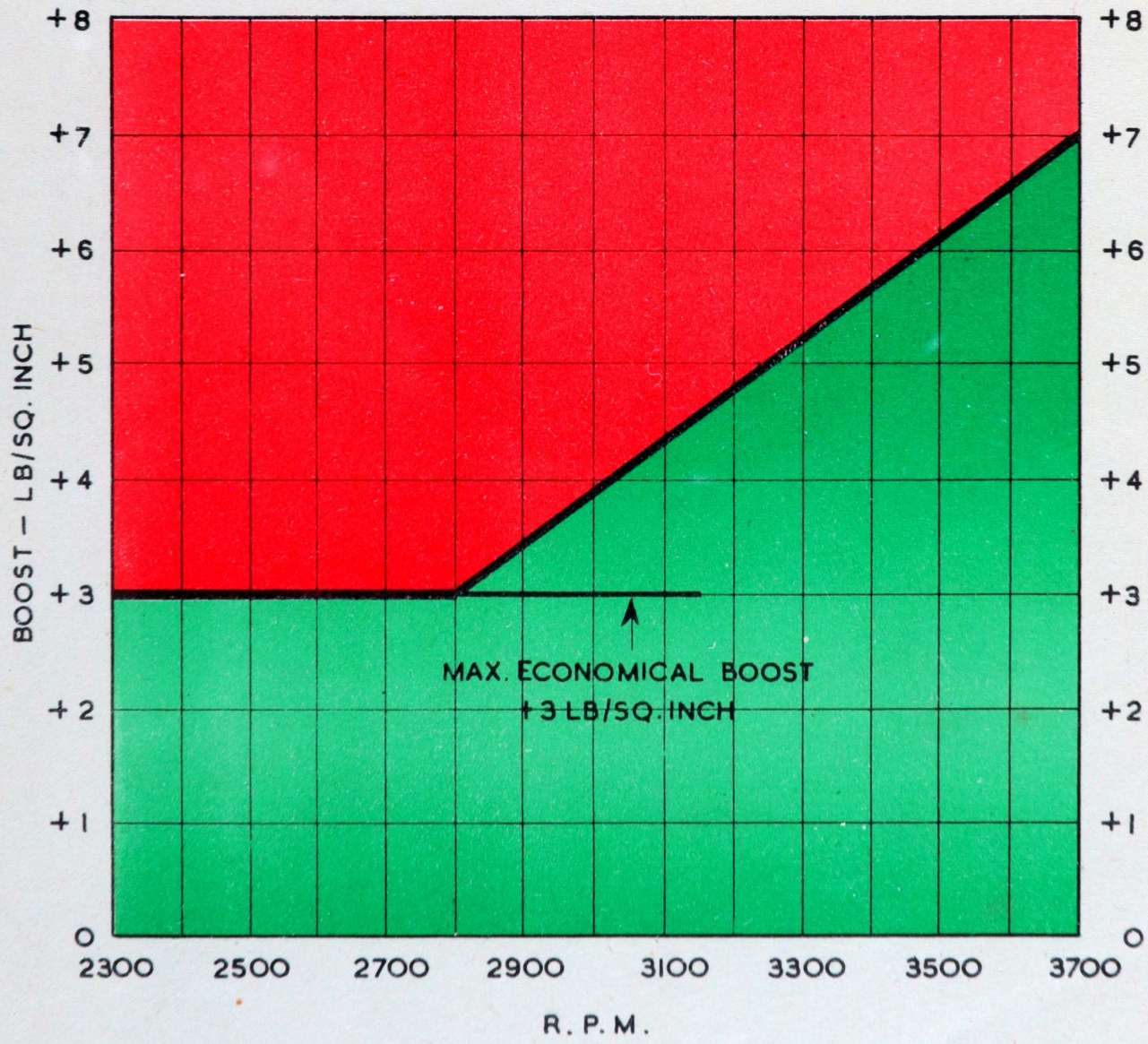
ISSUED BY A.L. No.26/H.

A P 1804A. VOL. & P. N. SECT.2

SABRE II

RECOMMENDED
ASSOCIATED BOOST & R.P.M.



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SECTION 2

HANDLING AND FLYING NOTES FOR PILOT

Note: The flying technique outlined in these notes is based on A.P.129, Flying Training Manual, Part I, Chapter III, and A.P.2095, Pilot's Notes General, to which reference should always be made if further information is required.

1. ENGINE DATA: SABRE II.

(i) Fuel: 100 octane only.

