as opposed to being pushed on their own wheels. Should the onboard wheelchair be required to be maneuverable on its own wheels when unoccupied?

202 Stowage

The onboard wheelchair must be collapsible for stowage in one of the spaces certified by the FAA for stowage of onboard wheelchairs (such as a closet or overhead luggage compartment).

Question 15. What are the FAA-certified stowage spaces on commercial passenger aircraft with over 125 passenger seats, and what are their respective dimensions?

Question 16. Would these proposed technical specifications result in an onboard wheelchair that will fit in at least one of the FAA-certified spaces for onboard wheelchair stowage? If not, how should the specifications be altered so that the onboard wheelchair will fit into such spaces?

203 Stability

This provision requires the onboard wheelchair to be stable throughout transport and transfer of the occupant. The purpose of this provision is to ensure that the onboard wheelchair will not tip or fall in any direction during use, which could result in injury to the occupant, attendant, or other passengers.

Question 17. What are the stability concerns regarding existing onboard wheelchair models?

Question 18. Would a design for over-toilet positioning affect the stability of the onboard wheelchair? Please explain.

Question 19. What additional requirements, if any, could be provided to ensure that the onboard wheelchair is stable during use?

204 Surface Hazards

The purpose of this provision is to reduce the risk of injury by requiring that the onboard wheelchair be free from sharp or abrasive components and have eased edges. Sharp edges or abrasive elements may cause a direct contact injury or result in an occupant or attendant losing his or her grip during positioning or transfer.

205 Instructions

In order to ensure the proper operation of the onboard wheelchair, the operation instructions must be prominently displayed. Providing instructions on the onboard wheelchair itself will ensure that any attendant using it will have access to the instructions and understand its proper operation.

206.1 (Seat) Height

For ease of transfer, the seat height of the onboard wheelchair should be as close to the height of the aircraft seat as possible to permit lateral transfer. See The Impact of Transfer Setup on the Performance of Independent Transfers: Final Report, https://www.herl.pitt.edu/ab/. The Access Board seeks information on aircraft passenger seat heights and aircraft toilet heights. In the Board's Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities, 36 CFR part 1191, and ADA Accessibility Guidelines for Transportation Vehicles, 36 CFR part 1192, we have routinely required a fixed height of 17 to 19 inches for transfer surfaces (See e.g. 36 CFR 1191, Appendix D, 604.4 (toilet seat), 610.2 (bathtub seats), 610.3 (shower compartment

seats), and 903.5 (benches) and 36 CFR 1192.107 and 1192.123 (toilet seat in commuter and intercity rail cars). We are unable to propose a seat height without further information regarding the height of passenger seats and the height of aircraft toilets.[6]

Question 20. What is the height of seats on single aisle aircraft with more than 125 passenger seats? Please provide the airline, the type of aircraft, class of seating (if there is a difference among classes), and the height of the seats measured from the floor to the uncompressed top of the cushion or padding.

Question 21. Please provide the following dimensions of the height of aircraft toilets: height of the bowl measured from the floor; height of the toilet seat measured from the rim of the bowl; and height of the closed toilet seat lid measured from the surface upon which it sits.

Question 22. What are the design and engineering considerations of an onboard wheelchair with an adjustable seat height?

206.2 (Seat) Size and 206.3 Padding

[6] The ACCESS Committee's Agreed Term Sheet indicates that "Tier 1" aircraft will be required to have a lavatory with a toilet height of 17 to 19 inches. Resolution of the Department of Transportation Access Committee, Annex A (Nov. 22, 2016). If this provision is implemented by the Department of Transportation, the Access Board, with additional information regarding the height of a closed toilet lid, could specify an appropriate height for the onboard wheelchair seat. However, because that requirement has not yet been implemented, the Access Board seeks information on existing aircraft toilet dimensions.

