

AEROPLANE HEAVEN



You're virtually there.

SPITFIRE Mk1A E

A TRIBUTE TO THE BATTLE OF BRITAIN LEGEND AND "THE FEW"

A HIGH DEFINITION SIMULATION OF THE SUPERMARINE SPITFIRE MK1A FOR MICROSOFT FLIGHT SIMULATOR 2020

COCKPIT GUIDE & FLYING NOTES

When designer Reginald J Mitchell died of cancer in 1937, although having seen the prototype take to the air the previous year, little could he have known just how much influence his brilliant design for “an all-metal monoplane, eight-gun fighter” would have on the outcome of the Second World War.

Spitfires fought from the earliest days of the War right through to its close in both the European and Pacific theatres and continued to serve with distinction through more conflicts to come all the way to the 1960s.

But it was in the darkest days of 1940, when Britain was on the back foot following a disastrous campaign in France, the following evacuations from Dunkirk and the consequential “Battle of Britain” that Mitchell’s graceful little fighter really proved its mettle.

Alongside the venerable Hawker Hurricane, its stablemate in many RAF squadrons of the day, pilots flew the Spitfire into battle all throughout each day of the long hot summer of 1940.

In this simulation you will find examples of Mk1As which fought in the “Battle of Britain” piloted by some of that battle’s “aces”.

In this guide we will take you through all the necessary steps needed to fly a Spitfire, point out some of the design’s unique features and get you as close as possible to feeling what it would have been like to fly this incredible aeroplane.

So strap on your Sutton harness and “let’s get one up!”

SUPERMARINE SPITFIRE Mk1A	
LEADING PARTICULARS	
LENGTH	29ft 11 in
HEIGHT	11ft 5 in
WINGSPAN	36ft 10 in
WING AREA	242 sq.ft.
EMPTY WEIGHT	4246 lbs
GROSS WEIGHT	5819 lbs
MAX. SPEED 295 MPH Indicated Air Speed @ 5,000 ft 2,475 rpm and +6.5 Boost	
CRUISE SPEED 200 MPH Indicated Air Speed (best economy)	
INITIAL CLIMB	975fpm
SERVICE CEILING	31, 900 ft
RANGE	400miles
POWERPLANT Rolls Royce Merlin II or III 12 cylinder super-charged developing up to 1060 hp.(MerlinII)	
PROPELLER Variable pitch De Havilland 9 ft 8 ins. dia. Metal, 3-blade	



In the very early stages of WWII, the RAF used a “DayNight” black and white scheme for the undersides of their fighters. N3200 “QV” carries an example of this scheme. It was not long, however, before all fighter schemes were standardised with an underside painted in “sky” or duck-egg green/blue

Aircraft included in this simulation

N3200 “ QV-” 19 Squadron May 1940.
Flown by Squadron Leader Geoffrey Stephenson, was shot down and beached. Discovered in 1986, finally restored to flying condition and flown again in 2014.

P9386 “QV-K” 19 Squadron Flown by Sqn.Leader Brian Lane, Fowlmere, September 1940. Note the yellow spinner, not officially sanctioned by “head office”.

X4382 “LO-G” 602 Squadron Flown by PO O.Hanbury, Westhampnett, August 1940.

X4590 “PR-F” 609 Squadron Flown by PO Sydney Jenkin Hill, Middle Wallop, October 1940.

P9433 DW-E 610 Squadron Flown by PO Constantine Pegge, Biggin Hill, August 1940.

P9398 KL-B 54 Squadron Flown by FO (later Suadron Leader) A.L.(AL) Deere. Hornchurch August1940.

R6840 ZP-C 74 Squadron May 1940. Flown by Squadron Leader John Freeborn.

A note on the PaintKit.
The new “PBR” (Physical-Based Rendering) materials and textures used in this package are very different to those used in previous incarnations of Flight Simulator. So, we are assuming that if you are going to attempt repaints of the Spitfire you have a working knowledge of a) Photoshop or simiar and techniques and b) working knowledge of the PBR process. For those of you who are comfortable with the above, we have included pre -painted camouflage textures for “A” and “B” schemes.



The Spitfire cockpit.

Although perhaps bewildering at first, you will find the cockpit of a Spitfire is actually laid out in a very logical manner with everything to hand.

It's a snug fit in here - as the saying goes, you don't sit in a Spitfire, you put one on.

There are three main areas of the cockpit which need to be studied in order for you to operate your aeroplane correctly and feel "at home" These are: 1. Pilot Panel
2. Left Cockpit
3. Right Cockpit

All wartime RAF aircraft including bombers used "The Flying Six" group panel for primary flight instruments. This was introduced so that pilots could transition across different aircraft types without having to learn where the primary gauges were located. The panel was used in many civilian types too, long after war's end.

