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

FOOD SAMPLES

MATERIALS	Cottonseed Oil	Cheerios	Peanuts
Combitherm	Cottonseed Oil/Combitherm	Cheerios/ Combitherm	Peanuts/ Combitherm
Technipaq	Cottonseed Oil/Technipaq	Cheerios/ Technipaq	Peanuts/ Technipaq
Tolas	Cottonseed Oil/Tolas	Cheerios/ Tolas	Peanuts/ Tolas

VARIABLES

Storage:	Storage:	Storage:
3 variables- *72oF & 25%RH *72oF & 50%RH *72oF & 75%RH	3 variables- *72oF & 25%RH *72oF & 50%RH *72oF & 75%RH	3 variables- *72oF & 25%RH *72oF & 50%RH *72oF & 75%RH
Analyses: *Free Fatty Acid *Peroxide Value	**Analyses:** *Moisture *Sensory	**Analyses:** *Hexanal *Sensory

Rate of Analysis = Full testing once every 3 months for 18 months, then quantitative analyses only through 36 months.

Permeation [illegible] omparison

- The table below shows the [illegible] water vapor transmission ra[illegible] listed.
- Glass and aluminum have t[illegible] food packaging purposes.
- Temperature and relative hu[illegible] permeation rate of a packag[illegible]

MATERIAL	OTR @ RH (g[illegible]	WVTR @ 100°F & 100% RH (grams/100in²/day
Combitherm	5.405	0.352
Technipaq	<0.000	<0.0003
Tolas	<0.003	<0.0003
Glass	<0.000	<0.0003
Aluminum	<0.000	<0.0003

C[illegible]

- Tolas (AlOX Coated [illegible] Film) [illegible]nipaq Film

- Peanuts in Combitherm [illegible] Combitherm

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 quadlaminate 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 [illegible] layer of aluminum oxide.
- PROS: Very lightweight with [illegible] barrier properties. Transpare[illegible] Microwaveable and can be i[illegible]
- CONS: Stress cracking caus[illegible] wrinkles during vacuum pac[illegible] reduce the barrier properties