



# **FALCON 4 SUPERPAK 4 USER MANUAL**







# Falcon 4 SuperPAK 4

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User's manual

Falcon 4.0 is the intellectual property of Infogrames Inc.

*With the "SuperPAK 4" (SP4) patch, your MicroProse Falcon 4.0 combat flight simulator (F4) has vastly improved from the original game. This document should be read in conjunction with the original Falcon 4.0 manual and the SuperPAK 3 manual to understand the extent of changes in this version.*

*For additional knowhow about the changes made to Falcon over the last four years and an insight into the ideas behind them, we suggest reading the Realism Patch 5 (RP5) manual - a worthy lecture in terms of air warfare, weapons, weapon systems and air combat tactics and techniques.*

*This is NOT an official patch release from MicroProse. DO NOT contact G2 Interactive, Atari, Hasbro Interactive or MicroProse for technical support if you are experiencing problems with this patch.*

**DISCLAIMER: WE ARE NOT RESPONSIBLE FOR ANYTHING THAT GOES WRONG WITH YOUR COMPUTER DUE TO ACTIONS TAKEN BASED ON THIS DOCUMENT OR THIS SOFTWARE. YOU USE THIS SOFTWARE ENTIRELY AT YOUR OWN RISK.**

rev. 1



## FAQ - FREQUENTLY ASKED QUESTIONS

### ▲ **I can't load HARMs onto my F-16**

Take care what variant of the F-16 you're using: SuperPAK 4 features more than a dozens different F-16 (-CG, -CJ, Block 40 etc.). Not all of them can use HARMs!

### ▲ **Why is this manual so small?**

In contrast to previous SuperPAKs, the SP4 manual isn't a replacement, but an addendum to the SuperPAK 3 manual. This is because SP4 doesn't feature any new cockpit or simulator functions that would need explanation. Instead, SP4 is major rehaul of the "Data Universe" of Falcon, improving the realism in all parts of the simulator.

In addition, SP4 includes a HTML-based introduction doc, including a vast list of reference links, plus a HTML-based version of the Tactical Reference. Enough reading, be assured...

### ▲ **Can I use SP4 with the new BMS patch?**

Yes, you can. While SP4 wasn't officially tested with BMS 1.x, it should work without problems (at least that's what many betatesters found in the last few weeks). Just make sure that you first install Falcon 4 1.08, then SP4, and finally BMS.

*Check [www.benchmarksim.com](http://www.benchmarksim.com) for the latest version of BMS.*

### ▲ **The FreeFalcon planes look much better**

Yes, that is because they already work with 512x512 and larger textures, while F4UT restricted itself to 256x256 to make SP4, as the final milestone in our classical SuperPAK series, available to ALL Users. Unfortunately, this is only possible by limiting the size of the textures used to 256x256 pixels, as some older video cards simply don't work with higher-res textures. *We hope that an additional patch for SP4 featuring the improved models and textures will be available soon.*

### ▲ **How can I add my own photos to the Tactical Reference?**

The photographs for the TacRef Reference are contained in the tacdata.zip in the Zips subfolder. If you extract this file (be sure to 'use folder names' or extract into Art/tacdata) you can add or replace the photographs. The photographs must have a maximum size 382x150 pixels, 16.7 M colours (24-bit) in Truevision Targa (.TGA) uncompressed format. All Tactical Reference entities have photograph names encoded in the TacRefDB.bin, the list of filenames can be found in the TacRef.xls in the Falcon directory.

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# *Chapter* *1*



*Welcome*





## INTRODUCTION

Welcome to SuperPAK 4! The Falcon 4 Unified Team takes another step forward in creating the ultimate combat flight simulator.

In relation to the last SuperPAK (SP3 featuring the final exe modifications), this version of SuperPAK concentrates on the data part of Falcon. This includes:

- ⚡ The graphics: 3D-Models (Planes, Vehicles, Weapons, Buildings), including detailed textures (skins).
- ⚡ Realistic weapons, weapon systems and flight models (well... as close as it can be!)
- ⚡ AI flight behaviour improvements
- ⚡ An even better, photorealistic F-16 cockpit (including a separate wide-view option)
- ⚡ Countless data bugfixes and corrections



## FOREWORD

Half a decade ago it was, December 1998, when Microprose finally released Falcon 4. The rest, they say, is history...

Today, we are happy to present you SuperPAK 4, the ultimate “spring-cleaning” of the Falcon 4 data universe. Building upon the foundation laid by the previous SuperPAKs, SP4 now brings to fruition many of the features introduced in the SP3 exe. In addition, tens of thousands of data entries in the various data tables have been edited, added, reworked and corrected to bring you the ultimate in combat flight simulation and campaign warfare realism.

It's been a long and treacherous road, with many pitfalls and unexpected turns. The work on SP4 proved to be much more difficult than any previous patch. The task was so huge, the developers so few, that keeping up the focus and effort wasn't always possible. In addition, the kind of work needed for SP4 was much more tedious than anything before – working on the source code for the exe and introducing new features is “easier”, more rewarding and more fun; creating new or updated 3D models and textures can be done for a selected single object and be released as a single small patch. SuperPAK 4 however brings it all together – and this big integration package needed not only a huge effort to coordinate all the works into one patch, but also exponentially increased the possibilities of bugs, as the data is all connected together into the Falcon 4 world that we know and love.

But now, the main task is done – SuperPAK 4 is the final “old school” patch for Falcon 4; the culmination of a generation of patches that started with the first iBeta and Realism patches ages ago. To make SP4 accessible to all virtual falconeers out there, we refrained from using textures larger than 256x256 pixels, so users of old Voodoo and TNT graphics cards can still use the rigs they originally bought for Falcon ;-)

Looking ahead, we are proud and happy to see that the end is also the beginning, that SuperPAK4 will be the foundation for a new generation of Falcon: Thanks to the support from the entire Falcon development community, producing models, skins, theaters and terrains, the best combat flight simulator ever will continue to grow and improve.

Enjoy the show!

