## COOLING WATER SYSTEM GREMLINS

Mort Goldman, T-30 #136, *Valium*, November 1995*

Intermittent — and seemingly random — occurrences of reduced seawater flow over the past few weeks had finally led from examining the usual causes, such as a bad impeller or slipping pump fan belt (neither guilty), to a somewhat more intensive search for the cause.

Concerned about possible blockage of the through-hull inlet fitting (which is not screened), I introduced the dock pressure water line successively through the disconnected pump inlet and then outlet hoses to ensure there were no blockages. The outlet hose rinse-out was a mistake — without the engine running exhaust gas out the manifold and muffler, enough water remained in the manifold to require an hour and a half of work drying out the manifold and cylinders before I could restart the engine.

The low water flow problem still remained — so the next step was to remove the outlet hose from the pump to see if the water was leaving the pump itself. Not much appeared. Next, the outlet pipe elbow fitting was removed, and it revealed an impeller blade wedged in the corner of the fitting. But the impeller blade was of a different color and material than the current or previous impellers — so it had been floating around the cooling system for at least three years, but where it had been hiding, I don't know!

Reconnecting the system showed that removing the blockage had only marginally improved the seawater flow — so on to the next step, removing the pump cover plate to observe the impeller turning. Although the pump pulley was turning, the impeller *wasn't!* The guilty part turned out to be a loosened set-screw holding the pulley wheel to the pumpshaft. Once that was tightened on the shaft flat, everything worked as it should — at least until the next time something else goes wrong.

*Mort has provided an excellent example of a point made very strongly by our engine mechanic in one of his seminars: If you inspect your water pump impeller and discover that one of its blades is missing,* ***then you must find it!*** *— ed.*

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## COOLING SYSTEM EMERGENCY FIX

Mort Goldman, T-30 #136, *Valium*, June 1994*

During this spring's recommissioning, I reconnected the cooling water intake hose to the through-hull valve and turned the handle to open the gate valve. Upon starting the fresh-water-cooled engine (the Atomic 4 took off almost immediately, after a three-month shutdown), I checked the exhaust flow, saw only smoke and steam coming out, and shut down the engine. I discovered that the gate valve was frozen closed, and the valve stem sheared — the handle turned forever with no valve stem movement. This exercise confirmed the importance of always doing an eyeball check on cooling water discharge flow — and led me to arrange for a tow to the yard at Herrington Harbour North for an earlier-than-planned haul to have the valve replaced (and the bottom painted concurrently).

We visited briefly with former T-30 owners Juan and Sue Perez, working on their newly-acquired Henri Waquiez 35 *Andante* (a gorgeous boat!) at Herrington Harbor South, and mentioned in passing my just-discovered problem. The following day, I received a call from Juan, who said he had been thinking of the frozen valve, and alternatives for getting cooling water to the engine, and suggested that I look at the feasibility of re-routing the hose from the head intake valve to the engine salt water cooling pump. The idea was great, and to insure reaching the pump I took along a 5/8" pipe nipple and hose clamps to allow joining the head and engine hoses if the additional length was needed. Re-routing the head hose was easy, and it just reached the cooling water pump inlet fitting (did Tartan design it that way???). The only concern was about the potential for collapse of the unreinforced, relatively soft hose under the engine pump suction. However, starting the engine demonstrated a good flow of water out the exhaust, and the tow arrangement was cancelled.

During the trip to the yard for haulout, the engine temperature stayed within its recent acceptable-but-warmer-than-desirable range under load. The engine temperature condition had been the subject of a lot of effort over the past two years, including cleanouts of both the fresh and salt-water sides, pump impeller replacements, and the use of synthetic motor oil. On the return trip, with a new ball valve and reinforced intake hose on the engine (and head) lines, the exhaust discharge flow was much greater than we had ever seen before, and the engine temperature stayed at or below 180° at full load. It seems clear that my engine overheating problem was created by the restrictions in the salt-water intake line caused by the gate-valve and possibly in the old reinforced (but soft) hose. Thanks to Juan.

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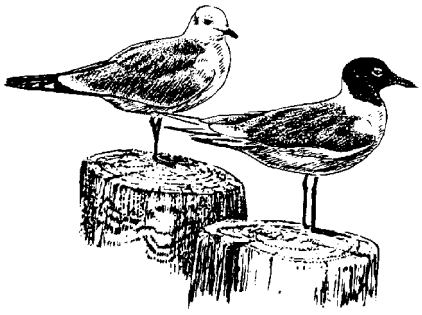
## MORE ON ATOMIC FOUR COOLING

Don Heaton, T-30 #221, *Elixir,* May 1992*

*Elixir's* engine never overheated badly, but near the end of the 1989 season it began running hotter than it should, swinging between 160° and 180-plus °F under fairly heavy load. After hauling her for the winter at the Navy Yard, we set about finding the cause behind these symptoms. First we cleaned, then tested the thermostat in a pot of water on the kitchen stove. According to Ellen's candy thermometer (she wasn't thrilled) it opened fully at about 140°F, which is normal. However, we found the exit from the thermostat cap nearly closed by a thick, black deposit. Next we removed the water pump end plate. One vane of the impeller, which had undoubtedly been in the engine since it was installed in 1974, had torn off and was lodged in the pump outlet. Either of these discoveries could have caused the overheating we had experienced. We cleaned the thermostat exit and replaced the faulty impeller with one I found in the spares kit I inherited from the former owner in 1981, who undoubtedly inherited it from the original owner. So it had probably been bought in 1974. However, the impeller, along with a replacement bearing, was sealed in plastic on a card and looked fine, so I used both.