Pilot Panel

The "Flying Six" -

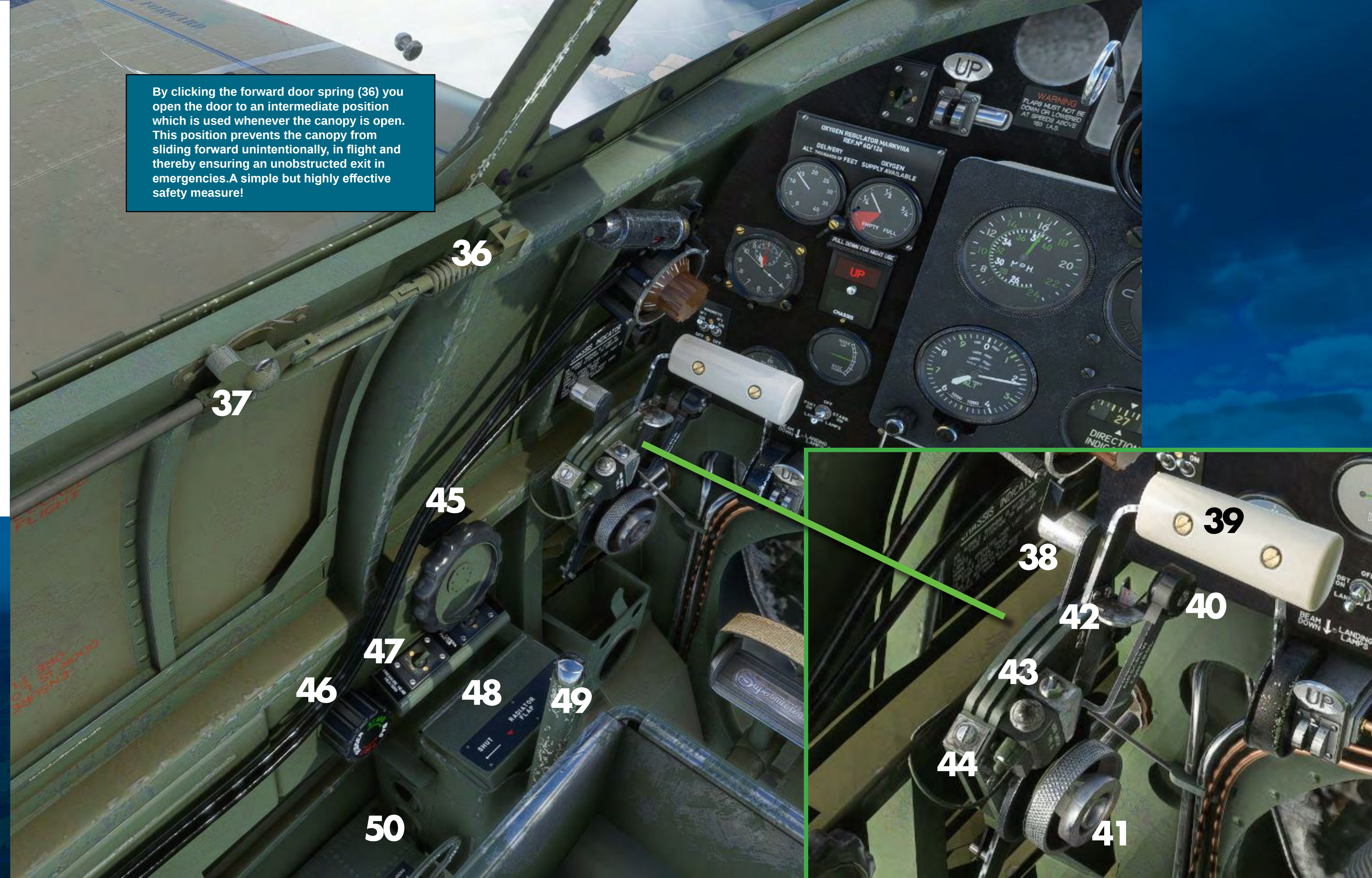
1. Airspeed Indicator
2. Artificial Horizon
3. Vertical Speed (VSI)
4. Altimeter
5. Gyro Compass
6. Turn/Slip
7. Nav lights
8. Flaps
9. Gunsight Sunshade
10. Gunsight Reticle Switch
11. Modern panel toggle
12. Battery Volts
13. Generator Amps
14. Generator Switch
15. Tachometer
16. Boost Gauge
17. Fuel Pressure
18. Oil Pressure
19. Oil Temperature
20. Coolant Radiator Temperature
21. Starting Magneto Switch
22. Fuel Gauges
23. Fuel Gauge Push-buttons
24. Engine Primer
25. Fuel Pressure cock
26. Fuel Tank cocks
27. Engine Starter
28. Cockpit torch switches
29. Oxygen Sub-panel
30. Clock with trip hands
31. Landing Gear Indicator
32. Trim indicator
33. Engine Magnetos
34. Landing Lights switch
35. Comms Radio Controls



Left Cockpit

36. Canopy Lock door position
37. Door Handle
38. Mixture Control
39. Throttle
40. Propeller Control
41. Friction Control
42. Boost Cut-out
43. Gear Indicator Lights switch
44. Gear Horn Cancel Switch
45. Elevator Trim Wheel
46. Rudder Trim Wheel
47. Pitot Heat Switch
48. Clickspot for engine covers
49. Radiator Flap control
50. "Cold-Dark-Start" switch

By clicking the forward door spring (36) you open the door to an intermediate position which is used whenever the canopy is open. This position prevents the canopy from sliding forward unintentionally, in flight and thereby ensuring an unobstructed exit in emergencies. A simple but highly effective safety measure!



Right Cockpit

- 51. Battery cart switch
- 52. Remote Contactor
- 53. Landing Gear Control
- 54. Harness release
- 55. Emergency Landing Gear Lever
- 56. Oxygen Flow Control
- 57. Engine Primer
- 58. Slow Running Cutout
- 59. Fuel Pressure Cock

