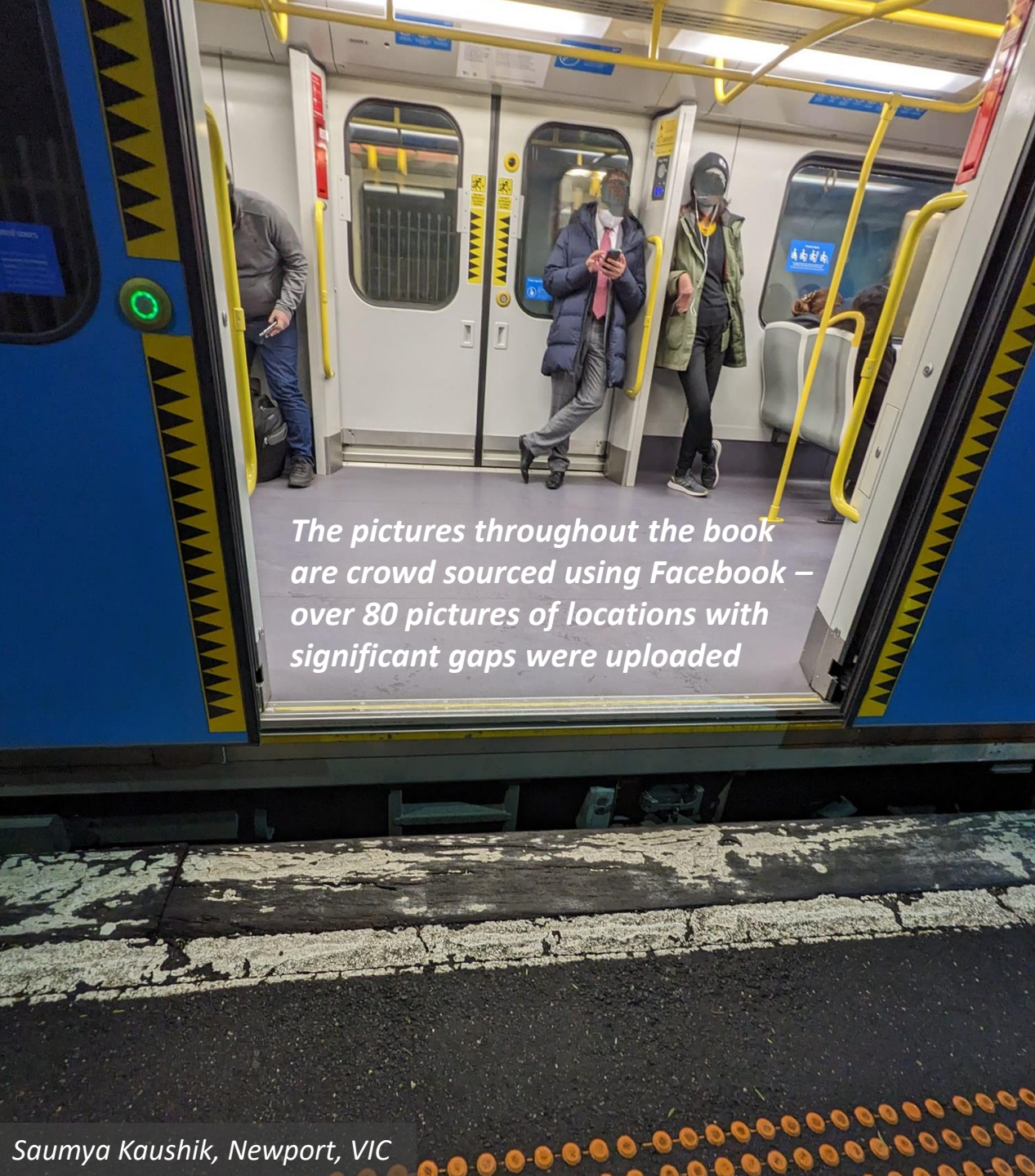




Railway station platform gap solutions

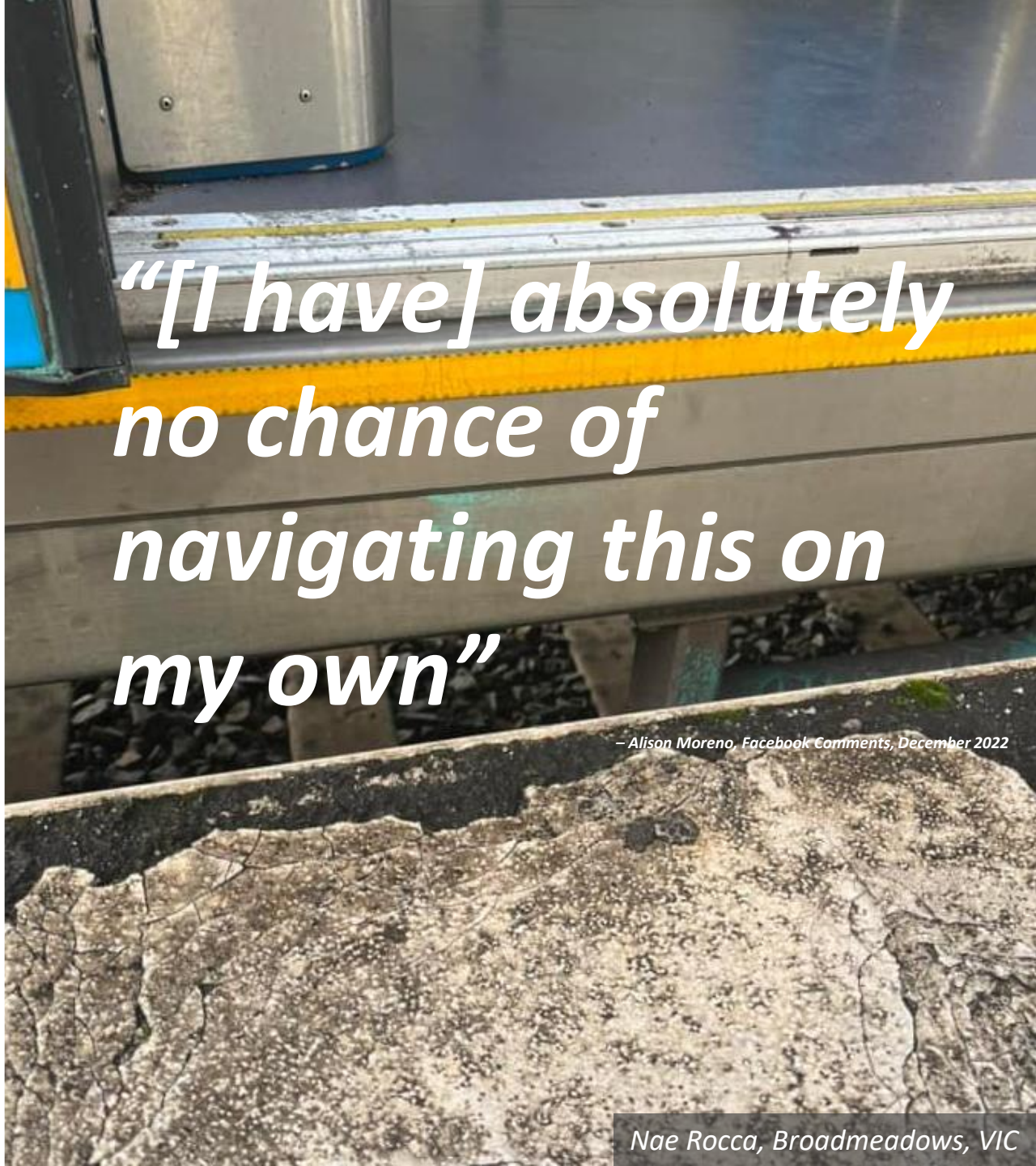
Project 1-056. This research funded by iMOVE CRC and supported by the Cooperative Research Centres program, an Australian Government initiative.





The pictures throughout the book are crowd sourced using Facebook – over 80 pictures of locations with significant gaps were uploaded

Saumya Kaushik, Newport, VIC



“[I have] absolutely no chance of navigating this on my own”

– Alison Moreno, Facebook Comments, December 2022

Nae Rocca, Broadmeadows, VIC

Using trains should be easy for everyone.

Due to gaps between rail platforms and trains it isn't easy for many people with disability (and poses a risk for other travellers too).

The current solution, the manual ramp, is far from ideal.

Automated ramps can provide unassisted access to trains.

They can bridge the height and depth and even accommodate stopping inaccuracies of trains.

This report shares the findings from our engagement with industry and people with disability around their experience with gaps, manual ramps, the Australian standards for gaps.

We tested 3 working prototype ramps which were – not surprisingly - received well by people with disability.

The proposed next step is to test these ramps in controlled operational conditions.



YouTube video player

We engaged people with a variety of disabilities

BKA on right leg, travel mainly in PWC
Power wheelchair dependent due to Multiple Sclerosis
have to use mobility aids wheelchair/rollator
Physical Disability and use an electric wheelchair
Physical
Right Above Knee amputee/Manual wheelchair user
C4 quadriplegic
Muscular Dystrophy using a power wheelchair
Cerebral Palsy
paraplegic + R arm amputation
I have autism epilepsy and add
Spinal Injury
Spinal Cord Injury
Spina bifida
Physical, spina bifida
Cerebral palsy
Hidden disability
physical, autonomic
paraplegic + R arm amputation
I have autism epilepsy and add
Spinal Injury
Spinal Cord Injury
Spina bifida
Physical, spina bifida
Cerebral palsy
Hidden disability
physical, autonomic
I'm double amputee
Physical & neurological
Physical - Spina Bifida
Fully wheelchair dependent, spina bifida.
I have Ehlers Danlos, Dysautonomia and COPD

so my ability to walk varies. If I am travelling
alone it's almost always with my electric wheelchair
physical disability caused by CP
Cerebral palsy (fully wheelchair bound)
Cerebral palsy
C5/6 quad incomplete
I have SMA
Physical disability. Basically a quadriplegic
so use a power wheelchair.
Ehlers Danlos Syndrome and Functional Neurological Disorder
Joint and heart issue uses a manual wheelchair on long days.
Physical and neurological
MS
Paraplegic
I use a motorised scooter while traveling on the train.
Parinaud syndrome (can only focus with one eye at a time,
attention jumps between eyes erratically), mild cerebral palsy
(weaker left side, trips over uneven gaps in pavement)
Parinaud Syndrome (aka 'Dorsal Midbrain Syndrome', mild
Cerebral Palsy
Physical and Neurological
Use manual wheelchair
Genetic connective tissue disorder and autonomic
dysfunction, ambulatory manual wheelchair user
Paraplegic
Cerebral Palsy
T4 Paraplegia
Multiple sclerosis
Mobility impairment post stroke
ME/CFS
Physical impairment
12 year old semi-ambulant user utilises wheelchair for pain

reduction due to foot/ankle deformity due to talipes. Survey
being completed by mother
Strokes drop foot.
Physical disability
Cerebral Palsy
Physical. Manual wheelchair user
My 11year old child has a disability, she is an ambulant
wheelchair user so fatigues easily and has balance issues
and intellectual disability. I am answering these questions as
the person who mobilises her in the wheel chair –
she does not self mobilise



“Another trip hazard, and impossible for wheelies.”

— Mark Slocum, Facebook Comments, April 2023

Deborah Solomon, Town Hall, NSW



“I could lose my wheelchair in that gap and no one would even notice.”

— Astrid Van Dyke, Facebook Comments, July 2023

Sam Valavanis, Berwick, VIC

1. The current platform gap



Not just for People with Disabilities, but a safety risk for all passengers:

According to new data, there were more than 380 slips, trips and falls across the city's train network in the past year.

