## Just Flight

# BATTLE of BRITAIN Spitfire



## Pilot's Notes

## The Spirit of Flight Simulation





Expansion for Flight Simulator X: Steam Edition

Please note that Flight Simulator X: Steam Edition must be correctly installed on your PC prior to the installation and use of this Spitfire simulation.

## BATTLE of BRITAIN Spitfire



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#### INTRODUCTION

In this simulation we have endeavoured to capture the Spitfire as it was in perhaps the most important phase of its development - the early years of WWII.

We begin with the Prototype as it was rolled out of the factory and first flown at Eastleigh in 1936, and end with the MklA 'standard' production Spitfire which fought alongside that other venerable fighter, the Hawker Hurricane, in the Battle of Britain.



The supplied paint schemes include a number of aircraft flown by the aces of the Battles of France and Britain and demonstrate some of the early confusion which reigned over camouflage and the placement of markings.

The flight dynamics of this simulation have been specially programmed to allow you to fly 'by the book', so go ahead and try your skill at matching the numbers achieved by 'Mutt' Summers and Jeffrey Quill in the prototype, or test your nerve on an endurance run over the fields of France and back in your MklA!

We hope you enjoy flying these Spitfires and experience some of the thrill and excitement that young pilots of the Royal Air Force must have felt when first getting their hands on Mitchell's legendary design.









#### ACCESSING THE AIRCRAFT

To access the aircraft:

1. Click on 'Free Flight'

2. Select 'Just Flight' from the 'Publisher' drop-down menu

3. Select 'Just Flight' from the Manufacturer drop-down and choose one of the variants

Tick the 'Show all variations' box to see all the available liveries.

#### UPDATES AND TECHNICAL SUPPORT

Please check the News and Support pages on our website at justflight.com for news about updates for this add-on and our other products.

Please contact the Just Flight Support team (www.justflight.com/ support) if you have a query about the Spitfire.

If you have an issue specific to FSX: Steam Edition, please send an email to support@dovetailgames.com.

#### JUST FLIGHT NEWS

To get the latest news about Just Flight products, sign up for our newsletter and regular emails at justflight.com/newsletter.

You can also keep up to date with Just Flight via Facebook (facebook.com/justflight) and Twitter (twitter.com/justflight).



#### INCLUDED AIRCRAFT

#### Prototype

On the morning of the 5th of March, 1936, at Eastleigh aerodrome in England, the big V12 Rolls-Royce Merlin of Spitfire prototype K5054 roared its approval as Capt. Joseph 'Mutt' Summers opened the throttle of Reginald Mitchell's inspired design and took off into a 35-degree crosswind.

Thus began a love affair between pilot and aeroplane that would last for the next 70 years and more.

The prototype airframe was unpainted save for a coat of yellow/ green primer on parts of the fuselage and wings. Actually this remains a much disputed area as it is unclear just how the airframe was finished except for a few references such as Jeffrey Quill's recollection that it was in "Works finish... that is to say it was unpainted except for its primer coats." The landing gear was locked down and carried no spats or covers. There was a simple curved Plexiglas windscreen and a flat-topped canopy. The airframe was fitted with a basic tailskid and carried no armament or radio equipment.

In the cockpit most items appeared as they would throughout the production life of the Spitfire.

There was a large tachometer and oil gauge in front of the pilot for testing purposes, but the basic layout was to remain unchanged for the life of the type. Generally speaking, the prototype bore all the hallmarks of the classic aircraft the world would come to know.

After making his first and perfect three-point landing, Summers was reputedly heard to say, "Leave everything as it is". Others have recorded his words as, "Touch nothing". Whatever he did say passed into Spitfire legend. Those that can recollect the story believe that what actually happened was that he left the aircraft (probably for a comfort stop!) and simply asked that nothing be touched until he got back. History, rather apocryphally, records it as meaning that the design was perfect and that no further work was required.

