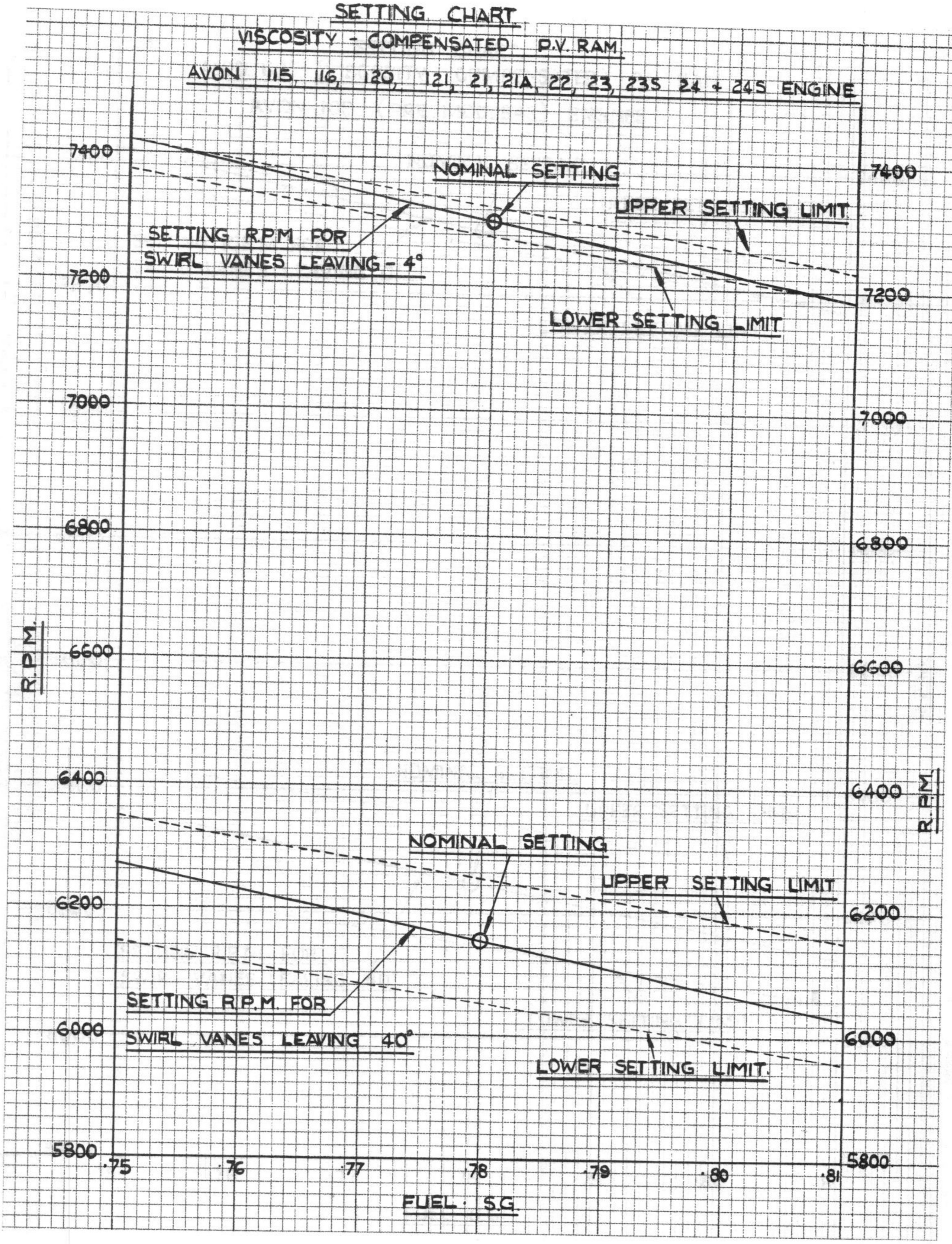
AERO ENGINE SCHOOL
COURSE NOTE
N° TAv.181



1.5.56

ADDITIONAL NOTES

FUEL SYSTEM.

B.P.C.

Samples the actual intake pressure.
Damping oil prevents engine vibration affecting capsule.
Push rod samples throttle inlet pressure, [illegible] when throttle pressure equals 1240 lb/□".

Engine Starting.

