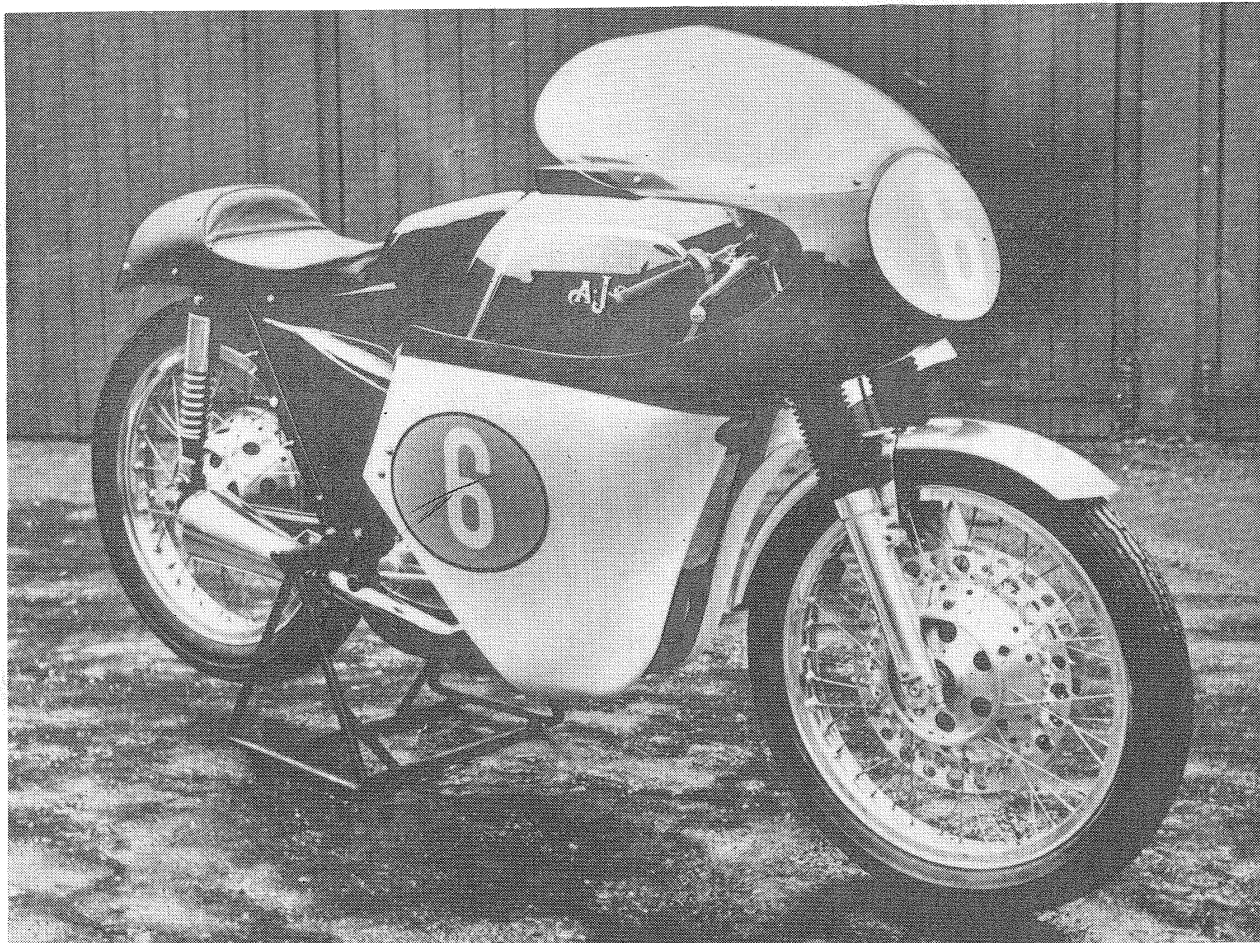


Improving the power output of the 7R

THE STORY OF THE
GAMMY AJAYS: PART 3



"It has always been a pretty bike rather than ruggedly handsome. . . ." A superb example of the 7R A.J.S., as prepared by Tom Kirby of Hornchurch

FIRST of all . . . apologies for one blatant mistake in last month's story: Rod Coleman's Junior T.T. win on the Triple Knocker A.J.S. was in 1954, of course, and not 1953, when Ray Amm won on a Norton. Now, to continue. . . . In 1954 C. J. Williams joined A.M.C. as Development Engineer but at first had little to do with the 7R; he concentrated on the 7R3, as the Triple Knocker was officially known. But in 1955 he took over responsibility for developing the Boy Racer—to increase the power output of the engine and improve the machine generally (the firm had decided not to progress any further with the three-valve racer).