In reality, the prototype was to be steadily upgraded with a broad range of improvements, alterations and additions over the course of its career.

The aircraft appeared at the Hendon Air Pageant in June, dressed in a blue/grey gloss finish, and sporting a set of folding wheel spats and oleo covers. It was around this time that the wings were first fitted with the famous eight-gun package of Browning .303 machine guns that were to be the nemesis of so many enemy aircraft in the dogfights of the Battle of Britain.



By the time the first production Spitfires were being delivered to RAF squadrons K5054, now finished in the new camouflage scheme designed for all RAF fighters, fell victim to an accidental crash on the 4th September 1939 and was written off.

It is worth noting that from a production cost of just over  $\pounds 20,000$ , Supermarine actually made a small loss of  $\pounds 787$ . A small price to pay for a machine which would change the course of history.



Prototype at roll-out in primer finish - 'first flight' scheme of natural metal engine panels and yellow/green primer over anodised alloy.

Flying surfaces such as ailerons and elevator were finished in silver dope. The oil cooler was finished in a red oxide primer.

K5054 was rolled out with fixed (locked down) undercarriage and a tailskid. Also of note is the angled rudder balance, which was later flattened off.





Prototype as seen at the Hendon Air Pageant in grey/blue gloss finish. At this point in the aircraft's evolution the rudder balance had changed shape, and wheel spats (later removed) and oleo covers had been fitted. The wheel spat arrangement completely covered the wheel wells when the gear was retracted. Guns and radio equipment were still to be fitted.

#### Specifications

Wingspan: 37 ft 8 in
Wing Area: 242 sq ft
Length: 29 ft 11 in
Height: 8 ft 2 <sup>1</sup>/2 in
Weight: 5332 lbs (take-off)
Powerplant: Rolls-Royce Merlin
II: 990 BHP @ 12,000 ft.
Maximum 1,050 BHP @ 16,000 ft
and 3,000 RPM, 7 lb boost.

Propeller: Watts wooden twoblade fixed pitch

Armament: None

#### Performance

Maximum speed: 349 MPH @ 16,800 ft

Cruise speed: Maximum 311 MPH @ 15,000 ft (160 MPH for economy range)

Climb speed: 2,530 ft/min

Range: 395 miles

Service ceiling: 35,400 ft

Time to 30,000 feet: 17 minutes



#### Mk1 Early

The first production Spitfires were delivered to 19 Squadron RAF in early 1938.

These early models were powered by the Rolls-Royce Merlin II, developing 1020 HP and turning a fixed-pitch wooden two-blade Watts propeller. The airframes had no armour protection for the pilot, simple single-pane Perspex windscreens and the flat-top canopy of the prototype. The landing gear was manually operated by a long wand-like lever used to pump the hydraulic system. Nervous or novice pilots inevitably rapped their knuckles on the side of the cockpit as they furiously pumped the lever. This resulted in a condition known as 'Spitfire knuckle'.

Eight Browning machine guns were fitted in the wings and aligned to converge on a single fixed point ahead of the aircraft. This created a murderous concentration of fire and few things would survive a direct hit from a skilful Spitfire pilot. Some more experienced pilots had their guns trained to converge at less than 200 yards to be sure of a kill.

It was in this form that the Spitfire, along with the Hawker Hurricane, was to embark with the British Expeditionary Force to France to repel the German invasion. The history of this period is well documented and needs no further analysis here other than to say that, together with the RAF's other front line fighter, the Hurricane, the Spitfires acquitted themselves admirably and many future Spitfire aces cut their teeth in the skies above the French countryside. Some fell in battle and several were to force land or crash on the beaches of Normandy and Dunkirk in the dark days leading up to the Battle of Britain.

In the months leading up to the fall of France, Supermarine designers and engineers were using priceless pilots' reports and experiences to further develop the Spitfire design and, thankfully in time for the Battle of Britain, the Spitfire had evolved into a potent and sophisticated fighting machine.





