DOGFIGHT

80 YEARS OF AERIAL WARFARE

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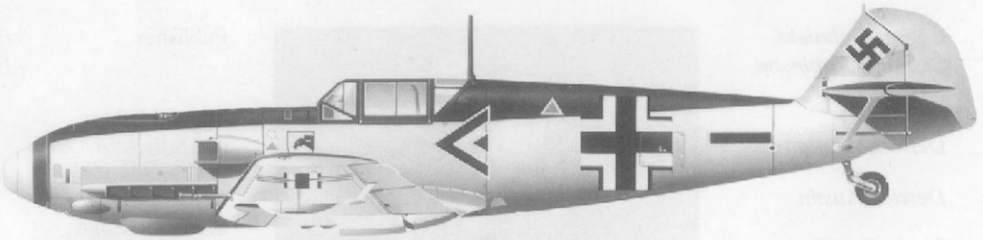
SIMULATION • SOFTWARE

DOGFIGHT



"Only the spirit of attack, born in a brave heart, will bring success to any fighter aircraft, no matter how highly developed it may be."

Adolf Galland WW2 Luftwaffe Ace

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DOGFIGHT

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Introduction

Dogfight is the first pure aerial combat flight simulation from MicroProse; presenting the action and excitement of two pilots battling for air supremacy across six historical scenarios. Fight over the World War One trenches in aircraft made of wood, canvas and wire then take a quantum leap to the latest fly-by-wire 'electric' jets, flying at twice the speed of sound. For some computer systems *Dogfight* allows you to duel against another player via modem/serial link; but whoever your opponent, remember to watch your 'six'!

Dogfight also gives you strategic decision making within each scenario, enabling you to plan combat missions; from attacking Zeppelins to destroying SAM sites. You will also have extra 'resources' at your command such as other fighters, bombers, and early warning aircraft. You must set each 'resource' an individual task so that, when the battle begins, you will have the best chance for attack or defence.

The *Dogfight* manual will teach you basic fighter manoeuvres, such as Scissors, Split-S or Yo-Yos, until you can perform them instinctively and recognize them when your opponent tries them on you. In the heart-pounding world of aerial combat, you either learn quickly or you're history!

Simulation Overview

Dogfight is made up of three basic elements:

Duel Mode that matches famous aircraft from the same historical period.

What If? Mode that allows you to select *any* aircraft against *any* other aircraft in *any* one of six air conflict scenarios.

Mission Mode that provides full mission planning, allocation of resources, ground and air targets.

Ideally, you'll begin with WW1, flying the earliest of fighters in a **Duel** against an aircraft from the same era. Here, Rookie pilots can practice basic manoeuvres without having to worry about undercarriage, flaps, missiles, HUDs or threat warning displays. When you feel confident of success in this scenario, change eras to WW2: fly a Spitfire or a Messerschmitt, get used to the more advanced controls and the faster speeds.

Eventually, you'll be flying in jets, firing missiles and rockets. The speed of air combat will have increased ten fold but you'll appreciate the universality of basic fighter manoeuvres. The final scenario will give you the choice of the most modern fighter aircraft travelling at over twice the speed of sound. If you have increased your pilot skills sufficiently you'll be able to take on even the most dangerous of opponents!

Tackle **Mission Mode** next; begin with WW1 and work your way up to the conflict over Syria. This is the core of *Dogfight* and is designed to test your tactical abilities to the full as well as your take-off, flying and landing skills.

The **What If? Mode** can be used at any time as a break from the historical conventions of a flight simulation. It's there for you to try things out - can you get Sidewinders to

lock-on to a Fokker Triplane, can you out turn a MiG-15 in a Mirage III? Use this fascinating mode to find out!

This Manual

The manual is organized to help you get into the air as quickly as possible.

First, you will be guided through a **Duel** between a MkII Spitfire and a Messerschmitt Bf109 in WWII above the south coast of England.

Secondly, you will be guided through a **What if?** scenario. You will pilot an F-16 Fighting Falcon against a Fokker Triplane over the Falkland Islands!

The third part takes you through a WWI mission. You will have to study mission objectives, plan the use of other resources, take-off, help complete the mission and land at your home base for a successful outcome.

The next part of the manual has full details of the 12 *Dogfight* aircraft. You must get to know your machine and understand its capabilities before you can succeed in piloting it at the highest difficulty levels.

Finally, there is a section on Air Combat Manoeuvres and Basic Flight details. Veteran MicroProse pilots may be familiar with this information but this is essential reading for those who are aiming for *Dogfight* glory!

Sorting the Materials

Your *Dogfight* package contains this Manual, a Technical Supplement, a Key Guide and a set of disks to run the simulation.

Installation and Loading

The Technical Supplement contains specific instructions for loading/installing the simulation for your type of computer.

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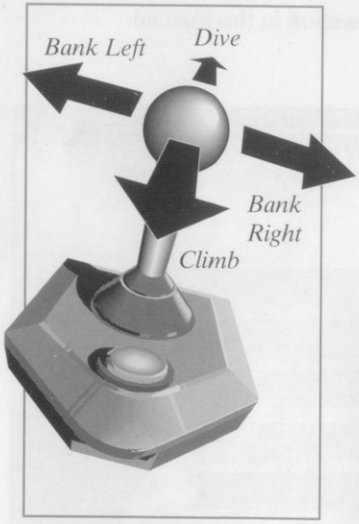
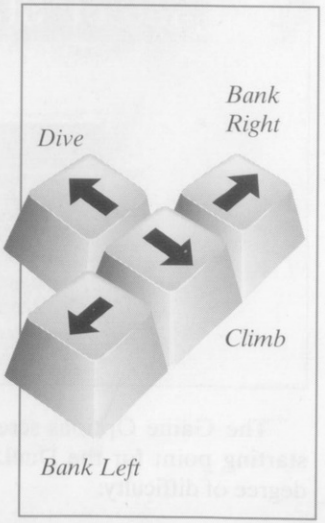
The Controller

Dogfight can be controlled using a combination of keyboard cursor keys, mouse or joystick. For flying it is recommended you use a joystick and for menu selection it is recommended you use the mouse pointer. Flight control is not possible with a mouse. In this manual, which is applicable to all computer systems, the three devices will be referred to as the *Controller.*



Joystick Flight Controller

Keyboard Flight Controller



The Selector

At times during the game you will be asked to select from a series of options. You will be able to use any one of three devices: Keyboard Return/Enter key and Spacebar; Left Mouse Button and the Joystick Fire Button. In this manual these devices will be called the *Selector.*

Instant Action

Duel Mode

Getting Started

For those of you who just want to get up there and fight one-on-one in an accurate historical setting, Duel Mode provides a choice of six eras and two typical opposing aircraft. You will start from a position of your own choice and you will only have one opponent to shoot down. Duel Mode is recommended for Rookie pilots who want to learn the basic air combat manoeuvres and get experience of their aircraft handling ability.

• Copy Protection

After the opening sequences *Dogfight* will take you to the Copy Protection Screen. Enter the correct word from the manual using the reference given.

• Configuration Screen

You will then see the Configuration Screen. This should be set for the easiest level. If you are flying your aircraft with a Joystick *Controller* you should calibrate your Joystick. Select Calibrate Joystick then follow the on-screen prompts.

Save the joystick calibration, then click on the OK button to accept the default set up.

• Select Mode Screen

You will then see the Select Mode Screen. This is where you choose between the three main elements in the game. Select Duel Mode.

• Select WW2

• Select Spitfire

For full details of instruments, weapons and performance consult The *Dogfight* Dozen section in this manual.

• Game Options

The Game Options screen lets you choose the precise starting point for the Duel. This allows you to set up any degree of difficulty:

Player flying out of the sun
Enemy flying out of the sun
Behind the enemy
Enemy behind player
Nose to nose
Bounce from above
Side by side
Altitude

• Fly

You will now be placed in your Spitfire, in the position specified in your Game Options selection. Get ready for battle! Remember - Key P will Pause the simulation. Press Key P again to unfreeze the action.

• Check your views:

Press Function Key F1 to see the main cockpit forward view

Press Function Key F2 to see the Instrument Panel. Press Key S to move your view up 50%

Press Function Key F3 to see your Spitfire in the foreground and the enemy aircraft position (it will probably be a dot) in the background (Tactical View)

Press Function Key F4 to see the enemy Bf109 in the foreground and your Spitfire (it will probably be a dot) in the background (Inverse Tactical View)

Press Function Key F5 to see the 'Heads-Up' View. Press Button 2 on the Joystick and use the joystick movement (or use PgUp / PgDn / Insert / Delete) to look all around from within the cockpit.

Press the TAB key to lock 'Heads-Up' View on target. Press TAB key again to unlock the view; it will then re-centre if no control movement occurs.

Press Function Key F6 to see Left Cockpit View

Press Function Key F7 to see Right Cockpit View

Press Function Key F8 to see Rear View (and you)

Press Function Key F9 to see the Map View

Press Function Key F10 to see Target View - in this case it will be your opponent

Press Shift/F1 to see the Slot View

Return to Cockpit View (F1)

• Combat

Duel Mode exists for pure air combat. You must now try to shoot your opponent down. If you are new to air combat, you might be shot down quite quickly. But, if this happens, you can re-enter Duel Mode quickly and easily to hone and improve your skills.

Select F3 Tactical View - your opponent will remain in the centre of the background and probably show up as a dot. If you head for the dot (into the middle of the screen) you will be heading for your opponent. Press Function Key F4 to see your position relative to him, this is useful for gauging relative heights, then return to F3 View.

Study the air combat manoeuvres in this manual and the quick tips below. *The rest is up to you!*

Duel Mode will end when one of the aircraft is shot down, crashes, or if you press the Esc Key to end the fight.

A fighter pilot is greeted by the squadron mascot while his aircraft is re-armed and refuelled by ground crew.

The Basics of Air Combat

• Surprise is your strongest weapon. 80% of 'kills' are over before the victim knows of his hazardous position.

• Use the sun. Keep it behind you if possible.

• Do not stay on a predictable course. 'Tack' diagonally to and fro.

• Don't be caught instrument watching. Keep looking out of the cockpit preferably all around (top fighter aces in WW2 were known as 'swivel-heads'!).

• Use all the available outside views, especially 'Heads-Up', Tactical and Inverse Tactical Views.

• Watch your Six (your rear). *This is your major blind spot; the optimum position for an enemy fighter who's going to shoot you down.*

• Attack decisively and aggressively. Be sure of your first shot. This may be your only chance!

What If?

Getting Started

What If? Mode lets you pick any one of twelve *Dogfight* aircraft and fly it against any other, over any of the six conflicts. In this guide you will fly an F-16 Falcon against a Fokker Triplane over the Falkland Isles!

• Copy Protection

After the opening sequences *Dogfight* will take you to the Copy Protection Screen. Enter the correct word from the manual using the reference given.

• Configuration Screen

You will then see the Configuration Screen. This should be set for the easiest level. If you are flying your aircraft with a Joystick *Controller* you should Calibrate your Joystick. Select Calibrate Joystick then follow the on-screen prompts.

Save the calibration and click on the OK button to accept the default game set up.

• Select Mode Screen

You will then see the Select Mode Screen. This is where you choose between the three main elements in the game. Select What If?

•Game Type

Select One Player

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The WW1 Fokker Triplanes of the Red Baron's 'Flying Circus' preparing to take-off for patrol over the British lines.

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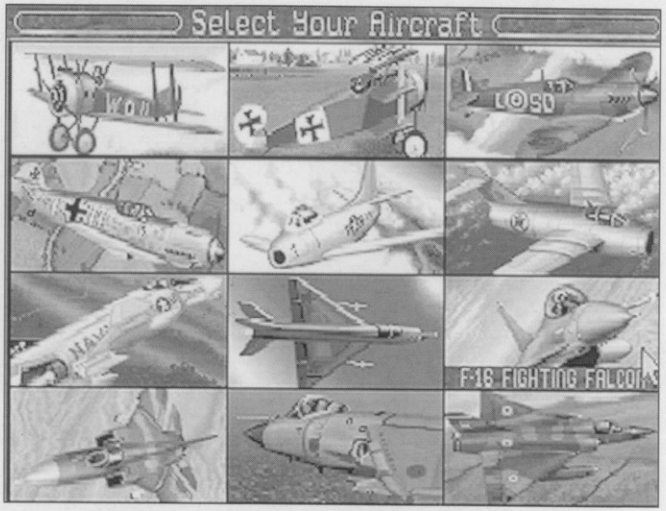
• Your Aircraft

Select the F-16 Fighting Falcon as your aircraft.



• Enemy Aircraft Options

Select the Fokker Triplane as your opponent

• Combat Zone

Select Falkland Islands

• Game Options

The Game Options screen lets you choose the precise starting point for air combat. This allows you to set up any degree of difficulty: for instance you can begin nose to nose or side by side with your opponent.

• Fly

You will now be placed in your F-16 Fighting Falcon ready for air combat. Press Key P if you want to pause the simulation and look at the manual. Press again to unfreeze the action.

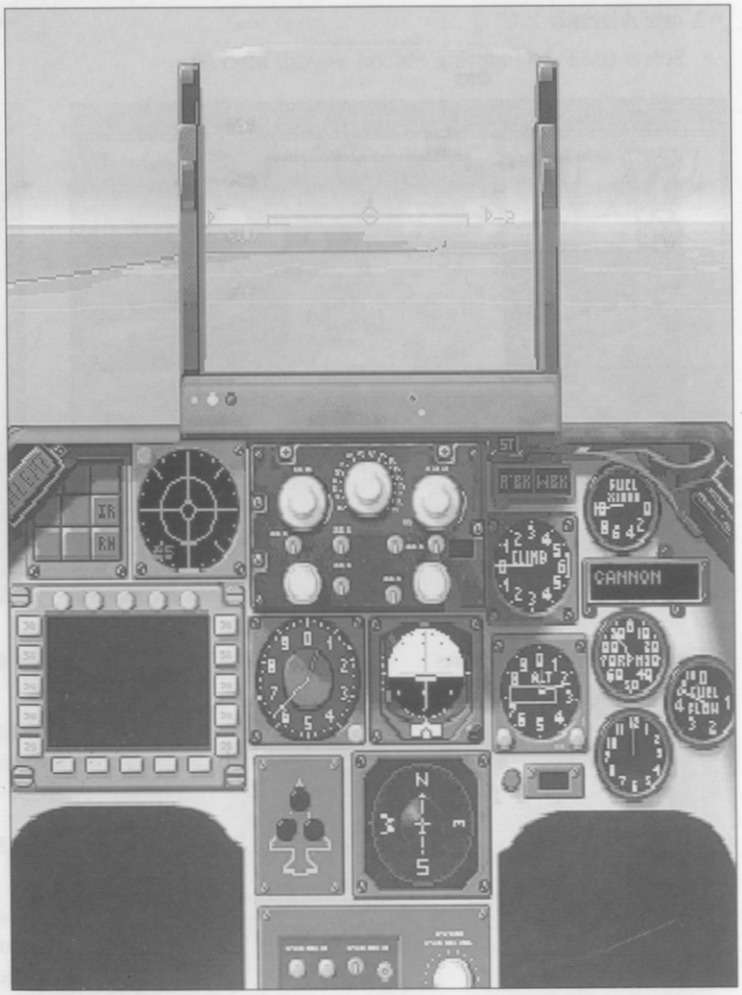
• Views

Check your views Function Keys F1-F10 (see Duel Mode above)

• F-16 Falcon Controls

The F-16 is one of the world's most modern fighter aircraft. To save you the indignity of being shot down by a WW1 Fokker Triplane, pause the simulation (Key P), take time to look through the cockpit details in this manual and become familiar with weapon selection, aiming, HUD and firing.

It won't be as easy as it sounds to shoot down the slower but tighter-turning Fokker Triplane; and don't feel confident of using Sidewinders! You will soon realize that you'll have to know as much about the opposing aircraft capabilities as your own. Next time you load the simulation - why not fly the Fokker?



The First Mission

Getting Started

Dogfight has different missions for each combat world. In this guide you will be taken through a basic World War One mission flying the Sopwith Camel over the trenches in Northern France.

• Copy Protection

After the opening sequences *Dogfight* will take you to the Copy Protection Screen. Enter the correct word from the manual using the reference given.

• Configuration Screen

You will then see the Configuration Screen. Initially, this should be set for the easiest level.

Ground Detail	High
Aircraft Detail	High
Graduated Horizon	On
Landing Realism	Easy
Sun Blind Spot	On
Sound Effects	On
Skill Level	Novice
Player Kill	Gradual
Opponent Kill	One Hit
Gun Aiming	Easy
Missile Effectiveness	Easy
Flight Control	Joystick (if available)

If you are flying your aircraft with a Joystick *Controller* you should Calibrate your Joystick. Select Calibrate Joystick then follow the on-screen prompts. When you have finished the Configuration select Save.

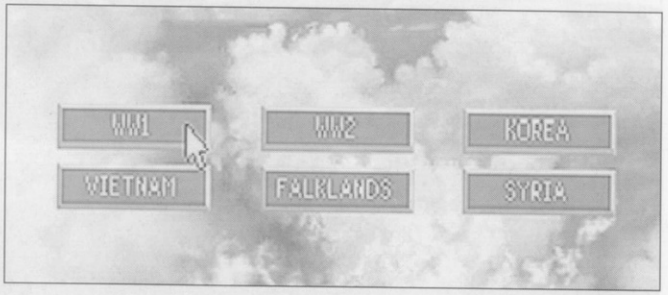
Click on the OK button to accept the above setup.

• Select Mode Screen

You will then see the Select Mode Screen. This is where you choose between the three main elements in the game. Select Missions.

• Select Era Screen

You will be given a choice of six aerial conflicts from WWI to Syria. Select WWI.



• Select Side

You can choose which side you want to fight on by selecting your aircraft. For this guide choose the Sopwith Camel; this will put you on the British side in the conflict.

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By the end of the war in 1918, the Sopwith Camel had destroyed more enemy aircraft than any other Allied type. The name was derived from the humped-back appearance created by the cowling over the machine guns in the nose.

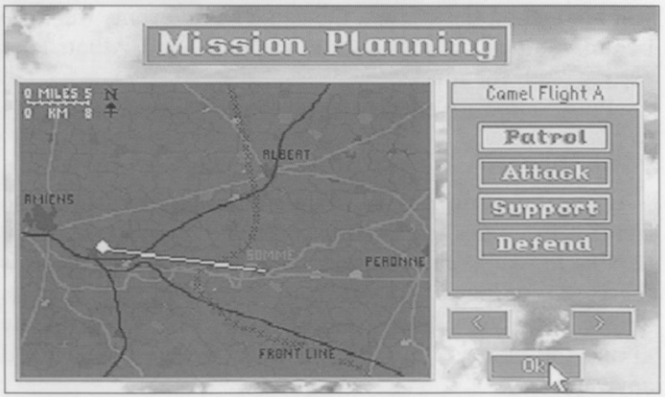
Mission Planning

The Mission Planning Screen gives you a background scenario and a list of mission orders for you, and your resources, to complete.

• Read the Mission Orders

This outlines the conflict you are participating in and lists your mission objectives.

• Select Resources



Resources are the other aircraft at your command for that mission. The number you have will vary depending on the complexity of the mission. You will see a map of the area of conflict on the left of the screen. In this case it will be Northern France.

On the right of the map are the control boxes.

Select the left arrow button and watch the top of the box. This will show the type of aircraft you have to issue orders to. Select again to cycle through all your other aircraft; these may be other Camels or DeHavilland DH4s.

Choose an aircraft then give it an order from the four types available:

Patrol

Choose an area on the map to patrol.

Attack

Attack a target from a given list. If you choose the Attack order another box will appear asking you for a choice of target for that aircraft. Simply highlight and select one from the list.

Support

Highlight and select an aircraft to support in an attack or a patrol.

Defend

You'll be given a list of home bases that could be defended. Highlight and select.

You will then return to the original control box but now the target will be shown at the lower part of the box and a mission flight path will be marked on the map.

Plan your mission carefully to get the best out of your resources.

Repeat the above procedure for each of your available aircraft. Don't forget to assign some form of defence. The enemy will be planning their attacks against you at the same time!

Click through the arrow buttons to check that all your resources have been used then select OK to exit.

• Mission Planning Screen

You will be returned to the main Mission Planning Screen.

• Select Arming

This option will only show armaments carried on more modern aircraft from Vietnam onwards. You will have to choose a combination of missiles and rockets for your particular mission. Select OK to return to the main Mission Planning Screen.

• Mission Planning Screen

Select Start to begin the mission.

Start Mission

You will begin on your home base runway for WW1 and WW2 missions. Due to the distances involved, missions in Korea, Vietnam, the Falklands and Syria will begin in the air.

• Map and Zoom

Before you take-off check the map by pressing Function Key F9.

Green dots are friendly aircraft. A highlighted dot is the selected game object; initially, this will be your Camel. Move your *controller* around the map and select other dots. The legend at the base of the map will tell you what all the dots represent. Red dots are enemy targets.

The Keypad + and - keys will zoom you in and out of selected areas. If the Zoom makes the object disappear from the screen, place your *controller* on one of the screen edges to move the map left/right/up/down. The zoom facility is a very powerful feature; it can home in on any game object with a high degree of magnification. Click on the Right Mouse Button to centre the map on the selected object.

• View Other Objects

Press Function Key F10 to view the mission targets/objects and resources. Press Key T to cycle through enemy and friendly objects. Remember that, even though you are still on the ground, the game world events will have begun. You can watch Fokker Triplanes and Albatrosses getting ready for attacks.

Press Shift/T to return to Your Aircraft View.

• The Take-Off

Press Function Key F1. You will be looking along the runway. In some aircraft (such as the Spitfire) you might not be able to see the runway when the plane is at rest. If this is the case, you must take off from an outside view such as Shift/F1 Slot View, positioning yourself behind and slightly above the plane. You might actually prefer this method anyway!

Set engine revs to maximum (Shift Plus +)

Steer along the runway until you gain maximum speed.

Pull back gently on the stick until the plane lifts off the ground.

Normally, you should raise your gear (Key G) but the Camel has a fixed undercarriage - so it's one less thing to worry about.

• In The Air

When the Camel is safely in the air, quickly cycle through all available views (see the section on Views in this manual), then check the map (Key F9) for your chosen target.

Press Key F10 and check on the progress of the other aircraft/targets (Key T). Press Shift/T to return to your aircraft view.

Now select a target. Press Tactical View F3 and then Key T. Each time you press Key T the view will change as each object/target is placed in the centre of the background.

You may support one of your other aircraft or attack a target on your own. The choice is yours! You can line up on static objects with F3 and F4 Keys. If you are attacked, or want to *Dogfight*, the F5 'Heads Up' View will help you locate the enemy fighters (look at the Views Section of this manual).

• Return to Base

Eventually, you will receive a message to tell you if the mission has been a success, failure or if the opposition have succeeded against you. You will then be told to return to base. Check your position and the location of your base or any friendly runway on the map (Key F9) and head for home using the compass and map grid.

• Landing

Locate your runway. The aircraft in *Dogfight* will only land on a runway.

Reduce power (Minus Key -).

Lose height.

Adopt the correct approach using an appropriate outside view. Slot View (Shift/F1) is very useful here.

Reduce Power

The Camel has fixed undercarriage and no flaps but remember to lower the landing gear (Key G) and flaps (Key Close Square Brackets]) on any aircraft from WW2 onwards.

Control your speed on jet aircraft with Airbrakes Key B.

Aim for the runway but do not point the nose of the aircraft down.

Land as gently as possible and cut power (Shift Minus -) as soon as you are on the ground.

Later aircraft will have wheelbrakes (Key W) to stop forward movement.

The mission will end when you come to a stop.

Mission Review

You will be given a summary of the major mission events. Appropriate medals and promotions will be awarded.

Head-to-Head Dogfight

If your version of the software supports head-to-head play, you will be able to do battle against another human opponent either in Direct Link or through a Modem. Select your choice of head-to-head mode as detailed in the Technical Supplement for your specific machine.

An American and a Polish fighter pilot wearing their flight gear exchange cigarettes and combat tales as they wait for the order to 'scramble'.

The Dogfight Dozen

The Sopwith Camel

The Sopwith Camel has the distinction of having destroyed more enemy aircraft than any other Allied type. The successor of the Pup and Tripe, the Camel did not have the easy handling of its predecessors. It had a very heavy 130 horsepower engine that tended to act like a huge gyroscope; it could out-turn any German fighter (with the possible exception of the Fokker Triplane). The name comes from its slightly hump-backed appearance created by the cowling over the machine guns in its nose.

During the 3rd Battle of Ypres and the Battle of Cambrai, the Camel was used extensively for ground support activities. Carrying four 20 pound bombs under the fuselage and armed with twin Vickers machine guns, the Camel was a fearsome fighter. However, its real strength lay in its dogfighting capabilities. Its tremendous turning finesse, speed and simplicity of construction (and therefore maintenance) made it the most reliable fighter on the Allied side.

By January 1918 there were over 1300 Sopwith Camels operating in France at the front and over 2100 more on order.

Technical Details

Manufacturer: The Sopwith Aviation Company Ltd., Kingston upon Thames, UK.

Type: Single seat Bi-plane fighter, bomber escort and occasional light bomber.

Engine: One 130hp Clerget 9B Rotary engine.

Dimensions: Span: 28ft. Length: 18ft 9in. Height: 8ft 6in.

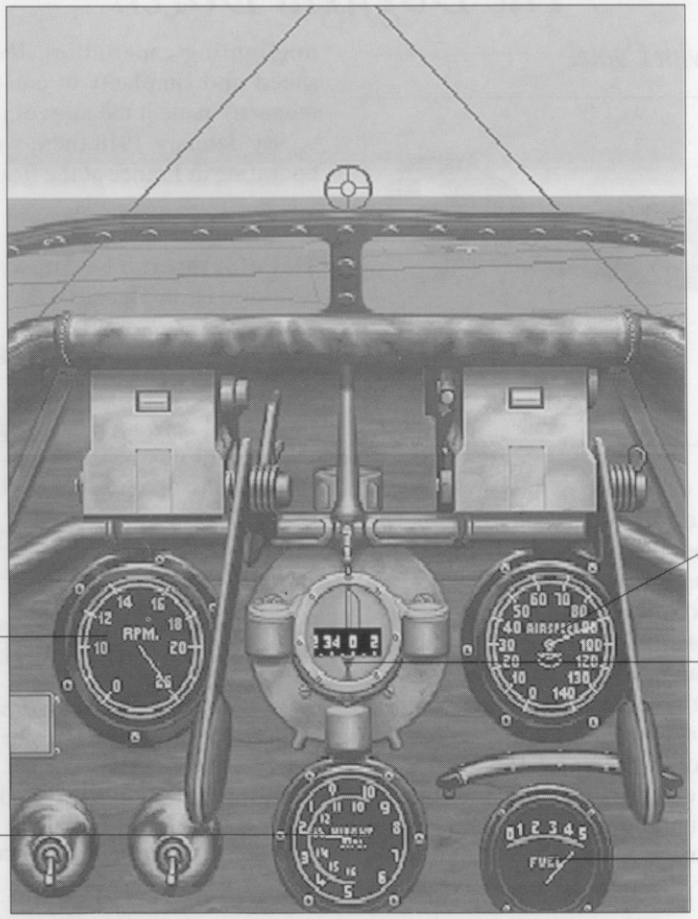
Weight: [empty] 950lbs [430kg], [with maximum load] 1,482lbs [673kg].

Performance: Maximum speed: 170 km/h [106 mph]. Ceiling: about 13,000 ft. Endurance: about 2 3/4 hours.

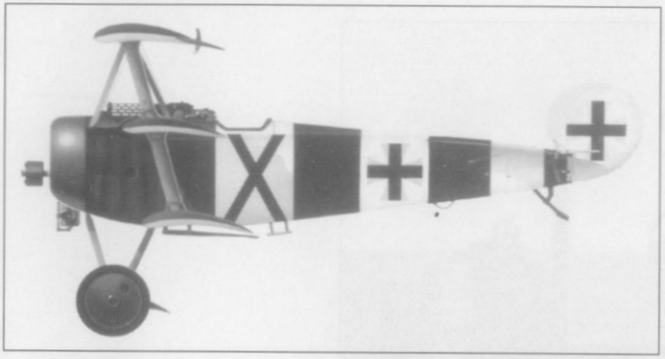
Weapons: Twin .303in [7.7mm] Vickers machine guns, with Kauper No. 3 interrupter gear. Rate of fire: about 200rpm.

