

# Frostbike

Transporting & cooling  
blood for diagnostic  
purposes

2.009 Yellow A  
Mockup Review

# Transporting Blood in Honduras

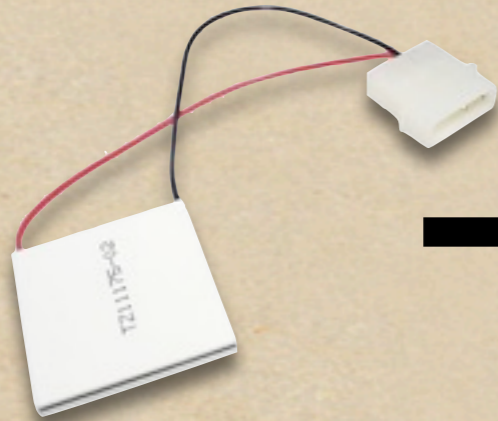


- Diagnosing blood born disease
- Working with Jose Gomez-Marquez of Innovations in International Health

Blood



Fan



Peltier



Motorbike



# Critical Questions

Cooling method

Insulation requirements

Size of container

Type of transportation

Bike-powered

Motorcycle-powered

# Product Contract

Product Description: motorcycle attachment for the transportation of blood samples for diagnostic purposes

Intended Customers: medical couriers in Honduras

Market: motorcycle accessories, biologicals transportation

# Product Contract

Customer Need	Product Attribute	Engineering Specs
Blood samples must stay cold for duration of trip	Maintains required blood storage temperature	$2^{\circ}\text{C} < T < 8^{\circ}\text{C}$
	Maintains blood temperature when product is disengaged from vehicle	Temperature maintained for over 8 hours
Operational in hot environments	Insulation	Above specs maintainable in ambient temperatures up to $36.1^{\circ}\text{C}$
Powered by a motorcycle	Power required	60 Watts
Fits on the back of a motorcycle	Size	Length: $0.2\text{ m} < x < 0.4\text{ m}$ Width: $0.15\text{ m} < y < 0.35\text{ m}$ Height: $0.35\text{ m} < z < 0.75\text{ m}$
Transportable by one person	Weight	Total weight less than 13 kg
Transports enough blood	Volume	At least 10 x 15 mL samples
Easily repairable using local materials	Materials	Metal, wood, plastic, foam

# Cooling

Cooling system	Price	COP	Power required to overcome thermal losses	Heat dissipation method	Robustness	Control system complexity	Size	Weight
Peltier	\$50	0.4	38.2 W	Heat sinks	High	Regulate current to peltier	23 x 23 x 3 mm (per unit)	< 1 kg
Stirling engine	\$564	2.2	6.9 W	Fan	Medium	Integrated temp control	173 x 186 x 279 mm	3 kg
Compressor	\$100	3.2	4.8 W	Fan and heat sink	Low	Feedback loop with on/off switch	304 x 203 x 170 mm	3 kg
Insulation with phase change materials	\$100	n/a	n/a	n/a	High	none	180 x 140 x 12 mm	2 kg

# What we've done...



Heat Sink: \$70

Peltier Device: \$ 31



HemaCool Mobile Blood

Storage Refrigerator: \$7225

Cool blood to 10C in 20 minutes.