
JOINT STRIKE FIGHTER
JSF
INNERLOOP
EIDOS
INTERACTIVE

EPILEPSY WARNING

Please read before using this video game system or allowing your children to use it. Some people are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns in everyday life. Such people may have a seizure while watching certain television images or playing certain video games. This may happen even if the person has no medical history of epilepsy or has never had any epileptic seizures. If you or anyone in your family has ever had symptoms related to epilepsy (seizures or loss of consciousness) when exposed to flashing lights,consult your doctor prior to playing. We advise that parents should monitor the use of video games by their children. If you or your child experience any of the following symptoms: dizziness, blurred vision, eye or muscle twitches, loss of consciousness, disorientation, any involuntary movement or convulsion, while playing a video game, IMMEDIATELY discontinue use and consult your doctor.

PRECAUTIONS TO TAKE DURING USE

- Do not stand too close to the screen. Sit a good distance away from the television screen, as far away as the length of the cable allows.
- Preferably play the game on a small television screen.
- Avoid playing if you are tired or have not had much sleep.
- Make sure that the room in which you are playing is well lit.
- Rest for at least 10 to 15 minutes per hour while playing a video game.

CONTENTS

PREFACE

Thank you for purchasing Joint Strike Fighter (JSF). The software you now hold in your hands came about as a result of thousands of hours of design, programming, graphic artistry, and just plain hard work by a great many people. We believe that we've captured the essence of these truly remarkable aircraft.

The Joint Strike Fighter can fly NOE (Nap Of the Earth) at supersonic speeds by virtue of its sophisticated Terrain Following Radar (TFR) and is nearly invisible to enemy radar due to its stealth technology. As a fighter, it carries a variety of air-to-air ordnance including both heat-seeking and radar guided missiles. As a strike aircraft, the JSF carries a wide array of ground attack ordnance including rocket pods and anti-tank cluster munitions.

Joint Strike Fighter gives you an opportunity to experience all the unique features of these high-tech, sophisticated aircraft in both single player and multiplayer modes. It comes complete with a Dogfight : Getting Started Fast environment and four different campaign theatres representing potential hot-spots around the globe. Regardless of where you wind up, the action is fast and furious. You'll be facing some of the most modern threat aircraft in existence, including the deadly Sukhoi Su-35 Flanker and Mikoyan-Gurevich MiG-29 Fulcrum. Enjoy.

HOW TO USE THIS MANUAL

The purpose of this manual is to familiarise you (the player) with key commands, user-interface and gameplay features of Joint Strike Fighter. Reading this manual will not make you an expert pilot,- only playing the game will do that. But after browsing through this manual, especially sections pertaining to Dogfight : Getting Started Fast, you'll be able to jump right in with confidence. You'll be planning and executing combat missions in no time.

This manual is geared toward use of the keyboard commands, especially the in-flight portions of the directions. Players with joysticks and flight systems should refer to Appendix 2: Joystick and GamePad Buttons, for complete button mappings for GamePads, Joysticks and Rudder systems.

HEY I WANNA SHOOT SOMETHING

We've also set up the structure of the manual to allow you to get flying fast and check out the flight simulator portion of the game. Read Section 4 (Dogfight : Getting Started Fast) first to get right into the action. *Tip: There are many player view commands not covered in detail in this manual. We recommend you keep the Keyboard Layout Card handy or refer to Appendix 1: Keyboard Commands section the first time you fly a Dogfight mission and check them all out. If you get lost or confused about what viewpoint you're in,*

SECTION ONE

Installing/Uninstalling Joint Strike Fighter

pressing the F1 key in flight will always return you to the forward cockpit view.

SYSTEM REQUIREMENTS

Minimum Configuration:

Pentium 90 processor, Windows 95 or Windows NT operating systems (Windows NT version requires DirectX 5.0 or newer), 16Mb of RAM, 16bit graphics card, 60Mb Hard Drive space, Double-speed (2x) CD-ROM drive (4x in order to view movies smoothly), keyboard and mouse.

Recommended Configuration:

Pentium 133 or faster processor, Windows 95 or Windows NT operating systems (Windows NT version requires DirectX 5.0 or newer), 32Mb of RAM, joystick, 16bit graphics card, 160 Mb Hard Drive space, Quadruple-speed (4x) or faster CD-ROM drive, any Windows supported sound card.

Satori State Configuration:

Recommended Configuration, plus: 3DFx Graphics Acceleration Card, throttle system, rudder pedals.

Installing Joint Strike Fighter

1. **Insert the Joint Strike Fighter CD in your CD-ROM drive. If you have Windows Autoplay enabled, the Joint Strike Fighter Launch Program is invoked automatically. If Autoplay is not enabled, you can start the installation by double-clicking Setup on the CD's root directory. Once the program has started, press the Install Joint Strike Fighter button.**

2. **Joint Strike Fighter will prepare the InstallShield® Wizard. Read the instructions on the Welcome screen; when you're ready to proceed, click Next.**

3. **Using the mouse, select one of three install options:**

- ***Small:*** **Copies approximately 50 meg. of files to your hard drive. Sacrifices some game performance in favour of saving hard drive space;**
- ***Medium:*** **Copies about 70 meg. to your hard drive; balances disk space and performance;**
- ***Large:*** **Copies about 150 meg. to the drive; optimum game performance at the expense of hard disk space.**

4. **The installer automatically defaults the installation folder location to C:\Program Files\Eidos Interactive\ Joint Strike Fighter. Click Next if this is OK or Browse if you wish to select a different drive or folder. Joint Strike Fighter will now install the program files to your hard disk drive.**

5. **JSF requires DirectX version 5.0 or newer. If this is not already installed on your computer, select Install DirectX 5.0 in the Joint Strike Fighter Launch Program. This automatically invokes the DirectX 5.0 setup which updates**

your hardware drivers.

6. If you have a 3DFx based card, JSF will automatically detect this and load the appropriate drivers. If you have a newer Voodoo Rush acceleration card installed in you computer, select Install 3DFx Drivers in the Joint Strike Fighter Launch Program. This will enable Joint Strike Fighter to take full advantage of your Voodoo Rush 3D hardware.

7. To run Joint Strike Fighter, press Run Joint Strike Fighter in the Joint Strike Fighter Launch Program. Alternatively, click the Windows® 95 Start button and go to Programs>Eidos Interactive>Joint Strike Fighter>Play Joint Strike Fighter.

Uninstalling Joint Strike Fighter

In order to uninstall the game, press Uninstall Joint Strike Fighter in the Joint Strike Fighter Launch Program. Alternatively, click the Windows® 95 Start button and go to Program Files>Eidos Interactive>Joint Strike Fighter>Uninstall Joint Strike Fighter. Note that this removes Joint Strike Fighter completely from your computer, including all saved games.

SECTION TWO

BACKGROUND OF THE

JOINT STRIKE FIGHTER PROGRAM

Background Story

The Pentagon's Joint Strike Fighter (JSF) was launched in 1993 as the Joint Advanced Strike Technology (JAST) program. This followed the cancellation of two projects in the Clinton Administration defence review of 1993:the A/F-X,a heavy attack aircraft for the USAF and Navy, and the Multi-Role Fighter (MRF), which was intended to replace the F-16 with the USAF.

JAST was originally planned as a technology program, intended to develop features which could be incorporated in future aircraft. However, this emphasis changed during 1994-95, for a number of reasons. One was that JAST took over a Defence Advanced Research Agency (DARPA) project, under way since 1991, to develop an advanced short-take-off, vertical landing (STOVL) fighter for the US Marine Corps and Royal Navy. Another reason was that planners realised that there would not be enough money in the foreseeable future for more than one new fighter program, and that the technology existed to meet a very wide range of post-Cold War needs in a single design.

JAST accordingly morphed into JSF (the name was changed officially in early 1996), an ambitious project to develop a single design to replace some 3000 aircraft. The plans call for three basic versions:

- STOVL version for the US Marine Corps (642 aircraft) and Royal Navy (60 aircraft).
- Long-range, stealthy attack aircraft for the US Navy (300 aircraft).
- Low-cost F-16 replacement for the USAF (2036 aircraft).

It is also likely that the JSF will replace many of the 3,000-plus F-16s and F-18s which have been exported since 1978.

In November, the Pentagon kicked off the most competitive phase of the JSF competition by awarding Concept Demonstration contracts to Lockheed Martin and Boeing; the latter scored an upset victory over McDonnell Douglas, the third contender for the two contracts. This stage will take four years. A single winner will be chosen in 2001 to start engineering & manufacturing development, and the fighter is expected to enter service in 2008.

Lockheed Martin and Boeing will each fly two prototypes in the current phase, with tests starting in 1998. The prototypes will be designated X-32 and X-35 (probably in alphabetical order with Boeing's design being X-32). Out of each pair of aircraft, one will be designed to land and take off from a conventional aircraft carrier and the other will be a STOVL variant: one of each pair will also be tested in the Air Force configuration. The two teams will

also conduct extensive demonstrations of systems and avionics.

The idea of JSF is to produce a largely common aircraft, in different versions that meet the services requirements where they differ. Common requirements include:

- Longer range than the aircraft they replace (an 800-1000 km radius of action for the Marines, more for the other services).
- Subsonic cruising speed and supersonic dash (about Mach 1.5).
- Air combat manoeuvrability at least as good as the F/A-18 or F-16, and preferably better.
- Stealth characteristics similar to the F-117 or B-2.
- The ability to carry two precision-guided bombs and two AIM-120 AMRAAM missiles internally, for first-day missions where stealth is paramount, and to carry more weapons on pylons later in the war, as the defences are beaten down.
- Comprehensive avionics (multi-mode radar, FLIR, laser, self-defence systems), permanently installed internally, in a stealthy manner.
- Technology to reduce the cost of designing, building, operating and upgrading the fighter.

Service Requirements:

USMC/Royal Navy: Take off without a catapult from a short deck and to land vertically aboard ship, carrying unused weapons and reserve fuel. RN version must fit Harrier-sized elevators on Invincible-class carriers. Podded gun. Internal weapons:AMRAAMs and two 450 kg class bombs.

US Navy: Stronger structure and landing gear for carrier landings. Lower approach speed and low-speed handling and visibility requirements set by carrier-landing requirements. Spot factor (the space the aircraft occupies on a deck) same as F-18. No gun. Internal weapons: AMRAAMs and two 900 kg class bombs.

USAF: Minimum cost. Refuelling receptacle for Flying Boom. Permanent internal gun. Internal weapons: AMRAAMs and two 450 kg class bombs.

Boeing X-32

Boeing has been working on a tri-service fighter since 1992, convinced that this is the only way to achieve low costs.

The most important feature of the Boeing JSF design is that it has a single common engine with no extra powered-lift devices. The largest available engines are modified versions of the Pratt & Whitney F119, being built for the F-22, and the General Electric YF120,which was the F119's rival. The thrust of these engines, fitted with a new fan, limits the landing weight of the Marine version, which in turn limits its empty weight to about 10t.

To keep the empty weight down while providing enough fuel volume to meet the Navy's range requirement, Boeing has chosen a thick-section delta wing with no separate horizontal tail. Because it is difficult to design a fold joint in the thick wing, Boeing has eliminated the wing fold. Instead, the designers have kept the fighter short, so that the spot factor is still small. (The Marine/RN version has clipped wingtips to reduce its size still further.) The restriction on internal length has forced the designers to a radical chin engine inlet.

In the USMC/RN version, the engine exhaust is ducted forwards, for landing and take-off, to a pair of retractable nozzles located on the centre of gravity. In the other versions, the ducts and nozzles are removed and some of the space is used for a larger internal weapons bay.

Lockheed Martin X-35

Lockheed Martin's JSF design is very reminiscent of the F-22, with a clipped-delta wing and aft tail surfaces. This was deliberately done to reduce risk: the aerodynamics, structural and stealth technology of the JSF is drawn from the F-22.

Externally, the three versions are identical out to the wing box. Compared with the Marine version, the Navy/AF aircraft have larger wing flaps and bigger outer wing panels (providing more wing area) and larger horizontal tails. The USMC/RN version has a thrust-vectoring nozzle on the engine, which can tilt down through 100 deg for vertical landings. To provide more vertical thrust, however, it has a lift fan behind the cockpit. This resembles the fan section of a jet engine, but is actually driven by a gearbox and shaft of the main engine.

JSF Deployment

The JSF will be expected to take on a wide spectrum of missions for its various operators. For the US Marine Corps and Royal Navy, it will be the sole combat aircraft available. It will be used for air defence of the fleet (replacing the Marines' F-18s), strike against land and sea targets,and even close air support.

Typical weapons will include Joint Direct Attack Munition (JDAM), a bomb with inertial & GPS guidance which will replace many of today's laser-guided bombs, and the BLU-108 smart anti-armour weapon. In the air-to-air role, it will probably carry up to six AMRAAMs,or four AMRAAMs and two AIM-9X close-range missiles.

The US Navy will use JSF for deep-strike missions, going 'downtown' against its most critical targets (such as head-quarters, command centres and air bases), using heavy precision-guided weapons such as the 2000lbs JDAM and

short-range stand-off weapons such as the JSOW glide bomb. In this case, the AMRAAMs will be used primarily for self-defence against a look-down, shoot-down fighter that is close enough to represent a threat. (The F/A-18E Super Hornet will continue to be the Navy's primary air-defence fighter, and will also be used for defence suppression and stand-off attack.)

USAF JSFs will be used as F-16s are used today. In the first days of the campaign,they will be used with AMRAAM and AIM-9X to destroy the adversary's air force in the air by day, and (given their stealthy qualities) will also take part in the nocturnal attacks on air bases and air defence systems. Once air supremacy has been established, they will become the asset of choice against many mobile targets (missile launchers and ground forces) with weapons such as BLU-108. The JSF is also the most likely candidate to take on the suppression of enemy air defence (SEAD) mission, using JDAM, JSOW and HARM. In operations other than war, JSF would be the most likely aircraft to protect airlifters from SAMs and ground forces from missile or artillery attack.

The JSF will be unusually flexible in terms of basing. The US Navy version will be able to share bases with the USAF, because the two versions are almost identical in terms of support requirements. This will be useful if land bases are available but operating areas for carriers are distant (as was the case in Desert Storm).

The USMC/RN version will be able to operate almost anywhere. For example, STOVL fighters could operate from a land base with a restricted runway (supported by C-17s), something which might be useful if an adversary could attack land bases with missiles.

Sea platforms could include converted merchant ships, and the Navy has looked at very large, austere off-shore platforms that could support C-130s and STOVL fighters, and would be pre-positioned in possible conflict zones.

SECTION THREE

NAVIGATING THE MENUS

Main Menu

General

After the intro and the title screen, the first screen presented when you run Joint Strike Fighter is the Main Menu, shown in the screen below.

The Main Menu

The Dogfight Menu

The Dogfight menu allows you to set up and fly a combat mission in any of the war theatres included in the Campaign version of Joint Strike Fighter. If this is your first time playing the game, we recommend you use Dogfight to learn how the planes handle in combat and to become familiar with the in-flight game commands. Refer to section 4 for details on how to jump into the cockpit and plunge directly into the action.

The Campaign Menu

Accessing the Campaign menu enables you to start playing on the war theatres. Here all your missions are planned using the secretly acquired intelligence data and the line between success and failure is drawn. Experience in Dogfighting is preferred before starting on the campaigns. Refer to Section 5 for more detailed information on the workings of the campaign mode of JSF.

The Multiplayer Menu

On the multiplayer menu you can team up with up to 8 other human players over various network protocols. Use the Multiplayer>Create Game menu to configure your own multiplayer game or choose an existing game from the Multiplayer menu. Decide your team colour and teammates in the Game Lobby and play the game in any of the 4 war theatres available in JSF. Please refer to Section 6 for the complete description on how to configure your multiplayer games.

Quit

This selection will quit the game and return to Windows. Choosing this will save all settings and player data.

Select Pilot

This option allows you to create new pilots or select previously created ones for play. It also displays the cumulative career score for each pilot, allowing you to judge your progress in the campaigns. This is discussed in detail overleaf.

Options

The Options command provides access to the game control and viewing options. A detailed description of these options are given below.

Select Pilot Menu

General

By pressing Select Pilot on the main menu, you are taken to the Select Pilot Menu. This menu

allows you to create, modify or delete pilots.

The select Pilot screen has been clicked and the Edit Pilot screen is shown

Creating A New Pilot

Press New on the pilot screen to create a new pilot. Click on the Name box to change your name, and the Call Sign box to change your call sign. Assign the pilot an aircraft, either the Boeing X-32 or the Lockheed Martin X-35.

Selecting A Pilot

Click on a call sign on the Duty Roster to select a pilot. That call sign is highlighted in yellow and is now considered the active pilot.

Deleting A Pilot

In order to delete a pilot, first select your choice by clicking on the Duty Roster. After the selection is made, click the Delete button at the lower left of the screen.

You will be asked to confirm the deletion; click on Yes to complete the deletion or No to return to the Select Pilot menu without deleting the pilot.

Viewing Pilot History

In addition to name, callsign and preferred plane, all pilots have a history where all achievements are recorded. This is accessed by selecting Stats on the pilot screen. Use the arrow buttons to cycle through the different scenarios to see how the pilot has performed on the different campaigns.

Resetting Pilot History

If a campaign has turned from bad to worse, and disaster seems certain, you might feel like starting over. This can be done by pressing Stats in the pilot screen, and then clicking on Reset Scenario. You'll be asked to confirm that you really want to reset the scenario - click Yes to perform the reset or No to return to the Select Pilot screen without clearing the history.

View Information Movies

Details on the JSF program, the weapons systems and the selected aircraft are available in FMV format. These movies can be played by clicking on one of the three film icons in the lower right of the screen.

The Options Menu

General

The options menu really consists of three different screens: the game menu, the graphics menu and the sound menu. From these three menus,you can use the mouse to activate or deactivate, adjust or reconfigure various settings of Joint Strike Fighter. Most elements are also available from the in-game menus. Each of the screens are described below.

Tip : Players using slower computers are encouraged to adjust terrain, object and

graphical details features of the game to achieve optimal performance during flight.

The Game Configuration Screen

General

The Options menu with the Game tab selected

The Game Screen is where you are able to configure how the game behaves during play. The following items are available:

Input Device

This item simply lets you select whether to play using keyboard, mouse or joystick. Further configuration must be done from the in-game menu, or alternatively (for basic hardware installation) in the Windows Control Panel.

Enemy Skill

This option sets the skill rating of the pilots you and your wingmen will be flying against. Select one of five (5) settings: Rookie, Novice, Average, Veteran and Ace. The default setting is Average, with Rookie the easiest type of enemy pilot to fight against and Ace the hardest.

Rookies know only basic flight skills; they've been rushed to the front straight from training school. They haven't had the benefit of learning new skills and maneuvers from the more experienced pilots. As they advance through the skill levels, they learn more maneuvers, develop better gunnery and bombing skills and become more willing to use both in combat.

Aces are wily, crafty opponents, the survivors and victors of many aerial combat missions; they should not be underestimated. They know all the standard air combat maneuvers and aren't afraid to use them at any time, and have also developed excellent gunnery skills.

Remember, you may be a match for the Aces in the game, but your wingmen may not be so skilled. Think carefully before selecting the Ace opponent skill, or you may find yourself going through wingmen by the bushel. Commanding officers have been known to take a dim view of flight leaders who continually come home as the sole survivor of a mission. Besides, who wants to write a lot of letters that begin with the sentence, "We regret to inform you…"?

Start On Runway

This allows you to start the mission with your aircraft ready on the runway, without the need for taxiing.

Easy Aiming

This is a toggle-option. When selected, your plane's cannon lead sight will be in Easy Aiming mode.

You won't have to think much about

leading the locked target; the cannon rounds will actually lead themselves and try to 'chase' the target. This is not a guaranteed, automatic hit; however, the closer the locked target is to the centre of your aiming sight,the better the chance of a hit with this option selected.

When not selected, cannon rounds will behave using the normal laws of physics. This will result in a wonderful aerial display of tracer lights but far fewer gunnery kills.

Easy Landings
When toggled on, your undercarriage can take more of a beating, making it significantly easier to land.

No Wind
Though not obvious when cruising at high altitudes, a strong wind may prove problematic during landings and takeoffs. When this option is checked,your plane is not affected by wind and weather.

No Fadeouts
When this option is selected, pilots won't experience red-outs or black-outs when pulling extreme G-forces in combat due to tight turns, dives or climbs.

No Turbulence
Even with no wind, hugging the terrain at low altitudes makes for a bumpy ride. Checking this box will disable low-level turbulence.

Measurement System
Most pilots would look at you like you were from another planet if you used anything else than feet and knots to measure distances and speeds respectively. Check this box, however, if you are a novice and find the metric system easier to get the hang of.

Network Protocol
This option allows you to select which network protocol to use. The most common protocols are IPX and TCP/IP, but the game will take advantage of the Mplayer system and any protocol supported by Direct Play. Refer to Appendix 3 for details.

The Graphics Configuration Screen

General

The Options menu
with the Graphics tab selected

This screen allows you to configure how the game looks during play. Configuring these options can dramatically change the performance of the game, so you are strongly encouraged to play around with different settings until you determine what is right for you. The following items are available:

Screen Resolution

This option allows the player click left or right to select screen resolution from the list available on the computer. The available modes may vary between different machines, from as low as 320x200 pixels (lo-res) to super-hi-res (1280x1024 or higher) and everything in-between. However, players using computers with slower processors may experience some jerkiness when game graphics are set at the higher resolutions. We recommend experimenting with the lower resolutions until you find the one that performs best for you.

Big Pixels

If you want to run the game in low-resolution modes, and your graphics card/driver does not support this, JSF can emulate low-resolution by redrawing using big pixels. This means that the game is redrawn in low-resolution internally, and then doubled to fit the physical screen resolution. This option is not available in modes less that 640x400.

Black Lines

If the Big Pixels option is enabled, the Black Lines option lets you select how the scaling of the screen is performed. When checked, every other line is not redrawn, but left black. This is slightly faster than the alternative, when all lines are drawn.

Screen Pageflip

(This is one for those familiar with the inner workings of their PC. You may need to play around with this option in order to get the best possible results.)

Internally, the game is able to render both to System Ram or (if enough memory is available) to Video Ram. Enabling Page Flipping may increase your frame rate on computers with relatively fast graphics cards; on the other hand, performance may suffer if your graphics card is relatively slow.

Object Detail

This slider adjusts the relative amount of polygons used for rendering the 3D objects in the game. Moving the slider to the right increases detail, but possibly at the expense of performance.

Terrain Detail

This slider works in a similar way as the object detail slider, only this adjusts the detail level on the terrain. Moving the slider to the right will increase the definition of the landscape and increase the number of ground objects, but again at the expense of refresh rate. Keeping this value around the centre is recommended.

Transparent Smoke

When checked, this option improves the appearance of the smoke-trails in the

game by using transparency. Performance may suffer on slower computers.

Transparent Shadows

When this box is checked, shadows are projected onto the ground with transparency, rather than as single colour silhouettes.

Transparent Explosions

Using transparent explosions will improve realism, but can be a serious performance hit. Keep this in mind if you are experiencing slowdown when viewing large explosions.

Lensflares

Lensflares emulate the optical effect created by a camera when exposed to strong light sources, for instance from the sun or a rocket blast. When checked,these effects are enabled. Disabling the effects will, however, improve performance.

Particles

When enabled, a particle system is used for rendering weather effects like wind and rain. This may reduce performance on slower computers.

3Dfx

Hardware rendering is enabled by checking this box. By default, 3Dfx acceleration is enabled if a 3Dfx card is detected in the computer. If no card is detected,this item is inactive.

The Options menu with the Sound tab selected

Sound Effects

Most actions performed in flight, such as firing a weapon and raising the landing gear, have sound effects that play when the action is performed. This box enables such sound effects.

Sound Volume

When sound effects are enabled, this slider adjusts the volume of the sound effects.

Music

JSF features several original music tracks that play during flight. This check-box determines whether music is played.

Music Volume

If music is enabled in the item above, the music volume can be adjusted here using the slider.

Speech

In-game speech is enabled by default, as this is one of your primary sources of information. It can, however, be disabled by unchecking this box. Note that this makes you totally rely on text messages for such things as radio communication and flight computer messages.

Speech Volume

When speech is enabled, this slider determines the volume of the speech.

Reverse Stereo

On some computers, the placement of the loudspeakers are exchanged. Checking this box reverses this.

Mute

When checked, all sound (sound effects, music and speech) are turned off.

