

# RC Truck Lift

## Concept Selection Case Study

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ME 491 – October 2017

# Concept Selection Process

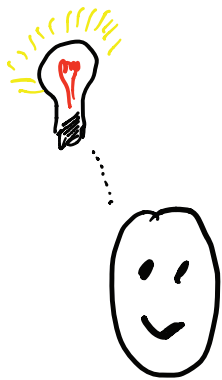
## Screening

- Eliminate infeasible ideas
- Is technology available to implement the idea?
- Go/no-go: Do ideas meet minimum customer requirements?

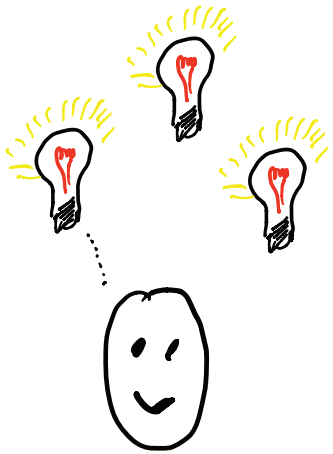
## Scoring

- Compare feasible concepts to each other using a baseline or reference design

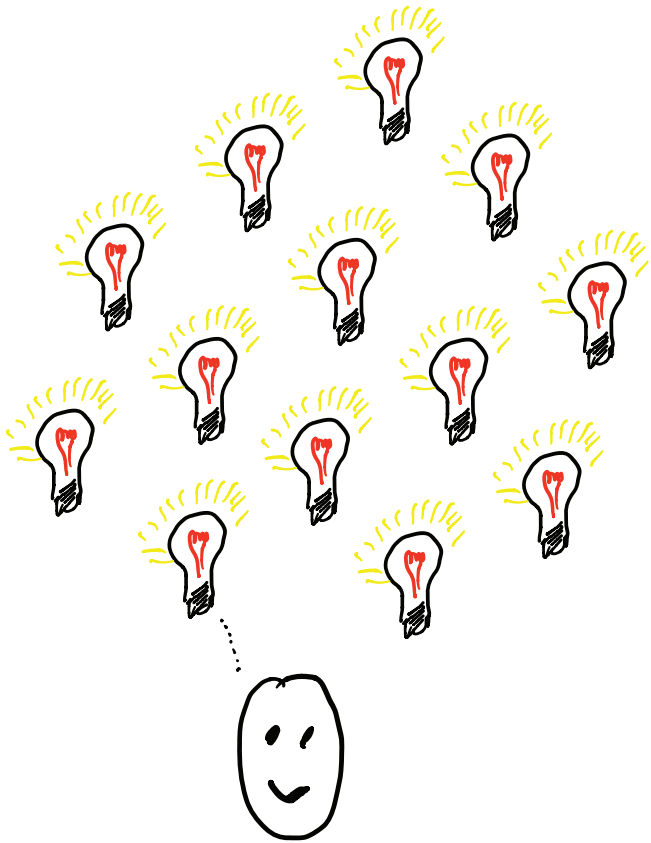
# Concept Selection Process



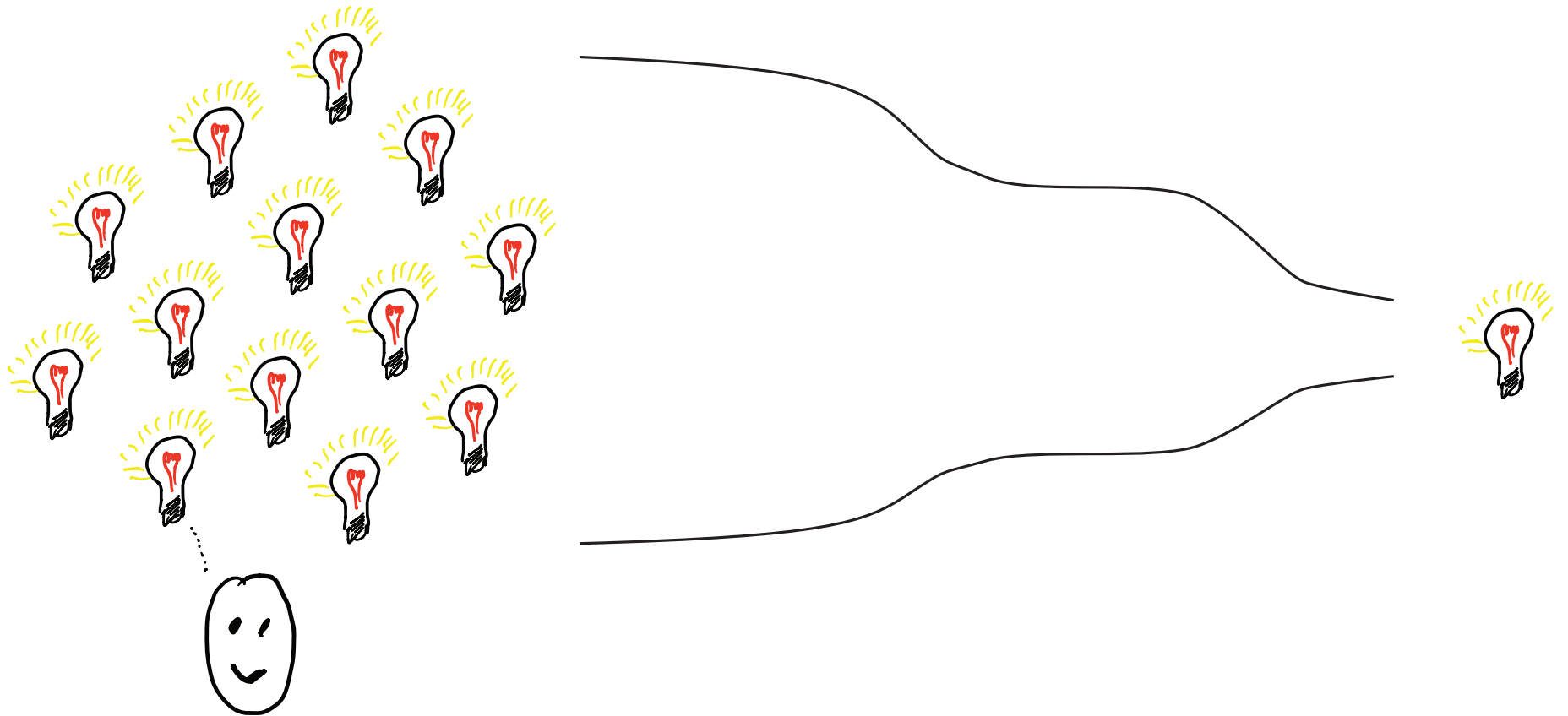
# Concept Selection Process



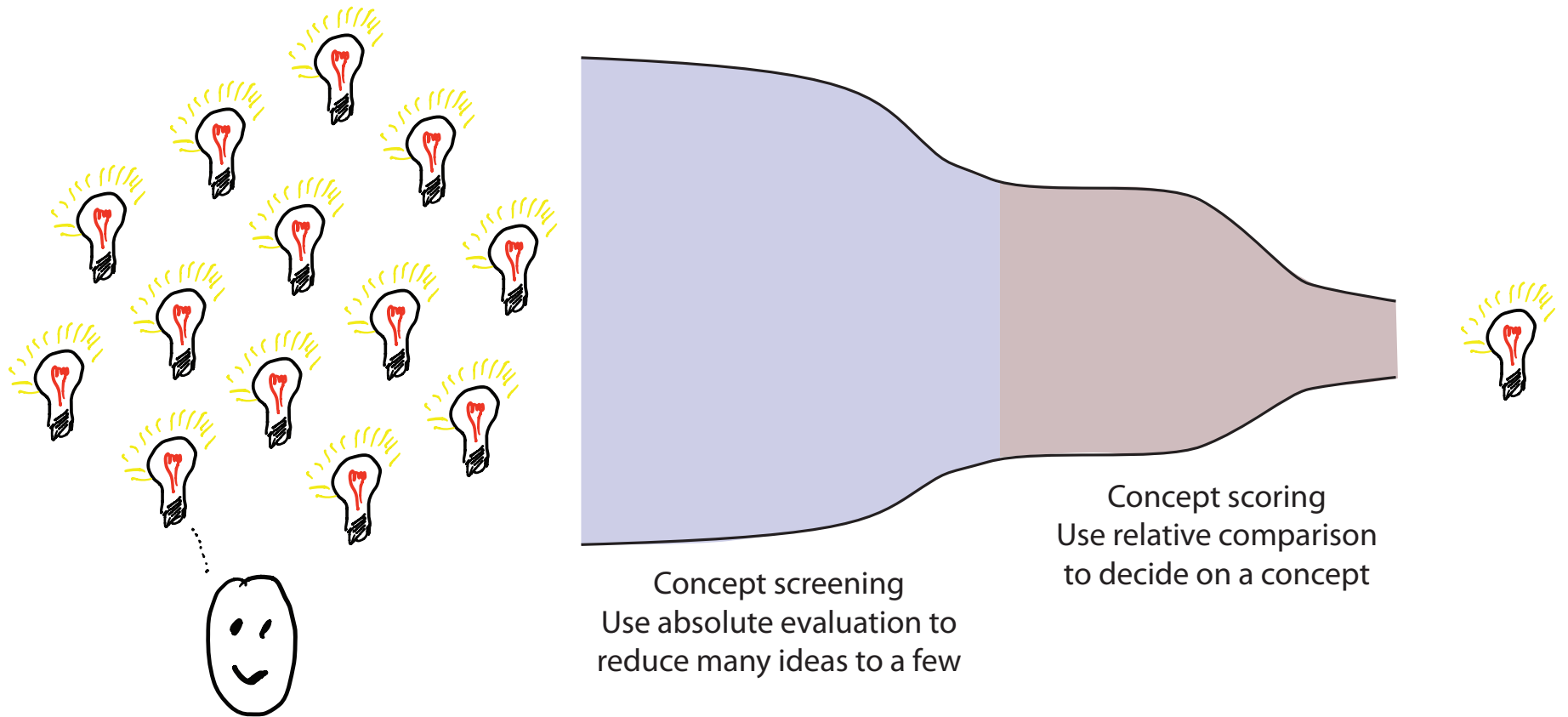
# Concept Selection Process



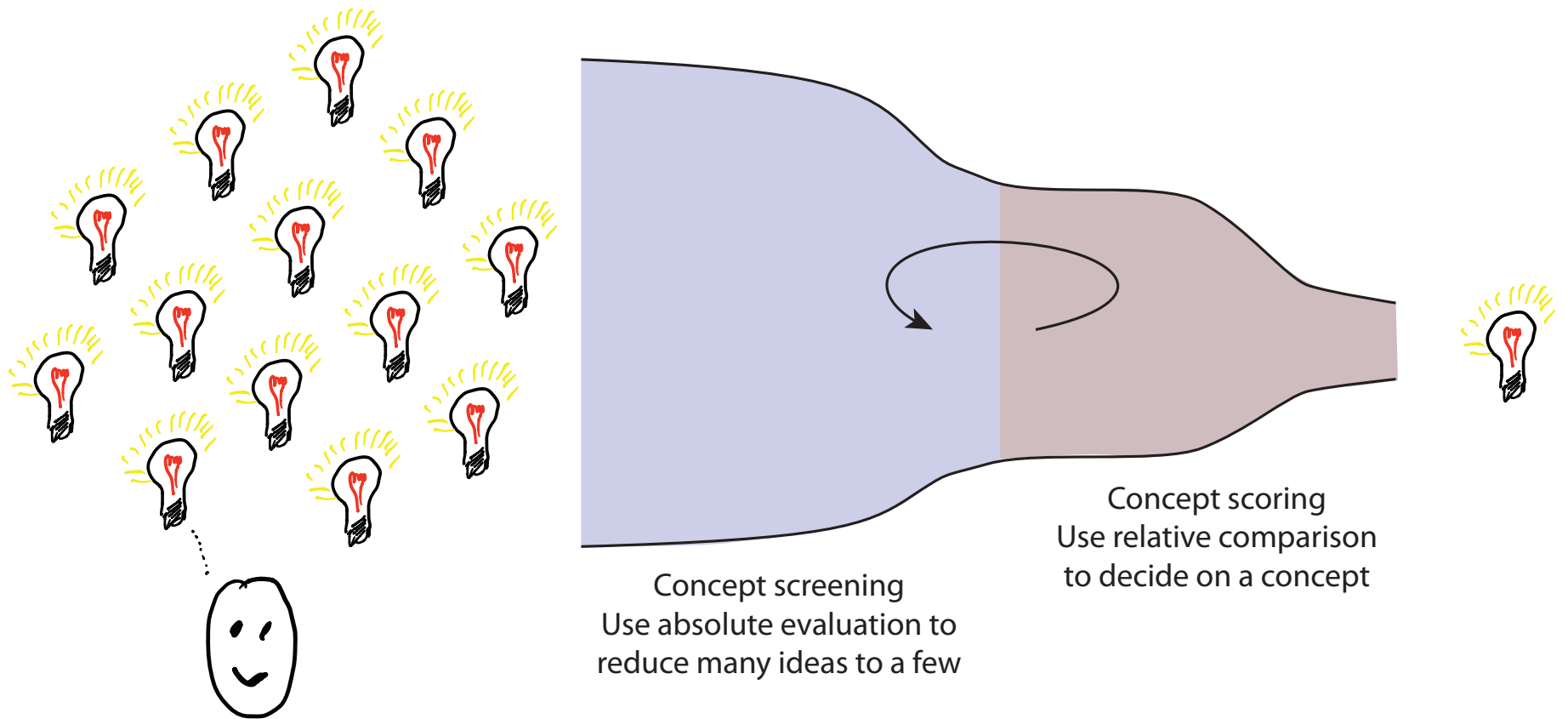
