

Numerous books have been consulted and the following are of particular interest for those wishing to learn more:

- Flight Briefing for Pilots - Vol 1
by N Birch & A Branson Publisher: Pitman
- Spitfire: A Test Pilot's Story
by Jeffrey Quill Publisher: John Murray
- The Spitfire Story
by Alfred Price Publisher: Jane's
- Fighter: The True Story of the Battle of Britain
by Len Deighton Publisher: Johnathan Cape
- Fighter Pilot Tactics
by M Spick Publisher: Patrick Stephens
- Pilot's Notes - Spitfire IIA
Air Publications HMSO

Available through Air Data Publications, St Annes-on-Sea, Lancs.



MIRRORSOFT

Spitfire



CONTENTS

INTRODUCTION	3
FLYING MODES	4
INSTRUMENT PANEL	6
AIRCRAFT CONTROLS	7
KEYBOARD	8
HANDLING AND FLYING NOTES	10
COMBAT	16
AEROBATICS	19
THEORY OF FLIGHT	20
HISTORICAL BACKGROUND	21
ACKNOWLEDGEMENTS	23
SELECTED BIBLIOGRAPHY	24

INTRODUCTION

Spitfire '40 is not only the closest you're likely to come to flying one of the most famous aircraft of all times - it's a spectacular war-time adventure too.

Picture the scene - it is the Summer of 1940 and you are a newly trained pilot, posted to a Spitfire Squadron somewhere in the South East of England.

Like so many of those young men in 1940, you will learn that a Spitfire is no ordinary plane. You will discover its special capabilities and, most important of all, how to handle it in combat. As you learn, you can save your growing experience on disk or cassette. With practice and your increasing skill, you can rise through the ranks, gaining medals, to reach for the highest accolade - to achieve the rank of Group Captain and the coveted VC, DSO and DFC medals.

Spitfire '40 gives you not just valuable experience in the principles and techniques of flight and combat; it's a lot of fun, too!

Loading Spitfire '40

See separate key sheet for details. When the program has loaded, you will then be asked to load:

ORIGINAL LOG

SAVED LOG

Use joystick and fire button to make your choice. See separate key sheet for loading a saved log.

You will be shown a list of pilots' names on the flight log. Choose your pilot by moving the joystick and pressing the fire button.

The log of the pilot you have chosen will be shown, including his rank, medals, flying hours and victories.

Press the fire button and you will then see a menu of *FLIGHT MODES*:

PRACTICE

COMBAT

COMBAT PRACTICE

Make your selection with joystick and fire button.

FLIGHT MODES

Practice

This option puts you into the cockpit at the take off point on the runway to enable you to practise flying your Spitfire before you head off into combat. If you can then land successfully on a runway, you can save your log on cassette or disk to start building up your experience. To save, follow the screen instructions and then press RETURN. You should read the flying and landing notes thoroughly first.

Combat

This mode is the heart of the program. On selection, you

will be given your combat instructions, eg:

ENEMY 3 (No. of aircraft)

INTERCEPT 14 (The distance in miles)

BEARING 200 (The bearing from the runway)

HEIGHT 6000 (The enemy's height)

Now you must take off and engage the enemy in combat. The enemy will remain at roughly the height first given in the combat instructions. If you are successful and return to a runway safely, you can save your combat record to build your experience record progressively.

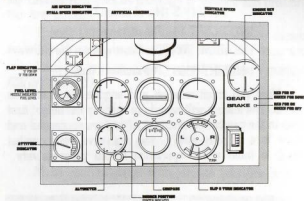
Combat Practice

The purpose of this option is to enable you to gain some elementary experience in handling the Spitfire in combat. You will find yourself at 10,000 feet with enemy aircraft coming at you in frontal attacks. Practise following and firing at them, allowing for deflection shooting, which requires you to judge where the enemy will be by the time your bullets have reached the target.

Your successes in combat practice are not recorded, and you can return to the main menu by pressing RETURN or by crashing.