SECTION FOUR

DOGFIGHT: GETTING STARTED FAST

General

Selecting Main Menu>Dogfight takes you to the Dogfight Settings menu. The Dogfight option allows you to hone your skill in the noble art of dogfighting, something which will come in handy as you progress through the campaigns. You'll be able to challenge increasingly more difficult enemies in the different scenarios in a variety of different settings. These parameters are described below.

The Dogfight Menu

In order to customise the Dogfight session you have a set of four options which determine the combat conditions:

Time Of Day

This option lets you decide at what time during the day the dogfight will take place. While the enemy may be easily seen at day-time, you may have to resort to systems like night vision and the synthetic object overlay when battling it out at night.

Weather

By clicking on this item, you'll be able to select in which weather condition you wish the fight to take place. Different regions on the globe have different weather types, which means that the available options will vary from scenario to scenario.

Guns Only

This option disables Air to Air missiles in the Dogfight session. Though not strictly realistic, it makes for some interesting aerial duels in the true spirit of the great aces of WWI and WWII.

Scenario

Here you set the theatre in which the dogfight takes place. Not only do the enemy aircraft become increasingly more capable on the later scenarios, the enemy pilots are also more skillful, aggressive and lethal.

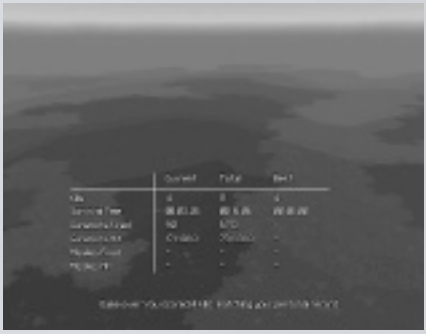
Playing

When you start the Dogfight session, you start out against a wave containing just one single enemy plane. If you destroy this first plane, your weapons are replenished and a new wave appears.

For every wave destroyed another plane is added, thereby giving an increasing difficulty level. This is further enhanced by the fact that, as time progresses, the enemy planes also are of increasingly better types. The dogfight session ends when you eventually are killed or when you decide to leave the session.

Statistics

When the Dogfight session is over, a statistics screen appears that lets you compare your dogfight performance to your previous merits and your own personal best. By comparing with old records, you'll soon see progress as you develop the dogfighting skills needed to succeed when taking on the campaign game.



Dogfight Statistics

SECTION FIVE

Flying a Campaign

General

While an individual mission has specific tactical goals (the destruction of a convoy or interdicting airspace over an enemy target, for example), a campaign is a series of individual missions designed to achieve one or more long-term or strategic goals. Take the air battle in the Gulf War, for instance: One of the major strategic goals of the campaign was to hurt Iraq's air and ground forces badly, making it easier to drive Iraq's army out of Kuwait and, in the process, save Allied Force's lives. To this end, thousands of individual air missions were launched to bomb ground units, shoot Iraq's air force out of the sky and destroy command and communications links.

In a JSF campaign, you are given similar strategic goals, based on one of the four hypothetical campaign scenarios included with the game. As a wing commander, your job is to plan and execute a series of tactical missions to help achieve the campaign's strategic goals. You accomplish these goals by destroying all the primary targets indicated in the mission planner. The object category is determined by a higher command.

The Campaign menu.
Select your campaign to start or re-enter

Starting A Campaign

1. To begin a new campaign or enter one in progress, select Campaign from the Main Menu. The War Theatre selection screen will appear. At any time you may select the Back button at the bottom right of each screen to return to the one previously displayed.

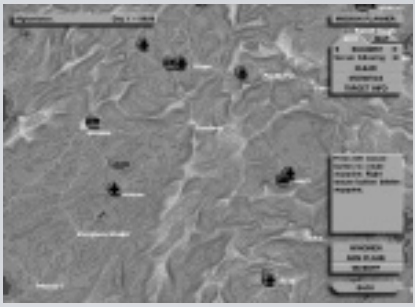
2. Highlight either one of the four scenarios using the mouse or the keyboard. In the box at the bottom of the screen a brief background story and a mission summary will appear, relevant for your current selection. Activate the scenario by clicking the mouse or hitting enter.

3. The first time you activate a scenario the complete mission text will be printed to the screen. You may speedup the text by hitting enter, space or by clicking the mouse. After loading, the Mission Planner will appear.

The Mission Planner

General

As a wing commander your main objective is to plan the best possible campaign for you and your wingmen so the main strategic goal can be reached with a minimum of casualties. This means you will have to plan your missions carefully before getting airborne. All planning is done prior to take-off in the Mission Planner, which loads automatically when you select a scenario.



The main Mission Planner screen

The Mission Planner is essentially a topographical map indicating the position of anything essential and important for planning a mission. This includes cities, factories, airports and roads (in grey), but most importantly all friendly installations and enemy targets indicated by the coloured icons. The icons pinpoint all enemy, friendly and civilian/non-combat ground and air units in your area of operations.

The planner operates in two different modes: Edit and Map mode. In Editing mode you can manually or automatically form a mission by creating waypoints and selecting targets. Map mode allows you to manipulate the map information displayed in the mission planner, this is detailed in the section entitled Mission Planner Usage below.

Mission Planner Map

General

The Mission Planner map is a topographical map displaying the current situation in the activated scenario.

All enemy targets and friendly installations are displayed using several different icons and colour codes. The position of each icon is altered according to the movement of the unit as the game progresses. If the unit is destroyed you will be notified and the icon will be removed from the mission planner.

Together with the icons marking the targets you will also see the waypoints and flight path displayed on the map. A waypoint is a position used by the flight computer for navigation placed in the mission planner prior to take-off. For more information on how to manipulate waypoints, refer to the section below entitled Mission Planner Usage.

Icons

Each icon on the map marks an enemy unit. This means an icon usually symbolises more then one target. The icon position is the centre position of all the objects included in that particular group. Each icon is colour coded, indicating the

object category. On the mission map you may find icons with the following colours: red, green and blue. Any red icon is an enemy target and should be considered as a potential threat. Both the green (neutral) and the blue (allied) symbolise friendly icons. Destroying these will have a negative impact on your statistics.

When you look on the mission map you may notice a red circle centred on some of the icons. The red border is a Surface-to-Air Missile Engagement Zone (SAM MEZ). When flying within this zone, you and your wingmen are subject to being detected and fired upon by enemy SAM installations.


Fighter/Bomber


Helicopter


Air Transport


AWAC Aircraft


Airport


Military Base


Military Camp


Factory


Nuclear Facility


Harbour


Radar Installation


SAM/AA Installation


Oil platform


Warship


Cargo Vessel


Submarine


Transport


Infantry Vehicle


SAM/AA Vehicle.

Waypoints

Waypoints are fixed three dimensional positions (longitude, latitude and altitude) used by the flight computer for navigation. They are easily created with the mouse or automatically with the Suggest option when in editing mode. Read more about waypoints and the their usage under the section Mission Planner Usage.

Mission Planner Windows

General

The Mission Planner Windows contains all the text, buttons and bars displayed in the mission planner. They may be hidden by selecting the button in the upper right corner labelled Mission Planner or by tapping the spacebar. Use this when planning a mission if any icons are concealed by the mission planner information text and the buttons. *Note: While any pop-up window is activated the Mission Planner Windows will be disabled and the buttons, bars and text-*

boxes will be changed in intensity. to get focus back to the windows you have to close the active window.

Planner Manager Window

General

The Planner Manager is the window in the upper right corner, below the Mission Planner caption or button. The manager has two tab dialogs which decides which state or mode the planner currently has active.

Edit Mode

General

To get in Edit Mode you select the Edit tab dialog from the Manager Window. When you are in editing mode you can create and alter your waypoint path by changing the position and height of your waypoints. The waypoints are uploaded to the on-board computer upon takeoff and used for navigation by the autopilot.

Suggest

The Suggest option will automatically suggest the closest visible primary target. If no primary icons are displayed the nearest secondary target will be selected. If you are not content with the target selected you may cycle all targets with the arrows left and right of the Suggest label. In Map Mode you may select which icons will appear on screen by checking the corresponding options, refer to the Map Mode section below for details.

Terrain following

If you enable the Terrain following option the suggested waypoints will be forced to the minimum height for low-level contour flying, keeping the fighter below radar. If no waypoint path or target have been previously suggested, enabling or disabling this option will automatically select a target and suggest a path.

Clear

Selecting Clear will delete all waypoints and target selections from the mission planner.

Statistics Window

From the Edit menu selecting Statistics will display the current scenario statistics. Select the Done button to close the Statistics Window.

Target Info Mode

When you click on this option the Mission Planner enters Target Info Mode. The change of state is indicated with a question mark in the lower right of the mouse pointer. In addition all the icons with target information visible in the Mission Planner Map are highlighted. Selecting a highlighted icon from the map will display the relevant target information with the corresponding photos and images made available by Mission Control. You may close the window by selecting Done at the bottom right corner of the window. At any time you can return to normal planner operation by clicking the right

mouse button or just by selecting any function from the Mission Planner Windows.

Tip: When in editing mode, pressing and holding the CTRL key will activate the Target Info Mode. It will remain active until the key is released or you exit Target Info Mode as mentioned above.

Map Mode

General

To get in Map Mode you select the Map tab on the Manager Window. When this is selected you will see on the Map menu a list of options divided into three groups: Object category, target class and map settings. Checking any of these settings will influence the information that appears on the Mission Map.

Object category

Only the targets that match any of the checked priorities will be displayed. This means if you only check the primary option, only the primary targets will be displayed.

Target Class

There are three different target classes and only the icons containing objects of the selected class will be displayed. When you plan a mission you might want to focus only on airborne targets. To do this, you would only check the air option and leave the ground and mobile blank.

Map Settings

General

The Map Settings are useful features when planning a mission. Both the SAM MEZ and the names option are checked by default.

SAM MEZ

If the SAM MEZ is checked the missile engagement zone will be displayed. Use the MEZ to avoid unnecessary contact with SAM sites on your way to the designated target.

Names

When the names option is checked the city and area names will be plotted on the Mission Map.

Grid

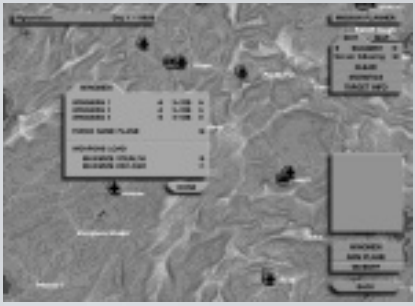
The grid is useful for calculating distances when planning a mission, but maybe most importantly for easier tracking of the enemies movements. The grid scale is 5400 NM.

Time Skip Window

In the upper left corner is the Time Skip bar indicating which scenario has been activated,the current day and the scenario time. When selecting this bar a dialog box will be displayed, giving you the opportunity to skip a maximum of eight hours at once to avoid bad weather and/or night flying conditions.

Wingmen Window

In addition to the two JSF contenders, the F-22 Raptor is also scheduled to be in active service at the time when the action in Joint Strike Fighter takes place. Your wingmen will always have the option to fly any of the three aircraft,at your discretion. You'll need to select which plane your wingmen will be flying, and whether to optimize the payload for stealth or mission effectiveness. This is done from the Wingmen Menu.



The Wingmen Window

To activate and use the menu:Click on the Wingmen option in the box at the lower right hand corner of your screen. The Wingman menu will be activated.

Click on the arrows next to each wingman to set his aircraft. Click on the Force Same Aircraft box if you want all three wingmen to use the same aircraft at all times. Under the Weapons Load section,click the radio button next to either Maximise Stealth or Maximise Payload. If you choose Maximise Payload,every hard point on the aircraft will carry either a bomb or missile. However, this will make it easier for enemy radar to detect the aircraft. Selecting Maximise Stealth reduces the payload,but makes it much harder for the aircraft to be detected.

When you're finished, click the Done button.

Now you're ready to check the aircraft payload and, if you wish, change the weapons your aircraft will carry into battle.

The Arm Plane Window

Arm Plane Window

Beside the cannon, there are a variety of Air-To-Air (A2A) and Air-To-Ground (A2G) missiles and bombs that can be carried by the JSF. Choosing the right payload to complete the mission is vital; cluster bombs are effective against mobile units, but JDAM are more effective against fixed targets.

The game will automatically select a payload configuration that includes both A2A and A2G weapons. However, you may have your own preferences on what weapon best completes the mission; the Arm Plane menu allows you to check and alter this configuration before flight to suit your needs and preferences.

In the previous screen, you can see the Arm Plane Window with the current weapon configuration shown on the graphical representation of the fighter. There are eight hard points on the JSF; four of which are internal attach points. Except for the rocket pod, which may only be fitted on the wings, most weapons available can be fixed to any hardpoint on the aircraft.

The weapons are shown to the right, divided into Missiles and Bombs. To see a description of the weapon and its capabilities, simply move the mouse pointer over the weapon; the description will appear in the text box at the bottom of the screen. See also Appendix 5:Weapons, for full descriptions.

Drag-and-drop Weapon Selection

The Arm Plane Window functions as a drag and drop editing box. To arm the plane with a missile, simply select the weapon with the pointer before draging it and place it on any of the hardpoint on the image to the left.

When you drag a weapon to a hardpoint already holding a weapon, the new selection will replace the former. If you drop a weapon anywhere other than a hardpoint, the selection will be discarded.

Changing The Default Weapons *Configuration*

You may carry any or all of the weapons in the game, limited only by the carrying capacity of the aircraft and its number of hard points.

To add a weapon to an empty hard point or swap out the current weapon for a new one, do one of the following:

- Move the mouse pointer over one of the weapon icons in the right-hand list;
- Left-click and hold down the mouse button;
- Drag the weapon to the desired hard point;
- Release the left mouse button. The weapon is now loaded onto the hard point.

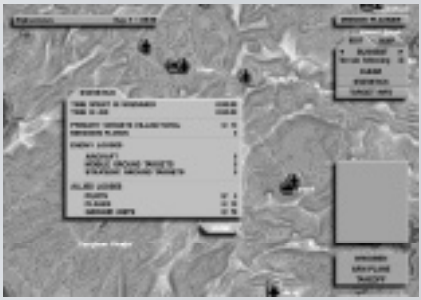
To add or subtract fuel from the aircraft: Locate the Fuel load gauge, located under the aircraft silhouette;

- Click on the black arrow icons to the left and right of the gauge to subtract or add fuel to the aircraft.
- Removing fuel from the aircraft will not allow you to put more ordnance on the aircraft. It will, however, make the aircraft more agile in flight, giving it an advantage in combat.
- The selected configuration will be automatically saved for future use. You can go back to the default configuration by clicking on the Default button at the bottom left of the screen.

When you're ready to jump in the cockpit and fly the mission, click Done.

Campaign Statistics Window

To view your overall campaign statistics from the Mission Planner, click on the Statistics button. When you're finished examining the stats,click Done to return to the Mission Planner.



The Mission Planner Statistics screen

Mission Planner Usage

Planning A MIssion

Planning missions is quick and easy. It involves a five step process:

1.Decide on one or more targets;
2.Plan and select flight waypoints;
3. Choose which aircraft your wing will fly;
4.Arm the aircraft;
5.Fly the mission.

There are four clickable windows to assist you in these tasks, accessed from the Planner Manager Window on the right-hand side of the screen. Detailed information about both these windows and their functions are given in the section above entitled Mission Planner Windows.

Selecting A Target

To plan a mission,first locate your take-off position. Your plane is indicated on the map by a blue plane icon surrounded by a green circle. The green circle indicates the Base or waypoint 0 and cannot be removed. After you have successfully located your fighter it's time to select a target.

Though the primary targets should be your first concern, any enemy unit should be considered a threat. All red icons are hostile, so selecting any of these are fine for a mission. But if you want to focus on campaign progress you might want to select only primary targets. This is easily done by clicking Suggest from the Edit menu. Alternatively, check the primary object category checkbox from the Map menu. This allows you to locate and identify just the primary targets for better mission planning.

When selecting targets you should consider the target composition. If the target is only lightly protected, you might want to leave some wingmen behind.

Getting Information On Enemy Targets

While you may plan a mission to any target in the Mission Planner, Headquarters will have designated priority targets that they wish attacked. You cannot complete the Campaign until you've destroyed all of primary targets.

With the CTRL key held down or while selecting Target Info from the Edit menu, certain targets will be highlighted on the

Mission Map. Intelligence information about these targets, including information on the weapons and installations in the target area is available by clicking on it's icon. This information can be crucial in planning what payload to carry on an attack mission. Rarely, if ever, will intelligence information be available on non-priority targets.

Target Info screen showing information on a priority target

To see the intelligence information about a priority target:

1. Click on Target Info, on the Edit Menu;
2. Left click on one of the priority targets on the Map;
3. The Info screen will appear. When you're finished,click on the Done button to return to the Mission Planner.
4. You may also right-click when no Info screen is displayed to cancel the Target Info command and return to the Mission Planner.

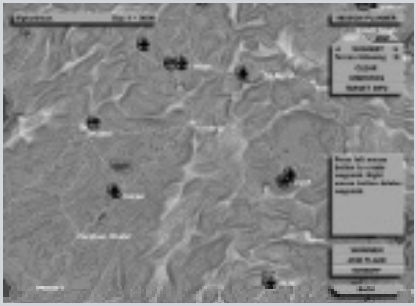
Once you have decided which target you'll be attacking for the mission, it's time to plan a route to it.

Planning A Route To The Target

General

It's important to remember that the JSF is designed to be stealthy. Not only is it built using stealth technology (which gives it a greater reduced radar signature), it is designed to be able to sneak into a target at very low altitudes, using terrain features to help hide the aircraft from enemy radar. To this end, it has a new version of the terrain-following radar/ autopilot electronics package. When the aircraft is placed on autopilot, it uses the onboard Terrain Following Radar to maintain a low altitude and steer itself around terrain obstacles.

Your objective as a wing commander should be to plan a route to the target that takes advantage of the surrounding terrain as much as possible.



The Suggest button has been clicked

Generating Waypoints To The Target:

The Suggest Option

The Mission Planner has an option to help you plan a route to priority targets. Here is how you take advantage of this option: On the Edit Menu,find the Suggest option. There are black arrows to the left and right of the Suggest button. Click on them to scroll forward and back through the current list of priority targets.

As you click to scroll through the targets, the Mission Planner suggests a route both to the target and back to your Base. These routes are denoted with a bright green line, interspersed with bright green boxes. The boxes are the actual waypoints which the plane will fly towards. Each waypoint includes altitude information. If you want them to be terrain following you check this option, if not the altitude will be set to 32000 ft. All targets which have been selected will be surrounded by a green circle, in the same way as your own plane. To get information about each waypoint move the pointer over it, and the text will appear in the text box on the right-side of the screen.

If you wish to accept this route, you need do nothing else; move on to the Arming The Fighter and Wingmen sections below.

Manually Editing Waypoints

General

As a general rule you always add waypoints with the left mouse button and delete with the right mouse button. you can not edit waypoints in Map Mode.

Usage

To create your own waypoint, just move the mouse pointer to the point on the map where you want the waypoint to appear, then left-click. You can use this method to plan your own route to a target, without using the Suggest option.

Note: All waypoint editing features will work for both your own created waypoints and those created by the Suggest option. If you wish to delete a waypoint,centre the mouse pointer on the waypoint box and right-click. The waypoint will disappear and the Mission Planner will fill in the route line.

If you wish to move a waypoint,centre the mouse pointer on a waypoint, then click and hold down the left mouse button. Now move the mouse; the waypoint and route line will move with the pointer. Move the waypoint to your desired location and release the left mouse button.

If you wish to alter the height of a waypoint, just left-click on the waypoint box to toggle through a range of preset waypoint altitudes. The height will be displayed in the textbox.

All waypoints currently on the map can be cleared by clicking on the Clear menu option, on the Edit Menu.

Tip: If you press and hold the ALT key, left-clicking on a waypoint will shift the altitude between terrain following and the maximum height.

Zooming: Getting A More Detailed Look At The Map

General

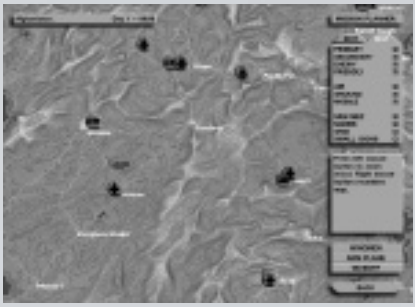
If you wish to get a more detailed look at the map this can easily be done with the mouse. Select Map mode and left-click to zoom. The map will be centred around the mouse pointer. If you want to continue editing waypoints when the map is zoomed, you just have to switch back to Edit mode.

Usage

The first thing you need to do is to select the Map tab dialog in the upper right corner of the screen. This will activate Map mode enabling you to manipulate the Mission Planner Map. When you are in Map Mode the mouse pointer will change to a magnifying glass until you go back to waypoint editing. Move the cursor to the point on the map you want to examine and left-click. The map will zoom in for a closer look.

To return to the larger map, left-click again. Repeat the procedure for each spot on the map you wish to examine in more detail.

When you're finished, click on the Edit button to return to Edit Mode for creating and editing waypoints.

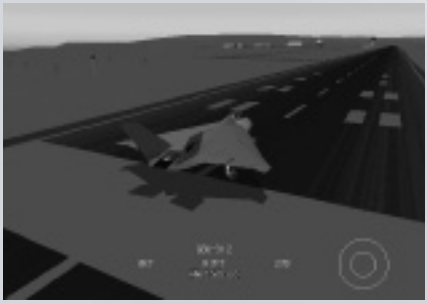


The Mission Planner with the Map tab selected

Flying A Mission

When you're satisfied with your route and waypoints, weapons load and the wingmen's aircraft,it's time to load up and fly the mission.

To do this,simply click the Take Off button in the lower right hand corner of your screen. The flight simulator will load and you'll be in the cockpit of your aircraft, ready to take off.



Ready for Takeoff!

General

The very first time you start a campaign and click on Take Off in the Mission Planner, your aircraft will not be on the runway, but nearby on a taxiway. You'll need to start your engines, add some power, brake while on the ground and steer the aircraft to and turn onto the runway to takeoff. refer to section 8:Flying the Plane for details.:

1. Request takeoff permission.
2. Turn on engine and increase to taxi speed (approx. 15 knots).
3. Taxi to the runway.
4. Extend flaps and go into afterburners.
5. Pull the stick back and when airborne retract the your gear.

How to taxi and take off

Whenever you start a mission there are several things you may do to facilitate your takeoff.

One of the first things you should do is to radio the tower and ask for takeoff permission. Doing this the tower will normally grant you permission to takeoff and turn on the runway lights. This makes taxing easier as also the taxiway will be lit. For more information on how the radio works, see Appendix 4: Radio communication.

When you have located the correct taxiway you are ready to increase the thrust and accelerate to taxing speed and manoeuvre to the runway:

- To add power to your aircraft and increase speed,press the 1-9 keys.
- To steer your aircraft, use the rudder keys, the ',' (comma) key to steer left and the '.' (period) key to steer right;
- To brake your aircraft and slow down, use the B key;

Tip: Press F11 for satellite view, using PageUp and PageDown to zoom in/out. Steer your aircraft forward and turn onto the runway, using the brake as needed, and coming as close to facing down the centreline stripe as possible. Then use the rudder keys to turn left or right, facing down the runway, with the centreline down the middle of your screen.

Press the CTRL + 0 (zero) key to engage afterburners. When the speed indicator on the HMD is at 150 mph or greater, lift back on the joystick to pitch the nose of the aircraft up and take off.

Tip: To save the time and trouble of taxiing out onto the runway each time you fly a campaign mission, use the ESC key to activate the in-flight menu while in the cockpit, then press the Right Arrow key until the Game menu is highlighted and press Enter. Then use the Down Arrow key to highlight Start On Runway and press Enter again. From now on, all campaign missions will start on the runway, ready to start engines and fly without the need to taxi onto the strip. Press ESC again to return to the cockpit.

Getting To The Target

General

The general idea is to manoeuvre your fighter according to the plan you laid out in the Mission Planner. This can be done either manually or by activating the autopilot.

Autopilot

Once in the air, getting to the target is pretty easy, if you follow these steps:

1. Gain at least 1000 feet of altitude;
2. Press the A key to activate the Autopilot. The HMD will display the word WAY above the altimeter tape; when the autopilot is set to follow waypoints and it is activated you can read the word WAY on the upper left side of the HMD.
3. With the Autopilot activated, the aircraft will automatically move from waypoint to waypoint.
4. If you wish to bypass a waypoint, press the W key to instruct the autopilot to take you to the next one in the route. Use the CTRL + W key combination to cycle backwards to a previous waypoint.
5. When you reach the target, press the A key to deactivate the autopilot and make your attack.

NOTE: Your autopilot will never turn itself off, even if you are bounced by enemy aircraft. If you are bounced by the enemy, you need to manually deactivate the autopilot if you wish to turn and fight.