History: First flight [prototype] December 1916; entered service July 1917; fought in Russian Civil War [1917-22]; continued in service in some countries until the late 1920's.

Sopwith Camel Cockpit



Fokker DR1



In the summer of 1917, there were 318 DR 1s on order. Baron Manfred Von Richthofen's 'Flying Circus' was the first unit to receive the new aircraft and the 'Red Baron' was thrilled with the plane. The high degree of manoeuvrability inherent in the plane's design, the triple wings and heavy 110 horsepower Oberursel rotary engine, made it successful despite early setbacks. It has often been compared to the Sopwith Camel in terms of handling, and to the Sopwith Triplane for its tremendous climbing capabilities.

Technical Details

Manufacturer: Fokker Aircraft Company, then of Germany, later, of Schiphol, Netherlands.

Type: Single-seat Triplane fighter and bomber escort.

Engine: 110hp Oberursel UR II rotary engine

Dimensions: Span: 26ft 10in. Length: 18ft. Height: 9ft 6in.

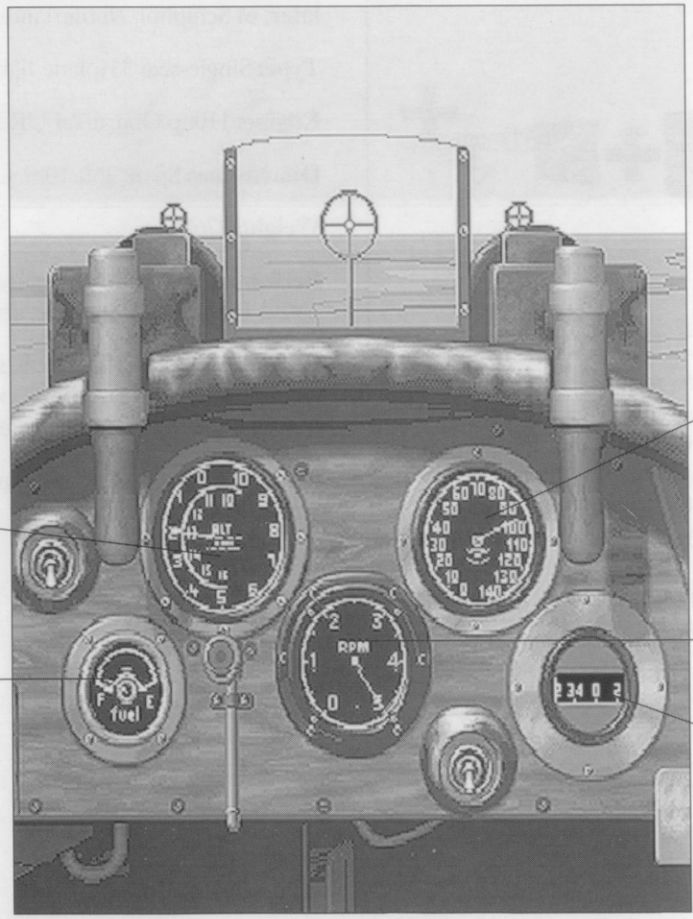
Weight: 376kg

Performance: Maximum speed: 166 km/h [103 mph]. Ceiling: about 14,000 ft. Endurance: about 4 hours.

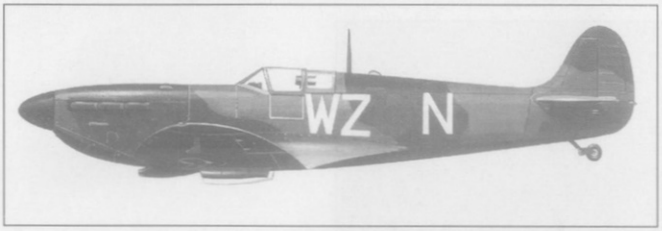
Weapons: Twin .312in [7.92mm] MG08/15 machine guns, with new Fokker camshaft-operated synchroniser gear. Rate of fire: about 600rpm, magazine capacity 97 rounds.

History: Entered service August 1917, replaced by D.VII in April 1918.

Fokker DR1 Cockpit



MkII Supermarine Spitfire



The Schneider Trophy air races, begun in 1912, sought to find the fastest aircraft that could take off and land from water. In 1929, the trophy was won by Britain, with a Supermarine S6, designed by R.J. Mitchell and powered by an engine designed by Henry Royce. From the S6, it was but a short step to the first experimental Spitfires. Mitchell struggled against the usual government indecision and reticence. By 1936 when war was becoming inevitable, the first fully working prototype, the Spitfire I, swept away all doubt and emerged, along with the Hawker Hurricane, as the British answer to rapidly increasing German fighter production.

The Spitfire's role was to take out the fighter escorts, the Messerschmitt Bf109s, and in this, with its superb manoeuvrability and speed in excess of 350mph, it was unsurpassed. Its many guises, in the space of five years, included the MkI & IIs that fought the Battle of Britain, the MkIXs that saw off the formidable 400mph+ Focke-Wulfe Fw190s, and the Mk21s that, with a top speed of over 450mph, were almost twice as fast as the original MkIs. The Spitfire was the only plane to have remained in production throughout the war.

Technical Details

Manufacturer: Supermarine, UK

Type: Single-seat, single-engine fixed wing monoplane fighter.

Engine: 1030hp Rolls-Royce Merlin III piston engine.

Dimensions: Span: 36ft 10in. Length: 29ft 11in. Height: 12ft 7 3/4in.

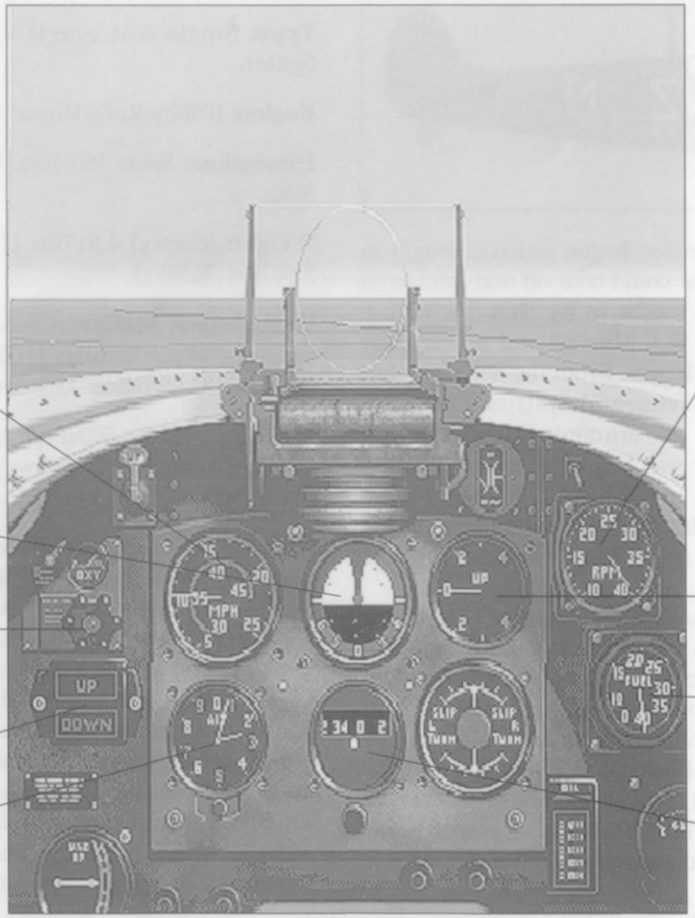
Weight: [empty] 4,517lbs [2050kg], [with maximum load] 5,844lbs [2656kg].

Performance: Maximum speed: 590 km/h [365 mph]. Max. range [slow]: 630 miles [1000km], [max. cruise] 415 miles [664km] . Endurance: 3.6 hours.

Weapons: Eight .303in [7.7mm] Colt-Browning Machine Guns, mounted in two rows of four in either wing. Rate of fire: 1100-1200rpm, magazine capacity 300 rounds per gun.

History: Prototype first flown 1936; MkIA entered service May 1938; More powerful MkVB supplied March 1941; later replaced with MkIX, with Merlin 60 engine, and 2 20mm Hispano cannon & 4 Browning machine guns; MkXII & MkXIV given R-R Griffon engine; Mk21, with 2050hp Griffon 60 engine and capable of 454mph, entered service mid-1945, shortly before the end of the war. Some French Air Force MkIXs Spitfires were still fighting in the early days of the Indo-China conflict, later to become the Vietnam war, whilst the British were still using them well into the jet age, often in situations where jets would be unsuitable - in anti-guerrilla engagements, for instance, like the Malaya campaign.

MkII Supermarine Spitfire Cockpit



Airspeed Indicator

Artificial Horizon

Oxygen Level Indicator

Landing Gear Indicator

Altimeter

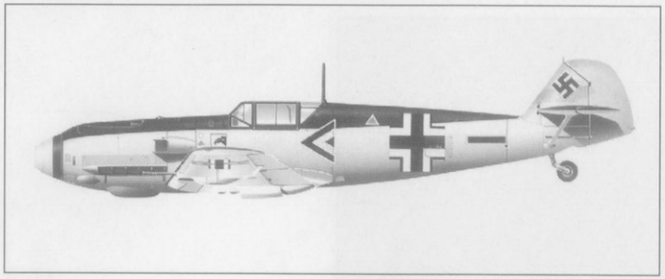
Tachometer (Engine Revs)

Rate of Climb Indicator
Indicates the rate at which the plane is climbing/diving.

Fuel Gauge

Directional Indicator (Compass)

Messerschmitt Bf109E



The German Luftwaffe's Bf109 was the first of a new generation of single-engine fighters to enter the service. The first models were, ironically, powered by a British engine, the Rolls-Royce Kestrel. This was changed when the Bf109B was produced. This aircraft flew with a Junkers Jumo 210 engine when it was used in the Spanish Civil War.

The fighter fulfilled a multitude of roles during the Civil War, including ground support of the Nationalist Army conventional air combat with the Russian-supplied Republican fighters. Its bomber escort duties allowed the Junkers Ju87, (or Stuka) and Heinkel He III light bombers to bomb the enemy ground forces and cities in relative air supremacy.

When WWII began, the Bf109B was relegated to training and reserve duties. Its place in the front line was taken by the first full production fighter, the Bf109E. This aircraft was a match for its allied counterparts: the Spitfire and Hurricane, and was superior in a dive thanks to its direct fuel injection. Allied planes often stalled through fuel starvation in a steep dive due to the effects of negative gravity.

Technical Details

The early 109s, including the 109E, were equipped with two MG FF 20mm cannons in the wings, and two MG-17s above the engine. In later models, the MG FFs were replaced by one MK [Machine Cannon] 108, mounted to fire through the propeller hub, and capable of firing 850 17oz shells a minute.

Manufacturer: Messerschmitt, Germany.

Type: Single-seat, single-engine fixed wing monoplane fighter.

Engine: 1100hp Daimler-Benz DB601Aa inverted V-12, fuel-injection engine.

Dimensions: Span: 32ft 4 1/2in. Length: 28ft 4 1/4in. Height: 8ft 2 1/2in.

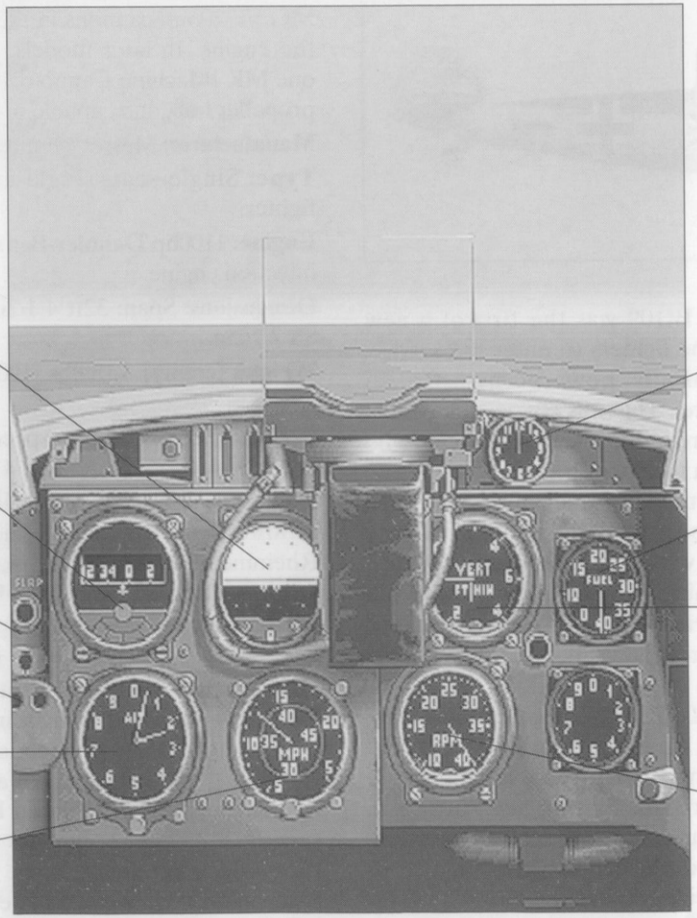
Weight: [empty] 4,189lbs [1904kg], [with max. load] 5,875lbs [2670kg].

Performance: Maximum speed: 570 km/h [354 mph]. Ceiling: about 34,450ft. Max. Range: 410 miles.

Weapons: Two 20mm Oerlikon-Bekker MG FF cannon mounted in the outer wings, two 0.312in [7.92mm] Rheinmetall-Borsig MG17 machine guns mounted above the engine. Rate of fire: MG FF cannon - 540rpm; MG17 machine guns - 1180rpm. Capacity [MG FF]: 60 rounds per gun, [MG17] 1000 rounds per gun.

History: First 109 flown September 1935, powered by R-R Kestrel engine; 109B fought in Spain with Junkers Jumo 210 engine; 109E first production plane proper, powered by 1100hp DB601 engine; 109F arrived early 1941, with DB601 uprated to 1300hp; replaced by 109G in late 1942 - despite speeds of 450mph+, heavier armament and engine caused drop in combat ability; some models were still produced in Spain and Czechoslovakia after the war.

Messerschmitt Bf109E Cockpit



DOGFIGHT

North American F-86E Sabre

By the end of WWII it was becoming obvious that the propeller had had its day as a method of fighter propulsion. From 1944 both sides rushed out a series of experimental jet fighters, with mixed success. The British Gloster Meteor was the allied answer to the German Me262. It remained in service for many years after the war, accompanied by a wide variety of other planes including the F-80 Shooting Star, F-84 Thunderjet and the de Havilland Vampire. But all of these first jet designs made the same mistake, (failing to learn from the Me262) - they were all straight-winged craft, and due to the potentially lethal air compression that happened along their leading edges when approaching the sound barrier, most were limited to speeds little greater than those achieved by the piston-engined planes they had replaced.

In 1949 the first operational North American F-86 appeared, complete with the swept wings first used by the pioneering Messerschmitt five years before. In December 1950, the F-86 first saw service in the Korean war.

On 17th December 1950 an F-86 shot down a MiG-15; the first combat between swept-wing fighters. The earliest models to see action were the F-86As, Es and Fs but, despite the high technology of their engines and construction, both Russian and American planes were still using conventional combat tactics. They were armed with M-3 heavy machine guns and a basic radar gunsight that was often discarded by the pilots. It was not until the arrival of the F-86D that rockets were first used and - in conjunction with a computerised interception package and an afterburner system- produced the first of the 'modern' jet fighters.

Technical Details

Manufacturers: North American Aviation Inc., Inglewood, USA.

Type: Single-seat fighter-bomber.

Engine One 5,970lb [2710kg] Wright J65 single-shaft turbojet.

Dimensions: Span: 37ft 1 1/2in [11.31m]. Length: 37ft 6in [11.43m]. Height: 14ft 8 3/4in [4.47m].

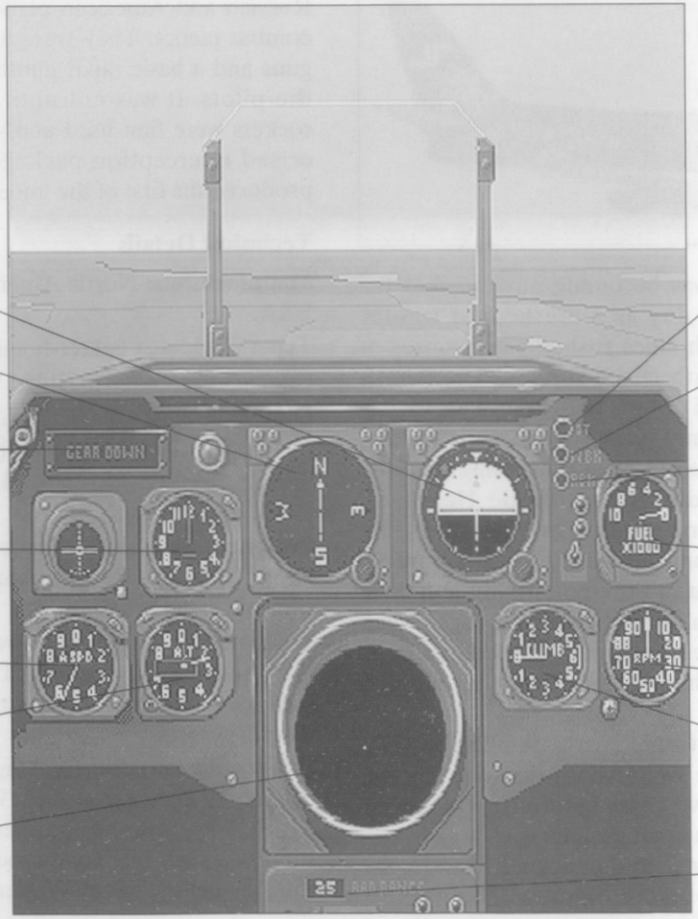
Weight: Empty: 11,125lbs [5,045kkg]. With maximum load: 20,611lbs [9350kg].

Performance: Maximum speed: 678 mph [1091km/h]. Ceiling: about 45,000 ft. Range: about 850 miles [1368km/h. Initial climb: 8,000ft [2440m]/min.

Weapons: Six 0.5in Colt-Browning M-3 heavy machine guns. Hardpoints for two external tanks or two loads of 1000lbs. Rate of fire: 1,150-1,250rpm. Capacity: min. 267, max. 500 rounds per gun.

History: First experimental flight November 27th 1946; service delivery [F-86A] December 1948; first service flight December 22nd 1949; first combat service late 1950; later models E,F,D,K,H,AF-1E. Total production, including under licence, 9502 the highest of any Western military plane since WWII.

North American F-86E Sabre Cockpit



Artificial Horizon

Directional Indicator (Compass)

Landing Gear Indicator

Clock

Airspeed Indicator

Altimeter

Radar Screen

Stall Warning Light

Wheelbrake Indicator

Airbrake Indicator

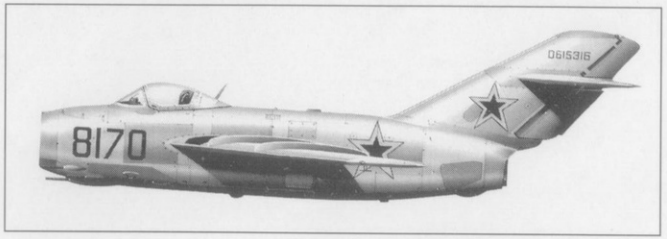
Fuel Gauge

Tachometer (Engine Revs)

Rate Of Climb/Dive Indicator

Radar Range (in miles)

Mikoyan-Gurevich MiG-15



At the end of WWII, the Allied forces were involved in a desperate race to be the first to reach Berlin. The haste was not only based on the removal of Hitler from power but also a desire by both sides to be the first to capture German rocket secrets, and the scientists who created them. Berlin was eventually divided amongst the Russians, Americans, British and French, and the same happened to the new captured technology.

Just as the German A-4 rocket was to form the basis of all subsequent ballistic missile research and development, so the Me262 and its variants were to be the basis of all modern jet fighters, especially for the Soviet Union and its chief jet designers, the Mikoyan-Gurevich Bureau. Although the USSR had designed its first revolutionary fighter within months of WWII's end, they had to wait longer for a suitable engine. Ironically, the first engine was given to them by the British. A Rolls-Royce 'Nene' turbojet was sent to the Soviet Union quickly copied and mass-produced (without a licence) as the RD-45.

The MiG-15 was flying by 1947, and in service by August 1948. While the Allies were still mainly relying on piston-engined fighters such as the Mustang and Spitfire. Needless to say there was panic in the UN ranks when these silver swept-wing jets roared out over the Korean arena for the first time, the F-80 Shooting Star was in service, but with its straight wings it was instantly outclassed by the vastly superior climbing, shooting and turning abilities of the MiG.

That an F-80 managed victory in the first jet-to-jet combat was due purely to the superior flying of the US pilot. It was not until the introduction of the F-86D in 1952 that the MiG-15 had any serious technological competition. Although the last service delivery to the Soviet Air Force was sometime around 1953, it is a sign of the quality of the MiG-15 that the UTI dual-control variant of this first Soviet jet fighter was still being used for training purposes as late as 1977.

Technical Details

Manufacturers: Mikoyan-Gurevich Bureau, Soviet Union, and under licence.

Type: Single-seat fighter.

Engine: One 5,005lb [2270kg] thrust Klimov RD-45 single shaft centrifugal turbojet.

Dimensions: Span: 33ft 0 3/4in [10.08m]. Length: 36ft 3 1/4in 11.05m]. Height: 11ft 1 3/4in [3.4m].

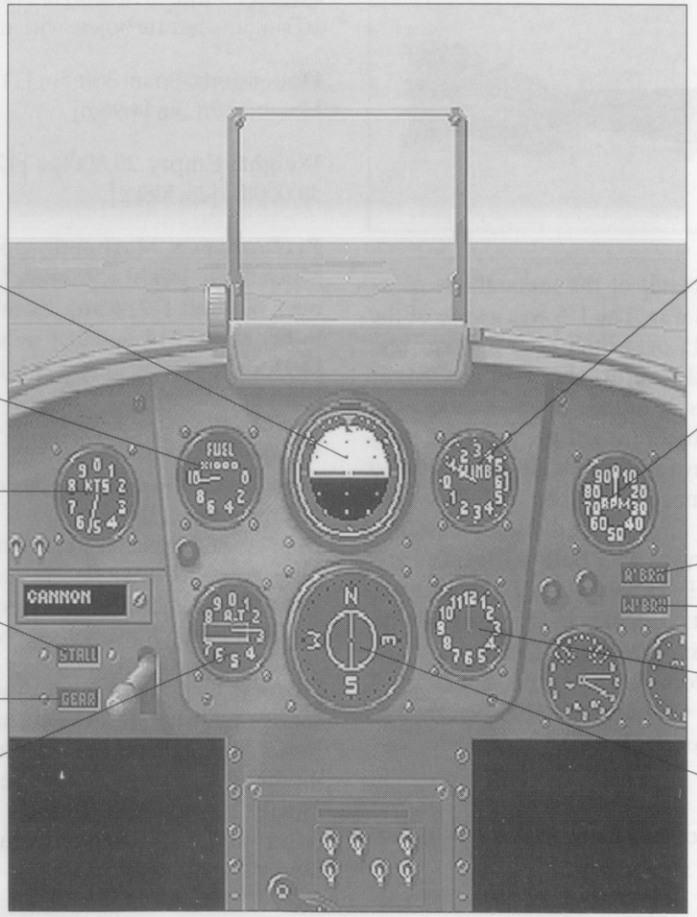
Weight: Empty 8,820lbs [4000kg]; With maximum load 12,566lbs [5700kg].

Performance Maximum speed: 668mph [1075km/h]. Ceiling: 51,000ft. Range: about 885 miles [1424km].

Weapons: One 37mm Nudelmann [N] cannon and one 23mm Nudelmann-Suranov [NS] cannon under the nose. Capacity: [N37] 40 rounds, [NS23] 80 rounds per gun.

History: First flight December 30th 1947; service delivery August 1948; last delivery to Soviet Air Force believed to be 1953. Continued to be delivered to Warsaw Pact countries until 1954; still used as a fighter by 15 countries until 1960, and MiG-15 UTI Trainer still in use in Soviet Union and over two dozen countries up to the late '70s.

Mikoyan-Gurevich MiG-15 Cockpit



Artificial Horizon

Fuel Gauge

Airspeed Indicator

Stall Warning Indicator

Landing Gear Indicator

Altimeter

Rate of Climb/Dive Indicator

Tachometer (Engine Revs)

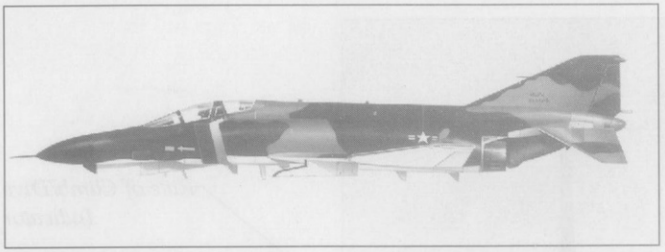
Airbrake Indicator

Wheelbrake Indicator

Clock

Directional Indicator (Compass)

McDonnell Douglas F-4J Phantom II



The F-4 Phantom was the result of the inequalities of jet combat during the Korean war. The US was aware of the prowess of the Russian MiG-15 over their own fighters, and needed a machine that would outdo this and any other Russian fighter for the foreseeable future. The F-4 underwent many changes of design even before it left the test bed: originally designed as a four-gun fighter, eventually entered service as a gunless, missile armed interceptor, and since then it has been everything from an unarmed reconnaissance plane to a tactical bomber, serving with both Air Forces and Navies the world over. The F-4J was adopted by the US Navy, and it is in this guise that it appears in Dogfight. The F-4 gave the Soviet-trained pilots a severe shock over Vietnam. Most of its early rivals have long been retired, but the F-4 remains stubbornly in service with innumerable Navies and Air Forces after nearly thirty years.

Technical Details

Manufacturers: McDonnell Douglas Corporation, St. Louis, USA and under licence.

Type: Twin-seat all-weather interceptor.

Engine: Twin 17,900lb [7711kg] thrust General Electric J79-10 single-shaft turbojets with afterburners.

Dimensions: Span: 38ft 5in [11.7m]. Length: 58ft 3in [17.76m]. Height: 16ft 3in [4.96m]

Weight: Empty 28,800lbs [12,700kg]; with maximum load 58,000lbs [26,308kg].

Performance: Maximum speed: [low] 910mph [1464km/h, Mach 1.19]. [high] 1,500mph [2414km/h, Mach 2.27]. Ceiling: over 60,000ft [19,685m]. Combat radius: [Ground attack, hi-lo-hi] about 517 nautical miles [960km]; [air patrol] 250nm [460km, 2 hours] inc. 2 minutes high altitude, high speed combat.

Weapons

One 20mm M-61A1 General Electric Vulcan 6-barrel machine gun (1200 rounds)
Four AIM-7 Sparrow air-to-air missiles under fuselage.
Four AIM-9 Sidewinder air-to-air missiles.
18 x 130mm Zuni Rockets (ground attack)
Four AGM-65 Mavericks (ground attack)

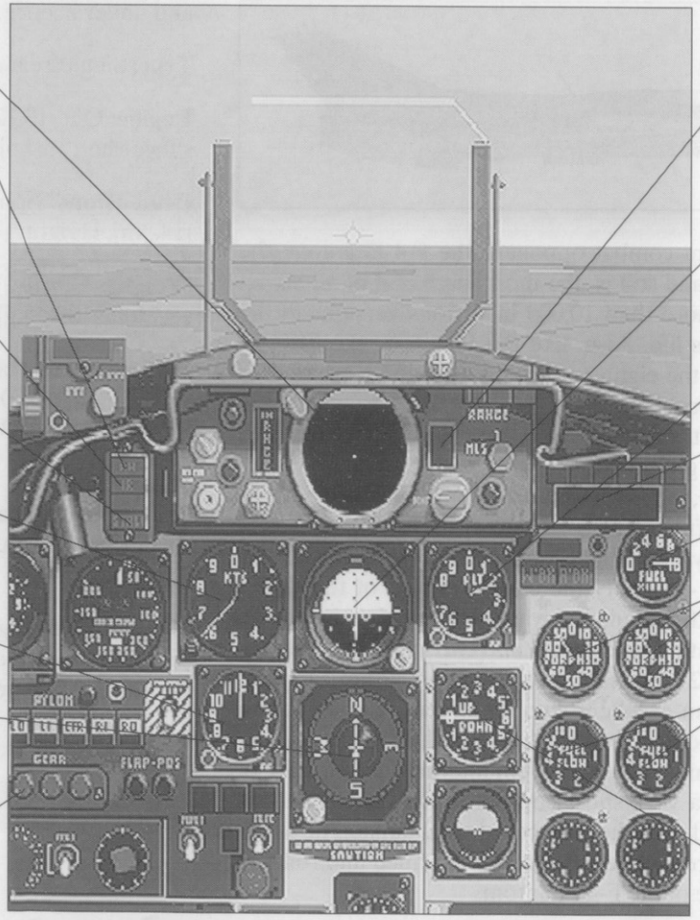
History: First flight [experimental XF4h-1] May 27th 1958; service delivery [F-4A] February 1960; first flight [Air Force F-4C] May 27th 1963. F-4J accepted by US Navy, later to be modified and uprated into the F-4S. Some modified models - mostly EF-4E Wild Weasels - still being delivered to date: latter model saw service from Allied carriers against Iraq in the 1991 Gulf War.

