



# SPITFIRE

## Mk.1a and Mk.IIa

For Microsoft Flight Simulator (MSFS 2020)



To get full enjoyment of the aircraft in this package, please read this Manual thoroughly and carefully.

**The manual and models in this package must not be used for real flight training purposes.**

## **BRIEF HISTORY:**

First flown on March 5, 1936, the Supermarine Spitfire is a British single-seat fighter aircraft used by the Royal Air Force and other Allied countries before, during, and after World War II. Many variants of the Spitfire were built, from the Mk 1 to the Rolls-Royce Griffon-engined Mk 24 using several wing configurations and guns. It was the only British fighter produced continuously throughout the war. The Spitfire remains popular among enthusiasts; around 70 remain airworthy, and many more are static exhibits in aviation museums throughout the world.

(Wikipedia)

The Spitfire first went into production in May 1938, and saw first combat against the German Luftwaffe on October 16, 1939. This package represents the Mk.1a during its development in 1940, leading up, to and including, the Battle of Britain.

The package also includes the Mk.IIa variant which first appeared in service towards the end of this period.

For interest, also included is the prototype Mk.1a LR (Long Range), which was a short-lived, but nonetheless operational, attempt to provide longer range to the Spitfire by attaching a 30 Imp. Gal fuel tank to the left wing.

## **Note:**

The aircraft in this package depict those using 100 Octane fuel only, to which all Spitfires were converted in early 1940. This gave increased performance over the earlier 87 Octane variants, and as such performance figures for these Merlin II equipped aircraft more closely match those of the Merlin III equipped Mk.IIa.

## COCKPIT NOTES

1. The Spitfire may **load** with switches in the wrong position and some cockpit animations not working. This is a known MSFS bug. Re-loading the aircraft will solve this.
  2. Spitfires developed and updated over the 1940 period, most notably in switching from 87 Octane fuel to **100 Octane**, and going from a manually pumped undercarriage system to an automatic hydraulic one. Both **undercarriage systems** are depicted in this package, although you won't have to personally do the 20-30 manual pump actions that raising and lowering the gear required. Just select the 'Raise' and 'Lower' handle.
  3. There were other small changes in the cockpits as time progressed. All are self-evident in the models and functionality remains essentially identical. The most prominent are the removal of the **flap position indicator** early on, and removal of the **clock** on later Mk.1a's and onward.
  4. As MSFS is not a combat sim, weapons-related switches etc. are not functional
  5. Fully functional **mirrors** are not presently available. The ones on the model will reflect accurately the sky and clouds, but that is all. Ground features, other aircraft and cockpit interior will not show.
  6. **Radios** in use at the time aren't available (although the controls are labelled for interest). Use the MSFS drop-down ATC screen for radio communications.
  7. Known issue: The **Alternator/Generator** switch will only move when the Master Battery switch is moved. This doesn't affect the functionality of the aircraft. We hope to have this solved in an update.
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# MAIN PANEL



