eventually. The right hose is indeed worth the search. I know of one highly regarded operation that managed to burn down three engines in a row before the much-maligned (and innocent) engine builder found the severely underbent and collapsed water hose at the bottom of one of the radiators (it WAS hidden by a side pod, but that is a feeble excuse). Pity that no one was present with a tape recorder. . . . If I have any doubts at all I insert a light coil spring in the hose, especially if it happens to be on the suction side.

I religiously replace even the best molded hose at the midpoint of each season, or when they start to feel the least bit "mushy." If I were building my own cars I would still bend the tubes and use Gates Green Stripe.

(2) Because I sincerely dislike burns on my body I use Stant brand lever-releasing pressure caps in the 14-15 psi range. I don't use more system pressure because:

(a) The caps are hard to find.

(b) We don't need higher pressures anymore; the POM's have reversed their historic trends and the typical English kit car now overcools.

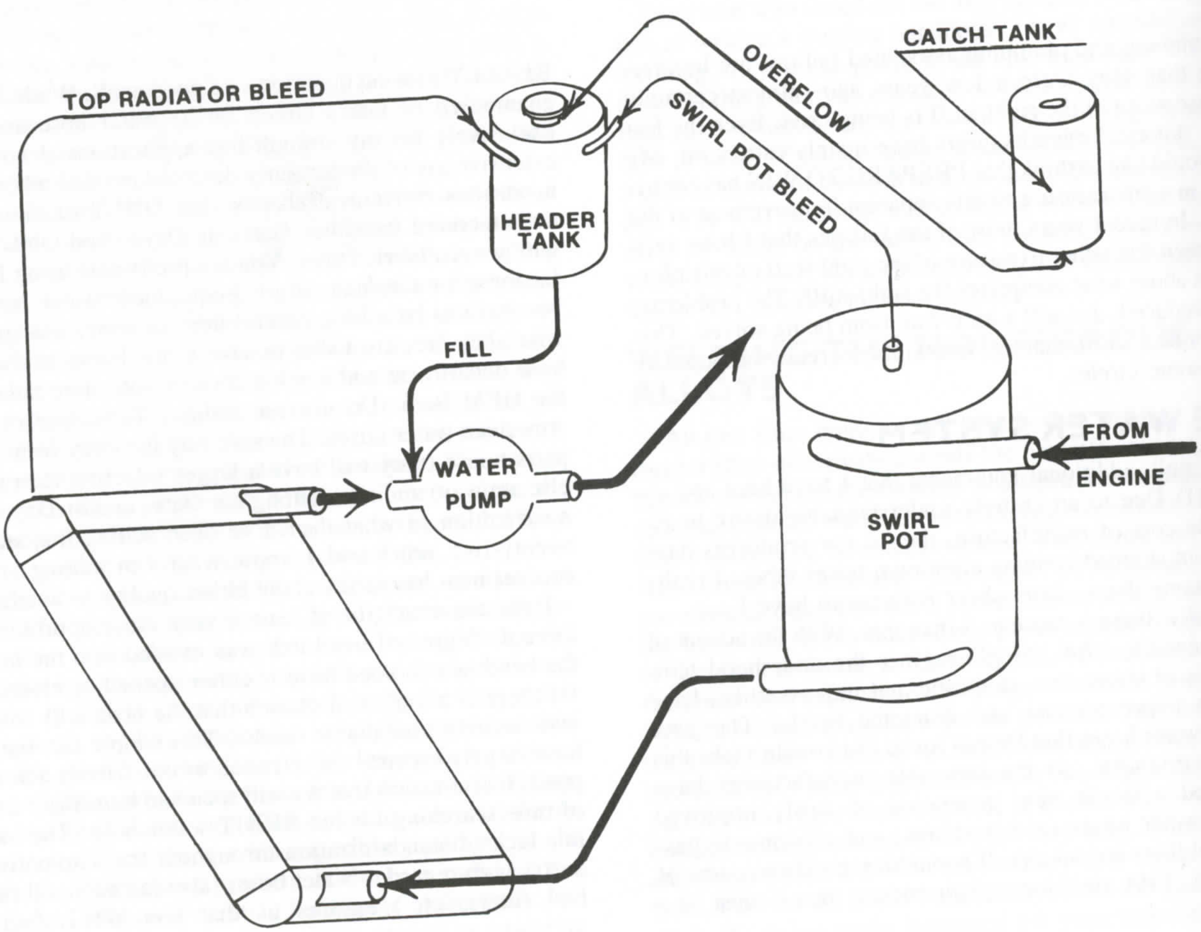
Instead of safety wiring the pressure cap I now use a small lock pin through the lip to make sure that it doesn't loosen.

(3) I still consider the water system de-aerating swirl pot (as described in PREPARE TO WIN) to be an absolute necessity on any racing car. Thanks to a tip from Alan McCall (clever man!) I now make them considerably larger than I used to (½ gallon minimum). The big one can save you when a head gasket begins to weep.

(4) I run a lot of block pressure, usually by means of a venturi-shaped restricter where the water exits the engine. This goes a long way toward the prevention of hot spots and attendant steam pockets in the cylinder head. I have also taken to running a SMALL line from the bottom of the header tank to the inlet side of the water pump, just to make very sure that there is always a positive head of water at the inlet of the pump to prevent cavitation. I strongly prefer to make the header tank noncirculating as shown in FIGURE [184].