Further details on the principles of air combat can be found in the section on page 16. The key guide also includes a quick reference flight checklist as an aide memoire while you're in action.

INSTRUMENT PANEL



Clockwise from the upper left of the panel, the instruments are:

Fuel Gauge: Indicates the amount of fuel remaining. You have enough for 45 minutes' flying.

Airspeed Indicator: Indicates air speed in units of 100 mph.

Artificial Horizon: Represents the view from the cockpit, with blue for the sky and brown for the ground. The Spitfire's attitude is indicated.

Vertical Speed Indicator (VSI): Represents vertical speed and vertical movement at intervals of 1000 feet per minute in the climb or descent section.

Engine Rev Indicator: This indicates the engine speed in 100's of revolutions per minute.

Slip & Turn Indicator: The top needle represents the sideways movement through the air (slip). The bottom needle measures the rate of turn; the more displaced the needle, the higher the rate of turn.

Compass: Indicates compass heading.

Altimeter: Shows height above the ground. The large needle indicates 100's of feet and the small needle 1000's of feet.

The instrument panel view is a faithful reproduction of that in the original Spitfire. However, two additional instruments have been included for ease of use:

Rudder Indicator: Shows the position of the rudder.

Pitch Indicator: Represents a sideways view of the Spitfire. Although this duplicates part of the function of the artificial horizon, it does also assist orientation when diving or climbing steeply.

AIRCRAFT CONTROLS

Joystick

The forward and backward movement of the joystick controls the Spitfire's elevators. Pulling the joystick backwards will raise the nose of the aircraft; pushing the joystick forward lowers it. This is known as altering the pitch of the aircraft. The sideways movement of the joystick controls the ailerons, which in turn will make the Spitfire roll or bank to the left or right. A secondary effect of rolling is that it causes the aircraft to turn and change

direction. The joystick fire button activates the eight Browning machine guns mounted in the wings.

The screen image of the Spitfire's joystick will assist you in judging how much joystick movement has been applied. The aircraft's joystick is self-centering when the computer's joystick is in the central position.

You should be aware that there is an inevitable time lag between the movement of the joystick and the reaction of the aircraft, particularly when applying an opposite correction such as reversing the joystick when rolling the aircraft back to straight and level flight after completing a turn.

KEYBOARD

Screen Views

SPACE BAR: Switches the screen between the cockpit view and instrument panel.

Throttle

Q W

Increases/decreases power; the exact power level can be gauged from the engine speed indicator on the instrument panel.

Rudder

Z X

Turns the rudder left/right; the exact position of the rudder is shown on the instrument panel. After applying a rudder key, the first press of the opposite rudder key will initially

centralise the rudder. This additional feature is particularly useful in situations where there is no time to make a visual check.

Flaps

F

Toggles the flaps up or down; the current position is indicated on the instrument panel by the letters U and D. Putting the flaps down will lower the stalling speed of the aircraft, but they should not be lowered at speeds of over 140 mph.

Undercarriage/Gear

G

Toggles the undercarriage up or down; the current position is indicated on the instrument panel (red for up, green for down). You should not attempt to fly with the undercarriage down at speeds much above 160 mph.

Brakes

B

Toggles the brakes on or off; the current position is indicated on the instrument panel (red for on, green for off).

Map

M

Toggles the map screen on or off; the map is a representation of the South East of England. A red aircraft symbol indicates the Spitfire's current position,

and a black aircraft symbol shows the position of the enemy. The three squares represent areas which can be examined in greater detail (see below).

Looking at the map also has the effect of freezing the simulation and can therefore be used as a pause key.

Expanding the Areas

N

If the Spitfire is within one of the three squares, then pressing N will show the ground detail; further presses will first expand the area, and then contract it. Ground detail is shown in a position relative to the Spitfire's current heading.

Cockpit View

When the Spitfire is below 800 feet, you will see a thin black line at the bottom right hand corner of the screen. This is an indication of your height when close to the ground.

At the bottom of the screen there are white dots on either side of the cockpit. The left-hand dot indicates speed, whilst the right-hand dot indicates rudder position.

