SAAB 91 Safir X

MS FSX add-on

User Guide

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INTRODUCTION

Welcome to SAAB 91 Safir X User Guide! The SibWings team, after the success of Safir FS2004 add-on, is happy to present you a fully recreated SAAB 91 Safir for FSX!

This package offers four versions of the Safir: B, C, and two D modifications. Each rendition faithfully reproduces all the particular, real-life, SAAB 91 Safir features in a meticulous way. We want you to enjoy the exquisite rendition of the external models, the super-detailed 3D-panels, the fully-animated dynamic VC, the authentic sounds, and so much more! We have spent quite a while developing all of these features with the invaluable contribution of real Safir pilots, who provided their endorsement. We guarantee you will enjoy flying our Saab 91 Safir X!

But before jumping into the cockpit and taking off at full power, allow us to recommend you invest a little time into getting acquainted with this User Guide. Even if you are an experienced real-life pilot, or an FSX advanced user, you must learn certain key concepts about setting up this particular aircraft, which will ensure you get the superior flight experience this package can deliver.

The following pages provide information about operating the Saab 91 Safir X, some of the airplane's history, specifications and characteristics, flight configurations, and also pre- and post-flight checklists. For those really eager to test the bird we provide a Quick-Flight Guide too! And if, after reading this manual, you still have any questions, drop by our forums for answers!

Have lots of fun!

SW-lab team

CREDITS

SW-lab Team

Andrey Tsvirenko: 3d Modeling, Aircraft Textures, Flight Dynamics
Alex Petrochenko: Gauge and System Logic, Sounds, Installer
Pavel Votintsev: Sound Engineering
Inna Muzychenko: Research and Support, Manual and Documentation

Team of our beta-testers

We want to profusely thank our Beta-Testers (all of them real-life Safir pilots) who did a fantastic job in helping us polish the Safir flight-model until it flew like the real thing. They have also contributed to the project with invaluable material such as photos, videos, authentic sound recordings, and original documentation. It was a pleasure working with you people, and we think you are REALLY COOL!

Daniel Novet, Johan Björck, Stefan Frisk, Per Gröndahl and Gerth Ericsson, Bill Womack, Zane Gard, Hakan Olsson, Simon Evans, Kofi.

Team of "Safir" enthusiasts

Special thanks to all those Safir enthusiasts who have been helping us during the whole development:

Leif Pettersson (http://www.fcfk.com) and Lars Persson from TeamM (http://www.teamm.se) for their contribution of photo and video materials, as well as historical data for the writing of an historical overview.

Thanks a lot to Alex Litvinov (lial) and Nick Sharmanzhinov (except) for their expert advice on programming.

Mikko Maliniemi also provided great help with aircraft photo materials.

And of course the great aviation photographer and big Safir fan, Lassi Tolvanen, whose photos we used extensively in our work. Sadly, Lassi is no longer with us.

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SYSTEM REQUIREMENTS

Minimal:

- Windows XP SP3/Vista
- Microsoft Flight Simulator X SP2
- 1024 MB Ram
- Processor: 1,5 GHz
- Available hard drive space: 250 MB
- Video card: 32MB DirectX 9 compatible

Recommended:

- Windows XP SP3/Vista
- Microsoft Flight Simulator X SP2
- 2048 MB Ram
- Processor: 2 GHz
- Available hard drive space: 400 MB
- Video card: 256 MB DirectX 9 compatible
- Other: mouse, joystick, sound card, speakers/headphones
- Online/multiplayer: 56.6 kbps modem or LAN

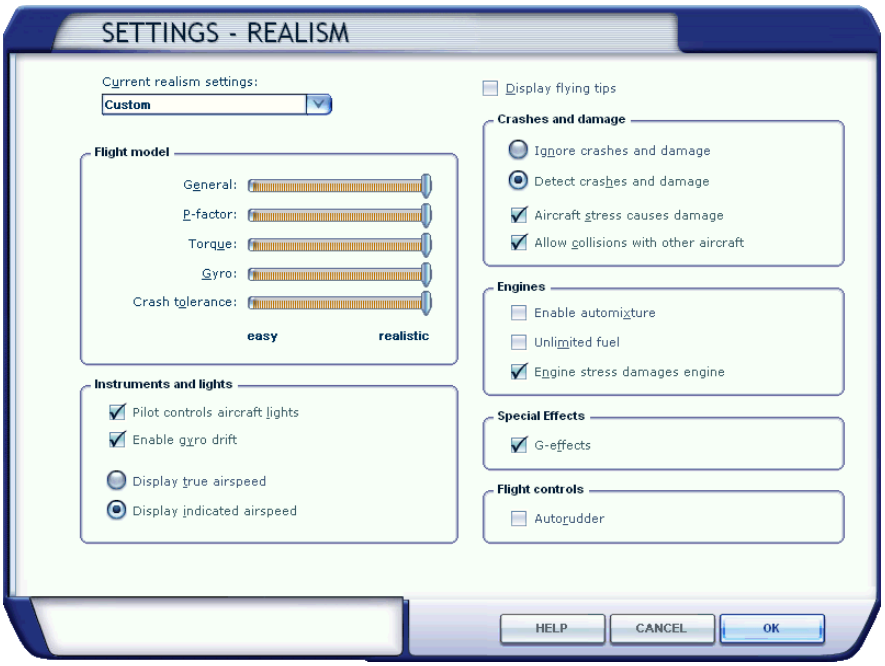
FEATURES

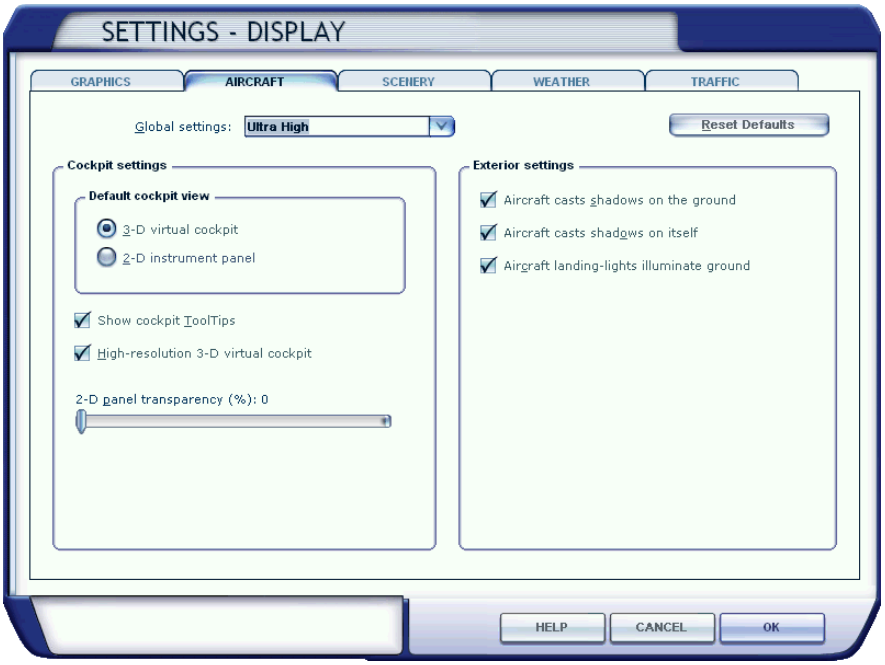
- Four different and absolutely identical to real aircrafts models fully recreated for FSX
- Highly detailed and fully animated exterior and interior models including such FSX features as bump, reflection and specular mapping, dynamic self shadows, advanced animation
- Ultra smooth gauges based on 3D parts animation
- Sounds (engine and VC custom sounds) recorded from the real Safir aircrafts
- Realistic flight dynamics tested by real Safir pilots
- 100% realistic night light panel with a 4 step highlight adjustment
- Additional camera views in the VC

FSX SETTINGS

We recommend the following FSX settings for the Safir X add-on:

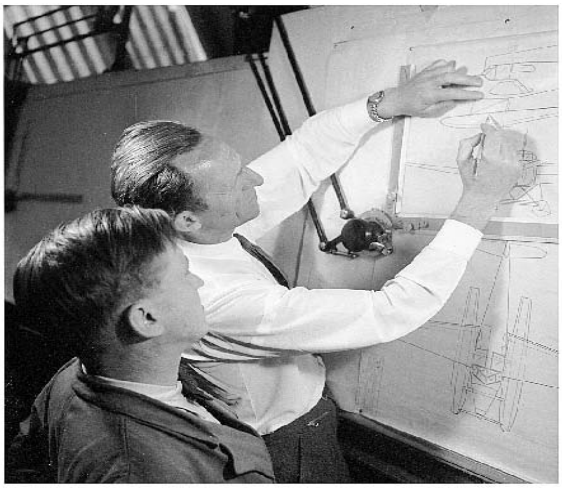
Remember to set all the REALISM sliders to their maximum in order to fly the aircraft as it is intended.





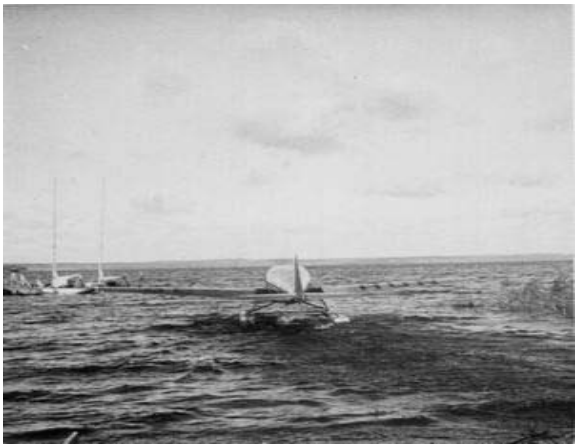
If you are not familiar with any of these settings, please, consult your MS FSX documentation.

