

DRS 660

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Nature inspired

Food dispersal packaging

For flood calamity

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Guided By

Prof. Vijay Bapat

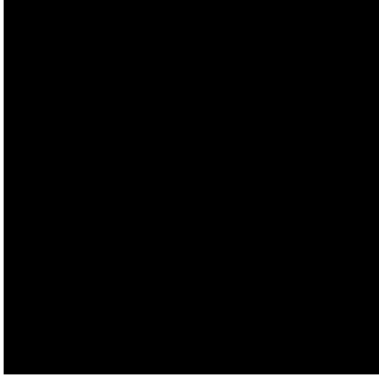
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Presented By

Rajat

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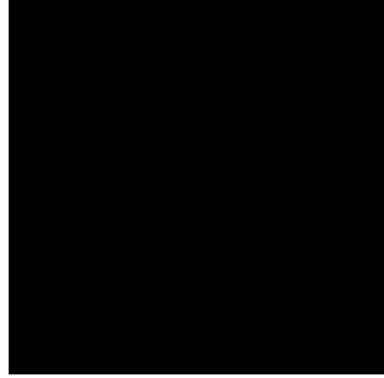
INDUSTRIAL DESIGN



Problem Identification

Presently, the food dispersal in flooded lands and condition is by dropping one or more big & bulky packages of food. This causes damage of food items due to impact with ground, which can also result in food contamination by exposure to environment around it. This kind of delivery results in chaos within people, improper food distribution & waste of food due to damage caused by people handling it. The food items are damaged especially when variety of items are mixed together and dropped in a single attempt.

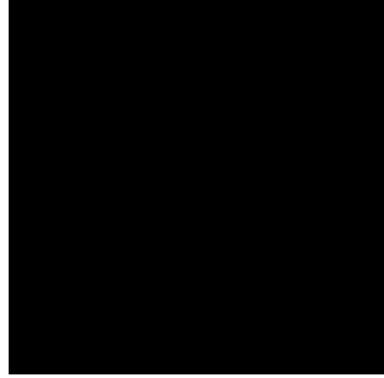




Design Approach

The problem Solving approach for the above issues is to be inspired from Nature. Majorly, the way of dispersion of seeds/Spores for Survival, as in the Plant Kingdom. The Biomimetic or Bio-mimicry forms the basis for the Design direction for this project. The Prototypes are to be tested by Drop test and the time of flight/drop achieved would be a major factor in deciding on the final design.





Design statement

To design a food packaging for food dispersal during flood calamity.

Design Objective

To deliver the food packets safely in smaller units.

Design Considerations

[The Must Haves]