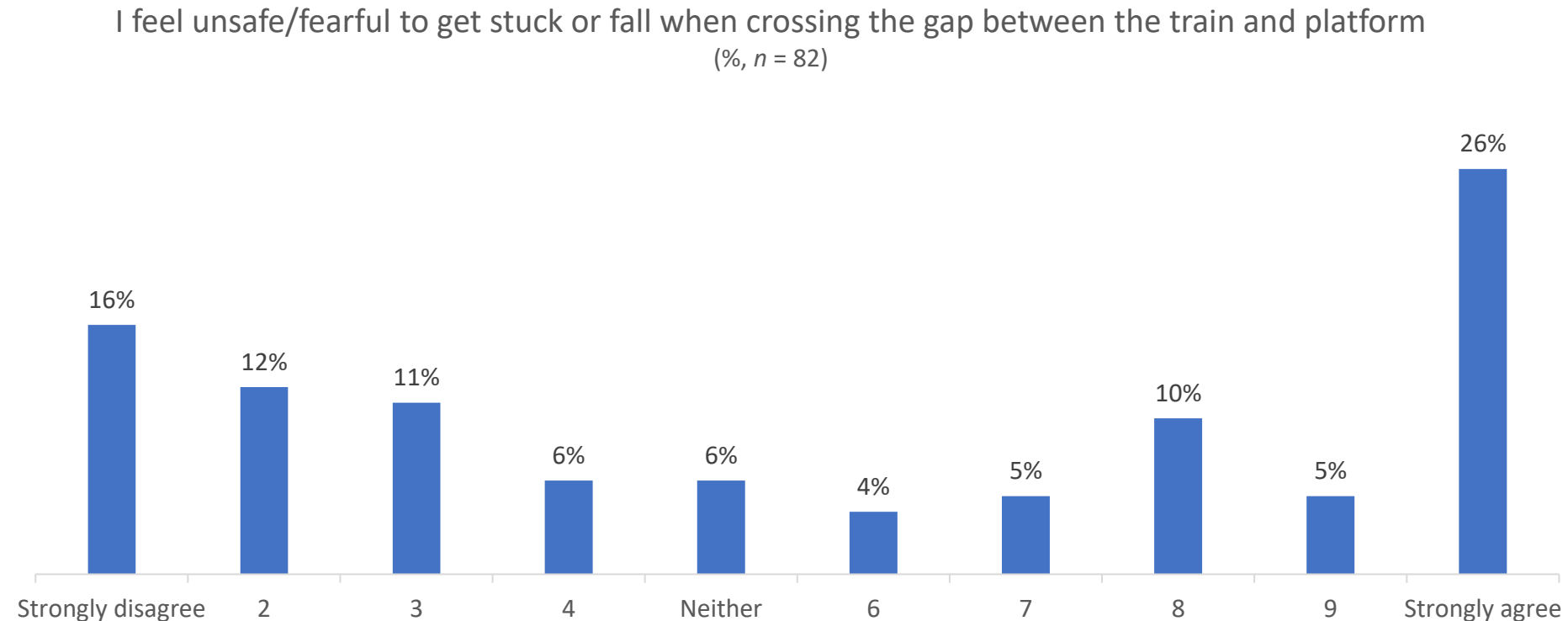
More than half of those resulted in injuries and trespassing was the most common safety risk.

Every mishap has the potential to cripple the entire network and potentially affect about 50,000 commuters.

(9News, 2022)

The current problem

Many users find it difficult to cross the gap between train and platform





Julie Duong, Central, NSW



*"I wonder how
many
wheelchairs are
under there"*

David Van Dyke, Facebook Comments,
July 2023

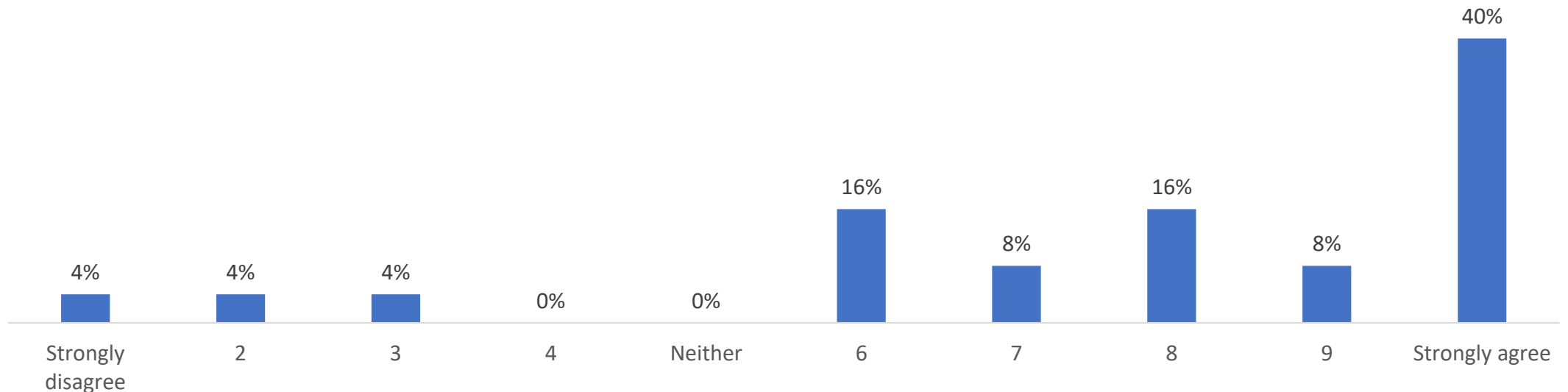
Leonard Mammoliti, Melbourne Central, VIC

The current problem

Many users find it difficult to cross the gap between train and platform

Because of the gap in between the train and the platform, it is difficult to alight and board trains in many train stations

(%, $n = 68$)



*"Sometimes there's a little gap
and drivers insist on just crossing,
even when I know it isn't safe"*

— La Trobe Modtas Survey, 2023



Zoe Phelan, Collingwood, VIC



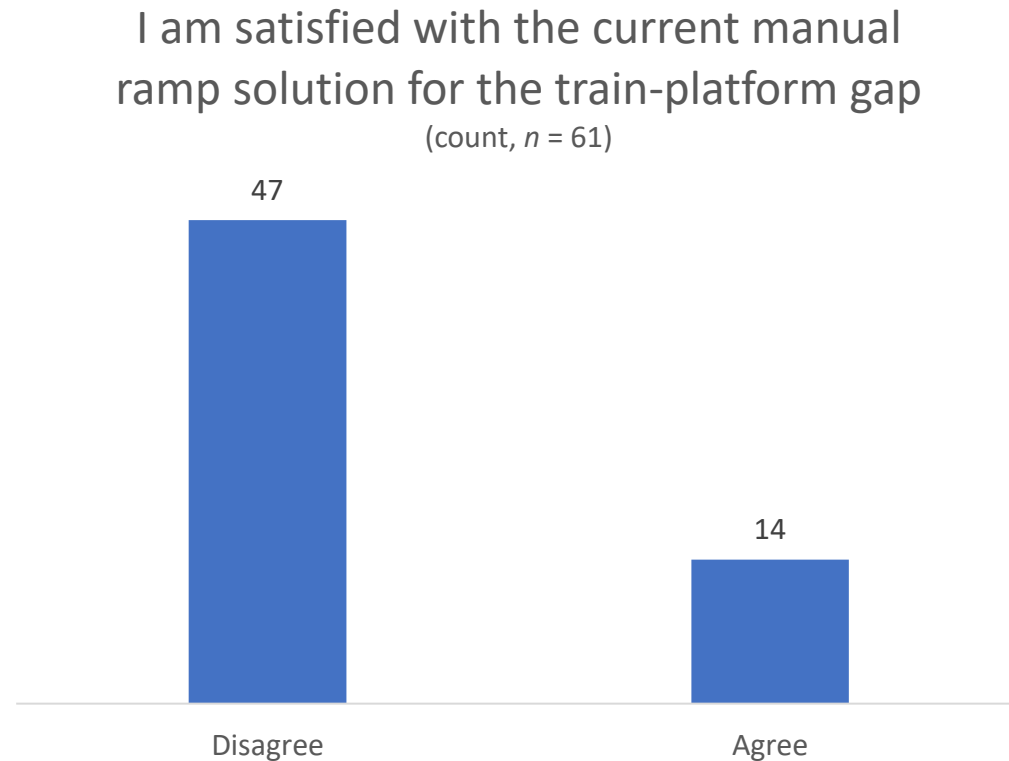
Freya Elliott, Epping, VIC

2. The current solution: Manual ramp



The Manual ramp

The solution is working but it is not ideal...





Lily Lee, Auburn, VIC



***“It’s
shameful.
Basically no
consideration
for disabled
or wheelchair
users.”***

*Astrid Van Dyke,
Facebook Comments, August 2023*

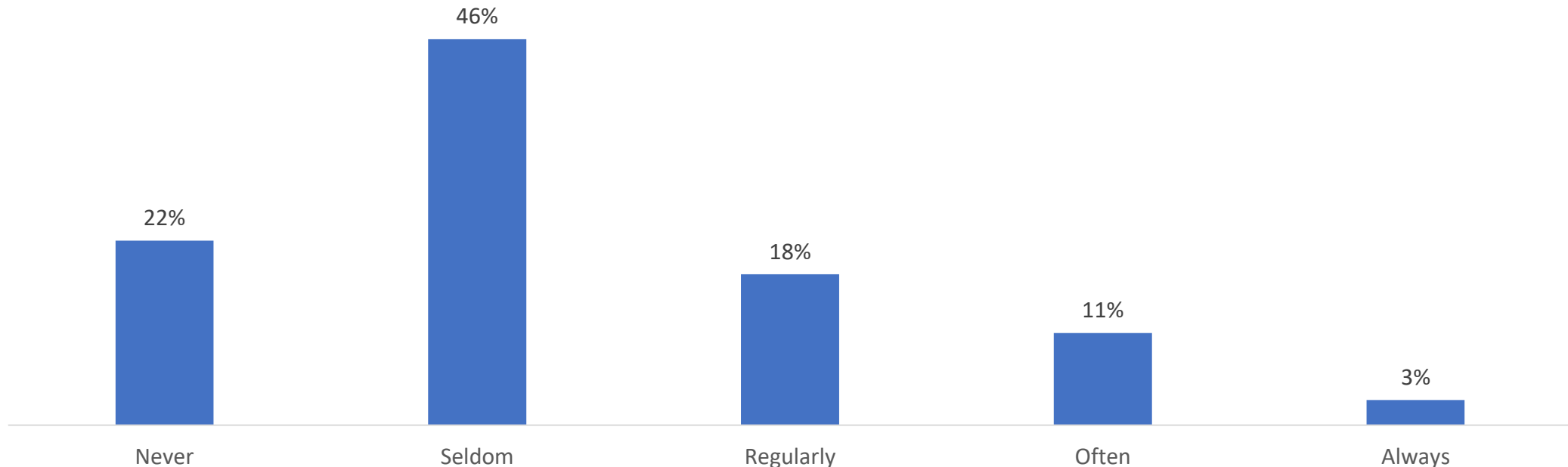
Wayne Townsend, North Melbourne, VIC

The Manual ramp

Something goes wrong regularly for one third of ramp users

How often does something go wrong with boarding or alighting from the train using the manual ramps?

(%, $n = 72$)





Alison Moreno, Yarraville, VIC



*"I'm too
scared to
even get off
this station"*

— Nicole Featherstonehaugh,
Facebook Comments, August 2023

Wayne Townsend, Essendon, VIC

The Manual ramp

Something goes wrong regularly...