SHORT HISTORY OF SAFIR



The design of the SAAB Safir was started in 1944, when it was obvious that the war in Europe was coming to an end. SAAB looked towards new civilian aero products, thus two aircrafts were developed; one of them was the SAAB 91 Safir. The new aircraft's Chief Designer was A.J.Andersson, who had worked for the German firm Bücker, where he had designed the Bü 181 Bestman. So, the resemblance between the "Safir" and the "Bestman" is far from just a coincidence, and it can be seen as the "next step" in its design. The main difference is that the Safir is built in a light metal-shell construction (except for control surfaces and aft part of the wings) and has a nose-wheel landing gear (which makes the aircraft safer by improving vision on the ground and making landings easier). The gear was retractable and the action spring balanced so the manual actuation did not require a lot of force.

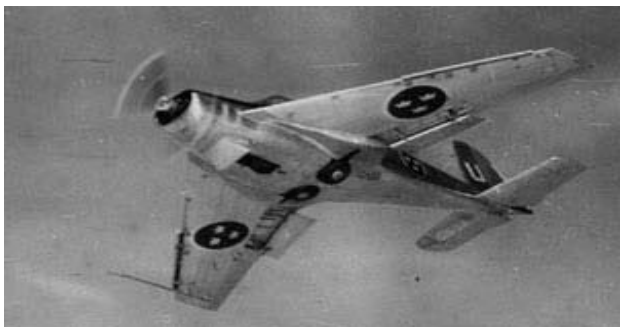
An attempt was also made in Norway to create an amphibian version of the SAAB 91, but after a number of unsatisfactory tests the idea was cancelled in 1947. However, an Air Force TP 91 was flown in the Antarctic in 1951, with both floats and skis.



SAAB 91 A SE-AUN, 11 Sept. 1946

Photo © by SAAB

The first prototype took to the air on November, 20 in 1945 and between 1946 and 1948 SAAB built 48 91As. This first version of the Safir was powered by a de Havilland D.H. Gipsy Major X in-line engine, of 147 hp. The 1947 prototype was fitted with scaled down J 29 Tunnan wings, to test how swept wings would behave at low speeds (in that configuration it was designated Saab 201). In 1950 it was given scaled-down Lansen wings, and a more powerful engine (designation SAAB 202).



SAAB 202, 01 March, 1950
Photo © by SAAB, photo taken by Ericson

An interesting fact about the 91A model was its ability to belly-land (with retracted gear) and take-off again, if the speed had not been reduced too much.

This feature of the 91A was supposedly lost when the larger-propeller 91B version appeared.

However, as can be seen in the picture, belly-landings are still possible with the SAAB 91B version!

Photo © by Dag Roger Stangeland

The SAAB Safir is mostly known as a trainer aircraft, but the first ten units of the 91A ordered by the Swedish Air Force were designated Tp-91 (TP for Transport), and used as a liaison aircraft. The Netherlands State Air Transport School purchased eight. The Ethiopian air force, sixteen. Most of the rest were sold to civilian owners. The TP-91 was finally retired by the Swedish Air Force in 1960. Today, although all original TP-91s were scrapped, a few civil-registered 91As are preserved.

SAAB 91B/91C SAFIR

SAAB 91 C Safir VH-AHA, 10 June, 1955

Photo © The A.J. Jackson Collection

The Swedish Air Force, argumenting the 91A model, it was too narrow and not powerful enough, were not satisfied. In order to fulfil their demands, in 1949 SAAB developed a more responsive version, the 91B, which was powered by a six-cylinder Lycoming O-435-A engine, of 190 hp. Other differences were a modified canopy for better visibility, and the addition of a small dorsal fin.

One-hundred-and-twenty 91B models were built between 1952 and 1954. Seventy-five of them were ordered by the Swedish Air Force (only one was sold back almost immediately) and became their new basic trainer (designation **SK-50B)**. As a three-seater it was designated 91B, and as a four-seater 91C. Space was made for the fourth seat by replacing the fuel tank to the left of the rear seat with tankage in the wings.

The one which was sold back to SAAB was exported to Japan. There it was used at the Japanese Flight Test Center as a research aircraft for high-lift tests, with a more powerful engine and an installed APU to blow hot air on the flaps. This is the only known with all-metal skin Safir (including the control surfaces as well) which was designed to stand the APU's heat. Under the designation Nihon Hikoki X1G STOL it was trialed and later transferred to the Japanese Air Force.

SAAB 91B TX-701 X1G1, Dec, 1957- Aug, 1958.
High lifting force wing research.

STOL Research Aircraft X1G (SAAB 91B Safir Mod.)

SAAB 91B TX-7101 X1G2, April,1959 - Sep,1960
Installed with gas turbine for providing compressed air to BLC blowing devices on leading and trailing edges of its wings.

SAAB 91B TX-7101 X1G3, April,1962 - Aug,1962
Research for high lifting coefficient and lateral control by wing end plates.

Photo © by TRDI

All of the Swedish Air Force SK50s left production with a yellow overall painting. Later on, after service at the flying schools, they were painted in camouflage. But many pilots were of the opinion that the proper painting for the Safir should be its traditional yellow, with the engine cover in green.

In 1955 production ofv91B/91C models was resumed in Sweden.

The Swedish Air Force bought fourteen of them in 1960 to be used as trainers (designated SK-50C).

The Norwegian Air Force purchased twenty-five 91Bs during 1956-57, and five retired Swedish SK-50B later in 1979.

The Finnish Air Force acquired twenty 91Cs in 1958.

The Ethiopian Air Force bought ten 91Cs in 1960, and a further six during 1963-66.

SAAB 91 C 50087, 6 may, 1960

After acceptance tests the aircraft was placed at the Fifth Wing (F5) in Ljungbyhed and was marked as F5-87.
Photo © by Svensk Flyghistorisk Förening

SAAB jubilee, 7 Sept, 1997 at SAAB airport ESSL in Linköping.
Photo © by Erik Frikke

After the SK-50s had been replaced by the SK-61 Scottish Aviation Bulldog as a trainer in 1971, they were used by all wings as liaison aircraft until their retirement. The last SK-50B was retired in 1990, the last SK-50C, in 1992. After that they were sold very cheap to different flying clubs, some affiliated with the Air Force.

SAAB 91D SF-29, 06 October, 1960
Photo © by Pertti Sipilä

In 1957 the last version of the SAAB 91 Safir was developed. Its power plant was a lighter 180 hp, Lycoming O-360-A1A engine. It also featured a new brake system and manual rudder trim.

The Finnish Air Force acquired ten of this type, and a further six during 1962-63. Two of these were fitted with cameras and used as reconnaissance aircraft.

SAAB 91D SF-9, 21 February, 1958 SAAB 91D SF-32, 18 December, 1962
Delivery to the Finnish Air Force where they were marked SF-9 and SF-32.

Photo © by Pertti Sipilä

Rijksluchtvaartschool in the Netherlands purchased eighteen 91Ds, which were delivered during 1959-1960 to replace the older Tiger Moths, Harvards, and SAAB 91As.

The Austrian Air Force bought twenty-four during 1964-1965, twelve to be used as basic trainers, and the rest as navigational trainers.

The Tunisian Air Force bought fifteen, which were delivered during 1960-1961.

Tunisian Safir. Photo © by SAAB, provided by TeamM

The Safir became SAAB's largest aircraft export success. They had good reasons to be pleased, as a total of three-hundred-and-twenty-three Safirs had been produced in five versions (A, B, B-2, C and D). They were sold to twenty-one countries and six Air Forces: the Swedish, Ethiopian, Norwegian, Finnish, Tunisian and Austrian, and to several civilian customers as well. Ninety-nine served with the Swedish Air Force between 1947 and 1992.

Photo © by SAAB, provided by TeamM

The Safir's Ethiopian experience

Emperor Haile Selassie of Ethiopia wanted the Swedes to organise a combined civil and military school of aviation in the country. Carl-Gustaf von Rosen was to be the liaison officer, and in the beginning of 1946 pilots, technicians and staff personnel arrived in Addis Abeba in order to make the necessary arrangements. An old Italian airfield at Bishoptu, south of Addis, was selected as the base. The SAAB 91A was the chosen aircraft, and requests were made for five of them, which became SAAB's first export order.

When the first Safirs were flown to Ethiopia, they were equipped with neither radio nor navigational equipment. However, the SK-50 had an FR8 equipment, and so transmission could be maintained with the Addis Abeba air control.

Ethiopian Air Force. Photo © by SAAB

This Ethiopian experience in the history of the Safir is also remembered for the fact that in May 1947 Count Carl-Gustaf von Rosen set a world record, flying non-stop from Stockholm to Addis Abeba in a SAAB Safir.

Photo © by SAAB, provided by TeamM

In total, fourty-eight Safirs in various versions were sold to Ethiopia, the last of them delivered in July 1966. In September of the previous year, the last of the Swedish technicians had left the country, and according to information, the purchased Safirs continued in service far into the eighties.

The Safir was also a favourite aircraft for civilian pilots. The Dutch Civil Aviation School first purchased eight 91As and (in 1958) eighteen 91Ds, with smaller and lighter

four-cylinder engines and more comprehensive civilian instrumentation. After purchasing a further five in 1962, they were flown until the eighties.

The Safir was also sold to the German Lufthansa and the French Air France airlines, for in-house pilot training purposes. Finland, Sweden's neighbour to the east, bought the "D" version of the aircraft. An order was made for thirty-five of them, which were to be used for training. The first was delivered in December of 1958, and the rest arrived in three consecutive deliveries until 1963. Almost twenty years later, in 1982, fourteen were sold by auction, and three of them returned to Sweden.

Photo © by SAAB, provided by TeamM

Production of Safirs ended in 1966, and the last one was written off from the Swedish Air Force stock in 1993. Many were sold for a symbolic sum of money to flying clubs at Air Force bases.

The airplane on the photos below is the world's oldest Safir which is still able to fly. It was rebuilt four times, and at first had a Gipsy engine of 147 hp. Racing driver Uno Ranch tried out the first prototype already in 1946, and as a consequence he bought one for himself. Since 1947 has been travelling around the country in his beloved Safir.