Up to 1954 improvements had been mainly concerned with stiffening up the crankshaft and main-bearing assembly—resulting in a narrower crankcase and, incidentally, better primary chain life—changing over from pad ends on the rockers to rollers—mainly because of the advantages in lubrication—and altering valve angle and combustion shape: these latter, of course, together with the improved fuel then available, permitting an increase in compression ratio. When Jack Williams took over, the 7R was churning out about $37\frac{1}{2}$ b.h.p. at 7,500 r.p.m. When he left the factory last year and stopped work on the engine, the figure had been pushed up to 42, with the engine revving safely at 7,800 r.p.m.—and one must remem-

ber that it was still a single-camshaft unit of the same original basic design of 1947. I think this speaks volumes for the amount of thought and painstaking hard work put into the problem by Jack, a modest but very clever engineer. Working with limited resources, he evolved his own methods and equipment to study and improve the breathing of the engine. At the time it was felt that more speed must come from greater b.m.e.p., not higher revs; the inertia loading on reciprocating parts was already quite high enough, and the valve gear seemed unlikely to cope with much higher revving.

The story of this development has already been written by Vic Willoughby in *Motor Cycle* in 1963, but as an old admirer of C. J. Williams (from the days when I used to watch him racing Raleighs very successfully at Syston Park) I went to Jack myself to get the details at first hand. To start with, he built a test rig to study air flow in the inlet tract and experiment with different port shapes. His air-flow comparator consisted of a dummy cylinder on top of which was a wooden head to which could be fitted different ports. The shape of these could be altered quickly by means of plasticene. Air was drawn through the port and cylinder by a pump and controlled by a proper inlet valve. Different shapes and sizes of valve could, of course, be tried, and the amount of lift could be readily altered.



Changing the rear-suspension units of a 7R. For several years riders complained in vain about the uncertain damping provided by the original units; eventually they were replaced by Girling equipment

What Jack was really interested in was the distribution of petrol droplets in the mixture inside the cylinder head, which is what really effects the volumetric efficiency of an engine. To enable him to study this, the inside of the cylinder was lined with white carding and a coloured dye introduced into an accurately measured amount of petrol injected into the air stream. By this means he could see exactly where the droplets of petrol were going when inside the head. Later on, a Manometer was introduced into the apparatus so that the air-flow coefficient could be measured.

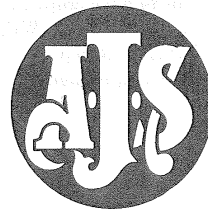
The first increase in power of $1\frac{1}{2}$ b.h.p. came with a swept-down port shape which, although not quite so good for breathing as a flat port, gave better fuel distribution. A further $1\frac{1}{2}$ b.h.p. was obtained when the port was straightened from the entrance to the valve. With these increases came an improvement in fuel consumption, and ignition advance was brought forward from 39 to 37 degrees before top dead centre. The next thing which Williams did was to investigate the squish-type piston and head then coming into fashion. With this new piston and head, having a squish gap of 25-30 thou, incorporated in the 7R improvements in both top and bottom end performance resulted. It was also possible to put up the compression ratio, and whereas 10.8 to 1 had been the old limit the engine was now quite happy at 12.2 to 1.

A lot of work was put into experiments with different sizes of carburettor choke, inlet tract lengths and valve seat shapes. Eventually a $1\frac{3}{32}$ in carburettor bore (previously it had been $1\frac{1}{32}$ in), with a total tract length from bellmouth to valve head of $13\frac{1}{4}$ in, was evolved. In 1956 the bore and stroke had been altered to 75×78 mm and with the shorter stroke the engine could now be buzzed faster, and peak revs were up to 7,800.