In Melbourne it is hard to locate (at the train stations) where you need to be to get assistance i.e a staff member to get the ramp for you. Its not like you can easily move around to find someone to assist you. There is also an issue of when trains pull in and they are crowded so there is no room to get on the train - you get left at the station

Rail staff forget to get the ramp at the end of the trip and a passenger has had to notify the train staff on the platform to let me off the train

There's not enough room on the ramp (not wide enough), so I need help to steer. It's also far to steep an incline and I never feel safe. There are "mini steps"/"ledges" to get on the ramp to get off the train, so I have to go backwards, which makes everything way worse!

1) ramp isnt placed down correctly so it moves 2) I have had an instance where the CSA used his foot to keep the ramp in place by placing his foot on the side of the ramp to which as i was rolling down the ramp my front castor hit his foot and my chair tipped, causing me to flip out of my chair and hit my face on the platform floor. 3) Train doors have also been closed on me whilst trying to alight a train whilst using a manual ramp Im sure theres other examples but thats just a few of my experiences

Wheelchair front wheels get stuck at ramp lip from the platform so my partner pushes my chair over the lip

I know sound dumb but if 'm on my own I always get stuck its better if staff assist me but I get scared to as in case I get abused. the new ramps here in NSW is wider and flatter but has a split in the middle of ramp looking as if about to break



Alison Moreno, Southern Cross, VIC



*"Sometimes
drivers just
ignore me
and head
off"*

La Trobe Modtas Survey, 2023

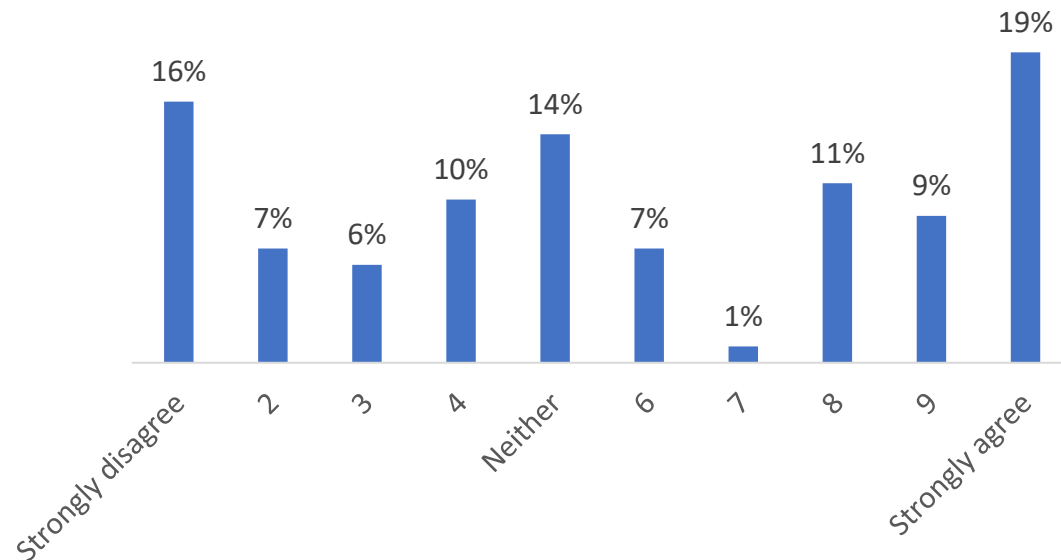
Sonya Marshall, Martin Place, NSW

The Manual ramp

Most importantly, many users struggle with independence

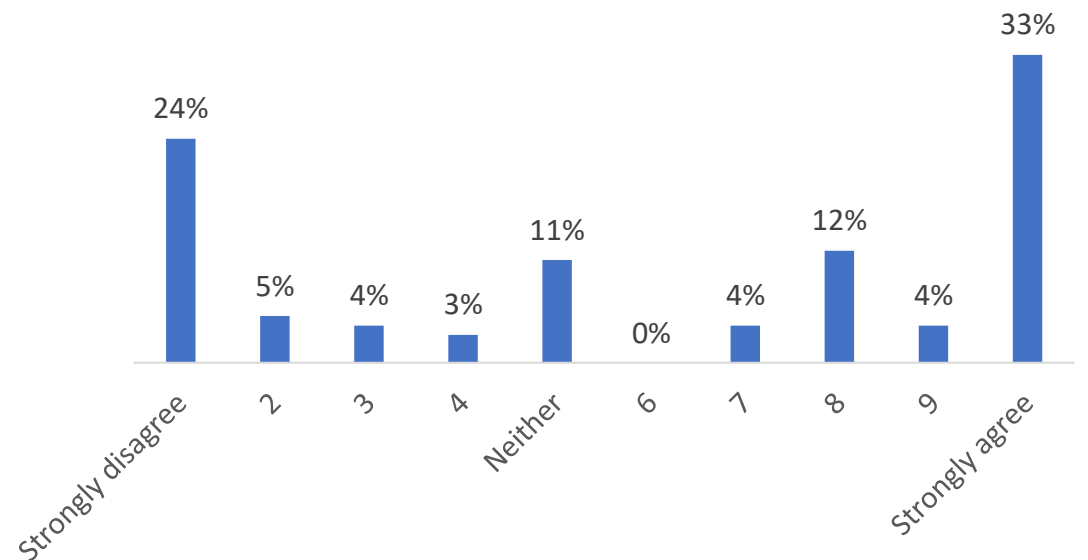
Getting a manual ramp organised for me is
easy

(%, $n = 81$)



I feel embarrassed when staff get to help
me to alight and board train

(%, $n = 75$)





“There has been times where I have made eye contact with the train driver, but they’ve just ignored me”

– La Trobe Ramp Survey, 2023

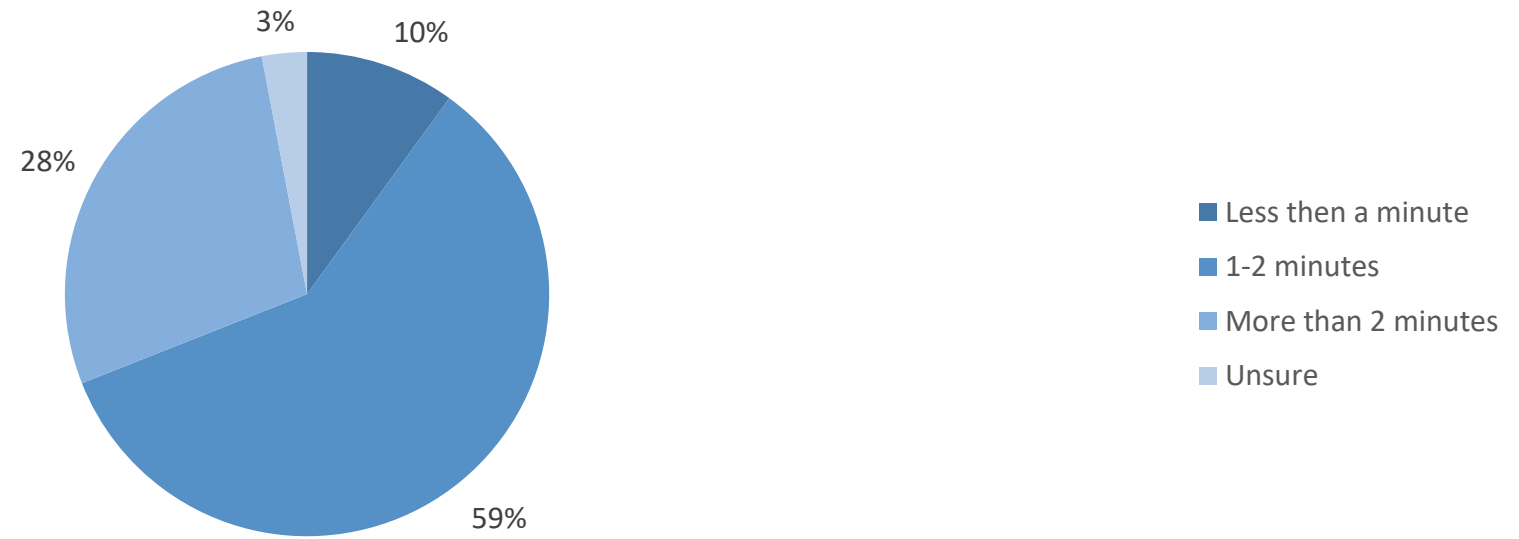
John Robert McPherson, Sunnybank Railway Station, QLD
(Creative Commons Attribution-Share Alike 4.0 International)

The Manual ramp

For the operator it takes time...

On average, how long would you estimate it takes to set up and use a manual ramp while boarding or alighting from the train, from the moment the train stops?

(count, $n = 61$)



A close-up photograph of a person's hand, wearing a watch and a ring, holding a yellow manual mobile ramp (Port-a-Ramp) in place. The ramp is a grey metal plate with a yellow border, mounted on a white base. The person is wearing a dark jacket. The background shows a grey floor and a blue object.

*“It’s scary to use,
especially when
it doesn't lock in
and the driver
just holds it in
place with their
foot”*

– La Trobe Ramp Survey, 2023

Bernhard Rüger, Manual mobile Ramp (Port-a-Ramp, UK)
(Image may be subject to copyright.)

The Manual ramp

...and is a health and safety risk for people who deploy the ramp

'I don't know Injury Statistics, but certainly, when I last spoke several years ago were retrieved typically, one staff member every month with the use of manual ramps. So that's one of the drawbacks of manual ramps.'

Rail operator



Kayden Lee, Westona, VIC



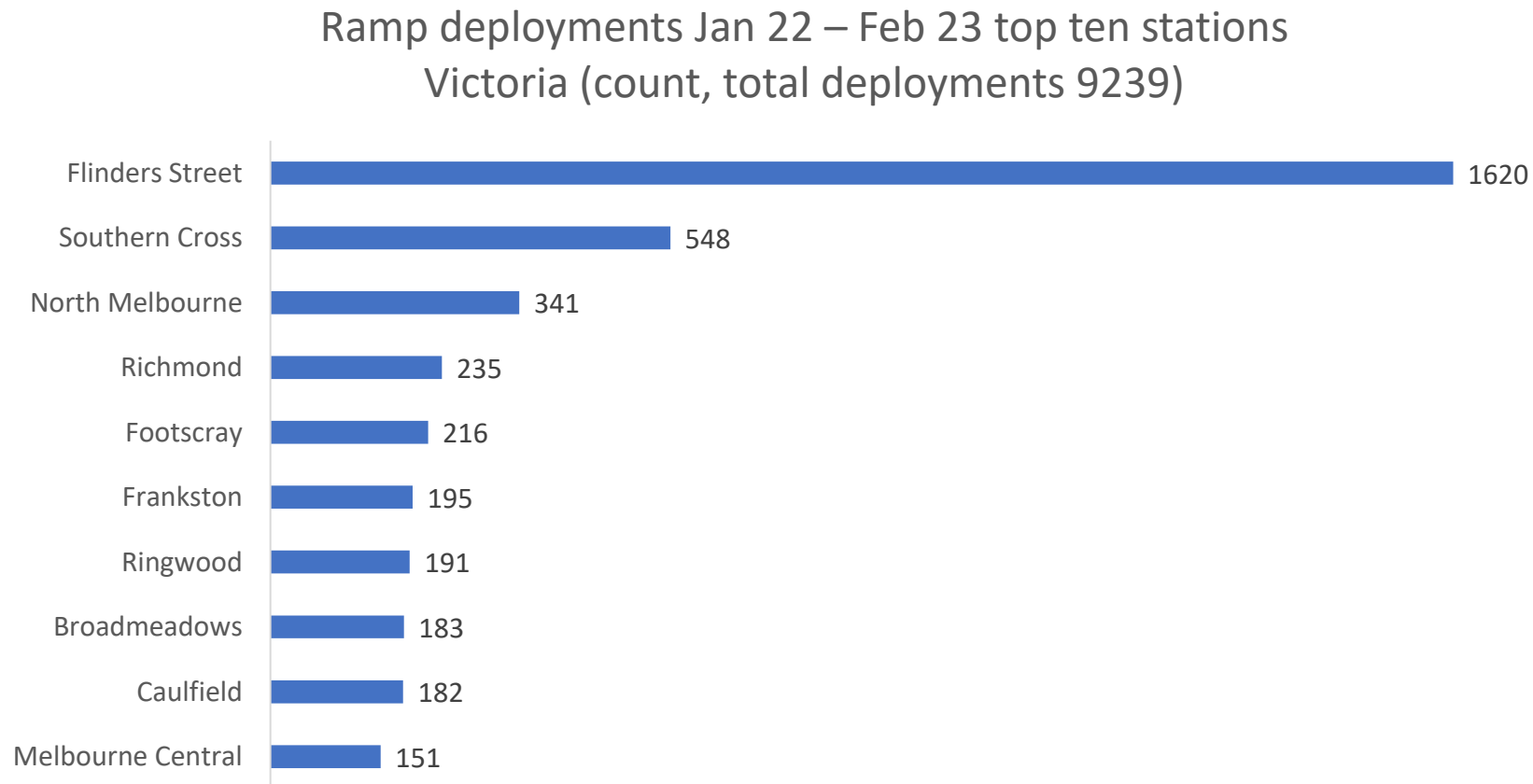
*“Sometimes
the ramp
drops, and I
can’t even get
over the edge”*