*The Falcon 4 Unified Team*



## NEW FEATURES IN SUPERPAK 4

Some of the most notable improvements in SuperPAK 4 are:

- The addition of over one hundred new planes, vehicles and munitions. This includes 3D models and textures, appropriate flight models and loadout configurations, squadron creation, and game mode configurations (TE, Dogfight), therefore creating a **unified, complete and theatre-independent database of weapons, weapon systems and aircraft** to allow seamless integration of additional theatres. Most notable features are
  - The inclusion of most variants of the F-16 (including two-seaters)
  - The addition of separate 3D cockpits for the A-10, F/A-18C and F/A-22A so that you will get matching 3D cockpits when flying these planes!
  - Beautiful new models for many key planes in the Korean theatre, such as the F-5, F/A-18D, SU-27, MiG-29A and MiG-19.
  - New planes such as the Mirage 2000, F/A-18E, or MB-339CD of Frecce Tricolori fame.
  - Older planes for usage in classical theatres such as Vietnam (e.g. A-4, A-7, F-100, F-105, F-4 and variants)
  - Many, many ships.
  - All major current and past weapon systems (missiles, bombs).
- A large re-population of all theatre objectives, including towns, villages, industrial complexes and airbases. The latter now also feature improved parking spot data, using different parking spots for smaller or larger aircraft and making the spawning of aircraft well before take-off a reality.
- A complete rework of all hitpoint and damage properties of all entities (so that a single AK-47 normally won't be able to take out an A-10 with a few shots or that a single bomb won't destroy a aircraft carrier anymore)
- A vastly extended Tactical Reference, also included as illustrated HTML for easier browsing, searching and printing.
- Optimisation of missile flight models
- Improved flight formations
- Reworked Air Traffic Operations, improving the mission generation and tasking in campaign mode.
- Hundreds of additional data fixes (e.g. plane shadow sizes).

## ABOUT THIS MANUAL

This manual is an addendum to the SP3 manual. As SuperPAK 4 doesn't feature any new functions, but rather a wealth of re-worked data, there isn't that much new to learn. We're therefore only trying to spotlight some of the major new stuff that is relevant or interesting.

To learn more about the munitions, vehicles and aircraft that make up Falcon 4, consult the Tactical Reference in Falcon or open the HTML version of it, found in the docs/SP\_TacRef subfolder.

## REPORTING GAME CRASHES

We need your crashlogs to further improve the SuperPAK! Even if the EXE modifications have stopped, crashlogs can still help in finding erroneous data.

If you experience a "crash to the desktop" in Falcon 4.0 with SuperPAK 4, you will find a file called "crashlog.txt" in your Falcon4 root folder. Please open this file with Notepad and add an exact description of what you were doing where when the game crashed. Include your system specifications and email this crashlog to our team ([crashlogs@f4ut.frugalsworld.com](mailto:crashlogs@f4ut.frugalsworld.com)). Please do also keep the TE (.tac file in campaign\SAVE folder), the campaign save file (.cam file) or the ACMI (if available) in a safe place in case our developers need them to recreate your crash.

## SUPERPAK AND THE UNIFIED TEAM ON THE WEB

Visit our homepage at [f4ut.frugalsworld.com](http://f4ut.frugalsworld.com) for feedback, SuperPAK news, additional downloads and in-depth articles!

*The big success of the SuperPAK series has caused server overloads and exponentially increased bandwidth costs for our hosting providers. Please check out [www.frugalsworld.com](http://www.frugalsworld.com) and [www.f4freeware.net](http://www.f4freeware.net) and support the community's main forums and file servers by giving a small donation.*

## Chapter 2

PAUSED

PAUSED - 00:00:00 (00:00:00)



*Brave new world*

## AIRBASES AND OBJECTIVES

The number of ground objects added to objectives has been increased by about 23,000 hand placed objects since the SP series started. There are now over 12,000 tree entries within the database, but many more are actually displayed as the simulation repeats objectives. Look out for cities starting to look like cities, ports, which have buildings on, radar sites with support buildings and active search radars the ATO will take account of.

*The addition of these new objects may cause stuttering or lower frame rates on lower specification machines and to counter this the non-trees option is included in F4Patch. This has the 12,000 tree entries deleted but retains all the other buildings that can be seen with trees enabled.*

## PARKING AND AIRPORT GROUND OPERATIONS

SP3 introduced code which enabled parked aircraft to be displayed before and after their missions. SP4 has now implemented the parking data needed to realise this feature: You will now find that airbases in campaigns may have aircraft parked and taxiing to and from the relevant runway. These can be bombed and will be deducted from the relevant country's inventory; along with the weapons they were carrying.

There are two main settings in the Falcon.cfg file, which determine the numbers of aircraft you will see on the airbases:

- Set g\_nDeagTimer 10
- Set g\_nReagTimer 15

These two numeric values dictate how many minutes prior to takeoff and after parking aircraft will appear or disappear in the 3D environment. Commonly, a low Deag value with a high Reag value is preferable. It is important that these values are consistent between multiplayer participants or strange behaviour will be observed!

### Known Issues

Aircraft killed on the ground will be counted as Air-to-Air kills. This is due to the class that aircraft are grouped under and would require a major change in the way Falcon runs to rectify.

Traffic jams can occur on some airbases where three or even more squadrons are stationed there. Unfortunately, the SP3 code base has not had the necessary ATO scheduling and ATC coding altered to cope with large numbers of aircraft on an airbase, although some remedial measures have been taken to minimise those "traffic jams".

Wingmen may not takeoff if they request taxi before you do. This is due to the way taxiing aircraft are handled in the SP3 executable. It can be minimised by requesting taxi as soon as you are in the aircraft (and able to do so). This ensures that you become "flight lead" to the ATC, and your wingmen won't be able to assume that role.



## BUILDING HITBOXES

All building-hitboxes has been checked and updated as necessary. Some of these hitboxes was way off, allowing you to fly directly through a building, or making you crash into it, even though you were flying 200ft over it. In most cases, the hitbox now covers the entire building and nothing more, but some buildings just doesn't fit into a box. An example is large factories with multiple buildings and a handful of chimneys. In such case, i have tried to fit as much of the buildings into the box, while minimizing deadspace. This means that in most cases, the chimneys are not covered. This allows you to fly through them, but on the other hand saves you from crashing just by flying past them.

Hangars on airfields all use a special setup. Their hitbox is lifted from the ground, so the bottom of the box is at the top of the hangar doors. This allows you to drive into a hangar - if your plane is small enough to clear the doors. Unfortunately, there's no way of telling F4 where the door is, so you'll be able to drive through the walls from all sides, even though the door's on the other side.

## AI FLIGHT ENHANCEMENTS

Many problems still existed with AI flight performance in SP3 seen by many on a regular basis. SP4 has addressed some of these issues.

### THE SLOW SPEED/HIGH AOA PROBLEM

These problems manifested itself resulting in aircraft flying with unrealistically high AOA (angles of attack) at slow speed with full flaps deployed. On many aircraft with poor thrust/weight characterises this would result in them getting stuck in this attitude unable to produce enough thrust to overcome the drag induced in the nose high position.

Aircraft in SP4 have received changes to the variables causing this behaviour. During everyday flying in Falcon in SP4 you should see aircraft flying in normal flight phases at more appropriate speeds and altitudes. High AOA flying and use of flaps in situations where they should not be deployed a thing of the past.

