O.E.C.D. Approval 386a
Report 622
February 1972

REPORT ON TEST IN ACCORDANCE WITH O.E.C.D. TEST CODE FOR AGRICULTURAL TRACTORS

COUNTY MODEL 1164 TRACTOR



Test No.: R.71/7609A/O.E.C.D.

Manufacturer: County Commercial Cars Ltd,
Fleet, Aldershot, Hampshire

NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING
Wrest Park . Silsoe . Bedford

This Bulletin is based on engineering tests in accordance with the O.E.C.D. Tractor Code. It does not contain an evaluation of the performance of the tractor on practical farm work

TABLE OF CONTENTS

	Sheet No.	Fig. No.
Specification of tractor	4	
Fuels and lubricants used in tests	8	
Compulsory tests		
Power take-off	9	1
Drawbar	11	
Turning space and turning circle	12	
Location of centre of gravity	12	
Braking	12	
Noise measurement	13	
Power lift and hydraulic pump performance	13	
Optional tests		
Engine crankshaft	15	2 & 3
Repairs, adjustments and remarks	18	

SPECIFICATION OF TRACTOR

Manufacturer	:	County Commercial Cars Ltd., Fleet, Aldershot, Hampshire
Submitted for test by	:	The manufacturer
Selected for test by	:	The manufacturer with the agreement of the testing station
Place of running-in	:	Motor Industry Research Association, Nuneaton
Duration of running-in:	:	70 hours

Tractor

Make	:	County
Model	:	1164
Type	:	Four-wheel drive, unit construction
Serial No.	:	22697

Engine

Make	:	Ford Motor Company Ltd.
Model	:	401 S
Type	:	Direct injection diesel
Serial No.	:	G 199402
Cylinders	:	6 cylinders, vertical, in-line, 4.40 in (111.8 mm) bore x 4.40 in (111.8 mm) stroke, capacity 401 in^3 (6.578 l), compression ratio 16.5:1, overhead valves monobloc construction
Fuel system	:	AC Model VP mechanical type fuel feed pump with hand primer; dual Simms type FH 53 paper element fuel filters on pressure side of feed pump; capacity of fuel tank 35 UK gal (159.1 l); Simms type P.5168 injection pump, Serial No. 8749; manufacturer's production setting for injection pump : 13.2 - 13.4 cm^3 for 200 injections at 900 rev/min pump speed (test bench figures); C.A.V. type NL 395 injector nozzles, injection pressure 175 atm (181 kg/cm^2)

Governor	:	Simms mechanical, incorporated in fuel injection pump. Governed range of engine speed 600-2500 rev/min, rated engine speed 2300 rev/min
Air cleaner	:	Coopers Cyclopac, dry paper element type situated under hood, centrifugal pre-cleaner above hood
Lubrication system	:	Forced feed from eccentric rotor type pump with metal strainer in sump, Serck twin element type cooler in front of radiator. Powell Duffryn duel media full flow replaceable element filter, total oil capacity 30 pt (17.0 l). Recommended oil change period 300 hours
Cooling system	:	Water cooled, impeller assisted with 18 in (457 mm) dia, belt driven 8-blade fan, thermostat for temperature control, pressurised at 7 lb/in^2 (0.49 kg/cm^2), coolant capacity 30 pt (17.0 l)
Starting system	:	Ford type C7NN 11000-D solenoid engaged electric starter motor, operable only when the high-low gear selector lever is in neutral; excess fuel device incorporated in fuel injection pump for cold starting

Electrical system

Voltage	:	12, negative earth
Generator	:	Lucas, type C40T
Battery	:	Exide Supreme, type 222, lead acid, capacity 120 Ah at 20 hour rating

Transmission

Clutch	:	Borg and Beck single plate dry clutch, 14 in (365 mm) dia, pedal operated
Gearbox	:	County, heavy duty type, constant mesh, 8 forward speeds and 2 reverse
Rear axle and final drives	:	Crown wheel and pinion and differential with epicyclic gear final drives to rear wheels; own make constant engagement front wheel drive taken by bevel gears from each differential half shaft forward to twin telescopic and universally jointed propellor shafts, wheels driven through a separate crown wheel and pinion on each side; pedal operated differential lock effective on all four wheels
Oil capacities	:	Gearbox 18.5 pt (10.5 l), rear axle centre housing 49 pt (27.8 l), outer housings 10.5 pt (6.0 l) each, front axle housings 7.0 pt (4.0 l) each, drive shaft housings 0.5 pt (0.3 l) each; recommended oil change period 1200 hours