# Concept Selection Process



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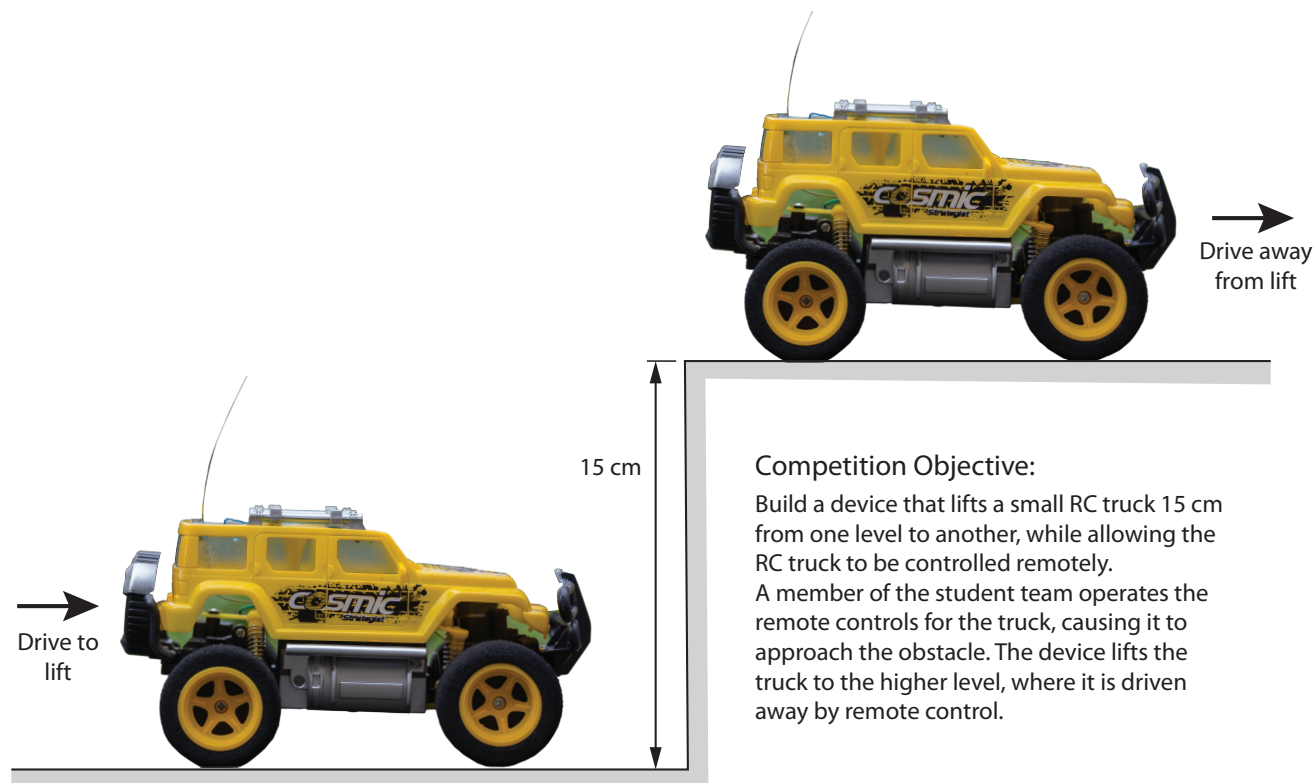




# Goal: Demonstrate Concept Selection Techniques

Revisit the Design Competition for ME 491 in Fall 2016

Design mechanism for lifting the RC Truck

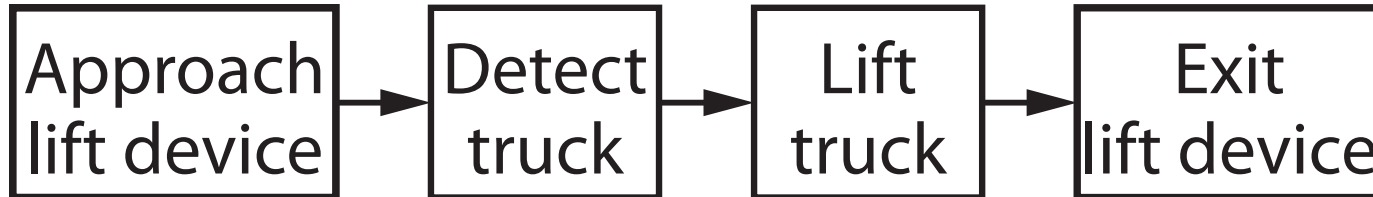


# Concept Generation

Internal and external searches were used to create a set of concepts for lifting the truck