- Ease of Manufacturing
- Fast & Ease to wrap
- Stackable
- Eco-friendly



*The
Rolling
Flower of
Bougainvillea*

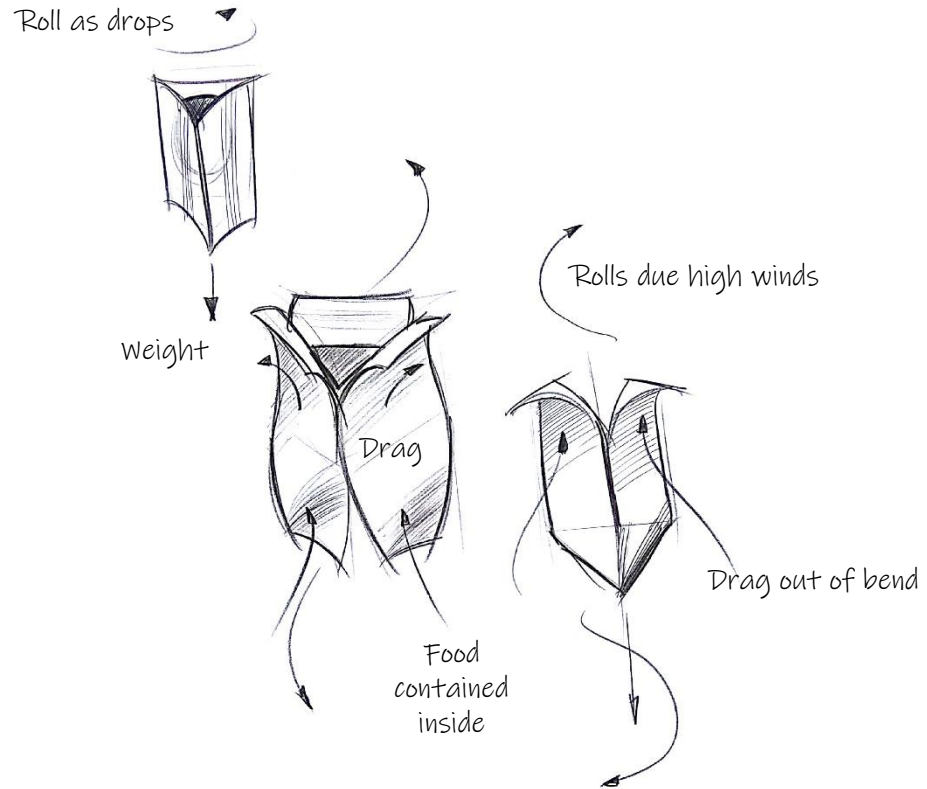
CONCEPT 1



The combination of three petals surrounding a core and their shape, helps the shaded flowers to roll by wind and get dispersed to distances on ground.

The idea was to make use of this surface expansion and petal combination to increase the drag during the drop.

Ideations & Mock ups



Mock up model



Result from drop test:

Time of drop from 20 m high- 4.94 sec

This design showed a gradual drop as it rolls over the wind current while it falls down.

The Spinning fruit of Thailand

CONCEPT 2



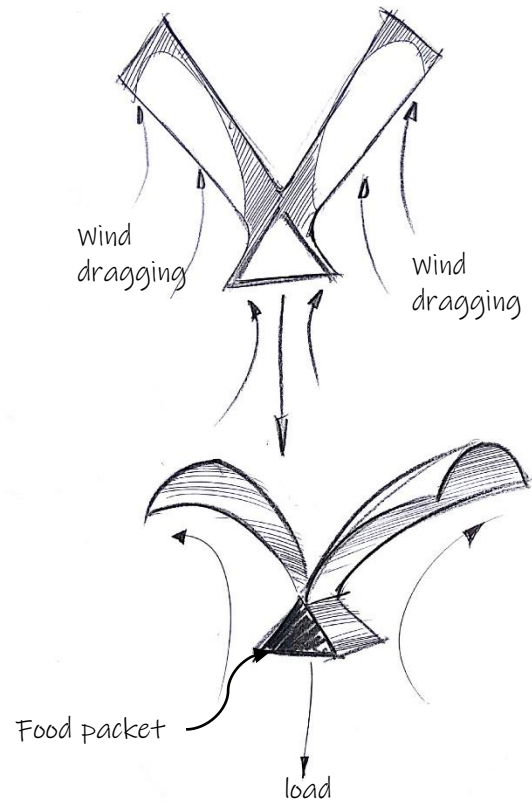
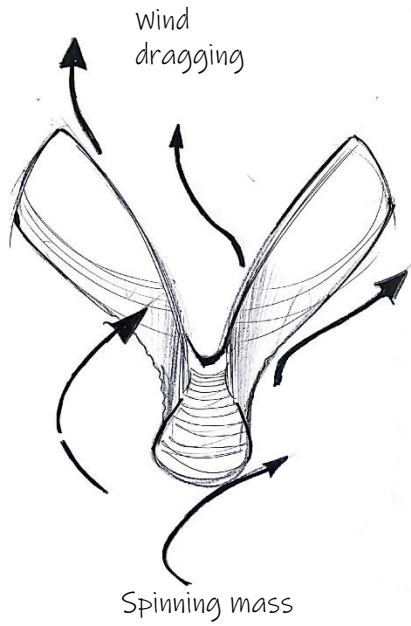
This spinning fruit of Thailand (Diptocarpus obtusifolius) has two leaves flaring symmetrically in opposite direction.