HANDLING AND FLYING NOTES

Taking Off

If you have chosen **Practice** or **Combat** mode, the Spitfire will be positioned on the runway ready to take off.

Checklist

- 1 _____ Flaps up
- 2 _____ Push throttle to give power of 1,800 rpm
- 3 _____ Brakes off
- 4 _____ Increase power to 3,200 rpm
- 5 _____ As speed approaches 90 mph switch to cockpit view
- 6 _____ Ease gently back on the joystick
- 7 _____ When the Spitfire lifts off, retract undercarriage. Check the instrument panel to see that the red light is on.
- 8 _____ Do not attempt a steep climb until the speed is over 140 mph
- 9 _____ After completing your climb, reduce power to around 2,900 rpm for cruising speed and level flight.

Climbing

The rate at which the Spitfire climbs is shown on the VSI. This rate is controlled by the power of the engine and the angle of climb.

The optimum rate of climb for this type of Spitfire was 185 mph at approximately 2,850 rpm, giving 2,500 feet per minute. At this attitude you will not be able to see the horizon out of the cockpit. The ceiling height for this aircraft was approximately 35,000 feet.

Experiment with various attitudes and power settings to gain experience. If you attempt too steep a climb with insufficient power, you will find the speed drops until a stall occurs.

The Stall

The stalling speed of the Spitfire was 75 mph with the undercarriage and flaps up and 65 mph with them down.

Remember that if the aircraft is too close to the ground, the consequent loss of altitude will cause a crash.

Straight & Level Flight

Straight and level flight is achieved with the wings horizontal and the VSI at zero. Level flight is achieved by adjusting the attitude of the aircraft first, and when level, adjusting the speed using the throttle. Practise flying at various speeds viewing the instrument panel, then switch to the cockpit view and note the position of the actual horizon. As power is increased, the nose of the Spitfire will tend to rise; with a reduction of power it will drop. This can be compensated for with the joystick.

Zooming around at maximum power, however tempting, is not recommended if you want to succeed as a Spitfire pilot. The optimum cruising speed is approximately 200 mph, but check this out. Remember, there is only a limited amount of fuel for each sortie.

Diving

You may find yourself in a full power vertical dive during aerobatics or combat, and pulling back on the joystick will

have no effect. Reduce power and you will find that control will return to the joystick.

Turns

The direction of flight can be changed by banking the aircraft with the joystick. The Spitfire will remain at a fixed angle of bank when the joystick is released, and the rate at which the aircraft turns is dependent on the angle of the bank. The turn can also be tightened by using the appropriate rudder at the same time. The nose tends to drop in a turn; this can be corrected by easing the joystick back slightly.

The aircraft can be returned to level flight by applying the opposite joystick movement. At first, you may find there is a tendency to apply too much opposite joystick and the aircraft will end up banked in the opposite direction. It is vital during combat to learn to anticipate the movement of the aircraft and small repeated movements of the joystick are far more effective than one large movement.

The direction of the aircraft can also be changed in level flight by using the rudder alone. However, as the wings are level, this also has the adverse effect of skidding the aircraft sideways in the opposite direction. Nevertheless, careful use of the rudder alone can be helpful in certain situations, particularly during an approach to a landing.

Slip

It is possible for the Spitfire to slip sideways and lose

height whilst maintaining a constant heading. To check out this feature, fly the Spitfire at a safe height while viewing the instrument panel. Put the Spitfire into a left turn, then apply right rudder until the compass stops moving. If you look at the slip and turn indicator, you will see that the turn needle is in the neutral position and the slip needle is to the left.

Landing

The recommended procedure for landing the Spitfire was to start the approach by reducing speed to 140 mph and lowering the undercarriage and flaps. The final part of the approach was made at a speed of 90 mph, descending at 1,000 feet per minute. Just before the landing, the joystick was eased back to bring the aircraft level, and the throttle reduced.

But, as in most things, the practice is rather more difficult than the theory, and landing is one of the trickiest parts in flying the Spitfire.

