MORE POWER FOR THE POWERFUL

MC-70

A TECHNICAL REPORT ON MODIFICATION PROCEDURES



Stock MC-70. It may look pale without its familiar yellow coat, but it doesn't run that way.

pense we can hardly avoid one obvious sore spot — the initial cost of the MC-70. Here we can only leave the scene in favor of those who care to debate the rising costs of equipping a B-C kart. And our sole comment won't improve the picture at all, to wit: if you're thinking of boring out a MC-40 and adding a MC-70 crank to beat the cost of a new pair of engines, don't, it just isn't worth it. True, with some considerable hogging out of the 40 case the 70 crank will fit, but the added .100 inch per side added swing will only add more heat problems to an already over loaded engine. Either go whole hog and buy the new MC-70 or be prepared to watch them go by. If you decide to splurge there are several modifications which are worth considering.

The principle modification is to convert your MC-70 to 9-port intake (McCulloch kart engines have 3 intake or transfer ports on each side of the block, giving a total of 6 intake ports in standard configuration). The extra 3 ports are gained by raising the level of the third ports. Before proceeding to detail this operation we must add a word of caution: this is definitely *not* a modification that should be done by hand with a drill and a rotary file. If you don't have machine equipment then have the work done for you by a competent shop.

To avoid any confusion and subsequent errors we have cut a stock MC-70 cylinder unit in half (slightly off-center) to clearly illustrate the areas to be worked on and the modifications to be made (Fig. 2). The first task is to raise the height of the three third ports. This may be done in one of two ways: (1) by raising each port individually as shown in Fig. 3 or (2) by raising the port level and making a single window port as shown in Fig. 4. The "traditional" method would call for raising each port individually, but our preference is for the single window port as it is much easier to cut one port than 3 and the angularity is much more uniform. The width of the single port should not exceed that of the exhaust port. Also, the roof or top angle of this port is quite critical. Bear in mind that any port controls not only the timing and amount of air flow but also directs the inflowing air current. The principal expected gain of this port is to sweep the back (third port) wall which is normally a rather "blind" area and thereby increase scavenging efficiency. To do this the incoming charge through these new intake ports must be directed up this back wall and this means a very sharp or steep roof angle. There is, of course, a limit to how close we can approach the perpendicular and here we suggest that the roof angle be a minimum of 65 degrees to a maximum of 70 degrees as measured from the horizontal (or crank centerline). Throughout this porting operation one other specification must be closely adhered to: the top level of the added port(s) must be below the level of the original intake or transfer ports by 2-3 degrees of crank angle. In other words, as the piston descends in the cylinder the original transfer ports must be uncovered before the new port area is opened. This permits the initial direction of the scavenging "loop" to be set up before introducing the flow effect from the new port area. In this way all intake ports work together and their combined effect gives an improved engine scavenging. Should this new port area be cut up to or above the level of the original transfer ports the net effect will be a loss of power as the separate inflow currents will be working out of phase with each other and also, a loss in the amount of blow down time will occur.

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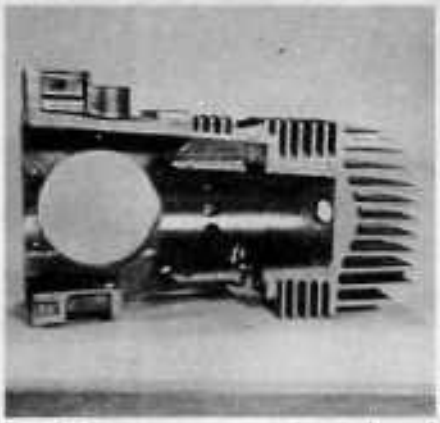


Fig. 1. Close-up cross sectional view of MC-70 cylinder wall showing grooves in cast iron liner. Practical determination of usable wall thickness is the minimum dimension of groove.

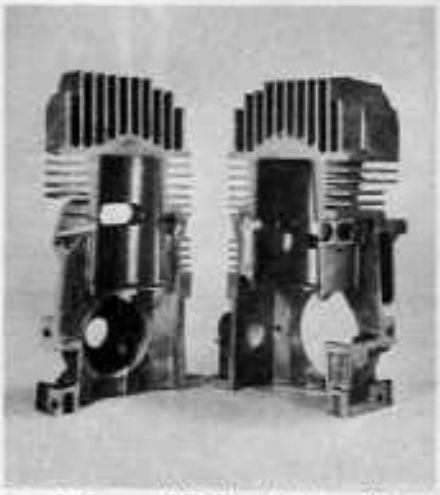


Fig. 2. A new MC-70 cylinder unit has been cut apart to show details of port modification and relief areas.