This pair of leaves helps the fruit to spin in the air. It also disperses the fruit and reduces the dropping velocity.

The idea was to use this twin leaves arrangement to disperse and drop the food gradually.

Ideations & Mock ups

Mock up model



Result from drop test:

Time of drop from 20 m high- 3.87 sec

This design spins as it comes down and falls on its base properly on the ground.

*The
Wings of
Black beetle*

CONCEPT 3

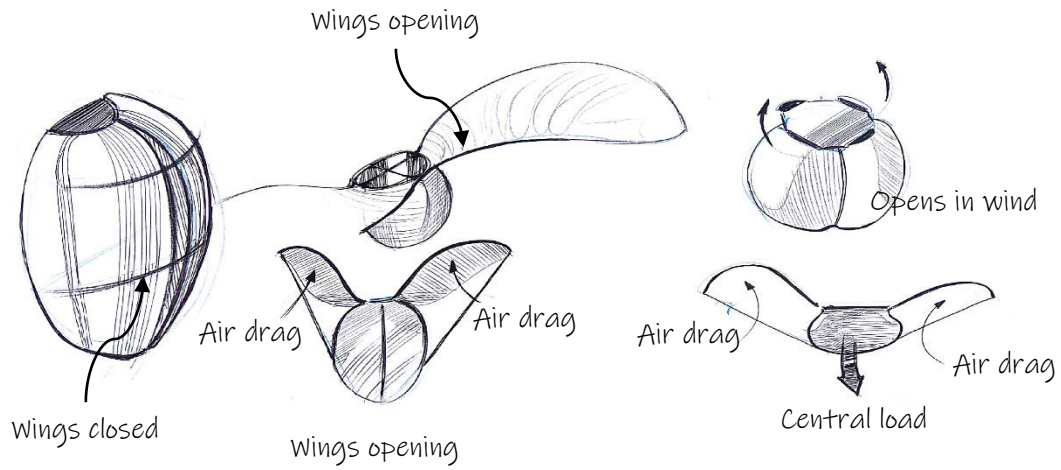


The beetles have an extra cover-like wing to increase the drag over the bulky body during they fly.

The cover also protects its expandable pair of wings that facilitates flying.

The idea was to take inspiration from this way of increasing drag over an bulky body.

Ideations & Mock ups



Result from drop test:

Time of drop from 20 m high- 4.60 sec

This design does not create sufficient drag to avoid fast drop to serve the function.