Manual Approach

When you are airborne you can easily follow the waypoints manually, but for this to be feasible make sure the HMD is turned on. Press the Del key on the numeric keypad to toggle the HMD on /off. You will be manoeuvring using the heading tape on the top of the HMD screen. The bearing (compass direction) of the currently selected waypoint will be indicated on the tape by the waypoint carat pointing in the direction you need to turn. You should direct the nose directly towards the carat, which means keeping the carat at the middle of the screen. When you have reached the waypoint you will be notified by the on-board computer, and you need to activate the next waypoint by pressing the W.

There are three types of waypoints, which waypoint you are following can be seen in the lower right corner of the screen,if you are heading towards a Engage waypoint it means you are flying towards a selected target.

When you have reached your target select the appropriate weapon and attack.

Note: To see the waypoint information you have to be in navigation mode; press the N key to activate Nav mode.

To cycle backwards between the waypoints press CTRL + W.

Attacking Ground Targets

1. Deactivate the autopilot;
2. Use the Backspace key (or the proper button on your joystick, see Appendix B) to cycle through your A2G weapons, until the one you want shows as active on the HMD.
3. Using the radar and arrow information on your HMD, manoeuvre your aircraft to line up on the target.
4. When the target reticle is over the target or you achieve a target lock, press the Spacebar to drop the bomb.

Remember The Hatch

When you are ready to attack your target, you have to prepare your weapon. If an external weapon have been selected, you need do nothing more. But if the weapon is carried inside the fuselage, you will need to open the hatch.

Remember opening the hatch increases your radar signature, and should therefore be done as late as possible during the attack.

Ending The Mission

General

When you have completed your mission and returned to your airbase, you are ready to end your mission. When you have parked on the tarmac it is time to Quit & Save.

Go Home!

To return to your base:

1. Activate the autopilot by pressing the A key;
2. The autopilot will follow the waypoints to your home base. If you haven't planned a return waypoint path,activate waypoint 0 (zero) to get back to base.
3. When you have reached the base de-activate the Autopilot by pressing A again;
4. Land the plane on the runway.

The Mission Debriefing

General

When you have finished a mission select Quit & Save from the in-game menu. You will exit the game and automatically enter the Mission Debriefing.

The Mission Debriefing screen will give you a summary of your mission's success or failure. It will include the area map, with points of action during the mission shown as small explosion-icons.

Mission Debriefing Map

General

This is the same map as you have seen in the Mission Planner. This includes all the icons and additional information displayed on the Mission Map. The only addition is a explosion-icon pinpointing the position of any destroyed objects and a blue line that shows that path you have flown.

Flight path

When you are in the mission debriefing you have the option of displaying your flight path. If you check the option in the Manager Window you will see a blue line. This is the distance covered by your fighter during your mission.

Mission Debriefing Windows

General

Note: While any window is activated the debriefer will be disabled and the buttons, bars and textboxes will be changed in intensity. To get focus back to the debriefer you have to close the Statistics window,

Scenario Bar

The scenario bar indicates the scenario progress. If everything is the way it should be, and your game is progressing normally the only text printed in the scenario bar will be Scenario Progress. If you on the other hand have for some reason failed, and the scenario is lost you will be notified in the scenario bar – in addition to the information screen that will be displayed when you exit the Mission Debriefing.

Debrief Manager Window

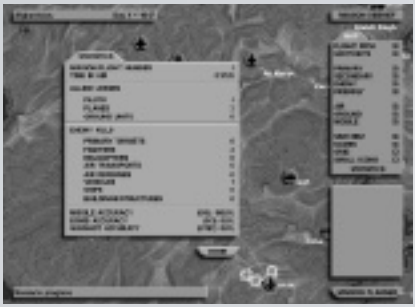
In the Debreif Manager Window you may select the information you want displayed on the Mission Map.

The options are similar to the Map menu, refer to the Mission Planner Windows paragraph above, except for the additional options: Flight Path and Waypoints. To see your flight path or waypoints, you select the corresponding checkbox.

Statistics Window

To get the overall statistics of the mission, click the Statistics button. This window lists several details regarding your last mission; such as flying time, the number of allied and enemy object destroyed and weapons in percentage.

When you are done reading the statistics you close the window by selecting the Done button in the lower right corner of the statistics screen.



The Mission Debriefing Statistics window

Progress Bar

The progress bar is located in the bottom left corner of the screen. This is where the game status will be printed. If you have failed completing the scenario or you have successfully finished the campaign the text will change accordingly.

If everything is normal and no special cases have occurred the text will read “Scenario Progress”.

Mission Debriefing - General

Move the mouse pointer over any of the explosion icons to see a brief action description of what was destroyed and when it occurred.

Using The Debrief Manager Window

Exiting Mission Debriefing

After ending a mission the debreifing is automatically loaded. On the mission map you will be presented with a mission summary. When you are done studying it and you are ready to move on, the mission planner will be loaded and your plane prepared for your next mission.

To exit the mission debriefing click the Mission Planner button in the lower right corner.

Continuing a Campaign

When you exit the Mission Debriefing your plane will be prepared and the game progress saved. The campaign will automatically continue from where you left off.

Note:The game progress does not include waypoints or target selections, which means all waypoints will be lost when you quit the Mission Planner.

SECTION SIX

Multiplayer Dogfight

General

The JSF Multiplayer Dogfight option allows you to go head to head with up to eight players at the same time. In this section you'll find out how to start or join a network game and how the game behaves when started. A closer description of the individual network protocols can be found in Section 3.

Starting your own game

The following steps need to be undertaken in order to start your own multi-player game:

1. **Choose the protocol you wish to use on the Options>Game menu, and then continue to the Multiplayer menu by selecting the Multiplayer item on the Main Menu.**

Multiplayer Menu

2. **On the Multiplayer menu select the Create item. This activates the Create Game menu.**

3. **The Multiplayer>Create Game menu contains five options that allows you to modify the default multiplayer game:**

- ***Time Of Day:*** **Allows you to change the hour at which the multiplayer game takes place. Using the late hours of the day decreases the possibility of visual detection, which will force players to fly and track using instruments instead.**
- ***Weather:*** **Switches between the different weather conditions. Note that the different theatres have different types of weather e.g.:Snow, rain and clear.**
- ***Number Of Kills:*** **This options selects the duration of the game. You can choose from a list of 5, 10, 15, 20, 25, 30 or UNLIMITED. If UNLIMITED is selected, the game will last until the last player leaves the game. Otherwise the game will continue until a player or a team has reached the selected number of kills.**
- ***Guns Only:*** **Enabling Guns Only will remove the Air to Air missiles from the multiplayer game.**
- ***Theatre:*** **Lets you choose the theatre to use for your multiplayer game. Choosing between the different scenarios also changes the weather, thus increasing the difficulty of flying on scenarios with demanding weather conditions.**

Multiplayer Create Game Menu

4. After adjusting the multiplayer game to your needs, select Start to create the multiplayer game and proceed to the Game Lobby.

Joining an existing game

1. Choose the protocol you wish to use on the Options>Game menu, and then continue to the multiplayer menu by selecting the Multiplayer item on the Main Menu.
2. On the Multiplayer menu select the Refresh item, this will, after a while display a list of active games in the Games in progress window. Each game has its own title (e.g. "JSF - Game created by Snapper") and also displays the number of free slots for new players. For more information on a multiplayer game, highlight a specific game. This will make a more specific description (including a theatre, weather and time of day) appear in the Game information window.
3. Now just select the active game you want to join,and you will automatically proceed to the Game Lobby menu.

Rules of play

General

When you're spawned in the game, you start of with a set amount of weapons and about two minutes of fuel (at 90% thrust). The rules of the game are described below.

Team Score

The score of a team is counted as the average of kills achieved by each team member. This means that playing in a big team is not necessarily an advantage, as players who do not contribute significantly will lower the team average.

Duration Of The Game

Depending on the settings selected by the host of a network game, the play may continue indefinitely (when unlimited kills are selected) or until one team has achieved the selected number of kills. At this time, the game freezes, and the statistics screen (described below) is shown.

Replenishing Fuel And Ammo

When blasting away at your opponents, you'll soon find your fuel and ammo running low. There are two ways to replenish these:

Fly through a reset point: In each theatre there is an object suspended in the air close to your starting position. Flying through it gives you fuel and weapons, but leaves you vulnerable while approaching.

Land at a nearby airbase: Close to the area where the multiplayer game takes place, there is an airbase which can be used for replenishing your plane. This also leaves you extremely vulnerable while approaching the landing strip, so it should be

attempted only as a last resort when you are out of fuel.

Multiplayer Lobby

When you enter the Game Lobby you'll see a window that displays the active players in the multiplayer game. The window shows all the information about you, the highlighted player, and the other players. The player information is split into five groups:

- *Team:* Each player is initially given their own team displayed as a colour-bar in the team colour. Selecting your own colour-bar will result in a team change, whereas selecting another player's colour-bar will join the team of that player. NOTE: The player who's team you joined,might change his own team. So you'll have to re-select his colour-bar to rejoin his team.
- *Player:* Displays the call-sign identifying the player.
- *Kills:* Displays the kill count of the player.
- *Deaths:* Tells how many times the player has died.
- *Status:* This indicates the players' states in the game (i.e. Playing, Dead or Loading).

Just below the Players Window is a status bar which displays your status in the multiplayer game. There are three different states, as follows:

- *Waiting for server response:* This means that you haven't been accepted in the game yet. Don't worry if this takes a while - if for instance the GameServer is busy loading, no players will be accepted until it's finished loading.
- *Ready to go:* The GameServer has accepted you as a participant of the game, and you can now select Go to start playing.
- *Game over:* This means that a team or a player has reached the number of kills set by the game host. All you can do is to leave the game and find another game to join.

After attaining Ready To Go and having selected your team colour, simply select Go to start the game.

Statistics

General

When playing you are able to view the advancement of the players by using the statistics screen. JSF has two different statistics screens that can be used during a multiplayer game:

Multiplayer Statistics

Simple Statistics

If enabled,this displays a horizontal list of the different team colours. The team values are listed so that the team with the highest average of kills is shown first.

Full Statistics

When using the advanced statistics, the horizontal list from the simple statistics is moved to middle of the screen. Below the list is a spreadsheet containing a list of players. The players are listed so that the player from the team with the highest average is first. Within the team, players are listed so that the player with most kills and least deaths are first. Each player listing show the player name, the player kills, the player deaths and the status of the player. The status of the player is the same as on the Game Lobby (i.e. Playing, Dead and Loading).To toggle between the statistics modes press the CAPS LOCK key.

SECTION SEVEN

THE IN-FLIGHT MENUS

General

The in-flight menus are accessible at the top of the screen at all times while you are flying. It allows you to change, adjust or reconfigure basic game options, including resolution mode, sound volumes, graphic detail of the terrain, buildings and other aircraft, enemy skill and more. Most of these options are also available from Options on the Main Menu, though the in-flight menu also includes a few other features, such as the ability to accelerate time to reduce Time to Target.

To access the drop-down menu bar, press the ESC key, located in the upper left-hand corner of your keyboard. The menu bar will appear across the top of your game screen. The game default is set to pause flight while the In-Flight menus are active. The menu is navigated using the arrow keys, and features can be selected by pressing Enter. To close the in-flight menu and return to active flight, press ESC again.

Campaign In-Flight Menu bar

The seven submenu sections of the Dogfight in-flight menu are:

Mission

Allows you to restart the mission, quit the mission or save your progress.

Dogfight

Allows you to restart or quit the game

Network

Allows you to quit the network game

Game

Set up time compression, Gameplay and menu options.

Cheats

Allows you to cheat by simplifying certain aspects of the game.

Difficulty

Allows you to select the skill level of your opponents

View

Camera and External view options.

Controls

Select plane flight control methods and alter/adjust options for them.

Mode

Select graphics modes and resolution options.

Graphics
Change terrain and transparency details.
Sound
Volume and stereo options.

Help
Display keyboard commands and game credits.

Please note that some of these sub-menus are only available in certain play modes (dogfight, campaign or network dogfight). This is described in greater detail below.

Mission
This sub-menu is only available when playing a campaign. When you select the Mission menu, you have access to three options: Restart, Quit and Quit & Save.

Restart
This option cancels the current mission and reloads it from scratch: your mission is restarted as if you had just left the mission planner. All of your mission waypoints are uploaded to the flight computer and the scenario time is rolled back to your current mission's initial time.

When you select Restart, no penalties of any kind are imposed, even if you have crashed or been killed; you will lose neither a fighter nor a pilot. It also means that any targets destroyed during your current flight will be not be scored.

Quit
Selecting Quit takes you back to the mission planner. If you're flying a campaign and select Quit, you'll have to plan your mission again from the start.
Quit & Save
You may select Quit & Save at anytime from the in-game menu; when you do, you will enter the Mission Debriefing screen. When you exit the mission debriefing screen, one hour will be added for preparing the aircraft for the next mission. If the mission is a success and you return to a friendly base with your aircraft, no additional penalties of any kind will occur.

This is not the case if you quit and save before reaching a friendly base. In this case, you'll lose an aircraft and,unless you eject and return to a friendly base on foot, you will lose a pilot, as well. In other words,try to get as close to a friendly base as possible before bailing out, in order to reduce the distance you'll have to cover on foot and the chances of losing a pilot.

Mission In-Flight Menu

Dogfight

This menu is only available when you are playing dogfight. It gives you access to items: Restart and Quit.

Dogfight In-Flight Menu

Restart
This option quits and restarts a new dogfight game with your current settings.

Quit

Selecting Quit takes you back to the Dogfight main menu screen. You'll be able to alter the Dogfight settings and relaunch into a new set of attack waves.

Network

The network menu is only available when you are playing multiplayer dogfight. There's only one item:

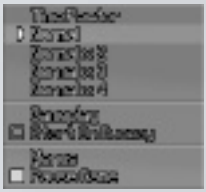
Network In-Flight Menu

Quit

This selection quits the network game and returns you to the lobby.

Game

There are three sub-menus you can alter in this menu, Time Factor, Gameplay and Menus.



Game In-Flight Menu.

Time Factor

This allows you to use time compression to speed up the action. There are four selections:

Normal

The default, which means that there is no time compression.

Normal x2

Double the time scale of the normal setting. This means that everything happens at twice its normal speed.

Normal x3

Triple the compression of the Normal setting, thereby making everything happen at three times normal speed.

Normal x4

Sets four times the compression of the Normal setting, effectively making everything happen at four times normal speed.

Normally, time compression is only desired in campaign mode. Please note that due to the complexity of the simulation, the processor may not always be able to run the game internally at the requested time factor. This may result in a lower framerate and jerky graphics.

Gameplay

There is one option under Gameplay, Start On Runway. This toggle option is only used in the Campaign games, though it can be turned on and off at any time. When checked, all campaign missions start with the aircraft out on the runway instead of in a taxi area. This saves you the time and trouble of taxing to the runway before each Campaign mission.

Menus

There is one option under Menus, Pause Game. When selected, pressing ESC to activate the in-flight menus will also pause the game. When not selected, your

aircraft continues in flight,even when you are checking the in-flight menus.

Cheats

These options are intended to make missions easier to fly and increase your chances of survival. They are divided into the following categories:

Cheats In-Flight Menu

View

This has just one customizable item:

No Fadeouts

When selected, pilots won't experience red- or blackouts of the field of view when pulling extreme G-forces in combat due to tight turns, dives or climbs.

Physics

Here you are able to simplify a few options which affect the way physics are simulated in the game:

Easy Landings

When the checkbox is toggled on, the undercarriage can take more of a beating, making it significantly easier to land.

No Wind

Though not obvious when cruising at high altitudes, a strong wind may prove problematic during landings and takeoffs. When this option is checked,your plane is not affected by wind and weather.

No Turbulence

Even with no wind, hugging the terrain at low altitudes makes for a bumpy ride. Checking this box will disable low-level turbulence.

Cannon

This section determines the behaviour of your gunshots. It has just one item:

Easy Aiming

This is a toggle-option. When selected, your plane's cannon lead sight will be in Easy Aiming mode. You won't have to think much about leading the locked target; the cannon rounds will actually lead themselves and try to 'chase' the target. This is not a guaranteed automatic hit however, the closer the locked target is to the centre of your aiming sight, the better the chance of a hit with this option selected.

When not selected, cannon rounds will conform to the normal laws of physics. This will result in a wonderful aerial display of tracer lights but far fewer gunnery kills.

Damage Level

This section determines which amount of damage applied to your plane. There are two selections possible in this menu, Realistic and Invulnerable. When Realistic is checked, your aircraft can take only a certain amount of damage and survive; modern warfare being what it is,that ain't

much.

Note: Selecting 'Invulnerable' disables your ability to save your progress in the campaigns.

Supplies

This section consist of a single item:

Unlimited Ammo

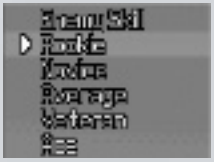
When this option is selected, you'll never run out of missiles, bombs or cannon rounds.

Note : Unlimited Ammo also disables your ability to save your progress.

Difficulty

Enemy Skill

This menu is only available in campaign play. It allows you to set the skill rating of the pilots you and your wingmen will be flying against. Select one of five settings: Rookie, Novice, Average, Veteran and Ace. The default setting is Average, with Rookie the easiest type of enemy pilot to fight against and Ace the hardest.



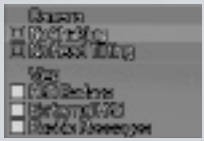
Difficulty In-Flight Menu

Rookies know only basic flight skills; they've been rushed to the front straight from training school. They haven't had the benefit of learning new skills and manoeuvres from the more experienced pilots. As they advance through the skill levels, they learn more manoeuvres, develop better gunnery and bombing skills and become more willing to use both in combat.

Aces are wily, crafty opponents, the survivors and victors of many aerial combat missions; they should not be underestimated. They know all the standard air combat maneuvers and aren't afraid to use them at any time, and have also developed excellent gunnery skills.

View

This menu is designed to allow the player to customize certain view options and has two sections: Camera and View.



View In-Flight Menu

Camera

There are two options deciding how the camera in the game behaves:

No Shaking

Normally, the camera shakes slightly at high velocities and during tight G-turns. When checked, this options turns such shaking off.

No Head Tilting

When this option is checked, the camera won't show the pilot's head experiencing

tilts due to G-forces during maneuvers.

View

This sub-menu allows you to configure whether or not flight information is super-imposed on the screen. It has three sections:

HMD Radars

When checked, the active and passive radar displays from the MFDs are superimposed on the lower corners of the HMD.

External HMD

When selected,portions of the HMD will be available to certain external views.

Enable Messages

When selected, this displays text messages that complement the computer and radio messages into the cockpit. Examples of such messages are “Enemy Lock-On” and “Shoot”

Controls

This sub-menu is used for configuring the input to the game. In addition to the basic choice of whether to use keyboard,mouse or joystick, it also presents a context-sensitive section that allows you to configure each device:

Keyboard

When keyboard is selected, the controls menu also shows the following item:

Keyboard Sensitivity

This slider adjusts how responsive the aircraft controls are to your keyboard input.

Controls In-Flight Menu with keyboard input device selected

Mouse

When playing with a mouse, the controls menu contains the following items:

Controls In-Flight Menu with mouse input device selected

Pitch Sensitivity

This slider adjusts how responsive the aircraft controls are to movement along the y-axis.

Roll Sensitivity

As above, but this slider adjusts the responsiveness along the x-axis.

Inertia

This slider determines how much inertia there is in the mouse controls.

Button Remapping

Here you have two displays. The upper line shows which button to edit (left, right or -

if playing with a three button mouse - the centre button). The lower line shows what function is currently assigned to that button. Selecting the upper line and pressing Enter changes which button to edit, doing the same on the lower line changes the function. Using CTRL toggles the opposite direction.

Joystick

When keyboard is selected, the controls menu also shows the following items:

Controls In-Flight Menu with joystick input device selected

Centre

When selected and the ENTER key pressed, this option pulls the joystick and reassigns the centre vector for the stick's current position.

XY Sensitivity

This is a gradient bar that raises or lowers the XY coordinate sensitivity to flight manoeuvre commands. The higher the sensitivity, the quicker the aircraft will respond to XY coordinate changes during flight.

To alter this setting, highlight the XY Sensitivity option and press the ENTER key. Then use the left arrow key to lower the sensitivity and the right arrow key to raise it.

Rudder Sensitivity

Works in the same manner as XY Sensitivity above, with the aircraft rudder becoming more or less sensitive to commands.

To alter this setting, highlight the Rudder Sensitivity option and press the ENTER key. Then use the left arrow key to lower the sensitivity and the right arrow key to raise it.

Slack

On many joysticks, the input is never completely zero, even when the joystick seems to be in the centre position. Normally, this could cause the aircraft to pitch and roll slightly, even when no force is used on the joystick. The slack slider can be used to define how much tolerance is to be used around the neutral position.
To alter this setting, highlight the Slack option and press the ENTER key. Then use the left arrow key to lower the slack and the right arrow key to add to it.

Force Feedback

If you have a Force Feedback joystick attached to your computer, this option allows you to select whether or not it should be enabled. Check the box to turn Force Feedback on.

If no Force Feedback joystick is selected in the Windows Control Panel, this option is

greyed out.

Button Mapping

This works exactly like the mouse button mapping described above, only here you are able to select the function of each button on your joystick. The upper line shows which button to edit (Fire 1, Fire 2, etc.). The lower line shows what function is currently assigned to that button. Selecting the upper line and pressing Enter changes which button to edit, doing the same on the lower line changes the function. Using CTRL toggles the opposite direction.

Mode

This menu allows you to select which screen resolution to use when playing the game. It contains three items:

Mode In-Flight Menu

Screen Resolution

This option allows the player to select screen resolution from the list available on the computer. This may vary between different machines, from as low as 320x200 pixels (lo-res) to super-hi-res (1280x1024 or higher) and everything in between. To select a new screen resolution, use the Up/Down arrows to highlight the desired resolution,then press the ENTER key.

However, players using computers with slower processors may experience some jerkiness when game graphics are set at the higher resolutions. We recommend experimenting with the lower resolutions until you find the one that performs best for you.

Lo-Res Emulation

This is short for Low Resolution Emulation, and features two options:

Big Pixels

If you want to run the game in low-resolution modes, and your graphics card/driver does not support this, JSF can emulate low-resolution by redrawing using big pixels. This means that the game is redrawn in low-resolution internally, and then doubled to fit the physical screen resolution. This option is not available in modes less that 640x400.

Black lines

If the Big Pixels option is enabled, the Black Lines option lets you select how the scaling of the screen is performed. When checked, every other line is not redrawn, but left black. This is slightly faster than the alternative, when all lines are drawn.

Graphics

This menu offers submenus which allow you to change object and terrain complexity

Graphics In-Flight Menu

to enhance performance, select certain graphics features in the game and add or remove some transparency effects during flight. Note that subtracting detail and features will enhance performance at the expense of visual appearance.

Detail
This section lets you add to or subtracts from the graphic detail of objects, such as aircraft, and terrain features, such as buildings and roads. It is divided in two:

Object Complexity
A gradient bar that adds or subtracts detail from objects you see during flight,such as other aircraft. To alter the current setting, use the Up/Down arrow keys to highlight the selection and press Enter. Then use the Left/Right arrow keys to vary the gradient bar setting. Moving the bar to the right will add complexity; move it to the left to subtract detail.

Terrain Complexity
This slider works in the same manner as Object Complexity. Use the Left/Right arrow keys to add or subtract from terrain detail.

Terrain Objects
This slider detemines how many terrain objects should be drawn-none, only the trees, or all terrain objects.

Features

The graphics engine of Joint Strike Fighter contains a number of effects and features which enhance the graphics, yet are not vital to the gameplay. These can be enabled or disabled in this and the following sub-menu.

Enable Lens Flares
Lens flares emulate the optical effect created by a camera when exposed to strong light sources, for instance from the sun or a rocket blast. When checked,these effects are enabled. Disabling the effects will improve performance.

Enable Particles
When enabled, a particle system is used for rendering weather effects like wind and rain. This may reduce performance on slower computers.

Transparency
Certain special effects in the game can be rendered with or without transparency. Though transparency may reduce the performance of the game, it may add to the visual appearance of the game. The following effects are handled separately:

Smoke
When checked, this option improves the appearance of the smoke-trails in the game by using transparency. Performance may suffer on slower computers.

Shadows
When this box is checked, shadows are projected onto the ground with transparency, rather than as single colour

silhouettes.

Explosions

Using transparent explosions will improve realism, but can be a serious performance hit. Keep this in mind if you are expe-riencing slowdown when viewing large explosions.

