

Summary Report of Lavatory Working Group Leader Tier I investigation

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Lavatory Working Participants: Ray Prentice- WG member and Host from Alaska Airlines, Lee Page- Working Group Co-Chair and PVA, Robert Gorman - USDOT, Roser Roca-Toha – Airbus, and Kate Hunter-Zaworski- Lavatory Working Group Co-Chair

Boeing Participants: Khashayar Borumand, Jeffrey Hatchel, Russell Roland, in place of Michelle Albert (ACCESS Committee member)

Alaska Airlines: Stephanie Gardner, Ashneel Prasad

Summary

Terminology

A tiered approach to implementation is suggested to expedite improvements in accessible lavatories in single aisle aircraft. The tiers refer to modifications that could be undertaken to increase the level of access for passengers with disabilities.

Tier I: A near term approach for **new** single aisle aircraft that are currently in production with accessibility solutions that could be implemented without significant aircraft changes. All changes (if needed) will require certification. As part of this approach, innovative on board wheel chair design solutions should be explored as an alternative or add-on to minor changes.

A key difference between Tier I and Tier II and Tier III lavatory accessibility is the type of transfer. In general pivot or standing transfers are possible in Tier I and independent and dependent or lateral transfers which require space for the on board chair adjacent to the toilet are only possible in Tier II or III lavatories.

Tier II: A longer term approach for **new** single aisle aircraft in production that provides a greater level of accessibility which may include the on board chair inside the lavatory adjacent to the toilet. It is assumed that the lavatory door is fully closed during the toileting and may also include other accessibility features that enhance accessibility.

Tier III: The overall goal is that the accessible lavatory permit a lateral (0°) or up to a 90° dependent transfers of a 95 percentile male by a 95 percentile male in an enclosed lavatory space. All transfers should be undertaken within the enclosed lavatory space. This goal is only achievable with significant redesign and allocation of space of the aircraft interior and may only be applicable to aircraft that may be in conceptual design phase.

New: An airplane coming off the production line and being placed into revenue service. The rule must include a phased/cut in approach for new airplanes where the interior configuration has already been defined (and will be based on the cost/benefit and undue burden analysis).

Transfers

Transfer – is defined as the physical movement of a passenger between a passenger seat, and an on-board wheelchair, and/or a lavatory toilet seat. . The generic types of transfers are defined as weight bearing pivot or standing transfer, and non weight bearing independent and dependent transfers.

A passenger's rotation is expressed in terms of "degrees of transfer," e.g., in a 90 degree transfer, a passenger is rotated through, a 90 degree arc. In a side by side or lateral transfer (0° - 90°), a passenger transfers across from one seat to another seat and in general the angle is about 30 or 45 degrees. . It must be noted that there are a wide variety of transfer techniques and toileting methods, each with their own spatial requirements.

Pivot Transfer –A pivot transfer may be referred to as a standing transfer. Typically in a pivot transfer, a person can weight bear, stand and/or bear some of their weight during a transfer. A pivot transfer may include lateral (0° to full (180°)).

Pivot Transfer -Independent: An independent transfer does not require the assistance of any other person, however the person may use grab bars and other assists during the transfer. For example a person on crutches may use the on board chair to access the lavatory, but can weight bear on one leg and pivot or rotate from the on board chair to the toilet.

Pivot Transfer -Assisted: Typically, a person requires assistance for stabilization and during the transfer process. Someone with weak legs may need assistance getting up and down from a seated position and need assistance in rotating from the on board chair to the toilet.

The independent and dependent transfers refer to transfers that are not weight bearing or standing transfers.

Independent Transfer-(In an out of a wheelchair, or on and off of a toilet) Some-passengers can-perform an *independent transfer* using appropriate hand bars, hand grips, hand grips, and platforms. These people do not require any assistance either in transfers or within the enclosed toilet compartment. Space adjacent to the toilet is required for the on board chair.

Dependent Transfer: (In an out of a wheelchair, or on and off of a toilet) People require physical assistance from another person to perform a *dependent transfer*. For people in this category, a variety of techniques are used to lift the passengers clear off one seat, move them until they are over the other seat, and then lower the passengers into a seated position. In general these are lateral or side to side transfers and these transfers require space adjacent to the toilet for the on board chair and

Most aircraft are designed for the 95 percentile male. The space required for a lateral transfer (0° up to 90° transfers) of a 95 percent male with a personal attendant who is also a 95 percent male should accommodate the needs of most other passengers with disabilities who use transfer techniques different from those described above, and whose method of using the toilet may not require transfer. It is important that amenities are located to accommodate both the 5 percentile female and 95 percentile male.

Table 1 shows the relation between transfer type and Tier

Transfer	Tier I	Tier II	Tier III
Pivot -Independent	Yes	Yes	Yes
Pivot -Assisted	No- Space is needed to accommodate person providing assistance in pivot	Yes	Yes

	transfer		
Independent	No	Yes	Yes
Dependent/Assisted	No	No -New concepts of lavatories may permit some dependent transfers	Yes

Observations from Aircraft visit

Coach Class Lavatories

The B737 aircraft with coach class lavatories located in the lateral position at the aft of the aircraft (See Figure 1) are very difficult to access with the on board chair and will be difficult to make Tier I or Tier II accessible and maintain that same lavatory configuration. To provide a Tier 2 type of access, the impact will be significant for airlines that require full galley operations, but may be more feasible for airlines that operate with half galley operations. The site visit team visited a B 737-800 in production at the Renton Plant with two aft lavatories located across the aisle. At SeaTac, the site visit team visited an Alaska Airlines B737-700 with two aft lavatories on either side of the aisle, and a B 737-800 with three aft lavatories and similar to Figure 1. All the Alaska Airlines aircraft had a full galley across the back of the aircraft as does the overwhelming majority of the 737 fleet.

