

Market Requirements Document

Automotive Group

Joseph Letteney

Cedric Oltramare

Neil Barbour

Jerry

Usukhbayar Amgalanbat

Table of Contents

1.0 Strategy and Overview	3
1.1 Goals and Objectives	3
1.2 Strategic Roadmap	3
1.3 Customer Profiles	3
1.4 Competitive Strengths and Weaknesses	4
1.5 Competitive Positioning	4
1.6 Current Competitors	4
2.0 Business Model	5
2.1 Value Proposition	5
2.2 Market Segment	6
2.3 Value Chain Structure	6
2.4 Cost Structure	7
2.5 Position within the Value Network	8
2.6 Competitive Strategy	8
3.0 Affected groups	9
3.1 Development	9
3.2 Marketing & Sales	9
3.3 Support	9
3.4 Operations	9
3.5 Sales	9
3.6 Legal	10
4.0 Highly Desirable Requirements	10
4.1 Status Indicators	10
5.0 Future Requirements	11
5.1 Smart Sensor Monitoring and Automatic Tire Inflation	11
5.2 Independent Power Supply System or Built-In Battery	11
6.0 Features Not Being Implemented	11
6.1 Heavy-Duty Truck Support	12
6.2 Use on Inclined Surfaces	12

1.0 Strategy and Overview

1.1 Goals and Objectives

The release of this product is designed to address three top requirements. In order these are: [1] Prevent flat spots on tires in long term storage through rotating the tires regularly, [2] allow for omni-directional movement of cars within long term storage, and [3] have 3 stable states that allow for positioning of the jack prior to engaging with the vehicle, long term storage of vehicle without motion with tire rotation, and lastly allow for omni-directional movement of the vehicle while jack is engaged.

There are a range of other extensions and improvements identified, but may be delayed or removed if they threaten the timeliness or functionality of the product release.

1.2 Strategic Roadmap

The release of this product is a plan to disrupt the current market for long term storage solutions and tire preservations, as there is not currently a largely effective option for preventing flat spot damage to tires within long term storage. Specifically, vintage and high end cars with high costs to replace tires on these classes of vehicles. Dealerships and collectors are other secondary (but still high value/focus) targets for this product.

1.3 Customer Profiles

Initial target customers are expected to fall into one of the following categories:

1.3.1: **Storage Facilities/Owners**, who are currently hosting large numbers of cars for long periods of time (more than one month consecutively in storage). These customers are keen to see the tire rotation and omni-directional movement due to the tight spaces and large quantities of vehicles typically present. Also provide a necessity to be able to engage and maneuver within tight spaces. Also a source for ideas for future improvements.

1.3.2: **Collectors**: The main market we are expecting to take to the product. Collectors who we are predicting will be most concerned with the ability to rotate the tires over time to prevent flat-spots, preventing the need for repeated tire purchases as well as providing a more elegant and polished solution that is aesthetically pleasing for their collections.

1.3.3: **Dealerships**, who are predicted to be interested in this product for movement of cars within warehouses and lots, as well as potentially for display purposes with the aesthetic design provided, potentially giving a more luxury feel to their products. This market is predicted to be the smallest of the 3, but still significant enough to warrant marketing due to the current lack of products like this in the market.

1.4 Competitive Strengths and Weaknesses

Other competitors who are in this market space have attempted to make a solution to this issue, but have done so in ways that are only marginally effective, and/or prevent the cars from moving without turning the car itself on. Other solutions also have issues when used in combination with vintage cars, where the size of the wheels doesn't match the size of wheel wells, causing more flat-spots and potentially damage over time.

Other competitors, however, are free from needing to attach to power in order to provide a flat spot solution within vehicle storage. Our marketing will focus more on the fact that it is a system and allows for a more elegant solution, and market it more as a luxury product.

1.5 Competitive Positioning

At launch, we will position our product with non-technical press as a way to save their cars' tires for long term storage, and focus on the solution to the problem of flat-spots in and of itself. Focus for technical readers and reviewers will be on why our product provides a more robust solution for flat-spots, and how the solution proposed can save money especially for large quantities of vehicles or for high value or vintage vehicles. Comparisons with existing competitors will focus on the collection of multiple features into one product, as well as the intent of a more luxury product and design to create a more aesthetic solution.