### FUEL RATES/ RANGES

Aircraft in SP4 have received changes to their range and fuel usage variables. Changes have been based upon researched real world performance data, applied to the variables in Falcon and tested in the sim for expected behaviour. The benefits of these changes are primarily:

- Improved fuel tank addition logic. Tanks should now only be added to an aircrafts loadout when necessary
- Improved tasking of aircraft in large theatres - no more empty skies in ODS etc.

The trigger amount of fuel causing the respective bingo and fumes 3D behaviour of AI has been addressed. The variables controlling these trigger points have been adjusted on an individual aircraft by aircraft basis. When aircraft are not in a "attack" mode they should now abort their flight and return to base, hopefully landing before running out of fuel. Unfortunately, until a code fix is implemented aircraft engaged in combat will not abort on low fuel.

### AI REFUELLING (TANKER) BEHAVIOUR

Many aircraft have received improvements to flight behaviour while refuelling. Aircraft that were unable to connect to the tanker will now do so and the AI approach flight behaviour and formation flying to the tanker has been improved for many aircraft.

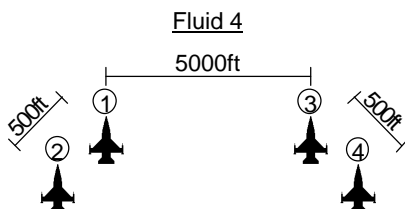
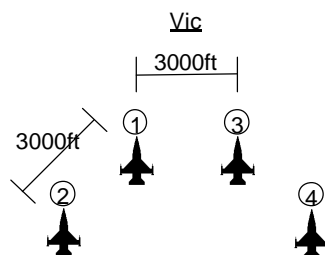
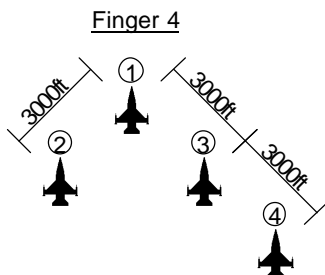
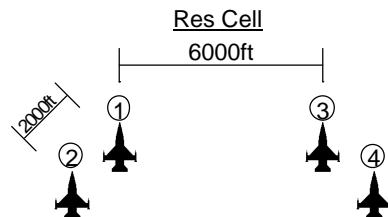
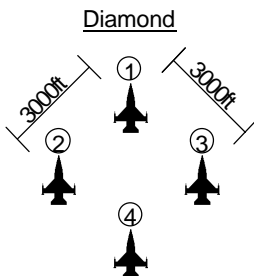




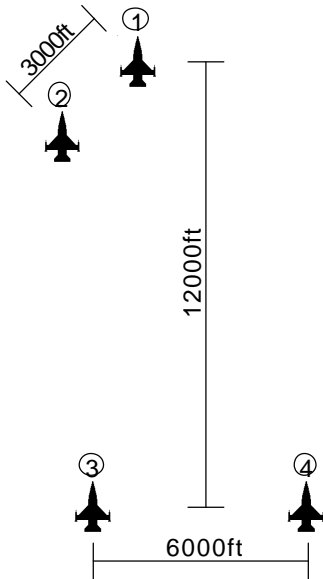
## FLIGHT FORMATIONS

Formation flying in SP4 has been changed based upon information publicly available, the multi-command handbook for the F16 being a very good source of information.

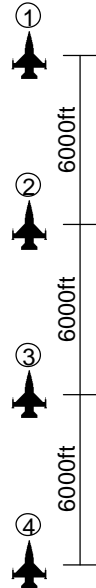
The following sketches indicate the new formations:



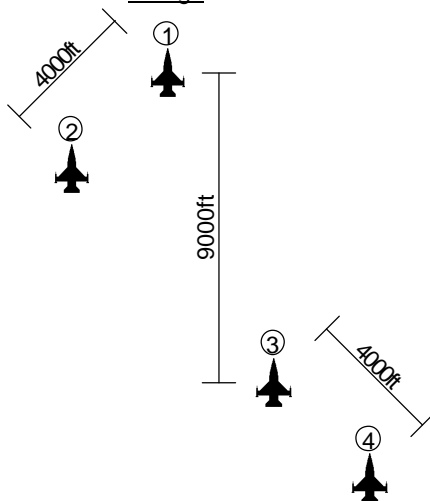
Arrowhead

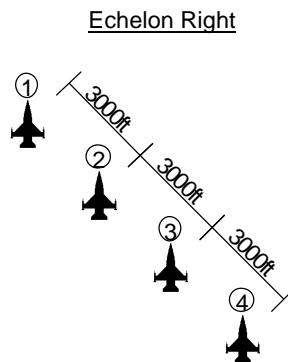
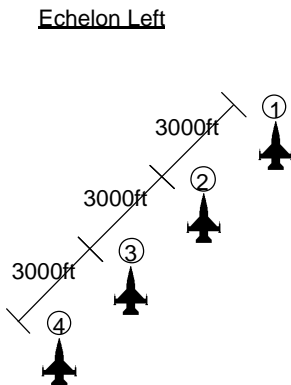
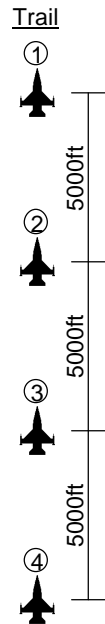
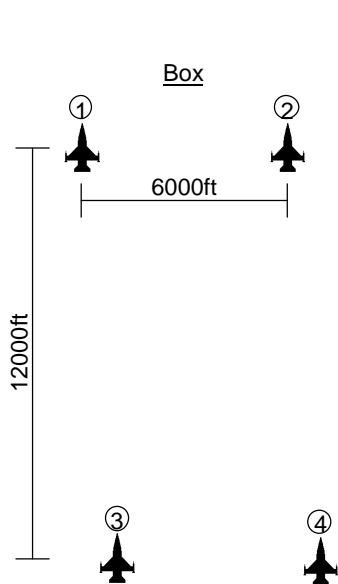


Line Astern



Wedge








## AIR TASKING ORDERS (ATO)

In campaign mode, each team has an ATO that plans and coordinates its air war. The air tasking orders included the planned sorties, capabilities and forces for selected targets and particular missions. They also provide specific instructions such as call signs and target lists, therefore providing operational and tactical direction at various levels of detail.

This makes the ATO the mission generator, the heart of the campaign and the "commander" of your air forces. You can influence it using the campaign priority sliders, thereby changing the targets selected and the mix of mission types generated.