There are three main principles to stick to:

- 1** Achieve a speed of 90-100 mph with a constant rate of descent.
- 2** Position the Spitfire on the approach path to the runway.
- 3** Reach the beginning of the runway at a height just above zero.

Try the following exercises to develop your landing skills.

Climb to 5,000 feet and cruise at 200 mph. Reduce power and hence speed. (Raising the nose slightly will drop your speed quickly.) Lower the undercarriage and flaps. When the speed drops to 100 mph, adjust the throttle and nose attitude so that constant speed is maintained and the VSI reads 1,000 feet per minute. The power setting should be around 600 rpm. Note the position of the horizon against the cockpit. Level out at a predetermined height and maintain speed and altitude. If you find difficulty in raising the nose despite pulling back on the joystick, then a quick burst of power will help.

The next stage is to practise flying the Spitfire so that you are lined up on the runway and flying over it at a predetermined height. Approach the runway from a distance so that you have plenty of time to alter your line of approach. As you gain experience, you will learn to use the ground objects as reference points to turn into the approach. There are no wind effects in this program to worry about. The accepted practice in landing was to fly parallel to the runway in the opposite direction to your final approach. You can then turn through 180 degrees and adjust your position so that you are lined up for the final approach. You will find that very gentle use of the rudder will assist in achieving the correct line.

The final stage of landing is a combination of the skills previously gained so that you reach ground level at a straight and level attitude, with a low flying speed.

You will find that in the early stages, the program is forgiving of errors in landing. However, as your experience and performance records build up, your skill must increase accordingly or you may crash when landing.

You can land away from runways, and take off again, but your experience and additional flying hours are not logged unless you land on a runway.

It is assumed in this simulation that there is a level of haze in the sky and ground detail disappears above 3,000 feet.

Maps

As an exercise in navigation, you may find it useful to fly over the areas and draw the maps, entering the relevant distances and bearings between objects. After combat, this information could be crucial in getting back safely.

COMBAT

The procedure for entering combat mode has already been explained.

It is important, however, to understand something of the air combat techniques that were relevant in 1940.

There were four golden rules in air combat:

- 1 _____ Climb quickly to give yourself a height advantage in attack. This enabled the pilot to climb away after an attack, as the speed gained in diving could be

translated into momentum to regain height.

- 2 _____ Never fly straight and level in the combat zone for more than a few seconds - weave about as much as possible. This increased the areas of the sky observed and made the Spitfire a moving rather than a static target. The key was to watch your mirror constantly.

- 3 _____ In reality, attacks usually came from the rear and at an angle. To evade these, it was necessary to turn as sharply as possible towards the direction of attack, increasing speed if possible. Turning in the opposite direction would place the defender in a stationary position in relation to the attacker.

More often than not, air combat ended up as a dog-fight with two aircraft trying to out-turn each other in ever-tightening circles, inevitably reducing height. Maintaining accurate turns was therefore a vital factor.

- 4 _____ Another method of escaping attack was to dive away. In 1940, this was an option open to the enemy fighters but not to the Spitfire. In the Spitfire, pushing the nose forward caused the

engine to cut (under negative G) and valuable seconds were lost, whereas enemy fighters did not suffer this problem. This is the reason why films of the period will show Spitfires rolling on to their backs before diving (hence maintaining positive G). Such problems do not occur in this program.

Simulation Combat

In Spitfire 40, the enemy appear in different colours; each colour indicates different speeds and skills. They will also appear in different positions, flying at a variety of speeds. Some may be approaching, and some flying away; you will have to vary your tactics accordingly.

The key rules of air combat have been built into the simulation.

If you are under attack from behind, the enemy aircraft will appear in the mirror. Try to increase speed to escape and turn as sharply as possible. Use your rudder to induce slip or skid.

If you lose contact with the enemy during combat, get back to the height of the original contact and check the map. In keeping with one of the key rules, a climbing turn is preferable in regaining height.

There is a much higher chance of hitting an enemy aircraft the closer you are to it.