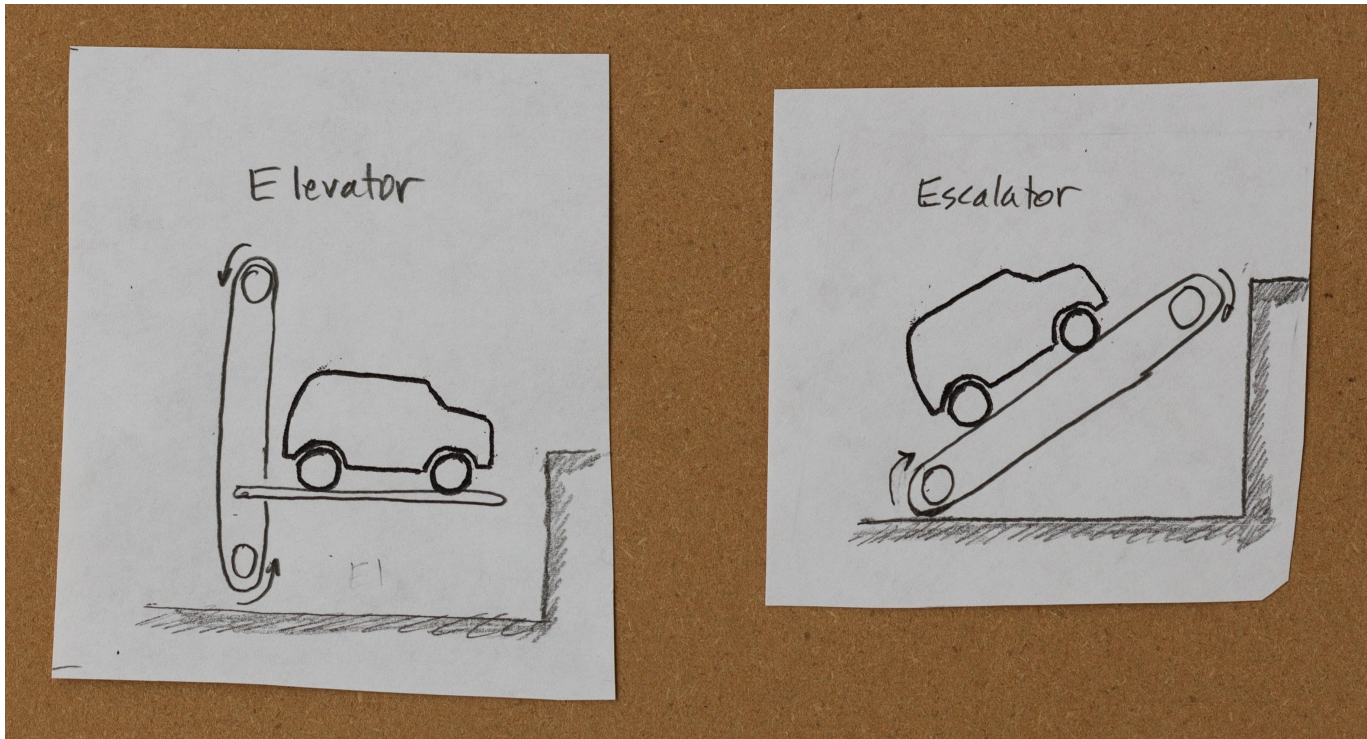
# Concept generation

First-pass functional decomposition

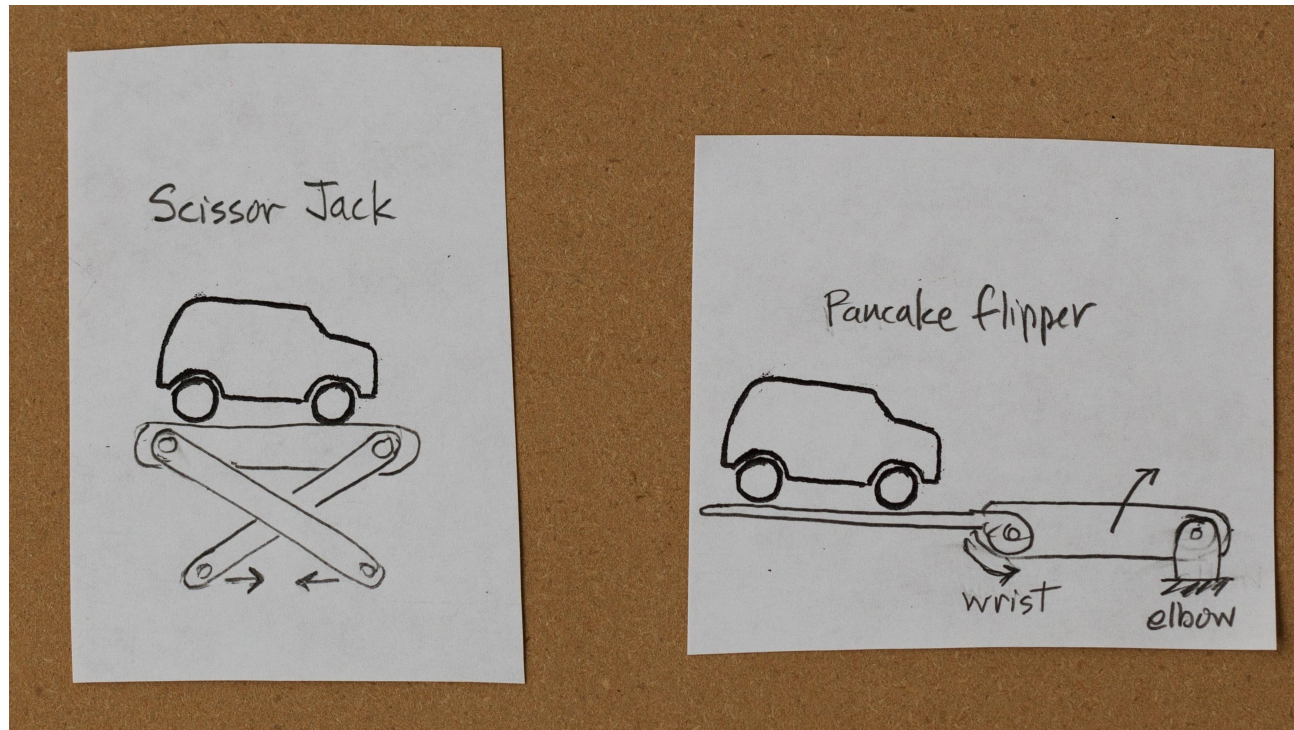


Internal and external searches were used to create a set of concepts for implementing the “lift truck” function.

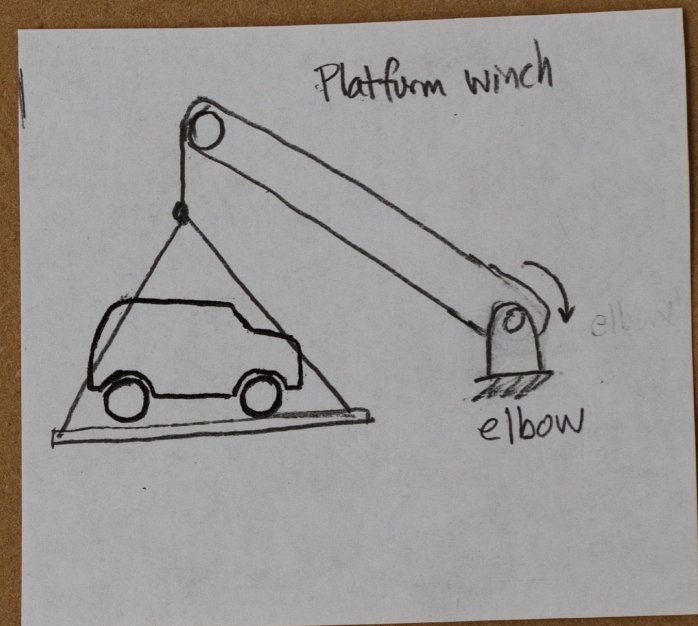
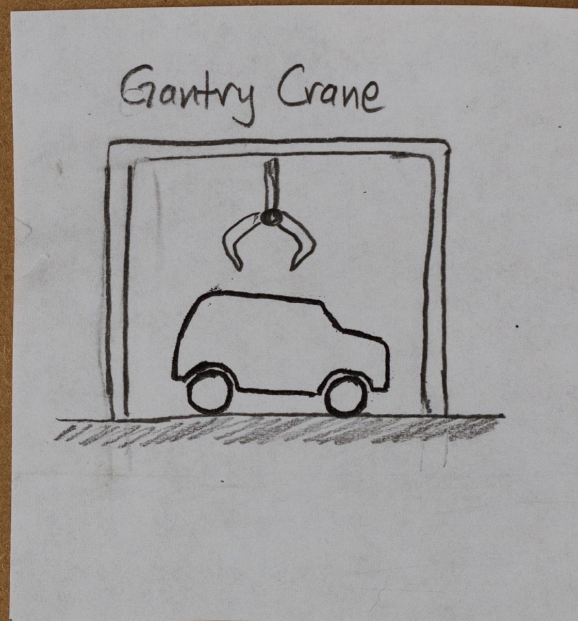
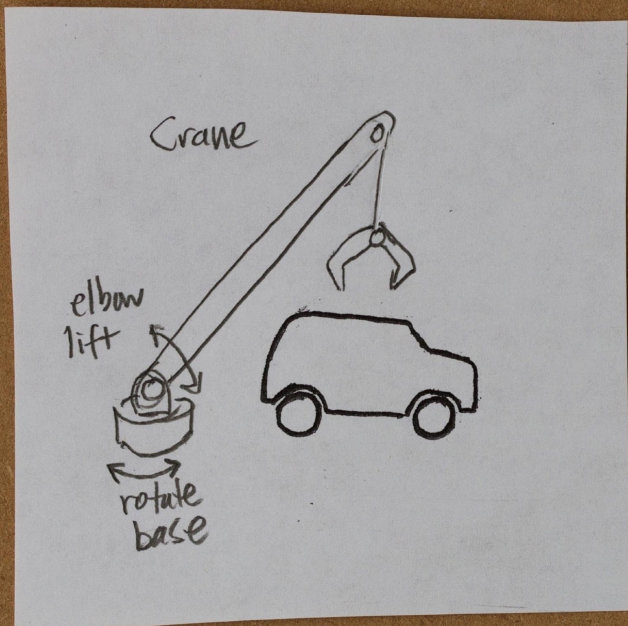
# Concepts: Mechanical Lifts