Gear	Number of engine revolutions for one revolution of driving wheel	*Nominal travelling speed for 2300 rev/min rated speed of engine, mile/h	(km/h)
Forward			
1	190.03	1.87	(3.01)
2	104.66	3.40	(5.47)
3	86.75	4.10	(6.60)
4	63.74	5.58	(8.98)
5	53.19	6.69	(10.76)
6	29.29	12.15	(19.55)
7	24.28	14.65	(23.57)
8	17.84	19.94	(31.08)
Reverse			
low	132.20	2.69	(4.33)
high	37.00	9.62	(15.48)

*Calculated with tyre rolling radius of 26.0 in (660 mm)

Power take off — At rear of tractor, $1\frac{3}{8}$ in (34.9 mm) dia, 21 spline, hydraulically engaged, to ISO standard, height above ground 25 in (635 mm), proportional engine speed giving 1117 rev/min at 2300 rev/min rated engine speed, 1000 rev/min (standard p.t.o. speed) at 2059 rev/min engine speed, direction of rotation clockwise, viewed facing driving end

Belt pulley — Not fitted

Power lift — Ford Motor Co., hydraulic, gear pump driven from power take-off shaft, independent of main and p.t.o. clutches, supplies oil from transmission to ram cylinder and external tappings (two additional external booster rams may be fitted); Category 2 implement linkage, draught or position control with auxiliary service control and flow control device

Drawbar — Swinging drawbar, vertical heights to centre of clevis, 14 in (356 mm) to $17\frac{3}{4}$ in (451 mm) change by inverting clevis, distance behind rear axle 25 in (635 mm) and 31 in (787 mm), position relative to p.t.o. $9\frac{1}{4}$ in (235 mm) and $15\frac{1}{4}$ in (387 mm) to rear, lateral adjustment 10 in (254 mm) and $18\frac{1}{2}$ in (470 mm), pivot position in line with rear wheel centres

Hitch — Not fitted

Steering — Own type hydraulic power steering incorporating Danfoss directional control valve with manual control for emergency, Plessey type gear driven hydraulic pump supplying oil to double acting steering cylinder with twin element oil cooler in circuit mounted in front of radiator

Brakes — Ford Motor Co., multiplate oil immersed disc type, mounted on differential half shafts, pedal operated independently or together, ratchet for parking, hand lever operated dry multi-disc transmission brake

Wheels — Two at front, two at rear, steered by front wheels, all wheels driven, Dunlop RT 35, 16.9/14-30 tyres, 8-ply rating, maximum permissible weight on each tyre, 4740 lb (2150 kg) at 22 lb/in^2 (1.5 kg/cm^2), track width 70 in (1778 mm)

Wheelbase — 5 ft 11$\frac{9}{16}$ in (1818 mm)

Weights

Tractor (without driver but with tanks full)

	Front, lb	(kg)	Rear, lb	(kg)	Total, lb	(kg)
Without ballast	5913	(2682)	3396	(1541)	9309	(4223)
With ballast	8652	(3925)	5295	(2402)	13947	(6327)

Ballast

	Number of weights	Total weight, lb	(kg)	Water, lb	(kg)
Front wheels	12	1422	(645)	1317	(598)
Rear wheels	4	474	(215)	1425	(646)

Seat — Bostrom, upholstered pan with combined cushion and backrest; Sifra parallelogram linkage with rubber torsion suspension adjustable for driver's weight; range of adjustment 8$\frac{1}{2}$ in (216 mm) fore and aft and 3$\frac{1}{8}$ in (79 mm) vertical

Number of grease points

Whole tractor — 22

Overall dimensions

	Length	Width	Height
With ballast	13 ft 5 in (4.09 m)	7 ft 3 in (2.21 m)	8 ft 0 in (2.44 m)
Without ballast	13 ft 5 in (4.09 m)	7 ft 3 in (2.21 m)	8 ft 1 in (2.46 m)