If you manage to shoot some or all of the enemy aircraft down, you can return to a runway and, on landing safely, save your latest status.

Aerobatics

A number of interesting aerobatic manoeuvres can be carried out on the Spitfire, some of which could be of considerable assistance in combat. For example:

Loop

At a speed of over 250 mph and full power, ease the joystick back gently. As you invert, reduce power and continue easing the joystick back until you are flying straight and level. Reapply power to come out of the loop.

Loop with Roll Off the Top

Enter the manoeuvre as for a loop. When you are inverted at the top of the climb, roll the Spitfire left or right until you are level. Use the joystick to keep the nose at a fixed position on the horizon as you roll out. You can use this manoeuvre to escape an enemy, gain height and reverse your direction.

Roll

Raise the Spitfire's nose slightly above the horizon. Apply left or right joystick. Keep rolling until the Spitfire is again straight and level.

Practise using the joystick to roll the plane whilst keeping the nose pointing at a fixed part of the scenery. Applying opposite rudder assists in keeping a constant heading.

Split S

Roll over until the Spitfire is inverted. Then pull the joystick back until the horizon appears and you are flying

level. You will have lost height and reversed your direction.

THE THEORY OF FLIGHT

This complex subject cannot be dealt with in a few words but it is necessary that you should understand the basic principles so that you may be better able to fly this simulation correctly.

Aircraft designers shape the top of a wing like the back of a spoon, so that air passing under a wing is slowed and pushed down as it hits the underside. This is the opposite of what is happening above the wing, so the pressure rises, pushing the wing up. With suction above and pressure below, lift is created. When this lifting force is greater than the weight of the aircraft, it will leave the ground. Lift and weight are only two of the forces that act upon the aircraft; the others are thrust and drag. In order to accelerate to a speed at which lift can overcome weight, a powered aircraft needs an engine to provide thrust. Just as lift needs to overcome weight, thrust has to overcome the resistance of the air to the aircraft moving through it. This force is called drag and it can be reduced by streamlining the shape of the aircraft or increased by spoiling the shape with the undercarriage and flaps.

These are the basic facts about the theory of flight for all powered aeroplanes. In addition, the most important criteria for a fighter such as the Spitfire are: manoeuvrability, speed and instability.

Speed and manoeuvrability are obvious needs for such an aircraft, but instability requires some explanation. Stability in an agile fighter would spell disaster because, when attacked out of the blue, the fighter pilot needs his aircraft to react immediately. So the designers built this instability into the plane; it's harder to keep them straight and level than to throw them all around the sky.

If you bear this in mind when flying Spitfire '40, you will understand better why things seem difficult at first. With a little practice, you too will be able to complete all the complex manoeuvres for which the Spitfire is justly famous.

HISTORICAL BACKGROUND

The Supermarine Spitfire is, perhaps, the most famous aeroplane ever built - both a legend in its own time and a most beautiful machine. But your chance to 'fly' this tremendous machine is only a part of the whole story. Conceived by R J Mitchell in 1925, the Spitfire was far in advance of the technology then available. It was not until 1936, when Rolls Royce developed the Merlin engine and a second World War was feared, that the impetus was there to turn the idea into a prototype aircraft.

The first flight was in March 1936, revealing a revolutionary aircraft design with a top speed of 350 mph and superb manoeuvrability, two factors which are the crux of all fighter designs.

By the outbreak of the Second World War, a total of 2,160 Spitfires were on order and on October 16 the first

combat occurred over Scotland. Then, in May 1940, the Germans pushed strongly towards the Low Countries and France, and the RAF retreated further until the final withdrawal from Dunkirk. Britain was alone, facing the most successful fighting machine since the Roman Empire across just 21 miles of water.

Hitler was well aware of the importance of superiority in the air. He was convinced by the Chief of the Luftwaffe, Hermann Goering, that his pilots and machines would soon gain a decisive victory over the Royal Air Force which the Luftwaffe outnumbered three to one.