Uno Ranch with his SAAB 91A SE-AUR, 1950

SAAB 91A SE-AUR is still in the air, 2000

Some eighty Safirs still remain flying in the world, and many can be seen at European meetings which are still held. We hope we will be seeing and hearing the unique, great Safir in the sky for many years to come!

So, keep on flying the SAAB 91 Safir!

GENERAL DESCRIPTION

SAAB 91 B "Safir" F5-46

All of our SAAB 91 Safir models are exact virtual replicas of existing, real-world aircraft. The F5-46 is the original that inspired us to develop a Safir add-on for FS, and the first one to be modelled. After regulation tests, this Safir was put in operation at the Fifth Wing (F5) in Ljungbyhed, where it was marked F5-46. Upon retirement it was placed in the Swedish Air Force Museum in Linköping, where it can be seen today.

SAAB 91C "Safir" SE-KVZ

This model holds an extensive record within the history of the Swedish Air Force since 1960, when it was built. It began military duty at F5 in Ljungbyhed, then it was transferred to F3 in Malmen, and after that it served at F13 in Bravalla. Finally it was transferred to F17 in Ronneby, until its retirement. In 1994 this Safir was registered as SE-KVZ and performed its first flight as a civilian aircraft. It is now located at the former F15 wing in Söderhamn, belonging to the F15 Flying Club. It is in great shape and can be often seen in the Swedish skies (thanks to Johan Björck and Per Gröndahl for giving the possibility to many FS users of virtually flying this airplane!).

SAAB 91D "Safir" HB-DBL

This model began service in 1961 as an entry-test aircraft for Flight Instructor courses in the Swiss Federal Office of Civil Aviation, where it stayed until 1990. In 1979 major modifications were done to the engine, propeller, instrumentation, wing-skin and cowl-flaps. The aircraft was at that time also downgraded from aerobatic to utility category. In 1996, five years after it had been sold, the aircraft was disassembled and put into storage! Luckily it was found by savvy and skilled airmen (Roger Pross and Daniel Novet, current owners) who restored it and put it back into service in July of 2005. Since then it flies high for the joy of its owners and now for the whole FS community! This beautiful aircraft is nowadays located in Grenchen, Switzerland (thank you Daniel for your invaluable contribution!).

SAAB 91D "Safir" SF-3

This model used to be a Finnish Air Force military aircraft, designated SF-3. It can be seen nowadays at the Tikkakoski Museum, Finland. All photographic material regarding this aircraft was generously provided by Mikko Maliniemi.

SPECIFICATIONS

SAAB 91 B "Safir"

Three-seat enclosed cabin, single engine monoplane. Tailplane of Monoplane type. All metal split flaps. Dual controls of conventional type. Fuel tank in fuselage.

Dimensions

Span 10,6 m (34 ft 9 in)
Length 7,9 m (25 ft 11 in)
Height 2,2 m (7 ft 3 in)
Wing area 13,6 m^2 (146 sq. ft.)

Engine

Lycoming O-435-A
Take-off: 190 hp at 2550 rpm
Normal: 140 hp at 2300 rpm

Fuel

Total tank capacity: 38. 5 Imp. galls (46. 2 US galls, 175 litres), reserve 25 litres.

Airspeed limits

Glide or dive 342 km/h (213 mph) IAS
Flaps extended 153 km/h (95 mph) IAS
Landing gear operation 175 km/h (109 mph) IAS
Landing gear extended 220 km/h (137 mph) IAS

Max weight

1165 kg (2570 lbs) for normal category
1050 kg (2315 lbs) for acrobatic category

Empty weight

Approximately 720-750 kg (1585-1650 lbs) according to equipment

SAAB 91 C "Safir"

Four-seat enclosed cabin, single engine monoplane. Tailplane of monoplane type. All metal split flaps. Dual controls of conventional type. Flexible fuel tanks, one in each wing.

Dimensions

Span 10,6 m (34 ft 9 in)
Length 7,9 m (25 ft 11 in)
Height 2,2 m (7 ft 3 in)
Wing area 13,6 m^2 (146 sq. ft.)

Engine

Lycoming O-435-A
Take-off: 190 hp at 2550 rpm
Normal: 140 hp at 2300 rpm

Fuel

Total tank capacity: 35.2 Imp. galls (42.3 US galls, 160 litres)

Airspeed limits

Glide or dive 350 km/h (218 mph) IAS
Flaps extended 170 km/h (106 mph) IAS
Landing gear operation 200 km/h (125 mph) IAS
Landing gear extended 220 km/h (137 mph) IAS

Max. weight

1215 kg (2680 lbs) for normal category,
1050 kg (2315 lbs) for acrobatic category

Empty weight

Approximately 720-740 kg (1600-1645 lbs) according to equipment

SAAB 91 D "Safir"

Three-seat enclosed cabin, single engine monoplane. Tailplane of monoplane type. All metal split flaps. Dual controls of conventional type. Fuel tank in fuselage.

Dimensions

Span 10,6 m (34 ft 9 in)
Length 7,9 m (25 ft 11 in)
Height 2,2 m (7 ft 3 in)
Wing area 13,6 m^2 (146 sq. ft.)

Engine

Lycoming O-360-A1A
Take-off: 180 hp at 2700 rpm
Normal: 135 hp at 2450 rpm

Fuel

Total tank capacity : 35.2 Imp. galls (42.3 US galls, 160 litres)

Airspeed limits

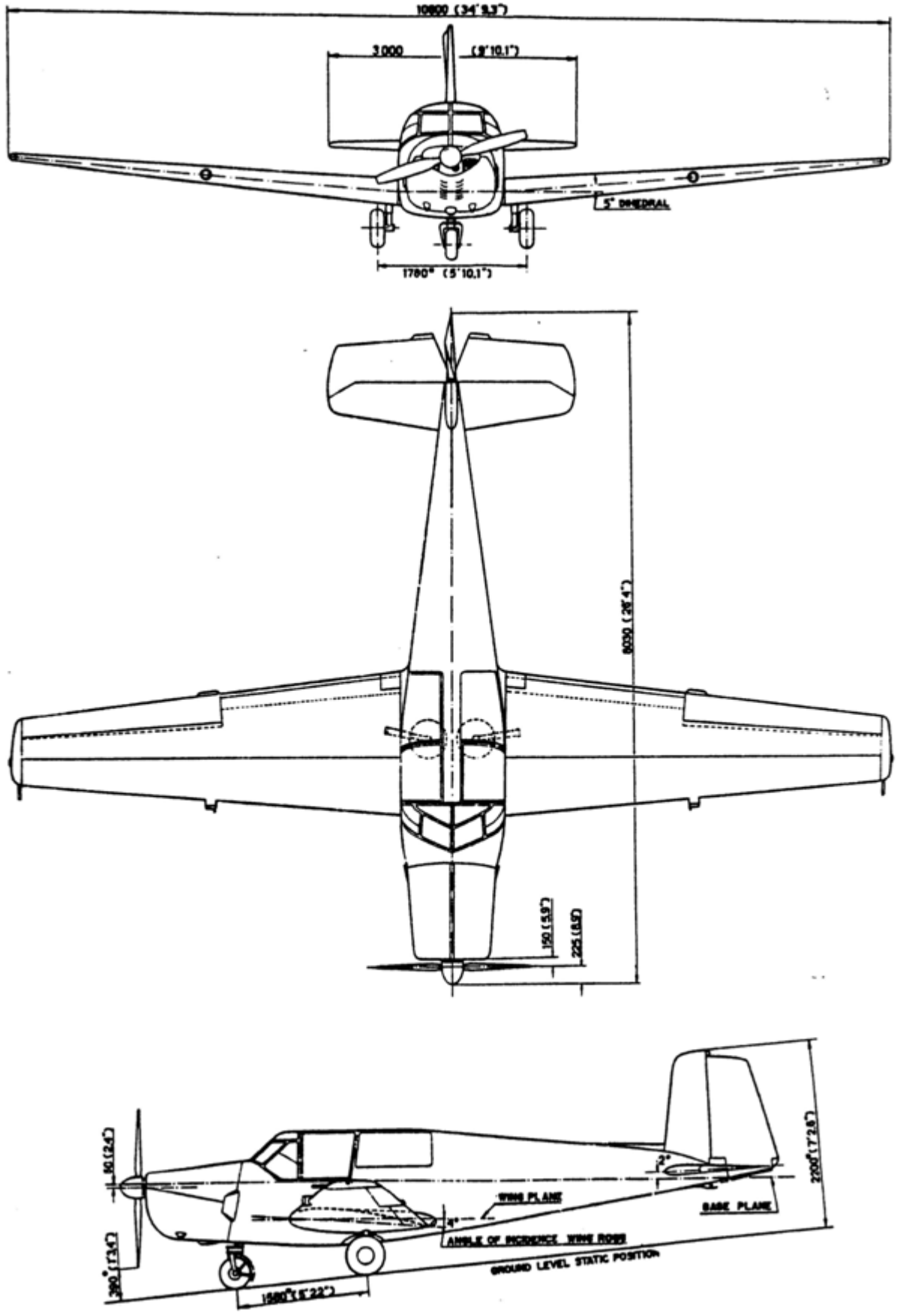
Glide or dive 342 km/h (213 mph) IAS
Flaps extended 153 km/h (95 mph) IAS
Landing gear operation 175 km/h (109 mph) IAS
Landing gear extended 220 km/h (137 mph) IAS