Overall height measured to top of exhaust pipe

Lighting

	Height above ground of centre, in (cm)	Size, in (cm)	Distance from outside edge of tractor at 70 in (1778 mm) wheel track, to centre, in (cm)
Headlights	38½ (97.8)	4 (10.2) dia	38½ (97.8)
Side lights	57 (144.8)	Semicircular 2½ (6.4) dia	10½ (26.7)
Rear lights	54⅞ (139.4)	Semicircular 2½ (6.4) dia	10½ (26.7)
Reflectors	49½ (125.7)	3¼ (8.3) dia	10½ (26.7)

Unrestricted beam angle of headlights in plan view 56°

FUELS AND LUBRICANTS USED IN TESTS

Fuel	:	Diesel oil, specific gravity 0.843 at 60°F (15.6°C), viscosity at 50°F (10°C) : 2.07 cSt, Cetane No. 48, to Class A British Standard 2869:1970
Engine oil	:	Series III SAE 20W
Gearbox and final drives	:	SAE 80 EP
Rear transmission	:	Ford specification ESEN M2C 86A

COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests : 7th September 1971;
N.I.A.E., Silsoe, Bedford, U.K.

Type of dynamometer : Water brake, Heenan and Froude

Horsepower (Metric hp)	Speed, rev/min		Fuel consumption,		
	Engine	p.t.o.	UK gal/h (l/h)	lb/hp h (g/metric hp h)	hp h/UKgal (metric hp h/l)
Maximum power - 2 hour test					
96.2 (97.5)	2300	1117	5.24 (23.82)	0.459 (205)	18.3 (4.08)
Standard p.t.o. speed (1000 rev/min)					
91.0 (92.3)	2059	1000	4.75 (21.59)	0.440 (197)	19.1 (4.26)
The speed recommended by the manufacturer for drawbar work					
96.2 (97.5)	2300	1117	5.24 (23.82)	0.459 (205)	18.3 (4.08)
Part loads					
83.9 (85.1)	2362	1147	4.68 (21.28)	0.470 (210)	17.9 (3.99)
0	2481	1205	1.61 (7.32)	-	-
42.9 (43.5)	2416	1173	2.98 (13.55)	0.585 (262)	14.4 (3.21)
96.2 (97.5)	2300	1117	5.24 (23.82)	0.459 (205)	18.3 (4.08)
21.7 (22.0)	2445	1187	2.23 (10.14)	0.866 (387)	9.7 (2.16)
63.5 (64.5)	2386	1159	3.75 (17.05)	0.497 (222)	16.9 (3.77)

No load, maximum engine speed : 2481 rev/min

Equivalent crankshaft torque at maximum power : 219.6 lb ft (30.4 kgm)

Maximum equivalent crankshaft torque : 244.2 lb ft (33.8 kgm) at 1480 rev/min engine speed

Mean atmospheric conditions : temperature 76°F (24°C)
: pressure 30.17 inHg (766 mmHg)
: relative humidity 48%

Maximum temperature : coolant 206°F (97°C)
: engine oil 209°F (98°C)
: fuel 93°F (34°C)