The seat size of the onboard wheelchair is restricted by the width of the aircraft aisle and the doorway opening of the aircraft lavatory. The purpose of this provision is to provide access to the largest number of individuals with disabilities, while also ensuring the onboard wheelchair can function as intended. We propose a seat size of at least 15 inches wide and at least 16 inches deep. These dimensions are consistent with the size required in our *Guidelines for Aircraft Boarding Chairs*. See https://www.access-board.gov/research/completed-research/guidelines-for-aircraft-boarding-chairs 1987. In that technical paper, we opined that the "narrowest part of the aircraft aisle is generally at the aircraft seat armrest" and is 17 inches. Id. at 22. Additionally, we referenced Wesley Woodson's 1981 Human Factors Design Handbook, which noted that the 95th percentile male seat width was 15.9 inches. Id. Based on both the confines of the aircraft dimensions and human factors, we have determined that 15 inches wide is still a valid width requirement for the onboard wheelchair. Additionally, the Board is proposing that the onboard wheelchair seat be padded or cushioned to preserve skin integrity, minimize injury, prevent spasticity, and provide greater safety and comfort.

Question 23. What recent human factors research provides data on seated hip breadth for the 95th percentile male?

Question 24. On single-aisle aircraft with more than 125 passenger seats, is there any part of the aircraft aisle that is narrower than 17 inches through which the onboard wheelchair would need to pass to transport a passenger from her seat to the lavatory?

Question 25. What are the cost implications, if any, of the proposed seat size?

207 Back Support

In determining the proposed height for the onboard wheelchair's back support, we looked to the current Department of Transportation Federal Aviation Administration Human Factors Design Standard, which indicates that the 95th percentile male for shoulder sitting height is 25.4 inches and the shoulder sitting height for a 5th percentile female is 20 inches. HF-STD001B (Dec. 30, 2016). These measurements reveal an increase in shoulder height from the dimensions used in the Access Board's 1987 Guidelines for Boarding Chairs, which recommended a minimum back support height of 25 inches.[7] Based on this updated anthropometric information, we are proposing that the onboard wheelchair back support be a minimum of 26 inches high above the seat. In addition, we are proposing to allow a gap of no more than 2 inches between the surface of the seat and the bottom of the back support. The purpose of this specification is to ensure that the backrest is positioned low enough to provide support to the occupant, while allowing manufacturing flexibility needed to ensure that the chair can be folded for stowage.

Question 26. Is a two-inch gap between the seat and the back support sufficiently large to allow the chair to be folded?

[7] At that time, the Access Board relied on anthropometrics from Wesley Woodson's Human Factors Design Handbook (1981) indicating a shoulder height of 25 inches for 95th percentile males and 18 inches for 5th percentile females.

Question 27. It is important that the onboard wheelchair provide sufficient trunk support to the occupant. Should these guidelines specify a minimum width for the back support? If so, what should the recommended width be?

Question 28. Should these guidelines specify a requirement for head and neck support? What are the design implications of adding head and neck support? Would the onboard wheelchair's functionality be affected?

208.1 (Arm Support) Length and 208.2 (Arm Support) Position and Securement

The Board proposes a requirement of two repositionable arm supports. The purpose of the arm supports on the onboard wheelchair is to provide transfer support to persons using the onboard wheelchair and to allow occupants seated in the chair to reposition themselves. In addition, the arm supports allow onboard wheelchair occupants to stabilize themselves during transport. While both arm supports may be used simultaneously for transfer into and out of the front of the onboard wheelchair, a side transfer from or to an aircraft seat will require the repositioning of one of the arm supports. For example, if the occupant is transferring into the onboard wheelchair from the left side of the chair, the arm support on the left side of the chair would be repositioned so as not to obstruct the transfer and the occupant would use the arm support on the right side to assist with transfer.

The proposed length of these supports is 15 inches. The proposed length is based on anthropometrics of elbow-grip length, which is the horizontal distance from the back of the elbow to the center of the clenched fist: 15.4 inches for 95th percentile males and 11.8 inches for 5th percentile females. Department of Transportation Federal Aviation Administration Human Factors Design Standard, HF-STD-001B, 5.12.3.2.1.23 (Dec. 30, 2016).

Question 29. Should these guidelines specify a width and shape for the armrests in order to achieve the purpose of this provision? If so, what armrest width and shape would be optimal to provide support during transfer and repositioning?