Max. weight

1205 kg (2660 lbs) for normal category
1110 kg (2450 lbs) for acrobatic category

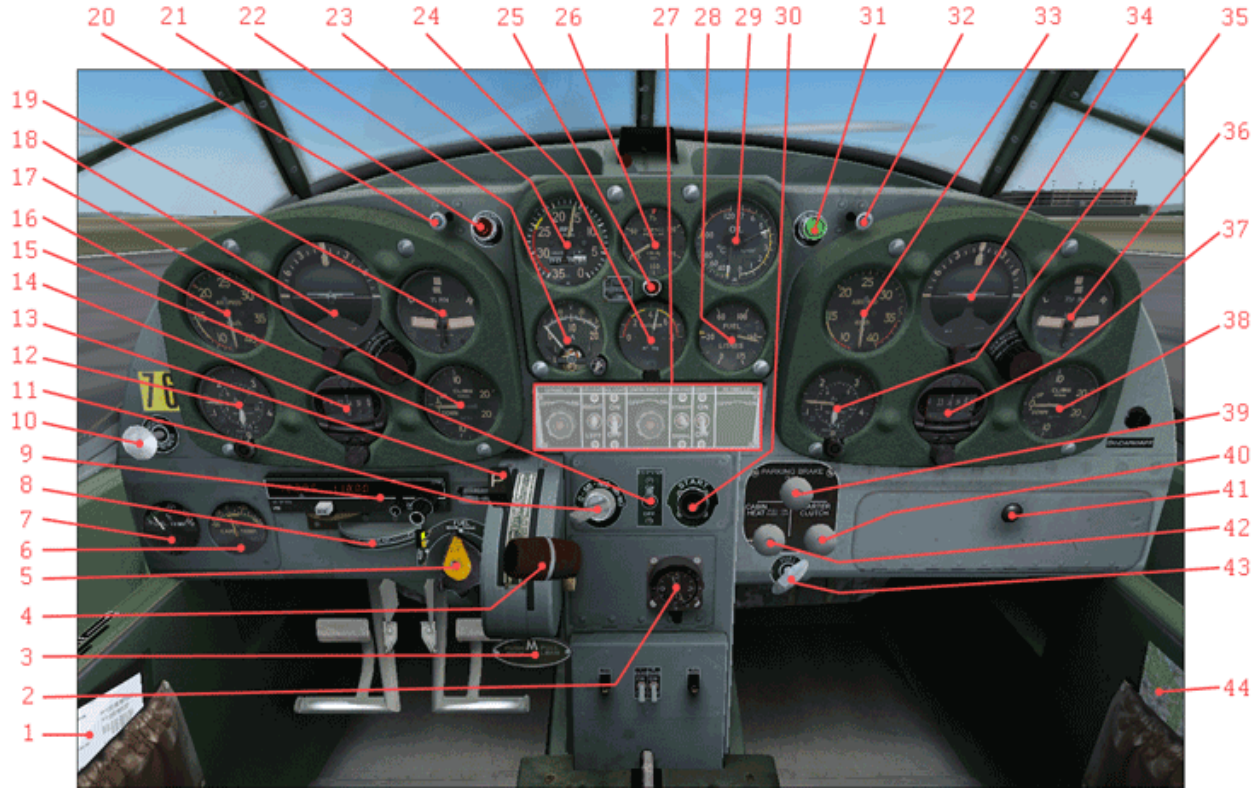
Empty weight

Approximately 720-780 kg (1590-1720 lbs) according to equipment


10800 (34'9.3")
3000
(9'10.1")
5° DIHEDRAL
1780* (5'10.1")
8030 (26'4")
150 (5.9")
225 (8.9")
WING PLANE
BASE PLANE
ANGLE OF INCIDENCE WING ROOT
GROUND LEVEL STATIC POSITION
2200 (7'2.6")

PANELS AND CONTROLS

SAAB 91 B "Safir"

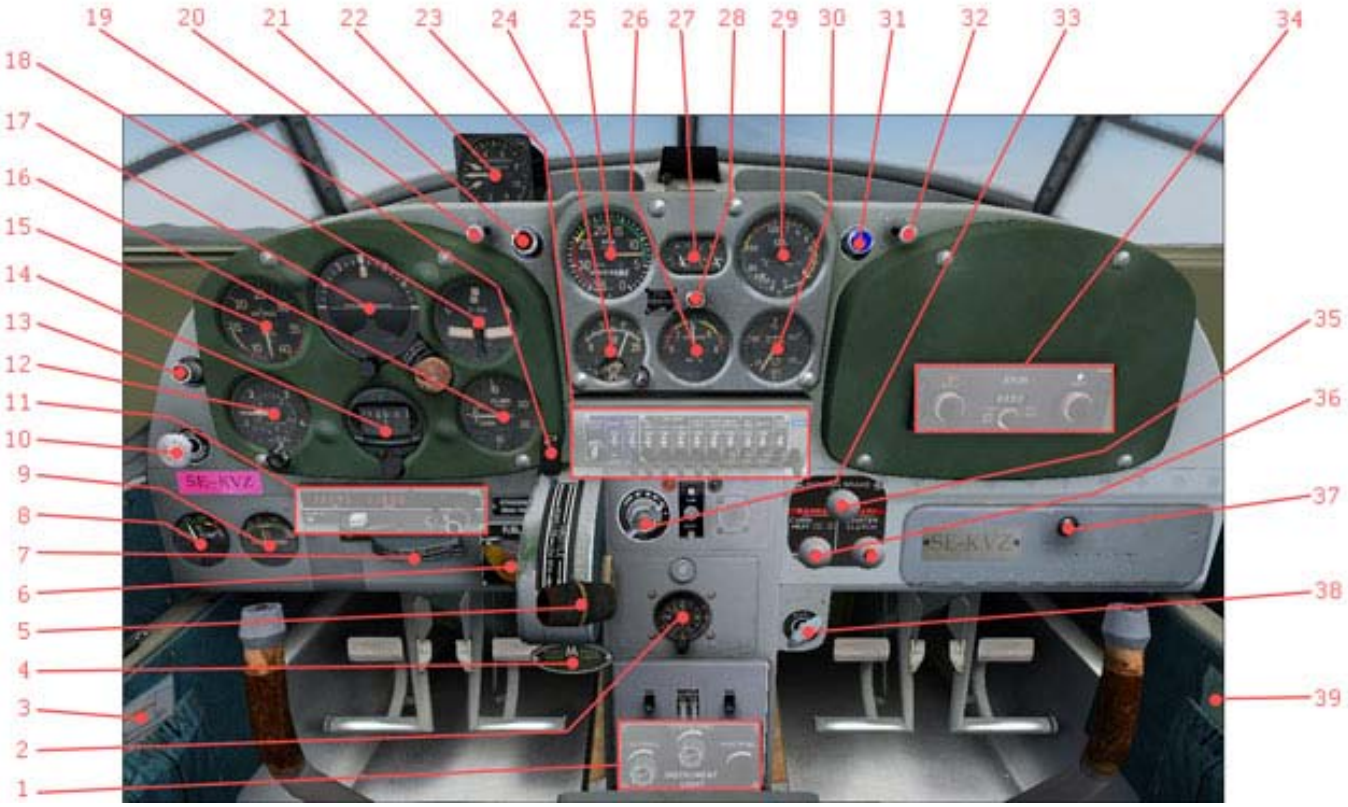


1. Kneeboards opening
2. Clock
3. Mixture control
4. Throttle control
5. Fuel selector
6. Carburetor temperature
7. Cylinder temperature
8. Carburetor air control
9. Radio
10. Engine primer
11. Magneto switch
12. Altimeter
13. Propeller control
14. Directional gyro indicator
15. Main switch
16. Airspeed indicator
17. Vertical speed indicator
18. Attitude indicator
19. Turn-and-bank indicator
20. LH fresh-air control
21. Warning lamp, landing gear not down
22. Voltammeter
23. Tachometer
24. Vacuum
25. Warning lamp, low fuel pressure
26. Manifold pressure
27. Lighting control panel
28. Fuel quantity indicator
29. Oil pressure/temperature indicator
30. Start button
31. Indicator lamp, landing gear locked down
32. RH fresh-air control
33. Airspeed indicator
34. Attitude indicator
35. Altimeter
36. Turn-and-bank indicator
37. Directional gyro indicator
38. Vertical speed indicator
39. Parking brake handle
40. Starter clutch control
41. GPS opening
42. Cabin heating control
43. Fuel hand pump
44. Map opening

Light control panel

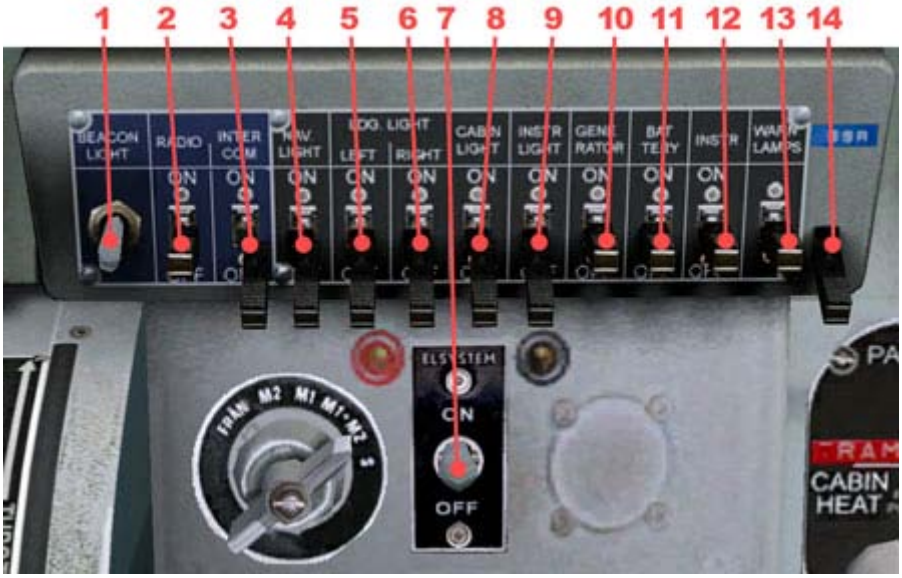
1. **Four step panel light brightness (right mouse click to increase light brightness, left mouse click to reduce light brightness).**
2. **Landing light (left lamp On/Off – left mouse click, right lamp On/Off – right mouse click)**
3. **Navigation light (On/Off – left mouse click)**
4. **Central panel light control (On/Off - left mouse click)**
5. **Signal light (steady On/Off – left mouse click, signal On/Off – right mouse click)**
6. **Cabin light (On/Off – left mouse click)**