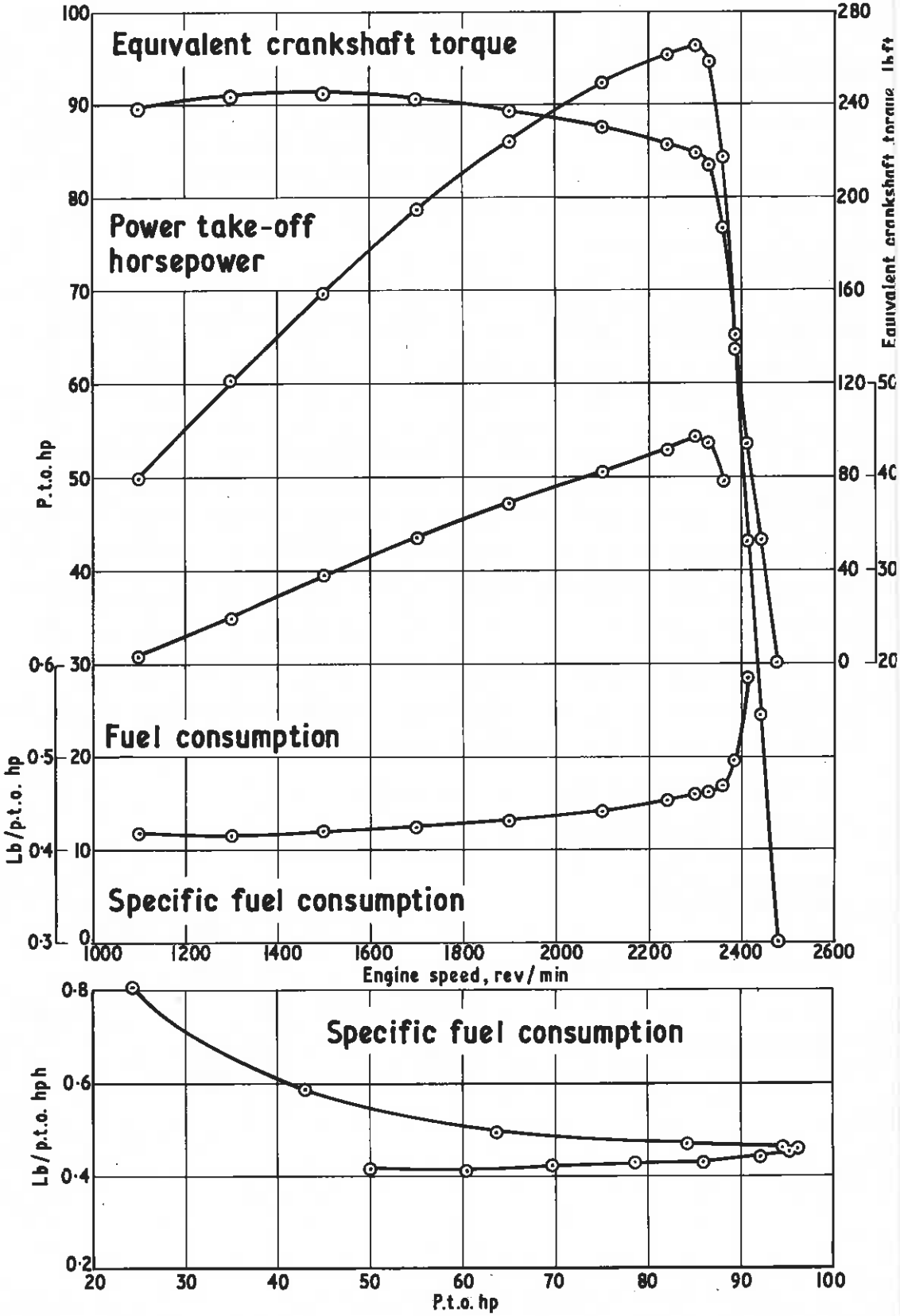


Fig. 1. Power take-off test

Date of tests: 18th September - 6th December 1971 Type of track: Concrete Height of drawbar above ground: 13½ in (343 mm)