NOTE: We highly recommend you exper-iment with the options in the in-flight dropdown menu, especially those playing JSF on computers with pro-cessors slower than a 166 megahertz Pentium. Adjusting the options in Graphics and Mode to display less object and terrain detail at lower resolu-tions can dramatically increase the per-formance of the game on these computers.

Sound

The sound menu allows you to configure how music, sound effects and speech are played back through your loudspeakers. It contains the following sections:

Sound In-Flight Menu

Volume Control

Music Track

JSF features several original music tracks that play during flight. Set your desired volume level of the in-game music by highlighting the option, pressing Enter to activate it, then using the Left/Right arrow keys to decrease or increase the volume.

Sound Effects

Most actions performed in flight, such as firing a weapon and raising the landing gear, have sound effects that play when the action is performed. Set your desired volume level of the in-game sound effects by highlighting the option, pressing Enter to active it,then using the Left/Right arrow keys to decrease or increase the volume.

Speech

This slider raises or lowers the volume on speech messages to you during flight. This applies both to radio messages and the VOCOM.

Stereo

Reverse Channels

On some computers, the placement of the loudspeakers are exchanged. Checking this box reverses this.

Enable Messages

In-game speech is enabled by default, as this is one of your primary sources of information. It can, however, be disabled be unchecking this box. Note that this makes you totally reliant on text messages for such things as radio communication and flight computer messages.

Master Volume

This submenu has only one item:

Mute

When checked, all sound in the game is disabled.

Help

This menu is intended to offer you keyboard help, as well as give access to the About Box and the credits list. It contains the following commands:

Help In-Flight Menu

Keys

Activating this option will display a screen listing the flight keyboard commands. Use [Up] and [Down] to scroll between pages. To return to the in-flight menu, press ESC.

About

Activating this option will display a screen with information on the developer and publisher. Pressing ESC will return you to the in-flight menu.

Credits

Activating this option will display a series of scrolling screens showing who contributed during the development of Joint Strike Fighter. Press ESC to return to the in-flight menu.

SECTION EIGHT

Flying the Plane

General

This section is intended to teach you the ins and outs of the Joint Strike Fighter planes. By reading this part you'll not only get familiar with the flight behaviour of the JSF planes; you'll also get a deeper understanding of the underlying systems of the aircraft. This includes the Flight Assistance Systems, Avionics Suites, Automated Defence Systems and your virtual cockpit environment.

If you find this too much information to digest in one go, you can always refer to this section later for technical details of the aircraft. Still, it's well worth the effort try to get an overview of what's going on "behind the scenes" as you ride through the sky.

Flight Handling

Operating the Engine

To start your engines and power up the aircraft, press the [~] key, located in the upper left of your keyboard, directly below ESC (or next to return).

To add power to your aircraft and increase speed, press the 1-0 keys, with 0 being 100% power and 1 being 64% power. To turn the engine off press CTRL and [~]. See also Appendix 1 for a complete list of all keyboard commands, and Appendix 2 for a description of joystick and gamepad configuration.

Taxing on the Ground

A speed of about 15 knots is usually convenient when taxiing on the airport. This is most easily achieved by applying a short burst of power to the engines, and then using the inertia of the plane to keep you rolling. The B key can be used to slow down your airplane if you go too fast.

To steer your aircraft, use the rudder keys [<] and [>] to steer left and right. Steer your aircraft forward and turn onto the runway, using the brake as needed, and coming as close to facing down the centreline stripe as possible. Then use the rudder keys to turn left or right, facing down the runway, with the centreline down the middle of your screen.

TIP 1: To save the time and trouble of taxing out onto the runway each time you fly a campaign mission, check the Start On Runway option on the in-flight menu. From now on, all campaign missions will start on the runway, ready to start engines and fly without the need to taxi onto the strip.

TIP 2:Throttle control is the key to taxing. Be careful to not go too fast during turns.

Takeoff

Press the zero, 0, key to push your thrust to 100%. When the speed indicator on the HMD is at approximately 150 mph or greater, pull the joystick back to tilt the nose of the aircraft and take off. Once in the air, press G to retract the gear.

In-Flight Operations Hatch

To use the weapons in the internal weapons stations, you'll need to open the hatch. This is done with the H key. Remember that having the hatch open increases your radar cross section - so don't forget to close it after you have delivered your weapon load.

Airbrake

The air brake or speed brake slows the plane down by increasing drag. Holding the B key down while you are in the air achieves this by elevating a moveable surface on the top rear of the aircraft.

Flaps

Use the flaps to gain extra lift during takeoffs. They are turned on and off with the F key. Remember that having the flaps out increases drag, so retract them once you have gained your desired speed.

Gear

Be sure to retract your gear after take-off so you don't damage your undercarriage. Having the gear down while airborne also increases drag on the plane. Take the gear in and out with the G key.

Jettison

If you for some reason need to reduce your weight during flight you have two options: Jettison Fuel or Jettison Weapons.

If you need to reduce your radar signature or reduce your weight press both CTRL keys and W at the same time. This command will first jettison external weapons, and if you invoke it a second time it will jettison your internal weapons.

You can also jettison fuel - this is activated by pressing both CTRL keys and J at the same time. Fuel jettison is turned off again by pressing the key combination once more. Note: Always check your fuel storage, fuel consumption and distance to nearest friendly airport before invoking this command.

Eject

When all hope of returning to base is lost, you may want to consider ejecting from the plane. This is done by pressing both CTRL keys and E at the same times. Note, however, that this is not without risk.

Landing

Landing should be performed at approximately 135 kt (250 km/h), depending on weapons load. Fully loaded, you may have to land slightly faster, while a virtually empty plane will allow you to land with reduced air speed.

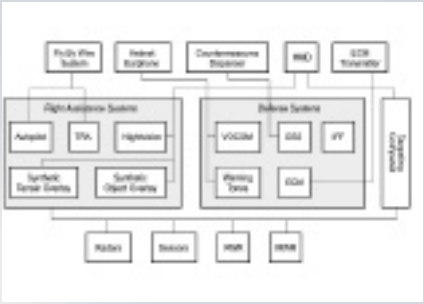
HMD with correct landing angle

The key to a successful landing is achieving the correct speed and Angle Of Attack (AOA). The AOA display is intended to help you judge your AOA at any time. It shows angles from 11° - 15°, and for ideal landing the velocity vector should be placed in the centre of this (i.e. at 13°). In addition, the velocity vector should be placed approximately 4° below the horizon for a perfect in-flight landing path.

TIP: If you are a rookie pilot be sure to enable Easy Landings on the in-flight menu. This will make it harder to get wheel damage when touching down

Flight Assistance Systems

General



Aircraft systems overview.

In today's combat environments, pilots experience enormous pressure and huge workloads. They must at all times maintain high situational awareness while communicating, monitoring aircraft systems,monitoring and evading missiles, positioning their aircraft, etc. Research on easing pilot workload has resulted in a number of sophisticated Flight Assistance Systems, all present in the JSF aircraft.

Autopilot

Almost all modern aircraft are equipped with an autopilot (a computer able to fly the aircraft). To activate the JSF's auto-pilot, press A. To deactivate its autopilot, press A again. The complete autopilot system is available on the Control MFD / AUT, and operates in 4 different modes. You can alter the data used by the autopilot, such as heading, height, speed, according to the situation requirements.

Mode 1: Waypoint

In waypoint mode, the autopilot directs your aircraft to the active waypoint, with the selected height and speed. Useful when you want to study the MFDs,fly with accelerated time or just to enjoy the view.

Mode 2: Heading

When selecting heading mode, the autopilot maintains the selected heading, at the selected height and speed.

Mode 3: Tracking

The tracking mode maintains the speed of the active air target. Perfect for lining up a cannon kill, or if you want to maintain a constant distance from a target.

Mode 4: Auto-Throttle

The auto-throttle mode helps the aircraft maintain a constant speed. This is selected by the pilot on Control MFD / AUT. Perfect for situations requiring constant speed, like landing and dogfights.

Terrain Avoidance System

Too many deaths of fighter pilots are not the cause of an enemy missile, but of their own inattention leading to an encounter with a hard surface - like the ground. This has especially been the case when flying at low altitudes. The designers of the X-32 and the X-35 therefore decided to include a Terrain Avoidance System in their planes. This system continually monitors the state of the aircraft, and adjusts the direction of the plane if there is a Crash Situation.

While using the autopilot in waypoint mode, the avoidance system is always on. This ensures that you will not crash while studying your MFD's. In all the other autopilot modes and when the autopilot is off the terrain avoidance state can be set in the Control MFD / AUT / TRA.

Note: The Terrain Avoidance System is automatically turned off when you extend the landing gear.

Terrain following box

Terrain Following Box

Sometimes it is preferable to fly terrain hogging without using the autopilot. In such a case you should take your gear in, turn off the terrain avoidance system, and a small box, called terrain following box, will appear on the HMD. If you keep your velocity vector inside this box you will fly safe at low altitude.

You can adjust the height of the terrain following box on the Control MFD / AUT / TRA up and down, as you can for terrain following waypoints. The recommended terrain following height depends on what kind of mission you are on,the terrain and how many wingmen who join your flight.

Level Function

If you lose control over your plane, press the level button to recover your flight. Your flight computer will then level your plane, and ensure that you gain speed if necessary. Level operation will cancel when you touch the throttle or stick. You can also cancel the operation by pressing the level button again. The level function is invoked with the L-button.

Avionics

General

JSF features a very sophisticated avionics suite; all combined into an internal suite of sensors and processors performing a wide range of different tasks. These tasks include the active radar, FLIR, SLS, GPS, IFDL amongst others.

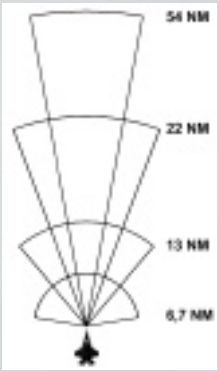
Active Radar

The JSF aircraft features a long-range doppler radar able to detect and track multiple air targets simultaneously. On the Attack MFD / RAD, you will find a wide range of functions for operating the radar, like turning the radar on/off, changing targets, ranging, target information, view modes etc.

Ranging

You can select among four different radar settings:

Range:	Cone:
54nm	20º
22nm	40º
13nm	80º
6.7nm	160º



Radar ranges.

View Modes

The radar cone can sometimes be difficult to interpret; therefore the JSF aircraft features three different view modes to select from on the Attack MFD / RAD:

Radar in plan view mode

The Normal Plan View

The normal plan view is the conventional, easy to interpret view. You will normally want to use this view mode.

Radar in side elevation view mode

Side Elevation View

The side elevation view is useful for checking relative altitudes of different air targets.

Radar in cross-section view mode

Cross Section View

If you want to determine enemy altitude and movement across your flight path,you should select this view mode.

Forward Looking Infra-Red (FLIR)

The JSF aircraft is capable of detecting and tracking vehicles and other moving objects from which it can obtain an IR-signature. The FLIR is based on the third-generation of ptronic devices, giving it a 360˚ coverage and a range about 20nm. All FLIR targets are projected onto HMD for easy detection and identification. You can cycle through all available FLIR targets and view information about the active FLIR target on the Offensive MFD / ATG. See the HMD chapter for more information about FLIR targets on the HMD.

Global Positioning System (GPS)

The Global Positioning System uses three or more satellites to calculate the exact position of the receiver. In this case, the receiver is the JSF aircraft, and it uses the GPS to pre-designate targets for use with GPS guided weapons, such as the JDAM and JSOW. All pre-designated targets are projected onto the HMD, and the pilot can acquire information about each GPS target (ID, range, E.T.A, etc.) through the Offensive MFD / ATG. See the HMD chapter for more information about GPS targets on the HMD.

Anti-Radiation Targeting System (ARTS)

The Anti-Radiation Target System is able to mark the position of radiating systems within detection range, primarily for use with the AGM88c HARM weapon. The ARST works in conjunction with the Radar Warning Receiver (RWR - see the chapter Systems for more information). The positions of the radiating systems are projected onto the HMD for easy localisation and targeting. To acquire information about the Anti-Radiation (AR) targets, you follow the same procedure as with FLIR and GPS targets.

In-Flight Data Link (IFDL)

The In-Flight Data Link is a communication system primarily used to receive information about the threat-picture from a nearby AWACS or your wingmen. This allows the JSF to minimise the use of its own active radar, and therefore operate more stealthily. You establish the IFDL by communicating with the AWACS (see the Radio Communications chapter for more information). The status of your IFDL can be viewed on the Offensive MFD.

Satellite Landing System (SLS)

HMD with SLSactive

The SLS can be activated by setting the HMD in SLS mode (by pressing S) when in the vicinity of an airport. A landing path is then projected in 3D onto the HMD. The SLS is completely passive; it relies only on predetermined coordinates that have been gathered from satellite data in advance. This means that an airport may be controlled by the enemy, even if SLS data is available. When an airport has not been verified as safe, the SLS path is displayed in red, rather than the normal green.

Altimeter

Up to altitudes of 5,000ft above the ground, the altimeter displays radar altitude. Basically it uses a small radar to calculate your real altitude above the ground. The altimeter automatically switches to barometric altitude when the altitude above ground exceeds 5,000ft. Barometric altitude means the aircraft's altitude above sea level. The altimeter is located on the HMD.

Automated Defence Systems

General

The Joint Strike Fighter is equipped with sophisticated automated defence systems. The purpose of the systems are to take care of the defensive parts - detecting and avoiding enemy fire - as far as possible, while leaving the pilot free for offensive operations.

Decoys

A decoy is a false target created to fool an enemy tracking the plane. The decoys have similar reflectivity to the target, though usually a bit stronger and more attractive. Decoys come in two flavours:

Radar decoys

Your plane is equipped with radar decoys called chaff. Chaff, also known as duppel or window, are small metallised plastic strips, which reflects one half of the radar wavelength. The best moment to release chaff is when the radar is trying to establish a lock on the target.

Infra-Red decoys

Flares are pyrotechnical packages that emit intense heat designed to confuse Infra-Red missiles.

Plane releasing flares

Radar Warning Receiver (RWR)

The Radar Warning Receiver (RWR) detects signals from enemy and friendly radar's. Its reading is displayed on the sensor radar (Offensive MFD). The receiver in the JFS aircraft compares the signals it receives with a database of known signals, and decides if the emitter is an aircraft, missile or ground unit.

Infra-Red Warning Receiver (IRWR)

The Infra-Red Warning Receiver (IRWR) works similarly to the RWR but it detects IR emitting sources instead of radar emitting sources.

The core of the IRWR is an Advanced Distributed Aperture System (ADAS). This system consists of multiple sensors under the skin of the JSF, designed to detect short range ground-to-air missiles, long-range A2A targets and long range A2G missiles.

Identification Friend or Foe (IFF)

The radar depends on the IFF system to determine if an aircraft is enemy, friendly or neutral. The system has two phases; first the IFF interrogator unit sends a radio message containing a coded enquiry that essentially requests friendly planes to identify themselves. Equipment carried by the friendly plane, called IFF transponders, automatically responds to this request with a coded message, which in turn is picked up by your plane and fed into your onboard computer. A positive reply allows your onboard computer to classify the plane as friendly or civilian.

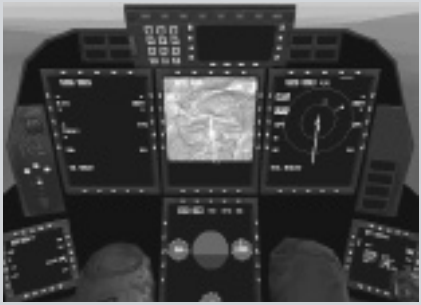
Electronic Counter Measures (ECM)

ECM is a wide description, defined as methods to confuse the enemy's usage of the electromagnetic spectrum. In this context ECM is a device that receives enemy radar signals (ECM receiver unit), and then retransmits them with a slight delay (ECM transmitter unit). The result is that the enemy pick up false signals and are unable to track you reliably.

Defence Subsystem (DSS)

To ease the stress on the pilot during dogfight, the Defence Sub-System (DSS) was developed. This system automates the release of chaff and flares. It monitors tracking data and calculates the right release moment. You should normally have the DSS activated at all times, as it is effective and economical in terms of chaff and flare usage. The pilot can still release chaff and flares manually when the DSS is on.

Cockpit Environment
Multi-Function Displays (MFD)



Cockpit view of all MFDs

General

The cockpit is fitted with six (6) different MFD panels; each designed to display easily and coherently information about the current state of your aircraft and mission. They also allow you to alter some of that information to meet the dynamic needs of an ever-changing combat environment.

You can make selections and alter data on the MFD panels by holding down the Alt key to activate the mouse pointer. Then click on the green buttons next to the selections,around the edge of each panel.

Tip: The MFD panels can be viewed while the game is paused. However, you cannot make button selections or alter any information until you the game is out of pause mode.

Below are some general explanations of the various panels and functions of the MFD.

Control MFD

The Control MFD provides the means to operate your HMD, including turning on and off night vision, activating and deactivating the HMD and altering auto-pilot data.

Status MFD

The Status MFD displays a host of critical information about the status of your aircraft. This includes general avionics, current damage (displayed in a range of colours from green to red), information about payload (including jettison controls and fuel consumption), RCS (radar cross-section) and IRCS (infra-red cross-section),(including a list of conditions that affect the RCS and IRCS).

Information MFD

The Information MFD includes information and functions for navigation (including waypoint selection, time to next waypoint, range, etc.) and activating/deactivating the Satellite Landing System (SLS).

Attack MFD

The Attack MFD is mainly the active radar panel where you can sort through and select from local, close-in threats and targets. See the Radar chapter for more details.

Strategic MFD

Navigating by map is mainly done from the Strategic MFD, which can also overlay the Offensive MFD display (including way-points and targets).

Offensive MFD

The Offensive MFD is mainly a display of the information from the different defensive systems, the IFDL and the navigation system. It also allows cycling through and selecting Air-To-Ground targets obtained by the FLIR, RWR and the GPS.

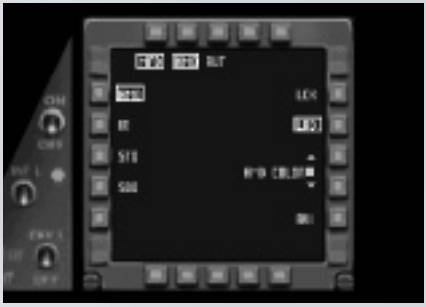
MFD Functions

General

Each MFD has an on/off button located in the top left corner, labelled "MFD". Next to the "MFD" button (top row) there may be one or several Mode Buttons. Activating a mode button will activate the rest of the buttons associated with that mode.

Note:In all cases of On or Off toggles while viewing an option in the MFD panels, the On position is indicated by a white-lined border around the option.

Control MFD "HMD" (HMD mode)



Control MFD

"HMD": Toggles HMD on/off.

"IR": Toggles night vision on/off.

"STO": Toggles Synthetic Terrain Overlay on/off.

"SOO": Toggles Synthetic Object Overlay on/off.

"LCK": Toggles lock of heading tape and pitch ladder. When locked, the heading tape and pitch ladder show the aircraft's heading and pitch,not the pilots view heading and pitch.

"LAD": Toggles Tapes and Ladders on/off.

"HMD COLOUR": Toggles HMD colour upwards/downwards.

"AVI": Overlays an artificial horizon with current speed, heading and height.

Control MFD "AUT" (Auto pilot mode)

Control MFD in Autopilot mode

"AUT" (Autopilot/Flight assistance systems mode)

"ECM": Toggles ECM on/off.

"DSS": Toggles DSS on/off.

"LEV": Levels the plane (recovery button).

"TRA HEIGHT": Increases/decreases terrain avoidance height.

"TRA": Toggles terrain avoidance on/off.

"AVI": Overlays an artificial horizon with current speed, heading and height.

"AUT": Toggles autopilot on/off.

"AM": Toggles autopilot mode (waypoint, heading, tracking, throttle).

"SEL": Selects data-entry (highlighted in white).

"↑": Increases selected data-entry.

"↓": Decreases selected data-entry.

Status MFD
"AVI"(Avionics mode)

Status MFD

"AVI": Overlays an artificial horizon with current speed, heading and height.

""Dam"
(Damage Mode)

Status MFD in Damage mode

"AVI": Overlays an artificial horizon with current speed, heading and height.

"STO"
(Stores mode)

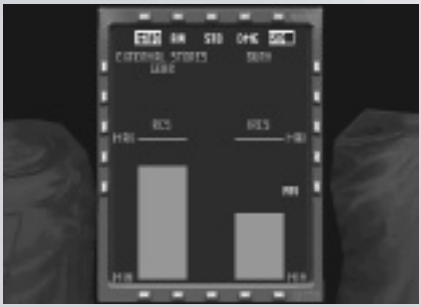
Status MFD in Storage mode

"JFV": Toggles Emergency Jettison Fuel on/off.

"JWE": Emergency Jettison Weapons. Jettisons first external weapons and if activated again, jettisons internal weapons.

"AVI": Overlays an artificial horizon with current speed, heading and height.

"SIG"
(Signature mode)



Status MFD in Signature mode

"AVI": Overlays an artificial horizon with current speed,heading and height.

Information MFD
"NAV"(Navigation mode)

Info MFD

"WAYPOINT": Increases/decreases active waypoint.

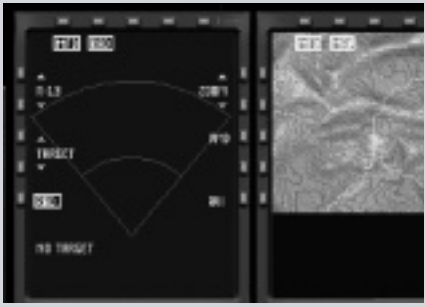
"NAV": Selects NAV mode for the HMD.

"SLS": Selects SLS mode for the HMD (activates SLS).

"LGT": Toggles external aircraft lights on/off.

"AVI": Overlays an artificial horizon with current speed, heading and height.

Attack MFD
"RAD"(Radar mode)



Attack MFD

"RANGE": Increase/decreases active radar range.

"TARGET": Toggle target upwards/downwards.

"RAD": Turns active radar on/off.

"ZOOM": Zooms display in/out.

"VMD": Toggles radar view mode.

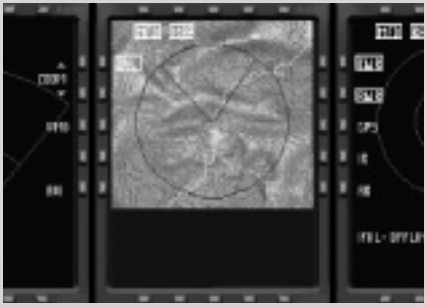
"AVI": Overlays an artificial horizon with current speed, heading and height.

"ENV"
(Environment mode)

Info MFD in Environment mode

"AVI": Overlays an artificial horizon with current speed, heading and height.

Strategic MFD
"MAP" (Map mode)

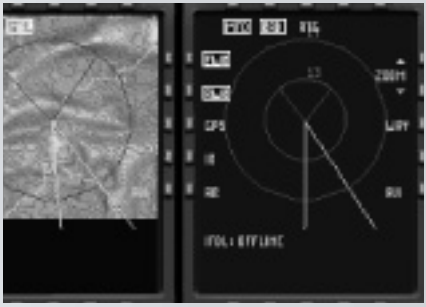


Strategic MFD

"OVL": Toggles overlay of Offensive MFD on/off.

"AVI": Overlays an artificial horizon with current speed, heading and height.

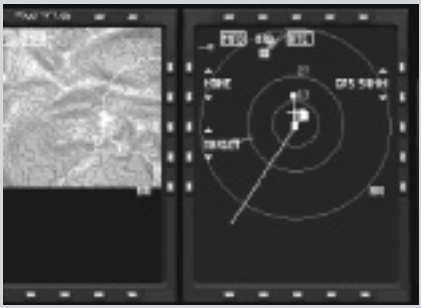
Offensive MFD
"RAD"(Offensive mode)



Offensive MFD

"EWR": Toggles display of information from the IFDL on/off.
"RWR": Toggles display of RWR lines on/off.
"GPS": Toggles display of GPS targets on/off.
"IR": Toggles display of FLIR targets on/off.
"AR": Toggles display of AR targets on/off.
"ZOOM": Zooms display in/out.
"WAY": Toggles display of waypoint route on/off.
"AVI": Overlays an artificial horizon with current speed, heading and height.

"ATG"
(Air-To-Ground mode)



Offensive MFD in ATG mode

"ATG": Toggles ATG-Discriminator upwards/downwards.
"TARGET": Toggles ATG target upwards/downwards.
"GPS RANGE": Increases/decreases operating range of GPS targets.
"AVI": Overlays an artificial horizon with current speed,heading and height.

