TEAM #3 INSTANT AIR

RK Baker Group

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OBJECTIVE

Design an easy to use, inexpensive system that prevents the interior of an automobile from reaching unsafe temperatures above 100°F.

BACKGROUND

Greenhouse effect causes rapid heating of vehicles. Temperatures above 100°F increase risk of heat injury for elderly, pets, and children.

ENGINEERING SPECIFICATIONS

Specification	Goal	Meets Goal? (Result)
Target Temperature of Interior	< 100°F	✓ (See Figure 3)
Time Taken to Cool Interior	< 10 min.	✗ (See Figure 4)
Battery life	> 1 month	✓ (See Figure 5)
Fan Weight	< 5 lbs	✓ (1.6 lbs)
Screen Weight	< 15 lbs	✓ (2 lbs)
Max Operating Temperature	150°F	✗ (140°F)
Cost of One Fan	< $40	✗ ($42)
Cost of Screen	< $40	✓ ($25)
Screen Installation Time	< 3 min.	✓ (1.5 min.)
Screen Uninstallation Time	< 5 min.	✓ (1 min.)

ANALYSIS

∴ Need Passive Cooling Method
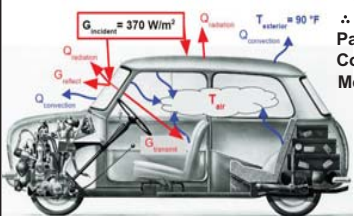
Figure 1: Heat Transfer Analysis
https://bit.ly/2ER23yM

Material Reflectance Versus Wavelength

∴ Aluminum Screen Material Selected

Figure 2: Material Reflectance
https://bit.ly/2qAlRC9

SYSTEM OVERVIEW

Vehicle with Screen and Fans

Fan View (Zoomed) — 4in, 3.6in, 4.8in

Main Enclosure, Outside Cover, Fan, Inside Cover, Battery Cover, Manual Power Switch

Instant Air Fan Exploded View (Above)

PCB (Left)

Inside View of Fan (Right)

Velcro Strap

Instant Air Screen (SolidWorks Model)

Instant Air Screen (Modeled on Sedan)

TEST RESULTS

Figure 3: Screen Tests — Vehicle Temperatures Versus Time

Legend: Control (Ambient), Instant Air (Ambient), Existing Sunshades (Ambient), Control (Surfaces), Instant Air (Surfaces), Existing Sunshades (Surfaces), Outside Temperature

Figure 4: Fan Tests — Ambient Vehicle Temperature Versus Time

Legend: 1 Fan, 2 Fans, 3 Fans, 4 Fans

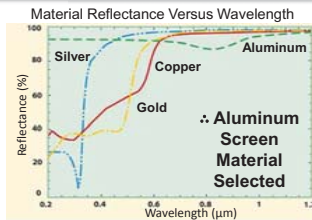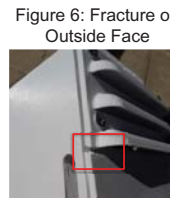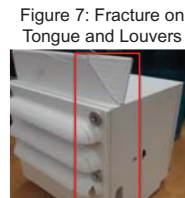Minutes After Fan Activation

Figure 6: Fracture on Outside Face

Figure 7: Fracture on Tongue and Louvers
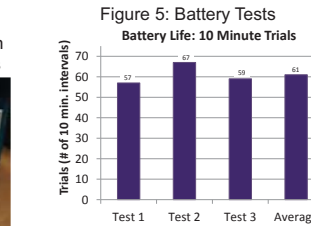
Figure 5: Battery Tests — Battery Life: 10 Minute Trials
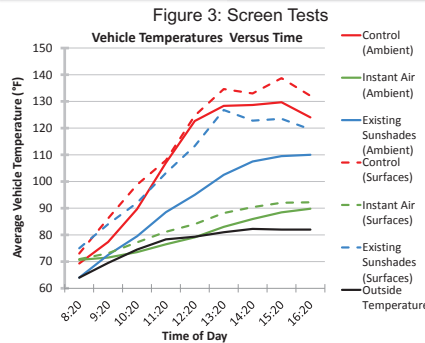
Test 1: 57, Test 2: 67, Test 3: 59, Average: 61

SAFETY

Fan Blade Guard, Manual Power Switch, Rubber Window Seal, Velcro Straps

BUDGET

Total Budget: $1200
Spent: $960

Screen, Fan, Electrical, Production

13.8%, 18.7%, 26.7%, 40.8%
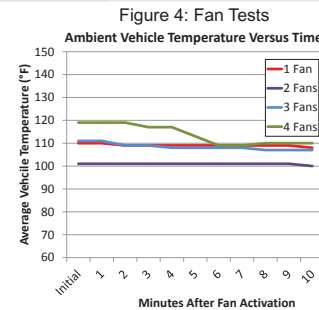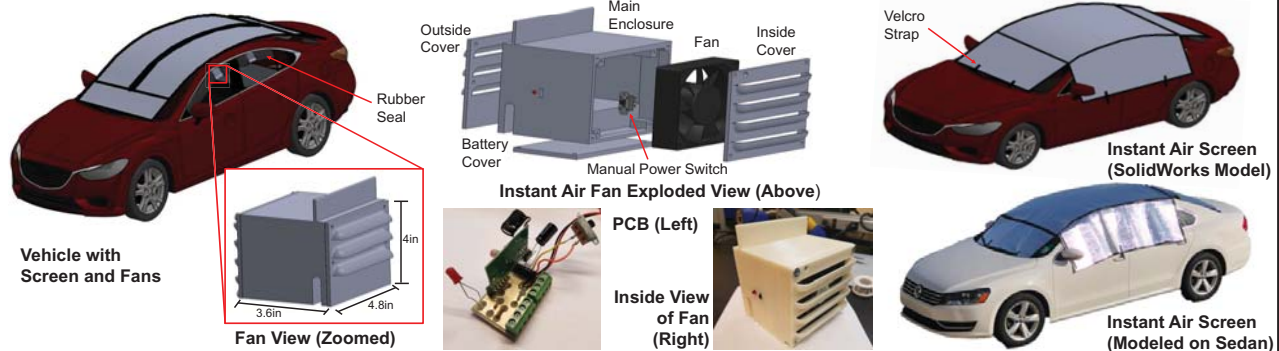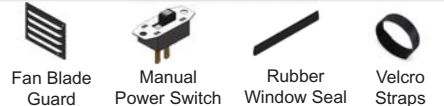
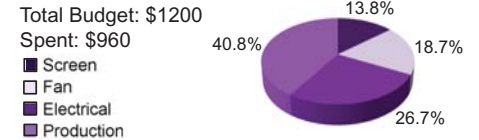## CONCLUSIONS

- Instant Air Screen reduced vehicle temperatures by an average of 33°F.
- Four Instant Air Fans reduce vehicle temperatures by 10°F.
- The screen is more effective, sturdier, cheaper, and easier to use than the fans.

SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL
Engineering Specification	Concept Generation	Engineering Analysis	Continued Analysis	Design Modifications	Order and Manufacture Parts	Assembly and Initial Testing	Final Tests and Modifications

Sponsor: Ron

Adviser: Dr. Tryfon