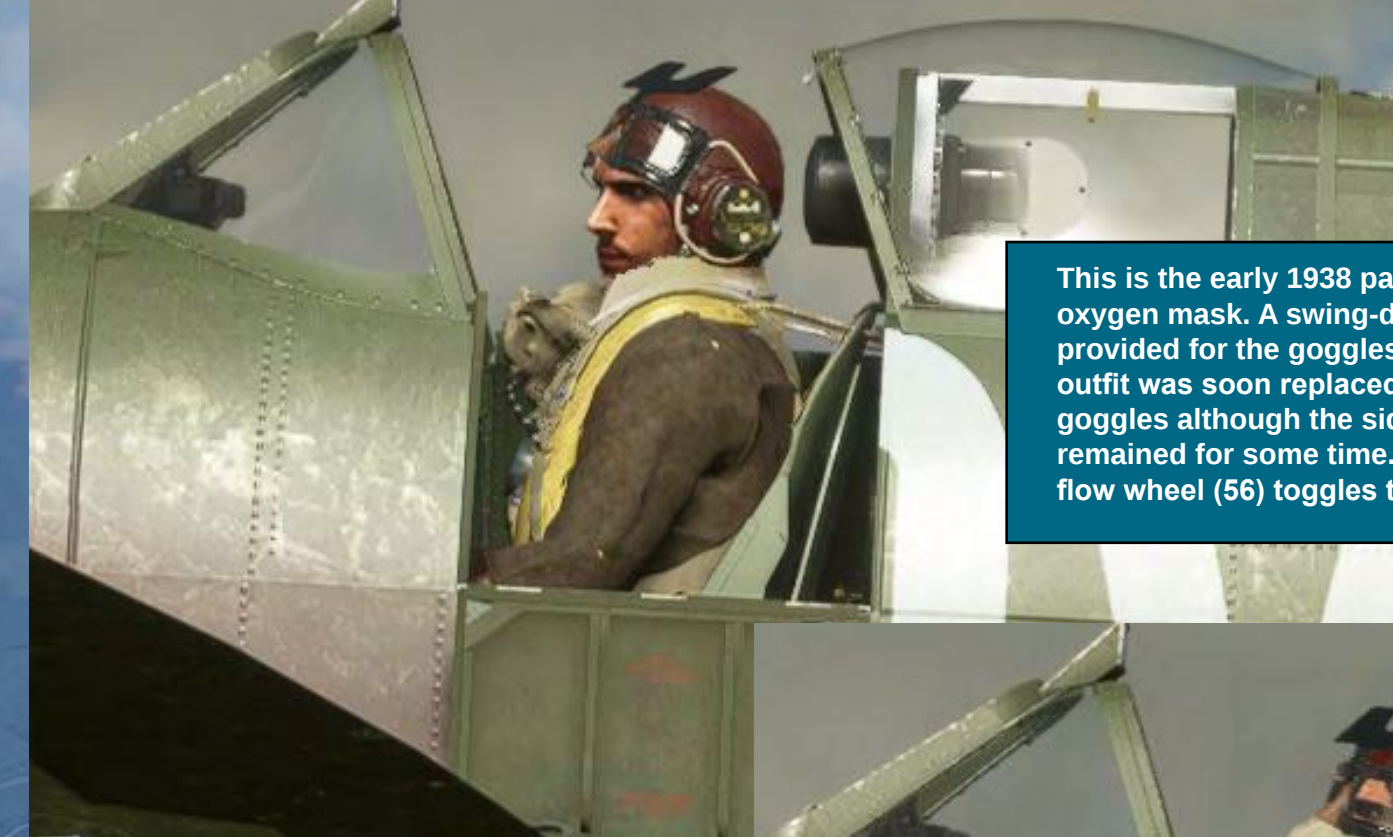
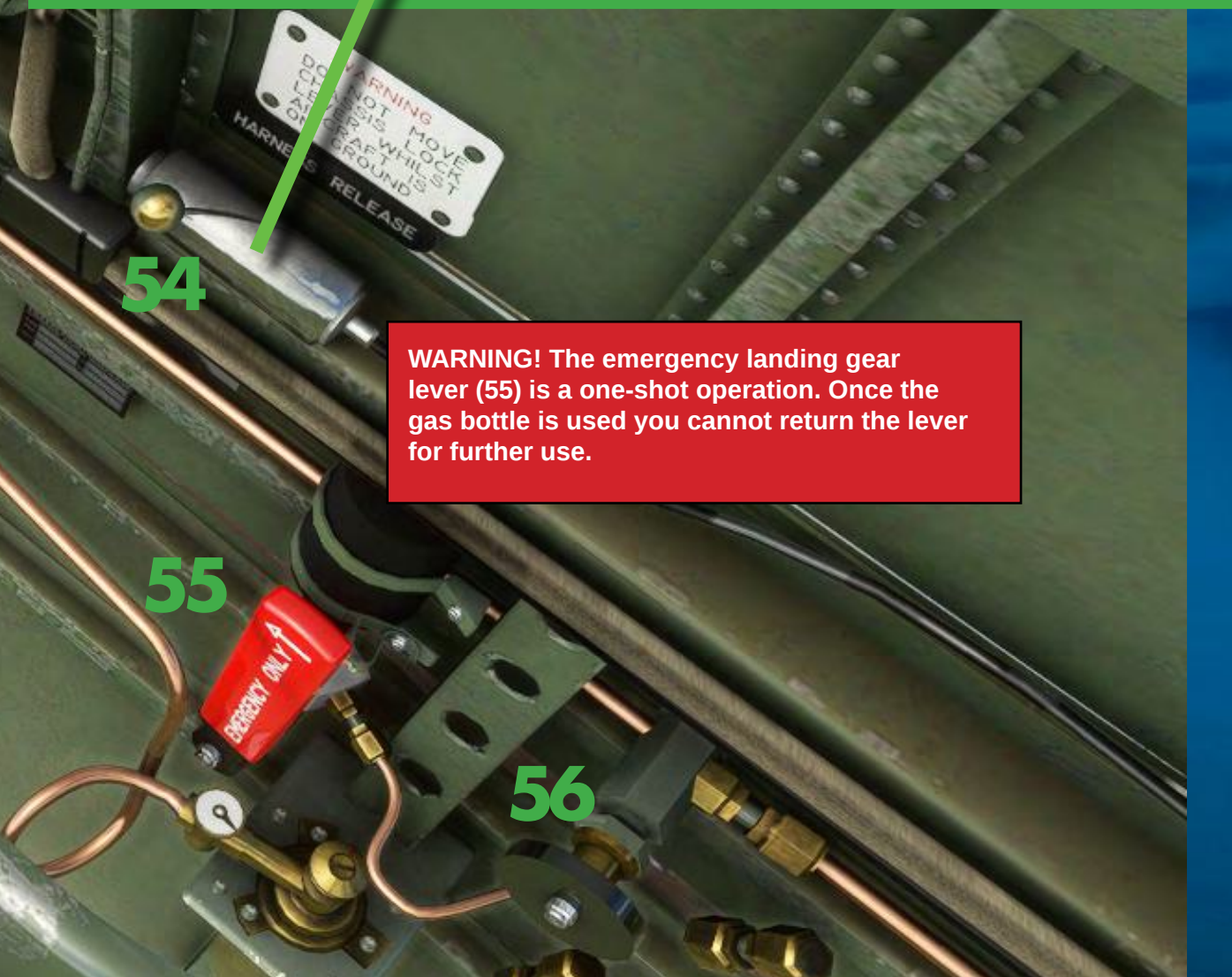
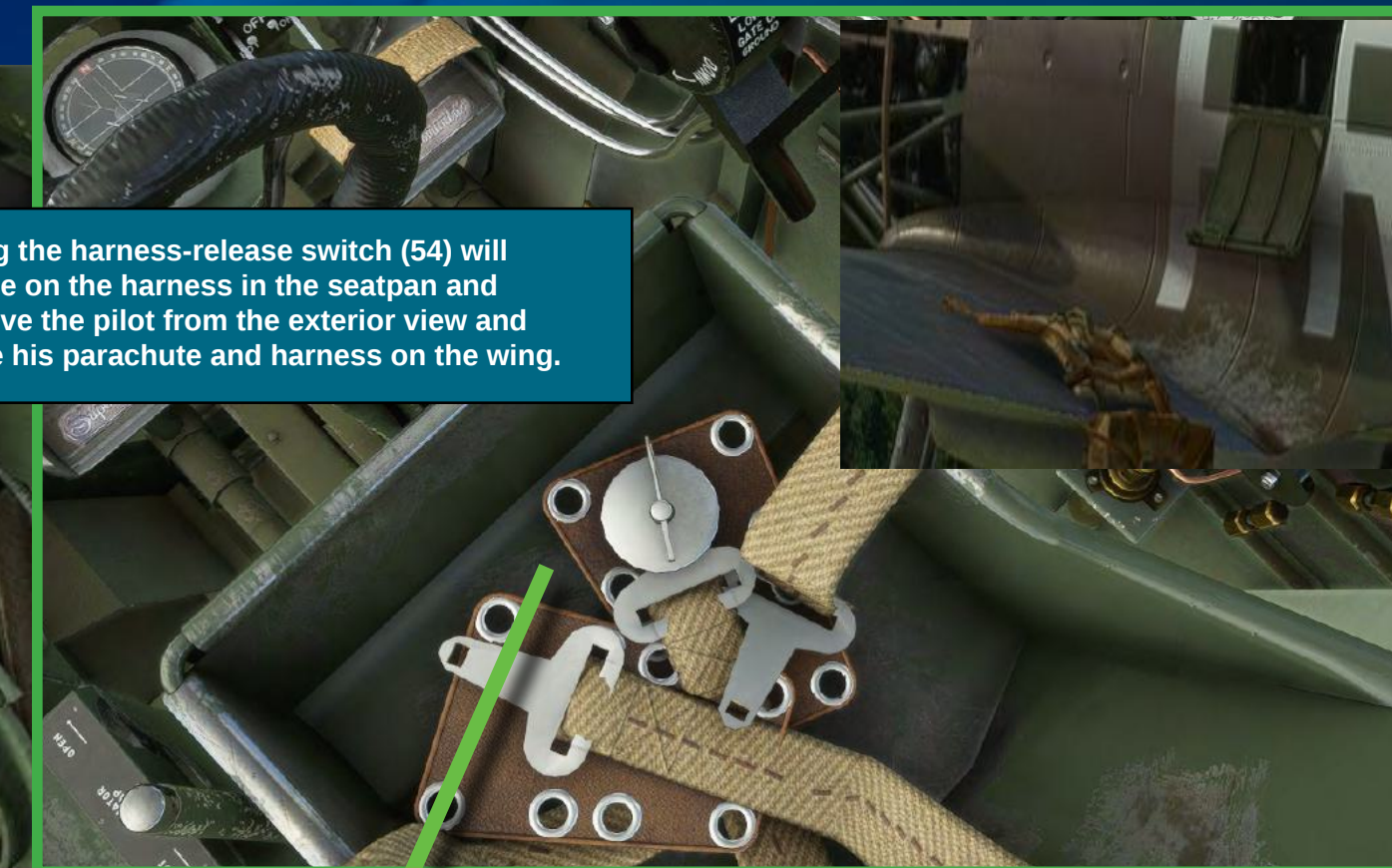
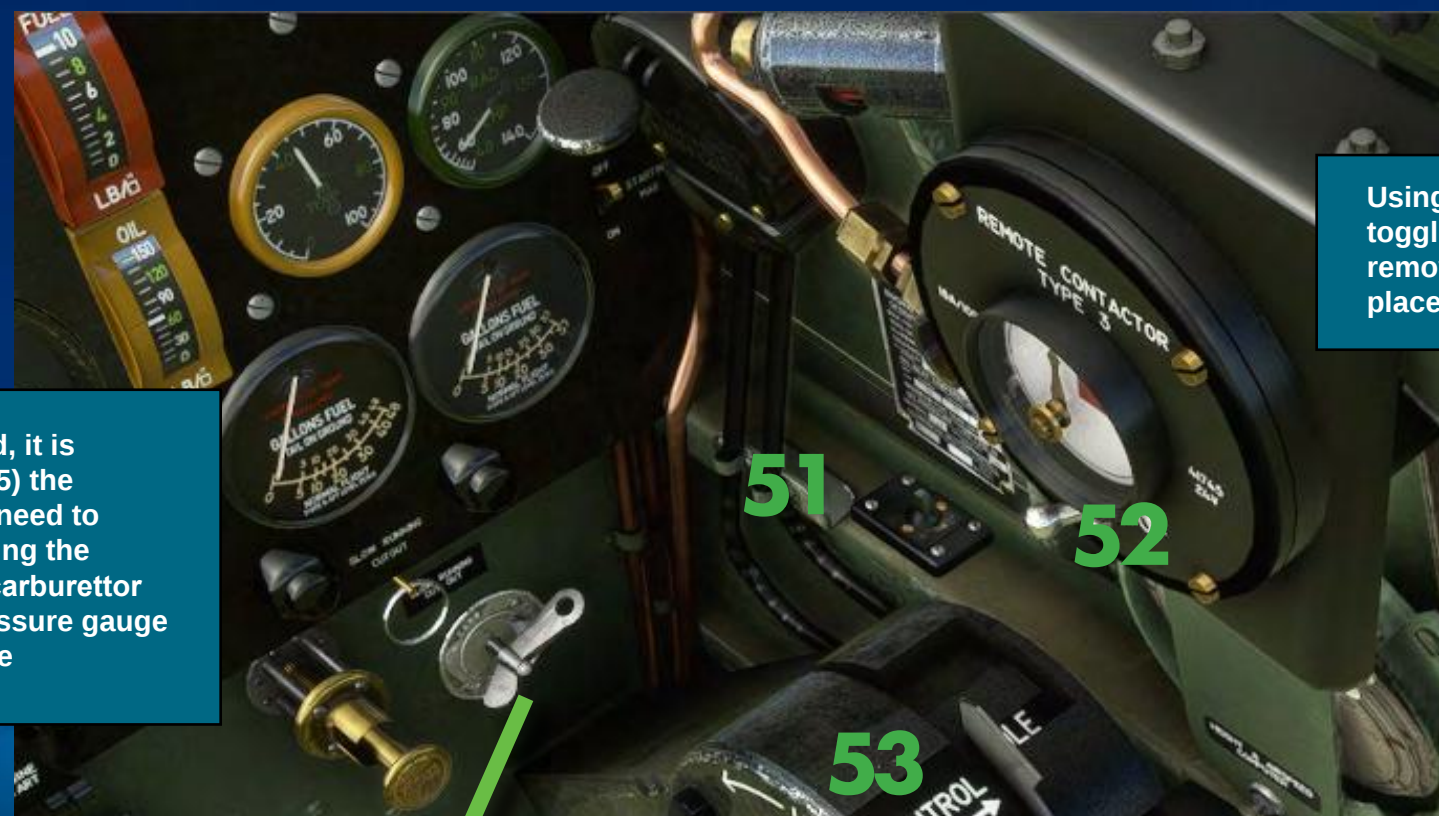
When starting the engine from cold, it is important to remember to prime (55) the cylinders. Before you do this, you need to pressurise the fuel system by turning the pressure cock (59) handle first to carburettor and then engine. Read the fuel pressure gauge to ensure you have pressure before continuing with the start.