209.1 (Foot Support) Size and 209.2 Position and Securement

The purpose of the foot support is to provide support and stability for the occupant's feet and legs during transport, as well as to assist the occupant with repositioning and transferring. In determining the appropriate size of the foot support, we considered anthropometric data of the human foot size. As noted above, we were unable to locate recent anthropometric data on feet, and thus relied on data from Wesley Woodson's 1981 Human Factors Design Handbook, which we referenced in our *Guidelines for Aircraft Boarding Chairs* (1987). This research indicates a foot breadth of 4.3 inches and foot length of 11.2 inches for 95th percentile males and a foot breadth of 3.2 inches and foot length of 8.7 inches for 5th percentile females. Based on this information, and taking into consideration additional space for footwear, the Access Board proposes a unitary foot

support that is a minimum of 9 inches wide and 12 inches deep. The unitary support allows for more stability as both feet move together. Further, the unitary support design requires fewer moving parts. Finally, the foot support must be repositionable so as not to obstruct transfer to or from the side or front of the onboard wheelchair.

Question 30. Is the proposed size of the foot support sufficient to provide a stable support for both feet?

Question 31. Do the proposed design, size, and repositionability of the foot support present any design or engineering concerns? Please describe those concerns, if any.

Question 32. Should the footrest fold in a specific direction, such as up or off to one side? If so, what direction should be specified and why?

209.3 (Foot Support) Threshold Clearance

The Access Board proposes that the bottom of the foot support be at least 0.75 inches higher than the highest point of the lavatory doorway threshold. The purpose of this provision is to ensure that the onboard wheelchair can easily and safely maneuver over the lavatory threshold to enter the lavatory in both a forward and backward approach.

Question 33. Are there any other barriers besides the lavatory threshold that would require the foot support to clear a specific height?

210.1 (Caster) Swivel Locks and 210.2 Wheel Locks

The Board proposes that onboard wheelchairs have independent caster wheels for maximum maneuverability in the tight spaces of an aircraft cabin and lavatory. For safety and stability, the Board proposes that each caster provide a swivel lock and a wheel lock. The purpose of the swivel locks is to allow an attendant to lock the wheels in position for linear movement, providing greater stability and directional control as the attendant pushes the chair down the aisle. The wheel locks ensure the onboard wheelchair can be secured in a static position for transfer or for use inside the lavatory.

Question 34. Should these guidelines specify a size of the caster wheels? If so, what size wheel would ensure stability of the onboard wheelchair and allow the chair to easily traverse the lavatory doorway threshold?

Question 35. What would be the cost implications of a requirement that the caster wheels have a five-inch diameter?

Question 36. Is it necessary for safety and stability that each caster have a swivel lock? Would swivel locks on two wheels be sufficient? Please explain.

Question 37. Please explain the design and engineering considerations involved in the provision of a wheel lock system that engages each caster wheel. What are the safety concerns with a chair that has locks on only two caster wheels?

Question 38. What are the engineering and design implications of a requirement for the swivel and wheel locks to be operable by the occupant?

Question 39. What effect on stability, if any, results from a requirement that all wheels be independent casters?

Question 40. Is it necessary for maneuverability that each wheel of the onboard wheelchair be an independent caster? Could an onboard wheelchair easily maneuver through the aisle and into the lavatory in both a forward and backward approach with fewer casters? If so, which wheels should be required to be independent casters and why?

211.1 Rear Assist Handles

The purpose of the rear assist handles is to allow the attendant to push or pull the occupied onboard wheelchair through the aircraft aisle. In addition, the attendant may use the rear assist handles to maneuver the onboard wheelchair into the lavatory in a forward orientation.

Question 41. Is it necessary for the rear assist handles to be repositionable to allow for over-toilet positioning of the onboard wheelchair?

211.2 Front Assist Handles

The purpose of the front assist handles is to allow the attendant to maneuver the occupied onboard wheelchair into the lavatory in a backward approach, position the onboard wheelchair over the toilet, and maneuver the onboard wheelchair out of the lavatory. The front assist handles must be capable of being repositioned so as not to obstruct transfer. The Board envisions that these assist handles would be attached to the onboard wheelchair at seat or knee height, similar to the design of some current models of aircraft boarding chairs.