MFD Colour Codes

General

The Attack MFD and the Offensive HMD uses colour codes for different types of targets and target categories. The colour code for each target each target is determined by the IFF system (see Defensive Systems chapter).
An active target has a yellow outline in addition to a colour coded square.

Air Targets		*Ground Targets*	
Enemy:	RED	GPS:	PURPLE
Friendly:	BLUE	FLIR:	ORANGE
Civilian:	GREEN	AR:	WHITE
Neutral:	GREEN		
Missile:	YELLOW		
Unidentified:	WHITE		

Head Mounted Display (HMD)

Forward view from the cockpit in flight,HMD active.

General

Like all modern fighter aircraft, the JSF features a Head Mounted Display (HMD) that projects information directly onto the forward view of the pilot. It provides the pilot with critical information about his flight path, speed, altitude, nearby enemy targets and which of his weapons are currently active and ready to shoot. This information is configurable by the pilot; he can tailor the display to suit his personal needs and the needs of the mission.

The HMD is perhaps the single most important source of information you have available. It can tell you where the threats are, how many of them there are, the current state of your aircraft in flight, weapons status; you name it - it's there.

You also have the option to superimpose the Attack MFD and the Offensive MFD on the HMD for convenience.

Tapes and symbols

Heading Tape

The heading tape shows your aircraft's current heading and the heading to the current selected waypoint. If the waypoint is outside the limits of the heading tape, a carat will appear either to the left or right of the HMD marking the direction of the waypoint.

Speed Tape

The speed tape shows your aircraft's current speed,and the rate of acceleration is shown by the speed of the tape.

Above the speed tape, the amount of G you are pulling and the actual thrust of your engines is displayed.

Altitude Tape

The altitude tape shows your aircraft's current barometric or radar altitude (indicated by an 'R' to the left of the altitude number).See the Altimeter chapter for a more thorough description.

The rate of climbing/descending is shown by the speed of the tape. Displayed above the altitude tape, are the autopilot mode, status of brakes, status of flap and the status of gear.

Pitch Ladder

The pitch ladder shows the pitch (in degrees) and roll of your aircraft relative to the horizon.

Other Symbols

The nose marker marks your current pitch on the pitch ladder. The velocity vector shows your aircraft's direction of movement.

Modes Of Operation

The HMD operates in four different modes:
NAV (navigation),
SLS (Satellite Landing System),
A2A (Air-To-Air),
A2G (Air-To-Ground).

The current mode is displayed below the speed tape.

NAV Mode

The NAV mode is used for navigation and it displays your current waypoint, including range and estimated time to reach the waypoint below the altitude tape.

SLS Mode

When in SLS mode, the HMD will display a secure in-flight corridor as a range of boxes.

A2A Mode

Below the altitude tape, you can view information about your current air target, such as target ID, range and speed.

All targets on your active radar are projected onto the HMD as brackets around each target. The active target is projected as a square with a number under it. The number indicates Velocity Of Closure. VOC indicates how fast the gap between you and your target changes. A positive number means the target is closing, and a negative number means the target is moving away from you.

Using the target toggle key ([TAB>) in this mode will cycle through air targets. Using the target view key ([F12>) in this mode will view the active air target.

A2G Mode

The A2G mode can operate on three different types of targets: FLIR (Infra-Red), GPS (Global Position System) and AR (Anti-Radiation).

You select the type of targets to operate with the A2G-Discriminator and it is displayed to the right of the HMD mode (only in A2G mode).

All these targets are projected onto the HMD as different symbols.

All GPS targets are projected as two carats. The active GPS target is projected as four carats (forming a marker).
All FLIR targets are projected as brackets around each target. The active FLIR target is projected as a rectangle.

All AR targets are projected as crosshairs. The active AR target is projected as a crosshair with a square.

Again, below the altitude tape, you can view information about the current target determined by the ATG-Discriminator.

Using the target toggle key ([TAB>) in A2G mode will cycle through targets determined by the A2G-Discriminator type. Using the target view key ([F12>) in A2G mode will view the active target determined by the A2G-Discriminator type.

Weapon Sights

Aspect Angle Indicator

The aspect angle indicator is visible on both the missile and cannon sight circles as a carat.

The symbology shows the target's HEADING relative to your POSITION. It indicates what orientation (or side) of the target aircraft you would see if you were close enough. The following table simplifies the situation:

Position of aspect carat on circle:
Aspect of enemy:

Top of the circle	Nose
Bottom of the circle	Tail
Left side of circle	Left wing
Right side of circle	Right wing

Hatch Closed Indicator

If you have selected an internal weapon (i.e. you have no external weapons left), and the weapons hatch is closed, a hatch closed indicator as an "X" will appear on top of the appropriate weapon sight. Before you can launch/release any weapon you need to open the hatch by pressing H.

Note: Keep the hatch closed as much as possible to minimise your radar signature!

Cannon Sight

Historical gunsight

The historical cannon sight consists of three parts:

1. A continuously simulated bullet trajectory.
2. A range circle positioned at the targets range along the simulated trajectory.
3. An aspect angle indicator.

The range circle indicates the range to the active target. 1 hour equals 1000 feet,so a full range circle means range to target is 12000 feet.

Missile Sight

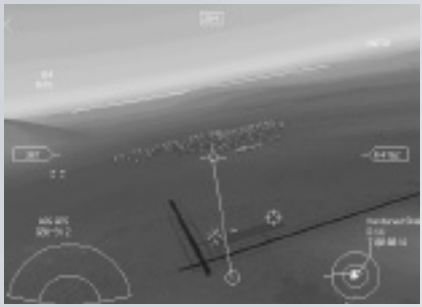
Missile sight with target lock indicator

The missile sight consists of three parts:

1. A missile boresight circle.
2. An aspect angle indicator.
3. A range indicator, located to the left of the missile boresight circle, with a carat indicating range to target relative to the missiles maximum and minimum range.

Note: If no carat is visible on the range indicator, don't waste your ammo!

Bomb Sight



Bomb sight

The bombing system is a standard CCIP (Continuously Calculated Impact Point) displayed as a straight line from the velocity vector to the impact-point (indicated by a small circle at the end of the line).

If you have the ATG-Discriminator in GPS mode, and you have an active GPS target, the weapon system will simulate a glide trajectory towards the GPS target. If the glide bomb is able to glide to the target, the impact point will "snap" to the target and the probability of a direct hit is very high.

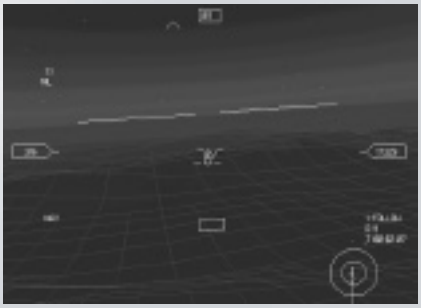
Synthetic Overlays

Object Overlay

Synthetic object overlay

The HMD is able to add colour coded velocity vectors to all targets registered by the aircraft's weapon systems (active radar, FLIR, GPS, AR). In effect, this will show the movement direction of all targets in true 3D space. The colour codes are the same as those used by the Attack MFD and the Offensive MFD.

Terrain Overlay



Synthetic terrain overlay

The JSF carries an onboard terrain database; together with information from other platforms, it can generate a synthetic terrain overlay on the HMD. Basically, the terrain overlay is a computer generated 3D image of the terrain that helps the pilot fly the aircraft in poor visibility.

Night Vision

The HMD has a built-in electro-optical device that intensifies (amplify) existing light making it possible for the pilot to see objects he would not normally see under poor light conditions (e.g. night). You can toggle night vision on/off using the Control MFD.

VOCOM

General

When the on-board computer detects a situation that is of great importance to the pilot, it can call attention to the pilot by displaying text on the HMD or activating warning lights. This is sometimes not enough to get the pilot's attention. The designers therefore put in an another way of notifying the pilot, called automated voice computer messages or VOCOM.

The VOCOM is a female voice that tells the pilot about certain incidents. The VOCOM is female because research has shown that this is the voice pilots focus on easiest.

Warning Tones

When your cockpit is filled with an annoying "alarm clock" noise, you are in trouble. The on-board computer uses this method to get your full attention in an

emergency situation like when an enemy is tracking your plane or you are close to crashing the plane.

Radio Communications

General

The air pioneers in World War I did not have a radio and had to use hand signals to communicate. In a modern jet fighter a UHF radio is taken for granted, and many operations depend heavily upon it. The radio com-munications menu is invoked by holding down Shift. The menu disappears when Shift is released. A numbered menu is displayed in the lower left corner of your screen. Make selections by continuing to hold down the Shift key and pressing the keyboard number corresponding to the proper menu item (e.g. Hold the Shift key down and press 1 to issue orders to All Wingmen…).

If the menu item is followed by three periods (…), selecting that item will display an additional menu of numbered items.

You have three available radio channels, one for wingmen, one for AWACS and one for tower communications. If you issue many commands at different radio channels simultaneously, the voice messages you receive may overlap.

The messages you send will appear on top of the screen (if text messages are enabled), and if you have speech enabled they will be spoken. You will also receive messages in the same manner. You enable or disable messages and speech from the JSF in-game menu.

Tower

The airfield towers are vital to modern air traffic; so be sure to use it to get safe takeoff's and landings.

Use the menu choices Request Landing Permission, Request Emergency Landing Permission, Request Takeoff Permission during takeoffs and landings.

When your plane is damaged, be sure to use the request emergency landing permission. The tower will then reroute other planes landing, and you will be given landing permission immediately.

AWACS

The Airborne Warning And Control System (AWACS) aircraft monitors the battlefield and reports relevant information to you if you have an In Flight Data Link (IFDL) established with the AWACS. This consists of an encrypted binary data link that feeds radar information directly into your flight computer, as well as radio messages informing you about enemy air activity. The link is established with the menu choices Request IFDL and disconnected with Disconnect IFDL.Giving Orders To Your Wingmen You can issue a wide variety of orders to your three wingmen, either

individually or as a group. Wingmen are often crucial to your mission, and it takes a skilled pilot to communicate with them correctly. Be sure to listen to them carefully, and give the correct response to their messages and status reports. For a full explanation of all radio commands you can issue, see Appendix 4.

For now, we will take you through how to order them to attack air targets.

Radio communications menu

Ordering The Wingmen To Attack Air Targets

If you are attacked in flight or the AWACS gives you a vector to enemy air targets, you can order your wingmen to attack them.

1. Hold down the Shift key; a numbered menu will appear in the lower left corner of the HMD;

2. Continuing to hold down the Shift key, press the 1 key, All Wingmen…;

3. Select Engage… by pressing the 2 key;

4. Select Engage At Will by pressing the 3 key;

5. Each wingman will now engage any enemies that come into radar range.

Ordering The Wingmen To Return To Formation

1. Hold down the Shift key; a numbered menu will appear in the lower left corner of the HMD;

2. Continuing to hold down the Shift key, press the 1 key, All Wingmen…;

3. Select Engage… by pressing the 2 key;

4. Select Disengage by pressing the 4 key;

5. Each wingman will acknowledge the order and return to formation.

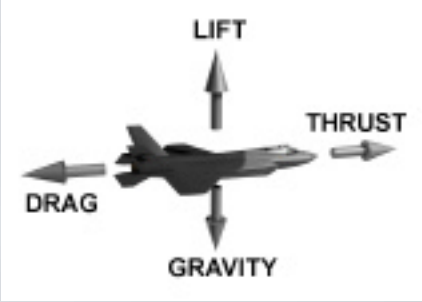
SECTION NINE

Plane Physics

Plane Physics

General

Despite the complexities of modern day aircraft, the concept of flying is really deceivingly simple. The positional behaviour of a plane can really be broken down into four separate forces, each usually working in different directions.



Aircraft Forces.

Gravity

Like death and taxes, gravity is one of those things you cannot easily get around. It is,naturally, the number one obstacle to flight,as it has to be overcome one way or the other. There are two ways of achieving this, aircraft lift and engine thrust.

Drag

Drag can be divided into two types; parasitic drag and induced drag.

Parasitic drag consists of the forces created between the airflow and the airplane structure, such as gear and flaps. Carrying external weapons will, for instance, increase the parasitic drag.

Induced drag, on the other hand, is introduced by the lift created by the wings. This means that whenever you increase your speed and/or lift, induced drag will also increase.

Lift

As wind flows across your wings, lift is induced because of the difference in air pressure above and below your wings. When this force equals the force of gravity, you are able to maintain level flight without neither gaining nor losing altitude. When pitching up or down, however, the net result also depends on the thrust of your engines.

Thrust

Eventually, your gain in altitude and speed must come from somewhere. This 'somewhere' is obviously your engine, delivering the thrust that propels your plane forward. For this reason, the performance of your engine relative to your mass and drag is of vital importance as far as acceleration and max speed is concerned. In level flight, when the forces of drag and thrust are equal, your speed will be constant.

SECTION TEN

Aerial Manouveres

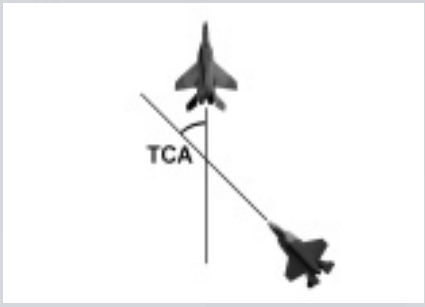
This section of the manual is intended to acquaint you with certain aspects of multi-aircraft fighter combat. In JSF, you take the role of a flight leaderable to make tactical decisions for a strike package of up to four aircraft. This means you will often be required to determine the formation and spread of your flight. The first two sections of this appendix outline the various formations and separation distances at your disposal.

Dogfighting Introduction
Definitions

Angle Of Tail (AOT)
The Angle Of Tail says how many degrees off an enemy's tail your plane is. If you are on tail you have zero degrees AOT; if an enemy is on your tail you have 180 degrees AOT.

Angle off tail.

Track Crossing Angle (TCA)
This is the difference (in degrees) between two planes' velocity vectors. If the two velocity vectors are parallel, the TCA is 0.



Track Crossing Angle.

Closure
The term indicates how fast two aircraft are closing. This is also referred to as the closure rate.

Manoeuvres.
Pure pursuit
When employing this manoeuvre, you're pointing your aircraft nose directly at the target. Ideally this would bring you towards 0 degrees AOT, but - as the figure below shows - more often than not, the plane parameters do not allow it. The greatest advantage of this manoeuvre is that the frontal area of the plane is reduced, therefore making the aircraft hard to spot.

Pure Pursuit.

Lead pursuit

In Lead pursuit, you are pointing the nose of your aircraft in front of the aircraft you are attacking. This can be used to increase the closure rate.

Lead Pursuit.

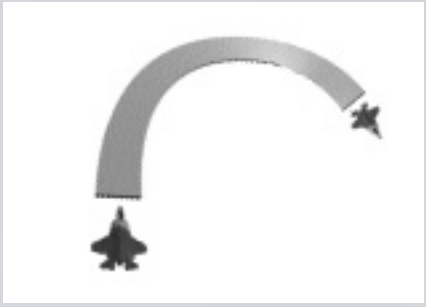
Lag pursuit

Lag pursuit means you are pointing the nose of your aircraft behind the aircraft you are attacking. The result is a reduction in closure rate.

Lag Pursuit.

Break

A break is one of the most basic fighter maneuvers. Perform this manoeuvre to reduce AOT. The manoeuvre can be performed in any direction with varying degrees of turn rate. A tight turn will reduce AOT most, but also reduce in a significant speed loss.



Break Manouvre.

Scissors manoeuvre

The scissors is really a series of break maneuvers. The goal is to get on the attackers tail and/or deny him a lockon.

Scissors manouvre.

Immelmann manoeuvre

This famous manoeuvre, developed by Max Immelmann during World War I, is heavily dependent on the plane paramers of the plane performing the manoeuvre. A high turn rate is necessary to perform this manoeuvre successfully.

Immelman manouvre.

High Yo-Yo

Use this manoeuvre to reduce AOT and/or avoid overshoot.

High Yo-Yo.

Low Yo-Yo

This manoeuvre can be used if you don't have enough energy to reach your target. Dive across the circle to gain speed, and catch up on the enemy.

Low Yo-Yo.

Terrain Masking

One of the main applications of the Joint Strike Fighter is low-level attack missions. In order to avoid detection both visually, from radars and from IR sensors, terrain masking is often crucial. Routing is one important factor in achieving this, as described in Section 5. When a route is found, it is also a great advantage to fully master the techniques required for nap-of-the-earth flying.

The obvious way of crossing a ridge is approaching low on the forward face. As shown below, this can result in your plane being thrown high on the rear face.

Low on forward face.

When accepting some exposure on the forward face, however, the amount of exposure on the rear face can be reduced. There will, however, still be a penalty.

Reduced exposure.

Taking advantage of your plane's ability to pull more positive than negative G's is the key to a perfect pass. By rolling inverted, the contour of the ridge can be maintained by pulling G. Obviously, you do not want to try this before you are very confident with your flying skills, as this requires you to return to normal flight at the exact right time to avoid crashing into the ground.

Positive G capability utilised.

Wing Co-Operation
General

Since the start of air combat during World War I, aircraft formations and tactics have been heavily developed. New developments in weapons, planes and radar have always resulted in new tactics and formations. During World War II,the typical formation had a wingman 45 degrees behind the leader with a separation of around 500 ft. The introduction of the missile during the Korean War forced the planes apart because a safety range is needed when the wingman fires a missile, so that he doesn't hit his leader. Today a separation of as much as 15,000 ft can be used.

The best separation and formation may vary during a mission depending on the dangers you meet. You should try to plan in advance what kind of formations you will use during your mission, but be ready to change if something unexpected happens.

Tight formations can be used with great success if you are trying to fool an enemy radar. Several close planes may show up as a single point on the enemy radar, and the enemy will respond too lightly to the threat. During combat, wide formations should be used.

Formation layout

General

The following formations are available:

- Arrow
- Card
- Four ship
- Decoy down
- Decoy front
- Vertical

As the flight leader, you should position your wingmen so that, in case of emergencies, you know where they are at all times. The best way to accomplish this is through the use of standardized formations.

There are several classic fighter formations in JSF that you can choose from. These are: Four Ship, Arrow, Card, and Vertical. These formations are based on a "four-ship" configuration consisting of yourself and up to three additional aircraft flown by your wingmen. Each has specific advantages as well as disadvantages that you should be aware of.

1. Arrow

The Arrow formation divides your four aircraft into two distinct operational pairs or sections. The lead "two-ship" pair, consisting of the #1 (flight leader) and #2 (wingman) aircraft is positioned out in front. The trailing section,consisting of the #3 (section leader) and #4 (wingman) aircraft is positioned astern of the lead section. Each section leader has his wingman flying tight cover.

The Arrow is useful as a traveling formation over enemy air space. By advancing one section, the chances of both pairs becoming engaged simultaneously is decreased. Usually, one section will go unnoticed and/or unengaged. This leaves it free to manouvre and assist the engaged section as necessary.

The Arrow is an attack formation best suited for engaging ground targets. As the lead section sweeps through the target area and executes its attack, it passes along pertinent information to the trailing pair of aircraft- in effect, acting as a forward spotter. This allows the formation to keep its speed high in the vicinity of the target thus reducing its risk to ground fire.

2. Card

The Card (or Box) formation arranges the four-ship into a square or rectangular pattern with all four aircraft flying at roughly the same altitude. The Card is a basic formation practiced by pilots of every nationality and a favourite among flight

leaders because it takes some command responsibility off their shoulders. The box-like arrangement is easily managed, even by inexperienced pilots.

The two section leaders, aircraft #1 and #3, take the two forward positions in the formation. Their respective wingmen, aircraft #2 and #4, position themselves directly behind. Station keeping within this formation is kept simple because the trailing aircraft have two reference points to go by. For long admin flights,the Card is the formation of choice.

In combat, however, the Card is less desirable. This two-dimensional formation is vulnerable on all four sides and the trailing aircraft have their forward firing arc masked by the presence of friendly aircraft. By all means, use the Card when necessary but in situations where enemy contact is likely, switch to either the Arrow or a Decoy formation.

3. Four-Ship

The Four-Ship formation consists of two pairs of flight lead wingmen combinations. It is a traveling formation used to keep the two "two-ship"elements in visual range while in transit from point A to point B. A Four-Ship formation will quickly dissolve once in combat as the individual pairs break off an engage separate enemy aircraft.

In a Four-Ship formation, the #2 and #4 aircraft are flared outward from their respective flight leader. This gives the formation greater visibility forward but makes it more vulnerable to attacks from the flanks and rear. Essentially, a Four-Ship is nothing more than two aircraft pairs flying in a line-abreast arrangement.

4. Vertical

The Vertical (or Ladder) formation is simply a vertical stack of aircraft. Each member of the formation is positioned a little below the aircraft directly in front. One advantage of this formation is that enemy pilots will have trouble judging how high (or low) it extends. It can easily be mistaken for a two-ship formation.

From a tactical standpoint and reasons of energy management, it's always best to take on aircraft at higher altitudes first. For this reason, locating and identifying the lead aircraft in a Vertical is extremely important to the attacker. If the lead elements of this formation go undetected, the enemy winds up going after the lower

aircraft. If this happens, it's a simple matter for the free fighters to come to the rescue.

5. Decoy Formations

In addition to the three standard formations mentioned above, there are also two special flight configurations designed to lure an enemy force out into the open. They are the Decoy Down and the Decoy Front formations.

• *Decoy Down*

The Decoy Down formation places a single fighter, the Decoy, (usually the #3 aircraft) out in front of the other three aircraft at a lower altitude. The premise of the Decoy Down is to trick enemy fighters into attacking the Decoy. Once the enemy fighters are committed, the remaining three fighters in your formation move in to engage them. In cases where the Decoy is overlooked and the main formation is spotted, the Decoy fighter is then free to reverse direction and engage the attackers.

• *Decoy Front*

The Decoy Front formation places a single fighter (once again, the #3 aircraft) out in front of the main formation at roughly the same altitude. The premise of this formation is to once again, spook an enemy into prematurely committing itself. If the Decoy is attacked, the remaining three fighters of the formation are in position to engage. Attackers seeking to take up a tail chase pursuit on the Decoy are themselves caught from behind.

B. Combat Spreads

Another aspect of formation flying is maintenance of safe separation distances or combat spreads between aircraft. Tight formations are more difficult to spot both visually and on radar. (Two tightly packed aircraft may appear as one to enemy radar.)

The trade-off is that close formation flying requires intense concentration. It is physically demanding on pilots and cannot be continued over extended periods of time. As flight leader, you may select from four different separation distances. These are:

- Separation Wide: maintains 2000 meters between aircraft.
- Separation Normal: maintains 150 meters between aircraft.
- Separation Close: maintains 50 meters between aircraft.
- Separation Display: maintains 15 meters between aircraft.

Formation separation

As well as formation, you can also order your wingmen to keep a certain separation between the planes. The following commands are used.

Wide

The separation between the planes are approximately 6000 feet. This separation is often the best in modern air warfare.

Normal

The separation between the planes are approximately 500 feet. Though not as compact as Separation Close, it keeps your wingmen within viewing distance.

Close

The separation between the planes are approximately 150 feet. Use this formation if you want your formation to keep tight together, without tiring out your wingmen.

Display

The separation between the planes are approximately 50 feet. Several planes may melt together to a single radar echo when traveling close enough. Note, however, that Separation Display wears out your pilots quickly and should only be used for a short period of time.