SAAB 91 C "Safir" (SE-KVZ)



1. Panel light control
2. Clock
3. Opening kneeboards
4. Mixture control
5. Throttle control
6. Fuel selector
7. Carburetor air control
8. Cylinder temperature
9. Carburetor temperature
10. Engine primer
11. Radio
12. Altimeter
13. Stall warning lamp
14. Directional gyro
15. Airspeed indicator
16. Vertical speed indicator
17. Attitude
18. Turn and bank indicator
19. Propeller control
20. LH fresh-air control
21. Warning lamp, landing gear not down
22. G-Force meter
23. Switch panel
24. Voltammeter
25. RPM indicator
26. Vacuum
27. Fuel Quantity indicator
28. Warning lamp, low fuel pressure
29. Oil pressure, temperature
30. Manifold pressure
31. Indicator lamp, landing gear down and locked
32. RH fresh-air control
33. Magneto switch
34. Transponder
35. parking brake
36. Cabin heating control
37. Opening GPS
38. Hand fuel pump
39. Opening MAP

Switch Panel



1. **Beacon switch**
2. **Radio power supply**
3. **Intercom power supply (dummy)**
4. **Navigation Light On/Off**
5. **Left landing light On/Off**
6. **Right landing light On/Off**
7. **Electrical systems switch (Gives battery power supply (DC) to the instruments, like the fuel and temp instrumets, lights, and the radio)**
8. **Cabin light switch**
9. **Instrument light switch (automatic – switched on if any light on)**
10. **Generator switch**
11. **Battery switch**
12. **Fuel and Temperature gauges Power supply**
13. **Stall and Landing Gear Warning Power supply**
14. **Transponder Power supply**

Transponder

1. Control lever switch 1-2. Left mouse click – first digit, Right mouse click – second digit.

2. Replay indicator

3. Tranponder mode switch: Off, Standby, On, Alt, Test). Right mouse click – colckwise, Right mouse click – anticlockwise

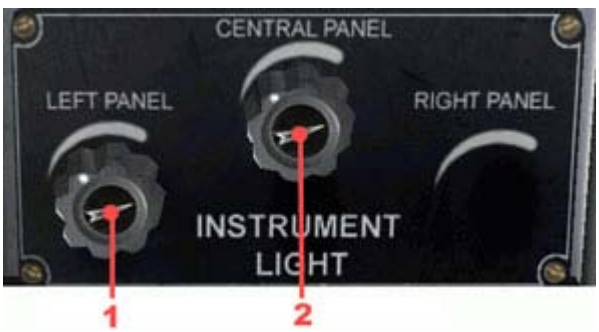
4. Ident button

5. Control lever switch 3-4 digits (Left mouse click – third digit, Right mouse click – fourth digit)

Radio

Please, see a separate BENDIX/KING KY 197 TSO radio manual.

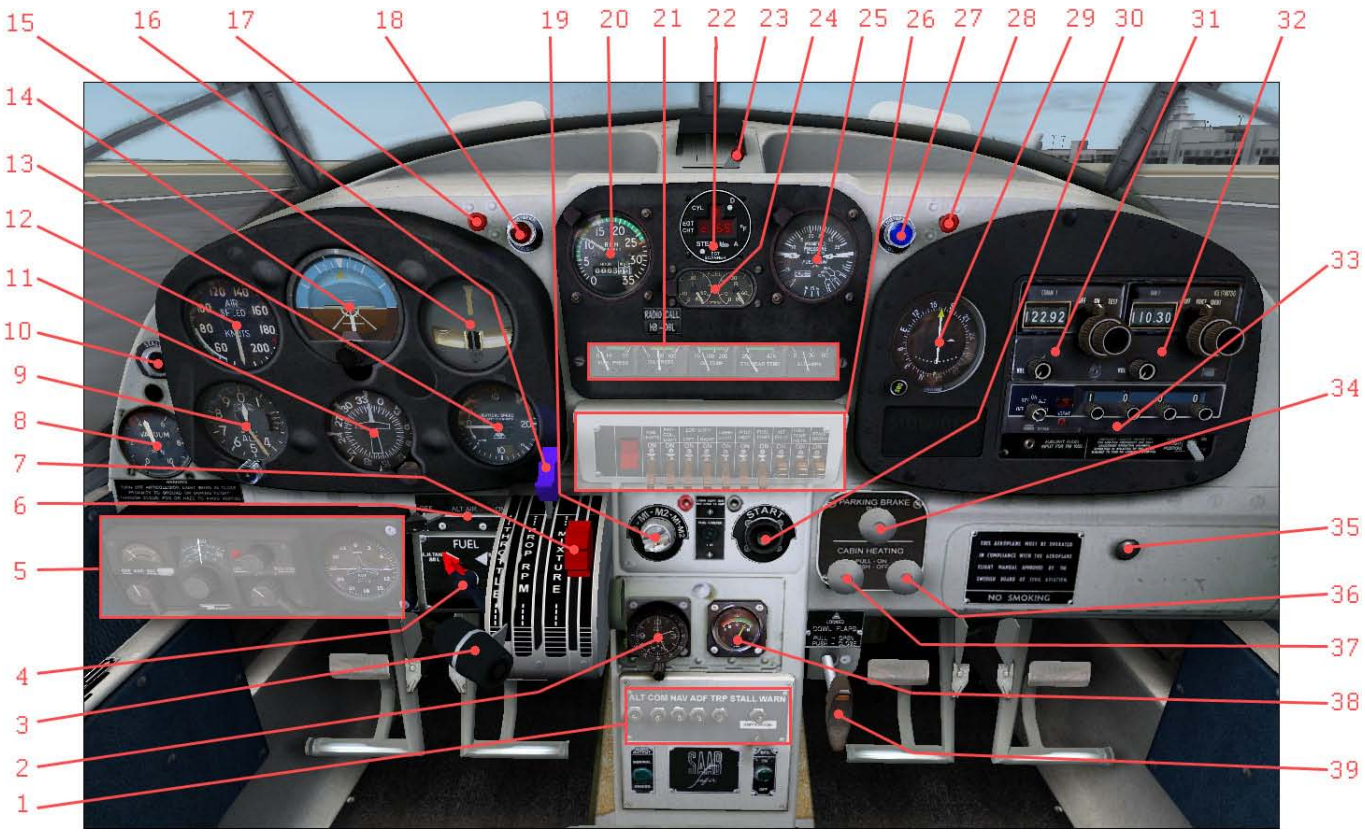
Panel light control



1. Four step left panel lights adjustment

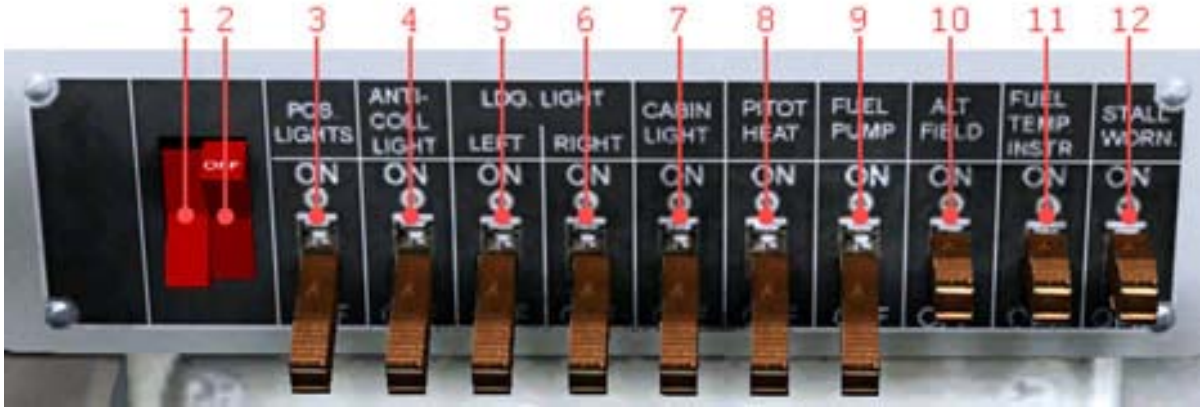
2. Central panel lights On/Off

SAAB 91 D "Safir" (HB-DBL)



1. Circuit breaker panel
2. Clock
3. Throttle control
4. Fuel selector
5. ADF
6. Alternate air
7. Mixture Control
8. Vacuum
9. Altimeter
10. Warning lamp, Stall
11. Directional gyro indicator
12. Airspeed indicator
13. Vertical speed indicator
14. Attitude
15. Turn-and-bank indicator
16. Propeller control
17. LH fresh-air control
18. Warning lamp, landing gear not down
19. Magneto switch
20. Tachometer
21. Fuel and temp. panel
22. EGT scanner
23. Fresh air intake
24. Fuel quantity indicator
25. Fuel flow / manifold pressure
26. Switch panel
27. Indicator lamp, landing gear locked down
28. RH fresh-air control
29. VOR indicator
30. Start button
31. COMM receiver
32. NAV receiver
33. Transponder
34. Parking break control
35. Opening GPS
36. RH cabin heating control
37. LH cabin heating control
38. Voltmeter
39. Cowl flaps control

Switch Panel



1. Battery On/Off
2. Alternator On/Off
3. Position light On/Off
4. Anti-collision light On/Off
5. Landing light left On/Off
6. Landing light right On/Off
7. Cabin light On/Off
8. Pitot heat On/Off
9. Fuel pump On/Off
10. Alternator field On/Off
11. Fuel and temperature gauges On/Off
12. Stall warning On/Off

Circuit breaker panel

1. Alternator CB On/Off
2. COMM receiver CB On/Off
3. NAV receiver CB On/Off
4. ADF receiver CB On/Off
5. Transponder CB On/Off
6. Stall Warning CB On/Off