Gear	Horse-power (metric hp)	Drawbar pull, lb (kg)	Speed, mile/h (km/h)	Engine speed, rev/min	Wheel -slip, %	Specific fuel consumption, lb/drawbar hp h (g/metric drawbar hp h)	drawbar hp h/UKgal (metric drawbar hp h/l)	Temperature, °F (°C) Coolant	Fuel	Engine oil	Atmospheric conditions Temperature, °F, (°C)	Relative humidity, %	Pressure, in Hg (mm Hg)
(i) Maximum power (ballasted)													
1	*61.5 (62.4)	13800 (6260)	1.67 (2.69)	2360	15.0	0.625 (280)	13.5 (3.01)	175 (79)	73 (23)	164 (73)	66 (19)	80	29.99 (762)
2	80.6 (81.7)	9600 (4355)	3.15 (5.07)	2212	5.4	0.540 (242)	15.6 (3.48)	174 (79)	78 (26)	156 (69)	66 (19)	80	29.99 (762)
3	84.0 (85.2)	7900 (3583)	3.99 (6.42)	2264	3.6	0.529 (237)	15.9 (3.55)	173 (78)	70 (21)	160 (71)	63 (17)	74	29.99 (762)
4	84.7 (85.9)	5800 (2631)	5.48 (8.82)	2248	2.0	0.525 (235)	16.0 (3.57)	180 (82)	71 (22)	155 (68)	61 (16)	84	29.99 (762)
5	85.1 (86.3)	4800 (2177)	6.65 (10.70)	2242	1.5	0.522 (233)	16.1 (3.59)	180 (82)	70 (21)	160 (71)	61 (16)	84	29.99 (762)
6	77.9 (79.0)	2400 (1089)	12.17 (19.58)	2258	0.8	0.567 (254)	14.9 (3.32)	178 (81)	73 (23)	160 (71)	64 (18)	90	29.99 (762)
(ii) Five hour test at 75% of pull at maximum power													
2	62.5 (63.4)	7200 (3226)	3.26 (5.25)	2416	3.0	0.558 (250)	15.1 (3.35)	175 (79)	76 (24)	165 (74)	51 (11)	87	29.96 (761)
(iii)/ Five hour test at pull corresponding to 15% wheelslip in test (i)													
1	-	13800 (6260)	1.71 (2.75)	2351	-	-	-	174 (79)	74 (23)	159 (71)	44 (7)	93	30.03 (763)
(iv) Maximum power (unballasted)													
1	45.5 (46.1)	9600 (9355)	1.78 (2.87)	2415	11.8	-	-	170 (77)	67 (19)	149 (65)	42 (6)	92	29.53 (750)
2	79.8 (80.9)	9300 (4218)	3.22 (5.18)	2326	10.0	-	-	174 (79)	66 (19)	156 (69)	43 (6)	92	29.53 (750)
3	83.1 (84.3)	8000 (3629)	3.90 (6.28)	2264	6.1	-	-	177 (81)	64 (18)	163 (73)	42 (6)	92	29.53 (750)
4	86.6 (87.8)	6000 (2722)	5.41 (8.70)	2248	4.0	-	-	175 (79)	66 (19)	150 (66)	41 (5)	92	29.53 (750)
5	87.5 (88.7)	5050 (2291)	6.50 (10.46)	2242	3.1	-	-	175 (79)	67 (19)	155 (68)	53 (12)	69	30.15 (766)
6	83.9 (85.1)	2600 (1179)	12.10 (19.47)	2272	1.6	-	-	175 (79)	69 (21)	159 (71)	53 (12)	69	30.15 (766)

Total oil consumption during ten hours duration of tests (ii) and (iii) 0.084 lb/h (38.1 g/h)

*Maximum power available at 15% wheelslip

/Test (iii) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance

3. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment : As in specification, without ballast

Track of wheels : front - 70 in (1778 mm)
: rear - 70 in (1778 mm)

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space	10 ft 2½ in (3.11 m)	10 ft 1 in (3.07 m)	20 ft 0 in (6.10 m)	19 ft 8½ in (6.01 m)
Radius of turning circle	9 ft 3½ in (2.83 m)	9 ft 2 in (2.79 m)	19 ft 1 in (5.82 m)	18 ft 9½ in (4.73 m)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground	34.1 in (866 mm)
Distance forward from the vertical plane containing the axis of the rear wheels	44.8 in (1138 mm)
Distance from the median plane of the tractor	0

5. BRAKING

Date of tests : 2nd and 25th November 1971

Type of track : Concrete roadway

Type of decelerometer : Moto Meter, recording type

Weight of ballasted tractor : 13947 lb (6327 kg)

Cold brakes

	Tractor without ballast	Tractor ballasted
Travelling speed of tractor, mile/h (km/h)	15.5 (25.0)	15.5 (25.0)
Maximum deceleration, ft/s^2 (m/s^2)	17.0 (5.2)	15.4 (4.7)
Stopping distance, ft (m)	18.0 (5.5)	19.0 (5.8)
Force on brake pedal, lb (kg)	120 (54)	163 (74)
Force exerted on the brake pedal to achieve a deceleration of 8.2 ft/s^2 (2.5 m/s^2), lb (kg)	63 (29)	80 (36)

The results of tests without ballast were obtained at the limit of rear wheel contact with the ground

Brake fade characteristics (hot tests)

Maximum deceleration hot/maximum deceleration cold x 100 : 105%

Stopping distance cold/stopping distance hot x 100 : 92%

Force on pedal cold/force on pedal hot x 100 : 98%

Efficacy of handbrake/parking latch : Satisfactory facing up and down slope

Pull on handbrake : 72 lb (33 kg)