What was the result of all this in terms of race success? Not a great deal on paper, at least not in the "classics," but private owners were having a fair share of the spoils in short-circuit meetings. The 7R was no doubt much faster and handled better than of old, but the "square," double-knocker three-fifty Norton had the legs of it. But the 7R did win the Junior Manx Grand Prix again, in 1954, in the hands of Derek Ennett, with John Hartle on another A.J.S. in third place. As far as the T.T. was concerned, in 1955 A.J.S. started their policy of using standard production machines for the official team and of not fitting streamlining on the models. The nearest approach to streamlining was in reshaping the petrol tank . . . narrow at the front, coming out wide and then cutting in to a narrow back end, so that the rider's knees were in recesses, out of the air stream. On the other hand, Moto Guzzi and certain Nortons, notably Bob MacIntyre's, used full streamlining, and they had most of the success. During the period 1955-57 the Boy Racer in the T.T. showed reliability—winning the team prize in 1956, when Derek Ennett finished second—but that was the only occasion when they were in the first three.

In the Manx Grand Prix Nortons also showed their superiority; apart from Alistair King holding second place for most of the race in the 1955 Junior before retiring with a broken chain, A.J.S.

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had no great success. And yet they lost little of their popularity. There were always more A.J.S.s entered than any other make, although in 1957 the entry was pretty evenly shared between A.J.S., Norton and B.S.A. There has always been something about a Boy Racer which endears itself to many riders. To give a reason is difficult, but for want of a better word I would say it is because riders found the 7R more "refined" than other three-fifties, Mark VII Velocettes excepted.

In 1958 A.J.S. did not have much more success, being beaten by Nortons time after time. In the T.T., for instance, the highest finisher was Bob Brown, who came in 14th at an average of 88.91 m.p.h., as compared with the fastest Norton (Dave Chadwick, in second place) at 91.68 m.p.h. Some trouble in the Island was experienced with excessive frothing of the fuel due to a new float chamber mounting (which was later rectified).

Apart from its popularity among private owners, sponsors and tuners also had faith in the model, notably Bill Bancroft of Leeds and Joe Potts, who will always be associated with the late Bob MacIntyre. Towards the end of 1958 their efforts were rewarded. A Bancroft A.J.S. won the Junior Manx after a brilliant ride by Alan Shepherd, although at not quite record speed, and a few days later Bob MacIntyre put the cat among the pigeons by winning the 350 c.c. championship race at Bemsee's Hutchinson 100 meeting at Silverstone at 92.88 m.p.h. MacIntyre followed this up by holding second place in the Junior T.T. the following year behind Surtees on his MV Augusta, and in front of Hartle on the second MV. Unfortunately, he had to retire on the fifth lap when the streamlining mountings cracked. His colleague, Alistair King, A.J.S.-mounted, won the Formula Junior Race that year. Bob MacIntyre's trouble was due to vibration. Many riders were beginning to complain about vibration at about this time.

Vibration trouble

C.J.W. was convinced the trouble lay in the frame, that engine resonance at certain r.p.m. coincided with the natural resonance of the frame at a certain part. He wanted to borrow some electronic equipment from Lucas which could tell him very quickly what he wanted to know, but the powers-that-be would not let him. This reluctance of the directors to call in outside help, to try something different, seems to have cropped up several times during the life of the A.J.S. racers. In Matt Wright's time there was a chance to try fuel injection—Bosch offered to help and would have supplied the necessary equipment in return for information A.J.S. found in their experiments—but the offer was turned down.

As regards frame changes, Jack Williams had, over the years, done much both to improve the steering and handling and to reduce weight. He got rid of the "scaffolding," as he used to call the part which held the rear mudguard and seat; steering trail, footrests and rear-brake cable came in for attention, and a much lighter glass-fibre seat and tail replaced the old mattress type. The front-fork springs and dampers were altered, and the A.M.C. rear-suspension units—"jampots" as the large-diameter type were always known—were finally replaced with proprietary units.

This tardy change over from "jampots" to Girling units was another case of reluctance on the directors' part to call in outside help. All the riders complained of the failure of the A.M.C. units to retain their damping properties, with subsequent deterioration in handling, but Mr Heather's comment to Jack when the subject was brought up was—"You don't want to believe what these riders say, they'll tell you anything!" Eventually, to convince him, Jack built a special test machine which illustrated without a shadow of doubt that what the riders had been saying for ages was absolutely justified.

