

Sukhoi Design Bureau

# Su-27

## AFS-design



Andreas Meyer

## Summary

The Sukhoi Su-27 is a one-seat Mach-2 class jet fighter originally manufactured by the Soviet Union, and designed by the Sukhoi Design Bureau.

The Su-27's basic design is aerodynamically similar to the MiG-29, but it is substantially larger. It is a very large aircraft, and to minimize its weight its structure has a high percentage of titanium (about 30%, more than any of its contemporaries). No composite materials were used. The swept wing blends into the fuselage at the leading edge extensions and is essentially a delta, although the tips are cropped for wingtip missile rails or ECM pods. The Su-27 is not a true delta, however, because it retains conventional tailplanes, with two vertical tailfins outboard of the engines, supplemented by two fold-down ventral fins for additional lateral stability.

The Su-27's Lyulka AL-31F turbofan engines are widely spaced, both for safety reasons and to ensure uninterrupted airflow through the intakes. The space between the engines also provides additional lift, reducing wing loading. Movable guide vanes in the intakes allow Mach 2+ speeds, and help to maintain engine airflow at high alpha. A mesh screen over each intake prevents debris from being drawn into the engines during take-off.

The Su-27 had the Soviet Union's first operational fly-by-wire control system. Combined with relatively low wing loading and powerful basic flight controls, it makes for an exceptionally agile aircraft, controllable even at very low speeds and high angles of attack. In airshows the aircraft has demonstrated its maneuverability with a Cobra (Pugachev's Cobra) or dynamic deceleration - briefly sustained level flight at a 120° angle of attack.

In addition to its considerable agility, the Su-27 uses its substantial internal volume for a large internal fuel capacity. In an overload configuration for maximum range, it can carry 9,400 kg (20,700 lb) of internal fuel, although its maneuverability with that load is limited, and normal load is 5,270 kg (11,620 lb).

The Su-27 is armed with a single 30 mm Gryazev-Shipunov GSh-30-1 cannon in the starboard wingroot, and has up to 10 hardpoints for missiles and other weapons. Its standard missile armament for air-to-air combat is a mixture of Vympel R-73 (AA-11 Archer), Vympel R-27 (AA-10 'Alamo') weapons, the latter including

extended range and IR guided models. More advanced Flanker variants (such as Su-30, -35, -37) may also carry Vympel R-77 (AA-12 Adder) missiles.

The Su-27 has a high-contrast tuneable HUD and a helmet-mounted sight capability, which, paired with the R-73 missile and the plane's superb agility make it one of the world's best dogfighter aircraft.

The radar proved to be a major developmental problem for the Su-27. The original Soviet requirement was very ambitious, demanding a multi-target engagement capability and 200 km range against "bombers" (16 m<sup>2</sup> RCS to match a Tu-16). This would greatly exceed the detection range of the F-15's APG-63 (about 180 km vs a 100 m<sup>2</sup> RCS target) and be broadly comparable to the 1-ton Zaslon phased array radar used on the MiG-31.

The Su-27 has an OLS-27 infrared search and track (IRST) system in the nose just forward of the cockpit with a 80-100km range[2], which also incorporates a laser rangefinder. This system can be slaved to the radar, or used independently for "stealthy" attacks with infrared missiles (such as the R-73 and R-27T/ET). It also controls the cannon, providing greater accuracy than a radar sighting mode.



## Contents

The Sukhoi Su-27 of AFS-design .....	4
System .....	5
Installation .....	5
Problem with DirectX in FSX (SP2) – when required only .....	6
Keyboard .....	7
The panel .....	8
Technical data of the Sukhoi Su-27 .....	9
Reference informations .....	10
Sukhoi Su-27 Check list .....	11
Right .....	14



## The Sukhoi Su-27 of AFS-design

- Include single seat and two seater, as well as formationsflightmodel with 4 Sukhois
- Detailed outside and interior model inclusive animated virtual cockpit
- Highly soluble textures with surfaces reflecting
- Extensive light effects (e.g. Navigation and landing lights)
- Numerous animations (e.g. canopy, move in gear with spring system)
- Animation of all tax flaps (e.g. airbrakes and spoilers)
  
- Realistic flight dynamics (inclusive different trim steps for optimal trim)
- Formation flight model with four Su-27
- Complete functioning autopilot
- Avionics for radio navigation
  
- Engine animation inclusive thrust reversing and afterburner
- Completely functioning virtual cockpit from view of the pilot

The AFS-design Su-27 product liveries the following:

- CHINA
- India
- Russia with special texture
- Poland
- Kazakhstan
- Erithrea
- Ethiopia

with 45 different textures.