All ball valves closed, pump at max stroke. When pumps are delivering sufficient fuel for slow running (4000 rpm) push rod will feel throttle inlet pressure & open B.P.C. ball valve against spring and decrease pump supply. At idling speed the ball valve will be bleeding away as much fuel as is being supplied to the rear of servo piston so pump remains steady.

Should the B.P.C. be disconnected or U/S fuel supply will continue increasing up to 1900 lb/□" when pump stall pressure ball valve will open and allow fuel to bleed from servo piston, and decrease pump stroke again. Under these conditions engine will stabilise ~~with throttle~~ at 4,500 rpm instead of 2750 at slow running.

On cold days governed r.p.m will be low.
" hot " " " " high.

Governed r.p.m. should be set on low limit on cold days and vice versa on hot.

The Specific Gravity of the fuel must be taken into account if varying types are being used.

On exceptionally cold day if governed speed cannot be set it is possible to do it by disconnecting the ram pressure pipe on the B.P.C.

B.P.C. Press.

Amplification is built in because at altitude in the slow running condition the fuel required is so low that if this amount were supplied the fuel would not vapourise and a flame would not occur. Consequently it is arranged that a maximum amount of fuel which will prevent flame out is supplied at the slow running condition at altitude, this then means that a overfueling condition applies and the S.R. revs increase with altitude. This condition will apply all all through the engine speed ranges at a decreasing rate. It must be remembered that the MAX. rpm cannot be exceeded because the governor would come into action.

ADDITIONAL NOTES

Isolating Valve.

If for any reason failure of B.P.C. A.C.U. an excessive servo bleed occurs, all servo would be lost. In that case the Isolating Valve is operated, putting the top pump out of servo control, but leaving it under control of the pump stall valve & max. gov control. In the case of one pump failure the n.r.v's below the pump rotor inlet will prevent a circulation of fuel from the serviceable pump to the u/s one.

Pressurising Valve.

Opens at 290 lbs/□" & permits fuel to main burner. Fuel draining down valve stem is returned to L.P. system. Throttle valve has same system.

ADDITIONAL NOTES

Lubrication System.

Two roller bearings (front and rear) One ball bearing (centre)

Oil. OX38 Alcohol base, must not be mixed.
34A/266 DERD 2487 R.DE/O/463-4.

Oil Pressure
Check at max. oil press must be at least 15 lb/□".

Normal Pressure — 20 lb/□" **Temperature range** — 40°c to 65°c.
min 40 lb/□"

Tank Capacity — 16 pints **Consumption** — 1 pint/hr.

Filters.
Three suction strainers
One pressure (Purolator

Pumps.
Three one pressure & two scavenge.

Pressure Pump capacity 1760 pts/hr.
The two scavenge pumps capacity 1600 pints/hr. each.

Oil Flow.
Oil flows from the sump through the centre strainer to the top pump. From pump to the cooler, from cooler to purolator filter, from filter to distribution gallery. One external pipe leads to the front bearings via 4 delivery jets. An internal drilling to a circular gallery which lubricates the centre bearing & rear bearing through jets.

Auxiliary Gearbox and External Wheel case drive Lubricated by pressure jets* from circular gallery (*via filter thread)
An external pipe leads to the auxiliary G/Box drive from the distribution gallery.

Oil Pump Drives Lubricated by pressure from gallery.
Centrifugal Breather by splash.
External Wheelcase mainly by oil jets except for
Proven Gas Pump which is fed from a small oil well in the wheelcase casting
Tach Generator. is fed by drilling from pressure system.

ADDITIONAL NOTES

Oil Cooler.

Oil & Fuel goes round the cooler, the fuel going through Matrix tubes, and the oil going between a frame work of baffles. A relief valve is fitted which lifts at 30 lb/in² (differential) so if there is a blockage in the cooler the oil will bypass.

Scavenge System.

Front.

Drain to bottom of housing through the 4 [illegible] exits to an external pipe to the front filter then to the lower pump then to a de-aerator funnel & to the de-aerator plate to sump.

Centre.

By gravity to top of de-aerator plate to sump.

Rear.

To bottom of centre casing by internal pipes, then external pipe to the sump, to rear filter, to centre pump, to de-aerator plate to sump.

External Wheelcase.

Gravity via bottom to sump.

Vent System.