Mock up model



*The
copter
Maple Seed*

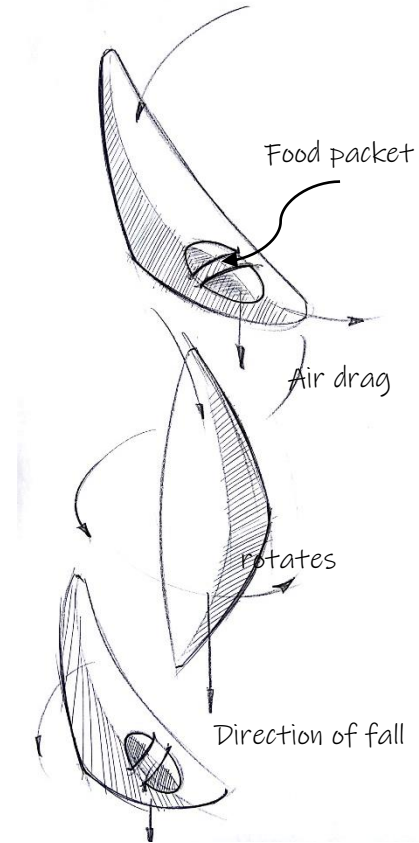
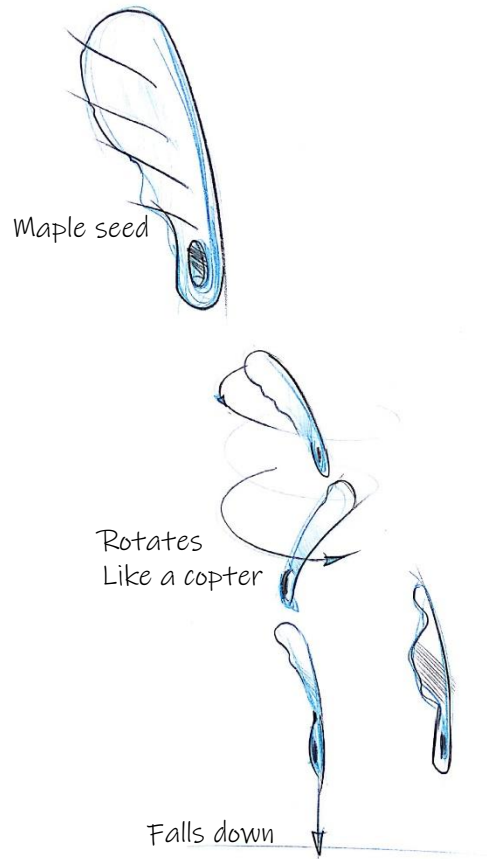
CONCEPT 4



The dynamic imbalance in the structure of a maple seed aids these seeds to fall and spin like a copter above ground.

The idea was to take inspiration from this minimal asymmetrical design to achieve similar motion.

Ideations & Mock ups



Mock up model



Result from drop test:

Time of drop from 20 m high-8.13sec

This design starts to spin after some time of flight and result in almost straight gradual drop.