*The ATO overview, listing all currently tasked packages for your team, sorted by mission type. Select an individual flight and view the assigned route to target (the thin black line).*

| AIR TASKING ORDER   |                |                         |                                     |
|---|----------------|-------------------------|-------------------------------------|
| + Offensive Counter Air (OCA)   |                |                         |                                     |
| - Strike  |                |                         |                                     |
| + Package 579A - Deep Strike  |                |                         | <input type="checkbox"/>            |
| + Package 5811 - Deep Strike  |                |                         | <input type="checkbox"/>            |
| - Package 5820 - Deep Strike  |                |                         | <input checked="" type="checkbox"/> |
|  | Deep Strike    | Viperb                  |                                     |
|   | 4 F-16C-40     | "14th Fighter Squadron" |                                     |
|   | Kunsan Airbase |                         |                                     |
|  | Deep Strike    | Turkey1                 |                                     |
|   | 4 F-15E-229    | "90th Fighter Squadron" |                                     |
|   | Taegu Airbase  |                         |                                     |
|  | TARCAP         | Weaselb                 |                                     |
|   | 2 F-16C-30     | "80th Fighter Squadron" |                                     |
|   | Kunsan Airbase |                         |                                     |
| + Package 6121 - Deep Strike  |                |                         | <input type="checkbox"/>            |
| - Interdiction  |                |                         |                                     |
| + Package 5112 - Strike   |                |                         | <input type="checkbox"/>            |

*The frag order: the detailed subset of ATO assigned to your squadron. Select your mission and off you go!*

For each team, its ATO selects targets according to campaign priorities, chooses appropriate mission types, arranges packages and organizes support flights. It also assigns individual flight details such as callsign, number and type of aircraft, selected squadron and airbase.

In SP4, the improvements concerning the ATO are manifold:

- A wider variety of mission types
- Better package generation: Bigger, more complete packages, including escort and SEAD flights. Less "suicidal" deep strike missions
- Optimized aircraft roles:
  - Assignment of proper roles to all new aircraft,
  - Update of existing aircraft roles to allow better usage of multi-role aircraft.
- Smarter aircraft loadouts: optimized default selection, more varied weapons

| 36TH FS FRAG ORDER |          |             |         |          |
|--------------------|----------|-------------|---------|----------|
| P                  | Takeoff  | Role        | Package | Status   |
| B                  | 09:24:00 | TARCAP      | 5802    | Patrol   |
| A                  | 09:37:00 | SEAD Escort | 5793    | Briefing |
| A                  | 09:38:00 | OCA Strike  | 5793    | Briefing |
| A                  | 09:39:00 | OCA Strike  | 5793    | Briefing |
| B                  | 09:39:00 | TARCAP      | 5802    | Briefing |
| A                  | 10:12:00 | Strike      | 5119    | Briefing |
| A                  | 10:13:00 | SEAD Escort | 5116    | Briefing |
| A                  | 10:14:00 | Strike      | 5116    | Briefing |
| A                  | 10:15:00 | SEAD Strike | 5049    | Briefing |
| A                  | 10:16:00 | SEAD Strike | 5047    | Briefing |
| A                  | 10:38:00 | SEAD Strike | 4941    | Briefing |
| A                  | 10:41:00 | TARCAP      | 4943    | Briefing |
| A                  | 10:44:00 | SEAD Escort | 4943    | Briefing |
| A                  | 10:45:00 | OCA Strike  | 4943    | Briefing |



## FLIGHT MODELS

There are many changes to the flight models in SP4 comprising of new flight models, graphical changes, fixing of models that are present in SP3, and alterations made to the additional data section.

### NEW MODELS

With the addition of several new 3D models came the need to make some new flight models or repair ones that were already available in SP3 but were only placeholders. Realism was again adhered to where possible during the making of these files and depended on the data and time available for each one.

There are quite a number of new F16 models available and we are now modeling the F16C block 52 as the default model. New models include block 15, 25, 30, 32, improved 40, 42, 50, 52 of various variants. Special thanks go to André "Raptor One" Josef for his time and effort in making these data files and allowing us to use them in SP4.

I won't go over each and every new addition - However with the relatively small amount of data available for the EF2000, this would have to be one of our greatest achievements next to the improved F16. This model took KingGeorge and myself quite some time to build and I can say that we are quite pleased with the outcome.

\*Other new models include the Aeromachi MB339, Antonov An124 and An225, Sukhoi Su15, J8, Su7bmk just to name a few.

Many of the variant aircraft now have their correct engines. These include the F111's all variants, B52D/G, SU39, AC130, KC130R

### F16 LIMITERS

All F16's (except F16XL) will now have the correct limiters due to a change in the database so that F16's have the same subtype specific of the default F16. This will also enable the programmable EWS, stall warning horn, and the deep stall routine. Due to this change and its adverse limitations, it was necessary to only include the F16 block 52 in the dogfight module.

### MIG29 VARIANTS

The spool rate for the RD33 turbofan fitted to the Mig29 and variants has been lowered due to data being found that states that this engine can go from idle to full burner in 4 seconds flat. Further inspection of the Mig29 data files showed that the corner Vcas was somewhat fast causing the AI not to fight at the FM's corner speed. This was also lowered and now the AI perform much better in a knife fight.

Based on the information on the RD33 spool rates the spool rates of the AL31F found in the Su27 variants was also lowered to match that of the RD33.

## WINGTIP AND ENGINE SMOKE

All wingtip and engine smoke positions have now been fixed and should all be generated from the correct positions.

## HITBOXES

The aircraft hitboxes have been updated once again, as the old ones were just too small. In general, they are slightly wider, but wings and tails are still not hittable in most cases. The hitbox-calculations are based upon the general directions first laid out and used in the RP-series, but with more fudge-factors in play. The old hitboxes contained very little deadspace, but that meant that the hittable areas of an aircraft became too small. The F-16 hitbox covered only the actual fuselage, making it only 4.4 ft wide. This has been changed to 9 ft to include the leading edge root extensions (LERX) as well.

## COG AND GEAR LOCATIONS

Whilst looking through LE at several models I noticed that quite a number had bad CoG (center of gravity) locations. This made setting of the correct gear locations on a lot of aircraft impossible. E.g. If the CoG were behind the main gear the aircraft would sit on its tail. The result was that the gear was usually placed way behind the aircraft making it look somewhat comical on takeoff and landings, vastly increasing the area needed for it to turn around while taxiing, and also making tail scrapes impossible. Another problem was that most gear locations were set too far apart giving the aircraft a massive wheel track (ever pass close to a taxi sign and wonder why you didn't clear it?)

With the help of Christian "Ripper" Thomsen (3D models) and Jason "Hippy" Davis we set about to correct this problem, with Christian fixing the locations, myself making the alterations to data files and Jason testing and repairing my ever so slight mistakes ;-)

The final outcome is that Aircraft now takeoff and land graphically and realistically correct, turning them on the taxi way is much easier. The floating down to the runway bug seems to have disappeared. And passing close to taxi signs is no longer a game of Russian roulette, so if your aircraft explodes then you actually hit it.