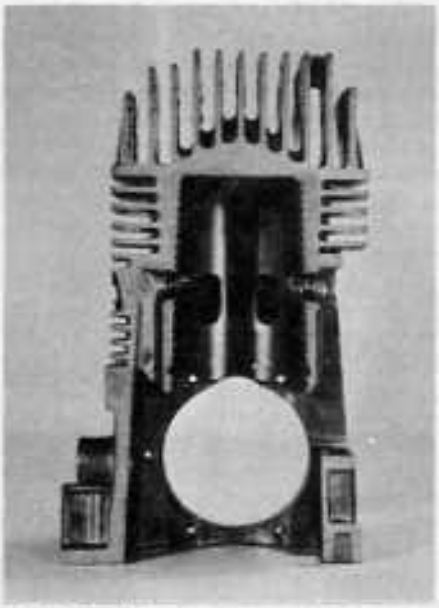
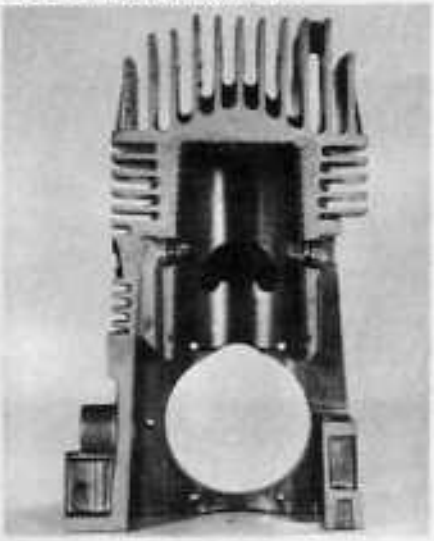


Fig. 3. Traditional or conventional method of cutting new ports calls for series porting — hence the term, "9-port configuration."

Fig. 4. Preferred method of converting standard 6-port engine into 9-port engine would be to make one single window port rather than 3 series ports as shown in Fig. 3. Even though intake ports number only 7 in this arrangement, the modification is still referred to as a 9-port conversion.



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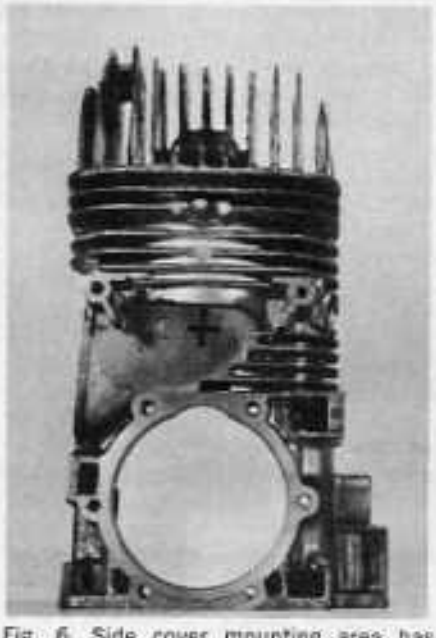
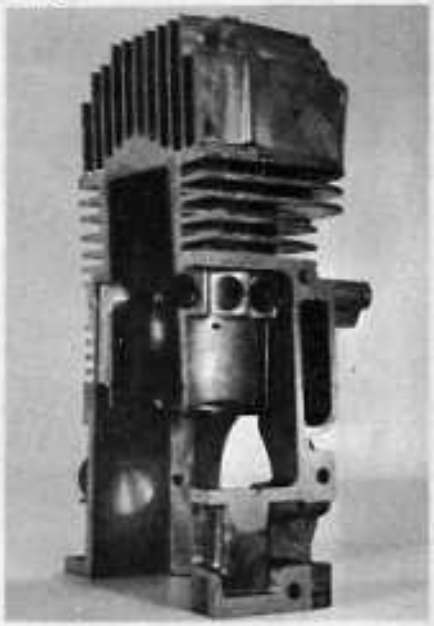


Fig. 6. Side cover mounting area has been noted to permit entry of long stroke crank even on MC-70 engine. This same relief must be made on earlier engines for conversion to 70 crankshaft.

Fig. 5. Area to be cut away in third port web is shaded in black. Note relieved areas in case to permit wide crank swing.



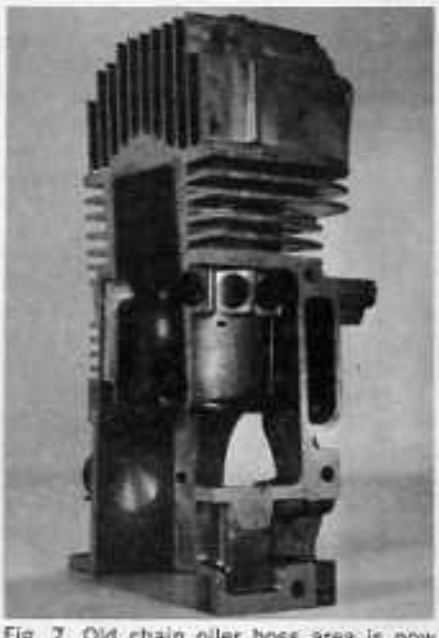


Fig. 7. Old chain oiler boss area is now relieved for crank throw. This relief must also be duplicated on earlier engines for installation of MC-70 crank such a conversion is not recommended.