(ii) Oil: Specification D.T.D.472B plus Additive No.1.
(It is important that Additive No.1 be used whenever available and for all operational flying)

(iii) Engine limitations:

		R.p.m.	Boost lb/sq.in.	Temp. °C Coolant.	Oil.
MAX. TAKE-OFF TO 1,000 FEET	M	3,700	+7	-	-
MAX. CLIMBING	M	3,500	+6	125	90
1 HR LIMIT	S	3,500	+6	125	90
MAX. RICH	M	3,150	+4½	110	80
CONTINUOUS	S	3,150	+4½	110	80
MAX. WEAK	M	3,150	+3	110	80
CONTINUOUS	S	3,150	+3	110	80
COMBAT	M	3,700	+7	130	95
5 MINS.LIMIT	S	3,700	+7	130	95

OIL PRESSURE: NORMAL: 60-85 lb/sq.in.
EMERGENCY MINM. (5 MINS): 50 lb./sq.in.

MINM. TEMP. FOR TAKE-OFF: OIL: 40°C.
COOLANT: 65°C.

FUEL PRESSURE: 2½ lb./sq.in.

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(iv) Supercharger gear changing:

Gear changes between 10,000 and 12,000 feet may be made at 3,500 r.p.m., but at all other altitudes and for ground checks r.p.m. must not exceed 3,150.

2. FLYING LIMITATIONS

The aircraft is designed for the following speeds:

Diving:	525 m.p.h. I.A.S.
Undercarriage down:	210 m.p.h. I.A.S.
Flaps down:	155 m.p.h. I.A.S.

3. PRELIMINARIES

(i) On entering the cockpit check:

Undercarriage lever	- DOWN
Undercarriage lever locking catch	- LOCK

(ii) Switch on the undercarriage indicator and check that the green lights appear.

(iii) See that the cabin roof is locked down on both sides and that both doors are properly fastened.

4. STARTING THE ENGINE AND WARMING UP.

Note.- Before starting the engine, ensure that the tail is tied down.

(i) Set:

Ignition switches	- OFF
Fuel cock	- MAIN TANKS
Mixture control (if fitted)	- RICH
Propeller speed control	- Fully forward
Supercharger control	- MODERATE
Radiator shutter	- DOWN

Note.- (a) If the main tanks are less than half full, set fuel cock to NOSE TANKS.

(b) In cold weather the radiator shutter should be closed (UP) in order to avoid freezing up of the radiator.

(ii) Check that there is not a live cartridge in the firing position, then have the engine hand-turned through three or four revolutions to ensure that it is free.

(iii) Starting from cold:

(a) Set the starting lever to START.

(b) Open the throttle slowly to the stop position.

(c) Prime the carburettor until the fuel pressure reaches 1½ to 2 lb/sq.in. Then screw down the pump.

(d) Load the cartridge starter. The following types of cartridge should be used:

At air temperatures above +5°C: No.2, Mark II.
At air temperatures below +5°C: No.3, Mark I.

(e) Switch ON the ignition.

(f) Carefully operate the cylinder priming pump until increased resistance is felt (so as to fill the pipe line and pump) and then prime the cylinders with full vigorous strokes as follows:

Oil temperature	No. of strokes
0°C to + 10°C	5
+10°C to + 20°C	4
+20°C to + 30°C	3

(g) Immediately priming as above has been completed press the booster coil and starter buttons, and as the engine fires, operate the pump, if and as required, until it is running evenly.

(h) As soon as the engine is running steadily depress the priming pump slowly and screw it down.

(i) Set the starting lever to NORMAL.

(iv) If the engine fails to start at first attempt:

(a) Reload the starter.

(b) Press the booster coil and starter buttons.

(c) As the engine fires, operate the priming pump as required until it is running evenly.

Note: If the engine does not start after 3 cartridges have been fired, switch off the main magnetos, blow out the engine by hand-turning and repeat the operations given in sub-para. (iii) above.

(v) Starting a hot engine:

(a) Set the starting lever to START.

(b) Open the throttle slowly to the stop position.

(c) Prime the carburettor until the fuel pressure reaches 1½ to 2 lb/sq.in. Then screw down the pump.

(d) Load the cartridge starter.

(e) Switch ON the ignition.

(f) If the engine has been standing less than half an hour prime the cylinders with one pumpful; if over half an hour and the oil temperature is still above +30°C, prime with two pumpfuls. If, however, the oil temperature is below +30°C. proceed as for a cold engine (sub.para. (iii) (g) to (i)).

(g) Press the booster coil and starter buttons.

(h) As soon as the engine fires evenly, depress the priming pump slowly and screw it down.

(i) Set the starting lever to NORMAL.

Note: Do not jerk the throttle if the engine fails to pick up, as no useful purpose is served by so doing and the air intake will be flooded with fuel, probably leading to a fire.

