Addendum to Tiger & Alpine Cooling Tales Are All Hot Air

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The following explanations, facts and plots provide supporting details for the article published in Tiger East/Alpines East Rootes Review and other marque newsletters.

The additional charts on this site illustrate some of the more significant variables we were able to quantify. Our intent is to show the more significant differences of the various variables we measured.

Our Appeal

We ran out of hot weather and our testing is incomplete. However, these tests have helped identify the key areas for improving cooling on a Tiger and Alpine as well. Building on the variety of information and experience gained, we can now focus on more specific objectives to improve cooling.

In the Summer of 2001, we are prepared to identify and quantify more specific improvements. We plan to test a variety of Fans/Radiators/Pulleys/Water pumps/Shrouds/Air restriction and ideas that you make available to us. The ideas can come any time. But we need the physical items for typically a couple of weeks in the heat of the summer so we can include them in our comparison test. We will do our best to coordinate testing with the availability of the components.

General Test Program Notes

1. Idle tests were run until engine temperature reached approximately 215 ° F, the point at which the fuel began to boil in the carburetor fuel bowl and affect the idle speed, AND/OR the temperature stabilized within one degree for three consecutive two minute measurement intervals.

Air Flow Enhancement

1. A Ford C9DZ-8600-A Maverick 6 cyl cut down to 14″ diameter was used for most of the testing. It is our opinion that the actual idle temperatures and times would have been lower and longer respectively throughout the tests if a more standard 15″ Maverick fan had been used. However the outcomes of the various tests clearly identify significant improvements even when using the 14″ fan.

2. An enclosed fan shroud fabricated from a Ford Taurus shroud was used for much of the testing in this test program while using a 14″ Maverick fan. Airflow testing shows an enclosed shroud does improve airflow through the radiator. Our enclosed shroud was not as deep (front to back) as a stock shroud. This provided an improved axial and radial position relationship with the fan blade over stock with respect to radiator/fan gap and blade tip and shroud edge. We also know that a 15″ fan can flow considerably more air than a 14″ fan. We ran out of hot weather and were not able to incorporate the enclosure principles into a stock shroud and test with a larger diameter 15″ fan. We are not providing data on this arrangement because the fabrication modifications of a stock shroud and performance measurements have not been completed.
3. Airflow testing of the Derale # 17015 fan indicated its performance was significantly superior to all other fans tested. Unfortunately we were unable to compare its performance at idle and interstate speeds

because the hot weather left us. We know it performs better and recommended it accordingly. We plan to quantify its performance in the summer of 2001.

4. The sheet metal brace located across the lower front of the radiator obstructs approximately 10% of the radiator surface area, about three rows of tubes. We recommend it be removed. We have done some testing without this brace obstructing the radiator. Our best results are without this brace in place. The addition of additional bracing and a deflector at the base of the radiator to the bottom of the valance are believed to offer improved cooling. However, we have not done a comparison test at idle or interstate speeds to quantify the effect. We plan to do a comparison test in the summer of 2001.
5. Engine compartment venting: Using streamers to identify air flow at idle, we observed large amounts of hot air EXITING the engine compartment and reentering the front of the radiator from two distinct sources. The openings in front of the horns and the gap between the radiator and crossmember.
   At highway speed the openings in front of the horns adversely effect cooling because air is forced to ENTER the engine compartment. Consequently air expelled from the radiator is reduced because it must compete with the additional volume of air to exit an already restricted engine compartment. Blocking the opening in front of the horns is a valid old time Tiger cooling improvement that should be first on the "To do" list.

Plot interpretation

These plots are intended to demonstrate specific issues as explained by comments with each plot. Values and differences shown on the plots are for reference purposes only. They indicate significant difference(s) or interactions between a given variable or variables as measured. The reader should not attempt to extrapolate data for any reason from a plot. There are significant testing factors that must be factored into the meaning of the data that may not be apparent to the reader. For this reason, the reader is encouraged to contact the authors for additional explanations or detailed test data used to create the plots. Our interpretation is provided for each plot. Of course, you may have some of your own……but be careful.

