

Case Study:

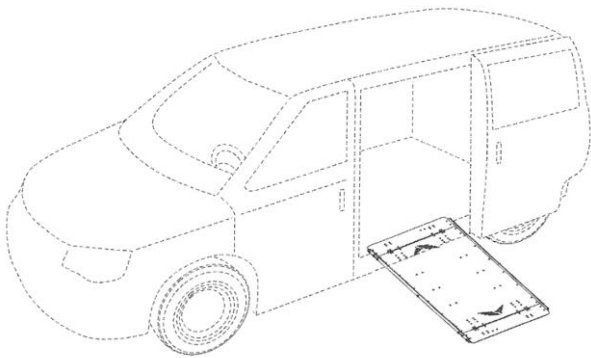
Fold-in Ramp Concept for Mobility Conversion


Overview

This case study explores the design, development and testing of a fold-in wheelchair ramp system for on-road minivan, with the objective of converting a standard minivan into a mobility vehicle. The project emphasizes modularity, safety and ease of integration across different vehicle floor heights.

Objective

Design a fold-in wheelchair ramp (power/ manual) for an on-road minivan to enable conversion into a mobility van. The ramp system should be modular, allowing adaptation to various vehicle floor heights and must be seamlessly integrated into the minivan.



Concept  Product

Development Process

The project followed a structured development process:

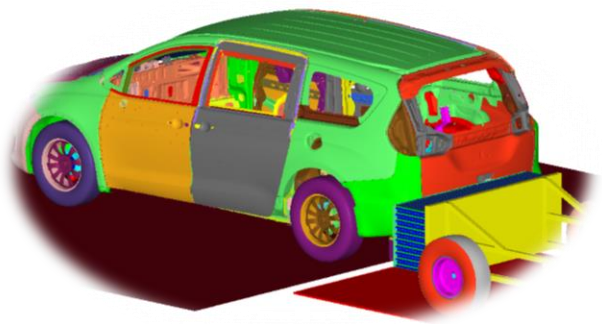
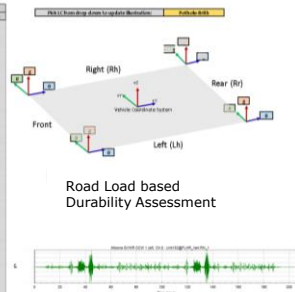
- Benchmarking
- Ideation
- Design
- Virtual Validation
- Prototyping
- Lab Tests
- Installation
- Field Tests

Key Steps

- Modify cross-car sections and reposition the fuel tank to accommodate the new ramp design.
- Re-evaluate the design for noise, vibration, harshness,

durability and compliance with federal vehicle crash standards.

Load Scenario	Load Case	Alt. Acceleration	Alt. Alt.	Load Direction	Front Left	Front Right	Rear Left	Rear Right
Gravity	Gravity	Gravity	1	Down	1	1	1	1
Brake	Brake	Deceleration	2	Forward	1	1	1	1
Turn	Turn	Turn	3	Turn	1	1	1	1
Turn	Turn	Turn	4	Turn	1	1	1	1
Turn	Turn	Turn	5	Turn	1	1	1	1
Turn	Turn	Turn	6	Turn	1	1	1	1
Turn	Turn	Turn	7	Turn	1	1	1	1
Turn	Turn	Turn	8	Turn	1	1	1	1
Turn	Turn	Turn	9	Turn	1	1	1	1
Turn	Turn	Turn	10	Turn	1	1	1	1
Turn	Turn	Turn	11	Turn	1	1	1	1
Turn	Turn	Turn	12	Turn	1	1	1	1
Turn	Turn	Turn	13	Turn	1	1	1	1



- Perform extensive field tests to validate performance and reliability under actual usage conditions.

Design Highlights

- Standalone, slim-profile ramp that can be bolted onto various minivan models.
- Drive system using a pulley-cable arrangement with a tensioner for smooth operation.
- Unique leaf spring design to reduce torque requirements and enhance user experience.
- Innovative kickstand to securely engage and disengage the bridge plate.
- Meets FMVSS 403/404 load and safety requirements.
- Proprietary technology with patent protection.

Conclusion

The development of the fold-in wheelchair ramp system successfully transformed the standard minivan into accessible mobility vehicle. The modular, patented design ensures adaptability, safety and reliability, meeting both user needs and regulatory standards. The project demonstrates the value of a structured, iterative development process in delivering innovative mobility solutions.



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