(vi) Fire: If the engine catches fire the following drill must be carried out:

(a) Ground personnel shout "FIRE".

(b) The pilot must switch OFF the ignition immediately and then extend both arms outside the cockpit to indicate that the engine is safe.

(c) When the man with the extinguisher sees that the pilot has his arms extended, he must immediately apply the extinguisher to the air intake.

(vii) Run the engine at 800-1000 r.p.m., just long enough to observe that oil pressure is recording on the gauge and that the engine is functioning normally. This period should normally not exceed 30 seconds.

(viii) Increase r.p.m. to 2,000 as soon as a maximum oil pressure of 140 lb./sq.in. will permit and continue running at this speed until the oil inlet temperature reaches the minimum for take-off.

Note: In cold weather it may be necessary to exceed the above period of 30 seconds.

WARNING: Should the coolant outlet temperature reach 125°C. during ground running, throttle back to about 2,000 r.p.m. so as to keep circulation going until temperature control is obtained.

5. TESTING THE ENGINE AND INSTALLATIONS.

While warming up:

(i) Make the usual checks of temperatures, pressures and controls. Normal pneumatic pressure: 450 lbs/sq.in.

After warming up:

(ii) Open up to zero boost in rich mixture and exercise and check operation of the two-speed supercharger once only. R.p.m. should fall when S ratio is engaged.

(iii) At +3 lb./sq.in. boost exercise and check operation of the constant speed propeller.

(iv) With the propeller control fully forward open the throttle lever fully and check take-off boost and static r.p.m.

(v) Throttle back to maximum rich continuous boost and test each magneto in turn. The drop in r.p.m. should not exceed 100.

6. TAXYING

The brakes should be used with care, particularly if they are new, and they should not be used more than is absolutely necessary. Excessive use of the brakes causes serious overheating and loss of efficiency.

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7. CHECK LIST FOR TAKE-OFF

T - Trimming tabs - Elevator: neutral
Rudder: full port.

M - Mixture control (if fitted) - RICH

P - Propeller control - Fully forward.

Fuel - Check cock setting and contents of both sets of tanks. Fuel pressurising cock - OFF. Under no circumstances must the take-off be made on a set of tanks which is less than half full.

Flaps - UP. Selector at VALVE SHUT position.
(When taking off from very small airfields the flaps should be lowered 30°)

Supercharger - MODERATE

Radiator shutter - DOWN.

8. TAKE-OFF

(i) When the take-off is made with flaps up, there is very little tendency to swing. The tail should be held slightly below the flying attitude and the aircraft allowed to fly itself off.

(ii) When the take-off is made with flaps 30° down, there is a strong tendency to swing to starboard, and unless the throttle is opened progressively as speed increases, the rudder control may be insufficient to keep the aircraft straight. Also the tail comes up rather more easily and care must be taken not to get it too high, as there is very little clearance between the propeller and the ground.

(iii) Do not start to climb steeply until a speed of 150 m.p.h. I.A.S. is attained.

(iv) If flaps have been used, raise them at 200-300 feet. Return the selector to VALVE SHUT.

9. CLIMBING

(i) The speeds for maximum rate of climb are as follows:

Up to	16,000 feet:	185 m.p.h. I.A.S.
At	21,000 feet:	170 m.p.h. I.A.S.
At	26,000 feet:	155 m.p.h. I.A.S.
At	31,000 feet:	140 m.p.h. I.A.S.

For intermediate heights, reduce speed by 3 m.p.h. per 1,000 feet.

(ii) For maximum rate of climb change to S ratio when the boost has dropped by 5 lb/sq.in. (at approximately 12,000 feet).

10. GENERAL FLYING

(i) Stability.- The aircraft is stable directionally and laterally but slightly unstable longitudinally, except at high speeds, when it is just stable. The elevator control is rather light and care must be taken not to use it too harshly. The aileron control remains light and effective up to the maximum permissible speed, but is a little sluggish at low speeds.

(ii) Change of trim:-

Flaps down	- No change
Undercarriage down	- Nose down
Radiator shutter up	- Nose down

Directional trim changes with variations in airspeed and throttle setting, and full use should be made of the rudder trimming tab to avoid flying with sideslip. Fore and aft trim is affected by changes in directional trim. Left yaw produces a tendency for the nose to drop and right yaw for it to rise.

(iii) For all conditions of flight other than taxying, take-off or climb, the radiator shutter should be UP.

(iv) The oil temperature should be carefully watched.

(v) For combat flight change to S ratio when the boost has dropped by 5 lb/sq.in.