But to get back to the vibration trouble. . . . Without the help of special equipment, Jack had to resort to the tedious job

of track testing, and with the assistance of Frank Perris and John Clarke, who were both employed by A.M.C. at the time, a series of tests was carried out to find the source of the trouble. They decided that when the engine was turning at 7,300 r.p.m. sympathetic vibrations were set up in the frame—in the region where the gearbox was held in place by a casting. This casting was subsequently altered so that the gearbox was held by plates, together with the engine, and not direct to the frame; this also had the effect of further narrowing the chain line. The trouble was cured. However, it remained necessary, as has always been the case with the 7R, to have the carburettor flexibly mounted.

Bob MacIntyre again rode his A.J.S. in the Junior T.T. in 1960 and this time finished in third place, only 2m 20s behind John Hartle's first-place four-cylinder MV and nearly catching slowing John Surtees on the other MV, who finished second with two of the five speeds missing in the gearbox. Bob's average speed was 95.11 m.p.h., the fastest by far for a 7R in the Island.

But apart from Bob Mac's fine effort, the 7R's performance generally in the T.T. had improved. Whereas in 1959 the first five A.J.S.s only occupied 10th place (George Catlin), 15th (Syd Mizen), 17th (Bill Smith), 18th (Derek Powell) and 21st (Arthur Wheeler), in 1960, apart from MacIntyre's third place, 7Rs were seventh (Alan Shepherd), 10th, 11th and 12th—Catlin, Mizen and Smith again—with Derek Powell again 18th, and in all cases except one their average speeds were higher.

But the sensation of 1960, where Ajays were concerned, was the performance of Alan Shepherd in the 350 c.c. class of the Ulster Grand Prix. He hung on to the leader, John Surtees on the MV, until a broken camshaft drive chain put him out—an unusual thing to happen, incidentally, the only time I have heard of one giving trouble. What shook everyone was that, although Shepherd's riding was superb and he was out-braking Surtees on occasions, the *speed* of the 7R just about equalled that of the MV. On one lap Alan almost overtook the four as they passed the Grandstand. The Italians were so impressed that they insisted on having the A.J.S.'s engine measured after the race . . . it was under 350 c.c. by 0.791 of a c.c.

Cams and valve springs

During all this excitement Jack Williams was quietly getting on with his search for more power. He had turned his attention to cams and valve springs. He designed an entirely new cam, involving something like 100 hours of work on the necessary calculations. Although he did not have access at the time to a computer he was able, later, to check his figures by computer . . . just 10 minutes' work! A certain amount of valve-spring trouble had been encountered about this time but was cured by changing over to springs, made by Morris Springs of Wolverhampton, of Swedish steel.

The sort of performance Jack was getting with the new cam was demonstrated by Mike Hailwood in the 1961 Junior T.T. Lapping at over 96 m.p.h. he looked all set for a win after Gary Hocking had led for three laps but then slowed with engine trouble. But on the last lap Hailwood retired at Milntown with less than 15 miles to go. The trouble was a broken gudgeon pin—a hairline crack.

In the Manx of 1961 the 7R really came into its own again, occupying the first four places. It would have been five, no doubt, if a tragic accident had not occurred on the last lap when Fred Neville crashed at Greeba while leading the race and was fatally injured. The race was run in poor weather and speeds were low. But, talking of speeds, it is interesting to note from the *T.T. Special* that in practice that year, on the two-mile stretch before the Highlander, the best Ajays (six of them) were clocking 114.7 m.p.h. as compared to the fastest Nortons with 113.2. Of course, these speeds are not very accurate, being hand-timed and not comparable with the N.S.A. equipment used in

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round the hilly grassy circuit to finish second and third respectively. Horsfield had a day to forget. In the first leg his clutch packed up and he changed gear without the clutch until the chain came off. In the second race the Matchless gearbox seized and that was that. Tibblin suffered condenser trouble in the first race, and a heavy practice fall persuaded him to miss the second race. Indeed, it was only "Pele" Persson who managed to stop a British 1-2-3-4. He sneaked home in third place in the overall placing to push Lampkin and Eastwood down to fourth and fifth.

Next in the series was the Finnish, and Smith again won. A surprise was the performance of the East German, Paul Friedrichs, on a 360 c.c. CZ. He finished second in both legs of the meeting, and it took all of Smithy's guile to shake off his shadow. Lundin was never happy with the circuit and retired in both races. The best Swedish performance came from Jan Johansson on the 360 c.c. Lindstrom, who battled with Eastwood in both legs, but had to concede defeat and take fourth spot overall behind the B.S.A. rider.