Question 42. Are there any existing onboard wheelchairs that have front assist handles? If so, where are the assist handles located?

Question 43. Are there any engineering or design concerns regarding front assist handles?

212 Restraints

This provision requires that the onboard wheelchair be equipped with both torso and leg restraints. The torso restraints are intended to secure the upper and lower torso of the

occupant in the onboard wheelchair and the leg restraints are intended to maintain the legs of the occupant in the correct position during transport. The purpose of these restraints is to keep the occupant securely seated in the chair and prevent injury during transport through the aircraft. These restraints must be designed such that they can be repositioned so as not to obstruct transfer of the occupant to or from the onboard wheelchair. The fastening mechanisms of the restraints must be operable by the occupant so that the occupant may fasten the restraints unassisted if desired. Finally, the restraints must be durable. The Access Board is aware of durability issues related to certain types of fasteners, such as hook-and-loop strip fasteners. The Board seeks comment on whether a specific type of fastener should be specified (or prohibited) by these guidelines.

Question 44. Are additional restraints needed to ensure safe use of the onboard wheelchair?

Question 45. Is it feasible to provide retractable restraints that auto-adjust (similar to the retractable seatbelts in cars)?

Question 46. Should specific types of fasteners be required or prohibited to ensure durability?

For the reasons stated in this notice, the Board proposes Advisory Guidelines for Aircraft Onboard Wheelchairs as follows:

Advisory Guidelines for Aircraft Onboard Wheelchairs

Section 1: General

101 General

101.1 Purpose. These recommended specifications for onboard wheelchairs are intended to improve accessibility of a non-accessible lavatory on a single-aisle aircraft with more than 125 passenger seats by improving the functionality and usability of onboard wheelchairs.

101.2 Voluntary Application. This guidance is not legally binding in its own right. Conformity with this guidance document is voluntary only, and nonconformity will not affect rights and obligations under existing statutes and regulations. This guidance provides one example of carriers might satisfy performance standards for onboard wheelchairs on covered aircraft.

101.3 Dimensions. These technical specifications are based on adult dimensions and anthropometrics.

101.4 Dimensional Tolerances. All dimensions are subject to conventional industry tolerances for manufacturing processes, material properties, and field conditions.

101.5 Units of Measurement. Measurements are stated in U.S. customary and metric units. The values stated in each system (U.S. customary and metric units) may not be exact equivalents, and each system should be able to be used independently of the other.

102 Definitions

102.1 Defined Terms. For the purpose of this document, the following terms have the indicated meaning.

Attendant. An individual who is assisting the occupant in using or operating the onboard wheelchair.

Caster. A wheel on a swivel assembly permitting the wheel to freely turn around its vertical axis.

Onboard Wheelchair. A wheelchair that is used to transport a person with a mobility disability between an aircraft seat and an aircraft lavatory.

102.2 Other Defined Terms. Terms defined in regulations issued by the Department of Transportation to implement the Air Carrier Access Act (14 CFR

382) and not defined in 102.1, shall have the meaning as defined in the Department of Transportation's regulations.

102.3 Undefined Terms. Any term not defined in 102.1 or in the Department of Transportation's regulations shall be given its ordinarily accepted meaning in the sense that the context implies.

102.4 Interchangeability. Words, terms, and phrases used in the singular include the plural and those used in the plural include the singular.

Section 2: Technical Specifications

201 Maneuverability. The onboard wheelchair must be maneuverable by an attendant on the aircraft.

201.1 Occupied Movement. The onboard wheelchair shall be designed to be moved both forward and backward through the aircraft aisle by an attendant.

201.1.1 Lavatory Transfer. The onboard wheelchair shall be designed to be maneuvered in a forward orientation partially into at least one aircraft lavatory to permit transfer from the onboard wheelchair to the toilet.

201.1.2 Over-Toilet Positioning. Onboard wheelchairs shall be designed to be maneuvered in a backward orientation to permit positioning over the closed toilet without protruding into the clear space needed to completely close the lavatory door, unless the lavatory already permits the occupant of the onboard wheelchair to enter, close the door, and independently transfer from the onboard wheelchair to the toilet.

