



# Comparative Packaging Study

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## PURPOSE

- Evaluate new high barrier food packaging films for use on long duration space missions.
- Determine the effects of:
  - High temperatures during heat sealing
  - Stress cracking from folds in the films caused by vacuum packing
  - Relative humidity during storage

## Deliverables

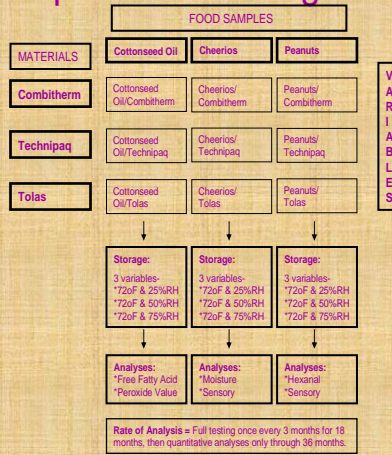
- Quantitatively evaluate each packaging material after final processing for oxygen and water vapor transmission through analysis of ingredients susceptible to moisture uptake and lipid oxidation.
- Qualitatively determine changes in food product attributes through sensory evaluation methods after storage in 3 different packaging films.
- Evaluate the potential of each packaging material based on qualitative and quantitative results.

## Food Sample Selection

- Dry cereal is prone to reduced quality from absorption of water vapor.
- Cottonseed oil is susceptible to lipid oxidation in the presence of oxygen.
- Peanuts produce a rancidity marker, hexanal, which can be quantified by analysis of the gas in the headspace of the package.



## Experimental Design Matrix



## Permeation

- The table below shows the water vapor transmission rate for each packaging material listed.
- Glass and aluminum have the best barrier properties for food packaging purposes.
- Temperature and relative humidity have an effect on the permeation rate of a package.

MATERIAL	OTR @ 100°F & 100% RH (gr/100in <sup>2</sup> /day)
Combitherm	5.405
Technipaq	<0.0003
Tolas	<0.003
Glass	<0.0003
Aluminum	<0.0003

## Comparison

Permeation rate (OTR) and water vapor transmission rate for each packaging material listed. The table below shows the barrier properties for each material and how they have an effect on the permeation rate of a package.

MATERIAL	OTR @ 100°F & 100% RH (grams/100in <sup>2</sup> /day)
Combitherm	0.362
Technipaq	<0.0003
Tolas	<0.0003
Glass	<0.0003
Aluminum	<0.0003

## Packaging Material Information

### Combitherm Film

- Structure: Nylon/EVOH/Nylon/High Ethylene Vinyl Acetate Polyethylene/LLDPE
- PROS: Lightweight and transparent. Microwaveable and can be incinerated.
- CONS: Requires an overwrap film due to poor barrier properties. Overwrap causes a major increase in mass for food system.

### Technipaq Film

- Structure: A quad laminate film. PET/Polyethylene/Aluminum/Ionomer
- PROS: Best barrier properties available in a film.
- CONS: Film cannot be incinerated or microwaved due to aluminum layer. Film is not clear to allow for food identification.

### Tolas Film

- Structure: A PET film coated with a layer of aluminum oxide.
- PROS: Very lightweight with the best barrier properties. Transparent, Microwaveable and can be incinerated.
- CONS: Stress cracking caused by wrinkles during vacuum packing can reduce the barrier properties.

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