CRAFTSMAN'S CORNER

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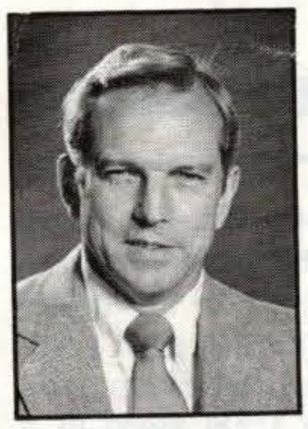

COLOR THEM COOL!

Colors have quite an impact on the way we see things. If you paint small, slender things, like engine mounts, black, they look stronger or bulkier than if they were painted white. However, for most of us, excessive heat is a problem in aircraft and aircraft engines, and cool temperatures, rather than appearances, is what we are shooting for.

One of the things most of us are aware of is that there is a lot of air flow through the cowling when you are moving fast. At a stop or slower speeds, things are hot. We can have an under cowl temperature of 175 degrees F or higher when the engine is turned off and the airplane is standing in the sun. An engine ingesting warm air will be down on power by more than you might imagine. Assuming the outside air temperature is 70 degrees F and the in-cowl temperature is 150 degrees F, if the engine produces 150 hp at 150 degrees F inlet temperature, it can be expected to produce 161 hp with 70 degrees F air inlet temperature. The density increase afforded by using outside cool air is considerable. Also, the hotter the fuel charge before ignition, the faster it burns, therefore requiring less spark advance. The speed of any chemical reaction is doubled by a temperature increase of 18 degrees F, so it is easy to see that the temperature of inlet air can have a significant effect, particularly on air cooled engines.

Many of us like to chrome our valve covers, but these valve covers are an integral part of the oil cooling process. Because they are always internally bathed in a thin film of oil, they can aid in cooling the engine if you use non-chrome covers painted flat black. It is not as pretty, but more effective in cooling. The ALCOA Engineering Handbook compares an "as cast" surface with one which has been black anodized to a depth of 1/7000". The black surface is more than 10 times better in heat radiating ability than a plain cast surface. We would like to have the engine rejecting heat as much as possible from the cylinder head area, and have this carried away from the cowling and not ingested into the carburetor intake.

In summary, for engines we need to copy the old time engine builders who put lamp black over the entire engine to assist in heat rejection. We won't use lamp black, but we have many modern day flat black paints that would be a great help on valve covers, cylinder heads and crankcases to help us reject heat.

The exhaust stacks put out a lot of heat, and it would be better if this heat were not contained inside the cowl. One way to do this is to apply a spray-on ceramic coating. If you want to contain the heat and hopefully have it go out with the exhaust, you can use a white coating. One big advantage of this is that plain carbon or mild steel exhaust stacks can be kept from rusting for a long period of time. Technical Counselor Dick Finch of Titusville, FL recommends VHT brand, and says he spray painted his Luscombe AD mild steel exhaust with 120 degree F high temperature white ceramic coating and one year later it looked almost as good as the day it was first coated. He says, "Beginning in 1963, I coated my race car exhaust pipes with this space age material, and the coating helped the mild steel exhaust pipes last over 10 times longer than if the pipes had been left bare." This paint is usually applied to a lightly sandblasted or sandpapered clean pipe. You can apply a thicker coat if the pipes are 125 to 200 degrees F temperature before coating. Just lay the pipes out in the hot sun and they will be just right for coating. He usually sprays on three or four coats, drying each coat with the heat from an open flamed gas heater in his workshop. The manufacturer of the coating recommends curing the last coat with a blow torch! If you don't heat cure the exhaust pipes prior to installation on your engine, you will chip and scratch the coating. Once the engine is started and run for 15 minutes, the coating is completely cured and should last for 5-10 years. This keeps a great deal of the heat where you want it — inside the exhaust tubes and going out the exhaust stack — lengthening the life of the exhaust system and making the exhaust look 100% better at the same time!

The airplanes surface can benefit from the coolness obtained by a gloss white or light color external surface. This is particularly effective on fiberglass surfaces. However, heat is an enemy of practically all aircraft structures, as far as strength and longevity goes. The accompanying color curve sheet compares peak surface temperature vs. ambient air temperature for various colors.

On fiberglass airplanes, where we are trying to get heat from getting to the interior and keep the surface temperature down, the lighter colors would be an excellent idea. Orange and yellow are excellent safety colors, but yellow is far and away the best choice to keep the surface temperature down and keep the strength up.

So for airframes and engines — color them cool!