Include repaint texture for repainters

## System

System:	Windows 98 SE / Me / 2000 / XP or Vista
FS VERSION:	FSX (SP1, SP2, Acceleration Pack) and FS2004
Filesize:	20 MB
Filesize hard drive:	200 MB
INSTALLATION:	EXE. file
PUBLISHER:	AFS-design
HOMEPAGE:	<a href="http://www.afs-design.de">http://www.afs-design.de</a>
SUPPORT mailto:	<a href="mailto:info@afs-design.de">info@afs-design.de</a>
FS VERSION:	FSX (SP1, SP2, Acceleration Pack) and FS2004

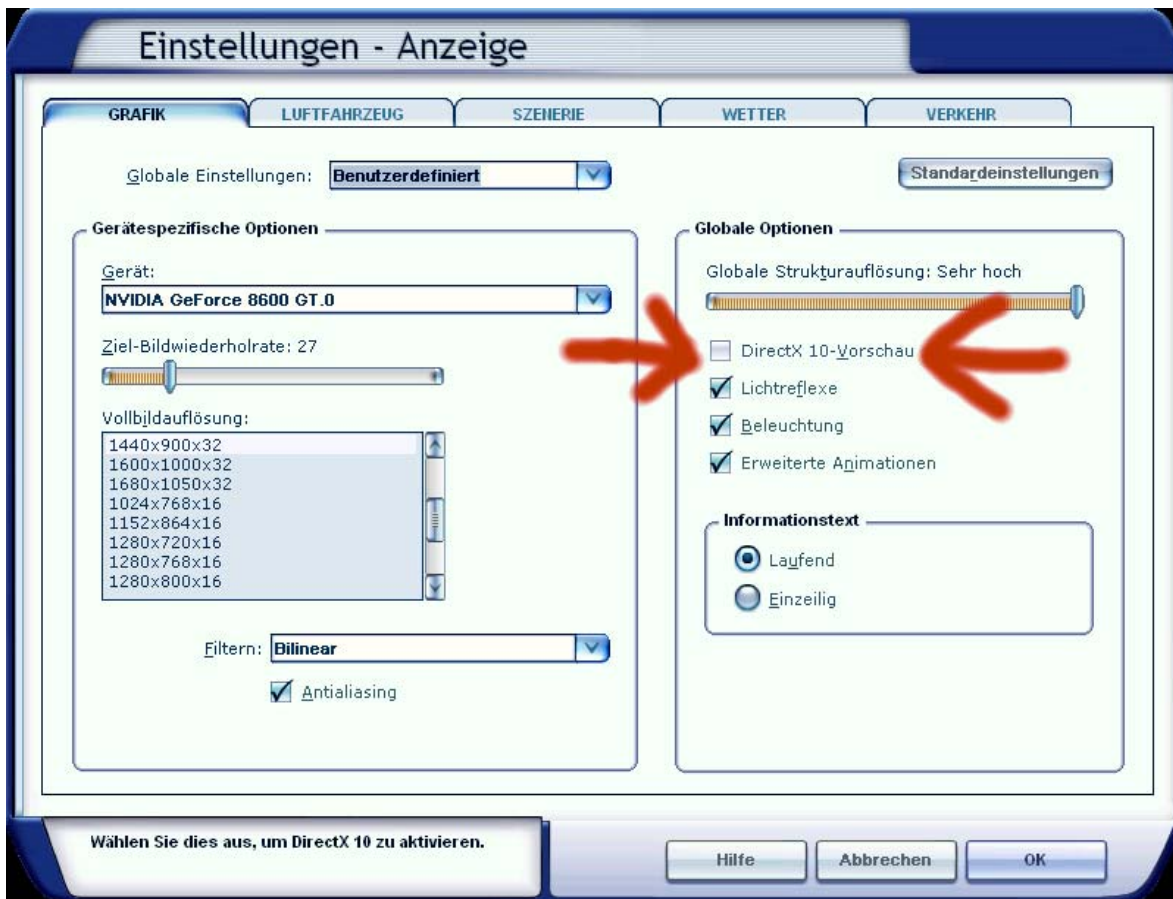
## Installation

1. For FSX download the „AFS-Su-27-FSX.exe“ to a temporary directory of your choice.
2. For FS2004 download the „AFS-Su-27-FS9.exe“ to a temporary directory of your choice.
3. Please start the „AFS-Su-27-FSX.exe“ or „AFS-Su-27-FS9.exe“ and
4. Install the AFS-design Su-27.
5. Than you start the Flight Simulator
6. Choice a flight with “Sukhoi Su-27, AFS-design“
7. Choice a kind of fighter wing and the equipment
8. Control the loading
9. Than you start the Flight Simulator

## Problem with DirectX in FSX (SP2) – when required only

This program use DirectX9 only. Please switch out DirectX 10 trailer !

1. Install this add-on
2. Start the Microsoft FSX
3. Choose a plane your choice
4. Start the simualotion (click start)
5. In the simulation switch button "ALT"
6. Choose options / adjustment / display (graphic settings)
7. In the graphic settings windows choose graphic
8. deactivate "DirectX 10 trailer" in small box ( without camisole )
9. Exit the FSX, and start the FSX new !



## Keyboard

Please use a joystick adequate for the Microsoft Flight Simulator. Other are all Keyboarddefinitions like in standard manual of Flight Simulator.