— La Trobe Facebook Survey, 2023

Ella Bibby, Flinders St, VIC

The Manual ramp

It is probably more cost efficient to have an automated ramp (vs. providing human assistance) at high traffic stations.





“There has been times where I have made eye contact with the train driver, but they’ve just ignored me”

La Trobe Ramp Survey, 2023

Nae Rocca, Pascoe vale, VIC



Mo'nique Witsen, Seven Hills, NSW

Video La Trobe test



“Why wasn’t it done before, it’s 2022!”

3. Australian vs International Standards



*We tested gaps according various standards (USA, Europe,
Australia) using a mock platform ramp at ATSA's
Independent Living Expo in Melbourne*

MELBOURNE
24-25 MAY 2023
MELBOURNE SHOWGROUNDS



Australian vs International Standards

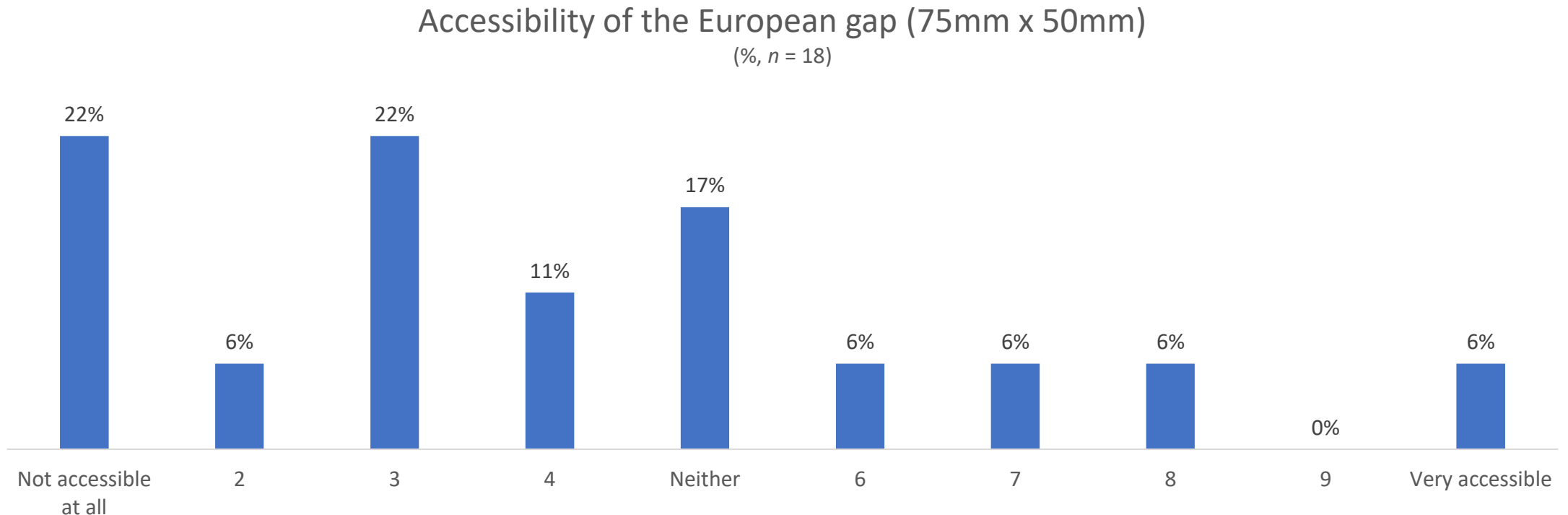
- Australia has the strictest standards globally

Country	Maximum acceptance (horizontal)	Maximum acceptance (vertical)
Australia	40 mm	12 mm
USA	76.2 mm	38.1 mm
Europe	< 75 mm	< 50 mm
France	50 mm	50 mm



European Standards

- The European standards (75mm x 50mm) are inaccessible for most, especially those with motorized wheelchairs; The Australian standards should not be loosened





NTRO
NATIONAL TRANSPORT RESEARCH ORGANISATION

ROAD

RAIL

AIRPORTS

PORTS

NTRO.ORG.AU

atac
expn

Learn More. Simplified by

SUNBLAZE
MEDICAL

4. Solutions

New platforms and trains will have minimal gaps. It will take many decades to implement across all trains and platforms (if feasible at all)



(Image may be subject to copyright.)



“The angle is never consistent. The driver often forgets what station I need to get off the train. The gap is different at every station. It’s a nightmare and it’s humiliating”

— La Trobe Facebook Survey, 2023

Lynn Kosy, Granville, NSW



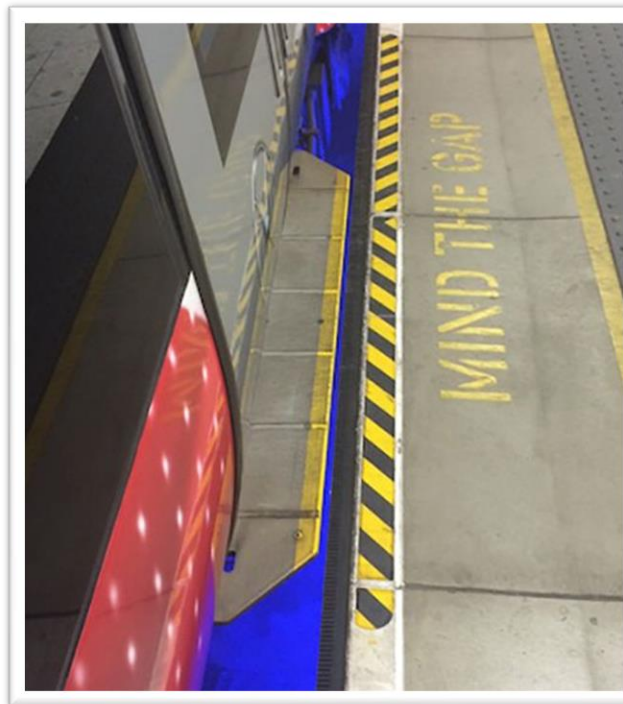
Ashlea Sanders, Watsonia, VIC

Existing solutions: train-mounted

- Mostly partial solutions, for instance, not addressing height differences
- Ranging from rubber fillers, to a static or retractable metal lip, to moving lifts or ramps



Public Transport Users Association



Delkor



Campaign for Level Boarding



Dave Cook, Claisebrook, WA

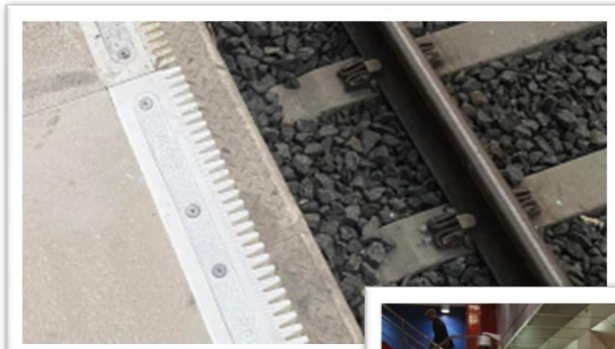


Janice Lovelock, Katoomba, NSW

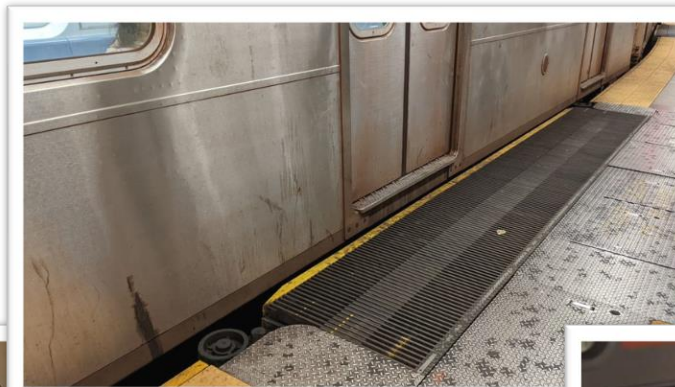
Existing solutions: Platform-mounted

- No perfect solution for Australian variety of circumstances with varying height of trains and gaps on the same platform, and many trains not able to stop at precise location

Rubber fillers, static bumps/raised areas, retractable platforms, or mechanic ramps (Japan)



Alpha Rail



Atlas Obscura



Wongm's Rail Gallery



NHK World Japan



Emma Phelan, West Richmond, VIC



***“I wouldn’t
dare wheel my
chair across it
without a
ramp!”***

– Julie Duong, Facebook Comments, April 2023

Sandra Louise, Redfern, NSW

5. Automated solutions

What if a platform ramp could be:

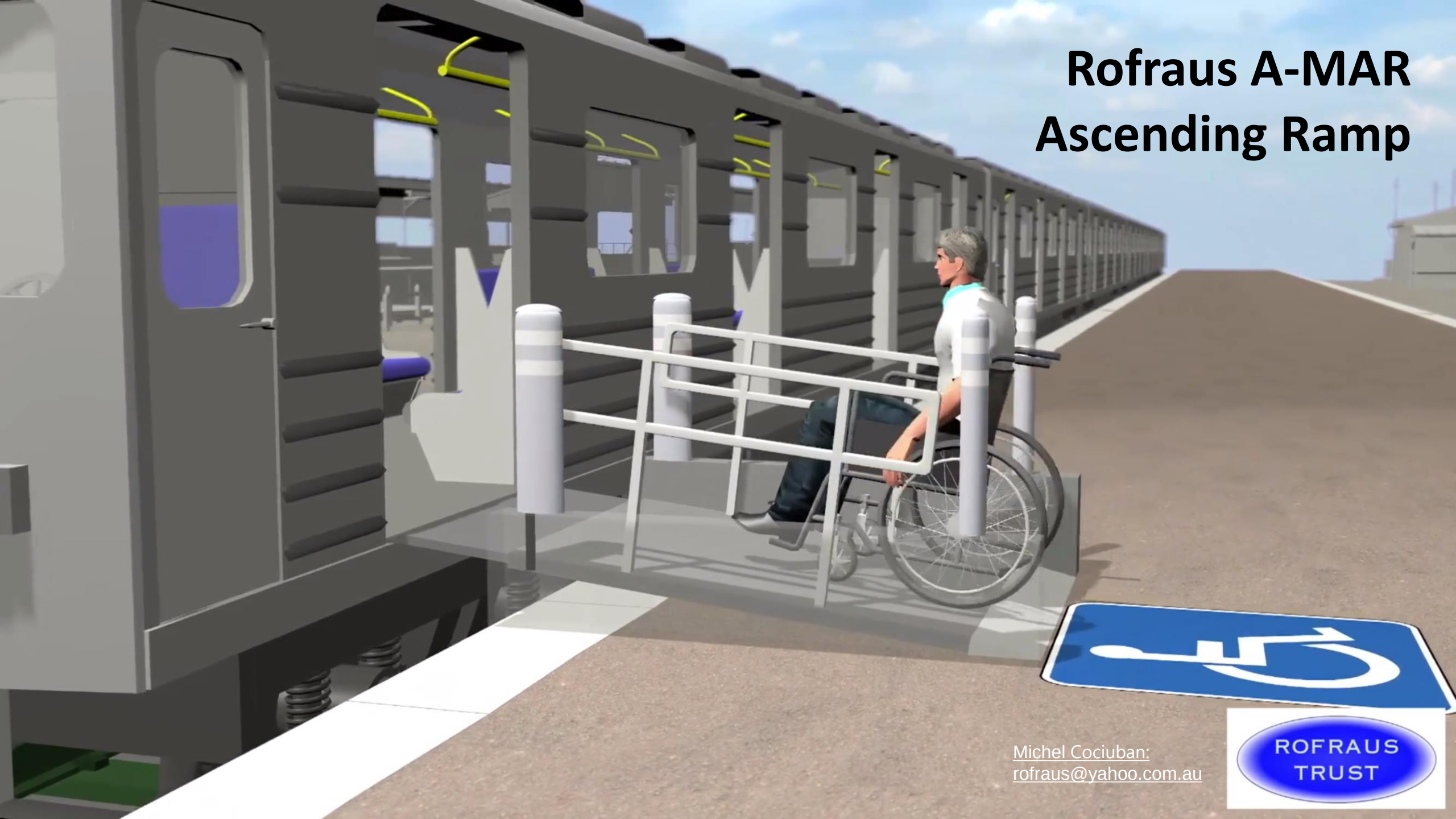
- automatic
- adjust for depth and height of the gap
- accommodate for stopping inaccuracies of the train by adjusting its position or by being modular?

We tested 3 solutions:

- Modtas
- Rofraus A-MAR
- Rofraus D-MAR

Rofraus

Rofraus A-MAR Ascending Ramp



Michel Cociuban:
rofraus@yahoo.com.au





We're very grateful for NTRO for taking the initiative to solve this problem.

Rofraus D-MAR Descending Ramp



Michel Cociuban: rofraus@

Michel Cociuban:
rofraus@yahoo.com.au



Rofraus D-MAR



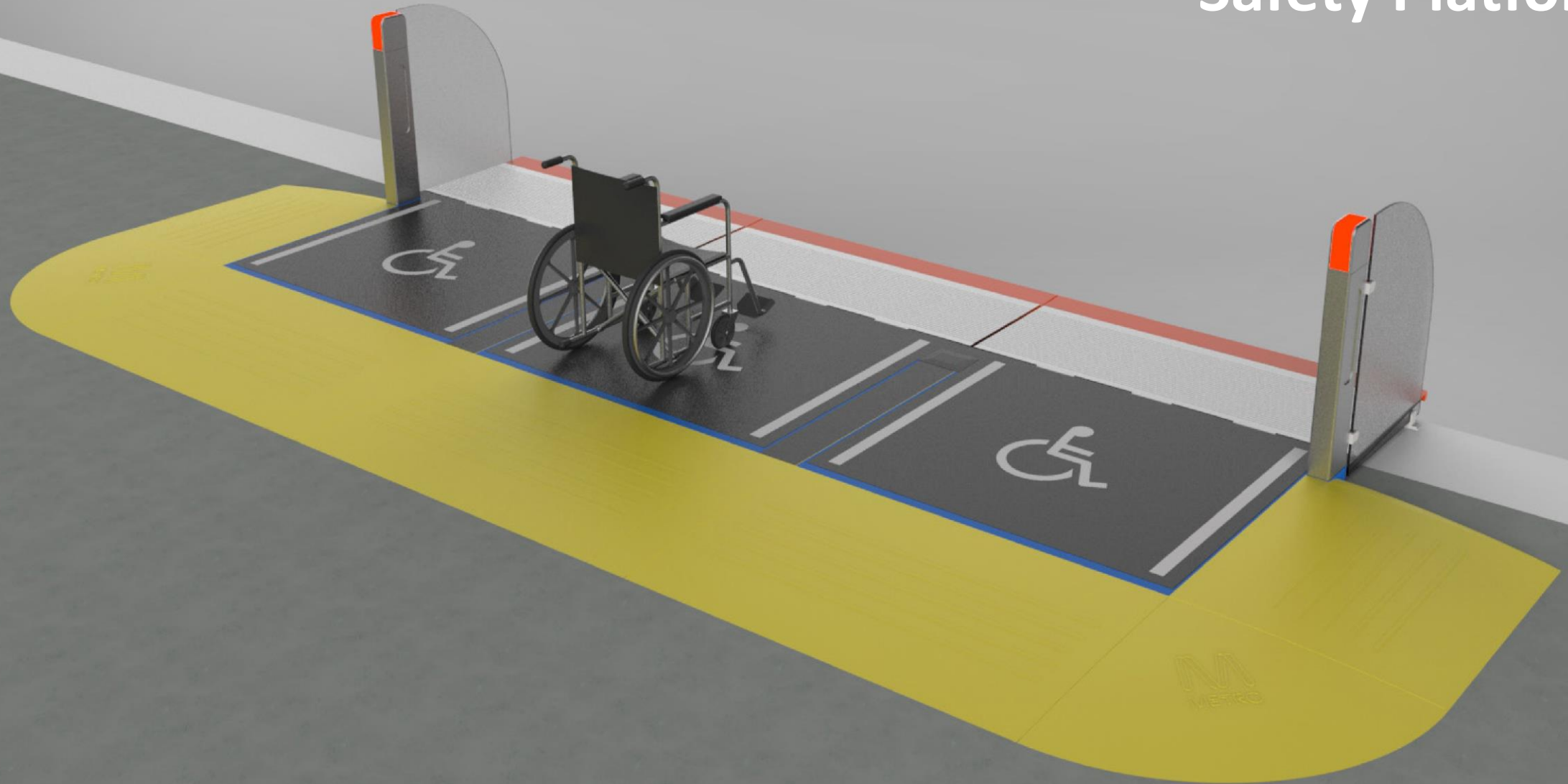
Michel Cociuban: rofraus@yahoo.com.au

Michel Cociuban:
rofraus@yahoo.com.au



Modtas

MODTAS Moveable Safety Platform



Robbie Phelan <info@modtas.com>

MODTAS Moveable Safety Platform



Robbie Phelan <info@modtas.com>



The Modtas ramp solution being tested

Robbie Phelan <info@modtas.com>

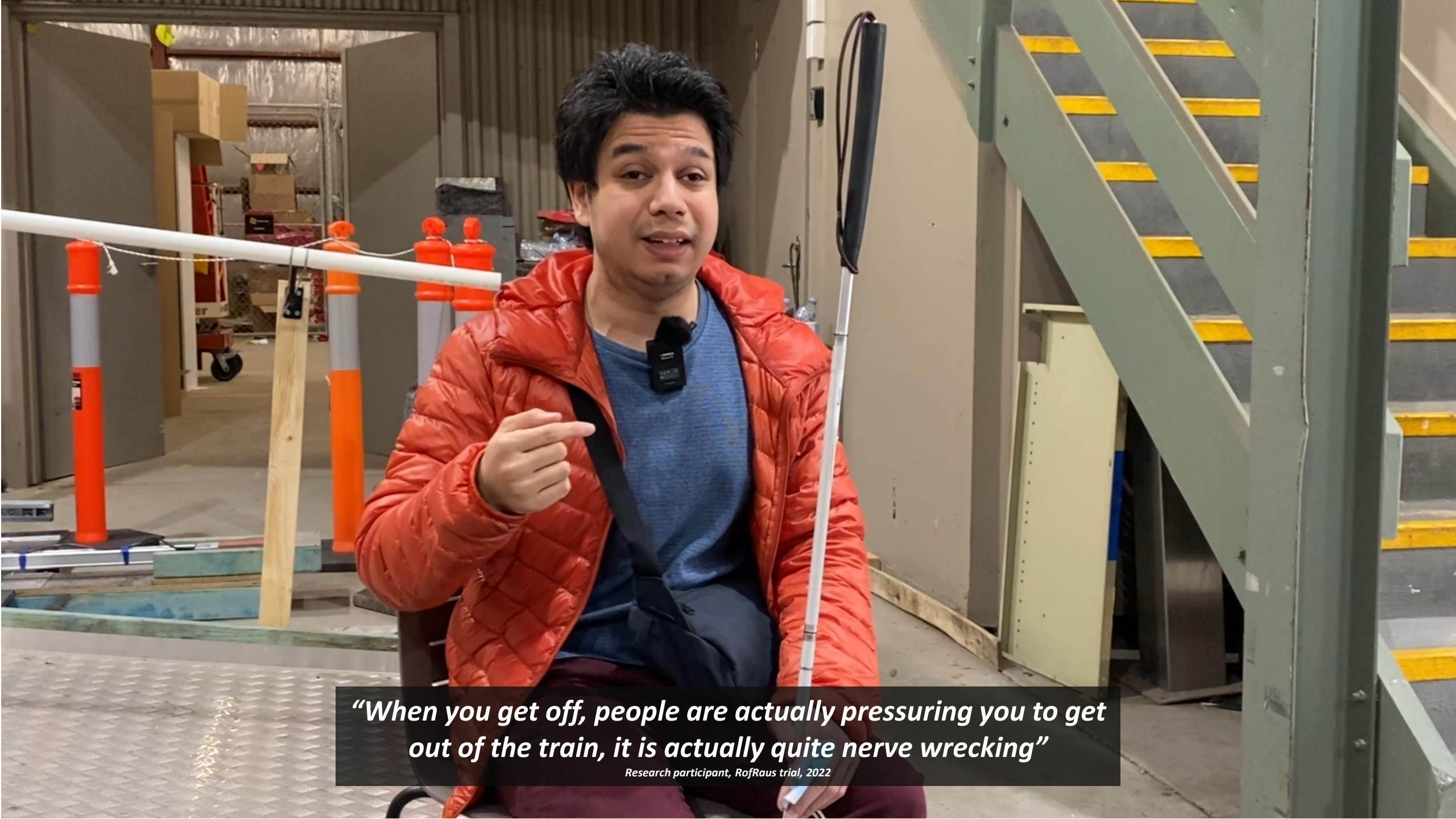
Modtas trial video



Robbie Phelan <info@modtas.com>

NTRO

Modtas trial video



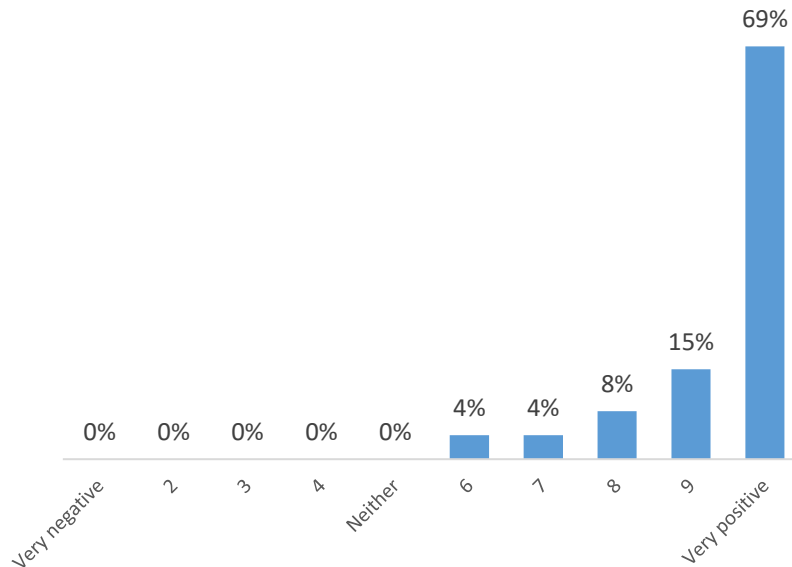
“When you get off, people are actually pressuring you to get out of the train, it is actually quite nerve wrecking”

Research participant, RofRaus trial, 2022

Feedback to the automated ramps was extremely positive

Average overall first impressions after trial

(%, n = 26)



Reactions

"This needs to be implemented at every door."