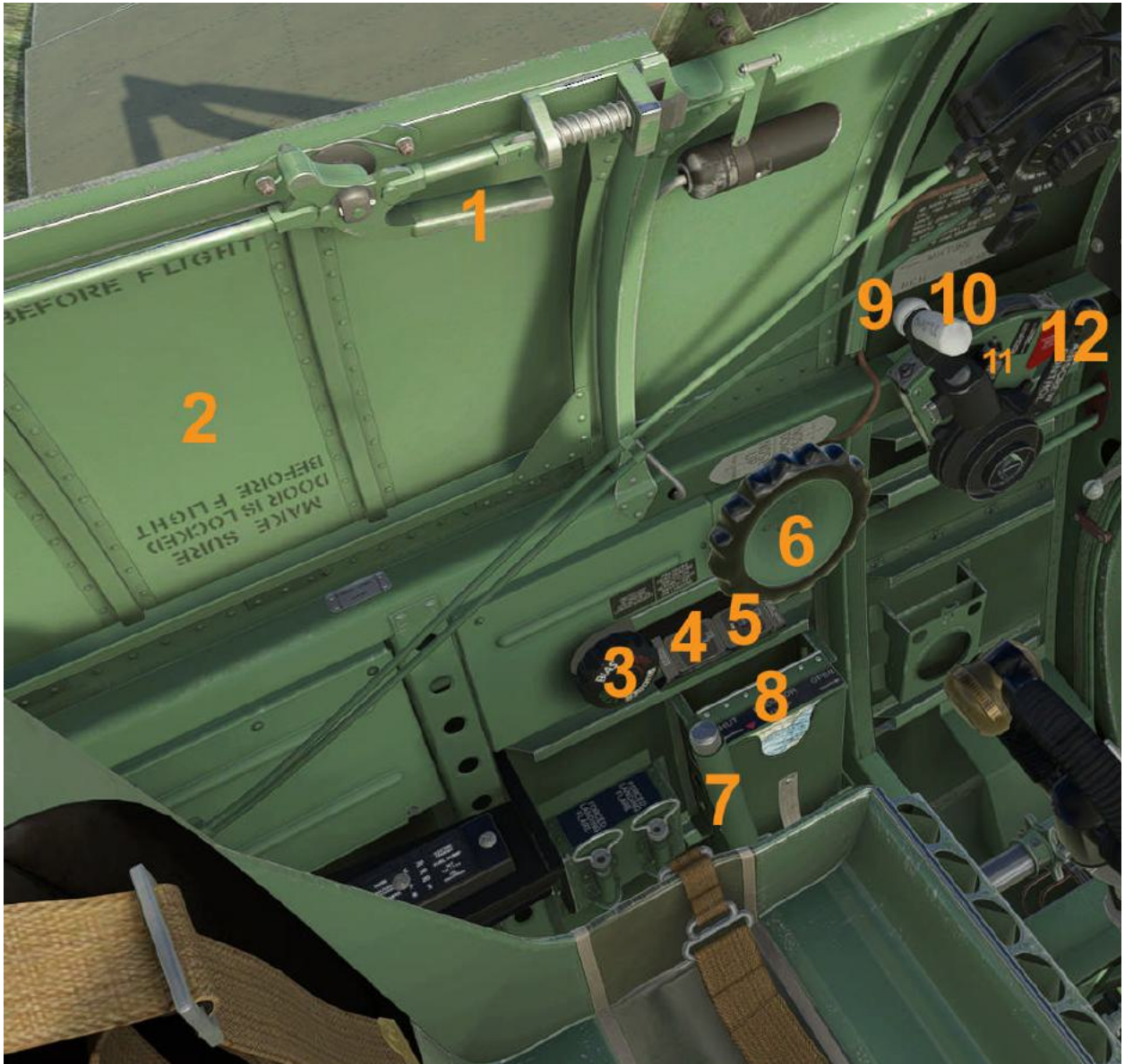
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## MAIN PANEL CONT'D

\* = non-functional

1. Magneto switches
2. Clock
3. Oxygen panel
4. Navigation lights switch
5. Flaps up/down (one position only)
6. Pull-down cover for undercarriage indicator
7. Undercarriage position indicator
8. Elevator trim position
9. Pneumatic system pressure indicator
10. Landing lights on/off
11. Landing lights up/down selector
12. Landing lights direction adjustor
13. Airspeed (MPH IAS)
14. Artificial Horizon
15. Vertical Speed (VSI)
16. Altimeter (ft)
17. Gyro Compass
18. Gyro Compass correction knob
19. Turn and Slip
20. Control visibility on/off
21. Panel lights (left and right)
22. Start button cover, with Starter button underneath
23. P8 Compass
24. Fuel valve selector levers (function unified on model)
25. Parking brake (**NOTE**: releasing the parking brake will make the pilot put on his mask. In flight, the parking brake lever can be used to make the pilot remove his mask if so desired)
26. Adjustable Range and Base knobs on gun sight \*
27. Volt meter
28. Alternator/Generator switch
29. Knob to open close air vent
30. Propeller RPM
31. Fuel Pressure
32. Boost
33. Oil Pressure
34. Oil temperature
35. Coolant temperature
36. Fuel top tank quantity (imperial gallons)
37. Fuel top tank needle on/off (in reality, the needle would only reveal tank contents as long as button was pressed. In the sim, for convenience the needle will remain enabled until buttons pressed again)
38. Fuel bottom tank quantity (imperial gallons)
39. Fuel bottom tank needle on/off
40. Master/Battery switch (**NOTE**: On Mk.IIa's this switch is replaced with a ring)
41. Primer
42. Primer fuel destination selector \*