**ZP-A** - A machine from 74 Squadron, Hornchurch, June/July 1940. Reportedly flown by Flt Lt Adolph 'Sailor' Malan, who was to become one of the RAF's top aces of the Battle of Britain. The serial number has been painted over, which was quite common on early combat aircraft of the RAF.



**FZ-L** - 65 Squadron Mk1 flown by Flt Lt Robert Stanford Tuck from Hornchurch, August 1939. Stanford Tuck was to become the first Spitfire ace of WWII. Standard combat finish for the period called for the 'day-night' scheme of black (port) and white (starboard) to be applied to the undersides. Some machines also carried RAF roundels of varying types over this scheme.





 ${\it QV-W}$  - 19 Squadron Mk1 Early, based at Duxford in October 1939 and flown by Flt Lt Wilfred Clouston.



 ${\it K9795}$  - A very early production machine from 1938. 19 Squadron was the first RAF squadron to receive the Spitfire. Note the Squadron number painted on the tail and the (then) standard silver finish to the undersides.



#### Specifications

Wingspan: 37 ft 8 in Wing Area: 242 sq ft Length: 29 ft 11 in Height: 8 ft 2 <sup>1</sup>/2 in Weight: 5,875 lbs (take-off)

**Powerplant:** Rolls-Royce Merlin II: 990 BHP @ 12,000 ft. Maximum 1,050 BHP @ 16,000 ft and 3,000 RPM, 7 lb boost

Propeller: Watts type twoblade wooden fixed pitch of 10 ft 8 in diameter. Weight: 83 lbs

Armament: Eight Browning .303 calibre machine guns, four per wing

#### Performance

Maximum speed: 362 MPH @ 18,500 ft

**Cruise speed:** Maximum 318 MPH @ 15,000 ft (160 MPH for economy range)

Climb speed: 2,530 ft/min

Range: 395 miles

Service ceiling: 31,900 ft

Time to 30,000 feet: 22 minutes 25 seconds

#### Mk1A

After the evacuation of Dunkirk, a vast amount of energy was put into improving the Spitfire. To battle the coming storm of enemy attacks would require competent machines capable of shooting down not only the bomber hordes but also their fighter escorts - swarms of highly manoeuvrable Messerschmitt Bf 109s that could outpace the RAF's best front line fighters.

The Hawker Hurricane was to prove more than competent in destroying enemy bombers but lacked the performance and agility of the German fighters, especially at higher altitudes. That said, it's worth mentioning that it was the Hurricane that was responsible for the lion's share of kills in the Battle of Britain.

The Spitfire was able to match the Messerschmitts at higher altitudes. Its speed meant that ground controllers could vector large numbers of aircraft to given rendezvous points in time for them to climb to altitude and 'get the drop' on the enemy.

By now the Spitfire airframe was fitted with thick plate armour for the pilot, armour-plated glass windscreens and a new 'bubble' canopy for increased visibility and headroom.

Up front, an improved Merlin engine developed 1030 HP and turned a variable pitch, three-bladed metal Hamilton or Rotol propeller. Electric-powered reflector gunsights replaced the antiquated ring-and-bead arrangements of the earlier models and other improvements like IFF ('Identify, Friend or Foe') and more powerful radios made flying the Spitfire a safer, more secure proposition.





Airframes were rolling off the production lines daily and replacement aircraft were plentiful - it was the lack of trained, experienced pilots that represented the biggest challenge for Air Marshall Hugh Dowding in the coming summer months of 1940.



**J-YT** - A machine from 65 Squadron, Hornchurch, June 1940. Many squadrons were sponsored with gifts of aircraft and equipment from other organisations and individuals. Some carried legends and insignia to denote their heritage or past glories, and 65 was one such squadron. Note that the airframe is still in the early 'daynight' scheme for the undersides.