McDonnell Douglas F-4J Phantom II Cockpit

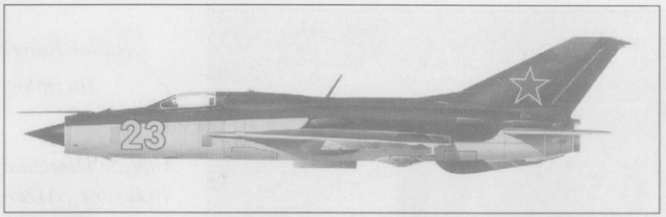
Aiming and Firing Missiles

Infra-red
Infra-red missiles will not lock-on until you position yourself behind the enemy.
A white box is the target acquisition.
A white box in a white circle - within range
A white box in a red circle - locked-on. Ready to fire.

Radar-guided
Radar-guided missiles are all aspect but must be kept in HUD view all the way to the target. A red lock-on circle will appear when within range of the target.



MiG-21F 'Fishbed'



Like its frequent combat opponent the F-4 Phantom, the MiG-21 was, and still is, the most successful of all Soviet fighters, selling more than 10,000 in various versions in the twenty years of its life. Also, like the Phantom, the MiG-21 was developed in the eighteen months after the Korean War in answer to the problems highlighted by that war, and was a multi-role aircraft, carrying out all types of missions from reconnaissance to ground attack.

This new MiG, largely based on its predecessor the MiG-19, was packed full of new features, including powered controls and body flaps and an armoured ejection seat. By the time the 21F - possibly the classic variant of the type - arrived, it was further equipped with radar ranging, improved performance, greater fuel capacity and two air-to-air missiles.

With a Mach 2 capability and two good 30mm cannons, the MiG-21 was an excellent combat aircraft, and served to ensure that the 'noble art of dogfighting' did not die out. Its only real limitation, with a maximum internal fuel capacity of 500 gallons, was a very short combat radius, but even this could be increased with the help of external tanks. The MiG-21 was faster, more manoeuvrable, better armed and roughly a third of the price of the F-4 Phantom.

Technical Details

Manufacturers: Mikoyan-Gurevich Bureau, Soviet Union, and under licence.

Type: Single-seat daytime fighter.

Engine: One 13,120lb [5950kg] thrust R-11-F2-300 Tumansky single-shaft turbojet with afterburner.

Dimensions: Span: 23ft 5 1/2in [7.15m]. Length: 46ft 11n [14.3m]. Height: 14ft 9in [4.5m].

Weight: Empty 11,464lbs [5200kg]; with maximum load 18,740lbs [8500kg].

Performance: Maximum speed: 1285mph [2070km/h, Mach 2.1]. Ceiling: 59,050ft. Range: [high, internal fuel] 683 miles [1100km]; [high, 3 ext. tanks] 1,118 miles [1800km].

Weapons:
One 30mm NR cannon under fuselage (200 rounds)
Two/four K-13 'Atoll' air-to-air missiles
Two/four AATO 'Advanced Atoll' air-to-air missiles

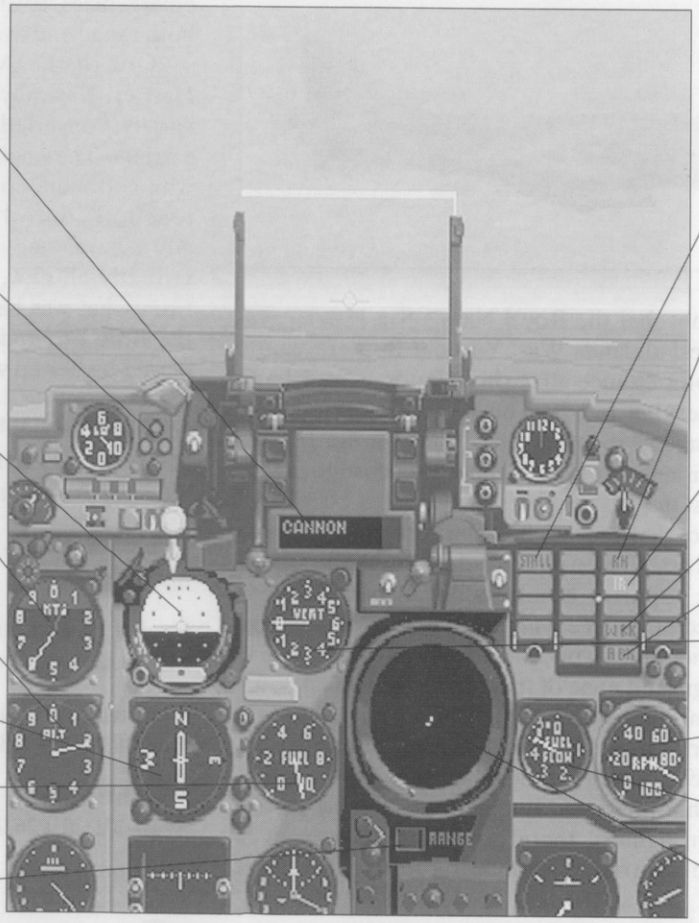
History: First flight [prototype] late 1955, [-21F] late 1957; service delivery early 1958; later variants still in service as trainer and second line fighter.

MiG-21F 'Fishbed'

Aiming and Firing Missiles

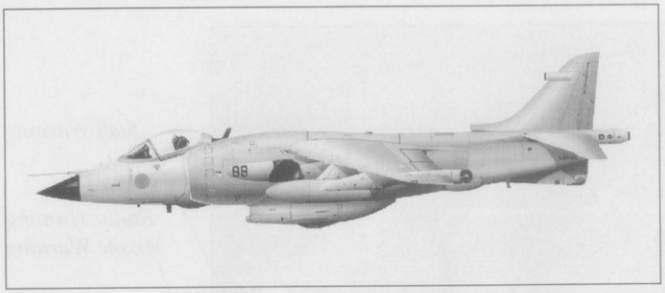
Infra-red
Infra-red missiles will not lock-on until you position yourself behind the enemy.
A white box is the target acquisition.
A white box in a white circle - within range
A white box in a red circle - locked-on. Ready to fire.

Radar-guided
Radar-guided missiles are all aspect but must be kept in HUD view all the way to the target. A red lock-on circle will appear when within range of the target.



Weapons Indicator
Landing Gear Indicator
ADI
Airspeed Indicator
Altimeter
Directional Indicator (Compass)
Fuel Gauge
Radar Range (in miles)
Stall Warning
Radar Homing Missile Warning
Infra Red Missile Warning
Wheelbrake Indicator
Airbrake Indicator
Rate Of Climb Indicator
Tachometer (Engine Revs)
Fuel Flow
Radar Screen

British Aerospace Sea Harrier FRS.1



There is no doubt that the Royal Navy's Sea Harrier was the star of the Falklands War. Without it, there would have been a strong chance that the islands would have remained in Argentine hands. The Argentine Air Force proved far more capable than expected, using Mirage IIIs, A-4s, and most surprisingly the slower Super Etendard to devastating effect against the Task Force.

Despite the fact that only 28 Sea Harriers were taken to the South Atlantic, they not only defended the naval presence against superior numbers but also performed ground attack, reconnaissance *and* interception duties. It is a credit to the Harrier and its pilots that only five were lost in the whole campaign, and none of these in aerial combat.

The most astonishing aspect of the Harrier is its V/STOL, or Vertical/Short Take Off and Landing capabilities, developed in anticipation of a time when the first casualties of a war will be the runways. Although considerably slower than most modern fighters, there is nothing that can even come close to the Harrier's manoeuvrability. Its main advantage was the ability to take off and land without a long runway; although this ability is generally reserved only for emergencies. Even a short take-off run substantially increases both range and available payload.

Out of the Air Forces Harrier GR.3 came the Sea Harrier. Basically, the FRS.1 is the same as the land-based variety, converted for use off the Navy's Invincible-class light carriers. The engine is a modified version of the GR.3s, but with extra anti-corrosion casings and increased power to the reaction control jets to take account of the often more adverse weather conditions at sea. The avionics, however, are virtually all-new, taking into account the changes needed from what was basically a low-level strike aircraft. They use the Blue Fox radar system that has enabled a new cockpit placed higher up with an improved all-round view.

Technical Details

Manufacturer: British Aerospace [originally Hawker Siddeley Aviation], UK

Type: Single-seat ship-based multi-role V/STOL fighter/bomber.

Engine One 21,500lb [9,752kg] thrust Rolls-Royce Pegasus II MkI04 two-shaft vectored thrust turbofan.

Dimensions: Span: 25ft 3in [7.7m]. Length: 48ft [14.63m]. Height: 11ft 3in [3.43m].

Weight: Empty 13,000lbs [5897kg]; with maximum load [Non-VTOL] 26,000lbs [11,793kg].

Performance: Maximum speed: [unloaded, low level] 737mph [1186km/h, Mach 0.972]; [Maximum dive] 985mph [1586km/h, Mach 1.3]. Ceiling: over 50,000ft. Combat/Tactical radius: [hi-lo-hi] about 260 miles [418km]; Max. Range: 2070 miles [3330km]. Initial climb [VTOL weight] 50,000ft/min.

Weapons: All external. Usual configuration:
Twin 30mm Aden cannon in ventral packs (400 rounds)
Two/Four AIM-9 Sidewinders
18/36 SNEB 68 Rockets (Ground Attack)

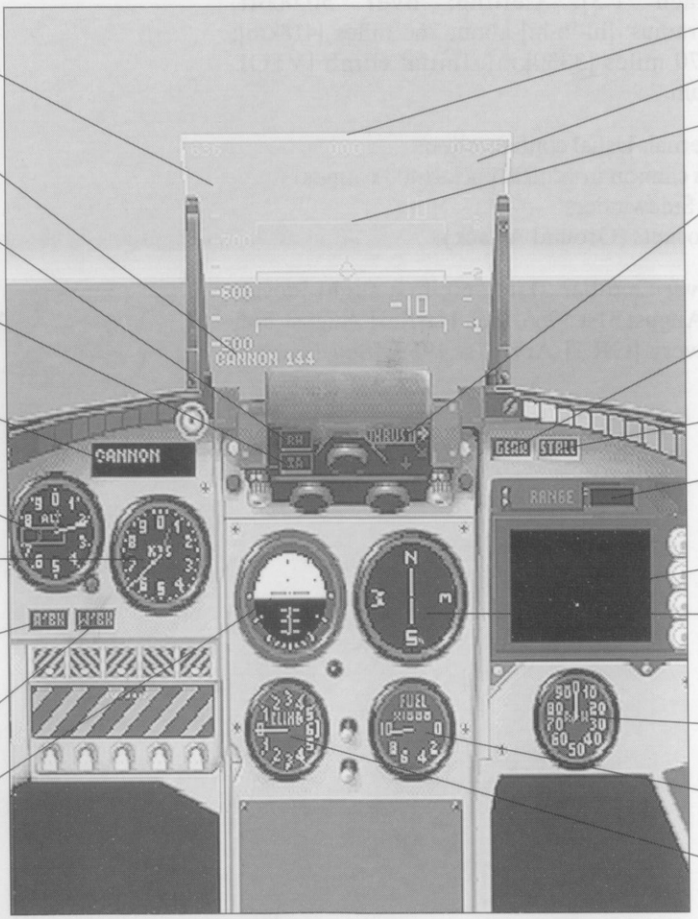
History: First hover October 21st 1960; first flight [development Harrier] August 31st 1966, [Sea Harrier] August 20th 1978; service delivery [GR.1] April 1st 1969, [Sea Harrier] June 1979.

British Aerospace Sea Harrier FRS.1 Cockpit

Aiming and Firing Missiles

Infra-red
Infra-red missiles will not lock-on until you position yourself behind the enemy.
A white box is the target acquisition.
A white box in a white circle - within range
A white box in a red circle - locked-on. Ready to fire.

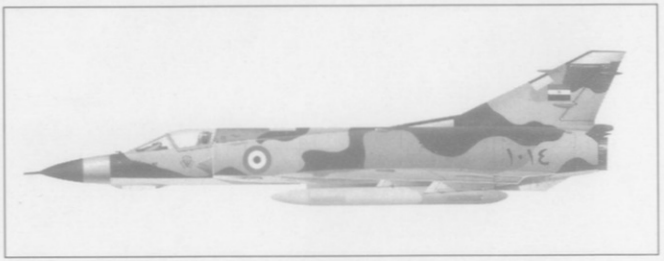
Radar-guided
Radar-guided missiles are all aspect but must be kept in HUD view all the way to the target. A red lock-on circle will appear when within range of the target.



HUD Airspeed
HUD Weapon
RH Missile Warning
IR Missile Warning
Weapon Selection Indicator
Altimeter
Airspeed Indicator
Airbrake Indicator
Wheelbrake Indicator
ADI

HUD Heading
HUD Altitude
HUD Pitch Lines
Thrust Nozzle Position - shows the angle of the thruster nozzles.
Landing Gear Indicator
Stall Warning
Radar Range (in miles)
Radar Screen
Direction Indicator (Compass)
Tachometer (Engine Revs)
Fuel Gauge
Rate Of Climb/ Dive Indicator

Dassault Breguet Mirage IIIE



The Mirage, in its many forms, is without doubt one of the most successful fighters since WWII and the III is probably the most popular Mirage of all variants.

- It was the first Western fighter to reach Mach 2 in level flight.
- It was remarkably cheap, costing just over $1 million each in 1960, with standardisation of variant parts being a large contributor to this economy of design.
- It was given huge publicity by the Israelis when they used them to great effect against the largely Russian-supplied Air Forces of the Egyptians, Syrians and Jordanians in the early hours of the 1967 Six Day War.

The definitive version was the Mirage IIIE, with its larger engine, improved avionics and increased fuel capacity, as well as its higher top speed of Mach 2.2, and it was these that Argentina used against the RN Harriers during the Falklands War. Although the Exocet-carrying Super Etendards grabbed all the headlines, it was the Mirages that were to do battle with the Harriers in the high level dogfights. The Mirages were to prove no match for the Royal Navy's combination of Harrier and AA missiles and guns, and almost all of Argentina's Mirage force was destroyed before the war had ended, largely due to operating at the end of their range.

Technical Details

Manufacturer: Avions Marcel Dassault/Breguet Aviation, France, and under licence.

Type: Single-seat multi-role fighter-bomber.

Engine: One 13,670lb [6000kg] thrust SNECMA Atar 9C single-shaft turbojet.

Dimensions: Span: 27ft [8.22m]. Length: 50ft 10 1/4in [15.5m]. Height: 13ft 11 1/2in [4.25m].

Weight: Empty 15,540lbs [7050kg]; with maximum load 29,760lbs [13,500kg].

Performance: Maximum speed: [unloaded] 1460mph [2350km/h, Mach 2.2]. Ceiling: 55,775ft. Multi-role combat radius: 745 miles [1200km]. Max. range: 2,485 miles [4000km]. Initial climb 16.400ft/min; [time to 11,000m (36,090ft)] 3 minutes.

Weapons:
Two 30mm DEFA 5-52 cannon (500 rounds)
One Matra R.530 Radar/Homing AAM
Two R550 Magic AAM
18/36 Matra RL F2 Rockets (Ground Attack)

History: First flight [Mirage I] June 25th 1955, [production IIIE] April 5th 1961; service delivery June 1962. Mirage III now largely replaced by Mirage F1 and/or 2000, but all-new Mirage IIING [New generation] flew for the first time in December 1982. In one form or another, the Mirage has remained in production for over thirty years and will probably continue to do so for some time to come.

Dassault Breguet Mirage IIIE Cockpit

Aiming and Firing Missiles

Infra-red
Infra-red missiles will not lock-on until you position yourself behind the enemy.
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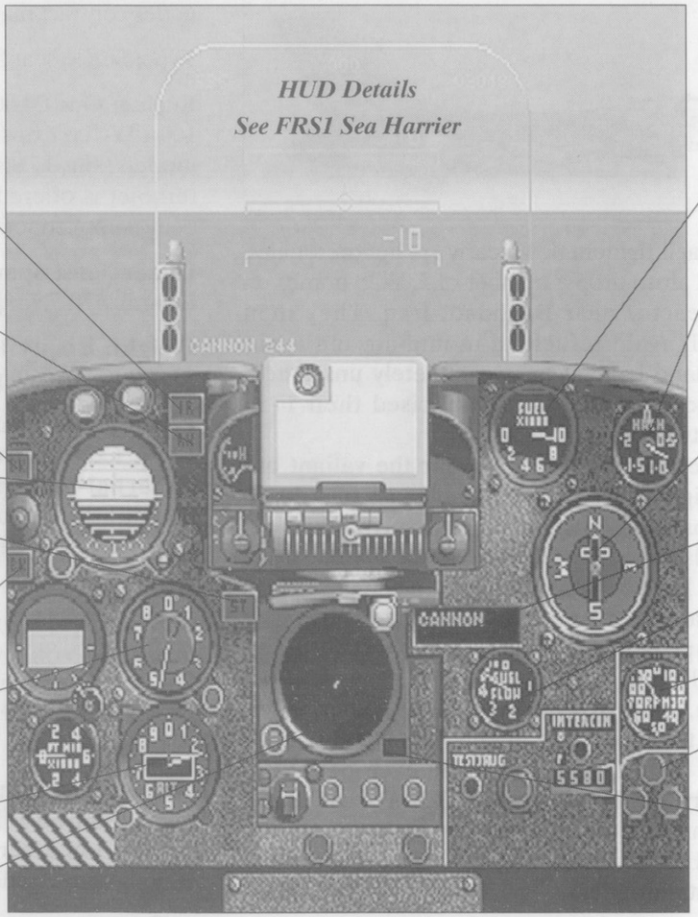
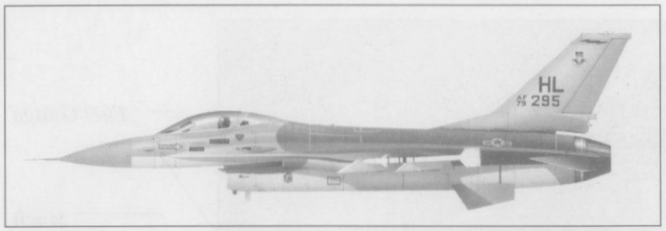


— *General Dynamics - F-16A Fighting Falcon* —



In 1981, eight Israeli fighters flew nearly six hundred miles, refuelling in mid air to drop a number of 2,000lb bombs on Osirak nuclear reactor near Baghdad, Iraq. They then returned to Israel, again refuelling in mid-air and again unchallenged, to land back at base completely unscathed. General Dynamics couldn't have publicised their F-16 Fighting Falcon better if they'd tried.

Designed largely as a replacement for the valiant but ageing F-104 Starfighter, it soon became obvious that the F-16, with its low cost, and outstanding manoeuvrability and adaptability, was also a worthy successor to the F-4 Phantom. With the excellent Pratt & Whitney F-100 engine the Falcon can climb at any airspeed, and thanks to highly advanced avionics, it is impossible for the pilot to execute any manoeuvre that will damage the plane. At the time of its first operational service, the F-16 could out-fly every other fighter in the world; even the super-agile uprated MiG-21. In air-to-air combat, if not in straight flight, it can even better the astonishing and terrifyingly powerful MiG-25 Foxbat. Just a few of the reasons why the F-16 has been bought in its thousands by the US Air Force and why Israel is still using them to such devastating effect.

Technical Details

Manufacturers: General Dynamics, Fort Worth, USA, and under contract manufacture in Europe.

Type: Single-seat fighter bomber.

Engine: One 24,000lb [10,885kg] thrust Pratt & Whitney F-100-PW-100 two-shaft afterburning turbofan. In some export models, the 17,900lb [7711kg] thrust General Electric J79 turbojet is offered, whilst the General Electric F110 is now being supplied for 50% of future production.

Dimensions: Span: [with Sidewinders] 32ft 10in [10.01m]. Length: 47ft 7.7in [14.52m]. Height: 16ft 5.2in [5.01m]

Weight: Empty 14,800lbs [6,733kg]; with maximum load 33,000lbs [14,969kg].

Performance: Maximum speed: 1300mph [2090km/h, Mach 1.95]. Ceiling: over 60,000ft [19,685m]. Combat radius: [Internal fuel on air-to-air mission] about 1300 miles [2100km]; [Ground Attack with maximum load] 120m [193km]; [Average radius with mixed load] 339 miles [546km]

Weapons:
One 20mm M-61 multi-barrel machine gun (511 rounds)
Four AIM-9 Sidewinders
Four AGM-65 Mavericks (Ground Attack)
18 Mk.4 2.75in FFAR Rockets in LAU-69/A Launcher (Ground Attack)

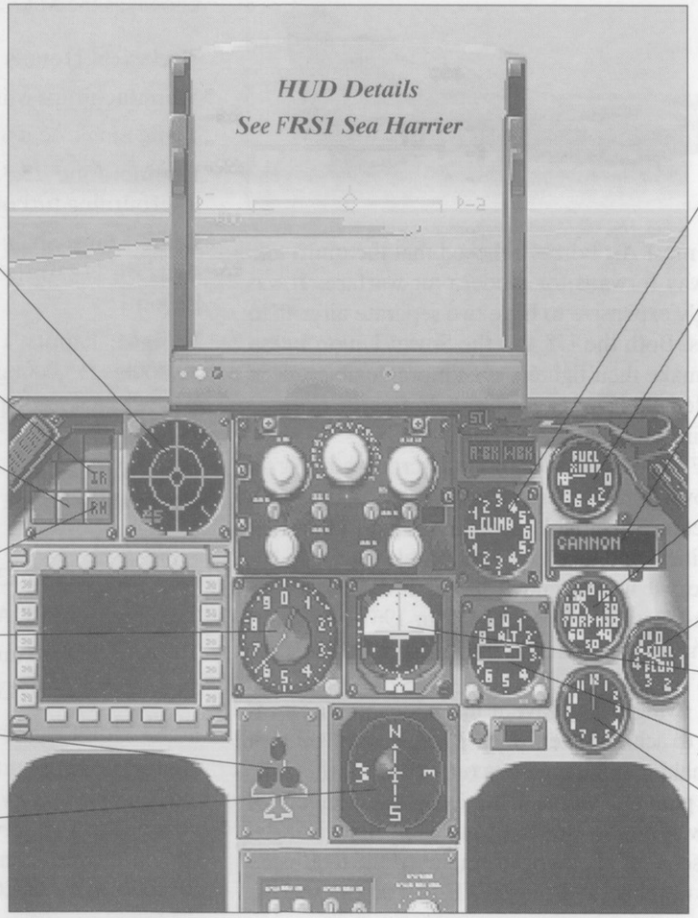
History: First flight [experimental YF-16] January 20th 1974; service delivery [F-16A] early 1978, with first operational flight soon afterwards. Still very much in production, although superseded by the F-15E Eagle.

General Dynamics - F-16A Fighting Falcon

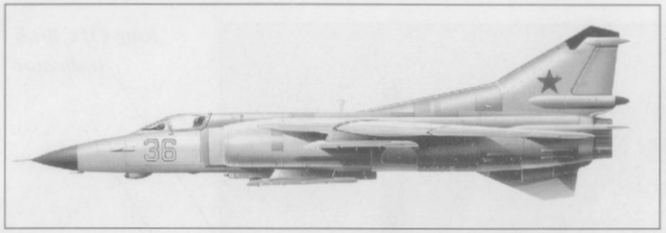
Aiming and Firing Missiles

Infra-red
Infra-red missiles will not lock-on until you position yourself behind the enemy.
A white box is the target acquisition.
A white box in a white circle - within range
A white box in a red circle - locked-on. Ready to fire.

Radar-guided
Radar-guided missiles are all aspect but must be kept in HUD view all the way to the target. A red lock-on circle will appear when within range of the target.



MiG-23S 'Flogger B'



In the early sixties most Air Forces believed that the multi-role aircraft was the way forward for modern air warfare. It was becoming increasingly expensive to have two separate aircraft to do two separate jobs. Both the US and the Soviet Union began looking for ways to make their fighters even more flexible and in 1964 the US unveiled the F-111, a multi-role fighter bomber designed for both Air Force and Navy roles.

Although the F-111 was not a small aircraft, having an unladen weight of over three times the later F-16, its flexibility came from a new feature - variable geometry wings. However, due to financial, political and mostly design problems, the F-111 was never the success it was intended to be. It did, however, inspire the Mikoyan-Gurevich designers and in 1967 the Soviet Union revealed their own swing wing fighter: the highly successful MiG-23.

The new MiG's swing wings gave it enormous manoeuvrability and enabled it to achieve over Mach 2 with ease, even with a full missile load, making it a dangerous opponent for the F-4s, and F-16s over the plains of Syria. Ultimately, the concept of variable geometry was not as awe-inspiring as at first thought, but a handful of subsequent planes have employed the technique to great effect, most notably the expensive F-14 Tomcat and the universally acclaimed Tornado. The MiG-23 itself has gone on to be redeveloped into a multi-role fighter-bomber version now known as the MiG-27.

Technical Details

Manufacturers: Mikoyan-Gurevich Bureau, Soviet Union.

Type: Single-seat all-weather interceptor.

Engine: One 23,350lb [11,500kg] thrust Tumansky R-29B afterburning turbofan.

Dimensions: Span: [min. sweep] 28ft 7in [8.7m]; [max. sweep] 47ft 3in [14.4m]. Length: 55ft 1/2in [16.8m]. Height: 13ft [3.96m].

Weight: Empty 17,500lbs [7940kg]; with maximum load 33,000lbs [15,000kg].

Performance: Maximum speed: [unloaded] 1520mph [2445km/h, Mach 2.2]; [with missiles] 1380mph [2222km/h, Mach 2]. Ceiling: 55,000ft. Combat radius: [hi-lo-hi] about 400 miles [640km].

Weapons:

One 23mm GSh-23 twin barrel machine gun (200 rounds)

Two/Four AA-8 'Aphid'

Two AATO Advanced 'Atoll'

Two AS7 Kerry (Ground Attack)

12 S5 57mm Rockets (Ground Attack)

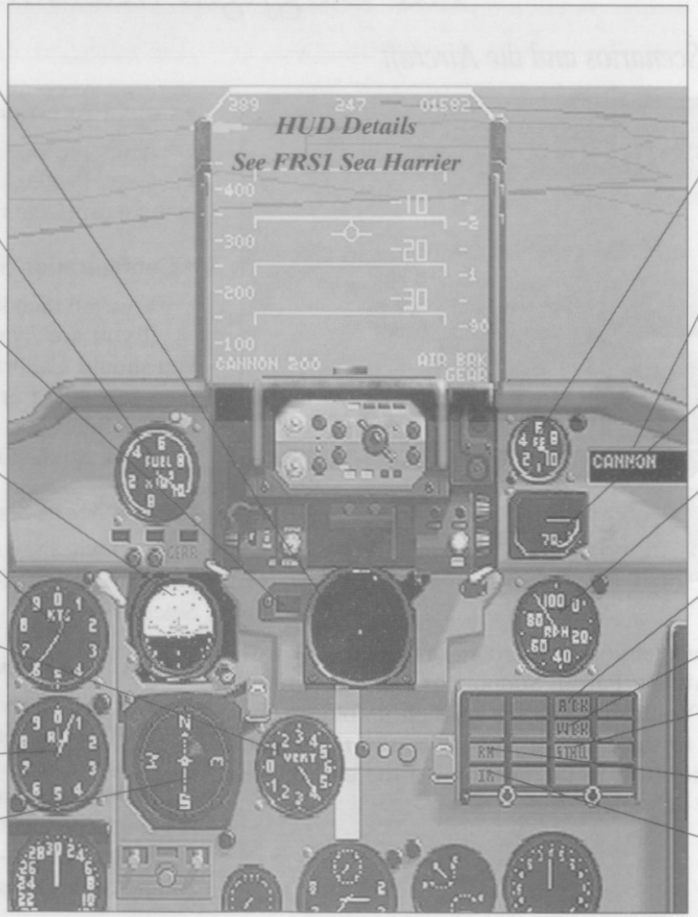
History: First flight estimated 1965; service delivery believed early 1971; later variants, largely MiG-27 multi-role attack version, still in service in most Warsaw Pact countries; -23U still employed in many countries as a dual-control trainer and sometimes as an ECM and reconnaissance vehicle.