## COCKPIT LEFT



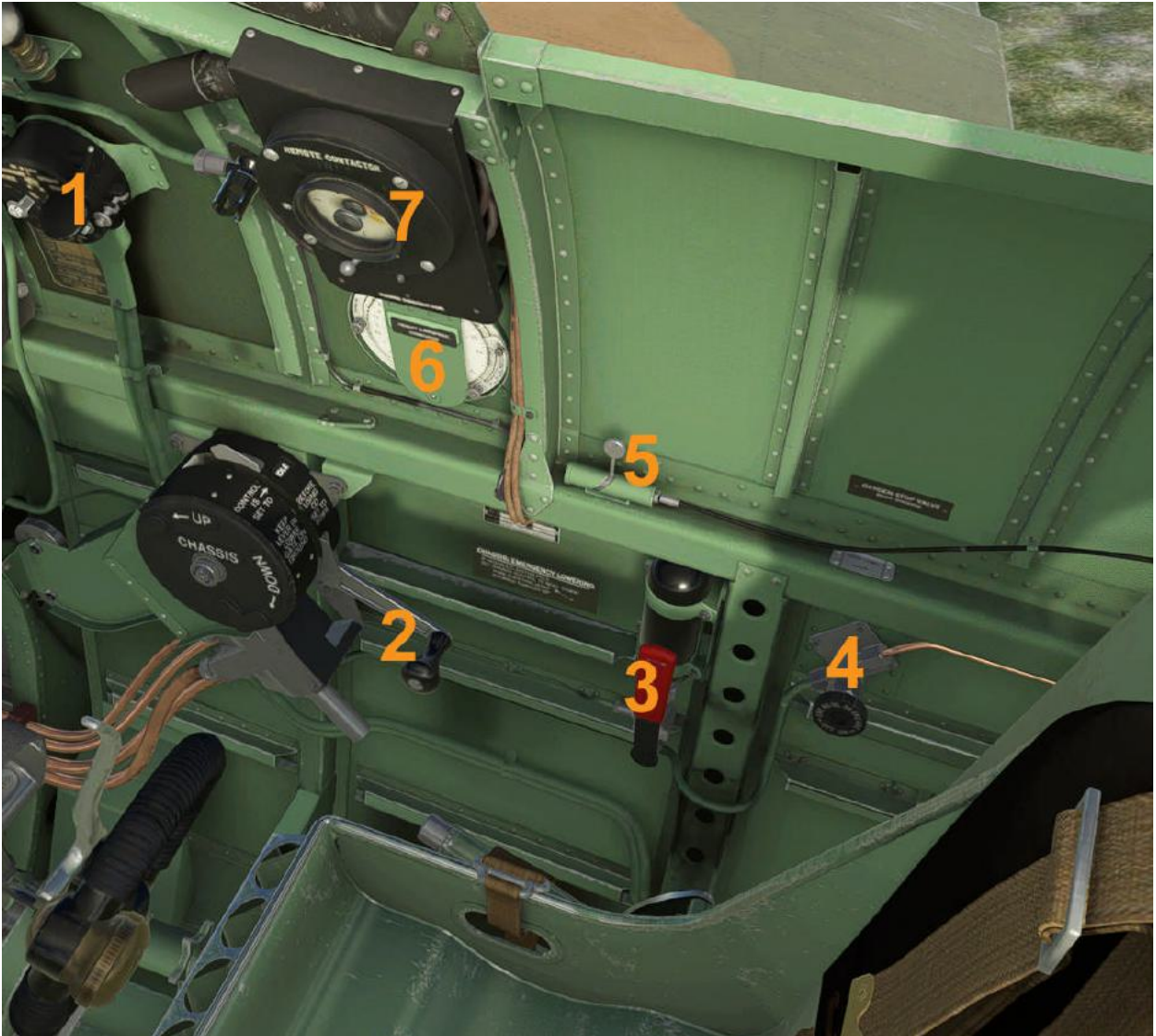
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## COCKPIT LEFT CONT'D