(vi) For stretching a glide in the event of a forced landing, the propeller speed control should be pulled right back. With flaps and undercarriage UP, the gliding angle is very flat at about 150 m.p.h. I.A.S.

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(vii) The main tanks must always be used first in order to prevent adverse change of C.G.

(viii) Flying at low airspeeds: Speed may be reduced to about 160 m.p.h. I.A.S. and the flaps lowered about 30° - 40°. The radiator shutter must be put DOWN and the propeller speed control set to give about 3,100 r.p.m.

11. MAXIMUM RANGE

(i) Climbing:
Use +3 lb/sq.in. boost and 3,150 r.p.m. in weak mixture at the speed recommended for maximum rate of climb. Change to S ratio when the boost has fallen by about +1 lb/sq.in. (at about 12,000 feet).

(ii) Cruising:
The recommended speed for maximum range is 210 m.p.h. I.A.S. Fly in weak mixture at maximum obtainable boost not exceeding +3 lb/sq.in. and reduce speed by reducing r.p.m., which may be as low as 2,300 if this will give the recommended speed. If at 2,300 r.p.m. and the maximum obtainable boost the recommended air speed is exceeded, reduce boost.
Change to S ratio if at 3,150 r.p.m. the recommended speed cannot be maintained in M ratio.

12. STALLING

(i) At the stall either wing may drop sharply with flaps either up or down.

(ii) Approximate stalling speeds when loaded to 10.650 lb. are:-

Flaps and undercarriage UP:	95 m.p.h. I.A.S.
Flaps and undercarriage DOWN:	75 m.p.h. I.A.S.

13. SPINNING

(i) Practice recovery from incipient spins is permitted by pilots who have written permission from the C.O. of their Squadron (C.F.I. of an O.T.U.)

(ii) Before practising spinning it is important to check the loading of the aircraft and ensure that the c.g. is not beyond the aft limit.

(iii) Spins must be started between 10,000 and 15,000 feet and recovery action is to be taken after not more than half a turn.

(iv) The use of engine assists recovery from spins to the left, although recovery can normally be effected without it. Spins to the left should be practised before spins to the right.

(v) To recover, the normal methods described in A.P.129 Chapter III, para.197 onwards should be followed. It is important that full opposite rudder is kept on until rotation stops, and it will be necessary to move the control column forward to about the central position. If an accidental spin to the right occurs at high altitudes, it may be necessary to rock the control column fore and aft as described in para.200. It is important not to ease out of the ensuing dive until the I.A.S. reaches 200 m.p.h. or the aircraft may stall and spin again.

14. DIVING

(i) Before diving, make certain that the radiator shutter is UP, for a violent nose down pitch results from closing the shutter in a dive.

(ii) If a dive is to be continued below 10,000 feet M ratio should be selected before commencing the dive. The throttle lever should not be fully closed.

(iii) In a dive the aircraft tends to become tail heavy but no retrimming is necessary. As speed increases it also tends to yaw to port but this can be easily corrected by the rudder trimming tab.

(iv) The elevator trimming tabs are very sensitive and should, therefore, not be used when diving. If, however, they are used the control should be moved slowly

15. AEROBATICS

All the normal aerobatics are easy to perform, but a large amount of height may be gained or lost during some manoeuvres and an ample margin must be allowed.

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Looping.- Use maximum cruising power and start the loop at a speed of at least 300 m.p.h. I.A.S. Care must be taken to avoid any harsh backward movement of the control column as this may induce a high speed stall.

Rolling.- Speed should be at least 250 m.p.h. I.A.S. and the roll should be 'barrelled' just sufficiently to keep the engine running and avoid any risk of loss of oil pressure.

Half roll off loop.- Maximum climbing power should be used and the speed should be at least 350 m.p.h. I.A.S. when starting the loop.

Upward roll.- Maximum climbing power should be used and the speed at the bottom of the dive should be about 400 m.p.h. I.A.S. for a fairly steep climbing roll, and 450 m.p.h. I.A.S. or more for a vertically upward roll.

Flick manoeuvres are not permitted.

16. CHECK LIST FOR LANDING

(i) Check contents of main tanks, and, if less than half full, change over to NOSE TANKS.

(ii) Reduce speed to 160 m.p.h. I.A.S.

U -	Undercarriage	- DOWN (Check green lights)
M -	Mixture control (if fitted)	- RICH
P -	Propeller control	- Fully forward
	Supercharger	- MODERATE
	Flaps	- DOWN As soon as the flap indicator shows that the flaps are fully down, return lever to VALVE SHUT position.
	Radiator shutter	- DOWN

(iii) A considerable tendency to yaw is noticeable as the undercarriage comes down. The indicator lights usually change to red, then green and back to red again two or three times before finally remaining green.

