

Background

TCP Concentrate is a lead scavenger that is effective in reducing spark plug fouling and other harmful effects from the antiknock additive, tetraethyl lead, that is in all aviation gasolines. TCP was first introduced for this application over 25 years ago and it has been in use to varying degrees ever since. The most dramatic use of TCP was for the B-36, our last long-range piston engine bomber (R-4360 engines). Without TCP, it has been said this aircraft could not have reached its long-range potential.

When TCP was introduced as an AvGas additive, it was quickly approved by the engine manufacturers who needed a solution to the lead digestion problem. This included Pratt & Whitney, Wright Aeronautical, and Air Cooled Motors (Franklin). Although TCP has not yet been approved by Continental and Lycoming it has been approved for these two makes of engines by the FAA, thereby making its use therein legal.

To explain the benefits of ALCOR TCP Concentrate, the following quote was taken from a text, "*Aviation Fuels*," by Maxwell Smith.

"Of these, tricresyl phosphate TCP was found to be the most effective in minimizing all three types of spark plug fouling. Very extensive bench and flight engine tests were conducted over a period of years to prove its effectiveness and disprove any side effects.

"The effectiveness of TCP in reducing plug failures is due to several factors. The deposits formed are softer in texture and less tenacious, so that they are more readily

blown out of the combustion chamber during the exhaust stroke. The deposits themselves have a higher electrical resistance and are less corrosive — which means less spark plug gap growth."

As to service experience, the following quotes are from the literature:

"In the B-36 tests there was a 70 to 90 per cent reduction in spark plug fouling; i.e., unscheduled removal rate."

"In the R-2800 F8F fighter aircraft, the figures were roughly the same as in the B-36. A high fouling rate was experienced in training operations and TCP reduced it about 90 per cent. It is significant that in the same calendar period aircraft operating on TCP fuel showed 20 to 23 per cent more flying time than did aircraft using regular fuel."

"...the incident rate of spark plug fouling is directly related to the concentration of tetra-ethyl lead ... the only agent that we have found to be effective in reducing the metallic lead concentration is TCP. As yet we have seen no evidence of detrimental effects of TCP on the engine. (Quote of a major engine manufacturer.)

"Periods of about 50 — 100 hours between cleaning have been obtained with TCP, but previously they were fouling between 10 — 15 hours." (helicopters)

"The most noticeable effect of the additive (TCP) was the greatly improved condition of the exhaust valve, which was almost free from the corrosive pitting observed after running on the normal fuel." (Full-scale, single-cylinder Rolls-Royce aircraft engine test by Thornton Research Center)

Recent Experience

Reports from ALCOR customers with Continental and Lycoming engines confirm the above background experience. Our most extensive report is from Embry-Riddle Aeronautical University, one of the world's largest flight schools. To quote from the October 15, 1977 issue of *The Aviation Consumer*, "ERAU also released last month the official report describing how TCP fuel additive reduced its plug-fouling problems by a factor of four. Like almost everyone else, ERAU suffered mightily from fouled plugs and sticking valves as a result of using 100 LL fuel in engines designed for 80 octane. The University's Wallace Research Center ran comparative tests of nine 80-octane Cessna Skyhawks burning 100 LL fuel with TCP and nine without. Among the conclusions of the 10,000-hour test:

"The ignition discrepancy rate for the control group of aircraft ranged from three to five times the rate for the TCP-fueled aircraft . . . the test has proven that the anti-fouling properties of TCP fuel additive are effective. The use of TCP treated fuel did not produce any detrimental

effects on engine components. On the contrary, there has been a definite reduction in the accumulation of deposits and sludge in the engines thus far disassembled for either overhaul or top overhaul. There is some evidence of the TCP actually cleaning out previously accumulated deposits from the standard 100LL fuel used prior to running on the TCP fuel. Engine areas examined included the rocker boxes, cylinder heads, valve and valve guides, piston heads, piston pin and piston ring areas, and intake and exhaust ports."

"The report concluded, 'Based on the test data to date, the use of TCP as a fuel additive can safely be recommended for use in nonsupercharged air-cooled aviation engines.'"

In addition to the Embry-Riddle tests, another program was conducted by PSA/TCA using Beech Barons, to determine the benefits of using TCP in 100 octane-rated engines. The result — "TCP is a definite help as we tripled the time between plug changes!"