"No gap, no issues!"

"Don't have to wait for the driver"

"It would literally change my life!"

"Super simple and I felt confident that I can sort myself"

"It's just easy, and I don't like talking to people, so it's great!"

Considerations

Communication: *It'd be good to have more communication, "like traffic lights" so you know when it's ready to cross*

Automation: *"The ramp could be activated with your MYKI system, or should be deployed automatically"*

Training: *"Metro staff need to be trained on how they work, and what to do if something goes wrong"*

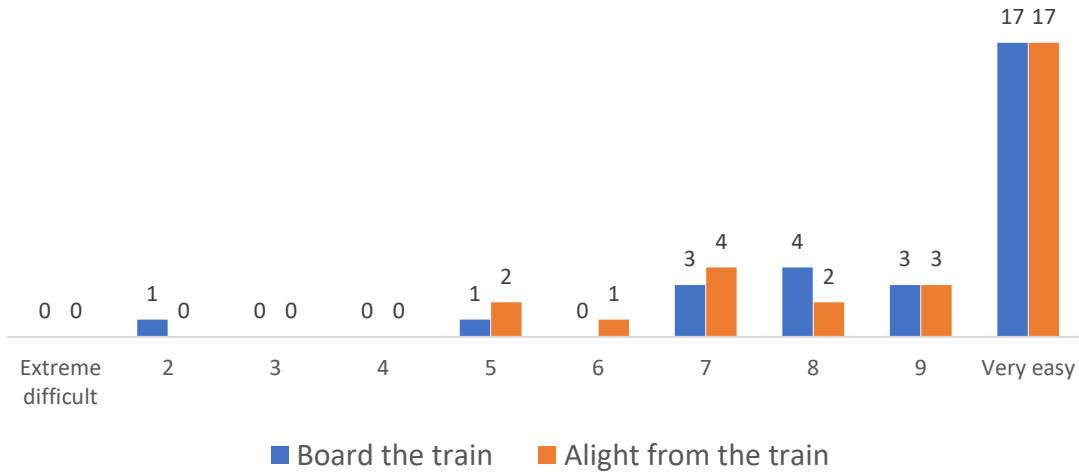
Tactility and High Contrast: *Ensure that it is clear where the ramp is, including on wayfinding apps*



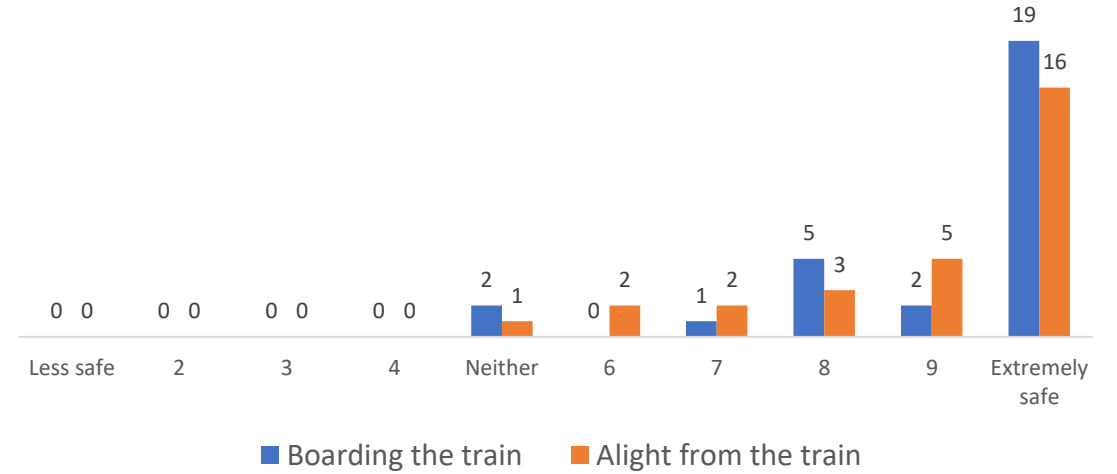
SAFE WORKING LOADS	
2000	MAINTENANCE OF
800 - 800	PACKING STRUCTURES
1000 - 1000	
1200 - 1200	
1400 - 1400	
1600 - 1600	
1800 - 1800	
2000 - 2000	
2200 - 2200	
2400 - 2400	
2600 - 2600	
2800 - 2800	
3000 - 3000	
3200 - 3200	
3400 - 3400	
3600 - 3600	
3800 - 3800	
4000 - 4000	
4200 - 4200	
4400 - 4400	
4600 - 4600	
4800 - 4800	
5000 - 5000	
5200 - 5200	
5400 - 5400	
5600 - 5600	
5800 - 5800	
6000 - 6000	
6200 - 6200	
6400 - 6400	
6600 - 6600	
6800 - 6800	
7000 - 7000	
7200 - 7200	
7400 - 7400	
7600 - 7600	
7800 - 7800	
8000 - 8000	

it's good for us.

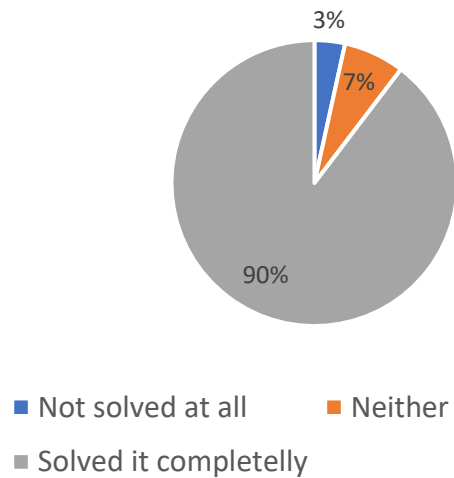
How easy was using the automated ramp solution?
(count, $n = 29$)



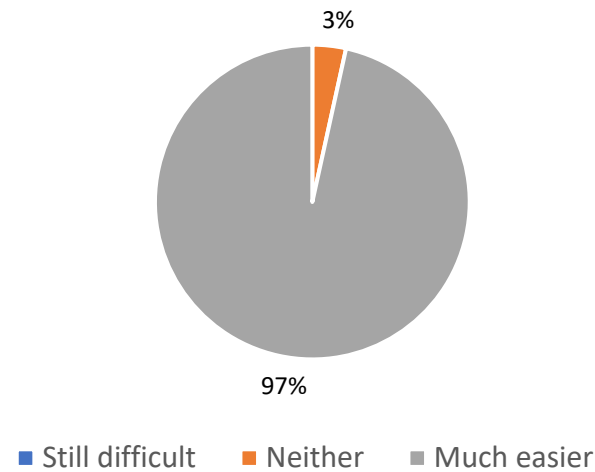
How safe did you feel using the automated ramp solution?
(count, $n = 29$)



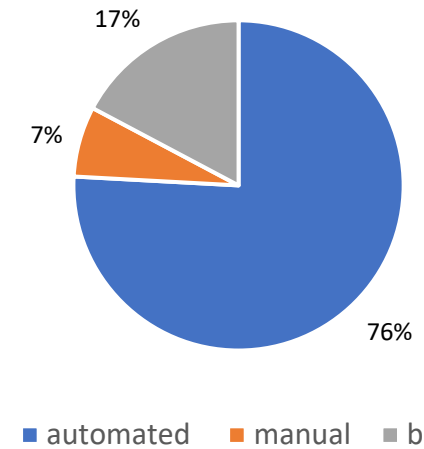
Did the automated ramp solutions solved the gap issue between platform and train?
(%, $n = 29$)



If this solution used in our public transport system, how much easier or more difficult do you think traveling by train will be?
(%, $n = 29$)



Would you prefer a manual ramp or (an improved version of) an automated ramp?
(%, $n = 29$)





Zoe Zamperini, Mortdale, NSW



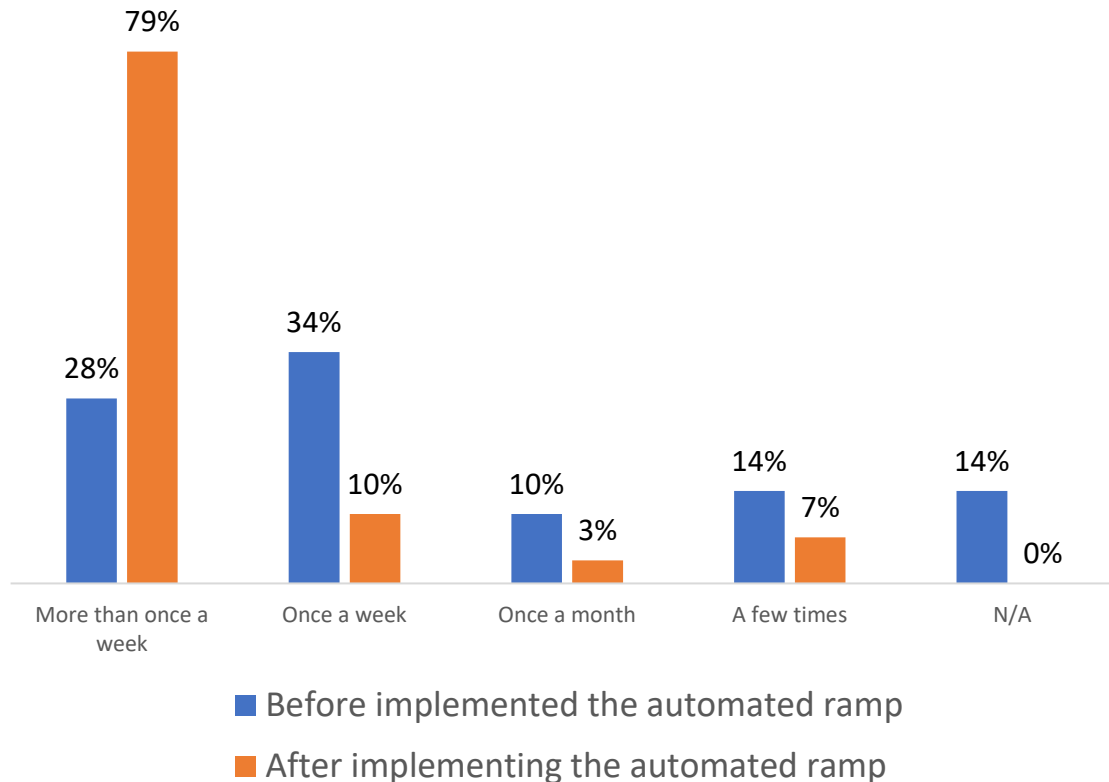
*“The gradient
of the ramp
means my
wheelchair tips”*