In this case I run a good sized hose (say, dash 10 or dash 12) to the inlet of the pump simply to facilitate the filling

Figure (184): Water system schematic.



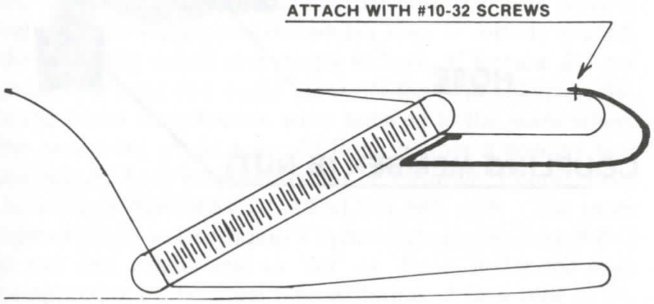
of the system. If, for whatever reason, the header tank is a part of the coolant circulating system then the size of this line must be severely restricted (say ¼'' ID) in order to prevent any sizeable portion of the coolant from following the path of least resistance from the header tank to the water pump, bypassing the radiator(s) entirely. Don't laugh—I have seen cars delivered from ''the works'' with just such a system (and, no, it didn't work).

(5) Most engines (and particularly Cosworths) like to run at about 90-95 degrees C water temperature. They were designed to run there; they will make more power there and they will last longer there—it is all a question of running clearances and cooling efficiency. This means that either we should run thermostats (which I am seldom brave enough to do) or that we should sometimes restrict the flow of air to our water radiator(s). The normal method of doing so with duct tape is ok for warming up but dumb to practice and qualify with. (No one tapes radiators for the race—we would all prefer to give up a little power in return for some excess cooling capacity in case of trouble.) We spend our lives and our money trying desperately to reduce aerodynamic drag and then we go out with an aerodynamic brick wall installed in the cooler duct—real smart!

Instead, form a piece of sheet aluminum into a radiused duct area and cooler restricter as shown by FIGURE [185]. Do not alter the flow of air into the ground effect tunnel(s) if any. Remember that, in order to do its job , the restricter must block off part of the cooler as well as part of the duct. Make very sure that your artistic addition cannot chafe the cooler. If nothing else, it will look as if you are trying. I attach mine with either nut plates or Riv-Nuts.

As for those people who try to reduce drag by directing the air ABOVE the cooling ducts in their side pods when they don't need one radiator (or the oil cooler)—one more time we are watching ignorance at work. They are actually INCREASING the total aerodynamic drag of the vehicle. In this situation, if you are worried about cooler drag, the right thing to do is to remove the cooler and close in the gaps in the duct floor and ceiling where it was, WHILE LEAVING THE DUCT ITSELF ALONE.

Figure (185): Low drag cooler/cooler duct restrictor.



(6) Lately I have run across a few people who no longer believe that it is necessary to bleed the top(s) of the radiator(s) back to the header tank. These worthies claim that if the cooling system is properly designed and bled there can be no bubbles, and that a running bleed is therefore unnecessary. I wonder how they feel about the requirement for dual-ignition systems in piston aircraft engines. Since I am all too aware that head gaskets DO develop seeps from time to time—AND that when an engine is changed in a flaming hurry it is possible that the water system will not be properly bled—I will continue to take the time, spend the money and cheerfully accept the minimal weight penalty entailed in making the water system self bleeding. I use dash 4 hose because dash 3 is too liable to clog with trash or make the bars leak and I blow through the lines on a daily basis to make sure that they are clear.

(7) Modine and Tyndall both market all-aluminum racing radiators. Harrison makes aluminum radiators in various configurations for Corvettes. All three are good units. Size for size there is no measurable difference in thermal efficiency between them. The Modine unit is the strongest, the Tyndall is both lightest and cheapest (by a lot). All are reasonably easy to modify. Those who tell you that the traditional copper/brass radiator is thermally more efficient than an aluminum radiator are correct—on an absolute basis. On a BTU per pound of cooling system basis, however, aluminum wins. Given a choice, I run aluminum every time.

(8) Vee belts do a very good job of driving the water pumps on street cars. They (and their pulleys) are cheap, adjustable, easy to obtain or replace and they work—at street-car-engine rpm. Any attempt to drive the water pump of a racing engine with the stock setup is an invitation to disaster. Except for Show Room Stock classes, the racing engine is going to use a lot more rpm than the street engine. The stock belt and pulley setup was carefully designed to drive the water pump at its optimum speed at an engine rpm corresponding to a road speed of about 65 mph in high gear, and for the belt not to come off the pulleys at whatever maximum rpm the engineers at the factory thought that the engine might see—usually far short of racing rpm. What usually happens is that the overspeeded belt literally turns itself inside out; it jumps off the pulley and the water pump stops. Alternatively, the water pump, if it is not slowed down by the installation of an appropriately larger driven pulley, may well cavitate at racing rpm and then the engine will overheat even if the belt does stay on. Most racing engines drive the water pump with a toothed Gilmer belt and cog wheel pulleys. These offer a virtually unlimited choice of drive ratios, and are light, efficient and expensive. Fortunately Dayco had a lot of experience in stock car racing in the days when NASCAR regulations insisted on vee belts. They developed a series of belts that WILL NOT turn themselves inside out. They are no longer specifically designated as racing belts but they have a black-and-white checkered flag type emblem both on the wrapper and on the