1.6 Current Competitors

Daytona: Mostly sell through other retailers like Harbor Freight and Amazon. Most searches for a "Wheel dolly jack" show listings for them. They come highly recommended from other auto websites. Our approach must be to pitch this as a product that is of higher quality due to additional features and that it is more visually appealing to customers, as well as marketing as a more elegant and luxury item over a more industrial use case.

Tuffiom: Make a range of jacks and dollies for vehicular uses (both automobiles and motorcycles). Another competitor that is highly recommended among auto websites, strategy for competition must be similar to strategy with Daytona in that it should be marketed as a more premium solution due to the additional features we provide.

2.0 Business Model

The vehicle tire rotator is designed to prevent flat spots caused by a car being stored for a long period of time without moving. The system will consist of four individual tire rotators that will slowly rotate the car's tires so that no one spot sits for too long creating a flat spot. Our system will also include an integrated roller system that will allow stored vehicles to be quickly and easily repositioned without starting the engine, simplifying storage management.

The product will generate revenue through hardware sales directly to customers in the high end automotive market, specifically car collectors, professional storage facilities, and luxury dealerships. The initial model will be sold as a high margin, one-time purchase, supported by optional service contracts (extended warranties, scheduled maintenance) and accessories (wireless monitoring, smart garage integration).

Future revenue streams may include:

- Institutional sales to automotive museums, professional storage facilities, and car dealerships that require multiple units.
- Partnerships with high end vehicle manufacturers who may recommend the product as part of the cars maintenance program.
- Subscription based monitoring programs for customers interested in remote health checks and usage tracking.

The long term business model is based on premium positioning in a niche but affluent market where the high value of the vehicles and the interest of the customer justifies investment.

2.1 Value Proposition

Flat spots are a well documented problem for vehicles stored without moving for weeks or months at a time. These flat spots can lead to vibration while driving, compromised handling, and accelerated tire degradation. This problem is especially relevant in the luxury car market where high performance is of great importance and replacement tires can be rare or extremely expensive. For example:

- A set of Bugatti Veyron tires costs around \$42,000.
- A set of Lamborghini Aventador tire can exceed \$5,000.
- The tires of the Ferrari 250 GTO are a unique and now obsolete size that can only be sourced through vintage tire makers.

This makes preserving the tires of these high end or rare cars especially important for their owners.

Current solutions are either inconvenient or inadequate:

- Jack stands or 2 post car lifts: Prevent flat spots but put prolonged strain on suspension components and require time consuming setup.
- Tire ramps: Passive and limited in effectiveness for long term storage.
- Manual repositioning: Labor-intensive, requires starting the vehicle, is impractical for multiple cars.

Our product addresses these shortcomings directly:

- Automation: Tires are rotated constantly without user intervention.
- Preservation: Tire shape and rubber integrity are maintained.
- Convenience: Integrated rollers allow for the car to be moved easily for cleaning, space optimization, or repositioning without operating the vehicle.
- Vehicle safety: Suspension remains unloaded in its natural resting position.

By combining tire preservation and repositioning functionality, our product creates a unique, hands off, premium solution that collectors value both for financial protection and convenience.

2.2 Market Segment

Primary market:

- Individual car collectors with high- value vehicles. These customers typically own multiple vehicles and have dedicated garage or storage spaces. Their willingness to spend on preservation is high, given the cost of their collections.

Secondary market:

- Automotive museums: Institutions housing rare and historic vehicles with a strong incentive to preserve original tires and minimize maintenance costs.
- Luxury dealerships: Dealerships displaying vehicles in showrooms for long periods of time where flat spots risk degrading customers' experience during test drives.
- Professional storage facilities: Businesses offering long-term storage services for collectors, where the rotator can be bundled as a premium add-on.

Market Characteristics:

- Customers value convenience, reliability, and preservation more than low costs.
- Purchase decisions are often driven by reputation and trust in premium automotive communities.
- Customers are concentrated in regions with high density of wealth and car collections(e.g. Los Angeles, Miami, Dubai, London).