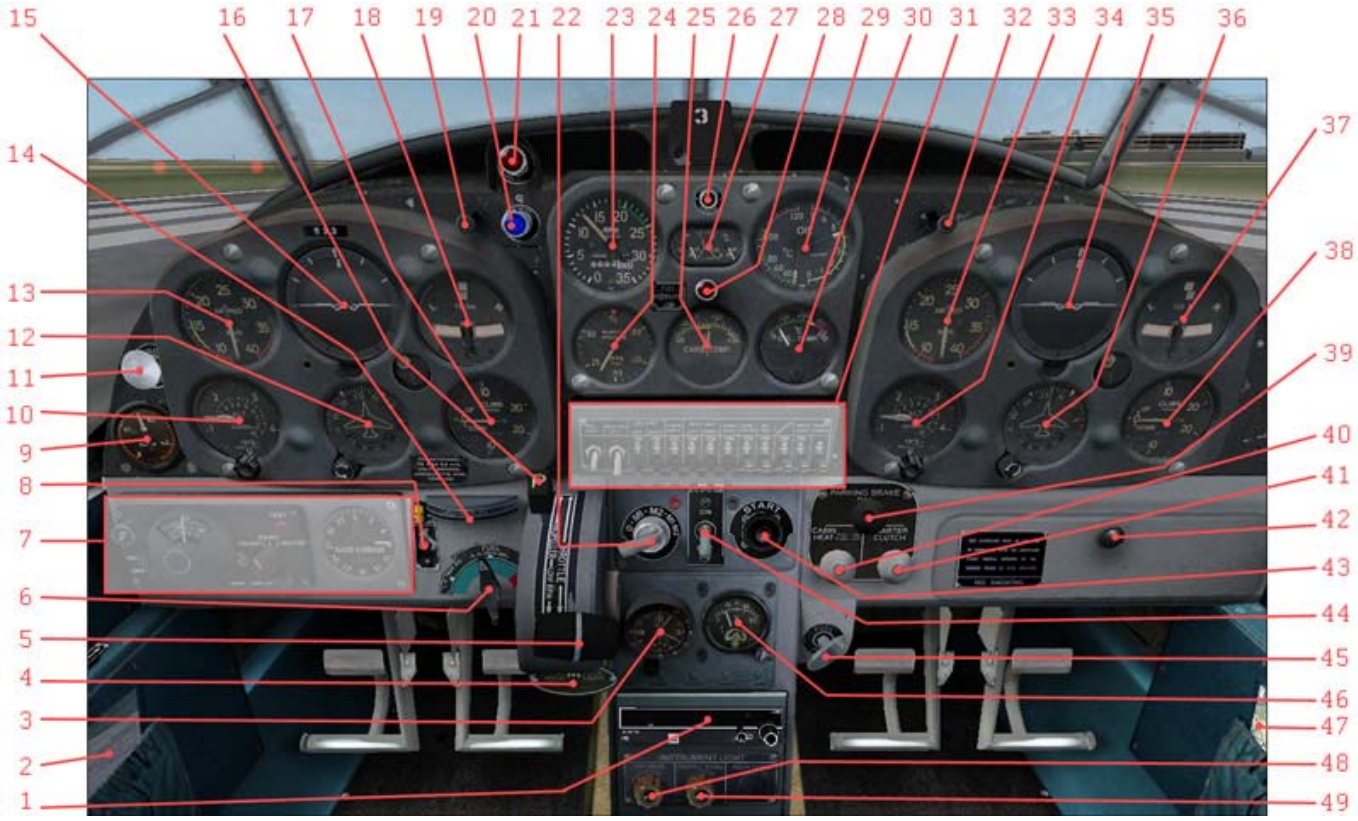
ADF

1. Switch ADF work mode (On/ADF only)
2. Signal Strengh
3. Tune Frequency (Increment frequency – RightMouseClick, Decrement frequency - LeftMouseClick)
4. ADF frequency indicator
5. Test button
6. ADF frequency range
7. Radio Compass

Fuel and temperature panel

1. Fuel pressure
2. Oil pressure
3. Oil temperature
4. Cylinder head temperature
5. Alternator amperes

SAAB 91 D "Safir" (SF-3)

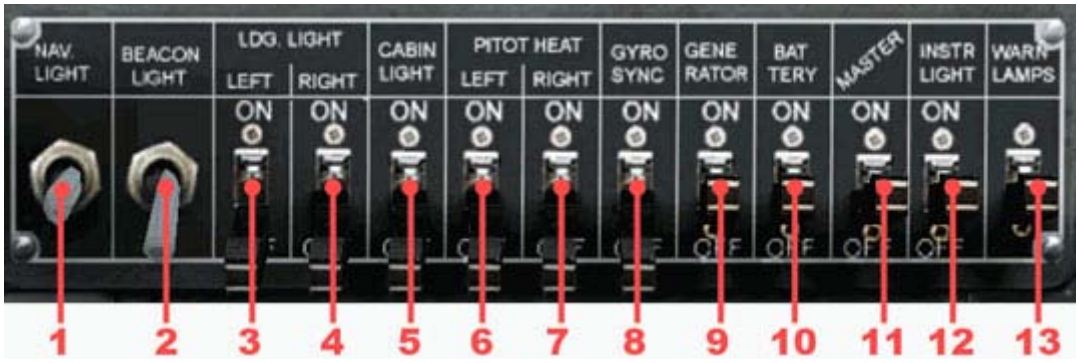


1. Radio
2. Kneeboards opening
3. Clock
4. Mixture control
5. Throttle control
6. Fuel selector
7. ADF
8. Flux valve
9. Vacuum
10. Altimeter
11. Engine primer
12. Directional gyro indicator
13. Airspeed indicator
14. Carburetor air control
15. Attitude
16. Propeller control
17. Vertical speed indicator
18. Turn-and-bank indicator
19. LH fresh-air control
20. Indicator lamp, landing gear locked down
21. Warning lamp, landing gear not down
22. Magneto switch
23. Tachometer
24. Manifold pressure
25. Carburetor temp. indicator
26. Indicator lamp, nav. light blink
27. Fuel quantity indicator
28. Warning lamp, low fuel pressure
29. Oil pressure / temperature
30. Cylinder temperature
31. Switch panel
32. RH fresh-air control
33. Airspeed indicator
34. Altimeter
35. Attitude
36. Directional gyro indicator
37. Turn-and-bank indicator
38. Vertical speed indicator
39. Parking brake handle
40. - 41. Cabin heating control
42. GPS Opening
43. Start button
44. DC system
45. Handle fuel pump
46. Voltammeter
47. Opening MAP
48. LH panel light control
49. Center panel light control

ADF

1. ADF mode switch (On/ADF)
2. Tuning ADF frequency knob (Left mouse –decrease frequency, Right mouse – increase frequency)
3. ADF frequency range switch
4. Test button
5. Direction needle

Switch panel



1. Navigation lights Blink/Off/Continuous
2. Beacon light On/Off
3. Left landing light On/Off
4. Right landing light On/Off
5. Cabin light On/Off
6. Pitot heat
7. Pitot heat
8. Gyro Sync.
9. Generator On/Off
10. Battery On/Off
11. Master switch
12. Instruments lights On/Off
13. Warning lamps On/Off

ENGINE CONTROLS

1. Propeller control

The propeller control operates the propeller governor in the pitch control system. By setting the lever on the HIGH RPM position the governor will set the blade at a low pitch. Moving the lever to the LOW RPM will set the blade at a high pitch. The lever is equipped with a friction brake for the adjustment of lever motion.

Standard shortcuts:
Set Prop RPM to Low ..... [CTRL+F1]
Decrease Prop RPM ..... [CTRL+F2]
Increase Prop RPM ..... [CTRL+F3]
Set Prop RPM to High ..... [CTRL+F4]

2. Throttle control

The throttle control consists of a control lever, mounted within the same casing as the propeller control lever. An extra throttle lever is installed under the L.H. railing as additional equipment.

The lever is provided with a friction brake by which the friction of the lever can be adjusted. There are no notches for the lever, and it can be set in any position between ends. The full forward position of the throttle is OPEN and the full backward position is CLOSED.

Standard shortcuts:
Cut Throttle .....[F1]
Decrease Throttle .....[F2 or Num Pad 3]
Increase Throttle .....[F3 or Num Pad 9]
Full Throttle .....[F4]

3. Mixture control

This lever enables the pilot to regulate the fuel-air mixture to the engine, to obtain efficient engine operation and maximum fuel economy at cruise. The RICH position is full forward, and full backward is IDLE CUT-OFF. Manual leaning is accomplished by placing the lever between the RICH and IDLE CUT-OFF positions. When pulled full backward to the IDLE CUT-OFF position, the mixture lever shuts off all fuel flow to the carburetor, and the engine should stop.

Standard shortcuts:

Set Mixture to Idle Cut-off..... [CTRL+SHIFT+F1]
Lean Mixture ..... [CTRL+SHIFT+F2]
Enrich Mixture..... [CTRL+SHIFT+F3]
Set Mixture to Rich..... [CTRL+SHIFT+F4]

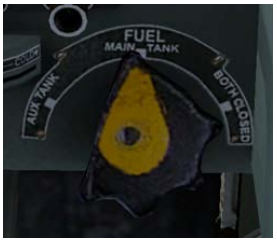
4. Carburetor air control

The carburetor air control consists of a lever connected to the mixture chamber, and regulates the carburetor air temperature. The control lever can be set in two notched positions: HOT and COLD.