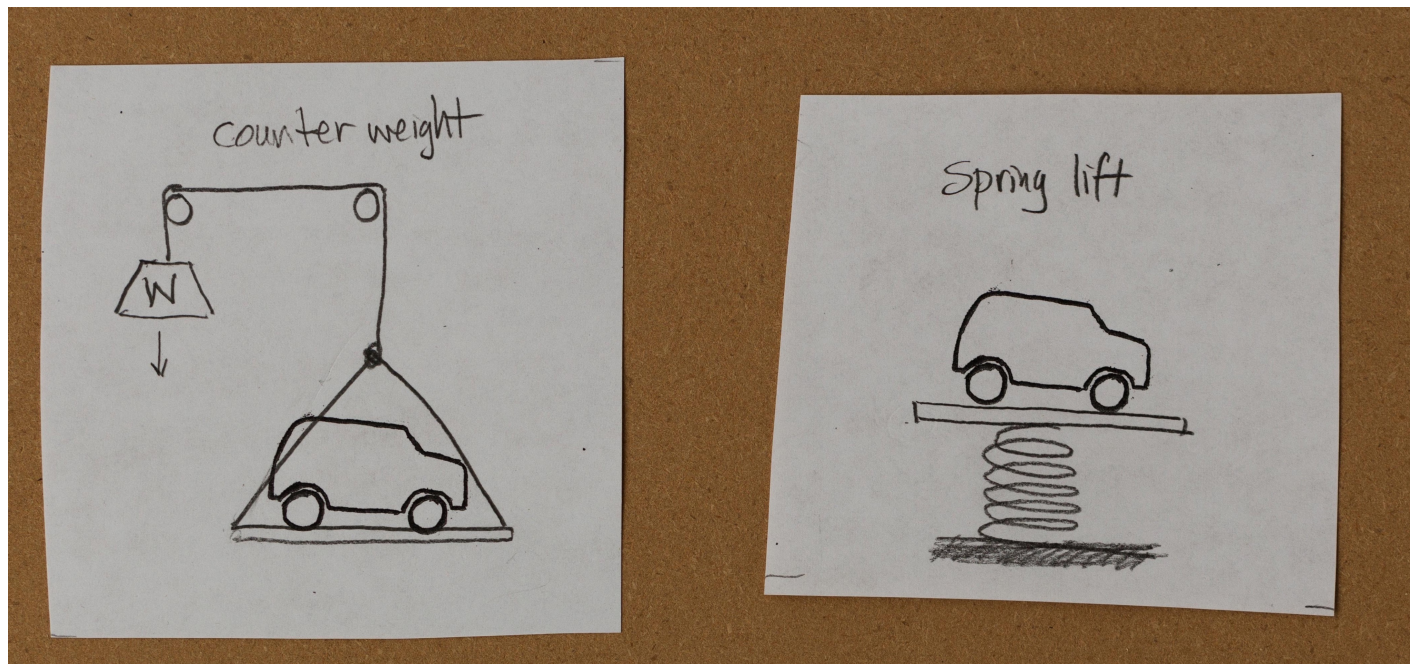
# Concepts: Mechanical Lifts



# Concepts: Crane concepts

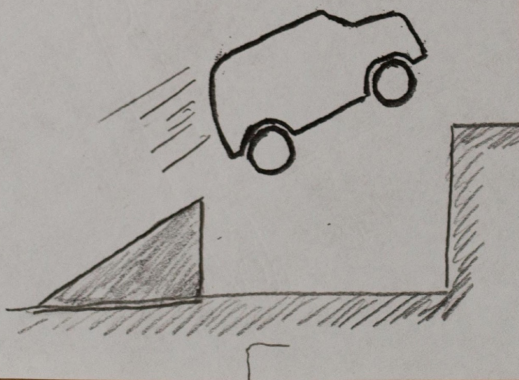


# Concepts: No-electricity

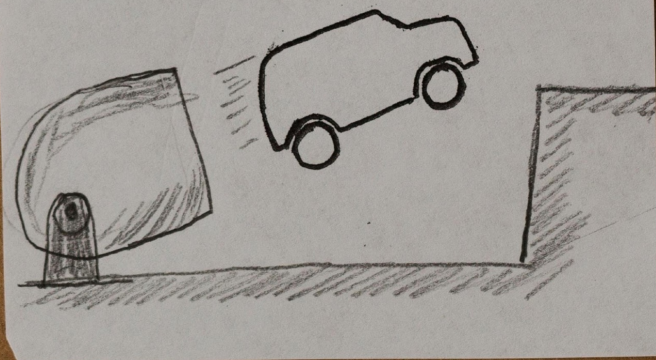


# Concepts: Use Momentum

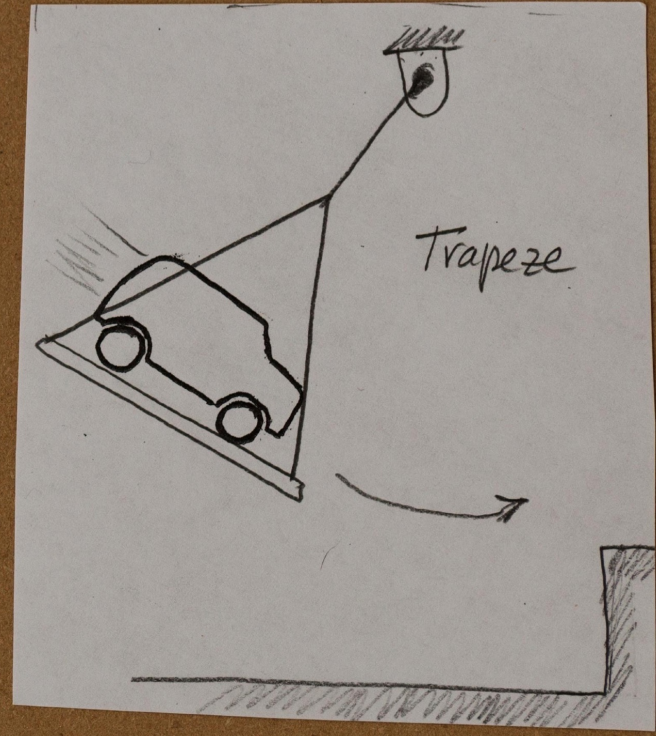
Dare devil ramp



Canon

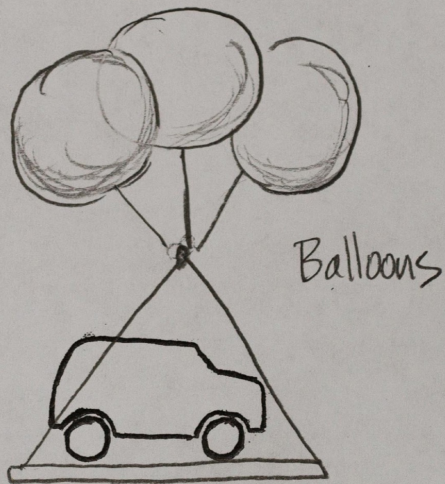


Trapeze

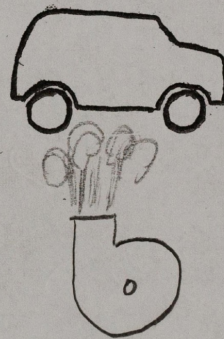




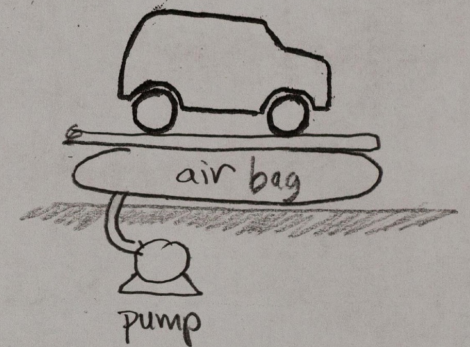
# Concepts: Use Air



Air lift



Inflatable lift



# Concept Screening

First pass: Three absolute criteria by Ullman

## 1. Feasibility judgement

Gut feeling: can we make this idea work?

## 2. Technology readiness

- ◆ Is technology available to implement the idea?
- ◆ Do we have time to develop the technology?
- ◆ Technology Readiness levels 1-9 are used by NASA and DoD