**DW-O** - 610 Squadron, flying from Biggin Hill in July 1940, was in the thick of things during the Battle of Britain. The squadron's aircraft were always recognisable by their outsize roundels and codes on the fuselage. DW-O survived the Battle to see service with other squadrons.





**ZD-F** - P9323 was a 'standard' Mk1A flying out of Hornchurch in July/August 1940 with 222 Squadron. This machine was shot down over Kent in August 1940.



 $\it KL-B$  - The mount of Flt Lt (Later Squadron Leader) A.L. 'Al' Deere, a New Zealander and another Battle of Britain ace.





QV-K - 19 Squadron was based at Fowlmere in September 1940, the height of the Battle of Britain. This famous machine was flown by Squadron Leader Brian Lane, C/O of 19 Squadron. Other pilots also flew this machine, recognisable by its non-standard yellow spinner, to claim several victories. The aeroplane was written off in 1944 whilst with 57 OTU.



QV-H - George 'Grumpy' Unwin began his flying carrier as a Sergeant Pilot, flying the early Spitfires delivered to 19 Squadron in France with the BEF. He was eventually commissioned in 1941 but by then had become one of the RAF's leading aces. He flew QV-H throughout the Battle of Britain to score 13 kills. This much decorated pilot epitomised the spirit shown by the young men - 'the few' - of the RAF during the dark days of 1940.



#### Specifications

Wingspan: 37 ft 8 in

Wing Area: 242 sq ft

Length: 29 ft 11 in

Height: 8 ft 2 1/2 in

Weight: 5,875 lbs (take-off)

**Powerplant:** Rolls-Royce Merlin III: 1030 BHP @ 12,000 ft. Maximum 1,060 BHP @ 16,000 ft and 3,000 RPM, 7 lb boost

**Propeller:** de Havilland or Rotol three-blade constantspeed metal of 10 ft 9 in diameter

Armament: Eight Browning .303 calibre machine guns, four per wing. Some were converted to two Hispano cannon and called Mk1Bs

#### Performance

Maximum speed: 363 MPH @ 18,500 ft

Cruise speed: Maximum 210 MPH @ 15,000 ft (160 MPH for economy range)

Climb speed: 2,530 ft/min

Range: 575 miles (combat: 395 miles)

Service ceiling: 31,900 ft

Time to 30,000 feet: 22 minutes 25 seconds



#### GETTING TO KNOW THE SPITFIRE

#### Simulator set-up

To enjoy this simulation to the full, we strongly recommend that you set up your host simulator in the following way:

Load up your desired aircraft, airport, time of day and so on in the usual way.

Using the Slew function (with the Y keystroke) position your aircraft on a concrete apron or grass area.

Enter the VC cockpit mode and turn everything off - battery, magnetos, fuel selectors etc. Also pull all levers such as prop, mixture and throttle to their zero limits.

You should now have what is called a 'cold and dark' cockpit.

Press the button to load in the battery start or 'acc' trolley. This was a trolley containing powerful starting batteries which was used to start all early Merlin-powered Spitfires.



The button is actually disguised as one of the flying panel mounting studs.

Moving outside you will see the cart in place ready to start the engine. Press Shift-E+4 to open the engine cover and flip-down engine starting access panel.



In the outside view, press Shift-E, Shift-E+2, and Shift-E+3. This will open the canopy, the radio hatches and remove the pilot.

You are now ready to get acquainted with the aeroplane.



#### Walkaround

In Spot view rotate your view around the aeroplane slowly, from the front.



The unique design of the Spitfire is immediately apparent. The slender undercarriage and its narrow track, the beautiful elliptical wings and that enormous nose housing the great Merlin V12 are hallmarks of the Spitfire.

Moving around to the left, or port, side, you will now see that the pilot's cockpit door is open as is the radio hatch, which on service models houses the radio equipment on sliding rails.



From the other side of the aircraft, you can see the aft equipment hatch open (Shift-E+2).