2.3 Value Chain Structure

The value chain begins with the sourcing of components (motors, rollers, housings, etc) from specialized suppliers and flows through assembly, quality assurance, distribution, and after-sales support.

Distribution Channels:

- Direct-to-Consumer: Through the company's own website as well as premium platforms like Amazon Luxury Auto Accessories, and niche collector car forums. This channel allows for higher margins and direct relationship-building with customers.
- Retail Partnerships: Specialty retailers that focus on collector and luxury car preservation(e.g., suppliers of custom car covers, battery maintainers, and detailing equipment). These partners already have strong credibility in the community.

- Institutional Sales: Direct sales to museums, dealerships, and professional storage facilities, often in bulk order.

2.4 Cost Structure

The tire rotator is a premium hardware product, with cost structure to maintain a healthy margin while supporting high quality standards expected in the luxury car market. The goal is to keep the cost per unit at approximately half of the retail price ensuring sustainable profitability.

Key Cost Drivers:

1. Research and Development:
 - Mechanical and electrical design, safety testing, and prototype iteration.
 - Upfront investment in equipment such as tooling, molds, and software.
2. Manufacturing and Assembly:
 - Component sourcing represents the bulk of the variable cost.
 - Assembly labor and quality testing ensure each unit can safely and reliably support vehicles weighing several tons.
 - Packaging and logistics, designed to emphasize premium branding, add modest but not insignificant per-unit costs.
3. Unit Economics:
 - Target retail price: \$500-1,500 per set.
 - Target cost per unit: \$250-750.
 - Target gross margin: 50-55%, aligning with specialty automotive accessories.

This cost structure creates a balance between premium positioning and scalability. While early volumes will be low-to-medium, per-unit costs are intentionally designed to remain about half of the retail price, protecting margins and allowing reinvestment into brand-building and R&D. Over time, economics of scale and bulk component sourcing will further reduce per-unit costs, expanding profitability without sacrificing quality.

2.5 Position within the Value Network

The company occupies a central role within the vehicle preservation ecosystem, linking specialized component suppliers with high-value end customers. Suppliers provide precision motors, rollers, housings, and electronics, while customers include individual collectors, museums, storage facilities, and luxury dealerships.

The rotator fits naturally alongside complementary products such as battery maintainers, climate-control systems, premium covers, and detailing services, all of which reinforce the broader preservation value chain. Competitors include static solutions such as jack stands, tire cradles, and hydraulic lifts. While these are less expensive, they lack automation, convenience,

and dual functionality, making them inadequate for long-term preservation of high-value vehicles.

Sales channels will extend beyond direct retail to include partnerships with accessory brands, collector networks, and storage providers. In many cases, professional storage facilities or dealerships can serve as lead sales partners, bundling the rotator with storage or showroom services.

2.6 Competitive Strategy

The competitive strategy focuses on differentiation through automation, dual functionality, and premium positioning. The tire rotator is the first purpose-built automated solution for preventing flat spots without stressing suspension systems or requiring manual repositioning. By also enabling vehicles to be repositioned easily within garages or showrooms, it adds a layer of convenience unmatched by existing alternatives.

Competitors lack the resources and positioning to replicate this model without undermining their own strategies. Low-cost providers of jack stands and tire cradles would dilute their value proposition by attempting to move upmarket, while lift manufacturers remain focused on storage maximization rather than preservation.

Defensibility comes from first-to-market status, proprietary integration of rotation and repositioning, and strong ties to enthusiast communities, collector clubs, and museum networks. Over time, the strategy is to solidify the product as the “gold standard” for tire preservation in the collector market, expand through institutional sales and OEM partnerships, and build recurring revenue through accessories and smart monitoring.

3.0 Affected groups

3.1 Development

Development will create the mechanical and control system for the car tire rotator, ensuring safe, reliable long duration operation. Initial product development will take place during the Q4 2025 in the ME691 laboratory. Our first goal will be to produce the minimally viable product that demonstrates our core product solution.