1. When canopy is **OPEN** only: Door latch (clicked once, door will open to first position. Clicked again, door will fully open)
2. When canopy is **OPEN** only: To close door: click door itself. First click will bring up door to first position. Click again to close fully. Canopy can then be opened or closed as needed.
3. Rudder trim knob. Fully right (+10 degrees) for takeoff. **FOR LR VERSION ONLY:** After takeoff, reduce trim to +3.5 only, to keep wing up. Adjust as needed as fuel used.
4. Gun camera system switch \*
5. Pitot heat switch
6. Elevator rim
7. Coolant radiator flap open/close
8. Map case open/close
9. Mixture lever (model uses automixture to best replicate actual system)
10. Throttle lever
11. Switch to turn of undercarriage indicator light in flight
12. Propeller pitch lever



## COCKPIT RIGHT



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## COCKPIT RIGHT CONT'D

1. Recognition/morse light on/off switch. (In reality, two additional small selectors on the unit enabled steady light if desired, but were too awkward for the model)
  2. Undercarriage position selector (small window will indicate if system active [blank] or [idle])
  3. Emergency undercarriage lowering \*
  4. Oxygen flow valve \*
  5. Seat harness release \*
  6. Altitude/airspeed hand calculator \*
  7. Remote connector unit \*
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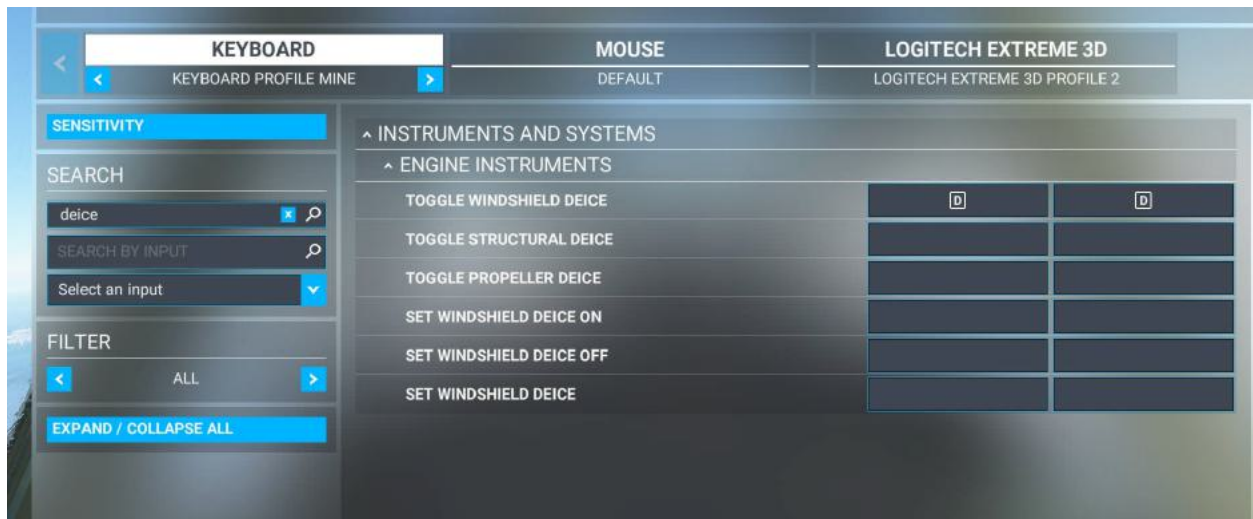
## OTHER CLICK SPOTS



1. Canopy open
2. Canopy close (small button)
3. Pilot visibility (**NOTE:** Pilot will appear when tooltip indicates “YES”. **Pilot must enter aircraft ON THE GROUND.** Click spot will not work once airborne.)

# Windscreen De-Icing

Early Spitfires did not have windscreen de-icing. However, as MSFS may coat the canopy with ice when the weather is still flyable, the canopy can be made to de-ice quickly using the settings below.



## FLYING THE SPITFIRE

The early Spitfires were well known for excellent handling and controllability, and being an exceptionally nice aircraft to fly. Nonetheless, care needs to be taken when taking-off or landing in a crosswind. In flight, some may note that the elevator is more sensitive than in other aircraft.

Flight model settings in MSFS must be set to “**Modern**”.

