TIGER COOLING — Tales are hot air

By Tiger Tom Ehrhart

A scientific test on Tiger cooling was conducted during the years of 2000-2003 to prove/disprove the many cooling ideas and myths espoused up to this time. A complete test report with supporting data and information is available at www.RootesAmerica.org. These tests and report are by Chuck King (kingjawbone@aol.com) & "Tiger Tom" Ehrhart (tt@tigertoms.net). The following is a summary of our testing and recommendations resulting from our testing.

SUMMARY OF TEST

Since our Tigers were produced in the mid-60's, one of the things that has continued to be considered a problem has been the cooling system; in particular overheating after extended periods of idling on hot days. Some owners have been successful at cooling their Tigers and some are still trying to keep their Tigers cool. Solutions have been offered by others in the past, but have generally been based on empirical evidence, with no scientific testing or data to substantiate these solutions and conclusions.

This is the first fact and data based findings published regarding effective cooling solutions for the Tiger and some fan airflow information for Alpines. Our findings are also applicable and may be of interest to other vehicle owners with similar engine cooling configurations with overheating problems.

We used Andy King's (Chuck's son) recently rebuilt 260, 2 Bbl. Tiger. The engine block had been cooked out, new stock water pump and hoses, the stock radiator had been cleaned and rodded out, and it had a stock fan and shroud. At the beginning of our testing the engine would overheat at an idle on hot days over 85F from a cold start within 1/2 hr.

Our testing was to correct overheating at an idle; but we also did tests at highway speeds (72MPH) to note the effects (positive or negative) of any changes we were making. Testing was typically performed with ambient temp. between 85 to 100 degrees F with final tests exceeding 100F during the summer of 2003. The tests we did were multi-variable but only one variable changed for each experiment.

We used calibrated digital temperature gauges. Engine temperature readings were from the engine intake manifold temperature sensor port; also the radiator inlet and outlet to measure temperature differential, caused by different setups effect on engine temperature. We took ambient temperature measurements from a probe extending 18" in front of the grille. Temperature measurements were taken at two minute intervals and plotted as Time versus Temperature graphs to analyze results.

When we started our testing we like others thought we would just need to come upon the right combination of radiator, fan and or water pump, and we would see improvements that could get us moving in the right direction. Instead, at an idle we saw virtually no change in our data and plots. We did notice improvement with some set ups at highways speeds, enough that we had to weld the thermostat open, so we could record temperatures under 180F. After doing this we could see great improvement at highways speeds with the same setup that didn't improve at an idle. The only difference was the amount of air going through the radiator into the engine compartment. We needed to see what difference increased airflow would have on the same setup at an idle.

We tested the hypothesis that more airflow would give the improvements we were looking for by simply trying a 10" electric pusher fan at an idle, in conjunction with the mechanical fan we were testing at that point and seeing the outcome. We went from having to shut the car off due to overheating to having the car run at an acceptable stable temperature for over an hour and shutting it off at our discretion.

We needed to test airflow variables outside the car so we could quantify the results. We built a test platform using an enclosed front end of an Alpine with a rheostatically controlled movable electric motor with a tachometer and an installed Tiger radiator. We equipped the electric motor with a water pump pulley to which we could attach a variety of mechanical fans. Air flow rates were measured with a digital anemometer to quantify airflow of various configurations. The best airflow data on variables was the criteria used for in-car testing. Since it was improved airflow we were looking for, we could quickly rule out fans and set-ups that weren't in contention.