(iv) The flaps are large and the rate of descent with them lowered is consequently rapid.

(v) Approach speeds (m.p.h. I.A.S.):

		(flaps up)
Engine assisted:	105	(120)
Glide:	120	(130)

On a flapless approach it is necessary to yaw the nose occasionally because of the obstructed view ahead.

Note.- Do not turn at speeds below 130-140 m.p.h.

17. MISLANDING

(i) The aircraft will climb away easily with undercarriage and flaps down, and the use of full take-off boost is unnecessary.

(ii) Open the throttle slowly to about +4 lb/sq.in. boost and counteract the tendency to swing right by firm use of the rudder.

(iii) Before the undercarriage is raised, the flap selector must be at the VALVE SHUT position, otherwise the undercarriage will not retract completely.

(iv) Climb at about 130-140 m.p.h. I.A.S. and raise the flaps at about 200 ft. The flaps come up slowly.

18. AFTER LANDING

(i) Raise the flaps before taxying.

(ii) Change to S ratio once and back to M ratio.

(iii) To stop the engine idle for 2 minutes, then open up to about 1,000 r.p.m. and move the starting lever to CUT OUT.

(iv) When the engine has stopped, switch OFF the ignition and turn the fuel cock to ALL OFF.

Note: Starter cartridges should be removed over night so as to avoid deterioration.

19. POSITION ERROR CORRECTIONS

From To	120 160	160 200	200 230	230 280	280 320	320 360	m.p.h. I.A.S. m.p.h. I.A.S.
Subtract	0	4	8	12	16	20	m.p.h.

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20. FUEL CAPACITY AND CONSUMPTIONS

(i) Fuel capacity.-

Two main tanks (40 gallons each):	80	gallons
Two nose tanks (37 gallons each):	74	gallons
Total effective capacity:	154	gallons

(ii) Fuel consumptions (approximate gals/hr.).-

(a) Weak mixture:

M ratio at 5,000 feet:

Boost lb/sq.in.	R.p.m.				
	3,150	2,900	2,700	2,500	2,300
+3	100	91	84	-	-
+1¾	91	84	78	72	66
+1	-	-	-	-	63
0	-	-	-	-	58
-2	-	-	-	-	49
-4	-	-	-	-	42

M ratio at 15,000 feet:

Boost lb/sq.in.	R.p.m.				
	3,150	2,900	2,700	2,500	2,300
0	94	-	-	-	-
-1	87	79	-	-	-
-2	80	74	69	63	-
-3	74	68	63	59	-
-4	67	62	58	54	49

S ratio at 25,000 feet:

Boost lb/sq.in.	R.p.m.					
	3,150	3,000	2,900	2,800	2,700	2,600
0	94	-	-	-	-	-
-1	-	86	-	-	-	-
-1½	-	-	81	-	-	-
-2	-	-	-	75	-	-
-3	-	-	-	-	70	-
-3¾	-	-	-	-	-	64

(b) Rich mixture:

Boost lb/sq.in.	R.p.m.	M ratio at 5,000 feet	S ratio at 15,000 feet
+7	3,700	190	190
+6	3,500	150	165
+4½	3,150	125	132

21. ABANDONING BY PARACHUTE

When abandoning the aircraft by parachute, considerable leverage may be obtained on the cockpit door jettison levers by crossing the arms, that is to say, by releasing the port door with the right hand and the starboard door with the left hand. Both doors must be released simultaneously.

22. UNDERCARRIAGE EMERGENCY OPERATION

If after selecting DOWN the red indicator lights do not come on, try the reserve set of lights. If the engine pump will not lower the undercarriage, the handpump or emergency release pedals must be used as follows:

(i) Leave the undercarriage selector DOWN and work the handpump until resistance is felt and the green lights come on. At least 120 strokes will be required.

(ii) If the red lights do not come on after the first 12 strokes of the handpump, leave the selector DOWN and use the emergency pedals. It is not necessary to press both pedals at the same time, but a firm push must be applied until the pedal moves 3 or 4 inches forward and the corresponding red light comes on.

Note: It is important when using the pedals to fly straight and level. Applying "g" will merely make it harder to release the wheels.

(iii) After the wheels have been released, it may be necessary to skid the aircraft from side to side before the green lights will come on. If one or both green lights still fail to come on after skidding, look at the wing indicators. If these show that both wheels are down, it should be assumed that they are locked.

(iv) If the flaps cannot be lowered, approach 15 m.p.h. I.A.S. faster than normally.