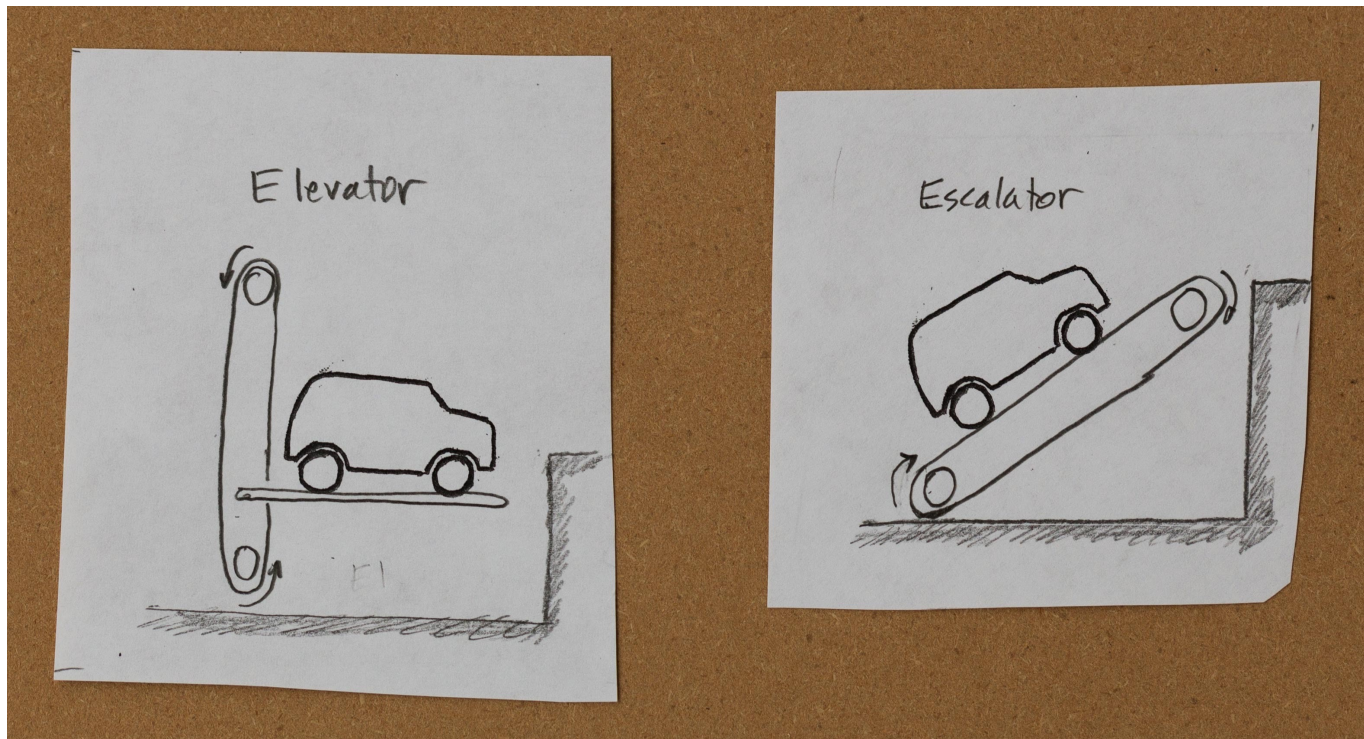
## 3. Go/no-go screening

Do ideas meet minimum customer requirements?

# Concept Screening for Feasibility

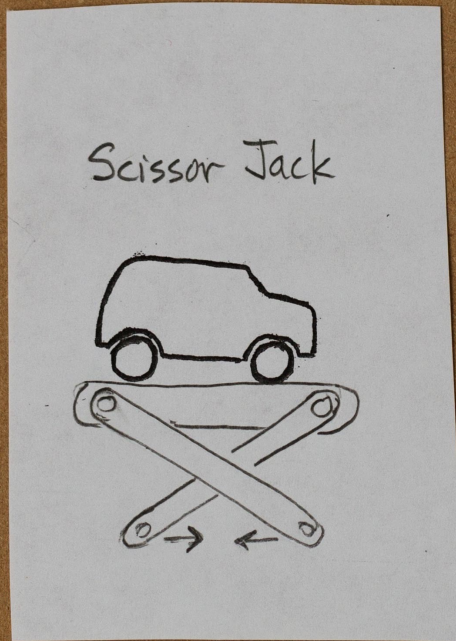
Yes

Yes

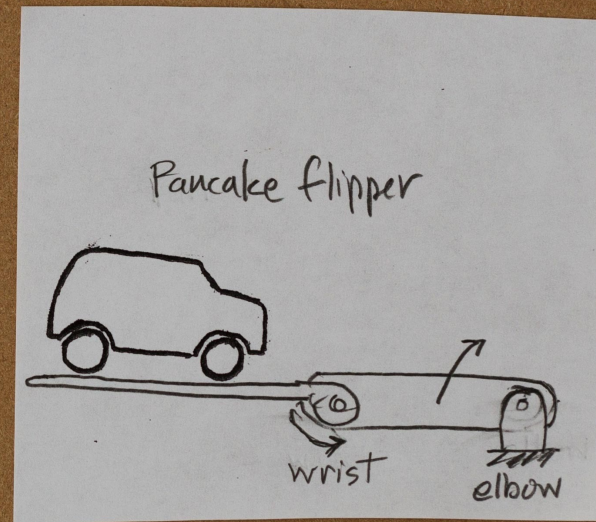


# Concept Screening for Feasibility

Yes

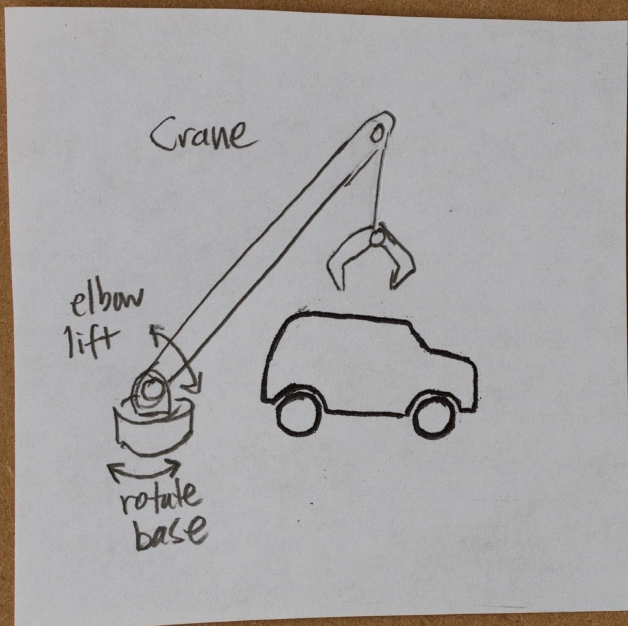


Yes

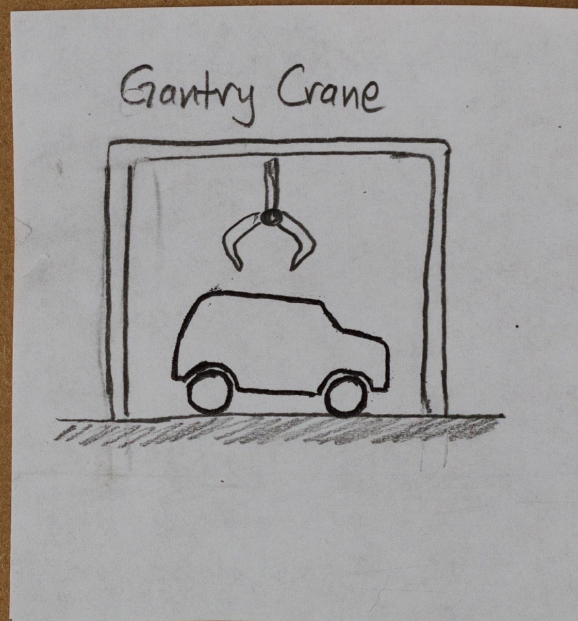


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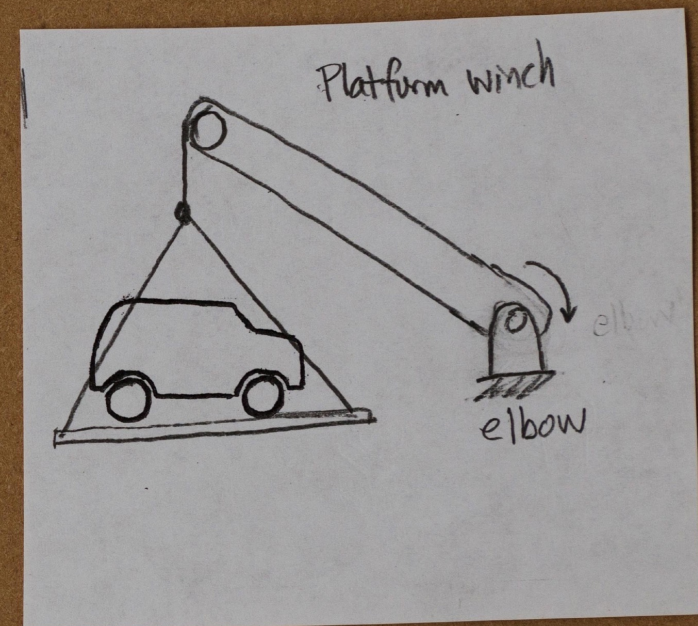
Yes