FUEL CONTROLS

1. SAAB 91B Safir with one fuel tank

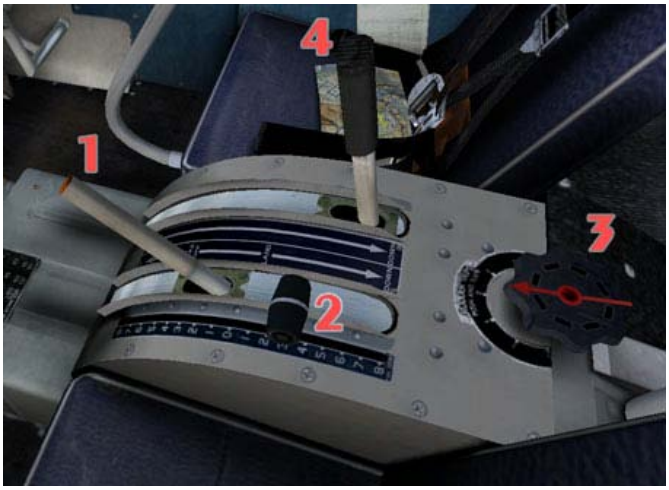
The B modification features one tank, which can be found behind the pilot's seat. The design of the fuel tank selector is shown on the picture. With the selector in the MAIN TANK position, fuel is fed from the tank until only 25 liters are rest in the tank. By switching over to AUX TANK position, fuel is fed from the tank until exhaustion.



2. SAAB 91C-D Safir with two fuel tanks in wings

With the selector in the RH TANK position, fuel is fed from the starboard wing tank. In the LH TANK position, fuel is drawn from the port wing tank.

FLIGHT CONTROLS



1. Wing Flap Control

This lever controls flap settings, and has three fixed positions: landing, take-off and fully retracted.

Standard shortcuts:
Retract Flaps (fully)..... [F5]
Retract Flaps (in increments)..... [F6]
Extend Flaps (in increments) ..... [F7]
Extend Flaps (fully) ..... [F8]

2. Elevator Trim Control

Elevator Trim Control relieves the pilotfrom constant adjusting of the controls. It allows to trim the elevator 8º up, or 8 º down. To trim the nose up pull the tab backward, to trim the nose down push the tab forward.

Standard shortcuts:
Pitch Down (elevator)..... [Num Pad 8]
Pitch Up (elevator)..... [Num Pad 2]
Elevator Trim Down..... [Num Pad 7]
Elevator Trim Up..... [Num Pad 1]

3. Rudder Trim Control

Rudder trim allows for aircraft trimming in the yaw axis. Turn the control wheel in the desired direction.

Standard shortcuts:
Yaw Left (rudder)..... [Num Pad 0]
Yaw Right (rudder)..... [Num Pad ENTER]
Rudder Trim Left..... [CTRL + Num Pad 0]
Rudder Trim Right ..... [CTRL + Num Pad ENTER]

4. Landing Gear Control

To extend the landing gear pull the lever up, to retract it push it down.

Standard shortcuts:
Landing Gear Up/Down ..... [G]

CHECKLISTS
SAAB 91B/C "Safir"

DAILY INSPECTION

Oil Quantity ..... min 9 qts
Engine Cowlings ..... locked
Propeller ..... check for leakage
Pull Bar ..... removed
Wing and Rudder surfaces ..... check for damage
Fuel Cap ..... check
Pitot Cover ..... removed
Seat Pan ..... adjusted and locked

BEFORE ENGINE START

Rudder Pedals ..... adjusted
Rudders ..... check
Safety Harness ..... tighten
Parking Brake ..... locked
Fuses ..... check
Magnetos and Main DC ..... off
Power Users ..... off
Radio / Nav ..... off
Gyro Instruments ..... locked
DC Power ..... on
Undercarriage Down ..... green light
Undercarriage Up ..... check, red light
Fuel ..... check
Fuel Selector >50 liters ..... main tank
Fuel Pressure ..... if low, pump
Carburetor heat ..... cold
Mixture ..... rich
Pitch Control ..... full forward
Throttle ..... partly open
Primer ..... use – locked

ENGINE START

Propeller Area ..... clear
Magnetos ..... contact, start
RPM ..... 1100 rpm
Oil Pressure ..... check, green arc
Mixture ..... standard

BEFORE ENGINE CHECK

Radio / Nav ..... on, tuned
Beacon ..... on
Nav. Light ..... on
Gyro Instruments ..... uncage
Engine Instruments ..... oil temp, pressure check
Doors / Hood ..... locked
Parking Brake ..... unlock

ENGINE CHECK

Mixture ..... rich
RPM ..... 1800 rpm
Pitch Control ..... pull lever full range, 3 times
Magnetos Check ..... drop max 100 rpm, max diff 50 rpm
Carburetor Heat ..... check
Charging ..... check, approx 28 V
Vacuum ..... check, green arc
Engine Instruments ..... oil temp, oil pressure - check
RPM ..... 1100 Rpm
Heading Gyro ..... adjusted
Altimeter ..... adjusted
Rudders ..... check
Flaps ..... check, take off
Trim ..... adjusted

BEFORE START

Pitch Control ..... full forward
Carburetor Heat ..... cold
Fuel ..... selector & pressure - check
Heading gyro ..... check
Altimeter ..... check
Flaps ..... take-off
Emergency Checklist ..... repeat

TAKE OFF

Throttle ..... full forward
Rotate ..... 100 km/h
Gear Up ..... green light off
RPM ..... 2400 RPM
Flaps ..... retract
Climb speed ..... 150 km/h

LEVEL FLIGHT

Effect Table ..... 60 cm / 2300 RPM
Mixture ..... adjusted
Engine Instruments ..... check
Cylinder Temperature ..... max 260 degrees
Carburetor Heat ..... check

LANDING

Inlet Pressure ..... 45 cm / 2200 RPM
Carburetor Heat ..... on
Fuel ..... check
Mixture ..... rich
Undercarriage ..... gear down (max 200 km/h)
Flaps ..... take-off (max 180 km/h)
Speed ..... 150 km/h
Final ..... 135 km/h
Flaps ..... landing
Pitch Control ..... full forward
Short Final ..... carburetor heat - off

PARKING

Parking Brake ..... on
Radio / Nav ..... off
Power Users ..... off
RPM ..... 800 RPM
Magnetos - Earth ..... check
Mixture ..... lean
Magnetos ..... off
Main DC ..... off
Gyro Instruments ..... locked
Fuel Selector ..... off

EMERGENCY CHECKLIST

Speed ..... 150 km/h
Carburetor Heat ..... on
Fuel Selector ..... shift
Mixture ..... rich
Fuel Pressure ..... pump
Pitch Control ..... full forward

CHECKLIST
SAAB 91D "Safir"
NORMAL PROCEDURES

PRE-FLIGHT CHECK

Outside Check ..... completed
Parking Brake ..... set
Controls ..... free
Battery + Alternator ..... on
Bar Switches ..... check on
Fuel Quantity ..... check
Fuel Selector ..... fuller tank
Cowl Flaps ..... open
Propeller ..... high RPM

STARTING ENGINE WHEN COLD

Throttle ..... open 1-2 cm
Ignition Switch M1
Booster Pump ..... on
Mixture ..... full rich until FF indicates then idle cut-off
Starter ..... engage
Mixture ..... move slowly to full rich when engine fires
Ignition Switch ..... both (M1 + M2)
Oil Pressure ..... check for rise within 30 sec
Booster Pump ..... off

STARTING ENGINE WHEN HOT

Throttle ..... open 1-2 cm
Ignition M1
Mixture ..... idle cut-off
Starter ..... engage
Mixture ..... move slowly to full rich when engine fires
Ignition Switch ..... both (M1 + M2)
Oil Pressure ..... check for rise within 30 sec

STARTING ENGINE WITH EXTERNAL POWER

Battery + Alternator ..... off
All Electrical Equipment ..... off
External Power Source ..... connect + switch on
Start Procedure ..... complete as above
Throttle ..... lowest possible setting

External Power Source ..... switch off + disconnect
Bat + Alternator ..... on
Amperemeter ..... check

WARM UP

Throttle ..... 1000 to 1200 RMP
Anticollision Light ..... on
Gyro Instruments ..... uncage
Radios ..... on as required

TAXIING

Parking Brake ..... release
Taxi Area ..... clear
Throttle ..... apply slowly
Brakes ..... check
Gyro Instruments ..... check

GROUND CHECK

Cylinder Head Temperature ..... green arc
Throttle ..... 1800 RMP
Magnetos ..... check (Max drop 175, max. difference in drop 50 RPM)
Propeller ..... exercise then high RPM
Suction Gage ..... within limits
Oil Pressure ..... within limits
Oil Temperature ..... within limits
Fuel Pressure ..... within limits
Alternate Air ..... check
Throttle ..... 1000 to 1200 RMP

CHECK BEFORE TAKE-OFF

Battery + Alternator ..... on
Ignition Switch ..... both
Flight Instruments ..... set and check
Engine Instruments ..... check
Fuel Quantity ..... check
Fuel Selector ..... check on proper tank
Mixture ..... full rich or adjusted
Booster Pump ..... on
Alternate Air ..... off
Cowl Flaps ..... open
Propeller ..... high RMP

Flaps..... set
Trims (Elev. + Rudder)..... set
Seat Belts..... fastened
Cabin Doors..... closed + locked

NORMAL TAKE-OFF

Directional Gyro..... check when lined up
Throttle..... open slowly
Accelerate to..... 60 KIAS
Nose Wheel..... lift off
Control Stick..... apply back pressure to rotate to climb attitude

SHORT FIELD TAKE-OFF

Directional Gyro..... check when lined up
Brakes..... hold
Throttle..... open slowly
Brakes..... release when full power
Accelerate to..... 60 KIAS
Control Stick..... apply back pressure to rotate positively to climb attitude
After Lift-Off..... maintain 60 KIAS
Gear..... up
Flaps..... retract slowly
Past Obstacle..... accelerate to 80 KIAS

AFTER TAKE-OFF

Gear..... up
Flaps..... up
Power..... set 25"/2500 RPM
Booster Pump..... off
Fuel Pressure..... check
Cowl Flaps..... open
Airspeed..... maintain 80-90 KIAS (cruise climb)

CRUISE

Normal Max. Cruise Power..... 75 %
Power..... set per table
Mixture..... adjust per EGT indicator

NOTE: Lean mixture in climb above 5000 ft and in all cruise operations is below 75 % power at all altitudes.