The small black 'keyhole' above the metal plate on the starboard engine cowling is the access point for the hand starting handle. The ground crew could insert a starting handle (just as with a car of the period) and rotate the engine for starting and adjustments.

The main airframe is constructed from skinned metal, but the ailerons, elevator and rudder were fabric-covered and dope-finished. Much later Spitfires have metal control surfaces.



The Merlin is liquid cooled by a mixture of glycol and water. The cooling radiator is quite large and hangs from the starboard wing. It has an adjustable 'door' on its aft end. The other wing carries the oil cooler radiator in a streamlined, bullet-shaped housing.

Flaps are either up or down and have indicators built into the top wing surfaces for the pilot to check their position. The landing gear also has indicators which poke up through the forward top surface of each wing when the undercarriage is down.

The Spitfire is fitted with two internal fuel tanks, one above the other, just forward of the pilot's position. A filler cap is mounted in the top surface of the nose. Spitfires were originally run on 89 octane fuel but were quite quickly converted to 100 octane which produced much improved performance.

The elevator is fitted with adjustable trim tabs, as is the rudder which is used in the full right position to counteract swing on take-off due to the massive torque generated by the Merlin engine.



If you load up the Early Mk1 or Prototype you will notice the differences straight away - the lack of armoured glass for the windscreen, the flat-top canopy and simpler aerial mast of the Mk1 Early. Most noticeable though is the twin-blade, wooden Watts propeller.



Now enter the cockpit and get acquainted with the controls of your Spitfire.



## COCKPIT GUIDE

Left side



Main panel





#### Left side

1. Pilot's door catch.

Click on the handle to open the pilot's door. Close with keystroke Shift-E+3. Make sure that the canopy is slid back before opening the door.

- 2. Crowbar (non-functional)
- Auto/manual cooler flap switch (late version only)
- 4. Oil dilution switch
- 5. Rudder trim wheel
- 6. Elevator trim wheel
- Radio control (visual function only. Press Shift-2 to bring up the radio panel)
- 8. Mixture control
- 9. Propeller control (Mk1A only)
- 10. Throttle
- 11. Friction adjuster
- Supercharger control (nonfunctional in FSX)
- 13. Radiator flap control
- 14. Opening map case
- 15.Cockpit light (switch on main panel)

#### Main Panel

- 16. Magneto switches
- 17. Clock (the target trip time can be set using the knob in the centre of the dial)
- 18. Master battery switch
- Brake pressure meter (test pressures by applying the brakes)
- 20. Landing lamps switch
- 21. Elevator trim indicator
- 22. Landing gear position indicator



The lights glow green or red depending on whether the gear is up (red) or down (green).



The intensity of light at night can be controlled by pulling down the blind and ensuring it is located over the button in the

centre of the unit.

- 23. Oxygen controls unit. Turning the butterfly screw will activate the system (visual function only)
- 24. Panel lighting switch
- Flaps control (check the indicators on wing upper surfaces)
- Sunshade control for gunsight reticle. Pull to operate shade.
- 27.ASI (Airspeed Indicator)
- Altimeter (adjustable via knob control)
- 29. AHI (Artificial Horizon Indicator)
- 30. Gyro Direction Indicator
   (adjustable via knob control)
- 31. Turn and Slip Indicator
- 32.VSI (Vertical Speed Indicator)
- 33. Voltmeter
- Electric reflector gunsight (MklA only)
- 35. Gunsight reticle (use switches 41 and 42 to control)
- 36. Boost coil push button (lift flap first)
- 37. Engine start button (lift flap first)
- 38. Tachometer
- 39. Emergency fuel cut-off
- Landing gear visual indicator (one on each wing surface)
- 41. Gunsight reticle switch
- Gunsight reticle dimmer switch (rotate for brightness)