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests	:	5th October 1971
Type of sound level meter	:	Bruel & Kjaer Type 2204
Type of track	:	Concrete
Results of tests	:	gear - 8th
	:	travelling speed before acceleration - 16.4 mile/h (26.4 km/h)
	:	sound level - 91 dBA

7. NOISE MEASUREMENTS AT THE DRIVER'S EAR LEVEL

Date of tests	:	5th October 1971
Type of sound level meter and octave filter	:	Bruel & Kjaer Type 2204 and 1613
Type of track	:	Concrete

Results of Tests

Gear	Travelling speed, mile/h (km/h)	Sones	dBA	Noise rating number
2nd	3.4 (5.5)	165	100	102

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests	:	24th September to 5th October 1971 N.I.A.E., Silsoe, Bedford, U.K.
Hydraulic fluid		
Make and type	:	Ford Specification ESEN-M2C 86A
Viscosity	:	10.5-11.6 cSt at 210°F (99°C)
Viscosity index	:	95
Type of linkage lock for transport	:	Hydraulic
Opening pressure of the cylinder over pressure relief valve (manufacturer's figures)	:	2750-2850 lb/in^2 (193-200 kg/cm^2)

Pump characteristics

(i) Opening pressure of relief valve	:	2100 lb/in^2 (148 kg/cm^2)
Sustained pressure of the open relief valve	:	2570 lb/in^2 (181 kg/cm^2)
(ii) Pump delivery rate at minimum pressure and rated engine speed	:	5.41 gal/min (24.6 l/min)
(iii) Pump delivery rate	:	5.45 gal/min (24.8 l/min)
Delivery pressure	:	2100 lb/in^2 (148 kg/cm^2)
Power	:	8.0 hp (8.1 metric hp)

	Height above ground in down position, in (mm)	Vertical movement, in (mm)	Maximum force exerted through full range, lb (kg)	Pressure, lb/in^2 (kg/cm^2)	Lifting force when front of tractor lifts off ground, lb (kg)
At hitch points	11¼ (286)	26¼ (667)	3450 (1565)	2570 (181)	-
On the frame	10¼ (260) 8½ (216)	29½ (749) 34¾ (883)	3250* (1474) 2900/ (1315)	2570 (181) 2570 (181)	- -
2 assister rams fitted					
At hitch points	11¼ (286)	26¼ (667)	8200 (3720)	2570 (181)	-
On the frame	10¼ (260) 8½ (216)	29½ (749) 34¾ (883)	7200* (3266) 6100/ (2767)	2570 (181) 2570 (181)	7200 (3266) 7000 (3175)

*Results obtained with the top link attached to the top rocker position on the tractor

/Results obtained with the top link attached to the bottom rocker position on the tractor

SUPPLEMENTARY TEST

9. PERFORMANCE AT ENGINE CRANKSHAFT

Date and location of tests : 14th September 1971
N.I.A.E., Silsoe, Bedford, U.K.

Type of dynamometer : Waterbrake, Heenan and Froude

Horsepower (Metric hp)	Speed, rev/min	Fuel consumption, UKgal/h (l/h)	lb/hp h (g/metric hp h)	hp h/UKgal (metric hp h/l)
Maximum power - 2 hour test				
100.6 (102.0)	2300	5.26 (23.91)	0.440 (197)	19.1 (4.26)
Part loads				
87.1 (88.3)	2343	4.56 (20.73)	0.442 (198)	19.1 (4.26)
0	2480	1.44 (6.55)	-	-
45.0 (45.6)	2418	2.84 (12.91)	0.532 (238)	15.8 (3.52)
100.6 (102.0)	2300	5.26 (23.91)	0.440 (197)	19.1 (4.26)
22.8 (23.1)	2453	2.08 (9.46)	0.770 (344)	10.9 (2.43)
66.3 (67.2)	2379	3.66 (16.64)	0.466 (208)	18.1 (4.04)

No load, maximum engine speed : 2480 rev/min

Crankshaft torque at maximum power : 229.7 lb ft (31.8 kgm)