The average age of a wartime Spitfire pilot was twenty, and some went to operational squadrons with as little as ten flying hours to their credit. Despite this, the Battle of Britain was won by three means: technology, spirit and, paradoxically, mistakes.

The advanced technology of the Spitfire enabled the RAF to arrest attacks - radar assisted in accurate interceptions being made. The spirit of the young pilots is legendary. German mistakes were the result of bad intelligence reports and an underestimation of the British resolve. Once the Germans altered their tactics to bombing civilian targets in the Blitz, the Battle was won.

The Spitfire continued as a front-line fighter in the RAF until the advent of jet propelled aircraft. Over 20,000 were built, and quite a number are still flown today.

**THE LEGEND OF THE
Spitfire
WILL LIVE FOREVER.**

ACKNOWLEDGEMENTS

The publishers of this program would like to thank Michael A Fopp and the Battle of Britain Museum for assistance and advice during the preparation of "Spitfire" 40".

There are three Spitfires on display at the Royal Air Force Museum, Hendon, including the earliest surviving Mk I aircraft and the post-war Mk 24 version. The Battle of Britain Museum, also at Hendon, tells the whole story of this famous battle, around which this program is written. The Museums are open from 10am to 6pm Monday to Saturday and 2pm to 6pm Sunday. Entry to the RAF Museum is FREE.

FLIGHT CHECK LIST FOR YOUR SPITFIRE

TAKE OFF

- 1 Brakes off
- 2 Engine revs 3,400 RPM
- 3 Lift off at 90 MPH
- 4 Retract gear

LANDING APPROACH

- 1 Reduce speed to 140 MPH
- 2 Lower flaps and gear
- 3 Final approach between 80 MPH and 100 MPH

OPTIMUM CLIMB

Varies with height:

200 MPH at 2,850 RPM giving 2,500 ft per minute

OPTIMUM CRUISE

200 MPH at 1,900 RPM

Level flight is achievable between speeds of
90 MPH and 350 MPH

FLYING LIMITS

STALL: Approx 65 MPH
with gear and flaps down

DIVING: 450 MPH

LOOP: Enter with a speed of
greater than 250 MPH

ROLL: Between 180 MPH
and 300 MPH. Nose just
above Horizon. Higher speed
for an upward roll.

CEILING: 35,000 ft

OUT OF CONTROL AND DISORIENTATED

- 1 Reduce power.
- 2 Apply joystick in opposite
direction to turn indicator.
- 3 If appropriate apply rudder
in direction of slip indicator.
Centralise when indicator at
zero.
- 4 Ease back on joystick if in a dive.

Spitfire



MIRRORSOFT

SPECTRUM 48K/SPECTRUM PLUS KEYBOARD CONTROLS

Joystick Controls

Normal up, and down, left and right movements and fire button apply.

Keyboard Controls

Controls given are for a Standard 48K Spectrum. Where these differ for Spectrum Plus, they are given in brackets.

Joystick up	P (cursor up)
Joystick down	L (cursor down)
Joystick left	A (cursor left)
Joystick right	S (cursor right)
Fire	Shift (or ;)
Left rudder	Z
Right rudder	X
Increase power	Q
Decrease power	W
Flaps	F
Screen switch	Space
Gear	G
Brakes	B
Map	M
Expand map	N

Loading

LOAD " " and press ENTER.

Loading saving your log

Insert a new tape and follow the on-screen instructions. Do not forget to press ENTER after typing your name.

AMSTRAD CPC KEYBOARD CONTROL

Joystick Controls

Normal up, and down, left and right movements and fire button apply.

Keyboard Controls

Joystick up	+
Joystick down	?
Joystick left	A
Joystick right	S
Fire	Shift
Left rudder	Z
Right rudder	X
Increase power	Q
Decrease power	W
Flaps	F
Screen switch	Space
Gear	G
Brakes	B
Map	M
Expand map	N

Spiritfire



Loading

Press CTRL and small ENTER key.

Loading saving your log

Insert a new tape and follow the on-screen instructions. Do not forget to press RETURN after typing your name.