### A. PRELIMINARIES

1. Master/battery switch: ON
2. Magneto switches: OFF
3. Undercarriage selector: DOWN
4. Check undercarriage light is GREEN
5. Flaps: UP
6. Landing lamps: UP
7. Lower fuel tank quantity

### B. STARTING ENGINE and WARMING UP

1. Brakes: ON
2. Fuel valve levers: ON
3. Mixture control: RICH (fully forward).
4. Magneto switches: ON (both)
5. Open starter button cover; press starter button until engine fires

|                                                                    |     |     |     |    |     |     |
|--------------------------------------------------------------------|-----|-----|-----|----|-----|-----|
| Prime the engine, the number of strokes required being as follows: |     |     |     |    |     |     |
| Air temperature °C.:                                               | +30 | +20 | +10 | 0  | -10 | -20 |
| Normal fuel:                                                       | 3   | 4   | 7   | 13 |     |     |
| High volatility fuel:                                              |     |     |     | 4  | 8   | 15  |

### C. TESTING ENGINE AND INSTALLATIONS

1. While warming up, exercise the airscrew speed control (prop pitch lever) a few times. Also make the usual checks of temperatures, pressures and controls. Brake pressure should be at least 120 lb/sq.in
2. See that the cockpit canopy is open and that the door is set at the first open position.
3. Prop pitch lever: FULLY FORWARD
4. Magneto check: At maximum boost for cruise speeds, check each magneto in turn. Drop in RPM should not exceed 150.
5. Warming up must not be unduly prolonged because the radiator coolant temperature before taxiing must not exceed 100 degrees C.

### D. PREPARATION FOR TAKEOFF

1. Drill to memorize is “T.M.P., Fuel, Flaps, and Radiator”
  - a. Trim - Elevator about one division nose down from neutral. Rudder trim fully to starboard (+10 degrees)
  - b. Mixture – RICH (fully forward)
  - c. Pitch – Prop lever fully forward
  - d. Fuel – Both valve levers ON and check contents of lower tank
  - e. Flaps – UP
  - f. Radiator shutter – Fully open

### E. TAKEOFF

2. Open throttle slowly to the gate (RATED BOOST position: +9.5 boost) (**IMPORTANT**: This is not pushing your sim throttle fully forward. Rather, advance throttle while looking at the boost gauge, and stop throttle movement when boost reaches +9.5).
3. If taking off from a small aerodrome with a full load, maximum boost may be obtained by opening the throttle to the TAKE-OFF BOOST position (**Note**: to do this, just push your throttle all the way forward – this will activate the small red gate ahead of the throttle, and boost will climb to +12).
4. After takeoff, raise undercarriage, and check that the red indicator light – UP – comes on.
5. Do not start to climb before a speed of 140 MPH IAS is attained

## F. CLIMB

1. Up to 15,000 ft the maximum rate of climb is obtained at 160 MPH IAS, but for normal climbing the following speeds are recommended:
  - a. Ground to 13,000 ft: 185 MPH IAS
  - b. 13,000 to 15,000 ft: 180 MPH IAS
  - c. 15,000 to 20,000 ft: 160 MPH IAS
  - d. 20,000 to 25,000 ft: 140 MPH IAS
  - e. 25,000 to 30,000 ft: 125 MPH IAS
  - f. 30,000 to 35,000 ft: 110 MPH IAS

1.

**Fuel:** 100 octane (the reduced limitations for use with 87 octane fuel are shown in brackets)

**Engine limitations:**

|                                        | R.p.m. | Boost<br>lb/sq.in. | Temp. °C<br>Clnt. | Oil. |
|----------------------------------------|--------|--------------------|-------------------|------|
| <b>MAX. TAKE-OFF<br/>TO 1,000 FEET</b> | 3,000  | +12½(+7)           | -                 | -    |
| <b>MAX. CLIMBING<br/>1 HR. LIMIT</b>   | 2,850  | + 9 (+7)           | 125               | 90   |
| <b>MAX. RICH<br/>CONTINUOUS</b>        | 2,650  | + 7 (+5)           | 105 <sup>±</sup>  | 90   |
| <b>MAX. WEAK<br/>CONTINUOUS</b>        | 2,650  | + 4 (+2½)          | 105 <sup>±</sup>  | 90   |
| <b>COMBAT<br/>5 MINS. LIMIT</b>        | 3,000  | +12(+7)            | 135               | 105  |

<sup>±</sup> 115°C. permitted for short periods if necessary.

**Note:** +12 lb/sq.in. combat boost is obtained by operating the boost control cut-out and is effective up to about 10,500 feet.