### *Importance notice for FSX:*

*Please operate keyboard combination onto call: “STRG” and “E”*

*Therewith the start of engines. After you can switch the engines with panel switch normal.*

engine on	<b>STRG E</b>
canopy open / close:	<b>SHIFT E</b>
gear	<b>G</b>
air brake	<b>#</b>
Trim	<b>7 and 1 (Number block out)</b>
Landing flaps down (step 4 and 5)	<b>F7</b>
Landing flaps up (step 3 and 4)	<b>F6</b>
Zoom in virtual cockpit: (not numeral field, but letter field)	<b>+ -</b>





## The panel



A – HUD  
B – HUD controls  
C – Master, Generator and Pitot Heat Switch  
D – Engine control switch  
E – Turn-Bank  
F – Vertical-Speed  
G – Gear, Flaps, Brake, Canopy - status  
H – Attitude  
I – Horizontal-Indicator  
J – Air-Speed  
K – Altitude

L – VOR  
M – ADF  
N – Altitude-Alerter  
O – Fuel Quantity  
P – DME  
Q – Pitch Trim  
R – NAVGPS  
S – Status Flaps, FS Icons  
T – Light switch  
U – Compass  
V – Clock

## Technical data of the Sukhoi Su-27

Producer:	Sukhoi Design Bureau
Engine:	2 x Saturn/Ljulka AL-31F- Mantelstromtriebwerke
Power:	je 122,58 kN kN with afterburner
Length:	21,94 m (with pitot)
Height:	5,93 m
Span:	14,70 m
Empty mass:	16.380 kg
Max. weight:	30.450 kg
Max. speed:	1.345 km/h low level 2.284 km/h / 2,15 mach of 11000 m
Maximum range:	2100 km
Transfer:	2900 km
Armament:	<ul style="list-style-type: none"> <li>- 1 × 30 mm GSh-30-1 cannon with 275 rounds</li> <li>- 8,000 kg (17,600 lb) on 10 external pylons</li> <li>- Up to 6 × medium-range AA missiles R-27, 2 × short-range heat-seeking AA missiles R-73</li> <li>- Upgraded Su-27SM is capable of using R-77 instead of R-27</li> </ul>
Crew:	1 or 2