Using the harness-release switch (54) will toggle on the harness in the seatpan and remove the pilot from the exterior view and place his parachute and harness on the wing.

WARNING! The emergency landing gear lever (55) is a one-shot operation. Once the gas bottle is used you cannot return the lever for further use.

In the restored version of N3200 "QV" you will find a 'modern' display pilot dressed in flight-suit and a "bone-dome" hard leather helmet , late model goggles and oxygen mask

This is the early 1938 pattern goggles and oxygen mask. A swing-down sun-shade was provided for the goggles. This cumbersome outfit was soon replaced with lighter, smaller goggles although the side entry oxygen pipe remained for some time. Turning the oxygen flow wheel (56) toggles the mask and goggles.



Using the battery cart.

Spitfires are ALWAYS started using an exterior power source. Forerunner of the modern GPU (GroundPowerUnit), the battery cart consisted of a number of lead-cell batteries connected together, mounted in a box and carried on a sturdy wheeled chassis.

A heavy cable runs from the cart to plug into a special recepticle behind a small door in the Spitfire's nose cowl.

In this simulation, you use the switch (51) to toggle ON the cart and cable. **Always remember to switch OFF the cart after engine start.**

Inspecting the Merlin.

A clickspot has been provided (48) to allow you to remove the port-side engine panels and reveal that beautiful Rolls Royce Merlin engine.

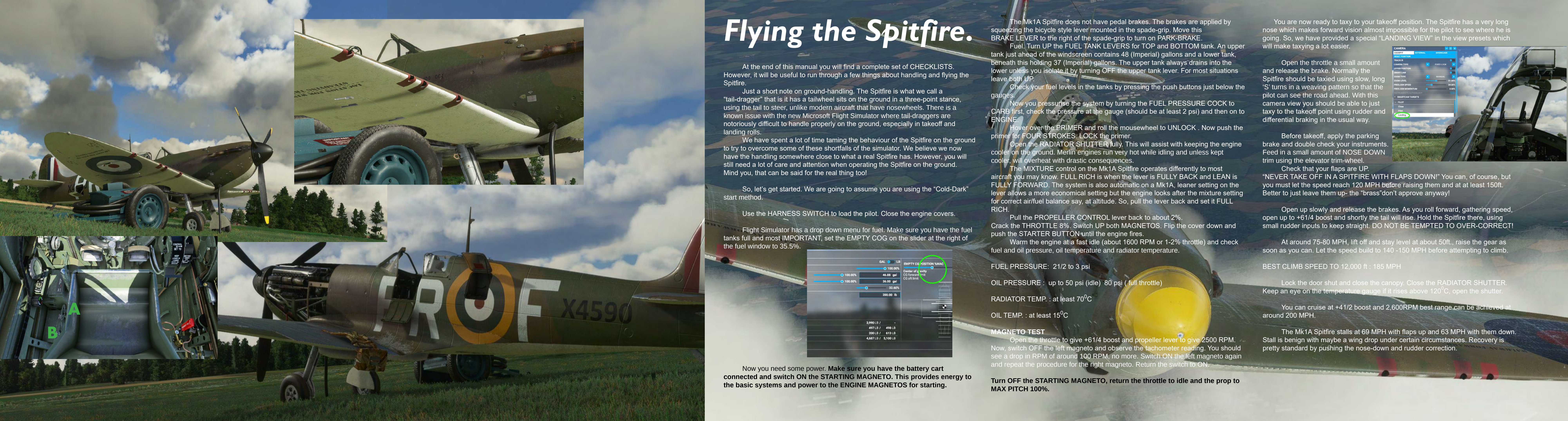
The Cold-Dark Start.

If you want a thoroughly authentic, immersive experience in your Spitfire, you need to begin your flights with a "Cold-Dark" start. That is EVERYTHING OFF, in neutral or closed. The door and canopy open, the pilot removed and the engine covers toggled OFF which will also open the radio and battery hatches on the exterior. The picture opposite is how she'd look. Now, how evocative is that?

To the left of the seatpan are two ring pull levers. In a real Spitfire these are flare release levers. We have used them to make things a little quicker when setting up.

For a Cold/Dark start you can either set things up manually or pull lever A.

For a "Quick-Start" pull lever B.



Flying the Spitfire.

At the end of this manual you will find a complete set of CHECKLISTS. However, it will be useful to run through a few things about handling and flying the Spitfire.