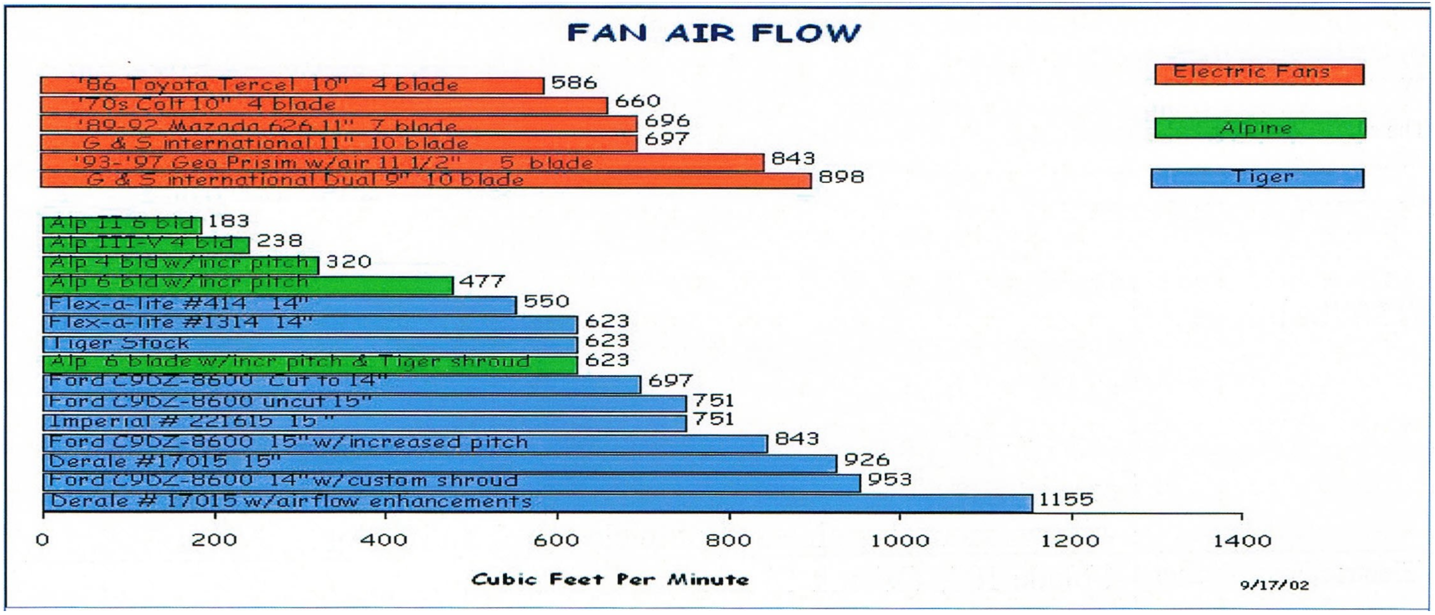
By the time-we finished our testing and improvements in 2003, Andy's Tiger was able to idle at a maximum temperature of 206F for over an hour on a 106F day, with no assist from the electric fan. We elected to shut the car off. We had achieved our objective.

The summary below represents the best cooling enhancements derived from hundreds of hours of measurements and reams of test data. The story of three summers of cooling testing with data summaries, performance plots and photos is available at

Summary of Best Cooling Enhancements

Engine Driven Fan (15")!!!!!!!!!!!	Derale #17015 Imperial #221615 (Increase pitch on blades symmetrically to with in 1/4 to 1/2" of fan belt. NOTE: NEVER reduce fan diameter to make fit. Fans may require careful repositioning of upper radiator hose and shimming engine higher with washers at engine mount to clear rack and pinion.
Electric Fans, Pusher	4 blade 10", (Mount 1" away from radiator) Use fans with 4 to 7 paddle type blades, not popular narrow turbine-like blades which are noisier and less efficient. Fans larger than 11" dia. have a detrimental effect at highway speeds. Connect to a thermostatically controlled switch.
Water Pump	Stock Vane type
Radiator	3 row brass VT Windsor core by Go/Dan industries. Use to re-core existing radiator. Griffin 11/4" or 11/2" Aluminum for complete bolt in radiator. Virtually all radiators performed well in these tests when airflow enhancements were incorporated.
Water Pump Pulley	'78-'82 6 cylinder Ford Fairmont & Mercury Zephyr, 5 3/16" diameter. 2 or 3 groove OK. Increases fan speed 12% above stock pulley.
Thermostat	Use at least 180F degree
Airflow enhancements	Block horn holes Remove brace in front of lower part of radiator. Air dam directly in front of cross-member and 2" below. Fan Shroud, stock —25% more airflow than no shroud Enclosed fan Shroud (metal on bottom of shroud completely encompasses blade) — additional 20-25% more air than stock shroud. Fan blade tips 3/4" from shroud edge Fan blades 1/2 to 3/4 outside of shroud (Move engine, water pump pulley, bend/trim shroud, Derale offset fan blade design helps a lot) Fan blade to radiator clearance, 1-1/8" @ 3 and 9 O-clock position

The following charts show the variables tested and the results of the air flow tests.



Variables Tested

Radiators Tested:

Stock
FX ProPrep/Wallace Single Pass (1-7/8")
Griffin (1-1/4")
Griffin (1-1/2")
Fluidyne, Triple Pass (2-1/4")
CX Core Triple Pass (1-7/8")
CX Core Single Pass (1-7/8")
Custom Dual Pass Aluminum
Hall Copper Brass W/ pressure equalizer
VT Windsor #128366 (2")

Water Pumps Tested:

Stock stamped steel paddle
Stock, vane
Milodon Hi Vol, #16230
Stewart Hi Vol Stage 1, #16

Pulleys Tested:

Stock: 5 7/8”
Ford Fairmount: 5 3/16” (12% speed increase)

Fans Tested:

Electric

10” dia, Summit equiv # SUM-G4910
12” dia, Perma-Cool # PRM-19008
Variety of OEM, “Junk Yard” specials

Engine Driven

Stock
Flex-a-lite #414
Flex-a-lite #1314
Imperial #221615
Derale #17015
Ford C9DZ-8600 14”
Ford C9DZ-8600 15”
Ford C9DZ-8600 15” increased pitch
Alpine 4 blade
Alpine 4 blade w/increased pitch
Alpine 6 blade
Alpine 6 blade w/increased pitch

Shrouds Tested:

Stock
Stock, enclosed
Custom fabricated from Taurus