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REDDITCH

WORCS. ENGLAND

8th May, 1961

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File

### Report of Preliminary Road and Track Tests of "350 Crusader"

#### 1. Road Tests

The engine/gear unit, which had already been run in and bench tested was fitted into a "Crusader Sports" machine and given a preliminary run on the road using a standard 350 Bullet carburettor (1 1/16" choke bore).

It was immediately apparent that the machine was much livelier than the average 350 Bullet. At first, it was thought that this extra liveliness might indicate incorrect gearing but since speeds of 50 m.p.h. in 2nd gear and 65 m.p.h. in 3rd gear were obtained without any suspicion of valve bounce it did not appear that the gear ratio was too low. In actual fact, it is virtually identical with that used on the standard 350 Bullet model, i.e.: 5.15 : 1 with the same size rear tyre (3.25 - 17" Universal). The maximum speed of the machine appeared to be at least 5 m.p.h. higher than that of the 350 Bullet.

At first difficulty was experienced in starting the engine due to clutch slip when operating the kick-starter, although there was no sign of slip under load. To overcome this, three additional clutch springs were used which, however, makes the clutch control undesirably heavy.

The excellent performance obtained, together with rather pronounced valve gear noise, suggested that the engine might have been assembled using Crusader Sports cams although the specification calls for standard Crusader 250 cams. Examination proved that this was the case. The cams were changed for standard ones which reduced the valve gear noise and the exhaust noise considerably, making piston noise more apparent. The performance did not

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Report of Preliminary Road and Track Tests  
of "350 Crusader" (Cont...)

1. Road Tests (Cont...)

appear to be affected to any great extent, although the rider had the impression that there seemed to be some trace of valve bounce at 50 m.p.h. in 2nd gear and 65 m.p.h. in 3rd gear (both approximately 6,300 r.p.m.)

2. M.I.R.A. Tests

Since it seemed probable that the clutch, gears and chains might prove unable to cope with the torque of the 350 cc engine, the main object of the visit to M.I.R.A. was to test these components. This was done in the usual way by using the unbanked No. 2 circuit, making six stops per lap of 2.3 miles. After each stop, the machine was taken up through the gears to about 80 m.p.h. in top gear then brought down through the gears again to rest, thus thoroughly testing all the transmission parts. After 30 laps of this treatment, the clutch burnt out which was not considered unreasonable in view of the fact that it had inserts of natural cork, and had been operated 1,260 times during the test. The chains and gears did not appear to have suffered any harm from this treatment.

Before testing the transmission components of the machine, it was checked for maximum speed down the timing straight. No changes of carburettor jet were made, but the ignition timing was varied, the best results being obtained when timed so that contact points opened with the piston  $\frac{1}{8}$ " before t.d.c. These maximum speeds recorded were as follows:-

West	76.56 m.p.h.	
East	90.37 "	91.59
Mean	83.46 "	86.50

these compared with the following speeds obtained from the last 350 Bullet tested:-

West	72.43 m.p.h.
East	84.13 "
Mean	78.28 "

Without altering the ignition timing, an "acceleration test" was run in the usual way with the rider seated upright, the throttle being opened wide from 40 m.p.h. in top gear as the rider passed the timing hut and the speed being measured through the lights. The following speeds were obtained:-

West	67.75 m.p.h.
East	73.59 "
Mean	68.17 "

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3. Conclusions

The machine obviously needs plenty of mileage work in order to find out any weaknesses which may exist.

Obviously, the weakest point is the clutch which, it has just been reported, has burnt out again during ordinary weekend riding. The steel plates are now somewhat buckled and the clutch has been re-assembled with slotted plates. Probably six springs of lighter gauge would give more satisfactory results and plates with J.17 facings may stand up to severe conditions better than natural cork while having approximately the same coefficient of friction when oily. In any case, J.17 facings will be less spongy than cork inserts and if necessary, their use would enable an extra pair of plates to be fitted and to be lifted free without providing extra movement on the clutch push rod. If an extra pair of plates proves desirable, however, it will be necessary either to make all the clutch plates thinner or widen the clutch drum and deepen the primary chain cover to provide more room.

.....R.A. Wilson-Jones  
R.A. Wilson-Jones

P.S.

During the M.I.R.A. tests, the engine smoked fairly heavily. This would no doubt be cured by fitting a more drastic oil control ring on the piston. The engine has now been assembled with dual oil control rings. The piston itself is of Enfield manufacture with a different skirt form from that used on Hepworth and Grandage pistons, and a check on the cylinder bore dimensions shows that these are put to .00055" above the nominal high limit. This will no doubt partly account for the heavy oil consumption as well as for the rather prominent piston slap.