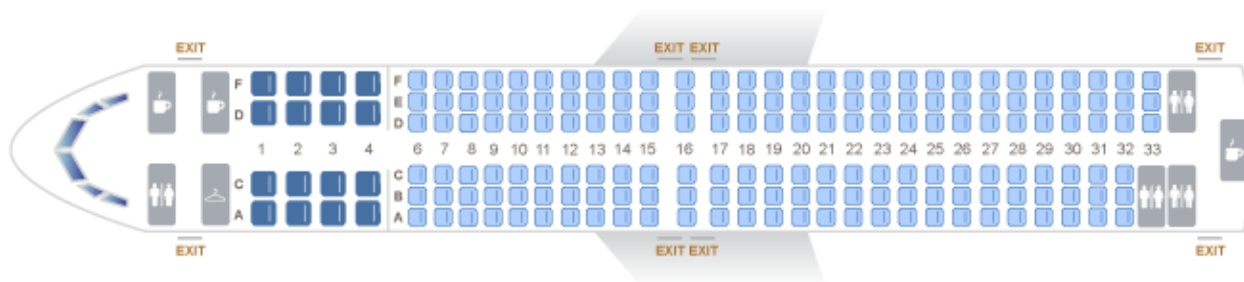


Figure 1. Alaska Airlines Configuration of B 737 -900- 3 aft lavatories

Given the different Airbus A320 Family aircraft geometry, it is recommended that similar testing on the accessibility of the rear lavatories on an A320 Family aircraft (A319/A320/A321). This would allow validating if the difficult access experimented on the Boeing 737 is also applicable to the Airbus A320 Family.

Lavatories that are located in the aft (where full galleys are usually located,) provide a much higher level of access and increase opportunities for Tier I and Tier II access. A schematic is shown below from the Virgin America- Airbus 319 (See Figure 2). These lavatories permitted Lee to maneuver into the lavatory because it was direct entry. All the other lavatories were not accessible due to the entry angles at the door. It should be noted that Lee would not be able to perform any type of assisted or independent transfer to the toilet.

The First Class Galley was filled with galley carts and this impacted the accessibility of the first class lavatory.



Figure 2 Virgin America Airbus 319 Configuration

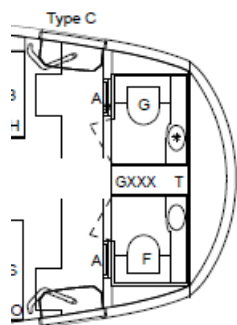


Figure 3 Schematic of A319 aft lavatories

First Class Lavatories

First Class lavatories, that are usually located near the front entry door and adjacent to the flight deck and are located across the aisle from half cart galleys can provide increased access and pivot transfers. For some aircraft only modest modifications such as curtains are required to increase Tier I accessibility. However, there may be operational, safety and security considerations. Airlines would need to permit coach class passengers who require the use of the on board wheelchair access to the First Class lavatory. The First Class lavatory, with a panel door not a bi fold door does provide more access for passengers who can stand and weight bear, but do not allow independent or dependent transfers due to the protrusion of the galley, and the approach angle of the on board chair.

The other advantages include:

- Shorter distance to move up and down the aisle since most airlines seat passengers who require transfers assistance in the row behind the bulkhead seat.
- The aisle width through first class may be wider than the coach aisle,
- Fewer passengers are impacted by a passengers requiring the use of the on board wheelchair using the first class lavatory.
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Key Observations from visit to the Aircraft

The lavatory door sill on most aircraft is too steep. It needs to have the angle reduced from 45 degrees to 30 degrees or less.



Figure 4 Photo of door sill showing 45 degree bevel. Recommended bevel should be much lower. Panel doors permit a wider open door clearance than bi-fold doors.

On board chair

Key observations of on board chair requirements that are in addition to the current specifications of the ACAA requirements:

1. Seat height: seat height of the on board chair needs to be compatible with aircraft seat height and toilet seat. Transfers to and from the on board chair should all be a same height. On many aircraft the average seat height and toilet seat height is 16-17 inches. This height may vary by airline.
2. Rated Load: onboard chair should be rated for a minimum load of 350 to 400 pounds.
3. Foot rest: needs to have sufficient clearance to clear the lavatory door sill. The underneath of the foot rest should be at least 0.75 inches off the floor.
4. On board chair stability: On board chair brakes or castor locks need to permit a person sitting in the on board chair to deploy brakes or castor locks independently. This is very important for independent users.
5. On board chair upholstery: Seat surface should be firm but not a hard surface, and seat pan length should be long enough to provide support for the thigh. Seat back height should be sufficiently long to provide back support.
6. Cleanliness: Consideration of FDA and other personal hygiene requirements.



Figure 5 Photo of on board chair that has many of the recommended features

