



Developing a Modular Overhead Storage System for Automotive Interiors

Industry

Automotive Tier 1 Supplier

Notable Results

Led concept development through production launch, including **crash validation**, system architecture, supplier development, and **OEM integration**. Product launched on a major OEM minivan platform with approximately **20,000 vehicles per year** equipped with the system.

AT A GLANCE

In the early 2000s, vehicle interiors were evolving as families began spending more time in their vehicles during travel and daily life. Storage and entertainment needs were increasing, but vehicle interior architecture had not yet adapted to support flexible configurations.

During a cross-functional brainstorming initiative at Johnson Controls, our team began exploring ways to utilize unused space inside the vehicle cabin. One area stood out: the **overhead zone above passengers**.

The concept that emerged was a **modular overhead rail system** that allowed accessories such as storage bins and entertainment modules to be easily installed, removed, and repositioned by vehicle occupants.

As **Lead Development Engineer for the Overhead Zone**, I led the development of the system from early concept through validation and production launch with a major automotive OEM.



CLIENT'S GOALS

Develop a **modular interior storage and accessory system**

- Allow customers to easily **remove and reposition accessories** within the vehicle
- Support **entertainment modules and storage solutions for long trips**
- Ensure the system met all **vehicle crash safety requirements**
- Integrate seamlessly with the vehicle roof structure and headliner system
- Achieve production readiness for launch on a new vehicle platform



Consumer research helped validate the concept. Families responded positively to the idea of **customizing the vehicle interior based on trip needs**, allowing children to load personal storage bins with books, toys, or travel items before entering the vehicle.

THE CHALLENGE

The greatest technical challenge involved **vehicle crash safety**.

Because the system placed removable storage bins above passenger seating areas, the design needed to ensure that bins and their contents could not become projectiles during a crash.

At the same time, the system needed to remain **simple enough for everyday use**, allowing bins to be easily removed and repositioned, even by a child.

This created a complex engineering balance between:

- **Secure crash retention**
- **Ease of use for consumers**

Additionally, the structural aluminum rails themselves needed to remain securely attached to the vehicle roof structure and could not become hazardous during crash events.

Another complication was that **existing safety standards did not clearly define testing conditions for removable overhead storage systems**, requiring close collaboration with OEM engineering teams to validate appropriate testing scenarios.

THE STRATEGY

I led the technical development of the entire system architecture while coordinating closely with cross-functional teams and OEM engineering partners.

The project began with a small exploratory team of five members and expanded to a **cross-functional program team of approximately twenty professionals** including engineering, sales, marketing, purchasing, manufacturing, and legal functions.

Key development efforts included:

Demonstration Vehicle

To demonstrate the concept to potential OEM partners, the team developed an early **demonstration vehicle using a Large SUV platform.**

System Architecture Development

The final system architecture consisted of several integrated components:

- extruded aluminum structural rails
- lighting and electronic accessory modules
- integrated power distribution within the hollow rail

Latching Mechanism Development

One of the first engineering priorities was the development of a retention system that could satisfy both safety and usability requirements.

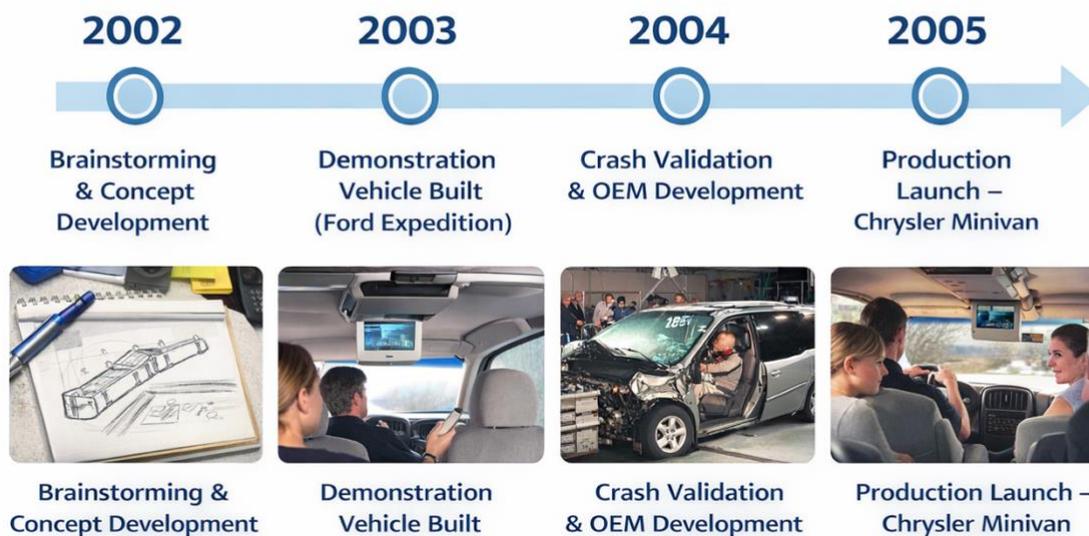
These designs were evaluated through multiple validation methods to ensure reliable performance in crash scenarios.

Crash Validation

Safety validation included a combination of:

- engineering simulations
- dynamic sled testing
- full vehicle crash testing with the OEM partner
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Concept to Production Timeline



THE RESULT

The modular overhead rail system successfully launched on the **2005 Minivan platform**, providing customers with a configurable interior storage and accessory solution.

The system allowed users to install and reposition storage bins and accessories throughout the overhead rail, supporting family travel needs and personal storage.

Production impact included approximately **20,000 vehicles per year equipped with the system option**.

A variation of the concept was later introduced on the **Pick-up Truck platform**, demonstrating the adaptability of the system architecture across vehicle types.

An additional unexpected benefit emerged during vehicle integration. The structural aluminum rails provided additional support for the vehicle headliner during assembly, reducing the risk of damage to the lightweight headliner materials and improving installation robustness at the OEM assembly plant.

ACHIEVEMENTS

- Concept developed from early brainstorming to production launch
- Led technical architecture and system development
- Primary engineering interface with OEM development teams
- Crash validation completed through simulation, sled tests, and full vehicle testing
- Successful production launch on major OEM minivan platform
- Approximately 20,000 vehicles per year equipped with the system

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ARE YOU READY TO TAKE YOUR IDEA FROM CONCEPT TO
PRODUCTION?**

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