Yes



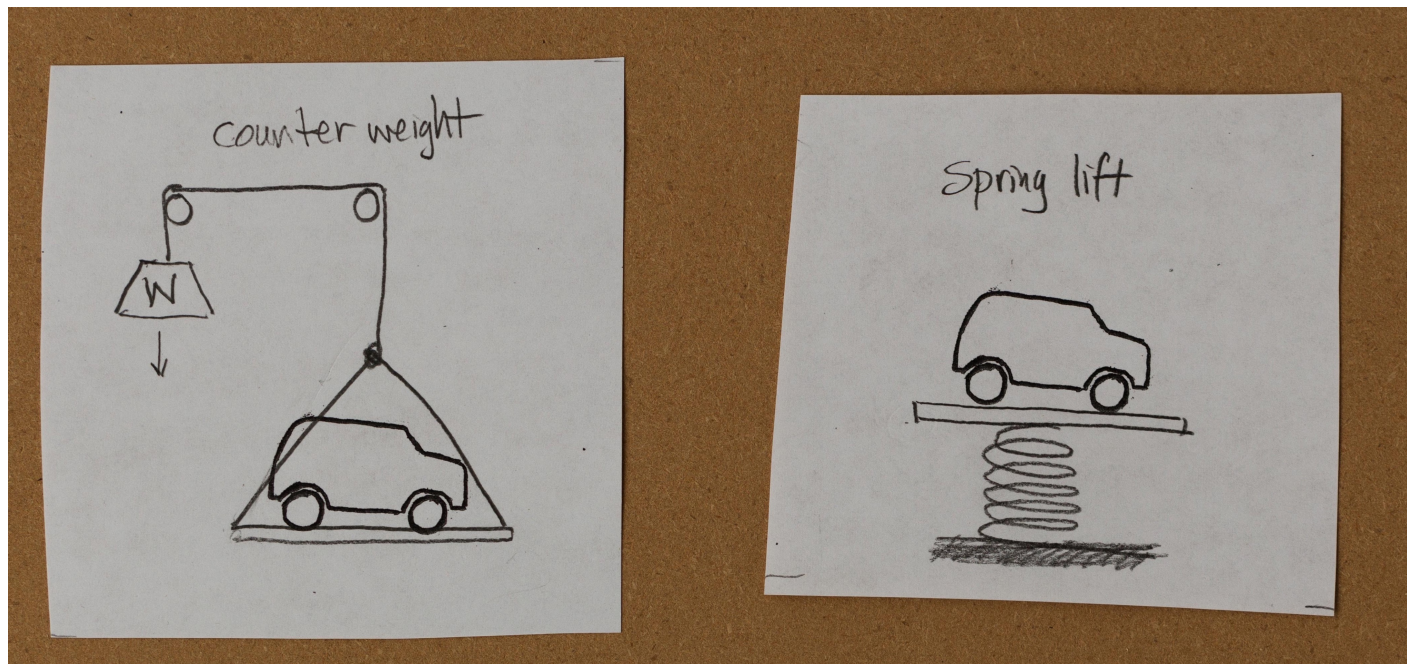
Yes



# Concept Screening for Feasibility

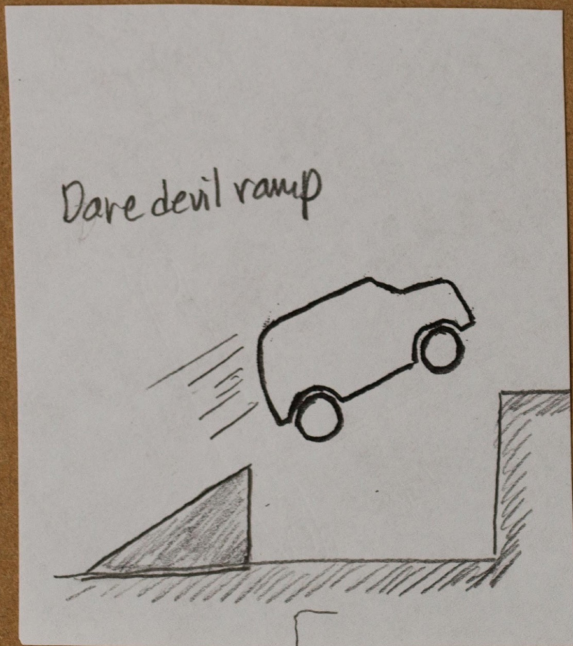
**Yes**

**No**

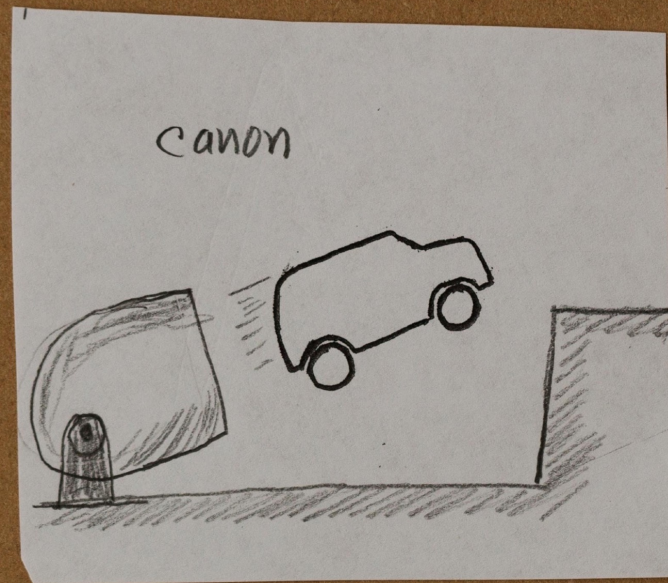


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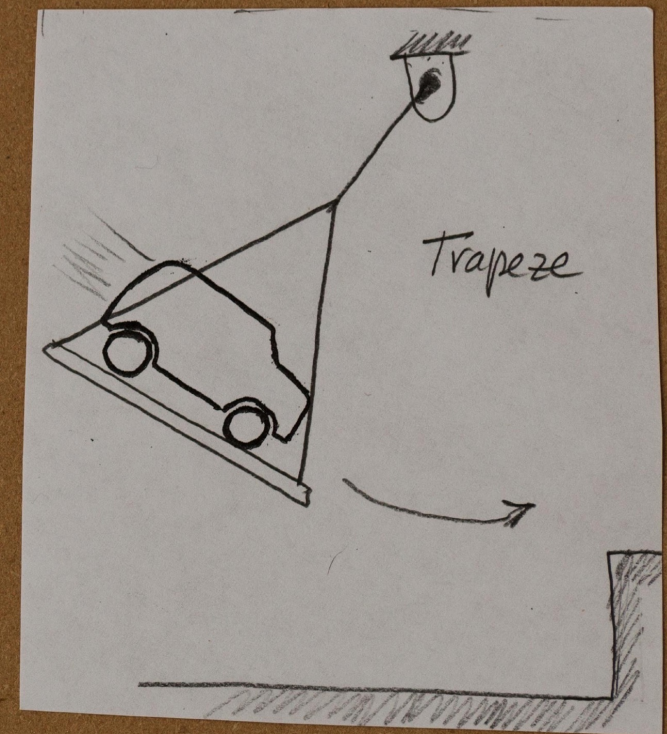
No