Cowl Flaps..... close

CHECK FOR APPROACH

Altimeter ..... set
Fuel Quantity ..... check
Fuel Selector ..... check on proper tank
Mixture ..... rich
Booster Pump ..... on
Power ..... reduce
Gear ..... down (Max. 95 KIAS)
Flaps ..... as required (Max. 83 KIAS)

FINAL CHECK

Gear ..... down + locked, light checked
Flaps ..... full down
Propeller ..... high RMP

OVERSHOOT

Throttle ..... open
Positive Climb ..... establish
Gear ..... up
Flaps ..... retract
Cowl Flaps ..... open
Booster Pump ..... off

AFTER CLEARING RUNWAY

Booster Pump ..... off
Flaps ..... up
Cowl Flaps ..... open

STOPPING ENGINE

Parking Brake ..... set
All Radios ..... off
All electrical equipment ..... off
Throttle ..... 1000 RMP for 1 minute
Mixture ..... idle cut-off
Ignition Switch ..... off, key removed
Battery + Alternator ..... off
Logbook ..... complete
ELT ..... off

EMERGENCY PROCEDURES

POWER LOSS DURING TAKE-OFF

If sufficient runway remains..... gear down, land straight ahead
If rough terrain is ahead or obstacles must be cleared..... gear up, land straight ahead

If sufficient altitude has been reached for restart:
Airspeed..... maintain safe
Fuel Selector ..... check on proper tank
Booster Pump .....check on
Mixture .....full rich
Alternate Air ..... on
If restart unsuccessful .....proceed with power off landing

POWER LOSS IN FLIGHT

Fuel Selector ..... check on tank containing fuel
Booster pump ..... on
Mixture .....rich
Alternate Air ..... on
Engine Instrument..... check for reason

NOTE: If no fuel pressure or flow is indicated, recheck fuel selector to be sure it is on tank containing fuel.

When power is restored:
Alternate Air ..... off
Booster Pump ..... off

POWER OFF LANDING

Airspeed.....trim for 81 KIAS
Landing Area .....establish
Gear Up or Down ..... decide

When committed:
Ignition..... off
Battery + Alternator ..... off
Fuel Selector ..... off
Mixture ..... idle cut-off
Seat Belts ..... tight

FIRE IN FLIGHT

Electrical Fire (smoke in cabin)
Battery + Alternator ..... off
Cabin Vents ..... open
Cabin Heat ..... off

Land as soon as practicable
Engine Fire
Fuel Selector ..... off
Throttle ..... full open
Mixture ..... idle cut-off
Booster Pump ..... check off
Heater + Vents ..... close
Proceed with power off landing

LOSS OF OIL PRESSURE

Land as soon as possible to investigate cause. Prepare for power off landing.

LOSS OF FUEL PRESSURE

Booster Pump ..... on
Fuel Selector ..... check

ALTERNATOR FAILURE

Electrical Load ..... reduce
Alternator Field C/B ..... check in
Alternator Output Switch ..... check on
Alternator Master Switch ..... off for 1 sec, then on
Amperemeter ..... check for output
If no output indicated:
Alternator Master Switch ..... off

NOTE: All electrical power will be drained from battery if alternator master switch is off. Observe voltmeter.

PROPELLER OVERSPEED

Throttle ..... retard
Airspeed ..... reduce
Oil Pressure ..... check
Propeller ..... full low RPM, then set to position giving control, if any
Throttle ..... as required to remain below 2700 RPM

SAAB 91 SAFIR X QUICK-FLIGHT GUIDE

In real life, every flight begins with an external and internal inspection, but we trust you have already checked everything. So, take away all the covers, remove those parking drags from the aircraft, and get in! Fasten your seat-belts and commence the checklist procedures to start the engine.

When you are ready to taxi, note that the nose gear is self-turning and cannot be controlled, so use differential brakes to turn. RPMs for taxiing should not exceed the 1500. Easily roll into the runway and get in position for take-off.

Set the flaps to the take-off position and gently push the throttle to the maximum. During the run, use rudders to keep the aircraft steady. At around 125 km/h, slowly pull the stick and start climbing.

During climbs it is normal to use full throttle, rich mixture, and propeller lever also full forward (small pitch on the prop). Climb speeds are: 135 km/h for a quick climb and 150 km/h for a normal one. Use the trimmer lever to ease pitch pressure. The Safir will cease climbing at 4600 m, which is its maximum ceiling.

Here you are, cruising on the Safir! Optimum settings for cruise are: 75% throttle, lean the mixture according to height, propeller lever set to maintain about 2350 RPM. Cruise speed is 235 km/h. Correct settings will provide you with consistent fuel consumptions and flight distances every time.

About to land, set mixture lever into the rich position, reduce throttle and lower the gear (maximum speed with gear down is 200 km/h), flaps full down (take out the first step of flaps below the 175 km/h maximum). Remember to push the prop lever fully forward when you take out the first step of flaps. Keep the speed around 150 km/h, and the vertical descent speed around 3 m/sec. Your speed on finals should be 135 km/h, and for the minimal landing distance touch-down speed should be about 100 km/h.

After touch-down reduce throttle slowly to idle, pull the stick and reduce speed with the help of the brakes. Roll gently to the hangar, follow the after-flight and shut-down procedures, and relax.

Hope you had a nice Safir experience ☺

AEROBATICS

The SAAB 91 Safir is able to perform aerobatic maneuvers, and if you follow the following instructions you will be able to perform them flawlessly. Due to limitations in the FS2004 code, the most realistic effects cannot be duplicated, though.

Swings

To perform this manoeuvre you need to commence at 250 km/h. Lift the nose and simultaneously start banking in the direction you want to start the swings.

When the aircraft reaches enough bank the nose will stop lifting, and the "swing movement" will begin. At this point you have maximum angle of attack for this maneuver.

Increase slowly the bank angle until the nose has dropped to "just above" the horizon (the bank angle should be 90 degrees). When the nose has just dropped below the horizon, start banking the aircraft into the opposite direction, but maintaining elevator deflection.

As the banking decreases, the nose will naturally rise again if you keep elevator deflection. When you reach the bottom of a swing you can proceed into a new one by maintaining deflection in all rudders.

Loops

Start off by selecting a visual cue in the terrain just in front of you. Then drop the nose and increase speed and maintain the course. Keep wings level and yaw centred (use the "ball").

When airspeed reaches 275 km/h check for clear sky above you and raise the nose. Look straight forward. Be sure that the nose rises straight up before the horizon disappears under the nose. Check by peripheral sight that your wings are still level and not rolling in any direction. Adjust the g-load with the stick so that the "turn speed" is the one you need. Maintain course.

"Catch" the horizon when you come closer to inverted flight, but also keep the nose of the aircraft in sight. Thus you can still prevent gyro effects with the rudder. Correct roll, if needed, to maintain the wings level while inverted.

Airspeed is very low at the top of the loop, with decreased effect on all rudders as a consequence. Therefore you need more rudder and aileron deflection to maintain course and level flight. The g-load should be positive throughout the whole manoeuvre. At the top of the loop your butt should be just about touching the seat. On the way down keep looking forward. Use peripheral vision to correct any roll tendencies.

Maintain course and catch the terrain mark you selected at the beginning of the manoeuvre, but still keep the nose of the aircraft in sight so you will be able to steer it towards the mark. Finish the loop in a positive angle of attack, to use the excess speed to gain height before the next manoeuvre.

Well done!

Rolls

Pick a visual cue in the terrain just in front of you, and enter the manoeuvre at a speed of 225 km/h. Raise the nose to about 15 degrees above the horizon.

Then, still maintaining the pitch up at 15 degrees, start rolling with ailerons and rudder. Maintain roll deflection and ease up on the rudder as needed during the first 90 degrees of the manoeuvre, so that the nose stays against the visual cue and well above the horizon (15 degrees).

Maintain positive G during the inverted part of the manoeuvre. Push the stick just a bit forward, and let the nose drop slowly during the rest of the roll. Adjust the ending of the roll so that the manoeuvre ends at level flight, and 10 degrees below the line of the horizon. Compensate the "downwards tendency" of the aircraft with rudder, and maintain course using the visual cue.

When the wings become level, raise the nose into level flight and try to finish the roll at the same height you started the roll.

Stall turn (Hammer-head)

Select a visual cue such as a straight road or rail tracks. Initial speed for this manoeuvre should be 300 km/h.

Check the sky above the aircraft, and start raising the nose as if to perform a loop. Look at the wingtips. Stop raising the nose at 80-85 degrees to prevent loosing engine power. Keep the aircraft steady at loop-and-roll plane.

At about 120 km/h, start applying rudder incrementally. If you do the manoeuvre to the left, the slipstream will help you turn around. Keep both the wingtip and the nose of the aircraft in sight using your peripheral vision. This way you will ensure the aircraft only turns around the yaw-axe.

Keep elevator neutral. Adjust roll movement with ailerons. When the nose reaches horizontal position simply follow the nose movement to descend in the vertical. Catch your visual cue and cancel the movement with rudder. Start raising the nose gently. Try to finish the manoeuvre at about 250 km/h.

Practice both left and right-hand stall turns. Note that in a right-hand stall turn the rudder deflection should be started at 130 km/h, and it's crucial to initially give about half rudder deflection to ensure that the aircraft begins the yaw movement.

After that, you need to increase to full right rudder. To make sure you get full slipstream, decrease power to about 25% after setting full rudder deflection.

(This chapter was kindly provided by Stefan Frisk, a real-life pilot and teacher in glider-aerobatics. He also owns a SAAB 91B Safir, the SE-KGZ).

CONTACTS

If you have any questions, comments, suggestions, or need any additional information concerning the SibWings SAAB 91 Safir X add-on, please email us at: info@sibwings.com

For technical support the fastest way is always the forum, where you will get prompt answers by our team members and users: http://forum.sibwings.com

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