In general, the plots clearly show that there is no one fix for cooling a Tiger. Efficient cooling requires a balanced cooling system design related to water and air management. It is a common practice in the Tiger community to focus on radiators for improved cooling. Clearly, as evidenced from our results, radiators, high tech or Godzilla monster of any kind do not provide significant cooling improvement with out lots of airflow. Our studies support the need for improved airflow. Airflow is a complex process of interactions between the radiator, fan, shroud and overall body constraints. We have made strides in identifying key areas to improve and have noted them in this report.

Improved Tiger cooling can be expected over a stock cooling system when a variable shown on a plot that produced significant improvement is incorporated in a Tiger, but the magnitude may be different than that shown on the plot. Maximum cooling will be achieved when all the changes listed in the Summary of results are implemented.

Reminder

When evaluating your cars cooling performance, verify the temperature sending unit, instrument voltage regulator and gauge provide accurate results as a system before making decisions, bragging or complaining about effectiveness of your cooling system.

General Plot Notes

When reviewing the plots, keep the following in mind:

1. Many plots show only the upper portion of the temperature/time spectrum since the purpose is to only compare differences at the extremes (temperature and Time).
2. The test # provides traceability to detailed test data used to create plots.
3. Some plots have multiple variables with emphasis only on the most significant outcome. Remember,

each test measurement evaluated only one variable. The reader should contact the authors if additional interpretation is desired.

- Stock VS Air Flow Enhancements
- Interstate Driving LOOP Better Performers
- Interstate Driving LOOP
- RADIATOR Comparison
- FAN Comparison
  Flexlite 1314 VS Maverick
- Open/Closed Hood & Increased Air Flow VS Radiator Change
- Radiators VS Increased Air Flow
- Water Pump Pulley
  Stock VS ’81 Fairmont 6 cyl.
- Radiator / Crossmember Gap
- Redline Water Wetter
- Electric Fan Comparison

Variables Tested

Radiators

- Stock
- Griffin Single row Aluminum, Single pass (1 1/4″)
- Fluidyne, Single Row,Triple Pass (2″)
- FX Single Three Row Single Pass (1 7/8″)
- CX Core Four Row, Triple Pass (2″)
- CX Core, Four Row, SinglePass (2″)

Pumps

- Stock stamped steel paddle
- Milodon Hi Vol, #16230 (Fits Tiger but requires longer mounting bolts, causes fan to be closer to radiator than other pumps, inlet close to fan belt)
- Stewart Hi Vol Stage 1, #16103, Mfg. claims 41% incr. vol.

Pulleys

- Stock: 5 7/8″ Diameter
- About 1978 to 1982 Ford Fairmont 6 cyl: 5 3/16″ Diameter (Pump hub should be pressed on 1/8″ further than stock location. Pulley fits standard Ford 5/8″ shaft.. Pulley hole must be enlarged to 1″ if used on a stock Tiger water pump hub)

Stress cracks emanating from mounting holes on Tiger water pump pulley are becoming more common. The problem is acerbated by the addition of increased radial loads from alternators, air conditioning, etc. Reinforce the hub in this area or change to a Fairmont hub, which already has the proper reinforcement.

Shrouds

- Stock
- Custom, fully enclosed: Fabricated from “Junk Yard Dog” Ford Taurus by Chuck King

Fans: Electric

- 10″ dia, 4 blade, Summit equiv # SUM-G4910
- 12″ dia, 10 blade, Perma-Cool # PRM-19008
- Other “Junk Yard” specials (See airflow data)

Engine Driven
(After-market fans fit 5/8″ Ford water pump shaft. They require enlarging to 1″ if mounted on a stock Tiger water pump with a 1″ hub.)