3.2 Marketing & Sales

Product positioning will highlight the prevention of costly tire replacements, convenience for collectors, and value for storage facilities. External PR and product announcements will also take place in Q4 2025. Sales collateral will include ROI calculators, training materials for car dealerships and tire shops.

3.3 Support

Support will prepare for customer inquiries around installation, compatibility, and warranty. A dedicated “tire specialists” team will handle early beta and production calls. Customer and internal training documentation will be signed off before general release. Support will also include recruiting untrained car owners to install and operate the rotator without manuals, rating their ease of use of the product. If a large portion of the car owners are not able to complete the basic tasks, product management and support will jointly review the UI and mechanical design.

3.4 Operations

Operations will oversee the initial manufacturing, quality assurance in mass production, and logistics for large/heavy volumes of products. Quality of service metrics will track failure rates, return rates, and on-site service calls.

3.5 Sales

Starting in Q4 2025, sales will identify potential early adopters among car collectors, storage facilities and dealerships in the local Boston area. Presale engineers will undergo multiple rounds of training: first on the technical fundamentals of tire storage damage, second on selling strategies to collectors and facilities. Sales training will adapt marketing deliverables into practical tools for field reps.

3.6 Legal

Legal review is critical, especially around liability issues tied to vehicle storage safety. Risk scenarios include mechanical failures leading to vehicle damage, improper use by untrained customers, or fire hazards from potential electrical faults. Legal will ensure disclaimers, user instructions, and safety certifications. For example, warning will cover weight limits, operation only on level surfaces and periodic inspection requirements to reduce exposure to lawsuits.

4.0 Highly Desirable Requirements

- Device will rotate all 4 wheels of a car to prevent flat spots
- Three positions
 - 1. Disengaged
 - 2. Car lifted on rollers with device wheels in contact with the floor. This is the repositioning position where the roller motors are off and the car could technically remain in Park.
 - 3. Long term storage position with car sitting on rollers but device wheels are disengaged. The device rests on a 4 pillar structure with antislip material to

secure the car in desired location. Roller motors are active for flat spot prevention.

- A 12V car battery charger must be able to charge the car's battery and power our 4 rollers. This electrical connection will only be made in Position 3.
- Effort required to lift each wheel of the car up onto our device should be moderate
- Based on car weight and tyre size, user should be able to select frequency of rotation in Position 3

4.1 Status Indicators

- Status indicator on each device to show when power is successfully connected
- In case car is accidentally left in Park, device shuts off if motor experience too high of a torque when attempting to rotate wheels
- Safety feature implemented so user cannot switch Positions in only one step
- Incline measurement to prevent user from activating Position 2 if car is on an incline
- Tyre pressure statement indicating tyre pressures must be within normal limits to ensure our device is able to rotate the wheels. Will be unable if pressures are too low
- Weight specifications describing total and max load on each wheel. Evaluate cars with unequal weight distribution (ex: Porsche 911)
- Think of mechanical status indicators to increase safety in Positions 1 and 2 when electrical power is not connected

5.0 Future Requirements

5.1 Smart Sensor Monitoring and Automatic Tire Inflation

1. App & Cloud Connectivity

- Control the device, schedule tire rotation cycles, and receive real-time status notifications through a dedicated smartphone application.

2. Real-Time Monitoring (Future Sensor Integration)

- Future versions will integrate tire pressure, temperature, and vibration sensors to provide continuous, real-time monitoring of tire and storage conditions.

3. Automatic Tire Inflation

- When low tire pressure is detected, the system will automatically inflate the affected tire to maintain optimal pressure and prevent flat spotting during long-term storage.

5.2 Independent Power Supply System or Built-In Battery

For vehicles parked outdoors or in garages without access to external power, an independent power supply is essential.

A built-in battery can effectively address this requirement; however, it will increase the overall cost.

6.0 Features Not Being Implemented

6.1 Heavy-Duty Truck Support

The current design targets personal vehicles (cars, SUVs). Support for heavy-duty trucks or buses is not planned, as it requires an entirely different mechanical and cost structure.

6.2 Use on Inclined Surfaces

The device is designed for flat, stable indoor garage and outdoor floors. It cannot be used on slopes or inclined surfaces due to safety and stability concerns.