

AMC TWIN ENGINES WITH 72mm BORE
DON MADDEN AJS&MOC #479

MOST AMC TWIN ENTHUZIESTS ARE AWARE THAT THE ENGINES CAME IN VARIOUS DISPLACEMENTS DURING THEIR HISTORY. THIS DISCUSSION IS LIMITED TO THE AJS AND MATCHLESS. (COMMONLY REFERRED TO AS AMC). ENGINES AND NOT THE NORTON TWINS INSTALLED IN LATER YEARS NOR THE RARE 750CC G15/45 AMC MODEL.

VARIOUS BORE AND STROKE COMBINATIONS WERE USED WITH ALL OF THE G11/MODEL30 AND G12/MODEL 31 VARIANTS USING A BORE OF 72mm. THERE ARE FOUR DISTINCT TYPES OF PISTONS. ALONG WITH SEVERAL COMPRESSION RATIOS AND OVERSIZE COMBINATIONS. THE FOUR TYPES ARE NOT MUTUALLY COMPATABLE. BUT UNFORTUNATELY ANY OF THEM CAN BE INSTALLED IN ANY OF THE DIFFERENT ENGINE TYPES. OFTEN WITH DISASTEROUS RESULTS. MY EXPERIENCE AND THAT OF OTHERS ORDERING PISTONS FROM TRADE SUPPLIERS OR INDIVIDUALS OFTEN RESULTS IN RECEIVING THE INCORRECT TYPE FOR THE ENGINE INVOLVED. HOPEFULLY THIS ARTICLE WILL UN-MUDDY THE WATERS A LITTLE.

AMC ENGINES WERE INTRODUCED FOR THE 1949 MODEL YEAR AS THE 498cc G9 AND MODEL 20. (ALL DATING REFERS TO THE MODEL YEAR. WHICH BEGAN IN THE FALL OF THE PRECEDING YEAR; I.E. 1949 MODELS ACTUALLY BEGAN PRODUCTION IN THE FALL OF 1948 AND RAN TO THE FALL OF 1949). THE 498cc ENGINES HAD A BORE OF 66mm AND A STROKE OF 72.8mm. THE 498cc ENGINE CONTINUED IN PRODUCTION FOR MANY YEARS. OFTEN CONCURRENT WITH LARGER DISPLACEMENT VARIANTS. ONE OF THESE WAS THE 1954-55 (EXPORT) 545cc G9B/20B WHICH USED A BORE OF 69mm.

FOR 1956 THE 593cc G11/MODEL 30 AND VARIOUS SPORTS VARIANTS WERE DEVELOPED BY INCREASING THE BORE TO 72mm. THIS CHANGE REQUIRED A NEW CRANKCASE AND A NEW CYLINDER BARREL HAVING SEVEN COOLING FINS. COMPARED WITH THE PREVIOUS MODELS WHICH HAD SIX. A CRITICAL DIMENSION FOR THESE AND ALL ENGINES IS THE DECK HEIGHT. THE DISTANCE FROM THE CENTER OF THE GUDGEON PIN TO THE TOP, OUTER EDGE OF THE PISTON. THIS EDGE OF THE PISTON IS EVEN WITH THE TOP OF THE CYLINDER BORE WHEN THE CRANKSHAFT IS ROTATED TO TOP DEAD CENTER (TDC). THE DECK HEIGHT OF THE 593cc ENGINE IS 37mm. (THIS AND OTHER DIMENSIONS HAVE BEEN TAKEN FROM ORIGINAL PISTONS AND IS THE BEST INFORMATION AT MY DISPOSAL).

FOR THE 1958 MODEL YEAR A NEW ENGINE WAS OFFERED FOR THE EXPORT MARKET. THIS VERSION INCREASED THE STROKE TO 79.3mm AND RETAINED THE BORE OF 72mm FOR A DISPLACEMENT OF 645cc. AND WERE FITTED INTO THE NEW G12/MODEL 31 AND G12CS/MODEL 31CS BIKES. THE SEVEN FIN BARRELS WERE RETAINED BY FITTING A PISTON DESIGN WITH A HIGHER GUDGEON PIN TO COMPENSATE FOR THE INCREASED STROKE. THE DECK HEIGHT FOR THIS MODEL IS 33.75mm AND THIS PISTON FITS ONLY THE 1958 YEAR MODEL 645cc ENGINES. ALL OTHER 72mm PISTONS HAVE A GREATER DECK HEIGHT AND IF USED WITH A 79.3mm STROKE CRANKSHAFT/SEVEN FIN BARREL COMBINATION WILL RESULT IN THE PISTON RISING ABOVE THE TOP OF THE CYLINDER AND COLLIDING WITH THE HEAD AND/OR VALVES.