This has also made the scraping of tails on the runway during takeoff and landing possible so if you are making your approach and come in with too great an AoA then you will die a most horrible death. The same goes for takeoff if you pull back too early or too much your tail will scrape the runway.

As with most changes in Falcon there has to be a downside somewhere. The lengths of some aircraft had to be reduced to actually not include part of the tail section. This mostly affects large



aircraft and results in a slightly reduced collision point at the rear. I will point out that this has no effect on flight. You may be able to slightly nudge the rear of someone on the taxiway and not explode. This is mostly evident on heavy aircraft not fighters

## GROUND EFFECT

All aircraft will now be subject to ground effect with the correct calculations made for the area2span for each aircraft wing. Ground effect is a disturbance to a wing's airflow caused by coming close to the ground. This basically has an effect on the induced drag of an aircraft causing it to decrease the closer the aircraft gets to the ground. The result of this is that if you have slightly too much speed the aircraft will tend to float above the runway. The area2span value governs when ground effect will come into play based on the span and area of the aircraft's wing. Up until now the only aircraft with the correct value was the F16.

## MOVE SPEEDS AND ADDITIONAL DATA

Kevin "Ktel" Thompson made a lot of changes to the move speeds in the database and updates had to be made to the data files these include BingoReturnDistance, bingoFactor, fumesFactor, Jokerfactor.

Due to the relatively short distances in the Korean theater some aircraft don't have the distance to be able to climb to their respective cruise altitudes so altitudes for cruise were lowered in the database. Falcons mission builder and campaign engine will take these values into account when calculating steerpoint times and altitudes.

Theta max changes were made in an effort to sacrifice altitude for steerpoint times. This will be most noticeable when a player is tasked for fighter escort of a flight of heavies. Hopefully now the heavies won't be late and want to abort.

Changes to the refueling speeds, distances and altitudes were also made to ensure that the AI was able to hook up.

Other changes include minVcas, maxflapVcas and flapVcasRange to stop the AI flying around with flaps down. Drag chute sound was incorrect and has now been set to correct sound in all data files.

## GENERAL CLEAN UP

The acdata folder within simdata.zip contained a lot of files that were not in use or superseded these have now been removed.

*\*Special note: The data available for some aircraft was poor and unfortunately I did not have the time or the resources available to research some models to the extent I would have liked to. Although a vast improvement on what was there to begin with, I do not take responsibility for breaches of realism TR1 and U2 are two and there are some others.*

## DAMAGE MODELLING

SP4 has had most objects, Buildings, AC and vehicles looked at and adjusted where necessary. There are few points we tried to improve on and model better.

- Better damage values for guns (AAA and small arms)
- Better CBU(HE and AP types) modeling so they do less damage on objects like bridges
- Better vehicle hitpoint scaling so a T90/M1A1 needs more damage than a T55 to destroy
- Improved engagement timings, how fast they fire AAA/sam/radar
- Radar fixes for SARH where lock breaks too easy on AC platform radar
- Ships fire SAMs now and have search modes working

On guns, there were also a few errors in data that made damage/hit chance way too high (>AK47 unit -7,62mmPKT).

One of the biggest problems was getting damage separation between CBU's and Mk-X/GBUs as they both use the same explosion model type CBU HE types(e.g. CBU52/58) must be of low damage type so as not to destroy the harder objects that only a GBU could kill, but at the same time still must destroy targets that are appropriate (foot soldiers, AAA, soft buildings). There are still some problems with multiple droppings adding up too much damage and destroying stuff it shouldn't - a limitation of F4, but overall a good improvement over SP3.

*PS: CBUs are now optimized for a BA release height between approx 1500-2500 ft.*

Most aircraft now also have much better "engine shutdown" damage values. This means that e.g. the A-10 now needs much higher damage for an engine shutdown; therefore a few hits of AAA won't immediately shut down the engine (like it did in SP3...)

Many buildings and bridges also needed higher hitpoints than in SP3; this now helps to stop CBU damage from destroying large buildings, bridges and hardened objectives.

For the vehicles, all hit points and damage were completely reworked so that proper scaling could be modeled. Values were adjusted according to armor thickness (mm) on tanks so that better armored vehicles need more damage to be destroyed. This works out pretty good in game and can e.g. be seen on how CBU-58 or CBU-87 affect different vehicles: A CBU-58 mainly will do damage to tanks and get some kills on very light armor. A CBU-87 will kill 3-4 T55 type tanks, but gets less kills as you move up to T90 armor classes. Also weapon damage capabilities are now scaling up in a similar way, according to their armor penetration (AP) capability (AGM-114, AGM-65, AT3-16, TOW, etc.)

Ships now are much harder to destroy, especially carriers.





## RADARS

The air defense weapon changes in Superpak 3 and Superpak 4

Falcon 4.0 features a wide variety of air defense systems. Since SP3, the radar systems of a guided SAM unit have to switch through multiple radar modes (search/acquire/track) before they can launch a missile (SP3\_Manual, p. 150). With SP4, the data of the air defense weapon systems has been vastly enhanced to take maximum advantage of these new functions and model them as real as possible. In addition, all SAM systems available in Falcon had their data tested, verified and corrected for optimum realism.

## RADAR MODE SWITCHING

With SP4, the maximum distance of the search modes has now been set to 125% of the official max range of the SAM. This makes sure that the system has enough time to go through the different search modes before the target enters the system's launch envelope. The time that a systems needs to switch to the next radar mode depends on the officially known reaction time. Therefore, when an aircraft pops up from terrain masking directly into the SAMs effective range, the system will still need some reaction time to cycle to the guide radar mode and fire.

However, while the SAMs now need more time to get a lock on you in the first pass, time-to-lock goes down once they know your position.

*Be advised that a SAM radar normally only shows up in your RWR when it has reached acquire mode (unless you selected the option in the RWR to also display search radars).*

## ENGAGEMENT ENVELOPES

SAMs will not fire at the edge of their engagement envelope, as this would most probably result in a wasted shot, especially against a highly maneuverable target (just like you hopefully don't fire your Amraams at their maximum range).

Accordingly, the guide mode and the launch distance are set to two-thirds of their known maximum range. From there on, the SAM will fire all the way down to its minimum range as set in the missile data files. To work properly, the SAM bubble ranges have been set according to their search radar ranges.

Be informed that the long range SAM's are however still limited to the max bubble size of the "F4 world" (The air defense modeling is also limited by other factors: just one target at a time can be engaged, the SAM envelope is oversimplified and there is no possibility of additional optical tracking that make older SAM's still deadly against modern fighters).