MiG-23S 'Flogger B'

Aiming and Firing Missiles

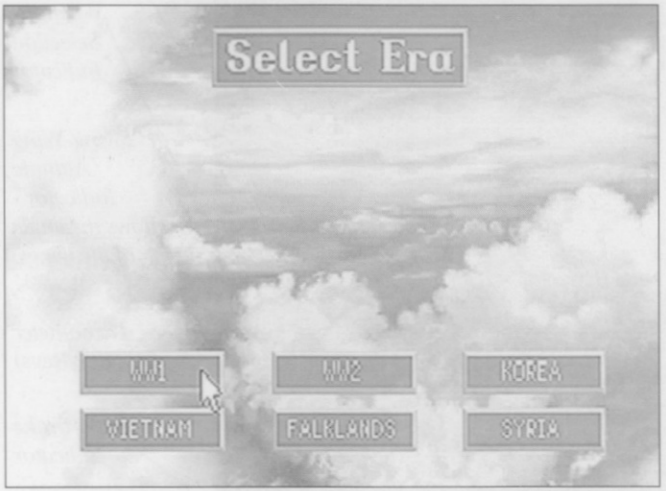
Infra-red
Infra-red missiles will not lock-on until you position yourself behind the enemy.
A white box is the target acquisition.
A white box in a white circle - within range
A white box in a red circle - locked-on. Ready to fire.

Radar-guided
Radar-guided missiles are all aspect but must be kept in HUD view all the way to the target. A red lock-on circle will appear when within range of the target.



The Dogfight Missions

The Scenarios and the Aircraft



Dogfight missions let you give orders to resources (other aircraft) to Attack, Patrol, Support or Defend various targets and areas. You can watch the mission unfold on the map screen, jump to the external 3-D views and then pilot your own aircraft to assist in the mission. At the end of the mission you will be debriefed.

Getting Started

• Copy Protection

After the opening sequences *Dogfight* will take you to the Copy Protection Screen. Enter the correct word from the manual using the reference given.

• Configuration Screen

You will then see the Configuration Screen.

If you are flying your aircraft with a Joystick *Controller* you should Calibrate your Joystick. Select Calibrate Joystick then follow the on-screen prompts. When you have finished the Configuration select Save.

Click on the OK button to accept your choice of set up.

• Select Mode Screen

You will then see the Select Mode Screen. This is where you choose between the three main elements in the game. Select Missions.

• Select Era Screen

You will be given a choice of six aerial conflicts:

WW1 - Sopwith Camel and **Fokker Dr 1 Triplane** over the trenches in Northern France.

WW2 - Spitfire Mk II and **Messerschmitt Bf109E** over the English Channel, the South and East Coast of England.

North Korea - F-86 Sabres and **MiG 15s** fighting from Kimpo to the Yalu river.

Vietnam - F-4J Phantoms and **MiG-21s** tangle over Hanoi and Haiphong.

Falkland Islands - FRS 1 Sea Harriers and **Mirage IIIs** battling over Port Stanley, San Carlos and the UK Task Force.

Syria - F-16A Falcons against **MiG-23s** over the Bekaa Valley, Beirut and the Golan Heights.

• Select Side

You can choose which side you want to fight on by selecting your aircraft.

Mission Planning

The Mission Planning Screen gives you a background scenario and a list of mission orders for you, and your resources, to complete.

• Read the Mission Orders

This outlines the conflict you are participating in and lists your mission objectives.

• Select Resources

Resources are the other aircraft at your command for that mission. The number you have will vary depending on the complexity of the mission. You will see a map of the area of conflict on the left of the screen. On the right of the map are the control boxes.

Select the left arrow button and watch the top of the box. This will show the type of aircraft you have. Select again to cycle through all your other aircraft.

Choose an aircraft then give it an order from the four types available:

Patrol

Choose an area on the map to patrol.

Attack

Attack a target from a given list. If you choose the Attack order, another box will appear asking you for a choice of target for that aircraft. Simply highlight and select one from the list.

Support

Highlight and select an aircraft to support in an attack or a patrol.

Defend

You'll be given a list of potential targets that could be defended. Highlight and select.

You will then return to the original Control Box but now the target will be shown at the lower part of the box and a mission flight path will be marked on the map.

Plan your mission carefully to get the best out of your resources.

Repeat the above procedure for each of your available aircraft. Don't forget to assign some form of defence for your home base. The enemy will be planning their attacks against you at the same time!

Click through the arrow buttons to check that all your resources have been used then select OK to exit.

• Mission Planning Screen

You will be returned to the main Mission Planning Screen.

Pilots on duty gather round the map in the Operations Room and receive instructions. The Squadron Leader indicates a method of attack. Members of No. 1 Squadron , RAF in France 1940.

Dogfight - Weapons Configuration

	F-4 Phantom	F-16	Harrier	MiG-21	MiG-23	Mirage
Mixed	Cannon - 1200 Sparrow - 4 Rocket - 18	Cannon - 511 AGM65 - 4 Sidewinder - 4	Cannon - 400 Sidewinder - 2 Rocket - 18		Cannon - 200 Kerry - 2 Aphid - 2	Cannon - 500 R550 - 2 Rocket - 18
Air combat	Cannon - 1200 Sidewinder - 4 Sparrow - 4	Cannon - 511 Sidewinder - 4	Cannon - 400 Sidewinder - 4		Cannon - 200 Aphid - 4 Advanced Atoll - 2	Cannon - 500 R550 - 2 R530 - 1
Ground attack	Cannon - 1200 Sparrow - 4 Rocket - 18 AGM65 - 4	Cannon - 511 AGM65 - 2 Rocket - 18 Sidewinder - 4	Cannon - 400 Rocket - 36		Cannon - 200 Kerry - 2 Rocket - 12 Aphid - 2	Cannon - 500 R530 - 1 Rocket - 36
Duel	Cannon - 1200 Sidewinder - 4 Sparrow - 4	Cannon - 511 Sidewinder - 4	Cannon - 400 Sidewinder - 4	Cannon - 200 Advanced Atoll - 4	Cannon - 200 Aphid - 4 Advanced Atoll - 4	Cannon - 500 R550 - 2 R530 - 1
Air-Air 1				Cannon - 200 Advanced Atoll - 4		
Air-Air 2				Cannon - 200 Atoll - 2 Advanced Atoll - 2		
Air-Air 3				Cannon - 200 Advanced Atoll - 4		

• Select Arming

This option will only show armaments carried on more modern aircraft from Vietnam onwards. You will have to choose a combination of missiles and rockets for your particular mission.

The weapon loads in these aircraft will vary depending on the type of mission or mode (See Weapons Configuration Chart).

Select OK to return to the main Mission Planning Screen.

• Mission Planning Screen

Select Start to begin the mission.

Start Mission

You will begin on your home base runway or in the air near the main action area.

• Map and Zoom

Before you take-off check the map by pressing Function Key F9.

A brown dot is a friendly ground target, blue and red dots are enemies and a highlighted dot is the selected game object. Initially, this will be your aircraft. Move your *controller* around the map and select other dots by placing the arrow cursor over the dot and pressing your *selector*. The legend at the base of the map will tell you what all the dots represent.

The Keypad + and - keys will zoom you in and out of selected areas. If the Zoom makes the object disappear from the screen, place your *controller* on one of the screen edges to move the map left/right/up/down. The zoom facility is a very powerful feature; it can home in on any game object with a high degree of magnification. Press Key T to cycle through objects.

• View Other Objects

Press Function Key F10 to view the mission targets/objects and resources. Press Key T repeatedly to cycle through enemy and friendly objects. Remember that, even though you are still on the ground, the game world events will have begun. You can watch enemy aircraft getting ready for attacks.

Press Shift/T to return to Your Aircraft View.

• The Take-Off

Press Function Key F1. You will be looking along the runway. In some aircraft (such as the Spitfire) you might not be able to see the runway when the plane is at rest. If this is the case you must take-off from an outside view such as Slot View Shift/F1, positioning yourself behind and slightly above the plane. You might actually prefer this method!

Set Flaps down (Key Close Square Brackets])

Set engine revs/thrust to maximum (Shift Plus +)

Steer along the runway until you gain maximum speed.

Pull back gently on the joystick until the plane lifts off the ground.

Once in the air, raise your gear (Key G) and flaps (Key])

At the height of the Battle of Britain a pilot who finishes his stint hands over a MkII Spitfire to a colleague. Valuable resources were not allowed to remain idle.

• In The Air

Cycle through all available views (see the section on Views in this manual), then check the map (Key F9) to find your chosen target.

Press Key F10 and check on the progress of the other aircraft/targets (Key T). Press Shift/T to return to your aircraft view.

Now select a target. Press Tactical View F3 and then Key Trepeatedly. The view will change as each object/target is placed in the centre of the background. You may support one of your aircraft or attack a target on your own. The choice is yours! For Rookie pilots it is recommended you initially select static or ground targets. You can line up on static objects with F3 and F4 Keys. If you are attacked or want to *Dogfight,* the F5 'Heads Up' View plus the TAB Key will help you locate the enemy fighters from within the cockpit (look at the Views Section of this manual).

Alternatively, you can select the nearest enemy target to you by going to the map screen (F9) and selecting the nearest red dot to your aircraft. Press P to pause the game at any time. Remember, you can change any view or select any target whilst the game is paused, and then unpause the game and fly to your next target.

Access the resource list by pressing key A from within F3, F4, F5, F9 or F10 views.

• Return to Base

You will receive a message to tell you if the mission has been a success, failure or if the opposition have succeeded against you. You will then be told to return to base. Check your position and the location of a friendly runway on the map (Key F9) and head for a landing site using your compass and map.

• Landing

Locate your runway. The aircraft, in *Dogfight* will only land on a runway.

Apply Air Brakes with Key B (if applicable)

Reduce power (Minus Key-).

Drop Flaps with Key Close Square Brackets](if applicable)

Drop Gear with Key G (if applicable)

Lose height.

Adopt the correct approach using an appropriate outside view. Shift/F1 Slot View is very useful here.

Reduce Power (Minus Key-)

Aim for the runway but do not point the nose of the aircraft down.

Land as gently as possible and cut power (Shift Minus -) as soon as you are on the ground. Apply Wheel Brakes Key W (if applicable) when the plane has slowed right down.

The mission will end when you come to a stop.

Mission Review

You will be given a summary of the major mission events along with times and result. Appropriate medals and promotions will be awarded.

Key Guide

Simulation System Keys

CTRL/Q	Quit to Operating System
Key P	Pause Game On/Off
ESC Key	Quit Game / Go to Mission Review (if applicable)

View Keys

F1	Forward Cockpit View
F2	Instrument View (two modes: Full instrument view or with 50% Forward View- Key S toggle)
F3	Tactical View
F4	Inverse Tactical View
F5	'Heads Up' View
F6	Left Cockpit View
F7	Right Cockpit View
F8	Rear Cockpit View
F9	Map Screen (Zoom in/out with Keypad +/-)
F10	External View of selected object (rotate using Insert, Delete, PageUp and PageDown)
Shift/F1	Slot View
Key S (in F2 mode)	Change from Full Instrument View to Half Instrument/Half Forward Cockpit View
TAB Key (in F5 Mode)	Fix 'Heads Up' View on Target/ Allow Head to To Move Freely
Keypad +	Zoom In Map View
Keypad -	Zoom Out Map View

Keyboard View Controls

Keypad Minus -	Zoom out from selected external view (F3, F4, F9, F10)
Keypad Plus +	Zoom in from selected external view (F3, F4, F9, F10)
Insert	Move External Camera (F10)/'Heads Up' View (F5) Clockwise
Delete	Move External Camera (F10)/'Heads Up' View (F5) Anti-Clockwise
PageUp	Move External Camera (F10)/'Heads Up' View (F5) Up
PageDown	Move External Camera (F10)/'Heads Up' (F5) View Down

DOGFIGHT

Fighter Controls

Key Plus +	Increase Power
Key Minus -	Decrease Power
Shift Plus +	Maximum Power
Shift Minus -	Minimum Power
Key Close Square Brackets]	Flaps Up/Down
Key <	Left Rudder (release to centre)
Key >	Right Rudder (release to centre)
Key G	Landing Gear Up/Down (if applicable)
Key W	Wheel Brakes On/Off
Key B	Air Brakes On/Off
Key R	Radar range key (for aircraft with radar threat display)
Key A	Resource Menu (in F3, F4, F5, F9 & F10 Mode). Select to go to that resource.
Shift/Z	Accelerate Time (two settings)
Shift/X	Return to Normal Time
CTRL/ T	On-Screen Mission Timer On/Off
CTRL/E	Eject (if applicable)

FRS 1 Sea Harrier Jet Nozzle Controls

Key 1	Nozzles to horizontal
Key 2	Nozzles to 45 degrees
Key 3	Nozzles to vertical

Weapon Control

Spacebar	Fire Selected Weapon
Return	Change Selected Weapon (if applicable)
Joystick	
Button 1	Fire Selected Weapon

Decoy Control

Key C	Chaff Release (if applicable to your aircraft)
Key F	Flare Release (if applicable to your aircraft)

Target Control

Backspace	Target Select for missile lock-on (if applicable to your aircraft)
Key T	Select next Target (on F3, F4, F5, F9 & F10 views)
Shift/T	Return to player's aircraft (on F3, F4, F5, F9 & F10 views)

DOGFIGHT

Gameplay Configuration Options

Alt/H	Horizon On/Off
Alt/D	Detail Level (Cycle Through)
Alt/V	Sound On/Off
Alt/S	Joystick/Keyboard Sensitivity

Joystick

Controller

Joystick Movement	Flight Controller
Button 1	Fire Selected Weapon
Button 2	Hold and move Joystick to rotate external views/rotate 'Heads Up' view
Buttons 1 & 2	Hold both and move joystick forwards/back to zoom in/out external object view

Menu Selector

Joystick
Button 1

Keyboard

Controller

Cursor Keys	Joystick Emulator & Movement through menus

Menu Selector

Return Key & Home Key
(Not during game)

Keypad

Controller 4, 8, 6, 2,	Joystick Emulator & movement through menus
Key 7	Select Option (Left Mouse Button)
Key 9	Centre Map F9 (Right Mouse Button)

Mouse

Controller

Arrow Cursor Movement	Movement through menus
Centre Selected Object on F9 Map View	Right Mouse Button

Menu Selector

Left Mouse Button

Views

All-Round Vision

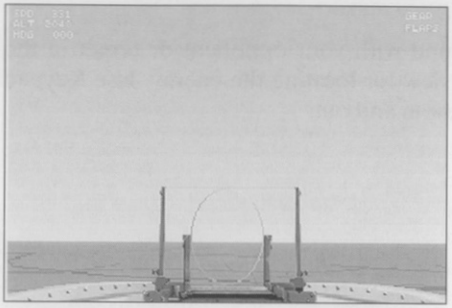
There are a multitude of Views in *Dogfight.* They are there to give you the best all-round vision of the combat area. You are advised to get used to all the View Keys as quickly as possible. It's very important to know exactly what the enemy aircraft is doing. Always look behind you for, if you give your opponent a chance he will be there lining up his best shot!

Tacti-Views

Dogfight provides full in-cockpit views including the unique 'Heads-Up' View. In addition, you have the option of Tactical and Inverse Tactical Views.

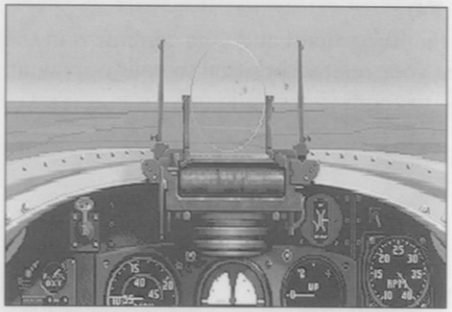
Joystick Controlled Views

Dogfight allows you to control aspects of in-cockpit and external views with the Joystick or Keyboard *Controllers.* This means that less valuable time is wasted searching for keys on the computer keyboard and more time can be spent scanning the skies for your opponent.



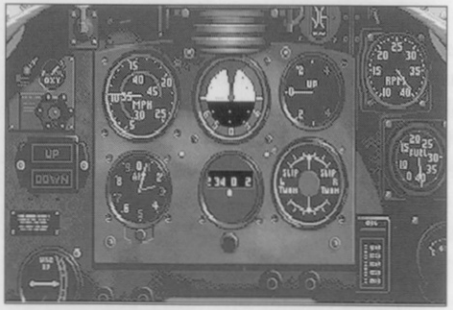
• Forward Cockpit View (Function Key F1)

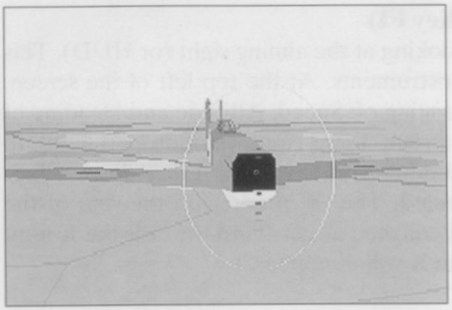
The main view out of the cockpit looking at the aiming sight (or HUD). This gives you a clear front view with no instruments. At the top left of the screen, there is information for the player consisting of: Speed, Altitude and Heading of your aircraft. At the top right of the screen, there is information pertaining to the status of your aircraft, such as whether you have your Gear down, Flaps down, Airbrakes on and weapon selected. The 'X' marker on the side of the screen points the way to your currently selected target. Turn towards the X until the target appears on the screen and the X will disappear.



•Instrument View (Function Key F2)

There are two Instrument View modes: Full instrument view or with 50% Forward View - Press Key S to move from one to another. *Dogfight* has extremely accurate dials and displays in each of the 12 cockpits. Look at the individual section for your choice of aircraft for more details.



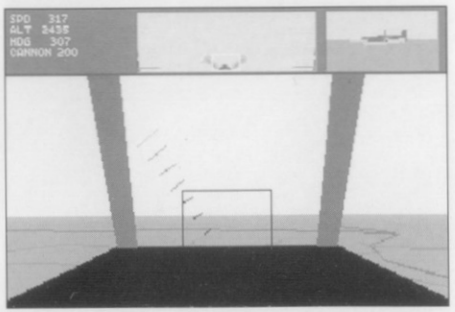


• Tactical View (Function Key F3)

Your aircraft stays in the foreground with your opponent or target in the background. This is a very important view for locating the enemy. Use Keypad plus + and Keypad minus - to zoom view in and out.

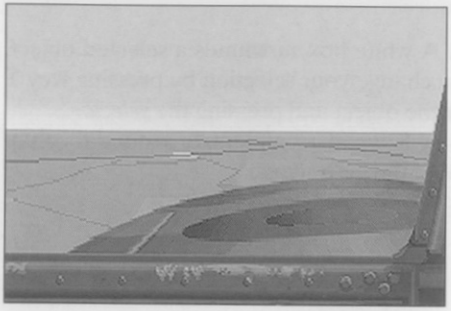
• Inverse Tactical View (Function Key F4)

Your opponent, or target, stays in the foreground and your aircraft is in the background. Use this view to determine your relative position to your opponent. Use Keypad plus + and Keypad minus - to zoom view in and out.

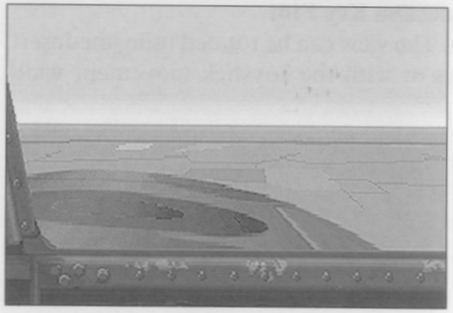


• 'Heads Up' View (Function Key F5)

This allows you to track flying targets from within the cockpit- just like a pilot 'eyeballing' the target continuously. Above the Heads-Up Cockpit view a tracking box shows where you are looking in relation to the nose, wings and tail of the aircraft. Use with Insert, Delete, PgUp, PgDn or Joystick movement + Button 2. The bar at the top left of the screen gives info on your aircraft's speed, altitude and heading. your target and the weapon you have selected. At the top right hand corner, there is a 3D representation of what your aircraft is doing from a Southerly viewpoint. This helps you keep track of your aircraft's attitude when looking out of the cockpit.



•Left Cockpit View (Function Key F6)
A fixed view out of the left side of the cockpit.



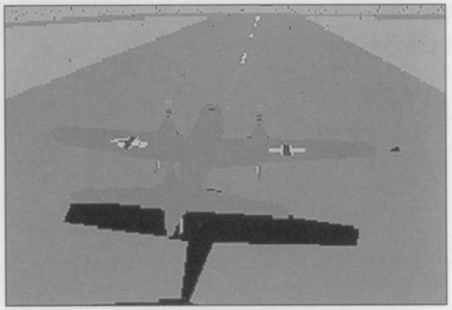
• Right Cockpit View (Function Key F7)
A fixed view out of the right side of the cockpit.

• Rear Cockpit View (Function Key F8)
A fixed view looking behind including the pilot.

• Map Screen (Function Key F9)

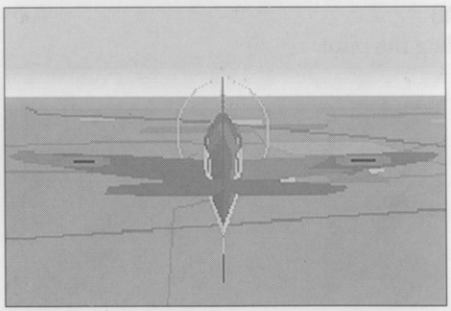
A map view of the area of conflict. A white box surrounds a selected object. Initially, this is your aircraft but you can change your selection by pressing Key T or by positioning the arrow cursor over the object and pressing the *selector*.

You can Zoom in and out by pressing Keypad +/- and move around the map by moving the arrow cursor to the edge of the map screen.



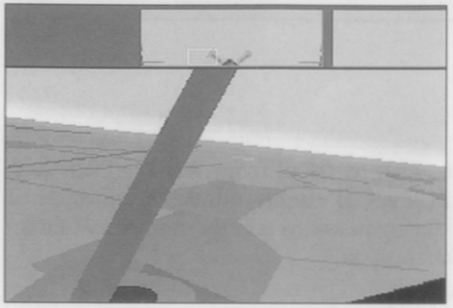
• External View of Selected Object (Function Key F10)

A view of any selected game object. The view can be rotated using the Insert, Delete, PageUp and PageDown Keys or with the Joystick movement while holding down Button 2.



• Slot View (Shift/F1)

A view to the rear of the aircraft that will assist you in landings and take-offs.



• **Fix 'Heads Up' View on Target (TAB Key)**

After selecting 'Heads-Up' View with Function Key F5 you can fix your cockpit view on flying targets by pressing the TAB key. TAB will select whatever target is selected in F3/F4 views, whether the target is on screen or not at the time. In missions, pressing key T when locked-on will swap the locked view to the next target. Your view will follow the movement of your air opponents. Press TAB again to re-centre your view to the front.

Other Views

• **Zoom out from selected External View (Keypad Minus -)**

Zoom out after selecting F3, F4, F9 and F10 external views.

• **Zoom in from selected External View (Keypad Plus +)**

Zoom in after selecting F3, F4, F9 and F10 external views.

• **External Camera/'Heads Up' Cockpit Views**

Move Clockwise (Insert Key)

Move Anti-Clockwise (Delete Key)

Move Up (PageUp Key)

Move Down (PageDown Key)

• **Joystick View Controls**

Button 2 and Movement

Rotate external/ 'Heads Up' views about 360°

Buttons 1 + 2 and forwards/back

Zoom in/out on selected external view

Configuration Menu

The Configuration Menu allows you to save the game setup of your choice:

Ground Detail (3 levels)

Dogfight provides three levels of map detail. The less detail you choose the faster your machine will run.

Aircraft Detail (2 levels)

Dogfight provides two levels of object shape detail. The less detail you choose the faster your machine will run.

Graduated Horizon On/Off

Turn off the Horizon to make your machine run faster.

Landing Realism (2 levels)

Select between Easy and Realistic landings

Sun Blindspot On/Off

The sun's glare can be used as an attacking device.

Sound Effects

On/No Engine Noise/Off

Skill Level

Select the level you wish to fly at from Rookie/Pilot/Ace. This affects the skill level of enemy pilots, the number of resources available during missions and the number of target kills to complete each mission.

Opponent Kill (3 levels)

Choose the level of hits you wish enemy aircraft to survive from One Hit/Quick or Gradual.

Player Kill (3 levels)

Choose the level you wish your aircraft to survive from One Hit/Quick or Gradual.

Gun Aiming (2 levels)

Select from Easy and Realistic levels.

Missile Effectiveness (2 levels)

Select from Easy and Realistic levels.

Flight Control (Joystick/Keyboard)

Select your option for flight control.

Save Configuration

Save the above so that the simulation will begin with your favourite set up.

Calibrate Joystick

If you are using a Joystick Controller you can re-calibrate it and save the settings.

OK

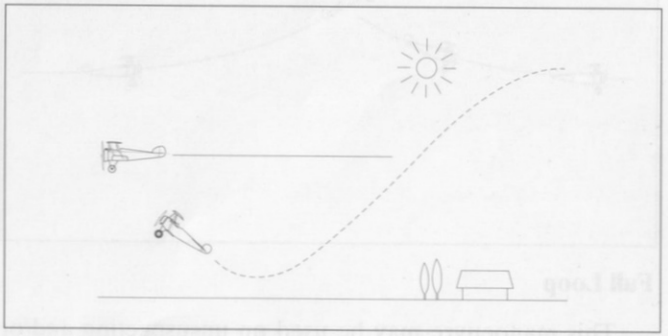
Select to Exit the Configuration Screen

Air Combat Manoeuvres

Tips

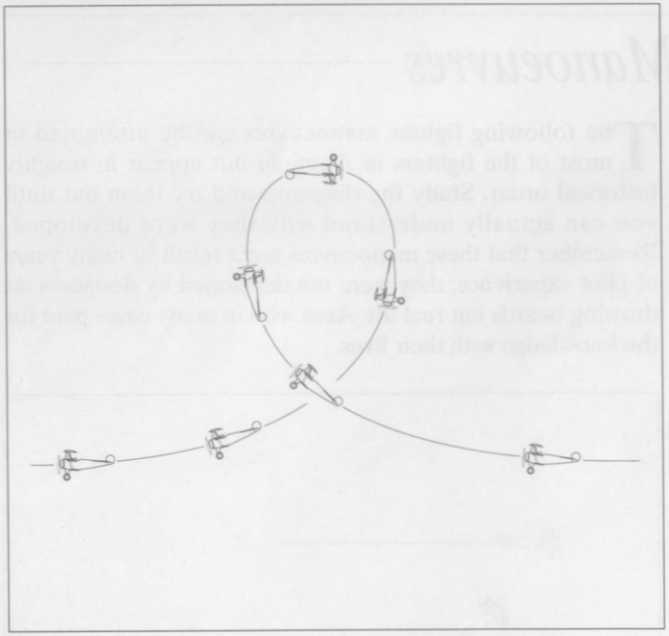
- Surprise is your strongest weapon. 80% of 'kills' are over before the victim knows of his hazardous position.
- Use the sun. Keep it behind you if possible.
- Do not stay on a direct predictable course, fly a 'tack' to and fro.
- Don't be caught instrument watching. Keep looking out of the cockpit preferably all around (top fighter aces in WW2 were known as 'swivel-heads'!).
- Use all the available outside views, especially 'Heads-Up', Tactical and Inverse Tactical Views.
- Watch your Six (your rear). This is your major blind spot; the optimum position for an enemy fighter.
- Attack decisively and aggressively. Be sure of your first shot. This may be your only chance.
- After an attack, get away as fast as possible. You have given your position away. Don't hang around!