Having now converted the third ports into transfer ports it is necessary to feed them directly from the crankcase in order to take advantage of the crankcase compression charge which is needed to give impetus or push to the air/fuel mixture going through the new port area. This is accomplished by simply cutting through the web area (Fig. 5) that separates the crankcase and third port intake areas. The web may be partially cut away as shown or completely removed. In either case the original third port intake area from the carburetor must be blocked off to prevent the crankcase charge from going back out the manifold and carburetor rather than into the new port area. At this point it is likely that many two-stroke mechanics, recalling that much of the efficiency of McCulloch engines being attributed to the third port arrangement, will have some question as to advisability or doing away with this arrangement. Actually, the point is well taken and at this stage in the modification our engine has been (1) equipped with almost one-third more transfer port area which means a corresponding increase of demand on the necessary crankcase volume and (2) deprived of the third port area which was designed and operates to assure adequate crankcase charge. To offset this dual disadvantage it will be necessary to insure adequate intake area to the crankcase. This, quite simply, means more carburetion area. In past instances it will be noted that we have commented critically on over-carburetion tendencies, particularly with regard to low and middle rpm range efficiency. With this modification we must reverse our position with some definite recommendations. First, dual carburetors are the *minimum* carburetion requirement and they should be located separately — one feeding the normal crankcase intake area and the other feeding through the bottom or stuffer area. Let's make this point quite clear: our recommendation to separate the carburetors does not stand as an objection to running the carburetors together in the same intake area (be it either top or bottom) but rather to the fact that many dual manifolds do not have adequate passageways and tend to impede the air flow. Obviously, this objection does not apply to a few of the bottom or stuffer mounted dual manifolds which have quite adequate flow areas throughout. Second, the separate carburetor arrangement is favored as many karters will wish to experiment with a three carburetor setup which will necessitate separate locations using a dual and one single. With the three carburetor arrangement, the location of the dual unit is not important performance-wise and become largely a matter of convenience for location and hookup. Our personal preference is to bottom mounted duals with a sloper-mounted top single carb. And while the inherent tuning problems of triple carbs still holds (unfortunately), tests have shown that this arrangement definitely does not tend to over-carburete the engine with the 9-port modifications.

There are two methods for cutting the 9-port modification. The first is to go through the exhaust with an end mill or rotary cutter and the second is to cut a section out of the outer third port wall through which a rotary cutter may be inserted to cut through the cylinder wall. The first operation, owing to the far reach is definitely a machine operation but is reasonably quick and doesn't require cutting an extra or entry hole into the case. The second operation, however, permits closer and easier access to the port area and may, if necessary, be done by hand. For this reason the second method may be preferred by the do-it-yourselfer even though it does require removing and rewelding a patch in the third port wall for access to the port area. In either case, be neat and accurate.

The stock transfer ports need not be modified beyond minor clean up and a light radius or parabolic cut on the outer wall side. The same applies to the exhaust port. For no reason should the exhaust port area be enlarged. The existing area has been found to provide optimum valve action and should not be altered.

WHICH WAY TO GO

It is highly probable that the present MC-40 equipped B-C kart owner will do much soul searching on what is the best way to go to achieve maximum power at minimum cost: to buy new MC-70 engines or to rework his present engines using the MC-70 crank. Obviously the former method is the most expensive which resolves the matter down to the basic question of whether or not the reworked 40's will do the job. Here we can only restate our earlier comments: they won't, or perhaps more to the point, they can't. It is literally impossible to rebore and restroke the MC-40 and make it as efficient as the MC-70. True, the case may be relieved enough (Fig's 5, 6 and 7) to carry the 70 crank and by stretching a point we'll agree that the 40 might be made to develop almost the same power as the 70 but in conceding this point we must also note that the 40 will then also develop as much heat as the 70. And here everything comes to a screeching halt — at least for the MC-40. Any way that you try to figure it a couple of facts cannot be avoided: first, the relationship of heat and power development are inseparable and second, the MC-70 with its integral head and cylinder is more efficient in dissipating heat than is the MC-40 and consequently will always be able, all other things being equal, to develop more power than the MC-40.

Speaking strictly in terms of power there is only one conclusion possible: a fully modified fuel burning MC-40 with maximum stroke and bore will be hard pushed to develop the same power that a *stock* MC-70 will develop burning straight gasoline.

All in all the MC-70 is a very impressive engine and in either stock or modified form we have one final suggestion which will help to put it in top form and keep it that way. Strip your 70 down to bare cylinder including removing the crank seal and then cook the cylinder unit in your home oven at 450 degrees for 5 hours. This will relieve the inherent stresses that normally develop in any engine and, in effect, season it. After cooling, gradually run a good hone through the cylinder to clear up any distortions. The point is that there will be some distortion which, normally, would have appeared during the initial running period and tended to slow the engine down. By eliminating them before hand your engine will run better right from the first pop. All normal distortion should clean up with a .001 inch hone finish. If it takes more than .002 inch to clean up you either cooked the cylinder too hot or you've got a bad casting, which is extremely rare. In any event a finely tuned MC-70 will have no difficulty in putting out 12 horses. Need we say more?