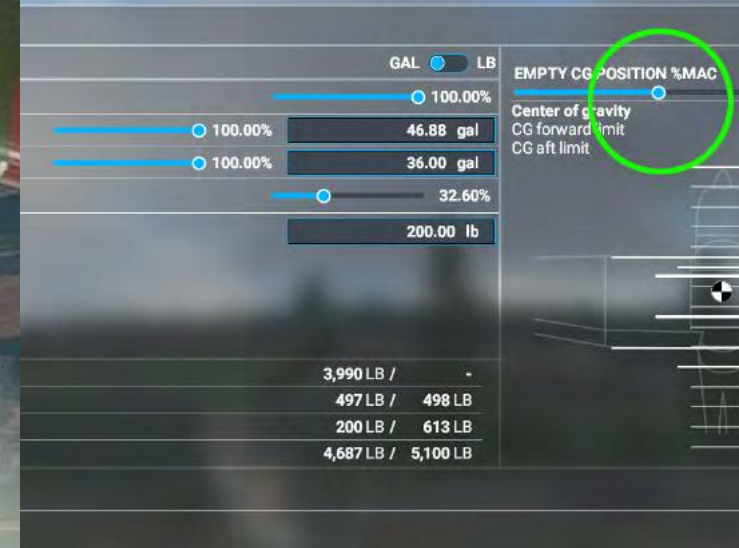
Just a short note on ground-handling. The Spitfire is what we call a "tail-dragger" that is it has a tailwheel sits on the ground in a three-point stance, using the tail to steer, unlike modern aircraft that have nosewheels. There is a known issue with the new Microsoft Flight Simulator where tail-draggers are notoriously difficult to handle properly on the ground, especially in takeoff and landing rolls.

We have spent a lot of time taming the behaviour of the Spitfire on the ground to try to overcome some of these shortfalls of the simulator. We believe we now have the handling somewhere close to what a real Spitfire has. However, you will still need a lot of care and attention when operating the Spitfire on the ground. Mind you, that can be said for the real thing too!

So, let's get started. We are going to assume you are using the "Cold-Dark" start method.

Use the HARNESS SWITCH to load the pilot. Close the engine covers.

Flight Simulator has a drop down menu for fuel. Make sure you have the fuel tanks full and most IMPORTANT, set the EMPTY COG on the slider at the right of the fuel window to 35.5%.



Now you need some power. **Make sure you have the battery cart connected and switch ON the STARTING MAGNETO.** This provides energy to the basic systems and power to the ENGINE MAGNETOS for starting.

The Mk1A Spitfire does not have pedal brakes. The brakes are applied by squeezing the bicycle style lever mounted in the spade-grip. Move this BRAKE LEVER to the right of the spade-grip to turn on PARK-BRAKE.

Fuel. Turn UP the FUEL TANK LEVERS for TOP and BOTTOM tank. An upper tank just ahead of the windscreen contains 48 (Imperial) gallons and a lower tank, beneath this holding 37 (Imperial) gallons. The upper tank always drains into the lower unless you isolate it by turning OFF the upper tank lever. For most situations leave both UP.

Check your fuel levels in the tanks by pressing the push buttons just below the gauges.

Now you pressurise the system by turning the FUEL PRESSURE COCK to CARB first, check the pressure at the gauge (should be at least 2 psi) and then on to ENGINE.

Hover over the PRIMER and roll the mousewheel to UNLOCK . Now push the primer for FOUR STROKES. LOCK the primer.

Open the RADIATOR SHUTTER fully. This will assist with keeping the engine cooler on the ground. Merlin engines run very hot while idling and unless kept cooler, will overheat with drastic consequences.

The MIXTURE control on the Mk1A Spitfire operates differently to most aircraft you may know. FULL RICH is when the lever is FULLY BACK and LEAN is FULLY FORWARD. The system is also automatic on a Mk1A, leaner setting on the lever allows a more economical setting but the engine looks after the mixture setting for correct air/fuel balance say, at altitude. So, pull the lever back and set it FULL RICH.

Pull the PROPELLER CONTROL lever back to about 2%. Crack the THROTTLE 8%. Switch UP both MAGNETOS. Flip the cover down and push the STARTER BUTTON until the engine fires.

Warm the engine at a fast idle (about 1600 RPM or 1-2% throttle) and check fuel and oil pressure, oil temperature and radiator temperature.

FUEL PRESSURE: 21/2 to 3 psi

OIL PRESSURE : up to 50 psi (idle) 80 psi (full throttle)

RADIATOR TEMP. : at least 70°C

OIL TEMP. : at least 15°C

MAGNETO TEST

Open the throttle to give +61/4 boost and propeller lever to give 2500 RPM. Now, switch OFF the left magneto and observe the tachometer reading. You should see a drop in RPM of around 100 RPM, no more. Switch ON the left magneto again and repeat the procedure for the right magneto. Return the switch to ON.

Turn OFF the STARTING MAGNETO, return the throttle to idle and the prop to MAX PITCH 100%.

You are now ready to taxi to your takeoff position. The Spitfire has a very long nose which makes forward vision almost impossible for the pilot to see where he is going. So, we have provided a special "LANDING VIEW" in the view presets which will make taxiing a lot easier.

Open the throttle a small amount and release the brake. Normally the Spitfire should be taxied using slow, long 'S' turns in a weaving pattern so that the pilot can see the road ahead. With this camera view you should be able to just taxi to the takeoff point using rudder and differential braking in the usual way.

Before takeoff, apply the parking brake and double check your instruments. Feed in a small amount of NOSE DOWN trim using the elevator trim-wheel.

Check that your flaps are UP. "NEVER TAKE OFF IN A SPITFIRE WITH FLAPS DOWN!" You can, of course, but you must let the speed reach 120 MPH before raising them and at least 150ft. Better to just leave them up- the "brass" don't approve anyway!

Open up slowly and release the brakes. As you roll forward, gathering speed, open up to +61/4 boost and shortly the tail will rise. Hold the Spitfire there, using small rudder inputs to keep straight. DO NOT BE TEMPTED TO OVER-CORRECT!

At around 75-80 MPH, lift off and stay level at about 50ft., raise the gear as soon as you can. Let the speed build to 140 -150 MPH before attempting to climb.