The Bloom of Mushroom

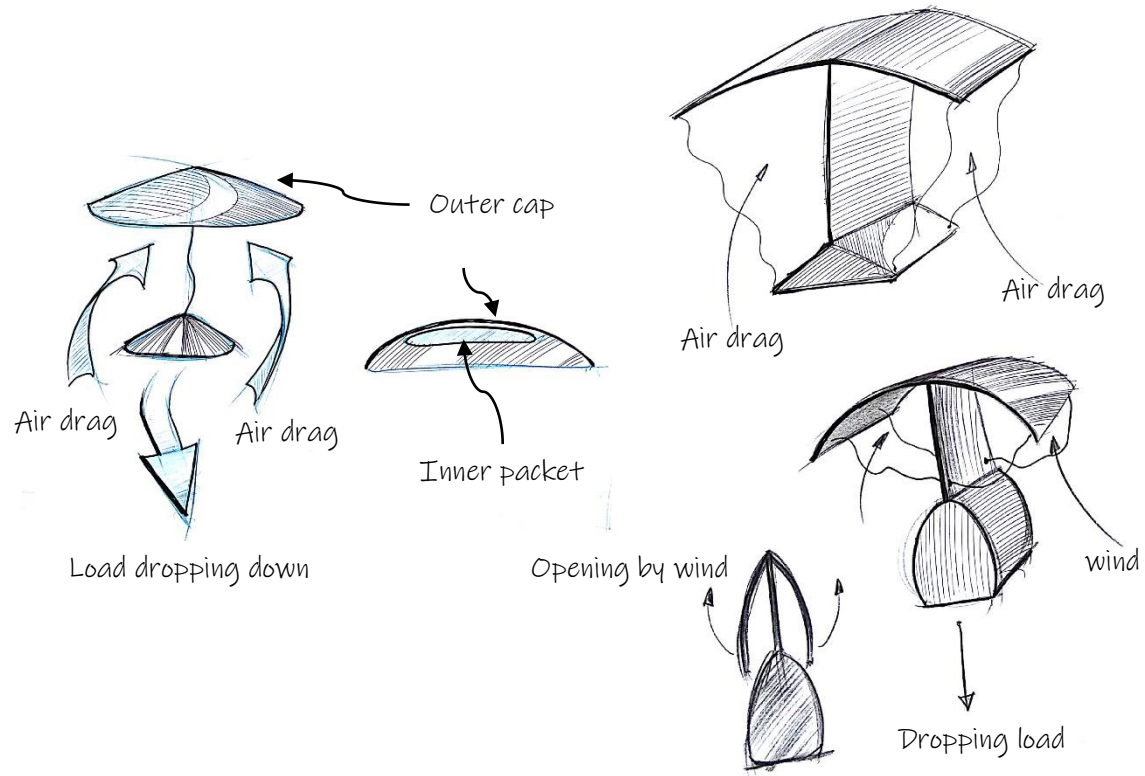
CONCEPT 5



The mushroom blooms to increase the exposure of its spores to disperse them away in the wind.

The idea was to make use of this blooming expansion phenomenon to increase the drag in the package delivery.

Ideations & Mock ups



Mock up model



Result from drop test:

Time of drop from 20 m high- 4.97 sec

This design showed an unbalanced and inefficient drop as it tilts after one side of cap is opened.



The Tumbling Drumstick seed

CONCEPT 6



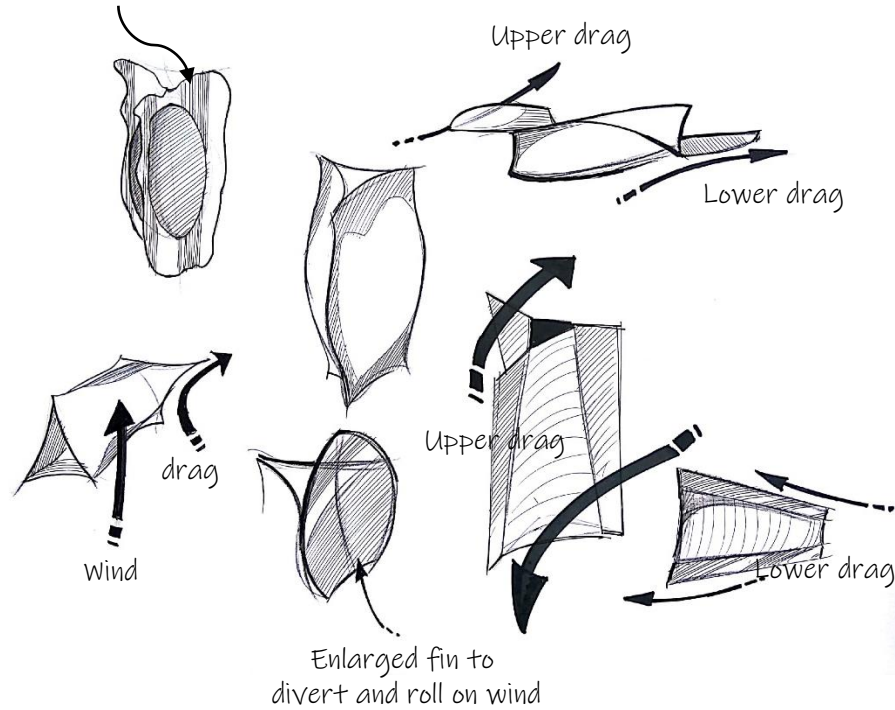
Fig. 6

The seed dispersal strategy in drumstick makes the seed fall out of naturally dried and cracked drumstick, allowing the seed to tumble on air currents with the help three fins grown on the triangular seed body.

The idea was to make use of this aerodynamic quality in these seeds which is achieved out of growing fins.