#### Right side





#### Right side

- 43. Gun button
- 44. Parking brake lever
- 45. Fuel boost pump
- 46. Engine primer
- 47. Boost Coil switch
- 48. Engine start switch
- 49. Lower tank gauge selector
- Fuel contents gauge (push button for lower tank reading)
- 51. Fuel pressure gauge
- 52.0il pressure gauge
- 53. Engine boost gauge
- 54.0il temperature gauge
- 55. Radiator temperature gauge
- 56. Morse button (can be used to signal Morse with the recognition light on the underbelly of the aircraft)
- 57. Fuel cut-off levers
- 58. Compass (the locking lever works to prevent the bezel from rotating once desired course is set)
- 59. Landing gear position indicator (this indicates the state of gear from up through transition to locked down

- 60. Landing gear lever
- 61. IFF ('Identify, Friend or Foe') equipment - visual functions only
- 62. Emergency landing gear extension lever gas-operated and one use only! Gear indicator must show 'locked down' before using
- 63. De-icing pump
- 64. Sutton harness release (non functional)
- 65. Remote Contactor Control switch. This switch, when turned on, energises the remote contactor unit which is designed to send a unique radio signal for 15 seconds in every 60 to 'friendly' receivers for recognition purposes and positioning for group controllers on the ground. The unit is simulated visually in this simulation but is non-functional. The Remote Contactor was powered by clockwork and had to be rewound when the aircraft returned from an operation.

#### Canopy latch



The canopy on the MklA is opened by using the wire rope pull on the central catch.

IMPORTANT - the red ball is
part of the canopy jettison
equipment. On no account
touch this unless you wish to
jettison the canopy prior to
baling out. It is a one-trip
device and the canopy cannot be
reset until a new flight
is loaded.

To jettison the canopy, click the red ball.



#### FLYING THE SPITFIRE

Begin with a cold, dark cockpit (or just hit Ctrl-E and take off!).

#### Pre-start

Check that the undercarriage selector lever is down, and the indicator lights show green 'down'. Check the fuel contents. Test for free movement of flying controls. Ensure parking brake is on. Ensure the ground cart is in position and connected. (Use button on panel.) Battery switch to ON.

#### Starting

Fuel control switches on - both levers in the UP position. Magnetos OFF. Crack the throttle about half an inch. Propeller control to FINE PITCH. Mixture control to FULL RICH. Fuel pump ON (turn off after start). Check fuel pressure. If starting from cold, pump the primer 4-6 strokes. Switch magnetos to ON. Press the starter switches simultaneously. Once the engine starts, open up to 1,000 RPM and warm engine.





#### Warm-up and taxi

Check oil pressure, fuel pressure and temperature gauges for normal operation.

Check flaps operation. View indicators on wings for confirmation of flaps down and then retract flaps.

Open throttle to take-off setting (2,600 RPM) and check boost which should be +7/+8.

Throttle back and idle at 950-1,000 RPM.

Release parking brake and open throttle slowly to start moving. Use a weaving motion when taxiing to get a better view of where you are heading. Switch to 'Approach' view (cycle through the views using the A key until you are at 'Approach').





#### Pre-take-off

Parking brake set. Elevator trim wheel at neutral. Rudder trim wheel FULL RIGHT.

The Spitfire has a marked tendency to pull strongly to the left when the throttle is opened. This is due to the significant torque generated by the V12 engine. It can be lessened by using full right trim on the rudder tab. However, you will still need to 'catch' the aeroplane with right rudder as you accelerate down the runway. Practice, as always, makes perfect and after a few flights this technique will come naturally.

Propeller control to FINE PITCH. Mixture control set at FULL RICH. Flaps are UP. Fuel pump OFF. Door closed and locked.

#### Take-off

Release the brakes. (Opening the throttle with brakes on is dangerous as the Spitfire will tend to nose over, resulting in a ground loop.)

Open the throttle steadily to +7 lbs of boost.

As you accelerate, apply right rudder to counteract swing.

The tail will lift first and at around 70-75 MPH a small amount of back pressure on the stick will see you airborne. Average take-off run for a Mk1A Spitfire is 225 yards.





