Objectives:

After defining the issues associated with the problem, to create a two in one car seat/stroller, our objectives for the projects this semester are as follows:

1.) Redesign an existing car seat with unique locomotive capabilities.
   a. The safety stroller/seat hybrid must retain all existing features of a standalone stroller and car seat.
   b. Must be safe for both the user and passenger to set up and use

2.) The device must be one piece
   a. Lightweight; however, not fragile
   b. small stature

3.) Transitions must not be a tedious process
   a. Conversions must but completed in as little actions as possible. (ie. least amount of effort plausible)

4.) Device that can traverse same terrain that a typical stroller could
   a. Wheel diameter: 4-6” (10.16cm-15.24cm)

5.) Not too costly for the consumer / inexpensive manufacturing
   a. price for consumer $65-$350
   b. cost of supplies under $100 (or at most $150-$200)
Background Information:

The team’s problem was to create a type of car seat that could easily transition to being wheeled. There are some models out there that strap into a type of base, but what if the wheels/frame were built into the seat itself to allow for easier transition from the car? The whole system of a stroller and a car seat can be very expensive for new families. They also take up a lot of space in the car. Babies already require a lot of things, we don’t need to add any more weight and hassle to the experience. Just the car seat alone can cost up to $300. The parents didn’t even buy the stroller yet which can cost another $200. With costs adding up having a baby is growing more and more expensive. To make the process cheaper many companies have tried to create two in one systems. This design uses up a lot of space and maybe convenient at first but later becomes a hassle when the 2nd part has to be drug out to use it as a stroller. Other designs can be very expensive costing well over $100 with extra features that are not particularly needed. A company that is leading manufacture in this industry is Graco. Their many two in one stroller systems range from $160 - $400. They have three traveling systems: the lightweight, full sized, and 3-wheel. The average stroller made by Graco is about 30 lbs. making it easy to lift the car seat and the attachable stroller component. Another company that has created a stroller that transforms from a car seat to a stroller is Doona. The system only weighs about 15 lbs. but the drawback is the cost which is around $380 - $500. Both of these companies’ strollers hold a child up to 35lbs. allowing the strollers to hold an
average 2 year old. The target age for these car seats are for newborns to 2 year olds because this age group mainly uses rear facing car seats. This is because the spinal cord gets stronger as children age; in an event of a crash the rear facing car seat compresses around the child to protect the head, neck, and spine. Children above 2 years of age will use a forward facing car seat and later a booster seat. After 2 years of age a child can weigh well over 30 lbs., making it very difficult to lift the child out of the car with the car seat. A 3-wheel stroller can be easier to maneuver and have a better turning radius. However, some parents found that the 3-wheel stroller can sometimes be wobbly and tip when bags are hung on the handle.

**Methodology:**

The process of completing each of the above objectives is as follows:

1. Redesign on existing car seat with unique locomotive capabilities:
   - **New Design Ideas**
     - Retain all existing features of standalone strollers and car seats by combining them into one.
     - The legs of the stroller will raise to an appropriate height above the ground for children to be safe.
   - **Strategy**
     - Research existing safety features
     - Research average height of a standard stroller
     - Devise a new design combining both strollers and car seats
     - Do a cost and labor analysis between the different designs
     - Make a decision on the most feasible design
     - Execute the manufacturing of a prototype
   - **Testing**
     - Test the safety of the product for children
     - Survey mothers about the height and their options
     - Check for easy of pushing the device and extending the legs

2. Redesign the car seat to also be a stroller that is easy to maneuver
   - **New Design Ideas**
     - Easy to lift out of the car
     - Able to hold the weight of a small child
   - **Strategy**
     - Research average weight of a car seat
     - Research average weight of a small child in a car seat
     - Choose lightweight materials
- Make modifications if necessary

- **Testing**
  - Check weight of prototype
  - Place prototype in a car and test lifting the prototype out of the car

(3) Transitions from car seat to stroller must be easy

- **New Design Ideas**
  - The wheels will drop with a single action with minimal assistance from the adult

- **Strategy**
  - Research dimensions of a car seat
  - Analyze the ease of the different wheel transition designs
  - Research best materials for the wheels
  - Prototype the chosen wheel transition design

- **Testing**
  - Test the difference between 4 and 3 wheel designs
  - Check the height of the wheels
  - Time the response time of the action
  - Test the ease of taking it out of the car and transitioning it

(4) A device that can traverse most terrain of a typical stroller

- **Strategy**
  - Research average surface a stroller will encounter
  - Research average wheel material and wheel diameter
  - Do a cost analysis between the different findings
  - Choose the best wheel

- **Testing**
  - Test the wheels on different surfaces
  - Calculate the best wheel diameter for the stroller

(5) Cost efficient for the consumer

- **New Design Strategy**
  - Two in one car seat that transforms to a stroller

- **Strategy**
  - Research costs of wheels and legs
  - Compare the cost of the prototype to the cost of similar products on the market already
  - Choose the design that is the most cost efficient and meets the needs of the customer