Ideations & Mock ups

Triangular seed with fins

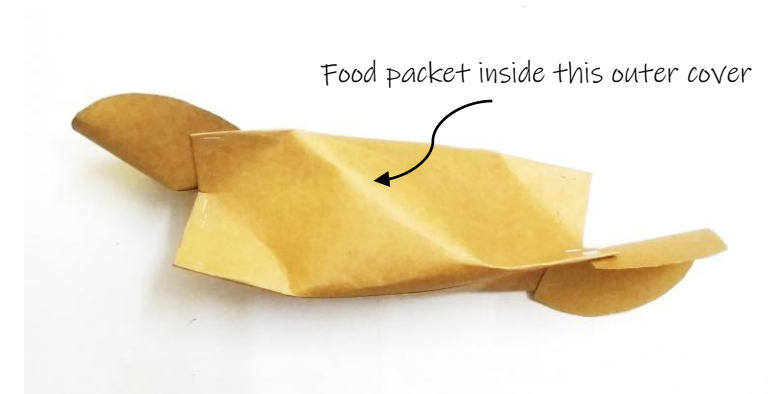


Result from drop test:

Time of drop from 20 m high- 5.33 sec

This design showed a good turning advantage for closer dispersal in an almost straight line drop.

Mock up model



The Flight of Barn Owl

CONCEPT 7



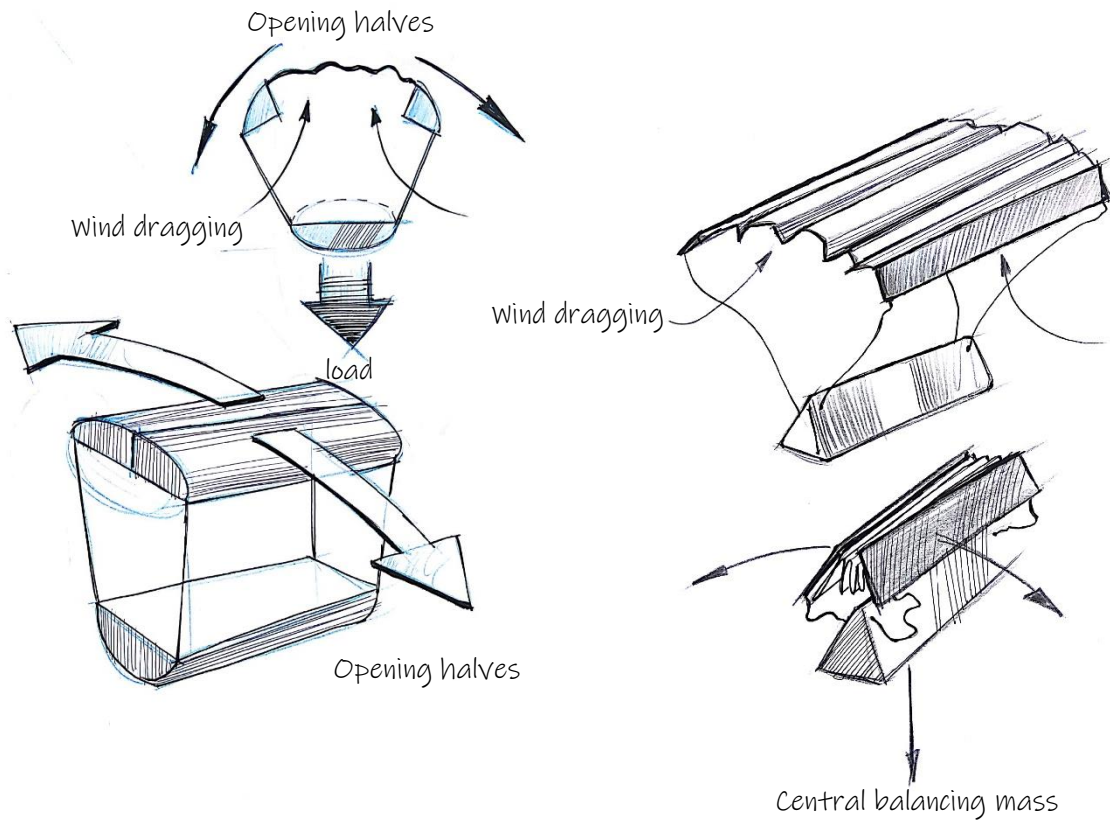
Fig. 7

Not fastest but, one of the most graceful flying birds of the planet- The Barn Owl. It has the ability to create sufficient drag in a controlled manner such that, the wings creates minimum possible turbulence in the air.