APPENDIX ONE

Keyboard Quick Reference

Basic flight controls

[Left] [Right]	Roll plane
[Up] [Down]	Pitch up/down
[>] [<]	Rudder pedals
H	Toggle Hatch
G	When grounded : toggle nose wheel lock
	When airborne: toggle gear
F	Toggle flap
B	Airbrake/wheel brake
O	When grounded: Back up with plane

Engine

[CTRL] [`]	Engine off
[`]	Engine idle 60%
1	64% thrust
2	68% thrust
3	72% thrust
4	76% thrust
5	80% thrust
6	84% thrust
7	88% thrust
8	92% thrust
9	96% thrust
0	100% thrust
[CTRL] 0	Afterburner thrust
[-]	Increase thrust
[CTRL] [-]	Increase thrust slow
[=]	Decrease thrust
[CTRL] [=]	Decrease thrust slow

Emergency Controls

[BothCTRL] [E]	Eject
[BothCTRL] [W]	Jettison first external weapons, then internal
[BothCTRL] [J]	Toggle fuel jettison

[BothCTRL] [Arrow]	Adjust trim. This needs only be done under extreme situations (i.e. your aircraft suffers serious structure damage)	
Camera Views		
External Camera Views		
[F1]	Player internal:	Forward
[F2]	Player internal:	Player virtual cockpit
	Player virtual	target padlock
[F3]	Player views:	Player external
	Player air flyby	
	Player ground flyby	
[F4]	Player action views:	Player chase
	Player back view	
	Player, below left wing	
	Player, below right wing	
[F5]	Wingman views:	Wingman external
	Player → Wingman	
	Wingman → Player	
	Wingman air flyby	
[F6]	Plane views:	Plane external
	Player → Plane	
	Plane → Player	
	Plane air flyby	
[F7]	Vehicle views:	Vehicle external
	Player → Vehicle	
	Vehicle → Player	
	Vehicle ground flyby	
[F8]	Generic object views:	Object external
	Player → Object	
	Object → Player	
[F9]	Incoming missile views:	
	Player → Incoming missile	
	Incoming missile → Player	
	Incoming missile external	
	Incoming missile air flyby	
[F10]	Outgoing missile views:	
	Outgoing missile external	
	Outgoing missile internal view	
	Outgoing missile air flyby	

[F11]	Secondary player views:	Player satellite view
		Tower → Player
		Wind Indicator view
[F12]	Player target views:	Player target external
		Player → Player target
		Player target → Player
		Player target air flyby

When applicable,these additional commands are available:

[Ins]	Next object in category
[Del]	Previous object in category
[CTRL] [Right]	Rotate camera right
[CTRL] [Left]	Rotate camera left
[CTRL] [Up]	Rotate camera up
[CTRL] [Down]	Rotate camera down
[PageUp]	Move camera closer to object
[PageDn]	Move camera farther from object

Normal Views

[CTRL] [Arrow]	Move head in virtual cockpit. Note that when doing this, the aircraft radar is connected to the motion sensor and rotates with your head.
[NumPad7]	Virtual cockpit look left
[NumPad8]	Virtual cockpit look back
[NumPad9]	Virtual cockpit look right

By default,transitions between these positions happen smoothly. By pressing [CTRL], however, the view snaps immediately.

MFD Views

[NumPad1]	Control MFD
[NumPad2]	Status MFD
[NumPad3]	Info MFD
[NumPad4]	Attack MFD
[NumPad5]	Strategic MFD
[NumPad6]	Offensive MFD

By default, the camera slides smoothly from one MFD to another. As above, however, an immediate change can be forced by keeping [CTRL] pressed while selecting the view.

Radio communication

[Shift]	Activate communications menu. The following commands only apply when shift is pressed:
1..9	Select message 1..9. Greyed out messages are inactive and therefore not selectable.
[BackSpace]	Go back one level
[`]	Go back one level

Weapons Controls

[Space]	Fire active weapon
[CTRL] [Space]	Fire gun
[Enter]	Next A2A weapon
[CTRL] [Enter]	Previous A2A weapon
[BackSpace]	Next A2G
[CTRL] [BackSpace]	Previous A2G weapon
D	Next A2G discriminator. The available modes are:
None	No ground target display
IR	Operate FLIR targets
GPS	Operate GPS targets
AR	Operate AR targets
[CTRL]D	Previous A2G discriminator
[Tab]	Next target
[CTRL] [Tab]	Previous target

Defence Controls

E	Toggle ECM
C	Chaff
Z	Flare

MFD Controls

[Alt]	Enable mouse pointer
[Alt] [NumPad1]	Active MFD set to Control MFD
[Alt] [NumPad2]	Active MFD set to Status MFD
[Alt] [NumPad3]	Active MFD set to Info MFD

[Alt] [NumPad4]	Active MFD set to Attack MFD
[Alt] [NumPad5]	Active MFD set to Strategic MFD
[Alt] [NumPad6]	Active MFD set to Offensive MFD
[Alt] 12345	Active MFD top row buttons
[Alt] QWERT	Active MFD left row buttons
[Alt] ASDFG	Active MFD right row buttons
[Alt] ZXCVB	Active MFD bottom row buttons

The active MFD is always a little brighter than the other MFDs.

HMD

[Numpad Decimal]	Toggle HMD on/off
S	Set HMD mode to SLS
N	Set HMD mode to NAV
[Enter]	Set HMD mode to A2G
[BackSpace]	Set HMD mode to A2G
[CTRL] T	Toggle synthetic terrain overlay
[CTRL] O	Toggle synthetic object overlay
[CTRL] N	Toggle night vision

Dropdown Menu

[Esc]	Toggle dropdown menu
[Arrow]	Navigate dropdown menus/Operate sliders
[Space] / [Enter]	Select dropdown item

Radar

X	Increase radar range
[CTRL] X	Decrease radar range
R	Radar on/off
[CTRL]R	Toggle radar view mode

Autopilot

A	Toggle autopilot on/off
W	Next waypoint
[CTRL] W	Previous waypoint
M	Match target speed
T	Autothrottle
L	Level plane

APPENDIX TWO

Joystick and GamePad Buttons

Input Device Configuration

General

Select your preferred input device from the JSF Main Menu > Options > Game > Input Device or the In-Flight menu (revealed by pressing ESC while playing the game) Controls / Input Device.

The keyboard commands are always enabled,independent of what input device you choose.

Configuring The Keyboard

The arrow keys are used for pitch and roll, and sensitivity can be adjusted through the In-Flight menu Controls / Settings / Sensitivity. The game is fully playable through the arrow keys, but for the best control we recommend that you use a joystick.

Configuring The Mouse

Vertical movement of the mouse corresponds to a pitch movement on the stick, while a horizontal movement corresponds to roll. Pitch Sensitivity, Roll Sensitivity and Inertia can be adjusted under Controls > Settings in the In-Flight menu.

You can also map your mouse buttons to keyboard commands. This is done under the In-Flight menu Controls / Button Mapping. Select the button you want to map, then select the function you want to map the button to.

Default button mappings:

Button	*Function*
1	Fire
2	Toggle A2A weapon
3	Toggle target

Note: If you want to use a 3-button mouse, be sure to have a 3-button mouse driver selected in Windows95‘ Control Panel / Mouse / General. Configuring Joysticks, Gamepads, throttles and rudders A joystick is the best way to control your aircraft. Joysticks, Gamepads, Throttles and Rudders are configured in the Windows 95 Control Panel / Joystick , the JSF In-Flight menu and when required configuration through a manufacturer program. See the listings below for information on your joystick.

For more information on controller specific configuration and controller capabilities, see your controller and Windows95‘ manuals.

XY Sensitivity, Rudder Sensitivity and Slack can be configured in the In-Flight menu under Controls / Settings. Rudder sensitivity only applies if you have selected rudder in Windows95‘ Control Panel.

The Centre command under Controls in the JSF In-Flight menu reads the controller position and uses this as controller centre

position. This is done every time you start JSF, but if you for some reason you need to re-centre the controller invoke this command.

Joystick buttons and a POV-button supported by your selected joystick driver can be mapped to keyboard commands. This is done under the In-Flight menu Controls>Button Mapping. Select the button or POV direction you want to map with Enter and the up/down arrow keys to select the function you want to map the button to.

Default button mappings:

Button	*Function*
POV up	Look up
POV left	Look left
POV down	Look down
POV right	Look right
1	Fire
2	Toggle ATA weapon

Note: If you have a controller with thrust control (third axis), and you want to disable it, do so in the Windows 95 Control Panel.

Throttles

Controller name	*Keyboard mapping file*	*Configuration*
CH throttle	controls\ch_th.key	Manufacturer program
ThrustMaster F16 TQS		Manufacturer program. Must be used with ThrustMaster F16 FLCS or ThrustMaster F22.
ThrustMaster MARK II WCS		Manufacturer program

Gamepads

Controller name	*Keyboard mapping file*	*Configuration*
ACT Labs Powerramp MITE		Windows 95 control panel, ingame menu
PHASE 9 Phantom 2		Windows 95 control panel, ingame menu
PRIMAX Firestorm gamepad		Windows 95 control panel, ingame menu
ThrustMaster Phazer Pad		Windows 95 control panel, ingame menu, manufacturer program

Joysticks

Controller name	*Keyboard mapping file*	*Configuration*	*Misc.*
ACT Labs Eaglemax		Windows95 control panel, ingame menu,manufacturer program	Thrust
CH F16 Fighter Stick	controls\ch_fight.fsc	Windows95 control panel, ingame menu,manufacturer program	Thrust
CH F16 Flight Stick		Windows95 control panel,ingame menu	Thrust
CH Force FX		Windows95 control panel, ingame menu,manufacturer program	
Logitec Wingman Extreme		Windows95 control panel,ingame menu	
Microsoft Sidewinder Professional		Windows95 control panel,ingame menu	Thrust,rudder
Microsoft Sidewinder Standard		Windows95 control panel,ingame menu	Thrust
ThrustMaster F16 FLCS	controls\f16tqs.m50 controls\f16tqs.b50 controls\f16wcs.m50 controls\f16wcs.b50	Windows95 control panel, ingame menu,manufacturer program	
ThrustMaster F22 Pro	controls\f22tqs.f22 controls\f22tqs.m22 controls\f22wcs.f22 controls\f22wcs.m22	Windows 95 control panel,ingame menu, manufacturer program	
ThrustMaster Pro FCS		Windows 95 control panel,ingame menu	

Rudders

Controller name	*Keyboard mapping file*	*Configuration*
ThrustMaster RCS		Windows 95 control panel, ingame menu

Button Mappings

For keyboard mappings for Thrustmaster F16 FLCS, F22, F16 TQS and MARK II WCS see the file CONTROLS\MAPPING.TXT.

CH Fighterstick

Button	*Command*
S1	Fire weapon
S2	Fire cannon
S3	Toggle ATA
S4	Toggle ATG
H1 up	Look forward
H1 down	Look back
H1 left	Look left
H1 right	Look right
H2 up	HMD 4
H2 down	HMD 1
H2 left	HMD 2
H2 right	HMD 3
H3 up	Radar zoom in
H3 down	Radar zoom out
H3 left	HMD 5
H3 right	HMD 6
H4 up	Trim up
H4 down	Trim down
H4 left	Trim left
H4 right	Trim right

CH throttle

Button	*Command*
1	Radar on/off
2	Level
3	ATG discriminator
4	Chaff
5	Flare
6	Autopilot
7	Next waypoint
8	Increase thrust slow
9	Prev. waypoints
10	Decrease thrust slow
11	Increase radar range
12	Decrease radar range

APPENDIX THREE

Multiplayer details

Miscellaneous

[CTRL] P

Pause/resume game

[CTRL] S

Toggle smoke trail

Choosing The Right Protocol

General

Before starting the JSF multiplayer it's important to choose the right connection method. JSF supports most protocols written for Direct X™ 5. Here is an explanation of the most common protocols:

Serial Connection

A serial connection is a cable that goes between the Serial or Parallel ports on 2 local machines. JSF only supports 2 players over a serial connection.

Modem Connection

When using a modem the player hosting the game will be waiting a phone-call from the player joining the game. Therefore the player joining will Dial-Up the host when querying for games. JSF only supports 2 players over a modem connection.

IPX Connection

IPX is LAN (Local Area Network) protocol, meaning that without IPX extenders like KALI, the protocol can only be used for local network play. JSF supports up to 8 players with IPX.

TCP/IP Connection

This is an Internet based protocol. The communication over the Internet is either via a Dial-Up connection to your ISP (Internet Service Provider) or over a LAN connected to the Internet. If you are connecting to the Internet over an ISP, you must connect to the ISP before accessing the Multiplayer mode in JSF. JSF supports up to 8 players with TCP/IP.

Configuring The Chosen Protocol

General

When you have chosen the right protocol, you can start playing the game. But when either hosting or joining games,you will be queried for information about the connection you're about to make.

Serial Connection

The serial connection needs the Port at which the cable is connected. Other options like Baud Rate, Stop bits, Parity and Flow MUST be same on the connected computers. For information on how to adjust the connection,please refer to your Windows documentation.

Modem Connection

When hosting a game using a Modem connection, you will be queried for the location of the modem. When joining a game you must provide the telephone number to the Host and the location of your modem.

IPX Connection

This protocol doesn't need any special configuration.

TCP/IP Connection

When joining a multiplayer game, the TCP/IP protocol needs to know the name or the IP of the server hosting the game (e.g. snapper.innerloop.no or 192.148.0.3).

NOTE: None of these addresses are valid, neither do they have anything to do with JSF.

Playing JSF on the Mplayer™ Internet Gaming Service

What is Mplayer?

Mplayer is the #1 multiplayer game service on the Internet. When you play JSF on Mplayer, you'll be able to play against other people from across the Internet in real time. After signing up for Mplayer, you'll join a friendly online community and where you can participate in regular tournaments, contests, and special events. Mplayer offers hundreds of innovative features, including real-time voice-chat which lets you taunt or tease your opponents and praise your team-mates.

Pricing

Mplayer is FREE—there are no charges or monthly fees to play JSF on Mplayer. So How Do I Get Started? Installing Mplayer is simple. Just follow these easy steps and you're on your way to the excitement of online multiplayer gaming!

There are two ways to start the Mplayer installer:

- From the game CD-ROM Autorun Menu: -select the option to Play on Mplayer
- From the Windows95' Start Menu select this game and the option to Play on Mplayer. This will start the Mplayer installer which will:

- Check for the presence of an Internet connection—if you don't have an Internet Service Provider, we'll give you the option of signing up for one.

- Check for the presence of a Web Browser—we'll install a copy of Microsoft's Internet Explorer" if you need it.

- Check for Mplayer — if you don't have it, we'll install everything you need! Just follow the easy install instructions at the prompts. During the process, you'll set up an Mplayer account and select your very own Mplayer member name and password.

After installing Mplayer, your web browser will launch and connect you to the Mplayer game page:

- Follow the instructions on the web page to download any additional files you might need to make the game playable on Mplayer

- Now click on the link to enter the game lobby of your game.

Now you are in the game lobby on Mplayer.

- Chat with other players by typing your message and pressing Enter.
- To enter a game room double click on a green room icon.
- If you want to create a new room click on the Create Room icon.

Almost there!

- Make sure the game CD-ROM is in the disk drive.

- Click on the Join Game icon.

- If you created the room you'll have to wait for some more players, then click on the Launch Game icon.

For more information about Mplayer visit the web site at www.mplayer.com. Technical Requirements You need the following PC configuration to install our software and play games on Mplayer:

System Requirements:
Minimum Configuration:
- Pentium 90 processor
- Windows 95 or Windows NT operating systems (Windows NT version requires DirectX 5.0 or newer)
- 16Mb of RAM
- 16bit graphics card
- 60Mb Hard Drive space
- Double-speed (2x) CD-ROM drive (4x in order to view movies smoothly)
- keyboard and mouse.

Recommended Configuration:
- Pentium 133 or faster processor
- Windows 95 or Windows NT operating systems (Windows NT version requires DirectX 5.0 or newer)
- 24Mb of RAM, joystick
- 16bit graphics card
- 160 Mb Hard Drive space
- Quadruple-speed (4x) or faster CD-ROM drive
- any Windows supported sound card.

Satori State Configuration:
Recommended Configuration plus:
- 3DFx Graphics Acceleration Card
- throttle system
- rudder pedals.

*AOL and CompuServe do not yet support adequate TCP/IP connections for FAST gameplay. Low latency games, turn-based or role playing games, however, can be played.

APPENDIX FOUR

Radio Communications

General

This appendix gives you a full overview of radio communications commands and radio messages available in the game.

Radio Menu

General

For information on how to use the radio communication menu, see Section 8.
The root menu has the following choices:

1. All Wingmen...	Issue orders to all your wingmen.
2. Two,...	Issue orders to wingman Two only.
3. Three,...	Issue orders to wingman Three only.
4. Four,...	Issue orders to wingman Four only.
5. Tower,...	Issue request to closest tower.
6. AWACS,...	Issue request to AWACS.

Wingmen

Selecting any of 1 through 4 on the root menu will display the following menu, in which you will issue orders or information requests to one or more wingmen:

1. Formation...	Execute the flight formation that follows...
2. Engage...	Execute the engagement order against an enemy target that follows...
3. Fire...	Fire at the target that follows...
4. Intercept...	Intercept a target, more information follows...
5. Defend...	Perform that defence action that follows...
6. Navigation...	Prepare to go where I tell you, more information follows
7. Status...	What is your aircraft status, additional request follows...

Formation...

As a flight group leader you are offered a wide range of formations and formation separations. For more information, see section 10.

1. Formation Four Ship.	Assume the classic Four Ship formation.
2. Formation Arrow.	Assume the Arrow formation (planes arranged in diamond).
3. Formation Card.	This is often the best formation. This formation maintains formation integrity during turns, and is difficult for ground defence to deal with.
4. Formation Decoy Down.	Assume the Decoy Down formation (one plane goes lower to act as a decoy).
5. Formation Decoy Front.	Assume the Decoy Front formation (one plane to goes to front to act as a decoy).
6. Formation Vertical.	Assume the Vertical formation (planes stacked vertically).
7. Separation...	Orders separation between the planes follows...
8. Formation Leader...	I will be choosing a new formation leader...

Separation...

1. Separation Wide.	Around 6000 feet distance between the planes.
2. Separation Normal.	Around 500 feet distance between the planes.
3. Separation Close.	Around 150 feet distance between the planes.
4. Separation Display.	Around 50 feet distance between the planes.

1. Formation Leader...

1. One.	Plane One is now the formation leader.
2. Two.	Plane Two is now the formation leader.
3. Three.	Plane Three is now the formation leader.
4. Four.	Plane Four is now the formation leader.

2. Engage...

1. Engage my target.	Engage the target I have target lock on.
2. Engage only when tracked.	Engage only when the enemy radar tracks you.
3. Engage at will.	Pick your own target and attack at will.
4. Disengage	Break off combat.

3. Fire...

1. Fire at will.	Use your own discretion, fire your weapons at will.
2. Fire at my target.	Line up and use your weapons on the target I have locked.
3. Fire at my command.	Stand by and do not use your weapons until I tell you.

4. Intercept...

1. Intercept my target.	I have a target locked; intercept it.
2. Intercept only when tracked.	Do not intercept unless an enemy gets target lock on you.
3. Intercept at will.	Use your discretion,intercept any target you wish.

5. Defend...

1. Radar...	Turn your radar on or off.
2. Check Six,...	Check your rear at the interval I will give you...
3. ECM...	Turn your ECM on or off.
4. Radio...	Radio silence to be ordered or counterordered.
5. Lights...	Turn your running lights on or off.

Radar

1. On.	Turn your radar on.
2. Off.	Turn it off.

Check Six

1. Now.	Check your six immediately.
2. Regular 2 Minutes.	Check every 2 minutes, beginning now.
3. Regular 5 minutes.	Check every 5 minutes, beginning now.
4. Regular 10 minutes.	Check every 10 minutes, beginning now.
5. Regular 20 minutes.	Check every 20 minutes, beginning now.
6. At my command.	Wait for me to tell you to check.

ECM

The wingmen will takeoff with ECM off. When planes are flying close, it is enough for one of them to have ECM on to defeat radar detection.

1. On.	Turn on your Electronic Counter-Measures.
2. Off.	Turn them off.

Radio

1. End Radio silence.	You may resume giving regular radio reports.
2. Radio Silence.	Cease using your radio until further notice.

Lights

The wingmen will by default have lights off. You should always ask the wingmen to turn off their lights when you are flying over enemy territory so they become more stealthy. When you are approaching a friendly airport however turn the lights on so it is easier for the tower crew to have visual contact with you and the wingmen.

1. On.	Turn your running lights on.
2. Off.	Turn your running lights off.

6. Navigation...

1. Land.	Return to base immediately to refuel your airplane.

7. Status...

1. Fuel.	How much fuel do you have left? If a wingman report 'Bingo Fuel' he has only enough fuel to reach back to base, and he should be given the 'Land' command immediately.
2. Ammo.	How many missiles, bombs and cannon round do you have left?
3. Action.	Are you currently engaged, in formation or following waypoints?
4. Damage.	Is your aircraft damaged; if so, where?
5. Full.	Ask the wingman for a full status report.

Tower

See Section 8 for more information about towers and tower communications.

1. Request landing permission.	I'm coming home, request permission to land.
2. Request emergency landing.	Low on fuel or hurt, request emergency landing permission.
3. Request take-off permission.	Ready to go, request permission to take-off.

AWACS

See Section 8 for more information about AWACS

1. Request IFDL.	Please begin transmitting air threat locations from your plane to mine
2. Disconnect IFDL.	Turn off your transmission to my plane.

Messages

General

This section gives a complete list of all speech messages, and their meaning.

Messages from tower

"You Are Cleared For ..."	Plane is cleared for landing or takeoff on the indicated runway
"On Runway Heading ..."	Land-takeoff-direction.

Messages to AWACS

"Contact 24,10,Angels 10"	AWACS reports on aircraft that is a possible threat (heading, range, altitude).
"Inbound 24,10,Angels 10"	AWACS reports that aircraft on indicated position is inbound (heading, range, altitude).
"IFDL Established"	In-flight data link established.
"IFDL Disconnected"	In-flight data link disconnected.

Messages from wingmen

"Airborne. Awaiting orders"	Wingman is airborne awaiting orders.
"Action Combat"	Wingman is in dogfight.
"Action Form"	Wingman follows formation defined by formation leader.
"Action Route"	Wingman follows waypoints.
"Fuel OK"	Wingman has enough fuel.
"Fuel Low"	Wingman is low on fuel.
"Fuel Bingo"	Wingman has enough fuel to return to base.
"Ammo OK"	Wingman has more than one missile left.
"Ammo Low"	Wingman has one missile left.
"Ammo Empty"	Wingman has zero missiles left.
"AOK"	Wingman reports everything OK.
"IncomingMissile"	Wingman reports an incoming missile.
"Turn"defensive	Wingman reports that he is making a turn to avoid an incoming missile.
"Decoy"	Wingman has released chaff/flare to fool an incoming missile.

“Copy That”	Wingman acknowledges command.
“Eject”	Wingman will eject due to plane damage.
“Permission To Fire”	Wingman has ‘lock on’ on a target, and asks for permission to open fire.
“Target Lock”	Wingman has ‘lock on’ on a target, but hasn’t been given permission to open fire.
“Target Lost”	Wingman lost his target.
“Engaging”	Wingman is engaging an enemy.
“Engaging 24, 15, Angels 10”	Wingman is engaging an enemy (heading, range, altitude).
“I’m Hit!”	Wingman was hit by gunfire/missile.
“Damage”	Wingman has sustained damage.
“Fox From Wingman	Wingman has released a missile.
“Good Kill”	When player shoots down a plane.
“I Hit Him!”	When wingman hits a plane.
“I Shot Him!”	When wingman hits a plane.
“On His Tail”	Wingman is on enemies tail and uses cannon.
“Target Lost”	Wingman lost his target.

Messages from VOCOM

“Incoming IR Missile”	Incoming infra-red missile.
“Waypoint Reached”	Waypoint reached.
“Pull Up”	Ground crash warning.
“Lock On”	Missile lock on.
“[Category] Target Destroyed”	Target of [category] destroyed.
“[Category] Plane Destroyed”	Plane of [category] destroyed.
“Decoy”	Automatic release of chaff/flares.
“Damage”	Aircraft sustained damage.
“IFDL Lost”	In-flight data link lost (AWACS shot down).
“Bingo Fuel”	Player has only enough fuel to reach base

APPENDIX FIVE

Weapons

various missiles and bombs it can carry, along with weight and other vital mission statistics. You can see abbreviated information on the weapons in the Campaign game by opening the Arm Plane menu and moving the mouse pointer over a weapon (see Section 5: Flying A Campaign]

General

Arming Screen.

The JSF aircraft can perform both ground strike and air combat missions on the same mission. Besides the cannon, your JSF features eight positions for hanging bombs or missiles (hardpoints).

The X-35 can carry about 10,000 pounds of ordnance externally, and 5,000 pounds internally. The X-32 can carry a slightly larger payload, with 12,000 pounds external capacity and 5,000 pounds internal. Below are descriptions of the

Note: The JSF was designed to be a stealthy aircraft. However, loading a bomb or missile onto one of the four wing hardpoints will interrupt the stealthy construction and reduce the plane's ability to hide from enemy radar. Whenever possible, you should attempt to plan missions that will allow you to use only the four interior fuselage hardpoints, to keep the stealthy radar profile.

Cannon M61A2

The baseline gun for the JSF aircraft is the newest updated version of the 50-year-old Project Vulcan design, the M61A2 20mm. Located in the forward chine, the gun carries 1,850 rounds of ammunition effective against any type of aircraft and soft targets.