Air/oil mist from deaerator plate passes to inner concentric tube through holes into hollow oil pump drive and into centrifugal breather, the oil is flung to the outside through holes drilled in breather and drops into sump. Air is led of the atmosphere.

Oil Draining.

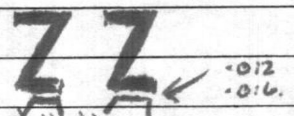
From centre suction filter.

Note.

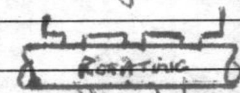
When refitting pipes with black oil seals, lubricate with OM 11 red seals lubricate with ZX.13. (34B/88).

ADDITIONAL NOTES

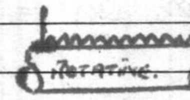
Air Cooling & Sealing



Self Clearing



Acme Thread (Left hand).
Air to Oil Seal



Air Seal.

Front Bearing. 3rd stage air

Taken from behind rotor blade via vortex reducer into compressor shaft, forward to pressurise front bearing rear face. Down shaft to intermediate casing. Air to oil seals, fore and aft of internal wheelcase prevents oil leaking from w/case & centre bearing. Some is tapped to breather to make the shaft leak proof. Cools rear bearing.

11th stage air.

Vortex reducer take out the swirl velocity, increase pressure and gives axial flow. 11th stage air goes into turbine shaft and between turbine discs to cool back surface of H.P. turbine and front of L.P. disc. and the rear face of L.P turbine via a drilling in main turbine securing nut.

Rear face of front turbine recieves more cooling air as it is hottest by arrangement of labyrinth seals. Air joins main gas flow at blade roots.

12th stage.

Via straightner vanes to spider via drilling to front face of H.P turbine.

ADDITIONAL NOTES

ENG. MK No.	A/C TYPE	ENGINE INFORMATION
MK. 1.	CANBERRA. B2. PR3. T4.	SINGLE BREECH STARTER. ~~STARTER~~ SINGLE B TYPE FUEL PUMPS. NON ALTITUDE SENSITIVE A.C.U. NO ANTI ICING SYSTEM.
MK 109.	CANBERRA B6 PR7 & B8.	TRIPLE BREECH STARTER DUAL "D" TYPE FUEL PUMPS. ALTITUDE SENSITIVE A.C.U. ANTI ICING SYSTEM.
MK 113.	HUNTER MK 14.	SIMILAR TO MK 109.
MK 115.	HUNTER MK 4	SIMILAR TO 109 + AUTOMATIC JET CONTROL SYSTEM.
MK 119.	HUNTER MK 4.	A MK 113 + MOD 1020 (GUN FIRING MOD).
MK 120.	HUNTER MK 4.	MK 115. + MOD 1020 (GUN FIRING MOD).
MK 121.	HUNTER MK 4.	REMATCHED ENGINE FOR GUN FIRING.
MK 114.	SWIFT MK 5.	SIMILAR TO MK 109 + REHEAT.
MK 116.	SWIFT MK 7.	SIMILAR TO MK 109 + REHEAT. AUTOMATIC J.P.T. CONTROL. LIQUID FUEL CONTROL MOTOR.
MK 117.	COMET. II TRANS COMM.	SIMILAR TO 109 + ELECTRIC STARTER MOTOR ENG/SPEED SYNCHRONISER, CONSUMABLE DRAINS.
MK 118.	COMET II BOMBER COMM.	SIMILAR TO 117 + STARTER MOTOR GENERATOR.

ADDITIONAL NOTES

EXHAUST NOZZLE.

THRUST CALCULATION.

MK104. 15°C, 14.7 P.S.I. 795 R.P.M.

STATIC CONDITION.

V_2 = 1790 ft per sec.

W = 119 lbs P.S. [ENGINE]

V_1 = 0 ft P.S.

REACTION THRUST $X_J = \frac{W(V_2 - V)}{G}$

$= \frac{119(1790 - 0)}{32.2} = 6606$ lbs.

NOZZLE THRUST $= A(P_4 - P_0) = 298(17.7 - 14.7)$
$= 894$ lbs.

17.7 (P_4) | 14.7 (P_0) | 298 □" (A)

GROSS THRUST $X_G = X_J + X_A$
$= 6606 + 894 = 7500$ lbs

This is the normal thrust on an engine on test bed at normal day.