— La Trobe Ramp Survey, 2023

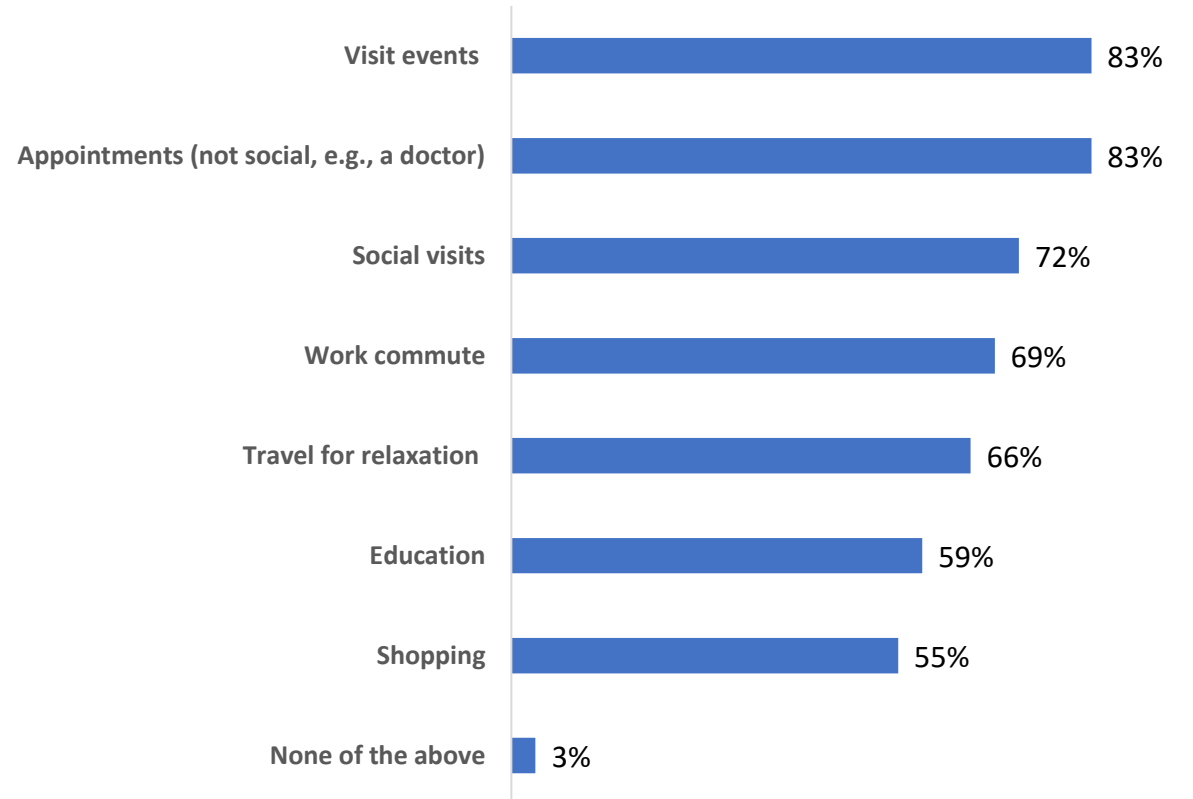
Poppy Aggenbach, Bendigo, VIC

Significant impact

How often will you use train if these solutions implemented in the train stations?
(%, $n = 29$)



What will you do more/new using a train if this is implemented (choose as many as relevant)?
(%, $n = 29$)





Kate Wirges, Malmsbury, VIC



“Definitely too steep, even with a ramp”

– Percy Oliver, Facebook Comments, July 2023

Percy Oliver, Richmond, VIC

Gov & Industry feedback

“The Department of Transport has a vision around simple safe and connected transport. Making sure that all journeys are accessible is absolutely core of our vision and what we are aiming to achieve as a state”

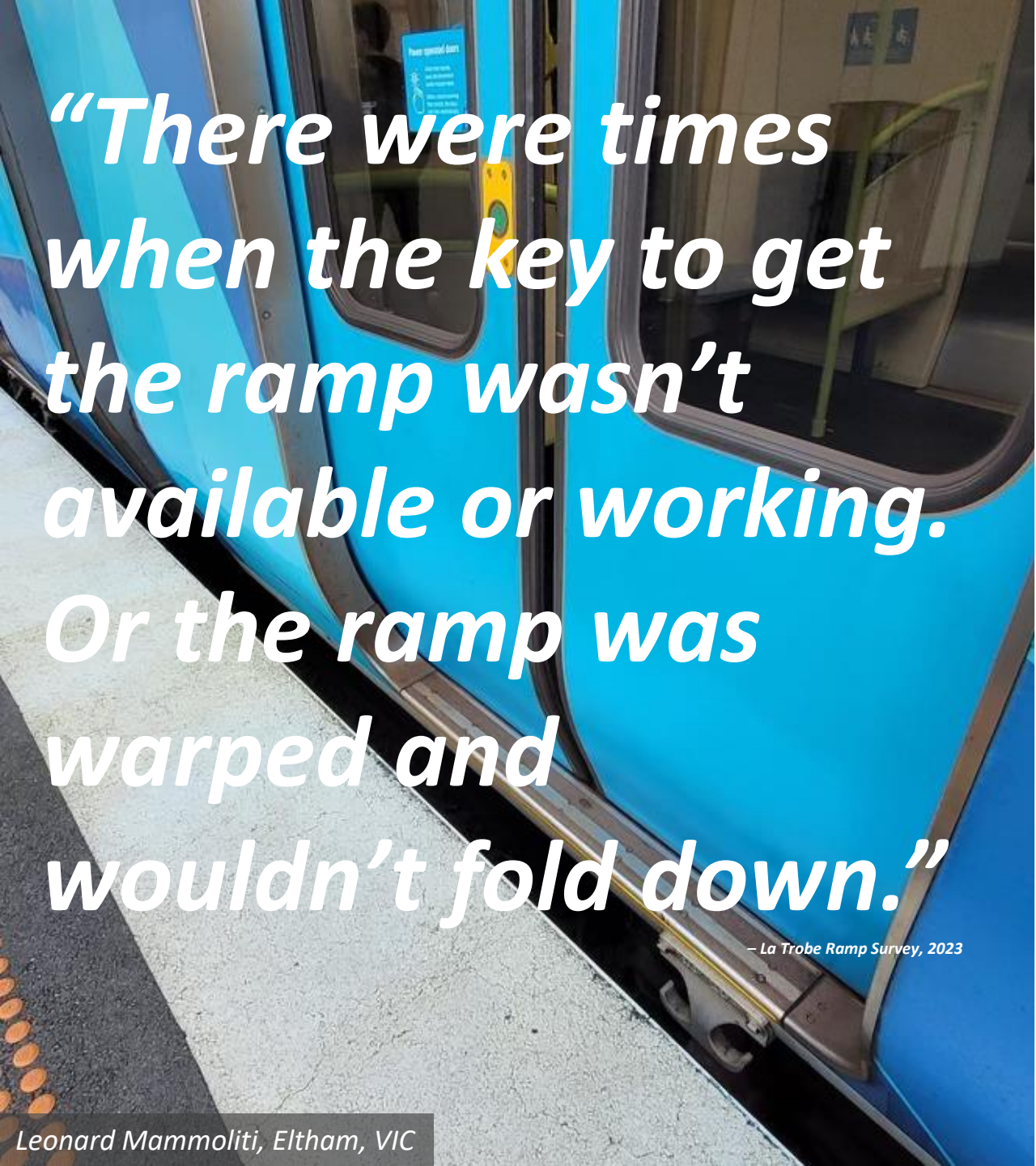
David Martin: Strategic data partnerships at DOT, Victoria.

“My experience here with the solutions presented here today, the AMR and the DMR provided me and my guide dog with very smooth access into the train thanks to the prototypes that were demonstrated here”

David Simmonds Director of transport accessibility, DOT, Victoria.

‘Ideally, the ramps are integrated with the doors so they become a fully integrated system. And in terms of reliability and throughout time, we're talking fractions of a second time you have for the ramp to be deployed, it's the same time that it takes for the door to open. Yes, so in terms of impact on dwell time, it's almost non yet almost zero. The heart of the issue, which is not so much about dwell time is reliability.

Rail operator



*“There were times
when the key to get
the ramp wasn’t
available or working.
Or the ramp was
warped and
wouldn’t fold down.”*

— La Trobe Ramp Survey, 2023

Leonard Mammoliti, Eltham, VIC



Janice Lovelock, Leura, NSW

Conclusion and next step

Unassisted access to trains using automated ramps would solve a major accessibility issue for a wide group of people with disability.

What is needed is an assessment of existing ramp prototypes in an operational environment:

1. Safety
2. Operational efficiency
3. Reliability



Thank you to the AFDO and their participants
who came from far and away and tested the ramps and gave crucial feedback to help
improve the systems. We appreciate the help and generosity.

Thank you

I-Move for their guidance and platform:

- Renae Leeson and Emilie Alexandre

For getting La Trobe University involved

- Paul Murray at NTRO
- Paul Bennett for the assistance on the project
- Sam Crees at NTRO for the excellent video's

For letting us trial their prototypes

- Rofraus: Michel Cociuban
- Modtas: Robbie Phelan

AFDO:

- Jim Jim Valavanis, Duncan Steward and all participants

Industry for giving us time and feedback

- Cross River Rail (CRRDA),
- Department of Transport and Main Roads Queensland (TMR)
- Transport for New South Wales
- MetroTrains
- Department of Transport Victoria
- Department for Infrastructure and Transport South Australia
- RISBB - Rail Industry Safety and Standard Board

All participants in our facebook platform: <https://www.facebook.com/groups/nomoreplatformgap>

The Centre for Technology Infusion, La Trobe University

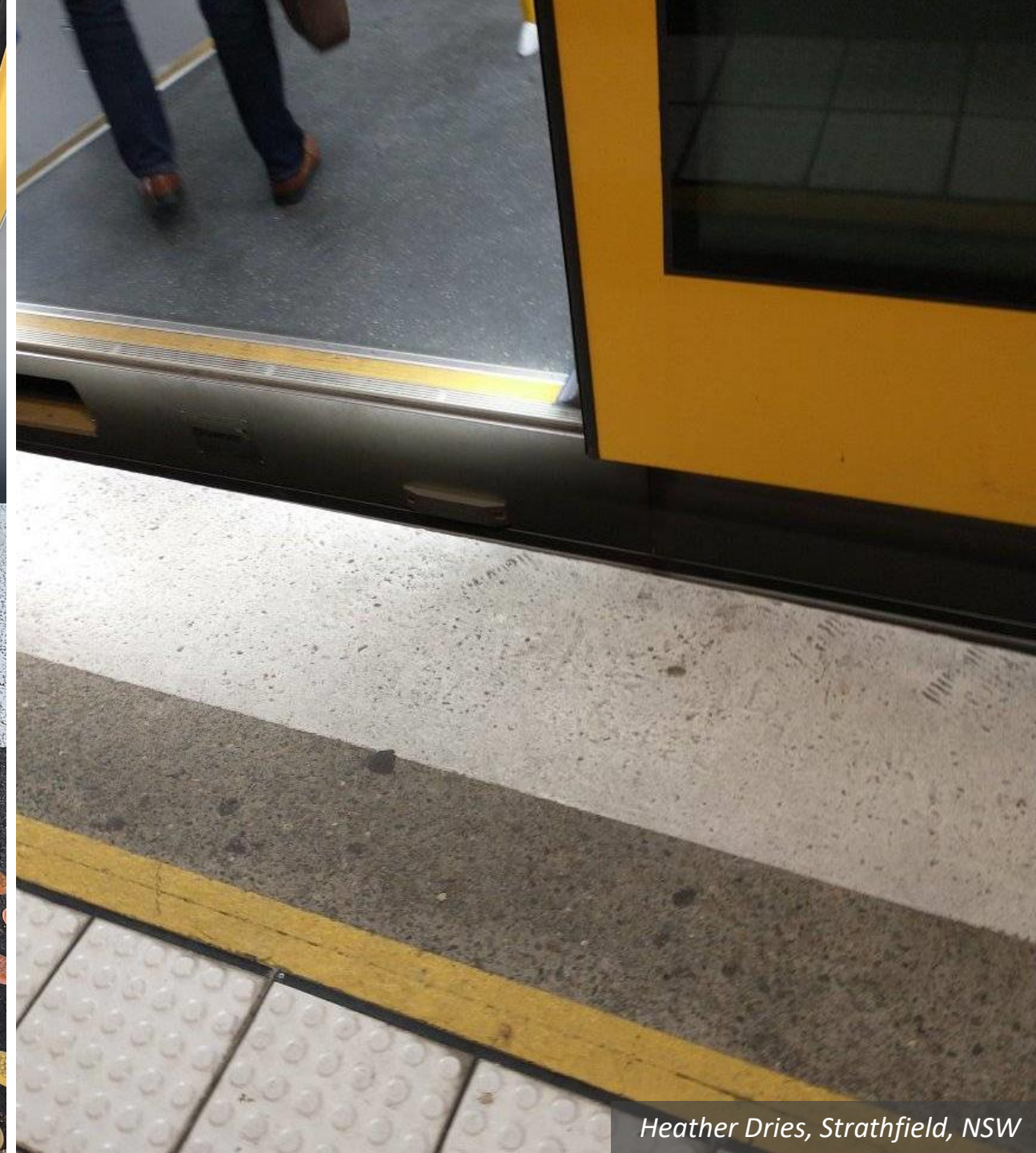
- Aseel Bervan and Dom Harvey for their tireless work on this research project
- Byron Palavikas for – amongst other technical support - driving out to NTRO to fix the ramp while sick just before a demo
- Daniel Reynolds for his drive to measure wheelchair gaps
- La Trobe I&O for their flexibility to host and store the ramps