Each SAM system now features a new minimum engagement altitude that depends on four factors: The low altitude engagement distance (which is 83% of the normal one), the earth radius,

the antenna height and the official minimum altitude a SAM system can engage. While not correct over the whole engagement distance, this feature simulates the primary role of a certain system (either long range high altitude or short range low altitude air defense) pretty well.

The maximum engagement altitude is set to 75% of the systems maximum altitude.

## HIT PROBABILITY

Since SP3, the Superpak series also feature more realistic hit probabilities of SAM weapon systems by separating by sensor technology: Therefore, sensor precision data has been modified to a great extent to make older SAMs less deadly while improving the accuracy of modern systems. While it is hard to simulate exact numbers of hit probabilities, the relation between hits and fired missiles is now much more accurate.

*Real life examples: In 1965, about 194 SA-2s were fired, but they managed to destroy only 11 US aircraft. Today, modern equipment and proper planning help to defeat common and well-known SAM systems: During the Kosovo air war, about 477 SA-6 and 124 Manpad missiles were fired at NATO aircraft. Most of these missiles were fired unguided, as patrolling HARM shooters while heavily threatened by HARM shooters. Only two aircrafts were hit, an F-16 and F-117.*

Radar chaff decoy chances have been lowered to get better results with SARH missiles; before, they were breaking lock at too far a distance, causing a very low kill probability (PK%). The targeted PK in SP4 is now about 25- 45% maximum, depending on missile type and aircraft/weapon system.

## MISSILE VOLLEYS

Another addition of Superpak 3 and 4 is that more than just one missile at a time can be guided at a target. On older systems a volley of two or three missiles has a higher probability of kill or at least forces the target to bleed off energy and get in the range of AAA and manpads. On the other hand a modern SAM system with a high probability of kill may just launch one missile at an aircraft. Did you know that some of the modern SAM systems can even engage cruise missiles and anti radar missiles?

## SMOKE TRAILS

Another change is the use of different smoke trails. A big flaw up to now was that the trails are hardly visible while the smoke should be a major factor in spotting a launch of an older SAM. There is now different trails available and set in the missile files.



## OTHER RADAR SYSTEMS

Radar data was also adjusted for Ships and AAA units (e.g. KS19, 2S6), optimizing engagement distances and search/lock times.

## ROTATING RADAR DISHES

Ground-based search-radars such as those on airfields have been made to rotate. The spinning radars add more life to the otherwise pretty lazy impression of radar-sites and SAM-batteries. There are two general types of radars; those with their antennas covered by a dome, and those with free antennas. The dome-type radars are left untouched, but the rest will now rotate slowly.

Some SAM radars such as the Long-Track will also rotate, and we've tried to modify their rotation-speed to realistic values. Thus the Bar-Lock-B (SA-5) will rotate slowly, while the search-radar of the SA-15 vehicle will have a more aggressive, fast spin.

## NOTES

There are many other flaws and limitations in Falcon's SAM modeling and the data now in SP4 (set as shown in the table below) is certainly not the most realistic one for every engagement situation. However, we believe that they result in a much optimized SAM weapon system behaviour, as they are based on a few selected principles:

- The main target environment consists of human controlled F-16C's.
- Figures are based on official and publicly available data and reports. If these weren't available, "educated guess" had to help.
- Individual data represents the role of a certain air defense system in the Air defense network.
- A system is modeled with respect to other air defense systems capabilities.
- The most recent or most used system versions are modeled.

## RADAR AND IR GUIDED SAM SYSTEMS – FIGURES USED IN SP4

| <i>System</i> | <i>Range<br/>(nm)</i> | <i>Max Altitude<br/>(ft)</i> | <i>Min Altitude<br/>(ft)</i> | <i>Min Range<br/>(nm)</i> | <i>Hit Probability</i> |
|---------------|-----------------------|------------------------------|------------------------------|---------------------------|------------------------|
| SA-2f         | 22.1                  | 73000                        | 2250                         | 3.2                       | Very low               |
| SA-3b         | 7                     | 44000                        | 180                          | 1.3                       | Low                    |
| SA-4b         | 20                    | 60000                        | 1000                         | 3.8                       | Low                    |
| SA-5c         | 60.5                  | 85000                        | 6200                         | 5.4                       | Very low               |
| SA-6b         | 11.3                  | 36000                        | 550                          | 2                         | Medium                 |
| SA-8b         | 4.3                   | 12000                        | 90                           | 0.8                       | Medium-high            |
| SA-10         | 32.4                  | 66000                        | 640                          | 2.7                       | High-Very high         |
| SA-11         | 13                    | 46000                        | 190                          | 1.6                       | High                   |
| SA-13         | 1.7                   | 9000                         | 40                           | 0.1                       | High                   |
| SA-15         | 4.9                   | 15000                        | 40                           | 0.5                       | Very high              |
| SA-17         | 13                    | 48000                        | 100                          | 1.6                       | High                   |
| SA-19         | 3.2                   | 10000                        | 20                           | 0.5                       | Medium-high            |
| Nike Herc     | 62                    | 100000                       | 8500                         | 2                         | Low                    |
| HAWK          | 16                    | 44000                        | 420                          | 0.5                       | High                   |
| Patriot PAC2  | 43.8                  | 60000                        | 1600                         | 1.5                       | High                   |
| Skyguard      | 3.8                   | 9000                         | 20                           | 0.5                       | Medium-high            |
| SA-7          | 1.9                   | 5000                         | 200                          | 0.3                       | Low                    |
| SA-9(M)       | 2.8                   | 20000                        | 50                           | 0.3                       | Medium                 |
| SA-14         | 2.1                   | 10000                        | 200                          | 0.3                       | Medium                 |
| SA-16         | 1.9                   | 12000                        | 50                           | 0.3                       | High                   |
| Stinger       | 2.8                   | 10000                        | 50                           | 0.5                       | High                   |



## MISSILES

Various missiles had their flight models optimized and abstract data corrected. This includes:

- Improvements to the JSOW/JDAM flight model, so that it works closer to an unpowered bomb.
- Lowered thrust amounts to try to get the missile look out of for its flight path and to keep its speed subsonic as it should be (JSOW/JDAM still not modeled 100% right)
- Extended RMax HUD ranges for the AGM-88, ALARM and AS37 Also the AI launch range for the AGM-88 was extended from 17nm to 24-25nm on deck.

## MISSILE VISIBILITY

The long-range visibility of AA-missiles has been changed to a more representative state, based on calculations about the resolution of the human eye:

The 3D-model for missiles at long range is as simple as possible: a dot. Until now, this meant that the missile looked the same for whatever long range - It always was at least a grey pixel, whether 3 NM or 200 NM away. Now beyond a certain range, this is obviously wrong, because the resolution of the human eye is limited to about 40 arcseconds (one 90th of a degree). An equation was setup to determine when a missile of a certain size would be close enough to cover these 40 arcseconds, i.e. when it would be close enough to be visible. The missile "size" used for this calculation is the average of the missile length and its finspan.