Missiles

AIM-120c AMRAAM

The Advanced Medium-Range Air-to-Air Missile (AMRAAM), built by both Hughes Missile Systems Company and Raytheon Company, is the latest weapon for fighter aircraft, capable of being launched beyond visual range, day or night and in all weather. It uses active homing radar, digital technology and state-of-the-art electronics to combine many capabilities. It has the ability to launch several missiles against multiple targets,look-down/shoot-down,and to track and intercept other aircraft at very short range in a dogfight.

The AIM-120c (Air Intercept Missile) is a 'fire and forget' weapon that will home in on the target without post-launch guidance from the pilot. This allows him to fire and then take evasive action or lock onto another target. Top speed is Mach 4 (2,374 kph), weight only 335lbs and range is 30 nautical miles, making it agile, fast and deadly at long ranges.

The AIM-120 series has officially scored three combat victories: two over Iraq and one in Bosnia. To date, more than 8,000 AMRAAMs have been produced.

AIM-9x SIDEWINDER

The AIM-9x Sidewinder series is an air-to-air, infrared heat-seeking missile with a relatively short range of 11 nautical miles. When launched, it locks on to and follows the heat signature of the target aircraft's engine at a speed of Mach 2.5 (1,457 kilometres per hour).

It first entered service with the US Air Force in 1956 as the AIM-9b and has since been extensively modified. It now includes night time use, all-angle firing capability including launches at targets approaching head-on, improved resistance to counter-measures and far greater maneuverability.

With its low weight of 190lbs and extremely low cost of about $84,000 per missile, it's no wonder that over 110,000 of them have been manufactured for use in 28 countries. The AIM-9x is a variant of the missile currently under development; the only current production model is the AIM-9m.

AGM-88c HARM

The AGM-88c High-speed Anti-Radiation Missile (HARM) is an air-to-surface tactical missile designed to seek and destroy enemy radar-equipped air defence systems. It is universally feared by SAM crew world-wide as a reliable and tenacious weapon, capable of quickly and efficiently 'riding down the beam' of enemy radar signals and destroying them.

Once locked on to an enemy ground radar position and launched, it will home in on that position, whether the radar remains active or not.

Manufactured by Texas Instruments,it first entered service in 1984 and currently sees service on the F4G Phantom 'Wild Weasel' and on F-16C Falcon. Weighing 800 pounds, it travels at a speed of nearly Mach 3 (1,781 kilometres per hour) and has a range of 40 nautical miles.

Bombs

GBU-31 JDAM-3

The GBU-31 Joint Direct Attack Munition (JDAM) began life as an ordinary, free-falling gravity bomb, converted by a guidance kit into a precision-guided 'smart' weapon.

The guidance package adds in an inertial navigation system and a link to the Global Positioning Satellite network. Capable of being dropped up to 15 miles from the target; the INS/GPS system guides the bomb to the target with an astounding accuracy, with an average error of less than 13 feet.

Weighing in at a whopping 2,000 pounds, the GBU-31 is considered one of two baseline air-to-ground bombs in the inventory, used against hardened targets.

GBU-32 JDAM-3

This is a lighter weight model of the GBU-31, totalling 1,000 pounds.

Both bombs are part of a joint project of the US Air Force and Navy featuring a host of contractors, Lockheed Martin Tactical Defence Systems for the mission computer, Honeywell, Inc., for the inertial measurement unit, Rockwell Collins for the global positioning system receiver, HR Textron for the tail actuator subsystem, Lockley for the tail fairing, Enser and Eagle-Picher for the battery, and MDI and Lambda for the power supply. McDonnell-Douglas is the prime contractor.

The Department of Defence has announced plans to buy 87,496 JDAMs for use by the Air Force and Navy at a cost of approximately $2 billion US.

AGM-154A JSOW Baseline

The Joint Stand-Off Weapon (JSOW) program is a family of precision-guided stand-off munitions, each featuring an INS/GPS guidance system to lock and track the bomb onto a target with frightening accuracy. Made to be dropped miles from the target zone, the INS/GPS system makes course corrections on the bomb in flight,via a set of fins. All versions are being designed to be fire in day, night and adverse weather conditions.

The AGM-154A JSOW Baseline is a 'cluster bomb,' carrying 145 BLU-97B 'bomblets,' known as a Combined Effects Munition (CEM).

When dropped, the bomb approaches the target and explodes above ground, spreading the BLU-97B bomblets over a wide area. Extremely effective against what are called 'soft' targets, such as trucks, jeeps, airplanes and troops in the field. It weighs 1,000 pounds.

AGM-154B JSOW Anti-Armour

The AGM-154B is the anti-armour variant of the JSOW series. Equipped with the same INS/GPS as the AGM154-A, its warhead consists of 6 BLU-108/B anti-armour cluster bombs. Each bomb is made up of 4 'skeets' with an attached infrared sensor for target detection, for a total of 24 skeets.

Essentially, this is a large metal dart that moves like the wind, locks onto a tank or other armoured vehicle and then punches a big hole in the tank- ruining it.
Weight : 1,000lbs.

AGM-154C JSOW Unitary

This JSOW variant is a single warhead (hence the designation 'Unitary') and designed to be used against 'hard' targets, such as bunkers, command centres and other buildings.

CBU-97 WCMD Anti-Armour

The CBU-97 Wind Corrected Munitions Dispenser (WCMD) Anti-Armour bomb is similar to the AGM-154B JSOW. It is a cluster bomb designed to seek out and attack tanks and other armoured vehicles. It uses an INS/GPS sensor system to manipulate tail fins,guiding the bomb near the selected target zone. It then explodes and releases ten BLU-108/D warheads with 4 skeets each, each skeet being an infrared Sensor Fused Weapon. The SFW is essentially a 'smart' weapon that can lock onto, track and destroy both stationary and moving land targets. As the BLU-108/Ds approaches the target, the skeets are released,each finding a target to home in on. With a total of 40 skeets being released by each CBU-97, this is a bomb that packs quite a wallop.

APPENDIX SIX

Units/Plane Information

Enemy Aircraft

What would a fighter combat simulation be without enemy aircraft? The following section details the enemy aircraft you'll encounter in JSF.

MiG-29 Fulcrum

The Mikoyan-Gurevich (MiG)-29 Fulcrum is a single seat all-weather interceptor and one of the more deadly opponents you'll face in aerial combat. Known in the Russian Air Force as "Baaz" or Eagle, these aircraft are powered by two Klimov /Sarkisov RD-33 turbofans, each producing 11,110 lbs. of dry thrust (18,300 lbs. of thrust with afterburning). All this power gives the MiG-29 a better than 1:1 thrust-to-weight ratio which allows it to compete with aircraft like the USAF's F-15 or F-16. The Fulcrum possesses an excellent flight envelope but where this aircraft really shines is in its ability to 'close-to-kill' undetected with an enemy. The MiG-29 is equipped with an Infrared Search and Track (IRST) sensor which allows it to track a target without using radar. The MiG-29 carries both radar-guided AA-10 Alamo-C and heat-seeking AA-11 Archer AAMs. A GSh-30 30mm gun with 150 rounds is mounted in the left wing-root. In a ground strike configuration, the MiG-29 can carry almost 9,000 lbs. of ordnance on eight external hard-points. This ordnance includes standard bombs, rocket pods, napalm, submunition dispensers and various AGMs.

Su-27/35 Flanker

The Sukhoi (Su)-27/35 is probably the best non-Western air superiority aircraft in the world. Although it is large (50% larger than the MiG-29) and easy to spot in combat, the Flanker has the capability to target and destroy multiple aircraft simultaneously, much like the USN's F-14 Tomcat. This all-weather interceptor is equipped with a formidable avionics suite which includes a powerful N001 Zhuk (NATO designation: Slot Back) 'look down-shoot down' TWS (track-while-scan) pulse-Doppler radar.

The Flanker's blended planform fuselage gives it a sleek and threatening appearance. Its two Saturn/Lyulka AL-31F afterburning turbofans are each rated at 17,857 lbs. of dry thrust. These engines give the Su-27 a maximum speed of mach 1.1 (725kts) at sea level and mach 2.35 (1350kts) at mission altitudes. Like the MiG-29, it also is equipped with an IRST system.

In addition to being a stable long range missile platform, the Flanker is also an excellent slow speed dogfighter, something the F-14 was not designed to be (Tom Cruise notwithstanding). Although its preferred method of engagement is the stand-off missile attack, it can fight up close and personal with no loss in effectiveness. It carries a GSh-30 30mm gun with 150 rounds in the right wing root for just this reason.

Mirage 5

The Mirage 5 is a strike fighter built by the French consortium, Dassault. It was originally developed as a low cost replacement for Israel's fleet of aging Mirage IIIs. This delta-winged aircraft features two 30 mm DEFA cannons and an ability to carry up to 8800 lbs of ordnance on seven external hardpoints.

The Mirage 5 has been consistently upgraded over the years. Most models now include a Cyrano radar able to accommodate the Matra R530 AAM. Export models of this aircraft commonly lack modern avionics packages. These aircraft should prove no match for a JSF in the hands of a skilled pilot.

Tu-22M Backfire

The Tupolev (Tu)-22M Backfire is a twin engined strategic bomber. Although it is designed for low level penetration of enemy airspace, the most likely role for this aircraft is performing anti-ship strikes out over the Atlantic. The Backfire normally carries several AS-4 or a rotary launcher with six AS-6 nuclear-tipped anti-ship missiles. Strangely, it also has a tail-mounted radar-directed 23 mm gun.

The TU-22M has a crew of four: pilot, co-pilot, navigator, and weapons officer. With one mid-air refueling, it can reach any point on the globe. This aircraft is extremely fast, even while loaded with ordnance. Its swept wings enable it to reach speeds of 600 knots at sea level and up to 1100 knots at high altitudes. A JSF pilot will have to be very lucky to intercept one of these bombers.

Il-76 Candid

The Ilyushin-76 Candid is a strategic heavy-lifter. This transport aircraft is able to carry up to 140 troops at a time plus their equipment. The Candid is capable of operating from short fields if necessary. It features the classic high T tail surface, rear cargo RO-RO ramp and cargo doors.

The IL-76 is powered by four Aviadvigatel turbo-fan engines giving it a top cruising speed of nearly 450 knots and a range (with full payload) of almost 4,000 kilometres. The IL-76 fuselage is also used as a re-fuelling platform (IL-78) and in an AWACS capacity (A-50).

A-50 Mainstay

The Beriev A-50 Mainstay is a second generation Russian AWACS (Airborne Warning and Control System) aircraft. It is powered by four Aviadvigatel D-30KP turbofans, each rated at 26,500 lbs. of non-afterburning thrust. This gives the Mainstay a top cruising speed of 430 knots and a mission ceiling of 30,000 ft. The aircraft is equipped with a radar dome above the fuselage and a comprehensive communications suite with nav/satellite uplink as well as ground control station downlink.

The Mainstay performs roughly the same function as the USAF E-767 or USN E-3 Sentry, that of monitoring airspace and issuing tactical guidance. It began replacing the less capable Tu-126 'Moss' back in the early 1980s. Once on-station, a Mainstay patrol can last for up to twelve hours at a time. The crew consists of two pilots, a flight engineer, navigator and mission crew of 15 technicians who are responsible for monitoring the various radar displays.

Mi-24 Hind

The Mi-24 Hind was designed and produced by the former Soviet Union during the 1970s. Since that time, this formidable tank killing helicopter has gone through a number of upgrades. The current version, the Hind F, features a 23 mm dual barrel cannon and AT-6 Spiral ATGMs. The Hind is heavily armoured and able to withstand direct hits from .50 cal machine guns.

The added protection afforded by all this armour comes with a price, however. The Hind cannot fly very high, very fast, or very far and in combat, relies on brute strength rather than tactical finesse. In

Afghanistan, many of these fine aircraft were turned into pots and pans by mujahedeen rebels. Just the same, these aircraft are tough and operate in flight envelopes outside the comfort zone of most JSF pilots. Hind Fs all carry electro-optical sensors (LLTV),and FLIR. Their twin 30 mm cannons can make short work out of a JSF if given the chance.

F-16 Fighting Falcon

The F-16 Falcon is currently the most numerous aircraft in USAF inventory. It is a highly manoeuvrable, fly-by-wire, single seat 'dogfighter'. The first of these fighters were delivered way back in 1978. Known to its pilots as the "Viper", the F-16 was also dubbed the "Electric Jet" because of its 'fly-by-wire' control systems. It has also been called the "Lawn Dart" because of the number of times this aircraft 'augured in' during testing.

Despite its age, the F-16 remains one of the world's best "phone booth knife-fighters". Although it has but one engine, it maintains a thrust/weight ratio of almost 1:1. A skilled F-16 'driver' is able to 'turn and burn' with the best of 'em. These aircraft carry the same mix of air-to-air weapons as the F-15 and have a limited capacity for delivering air-to-ground weapons. The F-16s represented in JSF are the heavier F-16C Block 30 models which feature a Westinghouse APG-68 radar and the improved F110-GE-100 turbofan.

The USAF intends on replacing the F-16 with the JSF early in the next century. By the time that many of these airframes are finally removed from active service, they will be older than the pilots that are flying them.

Friendly Aircraft

Not everything up there is hostile. The following sections lists the friendly aircraft you'll occasionally come across.

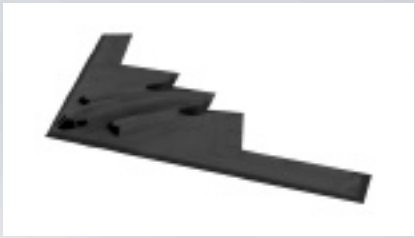
F-22 Raptor

The Lockheed Martin F-22 Raptor embodies the current state of US fighter technology. It possesses all the features that will one day become standard on all 21st century aircraft. The F-22 is a stealth aircraft, like the JSF, and carries an array of air-to-air and ground attack ordnance (again, like the JSF). For all their advantages, however, the fact remains

that each one costs over $100 million to produce. Stealth aircraft or not, few in the USAF would recommend exposing these aircraft to ground fire.

The F-22 carries both radar-guided missiles (the AIM-120C AMRAAM) and IR missiles (AIM-9X Sidewinder) in internal bays. It also has the ability to carry two JDAM munitions. By utilising emissionless GPS guided bombs,the aircraft can attack targets with precision but still remain stealthy. There are currently no plans to produce a VSTOL or “navalised”version of the Raptor.

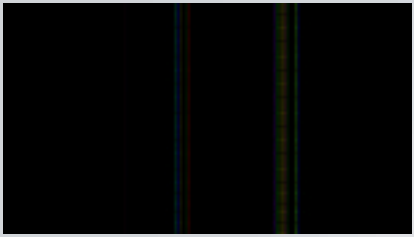
B-2 Spirit



The B-2 Spirit is literally worth its weight in gold. At more than $1 billion dollars each,these bat-winged aircraft have come under severe criticism and budgetary scrutiny. They are so expensive that the USAF has decided to only purchase twenty (down from the original 133). It seems that in the aftermath of the Cold War, the military has begun to question the practicality, if not the price tag of some of these weapons.

The primary purpose of the B-2 Spirit is to pick off targets inside an enemy country that manage to survive an initial exchange of nuclear weapons with the United States. It requires stealth to survive over enemy territory because with a top speed of only 500 knots,it’s barely fast enough to get out of its own way. These aircraft feature a honey-combed, radar absorbent structure which give them a low radar cross section.

KC-135



The Boeing KC-135 Stratotanker is a strategic mid-air refueler. Each aircraft can carry and transfer up to 200,000 lbs of jet fuel. The KC-135 features a single rigid boom refueling probe which is extended from the rear of the aircraft during operations.

These aircraft have a crew of four: pilot, co-pilot, navigator, and boom operator. They are powered by four turbofan engines which give the aircraft a maximum speed of 530 knots. This enables the aircraft to refuel other aircraft at close to their cruising speeds.

UH-1H Iroquois

The UH-1H, affectionately known as the Huey, has seemingly been around forever. Deliveries of the UH-1H helicopter first began in the late 1960s, at the height of the US involvement in Vietnam. The UH designation stands for "utility helicopter." These aircraft are used for a variety of missions, everything from "medivacs" to ground support.

The usual armament for a UH-1H consists of spindle-mounted door machine-guns although some have been equipped with mini-guns and rocket-pods. The Huey's 1400 shp engine drives a two-bladed main rotor and two bladed tail rotor. Normal cruising speed is around 100 knots. Its service ceiling is just less than 13,000 feet.

Ground Targets

JSF comes with a variety of ground targets. The following section lists some of the vehicles you are likely to encounter.

Armoured Fighting Vehicles

T-72 MBT

The T-72 is a Russian built main battle tank. Production began in 1972. It has since been widely exported to a number of third world countries. Although the T-72 is currently being phased out by the T-80 within the Russia army, the introduction of a new T-72 variant (the T-90) ensures that this design will remain in service for some time.

Most analysts agree that the T-72, while superior to the US M-60 in most respects, is not a match for the M1A2 Abrams. Iraqi T-72s faired poorly during the Gulf War due primarily to their lack of sophisticated optics and fire control. Though they carry a 125 mm smooth bore main gun, the auto reloader is thought to be unreliable. The T-72 also has a turret-mounted 12.7 mm machinegun for use against low flying aircraft but the affect of this weapon is mainly psychological.

BMP-2 IFV

The Boevaya Maschina Pekhota- 2 (or BMP-2) is a Russian-built amphibious armoured personnel carrier (APC). They are designed to transport squads of infantry and provide them with effective fire support. The BMP-2 is almost identical to the BMP-1 in outward appearance, but this hides a number of significant internal differences. The BMP-2 has additional armour plating which gives its crew and passengers greater protection from small arms fire.

Another major change is the upgraded firepower. The 73 mm main gun found on the BMP-1 has been replaced with a 2A42 30 mm cannon. The new gun has a greater field of fire which allows it to be used against helicopters and low flying aircraft. The vehicle's principal weapon is the AT-5 Spandrel anti-tank missile. The AT-5 is a wire-guided missile with a range of up to 4,000 meters. It contains a tandem warhead which is designed to negate the effects of reactive armour.

Air Defence Vehicles

ZSU-23-4 Shilka

The ZSU-23-4 (pronounced 'Zoo') is a self-propelled,triple-A platform which features four AZP-23M 23 mm guns and a J-band 'Gun Dish' target acquisition radar. Although these vehicles are currently being phased out in favour of the 2S6M Tunguska, they remain on active duty in a number of countries. The main weapon of the ZSU-23-4 is its quad 23 mm radar directed guns. They have an awesome rate of fire and are deadly accurate out to 3 kilometres.

The vehicle chassis is lightly armoured so that the ZSU-23-4 can operate close to the front alongside other tanks and AFVs. Typically they operate in pairs and enhance the local air defence umbrella by coordinating with units equipped with shoulder-launched heat-seeking SAMs.

SA-13 Gopher

The SA-13 Gopher is a self-propelled, point defence, heat-seeking, surface-to-air missile system. It has been designed to replace the SA-9 Gaskin on a one for one basis so that sixteen (16) of these vehicles can be found in air defence regiments. A Gopher battery consists of four MT-LB vehicles supported by a "Dog Ear" G-band acquisition radar mounted in a separate vehicle.

The Dog Ear radar is able to detect and track targets up to 20 miles away. The missile itself has an effective range of approximately six kilometres. The warhead consists of a 10 lb. HE fragmentation charge which can be fused for either contact or proximity detonation.

2S6M Tunguska

The 2S6M Tunguska is an air defence weapon unique to the former Soviet Union. It is actually two weapon systems mounted on a single mobile chasis. The Tunguska features a SA-19 Grison launcher with eight rounds. Target acquisition is achieved using an E-band surveillance radar. Once the target is acquired,fire control is passed to a J-band radar director in the vehicle turret.

In addition to the SAM system, the Tunguska is also equipped with two 30 mm GSh-30k water-cooled cannons. Although these radar-directed cannons are best used against helicopters, they are more than able of destroying enemy aircraft that happen to wander too close.

Transport Vehicles

Transportation is crucial on the modern battlefield. A few gallons of fuel can be worth their weight in gold to a mechanised army. Given the lethality of today's weapon systems, once a target is located and identified it is doomed. Mobility is often the only means of salvation. For this reason,a primary goal of any air campaign is the systematic elimination of an enemy's ability to move its troops and equipment. Take away an army's mobility and it no longer has the means to conduct offensive actions.

In JSF, there are several enemy transportation vehicles- the KrAZ-260,MT-LB, and ZiL-135. Although taking out one of these transporters is hardly as exciting as blowing up a tank, these vehicles are important targets nonetheless.

Enemy Naval Vessels

In addition to attacking targets on land, naval variants of the JSF will be tasked with conducting air strikes against enemy vessels at sea. Typically, attacking naval targets is more difficult. For one thing, pilots can't use terrain features to mask their approach. Even in rough seas,there's just nowhere to hide. To make matters worse, most naval vessels are well-equipped to handle air attacks. Even small patrol vessels normally carry a formidable array of triple A guns and surface-to-air missiles.

Krivak Class Figate (FFG)

The Krivak I was first seen in the early 1970s. Since that time, modifications have been made to transform this once poorly designed Frigate into a powerful ASW platform. The current mod, Krivak III, is powered by gas turbines that drive its twin shafts. The Krivak III can sustain a top cruising speed of 30 knots making these vessels effective partners for the Kirov class battle cruisers.

The primary mission of these vessels is anti-submarine warfare. Krivaks lack adequate surface attack and air defence weapons. For this reason, they rarely operate alone. Although they are equipped with a twin SA-N-4 SAM launcher, a JSF can engage a Krivak from a stand-off distance outside the range of its coverage. The presence of a 76 mm radar-directed DP gun does little to enhance the Krivak's protection from air attack.

Kirov Class Guided-Missile Cruiser (BCN)

With the exception of United States' aircraft carriers, the Kirov class of battlecruisers are the largest warships ever built. They represent the best in Soviet naval engineering. Each cruiser is powered by two pressurised-water nuclear reactors (PWR) and can sustain a top speed of 32 knots. Because they are nuclear powered they have an unlimited cruising range. Extended operations will rarely take place however in wartime because of ammunition shortages.

These vessels are crammed full of weapon systems- everything from anti-ship SSMs to RBU mortars for ASW engagements. The main striking power of the Kirov cruisers, however, is its complement of SS-N-19 cruise missiles. JSF pilots need to be

aware of the Kirov's formidable array of SAMs and triple-A guns. The Kirov carries both the SA-N-4 and vertically-launched SA-N-6 surface-to-air missile systems.

Typhoon Class Ballistic Missile Submarine (SSBN)

The Typhoon class ballistic missile submarine is truly a monster. It is the largest submarine ever built- featuring two separate inner pressure hulls surrounded by a single outer hull. (These submarines are 50% larger than USN's Ohio class submarine.) The outer hull is covered with a sound absorbing "Clusterguard" tiling. As big as these boats are, as "boomers" they are expected to hide out until ready to launch. They have a maximum subsurface speed of 26 knots and a crush depth of 300 meters.

The Typhoon's primary weapons are twenty SS-N-20 nuclear tipped SLBMs (submarine launched ballistic missiles) with ten MIRV warheads each. All twenty missiles are mounted forward of the sail in two rows of ten. In addition, Typhoon submarines are armed with six (fwd) torpedo tubes- two 533 mm and four 650 mm. Space is allocated for a total of 36 torpedoes including SS-N-15 and SS-N-16 weapon systems. Its detection systems include a hull mounted Shark Gill active/passive hull sonar, and Snoop Pair surface search radar.

Akula Class Nuclear Attack Submarine (SSN)

The Akula (meaning "shark" in Russian) class nuclear attack submarine is the most advanced underwater ASW platform currently in production and service with the CIS. It is the result of decades worth of research and development mixing in with a little high tech thievery. These submarines have a top subsurface speed of 35 knots and have a crush depth of 550 meters.

These submarines are armed with eight (fwd) torpedo tubes- four 533mm and four 650 mm. The Akula also carries both the SS-N-15, SS-N-16, and SS-N-21 "Sampson" missile systems. Space is allocated for a total of 40 tube launched weapons. Detection systems include a hull mounted Shark Gill active/passive sonar, a passive towed sonar array, and a Snoop Pair surface search radar.

Cargo vessels

The cargo vessels depicted in JSF represent the standard cavernous transport vessels used to move men and material. The value in sinking these vessels is derived from sending their cargoes to the bottom. Though cargo vessels are themselves only lightly armed, they often travel in "convoys" under the protection of one or more ASW platforms. Air defence protection will vary but it's not unheard of for large convoys to have their own dedicated VTOL carriers.