As I recall, we had no trouble installing the new impeller on its shaft, but the bearing was another matter. It probably was meant to be forced onto the shaft with a drill press. However, it was Sunday. We didn't have a drill press handy. So we improvised. First we drove the bearing onto the shaft until it was flush with the end of the shaft using a hammer and a piece of wood against the bearing to protect it. So far, so good. Next we had to drive the bearing down the shaft to its seat without damaging it. For this we used a short length of standard brass pipe I happened to have aboard — I think it was ½ inch I.D. Anyway, it fit around the shaft and transferred the force of the hammer blows evenly around the inner race of the bearing. Once in position, the bearing seemed none the worse for our hammering, and the assembled pump pumped coolant O.K. So we assumed our problem was solved.

The next summer (1990) the engine initially ran at a steady 160°F, just where we wanted it, but by late August the temperature gage was again oscillating between 160° and 180°F. During winterization that fall came a giveaway clue. At idle speed the pump would not circulate liquid through the coolant loop we use for winterizing the cooling system, but at least some came through when we revved up the engine. Given that we had a new impeller, clearly we had partial blockage somewhere in the loop downstream of the pump.



By the way, our "winterizing loop" consists of the following. Coolant in a bucket resting on the cabin sole next to the engine is sucked into the pump through a short length of garden hose which terminates in a female fitting. For winterizing, this fitting is attached to a male fitting on a gate valve which is permanently installed in the boat for this purpose. With the gate valve open, coolant can flow from the bucket through the valve into a pipe tee and thence to the pump inlet. The hose from the cooling water intake seacock is clamped to the other side of the tee. When winterizing, we of course close the seacock so the pump draws coolant from the bucket, not air through the seacock (boat out of the water). From the pump, coolant goes through the engine and exhaust manifold cooling passages and out the exit elbow, to which a second short hose has been clamped (in place of the hose to the water lift muffler) to return the coolant

to the bucket. We run the engine with each of a successions of fluids until the temperature gage reads 180°F to ensure that the thermostat has opened and the fluid is circulating through the entire loop. Our succession of fluids starts with a single-part radiator cleaner, followed by flushing water, and finally by a 50/50 mixture of water and an ethylene glycol antifreeze such as Prestone. When the antifreeze mixture reaches 180°F, we stop the engine, reattach the muffler hose, restart the engine and blow the mixture in our bucket through the whole system including the muffler, in the process coating all cooling passages with the rust inhibitor in the antifreeze mix. Any pools of the mixture left in the system stay there all winter.

Now, back to our conclusion that we had to look for a zone of partial clogging. First I called my old friend Dick Vosbury (local Atomic 4 guru in Annapolis). He advised me to clean out the cooling passages in the engine and the exhaust manifold. So we removed the cover on the right side of the engine, exposing the cooling passages around the cylinders, where we found liberal deposits of gunk. These we scraped loose as best we could with wires, putty knife, etc., and washed out the residue with a garden hose at full pressure. We made a mess of the cabin near the engine, but all cushions, carpet, etc. were out of the boat so we simply hosed everything into the bilge. This left the head and the exhaust manifold as additional sites for blockage. We checked the exhaust manifold first. We tried to remove the ends of the manifold to gain access for wires, etc., but the studs were frozen. We could not budge them. Then we removed the hose from the inlet elbow. It was full of a thick, gooey black stuff. Next problem, how to get rid of the gooey black stuff?

As a do-it-yourself home owner of long standing, liquid Drano came to mind. I called Dick Vosbury again. He said that Drano wouldn't hurt the manifold and might do the trick. It did, and this is how we went about it. We clamped about a 4½ foot length of garden hose onto the inlet elbow to the manifold cooling passages, and another onto the exit elbow in place of the hose to the muffler. The free ends of these hoses were fitted with female garden hose connectors and both were held in a vertical position by tying the free ends to a board propped against the engine. Using a funnel, we poured full strength Drano down the inlet hose, then topped it off as the head of fluid in this hose forced the gunk in the manifold cooling passages a little way up the exit hose. We then let it stand like that for a little more than the half-hour called for on the Drano bottle for cleaning house drains. We then fastened a hose from the marina water supply to the length of hose into which we had poured the Drano, lowered the upper end of the other hose (clamped to the exit elbow) into the bilge, and turned on the marina water full force. In no time the water gushing into the bilge was running perfectly clear. Then, for good measure, we back-flushed the system by introducing Drano into the exit hose, letting it stand for another half-hour, then blowing it out the inlet hose into the bilge. As a bonus result, the stuff in the bilge made excellent bilge cleaner. We pumped it out with the bilge pump and then rinsed the bilge with fresh water. The next spring I had the boat surveyed because I was changing to a different insurance company, and the surveyor said that I had the cleanest bilge he had ever seen!

Since this treatment the engine has run steadily at 160°F or a little cooler, and last fall fluid passed freely through the entire system at idle engine speed during winterization. It looks like we may have the cooling problems licked.

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