- **Testing**
  - Make surveys about the product for parents to take
Project Management:

<table>
<thead>
<tr>
<th>Outline of Subtask Teams and Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team Contact</strong></td>
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<tr>
<td>Team organization and Communication</td>
</tr>
<tr>
<td>Subtask Team 1</td>
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<tr>
<td>Subtasks Team 2</td>
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<td>Subtask Team 3</td>
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<tr>
<td>Subtask Team 4</td>
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</tbody>
</table>

Stage 1 – Identify the Problem
- Identify objectives for the project
- Group members’ qualifications
- Management plan and technical approach
- Resources, time, and money constraints

Stage 2 – Concept Development
- Analyze current products on the market
- Conceptualize new design ideas and improvements

Stage 3 – Detailed Design
- Develop more specific ideas and start sketching out the designs
- Do a concept screening and concept scoring analysis
- Decide upon a final design

Stage 4 – Production
- Manufacture the chosen design
- Purchase and fit parts

Stage 5 – Testing and Refinement
- Install all parts
- Test the installed devices
- Refine and make adjustments as needed

Stage 6 – Presentation Accessories
- Construct project web page
• Create project poster
Stage 7 – Project Finalization
• Final Project report
• Final project presentation
• Design showcase

**Expected Results:**

As a final product, the portable stroller car seat will be as simplistic as a general pre-existing model. It will be able to traverse most terrains while retaining all necessary safety features. The device will rise far enough above the ground in order to prevent any adolescents from reaching the ground and causing harm to themselves.

The transition from car seat to stroller will not be a tedious process. All of the moving parts are built into a single mechanism which will save time and effort when entering and exiting the vehicle. This device emphasizes independence of the user. It will not be a bulky item. It will retain a weight less than the similar products making it very easy for a single parent to operate. It will also be sold at a fraction of the cost.

The device will have wheels attached to the base of the car seat that will, when lifted, drop into a locked position enabling the user to now push the car seat as a stroller. The stroller seat will have comfortable and adjustable handles for the user to control the system.

The base:

The base will be made from a lightweight metal so that weight will be minimized while the strength is maximized.
The wheels:

The wheels will be on a hinge that will quickly drop and lock into place when the stroller seat is lifted. The wheels will be 6 inches in diameter with a soft rubber cushion to absorb any sudden impacts.

The seat:

Due to budget constraints, we will be using a pre-existing car seat that will be modified according to our final design.

In order to return the device back to a seated position, two buttons must be compressed to collapse the wheel extensions beneath the base. This will not be difficult to accomplish.

Costs:  Total Budgeted Amount $100.00

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<tr>
<th>Item</th>
<th>Cost</th>
<th>Quantity</th>
<th>Total Cost</th>
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<tr>
<td>Aluminum Pipes (per foot, .5” diameter)&lt;sup&gt;10&lt;/sup&gt;</td>
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<tr>
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Grand Total: $91.29
Sponsor Communication/ Coordination:

- The team plans on communicating with the OTA on a regular basis. Monthly meetings have been set up on every second Wednesday of the month at 12:00pm. All members of the team will attend these meetings.
- The engineering students plan on meeting every Wednesday at 3:00pm. All engineering team members will attend.
- The team will bring status reports to present at the scheduled meetings.
- If a meeting must be cancelled for any reason, an attempt will be made to reschedule that meeting at the earliest possible time. If that is impossible, the weekly progress reports will be attached to an email sent to all team members.
- Emails from the team will be mainly through the team contact Stephen Carns.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>02/10/16</td>
<td>First Meeting with OTA</td>
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<td>02/12/16</td>
<td>Submitted Code of Conduct</td>
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<td>02/17/16</td>
<td>Engineering Team Meeting</td>
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<td>02/24/16</td>
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<td>02/26/16</td>
<td>Preliminary Design Proposal</td>
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<td>03/02/16</td>
<td>Team Meeting</td>
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<td>03/04/16</td>
<td>Market Study Due</td>
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<td>03/09/16</td>
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<td>04/27/16</td>
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<td>05/02/16</td>
<td>Final Report Due</td>
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<tr>
<td>05/02/16</td>
<td>Oral Presentation</td>
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</tbody>
</table>
Sources:


<http://community.babycenter.com/post/a40065019/stroller_help...3_wheel_vs_4_wheel>


<http://www.lowes.com/pd_215889-37672-113951z0vj6dZ1z0xzpe?productId=3053611&pl=1>

<http://www.lowes.com/pd_543181-442-490-320-0002_1z0wgcjZ1z14059Z1z140rk?productId=50119663&Ns=p_product_price|0&pl=1>

<http://www.lowes.com/ProductDisplay?partNumber=54835-1814-PVC+08117++1000&catalogId=10051&storeId=10151&langId=-1&productId=3699152>