PICTORIAL OVERVIEW

Allied aircraft

Boeing X-32 prototype

Lockheed Martin F-22 Raptor

Lockheed Martin X-35 prototype

Lockheed F-16 Fighting Falcon

PICTORIAL OVERVIEW

Allied aircraft

Boeing E-3D Sentry (AEW)

Bell 205 UH-1H Huey helicopter

Boeing KC-135 Tanker

PICTORIAL OVERVIEW

Enemy aircraft

Mikoyan MiG 29 Fulcrum

Sukhoi SU-35 Flanker

Sukhoi SU-27 Flanker

Dassault Mirage 5

PICTORIAL OVERVIEW

Enemy aircraft

Tupolev Tu-22M-3 Backfire

Ilyushin/Antonov A-50 Mainstay

Ilyushin Il-76M Candid

Mil Mi-24 Hind Attack helicopter

PICTORIAL OVERVIEW

Enemy Vehicles

BMP-2 IFV

ZIL-135

KrAZ-260

T-72 MBT

PICTORIAL OVERVIEW

Enemy Vehicles

ZSU-23-4 Shilka

SA-13 Gopher

MT-LB

2S6M Tunguska

PICTORIAL OVERVIEW

Enemy Vessels

Krivak Class Patrol Ship

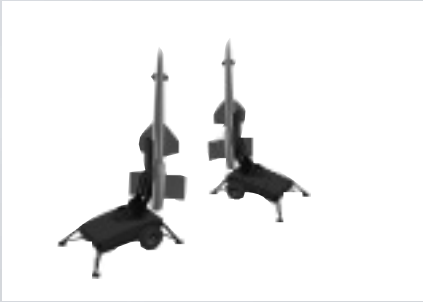
Typhoon Class Nuclear Sub

Kirov Class Rocket Cruiser

Akula Class Nuclear Attack Sub

PICTORIAL OVERVIEW

Strategic Targets



Anti aircraft launcher

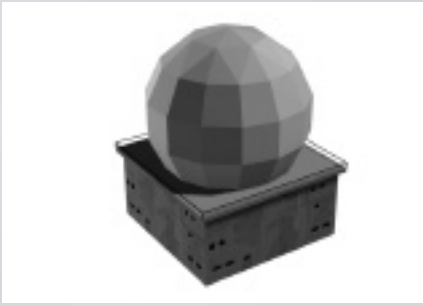
Communications base

Anti aircraft artillery

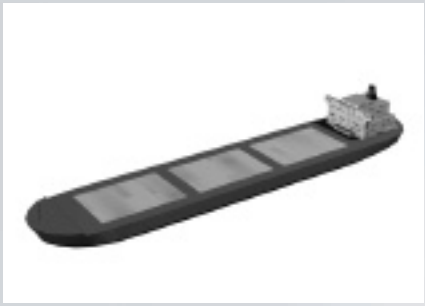
Mobile air defence radar

PICTORIAL OVERVIEW

Strategic Targets

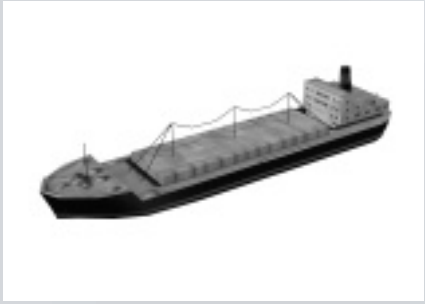


Air defence radar



Oil tanker

Nuclear plant



Cargo vessel

APPENDIX SEVEN

Troubleshooting

General

If, for some reason, you encounter problems while running Joint Strike Fighter, please refer to the list below for similar problems. This list contains typical problems that a user could run into:

Graphics

The In-Game Graphics move slowly

There are a lot of things which may cause performance to suffer. Among the most common one are:

- Object detail is too high.
  Lower the detail on the detail sliders found under Graphics in the in-game menu in order to increase the framerate.

- The screen resolution is too high.
  This can be changed by selecting a lower resolution from the Mode in-game menu. It may also be an idea to try out the Big Pixels option found in the same menu if low resolutions are not supported on your graphics hardware.

- Time compression is enabled.
  This can be fixed simply by selecting Normal under Game in the in-game menu, thereby restoring normal game speed.

Sound

My Stereo Channels are Reversed.

Use the Options>Sound>Reverse Stereo option in the in-game menu to reverse the stereo position.

The volume slider doesn't work correctly

Set the all the volume sliders on Options>Sound to maximum volume, and use the Volume Control in windows to adjust the volume instead.

Movies

The movies are jerky and slow when played back

This is probably because the CD Drive used is too slow. In order to watch the movies in full quality you MUST have at least a 4X CD Drive.

There's noise on the sound when I watch a movie

Set the all the volume sliders on Options>Sound to maximum volume, and use the Volume Control in Windows to adjust the volume instead.

Mission Planner

For some reason I get a red cross saying ILLEGAL when I try to arm my fighter.

This happens when the weapons selected aren't allowed on the desired pylon. A weapon configuration with rocket pods placed on internal pilons would have left the pods useless. Also, some configurations are not allowed because the aircraft frame is not capable of carrying heavy weapon loads on the outer wing pylons.

I cannot see what icon is in the mission planner because most of it is covered by the mission planner window.

There are two ways of displaying icons that are hidden behind the Mission Planner windows. You can remove the Mission Planner window by selecting the Mission Planner button or by pressing SPACE on the keyboard. Alternatively, you can activate the Map mode on the Mission Planner and recentre the Mission Map by pressing the right mouse button. Refer to Section 5 for information about how to use the Mission Planner.

Gameplay

My wingman doesn't respond when I talk to him.

This is probably because the wingman has died. To find out what your wingmen are doing or aren't doing, simply send a request for a full status to all the wingmen. Please refer to appendix 4 for more information on the Wingman

Communication system

I can't release my weapons

If there's a cross over the aim, you'll have to open the hatch to the internal weapons bay. For more information on the different weapons, please refer to Section 8.

My plane banks when I use keyboard control, even when I don't press any buttons

This can be caused by several things:

- The aircraft might have been trimmed to counter the bank of a damaged aircraft. Refer to Appendix 1 for a complete listing of the keyboard commands.
- It may be caused by the fact that the joystick control is active and an uncalibrated joystick is attached to the computer. The solution is to switch to keyboard control in the in-game menu or calibrate your joystick.
- Alternatively, your aircraft may be damaged. In this case, check your six!

Controllers

When I selected my joystick as controller I totally lost control of my fighter, even though I have selected Centre from the in-game menu many times

You will have to recalibrate the joystick by using the Windows joystick setup tool or a similar configuration tool provided by the joystick manufacturer.

I don't want to use the throttle on the joystick, but rather the keys on the keyboard.

How can I do this?

This will have to be changed in the Window Control Panel. The solution is to configure your stick so that you don't have the third axis (the throttle) enabled.

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Through this site you will also have access to our FTP (File Transfer Protocol) area where you can download patches and new enhancements as soon as they become available.

Assistance via Telephone or Fax:

We are available to take your calls Monday through Friday between 9:00 a.m.and 5:00 p.m., Pacific Time at (415) 615-6220 (voice) or (415) 547-1201(fax).Our tech support department is closed on all major holidays.Note: You are responsible for all toll charges when calling.

To ensure the quickest service you will need to be at your computer and have the following information at hand:

• A complete listing of your computer's hardware. (Contact your computer manufacturer if you are unsure)

•What version of Windows ® you are using.

•A copy of your DirectX Diagnostics report.

- *Click on Start*
- *Click on Run*
- *Type dxdiag*
- *Click on OK*
- *Click on the Save Information button and save the file to your computer.*
- *When you call our Technical Support line either have this file open or have a printed copy. If you send an e-mail query you may attach the file to the e-mail.*

•What error message(s),if any, you have had.

•How the game is currently configured.

NOTE: OUR SUPPORT AGENTS DO NOT HAVE AND WILL NOT GIVE GAME HINTS STRATEGIES OR CODES

GLOSSARY

A *(alpha) AL fah*

A2A
ATA Air-to-Air

AAA
Anti-Aircraft Artillery. Commonly referred to as "triple A."

AAM
Air-to-Air Missile. A missile fired from an aircraft with the intent of shooting down another aircraft.

ACM
Air Combat Maneuvering. A modern acronym for dogfighting.

ADAS
Advanced Distributed Aperture System. Multiple sensors under the skin of the aircraft, capable of detecting incoming IR threats.

AFB
Air Force Base. Bases in the continental United States use the acronym AFB while bases located outside the United States are simply designated as AB (Air Base).

AFTERBURNER
The practice of mixing fuel directly with engine exhaust, thrust is dramatically increased but at a cost of fuel consumption.

AGL
Above Ground Level. Refers to your altitude over the actual height of the terrain.

AGM
Air-to-Ground Missile.

ALLERON
Control surfaces on the aircraft's wings which command movement about its longitudinal axis.

AIM
Air Intercept Missile. Another name for U.S. air-to-air missiles, e.g. AIM-9 Sidewinder, AIM-120 AMRAAM.

AMRAAM
Advanced Medium Range Air-to-Air Missile. Pronounced am-RAM,a 'fire and forget' radar guided missile designated AIM-120. The JSF uses the "C" model.

ANGELS
A term used to indicate 1000s of feet,i.e. angels 20 equals 20,000 feet.

AOA
Angle of Attack. The angle between the aircraft's mean chord line and the relative wind speed.

ARM
Anti-Radiation Missile. A missile which targets radiation emitters specifically using their own emissions as a form of guidance, e.g. AGM-66 HARM.

ASL
Above Sea Level. Refers to your altitude above sea level, regardless of the height of the actual terrain.

ASPECT ANGLE
Angular comparison of flight paths between a target and attacking aircraft, usually from the attacking aircraft's perspective, i.e. head-on aspect, tail aspect, etc.

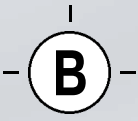
ATF
Advanced Tactical Fighter. The original name for the USAF F-22 program.

ATG
Air-to-Ground.

ATO
Air Tasking Order. A secret target list which schedules air attacks on ground targets.

AVIONICS
An aircraft's electronic components and subsystems which monitor flight activities.

AWACS
Airborne Warning and Control System. An aircraft with powerful radar and communication equipment.



(bravo) BRAH voh

BANDIT
Slang term for an enemy aircraft.

BARCAP
Barrier Combat Air Patrol. A group of fighter aircraft situated to act as a barrier preventing passage of enemy aircraft through or past a specific area.

BDA
Bomb Damage Assessment or alternatively Battle Damage Assessment. A post-strike report detailing damage caused to a particular target.

BEAMING
A term referring to an enemy aircraft that is approaching you from a 90° aspect angle.

BEARING
Horizontal direction to or from a given point, a compass heading usually given in degrees through 360°.

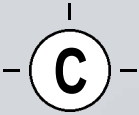
BFM
Basic Fighter Maneuvers. Simple flight maneuvers that every pilot must perform.

BINGO
Slang for aircraft with only enough fuel remaining to return to base.

BOGEY
An aircraft who's identity is not yet positively established, treated as an enemy aircraft.

BREAK
Radio call indicating an immediate high-g change in direction or altitude.

BVR
Beyond Visual Range. A target is too far away to be seen with the naked eye.



(charlie) CHAR lee

CALLSIGN
The nickname by which you are known in your squadron.

CAP
Combat Air Patrol. A term which usually refers to a counter-air sortie or Air-to-Air mission centred around a particular fixed location.

CAS
Close Air Support. Tactical aircraft used to attack enemy ground targets in conjunction with friendly forces on the ground.

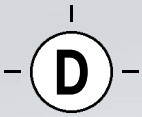
CBU
Cluster Bomb Unit. A munition that opens to release many sub-munitions which are dispersed over a wide area.

CHECK FIRE
Indication not to fire or to cease firing according to a current ROE.

CLOSURE
Rate (speed) at which two objects are approaching each other.

CTOL
Conventional Take-Off and Landing. Term used about an aircraft landing and takeoff capabilities.

CV
Carrier Vessel. A vessel used for transport.

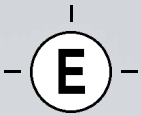


(delta) DELL tah

DITCH
Bailing out of an aircraft.

DRY THRUST
Term used to denote the thrust produced by non-afterburning engines, generally rated in lbs. of thrust.

DSS
Defensive Sub System. This system automates the release of chaff and flares during combat.



E (echo) ECK oh

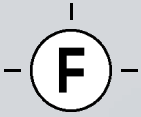
ECM
Electronic Counter-Measure. Devices whose purpose is to interfere with enemy radars or radio transmissions.

EGRESS
Leg of flight plan that an aircraft takes after striking a target.

EJECTING
Common term for bailing out of a damaged aircraft,pilots are equipped with an ejection seat which blasts them free from the aircraft.

EO/IR
Electro-Optical/Infrared. Term used about sensors.

EW
Electronic Warfare. Usually refers to jamming, signal intercept, etc.



(foxtrot) FOKS trot

FEBA
Forward Edge of the Battle Area. A new name for 'the front line'.

FINAL APPROACH
The last leg of traffic pattern, the flight path consisting of a line extending back from the runway centreline intersecting with the base leg.

FLARE
A magnesium pyrotechnic countermeasure designed to attract the IR sensor of a heat-seeking missile.

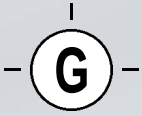
FLAPS
Hinged surfaces on the trailing edge of a wing used to generate additional lift.

FLIR
Forward-Looking Infrared. An imaging system that can see contrasting differences in object and background temperatures.

FOX II
Pilot warning indicating the launch of AIM-9 Sidewinder infrared missile.

FOX III
Pilot warning indicating the launch of AIM-120 AMRAAM radar guided missile.

FURBALL
A multiple aircraft engagement, a high G, twisting and turning dogfight.



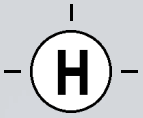
G (golf) GOLF

G FORCE
The force of gravity, one G is a measure of gravity equal to the force exerted on a stationary object at sea level.

GBU
Glide Bomb Unit. A munition with control surfaces (fins) which give it a limited ability to glide.

GLOC
G-induced Loss Of Consciousness. Blacking out due to positive G stress forcing blood from the brain and into the lower body.

GPS
Global Positioning System. A satellite-based navigation system used by many types of receivers, for example as a means of targeting for JDAM munitions.



(hotel) hoh TELL

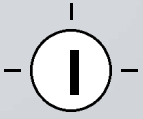
HEATER
Pilot slang for a heat-seeking (IR) missile like the AIM-9 Sidewinder.

HEADING
Direction of flight given as a compass heading where 360˚ equals magnetic north, 90˚ equals east, 180˚ equals south and 270˚ equals west.

HMD
Helmet Mounted Display. Display mounted projected on the face shield on the pilot helmet.

HOTAS
Hands On Throttle and Stick. Throttle and stick design which allows a pilot to operate the aircraft's flight and weapon systems using actuators located on these devices.

HUD
Head-Up Display. A transparent display containing flight / weapons symbology that is set directly in front of the pilot.



(india) IN dee ah

INDUCED DRAG
Drag created by the aircraft in the act of producing lift.

IFDL
In Flight Data Link. A communication link between aircrafts.

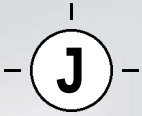
IFF
Identification Friend or Foe. System for determining weather a unit is friend or foe.

IHAVS
Integral Helmet Audio Visual System. A system which integrates audio and visual systems into the helmet.

INGRESS
The approach leg of flight plan to a target location.

IR
Infra-Red. Missiles or sensors able to detect radiated energy.

IRWR
Infra-Red Warning Receiver. Device which detects IR missiles.



(juliet) JEW lee ett

J/ST JAST
Integrated Subsystems Technology.

JAMMING
An active attempt to create signal interference to prevent an enemy from using radar or radio.

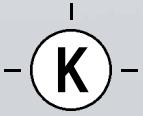
JAST
Joint Advanced Strike Technology.

JDAM
Joint Direct Attack Munition. An emissionless guidance system that uses GPS rather than radar or laser energy as means of precision targeting.

JHMCS
Joint Helmet Mounted Cueing System.

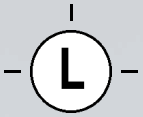
JINKING
Skidding manoeuvre designed to spoil an attacker's firing solution (gun).

JSF
Joint Strike Fighter.



(kilo) KEE loh

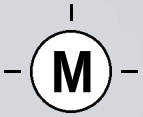
KIAS
Knots Indicated Air Speed. A knot is one nautical mile (2,000 yds)per hour.



(lima) LEE mah

LCC
Life Cycle Cost.

LO CHARACTERISTICS
LO characteristics Low Observable. Stealth features of the JSF aircraft which reduce or eliminate an enemy's ability to detect it in flight.



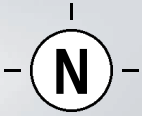
(mike) MIKE

MASKING
The act of using terrain to degrade the ability of an enemy's sensors to detect your aircraft.

MEZ
Missile Engagement Zone. The area targetable by a missile.

MFD
Multi-Function Display. Acronym referring to cockpit monitors which display various flight/weapon data.

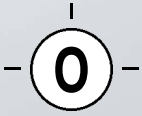
MOU
Memorandum of Understanding.



(november) noh VEM ber

NAUTICAL MILE
(nm) One nautical mile equals 2000 yds, 1.15 statute miles or 1852 m.

NEGATIVE
A term meaning no, the opposite of roger, a non-affirmative response

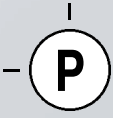


(oscar) OSS cah

ORDNANCE
Bombs,rockets, missiles carried by the aircraft.

OTH
Over the Horizon. Missiles being fired at targets so far away that they are masked by the curvature of the Earth.

OVERSHOOT
Extremely dangerous situation that occurs when your aircraft passes in front of an enemy aircraft,usually as a result of losing a 'scissors' fight.



(papa) pah PAH

PADLOCKED
A situation in which a pilot who cannot take his eyes off a target for fear of not being able to spot it again.

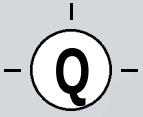
PAWWS
Precision Adverse Weather Weapon System. Weapon systems that maintain accuracy of fire independent of weather conditions.

PIPPER
The small aiming mark in the centre of the target reticule, also referred to as the 'death dot.'

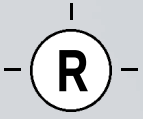
PITCH
Measure of aircraft motion around its lateral axis, controlled by input to the elevators.

PK
Probability kill. The percentage chance that a given munition will result in a target kill.

POV
Position Of View. Switch on a stick used to set view direction or view position.



(quebec) keh BECK



(romeo) ROW mee oh

RADAR
Radio, Detection,and Ranging. A device which detects objects by projecting energy into the atmosphere then detecting it as it bounces back off various objects.

RAM
Radar Absorbing Material. Type of construction materials used to enhance the non-radar reflective (stealth) features of the JSF aircraft.

RED OUT
Temporary blindness caused by negative Gs which force blood to collect in the eyes.

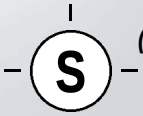
RELATIVE WIND
Direction of oncoming wind, usually refers to wind forced past an aircraft by its forward motion.

RF
Radio Frequency.

ROGER
A term meaning yes, opposite of negative, an affirmative acknowledgment.

ROLL
Aircraft motion around its longitudinal axis, controlled by input to the ailerons.

RWR
Radar Warning Receiver. Pronounced "raw"; a network of sensors around the aircraft which alert the pilot when radar emissions are detected.



(sierra) see AIR rah

SAM
Surface to Air missile. A missile which is fired from the ground at aerial targets.

SARH
Semi-Active Radar Homing. Type of homing guidance provided to a weapon which requires continued guidance from the pilot.

SEAD
Suppression of Enemy Air Defences. A mission designed to destroy or otherwise hinder the effectiveness of an enemy's air defence.

SIGNATURE
Indications of an aircraft's presence, such as a radar cross-section or IR emissions.

SITUATIONAL AWARENESS
Your mental ability to read a given situation, being aware of what is going on around you.

SIX
In clock terminology, your six is directly behind you or 180° from your direction of flight.

SNAP SHOOT
A gun attack with a high angle-off perspective, a desperation shot with little chance of success.

SPEED JEANS
Slang term for the G suit worn by pilots that delays the onset of GLOC, the suit forces blood to the upper body by applying pressure to the lower extremities.

STALL
The separation of airflow from the upper surface of a wing, a common mistake made by non-flyers is to equate a stall with engine failure.

STOVL
Short Take-Off Vertical Landing. Term used about an aircraft landing and takeoff capabilities.

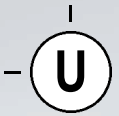
STRIKE PACKAGE
Group of different aircraft combined to perform a single mission.

(tango) TANG go

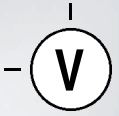
TRACERS
Projectiles which are coated with a phosphorus substance that ignites making them visible to the naked eye.

TRAILER
The last aircraft in a formation.

TRIPLE -A
Modern term for anti-aircraft artillery fire, (see AAA).



(uniform) YOU nee form

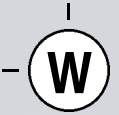


(victor) VIK tah

VNE
Velocity never exceed. Speed at which you begin to risk structural damage to the aircraft.

VOC
Velocity of closure. Speed at which two objects are approaching each other.

VOCOM
Automated Voice Computer Messages. A computerised female voice that warns a pilot about certain incidents.

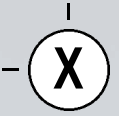


(whiskey) WISS key

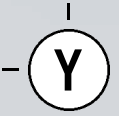
WAYPOINT
A fixed navigational point tied in to your auto-pilot flight controls.

WEAPONS FREE
Full freedom to fire weapons within a given air space.

WEAPONS HOLD
The opposite of weapons free, a directive to cease firing or not to begin firing.

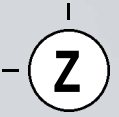


(xray) ECKS ray



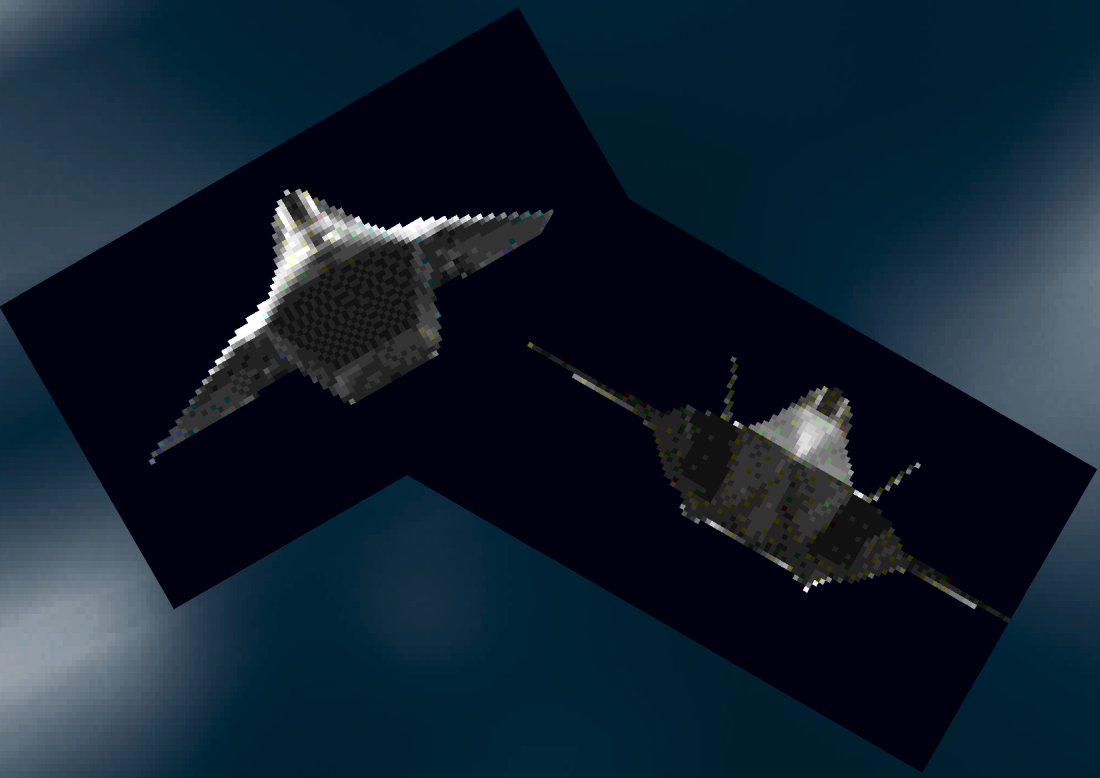
(yankee) YANG key

YAW
Aircraft motion around its vertical axis, controlled by input to the rudders.



(zulu) ZOO loo

ZOOM
An extended climb in which the aircraft trades its forward momentum into additional altitude.



EIDOS
INTERACTIVE