An example: for the AIM-9, the visibility range is now limited to 4.77 NM. Beyond this range, the missile will now be invisible – no more grey dots. While this range may still sound a little long, it's the optimum for the current environment; it's based on missile size only, and doesn't account for hazy conditions, background contrast etc.

## AIRCRAFT SENSOR/ ACD

Many aircraft don't share common data anymore, as most of them now have specific data available for their individual sensors. This allowed us to do more precise adjustments for specific aircraft types.

Many aircraft units now also have their own proper squadron stores; this should help campaign creators in adjusting weapon amounts for specific units.

Some new radars were added to go with new aircraft like the EF-2000. We also tried to better accommodate the various blocks of the F-16, so that e.g. the F16A-15 has a slightly less capable radar than F-16 Block 25 and higher.

*Additional sensor work is still in progress.*

# *Chapter* **3**



# *Appendix*



## CREDITS

The work of the following people has helped substantially in the production of SuperPAK 4:  
(For additional credits, please refer to the SP3 manual)

**Keeping it all together:** Joel 'Jackal' Bierling, Chris 'Washout' Carter, Christian 'Ripper' Thomsen, Manfred 'Schumi' Nelles, Julian 'Codec' Onions.

**Data masters:** Shawn 'Viper' Agne, Ed Kiefer, Kevin 'Ktel' Thompson, Stephen 'HotDogOne' French.

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**ATO:** Stephen 'HotDogOne' French

**2D Cockpit:** Rufus Parson

**3D Cockpits:** Eric 'Aeyes' de Best, Tomas Hamarcak

**Flight Models:** Tom 'Saint' Launder, Andre 'Raptor One' Joseph, Bennie Broughton, Instar, TAF, Georg 'Kinggeorge' Mumelter, Thorsten 'Firebird' Graf, Jose Alberto 'Coradan' Dominguez, Chris 'Washout' Carter, Davor 'Bowman' Perkovic, Ray 'Ratty' Gatterer, Simon 'Animal' Jessurun, Fabio 'Spieg' Incagli, Randall, Chuck Boothe, Paul Poulsen, Craig Homer, Greg Lewis, Francesco 'Mix' Missarino.

**2D/3D Artists (Skins and Models):** Alan Locatelli, Alex Lutz, Antonio "Quake" Lumia (FF 3D modeller member), Basil Greber, Bob "Snowman" Crawford, CCC, Charles "Cobracab" Bodiker, Chris "Washout" Carter, Cristian "Ripper" Thomsen, Dave "Waveydave" Cuthbert, David "Killer" Morrison, Davide "Daws" Sangiorgi, Eric "Aeyes", Fred "Baldeagle" Balding, Guilherme "Shinobi" Mauricio, Hannes "Noname" Wagner, Harald "Boots" Renner, Jerry "HCPookie" Davies, Joshua "Ender" Clarkson, Kevin "Ktel" Thompson, Kim "Winder" Gowney, Martin "Redfox" Degn, Martin "Spike" Sandrock, Mike "Speaker" Bradley, Mike "Vermin" Rivers, Recce, Rick "Dragon" Prior, Robert "Pumpyhead" Lozada, Rob "Viper" Senftle, Ron "Red1" Nair, Rufus Parson, Shawn "Viper" Agne, Stephane "EXO" Nguyen, Steve "Hustler" Wooters, Tim "Sphynx" Dieter, Tomas "ATARIBABY" Hamarcak.

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(FreeFalcon). TacRef work made possible thanks to the tools developed by Julian "Codec" Onions, Martin "Jupps" Friedrich, and Fabrice "Skyfire76" Mercier.

**User Interface:** Ivo 'Widmak' Schäperclaus

**Checklists:** Olivier 'Red Dog' Beaumont

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Keymap based on original work by Steve 'Spitfire' Southcombe

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**Beta test file server:** Martin 'Terrapin' Gerner.

**Entity testing website and coordination:** Marcin 'GuNNeR' Siwczuk

**MP Testing coordination:** Dennis 'Ripcut' Geister

**Beta Testing:** The active members of the F4UT betatest team.

## SPECIAL THANKS

### Flight Models

I can say that it has been a lot of fun working on the models for SP4 and I hope that you, the community, enjoy flying them as much as the team and I have enjoyed working on them. I'm proud to have been given the opportunity to be part of SP4 and think that we now have the most complete realistic set of flight models of any of the SuperPAK series.

Special thanks go out to: -

- Jason "Hippy" Davis without whose help I would not have gotten half of this done.
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- Dirk "Pacman" Verbist for his organizational skills.
- Dennis "Ripcut" Giester Multiplayer Developer and long time friend.
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- 16th Fighting Tigers for their help.
- All the beta testers who were involved in FM testing.
- And most of all my lovely wife Deanne for putting up with my countless hours sitting on the PC.

Ray "Ratty" Gatterer, F4UT Flight Models  
FreeBirds VFW





## KNOWN ISSUES IN SP4

While much improved in relation to the original Falcon 4, SuperPAK still has its share of bugs and issues. Some are known, others are still undetected. Meet us online ([www.frugalsworld.com](http://www.frugalsworld.com), [forums.delphiforums.com/falcon4](http://forums.delphiforums.com/falcon4)) and help improve SuperPAK by giving us your feedback!

*Please check the SP3 manual first – a number of additional issues is listed there.*

### **Aircraft killed on the ground count as A-A kills.**

- ▲ Check out the chapter “Airbases and Objectives”.

### **Too many aircraft only my airbase – and running around like chickens.**

- ▲ Check out the chapter “Airbases and Objectives”.

### **I can drive through the hangar walls**

- ▲ Check out the chapter “Airbases and Objectives”.

### **The Tactical Reference does not show all RWR symbols.**

- ▲ The in-cockpit RWR under SP3 is able to choose symbols from a library of 256 symbols. A limitation from the original MPS code restricts the RWR display in the Tactical Reference to only displaying the first 20 symbols. The SP4 Tactical Reference database (TacRefDB.bin) has been coded with the correct symbol references, so all the symbols will be available if the code issues can be resolved in a future version of the exe. All RWR sounds should work.

## UPGRADING FROM PREVIOUS VERSIONS

From whatever version you are upgrading to SuperPAK: please install only the logbook, and no other files, for use in SP. This means: Re-configure your in-game setup, and re-start a new campaign. It is not advisable to continue playing with an old campaign save file - too much has changed in the databases.

Tactical Engagements can be upgraded to SuperPAK in some cases. To do so, follow the procedure found in the SP3 manual.