The following fighter manoeuvres can be attempted in most of the fighters in *Dogfight* but appear in roughly historical order. Study the diagrams and try them out until you can actually understand why they were developed. Remember that these manoeuvres are a result of many years of pilot experience; they were not developed by designers on drawing boards but real life Aces who in many cases paid for the knowledge with their lives.



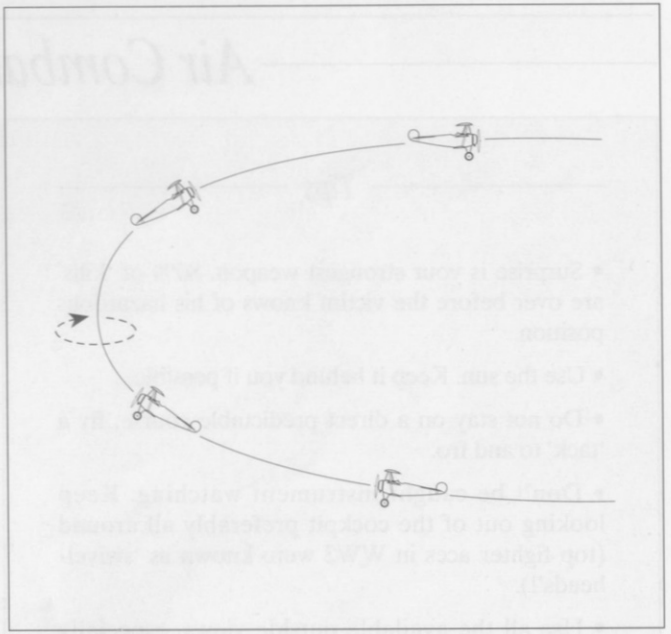
Fokker Bounce

This is a common manoeuvre used by the early Fokker pilots, Immelman and Boelke. Diving out of the sun on the rear of the victim, the Fokker would make an attack on the diving pass, then, using the speed gained from the dive, attack again from beneath the prey. To avoid this, don't let them get behind you! Failing that, turn to face them as soon as possible, or turn away sharply after the initial attack dive.



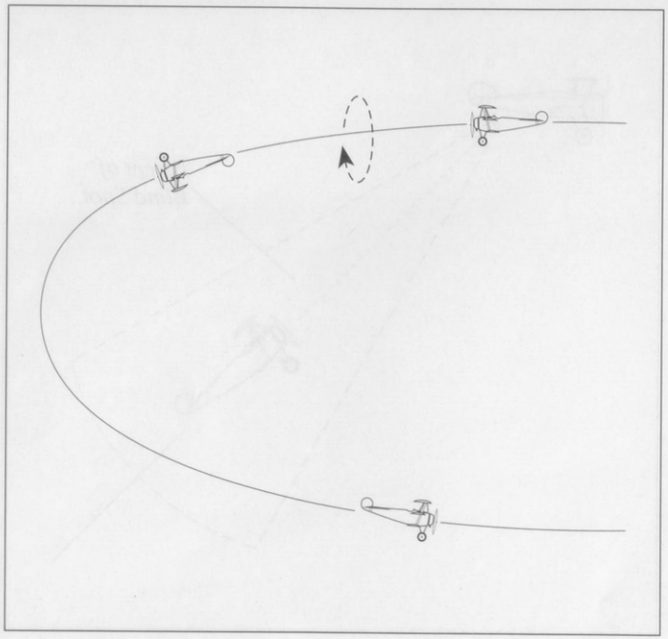
Full Loop

This manoeuvre may be used on unsuspecting and/or inexperienced pilots as a means of getting them off your tail and you on theirs. Gain considerable speed from a dive, pull back on the stick and keep it there. You'll go into a steep climb that'll take you over the top. Chances are, your victim will not react quickly enough to prevent you coming down on his tail.



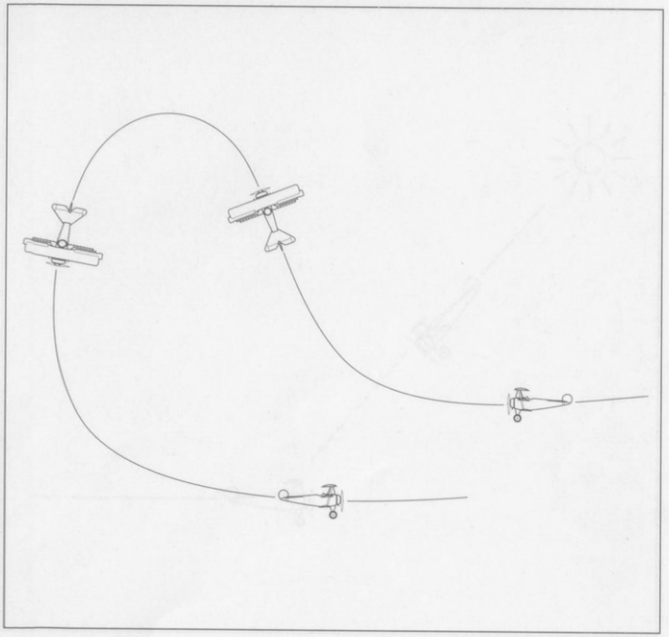
Immelman Turn

Tradition has it that Max Immelman developed this move, but there's some doubt as to whether the Fokker Eindekker could have done it. This is usually a 180° change of direction - climbing turn with a half roll while vertical. The beauty of the move is that rolling while vertical allows a good pilot to finish the half-loop in whatever direction he wants. For example, if you quarter-roll instead of half-roll, the overall manoeuvre becomes a 90° change of direction.



Split S

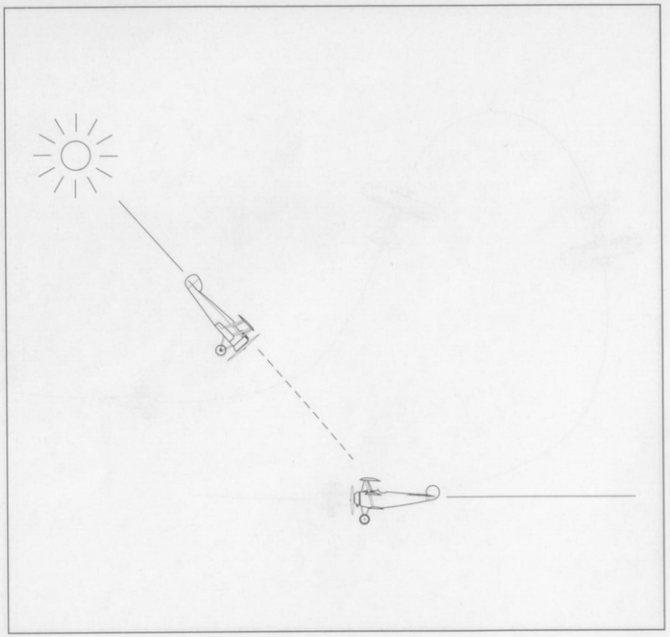
You'll need to practise for this one because you'll probably need to use it a lot. This allows you to turn 180° very quickly and gain speed at the same time; the only problem is that you will lose altitude. During intense turning battles, when you and your opponent are banking and turning as tightly as possible, and neither of you can see the other, a quick half-roll onto your back followed by pulling back on your stick will usually break the stalemate.



Climbing Turn

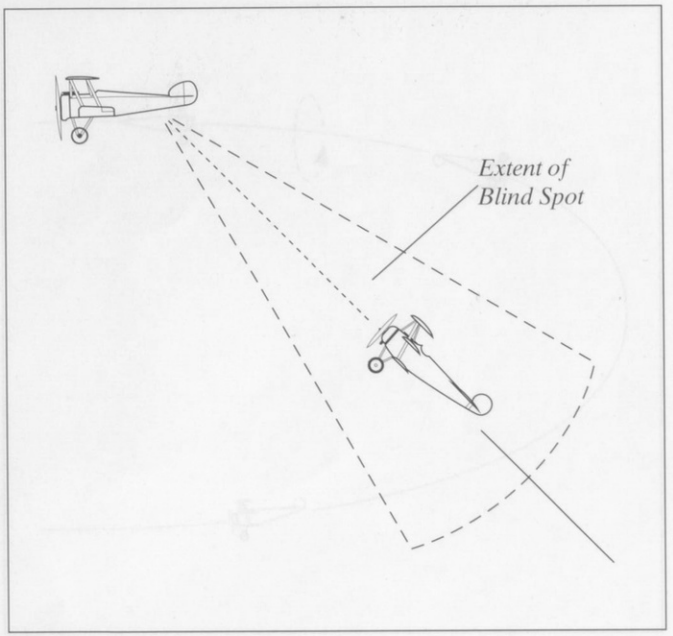
One bad thing about steep, banking turns is that you lose altitude and therefore potential energy. It is sometimes more important to maintain a height advantage over your opponent than to out-turn him. In situations where you must turn, but can't afford to lose altitude, you'll have to temporarily sacrifice some speed. While executing the turn, pull back slightly on the stick as you turn; you'll slow down during the turn, but regain the speed when the turn is done and you return to your original altitude.

DOGFIGHT



Swooping Out of the Sun

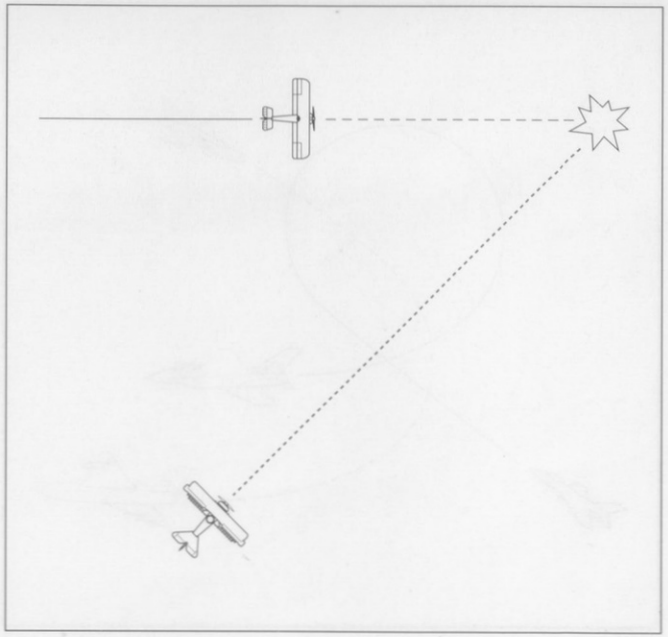
The diving attack out of the sun, still used today, was the most common, and the most successful of WWI. Once positioned between the enemy and the sun, the pilot dives down and fires while the enemy is still partially blinded by the sunlight.



Blind Spots

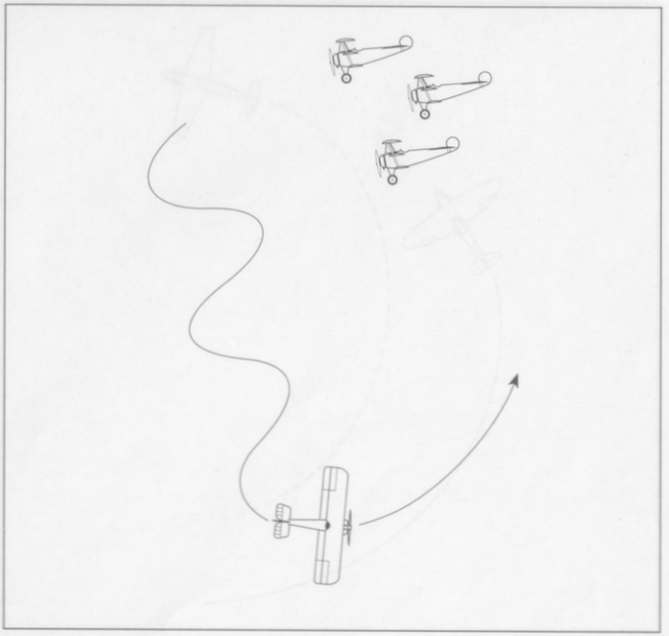
WWI aircraft had many blind spots, but the most effective, apart from diving out of the sun, was climbing up to them and attacking from behind and below the tail.

DOGFIGHT



Leading the Enemy

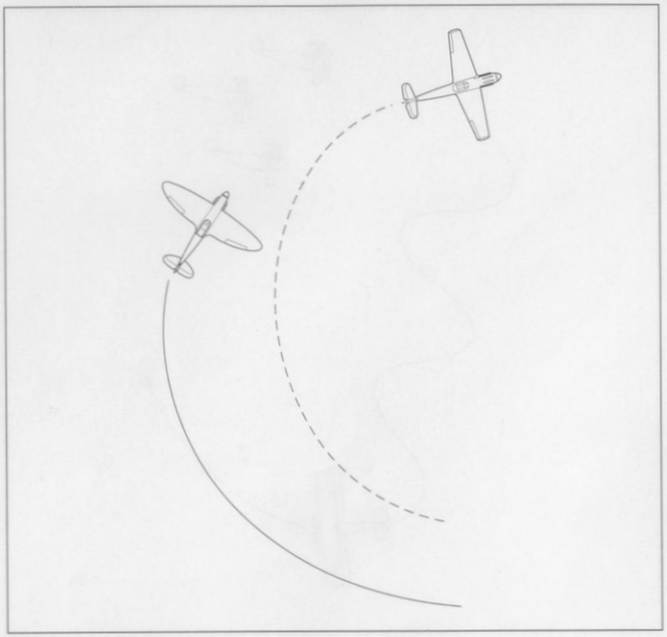
In order to hit the enemy plane, a pilot had to aim just in front of it, so that the bullets and the target reach the same point in time and space. No doubt the WW1 gentleman flyers' experience with clay pigeons was of some use on these occasions!



Desperate Measures

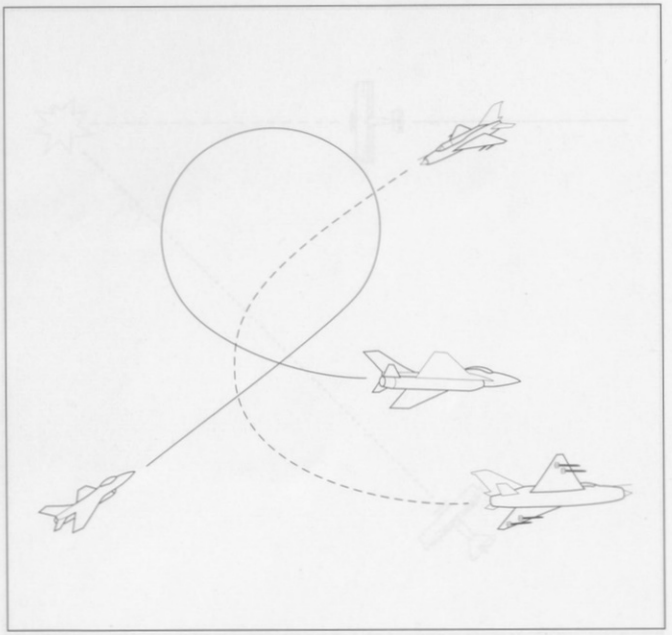
To confuse the enemy to the greatest effect, pilots would fake a spin out of a situation, then pull out and climb back up into the fray. Pulling out of a spin involved throwing the stick in the direction of the spin and then pushing forwards to unstall the aircraft followed by power upwards with everything the engine could muster.

DOGFIGHT



The Circling Attack

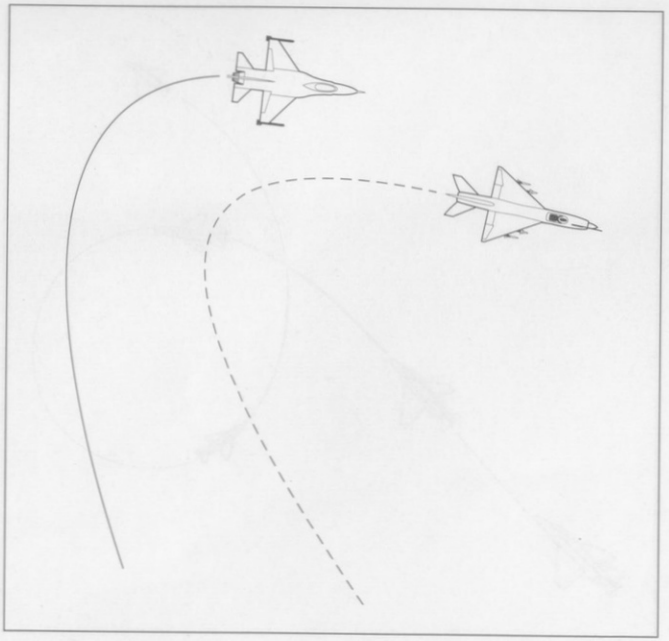
Most dogfights of WWII involved one plane trying to out-turn the other in a series of high-speed circles: once one plane could get inside the other's turning circle, he could get off his shot. To avoid being out-turned, it was necessary for the target to go quickly into an inverted dive, then pull out and turn fast to take out the attacker before he was sufficiently lined up.



Head-On

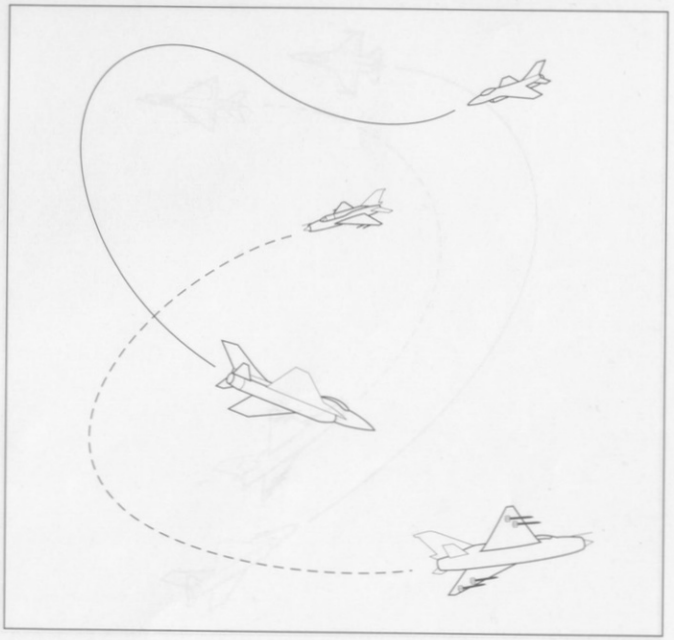
The classic confrontation: once shots have been fired head on with no result it's the plane that can turn on the tighter arc that will outmanoeuvre the other. It's difficult to guess which way the opponent will turn after passing you so keep watching him even as you are making your turn.

DOGFIGHT



Nose to Tail

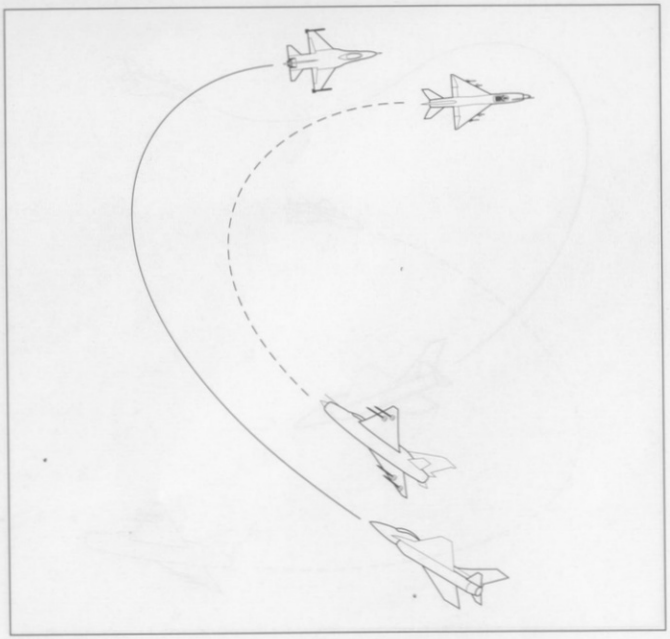
Pilots turn in the same direction, ending up nose to tail. This still might result in a circling fight, but each pilot has the option to break away and take the initiative.



Hi Yo-Yo

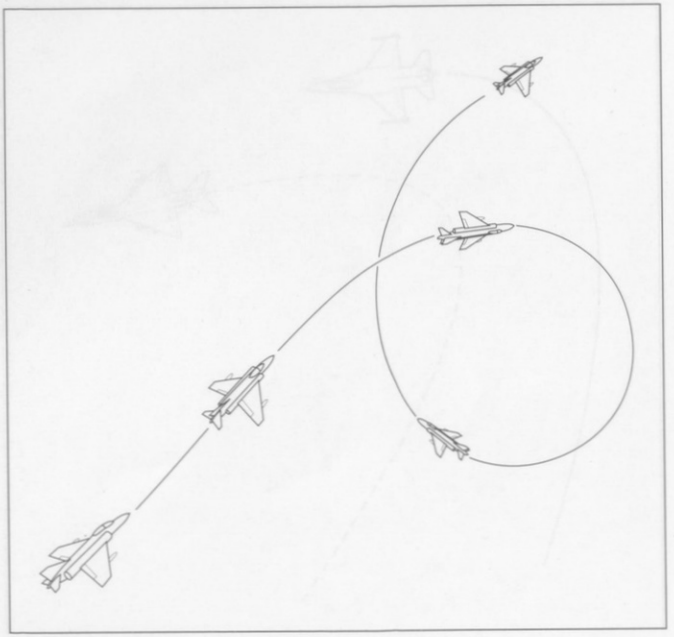
Essentially used to kill off speed while preserving energy, this manoeuvre takes the fight into three dimensions. The attacker no longer needs a tighter turning circle and gains the advantage of height and energy.

DOGFIGHT



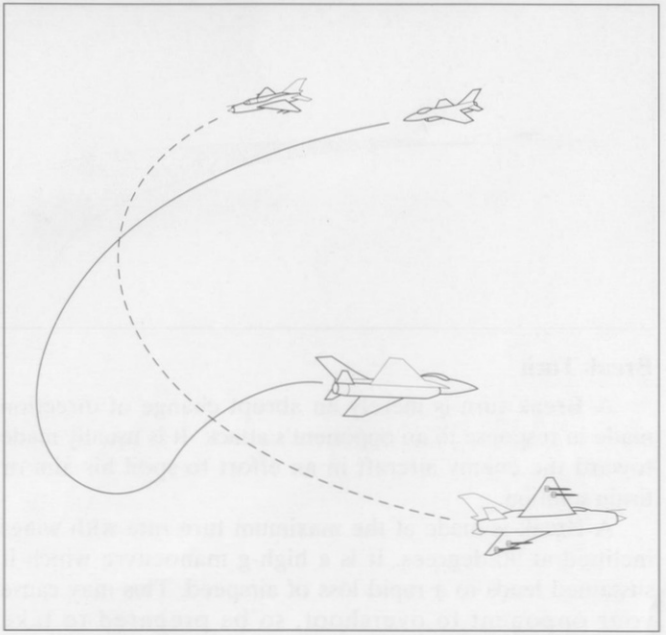
Lag Pursuit

When an enemy plane makes a Break, you can maintain your advantage with the Lag Pursuit by holding your advantageous position slightly behind and below the flight path of the enemy aircraft.



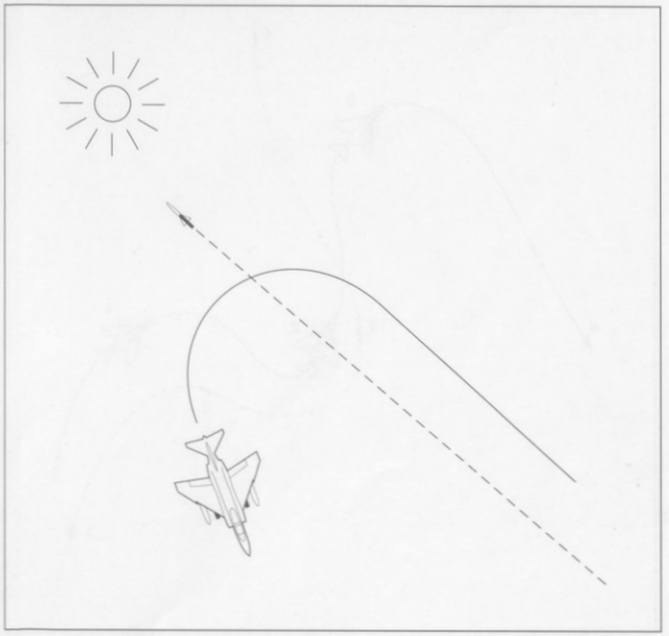
Barrel Rolls

A manoeuvre to lose ground speed while maintaining airspeed. A Barrel Roll with the enemy close behind will bring you out behind your opponent, ready to attack.



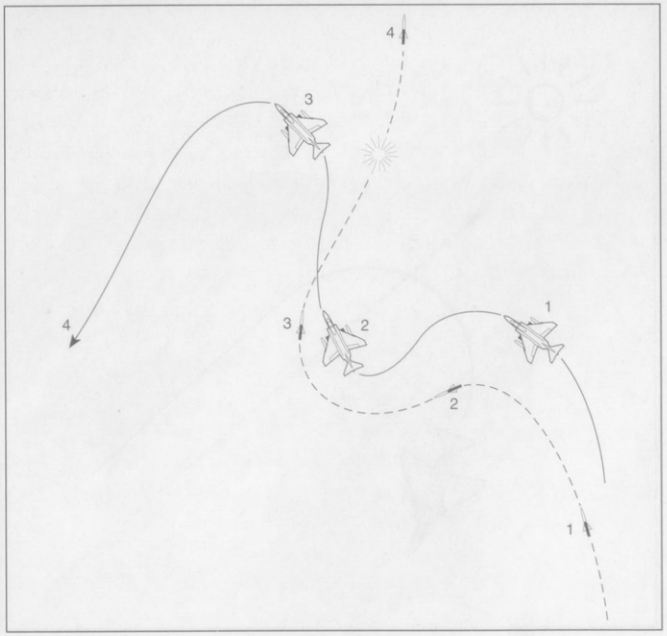
Lo Yo-Yo

In cases where the pilot was having difficulty chasing a faster opponent, he would dip the nose of his plane down, using gravity to assist him in the turn, quarter-roll, pull back and then up and, more often than not, he would be inside his opponent's turning circle.



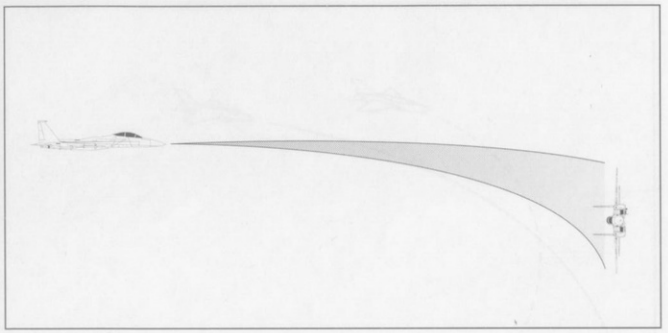
Run for the Sun

Early heat-seeking missiles were not over-intelligent, and usually blew up the first hot object they came across. The pilots usually led the missile up into the upper atmosphere where, as far as the missile was concerned, the sun's heat signature was the hottest thing around. Pilots also occasionally took the missile across the path of an enemy fighter, at which point the missile would lock onto that instead.



Evasive Action

The only other way pilots avoided a heat-seeking missile was to confuse it by weaving, diving and climbing in quick succession, throwing flares out as they went. After a while the missile's guidance system would give up, and the missile would veer off-course and/or explode before it hit its target.