Maximum crankshaft torque : 255.1 lb ft (35.3 kgm)
at 1500 rev/min engine speed

Mean atmospheric conditions : temperature 62°F (17°C)
pressure 30.10 in Hg (765 mm Hg)
relative humidity 74%

Maximum temperature : coolant 186°F (86°C)
engine oil 180°F (82°C)
fuel 90°F (32°C)

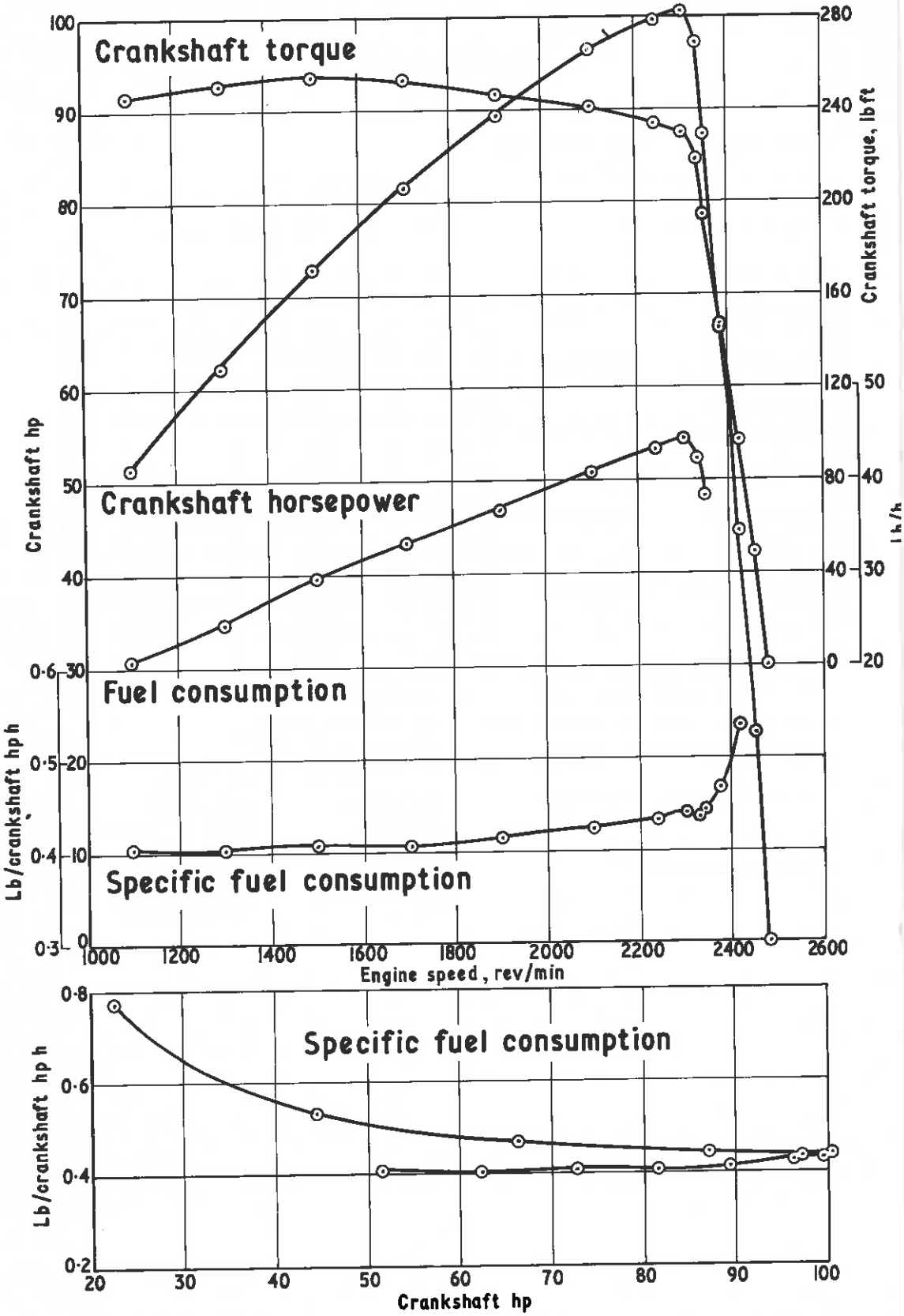


Fig.2. Engine test

R.71/7609/06CD