Illustration 1: Alpine I & II Stock & Increased Pitch

- Stock Alpine I-II & increased pitch

- Stock AlpineV & increased pitch
- Stock Tiger
- Flex-a-lite #414 14″ diameter
- Flex-a-lite #1314 14″ Diameter
- Imperial #221615 15″
- Diameter
- Derale #17015 15″ Diameter
- Ford C9DZ-8600-A Maverick 6 cyl. Cut down to 14″ diameter

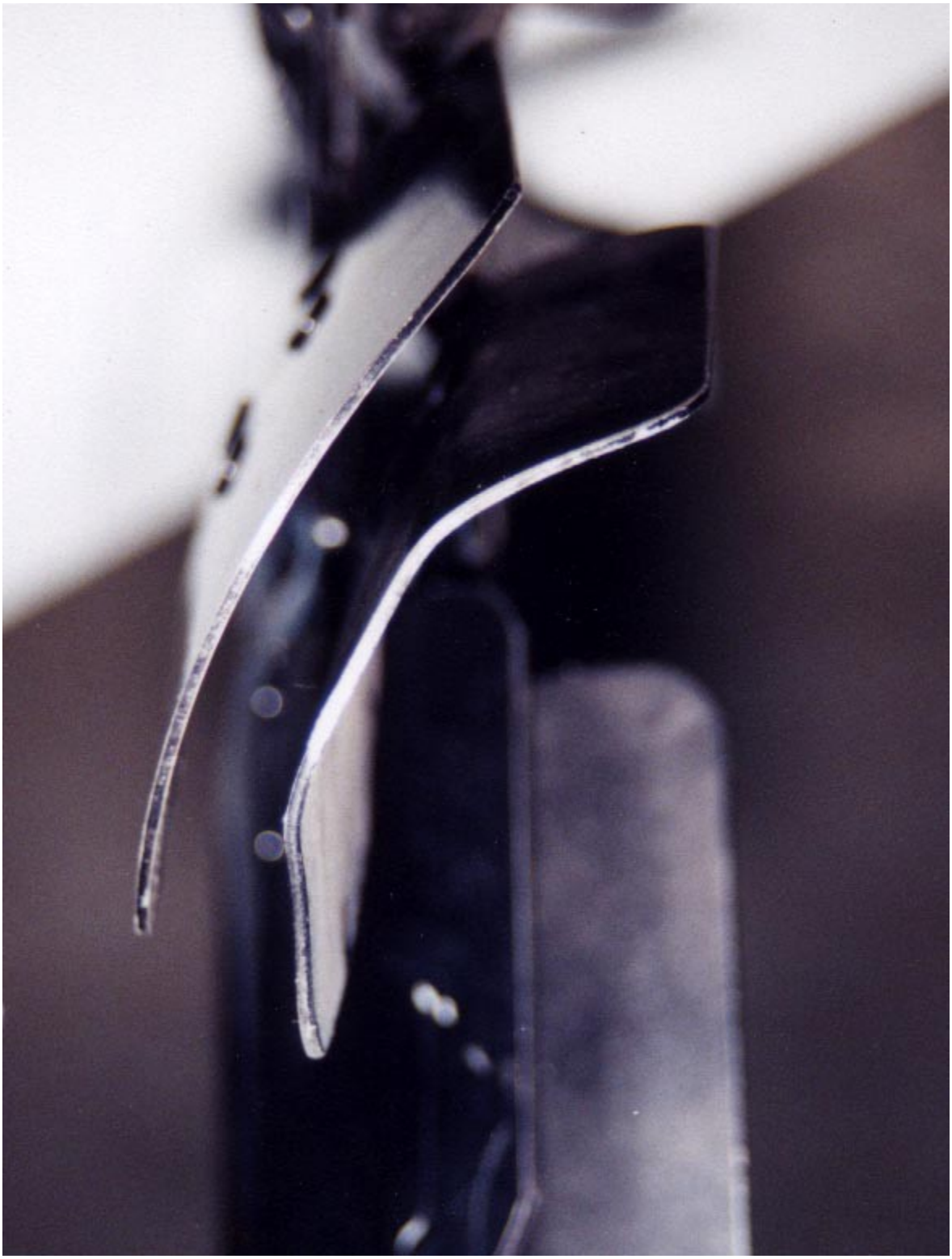

Illustration 2: Maverick 6 cyl stock & increased pitch

- Ford C9DZ-8600-A Maverick 6 cyl with increased pitch