BEST CLIMB SPEED TO 12,000 ft : 185 MPH

Lock the door shut and close the canopy. Close the RADIATOR SHUTTER. Keep an eye on the temperature gauge if it rises above 120°C, open the shutter.

You can cruise at +41/2 boost and 2,600RPM best range can be achieved at around 200 MPH.

The Mk1A Spitfire stalls at 69 MPH with flaps up and 63 MPH with them down. Stall is benign with maybe a wing drop under certain circumstances. Recovery is pretty standard by pushing the nose-down and rudder correction.



Using the P11 compass.

The Spitfire is fitted with a P11 Maritime Compass. You will find it mounted in its own tray immediately in front of the control column.

This type of compass is designed to give the pilot a rapid indication of the current heading and a desired course which can be set, using the bezel. The compass has a lubber line and has a lock lever which locks the bezel on the set course.

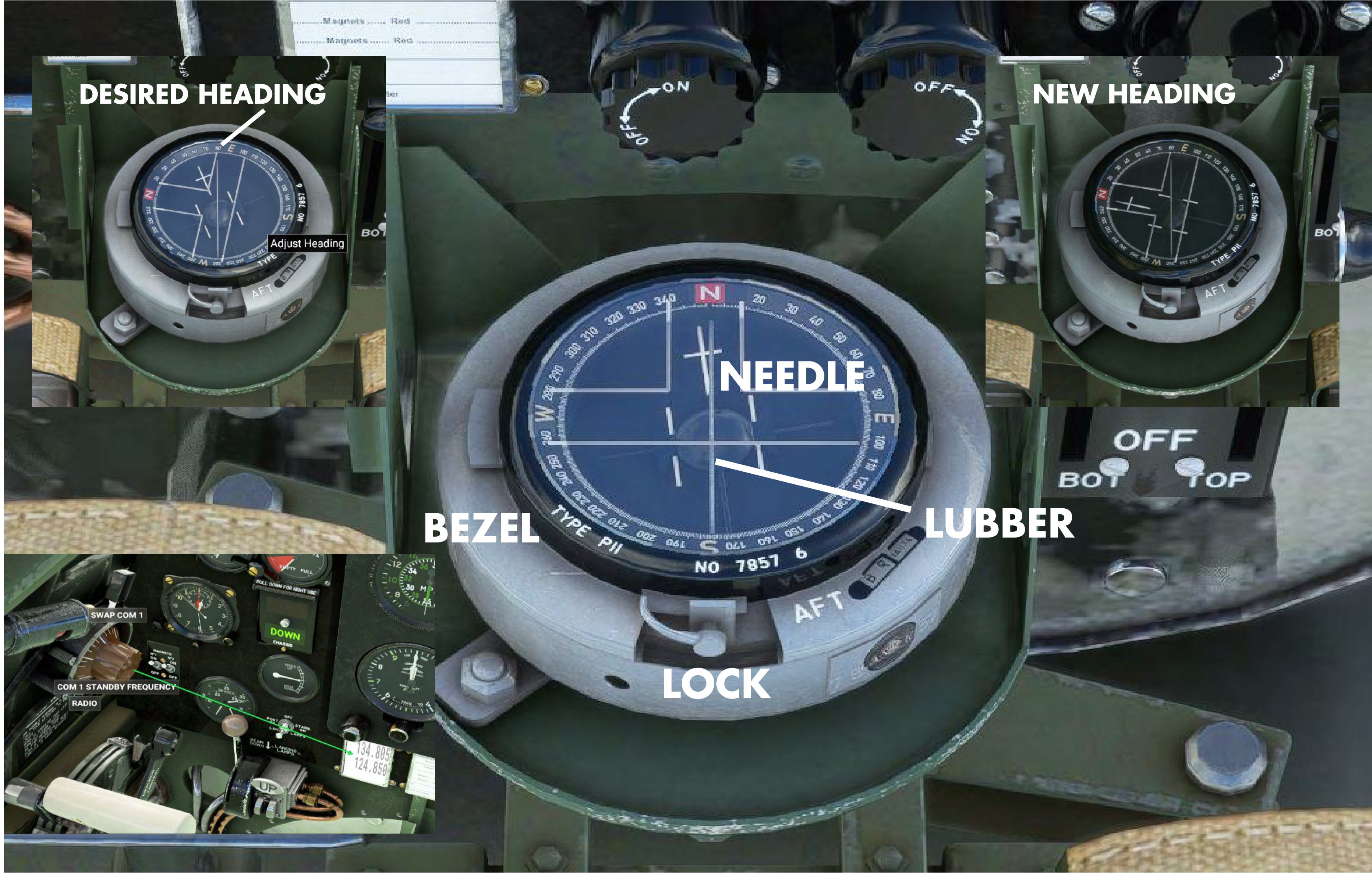
The compass needle has a white cross which is indicating the current course. In the illustration, this would appear to be 350°. Later we wish to turn to a course of 80°. So, by turning the bezel of the compass so that the 80 mark is opposite the lubber line, we can lock the bezel there. By using the lock, you can be sure your desired course will not move until you are ready to turn. Then, when the time comes for the course change we simply turn our Spitfire until the needle is nestling in between the course marks etched into the bezel glass. We will then be on an 80° course.

Just by turning the bezel and then turning the aircraft, the pilot can chage course with a high degree of accuracy and yet just glance at the compass.Simple but highly effective.

Radio.

The real Spitfire Mk1A was fitted with a TR9 communications radio set which lived in the small hatch behind the cockpit on the port side of the fuselage. The radio frequencies were selected by using an electro-mechanical control on the left cockpit wall, to tune into a number of pre-set frequencies.

In our simulation we have the control unit operational. By clicking on the lower lever beneath the unit housing, a small radio frequency window will open in the left hand compass card frame. Use the two controls (brown knobs) to tune the standby COM1 frequency. The upper lever will swap the standby frequency into the active channel. There is no navigation radio. Such things were non-existant in Battle of Britain Spitfires. You used the compass, the clock and ground communication to get home.



But wait, there's more...

A Garmin in a Spitfire?