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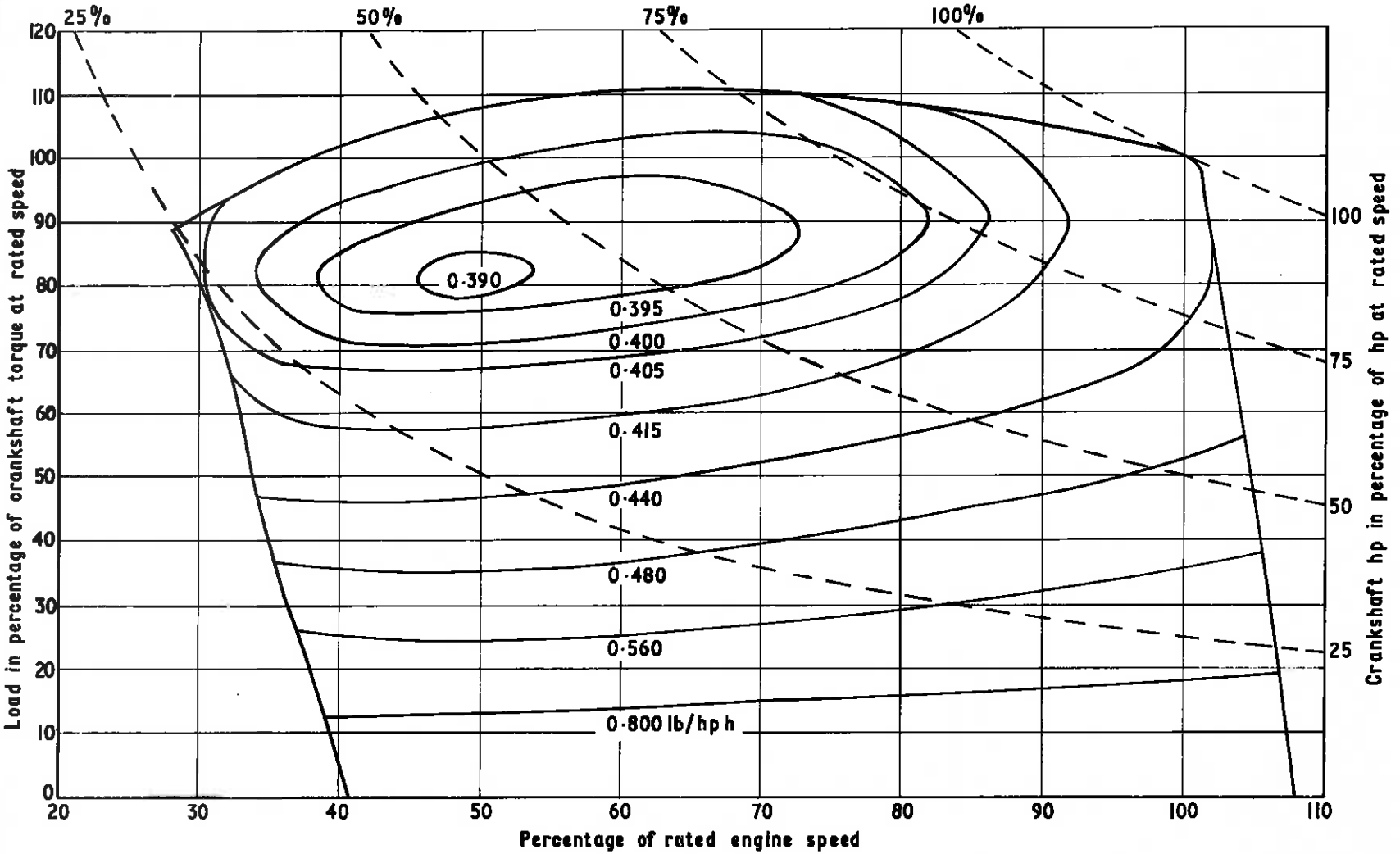


Fig. 3. Engine test

REPAIRS AND ADJUSTMENTS DURING TESTS	:	Two injectors were cleaned during the test of the engine to rectify a slight loss of power
REMARKS	:	None
Officer in charge	:	D.W. SMITH
Head of Tractor and Ergonomics Department	:	J. MATTHEWS
Date	:	18th February 1972

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