## Reference informations

total weight of aircraft with full tanks	67.140 Lbs
--	------------

$V_{MO}$ – limit speed	295 KIAS
$M_{MO}$ - limit speed Mach	0,84 Mach
Limit speed in turbulences	305 KIAS/0,84 Mach
$V_{LO}$ - limit speed for gear	256 KIAS/0,82 Mach
$V_{LE}$ - maximum speed for down gear	243 KIAS/0,82 Mach

$V_{LE}$ – limit speed with gear open	100 KIAS
Canopy open	48 KIAS

### Limit speed for flaps

Flap position (degrees)	KIAS
1	270
2	270

$V_{REF}$  - **landingspeed** flaps step 3, gear down

40.000 Lbs ( flaps down, land )	172 KIAS
---------------------------------	----------

# Sukhoi Su-27 Check list

Aktion	Combination of keys...
GPS in -/- fades	shift +3
Radio in -/- fades	shift +4

## PUT back (if at a gate one parked)

<input type="checkbox"/> putting back	REQUIREMENT (pressures it UMSCHALT+P and afterwards 1 for a tail movement to the left or 2 for a tail movement to the right. Press then UMSCHALT+P for stopping.)
---------------------------------------	---

## BEFORE THE START

<input type="checkbox"/> Parking brake	TIGHTEN (pressures it STRG+PUNKT.)
--	------------------------------------

## START THE ENGINE

Press STRG+E for the automatic engine start.

## AFTER THE START

<input type="checkbox"/> snow and ice removal	AS REQUIRED
<input type="checkbox"/> flight control	EXAMINING
<input type="checkbox"/> autopilot	ADJUSTING AND OUT
<input type="checkbox"/> of instruments	EXAMINED
<input type="checkbox"/> brake mechanism	RTO (ABORTED TAKE-OFF)
<input type="checkbox"/> avionics switch	on
<input type="checkbox"/> avionics	ADJUST (pressures it UMSCHALT+2 to indicate around the group of radio.)
<input type="checkbox"/> trimming	ADJUST
<input type="checkbox"/> Switch for round ambient light	on

## BEFORE THE START

<input type="checkbox"/> flaps	FOR START ADJUSTING (pressures it as often as necessarily F7.)
<input type="checkbox"/> Flight Director	on
<input type="checkbox"/> Automatic efficiency control	ACTIVATE (on use of the TO/GA mode when starting)

## START

<input type="checkbox"/> brake	SOLVE (pressures it the POINT KEY.)
<input type="checkbox"/> Flashlights	on
<input type="checkbox"/> Transponder	OLD (pressures it UMSCHALT+2 to indicate around the group of radio.)
<input type="checkbox"/> Vertical adjustment lock lever	LET US PUT forward ON 1,05 EPR (pressures it as often as necessarily F3 or F2.)
<input type="checkbox"/> Vertical adjustment lock lever - or -	SLOWLY ON 100% N1 INCREASING (pressures it as often as necessarily F3 or F2.)
<input type="checkbox"/> TO/GA-modus	ACTIVATE (pressures it STRG+UMSCHALT+R.)
<input type="checkbox"/> Achievement	EXAMINE WHETHER SUFFICIENT FOR START
<input type="checkbox"/> Airspeed 80 KIAS	ANNOUNCEMENT "80 KNOTEN"
<input type="checkbox"/> Airspeed V1	ANNOUNCEMENT "V1"
<input type="checkbox"/> Airspeed VR	ANNOUNCEMENT " TRICKS "

**- RAISING ON APPROXIMATELY 10 DEGREES OF PITCH ATTITUDE -**

- Airspeed V2 ANNOUNCEMENT "V2"
- Gear BRING in (AS SOON AS CLIMBING RATE REACHES POSITIVES)  
(pressures it G.)  
AN AS REQUIRED
- autopilot- Course selector switch
- Airspeed V2 + 15 KIAS MAINTAINED
- Autopilot ACTIVATE
- Flaps LET US BRING WITH 1.000 FOOT in ABOVE GROUND (pressures it as  
often as necessarily F6.)

**CLIMB**

- Automatic efficiency control off
- Landing lights off WITH OVER 10.000 ft NN
- Altimeter WHEN THE EXCEEDING 18.000 FOOT NN TO 29,92 ADJUSTING

**CRUISING**

- Vertical adjustment lock lever As required (pressures it as often as necessarily F3 or F2.)
- Trimming If necessary (pressures it as often as necessarily 6 or 7 on the numeric  
keyboard.)