201.2 Unoccupied Movement. When folded, the onboard wheelchair shall be capable of being moved on its own wheels.

202 Stowage. Onboard wheelchairs shall fit within at least one of the available certified onboard wheelchair stowage spaces consistent with weight and space limits applicable to each carrier's aircraft models.

203 Stability. When occupied for use, the onboard wheelchair shall not tip or fall in any direction under normal operating conditions, including when the swivel locks on the casters are engaged or when the wheel locks are applied.

204 Surface Hazards. The onboard wheelchair shall be free of sharp or abrasive components and shall have eased edges.

205 Instructions. The onboard wheelchair shall prominently display instructions for proper operation and stowage.

206 Seat. Onboard wheelchairs shall provide a seat that meets the following specifications:

206.1 Height. The top of the seat of the onboard wheelchair when uncompressed shall align with the height of the top of an aircraft seat when uncompressed to the maximum extent practicable.

206.2 Size. The surface of the seat shall be 15 inches (381 mm) wide minimum and 16 inches (406 mm) deep minimum.

206.3 Padding. The seat shall be a solid surface that is padded or cushioned.

206.4 Load. [Reserved.]

207 Back Support. Onboard wheelchairs shall provide a back support that meets the following recommended specifications:

207.1 Size. The back support shall extend from a point 2 inches (51 mm) maximum above the surface of the seat to a point 26 inches (660 mm) minimum above the surface of the seat.

207.2 Padding. The backrest shall be padded or cushioned.

207.3 Load. [Reserved.]

208 Arm Supports. Onboard wheelchairs shall provide two arm supports that meet the following recommended specifications:

208.1 Length. Arm supports shall have a length of 15 inches (381 mm) minimum.

208.2 Positions and Securement. Arm supports shall be repositionable so as not to obstruct transfer of the occupant to or from the seat of the onboard wheelchair. Arm supports shall be secure in their fittings when in place for transfer.

208.3 Load. [Reserved.]

209 Foot Support. Onboard wheelchairs shall provide foot support that meets the following recommended specifications:

209.1 Size. The foot support shall be unitary and shall be 9 inches (229 mm) wide minimum and 12 inches (305 mm) deep minimum.

209.2 Positions and Securement. The foot support shall be repositionable so as not to obstruct transfer of the occupant to or from the seat of the onboard

wheelchair. Foot supports shall be secure in their fittings when in place for transfer.

209.3 Threshold Clearance. When the onboard wheelchair is unoccupied, the underside of the foot support shall clear the highest point of the lavatory door threshold by 0.75 inches (19 mm) minimum.

209.4 Load. [Reserved.]

210 Casters. Onboard wheelchairs shall provide independent casters that meet the following recommended specifications:

210.1 Swivel Locks. Each caster shall provide a swivel lock that, when engaged, prevents the caster wheel from swiveling on its vertical axis and permits rotation of the wheel only in the direction of travel.

210.2 Wheel Locks. Each caster shall provide wheel locks that, when engaged, prevent rotation of the wheel and permits the onboard wheelchair to be secured in a stationary position.

210.3 Load. [Reserved.]

211 Assist Handles. Onboard wheelchairs shall provide assist handles that meet the following recommended specifications:

211.1 Rear Assist Handles. At least two assist handles shall be provided on the rear of the onboard wheelchair.

211.2 Front Assist Handles. At least two assist handles shall be provided on the front of the onboard wheelchair. The assist handles shall be capable of being repositioned so as not to obstruct transfer of the occupant to or from the onboard wheelchair.

211.3 Load. [Reserved.]

212 Restraints. Onboard wheelchairs shall provide functioning torso restraints and leg restraints that meet the following recommended specifications:

212.1 Torso Restraints. Torso restraints shall secure the upper and lower torso of the occupant of the onboard wheelchair so as to prevent the occupant from falling out of the onboard wheelchair during transport.

212.2 Leg Restraints. Leg restraints shall maintain the legs of the occupant in position during transport.

212.3 Fastening Mechanisms. Fastening mechanisms for restraints shall be durable and operable by the occupant.

212.4 Positions. Restraints and their attachments shall be capable of being repositioned so as not to obstruct transfer of the occupant to or from the seat of the onboard wheelchair.

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