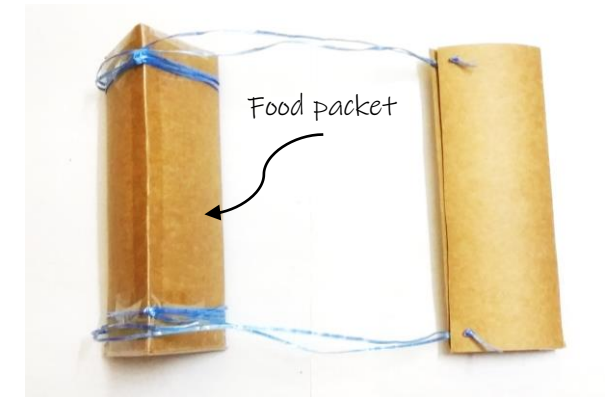
The wide wing spread and smaller body helps the owl to glide very smoothly and steadily even in low velocity winds.

The idea was to make use of this steady gliding ability in low winds for better dispersal.

Ideations & Mock ups



Mock up model



Result from drop test:

Time of drop from 20 m high- 8.980 secs
[Highest]

This design showed a wide spread and wind driven drop with achieving maximum time of flight for the process of dropping.

The Fall of Parijaatak

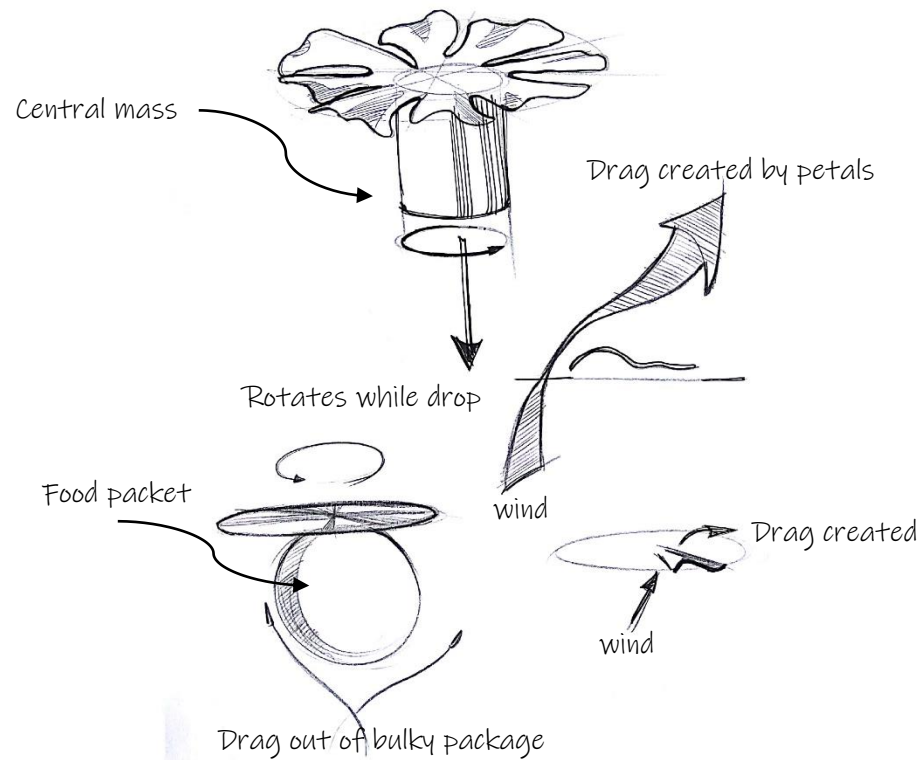
CONCEPT 8



The structure of petals in this flower helps the flower to drop gradually on the ground with the orange coloured stem balancing the mass centrally.

The idea was to replicate the peripheral form on the petals to achieve a gradual drop.

