BACKGROUND

Single-aisle aircrafts allow only the use of provided onboard wheelchairs to transfer wheelchair users in and out of an aircraft. People who use wheelchairs are not allowed to bring onboard their personal wheelchairs, despite their circumstances. Additionally, there is no federal requirement that forces airlines to provide accessible lavatories on single-aisle aircrafts. The lack of space in lavatories to transfer in and out of a wheelchair and to allow a caretaker to assist in transfers present significant challenges for those who use wheelchairs.

PROBLEM STATEMENT

People with mobility impairments avoid or cannot travel on airplanes due to wheelchair restrictions and inaccessible lavatories.

GOAL

Enable people with mobility impairments the use of personal wheelchairs in single aisle aircrafts and aircraft facilities to improve accessibility during air travel.

ASSUMPTIONS

• Design for Airbus A321
• Infinite budget
• Government subsidies and tax deductions offset lost seat(s)

CONSTRANTS

• A 5-year industry project condensed to 5 months
• FAA and Aircraft Carrier Access Act (ACAA) compliance

RISKS

Environmental: Waste from old lavatories
Risk Identification Sources
• Economic: Loss of Profit
• Safety: Wheelchair as a projectile
• Social: Special Treatment
• Political: Government says NO

CURRENT ISSUES

Are you or your family reluctant or unable to fly because of a mobility impairment that requires the use of a wheelchair?

What is the most difficult part about using an aircraft lavatory?

What makes the current lavatories the least accessible?

Wheelchair Accessible Seat

Steps to attach a personal wheelchair in the aircraft:
1. Lift up the toilet seat and ease the wheelchair in.
2. Slide the locking mechanism to lock door
3. Enter the lavatory
4. Push button to automatically lower door
5. Wheelchair Accessible Seat passengers are given an emergency sling such as ADAPTS Portable Transfer Sling and further emergency protocols.

Lavatory Design

How to use the lavatory:
1. Flight attendant unlocks lavatory door from the outside by sliding the lock over
2. Push the button to bring out the emergency handle and manually lift up door

In case of emergency:
1. Flight attendant unlocks lavatory door from the outside by sliding the lock over
2. Push the button to bring out the emergency handle and manually lift up door

IMPACT

Five major U.S. airlines have 262 A321 models in service. Assuming 60% of airlines implement the accessible seat, government subsidies and tax deductions can reward airlines who implement accessible seats therefore enabling fair ticket pricing that keeps the average domestic flight cost of $359. With a conservative estimate, an A321 does 2 flights/day, 365 days/year, the opportunity cost of the accessible seat is: (131 planes x 2 flights/day x 365 days/year x $359/ticket = $34,331,170/year)

When an organization reaches out to diverse customers, their connection to diversity and inclusion will tie into their brand and business performance.

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Figure 1: Functional Diagram for Wheelchair Reservation

Figure 2: Recommended Plane Layout

Figure 3: ADAPTS Portable Transfer Sling: https://www.adapts.org/

Figure 4: Original Lavatory Layout

Figure 5: Final Design Lavatory Layout

Problems with Original Layout

• No room for wheelchair access
• No space to transfer

Problems with First Iteration

• Minimal room to maneuver in front of toilet
• Hard to reach sink for people with back issues or mobility impairments
• Sink will splash water on toilet seat

Solutions in First Design

• Place sink in front of the toilet and a pop out that extends outward to maximize space inside the lavatory