"I normally end up just jumping the gap to the platform in my chair"

— La Trobe Facebook Survey, 2023

Kayden Lee, Caulfield, VIC



Heather Dries, Strathfield, NSW

ABOUT THIS PROJECT

About this project

The gap between a railway station platform and any train represents a major hazard and risk for all passengers boarding and exiting trains. This risk is amplified for mobility device users, people with a disability, the elderly and young children. The risk of slips, trips, falls, entrapment, and injury is ever present.

This project provides a fact base to recognise the problem as well as a pathway to a solution by testing proof of concept prototype/s. It is proposed to work closely with mobility device users and other vulnerable road users, to test and assess:

effectiveness for a range of existing platform gap solutions; and

a modular, automatic ramp that can be placed permanently on the platform (or train carriage) and only rise and/or extend when needed.

Have our articles emailed to you right as we publish them!

Receive a notification by email, with a link to our project news and articles straight after we publish them. Nothing else, just our articles, so you can stay on top of what iMOVE is doing.

Participants

Australasian Centre for Rail Innovation (ACRI)

La Trobe University's Centre for Technology Infusion

Project background

In order to minimise risks involved with the platform gap railway staff often manually deploy portable access ramps at designated locations along the station platform, which can be a confusing process for many in a busy station environment. In recent years various suppliers have commercialised fixed rubber block products to the platform edge to minimise the gap.

However, the fixed nature of these platform gap products means that some form of vertical and horizontal gap or offset is often present given the broad range of different passenger and freight train rolling stock operating on the rail networks. An

effectiveness study similar to what was done with earlier research from ACRI on entrapment risk for mobility devices at rail flange gaps is proposed. Collating definitive evidence of entrapment risk and ease of navigation will entail:

- production of a mock adjustable station platform to train floor jig
- design and conduct a laboratory experimental matrix program examining different horizontal and vertical gap combinations with and without platform gap products and a range of able-bodied pedestrians, lived experience pedestrians, mobility device users and lived experience mobility device users
- This will also be supplemented with a series of survey and/or interview questions of the participants of the lab study. In parallel to the iMOVE project ACRI and DoT Victoria will work with the MODTAS and ROFRAUS teams to develop/refine working prototype/s of the automated ramp concepts that allows for mobility impaired commuters to board and alight from trains unassisted.

The mobility access ramp prototypes promise to close the vertical and horizontal gap between the train and platform, allowing uninhibited access and egress for all commuters in particular those with impaired mobility, parents with prams, children, and mobility aides. The prototype automated ramp system/s will also be included in the lab entrapment risk experiments. Options to undertake the lab experiments at a relevant industry exhibition are currently being explored. ACRI, DoT Victoria, and other rail industry partners are also working together to test (in at least shadow mode) at a representative station platform/environment.

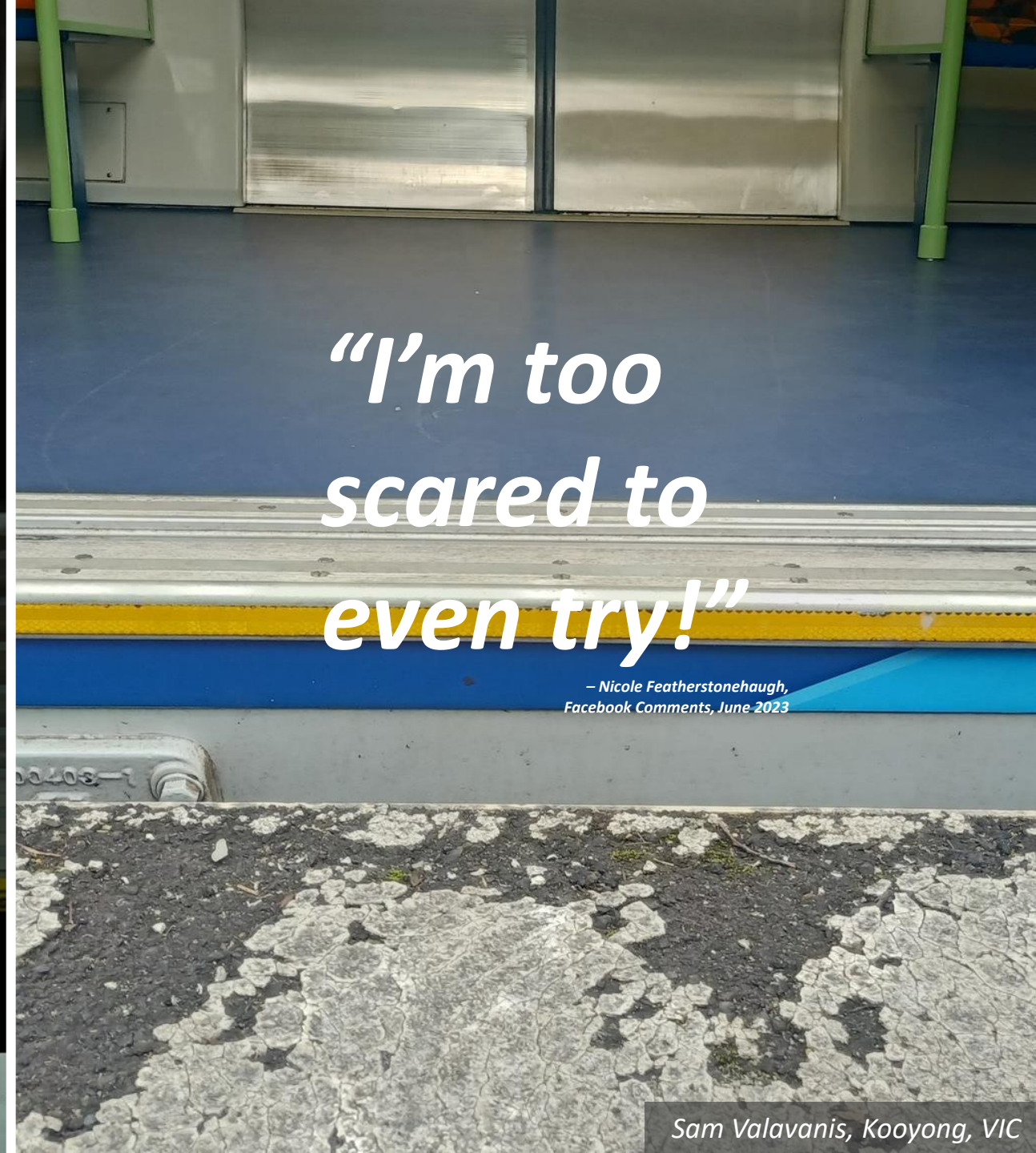
Project objectives

The objectives of this project were to:

- Generate objective evidence of which scenarios the different platform gap filler products are suitable for use in.
- Demonstrate and measure the effectiveness of the automated ramp prototypes in the same variety of scenarios.
- Provide an objective understanding of the effectiveness and characteristics of the various platform gap solutions will be useful for rail industry organisations to inform business case drivers for example deciding to deploy an automated ramp option versus manual ramp versus fixed rubber block type option/s.
- Propose solutions for enhanced accessibility for all commuters at train station platforms, which is a critical component of the future compliance requirements for new and existing train station platforms and this work will significantly advance the cause.



Erin Kinderis, Benalla, VIC



*"I'm too
scared to
even try!"*

– Nicole Featherstonehaugh,
Facebook Comments, June 2023

Sam Valavanis, Kooyong, VIC

Methods

Research activities	Date	Number of participants
Ramp survey: Survey on the manual ramp solution	30/01/2023-30/09/2023	81
Facebook page was created to get insights about how big the issue of the gap between platforms and trains in Australia.	3/08/2022- 30/10/2023	162 members- Photos of 85 locations have been uploaded.
Rofraus Trials – La Trobe University	23-24/11/2022	11
Rofraus Trials – NTRO	23/02/2023	8
ATSA Independent Living Expo participation to get feedback on international gap standards and Australian standards.	24-25/05/2023	21
Modtas Trial- Bayswater	13-14/09/2023	9
Industry engagement	Nov. '22 – May '23	Cross River Rail (CRRDA), Department of Transport and Main Roads Queensland (TMR) Transport for New South Wales MetroTrains Department of Transport Victoria Department for Infrastructure and Transport South Australia RISBB - Rail Industry Safety and Standard Board

References

Miscellaneous

- Title Page: *Leonard Mammoliti, Southern Cross, VIC, July 2023*
- <https://www.exhibitionparkincanberra.com.au/event/canberra-atsa-independent-living-expo-2023/>
- <https://www.enable-access.com/product/aerolight-axr/>
- <https://www.9news.com.au/national/hundreds-of-people-tripping-and-falling-near-trains-in-melbourne/fc4ca764-1d73-4d66-9372-4df775677d68>
https://www.researchgate.net/figure/Manual-mobile-Ramp-Port-a-Ramp-UK-bridging-the-gap-between-the-train-and-the-platform_fig3_344042662

Train-mounted ramps

- <https://www.ptua.org.au/category/news/page/2/>
- <https://www.delkorail.com/platform-gap-filler>
- <https://www.levelboarding.org.uk/open-letter-to-greater-anglia/>
- <https://www.masats-llc.com/en/rt1-dual-telescopic-ramp/>
- https://www.palfinger.com/en/products/passenger-lifts/models/mbb-trainlift_p_1921

Platform-mounted ramps

- <https://www.alpharail.com.au/>
- https://railgallery.wongm.com/melbourne-rail-accessibility/F112_5710.jpg.html
- <https://www.atlasobscura.com/places/14th-street-union-square-moving-platforms>
- <https://fb.watch/ogCOiCiYc1/>

Mind the Gap

A horizontal bar spanning the width of the image, divided into two equal horizontal sections. The top section is a solid gold color, and the bottom section is a solid black color.