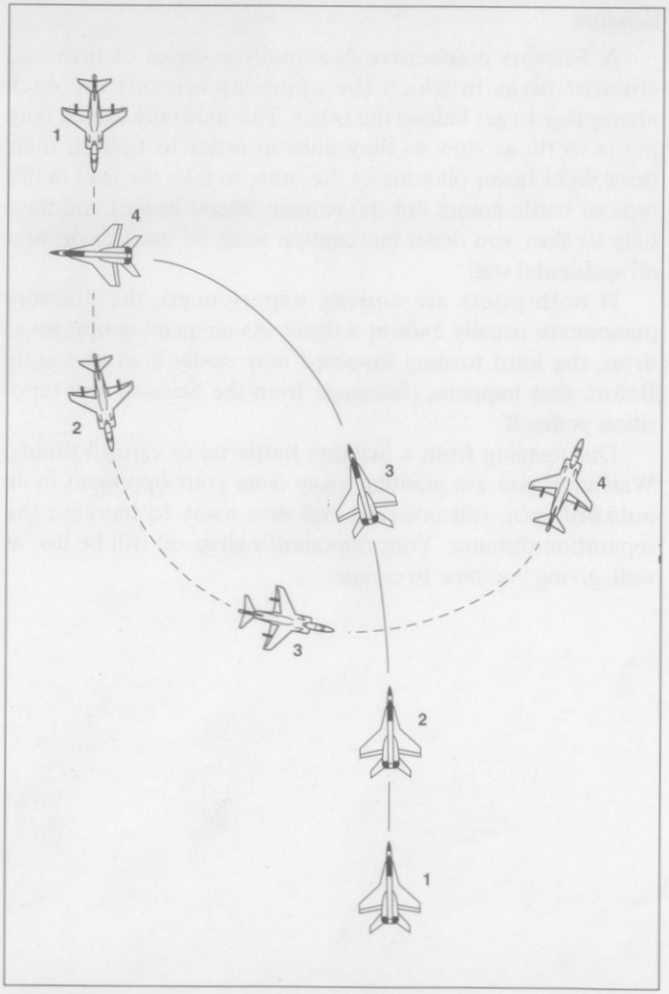


Break Turn

A Break turn is merely an abrupt change of direction made in response to an opponent's attack. It is usually made toward the enemy aircraft in an effort to spoil his aim or firing solution.

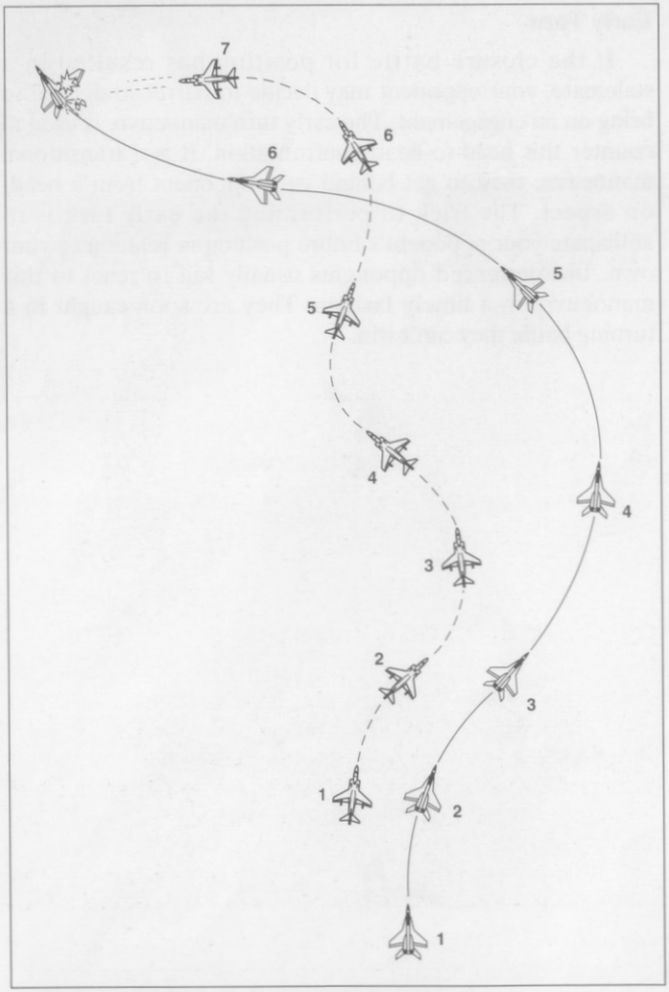
A Break is made at the maximum turn rate with wings inclined at 90 degrees. It is a high-g manoeuvre which if sustained leads to a rapid loss of airspeed. This may cause your opponent to overshoot, so be prepared to take advantage of his mistake.

Even if your opponent is able to stay on your tail, you'll make yourself a difficult target. If nothing else, a Break Turn gives you time to recover from your initial surprise and start your own manoeuvring. You cannot win air combat by remaining on the defensive. Use the Break Turn to begin your offensive strategy.



Early Turn

If the closure battle for position has resulted in a stalemate, your opponent may decide to barrel straight in to bring on an engagement. The early turn manoeuvre is used to counter this head-to-head confrontation. It is a transitional manoeuvre used to get behind your opponent from a head-on aspect. The trick to performing the early turn is to anticipate your opponent's future position in relation to your own. Inexperienced opponents usually fail to react to this manoeuvre in a timely fashion. They are soon caught in a turning battle they can't win.



Scissors

A Scissors manoeuvre is actually a series of turn and counter-turns in which the opposing aircraft are each attempting to get behind the other. This naturally causes both pilots to fly as slow as they dare in order to tighten their turns. Whichever pilot forces the other to take the lead in this type of battle comes out the winner. Speed brakes and flaps help to slow you down but caution must be used to prevent an accidental stall.

If both pilots are equally experienced, the Scissors manoeuvre usually ends in a draw. As airspeed continues to drop, the hard turning involved may easily lead to a stall. Before that happens, disengage from the Scissors and reposition yourself.

Disengaging from a Scissors battle takes careful timing. Wait until you are pointing away from your opponent in an outward turn, roll inverted and dive away to increase the separation distance. Your opponent's airspeed will be low as well, giving you time to escape.

DOGFIGHT

The manoeuvring is over. Lt. J. C. Ansell, a Korean War pilot has positioned his F-86 in the 'six' of a MiG-15. His Gyro Gun Sight (a reflected graticule in the rectangular piece of glass) helps him line up for his best shot.

The Dawn of Air Combat

The Early Days

In 1914 , at the outbreak of the First World War, there was little aviation history - and even less of a military aviation tradition. Hardly ten years had passed since Wilbur and Orville Wright had first flown at Kitty Hawk, North Carolina. The first military aviators of WWI flew machines with top speeds of 60-80 miles per hour; not even as fast as most automobiles today.

The Reconnaissance Machine

Military aviation theory did not exist to any significant degree in 1914, but both sides realized that the aeroplane would be a superb intelligence-gathering device. Stationary or 'captive' balloons had been used as observation platforms during the US Civil War in the early 1860's, and all modern armies continued to use them for high altitude observation of enemy movements and concentrations. It was clear from the beginning of WWI that the aeroplane would allow not only observation, but also the detailed exploration of enemy positions.

Additionally, the aeroplane might serve the artillery: an observer flying above the target could guide the fire of batteries to achieve optimum results. The French realized early in the war that aeroplanes could also serve as delivery systems for artillery - they were the first to carry out successful large-scale bombing sorties deep into enemy territory.

In the early days of the war, pilots from both sides flew unarmed. They made reconnaissance flights over enemy columns, reported enemy positions, and in general provided valuable information.

Trench Warfare

After the battle of the Marne, the opposing armies began a series of flanking manoeuvres on the western ends of their lines designed to get behind the enemy. Eventually an elaborate system of trenches was formed, stretching from Ostende on the English Channel to the Swiss frontier.

An entrenched army was all but invulnerable to artillery bombardments and, when machine guns were introduced, was also difficult to shift by infantry assault.

Artillery Bombardment

The Generals quickly came to the conclusion that the answer was to bombard and assault on a very large scale. Week-long artillery bombardments followed by wave after human wave of assaulting infantry, they concluded, was the only way to cut through enemy entrenchments and fortifications.

The problem with this was preparation: it was very difficult to hide hundreds of thousands of men and millions of tons of supplies and equipment. The role of the aeroplane as

The two Spandau machine-guns from Baron von Richtofen's wrecked Fokker Triplane being examined by Officers of No. 3 Squadron, Australian Air Flying Corps at Bertangles, 22 April 1918.

a reconnaissance tool became even more important. The trenches themselves provided a solid barrier of secrecy, behind which the armies could manoeuvre and concentrate for an assault; but reconnaissance flights could destroy this secrecy.

The First Fighter Aircraft

There was obviously an advantage to be gained if enemy recon flights could be stopped. If ones own troop movements are carried out in secrecy while those of the enemy are widely known, decisive results may be achieved. Enemy recon aircraft had to be destroyed before they reported what they'd seen - or before they saw anything. Obviously, the solution was to arm aircraft with weapons capable of destroying other aircraft.

The First Air Weapons

At first pilots carried pistols, rifles, bricks - even hand grenades - as air-to-air weapons. These implements, however, were little more than useless because it was hard to use them effectively while flying a fragile machine. Nevertheless, in January of 1915 an Allied flyer, using a carbine, shot down a German reconnaissance aircraft. Air combat had begun!

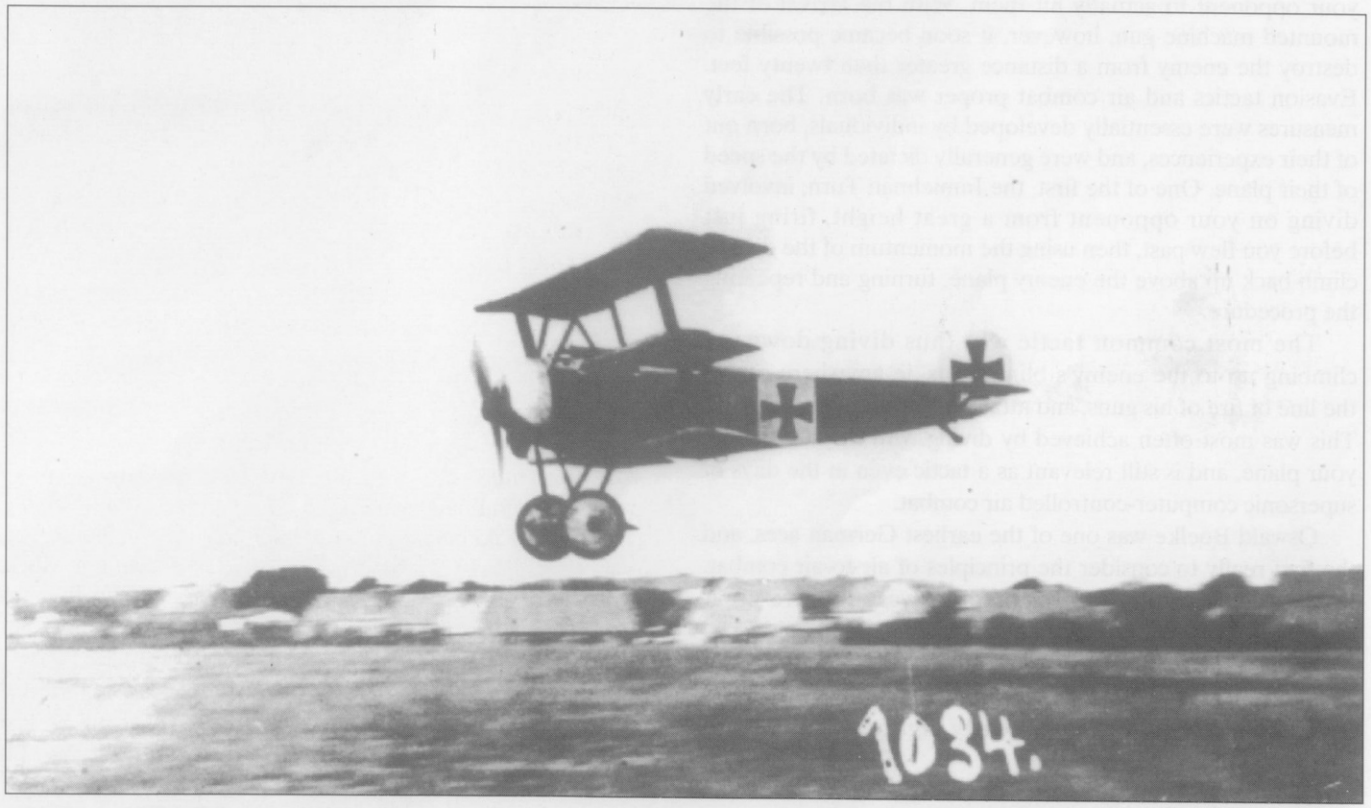
The Fuselage Mounted Machine Gun

There were essentially two types of aircraft at the time. The pusher type that had the propeller behind the wings and pilot so that the airframe was pushed along through the air; and the tractor type that had the propeller in front of the wings and pilot, at the tip of the fuselage. The latter had the potential of being much faster and more controllable than any pusher machine. The problem with this design was that you couldn't fire a machine gun forward through the arc of the propeller - you'd shoot it off and if you had the gun mounted so that it would fire outside the arc, your fire would be a lot less accurate.

The problem was initially tackled by Roland Garros, a pre-war stunt pilot: mount metal plates on the propeller blades and position them so the bullets that strike the blade will not do significant damage. Further, shape these plates to deflect any such bullets away from the pilot. Garros tried this a couple of times privately and determined that the propeller would be loosened and finally come off after a certain amount of firing. But that would be okay if, after each flight or so, the propeller was repaired. In February of 1915; Garros, flying a Morane Saulnier parasol monoplane, with a machine gun that fired through the arc of the propeller, shot down his first aircraft and completely changed the course of military aviation.

The Germans soon after used a device, developed by Antony Fokker, called an Interrupter Gear that allowed the German pilots to mount a machine gun on the fuselage, right behind the propeller, and fire directly through the arc without a bullet touching the blades! This proved extremely successful. The spiral of weapon and counter-weapon had begun!

Air Combat Tactics -WW1



Manfred von Richtofen's Triplane in flight. The Red Baron's 'Flying Circus' was the first German unit to get the DR1 in the summer of 1917.

DOGFIGHT

In the first year of WW1 the only armament carried by the early scouts and spotters were hand-held weapons (pistols, rifles, shotguns) and the only tactic was to get close enough to your opponent to actually hit them. With the arrival of the mounted machine gun, however, it soon became possible to destroy the enemy from a distance greater than twenty feet. Evasion tactics and air combat proper was born. The early measures were essentially developed by individuals, born out of their experiences, and were generally dictated by the speed of their plane. One of the first, the Immelman Turn, involved diving on your opponent from a great height, firing just before you flew past, then using the momentum of the dive to climb back up above the enemy plane, turning and repeating the procedure.

The most common tactic was thus diving down, or climbing up to the enemy's blind spots, ie anywhere out of the line of fire of his guns, and attacking before he could turn. This was most often achieved by diving with the sun behind your plane, and is still relevant as a tactic even in the days of supersonic computer-controlled air combat.

Oswald Boelke was one of the earliest German aces, and the first really to consider the principles of air-to-air combat. In the course of the war, his theories were to have great influence over the German Generals, and could be said to be some of the founding principles of modern air warfare. These early theories he wrote down, and became known as the 'Dikta Boelke', and though nearly eighty years old, are mostly still relevant today.

DOGFIGHT

Dikta Boelke

1. The pilot must know his machine, so as to avoid any weaknesses being exploited by the enemy.
2. The pilot must know the weaknesses of enemy planes.
3. The pilot must be fully at home with his machine, so that air manoeuvres become second nature.
4. The pilot must know his armaments, so that they can be utilized without distracting him from his main purpose.
5. The pilot must be able to spot the enemy without being seen himself.
6. The pilot must be aware of a multi-aircraft dogfight, so that he can't be surprised by a third party.
7. The pilot must become accustomed to flying in a regular position in a formation.
8. The pilot must memorize a number of rendezvous points in the combat area, so that he can rejoin his formation if separated.
9. The formation must be kept at all times, leaving the leader to spot the opposition, while the others watch his and each other's tails. If a member of the formation spots the enemy first, they must inform the leader immediately, and wait for instructions.
10. The leader will always make the attack decisions.
11. Once combat is joined, it must be 'every man for himself', except that the pilot must be aware of the three dimensional aspect of the combat, and aid any of the others if he himself is not under attack.
12. The pilot must avoid copybook - or predictable - manoeuvres such as loops that the enemy can anticipate and exploit.

This last point was the most successful of all WW1 tactics. The planes were quirky at best, and the top aces always used this quirkiness to their advantage, performing unusual and often dangerous manoeuvres that gave the enemy no idea where to fire.

World War Two - The Battle of Britain

A squadron of Mk II Supermarine Spitfires on patrol across the skies of south-east England during the Battle of Britain.

DOGFIGHT

The Battle of Britain might never have happened but for two major factors. Initially, during their massive rearming of the 1930's, Hitler had told his General Staff to prepare for a war that would not start until 1942: if this had been the case, both Britain and France would have been far more prepared in terms of strategy, size and quality of their forces, and the Germans may never have reached the English Channel. The second factor was the armistice that never happened. On June 21st 1940, a month after the British evacuation at Dunkirk, the French had been defeated, and by June 25th the fighting in Europe had stopped. But Churchill would have nothing to do with any talk of peace. Hitler was forced to plan for an invasion of Britain but before this was possible, the RAF would have to be eliminated. The scene was set for the Battle of Britain.

There is no doubt that all arms of the services were heroes to the general public, but none was more visible in the first years of the war than the RAF. There was no greater symbol of their struggle than the dogfights that happened almost hourly over the sun-drenched fields of southern England, and no aircraft more popular than the Spitfire, fighting valiantly against the Messerschmitts bomber escorts. In *Dogfight*, these two planes, the MkII Supermarine Spitfire and the Messerschmitt Bf109E, are pitted against each other in a classic Battle of Britain scenario.

Air Combat Tactics - WW2

The rules of engagement evolved during World War One still applied in World War Two, taking account of the increased speed and ability of the new planes. It was still vital for pilots to maintain superior altitude over the opponent, taking advantage of the sun and cloud cover where possible, and also to be able to spot the enemy before he spotted you.

Once combat had been joined, it was constantly necessary to check 'up sun' every few seconds, in case an enemy fighter had climbed above, ready to 'bounce' unwary pilots. If they were 'bounced' most pilots turned into the attack, climbing slightly so as to present a difficult shot for the enemy and so as to be above him if he continued in his dive. Generally, however, most WW2 dogfights involved two planes circling each other, the winner of such an engagement being the one who could out-turn his attacker, getting inside the circle for the first shot.

If a pilot knew he could not out-turn his opponent, he would immediately go into a dive by first opening up his throttle, then inverting the plane and pulling back on the stick so as to avoid the negative gs involved in a non-inverted dive. Once out of danger, the pilot would quickly pull up again and rejoin the fight where possible, hoping to catch the opponent from underneath. This manoeuvre was generally only possible from a reasonably high altitude, as it was very easy to lose 10,000 feet or more very quickly in such a dive.

Overall, the Spitfire was usually capable of out-turning a 109, but when it came to diving and climbing, the 109 did have the edge. This is what made their dogfights such an exciting sight; both of them employing similar but opposing tactics. Another reason was their armaments - neither machine's weapons had an effective kill range of more than 500 feet or so, and were therefore both compelled to get suicidally close to their opponents to be sure of a good shot.

The Korean War - Enter the Jets

In the 'Ops' tent pilots are briefed on their target, enemy defences, weather conditions, radio facilities and escape instructions (in the event of a mishap). The noticeboard shows identification outlines of the brand new and much feared MiG-15 jet.

DOGFIGHT

Although WW2 was the war of the piston engines, the first jet aircraft to fly, the Heinkel He 178, actually took off a week before the war started. The British and the Germans had been developing the turbojet engine during the thirties, and both Frank Whittle's and Hans von Ohain's jet engines ran for the first time in the late spring of 1937. The first operational jet fighters, however, were to take another seven years to appear - the German Messerschmitt Me 262 and the British Gloster Meteor. The two jets never met in combat: that historical moment was not to come until the early days of the Korean War when, on November 1st, 1950, an American Lockheed F-80C Shooting Star shot down a Russian-made MiG-15.

The Korean War was the first full-scale post-WW2 conflict between the new opposing superpowers, the USA and the Soviet Union. The invention of the atomic bomb had virtually assured that there would never again be a *major* war between them and the only occasions on which they could 'safely' come to blows was under cover of a 'third party war'; protecting opposing sides of a conflict that was outwardly nothing to do with either of them.

When communist North Korea attacked their virtually defenceless neighbours in South Korea it was a perfect opportunity for the respective militaries to test out their latest weapons without incurring any damage to their own countries.

This was the first time that opposing Generals had begun a war in the full knowledge that air power was no longer an adjunct to the army, but vital in its own right. By the end of the war they were to realise that it was almost certainly the *most* important of their forces.

Air Combat Tactics - Korea

In the first jet-to-jet combats, the rules were essentially no different to those of WW2 and in some cases of WW1. Despite having much increased speeds, pilots on both sides were still only armed with machine guns and/or cannon, and it wasn't until later on in the conflict that missiles were introduced, changing the whole basis of one-to-one fighter combat forever.

When the Sabres and MiG-15s got together, it was still a case of simply outmanoeuvring the opponent in what were usually either nose-to-nose or nose-to-tail engagements. The main difference that jet combat brought to the game was that the planes went a lot faster, giving pilots even less time to fire at their opponents.

So it was still essential to have superior altitude, giving the pilot an 'energy advantage' when attacking. It was still vital to be able to turn tighter than the opponent, so as to come out of a turn behind him, ready to fire; it was still essential to be able to get out quick, either by diving or climbing out of trouble. The successful pilots all used one part of their plane to great advantage: the brakes. In a turning fight, where there was little difference between the abilities of the respective planes, the pilot would jam his airbrakes on, and wait for his opponent to come rushing past him, just nicely lined up for a shot.

DOGFIGHT

The essential attribute for a pilot of one of the new jet fighters, however, was a quick reaction time. The average firing time in a jet-to-jet dogfight was only two or three seconds, and sometimes less. If the shot missed, the pilot got into trouble with overshooting, and then became the target himself.

Fifth Air Force, May 1953 Korea. Flight Lt. John R Dickinson, an RAF exchange pilot, flying F-86 Sabrejets with the US Air Force 51st Fighter interception Wing in Korea, damaged a MiG-15. It was his first score against the enemy jets and came on a day when the Sabrejet pilots shot down 11 MiGs and damaged 6 others in one of their highest scoring days of the war.

Vietnam - The Phantom War

The Vietnam War began in 1945 when the area was still known as French Indo-China. France tried to regain the colony from the control of the communist Viet-Minh guerrillas for several years but eventually, after the disastrous six month battle of Dien Bien Phu, gave up the struggle in late 1954.

From 1956 the Viet-Minh were conducting raids on government installations and by 1961 this had escalated to full scale war between North and South. The US originally committed ground forces to the assistance of South Vietnam in relatively small numbers. But by the end of 1965 there were 190,000 American forces in Vietnam.

US Air Force strategies were based on European scenarios against the forces of the Warsaw pact: dispensing air-launched nuclear missiles high over vast areas of relatively flat, open expanses of land. In Vietnam they were flying low, over a small area, dropping conventional bombs on the orders of aerial and forward ground reconnaissance.

Gone were the days of head-on jet-to-jet battles. This was the era of the surface-to-air missile, or SAM, and the electronic counter measures, or ECM, that were designed to foil them. The US pilots were additionally hampered by the need to ID visually any aircraft before firing, thereby negating any missile advantage. They were used to flying in at supersonic speeds, firing their missiles and flying out again even faster, not hanging about the battlefield like sitting ducks. Cannon and machine guns were rarely used in NATO European exercises, and pilots preferred the all-new Sidewinders and Sparrow AAMs. Vietnam soon showed this reliance to be mistaken. The US flagship fighter, the F-4 Phantom, was not fitted with an internal cannon until 1972, 11 years after the war unofficially began. While the MiG-21, its principal opponent in 'Nam, had two 30mm cannon as its main armament right from the first appearance.

Air Combat Tactics - The Missile Years

Guided air-to-air missiles were fitted to jet fighters towards the end of the Korean War, and very soon a new set of tactics came into play; a great many of these involved missile avoidance, especially once the heat-seeking missile came into service.

At first, pilots relied entirely on missiles and avionics; most of the fighters didn't actually *have* guns or cannon. This was later to change, with the guns being used in case the first missiles missed, to the point where, in the '91 Gulf War, a large proportion of kills were gun kills. In essence, the combat tactics of these hi-tech dogfights followed the same rules worked out in WW2 and, to a certain extent, in WW1.

But, back in the early days of 'Nam, it was all about Sidewinders and SAMs, and how to avoid them.

Defence against radar-guided SAMs were usually three-fold:

- Take out the missile on the ground before it could launch.
- Take out the radar installations, usually with anti-radiation missiles.

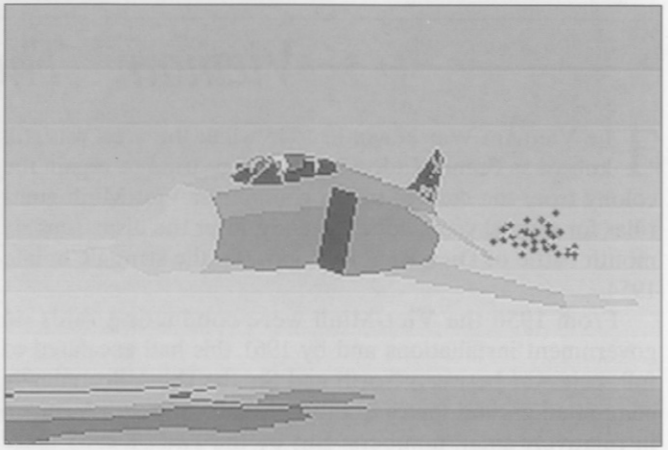
• Chaff: the most used and often simplest device. Chaff was made from small metal strips designed to give a false radar picture and jettisoned from the plane as soon as it picked up a missile warning. Chaff was also used against air-to-air radar guided missiles.

Once a heat-seeking missile had been launched, whether from the air or the ground, there were only two defences:

• Climb like hell toward the sun then break off quickly, so that the missile got confused by the sun's heat and forgot all about the plane.

• Throw flares out, again confusing the missile.

It was occasionally possible to outrun the missiles, hoping that by ducking and weaving the plane for long enough the missile would run out of propellant. Missiles often accelerated for 2-4 seconds then coasted the rest of the way, thus the longer a missile flies the slower it gets.



A Phantom F-4 releasing Chaff

The Falklands War

FRS 1 Sea Harriers are inspected by ground crew and pilots after carrying out an attack from the deck of HMS Hermes. Only 28 Sea Harriers were taken to the Falklands but managed to defend the Task Force, perform ground attack, recon and intercept duties.

DOGFIGHT

On 19 March 1982 a small Argentine force landed on the island of South Georgia, a British dependency in the south Atlantic, ostensibly to dismantle a derelict whaling station. On 2 April Argentine military Task Groups landed on the long-disputed Falkland Islands, overpowered the small Royal Marine garrison after a short fight and declared the Falkland Islands to be a part of Argentina.

The invasion had been anticipated for some time by British intelligence and on 31 March a decision had already been taken to assemble a task force capable of retaking the Falklands if necessary, and Operation "Corporate" was set in motion. A complex military Task Force involving thousands of troops, a fleet of ships drawn from the Royal Navy and the Merchant Marine supported by aircraft from all three services sailed on 5 April to a destination 8,000 miles across the world where, after a hard fight and the loss of irreplaceable men, valuable ships and aircraft, the Falkland Islands were finally retaken on 14 June and the Argentine commanders compelled to sign the surrender.

The principal air components of the British Task Force were the Royal Navy aircraft carriers HMS Hermes, HMS Invincible and HMS Illustrious with Sea Harrier FRS1s of 800, 801 and 809 Naval Air Squadrons (NAS) embarked. RAF Harrier GR3s from No 1 Squadron, Wittering, were earmarked to join the Task Force in the South Atlantic to reinforce the RN's Sea Harrier FRS1s in the air defence role. Fitted with long range ferry tanks and refuelling probes the RAF's GR3s flew south on 4 May from St Mawgan to Ascension Island on a 4,600-mile 9.25 hour almost non-stop record-breaking flight, accompanied by Handley Page Victor tankers. Here they were flown aboard the container ship MVAtlantic Conveyor with Sea Harriers of 809 NAS and Boeing-Vertol Chinook helicopters for the final journey south. The FRS1s and GR3s were finally cross-decked to HMS Hermes on 18 May, their home for the duration of Operation "Corporate". With the cessation of hostilities No 1 Squadron's GR3s were land-based at Port Stanley airport from 4 July until 10 November.