No



No



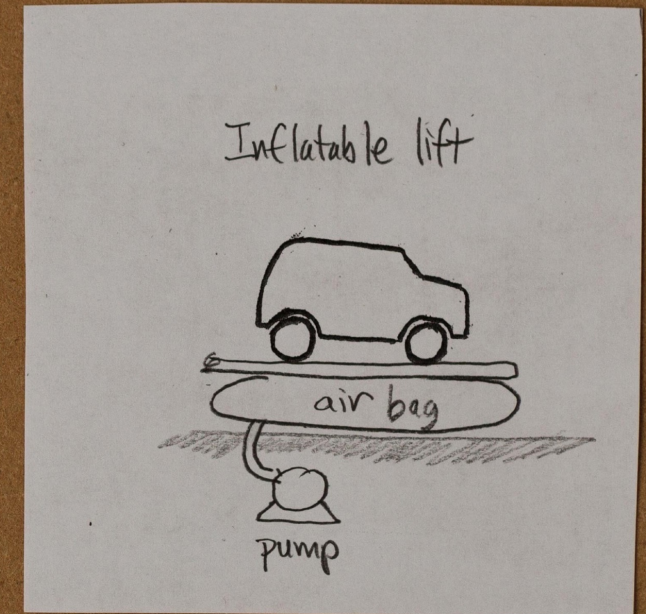
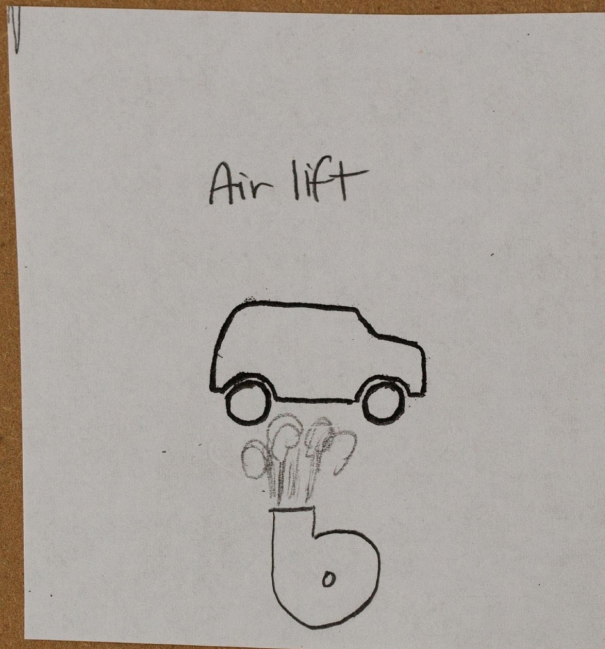
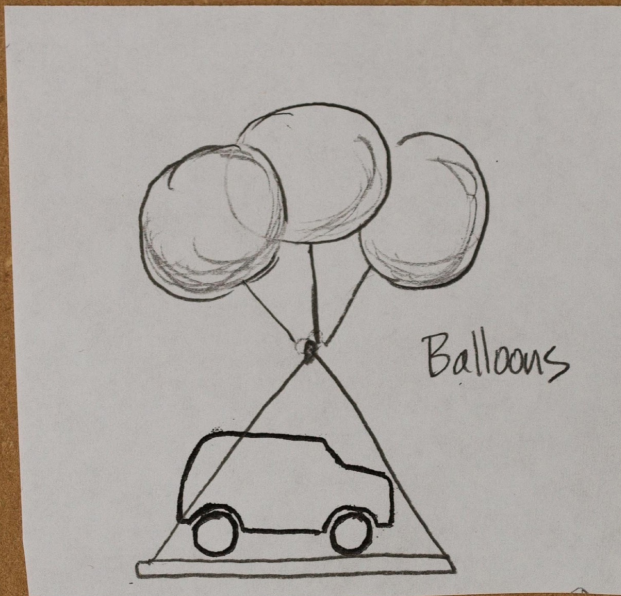
Although these concepts are deemed infeasible, they suggest the possibility of using momentum to move the truck

# Concept Screening for Feasibility

Yes

No

Yes





# Concept Screening Results

Keep these ideas

1. Elevator
2. Escalator
3. Scissor jack
4. Pancake flipper
5. Crane
6. Gantry crane
7. Platform winch
8. Counterweight
9. Balloons
10. Inflatable Lift

# Concept Screening for Technology Readiness

Technology readiness has a formal definition used by NASA and the Military. Here, we use a simple idea of whether or not the technology is currently available for the RC lift device.

1. Can we scavenge the technology from the printer?
2. Can we buy inexpensive parts to complete the design?
3. Do we need to manufacture parts?

How complex? How long to manufacture? Which method?

4. What happens if chosen technology fails?

Parts break; Can't make it work; Can't afford?

Do we have a fallback position?

# Concept Screening for Technology Readiness

## Procedure.

- Identify methods of realizing design concepts
  - ▶ Examples: scavenge, buy, manufacture, develop
- Assign weights to each method of realization
  - ▶ Weights are integer values
  - ▶ Higher weight means more importance.
- Estimate a percentage of each concept that can be achieved by each method of realization
- Compute a score for each design concept

# Concept Screening for Technology Readiness

Realization method	Weight	Elevator	Escalator	Scissor Jack	Gantry Crane
Scavengable parts	5	55	50	20	45
Parts to buy	2	10	10	20	10
Easy-to-manufacture parts	3	25	30	35	40
Hard-to-manufacture parts	1	0	0	5	0
Develop	1	10	10	20	5
	Check	100	100	100	100
	Weighted Score	3.8	3.7	2.7	3.7
	Risk	1	1	2	1
	Weighted Score minus risk	2.8	2.7	0.7	2.7

# Don't game the concept screening and scoring process

Recalculation of Table 2 from Progress Report

Total score is not consistent with table in the report

Total w/out "aesthetics" score is essentially tied between 3-wheel and 4-wheel scooters

	Weight	Cost	Balance	Aesthetics	Safety	Total	Total w/out aesthetics
Weight	4	1	3	2	5		
2 wheels	5	5	1	1	1	35	33
3 wheels	4	4	4	5	4	62	52
4 wheels	2	3	5	2	5	55	51

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3 wheels	4	4	4	5	4	62	52
4 wheels	2	3	5	2	5	55	51

“Aesthetics” has determining influence on the total score.

# Concept Scoring: Compare concepts to each other via a baseline design

Criterion	Reference Concept						
	Elevator	Escalator	Platform winch	Scissor jack	Pancake flipper	Air Bag	Dare Devil Ramp
Additional parts	0	0	-	-	-	-	+
Ease of fabrication	0	0	-	0	0	0	+
Ease of control	0	0	+	0	+	0	-
Speed of lift	0	0	-	-	0	-	0
Novely	0	0	+	+	+	+	+
Likelihood of success	0	0	0	-	+	-	-
Weight	0	0	0	-	-	0	+
Number of +	0	0	2	1	3	1	4
Number of 0	5	5	0	2	2	3	1
Number of -	0	0	3	4	2	3	2
<b>Relative score</b>	0	0	-1	-3	1	-2	2
<b>Decision</b>	Keep	Keep	Keep	Eliminate	Keep or combine	Eliminate	Keep & reflect on why