OK, we said there were no navigation radios in a Spitfire Mk1A. Technically, that is true. However, especially in the restored N3200, getting about a display circuit without navigation aids would be a big ask today, especially with modern air traffic in the skies with you.

So, in each cockpit you will find an optional Garmin Touch panel and Autopilot. They are hidden away behind the "flying-six"panel and can be toggled by using the **GUNSIGHT RHEOSTAT SWITCH (11)** with a tooltip "AVIONICS".

The Garmin is fully functional, as is the Autopilot. We have not included an instruction manual with these as we assume that if you fly MSFS regularly, you will already know how to use them. Obviously when in use, all comms and navigation radio tuning is done using the Garmin and not the old-school radio control.

If you want a "purist" approach to your Spitfire flying, Just leave that switch alone!



Fly your Spitfire with the most authentic Mk1A controls available!

Over the months of development of this special tribute, we have been working alongside AUTHENTIKIT, designers of highly accurate replica flight controls. As a result, Authentikit has produced designs for a unique set of controls specifically for the Mk1A!

If you own a 3D printer, you are already half way there. If you don't, all the files are supplied FREE to enable any commercial printer to do them for you. The electronics are solderless and child's play to put together. There will be full kits containing everything you need

We HIGHLY recommend that you visit AUTHENTIKIT at <https://www.authentikit.org/spitfire-mk1a> and check it all out.

Or check out this great video of the system being tested by Steve Walton flying the Aeroplane Heaven Spitfire Mk1A . And while you're at it, remember to subscribe to Steve's channel - great stuff!

<https://www.youtube.com/watch?v=ndbufeG2KVM>



Aerobatics.

We have included a copy of the original Pilot's Notes for the Mk1 Spitfire. You will find it in the "documents" folder with this manual. This, apart from verifying what you have read so far, contains some interesting facts and figures with regard to aerobatics and general flying procedures. It is a fascinating document and well-worth reading. You will be reading the self-same passages that new RAF pilots would have studied as they prepared themselves for the battles to come.

The Spitfire revels in aerobatics and is a delight to fly. That said, if you do not follow the correct procedures, she will bite!

A full set of instructional procedures for all aerobatic manoeuvres is included in the Pilot's Notes.

Landing the Spitfire.

Under official test-flight conditions, the best landing speed recorded for the Mk1A Spitfire is 68 MPH or just above stall-speed. From this you can see that it is vital to get speed off the aeroplane before attempting a landing. So, start your approach by reducing throttle to give around 120 - 130 MPH.

Before turning onto final, idle the throttle and drop the landing gear. Just before turning onto final, drop the flaps. Be prepared to balance the drag induced by the flaps, with the throttle to keep the nose up. (Spitfires nose down under flaps).

You should aim to have around 80 -90 MPH (and falling) over the threshold. Flare out with the stick back to get a three point attitude and let her settle, starting at around 70 MPH, all three wheels on the ground. Landing on the mains is OK but DO NOT BRAKE until the tailwheel is planted. Once all three wheels are firmly on the ground, apply brakes GENTLY and intermittently to bring the speed off. Raise the flaps and taxi in.

There, that wasn't difficult was it?

We sincerely hope you get many enjoyable flying hours from your Spitfire Mk1A and get as much pleasure from her as we did from making her.

The Aeroplane Heaven Team



CHECKLISTS

PRE-START

PILOT	ABOARD
ENGINE COVERS	ON
CANOPY	OPEN
DOOR	CANOPY LOCK POSITION
PARKING BRAKE	ON
BATTERY CART	ATTACHED
START MAGNETO	ON
MAGNETOS	OFF
UNDERCARRIAGE	DOWN (GREEN LIGHT ON INDICATOR)
FLAPS	UP
LANDING LIGHTS	UP
FUEL	SUFFICIENT FOR FLIGHT (CHECK GAUGES)
GENERATOR SWITCH	ON
PITOT HEAT	ON

START

THROTTLE	CLOSED
FUEL TANK LEVERS	BOTH UP
FUEL PRESSURE COCK	TO 'CARB' THEN 'ENGINE' (CHECK PRESSURE)
ENGINE PRIMER	UNLOCK THEN 4 STROKES THEN LOCK
MIXTURE	FULL RICH
PROPELLER	100% MAX REVS
MAGNETOS	ON (BOTH)
STARTER	PUSH

ENGINE WARM AND RUN-UP

RADIATOR SHUTTER	FULL OPEN
FUEL PRESSURE	21/2 - 3 PSI
BRAKE PRESSURES	CHECK
ALTIMETER	SET
COMPASS	FREE AND BEZEL SET AS DESIRED
TEMPERATURES	CHECK

MAG TEST

THROTTLE	+6 1/4 BOOST
RPM	2500
LEFT MAG	OFF 100 RPM DROP ON
LEFT MAG	ON
RIGHT MAG	OFF 100 RPM DROP ON
RIGHT MAG	ON
THROTTLE	IDLE
PROPELLER	100% MAX REVS
NAV LIGHTS	ON

TAXY

PARKING BRAKE	RELEASE
INSTRUMENTS	CHECK
ALTIMETER	SET

PRE-TAKEOFF

ENGINE	CHECK INSTRUMENTS
THROTTLE	IDLE
FLAPS	UP
TRIM	NOSE DOWN SMALL AMOUNT (CHECK GAUGE)
DOOR	CANOPY LOCK POSITION

TAKEOFF

BRAKES	RELEASE
THROTTLE	SMOOTHLY TO MAX RPM
ROTATION	75 - 85 MPH
UNDERCARRIAGE	UP (RED LIGHT ON INDICATOR)
ATTITUDE	LEVEL UNTIL 150 MPH

CLIMB

THROTTLE	+6 1/4 BOOST
TRIM	MAINTAIN 1000 FPM AT 180 MPH

LANDING

THROTTLE	TO MAINTAIN 140 MPH
TRIM	AS REQUIRED
UNDERCARRIAGE	DOWN (GREEN LIGHT ON INDICATOR)
FLAPS	DOWN (ON FINAL)
THROTTLE	TO GIVE 80 MPH OVER THRESHOLD
THROTTLE	IDLE TO LAND AT 68 MPH