Big two strokes second and fourth. Is the writing on the wall?

Another blow for the "keep-500s-for-500-Grand-Prix events" supporters came at the Swedish G.P., fifth and latest meeting in the series. Tibblin appeared on a factory-prepared 360 c.c. CZ. Damper



Bickers leads Robert . . . and in the 250 c.c. table Arbekov leads both

trouble put the ex-champion out of the running in the first leg, but he will be CZ-mounted for the Czech 500 c.c. meeting on June 20, and with Robert there, too, it should be a meeting to remember. The Swedish round added another eight to

Smith's score—five meetings, four wins. Eastwood, in third spot in the table with 14 points to Lundin's 17, on present form could join his team-mate at the head of the table and privateer Scott is a comfortable fifth.

THE STORY OF THE CAMMY AJAYS

Continued from page 274

From the end of 1961 to 1963, when production finished, only minor changes took place on the 7R. But this did not mean that people had lost interest. A.M.C., going through a difficult period in their trading history, could not afford to spend money on racing development. But thanks to enthusiastic dealer-entrants and tuners such as Tom Arter—whose experience with camshaft Ajays goes back further than that of almost anyone else in the game—Tom Kirby and Francis Beart, machines were still being developed (with Jack Williams helping behind the scenes)—and still are, for that matter.

Things which have been investigated more recently include an ultra-short-stroke engine—68mm, with an 81mm bore, using a special forged piston (up to 1963 sand-cast pistons had been used which, since 1955, had employed a single Dykes top ring with one double Wright type scraper), hairline inlet valve seats and titanium connecting rod and rockers. Mike Duff has been riding an A.J.S. with a special frame and Norton wheels which is reputed to be 40 lb lighter than a standard 7R; and no doubt many other things have been tried, and more will be tried in the near future.

During the last few years of production, the Boy Racer continued to add to its many successes. In the 1962 Junior T.T honours were shared between A.J.S. and Norton as far as the single-cylinder machines were concerned—of the first-class replicas each make took eight apiece. Roy Ingram (Norton) was the highest finisher, in fourth place, with Mike Duff, the first A.J.S. rider, fifth. Duff's speed was 93.81 m.p.h. but Alan Shepherd, lapping at no less than 97 m.p.h., lay fourth at the end of the second lap, over a minute in front of Stastny's Jawa twin, when he had to tour in with a split fuel tank. The tank was changed and he continued and finished the race, but had lost so much time that he was only 35th. Shepherd had no better luck the following year, retiring on the first lap with a

sick engine, but Ajays on the whole fared better than Nortons. Syd Mizen was rewarded for his consistent riding of a Boy Racer in the T.T. by finishing fourth. Mike Duff was sixth, Maurie Low seventh, Derek Woodman eighth and Paddy Driver ninth, and that was where the silver replicas finished. The only Norton rider to collect one was Jack Ahearn who came in fifth.

As far as the Junior Manx was concerned, the 7R continued to take the major honours; in fact, in the last three years Nortons have hardly had a look in. Robin Dawson won in 1962, Peter Darvill in 1963, both establishing record laps and Darvill setting record time for the race. The runner-up in both events was also A.J.S. mounted. Only last year was the run of success broken, when David Williams, on the Mularney-Williams Norton special, won, beating Darvill's race record although Peter still holds the lap record at 24 minutes 7 seconds, a speed of 93.87 m.p.h. Ajays were second, fourth and fifth.

In the 1964 TT

In the 1964 T.T., with Phil Read second, Mike Duff third and Ajays taking 14 out of 24 first-class replicas, the popularity and reliability of the 7R was once again proved—even if speeds were not so high as in some other years, notably 1960 when Bob McIntyre won and 1962 when Alan Shepherd won.

Like those old soldiers, I suppose, the 7R will eventually fade away—or the 350 c.c. class will disappear and there will be no further use for them—but old soldier is hardly the description for the Boy Racer. A Norton perhaps merits that tag; to my mind the Ajay is much more feminine. It has always been a pretty bike rather than ruggedly handsome, with definite female tendencies! Skittish at times and occasionally temperamental, requiring the delicate touch—remember Charlie Markham's description of the clutch reprinted last month?—but attractive and fascinating always. Yes, the Boy Racer has won many friends in its time, and I'm sure will continue to do so before it becomes a museum piece.

F. P. H.