Ideations & Mock ups



Mock up model



Result from drop test:

Time of drop from 20 m high- 6.63 sec

This design showed a very gradually and smooth drop with mild rotation that adds playfulness to the whole process of dropping.

Conclusion

Considering the specified design considerations and the results from drop test (with a dead load of 50 g dropped from 20 m OF height), the most suitable & optimally functional concept was found to be the Maple seed inspired-Concept 4



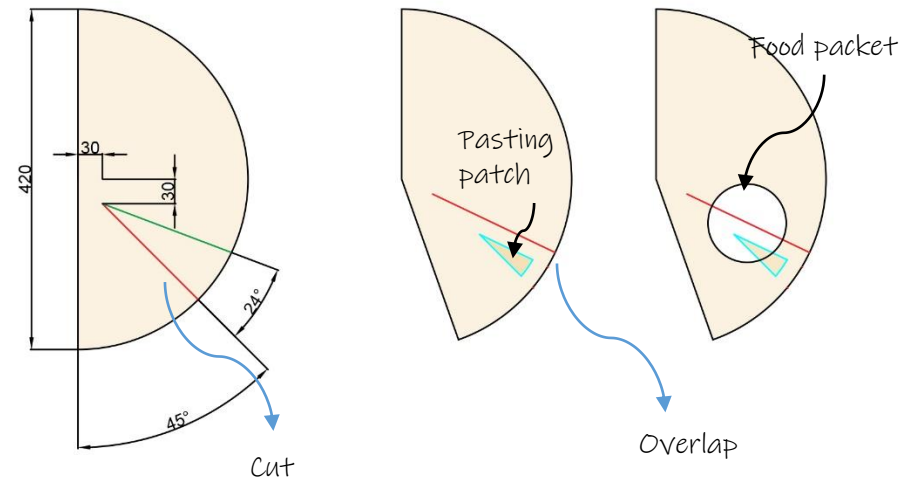
The material used for the manufacturing this packaging would be Box-Board Paper [210 GSM], which is popularly used in packaging industry. The air tight food packet should be adhered to this dispersal packaging. The air tight packet can be a plastic or a boxboard paper with PVC Coating on it.

The air-tightness would facilitate the floating of the packet in case it falls in water & the water proof packet would protect food from insects and moisture in the surrounding.

The packaging would be stacked parallel to each other in the box containing them. The box should be turned down from a open end to disperse the packaging.

The height of 20m and the weight of 50 g was chosen keeping in mind the efficacy of the present dropping methods.

Surface development
ALL DIMENSIONS ARE IN MM



The manufacturing of the surface development for this packaging would consist two simple following operations:

- One blanking operation*
- Two pasting operation*

REFERENCES

IMAGES

Fig.1- <https://in.pinterest.com/pin/499336677414490021/> dated 1/2/2019

Fig.2- <https://in.pinterest.com/pin/317644579955348312/> dated 1/2/2019

Fig.3- <https://in.pinterest.com/pin/499336677414490021/> dated 1/2/2019

Fig.4- <https://in.pinterest.com/pin/560698222350269066/> dated 3/2/2019

Fig.5-

<https://i.pinimg.com/originals/1f/d9/2e/1fd92ea65ffa473c356249a546d9e376.jpg> dated 3/2/2019

Fig.6- <https://in.pinterest.com/pin/396950154628044152/> dated 3/2/2019

Fig.7- <https://in.pinterest.com/pin/480759328952493519/> dated 4/2/2019

Fig.8- <https://in.pinterest.com/pin/491596115548475200/> dated 4/2/2019

WEB

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2. <https://www.youtube.com/watch?v=-Ukk07JH4ql> dated 1/2/2019
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7. <https://www2.palomar.edu/users/warmstrong/plfeb99.htm> 27/1/2019

VIDEOGRAPHY

<https://drive.google.com/drive/folders/1uoeSO8qBKqBTGW7C5X6N6gJ7jsOWj8q0?usp=sharing>