FOR 1959 YET ANOTHER 645cc TWIN WAS OFFERED TO REPLACE THE 593cc TYPES AND WAS USED IN THE G12/MODEL 31. ETC. SERIES. THIS PISTON WAS OF A MORE CONVENTIONAL DESIGN WITH A DECK HEIGHT OF 42.2mm. A NEW, TALLER EIGHT FIN CYLINDER WAS INTRODUCED TO BRING THE TOP EVEN WITH THE NEW PISTONS. AGAIN, USE OF THIS PISTON IN ANY SEVEN FIN BARREL WOULD CAUSE A COLLISION OF MOVING PARTS. CONVERSELY, USE OF ANY PREVIOUS PISTON DESIGN WOULD YIELD AN ENGINE WITH THE PISTON TOO LOW IN THE BARREL WITH LOW COMPRESSION RESULTING. AS AN EXAMPLE, G11 PISTONS USED IN A 1959 G12 ENGINE WOULD FIT, BUT HAVE A C.R. OF 5.5:1. THE ENGINE WOULD START EASILY AND RUN BUT HAVE POOR EFFICIENCY.

FOR 1960 THE TOP END OF ALL AMC ENGINES WAS RE-DESIGNED TO IMPROVE THE COMBUSTION EFFICIENCY. THE NEW PISTONS, OF A VERY MODERN DESIGN EVEN IN THE 1990'S FEATURED FLAT TOPS WITH THE CROWN PROTRUDING INTO COMBUSTION CHAMBER COMPARED TO THE HEMISPHERE-ON-A-PLANE USED EARLIER. THIS NEW DESIGN CREATED A "SQUISH" AREA AROUND THE PERIMETER FOR BETTER FUEL /AIR MIXING. THE BETTER MIXING REDUCES THE TENDENCY TO DETONATE PREMATURELY, ALLOWING THE USE OF LOWER QUALITY FUELS. THE DECK HEIGHT WAS CHANGED AGAIN TO 42.9mm AND FITTED INTO A REVISED EIGHT FIN CYLINDER BARREL. BE CAREFUL OF USING MIS-MATCHED CYLINDERS. THE CYLINDERS & HEADS ARE SEPARATE AND CAN BE BOLTED UP EVEN WITH A CONSIDERABLE DIFFERENCE IN HEIGHT. THE CATCH IS THAT THE INTAKE MANIFOLD FITS OVER STUDS ON BOTH HEADS AND IF ONE HEAD IS LOWER DUE TO DIFFERENCES IN THE CYLINDERS OR HEADS, IT MAY NOT TIGHTEN DOWN CORRECTLY LEADING TO BLOWN HEAD GASKETS. THE 1960-UP HEADS HAVE A VERY DIFFERENT SHAPE AND VOLUMN. AS BEFORE, USING THE LATER PISTONS IN A PRE-1960 TOP END WILL CAUSE MECHANICAL INTERFERENCE AND PRE-1960 PISTONS IN LATER TOP ENDS WILL HAVE VERY LOW COMPRESSION.

THE HIGHER COMPRESSION PISTONS OFFERED AS AN OPTION FOR 1965 'CSR MODELS WILL FIT ENGINES DATING FROM 1960 UPWARDS. ALTHOUGH THERE IS AN INCREASED RISK OF BLOWING HEAD GASKETS AS THE MAKERS HAD UPGRADED THE CYLINDER HEAD STUDS TO 3/8" FOR THE 1964 MODEL YEAR. IN ANY CASE IT IS ADVISABLE TO USE ONLY THE ORIGINAL TYPE WIRE RE-INFORCED HEAD GASKETS OR SOLID COPPER IN ALL TWIN ENGINES.