**DESCENDING FLIGHT**

- Airspeeds (VREF, VAPP) COMPUTED AND ADJUSTED (see side reference on the knee board)
- Brake mechanism AS REQUIRED
- Snow and ice removal AS REQUIRED
- autopilot AS REQUIRED
- Vertical adjustment lock lever AS REQUIRED  
(pressures it as often as necessarily F3 or F2.)
- Altimeter WHEN THE EXCEEDING 18.000 FOOT NN ON RESTAURANT  
ADJUSTING
- Avionik ADJUST  
(pressures it UMSCHALT+2 to indicate around the group of radio.)
- Airspeed <250 KIAS WITH UNDER 10.000 FOOT NN
- Landing lights A WITH UNDER 10.000 FOOT NN
- Approach procedure REPEAT

**APPROACH**

- Airspeed As required
- Vertical adjustment lock lever As required (pressures it as often as necessarily F3 or F2.)
- flaps As required (pressures it as often as necessarily F7.)
- autopilot As required

**LANDING**

- Airspeed As required
- Vertical adjustment lock lever As required (pressures it as often as necessarily F3 or F2.)
- gear DRIVEN out and CONFIRMED (pressures G.)
- flaps As required (pressures it as often as necessarily F7.)
- spoiler ACTIVATE (pressures SHIFT + # [NUMERIC CHARACTER].)
- autopilot As required
- Automatic efficiency control ACTIVATE (on use of the TO/GA mode with the touch-and-go)

## LANDING RUN

- |   |  |
|---|--|
| <input type="checkbox"/> Vertical adjustment lock lever | CLOSED (pressures it as often as necessarily F3 or F2.)  |
| <input type="checkbox"/> Automatic efficiency control   | EXAMINE WHETHER OUT  |
| <input type="checkbox"/> Spoiler lever                  | EXAMINE WHETHER WHOLE BROUGHT in (pressures you SWITCH + # (NUMERIC CHARACTER), until the flaps brought in.) |
| <input type="checkbox"/> Vertical adjustment lock lever | REVERSE THRUST (pressures you F2, to reverse thrust one activates.)  |
| <input type="checkbox"/> Vertical adjustment lock lever | NO-LOAD OPERATION WITH 60 KIAS (pressures it F3, until the engines are in the no-load operation.)            |
| <input type="checkbox"/> Brake mechanism                | off  |
| <input type="checkbox"/> prake                          | If necessary (pressures it the POINT KEY.)   |
| <input type="checkbox"/> autopilot                      | EXAMINE WHETHER SWITCHED OFF   |

## IN HERE ROLES

- |  |   |
|--|---|
| <input type="checkbox"/> Spoiler lever | DOWN (pressures it # [ numeric character ].)          |
| <input type="checkbox"/> lights        | AS REQUIRED   |
| <input type="checkbox"/> Flap lever    | BRING in (you bring the flaps in with F6 completely.) |
| <input type="checkbox"/> Transponder   | STBY  |

## PARKS

- |   |   |
|---|---|
| <input type="checkbox"/> Parking brake                                | TIGHTEN (pressures it STRG+PUNKT.)            |
| <input type="checkbox"/> Switch for the regulation of the fuel supply | INTERRUPTION (pressures it STRG+UMSCHALT+F1.) |
| <input type="checkbox"/> Snow and ice removal                         | off   |
| <input type="checkbox"/> lights                                       | AS REQUIRED                                   |
| <input type="checkbox"/> Flight Director                              | off   |

NOTE: The check lists for this aircraft, used in the real air traffic, were changed for the use in Flight simulator.

## Right

This product is a Add-On for the Microsoft Flight Simulator. It is build with FSDesign Studio 3, PHP and XML.

Please use a licenceversion of the Flight Simulator only.

You may the addition use private only. Every dissemination or publication is forbid.

Andreas Meyer

AFS-design

<http://www.afs-design.de/>

[info@afs-design.de](mailto:info@afs-design.de)

Copyright: Andreas Meyer