Air Combat Tactics - A New Twist

Ever since the jet fighter made its first kill, combat tactics have essentially remained unchanged: once both sides have effectively disposed of each other's technological advantages. In the Harrier, however, came a new variant in jet-to-jet combat, for here was a fighter that had the capability to behave unpredictably. For not only did the variable-geometry nozzles give the Harrier the ability to take off and land vertically, they did give it the capability to suddenly angle these nozzles in flight and veer off on a course totally unexpected by its attacker, or indeed by an incoming missile. This change of direction is called Vectoring in Forward Flight (VIFFing).

In practice, of course, when flying at some 600mph, angling the nozzles does not make it perform like a helicopter, but, when flying at low speed and coming suddenly under attack, the Harrier pilot can move his aircraft out of the way reasonably quickly. By moving at an extreme angle to his previous flight path, he can confuse his much faster attacker and make him perform an unstoppable overshoot giving the Harrier an unexpected chance for a shot as he flies past.

VIFFing can be used to decrease the radius of a turn in a turning manoeuvre, but as with all VIFFing techniques this involves trading manoeuvrability for speed and, more importantly energy. As pilots do their best to conserve energy, VIFFing is seen as a last ditch effort to shake off a pursuer.

A Sea Harrier performs a vertical landing on HMS Intrepid in sight of the Falklands coastline. Generally, a more difficult operation than normal because the pilot has to take ship and air speed into his calculations.

Syria 1982 - The Never Ending Conflict

Conflict of one sort or another between Israel and her Arab neighbours has never truly relaxed since the formation of the state in May 1948. The newly emerged Israel managed, largely by tactical daring to win conflicts in 1948 and again during the Suez crisis of 1956.

At that time they were fighting against the vastly superior MiG-15s and 17s using the underrated Dassault Mysteres. Israel then equipped itself with state of the art fighters like the Mirage and Super Mysteres. By the time of the Six Day War of 1967 the Israelis had one of the best air forces in the world.

When the relationship between France and Israel deteriorated it was to the US that they turned for the next generation of fighters. By the 1973 Arab-Israeli War, the Arabs were flying a range of Russian-made planes, from the outdated MiG-17s to the new MiG-25s. In two weeks of war, the Arab losses amounted to 286 planes, although a further 183 are reported to have been shot down by Israel in the periods immediately before and after the war. Israel lost 118 planes, of which 100 were to enemy AA fire. As always, it proved that a good pilot in an average plane is better than an average pilot in a good plane.

In June 1982, the conflict with Syria took place over the strategically important Bekaa Valley, with its concentrations of Syrian anti-aircraft batteries. Learning from their experiences of the 1973 War, when Israel had suffered severe losses at the hands of the Egyptian and Syrian AA missiles, the Israeli Air Force made a bee-line for the Bekaa Valley complex and destroyed 17 out of 19 batteries in a single day. The Syrians were never to recover from this initial attack, and ultimately the Israeli Air Force had virtual air supremacy, leaving them free both to attack bases inside Beirut and to provide air cover for ground forces.

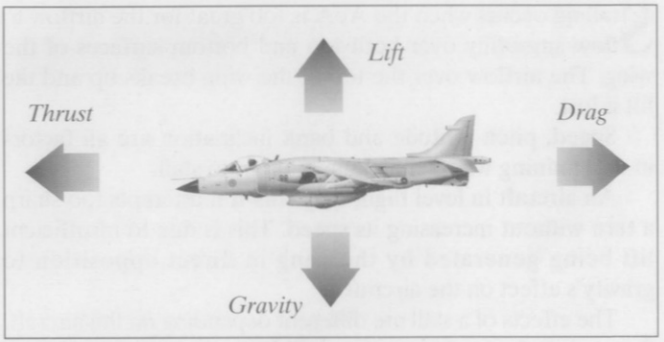
Air Combat Tactics - Syria

Since WWII, jet fighter technology has increased exponentially, with planes going ever faster and with ever-increasing accuracy. However, once missiles had been fired and a plane was locked into close-quarters combat, air combat tactics were still remarkably similar to those of their WWII predecessors. Planes were able to turn faster and tighter, and to pull more g's, but then so were their opponents. So, all in all, things haven't changed, only become faster, with even less time to loose off the 'end-game' shots.

The immensely complex computer-controlled targeting systems show the pilot where to fire and even sometimes fire for him. But essentially the planes are manoeuvred in the same manner; still hiding in blind spots, still using the sun's brightness for cover, and still hiding in clouds. The only difference was that they were doing all this in conjunction with ever-more sophisticated radar-jamming ECM devices. At the end of the day, when all missiles have been loosed off, and all radar has been jammed, it is still a question of one plane against another. The pilots have to use machine guns, instinct and courage.

The Basics of Flight

The Four Forces



There are four basic forces which affect each and every object which moves through the air:

- Lift
- Thrust
- Drag
- Gravity.

Controlled flight is the management of these four forces in order to travel through the air.

Lift

Lift is the difference in air pressure, above and below an object, caused by air rushing past it. As air strikes the leading surface of an object, the even flow of air is deflected over, under, and around the object. These deflected air streams change speed as they are forced past the object.

For an airplane this means that air moving over the top of a wing surface *moves at a greater speed* than the air moving below. Since slow moving air has a higher air pressure, it causes the wing surface to be sucked upwards. As the speed of the air moving over the top of the wing surface increases, the difference in pressure above and below the wing becomes greater. The greater the difference in pressure the more Lift is ultimately generated.

Thrust

Thrust is the aerodynamic force which propels an object through the air. The principle is the same whether the wing is pulled through air by a propeller or pushed from behind by a jet engine. *The purpose of Thrust is to force air across the wing surface in order to create Lift.* Obviously the faster an object moves through the air, the more air is forced past the wing.

Drag

Aerodynamic drag is anything which impedes the movement of an object through the air and is in direct opposition to Thrust. The more Drag created by a moving object, the greater amount of thrust is needed to overcome it.

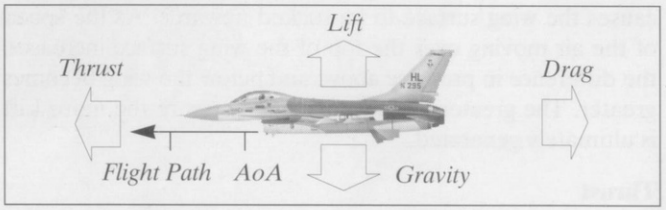
Gravity

The last of the four forces and the only one we cannot control to some extent is Gravity. Gravity must constantly be

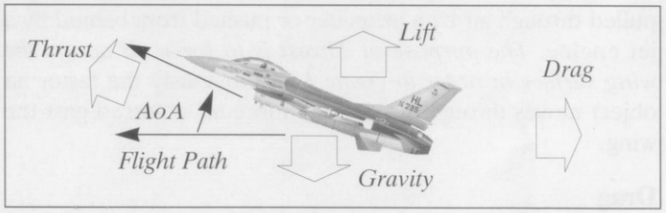
overcome by Lift in order for anything to remain airborne for long. If the force of Gravity becomes greater than the Lift being exerted, the object wing will be drawn toward the ground.

Angle of Attack (AoA)

High Speed Low AoA



Low Speed High AoA



The amount of lift generated by a particular surface is a function of its 'angle of attack'. AoA is the difference between the aircraft's flight path and the 'chord line' of the wing. In level flight, the 'chord line' of the wing is facing directly into the airflow. When climbing, the 'chord line' of the wing is pitched upward relative to the airflow. With its nose and wing pitched up, the aircraft is said to have increased its angle of attack. The reverse is true when diving.

Stalling the Aircraft

Stalling occurs when the AoA is too great for the airflow to flow smoothly over both top and bottom surfaces of the wing. The airflow over the top of the wing breaks up and the lift is lost.

Speed, pitch attitude and bank inclination are all factors in determining whether a plane is about to stall.

An aircraft in level flight may stall if it attempts too sharp a turn without increasing its speed. This is due to insufficient lift being generated by the wing in direct opposition to gravity's effect on the aircraft.

The effects of a stall are different depending on the aircraft. Some aircraft simply assume a mild nose-down attitude until they return to level flight. Other aircraft may enter a sudden and potentially dangerous spin. On low level missions a pilot may not have time to recover before striking the ground. This is especially true if one wing stalls before the other.

How to Fight

Energy Management

Aerial combat tests all your flying skills during periods of extreme stress. Engaging an enemy aircraft requires split-second timing. Reactions in combat must be instinctive since there is little time for decision making, particularly if you are travelling at Mach 1.

DOGFIGHT

The first thing every pilot should learn, in order to become a top fighter ace, is Energy Management. The principle behind energy management is being able to fly the aircraft using the benefits from the Four Forces. Used properly, the 'Big Four' can give you distinct advantages in combat. Ignoring them only leads to trouble.

Low and Slow

A pilot that is caught flying low and slow is a poor energy manager. If he is found in such a situation he will have few options if 'bounced' by enemy fighters. He cannot accelerate fast enough to escape nor can he trade altitude for speed. Low and slow is a deadly combination.

Gaining Speed

The best way of gathering speed is to point the nose of the aircraft down. Even shallow dives of short duration enable an aircraft to build-up considerable momentum. Converting this momentum into speed is a tactic which can only be used for so long. Sooner or later the aircraft must either pull out of the dive or strike the ground.

Losing Energy

One sure way to lose all the energy you've built up in the dive is to pull up too abruptly. To transition from a dive, gently pull back on the stick until your wings are horizontal to the ground. Your energy and airspeed will then bleed off gradually. This way you are making the most of your dive momentum.

Another way of losing speed unnecessarily is by making tight turns when less sharp turns would work equally well. Even aircraft as aerodynamically manoeuvrable as the F-16 have trouble sustaining high-g turns for long. Try it once and watch how rapidly your speed drops off. Once you load-up your wings in a sustained turn, all your lift is being directed horizontal. The aircraft runs the risk of stalling since nothing is being used to oppose gravitational forces.

Of course, the most obvious way to lose energy and air speed is by climbing. But in compensation the more altitude an aircraft possesses, the more potential energy will be available once in combat.

Energy management is a necessary part of everyday flying but is absolutely essential once in combat. Not only do you need to remain aware of your own aircraft's energy status, it is always a good idea to pay attention to what your opponent is doing with his aircraft.

Situational Awareness

Watching the opposition is another major element in air combat. Situational awareness is the concept of taking in the whole picture. New pilots become so focused on their own aircraft that they lose track of what is going on around them. In an effort to shoot down an opponent, a pilot may forget to look out for the enemy's wingman until it is too late.

Although air combat is a three dimensional affair, Rookie pilots tend to fight in only two. Pilots must learn to fight in the vertical as well as horizontal plane. As part of a pilot's situational awareness, he must be able to judge the distance relationships between his aircraft and the enemy's.

A Dogfight is still a Dogfight

Despite some truly remarkable advances in the last 80 years, the basics of air combat have not changed since the Wright brothers. Missiles and jet engines have quickened the

pace of combat considerably *but a dogfight is still a dogfight.* The human element has remained the one constant in an ever changing world and air combat continues to be a man against man proposition. *The better man almost always wins, even when flying an inferior aircraft.*

In fact, modern gadgetry often hinders rather than assists a pilot in completing his mission. The noise generated by all these systems is deafening and a distraction. Imagine having to concentrate on SAM warnings, missile-ready growls and your back-seater talking all at the same time. Add to that vector commands and real time intelligence coming over your headset from an AWACS. The pilot rapidly experiences an information overload and no longer hears anything being said.

Many pilots in the Vietnam era went through a personal check list whereby they began turning off various systems as soon as they left the ground. The advanced systems in contemporary fighters are nice to have but, in the final analysis, only a pilot's skill and instinct will bring him home.

The Five Phases of Air Combat

Detection

You can't shoot what you don't see. Detection is perhaps the most critical of all the preliminary phases of combat. Early detection of an enemy allows you to begin your manoeuvring, and possibly catch him unaware. Even if you are detected, you have already gained the initiative.

Early detection adds to your situational awareness and gives you the ability to keep the enemy at arm's length. Once you have detected an enemy, either visually or on radar, keep him in sight. If you lose sight of the enemy, you must start the detection process all over again. It may be too late. The enemy will have already started his pre-engagement manoeuvring by the time you spot him again.

The simple fact of air combat, from WW1 to the present day, is that most pilots are shot down before they ever detect the enemy.

Surprise is a key element of every engagement and usually deters the outcome of the battle. Stay alert!

Closure

The second phase of air combat is known as Closure. During this phase, you are faced with a number of very basic decisions. After making a detection, you must first determine if the contact is hostile and then, whether it is a threat.

Once you decide to engage the contact, you are committed.

The objective in this phase of combat is to bridge the distance between yourself and your intended target. You must quickly figure out how to approach the target so as to arrive in a superior firing position. The most advantageous firing position is directly behind your target, known as being in his 'six'.

From this position the enemy pilot will have a difficult time shaking you off his tail. Not only can you follow him through his manoeuvres but he will be unable to bring his weapons to bear on your aircraft. You must pay careful attention to your relative speeds. If you make a mistake and overshoot, the roles will be reversed. The enemy will now be in your 'six'.

Closure does not mean to imply being close to the enemy.

Sometimes the closure phase ends when the aircraft are still many tens of miles apart. The missile age has pushed back the engagement envelope to beyond visual detection ranges. In a modern context, the closure phase ends when you are able to bring a weapon system to bear. Remember that the enemy pilot will also be manoeuvring to achieve the same thing and speed is essential to cut down on his reaction time.

As you and the enemy close, your aircraft will either have the advantage, be disadvantaged, or be neutral in relation to the opposing aircraft. Which of the three positions you find yourself in determines your action in the next phase of combat.

Attack

The Attack portion of air combat is considered by many pilots to be merely the execution part of the previous phase.

Things are slightly different if you are in a disadvantaged position. It is imperative that you evade your opponent at the earliest opportunity and regain the superior position. As a minimum you should attempt to spoil your opponent's firing solution by performing one or more air combat manoeuvres.

If neither you or your opponent has achieved a superior position, the battle is momentarily a draw (neutral). Under these circumstances, the first pilot to make a mistake, loses the battle. There are few second chances in air combat, so don't be the one to make the first mistake.

Basic Fighter Manoeuvres

If a mistake is to be made, it is usually made here. The first pilot to pick a wrong manoeuvre or perform one incorrectly has given his opponent an edge. This phase of air combat is characterized by the twisting, turning and jinking battle. It is where pilots go head-to-head and perform Basic Fighter Manoeuvres (BFM) in an effort to get a clear shot. In order to survive in combat, you must learn how to perform them correctly and be able to recognize them when an opponent tries them on you.

Your objective in this phase of combat is to position your aircraft in the opponent's 'six o' clock' position. Once in his 'six', your objective becomes staying in there until you have shot him down. Easier said, than done. Your opponent will be trying his best to shake you off his tail and disengage.

Disengagement

The best way to disengage from combat is to shoot down your opponent. If this seems unlikely, maybe it's time to start thinking how you are going to get away.

Getting out of combat (especially in modern fighters) is much more difficult than getting in. You must figure out a method of putting some distance between you and the enemy before he realizes what you are up to. It requires careful timing to avoid being shot down while trying to get away.

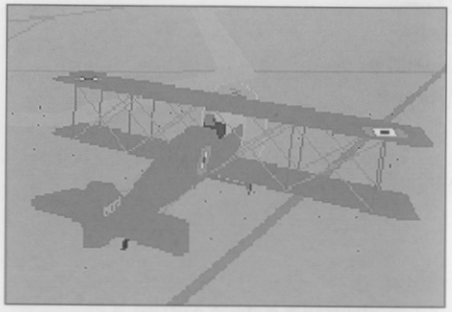
If your opponent is not equipped to carry missiles (or has run out), the job of disengaging is much easier. All you need do is maintain a lateral separation which exceeds the range of his guns. If he gets in your 'six' and wants to follow you home, fine.

A missile equipped opponent has a much longer reach. Even if your disengagement is successful, chances are your opponent will get at least a parting missile shot. There's no way to prevent this launch although ECM and skilful manoeuvring may keep it from hitting you.

Cannon/Gun Combat

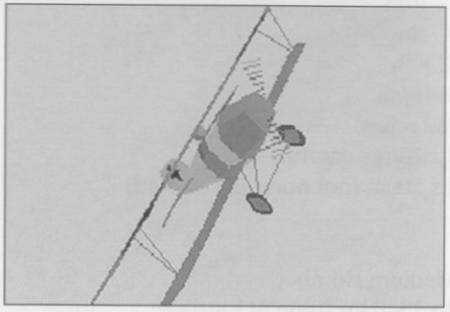
The use of gunfire in air combat has not changed since WW1. It is still a matter of getting in close to your enemy and then pumping lead into his aircraft until it goes down. The trick is to obtain a good firing position from where the enemy cannot return your fire. This generally means that most strafing attacks occur when one aircraft gets in the 'six' arc of another.

Resources



Airco Built De Havilland DH4

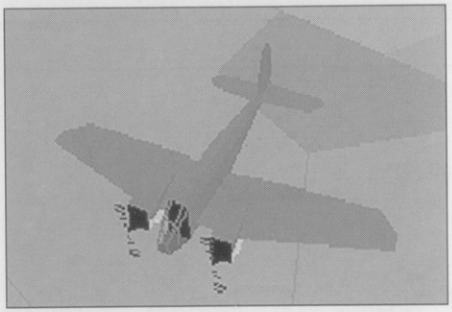
Engine:	B.H.P. 240 HP
Span:	42' 4"
Length:	30'
Weight:	3400 lbs
Max Speed:	120 MPH
Service Ceiling:	14,500'



Albatross D2

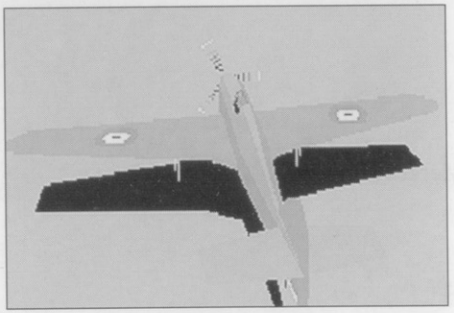
Engine:	160HP Mercedes Inline
Span:	27' 11"
Length:	24' 3"
Weight:	1958 lbs
Max Speed:	108 MPH
Service Ceiling:	15,060'
Endurance:	1 hour 30 minutes

DOGFIGHT



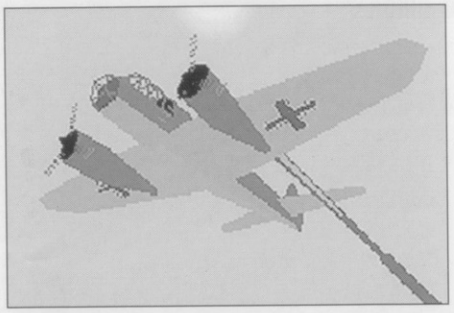
Heinkel III-H3

Type:	Medium bomber
Engines:	2 x 1350hp Junkers Jumo
Span:	22.6m
Length:	16.4m
Max weight:	14,000kg
Max level speed:	270mph
Max range:	1212 miles
Defensive weaponry:	1 x 13mm MG131, 1 x MG81, 1 x MGFF
Bomb load:	4500lb



Hurricane IIc

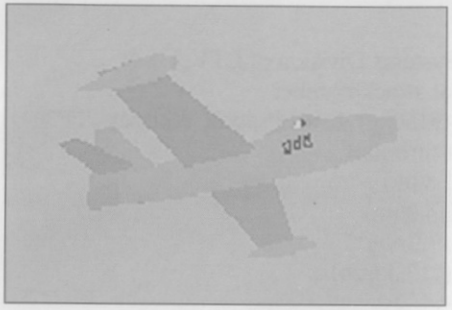
Type:	Fighter
Engine:	1 x 1185hp Rolls Royce Merlin XX
Span:	12.19m
Length:	9.75m
Weight:	8250lb
Speed:	334mph
Max Range:	460 miles
Defensive weaponry:	4 x 20mm cannon
Bomb load:	2 x 500lb (not normally carried)



Junkers Ju88

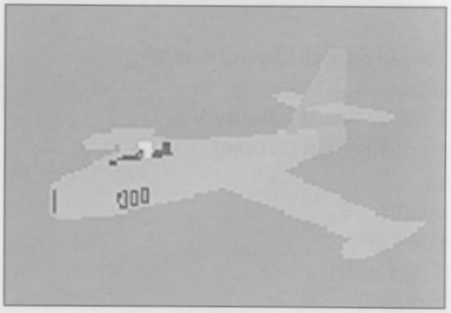
Type:	Medium Bomber
Engine:	2 x 1340 hp Jumo 211 in-line
Span:	22m
Length:	14.96m
Weight:	15,300 kg
Max speed:	292 mph
Max range:	600 miles
Bomb load:	2000 lb

DOGFIGHT



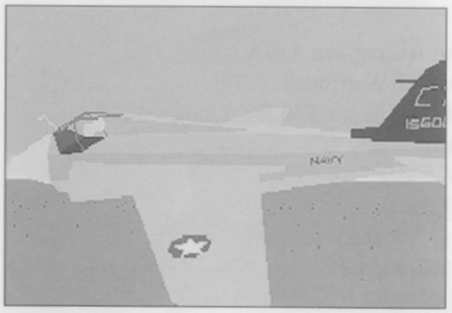
F-80

Origin:	Lockheed Aircraft Corporation, USA
Type:	Single-seat Fighter Bomber
Engine:	4,600lb (2087kg) Allison J33-9/19
Span:	38' 10" (11.85m) without tip tanks
Weight:	8,240lb (3741kg)
Maximum Speed:	590 mph (950km/h)
Service Ceiling:	47,500' (14,480m)



F-84

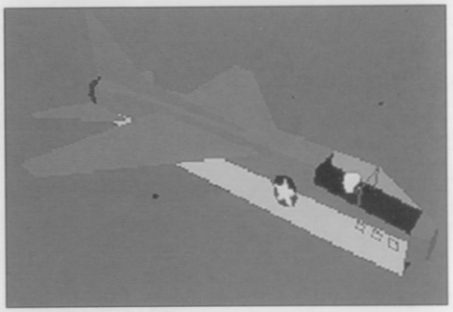
Origin:	Republic, USA
Type:	Single-seat Fighter Bomber
Engine:	3750 lb Allison J35-15
Span:	36ft 5in (11.09m)
Length:	43ft 4.75in (13.22m)
Weight:	9540lb (4325kg)
Maximum Speed:	695mph (1118 km/h)
Service Ceiling:	46,000 ft (14,000m)



Grumman A-6 Intruder

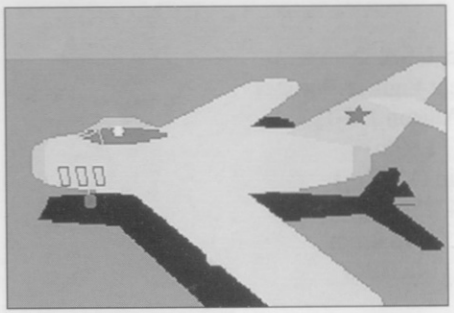
Origin:	Grumman Aerospace, USA
Type:	2 seat carrier based all-weather attack
Engines:	2 x 9,300lb (4218kg) thrust Pratt & Whitney J52-8A two-shaft turbojets
Span:	53' (16.15m)
Length:	54' 7" (16.64m)
Weight:	25,684lb (11,650kg)
Maximum Speed:	685mph (1102km/h)
Service Ceiling:	41,660' (12,700m)

DOGFIGHT



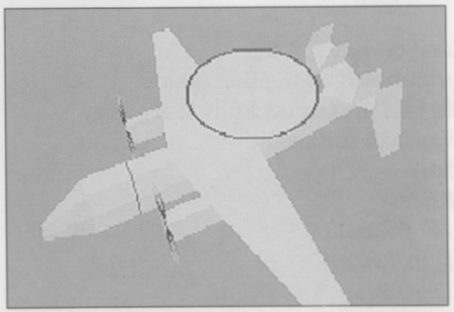
Vought A-7 Corsair II

Origin:	Vought Systems Division of LTV, USA
Type:	Single seat attack bomber
Engine:	11,350lb (5150kg) thrust Pratt & Whitney TF30-6 two-shaft turbofan
Span:	38' 9" (11.80m)
Length:	46' 1.5" (14.06m)
Weight:	15,904lb (7214kg)
Maximum Speed:	698mph (1123km/h)



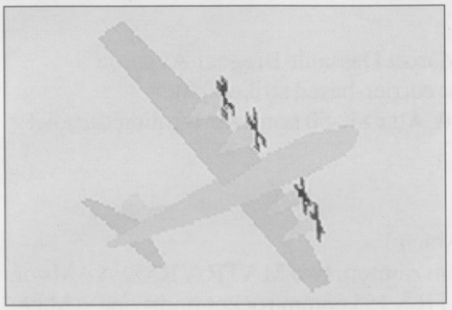
MiG-17

Origin:	Mikoyan and Gurevich, Soviet Union
Type:	Single seat fighter
Engine:	5,952lb (2700kg) thrust Klimov VK-1 single-shaft centrifugal turbojet
Span:	31' (9.45m)
Length:	36' 3" (11.05m)
Weight:	9,040lb (4100kg)
Maximum Speed:	711mph (1145km/h)
Service Ceiling:	54,460' (16,600m)



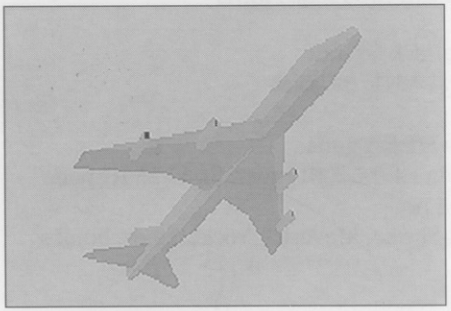
Grumman E2 Hawkeye

Origin:	Grumman Aerospace, USA
Type:	E-2 series, AEW aircraft
Engines:	2 x 4,050bhp Allison T56-8/8A single-shaft turboprops
Span:	80' 7" (24.56m)
Length:	57' 7" (17.55m)
Weight:	37,616lb (17,062kg)
Maximum Speed:	374mph (602km/h)
Service Ceiling:	28,500' (8650m)



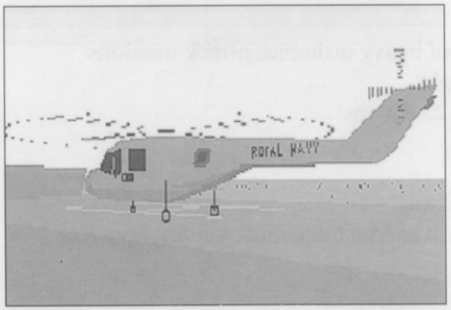
Boeing B-29 Superfortress

Type:	Heavy Bomber
Engines:	2200hp x 4 Wright R-3350
Span:	43.05m
Length:	30.18m
Weight:	64000 Kg
Max. Level Speed:	385 mph
Max Range:	4100 miles
Defensive Weaponry:	11 x 0.5 in guns
Bomb Load:	Up to 20,000 lbs



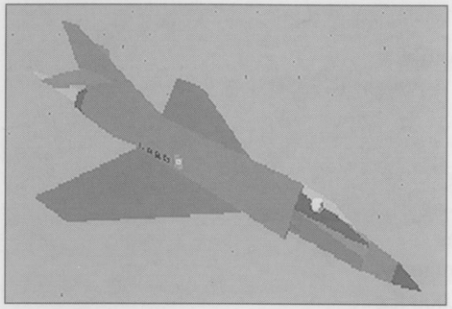
Boeing 707 Jammer

Origin:	The Boeing Company, USA
Type:	Jammer
Engines:	4 x 13,750lb (6238kg) thrust Pratt & Whitney J57-59W two-shaft turbojets
Span:	130' 10" (39.7m)
Length:	136' 3" (41.0m)
Weight:	109,000lb (49,442kg)
Maximum Speed:	600mph (966km/h)
Service Ceiling:	40,000' (12,192m)



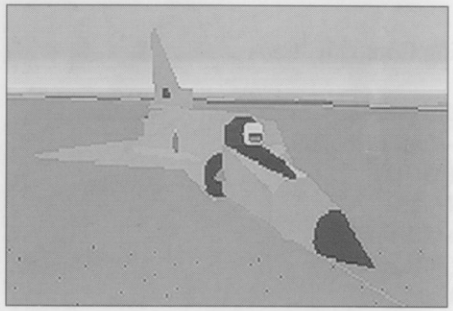
Westland Lynx AH Mk9

Origin:	Westland Helicopters, UK
Type:	Multi-purpose helicopter
Engines:	2 x Rolls Royce Gem 41-2 turboshafts
Weight:	5,125kg
Service Ceiling:	10,600'
Range:	630km
Cruising Speed:	140kts



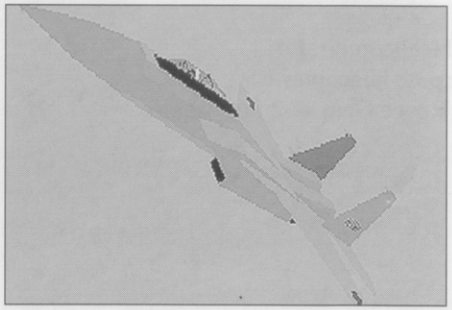
Dassault Super Etendard

Origin:	Avions Marcel Dassault-Breguet Aviation
Type:	Transonic carrier-based strike fighter
Engine:	SNECMA Atar 8K-50 non-afterburning turbojet
Weight:	12,000kg
Service Ceiling:	45,000'
Range:	850km
Maximum Speed:	approx. Mach 1
Armament:	Two 30mm cannon, two MATRA R550 AAMs or four MATRA 155 68mm rocket pods; one AM39 Exocet ASM, two AS30 ASMs



Kfir-C2

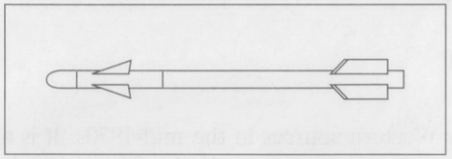
Type:	Ground attack aircraft
Engine:	One GE J79-J1E turbojet
Maximum Speed:	780km/h
Guns:	2 x 30mm DEFA guns
Sensors:	RWR, Elta EL/M-2001 radar, SUU-25 IR pod, Elta ECM pod
Ord:	AIM-7/9, Shrike, Maverick, rocket pods, bombs



F-15E Strike Eagle

Type:	Capable of heavy ordnance attack missions day or night
Engines:	Two AB 23,850 lbs
Weight:	25.5 tons
Max Speed:	800 kts
Main Gun:	20mm, 520rds
Missiles:	A selection of Maverick, Sidewinder, Sparrow
Weapon load:	11.1 tons

Weapons



AA-2 Atoll & AATO (Advanced Atoll)

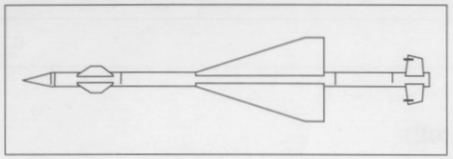
Origin:	Soviet Union
Type:	IR & Radar
Length:	2.8m
Weight:	70 kg
Speed:	Mach 2.5
Warhead:	Blast Fragmentation

The AA-2 Atoll was originally designed and produced during the 1960s. It was a reproduction of the early AIM-9B Sidewinder heat-seeking missile. Since then the missile has been periodically upgraded. There are now two versions of this missile; the improved heat-seeking AA-2D and radar-guided AA-2C. Despite the improvements, the AA-2D may only track targets from a tail-chase aspect only. The AA-2D uses a solid propellent and has a maximum range of 1.6 nm. The AA-2C incorporates a semi-active radar homer and has a maximum range of 4.5 nm.