**OIL PRESSURE:** MINM. IN FLIGHT: 30 lb/sq.in.

**MINM. TEMP. FOR TAKE-OFF:** OIL: 15°C  
COOLANT: 60°C

**FUEL PRESSURE:** NORMAL: 2½-3 lb/sq.in.

## G. CRUISE

2. Maximum **range** is obtained at 1700 RPM and at 160 MPH IAS
3. Maximum **endurance** is obtained at 1700 RPM and at the slowest speed at which the machine can be comfortably flown at.

|                                                                                                               |                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <u>Other limitations:</u>                                                                                     |                                                                                                                            |
| Diving:                                                                                                       | Maximum r.p.m.: 3,600<br>3,000 r.p.m. may be exceeded only for 20 seconds, with the throttle not less than one-third open. |
| <u>Combat concession:</u><br>3,000 r.p.m. may be used above 20,000 feet for periods not exceeding 30 minutes. |                                                                                                                            |
| FLYING LIMITATIONS                                                                                            |                                                                                                                            |
| <u>Maximum speeds (m.p.h. I.A.S.):</u>                                                                        |                                                                                                                            |
| Diving:                                                                                                       | 450                                                                                                                        |
| Undercarriage down:                                                                                           | 160                                                                                                                        |
| Flaps down:                                                                                                   | 140                                                                                                                        |
| Landing lamps lowered:                                                                                        | 140                                                                                                                        |

## H. COMBAT MANOEUVRES

4. For combat manoeuvres, climbing RPM should be used

## I. APPROACH AND LANDING

1. See that the canopy is fully open, and that the emergency exit door is at the first position (slightly open)
2. Reduce speed to 140 MPH IAS and carry out the Drill of Vital Actions, which must be memorized: "U.M.P. and flaps"
  - a. Undercarriage – DOWN (watch for green indicator)
  - b. Mixture – RICH
  - c. Pitch – Propeller lever fully forward
  - d. Flaps - DOWN
3. Correct speeds for the approach:
  - a. Power on: approximately 85 MPH IAS

- b. Power off: approximately 90 MPH IAS
- c. Cross wind limit: maximum 20 MPH

## J. PARKING AND SHUTTING DOWN

1. After stopping in parking spot, set brakes by pulling brake lever.
2. Allow the engine to idle for a few seconds, then shut down by turning off fuel valves and switching of magnetos.
3. Mixture lever fully back.
4. Turn Alternator and Master switches to OFF.

### AEROBATICS.

- 13.(1) This aeroplane is exceptionally good for aerobatics. Owing to its high performance and sensitive elevator control, care must be taken not to impose excessive loads either on the aeroplane or on the pilot and not to induce a high-speed stall. Many aerobatics may be done at much less than full throttle. Cruising r.p.m. should be used, because if reduced below this, detonation might occur if the throttle is opened up to climbing boost for any reason.
- (ii) The following speeds are recommended for aerobatics:-
- Looping.- Speed should be about 300 m.p.h. I.A.S. but may be reduced to 220-250 m.p.h. when the pilot is fully proficient.
- Rolling.- Speed should be anywhere between 180 and 300 m.p.h. I.A.S. The nose should be brought up about 30° above the horizon at the start, the roll being barrelled just enough to keep the engine running throughout.
- Half roll off loop.- Speed should be 320-350 m.p.h. I.A.S.
- Upward roll.- Speed should be about 350-400 m.p.h. I.A.S.
- Flick manoeuvres.- Flick manoeuvres are not permitted.

## TAKE OFF AND LANDING DISTANCES

For general reference and to help plan flights, here are the real-life recorded take off and landing (with brakes) distances of the Spitfire Mk.Ia and IIa.

These were recorded with Spitfire Mk.II P7280, weighing 6172 lb (prior to flight). Winds not recorded.

Reference image below is of EGKH Headcorn/Lashenden (an excellent version of this airfield, well known to Spitfires, is available for MSFS from ORBX).



A big “thank you!” to everyone that helped with this aircraft for MSFS - especially to John Terrell (Bomber\_12th), and Ron (DA40CGDFQ) and Bill (lionheart) over at the FS Think Tank discord forum. Bill, aka Lionheart Creations Ltd., deserves extra mention for his tireless patience with my endless questions. You can find Bill’s work here: <http://lionheartsimulations.com/> .

## **Support:**

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