Allow the climb to reach 100 feet before retracting the undercarriage.



Keep to around +7/+8 lb of boost and climb to altitude at around 150 MPH.



Once at altitude, throttle back to around +5/+6 lb of boost and 2,600 RPM (balance throttle and prop controls to achieve this).

Re-trim the controls for neutral handling.

**Beware!** The trimming controls in a Spitfire are very powerful and it is very easy to start 'chasing the needles' by overuse of the trimming controls. Adjust carefully and slowly to achieve the correct hands-off condition. NEVER trim the aeroplane using the VSI. Use the trim position gauge and AHI for visual reference but it is usual practice to align the horizon using those other important instruments - your eyes.





With full tanks and correct trim, the Spitfire MklA should have a range of approximately 400 miles, depending on engine RPM and mixture settings.

**Remember!** Lean off the mixture control as you gain altitude. One of the most common errors among novice flyers is to forget this. The result is poor engine performance or worse. Correct engine management is vital to successful operation of aircraft like the Spitfire.

#### Performance limitations

#### Maximum permissible dive speed

400 MPH (do not intentionally exceed for any lengthy period)

#### Stall Speeds

Undercarriage and flaps up: 78 MPH Undercarriage and flaps down: 68 MPH Do not extend flaps above 160 MPH indicated Do not extend gear above 145 MPH indicated The stall is quite benign and begins with a dip of either wing



#### Spinning

Any Spitfire spins more smoothly to the left than to the right. Recovery is standard (opposite rudder, stick forward). Ensure you have adequate altitude before spinning deliberately - at least 10,000 ft, and preferably 15,000 ft.

#### Aerobatics

The following minimum speeds should be observed if engaging in aerobatics: Loop: entry at 280 MPH Roll: 22 MPH Half-roll off loop: 33 MPH Climbing roll: 320 MPH





#### Approach and land

Reduce speed to 160 MPH and open the canopy. Undercarriage DOWN. Flaps DOWN. Propeller set to give 2,600 RPM, go to FINE PITCH, MAX RPM on final. Fuel pump ON. Check brake pressures by squeezing brake lever and check gauge. Throttle back to reduce speed to 100 MPH. On finals, reduce further to 95 MPH with flaps, 105 MPH without flaps. Aim to reach the landing strip threshold at around 75 MPH. The Spitfire's best landing speed is 66 MPH indicated. Due to risk of ground looping, touch down and apply brakes CAREFULLY, once the tail wheel is firmly on the ground.

#### Shut down and park

Raise the flaps and switch off the fuel pump. Open up to 0 boost and then back to idle at around 900 RPM. Close the throttle and pull the cut-off ring to shut down the engine. Close the mixture control, propeller control and switch off all electrical switches.

Turn off the fuel cocks.

In cold climates, below  $-10\,^\circ\text{C},$  press the oil dilution button for one minute.

Exit the aeroplane and make a visual check of the airframe and flying surfaces.



#### Basic controls and functions

VC hood latch or Shift-E - Open canopy VC red ball - Jettison canopy VC door latch or Shift-E+3 - Opens the pilot door Shift-E+2 - Opens the radio hatch and removes pilot from exterior view, if on ground Shift-E+4 - Opens the engine cover and exterior starting plug cover Shift-E+2 - Brings up the radio panel Shift-1 - Brings up a basic 2D flying panel When cycled, the views control will present various views of the

when cycled, the views control will present various views of the aircraft from close quarters. The 'Approach' view is especially helpful for approach and landing when the long nose of the Spitfire impedes forward vision. It is highly recommended that you use this view when landing.

 ${\bf Guns}$  - The guns on the Spitfire are all controlled by the `Smoke system on/off' command in the list of FSX control assignments. By default this is assigned to the I key on your keyboard, but we would suggest that you use the New Assignment button to also assign it to your joystick trigger and set the Repeat slider to the 50% setting.

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## The Spirit of Flight Simulation