AS7 Kerry

Origin:	Soviet Union
Type:	IR & Radar
Length:	Unknown
Weight:	1200 kg
Speed:	Mach 1.0
Warhead:	Conventional 100kg

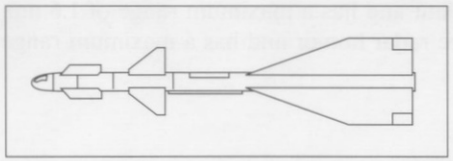
Little was known about this missile until 1983. It was carried by the Su-24 Fencer and the MiG-27. Guidance was originally an outdated form of radio command but later became a beam rider but it is still not known whether this was laser or radar. Possible targets: ships or general battlefield targets.



AA-7 Apex

Origin:	Soviet Union
Type:	Radar Guided
Length:	4.6m
Weight:	320kg
Speed:	Mach 3.0
Warhead:	40kg

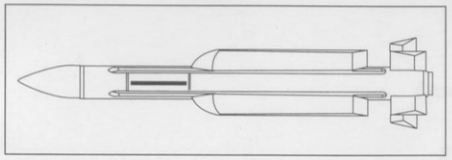
The AA-7 Apex was first detected by Western sources in the mid-1970s. It is a third generation Soviet medium range, radar-guided missile. The Apex is superior in performance to the U.S. AIM-7 Sparrow and boasts a 'look-down-shoot down' capability. The missile is equipped with a semi-active J-band radar seeker which is effective against low flying targets. The warhead represents approximately 15% of the missile's overall weight and is fitted with an active radar fuze. The Apex is carried by MiG-23s, MiG-25s, and the latest MiG-29 Fulcrum fighters.



AA-8 Aphid

Origin:	Soviet Union
Type:	IR & SARH
Length:	2.15m
Weight:	55 kg
Speed:	Mach 3.0
Warhead:	6 kg

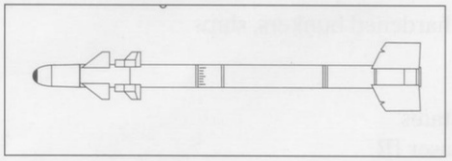
The AA-8 Aphid was designed as a replacement for the aging Soviet inventory of Atoll missiles. Carried in pairs by most Soviet fighters, the Aphid is a heat-seeking missile with a maximum range between 1.6 and 3 nm. Although radar-guided versions of this missile have been reported, to date only the IR model has been seen on Soviet fighters. Early Aphid models had only a tail-chase engagement aspect but later reproductions have been fitted with an electro-optical fuze. This addition gives the missile a much broader tracking envelope.



R.530 E & F

Origin:	France
Type:	SARH or IR Homing
Length:	3.28m
Weight:	192 kg
Speed:	Mach 2.7
Warhead:	2x 27kg pre-fragmented/continuous rod

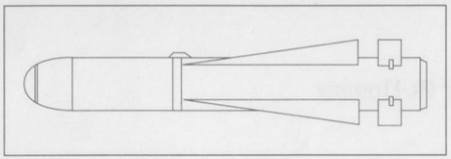
The R.530F is manufactured in France by the Matra firm. It may be carried on most Mirage series aircraft. The R.530F is a medium ranged, radar-guided missile which carries a 30 kg. fragmentation warhead. Early models of this missile suffered from being easily decoyed by ECM. With a range of only 14 nm, the R.530F has been rendered obsolete by more recent improvements to the design. Many of these missiles remain in service with Third World air forces, especially those equipped with Mirage fighters.



R.550 Magic 1

Origin:	SA Matra, France
Type:	IR
Length:	2.77m
Weight:	89.8kg
Speed:	Mach 3.0
Warhead:	Conventional rod/fragmentation (12.5kg)

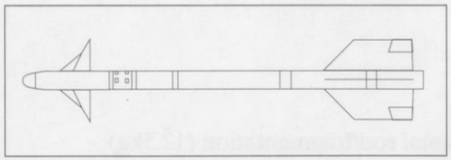
The R.550 Magic 1 is a French-built, short-range IR missile. It entered service in the mid-1970s. France exported a number of these missiles in sweet-heart deals to countries which also purchased French aircraft and over 7,000 of these missiles are in the hands of foreign customers. Although the Magic 1 lacks the all-aspect capability of the later Magic 2, the R.550 is a rough equivalent to the early model Sidewinders. In fact, the missile was designed with to be compatible with any aircraft capable of using Sidewinders. The Magic 1 has a range of almost 3 nm and carries a 12.5kg. HE fragmentation warhead.



AGM-65D Maverick

Origin:	USA
Type:	IR (various)
Length:	2.49m
Weight:	210-288kg
Speed:	Mach 1.2
Warhead:	Shaped charge 37.6kg/ Penetrator blast-frag

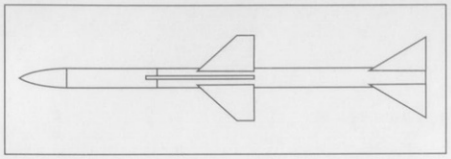
The AGM-65 Maverick is a highly accurate air to ground missile which can use a variety of guidance options. The AGM-65A model uses a simple TV system which allows the operator to "lock-on" to the target. The AGM-65D uses an Imaging Infrared (IIR) which gives the weapon a night capability. Maverick missiles are "fire and forget" weapons once the weapon has "locked-on" to a target. The thermal imaging is of such resolution that A-10 pilots Warthogs used the IIR as a poor man's FLIR. Later model Maverick missiles have an effective range approaching 13.7 nm.
Best Used Against: armored vehicles, hardened bunkers, ships



AIM-9L Sidewinder

Origin:	United States
Type:	Active Laser IR
Length:	2.85m
Weight:	85.3 kg
Speed:	Mach 2.5
Warhead:	Blast Fragmentation

The Sidewinder is a widely used medium range, heat seeking (IR) missile. Early models suffered from an inability to engage targets near the ground. Subsequent modifications have eliminated this problem plus given the missile an all aspect capability. Current models feature a reduced smoke propellant to make aerial detection difficult. Maximum engagement range is roughly 5 nm but depends entirely on the shooter's aspect angle.



AIM-7M Sparrow

Origin:	United States
Type:	Radar Guided
Length:	3.66m
Weight:	205 kg
Speed:	Mach 4.0
Warhead:	Continuous Rod (30kg)

The AIM-7 Sparrow is a radar guided air to air missile with a range of 17 nm. The firing aircraft must obtain a radar 'lock' on the target prior to firing. Once a target is 'locked,' the shooter must keep the target within his radar envelope or the missile will 'go ballistic.' The missile features an on-board processor which can be programmable to combat the effects of target ECM. The USAF and USN are expected to acquire an inventory of 17,000 Sparrows until the AMRAAM comes into full production. During the Gulf war, Sparrow "kills" outnumbered those made by Sidewinders by a ratio of 4-1.

Rockets

Sea Harrier FRS 1 & Mirage IIIE

SNEB Multi-Dart 68

Origin:	France
Type:	Unguided Aircraft Rocket
Warhead:	Multi-Projectile
Fired from:	18 Tube Matra RL155 116 MA(Harrier) Matra RL F2 (Mirage)

Phantom F-4

130 mm Zuni

Origin:	United States
Type:	Unguided Aircraft Rocket
Warhead:	GP explosive/Shaped charge (anti-armour)
Fired from:	LAU-10

Falcon F-16

Mk.4 2.75in in FFAR

Origin:	United States
Type:	Air launched rocket (A-A or A-S)
Warhead:	7.7kg
Fired from:	LAU-69/A

MiG-23

55mm S-5 Rockets

Origin:	USSR / CIS
Type:	Unguided Air-launched
Warhead:	Variety of HE, Fragmentation, Anti-tank and Chaff
Fired from:	UB-16-57 Pods.

Project Leader's Notes

When I joined this project halfway through 1992, Dogfight was a great idea that held the promise of developing into a new type of flight simulation that everyone would want to play. Luckily for me, there were some of the best programmers and artists that I have had the fortune to work with on this project.

We decided that, from the outset, our main objective was to make this a 'fun' simulation. The software collections of most flight sim enthusiasts are chock-full of highly detailed, fully realistic, in-depth simulations of one aircraft or another. What I particularly wanted was a flight sim that could provide some light relief for a short period of time, yet with enough authenticity and depth of gameplay for the player to keep coming back for more. Here I must give credit where credit's due to Ciaran Gultnieks, the main programmer of *Dogfight* that helped turn so many 'what if?' and 'wouldn't it be great if..' ideas into reality.

As is always the case with flight simulations for home computers, there are trade-offs in terms of detail, speed, gameplay, etc. We have attempted to place the emphasis on gameplay, but use as much realism as possible to help achieve this.

Where we did put the emphasis on the detail was in the flying characteristics and cockpit detail of all twelve aircraft featured in Dogfight. To this end, you will find yourself in twelve authentic cockpits, each with the dials working as they did in the real aircraft, all painstakingly drawn by Mark Griffiths, our resident bitmap artwork genius. Mark has been responsible for all artwork within *Dogfight* and I must say that I have never seen so much realism created with 256 colours and a 320x200 resolution screen.

Thanks are due to Ian Martin who designed the flight algorithms that allowed us to tweak various parameters so that all twelve aircraft fly realistically and, more importantly, have differing advantages and disadvantages. This then allows the experienced flyer to maximise the benefits and minimise the weaknesses of the particular aircraft that is flown.

For example, in Vietnam, the F-4 Phantom was a massive aircraft that had awesome power from its two afterburning J79 engines, but was easily outmanoeuvred in a turning fight by the smaller and more agile Mig-21. However, there was not an aircraft around at the time that could keep up with a Phantom in a flat-out, balls to the wall, zoom climb using full 'burners. The experienced pilot would therefore use the vertical to extend and reposition for another pass, but a Rookie would attempt to fly like the enemy and wallow helplessly at slower airspeeds as the MiG easily manoeuvred into firing position on the F-4's 6 o'clock.

However, we did standardise some of the HUD layouts. We decided that in the heat of the fight, it would cause problems if the player had to keep relearning the HUDs for each individual aircraft. So while trying to maintain as much realism as possible, it was decided that Airspeed would always be displayed at the top left of the HUD and Altitude would always figure in the top right. Along with this, the missile target acquisition and lock-on overlays would be the same to prevent confusion. Therefore, the three most important pieces of information given in each HUD are always where you expect to find them.

We also took out most of the button pushing and procedure checking common to most flight simulations these days. Aircraft are easy *to fly*. It is doing everything else, such as being aware of your surroundings (Situational Awareness), navigation, weapon selection, firing and taking in vast amounts of information at a glance while manoeuvring into the enemy's 'six' that makes the fighter pilot's life complicated. Given the limitations of a two-dimensional screen, we decided that the player would want to concentrate on

'the thrill of the chase', not checking to see whether his JPT (Jet Pipe Temperature) was within limits and that his weapons were primed and clear for firing.

One major innovation for *Dogfight* was in the implementation of the Heads-Up display. Other simulations have utilised one or other features of this view but, to me, were always found lacking. Because of the aircraft we were simulating, we could not use movable sprites for front and rear cockpit overlays. So we went for the viewpoint created by the 3D model of each aircraft. Designed by Derrick Austin, our resident 3D modeller, it allowed us to give the player the feel of being cooped up in a cramped WWII cockpit, such as the Messerchmitt Me 109, or the all-round viewpoint of the F16 cockpit.

In the Missions part of the game, you can use the 'look around' aspect of the view to constantly check the skies for bandits. Once an enemy aircraft is spotted you can 'lock-on' to him and the view will follow him around the sky, irrespective of your aircraft's attitude. It takes a while to get used to but, before you know it, you'll find it an invaluable aid to air combat.

Kristian Ramsey-Jones was able to answer an almost constant stream of technical questions about aircraft and weapons technology. As is always the case with MicroProse simulations, we do not use any information of a classified nature, even though we have access to all kinds of data. What you see in *Dogfight* is freely available in a vast amount of published material, such as the excellent *Janes* series, and it is simply a matter of knowing where to look.

With the improvement in East-West relations, there has been a noticeable increase in the availability of Russian aircraft within Europe and America. I must thank Sqn Ldr P Lindsay, RAF, for his invaluable help in allowing me to see numerous aircraft, such as the MiG-21, Sea Harrier and numerous Spitfires and Phantoms, in order that I could check the authenticity of our photographic material and the realism of our cockpits and Heads-Up views.

When you fly the MiG-21 and complain to yourself that there is no rearwards visibility in the Heads-Up view, believe me, the poor MiG pilots really could see precious little of what was happening anywhere from their 4 o'clock to 8 o'clock! No wonder F16 fighter pilots count their blessings!

Angus Fieldhouse designed and animated the 3D introduction to *Dogfight*. The amazingly detailed aircraft shapes were created by him and then animated utilising what has become almost an industry standard these days, Autodesk 3D Studio. Some of the aircraft actually have over 5000 surfaces! Alongside all this artwork, John Broomhall was composing music to fit in with the theme of the game. We discussed the idea of having something 'orchestral and inspirational'. John then went away and came up with some wonderful music, complementing the intro and the 'look and feel' of the game. While I'm on the subject of sound, Andrew Parton is the chap responsible for all the 'whizz-bang' sound effects within the game.

As is frequently the case, no one person was solely responsible for the overall game. We all worked as a team; pooling ideas, discussing gameplay (often until blue in the face!), researching long lost illustrations and photos.

One quote that goes well with the idea behind *Dogfight* comes from that great WWII Luftwaffe Ace, Adolf Galland: "Only the spirit of attack, born in a brave heart, will bring success to any fighter aircraft, no matter how highly developed it may be."

All that remains is for me to hope that you get as much pleasure out of playing *Dogfight* as we had in seeing the project come to fruition.

Martin Moth

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Unit 1 Hampton Road Industrial Estate, Tetbury, Gloucestershire GL8 8LD
Telephone 0666 504399

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DOGFIGHT
80 YEARS OF AERIAL WARFARE

Technical Supplement
for Atari ST Computers

Contents

Your *Dogfight* package should contain a manual, this Technical Supplement, a Key Guide, a set of Atari ST 3.5" disks and a registration card.

Required Equipment

Computer
This simulation requires an Atari ST with at least 512K of RAM.

Controls
Dogfight can be run entirely from the keyboard and mouse. Most sections also support joystick control.

Display
Dogfight requires a colour monitor.

Disk Drives
Dogfight must be played on an ST with at least one double-sided (1 Mb) disk drive. *It cannot be installed onto a hard disk.*

Installation on Floppy Disks

Write Protect
Check that all disks are write protected (the hole is visible in the top right-hand corner of the disk) if they are not, then flip across the small tab on each disk. This will protect your original disks from accidental erasure.

Backup Disks
Dogfight must not be played from the enclosed disks. You should copy the original game disks onto backup disks. See the copyright notice at the end of this document. For full details on disk copying please refer to your Atari ST computer manual.

Loading from the Floppy Disks

- Turn off your computer and remove all unnecessary peripherals.
- Insert your *Dogfight* backup Disk A into your double-sided drive and switch on the computer. The program will then auto-load.
- Please follow any on-screen prompts.

Note for single-sided internal drive owners with external double-sided drive:-

When the machine is first switched on, or reset, you must place backup Disk A into the internal drive and follow the on-screen prompts.

Saving Games

Games or game configuration are saved onto your copy of Disk A. You do not need an additional save game disk.

Copy Protection

Dogfight has no disk copy protection. However, the program asks you a manual-related question. Use the manual to answer the question. MicroProse regrets that continuing casual and organised software piracy requires that this minimal form of copy protection is retained.

The Read Me File

The latest notes regarding this program, additions, revisions etc can be found in a file named READ.ME on Disk B. You can read the file from the Desktop by double-clicking on the icon (further details are found in your computer manual).

— Updates and Enhancements — for the Atari ST Version of Dogfight

1. What If? Mode - Multi Aircraft

In the **What If?** Mode, you can now fight against a maximum of five out of the twelve featured aircraft.

- Select **What If?** from the Main Game Option screen.
- Select **Player vs. Computer** from the Game Type screen.
- Select **Your Aircraft.** Choose your aircraft as described in the manual.
- Select **Enemy Aircraft**.

This will allow you to select the aircraft you wish to fly against. Select your opposition aircraft; a small number will appear in each chosen aircraft's box indicating what you have chosen (3 Camels, 2 F-16s etc.). Press the Left Mouse Button to increase the number of enemy aircraft. Press the Right Mouse Button to decrease the number of enemy aircraft.

- Once the number of opposing aircraft have been selected, click on the OK button.
- Select **Combat Zone**. Choose the scenario you wish to dogfight over.
- Select **Start Position**. This allows you to set the start positions for all the aircraft. Once selected, you will find yourself in the cockpit of your chosen aircraft.

2. Mission Roster

There is a mission roster within the Mission Mode section of the simulation. This can have details of a maximum of eight pilot names with their careers from the various mission scenarios. The roster data is saved automatically onto your copy of the *Dogfight* Disk B.

- To start a new pilot, place your cursor over the name you wish to delete and press the *Selector*. The name will highlight in white.
- Select **New Pilot**. The existing name will be replaced by a cursor.
- Type in your name using the keyboard and press the Return Key. Your name will then appear on the roster with the initial rank of 2nd Lieutenant.
- Click your *Selector* on **Accept** and a new screen will appear with the player's name and Honours list.

The list will show you details of the era flown, the side that you took and the highest medal awarded for that particular mission.

The ultimate aim of Mission Mode is to get the Medal of Honour in all six scenarios and on both sides.

If you bail out on a mission, you will be rescued automatically. If you crash, however, your pilot will be killed and will no longer be active. You will then have to start a new pilot.

If you have selected a non-active pilot, then the **Fly Mission** option at the bottom right of the Honours list will not work. You must **Change Pilot**, go back to the Roster Screen and select (or create) an active pilot.

3. Auto-Intercept Mode On/Off (Alt/B)

For beginners, there is a key that will automatically line up your aircraft on the chosen target.

- Select your target and press Alt/B. Your aircraft will turn automatically and fly towards the target. This feature can be used in a dogfight, as it will compute the 'lead' required to hit an opposing aircraft using guns.

Note: this mode can cause your aircraft to collide if you are flying faster than the target and do not break off the mode by pressing Alt/B again. This is due to 'auto-intercept' leading you to the enemy aircraft, right down to zero feet separation. Head-on passes are not recommended: all that will happen is that the two aircraft will collide. The ideal way to use auto-intercept is to get into the enemy's six-o-clock (rear) flying normally, then press Alt/B. Use your throttle and speedbrakes to maintain separation as you close in on the enemy and, when you are within range, fire your guns. The bullets will head straight for the target.

If no target is selected or after a target is destroyed, the aircraft will level itself out. To avoid hitting the ground when a ground target is selected, your aircraft will not be allowed below 100 feet.

4. Rearm and Refuel Aircraft

If you land your aircraft at a friendly airbase, you will be refuelled and rearmed automatically. Damage is not repaired. The operation will begin as soon as your wheels have stopped turning, so a quick turn around is available to those who need to rearm in a dogfight.

The only question is - will you manage to take-off before the enemy aircraft destroys you on the ground?

To end a game when you have landed, press the Escape Key.

5. What If? Mode - Free Flight Option

The **Free Flight** option allows you to fly the aircraft of your choice over any scenario in order to practice flying, landings and take-offs. Press the Escape Key to return to the **Select Mode** screen.

6. Medals

Due to the differing scenarios within the game, *Dogfight* has a generic medal system. The medals are awarded for overall mission performance, not just for your own flight performance, so it is important to plan the mission and use your resources carefully. The medals awarded are as follows:-

- **Combat Gallantry Medal**

Awarded posthumously to the player who has not survived the mission.

- **Air Medal**

For successful completion of the mission.

- **Air Combat Valour Medal**

For achieving success in the mission and destroying targets in addition to those specified in the briefing.

- **Distinguished Flying Cross**

For achieving success in the mission far in excess of the specific mission orders.

- **Medal of Honour**

The ultimate accolade. Exceptional performance at the highest level of difficulty is needed to achieve this award.

7. Target Marker

The target marker appears on all internal cockpit views. When the selected target is off-screen, a small 'X' appears on the edge of the screen pointing to the direction you must fly for the shortest route to the target.

- If the marker is at the bottom edge of the screen, the target is below you, if it is at top centre, the target is above you. If the marker is not visible then the target is immediately behind you.

8. Configuration Options

The following options have been deleted from the original configuration menu:

Horizon
Flight Control
Calibrate Joystick

9. Key Changes

The ST version of *Dogfight* has been updated and enhanced. This means that there are some Keys that are not documented in the original manual. The Key Guide included in your *Dogfight* package should be used as the **definitive** key guide for all keys used in the game.

Operating Difficulties

In the vast majority of cases a loading problem is not because of faulty software, but either incorrect loading procedure or a hardware fault. Please ensure that the loading instructions have been correctly executed. The most common hardware failures are due to a misalignment of the heads in the disk drive. Such faults may be detected by loading the game on another computer.

Technical Assistance

If you experience difficulties with the game, you may need some help from us. As we receive many calls every day, we can deal with your enquiry more efficiently if you have the following information available:

1. The correct name of the game
2. The type of computer you are running it on
3. Exact error message reported (if any)
4. The version # of the game

Ring us on 0454 329510, Monday to Friday 0900 to 1700 hours. Have a pen and paper handy when you call. Alternately, you can write to Customer Services at the address shown in this document.

Virus

Be aware that a virus may have transferred into your hardware from another piece of software. Pirated copies of games are an incredibly common source of virus problems It always pays to own original software.

Software Fault

In the unlikely event of a software fault please return the complete package, with your receipt, to the **place of purchase**. MicroProse regret that goods cannot be replaced unless bought from the company directly.

Additional Credits

Artwork	John Guerin Dean Betton
Sound and Music	Paul Tonge
Producer	Steve Ramsden
Documentation	Kristian Ramsay-Jones
Typesetting	Sarah Kerr

MICROPROSE
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Made in the UK

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DOGFIGHT
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Key Guide for the Atari ST

Fighter Controls

[=]	Increase Power
[-]	Decrease Power
[Shift] [=]	Maximum Power
[Shift] [-]	Minimum Power
[ ]	Flaps Up/Down
[↑] [←] [→] [↓]	
or Joystick	Flight Controller
[<]	Left Rudder (release to centre)
[>]	Right Rudder (release to centre)
[G]	Landing Gear Up/Down (if applicable)
[W]	Wheel Brakes On/Off
[B]	Air Brakes On/Off (if applicable)
[R]	Radar range key (for aircraft with radar threat display)
[A]	Resource Menu (in F3, F4, F5, F9 & F10 Mode)
	Cursor Up/Down to move to resource
	Return to select the resource
[Shift] [Z]	Accelerate Time (3 settings x2, x4, x8)
[Shift] [X]	Return to Normal Time
[Ctrl] [T]	On-Screen Mission Timer On/Off
[Ctrl] [E]	Eject/Bail Out
[L]	Launch from Carrier (F-4 Phantom only)

FRS 1 Sea Harrier Jet Nozzle Controls

[1]	Nozzles to horizontal
[2]	Nozzles to 45 degrees
[3]	Nozzles to vertical

Weapon Control

[Spacebar]	Fire Selected Weapon
[Return]	Change Selected Weapon (if applicable)
Joystick	
Button 1	Fire Selected Weapon

Decoy Control

[C]	Chaff Release (if applicable to your aircraft)
[F]	Flare Release (if applicable to your aircraft)

Target Control

[T]	Select next Target (on F3, F4, F5, F9 & F10 views)
[Shift] [T]	Return to player's aircraft (on F3, F4, F5, F9 & F10 views)
[Y]	Select nearest enemy aircraft
[U]	Select nearest ground target
[Alt] [B]	Auto Intercept Mode

DOG FIGHT
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Key Guide for the Atari ST

View Keys

F1	Forward Cockpit View
F2	Instrument View (two modes: Full instrument view or with 50% Forward View- Key S toggle)
F3	Tactical View
F4	Inverse Tactical View
F5	'Heads Up' View
F6	Left Cockpit View
F7	Right Cockpit View
F8	Rear Cockpit View
F9	Map Screen (Zoom in/out with Keypad +/-)
F10	External View of selected object
Shift F1	Slot View
S	Change from Full Instrument (in F2 mode)View to Half Instrument/Half Forward Cockpit View
Tab	Fix 'Heads Up' View on Target/ (in F5 Mode) Allow Head to To Move Freely

Gameplay Configuration Options

Alt D	Detail Level (Cycle Through)
Alt C	Shape Complexity Level (Cycle Through)
Alt V	Sound Off/Engine Sound Off/All Sound On

View Controls

Keypad	**Function**
9	Pitch View Up
3	Pitch View Down
0	Rotate View Left
.	Rotate View Right
5	Centre 3-D View
+	Zoom View In
-	Zoom View Out

Mouse Controls

Left Mouse Button	Change target on F9 Map View
Right Mouse Button	Centre selected object on F9 Map View

Simulation System Keys

P	Pause Game On/Off
Esc	Quit Game / Go to Mission Review (if applicable) Return to previous screen (if applicable)

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