*Depending on their complexity, Tactical Engagements may or may not work if one tries to update them. Unfortunately, often they will not work. This is because a lot has changed in the databases, so units, airfields and such may be different now. Crashes to Desktop (CTD) will be the most likely result if a TE mission no longer works. It is therefore recommended to make the TE from scratch.*

## THE DATA WORLD OF FALCON 4

This chapter gives you an overview of all the data available in Falcon for edits. It's sorted by folder/subfolder of your Falcon directory. It can be used to find specific data for edits – or just give you an idea on how vast the Falcon 4 Data Universe is!

### FALCON 4 ROOT FOLDER

- FalconSP.cfg: Configuration File for detail configuration
- TacRefDB.bin: Tactical Reference

### ACMIBIN

Saved ACMI tapes

### ART

Various subfolders: User Interface layout definitions and resource files (graphics).  
*Created by Microprose for the classic brown 800x600 User Interface*

#### **Art/ckptart**

Cockpit definition graphics

Various subfolders: Cockpit definition graphics for other planes.

#### **Art/splash**

GIF files used as splash screens during mission loading/leaving

#### **Art1024**

Various subfolders: User Interface layout definitions and resource files (graphics).  
*Created by F4UT for the new modern blue 1024x768 User Interface*

#### **Art<theatre>**

Theatre-dependent replacement UI graphics

### CAMPAIGN/SAVE

Campaign definition, saved games, tactical engagements, training missions, instant action setup etc. for the default Korea theatre.



## **Campaign/<theatre>**

Campaign definition, saved games, tactical engagement, training missions, instant action setup etc. for additional theatres

## **CONFIG**

Logbooks, keyboard mapping definitions, display settings

## **DOCS**

SuperPAK documentation, Tactical Reference in HTML format.

## **F4PATCH**

Contains original and backup files plus configuration settings and parameters for the Falcon configuration and installation tool.

## **MOVIES**

Movies used in the Game Intro and the "News" flashes in the campaign.

## **MUSIC**

User Interface music

## **PATCHES**

Empty / not used

## **PICTURES**

Your in-game screenshots as uncompressed BMP files.

*Use a tool such as the freeware [irfanview\(.com\)](http://irfanview.com) to convert them to efficient JPG files.*

## **SOUNDS**

All sounds used in-game, including cockpit sounds, RWR blips, explosions, various engines and the pilot voices.

**Sounds<theatre>**

Theatre-specific replacement sounds.

**TERRDATA/<THEATRE>/TERRAIN**

Definition of theatre terrain: elevation map, tiles arrangement in various levels of detail (LOD).

**Terrdata/<theatre>/texture**

Terrain tiles (scenery textures)

- Texture.zip: ZIP-File of all textures (PCX-Files)
- Texture.bin: Definition of available tiles (relates between textures and terrain definition)
- Fartiles.raw: abstracted, simplified terrain scenery for horizon usage
- Fartiles.pal: Palette to be used with the Fartiles.

**Terrdata/<theatre>/weather**

Available weather patterns, including raw data and screenshots

**Terrdata/misctex**

Various textures used for clouds, explosions, sun and moon, dust, smoke, etc.

**Terrdata/misctex <theatre>**

Theatre-specific textures used for clouds, explosions, sun and moon, dust, smoke, etc.

**Terrdata/objects**

3D-objects definitions and databases. *Use LODEditor and F4Browse to edit.*

- f4sndtbl.sfx: Mapping of sounds and engines.
- Koreaobj.tex: Textures (skins) used by the 3d-objects.
- Koreaobj.lod: 3D-objects definition.
- Koreaobj.hdr: Link between 3D-objects (lods) and object database definition, Lod color palettes, used textures, Object Parent Data.
- Rack.dat: Definition of available weapon racks.
- Trail.dat: Definition of missile and engine trails.
- Falcon4.\*: Various Files containing the main simulation objects database:
  - Master Aircraft Data (Airframes, Sensors)
  - Network Data Priorities
  - Features (Repair time, Hit points, Vulnerability)



- Hardpoints (Types, possible loadouts)
- IR Data
- Objectives (Layout, included objects)
- Point Header Data (runways, taxiways, parking spots, naval docks)
- Radar Data (Sweep time, Range, Gain, Chances etc.)
- Rockets
- Radar Warning Receiver Data (Scan ranges),
- Abstract Basic Weapons (Type, Avionics, Drag, Weight)
- Sounds (filename, sound distance, properties)
- Squadron stores (Available Weapons, stores count)
- Squadrons/Units (Aircraft – Land – Ship – Submarine, Speed, Range, Capabilities, Damage properties, Role Scores, Movement costs, applicable Squadron stores data, unit composition)
- Vehicles: NCTR, Visual signature, IR signature coefficient, empty weight, fuel, fuel rate, Maximum take-off weight, max speed, cruise/max altitude, engine noise, callsign type, special abilities (VTOL, HMS, Chaff/Flares, ...), combat statistics
- Visual signature/detection data: Scan ranges / angles
- Weapons (Weight, Damage, Radius, Drag, Explosion Type, Fire Rate, Rarity, Hit Chances)

## **Terrdata/theaterdefinition**

- <theatre>.tga: The theatre title screen displayed in the theatre selector UI
- <theatre>.tdf: Theatre definition file, giving the path to the various theatre-dependent data subdirectories

## **ZIPS/SIMDATA**

### **ACDATA**

Aircraft Data: Flight Models

### **MISDATA**

Missiles Data: Flight Models

### **RADAR**

Radar Data: Capabilities, Ranges, Behaviour etc. (Generic.dat, f16.dat, nike.dat, ...)  
radtypes.lst: List of 330 radar types

## **SENSDATA**

Sensor data for IRST, RWR and Optical sensors.

- IRST (generic.irs, aim9l.irs, ...index: irst.lst)
- RWR (generic.rwr, harm.rwr, ...index: rwr.lst)
- VISUAL (generic.vss, mav.vss, tpod.vss, ... index: visual.lst)

## **SIGDATA**

Signature data (Elevation and Azimuth).

- IR (generic.ir0, generic.ir1, generic.ir2)
- RCSDAT (generic.rcs)
- TACAN (stations.dat)
- VISUAL (generic.vis)

## **STARTDAT**

Various IA.\* and \*.DAT files for ?????

## **VEHDEF**

About 200 basic data definitions for various weapon systems

## **ZIPS**

CPDATA: Old Backup cockpit data

SKY: Available skyfixes, including tod.lst and screenshots

WEATHER: Available weather patterns, including raw data and screenshots

TACRDATA: Photographs for the Tactical Reference. Mistakenly deleted by the 108us patch.



## Notes

## Notes

One thing I can tell you is you got to be free  
Come together right now over me